Red Hat OpenShift Service on AWS 4

Service Mesh

Service Mesh installation, usage, and release notes

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Abstract

This document provides information on how to use Service Mesh in Red Hat OpenShift Service on AWS.

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CHAPTER 1. SERVICE MESH 2.X

1.1. ABOUT OPENSHIFT SERVICE MESH

NOTE

Because Red Hat OpenShift Service Mesh releases on a different cadence from Red Hat OpenShift Service on AWS and because the Red Hat OpenShift Service Mesh Operator supports deploying multiple versions of the **ServiceMeshControlPlane**, the Service Mesh documentation does not maintain separate documentation sets for minor versions of the product. The current documentation set applies to the most recent version of Service Mesh unless version-specific limitations are called out in a particular topic or for a particular feature.

For additional information about the Red Hat OpenShift Service Mesh life cycle and supported platforms, refer to the Platform Life Cycle Policy.

1.1.1. Introduction to Red Hat OpenShift Service Mesh

Red Hat OpenShift Service Mesh addresses a variety of problems in a microservice architecture by creating a centralized point of control in an application. It adds a transparent layer on existing distributed applications without requiring any changes to the application code.

Microservice architectures split the work of enterprise applications into modular services, which can make scaling and maintenance easier. However, as an enterprise application built on a microservice architecture grows in size and complexity, it becomes difficult to understand and manage. Service Mesh can address those architecture problems by capturing or intercepting traffic between services and can modify, redirect, or create new requests to other services.

Service Mesh, which is based on the open source Istio project, provides an easy way to create a network of deployed services that provides discovery, load balancing, service-to-service authentication, failure recovery, metrics, and monitoring. A service mesh also provides more complex operational functionality, including A/B testing, canary releases, access control, and end-to-end authentication.

NOTE

Red Hat OpenShift Service Mesh 3 is generally available. For more information, see Red Hat OpenShift Service Mesh 3.0.

1.1.2. Core features

Red Hat OpenShift Service Mesh provides a number of key capabilities uniformly across a network of services:

- **Traffic Management** - Control the flow of traffic and API calls between services, make calls more reliable, and make the network more robust in the face of adverse conditions.
- **Service Identity and Security**- Provide services in the mesh with a verifiable identity and provide the ability to protect service traffic as it flows over networks of varying degrees of trustworthiness.
- **Policy Enforcement** - Apply organizational policy to the interaction between services, ensure access policies are enforced and resources are fairly distributed among consumers. Policy changes are made by configuring the mesh, not by changing application code.

- **Telemetry** - Gain understanding of the dependencies between services and the nature and flow of traffic between them, providing the ability to quickly identify issues.

1.2. SERVICE MESH RELEASE NOTES

1.2.1. Red Hat OpenShift Service Mesh version 2.6.11

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.11, and includes the **ServiceMeshControlPlane** resource version updates for 2.6.11.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

The most current version of the Red Hat OpenShift Service Mesh Operator can be used with all supported versions of Service Mesh. The version of Service Mesh is specified using the **ServiceMeshControlPlane**.

You can use the most current version of the Kiali Operator provided by Red Hat with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.1.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7
Kiali Server	1.73

1.2.2. Red Hat OpenShift Service Mesh version 2.6.10

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.10, and includes the **ServiceMeshControlPlane** resource version updates for 2.6.10.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

You can use the most current version of the Kiali Operator provided by Red Hat with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.2.1. Component updates

Component	Version
Istio	1.20.8

Component	Version
Envoy Proxy	1.28.7
Kiali Server	1.73

1.2.3. Red Hat OpenShift Service Mesh version 2.6.9

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.9, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.9 and 2.5.12.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

You can use the most current version of the Kiali Operator provided by Red Hat with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.3.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7
Kiali Server	1.73.22

1.2.4. Red Hat OpenShift Service Mesh version 2.5.12

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.9 and is supported on Red Hat OpenShift Service on AWS 4.14 and later. This release addresses Common Vulnerabilities and Exposures (CVEs).

1.2.4.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.22

1.2.5. Red Hat OpenShift Service Mesh version 2.6.8

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.8, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.8 and 2.5.11.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

You can use the most current version of the Kiali Operator provided by Red Hat with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.5.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7
Kiali Server	1.73.21

1.2.6. Red Hat OpenShift Service Mesh version 2.5.11

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.8 and is supported on Red Hat OpenShift Service on AWS 4.14 and later. This release addresses Common Vulnerabilities and Exposures (CVEs).

1.2.6.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.21

1.2.7. Red Hat OpenShift Service Mesh version 2.6.7

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.7, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.7 and 2.5.10.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

You can use the most current version of the Kiali Operator provided by Red Hat with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh is specified by using the **ServiceMeshControlPlane** resource. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.7.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7
Kiali Server	1.73.20

1.2.8. Red Hat OpenShift Service Mesh version 2.5.10

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.7 and is supported on Red Hat OpenShift Service on AWS 4.14 and later. This release addresses Common Vulnerabilities and Exposures (CVEs).

1.2.8.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.20

1.2.9. Red Hat OpenShift Service Mesh version 2.6.6

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.6, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.6, 2.5.9, and 2.4.15.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

You can use the most current version of the Kiali Operator provided by Red Hat with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh is specified by using the **ServiceMeshControlPlane** resource. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.9.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7

Component	Version
Kiali Server	1.73.19

1.2.9.2. New features

- With this update, the Operator for Red Hat OpenShift Service Mesh 2.6 is renamed to Red Hat OpenShift Service Mesh 2 to align with the release of Red Hat OpenShift Service Mesh 3.0 and improve clarity.

1.2.10. Red Hat OpenShift Service Mesh version 2.5.9

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.6 and is supported on Red Hat OpenShift Service on AWS 4.14 and later. This release addresses Common Vulnerabilities and Exposures (CVEs).

1.2.10.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.19

1.2.11. Red Hat OpenShift Service Mesh version 2.4.15

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.6 and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

1.2.11.1. Component updates

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali Server	1.65.20

1.2.12. Red Hat OpenShift Service Mesh version 2.6.5

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.5, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.5, 2.5.8, and 2.4.14.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

You can use the most current version of the Kiali Operator provided by Red Hat with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh is specified by using the **ServiceMeshControlPlane** resource. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.12.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7
Kiali Server	1.73.18

1.2.12.2. New features

- Red Hat OpenShift Distributed Tracing Platform Stack is now supported on IBM Z.

1.2.12.3. Fixed issues

- OSSM-8608 Previously, terminating a Container Network Interface (CNI) pod during the installation phase while copying binaries could leave Istio-CNI temporary files on the node file system. Repeated occurrences could eventually fill up the node disk space. Now, while terminating a CNI pod during the installation phase, existing temporary files are deleted before copying the CNI binary, ensuring that only one temporary file per Istio version exists on the node file system.

1.2.13. Red Hat OpenShift Service Mesh version 2.5.8

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.5 and is supported on Red Hat OpenShift Service on AWS 4.14 and later. This release addresses Common Vulnerabilities and Exposures (CVEs).

1.2.13.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.18

1.2.13.2. Fixed issues

- OSSM-8608 Previously, terminating a Container Network Interface (CNI) pod during the installation phase while copying binaries could leave Istio-CNI temporary files on the node file system. Repeated occurrences could eventually fill up the node disk space. Now, while terminating a CNI pod during the installation phase, existing temporary files are deleted before copying the CNI binary, ensuring that only one temporary file per Istio version exists on the node file system.

1.2.14. Red Hat OpenShift Service Mesh version 2.4.14

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.5 and is supported on Red Hat OpenShift Service on AWS 4.14 and later. This release addresses Common Vulnerabilities and Exposures (CVEs).

1.2.14.1. Component updates

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali Server	1.65.19

1.2.14.2. Fixed issues

- OSSM-8608 Previously, terminating a Container Network Interface (CNI) pod during the installation phase while copying binaries could leave Istio-CNI temporary files on the node file system. Repeated occurrences could eventually fill up the node disk space. Now, while terminating a CNI pod during the installation phase, existing temporary files are deleted before copying the CNI binary, ensuring that only one temporary file per Istio version exists on the node file system.

1.2.15. Red Hat OpenShift Service Mesh version 2.6.4

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.4, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.4, 2.5.7, and 2.4.13.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

The most current version of the Kiali Operator provided by Red Hat can be used with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh is specified by using the **ServiceMeshControlPlane** resource. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.15.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7
Kiali Server	1.73.17

1.2.16. Red Hat OpenShift Service Mesh version 2.5.7

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.4 and is supported on Red Hat OpenShift Service on AWS 4.14 and later. This release addresses Common Vulnerabilities and Exposures (CVEs).

1.2.16.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.17

1.2.17. Red Hat OpenShift Service Mesh version 2.4.13

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.4 and is supported on Red Hat OpenShift Service on AWS 4.14 and later. This release addresses Common Vulnerabilities and Exposures (CVEs).

1.2.17.1. Component updates

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali Server	1.65.18

1.2.18. Red Hat OpenShift Service Mesh version 2.6.3

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.3, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.3, 2.5.6, and 2.4.12.

This release addresses Common Vulnerabilities and Exposures (CVEs) and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

The most current version of the Kiali Operator provided by Red Hat can be used with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh is specified by using the **ServiceMeshControlPlane** resource. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.18.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7
Kiali Server	1.73.16

1.2.19. Red Hat OpenShift Service Mesh version 2.5.6

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.3, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

1.2.19.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.16

1.2.20. Red Hat OpenShift Service Mesh version 2.4.12

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.3, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

1.2.20.1. Component updates

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12

Component	Version
Kiali Server	1.65.17

1.2.21. Red Hat OpenShift Service Mesh version 2.6.2

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.2, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.2, 2.5.5 and 2.4.11.

This release addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

The most current version of the Kiali Operator provided by Red Hat can be used with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh is specified by using the **ServiceMeshControlPlane** resource. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.21.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.7
Kiali Server	1.73.15

1.2.21.2. New features

- The cert-manager Operator for Red Hat OpenShift is now supported on IBM Power, IBM Z, and IBM® LinuxONE.

1.2.21.3. Fixed issues

- OSSM-8099 Previously, there was an issue supporting persistent session labels when the endpoints were in the draining phase. Now, there is a method of handling draining endpoints for the stateful header sessions.
- OSSM-8001 Previously, when **runAsUser** and **runAsGroup** were set to the same value in pods, the proxy GID was incorrectly set to match the container's GID, causing traffic interception issues with iptables rules applied by Istio CNI. Now, containers can have the same value for runAsUser and runAsGroup, and iptables rules apply correctly.
- OSSM-8074 Previously, the Kiali Operator failed to install the Kiali server when a Service Mesh had a numeric-only namespace (e.g., **12345**). Now, namespaces with only numerals work correctly.

1.2.22. Red Hat OpenShift Service Mesh version 2.5.5

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.2, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

1.2.22.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.15

1.2.22.2. Fixed issues

- OSSM-8001 Previously, when the **runAsUser** and **runAsGroup** parameters were set to the same value in pods, the proxy GID was incorrectly set to match the container's GID, causing traffic interception issues with iptables rules applied by Istio CNI. Now, containers can have the same value for the **runAsUser** and **runAsGroup** parameters, and iptables rules apply correctly.
- OSSM-8074 Previously, the Kiali Operator provided by Red Hat failed to install the Kiali Server when a Service Mesh had a numeric-only namespace (e.g., **12345**). Now, namespaces with only numerals work correctly.

1.2.23. Red Hat OpenShift Service Mesh version 2.4.11

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.2, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

1.2.23.1. Component updates

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali Server	1.65.16

1.2.23.2. Fixed issues

- OSSM-8001 Previously, when the **runAsUser** and **runAsGroup** parameters were set to the same value in pods, the proxy GID was incorrectly set to match the container's GID, causing traffic interception issues with iptables rules applied by Istio CNI. Now, containers can have the same value for the **runAsUser** and **runAsGroup** parameters, and iptables rules apply correctly.

- OSSM-8074 Previously, the Kiali Operator provided by Red Hat failed to install the Kiali Server when a Service Mesh had a numeric-only namespace (e.g., **12345**). Now, namespaces with only numerals work correctly.

1.2.24. Red Hat OpenShift Service Mesh version 2.6.1

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.1, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.1, 2.5.4 and 2.4.10. This release addresses Common Vulnerabilities and Exposures (CVEs), contains a bug fix, and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

The most current version of the Kiali Operator provided by Red Hat can be used with all supported versions of Red Hat OpenShift Service Mesh. The version of Service Mesh is specified by using the **ServiceMeshControlPlane** resource. The version of Service Mesh automatically ensures a compatible version of Kiali.

1.2.24.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.5
Kiali Server	1.73.14

1.2.24.2. Fixed issues

- OSSM-6766 Previously, the OpenShift Service Mesh Console (OSSMC) plugin failed if the user wanted to update a namespace (for example, enabling or disabling injection), or create any Istio object (for example, creating traffic policies). Now, the OpenShift Service Mesh Console (OSSMC) plugin does not fail if the user updates a namespace or creates any Istio object.

1.2.25. Red Hat OpenShift Service Mesh version 2.5.4

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.1, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

1.2.25.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali Server	1.73.14

1.2.26. Red Hat OpenShift Service Mesh version 2.4.10

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.1, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

1.2.26.1. Component updates

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali Server	1.65.15

1.2.27. Red Hat OpenShift Service Mesh version 2.6.0

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.6.0, and includes the following **ServiceMeshControlPlane** resource version updates: 2.6.0, 2.5.3 and 2.4.9. This release adds new features, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.14 and later.

This release ends maintenance support for Red Hat OpenShift Service Mesh version 2.3. If you are using Service Mesh version 2.3, you should update to a supported version.

IMPORTANT

Red Hat OpenShift Service Mesh is designed for FIPS. Service Mesh uses the RHEL cryptographic libraries that have been submitted to NIST for FIPS 140-2/140-3 Validation on the x86_64, ppc64le, and s390x architectures. For more information about the NIST validation program, see Cryptographic Module Validation Program. For the latest NIST status for the individual versions of RHEL cryptographic libraries that have been submitted for validation, see Compliance Activities and Government Standards.

1.2.27.1. Component updates

Component	Version
Istio	1.20.8
Envoy Proxy	1.28.5
Kiali	1.73.9

1.2.27.2. Istio 1.20 support

Service Mesh 2.6 is based on Istio 1.20, which provides new features and product enhancements, including:

- Native sidecars are supported on Red Hat OpenShift Service on AWS 4.16 or later.

  Example ServiceMeshControlPlane resource

  ```
  apiVersion: maistra.io/v2
  kind: ServiceMeshControlPlane
  metadata:
    name: basic
  spec:
    runtime:
      components:
        pilot:
          container:
            env:
              ENABLE_NATIVE_SIDECARS: "true"
  ```

- Traffic mirroring in Istio 1.20 now supports multiple destinations. This feature enables the mirroring of traffic to various endpoints, allowing for simultaneous observation across different service versions or configurations.

While Red Hat OpenShift Service Mesh supports many Istio 1.20 features, the following exceptions should be noted:

- Ambient mesh is not supported
- QuickAssist Technology (QAT) PrivateKeyProvider in Istio is not supported

1.2.27.3. Istio and Kiali bundle image name changes

This release updates the Istio bundle image name and the Kiali bundle image name to better align with Red Hat naming conventions.

- Istio bundle image name: **openshift-service-mesh/istio-operator-bundle**
- Kiali bundle image name: **openshift-service-mesh/kiali-operator-bundle**

1.2.27.4. Integration with Red Hat OpenShift Distributed Tracing Platform and Red Hat build of OpenTelemetry

This release introduces a generally available integration of the tracing extension provider(s) Red Hat OpenShift Distributed Tracing Platform and Red Hat build of OpenTelemetry.

You can expose tracing data to the Red Hat OpenShift Distributed Tracing Platform by appending a named element and the **opentelemetry** provider to the **spec.meshConfig.extensionProviders** specification in the **ServiceMehControlPlane** resource. Then, a telemetry custom resource configures Istio proxies to collect trace spans and send them to the OpenTelemetry Collector endpoint.

You can create a Red Hat build of OpenTelemetry instance in a mesh namespace and configure it to send tracing data to a tracing platform backend service.

1.2.27.5. Red Hat OpenShift Distributed Tracing Platform (Jaeger) default setting change

This release disables Red Hat OpenShift Distributed Tracing Platform (Jaeger) by default for new instances of the **ServiceMeshControlPlane** resource.

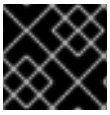
When updating existing instances of the **ServiceMeshControlPlane** resource to Red Hat OpenShift Service Mesh version 2.6, Distributed Tracing Platform (Jaeger) remains enabled by default.

Red Hat OpenShift Service Mesh 2.6 is the last release that includes support for Red Hat OpenShift Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator. Both Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator will be removed in the next release. If you are currently using Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator, you need to switch to Red Hat OpenShift Distributed Tracing Platform and Red Hat build of OpenTelemetry.

1.2.27.6. Gateway API use is generally available for Red Hat OpenShift Service Mesh cluster-wide deployments

This release introduces the General Availability for using the Kubernetes Gateway API version 1.0.0 with Red Hat OpenShift Service Mesh 2.6. This API use is limited to Red Hat OpenShift Service Mesh. The Gateway API custom resource definitions (CRDs) are not supported.

Gateway API is now enabled by default if cluster-wide mode is enabled (**spec.mode: ClusterWide**). It can be enabled even if the custom resource definitions (CRDs) are not installed in the cluster.



IMPORTANT

Gateway API for multitenant mesh deployments is still in Technology Preview.

Refer to the following table to determine which Gateway API version should be installed with the OpenShift Service Mesh version you are using:

Service Mesh Version	Istio Version	Gateway API Version	Notes
2.6	1.20.x	1.0.0	N/A
2.5.x	1.18.x	0.6.2	Use the experimental branch because **ReferenceGrand** is missing in v0.6.2.
2.4.x	1.16.x	0.5.1	For multitenant mesh deployment, all Gateway API CRDs must be present. Use the experimental branch.

You can disable this feature by setting **PILOT_ENABLE_GATEWAY_API** to **false**:

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  runtime:
    components:
      pilot:
```

```
container:
  env:
    PILOT_ENABLE_GATEWAY_API: "false"
```

1.2.27.7. Fixed issues

- OSSM-6754 Previously, in Red Hat OpenShift Service on AWS 4.15, when users navigated to a **Service details** page, clicked the **Service Mesh** tab, and refreshed the page, the **Service Mesh details** page remained stuck on Service Mesh content information, even though the active tab was the default **Details** tab. Now, after a refresh, users can navigate through the different tabs of the **Service details** page without issue.
- OSSM-2101 Previously, the Istio Operator never deleted the **istio-cni-node** DaemonSet and other CNI resources when they were no longer needed. Now, after upgrading the Operator, if there is at least one SMCP installed in the cluster, the Operator reconciles this SMCP, and then deletes all unused CNI installations (even very old CNI versions as early as v2.0).

1.2.27.8. Kiali known issues

- OSSM-6099 Installing the OpenShift Service Mesh Console (OSSMC) plugin fails on an IPv6 cluster.
  Workaround: Install the OSSMC plugin on an IPv4 cluster.

1.2.28. Red Hat OpenShift Service Mesh version 2.5.3

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.0, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

1.2.28.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali	1.73.9

1.2.29. Red Hat OpenShift Service Mesh version 2.4.9

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.6.0, addresses Common Vulnerabilities and Exposures (CVEs), and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

1.2.29.1. Component updates

Component	Version
Istio	1.16.7

Component	Version
Envoy Proxy	1.24.12
Kiali	1.65.11

1.2.30. Red Hat OpenShift Service Mesh version 2.5.2

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.5.2, and includes the following **ServiceMeshControlPlane** resource version updates: 2.5.2, 2.4.8 and 2.3.12. This release addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

1.2.30.1. Component updates

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali	1.73.8

1.2.30.2. Fixed issues

- OSSM-6331 Previously, the **smcp.general.logging.componentLevels** spec accepted invalid **LogLevel** values, and the **ServiceMeshControlPlane** resource was still created. Now, the terminal shows an error message if an invalid value is used, and the control plane is not created.
- OSSM-6290 Previously, the **Project** filter drop-down of the **Istio Config** list page did not work correctly. All **istio config** items were displayed from all namespaces even if you selected a specific project from the drop-down menu. Now, only the **istio config** items that belong to the selected project in the filter drop-down are displayed.
- OSSM-6298 Previously, when you clicked an item reference within the OpenShift Service Mesh Console (OSSMC) plugin, the console sometimes performed multiple redirects before opening the desired page. As a result, navigating back to the previous page that was open in the console caused your web browser to open the wrong page. Now, these redirects do not occur, and clicking **Back** in a web browser opens the correct page.
- OSSM-6299 Previously, in Red Hat OpenShift Service on AWS 4.15, when you clicked the **Node graph** menu option of any node menu within the traffic graph, the node graph was not displayed. Instead, the page refreshed with the same traffic graph. Now, clicking the **Node graph** menu option correctly displays the node graph.
- OSSM-6267 Previously, configuring a data source in Red Hat OpenShift Service Mesh 2.5 Grafana caused a data query authentication error, and users could not view data in the Istio service and workload dashboards. Now, upgrading an existing 2.5 SMCP to version 2.5.2 or later resolves the Grafana error.

1.2.31. Red Hat OpenShift Service Mesh version 2.4.8

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.5.2, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

The most current version of the Red Hat OpenShift Service Mesh Operator can be used with all supported versions of Service Mesh. The version of Service Mesh is specified using the **ServiceMeshControlPlane**.

1.2.31.1. Component updates

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali	1.65.11

1.2.32. Red Hat OpenShift Service Mesh version 2.3.12

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.5.2, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

The most current version of the Red Hat OpenShift Service Mesh Operator can be used with all supported versions of Service Mesh. The version of Service Mesh is specified using the **ServiceMeshControlPlane** resource.

1.2.32.1. Component updates

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.11
Kiali	1.57.14

1.2.33. Previous releases

These previous releases added features and improvements.

1.2.33.1. New features Red Hat OpenShift Service Mesh version 2.5.1

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.5.1, and includes the following **ServiceMeshControlPlane** resource version updates: 2.5.1, 2.4.7 and 2.3.11.

This release addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

1.2.33.1.1. Component versions for Red Hat OpenShift Service Mesh version 2.5.1

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali	1.73.7

1.2.33.2. New features Red Hat OpenShift Service Mesh version 2.5

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.5.0, and includes the following **ServiceMeshControlPlane** resource version updates: 2.5.0, 2.4.6 and 2.3.10.

This release adds new features, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

This release ends maintenance support for OpenShift Service Mesh version 2.2. If you are using OpenShift Service Mesh version 2.2, you should update to a supported version.

1.2.33.2.1. Component versions for Red Hat OpenShift Service Mesh version 2.5

Component	Version
Istio	1.18.7
Envoy Proxy	1.26.8
Kiali	1.73.4

1.2.33.2.2. Istio 1.18 support

Service Mesh 2.5 is based on Istio 1.18, which brings in new features and product enhancements. While Red Hat OpenShift Service Mesh supports many Istio 1.18 features, the following exceptions should be noted:

- Ambient mesh is not supported
- QuickAssist Technology (QAT) PrivateKeyProvider in Istio is not supported

1.2.33.2.3. Cluster-Wide mesh migration

This release adds documentation for migrating from a multitenant mesh to a cluster-wide mesh. For more information, see the following documentation:

- "About migrating to a cluster-wide mesh"
- "Excluding namespaces from a cluster-wide mesh"
- "Defining which namespaces receive sidecar injection in a cluster-wide mesh"
- "Excluding individual pods from a cluster-wide mesh"

1.2.33.2.4. Red Hat OpenShift Service Mesh Operator on ARM-based clusters

This release provides the Red Hat OpenShift Service Mesh Operator on ARM-based clusters as a generally available feature.

1.2.33.2.5. Integration with Red Hat OpenShift Distributed Tracing Platform (Tempo) Stack

This release introduces a generally available integration of the tracing extension provider(s). You can expose tracing data to the Red Hat OpenShift Distributed Tracing Platform (Tempo) stack by appending a named element and the **zipkin** provider to the **spec.meshConfig.extensionProviders** specification. Then, a telemetry custom resource configures Istio proxies to collect trace spans and send them to the Tempo distributor service endpoint.

NOTE

Red Hat OpenShift Distributed Tracing Platform (Tempo) Stack is not supported on IBM Z.

1.2.33.2.6. OpenShift Service Mesh Console plugin

This release introduces a generally available version of the OpenShift Service Mesh Console (OSSMC) plugin.

The OSSMC plugin is an extension to the OpenShift Console that provides visibility into your Service Mesh. With the OSSMC plugin installed, a new Service Mesh menu option is available on the navigation pane of the web console, as well as new Service Mesh tabs that enhance existing Workloads and Service console pages.

The features of the OSSMC plugin are very similar to those of the standalone Kiali Console. The OSSMC plugin does not replace the Kiali Console, and after installing the OSSMC plugin, you can still access the standalone Kiali Console.

1.2.33.2.7. Istio OpenShift Routing (IOR) default setting change

The default setting for Istio OpenShift Routing (IOR) has changed. Starting with this release, automatic routes are disabled by default for new instances of the **ServiceMeshControlPlane** resource.

For new instances of the **ServiceMeshControlPlane** resources, you can use automatic routes by setting the **enabled** field to **true** in the **gateways.openshiftRoute** specification of the **ServiceMeshControlPlane** resource.

Example ServiceMeshControlPlane resource

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
spec:
```

```
gateways:
  openshiftRoute:
    enabled: true
```

When updating existing instances of the **ServiceMeshControlPlane** resource to Red Hat OpenShift Service Mesh version 2.5, automatic routes remain enabled by default.

1.2.33.2.8. Istio proxy concurrency configuration enhancement

The **concurrency** parameter in the **networking.istio** API configures how many worker threads the Istio proxy runs.

For consistency across deployments, Istio now configures the **concurrency** parameter based upon the CPU limit allocated to the proxy container. For example, a limit of 2500m would set the **concurrency** parameter to **3**. If you set the **concurrency** parameter to a different value, then Istio uses that value to configure how many threads the proxy runs instead of using the CPU limit.

Previously, the default setting for the parameter was **2**.

1.2.33.2.9. Gateway API CRD versions

IMPORTANT

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

For more information about the support scope of Red Hat Technology Preview features, see Technology Preview Features Support Scope .

A new version of the Gateway API custom resource definition (CRD) is now available. Refer to the following table to determine which Gateway API version should be installed with the OpenShift Service Mesh version you are using:

Service Mesh Version	Istio Version	Gateway API Version	Notes
2.5.x	1.18.x	0.6.2	Use the experimental branch because **ReferenceGrand** is missing in v0.6.2
2.4.x	1.16.x	0.5.1	For multitenant mesh deployment, all Gateway API CRDs must be present. Use the experimental branch.

1.2.33.3. New features Red Hat OpenShift Service Mesh version 2.4.7

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.5.1, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

1.2.33.3.1. Component versions for Red Hat OpenShift Service Mesh version 2.4.7

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali	1.65.11

1.2.33.4. New features Red Hat OpenShift Service Mesh version 2.4.6

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.5.0, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

1.2.33.4.1. Component versions for Red Hat OpenShift Service Mesh version 2.4.6

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali	1.65.11

1.2.33.5. New features Red Hat OpenShift Service Mesh version 2.4.5

This release of Red Hat OpenShift Service Mesh updates the Red Hat OpenShift Service Mesh Operator version to 2.4.5, and includes the following **ServiceMeshControlPlane** resource version updates: 2.4.5, 2.3.9 and 2.2.12.

This release addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.11 and later.

1.2.33.5.1. Component versions included in Red Hat OpenShift Service Mesh version 2.4.5

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Kiali	1.65.11

Component	Version

1.2.33.6. New features Red Hat OpenShift Service Mesh version 2.4.4

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.11 and later versions.

1.2.33.6.1. Component versions included in Red Hat OpenShift Service Mesh version 2.4.4

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.12
Jaeger	1.47.0
Kiali	1.65.10

1.2.33.7. New features Red Hat OpenShift Service Mesh version 2.4.3

- The **envoyExtAuthzGrpc** field has been added, which is used to configure an external authorization provider using the gRPC API.
- Common Vulnerabilities and Exposures (CVEs) have been addressed.
- This release is supported on Red Hat OpenShift Service on AWS 4.10 and newer versions.

1.2.33.7.1. Component versions included in Red Hat OpenShift Service Mesh version 2.4.3

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.10
Jaeger	1.42.0
Kiali	1.65.8

1.2.33.7.2. Remote Procedure Calls (gRPC) API support for external authorization configuration

This enhancement adds the **envoyExtAuthzGrpc** field to configure an external authorization provider using the gRPC API.

1.2.33.8. New features Red Hat OpenShift Service Mesh version 2.4.2

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.8.1. Component versions included in Red Hat OpenShift Service Mesh version 2.4.2

Component	Version
Istio	1.16.7
Envoy Proxy	1.24.10
Jaeger	1.42.0
Kiali	1.65.7

1.2.33.9. New features Red Hat OpenShift Service Mesh version 2.4.1

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.9.1. Component versions included in Red Hat OpenShift Service Mesh version 2.4.1

Component	Version
Istio	1.16.5
Envoy Proxy	1.24.8
Jaeger	1.42.0
Kiali	1.65.7

1.2.33.10. New features Red Hat OpenShift Service Mesh version 2.4

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.10.1. Component versions included in Red Hat OpenShift Service Mesh version 2.4

Component	Version
Istio	1.16.5

Component	Version
Envoy Proxy	1.24.8
Jaeger	1.42.0
Kiali	1.65.6

1.2.33.10.2. Cluster-wide deployments

This enhancement introduces a generally available version of cluster-wide deployments. A cluster-wide deployment contains a service mesh control plane that monitors resources for an entire cluster. The control plane uses a single query across all namespaces to monitor each Istio or Kubernetes resource that affects the mesh configuration. Reducing the number of queries the control plane performs in a cluster-wide deployment improves performance.

1.2.33.10.3. Support for discovery selectors

This enhancement introduces a generally available version of the **meshConfig.discoverySelectors** field, which can be used in cluster-wide deployments to limit the services the service mesh control plane can discover.

```
spec:
  meshConfig
    discoverySelectors:
    - matchLabels:
        env: prod
        region: us-east1
    - matchExpressions:
      - key: app
        operator: In
        values:
          - cassandra
          - spark
```

1.2.33.10.4. Integration with cert-manager istio-csr

With this update, Red Hat OpenShift Service Mesh integrates with the **cert-manager** controller and the **istio-csr** agent. **cert-manager** adds certificates and certificate issuers as resource types in Kubernetes clusters, and simplifies the process of obtaining, renewing, and using those certificates. **cert-manager** provides and rotates an intermediate CA certificate for Istio. Integration with **istio-csr** enables users to delegate signing certificate requests from Istio proxies to **cert-manager**. **ServiceMeshControlPlane** v2.4 accepts CA certificates provided by **cert-manager** as **cacerts** secret.

> **NOTE**
>
> Integration with **cert-manager** and **istio-csr** is not supported on IBM Power®, IBM Z®, and IBM® LinuxONE.

1.2.33.10.5. Integration with external authorization systems

This enhancement introduces a generally available method of integrating Red Hat OpenShift Service Mesh with external authorization systems by using the **action: CUSTOM** field of the **AuthorizationPolicy** resource. Use the **envoyExtAuthzHttp** field to delegate the access control to an external authorization system.

1.2.33.10.6. Integration with external Prometheus installation

This enhancement introduces a generally available version of the Prometheus extension provider. You can expose metrics to the Red Hat OpenShift Service on AWS monitoring stack or a custom Prometheus installation by setting the value of the **extensionProviders** field to **prometheus** in the **spec.meshConfig** specification. The telemetry object configures Istio proxies to collect traffic metrics. Service Mesh only supports the Telemetry API for Prometheus metrics.

```
spec:
  meshConfig:
    extensionProviders:
    - name: prometheus
      prometheus: {}
---
apiVersion: telemetry.istio.io/v1alpha1
kind: Telemetry
metadata:
  name: enable-prometheus-metrics
spec:
  metrics:
  - providers:
    - name: prometheus
```

1.2.33.10.7. Single stack IPv6 support

This enhancement introduces generally available support for single stack IPv6 clusters, providing access to a broader range of IP addresses. Dual stack IPv4 or IPv6 cluster is not supported.

> **NOTE**
>
> Single stack IPv6 support is not available on IBM Power®, IBM Z®, and IBM® LinuxONE.

1.2.33.10.8. Enabling Red Hat OpenShift Service on AWS Gateway API

To enable the Red Hat OpenShift Service on AWS Gateway API, set the value of the **enabled** field to **true** in the **techPreview.gatewayAPI** specification of the **ServiceMeshControlPlane** resource.

```
spec:
  techPreview:
    gatewayAPI:
      enabled: true
```

Previously, environment variables were used to enable the Gateway API.

```
spec:
  runtime:
    components:
      pilot:
```

```
container:
  env:
    PILOT_ENABLE_GATEWAY_API: "true"
    PILOT_ENABLE_GATEWAY_API_STATUS: "true"
    PILOT_ENABLE_GATEWAY_API_DEPLOYMENT_CONTROLLER: "true"
```

1.2.33.10.9. Istio 1.16 support

Service Mesh 2.4 is based on Istio 1.16, which brings in new features and product enhancements. While many Istio 1.16 features are supported, the following exceptions should be noted:

- HBONE protocol for sidecars is an experimental feature that is not supported.
- Service Mesh on ARM64 architecture is not supported.

1.2.33.11. New features Red Hat OpenShift Service Mesh version 2.3.11

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.5.1, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

1.2.33.11.1. Component versions for Red Hat OpenShift Service Mesh version 2.3.11

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.11
Kiali	1.57.14

1.2.33.12. New features Red Hat OpenShift Service Mesh version 2.3.10

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.5.0, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.12 and later.

1.2.33.12.1. Component versions for Red Hat OpenShift Service Mesh version 2.3.10

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.11
Kiali	1.57.14

1.2.33.13. New features Red Hat OpenShift Service Mesh version 2.3.9

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.4.5, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.11 and later.

1.2.33.13.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.9

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.11
Jaeger	1.47.0
Kiali	1.57.14

1.2.33.14. New features Red Hat OpenShift Service Mesh version 2.3.8

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.11 and later versions.

1.2.33.14.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.8

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.11
Jaeger	1.47.0
Kiali	1.57.13

1.2.33.15. New features Red Hat OpenShift Service Mesh version 2.3.7

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.15.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.7

Component	Version
Istio	1.14.6
Envoy Proxy	1.22.11

Component	Version
Jaeger	1.42.0
Kiali	1.57.11

1.2.33.16. New features Red Hat OpenShift Service Mesh version 2.3.6

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.16.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.6

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.11
Jaeger	1.42.0
Kiali	1.57.10

1.2.33.17. New features Red Hat OpenShift Service Mesh version 2.3.5

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.17.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.5

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.9
Jaeger	1.42.0
Kiali	1.57.10

1.2.33.18. New features Red Hat OpenShift Service Mesh version 2.3.4

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.18.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.4

Component	Version
Istio	1.14.6
Envoy Proxy	1.22.9
Jaeger	1.42.0
Kiali	1.57.9

1.2.33.19. New features Red Hat OpenShift Service Mesh version 2.3.3

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.19.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.3

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.9
Jaeger	1.42.0
Kiali	1.57.7

1.2.33.20. New features Red Hat OpenShift Service Mesh version 2.3.2

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.20.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.2

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.7

Component	Version
Jaeger	1.39
Kiali	1.57.6

1.2.33.21. New features Red Hat OpenShift Service Mesh version 2.3.1

This release of Red Hat OpenShift Service Mesh introduces new features, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.21.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3.1

Component	Version
Istio	1.14.5
Envoy Proxy	1.22.4
Jaeger	1.39
Kiali	1.57.5

1.2.33.22. New features Red Hat OpenShift Service Mesh version 2.3

This release of Red Hat OpenShift Service Mesh introduces new features, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.22.1. Component versions included in Red Hat OpenShift Service Mesh version 2.3

Component	Version
Istio	1.14.3
Envoy Proxy	1.22.4
Jaeger	1.38
Kiali	1.57.3

1.2.33.22.2. New Container Network Interface (CNI) DaemonSet container and ConfigMap

The **openshift-operators** namespace includes a new istio CNI DaemonSet **istio-cni-node-v2-3** and a new **ConfigMap** resource, **istio-cni-config-v2-3**.

When upgrading to Service Mesh Control Plane 2.3, the existing **istio-cni-node** DaemonSet is not changed, and a new **istio-cni-node-v2-3** DaemonSet is created.

This name change does not affect previous releases or any **istio-cni-node** CNI DaemonSet associated with a Service Mesh Control Plane deployed using a previous release.

1.2.33.22.3. Gateway injection support

This release introduces generally available support for Gateway injection. Gateway configurations are applied to standalone Envoy proxies that are running at the edge of the mesh, rather than the sidecar Envoy proxies running alongside your service workloads. This enables the ability to customize gateway options. When using gateway injection, you must create the following resources in the namespace where you want to run your gateway proxy: **Service**, **Deployment**, **Role**, and **RoleBinding**.

1.2.33.22.4. Istio 1.14 Support

Service Mesh 2.3 is based on Istio 1.14, which brings in new features and product enhancements. While many Istio 1.14 features are supported, the following exceptions should be noted:

- ProxyConfig API is supported with the exception of the image field.
- SPIRE runtime is not a supported feature.

1.2.33.22.4.1. Configuring cluster-wide deployment

The following example **ServiceMeshControlPlane** object configures a cluster-wide deployment.

To create an SMCP for cluster-wide deployment, a user must belong to the **cluster-admin** ClusterRole. If the SMCP is configured for cluster-wide deployment, it must be the only SMCP in the cluster. You cannot change the control plane mode from multitenant to cluster-wide (or from cluster-wide to multitenant). If a multitenant control plane already exists, delete it and create a new one.

This example configures the SMCP for cluster-wide deployment.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: cluster-wide
  namespace: istio-system
spec:
  version: v2.3
  techPreview:
    controlPlaneMode: ClusterScoped (1)
```

1. Enables Istiod to monitor resources at the cluster level rather than monitor each individual namespace.

Additionally, the SMMR must also be configured for cluster-wide deployment. This example configures the SMMR for cluster-wide deployment.

```
apiVersion: maistra.io/v1
kind: ServiceMeshMemberRoll
metadata:
  name: default
```

```
spec:
  members:
  - '*' (1)
```

(1) Adds all namespaces to the mesh, including any namespaces you subsequently create. The following namespaces are not part of the mesh: kube, openshift, kube-* and openshift-*.

1.2.33.23. New features Red Hat OpenShift Service Mesh version 2.2.12

This release of Red Hat OpenShift Service Mesh is included with the Red Hat OpenShift Service Mesh Operator 2.4.5, addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.11 and later.

1.2.33.23.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.12

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.47.0
Kiali	1.48.11

1.2.33.24. New features Red Hat OpenShift Service Mesh version 2.2.11

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.11 and later versions.

1.2.33.24.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.11

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.47.0
Kiali	1.48.10

1.2.33.25. New features Red Hat OpenShift Service Mesh version 2.2.10

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.25.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.10

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.42.0
Kiali	1.48.8

1.2.33.26. New features Red Hat OpenShift Service Mesh version 2.2.9

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.26.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.9

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.42.0
Kiali	1.48.7

1.2.33.27. New features Red Hat OpenShift Service Mesh version 2.2.8

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.27.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.8

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.42.0
Kiali	1.48.7

1.2.33.28. New features Red Hat OpenShift Service Mesh version 2.2.7

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.10 and later versions.

1.2.33.28.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.7

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.42.0
Kiali	1.48.6

1.2.33.29. New features Red Hat OpenShift Service Mesh version 2.2.6

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.29.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.6

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.39
Kiali	1.48.5

1.2.33.30. New features Red Hat OpenShift Service Mesh version 2.2.5

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.30.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.5

Component	Version
Istio	1.12.9

Component	Version
Envoy Proxy	1.20.8
Jaeger	1.39
Kiali	1.48.3

1.2.33.31. New features Red Hat OpenShift Service Mesh version 2.2.4

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.31.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.4

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.36.14
Kiali	1.48.3

1.2.33.32. New features Red Hat OpenShift Service Mesh version 2.2.3

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.32.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.3

Component	Version
Istio	1.12.9
Envoy Proxy	1.20.8
Jaeger	1.36
Kiali	1.48.3

1.2.33.33. New features Red Hat OpenShift Service Mesh version 2.2.2

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.33.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.2

Component	Version
Istio	1.12.7
Envoy Proxy	1.20.6
Jaeger	1.36
Kiali	1.48.2-1

1.2.33.33.2. Copy route labels

With this enhancement, in addition to copying annotations, you can copy specific labels for an OpenShift route. Red Hat OpenShift Service Mesh copies all labels and annotations present in the Istio Gateway resource (with the exception of annotations starting with kubectl.kubernetes.io) into the managed OpenShift Route resource.

1.2.33.34. New features Red Hat OpenShift Service Mesh version 2.2.1

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.34.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2.1

Component	Version
Istio	1.12.7
Envoy Proxy	1.20.6
Jaeger	1.34.1
Kiali	1.48.2-1

1.2.33.35. New features Red Hat OpenShift Service Mesh 2.2

This release of Red Hat OpenShift Service Mesh adds new features and enhancements, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.35.1. Component versions included in Red Hat OpenShift Service Mesh version 2.2

Component	Version
Istio	1.12.7

Component	Version
Envoy Proxy	1.20.4
Jaeger	1.34.1
Kiali	1.48.0.16

1.2.33.35.2. **WasmPlugin** API

This release adds support for the **WasmPlugin** API and deprecates the **ServiceMeshExtension** API.

1.2.33.35.3. Red Hat OpenShift Service on AWS support

This release introduces service mesh support for Red Hat OpenShift Service on AWS, including multi-cluster federation.

1.2.33.35.4. **istio-node** DaemonSet renamed

This release, the **istio-node** DaemonSet is renamed to **istio-cni-node** to match the name in upstream Istio.

1.2.33.35.5. Envoy sidecar networking changes

Istio 1.10 updated Envoy to send traffic to the application container using **eth0** rather than **lo** by default.

1.2.33.35.6. Service Mesh Control Plane 1.1

This release marks the end of support for Service Mesh Control Planes based on Service Mesh 1.1 for all platforms.

1.2.33.35.7. Istio 1.12 Support

Service Mesh 2.2 is based on Istio 1.12, which brings in new features and product enhancements. While many Istio 1.12 features are supported, the following unsupported features should be noted:

- AuthPolicy Dry Run is a tech preview feature.
- gRPC Proxyless Service Mesh is a tech preview feature.
- Telemetry API is a tech preview feature.
- Discovery selectors is not a supported feature.
- External control plane is not a supported feature.
- Gateway injection is not a supported feature.

1.2.33.35.7.1. Installing the Gateway API CRDs

The Gateway API CRDs do not come preinstalled by default on OpenShift clusters. Install the CRDs prior to enabling Gateway API support in the SMCP.

```
$ kubectl get crd gateways.gateway.networking.k8s.io || { kubectl kustomize "github.com/kubernetes-sigs/gateway-api/config/crd?ref=v0.4.0" | kubectl apply -f -; }
```

1.2.33.35.7.2. Enabling Kubernetes Gateway API

To enable the feature, set the following environment variables for the **Istiod** container in **ServiceMeshControlPlane**:

```
spec:
  runtime:
    components:
      pilot:
        container:
          env:
            PILOT_ENABLE_GATEWAY_API: "true"
            PILOT_ENABLE_GATEWAY_API_STATUS: "true"
            # and optionally, for the deployment controller
            PILOT_ENABLE_GATEWAY_API_DEPLOYMENT_CONTROLLER: "true"
```

Restricting route attachment on Gateway API listeners is possible using the **SameNamespace** or **All** settings. Istio ignores usage of label selectors in **listeners.allowedRoutes.namespaces** and reverts to the default behavior (**SameNamespace**).

1.2.33.35.7.3. Manually linking an existing gateway to a Gateway resource

If the Kubernetes API deployment controller is disabled, you must manually deploy and then link an ingress gateway to the created Gateway resource.

```
apiVersion: gateway.networking.k8s.io/v1alpha2
kind: Gateway
metadata:
  name: gateway
spec:
  addresses:
  - value: ingress.istio-gateways.svc.cluster.local
    type: Hostname
```

1.2.33.36. New features Red Hat OpenShift Service Mesh 2.1.6

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.36.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.6

Component	Version
Istio	1.9.9
Envoy Proxy	1.17.5

Component	Version
Jaeger	1.36
Kiali	1.36.16

1.2.33.37. New features Red Hat OpenShift Service Mesh 2.1.5.2

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), contains bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.37.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.5.2

Component	Version
Istio	1.9.9
Envoy Proxy	1.17.5
Jaeger	1.36
Kiali	1.24.17

1.2.33.38. New features Red Hat OpenShift Service Mesh 2.1.5.1

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.38.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.5.1

Component	Version
Istio	1.9.9
Envoy Proxy	1.17.5
Jaeger	1.36
Kiali	1.36.13

1.2.33.39. New features Red Hat OpenShift Service Mesh 2.1.5

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 and later versions.

1.2.33.39.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.5

Component	Version
Istio	1.9.9
Envoy Proxy	1.17.1
Jaeger	1.36
Kiali	1.36.12-1

1.2.33.40. New features Red Hat OpenShift Service Mesh 2.1.4

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.40.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.4

Component	Version
Istio	1.9.9
Envoy Proxy	1.17.1
Jaeger	1.30.2
Kiali	1.36.12-1

1.2.33.41. New features Red Hat OpenShift Service Mesh 2.1.3

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.41.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.3

Component	Version
Istio	1.9.9
Envoy Proxy	1.17.1
Jaeger	1.30.2
Kiali	1.36.10-2

1.2.33.42. New features Red Hat OpenShift Service Mesh 2.1.2.1

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.42.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.2.1

Component	Version
Istio	1.9.9
Envoy Proxy	1.17.1
Jaeger	1.30.2
Kiali	1.36.9

1.2.33.43. New features Red Hat OpenShift Service Mesh 2.1.2

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

With this release, the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator is now installed to the **openshift-distributed-tracing** namespace by default. Previously the default installation had been in the **openshift-operator** namespace.

1.2.33.43.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.2

Component	Version
Istio	1.9.9
Envoy Proxy	1.17.1
Jaeger	1.30.1
Kiali	1.36.8

1.2.33.44. New features Red Hat OpenShift Service Mesh 2.1.1

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

This release also adds the ability to disable the automatic creation of network policies.

1.2.33.44.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1.1

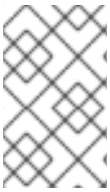
Component	Version
Istio	1.9.9

Component	Version
Envoy Proxy	1.17.1
Jaeger	1.24.1
Kiali	1.36.7

1.2.33.44.2. Disabling network policies

Red Hat OpenShift Service Mesh automatically creates and manages a number of **NetworkPolicies** resources in the Service Mesh control plane and application namespaces. This is to ensure that applications and the control plane can communicate with each other.

If you want to disable the automatic creation and management of **NetworkPolicies** resources, for example to enforce company security policies, you can do so. You can edit the **ServiceMeshControlPlane** to set the **spec.security.manageNetworkPolicy** setting to **false**



NOTE

When you disable **spec.security.manageNetworkPolicy** Red Hat OpenShift Service Mesh will not create **any NetworkPolicy** objects. The system administrator is responsible for managing the network and fixing any issues this might cause.

Procedure

1. In the Red Hat OpenShift Service on AWS web console, click **Ecosystem → Installed Operators**.
2. Select the project where you installed the Service Mesh control plane, for example **istio-system**, from the Project menu.
3. Click the Red Hat OpenShift Service Mesh Operator. In the **Istio Service Mesh Control Plane** column, click the name of your **ServiceMeshControlPlane**, for example **basic-install**.
4. On the **Create ServiceMeshControlPlane Details** page, click **YAML** to modify your configuration.
5. Set the **ServiceMeshControlPlane** field **spec.security.manageNetworkPolicy** to **false**, as shown in this example.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
spec:
  security:
     trust:
     manageNetworkPolicy: false
```

6. Click **Save**.

1.2.33.45. New features and enhancements Red Hat OpenShift Service Mesh 2.1

This release of Red Hat OpenShift Service Mesh adds support for Istio 1.9.8, Envoy Proxy 1.17.1, Jaeger 1.24.1, and Kiali 1.36.5 on Red Hat OpenShift Service on AWS 4.6 EUS, 4.7, 4.8, 4.9, along with new features and enhancements.

1.2.33.45.1. Component versions included in Red Hat OpenShift Service Mesh version 2.1

Component	Version
Istio	1.9.6
Envoy Proxy	1.17.1
Jaeger	1.24.1
Kiali	1.36.5

1.2.33.45.2. Service Mesh Federation

New Custom Resource Definitions (CRDs) have been added to support federating service meshes. Service meshes may be federated both within the same cluster or across different OpenShift clusters. These new resources include:

- **ServiceMeshPeer** - Defines a federation with a separate service mesh, including gateway configuration, root trust certificate configuration, and status fields. In a pair of federated meshes, each mesh will define its own separate **ServiceMeshPeer** resource.
- **ExportedServiceMeshSet** - Defines which services for a given **ServiceMeshPeer** are available for the peer mesh to import.
- **ImportedServiceSet** - Defines which services for a given **ServiceMeshPeer** are imported from the peer mesh. These services must also be made available by the peer's **ExportedServiceMeshSet** resource.

Service Mesh Federation is not supported between clusters on Red Hat OpenShift Service on AWS or OpenShift Dedicated.

1.2.33.45.3. OVN-Kubernetes Container Network Interface (CNI) generally available

The OVN-Kubernetes Container Network Interface (CNI) was previously introduced as a Technology Preview feature in Red Hat OpenShift Service Mesh 2.0.1 and is now generally available in Red Hat OpenShift Service Mesh 2.1 and 2.0.x for use on Red Hat OpenShift Service on AWS 4.7.32, Red Hat OpenShift Service on AWS 4.8.12, and Red Hat OpenShift Service on AWS 4.9.

1.2.33.45.4. Service Mesh WebAssembly (WASM) Extensions

The **ServiceMeshExtensions** Custom Resource Definition (CRD), first introduced in 2.0 as Technology Preview, is now generally available. You can use CRD to build your own plugins, but Red Hat does not provide support for the plugins you create.

Mixer has been completely removed in Service Mesh 2.1. Upgrading from a Service Mesh 2.0.x release to 2.1 will be blocked if Mixer is enabled. Mixer plugins will need to be ported to WebAssembly Extensions.

1.2.33.45.5. 3scale WebAssembly Adapter (WASM)

With Mixer now officially removed, OpenShift Service Mesh 2.1 does not support the 3scale mixer adapter. Before upgrading to Service Mesh 2.1, remove the Mixer-based 3scale adapter and any additional Mixer plugins. Then, manually install and configure the new 3scale WebAssembly adapter with Service Mesh 2.1+ using a **ServiceMeshExtension** resource.

3scale 2.11 introduces an updated Service Mesh integration based on **WebAssembly**.

1.2.33.45.6. Istio 1.9 Support

Service Mesh 2.1 is based on Istio 1.9, which brings in a large number of new features and product enhancements. While the majority of Istio 1.9 features are supported, the following exceptions should be noted:

- Virtual Machine integration is not yet supported
- Kubernetes Gateway API is not yet supported
- Remote fetch and load of WebAssembly HTTP filters are not yet supported
- Custom CA Integration using the Kubernetes CSR API is not yet supported
- Request Classification for monitoring traffic is a tech preview feature
- Integration with external authorization systems via Authorization policy's CUSTOM action is a tech preview feature

1.2.33.45.7. Improved Service Mesh operator performance

The amount of time Red Hat OpenShift Service Mesh uses to prune old resources at the end of every **ServiceMeshControlPlane** reconciliation has been reduced. This results in faster **ServiceMeshControlPlane** deployments, and allows changes applied to existing SMCPs to take effect more quickly.

1.2.33.45.8. Kiali updates

Kiali 1.36 includes the following features and enhancements:

- Service Mesh troubleshooting functionality
  - Control plane and gateway monitoring
  - Proxy sync statuses
  - Envoy configuration views
  - Unified view showing Envoy proxy and application logs interleaved
- Namespace and cluster boxing to support federated service mesh views
- New validations, wizards, and distributed tracing enhancements

1.2.33.46. New features Red Hat OpenShift Service Mesh 2.0.11.1

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 or later.

1.2.33.46.1. Component versions included in Red Hat OpenShift Service Mesh version 2.0.11.1

Component	Version
Istio	1.6.14
Envoy Proxy	1.14.5
Jaeger	1.36
Kiali	1.24.17

1.2.33.47. New features Red Hat OpenShift Service Mesh 2.0.11

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs), bug fixes, and is supported on Red Hat OpenShift Service on AWS 4.9 or later.

1.2.33.47.1. Component versions included in Red Hat OpenShift Service Mesh version 2.0.11

Component	Version
Istio	1.6.14
Envoy Proxy	1.14.5
Jaeger	1.36
Kiali	1.24.16-1

1.2.33.48. New features Red Hat OpenShift Service Mesh 2.0.10

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.48.1. Component versions included in Red Hat OpenShift Service Mesh version 2.0.10

Component	Version
Istio	1.6.14
Envoy Proxy	1.14.5
Jaeger	1.28.0

Component	Version
Kiali	1.24.16-1

1.2.33.49. New features Red Hat OpenShift Service Mesh 2.0.9

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.49.1. Component versions included in Red Hat OpenShift Service Mesh version 2.0.9

Component	Version
Istio	1.6.14
Envoy Proxy	1.14.5
Jaeger	1.24.1
Kiali	1.24.11

1.2.33.50. New features Red Hat OpenShift Service Mesh 2.0.8

This release of Red Hat OpenShift Service Mesh addresses bug fixes.

1.2.33.51. New features Red Hat OpenShift Service Mesh 2.0.7.1

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs).

1.2.33.51.1. Change in how Red Hat OpenShift Service Mesh handles URI fragments

Red Hat OpenShift Service Mesh contains a remotely exploitable vulnerability, CVE-2021-39156, where an HTTP request with a fragment (a section in the end of a URI that begins with a # character) in the URI path could bypass the Istio URI path-based authorization policies. For instance, an Istio authorization policy denies requests sent to the URI path **/user/profile**. In the vulnerable versions, a request with URI path **/user/profile#section1** bypasses the deny policy and routes to the backend (with the normalized URI **path /user/profile%23section1**), possibly leading to a security incident.

You are impacted by this vulnerability if you use authorization policies with DENY actions and **operation.paths**, or ALLOW actions and **operation.notPaths**.

With the mitigation, the fragment part of the request's URI is removed before the authorization and routing. This prevents a request with a fragment in its URI from bypassing authorization policies which are based on the URI without the fragment part.

To opt-out from the new behavior in the mitigation, the fragment section in the URI will be kept. You can configure your **ServiceMeshControlPlane** to keep URI fragments.

WARNING

Disabling the new behavior will normalize your paths as described above and is considered unsafe. Ensure that you have accommodated for this in any security policies before opting to keep URI fragments.

Example ServiceMeshControlPlane modification

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  techPreview:
    meshConfig:
      defaultConfig:
        proxyMetadata: HTTP_STRIP_FRAGMENT_FROM_PATH_UNSAFE_IF_DISABLED: "false"
```

1.2.33.51.2. Required update for authorization policies

Istio generates hostnames for both the hostname itself and all matching ports. For instance, a virtual service or Gateway for a host of "httpbin.foo" generates a config matching "httpbin.foo and httpbin.foo:*". However, exact match authorization policies only match the exact string given for the **hosts** or **notHosts** fields.

Your cluster is impacted if you have **AuthorizationPolicy** resources using exact string comparison for the rule to determine hosts or notHosts.

You must update your authorization policy rules to use prefix match instead of exact match. For example, replacing **hosts: ["httpbin.com"]** with **hosts: ["httpbin.com:*"]** in the first **AuthorizationPolicy** example.

First example AuthorizationPolicy using prefix match

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: httpbin
  namespace: foo
spec:
  action: DENY
  rules:
  - from:
    - source:
        namespaces: ["dev"]
    to:
    - operation:
        hosts: [“httpbin.com”,"httpbin.com:*"]
```

Second example AuthorizationPolicy using prefix match

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: httpbin
  namespace: default
spec:
  action: DENY
  rules:
  - to:
    - operation:
        hosts: ["httpbin.example.com:*"]
```

1.2.33.52. New features Red Hat OpenShift Service Mesh 2.0.7

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.53. Red Hat OpenShift Service Mesh on Red Hat OpenShift Dedicated

Red Hat OpenShift Service Mesh is now supported through Red Hat OpenShift Dedicated.

1.2.33.54. New features Red Hat OpenShift Service Mesh 2.0.6

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.55. New features Red Hat OpenShift Service Mesh 2.0.5

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.56. New features Red Hat OpenShift Service Mesh 2.0.4

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

IMPORTANT

There are manual steps that must be completed to address CVE-2021-29492 and CVE-2021-31920.

1.2.33.56.1. Manual updates required by CVE-2021-29492 and CVE-2021-31920

Istio contains a remotely exploitable vulnerability where an HTTP request path with multiple slashes or escaped slash characters (**%2F** or **%5C**) could potentially bypass an Istio authorization policy when path-based authorization rules are used.

For example, assume an Istio cluster administrator defines an authorization DENY policy to reject the request at path **/admin**. A request sent to the URL path **//admin** will NOT be rejected by the authorization policy.

According to RFC 3986, the path //**admin** with multiple slashes should technically be treated as a different path from the /**admin**. However, some backend services choose to normalize the URL paths by merging multiple slashes into a single slash. This can result in a bypass of the authorization policy (//**admin** does not match /**admin**), and a user can access the resource at path /**admin** in the backend; this would represent a security incident.

Your cluster is impacted by this vulnerability if you have authorization policies using **ALLOW action + notPaths** field or **DENY action + paths field** patterns. These patterns are vulnerable to unexpected policy bypasses.

Your cluster is NOT impacted by this vulnerability if:

- You don't have authorization policies.
- Your authorization policies don't define **paths** or **notPaths** fields.
- Your authorization policies use **ALLOW action + paths** field or **DENY action + notPaths** field patterns. These patterns could only cause unexpected rejection instead of policy bypasses. The upgrade is optional for these cases.

NOTE

The Red Hat OpenShift Service Mesh configuration location for path normalization is different from the Istio configuration.

1.2.33.56.2. Updating the path normalization configuration

Istio authorization policies can be based on the URL paths in the HTTP request. Path normalization, also known as URI normalization, modifies and standardizes the incoming requests' paths so that the normalized paths can be processed in a standard way. Syntactically different paths may be equivalent after path normalization.

Istio supports the following normalization schemes on the request paths before evaluating against the authorization policies and routing the requests:

Table 1.1. Normalization schemes

Option	Description	Example	Notes
NONE	No normalization is done. Anything received by Envoy will be forwarded exactly as-is to any backend service.	**../%2Fa../b** is evaluated by the authorization policies and sent to your service.	This setting is vulnerable to CVE-2021-31920.

Option	Description	Example	Notes
BASE	This is currently the option used in the **default** installation of Istio. This applies the **normalize_path** option on Envoy proxies, which follows RFC 3986 with extra normalization to convert backslashes to forward slashes.	**/a/../b** is normalized to **/b**. **\da** is normalized to **/da**.	This setting is vulnerable to CVE-2021-31920.
MERGE_SLASHES	Slashes are merged after the *BASE* normalization.	**/a//b** is normalized to **/a/b**.	Update to this setting to mitigate CVE-2021-31920.
DECODE_AND_MERGE_SLASHES	The strictest setting when you allow all traffic by default. This setting is recommended, with the caveat that you must thoroughly test your authorization policies routes. Percent-encoded slash and backslash characters (**%2F**, **%2f**, **%5C** and **%5c**) are decoded to/ or \, before the **MERGE_SLASHES** normalization.	**/a%2fb** is normalized to **/a/b**.	Update to this setting to mitigate CVE-2021-31920. This setting is more secure, but also has the potential to break applications. Test your applications before deploying to production.

The normalization algorithms are conducted in the following order:

1. Percent-decode **%2F**, **%2f**, **%5C** and **%5c**.
2. The RFC 3986 and other normalization implemented by the **normalize_path** option in Envoy.
3. Merge slashes.

WARNING

While these normalization options represent recommendations from HTTP standards and common industry practices, applications may interpret a URL in any way it chooses to. When using denial policies, ensure that you understand how your application behaves.

1.2.33.56.3. Path normalization configuration examples

Ensuring Envoy normalizes request paths to match your backend services' expectations is critical to the security of your system. The following examples can be used as a reference for you to configure your system. The normalized URL paths, or the original URL paths if **NONE** is selected, will be:

1. Used to check against the authorization policies.
2. Forwarded to the backend application.

Table 1.2. Configuration examples

If your application...	Choose...
Relies on the proxy to do normalization	**BASE**, **MERGE_SLASHES** or **DECODE_AND_MERGE_SLASHES**
Normalizes request paths based on RFC 3986 and does not merge slashes.	**BASE**
Normalizes request paths based on RFC 3986 and merges slashes, but does not decode percent-encoded slashes.	**MERGE_SLASHES**
Normalizes request paths based on RFC 3986, decodes percent-encoded slashes, and merges slashes.	**DECODE_AND_MERGE_SLASHES**
Processes request paths in a way that is incompatible with RFC 3986.	**NONE**

1.2.33.56.4. Configuring your SMCP for path normalization

To configure path normalization for Red Hat OpenShift Service Mesh, specify the following in your **ServiceMeshControlPlane**. Use the configuration examples to help determine the settings for your system.

SMCP v2 pathNormalization

```
spec:
  techPreview:
    global:
      pathNormalization: <option>
```

1.2.33.56.5. Configuring for case normalization

In some environments, it may be useful to have paths in authorization policies compared in a case insensitive manner. For example, treating **https://myurl/get** and **https://myurl/GeT** as equivalent. In those cases, you can use the **EnvoyFilter** shown below. This filter will change both the path used for comparison and the path presented to the application. In this example, **istio-system** is the name of the Service Mesh control plane project.

Save the **EnvoyFilter** to a file and run the following command:

```
$ oc create -f <myEnvoyFilterFile>
```

```
apiVersion: networking.istio.io/v1alpha3
kind: EnvoyFilter
metadata:
  name: ingress-case-insensitive
  namespace: istio-system
spec:
  configPatches:
  - applyTo: HTTP_FILTER
    match:
      context: GATEWAY
      listener:
        filterChain:
          filter:
            name: "envoy.filters.network.http_connection_manager"
            subFilter:
              name: "envoy.filters.http.router"
    patch:
      operation: INSERT_BEFORE
      value:
        name: envoy.lua
        typed_config:
            "@type": "type.googleapis.com/envoy.extensions.filters.http.lua.v3.Lua"
            inlineCode: |
              function envoy_on_request(request_handle)
                local path = request_handle:headers():get(":path")
                request_handle:headers():replace(":path", string.lower(path))
              end
```

1.2.33.57. New features Red Hat OpenShift Service Mesh 2.0.3

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

In addition, this release has the following new features:

- Added an option to the **must-gather** data collection tool that gathers information from a specified Service Mesh control plane namespace. For more information, see OSSM-351.
- Improved performance for Service Mesh control planes with hundreds of namespaces

1.2.33.58. New features Red Hat OpenShift Service Mesh 2.0.2

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.59. New features Red Hat OpenShift Service Mesh 2.0.1

This release of Red Hat OpenShift Service Mesh addresses Common Vulnerabilities and Exposures (CVEs) and bug fixes.

1.2.33.60. New features Red Hat OpenShift Service Mesh 2.0

This release of Red Hat OpenShift Service Mesh adds support for Istio 1.6.5, Jaeger 1.20.0, Kiali 1.24.2, and the 3scale Istio Adapter 2.0 and Red Hat OpenShift Service on AWS 4.6.

In addition, this release has the following new features:

- Simplifies installation, upgrades, and management of the Service Mesh control plane.
- Reduces the Service Mesh control plane's resource usage and startup time.
- Improves performance by reducing inter-control plane communication over networking.
  - Adds support for Envoy's Secret Discovery Service (SDS). SDS is a more secure and efficient mechanism for delivering secrets to Envoy side car proxies.
- Removes the need to use Kubernetes Secrets, which have well known security risks.
- Improves performance during certificate rotation, as proxies no longer require a restart to recognize new certificates.
  - Adds support for Istio's Telemetry v2 architecture, which is built using WebAssembly extensions. This new architecture brings significant performance improvements.
  - Updates the ServiceMeshControlPlane resource to v2 with a streamlined configuration to make it easier to manage the Service Mesh Control Plane.

1.2.34. Deprecated and removed features

Some features available in previous releases have been deprecated or removed.

Deprecated functionality is still included in Red Hat OpenShift Service on AWS and continues to be supported; however, it will be removed in a future release of this product and is not recommended for new deployments.

Removed functionality no longer exists in the product.

1.2.34.1. Deprecated and removed features in Red Hat OpenShift Service Mesh 2.5

The v2.2 **ServiceMeshControlPlane** resource is no longer supported. Customers should update their mesh deployments to use a later version of the **ServiceMeshControlPlane** resource.

Support for the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator is deprecated. To collect trace spans, use the Red Hat OpenShift Distributed Tracing Platform (Tempo) Stack.

Support for the OpenShift Elasticsearch Operator is deprecated.

Istio will remove support for first-party JSON Web Tokens (JWTs). Istio will still support third-Party JWTs.

1.2.34.2. Deprecated and removed features in Red Hat OpenShift Service Mesh 2.4

The v2.1 **ServiceMeshControlPlane** resource is no longer supported. Customers should upgrade their mesh deployments to use a later version of the **ServiceMeshControlPlane** resource.

Support for Istio OpenShift Routing (IOR) is deprecated and will be removed in a future release.

Support for Grafana is deprecated and will be removed in a future release.

Support for the following cipher suites, which were deprecated in Red Hat OpenShift Service Mesh 2.3, has been removed from the default list of ciphers used in TLS negotiations on both the client and server sides. Applications that require access to services requiring one of these cipher suites will fail to connect when a TLS connection is initiated from the proxy.

- ECDHE-ECDSA-AES128-SHA
- ECDHE-RSA-AES128-SHA
- AES128-GCM-SHA256
- AES128-SHA
- ECDHE-ECDSA-AES256-SHA
- ECDHE-RSA-AES256-SHA
- AES256-GCM-SHA384
- AES256-SHA

1.2.34.3. Deprecated and removed features in Red Hat OpenShift Service Mesh 2.3

Support for the following cipher suites has been deprecated. In a future release, they will be removed from the default list of ciphers used in TLS negotiations on both the client and server sides.

- ECDHE-ECDSA-AES128-SHA
- ECDHE-RSA-AES128-SHA
- AES128-GCM-SHA256
- AES128-SHA
- ECDHE-ECDSA-AES256-SHA
- ECDHE-RSA-AES256-SHA
- AES256-GCM-SHA384
- AES256-SHA

The **ServiceMeshExtension** API, which was deprecated in Red Hat OpenShift Service Mesh version 2.2, was removed in Red Hat OpenShift Service Mesh version 2.3. If you are using the **ServiceMeshExtension** API, you must migrate to the **WasmPlugin** API to continue using your WebAssembly extensions.

1.2.34.4. Deprecated features in Red Hat OpenShift Service Mesh 2.2

The **ServiceMeshExtension** API is deprecated as of release 2.2 and will be removed in a future release. While **ServiceMeshExtension** API is still supported in release 2.2, customers should start moving to the new **WasmPlugin** API.

1.2.34.5. Removed features in Red Hat OpenShift Service Mesh 2.2

This release marks the end of support for Service Mesh control planes based on Service Mesh 1.1 for all platforms.

1.2.34.6. Removed features in Red Hat OpenShift Service Mesh 2.1

In Service Mesh 2.1, the Mixer component is removed. Bug fixes and support is provided through the end of the Service Mesh 2.0 life cycle.

Upgrading from a Service Mesh 2.0.x release to 2.1 will not proceed if Mixer plugins are enabled. Mixer plugins must be ported to WebAssembly Extensions.

1.2.34.7. Deprecated features in Red Hat OpenShift Service Mesh 2.0

The Mixer component was deprecated in release 2.0 and will be removed in release 2.1. While using Mixer for implementing extensions was still supported in release 2.0, extensions should have been migrated to the new WebAssembly mechanism.

The following resource types are no longer supported in Red Hat OpenShift Service Mesh 2.0:

- **Policy** (authentication.istio.io/v1alpha1) is no longer supported. Depending on the specific configuration in your Policy resource, you may have to configure multiple resources to achieve the same effect.
  - Use **RequestAuthentication** (security.istio.io/v1beta1)
  - Use **PeerAuthentication** (security.istio.io/v1beta1)
- **ServiceMeshPolicy** (maistra.io/v1) is no longer supported.
  - Use **RequestAuthentication** or **PeerAuthentication**, as mentioned above, but place in the Service Mesh control plane namespace.
- **RbacConfig** (rbac.istio.io/v1alpha1) is no longer supported.
  - Replaced by **AuthorizationPolicy** (security.istio.io/v1beta1), which encompasses behavior of **RbacConfig**, **ServiceRole**, and **ServiceRoleBinding**.
- **ServiceMeshRbacConfig** (maistra.io/v1) is no longer supported.
  - Use **AuthorizationPolicy** as above, but place in Service Mesh control plane namespace.
- **ServiceRole** (rbac.istio.io/v1alpha1) is no longer supported.
- **ServiceRoleBinding** (rbac.istio.io/v1alpha1) is no longer supported.
- In Kiali, the **login** and **LDAP** strategies are deprecated. A future version will introduce authentication using OpenID providers.

1.2.35. Known issues

These limitations exist in Red Hat OpenShift Service Mesh:

- Red Hat OpenShift Service Mesh does not yet fully support IPv6. As a result, Red Hat OpenShift Service Mesh does not support dual-stack clusters.
- Graph layout - The layout for the Kiali graph can render differently, depending on your

application architecture and the data to display (number of graph nodes and their interactions). Because it is difficult if not impossible to create a single layout that renders nicely for every situation, Kiali offers a choice of several different layouts. To choose a different layout, you can choose a different **Layout Schema** from the **Graph Settings** menu.

- The first time you access related services such as Distributed Tracing Platform (Jaeger) and Grafana, from the Kiali console, you must accept the certificate and re-authenticate using your Red Hat OpenShift Service on AWS login credentials. This happens due to an issue with how the framework displays embedded pages in the console.

1.2.35.1. Service Mesh known issues

These are the known issues in Red Hat OpenShift Service Mesh: * OSSM-5556 Gateways are skipped when istio-system labels do not match discovery selectors.

+ Workaround: Label the control plane namespace to match discovery selectors to avoid skipping the Gateway configurations.

+ .Example **ServiceMeshControlPlane** resource

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
  namespace: istio-system
spec:
  mode: ClusterWide
  meshConfig:
    discoverySelectors:
    - matchLabels:
        istio-discovery: enabled
  gateways:
    ingress:
      enabled: true
```

+ Then, run the following command at the command line:

+

```
oc label namespace istio-system istio-discovery=enabled
```

- OSSM-3890 Attempting to use the Gateway API in a multitenant mesh deployment generates an error message similar to the following:

  ```
  2023-05-02T15:20:42.541034Z error watch error in cluster Kubernetes: failed to list
  *v1alpha2.TLSRoute: the server could not find the requested resource (get
  tlsroutes.gateway.networking.k8s.io)
  2023-05-02T15:20:42.616450Z info kube controller
  "gateway.networking.k8s.io/v1alpha2/TCPRoute" is syncing...
  ```

  To support Gateway API in a multitenant mesh deployment, all Gateway API Custom Resource Definition (CRD) files must be present in the cluster.

In a multitenant mesh deployment, CRD scan is disabled, and Istio has no way to discover which CRDs are present in a cluster. As a result, Istio attempts to watch all supported Gateway API CRDs, but generates errors if some of those CRDs are not present.

Service Mesh 2.3.1 and later versions support both **v1alpha2** and **v1beta1** CRDs. Therefore, both CRD versions must be present for a multitenant mesh deployment to support the Gateway API.

Workaround: In the following example, the **kubectl get** operation installs the **v1alpha2** and **v1beta1** CRDs. Note the URL contains the additional **experimental** segment and updates any of your existing scripts accordingly:

```
$ kubectl get crd gateways.gateway.networking.k8s.io ||  { kubectl kustomize
"github.com/kubernetes-sigs/gateway-api/config/crd/experimental?ref=v0.5.1" | kubectl apply
-f -; }
```

- OSSM-2042 Deployment of SMCP named **default** fails. If you are creating an SMCP object, and set its version field to v2.3, the name of the object cannot be **default**. If the name is **default**, then the control plane fails to deploy, and OpenShift generates a **Warning** event with the following message:
  Error processing component mesh-config: error: [mesh-config/templates/telemetryv2_1.6.yaml: Internal error occurred: failed calling webhook "rev.validation.istio.io": Post "https://istiod-default.istio-system.svc:443/validate?timeout=10s": x509: certificate is valid for istiod.istio-system.svc, istiod-remote.istio-system.svc, istio-pilot.istio-system.svc, not istiod-default.istio-system.svc, mesh-config/templates/enable-mesh-permissive.yaml

- OSSM-1655 Kiali dashboard shows error after enabling mTLS in **SMCP**.
  After enabling the **spec.security.controlPlane.mtls** setting in the SMCP, the Kiali console displays the following error message **No subsets defined**.

- OSSM-1505 This issue only occurs when using the **ServiceMeshExtension** resource on OpenShift Container Platform 4.11. When you use **ServiceMeshExtension** on OpenShift Container Platform 4.11 the resource never becomes ready. If you inspect the issue using **oc describe ServiceMeshExtension** you will see the following error: **stderr: Error creating mount namespace before pivot: function not implemented**.
  Workaround: **ServiceMeshExtension** was deprecated in Service Mesh 2.2. Migrate from **ServiceMeshExtension** to the **WasmPlugin** resource. For more information, see Migrating from **ServiceMeshExtension** to **WasmPlugin** resources.

- OSSM-1396 If a gateway resource contains the **spec.externalIPs** setting, instead of being recreated when the **ServiceMeshControlPlane** is updated, the gateway is removed and never recreated.

- OSSM-1168 When service mesh resources are created as a single YAML file, the Envoy proxy sidecar is not reliably injected into pods. When the SMCP, SMMR, and Deployment resources are created individually, the deployment works as expected.

- OSSM-1115 The **concurrency** field of the **spec.proxy** API did not propagate to the istio-proxy. The **concurrency** field works when set with **ProxyConfig**. The **concurrency** field specifies the number of worker threads to run. If the field is set to **0**, then the number of worker threads available is equal to the number of CPU cores. If the field is not set, then the number of worker threads available defaults to **2**.
  In the following example, the **concurrency** field is set to **0**.

```
apiVersion: networking.istio.io/v1beta1
kind: ProxyConfig
metadata:
  name: mesh-wide-concurrency
  namespace: <istiod-namespace>
spec:
  concurrency: 0
```

- OSSM-1052 When configuring a Service **ExternalIP** for the ingressgateway in the Service Mesh control plane, the service is not created. The schema for the SMCP is missing the parameter for the service.
  Workaround: Disable the gateway creation in the SMCP spec and manage the gateway deployment entirely manually (including Service, Role and RoleBinding).

- OSSM-882 This applies for Service Mesh 2.1 and earlier. Namespace is in the accessible_namespace list but does not appear in Kiali UI. By default, Kiali will not show any namespaces that start with "kube" because these namespaces are typically internal-use only and not part of a mesh.
  For example, if you create a namespace called 'akube-a' and add it to the Service Mesh member roll, then the Kiali UI does not display the namespace. For defined exclusion patterns, the software excludes namespaces that start with or contain the pattern.

  Workaround: Change the Kiali Custom Resource setting so it prefixes the setting with a carat (^). For example:

```
api:
  namespaces:
    exclude:
    - "^istio-operator"
    - "^kube-.*"
    - "^openshift.*"
    - "^kiali-operator"
```

- MAISTRA-2692 With Mixer removed, custom metrics that have been defined in Service Mesh 2.0.x cannot be used in 2.1. Custom metrics can be configured using **EnvoyFilter**. Red Hat is unable to support **EnvoyFilter** configuration except where explicitly documented. This is due to tight coupling with the underlying Envoy APIs, meaning that backward compatibility cannot be maintained.

- MAISTRA-1959 *Migration to 2.0* Prometheus scraping (**spec.addons.prometheus.scrape** set to **true**) does not work when mTLS is enabled. Additionally, Kiali displays extraneous graph data when mTLS is disabled.
  This problem can be addressed by excluding port 15020 from proxy configuration, for example,

```
spec:
  proxy:
    networking:
      trafficControl:
        inbound:
          excludedPorts:
          - 15020
```

- MAISTRA-453 If you create a new project and deploy pods immediately, sidecar injection does not occur. The operator fails to add the **maistra.io/member-of** before the pods are created, therefore the pods must be deleted and recreated for sidecar injection to occur.
- MAISTRA-158 Applying multiple gateways referencing the same hostname will cause all gateways to stop functioning.

1.2.35.2. Kiali known issues

> **NOTE**
>
> New issues for Kiali should be created in the OpenShift Service Mesh project with the **Component** set to **Kiali**.

These are the known issues in Kiali:

- OSSM-6299 In Red Hat OpenShift Service on AWS 4.15, when you click the **Node graph** menu option of any node menu within the traffic graph, the node graph is not displayed. Instead, the page is refreshed with the same traffic graph. Currently, no workaround exists for this issue.
- OSSM-6298 When you click an item reference within the OpenShift Service Mesh Console (OSSMC) plugin, such as a workload link related to a specific service, the console sometimes performs multiple redirections before opening the desired page. If you click **Back** in a web browser, a different page of the console opens instead of the previous page. As a workaround, click **Back** twice to navigate to the previous page.
- OSSM-6290 For Red Hat OpenShift Service on AWS 4.15, the **Project** filter of the **Istio Config** list page does not work correctly. All **istio** items are displayed even if you select a specific project from the dropdown. Currently, no workaround exists for this issue.
- KIALI-2206 When you are accessing the Kiali console for the first time, and there is no cached browser data for Kiali, the "View in Grafana" link on the Metrics tab of the Kiali Service Details page redirects to the wrong location. The only way you would encounter this issue is if you are accessing Kiali for the first time.
- KIALI-507 Kiali does not support Internet Explorer 11. This is because the underlying frameworks do not support Internet Explorer. To access the Kiali console, use one of the two most recent versions of the Chrome, Edge, Firefox or Safari browser.

1.2.36. Fixed issues

The following issues have been resolved in previous releases:

1.2.36.1. Service Mesh fixed issues

- OSSM-6177 Previously, when validation messages were enabled in the **ServiceMeshControlPlane** (SMCP), the **istiod** crashed continuously unless **GatewayAPI** support was enabled. Now, when validation messages are enabled but **GatewayAPI** support is not, the **istiod** does not continuously crash.
- OSSM-6163 Resolves the following issues:
  - Previously, an unstable Prometheus image was included in the Service Mesh control plane (SMCP) v2.5, and users were not able to access the Prometheus dashboard. Now, in the Service Mesh operator 2.5.1, the Prometheus image has been updated.

  - Previously, in the Service Mesh control plane (SMCP), a Grafana data source was not able to set Basic authentication password automatically and users were not able to view metrics from Prometheus in Grafana mesh dashboards. Now, a Grafana data source password is configured under the **secureJsonData** field. Metrics are displayed correctly in dashboards.

- OSSM-6148 Previously, the OpenShift Service Mesh Console (OSSMC) plugin did not respond when the user clicked any option in the menu of any node on the **Traffic Graph** page. Now, the plugin responds to the selected option in the menu by redirecting to the corresponding details page.

- OSSM-6099 Previously, the OpenShift Service Mesh Console (OSSMC) plugin failed to load correctly in an IPv6 cluster. Now, the OSSMC plugin configuration has been modified to ensure proper loading in an IPv6 cluster.

- OSSM-5960 Previously, the OpenShift Service Mesh Console (OSSMC) plugin did not display notification messages such as backend errors or Istio validations. Now, these notifications are displayed correctly at the top of the plugin page.

- OSSM-5959 Previously, the OpenShift Service Mesh Console (OSSMC) plugin did not display TLS and Istio certification information in the **Overview** page. Now, this information is displayed correctly.

- OSSM-5902 Previously, the OpenShift Service Mesh Console (OSSMC) plugin redirected to a "Not Found Page" error when the user clicked the **Istio config** health symbol on the **Overview** page. Now, the plugin redirects to the correct **Istio config** details page.

- OSSM-5541 Previously, an Istio operator pod might keep waiting for the leader lease in some restart conditions. Now, the leader election implementation has been enhanced to avoid this issue.

- OSSM-1397 Previously, if you removed the **maistra.io/member-of** label from a namespace, the Service Mesh Operator did not automatically reapply the label to the namespace. As a result, sidecar injection did not work in the namespace.
  The Operator would reapply the label to the namespace when you made changes to the **ServiceMeshMember** object, which triggered the reconciliation of this member object.

  Now, any change to the namespace also triggers the member object reconciliation.

- OSSM-3647 Previously, in the Service Mesh control plane (SMCP) v2.2 (Istio 1.12), WasmPlugins were applied only to inbound listeners. Since SMCP v2.3 (Istio 1.14), WasmPlugins have been applied to inbound and outbound listeners by default, which introduced regression for users of the 3scale WasmPlugin. Now, the environment variable **APPLY_WASM_PLUGINS_TO_INBOUND_ONLY** is added, which allows safe migration from SMCP v2.2 to v2.3 and v2.4.
  The following setting should be added to the SMCP config:

  ```
  spec:
    runtime:
      components:
        pilot:
          container:
            env:
              APPLY_WASM_PLUGINS_TO_INBOUND_ONLY: "true"
  ```

  To ensure safe migration, perform the following steps:

1. Set **APPLY_WASM_PLUGINS_TO_INBOUND_ONLY** in SMCP v2.2.
2. Upgrade to 2.4.
3. Set **spec.match[].mode: SERVER** in WasmPlugins.
4. Remove the previously-added environment variable.

- OSSM-4851 Previously, an error occurred in the operator deploying new pods in a namespace scoped inside the mesh when **runAsGroup**, **runAsUser**, or **fsGroup** parameters were **nil**. Now, a yaml validation has been added to avoid the **nil** value.
- OSSM-3771 Previously, OpenShift routes could not be disabled for additional ingress gateways defined in a Service Mesh Control Plane (SMCP). Now, a **routeConfig** block can be added to each **additionalIngress** gateway so the creation of OpenShift routes can be enabled or disabled for each gateway.
- OSSM-4197 Previously, if you deployed a v2.2 or v2.1 of the 'ServiceMeshControlPlane' resource, the **/etc/cni/multus/net.d/** directory was not created. As a result, the **istio-cni** pod failed to become ready, and the **istio-cni** pods log contained the following message:

  ```
  $ error  Installer exits with open /host/etc/cni/multus/net.d/v2-2-istio-cni.kubeconfig.tmp.841118073: no such file or directory
  ```

  Now, if you deploy a v2.2 or v2.1 of the 'ServiceMeshControlPlane' resource, the **/etc/cni/multus/net.d/** directory is created, and the **istio-cni** pod becomes ready.
- OSSM-3993 Previously, Kiali only supported OpenShift OAuth via a proxy on the standard HTTPS port of **443**. Now, Kiali supports OpenShift OAuth over a non-standard HTTPS port. To enable the port, you must set the **spec.server.web_port** field to the proxy's non-standard HTTPS port in the Kiali CR.
- OSSM-3936 Previously, the values for the **injection_label_rev** and **injection_label_name** attributes were hardcoded. This prevented custom configurations from taking effect in the Kiali Custom Resource Definition (CRD). Now, the attribute values are not hardcoded. You can customize the values for the **injection_label_rev** and **injection_label_name** attributes in the **spec.istio_labels** specification.
- OSSM-3644 Previously, the federation egress-gateway received the wrong update of network gateway endpoints, causing extra endpoint entries. Now, the federation-egress gateway has been updated on the server side so it receives the correct network gateway endpoints.
- OSSM-3595 Previously, the **istio-cni** plugin sometimes failed on RHEL because SELinux did not allow the utility **iptables-restore** to open files in the **/tmp** directory. Now, SELinux passes **iptables-restore** via **stdin** input stream instead of via a file.
- OSSM-3586 Previously, Istio proxies were slow to start when Google Cloud metadata servers were not available. When you upgrade to Istio 1.14.6, Istio proxies start as expected on Google Cloud, even if metadata servers are not available.
- OSSM-3025 Istiod sometimes fails to become ready. Sometimes, when a mesh contained many member namespaces, the Istiod pod did not become ready due to a deadlock within Istiod. The deadlock is now resolved and the pod now starts as expected.

- OSSM-2493 Default **nodeSelector** and **tolerations** in SMCP not passed to Kiali. The **nodeSelector** and **tolerations** you add to **SMCP.spec.runtime.defaults** are now passed to the Kiali resource.

- OSSM-2492 Default tolerations in SMCP not passed to Jaeger. The **nodeSelector** and **tolerations** you add to **SMCP.spec.runtime.defaults** are now passed to the Jaeger resource.

- OSSM-2374 If you deleted one of the **ServiceMeshMember** resources, then the Service Mesh operator deleted the **ServiceMeshMemberRoll**. While this is expected behavior when you delete the last **ServiceMeshMember**, the operator should not delete the **ServiceMeshMemberRoll** if it contains any members in addition to the one that was deleted. This issue is now fixed and the operator only deletes the ServiceMeshMemberRoll when the last **ServiceMeshMember** resource is deleted.

- OSSM-2373 Error trying to get OAuth metadata when logging in. To fetch the cluster version, the **system:anonymous** account is used. With the cluster's default bundled ClusterRoles and ClusterRoleBinding, the anonymous account can fetch the version correctly. If the **system:anonymous** account loses its privileges to fetch the cluster version, OpenShift authentication becomes unusable.
  This is fixed by using the Kiali SA to fetch the cluster version. This also allows for improved security on the cluster.

- OSSM-2371 Despite Kiali being configured as "view-only," a user can change the proxy logging level via the Workload details' Logs tab's kebab menu. This issue has been fixed so the options under "Set Proxy Log Level" are disabled when Kiali is configured as "view-only."

- OSSM-2344 Restarting Istiod causes Kiali to flood CRI-O with port-forward requests. This issue occurred when Kiali could not connect to Istiod and Kiali simultaneously issued a large number of requests to istiod. Kiali now limits the number of requests it sends to istiod.

- OSSM-2335 Dragging the mouse pointer over the Traces scatterchart plot sometimes caused the Kiali console to stop responding due to concurrent backend requests.

- OSSM-2221 Previously, gateway injection in the **ServiceMeshControlPlane** namespace was not possible because the **ignore-namespace** label was applied to the namespace by default.
  When creating a v2.4 control plane, the namespace no longer has the **ignore-namespace** label applied, and gateway injection is possible.

  In the following example, the **oc label** command removes the **ignore-namespace** label from a namespace in an existing deployment:

  ```
  $ oc label namespace istio-system maistra.io/ignore-namespace-
  ```

  where:

  istio_system

  Specified the name of the **ServiceMeshControlPlane** namespace.

- OSSM-2053 Using Red Hat OpenShift Service Mesh Operator 2.2 or 2.3, during SMCP reconciliation, the SMMR controller removed the member namespaces from **SMMR.status.configuredMembers**. This caused the services in the member namespaces to become unavailable for a few moments.
  Using Red Hat OpenShift Service Mesh Operator 2.2 or 2.3, the SMMR controller no longer removes the namespaces from **SMMR.status.configuredMembers**. Instead, the controller adds the namespaces to **SMMR.status.pendingMembers** to indicate that they are not up-to-date.

During reconciliation, as each namespace synchronizes with the SMCP, the namespace is automatically removed from **SMMR.status.pendingMembers**.

- OSSM-1962 Use **EndpointSlices** in federation controller. The federation controller now uses **EndpointSlices**, which improves scalability and performance in large deployments. The PILOT_USE_ENDPOINT_SLICE flag is enabled by default. Disabling the flag prevents use of federation deployments.
- OSSM-1668 A new field **spec.security.jwksResolverCA** was added to the Version 2.1 **SMCP** but was missing in the 2.2.0 and 2.2.1 releases. When upgrading from an Operator version where this field was present to an Operator version that was missing this field, the **.spec.security.jwksResolverCA** field was not available in the **SMCP**.
- OSSM-1325 istiod pod crashes and displays the following error message: **fatal error: concurrent map iteration and map write**.
- OSSM-1211 Configuring Federated service meshes for failover does not work as expected. The Istiod pilot log displays the following error: **envoy connection [C289] TLS error: 337047686:SSL routines:tls_process_server_certificate:certificate verify failed**
- OSSM-1099 The Kiali console displayed the message **Sorry, there was a problem. Try a refresh or navigate to a different page.**
- OSSM-1074 Pod annotations defined in SMCP are not injected in the pods.
- OSSM-999 Kiali retention did not work as expected. Calendar times were greyed out in the dashboard graph.
- OSSM-797 Kiali Operator pod generates **CreateContainerConfigError** while installing or updating the operator.
- OSSM-722 Namespace starting with **kube** is hidden from Kiali.
- OSSM-569 There is no CPU memory limit for the Prometheus **istio-proxy** container. The Prometheus **istio-proxy** sidecar now uses the resource limits defined in **spec.proxy.runtime.container**.
- OSSM-535 Support validationMessages in SMCP. The **ValidationMessages** field in the Service Mesh Control Plane can now be set to **True**. This writes a log for the status of the resources, which can be helpful when troubleshooting problems.
- OSSM-449 VirtualService and Service causes an error "Only unique values for domains are permitted. Duplicate entry of domain."
- OSSM-419 Namespaces with similar names will all show in Kiali namespace list, even though namespaces may not be defined in Service Mesh Member Role.
- OSSM-296 When adding health configuration to the Kiali custom resource (CR) is it not being replicated to the Kiali configmap.
- OSSM-291 In the Kiali console, on the Applications, Services, and Workloads pages, the "Remove Label from Filters" function is not working.
- OSSM-289 In the Kiali console, on the Service Details pages for the 'istio-ingressgateway' and 'jaeger-query' services there are no Traces being displayed. The traces exist in Jaeger.

- OSSM-287 In the Kiali console there are no traces being displayed on the Graph Service.
- OSSM-285 When trying to access the Kiali console, receive the following error message "Error trying to get OAuth Metadata".
  Workaround: Restart the Kiali pod.
- MAISTRA-2735 The resources that the Service Mesh Operator deletes when reconciling the SMCP changed in Red Hat OpenShift Service Mesh version 2.1. Previously, the Operator deleted a resource with the following labels:
  - **maistra.io/owner**
  - **app.kubernetes.io/version**

  Now, the Operator ignores resources that does not also include the **app.kubernetes.io/managed-by=maistra-istio-operator** label. If you create your own resources, you should not add the **app.kubernetes.io/managed-by=maistra-istio-operator** label to them.
- MAISTRA-2687 Red Hat OpenShift Service Mesh 2.1 federation gateway does not send the full certificate chain when using external certificates. The Service Mesh federation egress gateway only sends the client certificate. Because the federation ingress gateway only knows about the root certificate, it cannot verify the client certificate unless you add the root certificate to the federation import **ConfigMap**.
- MAISTRA-2635 Replace deprecated Kubernetes API. To remain compatible with Red Hat OpenShift Service on AWS 4.8, the **apiextensions.k8s.io/v1beta1** API was deprecated as of Red Hat OpenShift Service Mesh 2.0.8.
- MAISTRA-2631 The WASM feature is not working because podman is failing due to nsenter binary not being present. Red Hat OpenShift Service Mesh generates the following error message: **Error: error configuring CNI network plugin exec: "nsenter": executable file not found in $PATH**. The container image now contains nsenter and WASM works as expected.
- MAISTRA-2534 When istiod attempted to fetch the JWKS for an issuer specified in a JWT rule, the issuer service responded with a 502. This prevented the proxy container from becoming ready and caused deployments to hang. The fix for the community bug has been included in the Service Mesh 2.0.7 release.
- MAISTRA-2411 When the Operator creates a new ingress gateway using **spec.gateways.additionalIngress** in the **ServiceMeshControlPlane**, Operator is not creating a **NetworkPolicy** for the additional ingress gateway like it does for the default istio-ingressgateway. This is causing a 503 response from the route of the new gateway.
  Workaround: Manually create the **NetworkPolicy** in the **istio-system** namespace.
- MAISTRA-2401 CVE-2021-3586 servicemesh-operator: NetworkPolicy resources incorrectly specified ports for ingress resources. The NetworkPolicy resources installed for Red Hat OpenShift Service Mesh did not properly specify which ports could be accessed. This allowed access to all ports on these resources from any pod. Network policies applied to the following resources are affected:
  - Galley
  - Grafana
  - Istiod

  - Jaeger
  - Kiali
  - Prometheus
  - Sidecar injector

- MAISTRA-2378 When the cluster is configured to use OpenShift SDN with **ovs-multitenant** and the mesh contains a large number of namespaces (200+), the Red Hat OpenShift Service on AWS networking plugin is unable to configure the namespaces quickly. Service Mesh times out causing namespaces to be continuously dropped from the service mesh and then reenlisted.

- MAISTRA-2370 Handle tombstones in listerInformer. The updated cache codebase was not handling tombstones when translating the events from the namespace caches to the aggregated cache, leading to a panic in the go routine.

- MAISTRA-2117 Add optional **ConfigMap** mount to operator. The CSV now contains an optional **ConfigMap** volume mount, which mounts the **smcp-templates ConfigMap** if it exists. If the **smcp-templates ConfigMap** does not exist, the mounted directory is empty. When you create the **ConfigMap**, the directory is populated with the entries from the **ConfigMap** and can be referenced in **SMCP.spec.profiles**. No restart of the Service Mesh operator is required.
  Customers using the 2.0 operator with a modified CSV to mount the smcp-templates ConfigMap can upgrade to Red Hat OpenShift Service Mesh 2.1. After upgrading, you can continue using an existing ConfigMap, and the profiles it contains, without editing the CSV. Customers that previously used ConfigMap with a different name will either have to rename the ConfigMap or update the CSV after upgrading.

- MAISTRA-2010 AuthorizationPolicy does not support **request.regex.headers** field. The **validatingwebhook** rejects any AuthorizationPolicy with the field, and even if you disable that, Pilot tries to validate it using the same code, and it does not work.

- MAISTRA-1979 *Migration to 2.0* The conversion webhook drops the following important fields when converting **SMCP.status** from v2 to v1:
  - conditions
  - components
  - observedGeneration
  - annotations
    Upgrading the operator to 2.0 might break client tools that read the SMCP status using the maistra.io/v1 version of the resource.

    This also causes the READY and STATUS columns to be empty when you run **oc get servicemeshcontrolplanes.v1.maistra.io**.

- MAISTRA-1983 *Migration to 2.0* Upgrading to 2.0.0 with an existing invalid **ServiceMeshControlPlane** cannot easily be repaired. The invalid items in the **ServiceMeshControlPlane** resource caused an unrecoverable error. The fix makes the errors recoverable. You can delete the invalid resource and replace it with a new one or edit the resource to fix the errors. For more information about editing your resource, see [Configuring the Red Hat OpenShift Service Mesh installation].

- MAISTRA-1502 As a result of CVEs fixes in version 1.0.10, the Istio dashboards are not available from the **Home Dashboard** menu in Grafana. To access the Istio dashboards, click the **Dashboard** menu in the navigation panel and select the **Manage** tab.
- MAISTRA-1399 Red Hat OpenShift Service Mesh no longer prevents you from installing unsupported CNI protocols. The supported network configurations has not changed.
- MAISTRA-1089 *Migration to 2.0* Gateways created in a non-control plane namespace are automatically deleted. After removing the gateway definition from the SMCP spec, you need to manually delete these resources.
- MAISTRA-858 The following Envoy log messages describing deprecated options and configurations associated with Istio 1.1.x are expected:
  - [2019-06-03 07:03:28.943][19][warning][misc] [external/envoy/source/common/protobuf/utility.cc:129] Using deprecated option 'envoy.api.v2.listener.Filter.config'. This configuration will be removed from Envoy soon.
  - [2019-08-12 22:12:59.001][13][warning][misc] [external/envoy/source/common/protobuf/utility.cc:174] Using deprecated option 'envoy.api.v2.Listener.use_original_dst' from file lds.proto. This configuration will be removed from Envoy soon.
- MAISTRA-806 Evicted Istio Operator Pod causes mesh and CNI not to deploy. Workaround: If the **istio-operator** pod is evicted while deploying the control pane, delete the evicted **istio-operator** pod.
- MAISTRA-681 When the Service Mesh control plane has many namespaces, it can lead to performance issues.
- MAISTRA-193 Unexpected console info messages are visible when health checking is enabled for citadel.
- Bugzilla 1821432 The toggle controls in Red Hat OpenShift Service on AWS Custom Resource details page does not update the CR correctly. UI Toggle controls in the Service Mesh Control Plane (SMCP) Overview page in the Red Hat OpenShift Service on AWS web console sometimes updates the wrong field in the resource. To update a SMCP, edit the YAML content directly or update the resource from the command line instead of clicking the toggle controls.

1.3. UNDERSTANDING SERVICE MESH

Red Hat OpenShift Service Mesh provides a platform for behavioral insight and operational control over your networked microservices in a service mesh. With Red Hat OpenShift Service Mesh, you can connect, secure, and monitor microservices in your Red Hat OpenShift Service on AWS environment.

1.3.1. What is Red Hat OpenShift Service Mesh?

A *service mesh* is the network of microservices that make up applications in a distributed microservice architecture and the interactions between those microservices. When a Service Mesh grows in size and complexity, it can become harder to understand and manage.

Based on the open source Istio project, Red Hat OpenShift Service Mesh adds a transparent layer on existing distributed applications without requiring any changes to the service code. You add Red Hat OpenShift Service Mesh support to services by deploying a special sidecar proxy to relevant services in the mesh that intercepts all network communication between microservices. You configure and manage the Service Mesh using the Service Mesh control plane features.

Red Hat OpenShift Service Mesh gives you an easy way to create a network of deployed services that provide:

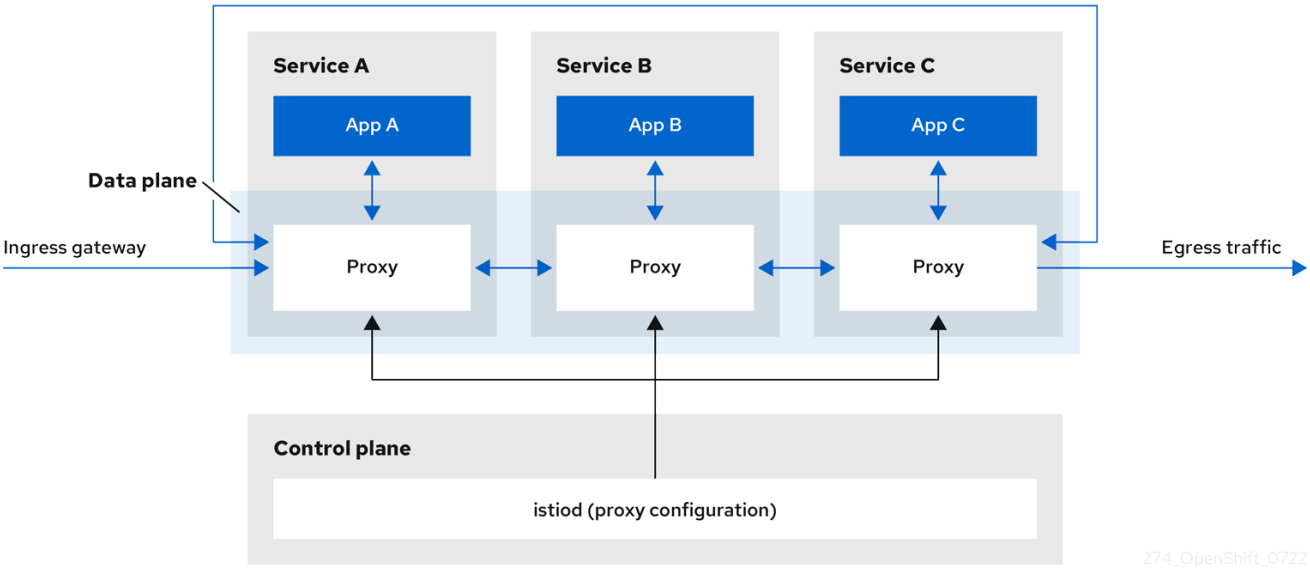
- Discovery
- Load balancing
- Service-to-service authentication
- Failure recovery
- Metrics
- Monitoring

Red Hat OpenShift Service Mesh also provides more complex operational functions including:

- A/B testing
- Canary releases
- Access control
- End-to-end authentication

1.3.2. Service Mesh architecture

Service mesh technology operates at the network communication level. That is, service mesh components capture or intercept traffic to and from microservices, either modifying requests, redirecting them, or creating new requests to other services.



At a high level, Red Hat OpenShift Service Mesh consists of a data plane and a control plane

The **data plane** is a set of intelligent proxies, running alongside application containers in a pod, that intercept and control all inbound and outbound network communication between microservices in the service mesh. The data plane is implemented in such a way that it intercepts all inbound (ingress) and

outbound (egress) network traffic. The Istio data plane consists of Envoy containers running along side application containers in a pod. The Envoy container acts as a proxy, controlling all network communication into and out of the pod.

- **Envoy proxies** are the only Istio components that interact with data plane traffic. All incoming (ingress) and outgoing (egress) network traffic between services flows through the proxies. The Envoy proxy also collects all metrics related to services traffic within the mesh. Envoy proxies are deployed as sidecars, running in the same pod as services. Envoy proxies are also used to implement mesh gateways.
  - **Sidecar proxies** manage inbound and outbound communication for their workload instance.
  - **Gateways** are proxies operating as load balancers receiving incoming or outgoing HTTP/TCP connections. Gateway configurations are applied to standalone Envoy proxies that are running at the edge of the mesh, rather than sidecar Envoy proxies running alongside your service workloads. You use a Gateway to manage inbound and outbound traffic for your mesh, letting you specify which traffic you want to enter or leave the mesh.
    - **Ingress-gateway** - Also known as an Ingress Controller, the Ingress Gateway is a dedicated Envoy proxy that receives and controls traffic entering the service mesh. An Ingress Gateway allows features such as monitoring and route rules to be applied to traffic entering the cluster.
    - **Egress-gateway** - Also known as an egress controller, the Egress Gateway is a dedicated Envoy proxy that manages traffic leaving the service mesh. An Egress Gateway allows features such as monitoring and route rules to be applied to traffic exiting the mesh.

The **control plane** manages and configures the proxies that make up the data plane. It is the authoritative source for configuration, manages access control and usage policies, and collects metrics from the proxies in the service mesh.

- The Istio control plane is composed of **Istiod** which consolidates several previous control plane components (Citadel, Galley, Pilot) into a single binary. Istiod provides service discovery, configuration, and certificate management. It converts high-level routing rules to Envoy configurations and propagates them to the sidecars at runtime.
  - Istiod can act as a Certificate Authority (CA), generating certificates supporting secure mTLS communication in the data plane. You can also use an external CA for this purpose.
  - Istiod is responsible for injecting sidecar proxy containers into workloads deployed to an OpenShift cluster.

Red Hat OpenShift Service Mesh uses the **istio-operator** to manage the installation of the control plane. An *Operator* is a piece of software that enables you to implement and automate common activities in your OpenShift cluster. It acts as a controller, allowing you to set or change the desired state of objects in your cluster, in this case, a Red Hat OpenShift Service Mesh installation.

Red Hat OpenShift Service Mesh also bundles the following Istio add-ons as part of the product:

- **Kiali** - Kiali is the management console for Red Hat OpenShift Service Mesh. It provides dashboards, observability, and robust configuration and validation capabilities. It shows the structure of your service mesh by inferring traffic topology and displays the health of your mesh. Kiali provides detailed metrics, powerful validation, access to Grafana, and strong integration with the Distributed Tracing Platform (Jaeger).

- **Prometheus** - Red Hat OpenShift Service Mesh uses Prometheus to store telemetry information from services. Kiali depends on Prometheus to obtain metrics, health status, and mesh topology.

- **Jaeger** - Red Hat OpenShift Service Mesh supports the Distributed Tracing Platform (Jaeger). Jaeger is an open source traceability server that centralizes and displays traces associated with a single request between multiple services. Using the Distributed Tracing Platform (Jaeger) you can monitor and troubleshoot your microservices-based distributed systems.

- **Elasticsearch** - Elasticsearch is an open source, distributed, JSON-based search and analytics engine. The Distributed Tracing Platform (Jaeger) uses Elasticsearch for persistent storage.

- **Grafana** - Grafana provides mesh administrators with advanced query and metrics analysis and dashboards for Istio data. Optionally, Grafana can be used to analyze service mesh metrics.

The following Istio integrations are supported with Red Hat OpenShift Service Mesh:

- **3scale** - Istio provides an optional integration with Red Hat 3scale API Management solutions. For versions prior to 2.1, this integration was achieved via the 3scale Istio adapter. For version 2.1 and later, the 3scale integration is achieved via a WebAssembly module.

For information about how to install the 3scale adapter, refer to the 3scale Istio adapter documentation

1.3.3. Understanding Kiali

Kiali provides visibility into your service mesh by showing you the microservices in your service mesh, and how they are connected.

1.3.3.1. Kiali overview

Kiali provides observability into the Service Mesh running on Red Hat OpenShift Service on AWS. Kiali helps you define, validate, and observe your Istio service mesh. It helps you to understand the structure of your service mesh by inferring the topology, and also provides information about the health of your service mesh.

Kiali provides an interactive graph view of your namespace in real time that provides visibility into features like circuit breakers, request rates, latency, and even graphs of traffic flows. Kiali offers insights about components at different levels, from Applications to Services and Workloads, and can display the interactions with contextual information and charts on the selected graph node or edge. Kiali also provides the ability to validate your Istio configurations, such as gateways, destination rules, virtual services, mesh policies, and more. Kiali provides detailed metrics, and a basic Grafana integration is available for advanced queries. Distributed tracing is provided by integrating Jaeger into the Kiali console.

Kiali is installed by default as part of the Red Hat OpenShift Service Mesh.

1.3.3.2. Kiali architecture

Kiali is based on the open source Kiali project. Kiali is composed of two components: the Kiali application and the Kiali console.

- **Kiali application** (back end) – This component runs in the container application platform and communicates with the service mesh components, retrieves and processes data, and exposes this data to the console. The Kiali application does not need storage. When deploying the application to a cluster, configurations are set in ConfigMaps and secrets.

- **Kiali console** (front end) – The Kiali console is a web application. The Kiali application serves the Kiali console, which then queries the back end for data to present it to the user.

In addition, Kiali depends on external services and components provided by the container application platform and Istio.

- **Red Hat Service Mesh** (Istio) - Istio is a Kiali requirement. Istio is the component that provides and controls the service mesh. Although Kiali and Istio can be installed separately, Kiali depends on Istio and will not work if it is not present. Kiali needs to retrieve Istio data and configurations, which are exposed through Prometheus and the cluster API.

- **Prometheus** - A dedicated Prometheus instance is included as part of the Red Hat OpenShift Service Mesh installation. When Istio telemetry is enabled, metrics data are stored in Prometheus. Kiali uses this Prometheus data to determine the mesh topology, display metrics, calculate health, show possible problems, and so on. Kiali communicates directly with Prometheus and assumes the data schema used by Istio Telemetry. Prometheus is an Istio dependency and a hard dependency for Kiali, and many of Kiali's features will not work without Prometheus.

- **Cluster API** - Kiali uses the API of the Red Hat OpenShift Service on AWS (cluster API) to fetch and resolve service mesh configurations. Kiali queries the cluster API to retrieve, for example, definitions for namespaces, services, deployments, pods, and other entities. Kiali also makes queries to resolve relationships between the different cluster entities. The cluster API is also queried to retrieve Istio configurations like virtual services, destination rules, route rules, gateways, quotas, and so on.

- **Jaeger** - Jaeger is optional, but is installed by default as part of the Red Hat OpenShift Service Mesh installation. When you install the Distributed Tracing Platform (Jaeger) as part of the default Red Hat OpenShift Service Mesh installation, the Kiali console includes a tab to display distributed tracing data. Note that tracing data will not be available if you disable Istio's distributed tracing feature. Also note that user must have access to the namespace where the Service Mesh control plane is installed to view tracing data.

- **Grafana** - Grafana is optional, but is installed by default as part of the Red Hat OpenShift Service Mesh installation. When available, the metrics pages of Kiali display links to direct the user to the same metric in Grafana. Note that user must have access to the namespace where the Service Mesh control plane is installed to view links to the Grafana dashboard and view Grafana data.

1.3.3.3. Kiali features

The Kiali console is integrated with Red Hat Service Mesh and provides the following capabilities:

- **Health** – Quickly identify issues with applications, services, or workloads.

- **Topology** – Visualize how your applications, services, or workloads communicate via the Kiali graph.

- **Metrics** – Predefined metrics dashboards let you chart service mesh and application performance for Go, Node.js. Quarkus, Spring Boot, Thorntail and Vert.x. You can also create your own custom dashboards.

- **Tracing** – Integration with Jaeger lets you follow the path of a request through various microservices that make up an application.

- **Validations** – Perform advanced validations on the most common Istio objects (Destination Rules, Service Entries, Virtual Services, and so on).

- **Configuration** – Optional ability to create, update and delete Istio routing configuration using wizards or directly in the YAML editor in the Kiali Console.

1.3.4. Understanding distributed tracing

Every time a user takes an action in an application, a request is executed by the architecture that may require dozens of different services to participate to produce a response. The path of this request is a distributed transaction. The Red Hat OpenShift Distributed Tracing Platform lets you perform distributed tracing, which follows the path of a request through various microservices that make up an application.

Distributed tracing is a technique that is used to tie the information about different units of work together—usually executed in different processes or hosts—to understand a whole chain of events in a distributed transaction. Distributed tracing lets developers visualize call flows in large service oriented architectures. It can be invaluable in understanding serialization, parallelism, and sources of latency.

The Red Hat OpenShift Distributed Tracing Platform records the execution of individual requests across the whole stack of microservices, and presents them as traces. A **trace** is a data/execution path through the system. An end-to-end trace comprises one or more spans.

A **span** represents a logical unit of work that has an operation name, the start time of the operation, and the duration. Spans may be nested and ordered to model causal relationships.

WARNING

The deprecated Red Hat OpenShift Distributed Tracing Platform (Jaeger) 3.5 was the last release of the Red Hat OpenShift Distributed Tracing Platform (Jaeger) that Red Hat supported.

All support and maintenance for the deprecated Red Hat OpenShift Distributed Tracing Platform (Jaeger) 3.5 ended on November 3, 2025.

If you still use Red Hat OpenShift Distributed Tracing Platform (Jaeger), you must migrate to Red Hat build of OpenTelemetry Operator and Tempo Operator for distributed tracing collection and storage. For more information, see "Migrating" in the Red Hat build of OpenTelemetry documentation, "Installing" in the Red Hat build of OpenTelemetry documentation, and "Installing" in the Red Hat OpenShift Distributed Tracing Platform documentation.

For more information, see the Red Hat Knowledgebase solution Jaeger Deprecation and Removal in OpenShift.

1.3.4.1. Key concepts in distributed tracing

Every time a user takes an action in an application, a request is executed by the architecture that may require dozens of different services to participate to produce a response. Red Hat OpenShift Distributed Tracing Platform lets you perform distributed tracing, which records the path of a request through various microservices that make up an application.

Distributed tracing is a technique that is used to tie the information about different units of work together – usually executed in different processes or hosts – to understand a whole chain of events in a

distributed transaction. Developers can visualize call flows in large microservice architectures with distributed tracing. It is valuable for understanding serialization, parallelism, and sources of latency.

Red Hat OpenShift Distributed Tracing Platform records the execution of individual requests across the whole stack of microservices, and presents them as traces. A *trace* is a data/execution path through the system. An end-to-end trace consists of one or more spans.

A *span* represents a logical unit of work in Red Hat OpenShift Distributed Tracing Platform that has an operation name, the start time of the operation, and the duration, as well as potentially tags and logs. Spans may be nested and ordered to model causal relationships.

As a service owner, you can use distributed tracing to instrument your services to gather insights into your service architecture. You can use Red Hat OpenShift Distributed Tracing Platform for monitoring, network profiling, and troubleshooting the interaction between components in modern, cloud-native, microservices-based applications.

With Distributed Tracing Platform, you can perform the following functions:

- Monitor distributed transactions
- Optimize performance and latency
- Perform root cause analysis

You can combine Distributed Tracing Platform with other relevant components of the Red Hat OpenShift Service on AWS:

- Red Hat build of OpenTelemetry for forwarding traces to a TempoStack instance
- Distributed tracing UI plugin of the Cluster Observability Operator (COO)

1.3.4.2. Red Hat OpenShift Distributed Tracing Platform architecture

Red Hat OpenShift Distributed Tracing Platform is made up of several components that work together to collect, store, and display tracing data.

- **Red Hat OpenShift Distributed Tracing Platform** - This component is based on the open source Grafana Tempo project.
  - **Gateway** – The Gateway handles authentication, authorization, and forwarding of requests to the Distributor or Query front-end service.
  - **Distributor** – The Distributor accepts spans in multiple formats, including Jaeger, OpenTelemetry, and Zipkin. It routes spans to Ingesters by hashing the **traceID** and using a distributed consistent hash ring.
  - **Ingester** – The Ingester batches a trace into blocks, creates bloom filters and indexes, and then flushes it all to the back end.
  - **Query Frontend** – The Query Frontend shards the search space for an incoming query and sends the query to the Queriers. The Query Frontend deployment exposes the Jaeger UI through the Tempo Query sidecar.
  - **Querier** - The Querier is responsible for finding the requested trace ID in either the Ingesters or the back-end storage. Depending on parameters, it can query the Ingesters and pull Bloom indexes from the back end to search blocks in object storage.

  - **Compactor** – The Compactor streams blocks to and from the back-end storage to reduce the total number of blocks.

- **Red Hat build of OpenTelemetry** - This component is based on the open source OpenTelemetry project.
  - **OpenTelemetry Collector** - The OpenTelemetry Collector is a vendor-agnostic way to receive, process, and export telemetry data. The OpenTelemetry Collector supports open-source observability data formats, for example, Jaeger and Prometheus, sending to one or more open-source or commercial back-ends. The Collector is the default location instrumentation libraries export their telemetry data.

1.3.4.3. Red Hat OpenShift Distributed Tracing Platform features

Red Hat OpenShift Distributed Tracing Platform provides the following capabilities:

- Integration with Kiali – When properly configured, you can view Distributed Tracing Platform data from the Kiali console.
- High scalability – The Distributed Tracing Platform back end is designed to have no single points of failure and to scale with the business needs.
- Distributed Context Propagation – Enables you to connect data from different components together to create a complete end-to-end trace.
- Backwards compatibility with Zipkin – Red Hat OpenShift Distributed Tracing Platform has APIs that enable it to be used as a drop-in replacement for Zipkin, but Red Hat is not supporting Zipkin compatibility in this release.

1.3.5. Next steps

- Prepare to install Red Hat OpenShift Service Mesh in your Red Hat OpenShift Service on AWS environment.

1.4. SERVICE MESH DEPLOYMENT MODELS

Red Hat OpenShift Service Mesh supports several different deployment models that can be combined in different ways to best suit your business requirements.

In Istio, a tenant is a group of users that share common access and privileges for a set of deployed workloads. You can use tenants to provide a level of isolation between different teams. You can segregate access to different tenants using **NetworkPolicies**, **AuthorizationPolicies**, and **exportTo** annotations on istio.io or service resources.

1.4.1. Cluster-Wide (Single Tenant) mesh deployment model

A cluster-wide deployment contains a Service Mesh Control Plane that monitors resources for an entire cluster. Monitoring resources for an entire cluster closely resembles Istio functionality in that the control plane uses a single query across all namespaces to monitor Istio and Kubernetes resources. As a result, cluster-wide deployments decrease the number of requests sent to the API server.

Similar to Istio, a cluster-wide mesh includes namespaces with the **istio-injection=enabled** namespace label by default. You can change this label by modifying the **spec.memberSelectors** field of the **ServiceMeshMemberRoll** resource.

1.4.2. Multitenant deployment model

Red Hat OpenShift Service Mesh installs a **ServiceMeshControlPlane** that is configured for multitenancy by default. Red Hat OpenShift Service Mesh uses a multitenant Operator to manage the Service Mesh control plane lifecycle. Within a mesh, namespaces are used for tenancy.

Red Hat OpenShift Service Mesh uses **ServiceMeshControlPlane** resources to manage mesh installations, whose scope is limited by default to namespace that contains the resource. You use **ServiceMeshMemberRoll** and **ServiceMeshMember** resources to include additional namespaces into the mesh. A namespace can only be included in a single mesh, and multiple meshes can be installed in a single OpenShift cluster.

Typical service mesh deployments use a single Service Mesh control plane to configure communication between services in the mesh. Red Hat OpenShift Service Mesh supports "soft multitenancy", where there is one control plane and one mesh per tenant, and there can be multiple independent control planes within the cluster. Multitenant deployments specify the projects that can access the Service Mesh and isolate the Service Mesh from other control plane instances.

The cluster administrator gets control and visibility across all the Istio control planes, while the tenant administrator only gets control over their specific Service Mesh, Kiali, and Jaeger instances.

You can grant a team permission to deploy its workloads only to a given namespace or set of namespaces. If granted the **mesh-user** role by the service mesh administrator, users can create a **ServiceMeshMember** resource to add namespaces to the **ServiceMeshMemberRoll**.

1.4.2.1. About migrating to a cluster-wide mesh

In a cluster-wide mesh, one **ServiceMeshControlPlane** (SMCP) watches all of the namespaces for an entire cluster. You can migrate an existing cluster from a multitenant mesh to a cluster-wide mesh using Red Hat OpenShift Service Mesh version 2.5 or later.

NOTE

If a cluster must have more than one SMCP, then you cannot migrate to a cluster-wide mesh.

By default, a cluster-wide mesh discovers all of the namespaces that comprise a cluster. However, you can configure the mesh to access a limited set of namespaces. Namespaces do not receive sidecar injection by default. You must specify which namespaces receive sidecar injection.

Similarly, you must specify which pods receive sidecar injection. Pods that exist in a namespace that receives sidecar injection do not inherit sidecar injection. Applying sidecar injection to namespaces and to pods are separate operations.

If you change the Istio version when migrating to a cluster-wide mesh, then you must restart the applications. If you use the same Istio version, the application proxies will connect to the new SMCP for the cluster-wide mesh, and work the same way they did for a multitenant mesh.

1.4.2.1.1. Including and excluding namespaces from a cluster-wide mesh by using the web console

Using the Red Hat OpenShift Service on AWS web console, you can add discovery selectors to the **ServiceMeshControlPlane** resource in a cluster-wide mesh. Discovery selectors define the namespaces that the control plane can discover. The control plane ignores any namespace that does not match one of the discovery selectors, which excludes the namespace from the mesh.

NOTE

If you install ingress or egress gateways in the control plane namespace, you must include the control plane namespace in the discovery selectors.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.
- You have deployed a **ServiceMeshControlPlane** resource.
- You are logged in as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you are logged in as a user with the **dedicated-admin** role.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Navigate to **Ecosystem → Installed Operators**.
3. Click the Red Hat OpenShift Service Mesh Operator.
4. Click **Istio Service Mesh Control Plane**
5. Click the name of the control plane.
6. Click **YAML**.
7. Modify the YAML file so that the **spec.meshConfig** field of the **ServiceMeshControlPlane** resource includes the discovery selector.

NOTE

When configuring namespaces that the **Istiod** service can discover, exclude namespaces that might contain sensitive services that should not be exposed to the rest of the mesh.

In the following example, the **Istiod** service discovers any namespace that is labeled **istio-discovery: enabled** or any namespace that has the name **bookinfo**, **httpbin** or **istio-system**:

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  mode: ClusterWide
  meshConfig:
    discoverySelectors:
    - matchLabels:
        istio-discovery: enabled (1)
    - matchExpressions:
      - key: kubernetes.io/metadata.name (2)
        operator: In
        values:
```

```
    - bookinfo
    - httpbin
    - istio-system
```

1. Ensures that the mesh discovers namespaces that contain the label **istio-discovery: enabled**.
2. Ensures that the mesh discovers namespaces **bookinfo**, **httpbin** and **istio-system**.

If a namespace matches any of the discovery selectors, then the mesh discovers the namespace. The mesh excludes namespaces that do not match any of the discovery selectors.

8. Save the file.

1.4.2.1.2. Including and excluding namespaces from a cluster-wide mesh by using the CLI

Using the Red Hat OpenShift Service on AWS CLI, you can add discovery selectors to the **ServiceMeshControlPlane** resource in a cluster-wide mesh. Discovery selectors define the namespaces that the control plane can discover. The control plane ignores any namespace that does not match one of the discovery selectors, which excludes the namespace from the mesh.

> **NOTE**
>
> If you install ingress or egress gateways in the control plane namespace, you must include the control plane namespace in the discovery selectors.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.
- You have deployed a **ServiceMeshControlPlane** resource.
- You are logged in as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you are logged in as a user with the **dedicated-admin** role.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI.
2. Open the **ServiceMeshControlPlane** resource as a YAML file by running the following command:

```
$ oc -n istio-system edit smcp <name> (1)
```

1. **<name>** represents the name of the **ServiceMeshControlPlane** resource.

3. Modify the YAML file so that the **spec.meshConfig** field of the **ServiceMeshControlPlane** resource includes the discovery selector.

NOTE

When configuring namespaces that the **Istiod** service can discover, exclude namespaces that might contain sensitive services that should not be exposed to the rest of the mesh.

In the following example, the **Istiod** service discovers any namespace that is labeled **istio-discovery: enabled** or any namespace that has the name **bookinfo**, **httpbin** or **istio-system**:

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  mode: ClusterWide
  meshConfig:
    discoverySelectors:
    - matchLabels:
        istio-discovery: enabled (1)
    - matchExpressions:
      - key: kubernetes.io/metadata.name (2)
        operator: In
        values:
        - bookinfo
        - httpbin
        - istio-system
```

1. Ensures that the mesh discovers namespaces that contain the label **istio-discovery: enabled**.
2. Ensures that the mesh discovers namespaces **bookinfo**, **httpbin** and **istio-system**.

If a namespace matches any of the discovery selectors, then the mesh discovers the namespace. The mesh excludes namespaces that do not match any of the discovery selectors.

4. Save the file and exit the editor.

1.4.2.1.3. Defining which namespaces receive sidecar injection in a cluster-wide mesh by using the web console

By default, the Red Hat OpenShift Service Mesh Operator uses member selectors to identify which namespaces receive sidecar injection. Namespaces that do not match the **istio-injection=enabled** label as defined in the **ServiceMeshMemberRoll** resource do not receive sidecar injection.

NOTE

Using discovery selectors to determine which namespaces the mesh can discover has no effect on sidecar injection. Discovering namespaces and configuring sidecar injection are separate operations.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.

- You have deployed a **ServiceMeshControlPlanae** resource with the **mode: ClusterWide** annotation.
- You are logged in as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you are logged in as a user with the **dedicated-admin** role.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Navigate to **Ecosystem → Installed Operators**.
3. Click the Red Hat OpenShift Service Mesh Operator.
4. Click **Istio Service Mesh Member Roll**
5. Click the **ServiceMeshMemberRoll** resource.
6. Click **YAML**.
7. Modify the **spec.memberSelectors** field in the **ServiceMeshMemberRoll** resource by adding a member selector that matches the **inject** label. The following example uses **istio-injection: enabled**:

```
apiVersion: maistra.io/v1
kind: ServiceMeshMemberRoll
metadata:
  name: default
spec:
  memberSelectors:
  - matchLabels:
      istio-injection: enabled (1)
```

(1) Ensures that the namespace receives sidecar injection.

8. Save the file.

1.4.2.1.4. Defining which namespaces receive sidecar injection in a cluster-wide mesh by using the CLI

By default, the Red Hat OpenShift Service Mesh Operator uses member selectors to identify which namespaces receive sidecar injection. Namespaces that do not match the **istio-injection=enabled** label as defined in the **ServiceMeshMemberRoll** resource do not receive sidecar injection.

> **NOTE**
>
> Using discovery selectors to determine which namespaces the mesh can discover has no effect on sidecar injection. Discovering namespaces and configuring sidecar injection are separate operations.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.

- You have deployed a **ServiceMeshControlPlanae** resource with the **mode: ClusterWide** annotation.
- You are logged in as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you are logged in as a user with the **dedicated-admin** role.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI.
2. Edit the **ServiceMeshMemberRoll** resource.

```
$ oc edit smmr -n <controlplane-namespace>
```

3. Modify the **spec.memberSelectors** field in the **ServiceMeshMemberRoll** resource by adding a member selector that matches the **inject** label. The following example uses **istio-injection: enabled**:

```
apiVersion: maistra.io/v1
kind: ServiceMeshMemberRoll
metadata:
  name: default
spec:
  memberSelectors:
  - matchLabels:
      istio-injection: enabled (1)
```

(1) Ensures that the namespace receives sidecar injection.

4. Save the file and exit the editor.

1.4.2.1.5. Excluding individual pods from a cluster-wide mesh by using the web console

A pod receives sidecar injection if it has the **sidecar.istio.io/inject: true** annotation applied, and the pod exists in a namespace that matches either the label selector or the members list defined in the **ServiceMeshMemberRoll** resource.

If a pod does not have the **sidecar.istio.io/inject** annotation applied, it cannot receive sidecar injection.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.
- You have deployed a **ServiceMeshControlPlane** resource with the **mode: ClusterWide** annotation.
- You are logged in as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you are logged in as a user with the **dedicated-admin** role.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.

2. Navigate to **Workloads → Deployments**.
3. Click the name of the deployment.
4. Click **YAML**.
5. Modify the YAML file to deploy one application that receives sidecar injection and one that does not, as shown in the following example:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx
spec:
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      annotations:
        sidecar.istio.io/inject: 'true' (1)
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.14.2
        ports:
        - containerPort: 80
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-without-sidecar
spec:
  selector:
    matchLabels:
      app: nginx-without-sidecar
  template:
    metadata:
      labels:
        app: nginx-without-sidecar (2)
    spec:
      containers:
      - name: nginx
        image: nginx:1.14.2
        ports:
        - containerPort: 80
```

1. This pod has the **sidecar.istio.io/inject** annotation applied, so it receives sidecar injection.
2. This pod does not have the annotation, so it does not receive sidecar injection.

6. Save the file.

1.4.2.1.6. Excluding individual pods from a cluster-wide mesh by using the CLI

A pod receives sidecar injection if it has the **sidecar.istio.io/inject: true** annotation applied, and the pod exists in a namespace that matches either the label selector or the members list defined in the **ServiceMeshMemberRoll** resource.

If a pod does not have the **sidecar.istio.io/inject** annotation applied, it cannot receive sidecar injection.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.
- You have deployed a **ServiceMeshControlPlane** resource with the **mode: ClusterWide** annotation.
- You are logged in as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you are logged in as a user with the **dedicated-admin** role.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI.
2. Edit the deployment by running the following command:

```
$ oc edit deployment -n <namespace> <deploymentName>
```

3. Modify the YAML file to deploy one application that receives sidecar injection and one that does not, as shown in the following example:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx
spec:
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      annotations:
        sidecar.istio.io/inject: 'true' (1)
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.14.2
        ports:
        - containerPort: 80
---
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-without-sidecar
spec:
```

```
selector:
  matchLabels:
    app: nginx-without-sidecar
template:
  metadata:
    labels:
      app: nginx-without-sidecar (2)
  spec:
    containers:
    - name: nginx
      image: nginx:1.14.2
      ports:
      - containerPort: 80
```

1. This pod has the **sidecar.istio.io/inject** annotation applied, so it receives sidecar injection.
2. This pod does not have the annotation, so it does not receive sidecar injection.

4. Save the file.

1.4.3. Multimesh or federated deployment model

Federation is a deployment model that lets you share services and workloads between separate meshes managed in distinct administrative domains.

The Istio multi-cluster model requires a high level of trust between meshes and remote access to all Kubernetes API servers on which the individual meshes reside. Red Hat OpenShift Service Mesh federation takes an opinionated approach to a multi-cluster implementation of Service Mesh that assumes *minimal* trust between meshes.

A *federated mesh* is a group of meshes behaving as a single mesh. The services in each mesh can be unique services, for example a mesh adding services by importing them from another mesh, can provide additional workloads for the same services across the meshes, providing high availability, or a combination of both. All meshes that are joined into a federated mesh remain managed individually, and you must explicitly configure which services are exported to and imported from other meshes in the federation. Support functions such as certificate generation, metrics and trace collection remain local in their respective meshes.

1.5. SERVICE MESH AND ISTIO DIFFERENCES

Red Hat OpenShift Service Mesh differs from an installation of Istio to provide additional features or to handle differences when deploying on Red Hat OpenShift Service on AWS.

1.5.1. Differences between Istio and Red Hat OpenShift Service Mesh

The following features are different in Service Mesh and Istio.

1.5.1.1. Command-line tool

The command-line tool for Red Hat OpenShift Service Mesh is **oc**. Red Hat OpenShift Service Mesh does not support **istioctl**.

1.5.1.2. Installation and upgrades

Red Hat OpenShift Service Mesh does not support Istio installation profiles.

Red Hat OpenShift Service Mesh does not support canary upgrades of the service mesh.

1.5.1.3. Automatic injection

The upstream Istio community installation automatically injects the sidecar into pods within the projects you have labeled.

Red Hat OpenShift Service Mesh does not automatically inject the sidecar into any pods, but you must opt in to injection using an annotation without labeling projects. This method requires fewer privileges and does not conflict with other Red Hat OpenShift Service on AWS capabilities such as builder pods. To enable automatic injection, specify the **sidecar.istio.io/inject** label, or annotation, as described in the *Automatic sidecar injection* section.

Table 1.3. Sidecar injection label and annotation settings

	Upstream Istio	Red Hat OpenShift Service Mesh
Namespace Label	supports "enabled" and "disabled"	supports "disabled"
Pod Label	supports "true" and "false"	supports "true" and "false"
Pod Annotation	supports "false" only	supports "true" and "false"

1.5.1.4. Istio Role Based Access Control features

Istio Role Based Access Control (RBAC) provides a mechanism you can use to control access to a service. You can identify subjects by user name or by specifying a set of properties and apply access controls accordingly.

The upstream Istio community installation includes options to perform exact header matches, match wildcards in headers, or check for a header containing a specific prefix or suffix.

Red Hat OpenShift Service Mesh extends the ability to match request headers by using a regular expression. Specify a property key of **request.regex.headers** with a regular expression.

Upstream Istio community matching request headers example

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: httpbin-usernamepolicy
spec:
  action: ALLOW
  rules:
    - when:
        - key: 'request.regex.headers[username]'
          values:
            - "allowed.*"
  selector:
    matchLabels:
      app: httpbin
```

1.5.1.5. OpenSSL

Red Hat OpenShift Service Mesh replaces BoringSSL with OpenSSL. OpenSSL is a software library that contains an open source implementation of the Secure Sockets Layer (SSL) and Transport Layer Security (TLS) protocols. The Red Hat OpenShift Service Mesh Proxy binary dynamically links the OpenSSL libraries (libssl and libcrypto) from the underlying Red Hat Enterprise Linux operating system.

1.5.1.6. External workloads

Red Hat OpenShift Service Mesh does not support external workloads, such as virtual machines running outside OpenShift on bare metal servers.

1.5.1.7. Virtual Machine Support

You can deploy virtual machines to OpenShift using OpenShift Virtualization. Then, you can apply a mesh policy, such as mTLS or AuthorizationPolicy, to these virtual machines, just like any other pod that is part of a mesh.

1.5.1.8. Component modifications

- A *maistra-version* label has been added to all resources.
- All Ingress resources have been converted to OpenShift Route resources.
- Grafana, distributed tracing (Jaeger), and Kiali are enabled by default and exposed through OpenShift routes.
- Godebug has been removed from all templates
- The **istio-multi** ServiceAccount and ClusterRoleBinding have been removed, as well as the **istio-reader** ClusterRole.

1.5.1.9. Envoy filters

Red Hat OpenShift Service Mesh does not support **EnvoyFilter** configuration except where explicitly documented. Due to tight coupling with the underlying Envoy APIs, backward compatibility cannot be maintained. **EnvoyFilter** patches are very sensitive to the format of the Envoy configuration that is generated by Istio. If the configuration generated by Istio changes, it has the potential to break the application of the **EnvoyFilter**.

1.5.1.10. Envoy services

Red Hat OpenShift Service Mesh does not support QUIC-based services.

1.5.1.11. Istio Container Network Interface (CNI) plugin

Red Hat OpenShift Service Mesh includes CNI plugin, which provides you with an alternate way to configure application pod networking. The CNI plugin replaces the **init-container** network configuration eliminating the need to grant service accounts and projects access to security context constraints (SCCs) with elevated privileges.

NOTE

By default, Istio Container Network Interface (CNI) pods are created on all Red Hat OpenShift Service on AWS nodes. To exclude the creation of CNI pods in a specific node, apply the **maistra.io/exclude-cni=true** label to the node. Adding this label removes any previously deployed Istio CNI pods from the node.

1.5.1.12. Global mTLS settings

Red Hat OpenShift Service Mesh creates a **PeerAuthentication** resource that enables or disables Mutual TLS authentication (mTLS) within the mesh.

1.5.1.13. Gateways

Red Hat OpenShift Service Mesh installs ingress and egress gateways by default. You can disable gateway installation in the **ServiceMeshControlPlane** (SMCP) resource by using the following settings:

- **spec.gateways.enabled=false** to disable both ingress and egress gateways.
- **spec.gateways.ingress.enabled=false** to disable ingress gateways.
- **spec.gateways.egress.enabled=false** to disable egress gateways.

NOTE

The Operator annotates the default gateways to indicate that they are generated by and managed by the Red Hat OpenShift Service Mesh Operator.

1.5.1.14. Multicluster configurations

Red Hat OpenShift Service Mesh support for multicluster configurations is limited to the federation of service meshes across multiple clusters.

1.5.1.15. Custom Certificate Signing Requests (CSR)

You cannot configure Red Hat OpenShift Service Mesh to process CSRs through the Kubernetes certificate authority (CA).

1.5.1.16. Routes for Istio Gateways

OpenShift routes for Istio Gateways are automatically managed in Red Hat OpenShift Service Mesh. Every time an Istio Gateway is created, updated or deleted inside the service mesh, an OpenShift route is created, updated or deleted.

A Red Hat OpenShift Service Mesh control plane component called Istio OpenShift Routing (IOR) synchronizes the gateway route. For more information, see Automatic route creation.

1.5.1.16.1. Catch-all domains

Catch-all domains ("*") are not supported. If one is found in the Gateway definition, Red Hat OpenShift Service Mesh *will* create the route, but will rely on OpenShift to create a default hostname. This means that the newly created route will *not* be a catch all ("*") route, instead it will have a hostname in the form **<route-name>[-<project>].<suffix>**. See the Red Hat OpenShift Service on AWS documentation for

more information about how default hostnames work and how a **cluster-admin** can customize it. If you use Red Hat OpenShift Dedicated, refer to the Red Hat OpenShift Dedicated the **dedicated-admin** role.

1.5.1.16.2. Subdomains

Subdomains (e.g.: "*.domain.com") are supported. However this ability does not come enabled by default in Red Hat OpenShift Service on AWS. This means that Red Hat OpenShift Service Mesh *will* create the route with the subdomain, but it will only be in effect if Red Hat OpenShift Service on AWS is configured to enable it.

1.5.1.16.3. Transport layer security

Transport Layer Security (TLS) is supported. This means that, if the Gateway contains a **tls** section, the OpenShift Route will be configured to support TLS.

Additional resources

- Automatic route creation

1.5.2. Multitenant installations

Whereas upstream Istio takes a single tenant approach, Red Hat OpenShift Service Mesh supports multiple independent control planes within the cluster. Red Hat OpenShift Service Mesh uses a multitenant operator to manage the control plane lifecycle.

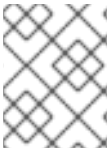
Red Hat OpenShift Service Mesh installs a multitenant control plane by default. You specify the projects that can access the Service Mesh, and isolate the Service Mesh from other control plane instances.

1.5.2.1. Multitenancy versus cluster-wide installations

The main difference between a multitenant installation and a cluster-wide installation is the scope of privileges used by istod. The components no longer use cluster-scoped Role Based Access Control (RBAC) resource **ClusterRoleBinding**.

Every project in the **ServiceMeshMemberRoll members** list will have a **RoleBinding** for each service account associated with the control plane deployment and each control plane deployment will only watch those member projects. Each member project has a **maistra.io/member-of** label added to it, where the **member-of** value is the project containing the control plane installation.

Red Hat OpenShift Service Mesh configures each member project to ensure network access between itself, the control plane, and other member projects by creating a **NetworkPolicy** resource in each member project allowing ingress to all pods from the other members and the control plane. If you remove a member from Service Mesh, this **NetworkPolicy** resource is deleted from the project.



NOTE

This also restricts ingress to only member projects. If you require ingress from non-member projects, you need to create a **NetworkPolicy** to allow that traffic through.

1.5.2.2. Cluster scoped resources

Upstream Istio has two cluster scoped resources that it relies on. The **MeshPolicy** and the **ClusterRbacConfig**. These are not compatible with a multitenant cluster and have been replaced as described below.

- *ServiceMeshPolicy* replaces MeshPolicy for configuration of control-plane-wide authentication policies. This must be created in the same project as the control plane.
- *ServicemeshRbacConfig* replaces ClusterRbacConfig for configuration of control-plane-wide role based access control. This must be created in the same project as the control plane.

1.5.3. Kiali and service mesh

Installing Kiali via the Service Mesh on Red Hat OpenShift Service on AWS differs from community Kiali installations in multiple ways. These modifications are sometimes necessary to resolve issues, provide additional features, or to handle differences when deploying on Red Hat OpenShift Service on AWS.

- Kiali has been enabled by default.
- Ingress has been enabled by default.
- Updates have been made to the Kiali ConfigMap.
- Updates have been made to the ClusterRole settings for Kiali.
- Do not edit the ConfigMap, because your changes might be overwritten by the Service Mesh or Kiali Operators. Files that the Kiali Operator manages have a **kiali.io**/ label or annotation. Updating the Operator files should be restricted to those users with **cluster-admin** privileges. If you use Red Hat OpenShift Dedicated, updating the Operator files should be restricted to those users with **dedicated-admin** privileges.

1.5.4. Distributed tracing and service mesh

Installing the Distributed Tracing Platform (Jaeger) with the Service Mesh on Red Hat OpenShift Service on AWS differs from community Jaeger installations in multiple ways. These modifications are sometimes necessary to resolve issues, provide additional features, or to handle differences when deploying on Red Hat OpenShift Service on AWS.

- Distributed tracing has been enabled by default for Service Mesh.
- Ingress has been enabled by default for Service Mesh.
- The name for the Zipkin port name has changed to **jaeger-collector-zipkin** (from **http**)
- Jaeger uses Elasticsearch for storage by default when you select either the **production** or **streaming** deployment option.
- The community version of Istio provides a generic "tracing" route. Red Hat OpenShift Service Mesh uses a "jaeger" route that is installed by the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator and is already protected by OAuth.
- Red Hat OpenShift Service Mesh uses a sidecar for the Envoy proxy, and Jaeger also uses a sidecar, for the Jaeger agent. These two sidecars are configured separately and should not be confused with each other. The proxy sidecar creates spans related to the pod’s ingress and egress traffic. The agent sidecar receives the spans emitted by the application and sends them to the Jaeger Collector.

1.6. PREPARING TO INSTALL SERVICE MESH

Before you can install Red Hat OpenShift Service Mesh, you must subscribe to Red Hat OpenShift Service on AWS and install Red Hat OpenShift Service on AWS in a supported configuration.

1.6.1. Prerequisites

- Maintain an active Red Hat OpenShift Service on AWS subscription on your Red Hat account. If you do not have a subscription, contact your sales representative for more information.
- Install the version of the Red Hat OpenShift Service on AWS command-line utility (the **oc** client tool) that matches your Red Hat OpenShift Service on AWS version and add it to your path.

For additional information about Red Hat OpenShift Service Mesh lifecycle and supported platforms, refer to the Support Policy.

1.6.2. Supported configurations

The following configurations are supported for the current release of Red Hat OpenShift Service Mesh.

1.6.2.1. Supported platforms

The Red Hat OpenShift Service Mesh Operator supports multiple versions of the **ServiceMeshControlPlane** resource. Version 2.6 Service Mesh control planes are supported on the following platform versions:

- Red Hat OpenShift Container Platform version 4.10 or later
- Red Hat OpenShift Dedicated version 4
- Azure Red Hat OpenShift (ARO) version 4
- Red Hat OpenShift Service on AWS
- Red Hat OpenShift Service on AWS classic architecture

1.6.2.2. Unsupported configurations

Explicitly unsupported cases include:

- OpenShift Online is not supported for Red Hat OpenShift Service Mesh.
- Red Hat OpenShift Service Mesh does not support the management of microservices outside the cluster where Service Mesh is running.

1.6.2.3. Supported network configurations

Red Hat OpenShift Service Mesh supports the following network configurations.

- OpenShift-SDN
- OVN-Kubernetes is available on all supported versions of Red Hat OpenShift Service on AWS.

- Third-Party Container Network Interface (CNI) plugins that have been certified on Red Hat OpenShift Service on AWS and passed Service Mesh conformance testing. See Certified OpenShift CNI Plug-ins for more information.

1.6.2.4. Supported configurations for Service Mesh

- This release of Red Hat OpenShift Service Mesh is only available on Red Hat OpenShift Service on AWS x86_64.
- Configurations where all Service Mesh components are contained within a single Red Hat OpenShift Service on AWS cluster.
- Configurations that do not integrate external services such as virtual machines.
- Red Hat OpenShift Service Mesh does not support **EnvoyFilter** configuration except where explicitly documented.

1.6.2.5. Supported configurations for Kiali

- The Kiali console is only supported on the two most recent releases of the Google Chrome, Microsoft Edge, Mozilla Firefox, or Apple Safari browsers.
- The **openshift** authentication strategy is the only supported authentication configuration when Kiali is deployed with Red Hat OpenShift Service Mesh (OSSM). The **openshift** strategy controls access based on the individual's role-based access control (RBAC) roles of the Red Hat OpenShift Service on AWS.

1.6.2.6. Supported configurations for Distributed Tracing

- Jaeger agent as a sidecar is the only supported configuration for Jaeger. Jaeger as a daemonset is not supported for multitenant installations or OpenShift Dedicated.

1.6.2.7. Supported WebAssembly module

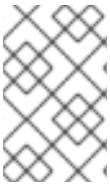
- 3scale WebAssembly is the only provided WebAssembly module. You can create custom WebAssembly modules.

1.6.3. Next steps

- Install Red Hat OpenShift Service Mesh in your Red Hat OpenShift Service on AWS environment.

1.7. INSTALLING THE OPERATORS

To install Red Hat OpenShift Service Mesh, first install the Red Hat OpenShift Service Mesh Operator and any optional Operators on Red Hat OpenShift Service on AWS. Then create a **ServiceMeshControlPlane** resource to deploy the control plane.



NOTE

This basic installation is configured based on the default OpenShift settings and is not designed for production use. Use this default installation to verify your installation, and then configure your service mesh for your specific environment.

Prerequisites

- Read the Preparing to install Red Hat OpenShift Service Mesh process.
- An account with the **cluster-admin** role.

The following steps show how to install a basic instance of Red Hat OpenShift Service Mesh on Red Hat OpenShift Service on AWS.

IMPORTANT

Starting with Red Hat OpenShift Service Mesh 2.5, Red Hat OpenShift Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator are deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for these features during the current release lifecycle, but this feature will no longer receive enhancements and will be removed. As an alternative to Red Hat OpenShift Distributed Tracing Platform (Jaeger), you can use Red Hat OpenShift Distributed Tracing Platform instead.

1.7.1. Service Mesh Operators overview

Red Hat OpenShift Service Mesh requires the use of the Red Hat OpenShift Service Mesh Operator which allows you to connect, secure, control, and observe the microservices that comprise your applications. You can also install other Operators to enhance your service mesh experience.

WARNING

Do not install Community versions of the Operators. Community Operators are not supported.

The following Operator is required:

Red Hat OpenShift Service Mesh Operator

Allows you to connect, secure, control, and observe the microservices that comprise your applications. It also defines and monitors the **ServiceMeshControlPlane** resources that manage the deployment, updating, and deletion of the Service Mesh components. It is based on the open source Istio project.

The following Operators are optional:

Kiali Operator provided by Red Hat

Provides observability for your service mesh. You can view configurations, monitor traffic, and analyze traces in a single console. It is based on the open source Kiali project.

Red Hat OpenShift Distributed Tracing Platform

Provides distributed tracing to monitor and troubleshoot transactions in complex distributed systems. It is based on the open source Grafana Tempo project.

The following optional Operators are deprecated:

IMPORTANT

Starting with Red Hat OpenShift Service Mesh 2.5, Red Hat OpenShift Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator are deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for these features during the current release lifecycle, but these features will no longer receive enhancements and will be removed. As an alternative to Red Hat OpenShift Distributed Tracing Platform (Jaeger), you can use Red Hat OpenShift Distributed Tracing Platform instead.

Red Hat OpenShift Distributed Tracing Platform (Jaeger)

Provides distributed tracing to monitor and troubleshoot transactions in complex distributed systems. It is based on the open source Jaeger project.

OpenShift Elasticsearch Operator

Provides database storage for tracing and logging with the Distributed Tracing Platform (Jaeger). It is based on the open source Elasticsearch project.

1.7.2. Installing the Operators

To install Red Hat OpenShift Service Mesh, you must install the Red Hat OpenShift Service Mesh Operator. Repeat the procedure for each additional Operator you want to install.

Additional Operators include:

- Kiali Operator provided by Red Hat
- Tempo Operator

Deprecated additional Operators include:

IMPORTANT

Starting with Red Hat OpenShift Service Mesh 2.5, Red Hat OpenShift Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator are deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for these features during the current release lifecycle, but this feature will no longer receive enhancements and will be removed. As an alternative to Red Hat OpenShift Distributed Tracing Platform (Jaeger), you can use Red Hat OpenShift Distributed Tracing Platform instead.

- Red Hat OpenShift Distributed Tracing Platform (Jaeger)
- OpenShift Elasticsearch Operator

NOTE

If you have already installed the OpenShift Elasticsearch Operator as part of OpenShift Logging, you do not need to install the OpenShift Elasticsearch Operator again. The Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator creates the Elasticsearch instance using the installed OpenShift Elasticsearch Operator.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console as a user with the **dedicated-admin** role.
2. In the Red Hat OpenShift Service on AWS web console, click **Ecosystem → Software Catalog**.
3. Type the name of the Operator into the filter box and select the Red Hat version of the Operator. Community versions of the Operators are not supported.
4. Click **Install**.
5. On the **Install Operator** page for each Operator, accept the default settings.
6. Click **Install**. Wait until the Operator installs before repeating the steps for the next Operator you want to install.
   - The Red Hat OpenShift Service Mesh Operator installs in the **openshift-operators** namespace and is available for all namespaces in the cluster.
   - The Kiali Operator provided by Red Hat installs in the **openshift-operators** namespace and is available for all namespaces in the cluster.
   - The Tempo Operator installs in the **openshift-tempo-operator** namespace and is available for all namespaces in the cluster.
   - The Red Hat OpenShift Distributed Tracing Platform (Jaeger) installs in the **openshift-distributed-tracing** namespace and is available for all namespaces in the cluster.

     IMPORTANT

     Starting with Red Hat OpenShift Service Mesh 2.5, Red Hat OpenShift Distributed Tracing Platform (Jaeger) is deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for this feature during the current release lifecycle, but this feature will no longer receive enhancements and will be removed. As an alternative to Red Hat OpenShift Distributed Tracing Platform (Jaeger), you can use Red Hat OpenShift Distributed Tracing Platform instead.

   - The OpenShift Elasticsearch Operator installs in the **openshift-operators-redhat** namespace and is available for all namespaces in the cluster.

     IMPORTANT

     Starting with Red Hat OpenShift Service Mesh 2.5, OpenShift Elasticsearch Operator is deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for this feature during the current release lifecycle, but this feature will no longer receive enhancements and will be removed.

Verification

- After all you have installed all four Operators, click **Ecosystem → Installed Operators** to verify that your Operators are installed.

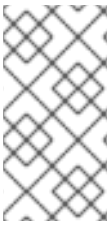
1.7.3. Next steps

- The Red Hat OpenShift Service Mesh Operator does not create the Service Mesh custom resource definitions (CRDs) until you deploy a Service Mesh control plane. You can use the **ServiceMeshControlPlane** resource to install and configure the Service Mesh components. For more information, see Creating the ServiceMeshControlPlane.

1.8. CREATING THE SERVICEMESHCONTROLPLANE

1.8.1. About ServiceMeshControlPlane

The control plane includes Istiod, Ingress and Egress Gateways, and other components, such as Kiali and Jaeger. The control plane must be deployed in a separate namespace than the Service Mesh Operators and the data plane applications and services. You can deploy a basic installation of the **ServiceMeshControlPlane**(SMCP) from the Red Hat OpenShift Service on AWS web console or the command line using the **oc** client tool.



NOTE

This basic installation is configured based on the default Red Hat OpenShift Service on AWS settings and is not designed for production use. Use this default installation to verify your installation, and then configure your **ServiceMeshControlPlane** settings for your environment.

If you are deploying the control plane for use on Red Hat OpenShift Service on AWS, see the Red Hat Knowledgebase article OpenShift service mesh operator Istio basic not starting due to authentication errors, which discusses adding a new project and starting pods.

1.8.1.1. Deploying the Service Mesh control plane from the web console

You can deploy a basic **ServiceMeshControlPlane** by using the web console. In this example, **istio-system** is the name of the Service Mesh control plane project.

Prerequisites

- The Red Hat OpenShift Service Mesh Operator must be installed.
- You are logged in to the Red Hat OpenShift Service on AWS web console as a user with the **dedicated-admin** role.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.
2. Create a project named **istio-system**.
   a. Navigate to **Home** → **Projects**.
   b. Click **Create Project**.
   c. In the **Name** field, enter **istio-system**. The **ServiceMeshControlPlane** resource must be installed in the **istio-system** project, separate from your microservices and Operators.

d. Click **Create**.

3. Navigate to **Ecosystem → Installed Operators**.

4. Click the Red Hat OpenShift Service Mesh Operator, then click **Istio Service Mesh Control Plane**.

5. On the **Istio Service Mesh Control Plane** tab, click **Create ServiceMeshControlPlane**.

   a. Accept the default Service Mesh control plane version to take advantage of the features available in the most current version of the product. The version of the control plane determines the features available regardless of the version of the Operator.

   b. Add the **spec.security.identity.type.ThirdParty** field, required by Red Hat OpenShift Service on AWS.

   c. Click **Create**.

   The Operator creates pods, services, and Service Mesh control plane components based on your configuration parameters. You can configure **ServiceMeshControlPlane** settings at a later time.

Verification

- To verify the control plane installed correctly, click the **Istio Service Mesh Control Plane** tab.

  a. Click the name of the new control plane.

  b. Click the **Resources** tab to see the Red Hat OpenShift Service Mesh control plane resources the Operator created and configured.

1.8.1.2. Deploying the Service Mesh control plane using the CLI

You can deploy a basic **ServiceMeshControlPlane** from the command line.

Prerequisites

- The Red Hat OpenShift Service Mesh Operator must be installed.
- Access to the OpenShift CLI (**oc**).
- You are logged in to Red Hat OpenShift Service on AWS as a user with the **dedicated-admin** role.

Procedure

1. Create a project named **istio-system**.

```
$ oc new-project istio-system
```

   The **ServiceMeshControlPlane** resource must be installed in the **istio-system** project, separate from your microservices and Operators.

2. Create a **ServiceMeshControlPlane** file named **istio-installation.yaml** using the following example. The version of the Service Mesh control plane determines the features available regardless of the version of the Operator.

Example ServiceMeshControlPlane resource

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
  namespace: istio-system
spec:
  version: v2.6
  security:
    identity:
      type: ThirdParty (1)
  tracing:
    type: None
    sampling: 10000
  policy:
    type: Istiod
  addons:
    grafana:
      enabled: true
    kiali:
      enabled: true
    prometheus:
      enabled: true
  telemetry:
    type: Istiod
```

(1) Specifies a required setting for Red Hat OpenShift Service on AWS.

3. Run the following command to deploy the Service Mesh control plane, where **<istio_installation.yaml>** includes the full path to your file.

```
$ oc create -n istio-system -f <istio_installation.yaml>
```

4. To watch the progress of the pod deployment, run the following command:

```
$ oc get pods -n istio-system -w
```

You should see output similar to the following:

```
NAME                                  READY   STATUS    RESTARTS   AGE
grafana-b4d59bd7-mrgbr                2/2     Running   0          65m
istio-egressgateway-678dc97b4c-wrjkp  1/1     Running   0          108s
istio-ingressgateway-b45c9d54d-4qg6n  1/1     Running   0          108s
istiod-basic-55d78bbbcd-j5556         1/1     Running   0          108s
kiali-6476c7656c-x5msp                1/1     Running   0          43m
prometheus-58954b8d6b-m5std           2/2     Running   0          66m
```

1.8.1.3. Validating your SMCP installation with the CLI

You can validate the creation of the **ServiceMeshControlPlane** from the command line.

1. Prerequisites
   - The Red Hat OpenShift Service Mesh Operator must be installed.
   - Access to the OpenShift CLI (**oc**).
   - You are logged in to Red Hat OpenShift Service on AWS as a user with the **dedicated-admin** role.

Procedure

1. Run the following command to verify the Service Mesh control plane installation, where **istio-system** is the namespace where you installed the Service Mesh control plane.

```
$ oc get smcp -n istio-system
```

The installation has finished successfully when the **STATUS** column is **ComponentsReady**.

```
NAME    READY   STATUS            PROFILES      VERSION   AGE
basic   10/10   ComponentsReady   ["default"]   2.6.11    66m
```

1.8.2. About control plane and cluster-wide deployments

A cluster-wide deployment contains a Service Mesh Control Plane that monitors resources for an entire cluster. Monitoring resources for an entire cluster closely resembles Istio functionality in that the control plane uses a single query across all namespaces to monitor Istio and Kubernetes resources. As a result, cluster-wide deployments decrease the number of requests sent to the API server.

You can configure the Service Mesh Control Plane for cluster-wide deployments using either the Red Hat OpenShift Service on AWS web console or the CLI.

1.8.2.1. Configuring the control plane for cluster-wide deployment with the web console

You can configure the **ServiceMeshControlPlane** resource for cluster-wide deployment using the Red Hat OpenShift Service on AWS web console. In this example, **istio-system** is the name of the Service Mesh control plane project.

Prerequisites

- The Red Hat OpenShift Service Mesh Operator is installed.
- You are logged in to Red Hat OpenShift Service on AWS as a user with the **dedicated-admin** role.

Procedure

1. Create a project named **istio-system**.
   a. Navigate to **Home → Projects**.
   b. Click **Create Project**.

c. In the **Name** field, enter **istio-system**. The **ServiceMeshControlPlane** resource must be installed in a project that is separate from your microservices and Operators.
These steps use **istio-system** as an example. You can deploy the Service Mesh control plane to any project as long as it is separate from the project that contains your services.

d. Click **Create**.

2. Navigate to **Ecosystem → Installed Operators**.

3. Click the Red Hat OpenShift Service Mesh Operator, then click **Istio Service Mesh Control Plane**.

4. On the **Istio Service Mesh Control Plane**tab, click **Create ServiceMeshControlPlane**.

5. Click **YAML view**. The version of the Service Mesh control plane determines the features available regardless of the version of the Operator.

6. Modify the **spec.mode** field and add the **spec.security.identity.type.ThirdParty** field:

Example ServiceMeshControlPlane resource

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
  namespace: istio-system
spec:
  version: v2.6
  mode: ClusterWide (1)
  security:
    identity:
      type: ThirdParty (2)
  tracing:
    type: Jaeger
    sampling: 10000
  policy:
    type: Istiod
  addons:
    grafana:
      enabled: true
    jaeger:
      install:
        storage:
          type: Memory
    kiali:
      enabled: true
    prometheus:
      enabled: true
  telemetry:
    type: Istiod
```

1. Specifies that the resource is for a cluster-wide deployment.

2. Specifies a required setting for Red Hat OpenShift Service on AWS.

7. Click **Create**. The Operator creates pods, services, and Service Mesh control plane components based on your configuration parameters. The operator also creates the **ServiceMeshMemberRoll** if it does not exist as part of the default configuration.

Verification

- To verify that the control plane installed correctly:
  a. Click the **Istio Service Mesh Control Plane**tab.
  b. Click the name of the new **ServiceMeshControlPlane** object.
  c. Click the **Resources** tab to see the Red Hat OpenShift Service Mesh control plane resources that the Operator created and configured.

1.8.2.2. Configuring the control plane for cluster-wide deployment with the CLI

You can configure the **ServiceMeshControlPlane** resource for cluster-wide deployment using the CLI. In this example, **istio-system** is the name of the Service Mesh control plane namespace.

Prerequisites

- The Red Hat OpenShift Service Mesh Operator is installed.
- You have access to the OpenShift CLI (**oc**).
- You are logged in to Red Hat OpenShift Service on AWS as a user with the **dedicated-admin** role.

Procedure

1. Create a project named **istio-system**.

```
$ oc new-project istio-system
```

2. Create a **ServiceMeshControlPlane** file named **istio-installation.yaml** using the following example:

Example ServiceMeshControlPlane resource

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
  namespace: istio-system
spec:
  version: v2.6
  mode: ClusterWide (1)
  security:
    identity:
      type: ThirdParty (2)
```

(1) Specifies that the resource is for a cluster-wide deployment.

2 Specifies a required setting for Red Hat OpenShift Service on AWS.

3. Run the following command to deploy the Service Mesh control plane:

```
$ oc create -n istio-system -f <istio_installation.yaml>
```

where:

<istio_installation.yaml>
Specifies the full path to your file.

Verification

1. To monitor the progress of the pod deployment, run the following command:

```
$ oc get pods -n istio-system -w
```

You should see output similar to the following example:

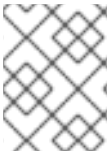
Example output

```
NAME                                READY   STATUS    RESTARTS   AGE
grafana-b4d59bd7-mrgbr              2/2     Running   0          65m
istio-egressgateway-678dc97b4c-wrjkp   1/1     Running   0          108s
istio-ingressgateway-b45c9d54d-4qg6n   1/1     Running   0          108s
istiod-basic-55d78bbbcd-j5556       1/1     Running   0          108s
jaeger-67c75bd6dc-jv6k6             2/2     Running   0          65m
kiali-6476c7656c-x5msp              1/1     Running   0          43m
prometheus-58954b8d6b-m5std         2/2     Running   0          66m
```

1.8.2.3. Customizing the member roll for a cluster-wide mesh

In cluster-wide mode, when you create the **ServiceMeshControlPlane** resource, the **ServiceMeshMemberRoll** resource is also created. You can modify the **ServiceMeshMemberRoll** resource after it gets created. After you modify the resource, the Service Mesh operator no longer changes it. If you modify the **ServiceMeshMemberRoll** resource by using the Red Hat OpenShift Service on AWS web console, accept the prompt to overwrite the modifications.

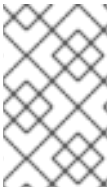
Alternatively, you can create a **ServiceMeshMemberRoll** resource before deploying the **ServiceMeshControlPlane** resource. When you create the **ServiceMeshControlPlane** resource, the Service Mesh Operator will not modify the **ServiceMeshMemberRoll**.



NOTE

The **ServiceMeshMemberRoll** resource name must be named **default** and must be created in the same project namespace as the **ServiceMeshControlPlane** resource.

There are two ways to add a namespace to the mesh. You can either add the namespace by specifying its name in the **spec.members** list, or configure a set of namespace label selectors to include or exclude namespaces based on their labels.



NOTE

Regardless of how members are specified in the **ServiceMeshMemberRoll** resource, you can also add members to the mesh by creating the **ServiceMeshMember** resource in each namespace.

1.8.3. Validating your SMCP installation with Kiali

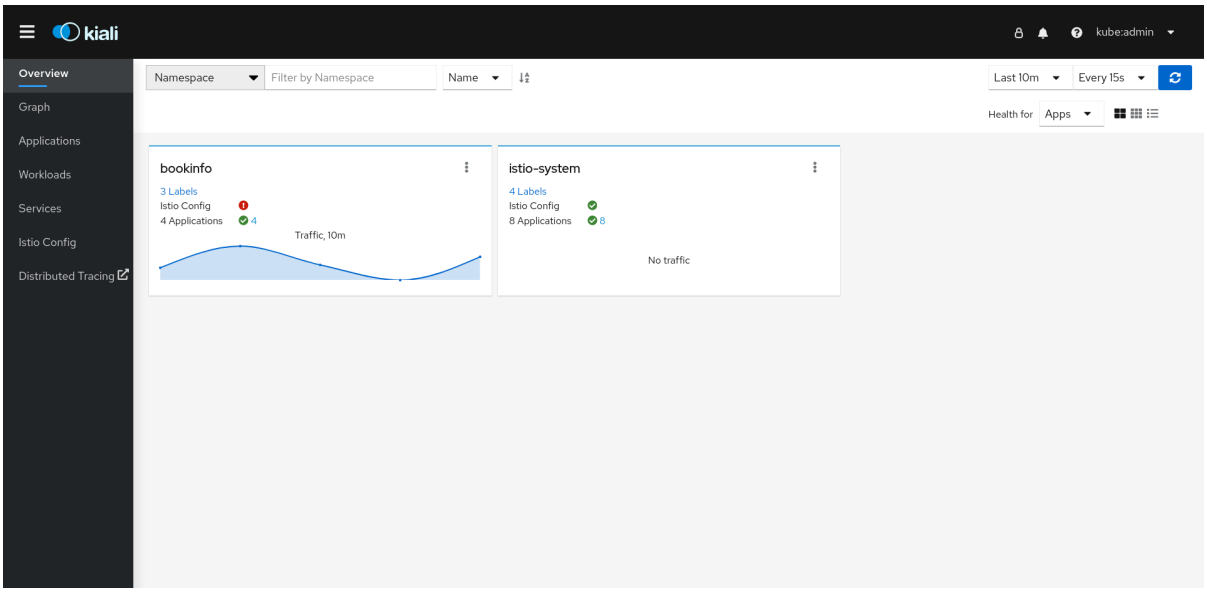
You can use the Kiali console to validate your Service Mesh installation. The Kiali console offers several ways to validate your Service Mesh components are deployed and configured properly.

1. Prerequisites
   - The Red Hat OpenShift Service Mesh Operator must be installed.
   - Access to the OpenShift CLI (**oc**).
   - You are logged in to Red Hat OpenShift Service on AWS as a user with the **dedicated-admin** role.

Procedure

1. In the Red Hat OpenShift Service on AWS web console, navigate to **Networking** → **Routes**.
2. On the **Routes** page, select the Service Mesh control plane project, for example **istio-system**, from the **Namespace** menu.
   The **Location** column displays the linked address for each route.
3. If necessary, use the filter to find the route for the Kiali console. Click the route **Location** to launch the console.
4. Click **Log In With OpenShift**
   When you first log in to the Kiali Console, you see the **Overview** page which displays all the namespaces in your service mesh that you have permission to view. When there are multiple namespaces shown on the **Overview** page, Kiali shows namespaces with health or validation problems first.

   Figure 1.1. Kiali Overview page



The tile for each namespace displays the number of labels, the **Istio Config** health, the number of and **Applications** health, and **Traffic** for the namespace. If you are validating the console installation and namespaces have not yet been added to the mesh, there might not be any data to display other than **istio-system**.

5. Kiali has four dashboards specifically for the namespace where the Service Mesh control plane is installed. To view these dashboards, click the Options menu ⋮ on the tile for the control plane namespace, for example, **istio-system**, and select one of the following options:

   - **Istio Mesh Dashboard**
   - **Istio Control Plane Dashboard**
   - **Istio Performance Dashboard**
   - **Istio Wasm Exetension Dashboard**

   Figure 1.2. Grafana Istio Control Plane Dashboard

   Kiali also installs two additional Grafana dashboards, available from the Grafana **Home** page:

   - **Istio Workload Dashboard**
   - **Istio Service Dashboard**

6. To view the Service Mesh control plane nodes, click the **Graph** page, select the **Namespace** where you installed the **ServiceMeshControlPlane** from the menu, for example **istio-system**.

   a. If necessary, click **Display idle nodes**.

   b. To learn more about the **Graph** page, click the **Graph tour** link.

   c. To view the mesh topology, select one or more additional namespaces from the Service Mesh Member Roll from the **Namespace** menu.

7. To view the list of applications in the **istio-system** namespace, click the **Applications** page. Kiali displays the health of the applications.

a. Hover your mouse over the information icon to view any additional information noted in the **Details** column.

8. To view the list of workloads in the **istio-system** namespace, click the **Workloads** page. Kiali displays the health of the workloads.

   a. Hover your mouse over the information icon to view any additional information noted in the **Details** column.

9. To view the list of services in the **istio-system** namespace, click the **Services** page. Kiali displays the health of the services and of the configurations.

   a. Hover your mouse over the information icon to view any additional information noted in the **Details** column.

10. To view a list of the Istio Configuration objects in the **istio-system** namespace, click the **Istio Config** page. Kiali displays the health of the configuration.

    a. If there are configuration errors, click the row and Kiali opens the configuration file with the error highlighted.

1.8.4. Additional resources

Red Hat OpenShift Service Mesh supports multiple independent control planes within the cluster. You can create reusable configurations with **ServiceMeshControlPlane** profiles. For more information, see Creating control plane profiles .

1.8.5. Next steps

- Add a project to the Service Mesh so that applications can be made available. For more information, see Adding services to a service mesh .

1.9. ADDING SERVICES TO A SERVICE MESH

A project contains services; however, the services are only available if you add the project to the service mesh.

1.9.1. About adding projects to a service mesh

After installing the Operators and creating the **ServiceMeshControlPlane** resource, add one or more projects to the service mesh.

NOTE

In Red Hat OpenShift Service on AWS, a project is essentially a Kubernetes namespace with additional annotations, such as the range of user IDs that can be used in the project. Typically, the Red Hat OpenShift Service on AWS web console uses the term project, and the CLI uses the term namespace, but the terms are essentially synonymous.

You can add projects to an existing service mesh using either the Red Hat OpenShift Service on AWS web console or the CLI. There are three methods to add a project to a service mesh:

- Specifying the project name in the **ServiceMeshMemberRoll** resource.

- Configuring label selectors in the **spec.memberSelectors** field of the **ServiceMeshMemberRoll** resource.
- Creating the **ServiceMeshMember** resource in the project.

If you use the first method, then you must create the **ServiceMeshMemberRoll** resource.

1.9.2. Creating the Red Hat OpenShift Service Mesh member roll

The **ServiceMeshMemberRoll** lists the projects that belong to the Service Mesh control plane. Only projects listed in the **ServiceMeshMemberRoll** are affected by the control plane. A project does not belong to a service mesh until you add it to the member roll for a particular control plane deployment.

You must create a **ServiceMeshMemberRoll** resource named **default** in the same project as the **ServiceMeshControlPlane**, for example **istio-system**.

1.9.2.1. Creating the member roll from the web console

You can add one or more projects to the Service Mesh member roll from the web console. In this example, **istio-system** is the name of the Service Mesh control plane project.

Prerequisites

- An installed, verified Red Hat OpenShift Service Mesh Operator.
- List of existing projects to add to the service mesh.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. If you do not already have services for your mesh, or you are starting from scratch, create a project for your applications. It must be different from the project where you installed the Service Mesh control plane.
   a. Navigate to **Home** → **Projects**.
   b. Enter a name in the **Name** field.
   c. Click **Create**.
3. Navigate to **Ecosystem** → **Installed Operators**.
4. Click the **Project** menu and choose the project where your **ServiceMeshControlPlane** resource is deployed from the list, for example **istio-system**.
5. Click the Red Hat OpenShift Service Mesh Operator.
6. Click the **Istio Service Mesh Member Roll**tab.
7. Click **Create ServiceMeshMemberRoll**
8. Click **Members**, then enter the name of your project in the **Value** field. You can add any number of projects, but a project can only belong to one **ServiceMeshMemberRoll** resource.
9. Click **Create**.

1.9.2.2. Creating the member roll from the CLI

You can add a project to the **ServiceMeshMemberRoll** from the command line.

Prerequisites

- An installed, verified Red Hat OpenShift Service Mesh Operator.
- List of projects to add to the service mesh.
- Access to the OpenShift CLI (**oc**).

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI.

```
$ oc login --username=<NAMEOFUSER> https://<HOSTNAME>:6443
```

2. If you do not already have services for your mesh, or you are starting from scratch, create a project for your applications. It must be different from the project where you installed the Service Mesh control plane.

```
$ oc new-project <your-project>
```

3. To add your projects as members, modify the following example YAML. You can add any number of projects, but a project can only belong to one **ServiceMeshMemberRoll** resource. In this example, **istio-system** is the name of the Service Mesh control plane project.

Example servicemeshmemberroll-default.yaml

```
apiVersion: maistra.io/v1
kind: ServiceMeshMemberRoll
metadata:
  name: default
  namespace: istio-system
spec:
  members:
    # a list of projects joined into the service mesh
    - your-project-name
    - another-project-name
```

4. Run the following command to upload and create the **ServiceMeshMemberRoll** resource in the **istio-system** namespace.

```
$ oc create -n istio-system -f servicemeshmemberroll-default.yaml
```

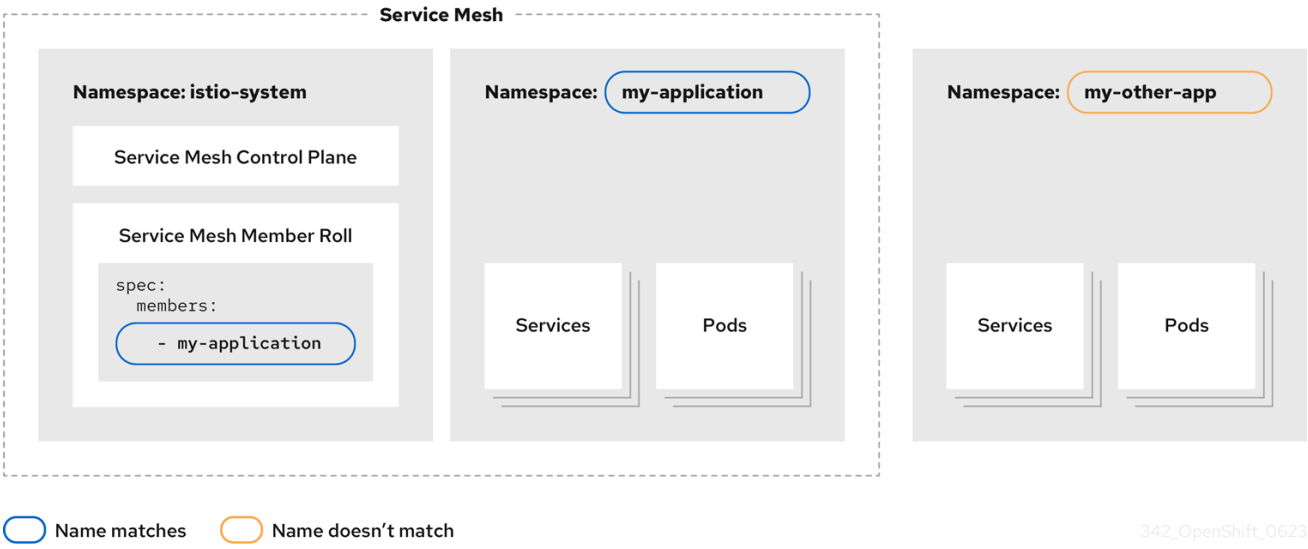
5. Run the following command to verify the **ServiceMeshMemberRoll** was created successfully.

```
$ oc get smmr -n istio-system default
```

The installation has finished successfully when the **STATUS** column is **Configured**.

1.9.3. About adding projects using the ServiceMeshMemberRoll resource

Using the **ServiceMeshMemberRoll** resource is the simplest way to add a project to a service mesh. To add a project, specify the project name in the **spec.members** field of the **ServiceMeshMemberRoll** resource. The **ServiceMeshMemberRoll** resource specifies which projects are controlled by the **ServiceMeshControlPlane** resource.



NOTE

Adding projects using this method requires the user to have the **update servicemeshmemberrolls** and the **update pods** privileges in the project that is being added.

- If you already have an application, workload, or service to add to the service mesh, see the following:
  - Adding or removing projects from the mesh using the **ServiceMeshMemberRoll** resource with the web console
  - Adding or removing projects from the mesh using the **ServiceMeshMemberRoll** resource with the CLI
- Alternatively, to install a sample application called Bookinfo and add it to a **ServiceMeshMemberRoll** resource, see the Bookinfo example application tutorial.

1.9.3.1. Adding or removing projects from the mesh using the ServiceMeshMemberRoll resource with the web console

You can add or remove projects from the mesh using the **ServiceMeshMemberRoll** resource with the Red Hat OpenShift Service on AWS web console. You can add any number of projects, but a project can only belong to one mesh.

The **ServiceMeshMemberRoll** resource is deleted when its corresponding **ServiceMeshControlPlane** resource is deleted.

Prerequisites

- An installed, verified Red Hat OpenShift Service Mesh Operator.

- An existing **ServiceMeshMemberRoll** resource.
- The name of the project with the **ServiceMeshMemberRoll** resource.
- The names of the projects you want to add or remove from the mesh.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Navigate to **Ecosystem → Installed Operators**.
3. Click the **Project** menu and choose the project where your **ServiceMeshControlPlane** resource is deployed from the list. For example **istio-system**.
4. Click the Red Hat OpenShift Service Mesh Operator.
5. Click the **Istio Service Mesh Member Roll**tab.
6. Click the **default** link.
7. Click the YAML tab.
8. Modify the YAML to add projects as members (or delete them to remove existing members). You can add any number of projects, but a project can only belong to one **ServiceMeshMemberRoll** resource.

   Example servicemeshmemberroll-default.yaml

   ```
   apiVersion: maistra.io/v1
   kind: ServiceMeshMemberRoll
   metadata:
     name: default
     namespace: istio-system #control plane project
   spec:
     members:
       # a list of projects joined into the service mesh
       - your-project-name
       - another-project-name
   ```

9. Click **Save**.
10. Click **Reload**.

1.9.3.2. Adding or removing projects from the mesh using ServiceMeshMemberRoll resource with the CLI

You can add one or more projects to the mesh using the **ServiceMeshMemberRoll** resource with the CLI. You can add any number of projects, but a project can only belong to one mesh.

The **ServiceMeshMemberRoll** resource is deleted when its corresponding **ServiceMeshControlPlane** resource is deleted.

Prerequisites

- An installed, verified Red Hat OpenShift Service Mesh Operator.
- An existing **ServiceMeshMemberRoll** resource.
- The name of the project with the **ServiceMeshMemberRoll** resource.
- The names of the projects you want to add or remove from the mesh.
- Access to the OpenShift CLI (**oc**).

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI.
2. Edit the **ServiceMeshMemberRoll** resource.

```
$ oc edit smmr -n <controlplane-namespace>
```

3. Modify the YAML to add or remove projects as members. You can add any number of projects, but a project can only belong to one **ServiceMeshMemberRoll** resource.

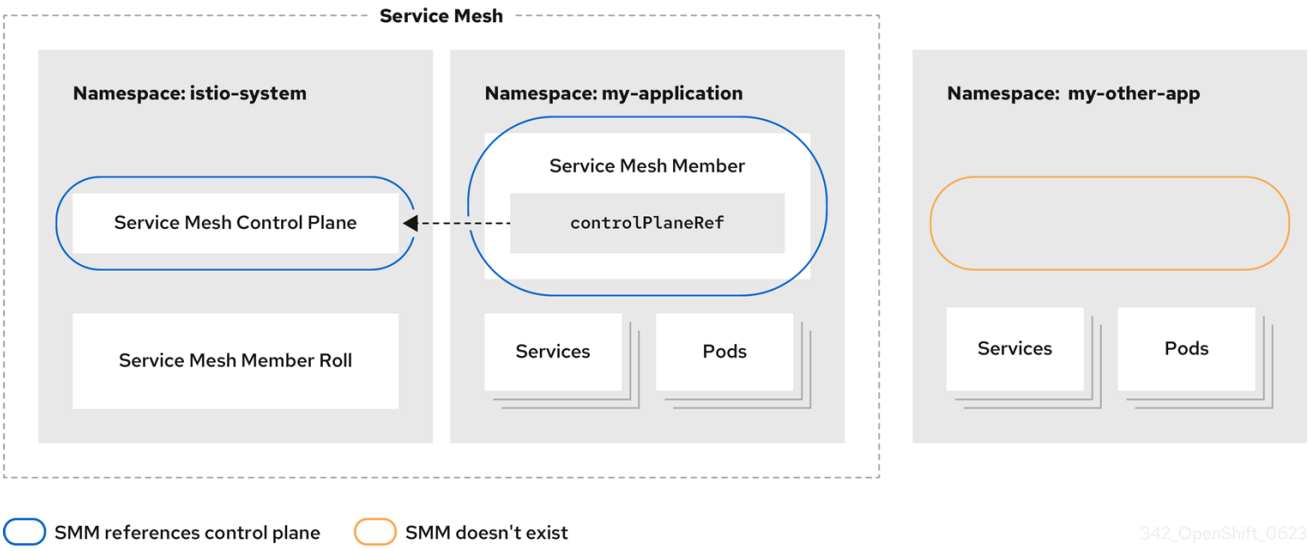
Example servicemeshmemberroll-default.yaml

```
apiVersion: maistra.io/v1
kind: ServiceMeshMemberRoll
metadata:
  name: default
  namespace: istio-system #control plane project
spec:
  members:
    # a list of projects joined into the service mesh
    - your-project-name
    - another-project-name
```

4. Save the file and exit the editor.

1.9.4. About adding projects using the ServiceMeshMember resource

A **ServiceMeshMember** resource provides a way to add a project to a service mesh without modifying the **ServiceMeshMemberRoll** resource. To add a project, create a **ServiceMeshMember** resource in the project that you want to add to the service mesh. When the Service Mesh Operator processes the **ServiceMeshMember** object, the project appears in the **status.members** list of the **ServiceMeshMemberRoll** resource. Then, the services that reside in the project are made available to the mesh.



The mesh administrator must grant each mesh user permission to reference the **ServiceMeshControlPlane** resource in the **ServiceMeshMember** resource. With this permission in place, a mesh user can add a project to a mesh even when that user does not have direct access rights for the service mesh project or the **ServiceMeshMemberRoll** resource. For more information, see Creating the Red Hat OpenShift Service Mesh members.

1.9.4.1. Adding a project to the mesh using the ServiceMeshMember resource with the web console

You can add one or more projects to the mesh using the **ServiceMeshMember** resource with the Red Hat OpenShift Service on AWS web console.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.
- You know the name of the **ServiceMeshControlPlane** resource and the name of the project that the resource belongs to.
- You know the name of the project you want to add to the mesh.
- A service mesh administrator must explicitly grant access to the service mesh. Administrators can grant users permissions to access the mesh by assigning them the **mesh-user Role** using a **RoleBinding** or **ClusterRoleBinding**. For more information, see *Creating the Red Hat OpenShift Service Mesh members*.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Navigate to **Ecosystem → Installed Operators**.
3. Click the **Project** menu and choose the project that you want to add to the mesh from the drop-down list. For example, **istio-system**.
4. Click the Red Hat OpenShift Service Mesh Operator.
5. Click the **Istio Service Mesh Member** tab.

6. Click **Create ServiceMeshMember**
7. Accept the default name for the **ServiceMeshMember**.
8. Click to expand **ControlPlaneRef**.
9. In the **Namespace** field, select the project that the **ServiceMeshControlPlane** resource belongs to. For example, **istio-system**.
10. In the **Name** field, enter the name of the **ServiceMeshControlPlane** resource that this namespace belongs to. For example, **basic**.
11. Click **Create**.

Verification

1. Confirm the **ServiceMeshMember** resource was created and that the project was added to the mesh by using the following steps:
   a. Click the resource name, for example, **default**.
   b. View the **Conditions** section shown at the end of the screen.
   c. Confirm that the **Status** of the **Reconciled** and **Ready** conditions is **True**.
   If the **Status** is **False**, see the **Reason** and **Message** columns for more information.

1.9.4.2. Adding a project to the mesh using the ServiceMeshMember resource with the CLI

You can add one or more projects to the mesh using the **ServiceMeshMember** resource with the CLI.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.
- You know the name of the **ServiceMeshControlPlane** resource and the name of the project it belongs to.
- You know the name of the project you want to add to the mesh.
- A service mesh administrator must explicitly grant access to the service mesh. Administrators can grant users permissions to access the mesh by assigning them the **mesh-user Role** using a **RoleBinding** or **ClusterRoleBinding**. For more information, see *Creating the Red Hat OpenShift Service Mesh members*.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI.
2. Create the YAML file for the **ServiceMeshMember** manifest. The manifest adds the **my-application** project to the service mesh that was created by the **ServiceMeshControlPlane** resource deployed in the **istio-system** namespace:

```
apiVersion: maistra.io/v1
kind: ServiceMeshMember
metadata:
```

```
  name: default
  namespace: my-application
spec:
  controlPlaneRef:
    namespace: istio-system
    name: basic
```

3. Apply the YAML file to create the **ServiceMeshMember** resource:

```
$ oc apply -f <file-name>
```

Verification

- Verify that the namespace is part of the mesh by running the following command. Confirm the that the value **True** appears in the **READY** column.

```
$ oc get smm default -n my-application
```

Example output

```
NAME      CONTROL PLANE        READY   AGE
default   istio-system/basic   True    2m11s
```

- Alternatively, view the **ServiceMeshMemberRoll** resource to confirm that the **my-application** namespace is displayed in the **status.members** and **status.configuredMembers** fields of the **ServiceMeshMemberRoll** resource.

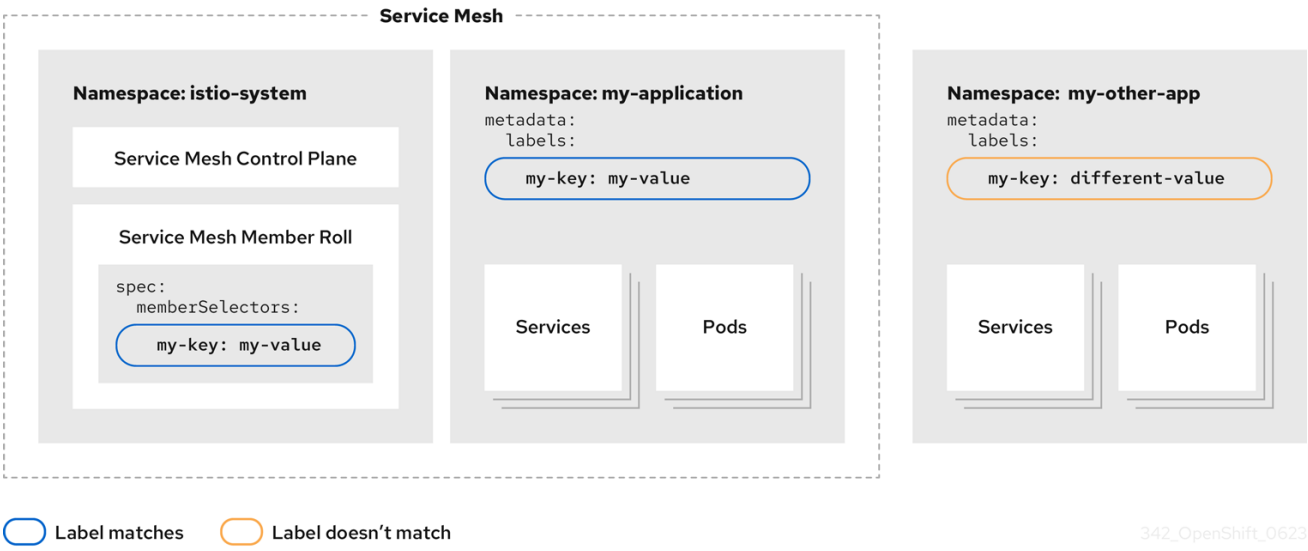
```
$ oc describe smmr default -n istio-system
```

Example output

```
Name:         default
Namespace:    istio-system
Labels:       <none>
# ...
Status:
# ...
  Configured Members:
    default
    my-application
# ...
  Members:
    default
    my-application
```

1.9.5. About adding projects using label selectors

For cluster-wide deployments, you can use label selectors to add projects to the mesh. Label selectors specified in the **ServiceMeshMemberRoll** resource enable the Service Mesh Operator to add or remove namespaces to or from the mesh based on namespace labels. Unlike other standard Red Hat OpenShift Service on AWS resources that you can use to specify a single label selector, you can use the **ServiceMeshMemberRoll** resource to specify multiple label selectors.



If the labels for a namespace match any of the selectors specified in the **ServiceMeshMemberRoll** resource, then the namespace is included in the mesh.

NOTE

In Red Hat OpenShift Service on AWS, a project is essentially a Kubernetes namespace with additional annotations, such as the range of user IDs that can be used in the project. Typically, the Red Hat OpenShift Service on AWS web console uses the term *project*, and the CLI uses the term *namespace*, but the terms are essentially synonymous.

1.9.5.1. Adding a project to the mesh using label selectors with the web console

You can use labels selectors to add a project to the Service Mesh with the Red Hat OpenShift Service on AWS web console.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.
- The deployment has an existing **ServiceMeshMemberRoll** resource.
- You are logged in to the Red Hat OpenShift Service on AWS web console as a user with the **dedicated-admin** role.

Procedure

1. Navigate to **Ecosystem → Installed Operators**.
2. Click the **Project** menu, and from the drop-down list, select the project where your **ServiceMeshMemberRoll** resource is deployed. For example, **istio-system**.
3. Click the Red Hat OpenShift Service Mesh Operator.
4. Click the **Istio Service Mesh Member Roll**tab.
5. Click **Create ServiceMeshMember Roll**
6. Accept the default name for the **ServiceMeshMemberRoll**.

7. In the **Labels** field, enter key-value pairs to define the labels that identify which namespaces to include in the service mesh. If a project namespace has either label specified by the selectors, then the project namespace is included in the service mesh. You do not need to include both labels.
   For example, entering **mykey=myvalue** includes all namespaces with this label as part of the mesh. When the selector identifies a match, the project namespace is added to the service mesh.

   Entering **myotherkey=myothervalue** includes all namespaces with this label as part of the mesh. When the selector identifies a match, the project namespace is added to the service mesh.

8. Click **Create**.

1.9.5.2. Adding a project to the mesh using label selectors with the CLI

You can use label selectors to add a project to the Service Mesh with the CLI.

Prerequisites

- You have installed the Red Hat OpenShift Service Mesh Operator.
- The deployment has an existing **ServiceMeshMemberRoll** resource.
- You are logged in to Red Hat OpenShift Service on AWS as a user with the **dedicated-admin** role.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI.
2. Edit the **ServiceMeshMemberRoll** resource.

```
$ oc edit smmr default -n istio-system
```

   You can deploy the Service Mesh control plane to any project provided that it is separate from the project that contains your services.

3. Modify the YAML file to include namespace label selectors in the **spec.memberSelectors** field of the **ServiceMeshMemberRoll** resource.

> **NOTE**
>
> Instead of using the **matchLabels** field, you can also use the **matchExpressions** field in the selector.

```
apiVersion: maistra.io/v1
kind: ServiceMeshMemberRoll
metadata:
  name: default
  namespace: istio-system
spec:
  memberSelectors: (1)
  - matchLabels: (2)
```

```
    mykey: myvalue (3)
  - matchLabels: (4)
    myotherkey: myothervalue (5)
```

(1) Contains the label selectors used to identify which project namespaces are included in the service mesh. If a project namespace has either label specified by the selectors, then the project namespace is included in the service mesh. The project namespace does not need both labels to be included.

(2) (3) Specifies all namespaces with the **mykey=myvalue** label. When the selector identifies a match, the project namespace is added to the service mesh.

(4) (5) Specifies all namespaces with the **myotherkey=myothervalue** label. When the selector identifies a match, the project namespace is added to the service mesh.

1.9.6. Bookinfo example application

The Bookinfo example application allows you to test your Red Hat OpenShift Service Mesh 2.6.11 installation on Red Hat OpenShift Service on AWS.

The Bookinfo application displays information about a book, similar to a single catalog entry of an online book store. The application displays a page that describes the book, book details (ISBN, number of pages, and other information), and book reviews.

The Bookinfo application consists of these microservices:

- The **productpage** microservice calls the **details** and **reviews** microservices to populate the page.
- The **details** microservice contains book information.
- The **reviews** microservice contains book reviews. It also calls the **ratings** microservice.
- The **ratings** microservice contains book ranking information that accompanies a book review.

There are three versions of the reviews microservice:

- Version v1 does not call the **ratings** Service.
- Version v2 calls the **ratings** Service and displays each rating as one to five black stars.
- Version v3 calls the **ratings** Service and displays each rating as one to five red stars.

1.9.6.1. Installing the Bookinfo application

This tutorial walks you through how to create a sample application by creating a project, deploying the Bookinfo application to that project, and viewing the running application in Service Mesh.

Prerequisites

- Red Hat OpenShift Service on AWS 4.1 or higher installed.
- Red Hat OpenShift Service Mesh 2.6.11 installed.

- Access to the OpenShift CLI (**oc**).
- You are logged in to Red Hat OpenShift Service on AWS as a user with the **dedicated-admin** role.

> **NOTE**
>
> The commands in this section assume the Service Mesh control plane project is **istio-system**. If you installed the control plane in another namespace, edit each command before you run it.

Procedure

1. Click **Home** → **Projects**.
2. Click **Create Project**.
3. Enter **bookinfo** as the **Project Name**, enter a **Display Name**, and enter a **Description**, then click **Create**.
   - Alternatively, you can run this command from the CLI to create the **bookinfo** project.

     ```
     $ oc new-project bookinfo
     ```

4. Click **Ecosystem** → **Installed Operators**.
5. Click the **Project** menu and use the Service Mesh control plane namespace. In this example, use **istio-system**.
6. Click the **Red Hat OpenShift Service Mesh** Operator.
7. Click the **Istio Service Mesh Member Roll**tab.
   a. If you have already created a Istio Service Mesh Member Roll, click the name, then click the YAML tab to open the YAML editor.
   b. If you have not created a **ServiceMeshMemberRoll**, click **Create ServiceMeshMemberRoll**.
8. Click **Members**, then enter the name of your project in the **Value** field.
9. Click **Create** to save the updated Service Mesh Member Roll.
   a. Or, save the following example to a YAML file.

      Bookinfo ServiceMeshMemberRoll example servicemeshmemberroll-default.yaml

      ```
      apiVersion: maistra.io/v1
      kind: ServiceMeshMemberRoll
      metadata:
        name: default
      spec:
        members:
        - bookinfo
      ```

b. Run the following command to upload that file and create the **ServiceMeshMemberRoll** resource in the **istio-system** namespace. In this example, **istio-system** is the name of the Service Mesh control plane project.

```
$ oc create -n istio-system -f servicemeshmemberroll-default.yaml
```

10. Run the following command to verify the **ServiceMeshMemberRoll** was created successfully.

```
$ oc get smmr -n istio-system -o wide
```

The installation has finished successfully when the **STATUS** column is **Configured**.

```
NAME      READY   STATUS      AGE   MEMBERS
default   1/1     Configured   70s   ["bookinfo"]
```

11. From the CLI, deploy the Bookinfo application in the `*bookinfo*` project by applying the **bookinfo.yaml** file:

```
$ oc apply -n bookinfo -f https://raw.githubusercontent.com/Maistra/istio/maistra-
2.6/samples/bookinfo/platform/kube/bookinfo.yaml
```

You should see output similar to the following:

```
service/details created
serviceaccount/bookinfo-details created
deployment.apps/details-v1 created
service/ratings created
serviceaccount/bookinfo-ratings created
deployment.apps/ratings-v1 created
service/reviews created
serviceaccount/bookinfo-reviews created
deployment.apps/reviews-v1 created
deployment.apps/reviews-v2 created
deployment.apps/reviews-v3 created
service/productpage created
serviceaccount/bookinfo-productpage created
deployment.apps/productpage-v1 created
```

12. Create the ingress gateway by applying the **bookinfo-gateway.yaml** file:

```
$ oc apply -n bookinfo -f https://raw.githubusercontent.com/Maistra/istio/maistra-
2.6/samples/bookinfo/networking/bookinfo-gateway.yaml
```

You should see output similar to the following:

```
gateway.networking.istio.io/bookinfo-gateway created
virtualservice.networking.istio.io/bookinfo created
```

13. Set the value for the **GATEWAY_URL** parameter:

```
$ export GATEWAY_URL=$(oc -n istio-system get route istio-ingressgateway -o
jsonpath='{.spec.host}')
```

1.9.6.2. Adding default destination rules

Before you can use the Bookinfo application, you must first add default destination rules. There are two preconfigured YAML files, depending on whether or not you enabled mutual transport layer security (TLS) authentication.

Procedure

1. To add destination rules, run one of the following commands:

   - If you did not enable mutual TLS:

     ```
     $ oc apply -n bookinfo -f https://raw.githubusercontent.com/Maistra/istio/maistra-2.6/samples/bookinfo/networking/destination-rule-all.yaml
     ```

   - If you enabled mutual TLS:

     ```
     $ oc apply -n bookinfo -f https://raw.githubusercontent.com/Maistra/istio/maistra-2.6/samples/bookinfo/networking/destination-rule-all-mtls.yaml
     ```

     You should see output similar to the following:

     ```
     destinationrule.networking.istio.io/productpage created
     destinationrule.networking.istio.io/reviews created
     destinationrule.networking.istio.io/ratings created
     destinationrule.networking.istio.io/details created
     ```

1.9.6.3. Verifying the Bookinfo installation

To confirm that the sample Bookinfo application was successfully deployed, perform the following steps.

Prerequisites

- Red Hat OpenShift Service Mesh installed.
- Complete the steps for installing the Bookinfo sample app.
- You are logged in to Red Hat OpenShift Service on AWS as a user with the **dedicated-admin** role.

Procedure from CLI

1. Verify that all pods are ready with this command:

   ```
   $ oc get pods -n bookinfo
   ```

   All pods should have a status of **Running**. You should see output similar to the following:

   ```
   NAME                              READY   STATUS    RESTARTS   AGE
   details-v1-55b869668-jh7hb        2/2     Running   0          12m
   productpage-v1-6fc77ff794-nsl8r   2/2     Running   0          12m
   ratings-v1-7d7d8d8b56-55scn       2/2     Running   0          12m
   ```

```
reviews-v1-868597db96-bdxgq      2/2     Running   0          12m
reviews-v2-5b64f47978-cvssp      2/2     Running   0          12m
reviews-v3-6dfd49b55b-vcwpf      2/2     Running   0          12m
```

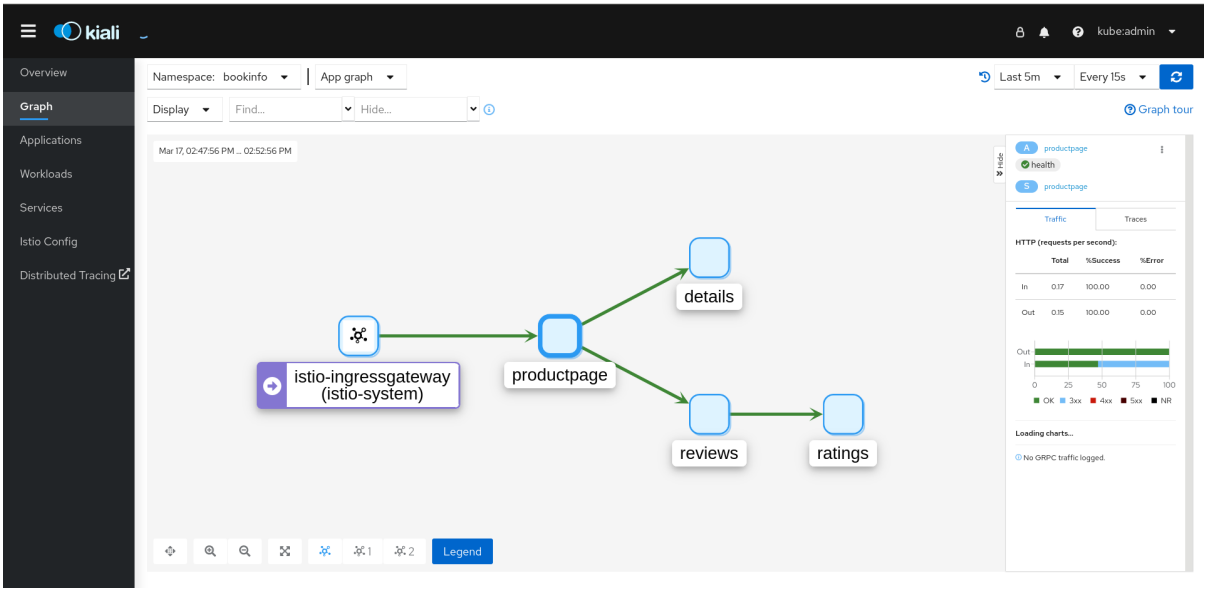
2. Run the following command to retrieve the URL for the product page:

```
echo "http://$GATEWAY_URL/productpage"
```

3. Copy and paste the output in a web browser to verify the Bookinfo product page is deployed.

Procedure from Kiali web console

1. Obtain the address for the Kiali web console.
   a. Log in to the Red Hat OpenShift Service on AWS web console.
   b. Navigate to **Networking → Routes**.
   c. On the **Routes** page, select the Service Mesh control plane project, for example **istio-system**, from the **Namespace** menu.
      The **Location** column displays the linked address for each route.
   d. Click the link in the **Location** column for Kiali.
   e. Click **Log In With OpenShift** The Kiali **Overview** screen presents tiles for each project namespace.
2. In Kiali, click **Graph**.
3. Select bookinfo from the **Namespace** list, and App graph from the **Graph Type** list.
4. Click **Display idle nodes** from the **Display** menu.
   This displays nodes that are defined but have not received or sent requests. It can confirm that an application is properly defined, but that no request traffic has been reported.



- Use the **Duration** menu to increase the time period to help ensure older traffic is captured.
- Use the **Refresh Rate** menu to refresh traffic more or less often, or not at all.

5. Click **Services**, **Workloads** or **Istio Config** to see list views of bookinfo components, and confirm that they are healthy.

1.9.6.4. Removing the Bookinfo application

Follow these steps to remove the Bookinfo application.

Prerequisites

- Red Hat OpenShift Service on AWS 4.1 or higher installed.
- Red Hat OpenShift Service Mesh 2.6.11 installed.
- Access to the OpenShift CLI (**oc**).

1.9.6.4.1. Delete the Bookinfo project

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Click to **Home** → **Projects**.
3. Click the **bookinfo** menu ⋮, and then click **Delete Project**.
4. Type **bookinfo** in the confirmation dialog box, and then click **Delete**.
   - Alternatively, you can run this command using the CLI to create the **bookinfo** project.

```
$ oc delete project bookinfo
```

1.9.6.4.2. Remove the Bookinfo project from the Service Mesh member roll

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Click **Ecosystem** → **Installed Operators**.
3. Click the **Project** menu and choose **istio-system** from the list.
4. Click the **Istio Service Mesh Member Roll**link under **Provided APIS** for the **Red Hat OpenShift Service Mesh** Operator.
5. Click the **ServiceMeshMemberRoll** menu ⋮ and select **Edit Service Mesh Member Roll**
6. Edit the default Service Mesh Member Roll YAML and remove **bookinfo** from the **members** list.
   - Alternatively, you can run this command using the CLI to remove the **bookinfo** project from the **ServiceMeshMemberRoll**. In this example, **istio-system** is the name of the Service Mesh control plane project.

```
$ oc -n istio-system patch --type='json' smmr default -p '[{"op": "remove", "path":
"/spec/members", "value":["""bookinfo"""]}]'
```

7. Click **Save** to update Service Mesh Member Roll.

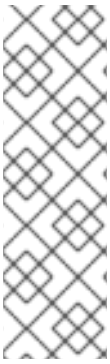
1.9.7. Next steps

- To continue the installation process, you must enable sidecar injection.

1.10. ENABLING SIDECAR INJECTION

After adding the namespaces that contain your services to your mesh, the next step is to enable automatic sidecar injection in the Deployment resource for your application. You must enable automatic sidecar injection for each deployment.

If you have installed the Bookinfo sample application, the application was deployed and the sidecars were injected as part of the installation procedure. If you are using your own project and service, deploy your applications on Red Hat OpenShift Service on AWS.



NOTE

Traffic started by Init Containers, specialized containers that run before the application containers in a pod, cannot travel outside of the service mesh by default. Any action Init Containers perform that requires establishing a network traffic connection outside of the mesh fails.

For more information about connecting Init Containers to a service, see the Red Hat Knowledgebase solution initContainer in CrashLoopBackOff on pod with Service Mesh sidecar injected

1.10.1. Prerequisites

- Services deployed to the mesh, for example the Bookinfo sample application.
- A Deployment resource file.

1.10.2. Enabling automatic sidecar injection

When deploying an application, you must opt-in to injection by configuring the label **sidecar.istio.io/inject** in **spec.template.metadata.labels** to **true** in the **deployment** object. Opting in ensures that the sidecar injection does not interfere with other Red Hat OpenShift Service on AWS features such as builder pods used by numerous frameworks within the Red Hat OpenShift Service on AWS ecosystem.

Prerequisites

- Identify the namespaces that are part of your service mesh and the deployments that need automatic sidecar injection.

Procedure

1. To find your deployments use the **oc get** command.

```
$ oc get deployment -n <namespace>
```

For example, to view the **Deployment** YAML file for the 'ratings-v1' microservice in the **bookinfo** namespace, use the following command to see the resource in YAML format.

```
oc get deployment -n bookinfo ratings-v1 -o yaml
```

2. Open the application's **Deployment** YAML file in an editor.

3. Add **spec.template.metadata.labels.sidecar.istio/inject** to your Deployment YAML file and set **sidecar.istio.io/inject** to **true** as shown in the following example.

Example snippet from bookinfo deployment-ratings-v1.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ratings-v1
  namespace: bookinfo
  labels:
    app: ratings
    version: v1
spec:
  template:
    metadata:
      labels:
        sidecar.istio.io/inject: 'true'
```

NOTE

Using the **annotations** parameter when enabling automatic sidecar injection is deprecated and is replaced by using the **labels** parameter.

4. Save the **Deployment** YAML file.

5. Add the file back to the project that contains your app.

```
$ oc apply -n <namespace> -f deployment.yaml
```

In this example, **bookinfo** is the name of the project that contains the **ratings-v1** app and **deployment-ratings-v1.yaml** is the file you edited.

```
$ oc apply -n bookinfo -f deployment-ratings-v1.yaml
```

6. To verify that the resource uploaded successfully, run the following command.

```
$ oc get deployment -n <namespace> <deploymentName> -o yaml
```

For example,

```
$ oc get deployment -n bookinfo ratings-v1 -o yaml
```

1.10.3. Validating sidecar injection

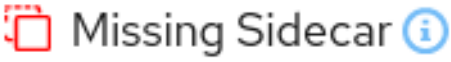
The Kiali console offers several ways to validate whether or not your applications, services, and workloads have a sidecar proxy.

Figure 1.3. Missing sidecar badge

The **Graph** page displays a node badge indicating a **Missing Sidecar** on the following graphs:

- App graph
- Versioned app graph
- Workload graph

Figure 1.4. Missing sidecar icon



The **Applications** page displays a **Missing Sidecar** icon in the **Details** column for any applications in a namespace that do not have a sidecar.

The **Workloads** page displays a **Missing Sidecar** icon in the **Details** column for any applications in a namespace that do not have a sidecar.

The **Services** page displays a **Missing Sidecar** icon in the **Details** column for any applications in a namespace that do not have a sidecar. When there are multiple versions of a service, you use the **Service Details** page to view **Missing Sidecar** icons.

The **Workload Details** page has a special unified **Logs** tab that lets you view and correlate application and proxy logs. You can view the Envoy logs as another way to validate sidecar injection for your application workloads.

The **Workload Details** page also has an **Envoy** tab for any workload that is an Envoy proxy or has been injected with an Envoy proxy. This tab displays a built-in Envoy dashboard that includes subtabs for **Clusters**, **Listeners**, **Routes**, **Bootstrap**, **Config**, and **Metrics**.

For information about enabling Envoy access logs, see the Troubleshooting section.

For information about viewing Envoy logs, see Viewing logs in the Kiali console .

1.10.4. Setting proxy environment variables through annotations

Configuration for the Envoy sidecar proxies is managed by the **ServiceMeshControlPlane**.

You can set environment variables for the sidecar proxy for applications by adding pod annotations to the deployment in the **injection-template.yaml** file. The environment variables are injected to the sidecar.

Example injection-template.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: resource
spec:
  replicas: 7
  selector:
    matchLabels:
      app: resource
  template:
    metadata:
      annotations:
        sidecar.maistra.io/proxyEnv: "{ \"maistra_test_env\": \"env_value\", \"maistra_test_env_2\":
\"env_value_2\" }"
```

> **WARNING**
>
> You should never include **maistra.io**/ labels and annotations when creating your own custom resources. These labels and annotations indicate that the resources are generated and managed by the Operator. If you are copying content from an Operator-generated resource when creating your own resources, do not include labels or annotations that start with **maistra.io**/. Resources that include these labels or annotations will be overwritten or deleted by the Operator during the next reconciliation.

1.10.5. Updating sidecar proxies

In order to update the configuration for sidecar proxies the application administrator must restart the application pods.

If your deployment uses automatic sidecar injection, you can update the pod template in the deployment by adding or modifying an annotation. Run the following command to redeploy the pods:

```
$ oc patch deployment/<deployment> -p '{"spec":{"template":{"metadata":{"annotations":
{"kubectl.kubernetes.io/restartedAt": "`date -Iseconds`"}}}}}'
```

If your deployment does not use automatic sidecar injection, you must manually update the sidecars by modifying the sidecar container image specified in the deployment or pod, and then restart the pods.

1.10.6. Next steps

Configure Red Hat OpenShift Service Mesh features for your environment.

- Security

- Traffic management
- Metrics, logs, and traces

1.11. UPGRADING SERVICE MESH

To access the most current features of Red Hat OpenShift Service Mesh, upgrade to the current version, 2.6.11.

1.11.1. Understanding versioning

Red Hat uses semantic versioning for product releases. Semantic Versioning is a 3-component number in the format of X.Y.Z, where:

- X stands for a Major version. Major releases usually denote some sort of breaking change: architectural changes, API changes, schema changes, and similar major updates.
- Y stands for a Minor version. Minor releases contain new features and functionality while maintaining backwards compatibility.
- Z stands for a Patch version (also known as a z-stream release). Patch releases are used to addresses Common Vulnerabilities and Exposures (CVEs) and release bug fixes. New features and functionality are generally not released as part of a Patch release.

1.11.1.1. How versioning affects Service Mesh upgrades

Depending on the version of the update you are making, the upgrade process is different.

- **Patch updates** - Patch upgrades are managed by the Operator Lifecycle Manager (OLM); they happen automatically when you update your Operators.
- **Minor upgrades** - Minor upgrades require both updating to the most recent Red Hat OpenShift Service Mesh Operator version and manually modifying the **spec.version** value in your **ServiceMeshControlPlane** resources.
- **Major upgrades** - Major upgrades require both updating to the most recent Red Hat OpenShift Service Mesh Operator version and manually modifying the **spec.version** value in your **ServiceMeshControlPlane** resources. Because major upgrades can contain changes that are not backwards compatible, additional manual changes might be required.

1.11.1.2. Understanding Service Mesh versions

In order to understand what version of Red Hat OpenShift Service Mesh you have deployed on your system, you need to understand how each of the component versions is managed.

- **Operator** version - The most current Operator version is 2.6.11. The Operator version number only indicates the version of the currently installed Operator. Because the Red Hat OpenShift Service Mesh Operator supports multiple versions of the Service Mesh control plane, the version of the Operator does not determine the version of your deployed **ServiceMeshControlPlane** resources.

IMPORTANT

Upgrading to the latest Operator version automatically applies patch updates, but does not automatically upgrade your Service Mesh control plane to the latest minor version.

- **ServiceMeshControlPlane** version - The **ServiceMeshControlPlane** version determines what version of Red Hat OpenShift Service Mesh you are using. The value of the **spec.version** field in the **ServiceMeshControlPlane** resource controls the architecture and configuration settings that are used to install and deploy Red Hat OpenShift Service Mesh. When you create the Service Mesh control plane you can set the version in one of two ways:
  - To configure in the Form View, select the version from the **Control Plane Version** menu.
  - To configure in the YAML View, set the value for **spec.version** in the YAML file.

Operator Lifecycle Manager (OLM) does not manage Service Mesh control plane upgrades, so the version number for your Operator and **ServiceMeshControlPlane** (SMCP) may not match, unless you have manually upgraded your SMCP.

1.11.2. Upgrade considerations

The **maistra.io/** label or annotation should not be used on a user-created custom resource, because it indicates that the resource was generated by and should be managed by the Red Hat OpenShift Service Mesh Operator.

WARNING

During the upgrade, the Operator makes changes, including deleting or replacing files, to resources that include the following labels or annotations that indicate that the resource is managed by the Operator.

Before upgrading check for user-created custom resources that include the following labels or annotations:

- **maistra.io/** AND the **app.kubernetes.io/managed-by** label set to **maistra-istio-operator** (Red Hat OpenShift Service Mesh)
- **kiali.io/** (Kiali)
- **jaegertracing.io/** (Red Hat OpenShift Distributed Tracing Platform (Jaeger))
- **logging.openshift.io/** (Red Hat Elasticsearch)

Before upgrading, check your user-created custom resources for labels or annotations that indicate they are Operator managed. Remove the label or annotation from custom resources that you do not want to be managed by the Operator.

When upgrading to version 2.0, the Operator only deletes resources with these labels in the same namespace as the SMCP.

When upgrading to version 2.1, the Operator deletes resources with these labels in all namespaces.

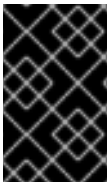
1.11.2.1. Known issues that may affect upgrade

Known issues that may affect your upgrade include:

- When upgrading an Operator, custom configurations for Jaeger or Kiali might be reverted. Before upgrading an Operator, note any custom configuration settings for the Jaeger or Kiali objects in the Service Mesh production deployment so that you can recreate them.
- Red Hat OpenShift Service Mesh does not support the use of **EnvoyFilter** configuration except where explicitly documented. This is due to tight coupling with the underlying Envoy APIs, meaning that backward compatibility cannot be maintained. If you are using Envoy Filters, and the configuration generated by Istio has changed due to the lastest version of Envoy introduced by upgrading your **ServiceMeshControlPlane**, that has the potential to break any **EnvoyFilter** you may have implemented.
- OSSM-1505 **ServiceMeshExtension** does not work with Red Hat OpenShift Service on AWS version 4.11. Because **ServiceMeshExtension** has been deprecated in Red Hat OpenShift Service Mesh 2.2, this known issue will not be fixed and you must migrate your extensions to **WasmPluging**
- OSSM-1396 If a gateway resource contains the **spec.externalIPs** setting, rather than being recreated when the **ServiceMeshControlPlane** is updated, the gateway is removed and never recreated.
- OSSM-1052 When configuring a Service **ExternalIP** for the ingressgateway in the Service Mesh control plane, the service is not created. The schema for the SMCP is missing the parameter for the service.
  Workaround: Disable the gateway creation in the SMCP spec and manage the gateway deployment entirely manually (including Service, Role and RoleBinding).

1.11.3. Upgrading the Operators

In order to keep your Service Mesh patched with the latest security fixes, bug fixes, and software updates, you must keep your Operators updated. You initiate patch updates by upgrading your Operators.



IMPORTANT

The version of the Operator does **not** determine the version of your service mesh. The version of your deployed Service Mesh control plane determines your version of Service Mesh.

Because the Red Hat OpenShift Service Mesh Operator supports multiple versions of the Service Mesh control plane, updating the Red Hat OpenShift Service Mesh Operator does *not* update the **spec.version** value of your deployed **ServiceMeshControlPlane**. Also note that the **spec.version** value is a two digit number, for example 2.2, and that patch updates, for example 2.2.1, are not reflected in the SMCP version value.

Operator Lifecycle Manager (OLM) controls the installation, upgrade, and role-based access control (RBAC) of Operators in a cluster. The OLM runs by default in Red Hat OpenShift Service on AWS. OLM queries for available Operators as well as upgrades for installed Operators.

Whether or not you have to take action to upgrade your Operators depends on the settings you selected when installing them. When you installed each of your Operators, you selected an **Update Channel** and an **Approval Strategy**. The combination of these two settings determine when and how your Operators are updated.

Table 1.4. Interaction of Update Channel and Approval Strategy

	Versioned channel	"Stable" or "Preview" Channel
Automatic	Automatically updates the Operator for minor and patch releases for that version only. Will not automatically update to the next major version (that is, from version 2.0 to 3.0). Manual change to Operator subscription required to update to the next major version.	Automatically updates Operator for all major, minor, and patch releases.
Manual	Manual updates required for minor and patch releases for the specified version. Manual change to Operator subscription required to update to the next major version.	Manual updates required for all major, minor, and patch releases.

When you update your Red Hat OpenShift Service Mesh Operator the Operator Lifecycle Manager (OLM) removes the old Operator pod and starts a new pod. Once the new Operator pod starts, the reconciliation process checks the **ServiceMeshControlPlane** (SMCP), and if there are updated container images available for any of the Service Mesh control plane components, it replaces those Service Mesh control plane pods with ones that use the new container images.

When you upgrade the Kiali and Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operators, the OLM reconciliation process scans the cluster and upgrades the managed instances to the version of the new Operator. For example, if you update the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator from version 1.30.2 to version 1.34.1, the Operator scans for running instances of Distributed Tracing Platform (Jaeger) and upgrades them to 1.34.1 as well.

To stay on a particular patch version of Red Hat OpenShift Service Mesh, you would need to disable automatic updates and remain on that specific version of the Operator.

1.11.4. Upgrading the control plane

You must manually update the control plane for minor and major releases. The community Istio project recommends canary upgrades, Red Hat OpenShift Service Mesh only supports in-place upgrades. Red Hat OpenShift Service Mesh requires that you upgrade from each minor release to the next minor release in sequence. For example, you must upgrade from version 2.0 to version 2.1, and then upgrade to version 2.2. You cannot update from Red Hat OpenShift Service Mesh 2.0 to 2.2 directly.

When you upgrade the service mesh control plane, all Operator managed resources, for example gateways, are also upgraded.

Although you can deploy multiple versions of the control plane in the same cluster, Red Hat OpenShift Service Mesh does not support canary upgrades of the service mesh. That is, you can have different SCMP resources with different values for **spec.version**, but they cannot be managing the same mesh.

For more information about migrating your extensions, refer to Migrating from ServiceMeshExtension to WasmPlugin resources.

1.11.4.1. Upgrade changes from version 2.5 to version 2.6

1.11.4.1.1. Red Hat OpenShift Distributed Tracing Platform (Jaeger) default setting change

This release disables Red Hat OpenShift Distributed Tracing Platform (Jaeger) by default for new instances of the **ServiceMeshControlPlane** resource.

When updating existing instances of the **ServiceMeshControlPlane** resource to Red Hat OpenShift Service Mesh version 2.6, Distributed Tracing Platform (Jaeger) remains enabled by default.

Red Hat OpenShift Service Mesh 2.6 is the last release that includes support for Red Hat OpenShift Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator. Both Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator will be removed in the next release. If you are currently using Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator, you must migrate to Red Hat OpenShift Distributed Tracing Platform and Red Hat build of OpenTelemetry.

1.11.4.1.2. Envoy sidecar container default setting change

To enhance pod startup times, Istio now includes a **startupProbe** in sidecar containers by default. The pod's readiness probes do not start until the Envoy sidecar has started.

1.11.4.2. Upgrade changes from version 2.4 to version 2.5

1.11.4.2.1. Istio OpenShift Routing (IOR) default setting change

The default setting for Istio OpenShift Routing (IOR) has changed. The setting is now disabled by default.

You can use IOR by setting the **enabled** field to **true** in the **spec.gateways.openshiftRoute** specification of the **ServiceMeshControlPlane** resource.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
spec:
  gateways:
    openshiftRoute:
      enabled: true
```

1.11.4.2.2. Istio proxy concurrency configuration enhancement

For consistency across deployments, Istio now configures the **concurrency** parameter based on the CPU limit allocated to the proxy container. For example, a limit of 2500m would set the **concurrency** parameter to 3. If you set the **concurrency** parameter to a value, Istio uses that value to configure how many threads the proxy runs instead of using the CPU limit.

Previously, the default setting for the parameter was 2.

1.11.4.3. Upgrade changes from version 2.3 to version 2.4

Upgrading the Service Mesh control plane from version 2.3 to 2.4 introduces the following behavioral changes:

- Support for Istio OpenShift Routing (IOR) has been deprecated. IOR functionality is still enabled, but it will be removed in a future release.
- The following cipher suites are no longer supported, and were removed from the list of ciphers used in client and server side TLS negotiations.
  - ECDHE-ECDSA-AES128-SHA
  - ECDHE-RSA-AES128-SHA
  - AES128-GCM-SHA256
  - AES128-SHA
  - ECDHE-ECDSA-AES256-SHA
  - ECDHE-RSA-AES256-SHA
  - AES256-GCM-SHA384
  - AES256-SHA
    Applications that require access to services that use one of these cipher suites will fail to connect when the proxy initiates a TLS connection.

1.11.4.4. Upgrade changes from version 2.2 to version 2.3

Upgrading the Service Mesh control plane from version 2.2 to 2.3 introduces the following behavioral changes:

- This release requires use of the **WasmPlugin** API. Support for the **ServiceMeshExtension** API, which was deprecated in 2.2, has now been removed. If you attempt to upgrade while using the **ServiceMeshExtension** API, then the upgrade fails.

1.11.4.5. Upgrade changes from version 2.1 to version 2.2

Upgrading the Service Mesh control plane from version 2.1 to 2.2 introduces the following behavioral changes:

- The **istio-node** DaemonSet is renamed to **istio-cni-node** to match the name in upstream Istio.
- Istio 1.10 updated Envoy to send traffic to the application container using **eth0** rather than **lo** by default.
- This release adds support for the **WasmPlugin** API and deprecates the **ServiceMeshExtension** API.

1.11.4.6. Upgrade changes from version 2.0 to version 2.1

Upgrading the Service Mesh control plane from version 2.0 to 2.1 introduces the following architectural and behavioral changes.

Architecture changes

Mixer has been completely removed in Red Hat OpenShift Service Mesh 2.1. Upgrading from a Red Hat OpenShift Service Mesh 2.0.x release to 2.1 will be blocked if Mixer is enabled.

If you see the following message when upgrading from v2.0 to v2.1, update the existing **Mixer** type to **Istiod** type in the existing Control Plane spec before you update the **.spec.version** field:

```
An error occurred
admission webhook smcp.validation.maistra.io denied the request: [support for policy.type "Mixer"
and policy.Mixer options have been removed in v2.1, please use another alternative, support for
telemetry.type "Mixer" and telemetry.Mixer options have been removed in v2.1, please use another
alternative]”
```

For example:

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
spec:
  policy:
    type: Istiod
  telemetry:
    type: Istiod
  version: v2.6
```

Behavioral changes

- **AuthorizationPolicy** updates:
  - With the PROXY protocol, if you are using **ipBlocks** and **notIpBlocks** to specify remote IP addresses, update the configuration to use **remoteIpBlocks** and **notRemoteIpBlocks** instead.
  - Added support for nested JSON Web Token (JWT) claims.
- **EnvoyFilter** breaking changes>
  - Must use **typed_config**
  - xDS v2 is no longer supported
  - Deprecated filter names
- Older versions of proxies may report 503 status codes when receiving 1xx or 204 status codes from newer proxies.

1.11.4.7. Upgrading the Service Mesh control plane

To upgrade Red Hat OpenShift Service Mesh, you must update the version field of the Red Hat OpenShift Service Mesh **ServiceMeshControlPlane** v2 resource. Then, once it is configured and applied, restart the application pods to update each sidecar proxy and its configuration.

Prerequisites

- You are running Red Hat OpenShift Service on AWS 4.9 or later.

- You have the latest Red Hat OpenShift Service Mesh Operator.

Procedure

1. Switch to the project that contains your **ServiceMeshControlPlane** resource. In this example, **istio-system** is the name of the Service Mesh control plane project.

```
$ oc project istio-system
```

2. Check your v2 **ServiceMeshControlPlane** resource configuration to verify it is valid.

   a. Run the following command to view your **ServiceMeshControlPlane** resource as a v2 resource.

```
$ oc get smcp -o yaml
```

   TIP

   Back up your Service Mesh control plane configuration.

3. Update the **.spec.version** field and apply the configuration.
   For example:

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  version: v2.6
```

   Alternatively, instead of using the command line, you can use the web console to edit the Service Mesh control plane. In the Red Hat OpenShift Service on AWS web console, click **Project** and select the project name you just entered.

   a. Click **Ecosystem → Installed Operators**.

   b. Find your **ServiceMeshControlPlane** instance.

   c. Select **YAML view** and update text of the YAML file, as shown in the previous example.

   d. Click **Save**.

1.11.4.8. Migrating Red Hat OpenShift Service Mesh from version 1.1 to version 2.0

Upgrading from version 1.1 to 2.0 requires manual steps that migrate your workloads and application to a new instance of Red Hat OpenShift Service Mesh running the new version.

Prerequisites

- You must upgrade to Red Hat OpenShift Service on AWS 4.7. before you upgrade to Red Hat OpenShift Service Mesh 2.0.

- You must have Red Hat OpenShift Service Mesh version 2.0 operator. If you selected the

automatic upgrade path, the operator automatically downloads the latest information. However, there are steps you must take to use the features in Red Hat OpenShift Service Mesh version 2.0.

1.11.4.8.1. Upgrading Red Hat OpenShift Service Mesh

To upgrade Red Hat OpenShift Service Mesh, you must create an instance of Red Hat OpenShift Service Mesh **ServiceMeshControlPlane** v2 resource in a new namespace. Then, once it is configured, move your microservice applications and workloads from your old mesh to the new service mesh.

Procedure

1. Check your v1 **ServiceMeshControlPlane** resource configuration to make sure it is valid.

   a. Run the following command to view your **ServiceMeshControlPlane** resource as a v2 resource.

   ```
   $ oc get smcp -o yaml
   ```

   b. Check the **spec.techPreview.errored.message** field in the output for information about any invalid fields.

   c. If there are invalid fields in your v1 resource, the resource is not reconciled and cannot be edited as a v2 resource. All updates to v2 fields will be overridden by the original v1 settings. To fix the invalid fields, you can replace, patch, or edit the v1 version of the resource. You can also delete the resource without fixing it. After the resource has been fixed, it can be reconciled, and you can to modify or view the v2 version of the resource.

   d. To fix the resource by editing a file, use **oc get** to retrieve the resource, edit the text file locally, and replace the resource with the file you edited.

   ```
   $ oc get smcp.v1.maistra.io <smcp_name> > smcp-resource.yaml
   #Edit the smcp-resource.yaml file.
   ```

   ```
   $ oc replace -f smcp-resource.yaml
   ```

   e. To fix the resource using patching, use **oc patch**.

   ```
   $ oc patch smcp.v1.maistra.io <smcp_name> --type json --patch '[{"op":
   "replace","path":"/spec/path/to/bad/setting","value":"corrected-value"}]'
   ```

   f. To fix the resource by editing with command-line tools, use **oc edit**.

   ```
   $ oc edit smcp.v1.maistra.io <smcp_name>
   ```

2. Back up your Service Mesh control plane configuration. Switch to the project that contains your **ServiceMeshControlPlane** resource. In this example, **istio-system** is the name of the Service Mesh control plane project.

   ```
   $ oc project istio-system
   ```

3. Enter the following command to retrieve the current configuration. Your <smcp_name> is specified in the metadata of your **ServiceMeshControlPlane** resource, for example **basic-install** or **full-install**.

```
$ oc get servicemeshcontrolplanes.v1.maistra.io <smcp_name> -o yaml >
<smcp_name>.v1.yaml
```

4. Convert your **ServiceMeshControlPlane** to a v2 control plane version that contains information about your configuration as a starting point.

```
$ oc get smcp <smcp_name> -o yaml > <smcp_name>.v2.yaml
```

5. Create a project. In the Red Hat OpenShift Service on AWS console Project menu, click **New Project** and enter a name for your project, **istio-system-upgrade**, for example. Or, you can run this command from the CLI.

```
$ oc new-project istio-system-upgrade
```

6. Update the **metadata.namespace** field in your v2 **ServiceMeshControlPlane** with your new project name. In this example, use **istio-system-upgrade**.

7. Update the **version** field from 1.1 to 2.0 or remove it in your v2 **ServiceMeshControlPlane**.

8. Create a **ServiceMeshControlPlane** in the new namespace. On the command line, run the following command to deploy the control plane with the v2 version of the **ServiceMeshControlPlane** that you retrieved. In this example, replace `<smcp_name.v2> `with the path to your file.

```
$ oc create -n istio-system-upgrade -f <smcp_name>.v2.yaml
```

Alternatively, you can use the console to create the Service Mesh control plane. In the Red Hat OpenShift Service on AWS web console, click **Project**. Then, select the project name you just entered.

a. Click **Ecosystem → Installed Operators**.

b. Click **Create ServiceMeshControlPlane**.

c. Select **YAML view** and paste text of the YAML file you retrieved into the field. Check that the **apiVersion** field is set to **maistra.io/v2** and modify the **metadata.namespace** field to use the new namespace, for example **istio-system-upgrade**.

d. Click **Create**.

1.11.4.8.2. Configuring the 2.0 ServiceMeshControlPlane

The **ServiceMeshControlPlane** resource has been changed for Red Hat OpenShift Service Mesh version 2.0. After you created a v2 version of the **ServiceMeshControlPlane** resource, modify it to take advantage of the new features and to fit your deployment. Consider the following changes to the specification and behavior of Red Hat OpenShift Service Mesh 2.0 as you are modifying your **ServiceMeshControlPlane** resource. You can also refer to the Red Hat OpenShift Service Mesh 2.0 product documentation for new information to features you use. The v2 resource must be used for Red Hat OpenShift Service Mesh 2.0 installations.

1.11.4.8.2.1. Architecture changes

The architectural units used by previous versions have been replaced by Istiod. In 2.0 the Service Mesh control plane components Mixer, Pilot, Citadel, Galley, and the sidecar injector functionality have been combined into a single component, Istiod.

Although Mixer is no longer supported as a control plane component, Mixer policy and telemetry plugins are now supported through WASM extensions in Istiod. Mixer can be enabled for policy and telemetry if you need to integrate legacy Mixer plugins.

Secret Discovery Service (SDS) is used to distribute certificates and keys to sidecars directly from Istiod. In Red Hat OpenShift Service Mesh version 1.1, secrets were generated by Citadel, which were used by the proxies to retrieve their client certificates and keys.

1.11.4.8.2.2. Annotation changes

The following annotations are no longer supported in v2.0. If you are using one of these annotations, you must update your workload before moving it to a v2.0 Service Mesh control plane.

- **sidecar.maistra.io/proxyCPULimit** has been replaced with **sidecar.istio.io/proxyCPULimit**. If you were using **sidecar.maistra.io** annotations on your workloads, you must modify those workloads to use **sidecar.istio.io** equivalents instead.
- **sidecar.maistra.io/proxyMemoryLimit** has been replaced with **sidecar.istio.io/proxyMemoryLimit**
- **sidecar.istio.io/discoveryAddress** is no longer supported. Also, the default discovery address has moved from **pilot.<control_plane_namespace>.svc:15010** (or port 15011, if mtls is enabled) to **istiod-<smcp_name>.<control_plane_namespace>.svc:15012**.
- The health status port is no longer configurable and is hard-coded to 15021. * If you were defining a custom status port, for example, **status.sidecar.istio.io/port**, you must remove the override before moving the workload to a v2.0 Service Mesh control plane. Readiness checks can still be disabled by setting the status port to **0**.
- Kubernetes Secret resources are no longer used to distribute client certificates for sidecars. Certificates are now distributed through Istiod's SDS service. If you were relying on mounted secrets, they are longer available for workloads in v2.0 Service Mesh control planes.

1.11.4.8.2.3. Behavioral changes

Some features in Red Hat OpenShift Service Mesh 2.0 work differently than they did in previous versions.

- The readiness port on gateways has moved from **15020** to **15021**.
- The target host visibility includes VirtualService, as well as ServiceEntry resources. It includes any restrictions applied through Sidecar resources.
- Automatic mutual TLS is enabled by default. Proxy to proxy communication is automatically configured to use mTLS, regardless of global PeerAuthentication policies in place.
- Secure connections are always used when proxies communicate with the Service Mesh control plane regardless of **spec.security.controlPlane.mtls** setting. The **spec.security.controlPlane.mtls** setting is only used when configuring connections for Mixer telemetry or policy.

1.11.4.8.2.4. Migration details for unsupported resources

Policy (authentication.istio.io/v1alpha1)

Policy resources must be migrated to new resource types for use with v2.0 Service Mesh control planes, PeerAuthentication and RequestAuthentication. Depending on the specific configuration in your Policy resource, you may have to configure multiple resources to achieve the same effect.

Mutual TLS

Mutual TLS enforcement is accomplished using the **security.istio.io/v1beta1** PeerAuthentication resource. The legacy **spec.peers.mtls.mode** field maps directly to the new resource's **spec.mtls.mode** field. Selection criteria has changed from specifying a service name in **spec.targets[x].name** to a label selector in **spec.selector.matchLabels**. In PeerAuthentication, the labels must match the selector on the services named in the targets list. Any port-specific settings will need to be mapped into **spec.portLevelMtls**.

Authentication

Additional authentication methods specified in **spec.origins**, must be mapped into a **security.istio.io/v1beta1** RequestAuthentication resource. **spec.selector.matchLabels** must be configured similarly to the same field on PeerAuthentication. Configuration specific to JWT principals from **spec.origins.jwt** items map to similar fields in **spec.rules** items.

- **spec.origins[x].jwt.triggerRules** specified in the Policy must be mapped into one or more **security.istio.io/v1beta1** AuthorizationPolicy resources. Any **spec.selector.labels** must be configured similarly to the same field on RequestAuthentication.
- **spec.origins[x].jwt.triggerRules.excludedPaths** must be mapped into an AuthorizationPolicy whose spec.action is set to ALLOW, with **spec.rules[x].to.operation.path** entries matching the excluded paths.
- **spec.origins[x].jwt.triggerRules.includedPaths** must be mapped into a separate AuthorizationPolicy whose **spec.action** is set to **ALLOW**, with **spec.rules[x].to.operation.path** entries matching the included paths, and **spec.rules.[x].from.source.requestPrincipals** entries that align with the **specified spec.origins[x].jwt.issuer** in the Policy resource.

ServiceMeshPolicy (maistra.io/v1)

ServiceMeshPolicy was configured automatically for the Service Mesh control plane through the **spec.istio.global.mtls.enabled** in the v1 resource or **spec.security.dataPlane.mtls** in the v2 resource setting. For v2 control planes, a functionally equivalent PeerAuthentication resource is created during installation. This feature is deprecated in Red Hat OpenShift Service Mesh version 2.0

RbacConfig, ServiceRole, ServiceRoleBinding (rbac.istio.io/v1alpha1)

These resources were replaced by the **security.istio.io/v1beta1** AuthorizationPolicy resource.

Mimicking RbacConfig behavior requires writing a default AuthorizationPolicy whose settings depend on the spec.mode specified in the RbacConfig.

- When **spec.mode** is set to **OFF**, no resource is required as the default policy is ALLOW, unless an AuthorizationPolicy applies to the request.
- When **spec.mode** is set to ON, set **spec: {}**. You must create AuthorizationPolicy policies for all services in the mesh.

- **spec.mode** is set to **ON_WITH_INCLUSION**, must create an AuthorizationPolicy with **spec: {}** in each included namespace. Inclusion of individual services is not supported by AuthorizationPolicy. However, as soon as any AuthorizationPolicy is created that applies to the workloads for the service, all other requests not explicitly allowed will be denied.
- When **spec.mode** is set to **ON_WITH_EXCLUSION**, it is not supported by AuthorizationPolicy. A global DENY policy can be created, but an AuthorizationPolicy must be created for every workload in the mesh because there is no allow-all policy that can be applied to either a namespace or a workload.

AuthorizationPolicy includes configuration for both the selector to which the configuration applies, which is similar to the function ServiceRoleBinding provides and the rules which should be applied, which is similar to the function ServiceRole provides.

ServiceMeshRbacConfig (maistra.io/v1)

This resource is replaced by using a **security.istio.io/v1beta1** AuthorizationPolicy resource with an empty spec.selector in the Service Mesh control plane's namespace. This policy will be the default authorization policy applied to all workloads in the mesh. For specific migration details, see RbacConfig above.

1.11.4.8.2.5. Mixer plugins

Mixer components are disabled by default in version 2.0. If you rely on Mixer plugins for your workload, you must configure your version 2.0 **ServiceMeshControlPlane** to include the Mixer components.

To enable the Mixer policy components, add the following snippet to your **ServiceMeshControlPlane**.

```
spec:
  policy:
    type: Mixer
```

To enable the Mixer telemetry components, add the following snippet to your **ServiceMeshControlPlane**.

```
spec:
  telemetry:
    type: Mixer
```

Legacy mixer plugins can also be migrated to WASM and integrated using the new ServiceMeshExtension (maistra.io/v1alpha1) custom resource.

Built-in WASM filters included in the upstream Istio distribution are not available in Red Hat OpenShift Service Mesh 2.0.

1.11.4.8.2.6. Mutual TLS changes

When using mTLS with workload specific PeerAuthentication policies, a corresponding DestinationRule is required to allow traffic if the workload policy differs from the namespace/global policy.

Auto mTLS is enabled by default, but can be disabled by setting **spec.security.dataPlane.automtls** to false in the **ServiceMeshControlPlane** resource. When disabling auto mTLS, DestinationRules may be required for proper communication between services. For example, setting PeerAuthentication to **STRICT** for one namespace may prevent services in other namespaces from accessing them, unless a DestinationRule configures TLS mode for the services in the namespace.

For information about mTLS, see Enabling mutual Transport Layer Security (mTLS)

1.11.4.8.2.6.1. Other mTLS Examples

To disable mTLS For productpage service in the bookinfo sample application, your Policy resource was configured the following way for Red Hat OpenShift Service Mesh v1.1.

Example Policy resource

```
apiVersion: authentication.istio.io/v1alpha1
kind: Policy
metadata:
  name: productpage-mTLS-disable
  namespace: <namespace>
spec:
  targets:
  - name: productpage
```

To disable mTLS For productpage service in the bookinfo sample application, use the following example to configure your PeerAuthentication resource for Red Hat OpenShift Service Mesh v2.0.

Example PeerAuthentication resource

```
apiVersion: security.istio.io/v1beta1
kind: PeerAuthentication
metadata:
  name: productpage-mTLS-disable
  namespace: <namespace>
spec:
  mtls:
    mode: DISABLE
  selector:
    matchLabels:
      # this should match the selector for the "productpage" service
      app: productpage
```

To enable mTLS With JWT authentication for the **productpage** service in the bookinfo sample application, your Policy resource was configured the following way for Red Hat OpenShift Service Mesh v1.1.

Example Policy resource

```
apiVersion: authentication.istio.io/v1alpha1
kind: Policy
metadata:
  name: productpage-mTLS-with-JWT
  namespace: <namespace>
spec:
  targets:
  - name: productpage
    ports:
    - number: 9000
  peers:
  - mtls:
  origins:
```

```
  - jwt:
      issuer: "https://securetoken.google.com"
      audiences:
      - "productpage"
      jwksUri: "https://www.googleapis.com/oauth2/v1/certs"
      jwtHeaders:
      - "x-goog-iap-jwt-assertion"
      triggerRules:
      - excludedPaths:
        - exact: /health_check
  principalBinding: USE_ORIGIN
```

To enable mTLS With JWT authentication for the productpage service in the bookinfo sample application, use the following example to configure your PeerAuthentication resource for Red Hat OpenShift Service Mesh v2.0.

Example PeerAuthentication resource

```
#require mtls for productpage:9000
apiVersion: security.istio.io/v1beta1
kind: PeerAuthentication
metadata:
  name: productpage-mTLS-with-JWT
  namespace: <namespace>
spec:
  selector:
    matchLabels:
      # this should match the selector for the "productpage" service
      app: productpage
  portLevelMtls:
    9000:
      mode: STRICT
---
#JWT authentication for productpage
apiVersion: security.istio.io/v1beta1
kind: RequestAuthentication
metadata:
  name: productpage-mTLS-with-JWT
  namespace: <namespace>
spec:
  selector:
    matchLabels:
      # this should match the selector for the "productpage" service
      app: productpage
  jwtRules:
  - issuer: "https://securetoken.google.com"
    audiences:
    - "productpage"
    jwksUri: "https://www.googleapis.com/oauth2/v1/certs"
    fromHeaders:
    - name: "x-goog-iap-jwt-assertion"
---
#Require JWT token to access product page service from
#any client to all paths except /health_check
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
```

```
metadata:
  name: productpage-mTLS-with-JWT
  namespace: <namespace>
spec:
  action: ALLOW
  selector:
    matchLabels:
      # this should match the selector for the "productpage" service
      app: productpage
  rules:
  - to: # require JWT token to access all other paths
      - operation:
          notPaths:
          - /health_check
    from:
      - source:
          # if using principalBinding: USE_PEER in the Policy,
          # then use principals, e.g.
          # principals:
          # - “*”
          requestPrincipals:
          - “*”
  - to: # no JWT token required to access health_check
      - operation:
          paths:
          - /health_check
```

1.11.4.8.3. Configuration recipes

You can configure the following items with these configuration recipes.

1.11.4.8.3.1. Mutual TLS in a data plane

Mutual TLS for data plane communication is configured through **spec.security.dataPlane.mtls** in the **ServiceMeshControlPlane** resource, which is **false** by default.

1.11.4.8.3.2. Custom signing key

Istiod manages client certificates and private keys used by service proxies. By default, Istiod uses a self-signed certificate for signing, but you can configure a custom certificate and private key. For more information about how to configure signing keys, see Adding an external certificate authority key and certificate

1.11.4.8.3.3. Tracing

Tracing is configured in **spec.tracing**. Currently, the only type of tracer that is supported is **Jaeger**. Sampling is a scaled integer representing 0.01% increments, for example, 1 is 0.01% and 10000 is 100%. The tracing implementation and sampling rate can be specified:

```
spec:
  tracing:
    sampling: 100 # 1%
    type: Jaeger
```

Jaeger is configured in the **addons** section of the **ServiceMeshControlPlane** resource.

```
spec:
  addons:
    jaeger:
      name: jaeger
      install:
        storage:
          type: Memory # or Elasticsearch for production mode
          memory:
            maxTraces: 100000
          elasticsearch: # the following values only apply if storage:type:=Elasticsearch
            storage: # specific storageclass configuration for the Jaeger Elasticsearch (optional)
              size: "100G"
              storageClassName: "storageclass"
            nodeCount: 3
            redundancyPolicy: SingleRedundancy
  runtime:
    components:
      tracing.jaeger: {} # general Jaeger specific runtime configuration (optional)
      tracing.jaeger.elasticsearch: #runtime configuration for Jaeger Elasticsearch deployment
(optional)
        container:
          resources:
            requests:
              memory: "1Gi"
              cpu: "500m"
            limits:
              memory: "1Gi"
```

The Jaeger installation can be customized with the **install** field. Container configuration, such as resource limits is configured in **spec.runtime.components.jaeger** related fields. If a Jaeger resource matching the value of **spec.addons.jaeger.name** exists, the Service Mesh control plane will be configured to use the existing installation. Use an existing Jaeger resource to fully customize your Jaeger installation.

1.11.4.8.3.4. Visualization

Kiali and Grafana are configured under the **addons** section of the **ServiceMeshControlPlane** resource.

```
spec:
  addons:
    grafana:
      enabled: true
      install: {} # customize install
    kiali:
      enabled: true
      name: kiali
      install: {} # customize install
```

The Grafana and Kiali installations can be customized through their respective **install** fields. Container customization, such as resource limits, is configured in **spec.runtime.components.kiali** and **spec.runtime.components.grafana**. If an existing Kiali resource matching the value of name exists, the

Service Mesh control plane configures the Kiali resource for use with the control plane. Some fields in the Kiali resource are overridden, such as the **accessible_namespaces** list, as well as the endpoints for Grafana, Prometheus, and tracing. Use an existing resource to fully customize your Kiali installation.

1.11.4.8.3.5. Resource utilization and scheduling

Resources are configured under **spec.runtime.<component>**. The following component names are supported.

Component	Description	Versions supported
security	Citadel container	v1.0/1.1
galley	Galley container	v1.0/1.1
pilot	Pilot/Istiod container	v1.0/1.1/2.0
mixer	istio-telemetry and istio-policy containers	v1.0/1.1
mixer.policy	istio-policy container	v2.0
mixer.telemetry	istio-telemetry container	v2.0
global.oauthproxy	oauth-proxy container used with various addons	v1.0/1.1/2.0
sidecarInjectorWebhook	sidecar injector webhook container	v1.0/1.1
tracing.jaeger	general Jaeger container - not all settings may be applied. Complete customization of Jaeger installation is supported by specifying an existing Jaeger resource in the Service Mesh control plane configuration.	v1.0/1.1/2.0
tracing.jaeger.agent	settings specific to Jaeger agent	v1.0/1.1/2.0
tracing.jaeger.allInOne	settings specific to Jaeger allInOne	v1.0/1.1/2.0
tracing.jaeger.collector	settings specific to Jaeger collector	v1.0/1.1/2.0
tracing.jaeger.elasticsearch	settings specific to Jaeger elasticsearch deployment	v1.0/1.1/2.0

Component	Description	Versions supported
tracing.jaeger.query	settings specific to Jaeger query	v1.0/1.1/2.0
prometheus	prometheus container	v1.0/1.1/2.0
kiali	Kiali container - complete customization of Kiali installation is supported by specifying an existing Kiali resource in the Service Mesh control plane configuration.	v1.0/1.1/2.0
grafana	Grafana container	v1.0/1.1/2.0
3scale	3scale container	v1.0/1.1/2.0
wasmExtensions.cacher	WASM extensions cacher container	v2.0 - tech preview

Some components support resource limiting and scheduling. For more information, see Performance and scalability.

1.11.4.8.4. Next steps for migrating your applications and workloads

Move the application workload to the new mesh and remove the old instances to complete your upgrade.

1.11.5. Upgrading the data plane

Your data plane will still function after you have upgraded the control plane. But in order to apply updates to the Envoy proxy and any changes to the proxy configuration, you must restart your application pods and workloads.

1.11.5.1. Updating your applications and workloads

To complete the migration, restart all of the application pods in the mesh to upgrade the Envoy sidecar proxies and their configuration.

To perform a rolling update of a deployment use the following command:

```
$ oc rollout restart <deployment>
```

You must perform a rolling update for all applications that make up the mesh.

1.12. MANAGING USERS AND PROFILES

1.12.1. Creating the Red Hat OpenShift Service Mesh members

ServiceMeshMember resources provide a way for Red Hat OpenShift Service Mesh administrators to

delegate permissions to add projects to a service mesh, even when the respective users do not have direct access to the service mesh project or member roll. While project administrators are automatically given permission to create the **ServiceMeshMember** resource in their project, they cannot point it to any **ServiceMeshControlPlane** until the service mesh administrator explicitly grants access to the service mesh. Administrators can grant users permissions to access the mesh by granting them the **mesh-user** user role. In this example, **istio-system** is the name of the Service Mesh control plane project.

```
$ oc policy add-role-to-user -n istio-system --role-namespace istio-system mesh-user <user_name>
```

Administrators can modify the **mesh-user** role binding in the Service Mesh control plane project to specify the users and groups that are granted access. The **ServiceMeshMember** adds the project to the **ServiceMeshMemberRoll** within the Service Mesh control plane project that it references.

```
apiVersion: maistra.io/v1
kind: ServiceMeshMember
metadata:
  name: default
spec:
  controlPlaneRef:
    namespace: istio-system
    name: basic
```

The **mesh-users** role binding is created automatically after the administrator creates the **ServiceMeshControlPlane** resource. An administrator can use the following command to add a role to a user.

```
$ oc policy add-role-to-user
```

The administrator can also create the **mesh-user** role binding before the administrator creates the **ServiceMeshControlPlane** resource. For example, the administrator can create it in the same **oc apply** operation as the **ServiceMeshControlPlane** resource.

This example adds a role binding for **alice**:

```
apiVersion: rbac.authorization.k8s.io/v1
kind: RoleBinding
metadata:
  namespace: istio-system
  name: mesh-users
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: Role
  name: mesh-user
subjects:
- apiGroup: rbac.authorization.k8s.io
  kind: User
  name: alice
```

1.12.2. Creating Service Mesh control plane profiles

You can create reusable configurations with **ServiceMeshControlPlane** profiles. Individual users can extend the profiles they create with their own configurations. Profiles can also inherit configuration

information from other profiles. For example, you can create an accounting control plane for the accounting team and a marketing control plane for the marketing team. If you create a development template and a production template, members of the marketing team and the accounting team can extend the development and production profiles with team-specific customization.

When you configure Service Mesh control plane profiles, which follow the same syntax as the **ServiceMeshControlPlane**, users inherit settings in a hierarchical fashion. The Operator is delivered with a **default** profile with default settings for Red Hat OpenShift Service Mesh.

1.12.2.1. Creating the ConfigMap

To add custom profiles, you must create a **ConfigMap** named **smcp-templates** in the **openshift-operators** project. The Operator container automatically mounts the **ConfigMap**.

Prerequisites

- An installed, verified Service Mesh Operator.
- An account with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.
- Location of the Operator deployment.
- Access to the OpenShift CLI (**oc**).

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI as a **cluster-admin**. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.
2. From the CLI, run this command to create the ConfigMap named **smcp-templates** in the **openshift-operators** project and replace **<profiles-directory>** with the location of the **ServiceMeshControlPlane** files on your local disk:

```
$ oc create configmap --from-file=<profiles-directory> smcp-templates -n openshift-operators
```

3. You can use the **profiles** parameter in the **ServiceMeshControlPlane** to specify one or more templates.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  profiles:
  - default
```

1.12.2.2. Setting the correct network policy

Service Mesh creates network policies in the Service Mesh control plane and member namespaces to allow traffic between them. Before you deploy, consider the following conditions to ensure the services in your service mesh that were previously exposed through an Red Hat OpenShift Service on AWS route.

- Traffic into the service mesh must always go through the ingress-gateway for Istio to work properly.
- Deploy services external to the service mesh in separate namespaces that are not in any service mesh.
- Non-mesh services that need to be deployed within a service mesh enlisted namespace should label their deployments **maistra.io/expose-route: "true"**, which ensures Red Hat OpenShift Service on AWS routes to these services still work.

1.13. SECURITY

If your service mesh application is constructed with a complex array of microservices, you can use Red Hat OpenShift Service Mesh to customize the security of the communication between those services. The infrastructure of Red Hat OpenShift Service on AWS along with the traffic management features of Service Mesh help you manage the complexity of your applications and secure microservices.

Before you begin

If you have a project, add your project to the **ServiceMeshMemberRoll** resource.

If you don't have a project, install the Bookinfo sample application and add it to the **ServiceMeshMemberRoll** resource. The sample application helps illustrate security concepts.

1.13.1. About mutual Transport Layer Security (mTLS)

Mutual Transport Layer Security (mTLS) is a protocol that enables two parties to authenticate each other. It is the default mode of authentication in some protocols (IKE, SSH) and optional in others (TLS). You can use mTLS without changes to the application or service code. The TLS is handled entirely by the service mesh infrastructure and between the two sidecar proxies.

By default, mTLS in Red Hat OpenShift Service Mesh is enabled and set to permissive mode, where the sidecars in Service Mesh accept both plain-text traffic and connections that are encrypted using mTLS. If a service in your mesh configured to use strict mTLS is communicating with a service outside the mesh, communication might break between those services because strict mTLS requires both the client and the server to be able to verify the identify of each other. Use permissive mode while you migrate your workloads to Service Mesh. Then, you can enable strict mTLS across your mesh, namespace, or application.

Enabling mTLS across your mesh at the Service Mesh control plane level secures all the traffic in your service mesh without rewriting your applications and workloads. You can secure namespaces in your mesh at the data plane level in the **ServiceMeshControlPlane** resource. To customize traffic encryption connections, configure namespaces at the application level with **PeerAuthentication** and **DestinationRule** resources.

1.13.1.1. Enabling strict mTLS across the service mesh

If your workloads do not communicate with outside services, you can quickly enable mTLS across your mesh without communication interruptions. You can enable it by setting **spec.security.dataPlane.mtls** to **true** in the **ServiceMeshControlPlane** resource. The Operator creates the required resources.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
spec:
  version: v2.6
```

```
security:
  dataPlane:
    mtls: true
```

You can also enable mTLS by using the Red Hat OpenShift Service on AWS web console.

Procedure

1. Log in to the web console.
2. Click the **Project** menu and select the project where you installed the Service Mesh control plane, for example **istio-system**.
3. Click **Ecosystem → Installed Operators**.
4. Click **Service Mesh Control Plane** under **Provided APIs**.
5. Click the name of your **ServiceMeshControlPlane** resource, for example, **basic**.
6. On the **Details** page, click the toggle in the **Security** section for **Data Plane Security**.

1.13.1.1.1. Configuring sidecars for incoming connections for specific services

You can also configure mTLS for individual services by creating a policy.

Procedure

1. Create a YAML file using the following example.

   PeerAuthentication Policy example policy.yaml

   ```
   apiVersion: security.istio.io/v1beta1
   kind: PeerAuthentication
   metadata:
     name: default
     namespace: <namespace>
   spec:
     mtls:
       mode: STRICT
   ```

   a. Replace **<namespace>** with the namespace where the service is located.

2. Run the following command to create the resource in the namespace where the service is located. It must match the **namespace** field in the Policy resource you just created.

   ```
   $ oc create -n <namespace> -f <policy.yaml>
   ```

> **NOTE**
>
> If you are not using automatic mTLS and you are setting **PeerAuthentication** to STRICT, you must create a **DestinationRule** resource for your service.

1.13.1.1.2. Configuring sidecars for outgoing connections

Create a destination rule to configure Service Mesh to use mTLS when sending requests to other services in the mesh.

Procedure

1. Create a YAML file using the following example.

   DestinationRule example destination-rule.yaml

   ```
   apiVersion: networking.istio.io/v1alpha3
   kind: DestinationRule
   metadata:
     name: default
     namespace: <namespace>
   spec:
     host: "*.<namespace>.svc.cluster.local"
     trafficPolicy:
      tls:
       mode: ISTIO_MUTUAL
   ```

   a. Replace **<namespace>** with the namespace where the service is located.

2. Run the following command to create the resource in the namespace where the service is located. It must match the **namespace** field in the **DestinationRule** resource you just created.

   ```
   $ oc create -n <namespace> -f <destination-rule.yaml>
   ```

1.13.1.1.3. Setting the minimum and maximum protocol versions

If your environment has specific requirements for encrypted traffic in your service mesh, you can control the cryptographic functions that are allowed by setting the **spec.security.controlPlane.tls.minProtocolVersion** or **spec.security.controlPlane.tls.maxProtocolVersion** in your **ServiceMeshControlPlane** resource. Those values, configured in your Service Mesh control plane resource, define the minimum and maximum TLS version used by mesh components when communicating securely over TLS.

The default is **TLS_AUTO** and does not specify a version of TLS.

Table 1.5. Valid values

Value	Description
TLS_AUTO	default
TLSv1_0	TLS version 1.0
TLSv1_1	TLS version 1.1
TLSv1_2	TLS version 1.2
TLSv1_3	TLS version 1.3

Procedure

1. Log in to the web console.
2. Click the **Project** menu and select the project where you installed the Service Mesh control plane, for example **istio-system**.
3. Click **Ecosystem → Installed Operators**.
4. Click **Service Mesh Control Plane** under **Provided APIs**.
5. Click the name of your **ServiceMeshControlPlane** resource, for example, **basic**.
6. Click the **YAML** tab.
7. Insert the following code snippet in the YAML editor. Replace the value in the **minProtocolVersion** with the TLS version value. In this example, the minimum TLS version is set to **TLSv1_2**.

   ServiceMeshControlPlane snippet

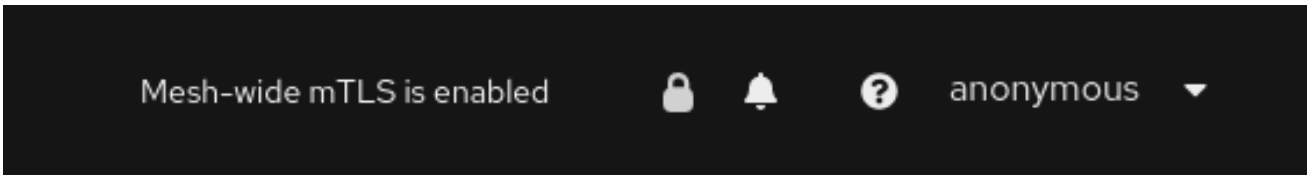
   ```
   kind: ServiceMeshControlPlane
   spec:
     security:
       controlPlane:
         tls:
           minProtocolVersion: TLSv1_2
   ```

8. Click **Save**.
9. Click **Refresh** to verify that the changes updated correctly.

1.13.1.2. Validating encryption with Kiali

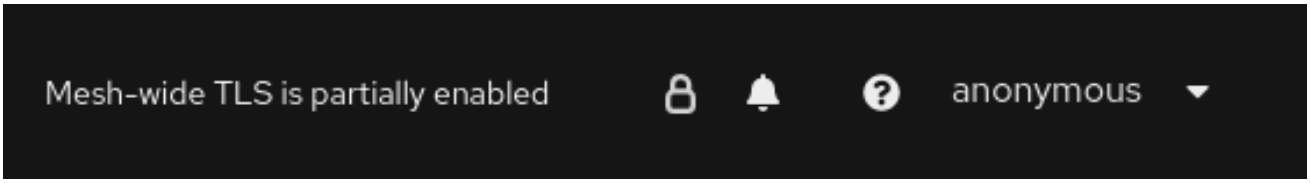
The Kiali console offers several ways to validate whether or not your applications, services, and workloads have mTLS encryption enabled.

Figure 1.5. Masthead icon mesh-wide mTLS enabled



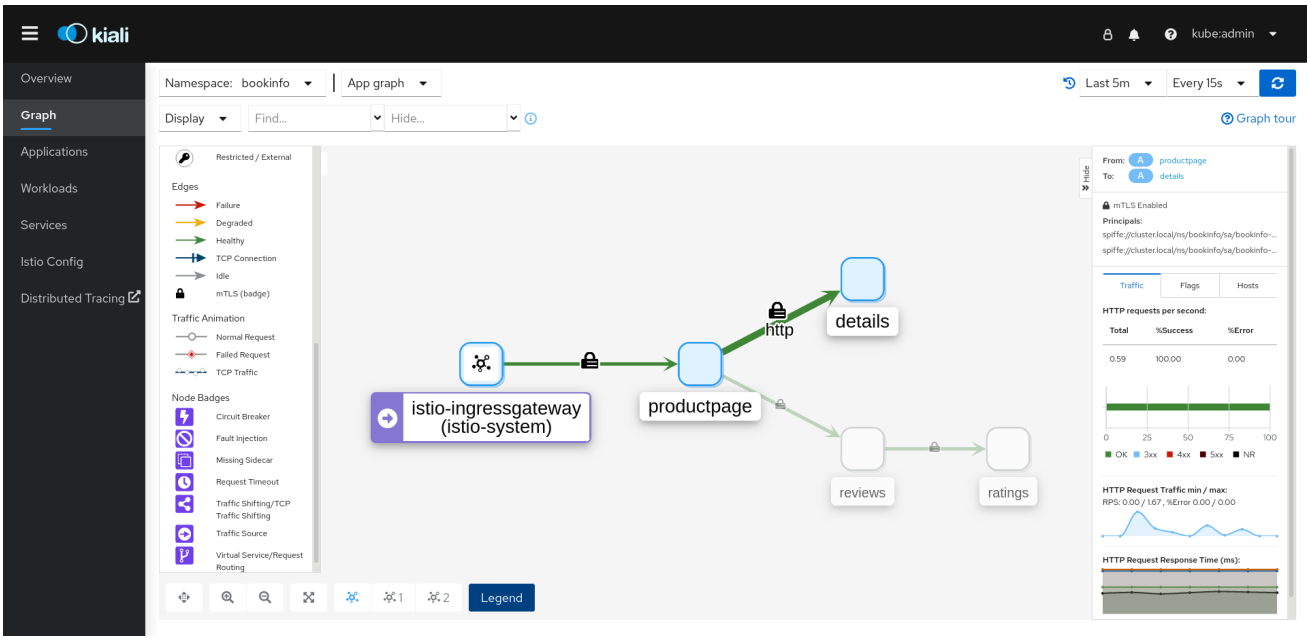
At the right side of the masthead, Kiali shows a lock icon when the mesh has strictly enabled mTLS for the whole service mesh. It means that all communications in the mesh use mTLS.

Figure 1.6. Masthead icon mesh-wide mTLS partially enabled



Kiali displays a hollow lock icon when either the mesh is configured in **PERMISSIVE** mode or there is a error in the mesh-wide mTLS configuration.

Figure 1.7. Security badge



The **Graph** page has the option to display a **Security** badge on the graph edges to indicate that mTLS is enabled. To enable security badges on the graph, from the **Display** menu, under **Show Badges**, select the **Security** checkbox. When an edge shows a lock icon, it means at least one request with mTLS enabled is present. In case there are both mTLS and non-mTLS requests, the side-panel will show the percentage of requests that use mTLS.

The **Applications Detail Overview** page displays a **Security** icon on the graph edges where at least one request with mTLS enabled is present.

The **Workloads Detail Overview** page displays a **Security** icon on the graph edges where at least one request with mTLS enabled is present.

The **Services Detail Overview** page displays a **Security** icon on the graph edges where at least one request with mTLS enabled is present. Also note that Kiali displays a lock icon in the **Network** section next to ports that are configured for mTLS.

1.13.2. Configuring Role Based Access Control (RBAC)

Role-based access control (RBAC) objects determine whether a user or service is allowed to perform a given action within a project. You can define mesh-, namespace-, and workload-wide access control for your workloads in the mesh.

To configure RBAC, create an **AuthorizationPolicy** resource in the namespace for which you are configuring access. If you are configuring mesh-wide access, use the project where you installed the Service Mesh control plane, for example **istio-system**.

For example, with RBAC, you can create policies that:

- Configure intra-project communication.
- Allow or deny full access to all workloads in the default namespace.
- Allow or deny ingress gateway access.

- Require a token for access.

An authorization policy includes a selector, an action, and a list of rules:

- The **selector** field specifies the target of the policy.
- The **action** field specifies whether to allow or deny the request.
- The **rules** field specifies when to trigger the action.
  - The **from** field specifies constraints on the request origin.
  - The **to** field specifies constraints on request target and parameters.
  - The **when** field specifies additional conditions that to apply the rule.

Procedure

1. Create your **AuthorizationPolicy** resource. The following example shows a resource that updates the ingress-policy **AuthorizationPolicy** to deny an IP address from accessing the ingress gateway.

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: ingress-policy
  namespace: istio-system
spec:
  selector:
    matchLabels:
      app: istio-ingressgateway
  action: DENY
  rules:
  - from:
    - source:
        ipBlocks: ["1.2.3.4"]
```

2. Run the following command after you write your resource to create your resource in your namespace. The namespace must match your **metadata.namespace** field in your **AuthorizationPolicy** resource.

```
$ oc create -n istio-system -f <filename>
```

Next steps

Consider the following examples for other common configurations.

1.13.2.1. Configure intra-project communication

You can use **AuthorizationPolicy** to configure your Service Mesh control plane to allow or deny the traffic communicating with your mesh or services in your mesh.

1.13.2.1.1. Restrict access to services outside a namespace

You can deny requests from any source that is not in the **bookinfo** namespace with the following **AuthorizationPolicy** resource example.

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
 name: httpbin-deny
 namespace: bookinfo
spec:
 selector:
   matchLabels:
     app: httpbin
     version: v1
 action: DENY
 rules:
 - from:
   - source:
       notNamespaces: ["bookinfo"]
```

1.13.2.1.2. Creating allow-all and default deny-all authorization policies

The following example shows an allow-all authorization policy that allows full access to all workloads in the **bookinfo** namespace.

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: allow-all
  namespace: bookinfo
spec:
  action: ALLOW
  rules:
  - {}
```

The following example shows a policy that denies any access to all workloads in the **bookinfo** namespace.

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: deny-all
  namespace: bookinfo
spec:
  {}
```

1.13.2.2. Allow or deny access to the ingress gateway

You can set an authorization policy to add allow or deny lists based on IP addresses.

```
apiVersion: security.istio.io/v1beta1
kind: AuthorizationPolicy
metadata:
  name: ingress-policy
  namespace: istio-system
```

```
spec:
  selector:
    matchLabels:
      app: istio-ingressgateway
  action: ALLOW
  rules:
  - from:
    - source:
        ipBlocks: ["1.2.3.4", "5.6.7.0/24"]
```

1.13.2.3. Restrict access with JSON Web Token

You can restrict what can access your mesh with a JSON Web Token (JWT). After authentication, a user or service can access routes, services that are associated with that token.

Create a **RequestAuthentication** resource, which defines the authentication methods that are supported by a workload. The following example accepts a JWT issued by **http://localhost:8080/auth/realms/master**.

```
apiVersion: "security.istio.io/v1beta1"
kind: "RequestAuthentication"
metadata:
  name: "jwt-example"
  namespace: bookinfo
spec:
  selector:
    matchLabels:
      app: httpbin
  jwtRules:
  - issuer: "http://localhost:8080/auth/realms/master"
    jwksUri: "http://keycloak.default.svc:8080/auth/realms/master/protocol/openid-connect/certs"
```

Then, create an **AuthorizationPolicy** resource in the same namespace to work with **RequestAuthentication** resource you created. The following example requires a JWT to be present in the **Authorization** header when sending a request to **httpbin** workloads.

```
apiVersion: "security.istio.io/v1beta1"
kind: "AuthorizationPolicy"
metadata:
  name: "frontend-ingress"
  namespace: bookinfo
spec:
  selector:
    matchLabels:
      app: httpbin
  action: DENY
  rules:
  - from:
    - source:
        notRequestPrincipals: ["*"]
```

1.13.3. Configuring cipher suites and ECDH curves

Cipher suites and Elliptic-curve Diffie–Hellman (ECDH curves) can help you secure your service mesh.

You can define a comma separated list of cipher suites using **spec.security.controlplane.tls.cipherSuites** and ECDH curves using **spec.security.controlplane.tls.ecdhCurves** in your **ServiceMeshControlPlane** resource. If either of these attributes are empty, then the default values are used.

The **cipherSuites** setting is effective if your service mesh uses TLS 1.2 or earlier. It has no effect when negotiating with TLS 1.3.

Set your cipher suites in the comma separated list in order of priority. For example, **ecdhCurves: CurveP256, CurveP384** sets **CurveP256** as a higher priority than **CurveP384**.

NOTE

You must include either **TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256** or **TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256** when you configure the cipher suite. HTTP/2 support requires at least one of these cipher suites.

The supported cipher suites are:

- TLS_ECDHE_RSA_WITH_CHACHA20_POLY1305_SHA256
- TLS_ECDHE_ECDSA_WITH_CHACHA20_POLY1305_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_ECDSA_WITH_AES_128_GCM_SHA256
- TLS_ECDHE_RSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_ECDSA_WITH_AES_256_GCM_SHA384
- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_RSA_WITH_AES_128_CBC_SHA
- TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_ECDSA_WITH_AES_128_CBC_SHA
- TLS_ECDHE_RSA_WITH_AES_256_CBC_SHA
- TLS_ECDHE_ECDSA_WITH_AES_256_CBC_SHA
- TLS_RSA_WITH_AES_128_CBC_SHA256
- TLS_ECDHE_RSA_WITH_3DES_EDE_CBC_SHA

The supported ECDH Curves are:

- CurveP256
- CurveP384
- CurveP521
- X25519

1.13.4. Configuring JSON Web Key Sets resolver certificate authority

You can configure your own JSON Web Key Sets (JWKS) resolver certificate authority (CA) from the **ServiceMeshControlPlane** (SMCP) spec.

Procedure

1. Edit the **ServiceMeshControlPlane** spec file:

```
$ oc edit smcp <smcp-name>
```

2. Enable **mtls** for the data plane by setting the value of the **mtls** field to **true** in the **ServiceMeshControlPlane** spec, as shown in the following example:

```
spec:
  security:
    dataPlane:
      mtls: true # enable mtls for data plane
    # JWKSResolver extra CA
    # PEM-encoded certificate content to trust an additional CA
    jwksResolverCA: |
      -----BEGIN CERTIFICATE-----
      [...]
      [...]
      -----END CERTIFICATE-----
...
```

3. Save the changes. Red Hat OpenShift Service on AWS automatically applies them.

A **ConfigMap** such as **pilot-jwks-cacerts-<SMCP name>** is created with the CA **.pem data**.

Example ConfigMap pilot-jwks-cacerts-<SMCP name>

```
kind: ConfigMap
apiVersion: v1
data:
  extra.pem: |
    -----BEGIN CERTIFICATE-----
    [...]
    [...]
    -----END CERTIFICATE-----
```

1.13.5. Adding an external certificate authority key and certificate

By default, Red Hat OpenShift Service Mesh generates a self-signed root certificate and key and uses them to sign the workload certificates. You can also use the user-defined certificate and key to sign workload certificates with user-defined root certificate. This task demonstrates an example to plug certificates and key into Service Mesh.

Prerequisites

- Install Red Hat OpenShift Service Mesh with mutual TLS enabled to configure certificates.

- This example uses the certificates from the Maistra repository. For production, use your own certificates from your certificate authority.
- Deploy the Bookinfo sample application to verify the results with these instructions.
- OpenSSL is required to verify certificates.

1.13.5.1. Adding an existing certificate and key

To use an existing signing (CA) certificate and key, you must create a chain of trust file that includes the CA certificate, key, and root certificate. You must use the following exact file names for each of the corresponding certificates. The CA certificate is named **ca-cert.pem**, the key is **ca-key.pem**, and the root certificate, which signs **ca-cert.pem**, is named **root-cert.pem**. If your workload uses intermediate certificates, you must specify them in a **cert-chain.pem** file.

1. Save the example certificates from the Maistra repository locally and replace **<path>** with the path to your certificates.
2. Create a secret named **cacert** that includes the input files **ca-cert.pem**, **ca-key.pem**, **root-cert.pem** and **cert-chain.pem**.

```
$ oc create secret generic cacerts -n istio-system --from-file=<path>/ca-cert.pem \
  --from-file=<path>/ca-key.pem --from-file=<path>/root-cert.pem \
  --from-file=<path>/cert-chain.pem
```

3. In the **ServiceMeshControlPlane** resource set **spec.security.dataPlane.mtls true** to **true** and configure the **certificateAuthority** field as shown in the following example. The default **rootCADir** is **/etc/cacerts**. You do not need to set the **privateKey** if the key and certs are mounted in the default location. Service Mesh reads the certificates and key from the secret-mount files.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
spec:
  security:
    dataPlane:
      mtls: true
    certificateAuthority:
      type: Istiod
      istiod:
        type: PrivateKey
        privateKey:
          rootCADir: /etc/cacerts
```

4. After creating/changing/deleting the **cacert** secret, the Service Mesh control plane **istiod** and **gateway** pods must be restarted so the changes go into effect. Use the following command to restart the pods:

```
$ oc -n istio-system delete pods -l 'app in (istiod,istio-ingressgateway, istio-egressgateway)'
```

   The Operator will automatically recreate the pods after they have been deleted.

5. Restart the bookinfo application pods so that the sidecar proxies pick up the secret changes. Use the following command to restart the pods:

```
$ oc -n bookinfo delete pods --all
```

You should see output similar to the following:

```
pod "details-v1-6cd699df8c-j54nh" deleted
pod "productpage-v1-5ddcb4b84f-mtmf2" deleted
pod "ratings-v1-bdbcc68bc-kmng4" deleted
pod "reviews-v1-754ddd7b6f-lqhsv" deleted
pod "reviews-v2-675679877f-q67r2" deleted
pod "reviews-v3-79d7549c7-c2gjs" deleted
```

6. Verify that the pods were created and are ready with the following command:

```
$ oc get pods -n bookinfo
```

1.13.5.2. Verifying your certificates

Use the Bookinfo sample application to verify that the workload certificates are signed by the certificates that were plugged into the CA. This process requires that you have **openssl** installed on your machine.

1. To extract certificates from bookinfo workloads use the following command:

```
$ sleep 60
```

```
$ oc -n bookinfo exec "$(oc -n bookinfo get pod -l app=productpage -o jsonpath=
{.items..metadata.name})" -c istio-proxy -- openssl s_client -showcerts -connect details:9080
> bookinfo-proxy-cert.txt
```

```
$ sed -n '/-----BEGIN CERTIFICATE-----/{:start /-----END CERTIFICATE-----/!{N;b
start};/.*/p}' bookinfo-proxy-cert.txt > certs.pem
```

```
$ awk 'BEGIN {counter=0;} /BEGIN CERT/{counter++} { print > "proxy-cert-" counter ".pem"}'
< certs.pem
```

After running the command, you should have three files in your working directory: **proxy-cert-1.pem**, **proxy-cert-2.pem** and **proxy-cert-3.pem**.

2. Verify that the root certificate is the same as the one specified by the administrator. Replace **<path>** with the path to your certificates.

```
$ openssl x509 -in <path>/root-cert.pem -text -noout > /tmp/root-cert.crt.txt
```

Run the following syntax at the terminal window.

```
$ openssl x509 -in ./proxy-cert-3.pem -text -noout > /tmp/pod-root-cert.crt.txt
```

Compare the certificates by running the following syntax at the terminal window.

```
$ diff -s /tmp/root-cert.crt.txt /tmp/pod-root-cert.crt.txt
```

You should see the following result: **Files /tmp/root-cert.crt.txt and /tmp/pod-root-cert.crt.txt are identical**

3. Verify that the CA certificate is the same as the one specified by the administrator. Replace **<path>** with the path to your certificates.

```
$ openssl x509 -in <path>/ca-cert.pem -text -noout > /tmp/ca-cert.crt.txt
```

Run the following syntax at the terminal window.

```
$ openssl x509 -in ./proxy-cert-2.pem -text -noout > /tmp/pod-cert-chain-ca.crt.txt
```

Compare the certificates by running the following syntax at the terminal window.

```
$ diff -s /tmp/ca-cert.crt.txt /tmp/pod-cert-chain-ca.crt.txt
```

You should see the following result: **Files /tmp/ca-cert.crt.txt and /tmp/pod-cert-chain-ca.crt.txt are identical.**

4. Verify the certificate chain from the root certificate to the workload certificate. Replace **<path>** with the path to your certificates. After you run the command, the expected output shows **./proxy-cert-1.pem: OK**.

```
$ openssl verify -CAfile <(cat <path>/ca-cert.pem <path>/root-cert.pem) ./proxy-cert-1.pem
```

1.13.5.3. Removing the certificates

To remove the certificates you added, follow these steps.

1. Remove the secret **cacerts**. In this example, **istio-system** is the name of the Service Mesh control plane project.

```
$ oc delete secret cacerts -n istio-system
```

2. Redeploy Service Mesh with a self-signed root certificate in the **ServiceMeshControlPlane** resource.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
spec:
  security:
    dataPlane:
      mtls: true
```

1.13.6. About integrating Service Mesh with cert-manager and istio-csr

The cert-manager tool is a solution for X.509 certificate management on Kubernetes. It delivers a unified API to integrate applications with private or public key infrastructure (PKI), such as Vault, Google Cloud Certificate Authority Service, Let's Encrypt, and other providers.

The cert-manager tool ensures the certificates are valid and up-to-date by attempting to renew certificates at a configured time before they expire.

For Istio users, cert-manager also provides integration with **istio-csr**, which is a certificate authority (CA) server that handles certificate signing requests (CSR) from Istio proxies. The server then delegates signing to cert-manager, which forwards CSRs to the configured CA server.

> **NOTE**
>
> Red Hat provides support for integrating with **istio-csr** and cert-manager. Red Hat does not provide direct support for the **istio-csr** or the community cert-manager components. The use of community cert-manager shown here is for demonstration purposes only.

Prerequisites

- One of these versions of cert-manager:
  - cert-manager Operator for Red Hat OpenShift 1.10 or later
  - community cert-manager Operator 1.11 or later
  - cert-manager 1.11 or later
- OpenShift Service Mesh Operator 2.4 or later
- **istio-csr** 0.6.0 or later

> **NOTE**
>
> To avoid creating config maps in all namespaces when the **istio-csr** server is installed with the **jetstack/cert-manager-istio-csr** Helm chart, use the following setting: **app.controller.configmapNamespaceSelector: "maistra.io/member-of: <istio-namespace>"** in the **istio-csr.yaml** file.

1.13.6.1. Installing cert-manager

You can install the **cert-manager** tool to manage the lifecycle of TLS certificates and ensure that they are valid and up-to-date. If you are running Istio in your environment, you can also install the **istio-csr** certificate authority (CA) server, which handles certificate signing requests (CSR) from Istio proxies. The **istio-csr** CA delegates signing to the **cert-manager** tool, which delegates to the configured CA.

Procedure

1. Create the root cluster issuer:
   a. Create the **cluster-issuer** object as in the following example:

Example cluster-issuer.yaml

```
apiVersion: cert-manager.io/v1
kind: Issuer
metadata:
  name: selfsigned-root-issuer
  namespace: cert-manager
spec:
  selfSigned: {}
---
```

```
apiVersion: cert-manager.io/v1
kind: Certificate
metadata:
  name: root-ca
  namespace: cert-manager
spec:
  isCA: true
  duration: 21600h # 900d
  secretName: root-ca
  commonName: root-ca.my-company.net
  subject:
    organizations:
    - my-company.net
  issuerRef:
    name: selfsigned-root-issuer
    kind: Issuer
    group: cert-manager.io
---
apiVersion: cert-manager.io/v1
kind: ClusterIssuer
metadata:
  name: root-ca
spec:
  ca:
    secretName: root-ca
```

NOTE

The namespace of the **selfsigned-root-issuer** issuer and **root-ca** certificate is **cert-manager** because **root-ca** is a cluster issuer, so the cert-manager looks for a referenced secret in its own namespace. The namespace is called **cert-manager** in the case of the cert-manager Operator for Red Hat OpenShift.

b. Create the object by using the following command:

```
$ oc apply -f cluster-issuer.yaml
```

c. Create the **istio-ca** object as in the following example:

Example istio-ca.yaml

```
apiVersion: cert-manager.io/v1
kind: Certificate
metadata:
  name: istio-ca
  namespace: istio-system
spec:
  isCA: true
  duration: 21600h
  secretName: istio-ca
  commonName: istio-ca.my-company.net
  subject:
    organizations:
```

```
    - my-company.net
  issuerRef:
    name: root-ca
    kind: ClusterIssuer
    group: cert-manager.io
---
apiVersion: cert-manager.io/v1
kind: Issuer
metadata:
  name: istio-ca
  namespace: istio-system
spec:
  ca:
    secretName: istio-ca
```

d. Use the following command to create the object:

```
$ oc apply -n istio-system -f istio-ca.yaml
```

2. Install **istio-csr**:

```
$ helm install istio-csr jetstack/cert-manager-istio-csr \
    -n istio-system \
    -f deploy/examples/cert-manager/istio-csr/istio-csr.yaml
```

Example istio-csr.yaml

```
replicaCount: 2

image:
  repository: quay.io/jetstack/cert-manager-istio-csr
  tag: v0.6.0
  pullSecretName: ""

app:
  certmanager:
    namespace: istio-system
    issuer:
      group: cert-manager.io
      kind: Issuer
      name: istio-ca

  controller:
    configmapNamespaceSelector: "maistra.io/member-of=istio-system"
    leaderElectionNamespace: istio-system

  istio:
    namespace: istio-system
    revisions: ["basic"]

  server:
    maxCertificateDuration: 5m

  tls:
    certificateDNSNames:
```

```
    # This DNS name must be set in the SMCP spec.security.certificateAuthority.cert-manager.address
    - cert-manager-istio-csr.istio-system.svc
```

3. Deploy SMCP:

```
$ oc apply -f mesh.yaml -n istio-system
```

Example mesh.yaml

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  addons:
    grafana:
      enabled: false
    kiali:
      enabled: false
    prometheus:
      enabled: false
  proxy:
    accessLogging:
      file:
        name: /dev/stdout
  security:
    certificateAuthority:
      cert-manager:
        address: cert-manager-istio-csr.istio-system.svc:443
      type: cert-manager
    dataPlane:
      mtls: true
    identity:
      type: ThirdParty
  tracing:
    type: None
---
apiVersion: maistra.io/v1
kind: ServiceMeshMemberRoll
metadata:
  name: default
spec:
  members:
  - httpbin
  - sleep
```

NOTE

security.identity.type: ThirdParty must be set when **security.certificateAuthority.type: cert-manager** is configured.

Verification

Use the sample **httpbin** service and **sleep** app to check mTLS traffic from ingress gateways and verify that the **cert-manager** tool is installed.

1. Deploy the HTTP and **sleep** apps:

```
$ oc new-project <namespace>
```

```
$ oc apply -f https://raw.githubusercontent.com/maistra/istio/maistra-2.4/samples/httpbin/httpbin.yaml
```

```
$ oc apply -f https://raw.githubusercontent.com/maistra/istio/maistra-2.4/samples/sleep/sleep.yaml
```

2. Verify that **sleep** can access the **httpbin** service:

```
$ oc exec "$(oc get pod -l app=sleep -n <namespace> \
  -o jsonpath={.items..metadata.name})" -c sleep -n <namespace> -- \
  curl http://httpbin.<namespace>:8000/ip -s -o /dev/null \
  -w "%{http_code}\n"
```

Example output

```
200
```

3. Check mTLS traffic from the ingress gateway to the **httpbin** service:

```
$ oc apply -n <namespace> -f https://raw.githubusercontent.com/maistra/istio/maistra-2.4/samples/httpbin/httpbin-gateway.yaml
```

4. Get the **istio-ingressgateway** route:

```
INGRESS_HOST=$(oc -n istio-system get routes istio-ingressgateway -o jsonpath='{.spec.host}')
```

5. Verify mTLS traffic from the ingress gateway to the **httpbin** service:

```
$ curl -s -I http://$INGRESS_HOST/headers -o /dev/null -w "%{http_code}" -s
```

1.13.7. Additional resources

For information about how to install the cert-manager Operator for Red Hat OpenShift Service on AWS, see: Installing the cert-manager Operator for Red Hat OpenShift .

1.14. MANAGING TRAFFIC IN YOUR SERVICE MESH

Using Red Hat OpenShift Service Mesh, you can control the flow of traffic and API calls between services. Some services in your service mesh might need to communicate within the mesh and others might need to be hidden. You can manage the traffic to hide specific backend services, expose services, create testing or versioning deployments, or add a security layer on a set of services.

1.14.1. Using gateways

You can use a gateway to manage inbound and outbound traffic for your mesh to specify which traffic you want to enter or leave the mesh. Gateway configurations are applied to standalone Envoy proxies that are running at the edge of the mesh, rather than sidecar Envoy proxies running alongside your service workloads.

Unlike other mechanisms for controlling traffic entering your systems, such as the Kubernetes Ingress APIs, Red Hat OpenShift Service Mesh gateways use the full power and flexibility of traffic routing.

The Red Hat OpenShift Service Mesh gateway resource can use layer 4-6 load balancing properties, such as ports, to expose and configure Red Hat OpenShift Service Mesh TLS settings. Instead of adding application-layer traffic routing (L7) to the same API resource, you can bind a regular Red Hat OpenShift Service Mesh virtual service to the gateway and manage gateway traffic like any other data plane traffic in a service mesh.

Gateways are primarily used to manage ingress traffic, but you can also configure egress gateways. An egress gateway lets you configure a dedicated exit node for the traffic leaving the mesh. This enables you to limit which services have access to external networks, which adds security control to your service mesh. You can also use a gateway to configure a purely internal proxy.

Gateway example

A gateway resource describes a load balancer operating at the edge of the mesh receiving incoming or outgoing HTTP/TCP connections. The specification describes a set of ports that should be exposed, the type of protocol to use, SNI configuration for the load balancer, and so on.

The following example shows a sample gateway configuration for external HTTPS ingress traffic:

```
apiVersion: networking.istio.io/v1alpha3
kind: Gateway
metadata:
  name: ext-host-gwy
spec:
  selector:
    istio: ingressgateway # use istio default controller
  servers:
  - port:
      number: 443
      name: https
      protocol: HTTPS
    hosts:
    - ext-host.example.com
    tls:
      mode: SIMPLE
      serverCertificate: /tmp/tls.crt
      privateKey: /tmp/tls.key
```

This gateway configuration lets HTTPS traffic from **ext-host.example.com** into the mesh on port 443, but doesn't specify any routing for the traffic.

To specify routing and for the gateway to work as intended, you must also bind the gateway to a virtual service. You do this using the virtual service's gateways field, as shown in the following example:

```
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
```

```
metadata:
  name: virtual-svc
spec:
  hosts:
  - ext-host.example.com
  gateways:
    - ext-host-gwy
```

You can then configure the virtual service with routing rules for the external traffic.

1.14.1.1. Managing ingress traffic

In Red Hat OpenShift Service Mesh, the Ingress Gateway enables features such as monitoring, security, and route rules to apply to traffic that enters the cluster. Use a Service Mesh gateway to expose a service outside of the service mesh.

1.14.1.1.1. Determining the ingress IP and ports

Ingress configuration differs depending on if your environment supports an external load balancer. An external load balancer is set in the ingress IP and ports for the cluster. To determine if your cluster's IP and ports are configured for external load balancers, run the following command. In this example, **istio-system** is the name of the Service Mesh control plane project.

```
$ oc get svc istio-ingressgateway -n istio-system
```

That command returns the **NAME**, **TYPE**, **CLUSTER-IP**, **EXTERNAL-IP**, **PORT(S)**, and **AGE** of each item in your namespace.

If the **EXTERNAL-IP** value is set, your environment has an external load balancer that you can use for the ingress gateway.

If the **EXTERNAL-IP** value is **<none>**, or perpetually **<pending>**, your environment does not provide an external load balancer for the ingress gateway.

1.14.1.1.1.1. Determining ingress ports with a load balancer

Follow these instructions if your environment has an external load balancer.

Procedure

1. Run the following command to set the ingress IP and ports. This command sets a variable in your terminal.

```
$ export INGRESS_HOST=$(oc -n istio-system get service istio-ingressgateway -o
jsonpath='{.status.loadBalancer.ingress[0].ip}')
```

2. Run the following command to set the ingress port.

```
$ export INGRESS_PORT=$(oc -n istio-system get service istio-ingressgateway -o
jsonpath='{.spec.ports[?(@.name=="http2")].port}')
```

3. Run the following command to set the secure ingress port.

```
$ export SECURE_INGRESS_PORT=$(oc -n istio-system get service istio-ingressgateway -
```

```
o jsonpath='{.spec.ports[?(@.name=="https")].port}')
```

4. Run the following command to set the TCP ingress port.

```
$ export TCP_INGRESS_PORT=$(kubectl -n istio-system get service istio-ingressgateway -o
jsonpath='{.spec.ports[?(@.name=="tcp")].port}')
```

NOTE

In some environments, the load balancer may be exposed using a hostname instead of an IP address. For that case, the ingress gateway's **EXTERNAL-IP** value is not an IP address. Instead, it is a hostname, and the previous command fails to set the **INGRESS_HOST** environment variable.

In that case, use the following command to correct the **INGRESS_HOST** value:

```
$ export INGRESS_HOST=$(oc -n istio-system get service istio-ingressgateway -o
jsonpath='{.status.loadBalancer.ingress[0].hostname}')
```

1.14.1.1.1.2. Determining ingress ports without a load balancer

If your environment does not have an external load balancer, determine the ingress ports and use a node port instead.

Procedure

1. Set the ingress ports.

```
$ export INGRESS_PORT=$(oc -n istio-system get service istio-ingressgateway -o
jsonpath='{.spec.ports[?(@.name=="http2")].nodePort}')
```

2. Run the following command to set the secure ingress port.

```
$ export SECURE_INGRESS_PORT=$(oc -n istio-system get service istio-ingressgateway -
o jsonpath='{.spec.ports[?(@.name=="https")].nodePort}')
```

3. Run the following command to set the TCP ingress port.

```
$ export TCP_INGRESS_PORT=$(kubectl -n istio-system get service istio-ingressgateway -o
jsonpath='{.spec.ports[?(@.name=="tcp")].nodePort}')
```

1.14.1.2. Configuring an ingress gateway

An ingress gateway is a load balancer operating at the edge of the mesh that receives incoming HTTP/TCP connections. It configures exposed ports and protocols but does not include any traffic routing configuration. Traffic routing for ingress traffic is instead configured with routing rules, the same way as for internal service requests.

The following steps show how to create a gateway and configure a **VirtualService** to expose a service in the Bookinfo sample application to outside traffic for paths **/productpage** and **/login**.

Procedure

1. Create a gateway to accept traffic.

   a. Create a YAML file, and copy the following YAML into it.

   Gateway example gateway.yaml

```
apiVersion: networking.istio.io/v1alpha3
kind: Gateway
metadata:
  name: bookinfo-gateway
spec:
  selector:
    istio: ingressgateway
  servers:
  - port:
      number: 80
      name: http
      protocol: HTTP
    hosts:
    - "*"
```

   b. Apply the YAML file.

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

2. Create a **VirtualService** object to rewrite the host header.

   a. Create a YAML file, and copy the following YAML into it.

   Virtual service example

```
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: bookinfo
spec:
  hosts:
  - "*"
  gateways:
  - bookinfo-gateway
  http:
  - match:
    - uri:
        exact: /productpage
    - uri:
        prefix: /static
    - uri:
        exact: /login
    - uri:
        exact: /logout
    - uri:
        prefix: /api/v1/products
    route:
    - destination:
```

```
        host: productpage
        port:
          number: 9080
```

b. Apply the YAML file.

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

3. Test that the gateway and VirtualService have been set correctly.

a. Set the Gateway URL.

```
export GATEWAY_URL=$(oc -n istio-system get route istio-ingressgateway -o
jsonpath='{.spec.host}')
```

b. Set the port number. In this example, **istio-system** is the name of the Service Mesh control plane project.

```
export TARGET_PORT=$(oc -n istio-system get route istio-ingressgateway -o
jsonpath='{.spec.port.targetPort}')
```

c. Test a page that has been explicitly exposed.

```
curl -s -I "$GATEWAY_URL/productpage"
```

The expected result is **200**.

1.14.2. Understanding automatic routes

IMPORTANT

Istio OpenShift Routing (IOR) is a deprecated feature. Deprecated functionality is still included in Red Hat OpenShift Service on AWS and continues to be supported; however, it will be removed in a future release of this product and is not recommended for new deployments.

For the most recent list of major functionality that has been deprecated or removed within Red Hat OpenShift Service on AWS, refer to the *Deprecated and removed features* section of the Red Hat OpenShift Service on AWS release notes.

OpenShift routes for gateways are automatically managed in Service Mesh. Every time an Istio Gateway is created, updated or deleted inside the service mesh, an OpenShift route is created, updated or deleted.

NOTE

Starting with Service Mesh 2.5, automatic routes are disabled by default for new instances of the **ServiceMeshControlPlane** resource.

1.14.2.1. Routes with subdomains

Red Hat OpenShift Service Mesh creates the route with the subdomain, but Red Hat OpenShift Service

on AWS must be configured to enable it. Subdomains, for example ***.domain.com**, are supported, but not by default. Configure an Red Hat OpenShift Service on AWS wildcard policy before configuring a wildcard host gateway.

1.14.2.2. Creating subdomain routes

The following example creates a gateway in the Bookinfo sample application, which creates subdomain routes.

```
apiVersion: networking.istio.io/v1alpha3
kind: Gateway
metadata:
  name: gateway1
spec:
  selector:
    istio: ingressgateway
  servers:
  - port:
      number: 80
      name: http
      protocol: HTTP
    hosts:
    - www.bookinfo.com
    - bookinfo.example.com
```

The **Gateway** resource creates the following OpenShift routes. You can check that the routes are created by using the following command. In this example, **istio-system** is the name of the Service Mesh control plane project.

```
$ oc -n istio-system get routes
```

Expected output

```
NAME          HOST/PORT              PATH  SERVICES              PORT  TERMINATION   WILDCARD
gateway1-lvlfn bookinfo.example.com        istio-ingressgateway   <all>              None
gateway1-scqhv www.bookinfo.com            istio-ingressgateway   <all>              None
```

If you delete the gateway, Red Hat OpenShift Service Mesh deletes the routes. However, routes you have manually created are never modified by Red Hat OpenShift Service Mesh.

1.14.2.3. Route labels and annotations

Sometimes specific labels or annotations are needed in an OpenShift route.

For this and other use cases, Red Hat OpenShift Service Mesh will copy all labels and annotations present in the Istio gateway resource (with the exception of annotations starting with **kubectl.kubernetes.io**) into the managed OpenShift route resource.

If you need specific labels or annotations in the OpenShift routes created by Service Mesh, create them in the Istio gateway resource and they will be copied into the OpenShift route resources managed by the Service Mesh.

1.14.2.4. Disabling automatic route creation

By default, the **ServiceMeshControlPlane** resource automatically synchronizes the Istio gateway resources with OpenShift routes. Disabling the automatic route creation allows you more flexibility to control routes if you have a special case or prefer to control routes manually.

1.14.2.4.1. Disabling automatic route creation for specific cases

If you want to disable the automatic management of OpenShift routes for a specific Istio gateway, you must add the annotation **maistra.io/manageRoute: false** to the gateway metadata definition. Red Hat OpenShift Service Mesh will ignore Istio gateways with this annotation, while keeping the automatic management of the other Istio gateways.

1.14.2.4.2. Disabling automatic route creation for all cases

You can disable the automatic management of OpenShift routes for all gateways in your mesh.

Disable integration between Istio gateways and OpenShift routes by setting the **ServiceMeshControlPlane** field **gateways.openshiftRoute.enabled** to **false**. For example, see the following resource snippet.

```
apiVersion: maistra.io/v1alpha1
kind: ServiceMeshControlPlane
metadata:
  namespace: istio-system
spec:
  gateways:
    openshiftRoute:
      enabled: false
```

1.14.3. Understanding service entries

A service entry adds an entry to the service registry that Red Hat OpenShift Service Mesh maintains internally. After you add the service entry, the Envoy proxies send traffic to the service as if it is a service in your mesh. Service entries allow you to do the following:

- Manage traffic for services that run outside of the service mesh.
- Redirect and forward traffic for external destinations (such as, APIs consumed from the web) or traffic to services in legacy infrastructure.
- Define retry, timeout, and fault injection policies for external destinations.
- Run a mesh service in a Virtual Machine (VM) by adding VMs to your mesh.

NOTE

Add services from a different cluster to the mesh to configure a multicluster Red Hat OpenShift Service Mesh mesh on Kubernetes.

Service entry examples

The following example is a mesh-external service entry that adds the **ext-resource** external dependency to the Red Hat OpenShift Service Mesh service registry:

```
apiVersion: networking.istio.io/v1alpha3
```

```
kind: ServiceEntry
metadata:
  name: svc-entry
spec:
  hosts:
  - ext-svc.example.com
  ports:
  - number: 443
    name: https
    protocol: HTTPS
  location: MESH_EXTERNAL
  resolution: DNS
```

Specify the external resource using the **hosts** field. You can qualify it fully or use a wildcard prefixed domain name.

You can configure virtual services and destination rules to control traffic to a service entry in the same way you configure traffic for any other service in the mesh. For example, the following destination rule configures the traffic route to use mutual TLS to secure the connection to the **ext-svc.example.com** external service that is configured using the service entry:

```
apiVersion: networking.istio.io/v1alpha3
kind: DestinationRule
metadata:
  name: ext-res-dr
spec:
  host: ext-svc.example.com
  trafficPolicy:
    tls:
      mode: MUTUAL
      clientCertificate: /etc/certs/myclientcert.pem
      privateKey: /etc/certs/client_private_key.pem
      caCertificates: /etc/certs/rootcacerts.pem
```

1.14.4. Using VirtualServices

You can route requests dynamically to multiple versions of a microservice through Red Hat OpenShift Service Mesh with a virtual service. With virtual services, you can:

- Address multiple application services through a single virtual service. If your mesh uses Kubernetes, for example, you can configure a virtual service to handle all services in a specific namespace. A virtual service enables you to turn a monolithic application into a service consisting of distinct microservices with a seamless consumer experience.
- Configure traffic rules in combination with gateways to control ingress and egress traffic.

1.14.4.1. Configuring VirtualServices

Requests are routed to services within a service mesh with virtual services. Each virtual service consists of a set of routing rules that are evaluated in order. Red Hat OpenShift Service Mesh matches each given request to the virtual service to a specific real destination within the mesh.

Without virtual services, Red Hat OpenShift Service Mesh distributes traffic using least requests load balancing between all service instances. With a virtual service, you can specify traffic behavior for one or more hostnames. Routing rules in the virtual service tell Red Hat OpenShift Service Mesh how to send

the traffic for the virtual service to appropriate destinations. Route destinations can be versions of the same service or entirely different services.

Procedure

1. Create a YAML file using the following example to route requests to different versions of the Bookinfo sample application service depending on which user connects to the application.

   Example VirtualService.yaml

   ```
   apiVersion: networking.istio.io/v1alpha3
   kind: VirtualService
   metadata:
     name: reviews
   spec:
     hosts:
     - reviews
     http:
     - match:
       - headers:
           end-user:
             exact: jason
       route:
       - destination:
           host: reviews
           subset: v2
     - route:
       - destination:
           host: reviews
           subset: v3
   ```

2. Run the following command to apply **VirtualService.yaml**, where **VirtualService.yaml** is the path to the file.

   ```
   $ oc apply -f <VirtualService.yaml>
   ```

1.14.4.2. VirtualService configuration reference

Parameter	Description
`spec:` `  hosts:`	The **hosts** field lists the virtual service's destination address to which the routing rules apply. This is the address(es) that are used to send requests to the service. The virtual service hostname can be an IP address, a DNS name, or a short name that resolves to a fully qualified domain name.

Parameter	Description

`spec:`
`  http:`
`  - match:`
	The **http** section contains the virtual service's routing rules which describe match conditions and actions for routing HTTP/1.1, HTTP2, and gRPC traffic sent to the destination as specified in the hosts field. A routing rule consists of the destination where you want the traffic to go and any specified match conditions. The first routing rule in the example has a condition that begins with the match field. In this example, this routing applies to all requests from the user **jason**. Add the **headers**, **end-user**, and **exact** fields to select the appropriate requests.

`spec:`
`  http:`
`  - match:`
`  - destination:`
	The **destination** field in the route section specifies the actual destination for traffic that matches this condition. Unlike the virtual service's host, the destination's host must be a real destination that exists in the Red Hat OpenShift Service Mesh service registry. This can be a mesh service with proxies or a non-mesh service added using a service entry. In this example, the hostname is a Kubernetes service name:

1.14.5. Understanding destination rules

Destination rules are applied after virtual service routing rules are evaluated, so they apply to the traffic's real destination. Virtual services route traffic to a destination. Destination rules configure what happens to traffic at that destination.

By default, Red Hat OpenShift Service Mesh uses a least requests load balancing policy, where the service instance in the pool with the least number of active connections receives the request. Red Hat OpenShift Service Mesh also supports the following models, which you can specify in destination rules for requests to a particular service or service subset.

- Random: Requests are forwarded at random to instances in the pool.
- Weighted: Requests are forwarded to instances in the pool according to a specific percentage.
- Least requests: Requests are forwarded to instances with the least number of requests.

Destination rule example

The following example destination rule configures three different subsets for the **my-svc** destination service, with different load balancing policies:

```
apiVersion: networking.istio.io/v1alpha3
kind: DestinationRule
metadata:
  name: my-destination-rule
spec:
  host: my-svc
  trafficPolicy:
    loadBalancer:
```

```
    simple: RANDOM
  subsets:
  - name: v1
    labels:
      version: v1
  - name: v2
    labels:
      version: v2
    trafficPolicy:
      loadBalancer:
        simple: ROUND_ROBIN
  - name: v3
    labels:
      version: v3
```

1.14.6. Understanding network policies

Red Hat OpenShift Service Mesh automatically creates and manages a number of **NetworkPolicies** resources in the Service Mesh control plane and application namespaces. This is to ensure that applications and the control plane can communicate with each other.

For example, if you have configured your Red Hat OpenShift Service on AWS cluster to use the SDN plugin, Red Hat OpenShift Service Mesh creates a **NetworkPolicy** resource in each member project. This enables ingress to all pods in the mesh from the other mesh members and the control plane. This also restricts ingress to only member projects. If you require ingress from non-member projects, you need to create a **NetworkPolicy** to allow that traffic through. If you remove a namespace from Service Mesh, this **NetworkPolicy** resource is deleted from the project.

1.14.6.1. Disabling automatic NetworkPolicy creation

If you want to disable the automatic creation and management of **NetworkPolicy** resources, for example to enforce company security policies, or to allow direct access to pods in the mesh, you can do so. You can edit the **ServiceMeshControlPlane** and set **spec.security.manageNetworkPolicy** to **false**.

NOTE

When you disable **spec.security.manageNetworkPolicy** Red Hat OpenShift Service Mesh will not create **any NetworkPolicy** objects. The system administrator is responsible for managing the network and fixing any issues this might cause.

Prerequisites

- Red Hat OpenShift Service Mesh Operator version 2.1.1 or higher installed.
- **ServiceMeshControlPlane** resource updated to version 2.1 or higher.

Procedure

1. In the Red Hat OpenShift Service on AWS web console, click **Ecosystem → Installed Operators**.
2. Select the project where you installed the Service Mesh control plane, for example **istio-system**, from the **Project** menu.

3. Click the Red Hat OpenShift Service Mesh Operator. In the **Istio Service Mesh Control Plane** column, click the name of your **ServiceMeshControlPlane**, for example **basic-install**.

4. On the **Create ServiceMeshControlPlane Details** page, click **YAML** to modify your configuration.

5. Set the **ServiceMeshControlPlane** field **spec.security.manageNetworkPolicy** to **false**, as shown in this example.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
spec:
  security:
    manageNetworkPolicy: false
```

6. Click **Save**.

1.14.7. Configuring sidecars for traffic management

By default, Red Hat OpenShift Service Mesh configures every Envoy proxy to accept traffic on all the ports of its associated workload, and to reach every workload in the mesh when forwarding traffic. You can use a sidecar configuration to do the following:

- Fine-tune the set of ports and protocols that an Envoy proxy accepts.
- Limit the set of services that the Envoy proxy can reach.

NOTE

To optimize performance of your service mesh, consider limiting Envoy proxy configurations.

In the Bookinfo sample application, configure a Sidecar so all services can reach other services running in the same namespace and control plane. This Sidecar configuration is required for using Red Hat OpenShift Service Mesh policy and telemetry features.

Procedure

1. Create a YAML file using the following example to specify that you want a sidecar configuration to apply to all workloads in a particular namespace. Otherwise, choose specific workloads using a **workloadSelector**.

Example sidecar.yaml

```
apiVersion: networking.istio.io/v1alpha3
kind: Sidecar
metadata:
  name: default
  namespace: bookinfo
spec:
  egress:
  - hosts:
    - "./*"
    - "istio-system/*"
```

2. Run the following command to apply **sidecar.yaml**, where **sidecar.yaml** is the path to the file.

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

3. Run the following command to verify that the sidecar was created successfully.

```
$ oc get sidecar
```

1.14.8. Routing Tutorial

This guide references the Bookinfo sample application to provide examples of routing in an example application. Install the Bookinfo application to learn how these routing examples work.

1.14.8.1. Bookinfo routing tutorial

The Service Mesh Bookinfo sample application consists of four separate microservices, each with multiple versions. After installing the Bookinfo sample application, three different versions of the **reviews** microservice run concurrently.

When you access the Bookinfo app /**product** page in a browser and refresh several times, sometimes the book review output contains star ratings and other times it does not. Without an explicit default service version to route to, Service Mesh routes requests to all available versions one after the other.

This tutorial helps you apply rules that route all traffic to **v1** (version 1) of the microservices. Later, you can apply a rule to route traffic based on the value of an HTTP request header.

Prerequisites

- Deploy the Bookinfo sample application to work with the following examples.

1.14.8.2. Applying a virtual service

In the following procedure, the virtual service routes all traffic to **v1** of each micro-service by applying virtual services that set the default version for the micro-services.

Procedure

1. Apply the virtual services.

```
$ oc apply -f https://raw.githubusercontent.com/Maistra/istio/maistra-
2.6/samples/bookinfo/networking/virtual-service-all-v1.yaml
```

2. To verify that you applied the virtual services, display the defined routes with the following command:

```
$ oc get virtualservices -o yaml
```

That command returns a resource of **kind: VirtualService** in YAML format.

You have configured Service Mesh to route to the **v1** version of the Bookinfo microservices including the **reviews** service version 1.

1.14.8.3. Testing the new route configuration

Test the new configuration by refreshing the /**productpage** of the Bookinfo application.

Procedure

1. Set the value for the **GATEWAY_URL** parameter. You can use this variable to find the URL for your Bookinfo product page later. In this example, istio-system is the name of the control plane project.

```
export GATEWAY_URL=$(oc -n istio-system get route istio-ingressgateway -o
jsonpath='{.spec.host}')
```

2. Run the following command to retrieve the URL for the product page.

```
echo "http://$GATEWAY_URL/productpage"
```

3. Open the Bookinfo site in your browser.

The reviews part of the page displays with no rating stars, no matter how many times you refresh. This is because you configured Service Mesh to route all traffic for the reviews service to the version **reviews:v1** and this version of the service does not access the star ratings service.

Your service mesh now routes traffic to one version of a service.

1.14.8.4. Route based on user identity

Change the route configuration so that all traffic from a specific user is routed to a specific service version. In this case, all traffic from a user named **jason** will be routed to the service **reviews:v2**.

Service Mesh does not have any special, built-in understanding of user identity. This example is enabled by the fact that the **productpage** service adds a custom **end-user** header to all outbound HTTP requests to the reviews service.

Procedure

1. Run the following command to enable user-based routing in the Bookinfo sample application.

```
$ oc apply -f https://raw.githubusercontent.com/Maistra/istio/maistra-
2.6/samples/bookinfo/networking/virtual-service-reviews-test-v2.yaml
```

2. Run the following command to confirm the rule is created. This command returns all resources of **kind: VirtualService** in YAML format.

```
$ oc get virtualservice reviews -o yaml
```

3. On the /**productpage** of the Bookinfo app, log in as user **jason** with no password.

4. Refresh the browser. The star ratings appear next to each review.

5. Log in as another user (pick any name you want). Refresh the browser. Now the stars are gone. Traffic is now routed to **reviews:v1** for all users except Jason.

You have successfully configured the Bookinfo sample application to route traffic based on user identity.

1.15. METRICS, LOGS, AND TRACES

Once you have added your application to the mesh, you can observe the data flow through your application. If you do not have your own application installed, you can see how observability works in Red Hat OpenShift Service Mesh by installing the Bookinfo sample application.

1.15.1. Discovering console addresses

Red Hat OpenShift Service Mesh provides the following consoles to view your service mesh data:

- **Kiali console** - Kiali is the management console for Red Hat OpenShift Service Mesh.
- **Jaeger console** - Jaeger is the management console for Red Hat OpenShift Distributed Tracing Platform.
- **Grafana console** - Grafana provides mesh administrators with advanced query and metrics analysis and dashboards for Istio data. Optionally, Grafana can be used to analyze service mesh metrics.
- **Prometheus console** - Red Hat OpenShift Service Mesh uses Prometheus to store telemetry information from services.

When you install the Service Mesh control plane, it automatically generates routes for each of the installed components. Once you have the route address, you can access the Kiali, Jaeger, Prometheus, or Grafana console to view and manage your service mesh data.

Prerequisite

- The component must be enabled and installed. For example, if you did not install distributed tracing, you will not be able to access the Jaeger console.

Procedure from OpenShift console

1. Log in to the Red Hat OpenShift Service on AWS web console as a user with cluster-admin rights. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.
2. Navigate to **Networking → Routes**.
3. On the **Routes** page, select the Service Mesh control plane project, for example **istio-system**, from the **Namespace** menu.
   The **Location** column displays the linked address for each route.
4. If necessary, use the filter to find the component console whose route you want to access. Click the route **Location** to launch the console.
5. Click **Log In With OpenShift**

Procedure from the CLI

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.

```
$ oc login --username=<NAMEOFUSER> https://<HOSTNAME>:6443
```

2. Switch to the Service Mesh control plane project. In this example, **istio-system** is the Service Mesh control plane project. Run the following command:

```
$ oc project istio-system
```

3. To get the routes for the various Red Hat OpenShift Service Mesh consoles, run the folowing command:

```
$ oc get routes
```

This command returns the URLs for the Kiali, Jaeger, Prometheus, and Grafana web consoles, and any other routes in your service mesh. You should see output similar to the following:

```
NAME                   HOST/PORT                        SERVICES              PORT    TERMINATION
bookinfo-gateway       bookinfo-gateway-yourcompany.com  istio-ingressgateway  http2
grafana                grafana-yourcompany.com          grafana               <all>
reencrypt/Redirect
istio-ingressgateway   istio-ingress-yourcompany.com    istio-ingressgateway  8080
jaeger                 jaeger-yourcompany.com           jaeger-query          <all>   reencrypt
kiali                  kiali-yourcompany.com            kiali                 20001   reencrypt/Redirect
prometheus             prometheus-yourcompany.com       prometheus            <all>
reencrypt/Redirect
```

4. Copy the URL for the console you want to access from the **HOST/PORT** column into a browser to open the console.

5. Click **Log In With OpenShift**

1.15.2. Accessing the Kiali console

You can view your application's topology, health, and metrics in the Kiali console. If your service is experiencing problems, the Kiali console lets you view the data flow through your service. You can view insights about the mesh components at different levels, including abstract applications, services, and workloads. Kiali also provides an interactive graph view of your namespace in real time.

To access the Kiali console you must have Red Hat OpenShift Service Mesh installed, Kiali installed and configured.

The installation process creates a route to access the Kiali console.

If you know the URL for the Kiali console, you can access it directly. If you do not know the URL, use the following directions.

Procedure for administrators

1. Log in to the Red Hat OpenShift Service on AWS web console with an administrator role.

2. Click **Home → Projects**.

3. On the **Projects** page, if necessary, use the filter to find the name of your project.
4. Click the name of your project, for example, **bookinfo**.
5. On the **Project details** page, in the **Launcher** section, click the **Kiali** link.
6. Log in to the Kiali console with the same user name and password that you use to access the Red Hat OpenShift Service on AWS console.
   When you first log in to the Kiali Console, you see the **Overview** page which displays all the namespaces in your service mesh that you have permission to view.

   If you are validating the console installation and namespaces have not yet been added to the mesh, there might not be any data to display other than **istio-system**.

Procedure for developers

1. Log in to the Red Hat OpenShift Service on AWS web console with a developer role.
2. Click **Project**.
3. On the **Project Details** page, if necessary, use the filter to find the name of your project.
4. Click the name of your project, for example, **bookinfo**.
5. On the **Project** page, in the **Launcher** section, click the **Kiali** link.
6. Click **Log In With OpenShift**

1.15.3. Viewing service mesh data in the Kiali console

The Kiali Graph offers a powerful visualization of your mesh traffic. The topology combines real-time request traffic with your Istio configuration information to present immediate insight into the behavior of your service mesh, letting you quickly pinpoint issues. Multiple Graph Types let you visualize traffic as a high-level service topology, a low-level workload topology, or as an application-level topology.

There are several graphs to choose from:

- The **App graph** shows an aggregate workload for all applications that are labeled the same.
- The **Service graph** shows a node for each service in your mesh but excludes all applications and workloads from the graph. It provides a high level view and aggregates all traffic for defined services.
- The **Versioned App graph** shows a node for each version of an application. All versions of an application are grouped together.
- The **Workload graph** shows a node for each workload in your service mesh. This graph does not require you to use the application and version labels. If your application does not use version labels, use this the graph.

Graph nodes are decorated with a variety of information, pointing out various route routing options like virtual services and service entries, as well as special configuration like fault-injection and circuit breakers. It can identify mTLS issues, latency issues, error traffic and more. The Graph is highly configurable, can show traffic animation, and has powerful Find and Hide abilities.

Click the **Legend** button to view information about the shapes, colors, arrows, and badges displayed in the graph.

To view a summary of metrics, select any node or edge in the graph to display its metric details in the summary details panel.

1.15.3.1. Changing graph layouts in Kiali

The layout for the Kiali graph can render differently depending on your application architecture and the data to display. For example, the number of graph nodes and their interactions can determine how the Kiali graph is rendered. Because it is not possible to create a single layout that renders nicely for every situation, Kiali offers a choice of several different layouts.

Prerequisites

- If you do not have your own application installed, install the Bookinfo sample application. Then generate traffic for the Bookinfo application by entering the following command several times.

  ```
  $ curl "http://$GATEWAY_URL/productpage"
  ```

  This command simulates a user visiting the **productpage** microservice of the application.

Procedure

1. Launch the Kiali console.
2. Click **Log In With OpenShift**
3. In Kiali console, click **Graph** to view a namespace graph.
4. From the **Namespace** menu, select your application namespace, for example, **bookinfo**.
5. To choose a different graph layout, do either or both of the following:
   - Select different graph data groupings from the menu at the top of the graph.
     - App graph
     - Service graph
     - Versioned App graph (default)
     - Workload graph
   - Select a different graph layout from the Legend at the bottom of the graph.
     - Layout default dagre
     - Layout 1 cose-bilkent
     - Layout 2 cola

1.15.3.2. Viewing logs in the Kiali console

You can view logs for your workloads in the Kiali console. The **Workload Detail** page includes a **Logs** tab which displays a unified logs view that displays both application and proxy logs. You can select how often you want the log display in Kiali to be refreshed.

To change the logging level on the logs displayed in Kiali, you change the logging configuration for the workload or the proxy.

Prerequisites

- Service Mesh installed and configured.
- Kiali installed and configured.
- The address for the Kiali console.
- Application or Bookinfo sample application added to the mesh.

Procedure

1. Launch the Kiali console.
2. Click **Log In With OpenShift**
   The Kiali Overview page displays namespaces that have been added to the mesh that you have permissions to view.
3. Click **Workloads**.
4. On the **Workloads** page, select the project from the **Namespace** menu.
5. If necessary, use the filter to find the workload whose logs you want to view. Click the workload **Name**. For example, click **ratings-v1**.
6. On the **Workload Details** page, click the **Logs** tab to view the logs for the workload.

TIP

If you do not see any log entries, you may need to adjust either the Time Range or the Refresh interval.

1.15.3.3. Viewing metrics in the Kiali console

You can view inbound and outbound metrics for your applications, workloads, and services in the Kiali console. The Detail pages include the following tabs:

- inbound Application metrics
- outbound Application metrics
- inbound Workload metrics
- outbound Workload metrics
- inbound Service metrics

These tabs display predefined metrics dashboards, tailored to the relevant application, workload or service level. The application and workload detail views show request and response metrics such as volume, duration, size, or TCP traffic. The service detail view shows request and response metrics for

inbound traffic only.

Kiali lets you customize the charts by choosing the charted dimensions. Kiali can also present metrics reported by either source or destination proxy metrics. And for troubleshooting, Kiali can overlay trace spans on the metrics.

Prerequisites

- Service Mesh installed and configured.
- Kiali installed and configured.
- The address for the Kiali console.
- (Optional) Distributed tracing installed and configured.

Procedure

1. Launch the Kiali console.
2. Click **Log In With OpenShift**
   The Kiali Overview page displays namespaces that have been added to the mesh that you have permissions to view.
3. Click either **Applications**, **Workloads**, or **Services**.
4. On the **Applications**, **Workloads**, or **Services** page, select the project from the **Namespace** menu.
5. If necessary, use the filter to find the application, workload, or service whose logs you want to view. Click the **Name**.
6. On the **Application Detail**, **Workload Details**, or **Service Details** page, click either the **Inbound Metrics** or **Outbound Metrics** tab to view the metrics.

1.15.4. Distributed tracing

Distributed tracing is the process of tracking the performance of individual services in an application by tracing the path of the service calls in the application. Each time a user takes action in an application, a request is executed that might require many services to interact to produce a response. The path of this request is called a distributed transaction.

Red Hat OpenShift Service Mesh uses Red Hat OpenShift Distributed Tracing Platform to allow developers to view call flows in a microservice application.

1.15.4.1. Configuring the Red Hat OpenShift Distributed Tracing Platform and the Red Hat build of OpenTelemetry

You can expose tracing data to the Red Hat OpenShift Distributed Tracing Platform by appending a named element and the **opentelemetry** provider to the **spec.meshConfig.extensionProviders** specification in the **ServiceMeshControlPlane**. Then, a telemetry custom resource configures Istio proxies to collect trace spans and send them to the OpenTelemetry Collector endpoint.

You can create a Red Hat build of OpenTelemetry instance in a mesh namespace and configure it to send tracing data to a tracing platform backend service.

Prerequisites

- You created a TempoStack instance using the Red Hat Tempo Operator in the **tracing-system** namespace. For more information, see "Installing Red Hat OpenShift Distributed Tracing Platform".
- You installed the Red Hat build of OpenTelemetry Operator in either the recommended namespace or the **openshift-operators** namespace. For more information, see "Installing the Red Hat build of OpenTelemetry".
- If using Red Hat OpenShift Service Mesh 2.5 or earlier, set the **spec.tracing.type** parameter of the **ServiceMeshControlPlane** resource to **None** so tracing data can be sent to the OpenTelemetry Collector.

Procedure

1. Create an OpenTelemetry Collector instance in a mesh namespace. This example uses the **bookinfo** namespace:

Example OpenTelemetry Collector configuration

```
apiVersion: opentelemetry.io/v1alpha1
kind: OpenTelemetryCollector
metadata:
  name: otel
  namespace: bookinfo (1)
spec:
  mode: deployment
  config: |
    receivers:
      otlp:
        protocols:
          grpc:
            endpoint: 0.0.0.0:4317
    exporters:
      otlp:
        endpoint: "tempo-sample-distributor.tracing-system.svc.cluster.local:4317" (2)
        tls:
          insecure: true
    service:
      pipelines:
        traces:
          receivers: [otlp]
          processors: []
          exporters: [otlp]
```

(1) Include the namespace in the **ServiceMeshMemberRoll** member list.

(2) In this example, a TempoStack instance is running in the **tracing-system** namespace. You do not have to include the TempoStack namespace, such as `tracing-system`, in the **ServiceMeshMemberRoll** member list.

NOTE

- Create a single instance of the OpenTelemetry Collector in one of the **ServiceMeshMemberRoll** member namespaces.
- You can add an **otel-collector** as a part of the mesh by adding **sidecar.istio.io/inject: 'true'** to the **OpenTelemetryCollector** resource.

2. Check the **otel-collector** pod log and verify that the pod is running:

Example otel-collector pod log check

```
$ oc logs -n bookinfo  -l app.kubernetes.io/name=otel-collector
```

3. Create or update an existing **ServiceMeshControlPlane** custom resource (CR) in the **istio-system** namespace:

Example SMCP custom resource

```
kind: ServiceMeshControlPlane
apiVersion: maistra.io/v2
metadata:
  name: basic
  namespace: istio-system
spec:
  addons:
    grafana:
      enabled: false
    kiali:
      enabled: true
    prometheus:
      enabled: true
  meshConfig:
    extensionProviders:
      - name: otel
        opentelemetry:
          port: 4317
          service: otel-collector.bookinfo.svc.cluster.local
  policy:
    type: Istiod
  telemetry:
    type: Istiod
  version: v2.6
```

NOTE

When upgrading from SMCP 2.5 to 2.6, set the **spec.tracing.type** parameter to **None**:

Example SMCP spec.tracing.type parameter

```
spec:
  tracing:
    type: None
```

4. Create a Telemetry resource in the **istio-system** namespace:

Example Telemetry resource

```
apiVersion: telemetry.istio.io/v1alpha1
kind: Telemetry
metadata:
  name: mesh-default
  namespace: istio-system
spec:
  tracing:
  - providers:
    - name: otel
    randomSamplingPercentage: 100
```

5. Verify the **istiod** log.

6. Configure the Kiali resource specification to enable a Kiali workload traces dashboard. You can use the dashboard to view tracing query results.

Example Kiali resource

```
apiVersion: kiali.io/v1alpha1
kind: Kiali
# ...
spec:
  external_services:
    tracing:
      query_timeout: 30 (1)
      enabled: true
      in_cluster_url: 'http://tempo-sample-query-frontend.tracing-
system.svc.cluster.local:16685'
      url: '[Tempo query frontend Route url]'
      use_grpc: true (2)
```

1. The default **query_timeout** integer value is 30 seconds. If you set the value to greater than 30 seconds, you must update **.spec.server.write_timeout** in the Kiali CR and add the annotation **haproxy.router.openshift.io/timeout=50s** to the Kiali route. Both **.spec.server.write_timeout** and **haproxy.router.openshift.io/timeout=** must be greater than **query_timeout**.

2. If you are not using the default HTTP or gRPC port, replace the **in_cluster_url:** port with

> **NOTE**
>
> Kiali 1.73 uses the Jaeger Query API, which causes a longer response time depending on Tempo resource limits. If you see a **Could not fetch spans** error message in the Kiali UI, then check your Tempo configuration or reduce the limit per query in Kiali.

7. Send requests to your application.
8. Verify the **istiod** pod logs and the **otel-collector** pod logs.

1.15.4.1.1. Configuring the OpenTelemetryCollector in a mTLS encrypted Service Mesh member namespace

All traffic is TLS encrypted when you enable Service Mesh **dataPlane** mTLS encryption.

To enable the mesh to communicate with the **OpenTelemetryCollector** service, disable the TLS **trafficPolicy** by applying a **DestinationRule** for the **OpenTelemetryCollector** service:

Example DestinationRule Tempo CR

```
apiVersion: networking.istio.io/v1alpha3
kind: DestinationRule
metadata:
  name: otel-disable-tls
spec:
  host: "otel-collector.bookinfo.svc.cluster.local"
  trafficPolicy:
    tls:
      mode: DISABLE
```

1.15.4.1.2. Configuring the Red Hat OpenShift Distributed Tracing Platform in a mTLS encrypted Service Mesh member namespace

> **NOTE**
>
> You don’t need this additional **DestinationRule** configuration if you created a TempoStack instance in a namespace that is not a Service Mesh member namespace.

All traffic is TLS encrypted when you enable Service Mesh **dataPlane** mTLS encryption and you create a TempoStack instance in a Service Mesh member namespace such as **tracing-system-mtls**. This encryption is not expected from the Tempo distributed service and returns a TLS error.

To fix the TLS error, disable the TLS **trafficPolicy** by applying a **DestinationRule** for Tempo and Kiali:

Example DestinationRule Tempo

```
apiVersion: networking.istio.io/v1alpha3
kind: DestinationRule
metadata:
  name: tempo
  namespace: tracing-system-mtls
spec:
```

```
  host: "*.tracing-system-mtls.svc.cluster.local"
  trafficPolicy:
    tls:
      mode: DISABLE
```

Example DestinationRule Kiali

```
apiVersion: networking.istio.io/v1alpha3
kind: DestinationRule
metadata:
  name: kiali
  namespace: istio-system
spec:
  host: kiali.istio-system.svc.cluster.local
  trafficPolicy:
    tls:
      mode: DISABLE
```

1.15.4.2. Connecting an existing distributed tracing Jaeger instance

If you already have an existing Red Hat OpenShift Distributed Tracing Platform (Jaeger) instance in Red Hat OpenShift Service on AWS, you can configure your **ServiceMeshControlPlane** resource to use that instance for Distributed Tracing Platform.

IMPORTANT

Starting with Red Hat OpenShift Service Mesh 2.5, Red Hat OpenShift Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator are deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for these features during the current release lifecycle, but these features will no longer receive enhancements and will be removed. As an alternative to Red Hat OpenShift Distributed Tracing Platform (Jaeger), you can use Red Hat OpenShift Distributed Tracing Platform instead.

Prerequisites

- Red Hat OpenShift Distributed Tracing Platform instance installed and configured.

Procedure

1. In the Red Hat OpenShift Service on AWS web console, click **Ecosystem → Installed Operators**.
2. Click the **Project** menu and select the project where you installed the Service Mesh control plane, for example **istio-system**.
3. Click the Red Hat OpenShift Service Mesh Operator. In the **Istio Service Mesh Control Plane** column, click the name of your **ServiceMeshControlPlane** resource, for example **basic**.
4. Add the name of your Distributed Tracing Platform (Jaeger) instance to the **ServiceMeshControlPlane**.
   a. Click the **YAML** tab.

b. Add the name of your Distributed Tracing Platform (Jaeger) instance to **spec.addons.jaeger.name** in your **ServiceMeshControlPlane** resource. In the following example, **distr-tracing-production** is the name of the Distributed Tracing Platform (Jaeger) instance.

Example distributed tracing configuration

```
spec:
  addons:
    jaeger:
      name: distr-tracing-production
```

c. Click **Save**.

5. Click **Reload** to verify the **ServiceMeshControlPlane** resource was configured correctly.

1.15.4.3. Adjusting the sampling rate

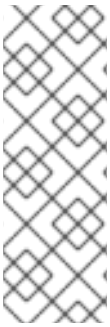
A trace is an execution path between services in the service mesh. A trace is comprised of one or more spans. A span is a logical unit of work that has a name, start time, and duration. The sampling rate determines how often a trace is persisted.

The Envoy proxy sampling rate is set to sample 100% of traces in your service mesh by default. A high sampling rate consumes cluster resources and performance but is useful when debugging issues. Before you deploy Red Hat OpenShift Service Mesh in production, set the value to a smaller proportion of traces. For example, set **spec.tracing.sampling** to **100** to sample 1% of traces.

Configure the Envoy proxy sampling rate as a scaled integer representing 0.01% increments.

In a basic installation, **spec.tracing.sampling** is set to **10000**, which samples 100% of traces. For example:

- Setting the value to 10 samples 0.1% of traces.
- Setting the value to 500 samples 5% of traces.



NOTE

The Envoy proxy sampling rate applies for applications that are available to a Service Mesh, and use the Envoy proxy. This sampling rate determines how much data the Envoy proxy collects and tracks.

The Jaeger remote sampling rate applies to applications that are external to the Service Mesh, and do not use the Envoy proxy, such as a database. This sampling rate determines how much data Red Hat OpenShift Distributed Tracing Platform collects and stores.

Procedure

1. In the Red Hat OpenShift Service on AWS web console, click **Ecosystem → Installed Operators**.
2. Click the **Project** menu and select the project where you installed the control plane, for example **istio-system**.

3. Click the Red Hat OpenShift Service Mesh Operator. In the **Istio Service Mesh Control Plane** column, click the name of your **ServiceMeshControlPlane** resource, for example **basic**.

4. To adjust the sampling rate, set a different value for **spec.tracing.sampling**.

   a. Click the **YAML** tab.

   b. Set the value for **spec.tracing.sampling** in your **ServiceMeshControlPlane** resource. In the following example, set it to **100**.

   Jaeger sampling example

   ```
   spec:
     tracing:
       sampling: 100
   ```

   c. Click **Save**.

5. Click **Reload** to verify the **ServiceMeshControlPlane** resource was configured correctly.

1.15.5. Accessing the Jaeger console

To access the Jaeger console you must have Red Hat OpenShift Service Mesh installed, Red Hat OpenShift Distributed Tracing Platform (Jaeger) installed and configured.

The installation process creates a route to access the Jaeger console.

If you know the URL for the Jaeger console, you can access it directly. If you do not know the URL, use the following directions.

> **IMPORTANT**
>
> Starting with Red Hat OpenShift Service Mesh 2.5, Red Hat OpenShift Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator have been deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for this feature during the current release lifecycle, but this feature will no longer receive enhancements and will be removed. As an alternative to Red Hat OpenShift Distributed Tracing Platform (Jaeger), you can use Red Hat OpenShift Distributed Tracing Platform instead.

Procedure from OpenShift console

1. Log in to the Red Hat OpenShift Service on AWS web console as a user with cluster-admin rights. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.

2. Navigate to **Networking** → **Routes**.

3. On the **Routes** page, select the Service Mesh control plane project, for example **istio-system**, from the **Namespace** menu.
   The **Location** column displays the linked address for each route.

4. If necessary, use the filter to find the **jaeger** route. Click the route **Location** to launch the console.

5. Click **Log In With OpenShift**

Procedure from Kiali console

1. Launch the Kiali console.
2. Click **Distributed Tracing** in the left navigation pane.
3. Click **Log In With OpenShift**

Procedure from the CLI

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.

```
$ oc login --username=<NAMEOFUSER> https://<HOSTNAME>:6443
```

2. To query for details of the route using the command line, enter the following command. In this example, **istio-system** is the Service Mesh control plane namespace.

```
$ oc get route -n istio-system jaeger -o jsonpath='{.spec.host}'
```

3. Launch a browser and navigate to **https://<JAEGER_URL>**, where **<JAEGER_URL>** is the route that you discovered in the previous step.
4. Log in using the same user name and password that you use to access the Red Hat OpenShift Service on AWS console.
5. If you have added services to the service mesh and have generated traces, you can use the filters and **Find Traces** button to search your trace data.
   If you are validating the console installation, there is no trace data to display.

1.15.6. Accessing the Grafana console

Grafana is an analytics tool you can use to view, query, and analyze your service mesh metrics. In this example, **istio-system** is the Service Mesh control plane namespace. To access Grafana, do the following:

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Click the **Project** menu and select the project where you installed the Service Mesh control plane, for example **istio-system**.
3. Click **Routes**.
4. Click the link in the **Location** column for the **Grafana** row.
5. Log in to the Grafana console with your Red Hat OpenShift Service on AWS credentials.

1.15.7. Accessing the Prometheus console

Prometheus is a monitoring and alerting tool that you can use to collect multi-dimensional data about your microservices. In this example, **istio-system** is the Service Mesh control plane namespace.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Click the **Project** menu and select the project where you installed the Service Mesh control plane, for example **istio-system**.
3. Click **Routes**.
4. Click the link in the **Location** column for the **Prometheus** row.
5. Log in to the Prometheus console with your Red Hat OpenShift Service on AWS credentials.

1.15.8. Integrating with user-workload monitoring

By default, Red Hat OpenShift Service Mesh (OSSM) installs the Service Mesh control plane (SMCP) with a dedicated instance of Prometheus for collecting metrics from a mesh. However, production systems need more advanced monitoring systems, like Red Hat OpenShift Service on AWS monitoring for user-defined projects.

The following steps show how to integrate Service Mesh with user-workload monitoring.

Prerequisites

- User-workload monitoring is enabled.
- Red Hat OpenShift Service Mesh Operator 2.4 is installed.
- Kiali Operator 1.65 is installed.

Procedure

1. Grant the **cluster-monitoring-view** role to the Kiali Service Account:

```
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRoleBinding
metadata:
  name: kiali-monitoring-rbac
roleRef:
  apiGroup: rbac.authorization.k8s.io
  kind: ClusterRole
  name: cluster-monitoring-view
subjects:
- kind: ServiceAccount
  name: kiali-service-account
  namespace: istio-system
```

2. Configure Kiali for user-workload monitoring:

```
apiVersion: kiali.io/v1alpha1
kind: Kiali
metadata:
```

```
  name: kiali
  namespace: istio-system
spec:
  auth:
    strategy: openshift
  deployment:
    accessible_namespaces:   #restricted setting for ROSA
      - istio-system
    image_pull_policy: ''
    ingress_enabled: true
    namespace: istio-system
```

- If you use Istio Operator 2.4, use this configuration to configure Kiali for user-workload monitoring:

```
apiVersion: kiali.io/v1alpha1
kind: Kiali
metadata:
  name: kiali-user-workload-monitoring
  namespace: istio-system
spec:
  external_services:
    istio:
      config_map_name: istio-<smcp-name>
      istio_sidecar_injector_config_map_name: istio-sidecar-injector-<smcp-name>
      istiod_deployment_name: istiod-<smcp-name>
      url_service_version: 'http://istiod-<smcp-name>.istio-system:15014/version'
    prometheus:
      auth:
        token: secret:thanos-querier-web-token:token
        type: bearer
        use_kiali_token: false
      query_scope:
        mesh_id: "basic-istio-system"
      thanos_proxy:
        enabled: true
      url: https://thanos-querier.openshift-monitoring.svc.cluster.local:9091
  version: v1.65
```

NOTE

Red Hat OpenShift Service on AWS places additional restrictions on where you can create resources and does not let you create the Kiali resource in a Red Hat managed namespace.

This means that the following common settings for **spec.deployment.accessible_namespaces** are not allowed in an OpenShift dedicated cluster:

- **['**']** (all namespaces)
- **default**
- **codeready-***
- **openshift-***
- **redhat-***

The validation error message provides a complete list of all the restricted namespaces.

3. Configure the SMCP for external Prometheus:

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
  namespace: istio-system
spec:
  addons:
    prometheus:
      enabled: false (1)
    grafana:
      enabled: false (2)
    kiali:
      name: kiali-user-workload-monitoring
  meshConfig:
    extensionProviders:
    - name: prometheus
      prometheus: {}
```

1. Disable the default Prometheus instance provided by OSSM.
2. Disable Grafana. It is not supported with an external Prometheus instance.

4. Apply a custom network policy to allow ingress traffic from the monitoring namespace:

```
apiVersion: networking.k8s.io/v1
kind: NetworkPolicy
metadata:
  name: user-workload-access
  namespace: istio-system (1)
```

```
spec:
  ingress:
  - from:
    - namespaceSelector:
        matchLabels:
          network.openshift.io/policy-group: monitoring
  podSelector: {}
  policyTypes:
  - Ingress
```

1. The custom network policy must be applied to all namespaces.

5. Apply a **Telemetry** object to enable traffic metrics in Istio proxies:

```
apiVersion: telemetry.istio.io/v1alpha1
kind: Telemetry
metadata:
  name: enable-prometheus-metrics
  namespace: istio-system (1)
spec:
  selector: (2)
    matchLabels:
      app: bookinfo
  metrics:
  - providers:
    - name: prometheus
```

1. A **Telemetry** object created in the control plane namespace applies to all workloads in a mesh. To apply telemetry to only one namespace, create the object in the target namespace.
2. Optional: Setting the **selector.matchLabels** spec applies the **Telemetry** object to specific workloads in the target namespace.

6. Apply a **ServiceMonitor** object to monitor the Istio control plane:

```
apiVersion: monitoring.coreos.com/v1
kind: ServiceMonitor
metadata:
  name: istiod-monitor
  namespace: istio-system (1)
spec:
  targetLabels:
  - app
  selector:
    matchLabels:
      istio: pilot
  endpoints:
  - port: http-monitoring
    interval: 30s
    relabelings:
```

```
    - action: replace
      replacement: "basic-istio-system" (2)
      targetLabel: mesh_id
```

1. Create this **ServiceMonitor** object in the Istio control plane namespace because it monitors the Istiod service. In this example, the namespace is **istio-system**.
2. The string **"basic-istio-system"** is a combination of the SMCP name and its namespace, but any label can be used as long as it is unique for every mesh using user workload monitoring in the cluster. The **spec.prometheus.query_scope** of the Kiali resource configured in Step 2 needs to match this value.

> **NOTE**
>
> If there is only one mesh using user-workload monitoring, then both the **mesh_id** relabeling and the **spec.prometheus.query_scope** field in the Kiali resource are optional (but the **query_scope** field given here should be removed if the **mesh_id** label is removed).
>
> If multiple mesh instances on the cluster might use user-workload monitoring, then both the **mesh_id** relabelings and the **spec.prometheus.query_scope** field in the Kiali resource are required. This ensures that Kiali only sees metrics from its associated mesh.
>
> If you are not deploying Kiali, you can still apply **mesh_id** relabeling so that metrics from different meshes can be distinguished from one another.

7. Apply a **PodMonitor** object to collect metrics from Istio proxies:

```
apiVersion: monitoring.coreos.com/v1
kind: PodMonitor
metadata:
  name: istio-proxies-monitor
  namespace: istio-system (1)
spec:
  selector:
    matchExpressions:
    - key: istio-prometheus-ignore
      operator: DoesNotExist
  podMetricsEndpoints:
  - path: /stats/prometheus
    interval: 30s
    relabelings:
    - action: keep
      sourceLabels: [__meta_kubernetes_pod_container_name]
      regex: "istio-proxy"
    - action: keep
      sourceLabels: [__meta_kubernetes_pod_annotationpresent_prometheus_io_scrape]
    - action: replace
      regex: (\d+);(([A-Fa-f0-9]{1,4}::?){1,7}[A-Fa-f0-9]{1,4})
      replacement: '[$2]:$1'
      sourceLabels: [__meta_kubernetes_pod_annotation_prometheus_io_port,
      __meta_kubernetes_pod_ip]
      targetLabel: __address__
```

```
- action: replace
  regex: (\d+);((([0-9]+?)(\.|$)){4})
  replacement: $2:$1
  sourceLabels: [__meta_kubernetes_pod_annotation_prometheus_io_port,
  __meta_kubernetes_pod_ip]
  targetLabel: __address__
- action: labeldrop
  regex: "__meta_kubernetes_pod_label_(.+)"
- sourceLabels: [__meta_kubernetes_namespace]
  action: replace
  targetLabel: namespace
- sourceLabels: [__meta_kubernetes_pod_name]
  action: replace
  targetLabel: pod_name
- action: replace
  replacement: "basic-istio-system" (2)
  targetLabel: mesh_id
```

1. Since Red Hat OpenShift Service on AWS monitoring ignores the **namespaceSelector** spec in **ServiceMonitor** and **PodMonitor** objects, you must apply the **PodMonitor** object in all mesh namespaces, including the control plane namespace.

2. The string **"basic-istio-system"** is a combination of the SMCP name and its namespace, but any label can be used as long as it is unique for every mesh using user workload monitoring in the cluster. The **spec.prometheus.query_scope** of the Kiali resource configured in Step 2 needs to match this value.

NOTE

If there is only one mesh using user-workload monitoring, then both the **mesh_id** relabeling and the **spec.prometheus.query_scope** field in the Kiali resource are optional (but the **query_scope** field given here should be removed if the **mesh_id** label is removed).

If multiple mesh instances on the cluster might use user-workload monitoring, then both the **mesh_id** relabelings and the **spec.prometheus.query_scope** field in the Kiali resource are required. This ensures that Kiali only sees metrics from its associated mesh.

If you are not deploying Kiali, you can still apply **mesh_id** relabeling so that metrics from different meshes can be distinguished from one another.

8. Open the Red Hat OpenShift Service on AWS web console, and check that metrics are visible.

1.16. PERFORMANCE AND SCALABILITY

The default **ServiceMeshControlPlane** settings are not intended for production use; they are designed to install successfully on a default Red Hat OpenShift Service on AWS installation, which is a resource-limited environment. After you have verified a successful SMCP installation, you should modify the settings defined within the SMCP to suit your environment.

1.16.1. Setting limits on compute resources

By default, **spec.proxy** has the settings **cpu: 10m** and **memory: 128M**. If you are using Pilot, **spec.runtime.components.pilot** has the same default values.

The settings in the following example are based on 1,000 services and 1,000 requests per second. You can change the values for **cpu** and **memory** in the **ServiceMeshControlPlane**.

Procedure

1. In the Red Hat OpenShift Service on AWS web console, click **Ecosystem → Installed Operators**.
2. Click the **Project** menu and select the project where you installed the Service Mesh control plane, for example **istio-system**.
3. Click the Red Hat OpenShift Service Mesh Operator. In the **Istio Service Mesh Control Plane** column, click the name of your **ServiceMeshControlPlane**, for example **basic**.
4. Add the name of your standalone Jaeger instance to the **ServiceMeshControlPlane**.
   a. Click the **YAML** tab.
   b. Set the values for **spec.proxy.runtime.container.resources.requests.cpu**, **spec.proxy.runtime.container.resources.requests.memory**, **components.kiali.container**, and **components.global.oauthproxy** in your **ServiceMeshControlPlane** resource.

Example version 2.6 ServiceMeshControlPlane

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
  namespace: istio-system
spec:
  version: v2.6
  proxy:
    runtime:
      container:
        resources:
          requests:
            cpu: 600m
            memory: 50Mi
          limits: {}
  runtime:
    components:
      pilot:
        container:
          resources:
            requests:
              cpu: 1000m
              memory: 1.6Gi
            limits: {}
      kiali:
        container:
          resources:
            limits:
```

```
            cpu: "90m"
            memory: "245Mi"
          requests:
            cpu: "30m"
            memory: "108Mi"
      global.oauthproxy:
        container:
          resources:
            requests:
              cpu: "101m"
              memory: "256Mi"
            limits:
              cpu: "201m"
              memory: "512Mi"
```

c. To set values for Red Hat OpenShift Distributed Tracing Platform (Jaeger), see "Configuring and deploying the distributed tracing platform Jaeger".

d. Click **Save**.

Verification

- Click **Reload** to verify that the **ServiceMeshControlPlane** resource was configured correctly.

1.16.2. Load test results

The upstream Istio community load tests mesh consists of **1000** services and **2000** sidecars with 70,000 mesh-wide requests per second. Running the tests using Istio 1.12.3, generated the following results:

- The Envoy proxy uses **0.35 vCPU** and **40 MB memory** per 1000 requests per second going through the proxy.
- Istiod uses **1 vCPU** and **1.5 GB** of memory.
- The Envoy proxy adds **2.65 ms** to the 90th percentile latency.
- The legacy **istio-telemetry** service (disabled by default in Service Mesh 2.0) uses **0.6 vCPU** per 1000 mesh-wide requests per second for deployments that use Mixer. The data plane components, the Envoy proxies, handle data flowing through the system. The Service Mesh control plane component, Istiod, configures the data plane. The data plane and control plane have distinct performance concerns.

1.16.2.1. Service Mesh Control plane performance

Istiod configures sidecar proxies based on user authored configuration files and the current state of the system. In a Kubernetes environment, Custom Resource Definitions (CRDs) and deployments constitute the configuration and state of the system. The Istio configuration objects like gateways and virtual services, provide the user-authored configuration. To produce the configuration for the proxies, Istiod processes the combined configuration and system state from the Kubernetes environment and the user-authored configuration.

The Service Mesh control plane supports thousands of services, spread across thousands of pods with a similar number of user authored virtual services and other configuration objects. Istiod's CPU and memory requirements scale with the number of configurations and possible system states. The CPU

consumption scales with the following factors:

- The rate of deployment changes.
- The rate of configuration changes.
- The number of proxies connecting to Istiod.

However this part is inherently horizontally scalable.

1.16.2.2. Data plane performance

Data plane performance depends on many factors, for example:

- Number of client connections
- Target request rate
- Request size and response size
- Number of proxy worker threads
- Protocol
- CPU cores
- Number and types of proxy filters, specifically telemetry v2 related filters.

The latency, throughput, and the proxies' CPU and memory consumption are measured as a function of these factors.

1.16.2.2.1. CPU and memory consumption

Since the sidecar proxy performs additional work on the data path, it consumes CPU and memory. As of Istio 1.12.3, a proxy consumes about 0.5 vCPU per 1000 requests per second.

The memory consumption of the proxy depends on the total configuration state the proxy holds. A large number of listeners, clusters, and routes can increase memory usage.

Since the proxy normally does not buffer the data passing through, request rate does not affect the memory consumption.

1.16.2.2.2. Additional latency

Since Istio injects a sidecar proxy on the data path, latency is an important consideration. Istio adds an authentication filter, a telemetry filter, and a metadata exchange filter to the proxy. Every additional filter adds to the path length inside the proxy and affects latency.

The Envoy proxy collects raw telemetry data after a response is sent to the client. The time spent collecting raw telemetry for a request does not contribute to the total time taken to complete that request. However, because the worker is busy handling the request, the worker does not start handling the next request immediately. This process adds to the queue wait time of the next request and affects average and tail latencies. The actual tail latency depends on the traffic pattern.

Inside the mesh, a request traverses the client-side proxy and then the server-side proxy. In the default configuration of Istio 1.12.3 (that is, Istio with telemetry v2), the two proxies add about 1.7 ms and 2.7 ms to the 90th and 99th percentile latency, respectively, over the baseline data plane latency.

1.17. CONFIGURING SERVICE MESH FOR PRODUCTION

When you are ready to move from a basic installation to production, you must configure your control plane, tracing, and security certificates to meet production requirements.

Prerequisites

- Install and configure Red Hat OpenShift Service Mesh.
- Test your configuration in a staging environment.

1.17.1. Configuring your ServiceMeshControlPlane resource for production

If you have installed a basic **ServiceMeshControlPlane** resource to test Service Mesh, you must configure it to production specification before you use Red Hat OpenShift Service Mesh in production.

You cannot change the **metadata.name** field of an existing **ServiceMeshControlPlane** resource. For production deployments, you must customize the default template.

Procedure

1. Configure the Distributed Tracing Platform (Jaeger) for production.
   a. Edit the **ServiceMeshControlPlane** resource to use the **production** deployment strategy, by setting **spec.addons.jaeger.install.storage.type** to **Elasticsearch** and specify additional configuration options under **install**. You can create and configure your Jaeger instance and set **spec.addons.jaeger.name** to the name of the Jaeger instance.

      Default Jaeger parameters including Elasticsearch

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  version: v2.6
  tracing:
    sampling: 100
    type: Jaeger
  addons:
    jaeger:
      name: MyJaeger
      install:
        storage:
          type: Elasticsearch
        ingress:
          enabled: true
  runtime:
    components:
      tracing.jaeger.elasticsearch: # only supports resources and image name
        container:
          resources: {}
```

   b. Configure the sampling rate for production. For more information, see the Performance and scalability section.

2. Ensure your security certificates are production ready by installing security certificates from an external certificate authority. For more information, see the Security section.

Verification

1. Enter the following command to verify that the **ServiceMeshControlPlane** resource updated properly. In this example, **basic** is the name of the **ServiceMeshControlPlane** resource.

```
$ oc get smcp basic -o yaml
```

1.17.2. Additional resources

- For more information about tuning Service Mesh for performance, see Performance and scalability.

1.18. CONNECTING SERVICE MESHES

Federation is a deployment model that lets you share services and workloads between separate meshes managed in distinct administrative domains.

1.18.1. Federation overview

Federation is a set of features that let you connect services between separate meshes, allowing the use of Service Mesh features such as authentication, authorization, and traffic management across multiple, distinct administrative domains.

Implementing a federated mesh lets you run, manage, and observe a single service mesh running across multiple OpenShift clusters. Red Hat OpenShift Service Mesh federation takes an opinionated approach to a multi-cluster implementation of Service Mesh that assumes *minimal* trust between meshes.

Service Mesh federation assumes that each mesh is managed individually and retains its own administrator. The default behavior is that no communication is permitted and no information is shared between meshes. The sharing of information between meshes is on an explicit opt-in basis. Nothing is shared in a federated mesh unless it has been configured for sharing. Support functions such as certificate generation, metrics and trace collection remain local in their respective meshes.

You configure the **ServiceMeshControlPlane** on each service mesh to create ingress and egress gateways specifically for the federation, and to specify the trust domain for the mesh.

Federation also involves the creation of additional federation files. The following resources are used to configure the federation between two or more meshes.

- A **ServiceMeshPeer** resource declares the federation between a pair of service meshes.
- An **ExportedServiceSet** resource declares that one or more services from the mesh are available for use by a peer mesh.
- An **ImportedServiceSet** resource declares which services exported by a peer mesh will be imported into the mesh.

1.18.2. Federation features

Features of the Red Hat OpenShift Service Mesh federated approach to joining meshes include the following:

- Supports common root certificates for each mesh.
- Supports different root certificates for each mesh.
- Mesh administrators must manually configure certificate chains, service discovery endpoints, trust domains, etc for meshes outside of the Federated mesh.
- Only export/import the services that you want to share between meshes.
  - Defaults to not sharing information about deployed workloads with other meshes in the federation. A service can be **exported** to make it visible to other meshes and allow requests from workloads outside of its own mesh.
  - A service that has been exported can be **imported** to another mesh, enabling workloads on that mesh to send requests to the imported service.
- Encrypts communication between meshes at all times.
- Supports configuring load balancing across workloads deployed locally and workloads that are deployed in another mesh in the federation.

When a mesh is joined to another mesh it can do the following:

- Provide trust details about itself to the federated mesh.
- Discover trust details about the federated mesh.
- Provide information to the federated mesh about its own exported services.
- Discover information about services exported by the federated mesh.

1.18.3. Federation security

Red Hat OpenShift Service Mesh federation takes an opinionated approach to a multi-cluster implementation of Service Mesh that assumes minimal trust between meshes. Data security is built in as part of the federation features.

- Each mesh is considered to be a unique tenant, with a unique administration.
- You create a unique trust domain for each mesh in the federation.
- Traffic between the federated meshes is automatically encrypted using mutual Transport Layer Security (mTLS).
- The Kiali graph only displays your mesh and services that you have imported. You cannot see the other mesh or services that have not been imported into your mesh.

1.18.4. Federation limitations

The Red Hat OpenShift Service Mesh federated approach to joining meshes has the following limitations:

- Federation of meshes is not supported on OpenShift Dedicated.

1.18.5. Federation prerequisites

The Red Hat OpenShift Service Mesh federated approach to joining meshes has the following prerequisites:

- Two or more Red Hat OpenShift Service on AWS 4.6 or above clusters.
- Federation was introduced in Red Hat OpenShift Service Mesh 2.1 or later. You must have the Red Hat OpenShift Service Mesh 2.1 or later Operator installed on each mesh that you want to federate.
- You must have a version 2.1 or later **ServiceMeshControlPlane** deployed on each mesh that you want to federate.
- You must configure the load balancers supporting the services associated with the federation gateways to support raw TLS traffic. Federation traffic consists of HTTPS for discovery and raw encrypted TCP for service traffic.
- Services that you want to expose to another mesh should be deployed before you can export and import them. However, this is not a strict requirement. You can specify service names that do not yet exist for export/import. When you deploy the services named in the **ExportedServiceSet** and **ImportedServiceSet** they will be automatically made available for export/import.

1.18.6. Planning your mesh federation

Before you start configuring your mesh federation, you should take some time to plan your implementation.

- How many meshes do you plan to join in a federation? You probably want to start with a limited number of meshes, perhaps two or three.
- What naming convention do you plan to use for each mesh? Having a pre-defined naming convention will help with configuration and troubleshooting. The examples in this documentation use different colors for each mesh. You should decide on a naming convention that will help you determine who owns and manages each mesh, as well as the following federation resources:
  - Cluster names
  - Cluster network names
  - Mesh names and namespaces
  - Federation ingress gateways
  - Federation egress gateways
  - Security trust domains

    NOTE

    Each mesh in the federation must have its own unique trust domain.
- Which services from each mesh do you plan to export to the federated mesh? Each service can be exported individually, or you can specify labels or use wildcards.
  - Do you want to use aliases for the service namespaces?

  - Do you want to use aliases for the exported services?

- Which exported services does each mesh plan to import? Each mesh only imports the services that it needs.
  - Do you want to use aliases for the imported services?

1.18.7. Mesh federation across clusters

To connect one instance of the OpenShift Service Mesh with one running in a different cluster, the procedure is not much different as when connecting two meshes deployed in the same cluster. However, the ingress gateway of one mesh must be reachable from the other mesh. One way of ensuring this is to configure the gateway service as a **LoadBalancer** service if the cluster supports this type of service.

The service must be exposed through a load balancer that operates at Layer4 of the OSI model.

1.18.7.1. Exposing the federation ingress on clusters running on bare metal

If the cluster runs on bare metal and fully supports **LoadBalancer** services, the IP address found in the **.status.loadBalancer.ingress.ip** field of the ingress gateway **Service** object should be specified as one of the entries in the **.spec.remote.addresses** field of the **ServiceMeshPeer** object.

If the cluster does not support **LoadBalancer** services, using a **NodePort** service could be an option if the nodes are accessible from the cluster running the other mesh. In the **ServiceMeshPeer** object, specify the IP addresses of the nodes in the **.spec.remote.addresses** field and the service's node ports in the **.spec.remote.discoveryPort** and **.spec.remote.servicePort** fields.

1.18.7.2. Exposing the federation ingress on Amazon Web Services (AWS)

By default, LoadBalancer services in clusters running on AWS do not support L4 load balancing. In order for Red Hat OpenShift Service Mesh federation to operate correctly, the following annotation must be added to the ingress gateway service:

service.beta.kubernetes.io/aws-load-balancer-type: nlb

The Fully Qualified Domain Name found in the **.status.loadBalancer.ingress.hostname** field of the ingress gateway **Service** object should be specified as one of the entries in the **.spec.remote.addresses** field of the **ServiceMeshPeer** object.

1.18.8. Federation implementation checklist

Federating services meshes involves the following activities:

❑ Configure networking between the clusters that you are going to federate.

  ❑ Configure the load balancers supporting the services associated with the federation gateways to support raw TLS traffic.

❑ Installing the Red Hat OpenShift Service Mesh version 2.1 or later Operator in each of your clusters.

❑ Deploying a version 2.1 or later **ServiceMeshControlPlane** to each of your clusters.

❑ Configuring the SMCP for federation for each mesh that you want to federate:

- ❑ Create a federation egress gateway for each mesh you are going to federate with.
- ❑ Create a federation ingress gateway for each mesh you are going to federate with.
- ❑ Configure a unique trust domain.

❑ Federate two or more meshes by creating a **ServiceMeshPeer** resource for each mesh pair.

❑ Export services by creating an **ExportedServiceSet** resource to make services available from one mesh to a peer mesh.

❑ Import services by creating an **ImportedServiceSet** resource to import services shared by a mesh peer.

1.18.9. Configuring a Service Mesh control plane for federation

Before a mesh can be federated, you must configure the **ServiceMeshControlPlane** for mesh federation. Because all meshes that are members of the federation are equal, and each mesh is managed independently, you must configure the SMCP for *each* mesh that will participate in the federation.

In the following example, the administrator for the **red-mesh** is configuring the SMCP for federation with both the **green-mesh** and the **blue-mesh**.

Sample SMCP for red-mesh

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: red-mesh
  namespace: red-mesh-system
spec:
  version: v2.6
  runtime:
    defaults:
      container:
        imagePullPolicy: Always
  gateways:
    additionalEgress:
      egress-green-mesh:
        enabled: true
        requestedNetworkView:
        - green-network
        routerMode: sni-dnat
        service:
          metadata:
            labels:
              federation.maistra.io/egress-for: egress-green-mesh
          ports:
          - port: 15443
            name: tls
          - port: 8188
            name: http-discovery  #note HTTP here
      egress-blue-mesh:
        enabled: true
        requestedNetworkView:
```

```
        - blue-network
        routerMode: sni-dnat
        service:
          metadata:
            labels:
              federation.maistra.io/egress-for: egress-blue-mesh
          ports:
          - port: 15443
            name: tls
          - port: 8188
            name: http-discovery  #note HTTP here
    additionalIngress:
      ingress-green-mesh:
        enabled: true
        routerMode: sni-dnat
        service:
          type: LoadBalancer
          metadata:
            labels:
              federation.maistra.io/ingress-for: ingress-green-mesh
          ports:
          - port: 15443
            name: tls
          - port: 8188
            name: https-discovery  #note HTTPS here
      ingress-blue-mesh:
        enabled: true
        routerMode: sni-dnat
        service:
          type: LoadBalancer
          metadata:
            labels:
              federation.maistra.io/ingress-for: ingress-blue-mesh
          ports:
          - port: 15443
            name: tls
          - port: 8188
            name: https-discovery  #note HTTPS here
    security:
      identity:
        type: ThirdParty
      trust:
        domain: red-mesh.local
```

Table 1.6. ServiceMeshControlPlane federation configuration parameters

Parameter	Description	Values	Default value

`spec:`
`  cluster:`
`  name:`
	Name of the cluster. You are not required to specify a cluster name, but it is helpful for troubleshooting.	String	N/A

Parameter	Description	Values	Default value

`spec:`
`  cluster:`
`  network:`
	Name of the cluster network. You are not required to specify a name for the network, but it is helpful for configuration and troubleshooting.	String	N/A

1.18.9.1. Understanding federation gateways

You use a **gateway** to manage inbound and outbound traffic for your mesh, letting you specify which traffic you want to enter or leave the mesh.

You use ingress and egress gateways to manage traffic entering and leaving the service mesh (North-South traffic). When you create a federated mesh, you create additional ingress/egress gateways, to facilitate service discovery between federated meshes, communication between federated meshes, and to manage traffic flow between service meshes (East-West traffic).

To avoid naming conflicts between meshes, you must create separate egress and ingress gateways for each mesh. For example, **red-mesh** would have separate egress gateways for traffic going to **green-mesh** and **blue-mesh**.

Table 1.7. Federation gateway parameters

Parameter	Description	Values	Default value

`spec:`
`  gateways:`
`additionalEgress:`
`<egress_name>:`
	Define an additional egress gateway for *each* mesh peer in the federation.		

`spec:`
`  gateways:`
`additionalEgress:`
`<egress_name>:`
`  enabled:`
	This parameter enables or disables the federation egress.	**true**/**false**	**true**

Parameter	Description	Values	Default value
spec: gateways: additionalEgress: <egress_name>: requestedNetwork View:	Networks associated with exported services.	Set to the value of **spec.cluster.network** in the SMCP for the mesh, otherwise use <ServiceMeshPeer-name>-network. For example, if the **ServiceMeshPeer** resource for that mesh is named **west**, then the network would be named **west-network**.	
spec: gateways: additionalEgress: <egress_name>: service: metadata: labels: federation.maistra.io/egress-for:	Specify a unique label for the gateway to prevent federated traffic from flowing through the cluster's default system gateways.		
spec: gateways: additionalEgress: <egress_name>: service: ports:	Used to specify the **port:** and **name:** used for TLS and service discovery. Federation traffic consists of raw encrypted TCP for service traffic.	Port **15443** is required for sending TLS service requests to other meshes in the federation. Port **8188** is required for sending service discovery requests to other meshes in the federation.	
spec: gateways: additionalIngress:	Define an additional ingress gateway gateway for *each* mesh peer in the federation.		

Parameter	Description	Values	Default value
spec: gateways: additionalIgress: <ingress_name>: enabled:	This parameter enables or disables the federation ingress.	**true/false**	**true**
spec: gateways: additionalIngress: <ingress_name>: service: type:	The ingress gateway service must be exposed through a load balancer that operates at Layer 4 of the OSI model and is publicly available.	**LoadBalancer**	
spec: gateways: additionalIngress: <ingress_name>: service: type:	If the cluster does not support **LoadBalancer** services, the ingress gateway service can be exposed through a **NodePort** service.	**NodePort**	
spec: gateways: additionalIngress: <ingress_name>: service: metadata: labels: federation.maistra.io/ingress-for:	Specify a unique label for the gateway to prevent federated traffic from flowing through the cluster's default system gateways.		

Parameter	Description	Values	Default value
spec: gateways: additionalIngress: <ingress_name>: service: ports:	Used to specify the **port:** and **name:** used for TLS and service discovery. Federation traffic consists of raw encrypted TCP for service traffic. Federation traffic consists of HTTPS for discovery.	Port **15443** is required for receiving TLS service requests to other meshes in the federation. Port **8188** is required for receiving service discovery requests to other meshes in the federation.	
spec: gateways: additionalIngress: <ingress_name>: service: ports: nodePort:	Used to specify the **nodePort:** if the cluster does not support **LoadBalancer** services.	If specified, is required in addition to **port:** and **name:** for both TLS and service discovery. **nodePort:** must be in the range **30000**-**32767**.	

In the following example, the administrator is configuring the SMCP for federation with the **green-mesh** using a **NodePort** service.

Sample SMCP for NodePort

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: green-mesh
  namespace: green-mesh-system
spec:
# ...
  gateways:
    additionalIngress:
     ingress-green-mesh:
       enabled: true
       service:
         type: NodePort
         metadata:
           labels:
             federation.maistra.io/ingress-for: ingress-green-mesh
         ports:
         - port: 15443
           nodePort: 30510
           name: tls
         - port: 8188
           nodePort: 32359
           name: https-discovery
```

1.18.9.2. Understanding federation trust domain parameters

Each mesh in the federation must have its own unique trust domain. This value is used when configuring mesh federation in the **ServiceMeshPeer** resource.

```
kind: ServiceMeshControlPlane
metadata:
  name: red-mesh
  namespace: red-mesh-system
spec:
  security:
    trust:
      domain: red-mesh.local
```

Table 1.8. Federation security parameters

Parameter	Description	Values	Default value

`spec:`
`  security:`
`  trust:`
`  domain:`
	Used to specify a unique name for the trust domain for the mesh. Domains must be unique for every mesh in the federation.	**<mesh-name>.local**	N/A

Procedure from the Console

Follow this procedure to edit the **ServiceMeshControlPlane** with the Red Hat OpenShift Service on AWS web console. This example uses the **red-mesh** as an example.

1. Log in to the Red Hat OpenShift Service on AWS web console as a user with the cluster-admin role.
2. Navigate to **Ecosystem → Installed Operators**.
3. Click the **Project** menu and select the project where you installed the Service Mesh control plane. For example, **red-mesh-system**.
4. Click the Red Hat OpenShift Service Mesh Operator.
5. On the **Istio Service Mesh Control Plane** tab, click the name of your **ServiceMeshControlPlane**, for example **red-mesh**.
6. On the **Create ServiceMeshControlPlane Details** page, click **YAML** to modify your configuration.
7. Modify your **ServiceMeshControlPlane** to add federation ingress and egress gateways and to specify the trust domain.
8. Click **Save**.

Procedure from the CLI

Follow this procedure to create or edit the **ServiceMeshControlPlane** with the command line. This example uses the **red-mesh** as an example.

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role. Enter the following command. Then, enter your username and password when prompted.

```
$ oc login --username=<NAMEOFUSER> https://<HOSTNAME>:6443
```

2. Change to the project where you installed the Service Mesh control plane, for example red-mesh-system.

```
$ oc project red-mesh-system
```

3. Edit the **ServiceMeshControlPlane** file to add federation ingress and egress gateways and to specify the trust domain.

4. Run the following command to edit the Service Mesh control plane where **red-mesh-system** is the system namespace and **red-mesh** is the name of the **ServiceMeshControlPlane** object:

```
$ oc edit -n red-mesh-system smcp red-mesh
```

5. Enter the following command, where **red-mesh-system** is the system namespace, to see the status of the Service Mesh control plane installation.

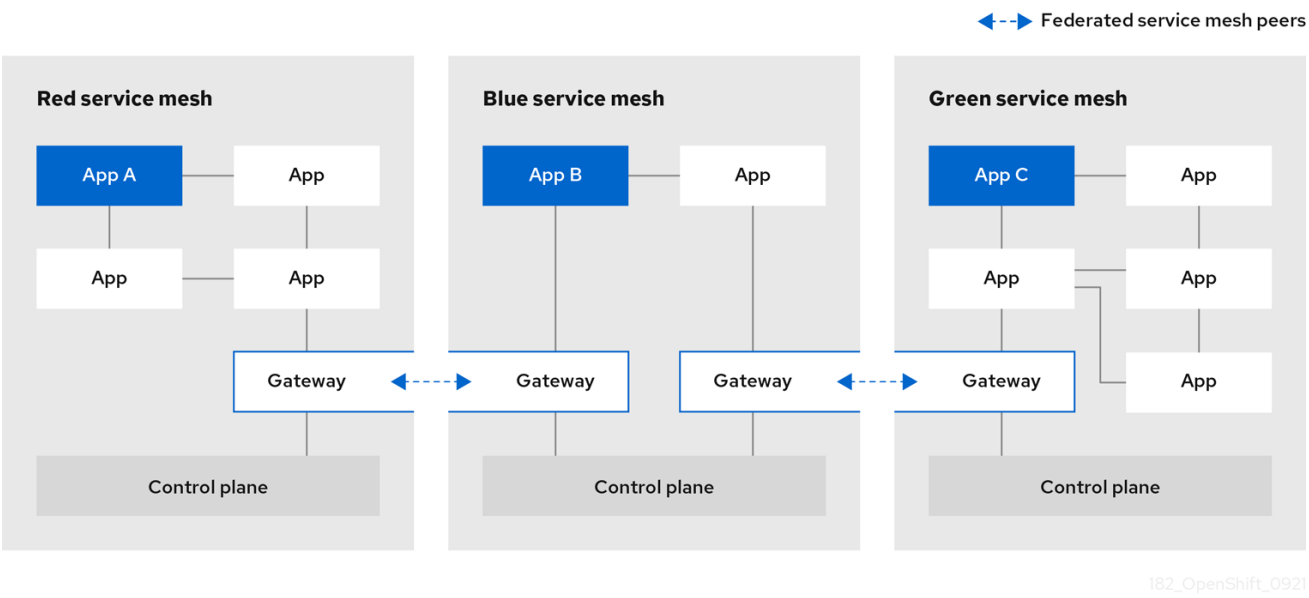
```
$ oc get smcp -n red-mesh-system
```

The installation has finished successfully when the READY column indicates that all components are ready.

```
NAME       READY   STATUS            PROFILES      VERSION   AGE
red-mesh   10/10   ComponentsReady   ["default"]   2.1.0     4m25s
```

1.18.10. Joining a federated mesh

You declare the federation between two meshes by creating a **ServiceMeshPeer** resource. The **ServiceMeshPeer** resource defines the federation between two meshes, and you use it to configure discovery for the peer mesh, access to the peer mesh, and certificates used to validate the other mesh's clients.



Meshes are federated on a one-to-one basis, so each pair of peers requires a pair of **ServiceMeshPeer** resources specifying the federation connection to the other service mesh. For example, federating two meshes named **red** and **green** would require two **ServiceMeshPeer** files.

1. On red-mesh-system, create a **ServiceMeshPeer** for the green mesh.
2. On green-mesh-system, create a **ServiceMeshPeer** for the red mesh.

Federating three meshes named **red**, **blue**, and **green** would require six **ServiceMeshPeer** files.

1. On red-mesh-system, create a **ServiceMeshPeer** for the green mesh.
2. On red-mesh-system, create a **ServiceMeshPeer** for the blue mesh.
3. On green-mesh-system, create a **ServiceMeshPeer** for the red mesh.
4. On green-mesh-system, create a **ServiceMeshPeer** for the blue mesh.
5. On blue-mesh-system, create a **ServiceMeshPeer** for the red mesh.
6. On blue-mesh-system, create a **ServiceMeshPeer** for the green mesh.

Configuration in the **ServiceMeshPeer** resource includes the following:

- The address of the other mesh's ingress gateway, which is used for discovery and service requests.
- The names of the local ingress and egress gateways that is used for interactions with the specified peer mesh.
- The client ID used by the other mesh when sending requests to this mesh.
- The trust domain used by the other mesh.
- The name of a **ConfigMap** containing a root certificate that is used to validate client certificates in the trust domain used by the other mesh.

In the following example, the administrator for the **red-mesh** is configuring federation with the **green-mesh**.

Example ServiceMeshPeer resource for red-mesh

```
kind: ServiceMeshPeer
apiVersion: federation.maistra.io/v1
metadata:
  name: green-mesh
  namespace: red-mesh-system
spec:
  remote:
    addresses:
    - ingress-red-mesh.green-mesh-system.apps.domain.com
  gateways:
    ingress:
      name: ingress-green-mesh
    egress:
      name: egress-green-mesh
  security:
    trustDomain: green-mesh.local
    clientID: green-mesh.local/ns/green-mesh-system/sa/egress-red-mesh-service-account
    certificateChain:
      kind: ConfigMap
      name: green-mesh-ca-root-cert
```

Table 1.9. ServiceMeshPeer configuration parameters

Parameter	Description	Values
`metadata:` `  name:`	Name of the peer mesh that this resource is configuring federation with.	String
`metadata:` `  namespace:`	System namespace for this mesh, that is, where the Service Mesh control plane is installed.	String

`spec:`
`  remote:`
`  addresses:`
	List of public addresses of the peer meshes' ingress gateways that are servicing requests from this mesh.	

`spec:`
`  remote:`
`  discoveryPort:`
	The port on which the addresses are handling discovery requests.	Defaults to 8188

Parameter	Description	Values
spec: remote: servicePort:	The port on which the addresses are handling service requests.	Defaults to 15443
spec: gateways: ingress: name:	Name of the ingress on this mesh that is servicing requests received from the peer mesh. For example, **ingress-green-mesh**.	
spec: gateways: egress: name:	Name of the egress on this mesh that is servicing requests sent to the peer mesh. For example, **egress-green-mesh**.	
spec: security: trustDomain:	The trust domain used by the peer mesh.	<peerMeshName>.local
spec: security: clientID:	The client ID used by the peer mesh when calling into this mesh.	<peerMeshTrustDomain>/ns/<peerMeshSystem>/sa/<peerMeshEgressGatewayName>-service-account
spec: security: certificateChain: kind: ConfigMap name:	The kind (for example, ConfigMap) and name of a resource containing the root certificate used to validate the client and server certificate(s) presented to this mesh by the peer mesh. The key of the config map entry containing the certificate should be **root-cert.pem**.	kind: ConfigMap name: <peerMesh>-ca-root-cert

1.18.10.1. Creating a ServiceMeshPeer resource

Prerequisites

- Two or more Red Hat OpenShift Service on AWS 4.6 or above clusters.

- The clusters must already be networked.
- The load balancers supporting the services associated with the federation gateways must be configured to support raw TLS traffic.
- Each cluster must have a version 2.1 or later **ServiceMeshControlPlane** configured to support federation deployed.
- An account with the **cluster-admin** role.

Procedure from the CLI

Follow this procedure to create a **ServiceMeshPeer** resource from the command line. This example shows the **red-mesh** creating a peer resource for the **green-mesh**.

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role. Enter the following command. Then, enter your username and password when prompted.

```
$ oc login --username=<NAMEOFUSER> <API token> https://<HOSTNAME>:6443
```

2. Change to the project where you installed the control plane, for example, **red-mesh-system**.

```
$ oc project red-mesh-system
```

3. Create a **ServiceMeshPeer** file based the following example for the two meshes that you want to federate.

Example ServiceMeshPeer resource for red-mesh to green-mesh

```
kind: ServiceMeshPeer
apiVersion: federation.maistra.io/v1
metadata:
  name: green-mesh
  namespace: red-mesh-system
spec:
  remote:
    addresses:
    - ingress-red-mesh.green-mesh-system.apps.domain.com
  gateways:
    ingress:
      name: ingress-green-mesh
    egress:
      name: egress-green-mesh
  security:
    trustDomain: green-mesh.local
    clientID: green-mesh.local/ns/green-mesh-system/sa/egress-red-mesh-service-account
    certificateChain:
      kind: ConfigMap
      name: green-mesh-ca-root-cert
```

4. Run the following command to deploy the resource, where **red-mesh-system** is the system namespace and **servicemeshpeer.yaml** includes a full path to the file you edited:

```
$ oc create -n red-mesh-system -f servicemeshpeer.yaml
```

5. To confirm that connection between the red mesh and green mesh is established, inspect the status of the green-mesh **ServiceMeshPeer** in the red-mesh-system namespace:

```
$ oc -n red-mesh-system get servicemeshpeer green-mesh -o yaml
```

Example ServiceMeshPeer connection between red-mesh and green-mesh

```
status:
  discoveryStatus:
    active:
    - pod: istiod-red-mesh-b65457658-9wq5j
      remotes:
      - connected: true
        lastConnected: "2021-10-05T13:02:25Z"
        lastFullSync: "2021-10-05T13:02:25Z"
        source: 10.128.2.149
      watch:
        connected: true
        lastConnected: "2021-10-05T13:02:55Z"
        lastDisconnectStatus: 503 Service Unavailable
        lastFullSync: "2021-10-05T13:05:43Z"
```

The **status.discoveryStatus.active.remotes** field shows that istiod in the peer mesh (in this example, the green mesh) is connected to istiod in the current mesh (in this example, the red mesh).

The **status.discoveryStatus.active.watch** field shows that istiod in the current mesh is connected to istiod in the peer mesh.

If you check the **servicemeshpeer** named **red-mesh** in **green-mesh-system**, you can find information about the same two connections from the perspective of the green mesh.

When the connection between two meshes is not established, the **ServiceMeshPeer** status indicates this in the **status.discoveryStatus.inactive** field.

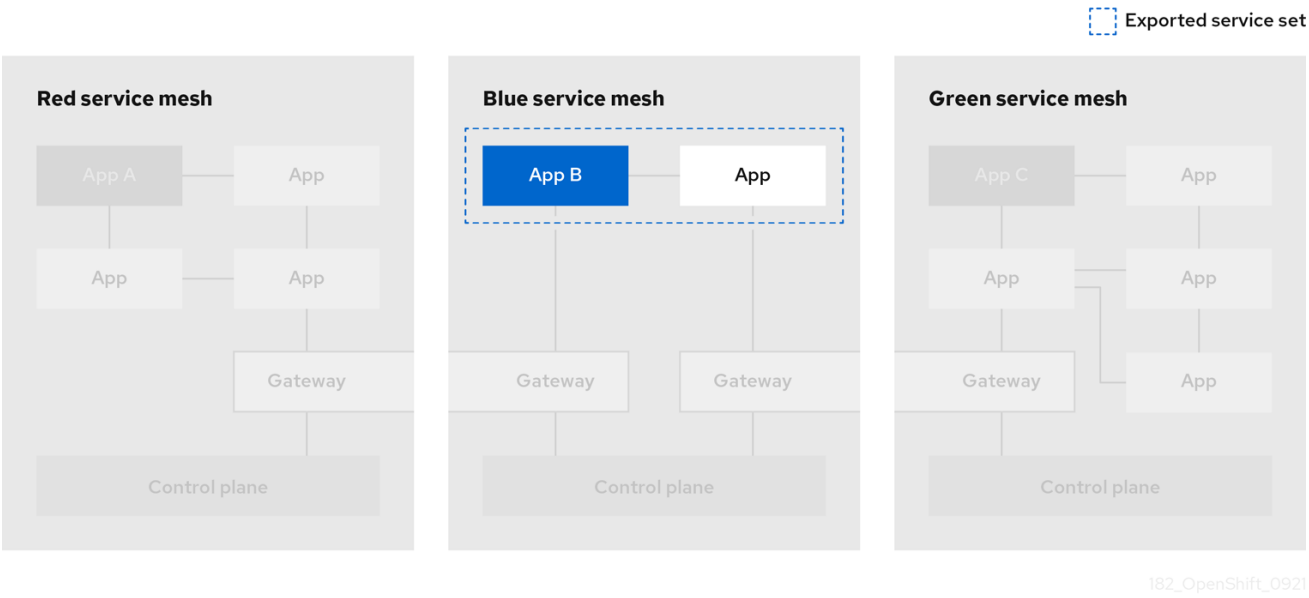
For more information on why a connection attempt failed, inspect the Istiod log, the access log of the egress gateway handling egress traffic for the peer, and the ingress gateway handling ingress traffic for the current mesh in the peer mesh.

For example, if the red mesh cannot connect to the green mesh, check the following logs:

- istiod-red-mesh in red-mesh-system
- egress-green-mesh in red-mesh-system
- ingress-red-mesh in green-mesh-system

1.18.11. Exporting a service from a federated mesh

Exporting services allows a mesh to share one or more of its services with another member of the federated mesh.



You use an **ExportedServiceSet** resource to declare the services from one mesh that you are making available to another peer in the federated mesh. You must explicitly declare each service to be shared with a peer.

- You can select services by namespace or name.
- You can use wildcards to select services; for example, to export all the services in a namespace.
- You can export services using an alias. For example, you can export the **foo/bar** service as **custom-ns/bar**.
- You can only export services that are visible to the mesh's system namespace. For example, a service in another namespace with a **networking.istio.io/exportTo** label set to '.' would not be a candidate for export.
- For exported services, their target services will only see traffic from the ingress gateway, not the original requestor (that is, they won't see the client ID of either the other mesh's egress gateway or the workload originating the request)

The following example is for services that **red-mesh** is exporting to **green-mesh**.

Example ExportedServiceSet resource

```
kind: ExportedServiceSet
apiVersion: federation.maistra.io/v1
metadata:
  name: green-mesh
  namespace: red-mesh-system
spec:
  exportRules:
  # export ratings.mesh-x-bookinfo as ratings.bookinfo
  - type: NameSelector
    nameSelector:
      namespace: red-mesh-bookinfo
      name: red-ratings
      alias:
        namespace: bookinfo
```

```
      name: ratings
# export any service in red-mesh-bookinfo namespace with label export-service=true
- type: LabelSelector
  labelSelector:
    namespace: red-mesh-bookinfo
    selector:
      matchLabels:
        export-service: "true"
    aliases: # export all matching services as if they were in the bookinfo namespace
    - namespace: "*"
      name: "*"
      alias:
        namespace: bookinfo
```

Table 1.10. ExportedServiceSet parameters

Parameter	Description	Values
`metadata:` `  name:`	Name of the ServiceMeshPeer you are exposing this service to.	Must match the **name** value for the mesh in the **ServiceMeshPeer** resource.
`metadata:` `  namespace:`	Name of the project/namespace containing this resource (should be the system namespace for the mesh) .	

`spec:`
`  exportRules:`
`  - type:`
	Type of rule that will govern the export for this service. The first matching rule found for the service will be used for the export.	**NameSelector**, **LabelSelector**

`spec:`
`  exportRules:`
`  - type: NameSelector`
`  nameSelector:`
`  namespace:`
`  name:`
	To create a **NameSelector** rule, specify the **namespace** of the service and the **name** of the service as defined in the **Service** resource.	

`spec:`
`  exportRules:`
`  - type: NameSelector`
`  nameSelector:`
`  alias:`
`  namespace:`
`  name:`
	To create a **NameSelector** rule that uses an alias for the service, after specifying the **namespace** and **name** for the service, then specify the alias for the **namespace** and the alias to be used for **name** of the service.	

Parameter	Description	Values
spec: exportRules: - type: LabelSelector labelSelector: namespace: <exportingMesh> selector: matchLabels: <labelKey>: <labelValue>	To create a **LabelSelector** rule, specify the **namespace** of the service and specify the **label** defined in the **Service** resource. In the example above, the label is **export-service**.	
spec: exportRules: - type: LabelSelector labelSelector: namespace: <exportingMesh> selector: matchLabels: <labelKey>: <labelValue> aliases: - namespace: name: alias: namespace: name:	To create a **LabelSelector** rule that uses aliases for the services, after specifying the **selector**, specify the aliases to be used for **name** or **namespace** of the service. In the example above, the namespace alias is **bookinfo** for all matching services.	

Export services with the name "ratings" from all namespaces in the red-mesh to blue-mesh.

```
kind: ExportedServiceSet
apiVersion: federation.maistra.io/v1
metadata:
  name: blue-mesh
  namespace: red-mesh-system
spec:
  exportRules:
  - type: NameSelector
    nameSelector:
      namespace: "*"
      name: ratings
```

Export all services from the west-data-center namespace to green-mesh

```
kind: ExportedServiceSet
apiVersion: federation.maistra.io/v1
metadata:
  name: green-mesh
```

```
  namespace: red-mesh-system
spec:
  exportRules:
  - type: NameSelector
    nameSelector:
      namespace: west-data-center
      name: "*"
```

1.18.11.1. Creating an ExportedServiceSet

You create an **ExportedServiceSet** resource to explicitly declare the services that you want to be available to a mesh peer.

Services are exported as **<export-name>.<export-namespace>.svc.<ServiceMeshPeer.name>-exports.local** and will automatically route to the target service. This is the name by which the exported service is known in the exporting mesh. When the ingress gateway receives a request destined for this name, it will be routed to the actual service being exported. For example, if a service named **ratings.red-mesh-bookinfo** is exported to **green-mesh** as **ratings.bookinfo**, the service will be exported under the name **ratings.bookinfo.svc.green-mesh-exports.local**, and traffic received by the ingress gateway for that hostname will be routed to the **ratings.red-mesh-bookinfo** service.

NOTE

When you set the **importAsLocal** parameter to **true** to aggregate the remote endpoint with local services, you must use an alias for the service. When you set the parameter **false**, no alias is required.

Prerequisites

- The cluster and **ServiceMeshControlPlane** have been configured for mesh federation.
- An account with the **cluster-admin** role.

NOTE

You can configure services for export even if they do not exist yet. When a service that matches the value specified in the ExportedServiceSet is deployed, it will be automatically exported.

Procedure from the CLI

Follow this procedure to create an **ExportedServiceSet** from the command line.

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role. Enter the following command. Then, enter your username and password when prompted.

```
$ oc login --username=<NAMEOFUSER> <API token> https://<HOSTNAME>:6443
```

2. Change to the project where you installed the Service Mesh control plane; for example, **red-mesh-system**.

```
$ oc project red-mesh-system
```

3. Create an **ExportedServiceSet** file based on the following example where **red-mesh** is exporting services to **green-mesh**.

Example ExportedServiceSet resource from red-mesh to green-mesh

```
apiVersion: federation.maistra.io/v1
kind: ExportedServiceSet
metadata:
  name: green-mesh
  namespace: red-mesh-system
spec:
  exportRules:
  - type: NameSelector
    nameSelector:
      namespace: red-mesh-bookinfo
      name: ratings
      alias:
        namespace: bookinfo
        name: red-ratings
  - type: NameSelector
    nameSelector:
      namespace: red-mesh-bookinfo
      name: reviews
```

4. Run the following command to upload and create the **ExportedServiceSet** resource in the red-mesh-system namespace.

```
$ oc create -n <ControlPlaneNamespace> -f <ExportedServiceSet.yaml>
```

For example:

```
$ oc create -n red-mesh-system -f export-to-green-mesh.yaml
```

5. Create additional **ExportedServiceSets** as needed for each mesh peer in your federated mesh.

Verification

- Run the following command to validate the services the red-mesh exports to share with green-mesh:

```
$ oc get exportedserviceset <PeerMeshExportedTo> -o yaml
```

For example:

```
$ oc -n red-mesh-system get exportedserviceset green-mesh -o yaml
```

Example validating the services exported from the red mesh that are shared with the green mesh.

```
status:
  exportedServices:
  - exportedName: red-ratings.bookinfo.svc.green-mesh-exports.local
    localService:
```

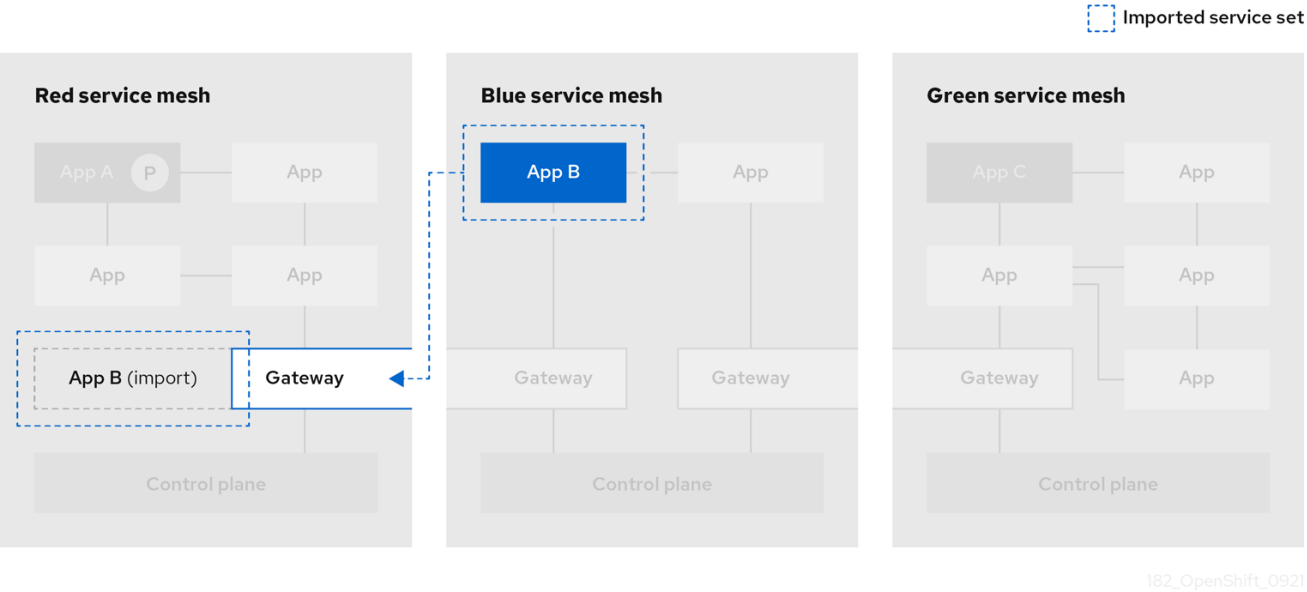
```
      hostname: ratings.red-mesh-bookinfo.svc.cluster.local
      name: ratings
      namespace: red-mesh-bookinfo
  - exportedName: reviews.red-mesh-bookinfo.svc.green-mesh-exports.local
    localService:
      hostname: reviews.red-mesh-bookinfo.svc.cluster.local
      name: reviews
      namespace: red-mesh-bookinfo
```

The **status.exportedServices** array lists the services that are currently exported (these services matched the export rules in the **ExportedServiceSet object**). Each entry in the array indicates the name of the exported service and details about the local service that is exported.

If a service that you expected to be exported is missing, confirm the Service object exists, its name or labels match the **exportRules** defined in the **ExportedServiceSet** object, and that the Service object's namespace is configured as a member of the service mesh using the **ServiceMeshMemberRoll** or **ServiceMeshMember** object.

1.18.12. Importing a service into a federated mesh

Importing services lets you explicitly specify which services exported from another mesh should be accessible within your service mesh.



You use an **ImportedServiceSet** resource to select services for import. Only services exported by a mesh peer and explicitly imported are available to the mesh. Services that you do not explicitly import are not made available within the mesh.

- You can select services by namespace or name.
- You can use wildcards to select services, for example, to import all the services that were exported to the namespace.
- You can select services for export using a label selector, which may be global to the mesh, or scoped to a specific member namespace.
- You can import services using an alias. For example, you can import the **custom-ns/bar** service as **other-mesh/bar**.

- You can specify a custom domain suffix, which will be appended to the **name.namespace** of an imported service for its fully qualified domain name; for example, **bar.other-mesh.imported.local**.

The following example is for the **green-mesh** importing a service that was exported by **red-mesh**.

Example ImportedServiceSet

```
kind: ImportedServiceSet
apiVersion: federation.maistra.io/v1
metadata:
  name: red-mesh #name of mesh that exported the service
  namespace: green-mesh-system #mesh namespace that service is being imported into
spec:
  importRules: # first matching rule is used
  # import ratings.bookinfo as ratings.bookinfo
  - type: NameSelector
    importAsLocal: false
    nameSelector:
      namespace: bookinfo
      name: ratings
      alias:
        # service will be imported as ratings.bookinfo.svc.red-mesh-imports.local
        namespace: bookinfo
        name: ratings
```

Table 1.11. ImportedServiceSet parameters

Parameter	Description	Values
`metadata:` `  name:`	Name of the ServiceMeshPeer that exported the service to the federated mesh.	
`metadata:` `  namespace:`	Name of the namespace containing the ServiceMeshPeer resource (the mesh system namespace).	

`spec:`
`  importRules:`
`  - type:`
	Type of rule that will govern the import for the service. The first matching rule found for the service will be used for the import.	**NameSelector**

`spec:`
`  importRules:`
`  - type: NameSelector`
`  nameSelector:`
`  namespace:`
`  name:`
	To create a **NameSelector** rule, specify the **namespace** and the **name** of the exported service.	

Parameter	Description	Values

`spec:`
`  importRules:`
`  - type: NameSelector`
`  importAsLocal:`
	Set to **true** to aggregate remote endpoint with local services. When **true** services are imported as **<name>.<namespace>.svc.cluster.local**. When **true**, an alias is required. When **false**, no alias is required.	**true**/**false**

`spec:`
`  importRules:`
`  - type: NameSelector`
`  nameSelector:`
`  namespace:`
`  name:`
`  alias:`
`  namespace:`
`  name:`
	To create a **NameSelector** rule that uses an alias for the service, after specifying the **namespace** and **name** for the service, then specify the alias for the **namespace** and the alias to be used for **name** of the service.	

Import the "bookinfo/ratings" service from the red-mesh into blue-mesh

```
kind: ImportedServiceSet
apiVersion: federation.maistra.io/v1
metadata:
  name: red-mesh
  namespace: blue-mesh-system
spec:
  importRules:
  - type: NameSelector
    importAsLocal: false
    nameSelector:
      namespace: bookinfo
      name: ratings
```

Import all services from the red-mesh's west-data-center namespace into the green-mesh. These services will be accessible as <name>.west-data-center.svc.red-mesh-imports.local

```
kind: ImportedServiceSet
apiVersion: federation.maistra.io/v1
metadata:
  name: red-mesh
  namespace: green-mesh-system
spec:
  importRules:
  - type: NameSelector
    importAsLocal: false
    nameSelector:
      namespace: west-data-center
      name: "*"
```

1.18.12.1. Creating an ImportedServiceSet

You create an **ImportedServiceSet** resource to explicitly declare the services that you want to import into your mesh.

Services are imported with the name **<exported-name>.<exported-namespace>.svc.<ServiceMeshPeer.name>.remote** which is a "hidden" service, visible only within the egress gateway namespace and is associated with the exported service's hostname. The service will be available locally as **<export-name>.<export-namespace>.<domainSuffix>**, where **domainSuffix** is **svc.<ServiceMeshPeer.name>-imports.local** by default, unless **importAsLocal** is set to **true**, in which case **domainSuffix** is **svc.cluster.local**. If **importAsLocal** is set to **false**, the domain suffix in the import rule will be applied. You can treat the local import just like any other service in the mesh. It automatically routes through the egress gateway, where it is redirected to the exported service's remote name.

Prerequisites

- The cluster and **ServiceMeshControlPlane** have been configured for mesh federation.
- An account with the **cluster-admin** role.

NOTE

You can configure services for import even if they have not been exported yet. When a service that matches the value specified in the ImportedServiceSet is deployed and exported, it will be automatically imported.

Procedure

Follow this procedure to create an **ImportedServiceSet** from the command line.

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role. Enter the following command. Then, enter your username and password when prompted.

```
$ oc login --username=<NAMEOFUSER> <API token> https://<HOSTNAME>:6443
```

2. Change to the project where you installed the Service Mesh control plane; for example, **green-mesh-system**.

```
$ oc project green-mesh-system
```

3. Create an **ImportedServiceSet** file based on the following example where **green-mesh** is importing services previously exported by **red-mesh**.

Example ImportedServiceSet resource from red-mesh to green-mesh

```
kind: ImportedServiceSet
apiVersion: federation.maistra.io/v1
metadata:
  name: red-mesh
  namespace: green-mesh-system
spec:
  importRules:
  - type: NameSelector
    importAsLocal: false
```

```
    nameSelector:
      namespace: bookinfo
      name: red-ratings
      alias:
        namespace: bookinfo
        name: ratings
```

4. Run the following command to upload and create the **ImportedServiceSet** resource in the green-mesh-system namespace.

```
$ oc create -n <ControlPlaneNamespace> -f <ImportedServiceSet.yaml>
```

For example:

```
$ oc create -n green-mesh-system -f import-from-red-mesh.yaml
```

5. Create additional **ImportedServiceSet** resources as needed for each mesh peer in your federated mesh.

Verification

- Run the following command to verify that the services were imported into **green-mesh**:

```
$ oc get importedserviceset <PeerMeshImportedInto> -o yaml
```

Example verifying that the services exported from the red mesh have been imported into the green mesh using the status section of the importedserviceset/red-mesh' object in the 'green-mesh-system namespace

```
$ oc -n green-mesh-system get importedserviceset/red-mesh -o yaml
```

```
status:
  importedServices:
  - exportedName: red-ratings.bookinfo.svc.green-mesh-exports.local
    localService:
      hostname: ratings.bookinfo.svc.red-mesh-imports.local
      name: ratings
      namespace: bookinfo
  - exportedName: reviews.red-mesh-bookinfo.svc.green-mesh-exports.local
    localService:
      hostname: ""
      name: ""
      namespace: ""
```

In the preceding example only the ratings service is imported, as indicated by the populated fields under **localService**. The reviews service is available for import, but is not currently imported because it does not match any **importRules** in the **ImportedServiceSet** object.

1.18.13. Configuring a federated mesh for failover

Failover is the ability to switch automatically and seamlessly to a reliable backup system, for example another server. In the case of a federated mesh, you can configure a service in one mesh to failover to a service in another mesh.

You configure Federation for failover by setting the **importAsLocal** and **locality** settings in an **ImportedServiceSet** resource and then configuring a **DestinationRule** that configures failover for the service to the locality specified in the **ImportedServiceSet**.

Prerequisites

- Two or more Red Hat OpenShift Service on AWS 4.6 or above clusters already networked and federated.
- **ExportedServiceSet** resources already created for each mesh peer in the federated mesh.
- **ImportedServiceSet** resources already created for each mesh peer in the federated mesh.
- An account with the **cluster-admin** role.

1.18.13.1. Configuring an ImportedServiceSet for failover

Locality-weighted load balancing allows administrators to control the distribution of traffic to endpoints based on the localities of where the traffic originates and where it will terminate. These localities are specified using arbitrary labels that designate a hierarchy of localities in {region}/{zone}/{sub-zone} form.

In the examples in this section, the **green-mesh** is located in the **us-east** region, and the **red-mesh** is located in the **us-west** region.

Example ImportedServiceSet resource from red-mesh to green-mesh

```
kind: ImportedServiceSet
apiVersion: federation.maistra.io/v1
metadata:
  name: red-mesh #name of mesh that exported the service
  namespace: green-mesh-system #mesh namespace that service is being imported into
spec:
  importRules: # first matching rule is used
  # import ratings.bookinfo as ratings.bookinfo
  - type: NameSelector
    importAsLocal: true
    nameSelector:
      namespace: bookinfo
      name: ratings
      alias:
        # service will be imported as ratings.bookinfo.svc.red-mesh-imports.local
        namespace: bookinfo
        name: ratings
  #Locality within which imported services should be associated.
  locality:
    region: us-west
```

Table 1.12. ImportedServiceLocality fields table

Name	Description	Type
region:	Region within which imported services are located.	string
subzone:	Subzone within which imported services are located. I Subzone is specified, Zone must also be specified.	string
zone:	Zone within which imported services are located. If Zone is specified, Region must also be specified.	string

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role, enter the following command:

```
$ oc login --username=<NAMEOFUSER> <API token> https://<HOSTNAME>:6443
```

2. Change to the project where you installed the Service Mesh control plane, enter the following command:

```
$ oc project <smcp-system>
```

For example, **green-mesh-system**.

```
$ oc project green-mesh-system
```

3. Edit the **ImportedServiceSet** file, where **<ImportedServiceSet.yaml>** includes a full path to the file you want to edit, enter the following command:

```
$ oc edit -n <smcp-system> -f <ImportedServiceSet.yaml>
```

For example, if you want to modify the file that imports from the red-mesh-system to the green-mesh-system as shown in the previous **ImportedServiceSet** example.

```
$ oc edit -n green-mesh-system -f import-from-red-mesh.yaml
```

4. Modify the file:

   a. Set **spec.importRules.importAsLocal** to **true**.

   b. Set **spec.locality** to a **region**, **zone**, or **subzone**.

   c. Save your changes.

1.18.13.2. Configuring a DestinationRule for failover

Create a **DestinationRule** resource that configures the following:

- Outlier detection for the service. This is required in order for failover to function properly. In particular, it configures the sidecar proxies to know when endpoints for a service are unhealthy, eventually triggering a failover to the next locality.
- Failover policy between regions. This ensures that failover beyond a region boundary will behave predictably.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role. Enter the following command. Then, enter your username and password when prompted.

```
$ oc login --username=<NAMEOFUSER> <API token> https://<HOSTNAME>:6443
```

2. Change to the project where you installed the Service Mesh control plane.

```
$ oc project <smcp-system>
```

For example, **green-mesh-system**.

```
$ oc project green-mesh-system
```

3. Create a **DestinationRule** file based on the following example where if green-mesh is unavailable, the traffic should be routed from the green-mesh in the **us-east** region to the red-mesh in **us-west**.

Example DestinationRule

```
apiVersion: networking.istio.io/v1beta1
kind: DestinationRule
metadata:
  name: default-failover
  namespace: bookinfo
spec:
  host: "ratings.bookinfo.svc.cluster.local"
  trafficPolicy:
    loadBalancer:
      localityLbSetting:
        enabled: true
        failover:
          - from: us-east
            to: us-west
    outlierDetection:
      consecutive5xxErrors: 3
      interval: 10s
      baseEjectionTime: 1m
```

4. Deploy the **DestinationRule**, where **<DestinationRule>** includes the full path to your file, enter the following command:

```
$ oc create -n <application namespace> -f <DestinationRule.yaml>
```

For example:

```
$ oc create -n bookinfo -f green-mesh-us-west-DestinationRule.yaml
```

1.18.14. Removing a service from the federated mesh

If you need to remove a service from the federated mesh, for example if it has become obsolete or has been replaced by a different service, you can do so.

1.18.14.1. To remove a service from a single mesh

Remove the entry for the service from the **ImportedServiceSet** resource for the mesh peer that no longer should access the service.

1.18.14.2. To remove a service from the entire federated mesh

Remove the entry for the service from the **ExportedServiceSet** resource for the mesh that owns the service.

1.18.15. Removing a mesh from the federated mesh

If you need to remove a mesh from the federation, you can do so.

1. Edit the removed mesh's **ServiceMeshControlPlane** resource to remove all federation ingress gateways for peer meshes.
2. For each mesh peer that the removed mesh has been federated with:
   a. Remove the **ServiceMeshPeer** resource that links the two meshes.
   b. Edit the peer mesh's **ServiceMeshControlPlane** resource to remove the egress gateway that serves the removed mesh.

1.19. EXTENSIONS

You can use WebAssembly extensions to add new features directly into the Red Hat OpenShift Service Mesh proxies. This lets you move even more common functionality out of your applications, and implement them in a single language that compiles to WebAssembly bytecode.

1.19.1. WebAssembly modules overview

WebAssembly modules can be run on many platforms, including proxies, and have broad language support, fast execution, and a sandboxed-by-default security model.

Red Hat OpenShift Service Mesh extensions are Envoy HTTP Filters, giving them a wide range of capabilities:

- Manipulating the body and headers of requests and responses.
- Out-of-band HTTP requests to services not in the request path, such as authentication or policy checking.
- Side-channel data storage and queues for filters to communicate with each other.

NOTE

When creating new WebAssembly extensions, use the **WasmPlugin** API. The **ServiceMeshExtension** API was deprecated in Red Hat OpenShift Service Mesh version 2.2 and was removed in Red Hat OpenShift Service Mesh version 2.3.

There are two parts to writing a Red Hat OpenShift Service Mesh extension:

1. You must write your extension using an SDK that exposes the proxy-wasm API and compile it to a WebAssembly module.
2. You must then package the module into a container.

Supported languages

You can use any language that compiles to WebAssembly bytecode to write a Red Hat OpenShift Service Mesh extension, but the following languages have existing SDKs that expose the proxy-wasm API so that it can be consumed directly.

Table 1.13. Supported languages

Language	Maintainer	Repository
AssemblyScript	solo.io	solo-io/proxy-runtime
C++	proxy-wasm team (Istio Community)	proxy-wasm/proxy-wasm-cpp-sdk
Go	tetrate.io	tetratelabs/proxy-wasm-go-sdk
Rust	proxy-wasm team (Istio Community)	proxy-wasm/proxy-wasm-rust-sdk

1.19.2. WasmPlugin container format

Istio supports Open Container Initiative (OCI) images in its Wasm Plugin mechanism. You can distribute your Wasm Plugins as a container image, and you can use the **spec.url** field to refer to a container registry location. For example, **quay.io/my-username/my-plugin:latest**.

Because each execution environment (runtime) for a WASM module can have runtime-specific configuration parameters, a WASM image can be composed of two layers:

- **plugin.wasm** (Required) - Content layer. This layer consists of a **.wasm** binary containing the bytecode of your WebAssembly module, to be loaded by the runtime. You must name this file **plugin.wasm**.
- **runtime-config.json** (Optional) - Configuration layer. This layer consists of a JSON-formatted string that describes metadata about the module for the target runtime. The config layer might also contain additional data, depending on the target runtime. For example, the config for a WASM Envoy Filter contains root_ids available on the filter.

1.19.3. WasmPlugin API reference

The WasmPlugins API provides a mechanism to extend the functionality provided by the Istio proxy through WebAssembly filters.

You can deploy multiple WasmPlugins. The **phase** and **priority** settings determine the order of execution (as part of Envoy's filter chain), allowing the configuration of complex interactions between user-supplied WasmPlugins and Istio's internal filters.

In the following example, an authentication filter implements an OpenID flow and populates the Authorization header with a JSON Web Token (JWT). Istio authentication consumes this token and deploys it to the ingress gateway. The WasmPlugin file lives in the proxy sidecar filesystem. Note the field **url**.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: openid-connect
  namespace: istio-ingress
spec:
  selector:
    matchLabels:
      istio: ingressgateway
  url: file:///opt/filters/openid.wasm
  sha256: 1ef0c9a92b0420cf25f7fe5d481b231464bc88f486ca3b9c83ed5cc21d2f6210
  phase: AUTHN
  pluginConfig:
    openid_server: authn
    openid_realm: ingress
```

Below is the same example, but this time an Open Container Initiative (OCI) image is used instead of a file in the filesystem. Note the fields **url**, **imagePullPolicy**, and **imagePullSecret**.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: openid-connect
  namespace: istio-system
spec:
  selector:
    matchLabels:
      istio: ingressgateway
  url: oci://private-registry:5000/openid-connect/openid:latest
  imagePullPolicy: IfNotPresent
  imagePullSecret: private-registry-pull-secret
  phase: AUTHN
  pluginConfig:
    openid_server: authn
    openid_realm: ingress
```

Table 1.14. WasmPlugin Field Reference

Field	Type	Description	Required

Field	Type	Description	Required
spec.selector	WorkloadSelector	Criteria used to select the specific set of pods/VMs on which this plugin configuration should be applied. If omitted, this configuration will be applied to all workload instances in the same namespace. If the **WasmPlugin** field is present in the config root namespace, it will be applied to all applicable workloads in any namespace.	No
spec.url	string	URL of a Wasm module or OCI container. If no scheme is present, defaults to **oci:**//, referencing an OCI image. Other valid schemes are **file:**// for referencing .wasm module files present locally within the proxy container, and **http[s]:**// for .wasm module files hosted remotely.	No
spec.sha256	string	SHA256 checksum that will be used to verify the Wasm module or OCI container. If the **url** field already references a SHA256 (using the **@sha256:** notation), it must match the value of this field. If an OCI image is referenced by tag and this field is set, its checksum will be verified against the contents of this field after pulling.	No

Field	Type	Description	Required
spec.imagePullPolicy	PullPolicy	The pull behavior to be applied when fetching an OCI image. Only relevant when images are referenced by tag instead of SHA. Defaults to the value **IfNotPresent**, except when an OCI image is referenced in the **url** field and the **latest** tag is used, in which case the value **Always** is the default, mirroring K8s behavior. Setting is ignored if the **url** field is referencing a Wasm module directly using **file:**// or **http[s]:**//.	No
spec.imagePullSecret	string	Credentials to use for OCI image pulling. The name of a secret in the same namespace as the **WasmPlugin** object that contains a pull secret for authenticating against the registry when pulling the image.	No
spec.phase	PluginPhase	Determines where in the filter chain this **WasmPlugin** object is injected.	No

Field	Type	Description	Required
spec.priority	**int64**	Determines the ordering of **WasmPlugins** objects that have the same **phase** value. When multiple **WasmPlugins** objects are applied to the same workload in the same phase, they will be applied by priority and in descending order. If the **priority** field is not set, or two **WasmPlugins** objects with the same value, the ordering will be determined from the name and namespace of the **WasmPlugins** objects. Defaults to the value **0**.	No
spec.pluginName	string	The plugin name used in the Envoy configuration. Some Wasm modules might require this value to select the Wasm plugin to execute.	No
spec.pluginConfig	Struct	The configuration that will be passed on to the plugin.	No
spec.pluginConfig.verificationKey	string	The public key used to verify signatures of signed OCI images or Wasm modules. Must be supplied in PEM format.	No

The **WorkloadSelector** object specifies the criteria used to determine if a filter can be applied to a proxy. The matching criteria includes the metadata associated with a proxy, workload instance information such as labels attached to the pod/VM, or any other information that the proxy provides to Istio during the initial handshake. If multiple conditions are specified, all conditions need to match in order for the workload instance to be selected. Currently, only label based selection mechanism is supported.

Table 1.15. WorkloadSelector

Field	Type	Description	Required
matchLabels	map<string, string>	One or more labels that indicate a specific set of pods/VMs on which a policy should be applied. The scope of label search is restricted to the configuration namespace in which the resource is present.	Yes

The **PullPolicy** object specifies the pull behavior to be applied when fetching an OCI image.

Table 1.16. PullPolicy

Value	Description
<empty>	Defaults to the value **IfNotPresent**, except for OCI images with tag latest, for which the default will be the value **Always**.
IfNotPresent	If an existing version of the image has been pulled before, that will be used. If no version of the image is present locally, we will pull the latest version.
Always	Always pull the latest version of an image when applying this plugin.

Struct represents a structured data value, consisting of fields which map to dynamically typed values. In some languages, Struct might be supported by a native representation. For example, in scripting languages like JavaScript a struct is represented as an object.

Table 1.17. Struct

Field	Type	Description
fields	map<string, Value>	Map of dynamically typed values.

PluginPhase specifies the phase in the filter chain where the plugin will be injected.

Table 1.18. PluginPhase

Field	Description
<empty>	Control plane decides where to insert the plugin. This will generally be at the end of the filter chain, right before the Router. Do not specify PluginPhase if the plugin is independent of others.

Field	Description
AUTHN	Insert plugin before Istio authentication filters.
AUTHZ	Insert plugin before Istio authorization filters and after Istio authentication filters.
STATS	Insert plugin before Istio stats filters and after Istio authorization filters.

1.19.3.1. Deploying WasmPlugin resources

You can enable Red Hat OpenShift Service Mesh extensions using the **WasmPlugin** resource. In this example, **istio-system** is the name of the Service Mesh control plane project. The following example creates an **openid-connect** filter that performs an OpenID Connect flow to authenticate the user.

Procedure

1. Create the following example resource:

   Example plugin.yaml

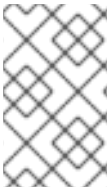
```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: openid-connect
  namespace: istio-system
spec:
  selector:
    matchLabels:
      istio: ingressgateway
  url: oci://private-registry:5000/openid-connect/openid:latest
  imagePullPolicy: IfNotPresent
  imagePullSecret: private-registry-pull-secret
  phase: AUTHN
  pluginConfig:
    openid_server: authn
    openid_realm: ingress
```

2. Apply your **plugin.yaml** file with the following command:

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

1.19.4. ServiceMeshExtension container format

You must have a **.wasm** file containing the bytecode of your WebAssembly module, and a **manifest.yaml** file in the root of the container filesystem to make your container image a valid extension image.



NOTE

When creating new WebAssembly extensions, use the **WasmPlugin** API. The **ServiceMeshExtension** API was deprecated in Red Hat OpenShift Service Mesh version 2.2 and was removed in Red Hat OpenShift Service Mesh version 2.3.

manifest.yaml

```
schemaVersion: 1

name: <your-extension>
description: <description>
version: 1.0.0
phase: PreAuthZ
priority: 100
module: extension.wasm
```

Table 1.19. Field Reference for manifest.yml

Field	Description	Required
schemaVersion	Used for versioning of the manifest schema. Currently the only possible value is **1**.	This is a required field.
name	The name of your extension.	This field is just metadata and currently unused.
description	The description of your extension.	This field is just metadata and currently unused.
version	The version of your extension.	This field is just metadata and currently unused.
phase	The default execution phase of your extension.	This is a required field.
priority	The default priority of your extension.	This is a required field.
module	The relative path from the container filesystem's root to your WebAssembly module.	This is a required field.

1.19.5. ServiceMeshExtension reference

The ServiceMeshExtension API provides a mechanism to extend the functionality provided by the Istio proxy through WebAssembly filters. There are two parts to writing a WebAssembly extension:

1. Write your extension using an SDK that exposes the proxy-wasm API and compile it to a WebAssembly module.

2. Package it into a container.

NOTE

When creating new WebAssembly extensions, use the **WasmPlugin** API. The **ServiceMeshExtension** API, which was deprecated in Red Hat OpenShift Service Mesh version 2.2, was removed in Red Hat OpenShift Service Mesh version 2.3.

Table 1.20. ServiceMeshExtension Field Reference

Field	Description
metadata.namespace	The **metadata.namespace** field of a **ServiceMeshExtension** source has a special semantic: if it equals the Control Plane Namespace, the extension will be applied to all workloads in the Service Mesh that match its **workloadSelector** value. When deployed to any other Mesh Namespace, it will only be applied to workloads in that same Namespace.
spec.workloadSelector	The **spec.workloadSelector** field has the same semantic as the **spec.selector** field of the Istio Gateway resource. It will match a workload based on its Pod labels. If no **workloadSelector** value is specified, the extension will be applied to all workloads in the namespace.
spec.config	This is a structured field that will be handed over to the extension, with the semantics dependent on the extension you are deploying.
spec.image	A container image URI pointing to the image that holds the extension.
spec.phase	The phase determines where in the filter chain the extension is injected, in relation to existing Istio functionality like Authentication, Authorization and metrics generation. Valid values are: PreAuthN, PostAuthN, PreAuthZ, PostAuthZ, PreStats, PostStats. This field defaults to the value set in the **manifest.yaml** file of the extension, but can be overwritten by the user.
spec.priority	If multiple extensions with the same **spec.phase** value are applied to the same workload instance, the **spec.priority** value determines the ordering of execution. Extensions with higher priority will be executed first. This allows for inter-dependent extensions. This field defaults to the value set in the **manifest.yaml** file of the extension, but can be overwritten by the user.

Field	Description

1.19.5.1. Deploying ServiceMeshExtension resources

You can enable Red Hat OpenShift Service Mesh extensions using the **ServiceMeshExtension** resource. In this example, **istio-system** is the name of the Service Mesh control plane project.

> **NOTE**
>
> When creating new WebAssembly extensions, use the **WasmPlugin** API. The **ServiceMeshExtension** API was deprecated in Red Hat OpenShift Service Mesh version 2.2 and removed in Red Hat OpenShift Service Mesh version 2.3.

For a complete example that was built using the Rust SDK, take a look at the header-append-filter. It is a simple filter that appends one or more headers to the HTTP responses, with their names and values taken out from the **config** field of the extension. See a sample configuration in the snippet below.

Procedure

1. Create the following example resource:

   Example ServiceMeshExtension resource extension.yaml

   ```
   apiVersion: maistra.io/v1
   kind: ServiceMeshExtension
   metadata:
     name: header-append
     namespace: istio-system
   spec:
     workloadSelector:
       labels:
         app: httpbin
     config:
       first-header: some-value
       another-header: another-value
     image: quay.io/maistra-dev/header-append-filter:2.1
     phase: PostAuthZ
     priority: 100
   ```

2. Apply your **extension.yaml** file with the following command:

   ```
   $ oc apply -f <extension>.yaml
   ```

1.19.6. Migrating from ServiceMeshExtension to WasmPlugin resources

The **ServiceMeshExtension** API, which was deprecated in Red Hat OpenShift Service Mesh version 2.2, was removed in Red Hat OpenShift Service Mesh version 2.3. If you are using the **ServiceMeshExtension** API, you must migrate to the **WasmPlugin** API to continue using your WebAssembly extensions.

The APIs are very similar. The migration consists of two steps:

1. Renaming your plugin file and updating the module packaging.
2. Creating a **WasmPlugin** resource that references the updated container image.

1.19.6.1. API changes

The new **WasmPlugin** API is similar to the **ServiceMeshExtension**, but with a few differences, especially in the field names:

Table 1.21. Field changes between ServiceMeshExtensions and WasmPlugin

ServiceMeshExtension	WasmPlugin
spec.config	**spec.pluginConfig**
spec.workloadSelector	**spec.selector**
spec.image	**spec.url**
spec.phase valid values: PreAuthN, PostAuthN, PreAuthZ, PostAuthZ, PreStats, PostStats	**spec.phase** valid values: <empty>, AUTHN, AUTHZ, STATS

The following is an example of how a **ServiceMeshExtension** resource could be converted into a **WasmPlugin** resource.

ServiceMeshExtension resource

```
apiVersion: maistra.io/v1
kind: ServiceMeshExtension
metadata:
  name: header-append
  namespace: istio-system
spec:
  workloadSelector:
    labels:
      app: httpbin
  config:
    first-header: some-value
    another-header: another-value
  image: quay.io/maistra-dev/header-append-filter:2.2
  phase: PostAuthZ
  priority: 100
```

New WasmPlugin resource equivalent to the ServiceMeshExtension above

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: header-append
  namespace: istio-system
spec:
  selector:
    matchLabels:
      app: httpbin
  url: oci://quay.io/maistra-dev/header-append-filter:2.2
  phase: STATS
  pluginConfig:
    first-header: some-value
    another-header: another-value
```

1.19.6.2. Container image format changes

The new **WasmPlugin** container image format is similar to the **ServiceMeshExtensions**, with the following differences:

- The **ServiceMeshExtension** container format required a metadata file named **manifest.yaml** in the root directory of the container filesystem. The **WasmPlugin** container format does not require a **manifest.yaml** file.
- The **.wasm** file (the actual plugin) that previously could have any filename now must be named **plugin.wasm** and must be located in the root directory of the container filesystem.

1.19.6.3. Migrating to WasmPlugin resources

To upgrade your WebAssembly extensions from the **ServiceMeshExtension** API to the **WasmPlugin** API, you rename your plugin file.

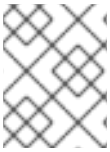
Prerequisites

- **ServiceMeshControlPlane** is upgraded to version 2.2 or later.

Procedure

1. Update your container image. If the plugin is already in **/plugin.wasm** inside the container, skip to the next step. If not:
   a. Ensure the plugin file is named **plugin.wasm**. You must name the extension file **plugin.wasm**.
   b. Ensure the plugin file is located in the root (/) directory. You must store extension files in the root of the container filesystem..
   c. Rebuild your container image and push it to a container registry.
2. Remove the **ServiceMeshExtension** resource and create a **WasmPlugin** resource that refers to the new container image you built.

1.20. USING THE 3SCALE WEBASSEMBLY MODULE



NOTE

The **threescale-wasm-auth** module runs on integrations of 3scale API Management 2.11 or later with Red Hat OpenShift Service Mesh 2.1.0 or later.

The **threescale-wasm-auth** module is a WebAssembly module that uses a set of interfaces, known as an application binary interfaces (*ABI*). This is defined by the *Proxy-WASM* specification to drive any piece of software that implements the ABI so it can authorize HTTP requests against 3scale.

As an ABI specification, Proxy-WASM defines the interaction between a piece of software named *host* and another named *module*, *program*, or *extension*. The host exposes a set of services used by the module to perform a task, and in this case, to process proxy requests.

The host environment is composed of a WebAssembly virtual machine interacting with a piece of software, in this case, an HTTP proxy.

The module itself runs in isolation to the outside world except for the instructions it runs on the virtual machine and the ABI specified by Proxy-WASM. This is a safe way to provide extension points to software: the extension can only interact in well-defined ways with the virtual machine and the host. The interaction provides a computing model and a connection to the outside world the proxy is meant to have.

1.20.1. Compatibility

The **threescale-wasm-auth** module is designed to be fully compatible with all implementations of the *Proxy-WASM ABI* specification. At this point, however, it has only been thoroughly tested to work with the Envoy reverse proxy.

1.20.2. Usage as a stand-alone module

Because of its self-contained design, it is possible to configure this module to work with Proxy-WASM proxies independently of Service Mesh, as well as 3scale Istio adapter deployments.

1.20.3. Configuring the threescale-wasm-auth module

Cluster administrators on Red Hat OpenShift Service on AWS can configure the **threescale-wasm-auth** module to authorize HTTP requests to 3scale API Management through an application binary interface (ABI). The ABI defines the interaction between host and the module, exposing the hosts services, and allows you to use the module to process proxy requests.

1.20.3.1. The WasmPlugin API extension

Service Mesh provides a custom resource definition to specify and apply Proxy-WASM extensions to sidecar proxies, known as **WasmPlugin**. Service Mesh applies this custom resource to the set of workloads that require HTTP API management with 3scale.

NOTE

Configuring the WebAssembly extension is currently a manual process. Support for fetching the configuration for services from the 3scale system will be available in a future release.

Prerequisites

- Identify a Kubernetes workload and namespace on your Service Mesh deployment that you will apply this module.
- You must have a 3scale tenant account. See SaaS or 3scale 2.11 On-Premises with a matching service and relevant applications and metrics defined.
  - The following example is the YAML format for the custom resource for **threescale-wasm-auth** module. This example refers to the upstream Maistra version of Service Mesh, **WasmPlugin** API. You must declare the namespace where the **threescale-wasm-auth** module is deployed, alongside a **selector** to identify the set of applications the module will apply to:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
  namespace: <bookinfo> (1)
spec:
  selector: (2)
    labels:
      app: <product_page>
  pluginConfig: <yaml_configuration>
  url: oci://registry.redhat.io/3scale-amp2/3scale-auth-wasm-rhel8:0.0.3
  phase: AUTHZ
  priority: 100
```

(1) The **namespace**.

(2) The **selector**.

- The **spec.pluginConfig** field depends on the module configuration and it is not populated in the previous example. Instead, the example uses the **<yaml_configuration>** placeholder value. You can use the format of this custom resource example.
  - The **spec.pluginConfig** field varies depending on the application. All other fields persist across multiple instances of this custom resource. As examples:
    - **url**: Only changes when newer versions of the module are deployed.
    - **phase**: Remains the same, since this module needs to be invoked after the proxy has done any local authorization, such as validating OpenID Connect (OIDC) tokens.
- After you have the module configuration in **spec.pluginConfig** and the rest of the custom resource, apply it with the **oc apply** command:

```
$ oc apply -f threescale-wasm-auth-bookinfo.yaml
```

Additional resources

- Migrating from **ServiceMeshExtension** to **WasmPlugin** resources
- Custom Resources

1.20.4. Applying 3scale external ServiceEntry objects

To have the **threescale-wasm-auth** module authorize requests against 3scale, the module must have access to 3scale services. You can do this within Red Hat OpenShift Service Mesh by applying an external **ServiceEntry** object and a corresponding **DestinationRule** object for TLS configuration to use the HTTPS protocol.

The custom resources (CRs) set up the service entries and destination rules for secure access from within Service Mesh to 3scale Hosted (SaaS) for the backend and system components of the Service Management API and the Account Management API. The Service Management API receives queries for the authorization status of each request. The Account Management API provides API management configuration settings for your services.

Procedure

1. Apply the following external **ServiceEntry** CR and related **DestinationRule** CR for 3scale Hosted **backend** to your cluster:

   a. Add the **ServiceEntry** CR to a file called **service-entry-threescale-saas-backend.yml**:

   ServiceEntry CR

   ```
   apiVersion: networking.istio.io/v1beta1
   kind: ServiceEntry
   metadata:
     name: service-entry-threescale-saas-backend
   spec:
     hosts:
     - su1.3scale.net
     ports:
     - number: 443
       name: https
       protocol: HTTPS
     location: MESH_EXTERNAL
     resolution: DNS
   ```

   b. Add the **DestinationRule** CR to a file called **destination-rule-threescale-saas-backend.yml**:

   DestinationRule CR

   ```
   apiVersion: networking.istio.io/v1beta1
   kind: DestinationRule
   metadata:
     name: destination-rule-threescale-saas-backend
   spec:
     host: su1.3scale.net
     trafficPolicy:
       tls:
         mode: SIMPLE
         sni: su1.3scale.net
   ```

   c. Apply and save the external **ServiceEntry** CR for the 3scale Hosted backend to your cluster, by running the following command:

```
$ oc apply -f service-entry-threescale-saas-backend.yml
```

d. Apply and save the external **DestinationRule** CR for the 3scale Hosted backend to your cluster, by running the following command:

```
$ oc apply -f destination-rule-threescale-saas-backend.yml
```

2. Apply the following external **ServiceEntry** CR and related **DestinationRule** CR for 3scale Hosted **system** to your cluster:

a. Add the **ServiceEntry** CR to a file called **service-entry-threescale-saas-system.yml**:

ServiceEntry CR

```
apiVersion: networking.istio.io/v1beta1
kind: ServiceEntry
metadata:
  name: service-entry-threescale-saas-system
spec:
  hosts:
  - multitenant.3scale.net
  ports:
  - number: 443
    name: https
    protocol: HTTPS
  location: MESH_EXTERNAL
  resolution: DNS
```

b. Add the **DestinationRule** CR to a file called **destination-rule-threescale-saas-system.yml**:

DestinationRule CR

```
apiVersion: networking.istio.io/v1beta1
kind: DestinationRule
metadata:
  name: destination-rule-threescale-saas-system
spec:
  host: multitenant.3scale.net
  trafficPolicy:
    tls:
      mode: SIMPLE
      sni: multitenant.3scale.net
```

c. Apply and save the external **ServiceEntry** CR for the 3scale Hosted system to your cluster, by running the following command:

```
$ oc apply -f service-entry-threescale-saas-system.yml
```

d. Apply and save the external **DestinationRule** CR for the 3scale Hosted system to your cluster, by running the following command:

```
$ oc apply -f <destination-rule-threescale-saas-system.yml>
```

Alternatively, you can deploy an in-mesh 3scale service. To deploy an in-mesh 3scale service, change the location of the services in the CR by deploying 3scale and linking to the deployment.

Additional resources

- Service entry and destination rule documentation

1.20.5. The 3scale WebAssembly module configuration

The **WasmPlugin** custom resource spec provides the configuration that the **Proxy-WASM** module reads from.

The spec is embedded in the host and read by the **Proxy-WASM** module. Typically, the configurations are in the JSON file format for the modules to parse, however the **WasmPlugin** resource can interpret the spec value as YAML and convert it to JSON for consumption by the module.

If you use the **Proxy-WASM** module in stand-alone mode, you must write the configuration using the JSON format. Using the JSON format means using escaping and quoting where needed within the **host** configuration files, for example **Envoy**. When you use the WebAssembly module with the **WasmPlugin** resource, the configuration is in the YAML format. In this case, an invalid configuration forces the module to show diagnostics based on its JSON representation to a sidecar's logging stream.

IMPORTANT

The **EnvoyFilter** custom resource is not a supported API, although it can be used in some 3scale Istio adapter or Service Mesh releases. Using the **EnvoyFilter** custom resource is not recommended. Use the **WasmPlugin** API instead of the **EnvoyFilter** custom resource. If you must use the **EnvoyFilter** custom resource, you must specify the spec in JSON format.

1.20.5.1. Configuring the 3scale WebAssembly module

The architecture of the 3scale WebAssembly module configuration depends on the 3scale account and authorization service, and the list of services to handle.

Prerequisites

The prerequisites are a set of minimum mandatory fields in all cases:

- For the 3scale account and authorization service: the **backend-listener** URL.
- For the list of services to handle: the service IDs and at least one credential look up method and where to find it.
- You will find examples for dealing with **userkey**, **appid** with **appkey**, and OpenID Connect (OIDC) patterns.
- The WebAssembly module uses the settings you specified in the static configuration. For example, if you add a mapping rule configuration to the module, it will always apply, even when the 3scale Admin Portal has no such mapping rule. The rest of the **WasmPlugin** resource exists around the **spec.pluginConfig** YAML entry.

1.20.5.2. The 3scale WebAssembly module api object

The **api** top-level string from the 3scale WebAssembly module defines which version of the configuration the module will use.

> **NOTE**
>
> A non-existent or unsupported version of the **api** object renders the 3scale WebAssembly module inoperable.

The api top-level string example

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
  namespace: <bookinfo>
spec:
  pluginConfig:
    api: v1
# ...
```

The **api** entry defines the rest of the values for the configuration. The only accepted value is **v1**. New settings that break compatibility with the current configuration or need more logic that modules using **v1** cannot handle, will require different values.

1.20.5.3. The 3scale WebAssembly module system object

The **system** top-level object specifies how to access the 3scale Account Management API for a specific account. The **upstream** field is the most important part of the object. The **system** object is optional, but recommended unless you are providing a fully static configuration for the 3scale WebAssembly module, which is an option if you do not want to provide connectivity to the *system* component of 3scale.

When you provide static configuration objects in addition to the **system** object, the static ones always take precedence.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
    system:
      name: <saas_porta>
      upstream: <object>
      token: <my_account_token>
      ttl: 300
# ...
```

Table 1.22. system object fields

Name	Description	Required
name	An identifier for the 3scale service, currently not referenced elsewhere.	Optional
upstream	The details about a network host to be contacted. **upstream** refers to the 3scale Account Management API host known as system.	Yes
token	A 3scale personal access token with read permissions.	Yes
ttl	The minimum amount of seconds to consider a configuration retrieved from this host as valid before trying to fetch new changes. The default is 600 seconds (10 minutes). **Note:** there is no maximum amount, but the module will generally fetch any configuration within a reasonable amount of time after this TTL elapses.	Optional

1.20.5.4. The 3scale WebAssembly module upstream object

The **upstream** object describes an external host to which the proxy can perform calls.

```
apiVersion: maistra.io/v1
upstream:
  name: outbound|443||multitenant.3scale.net
  url: "https://myaccount-admin.3scale.net/"
  timeout: 5000
# ...
```

Table 1.23. **upstream** object fields

Name	Description	Required

Name	Description	Required
name	**name** is not a free-form identifier. It is the identifier for the external host as defined by the proxy configuration. In the case of stand-alone **Envoy** configurations, it maps to the name of a Cluster, also known as **upstream** in other proxies.**Note:** the value of this field, because the Service Mesh and 3scale Istio adapter control plane configure the name according to a format using a vertical bar (|) as the separator of multiple fields. For the purposes of this integration, always use the format: **outbound|<port>|| <hostname>**.	Yes
url	The complete URL to access the described service. Unless implied by the scheme, you must include the TCP port.	Yes
Timeout	Timeout in milliseconds so that connections to this service that take more than the amount of time to respond will be considered errors. Default is 1000 seconds.	Optional

1.20.5.5. The 3scale WebAssembly module backend object

The **backend** top-level object specifies how to access the 3scale Service Management API for authorizing and reporting HTTP requests. This service is provided by the *Backend* component of 3scale.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
# ...
    backend:
      name: backend
      upstream: <object>
# ...
```

Table 1.24. **backend** object fields

Name	Description	Required
name	An identifier for the 3scale backend, currently not referenced elsewhere.	Optional
upstream	The details about a network host to be contacted. This must refer to the 3scale Account Management API host, known, system.	Yes. The most important and required field.

1.20.5.6. The 3scale WebAssembly module services object

The **services** top-level object specifies which service identifiers are handled by this particular instance of the **module**.

Since accounts have multiple services, you must specify which ones are handled. The rest of the configuration revolves around how to configure services.

The **services** field is required. It is an array that must contain at least one service to be useful.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
# ...
    services:
    - id: "2555417834789"
      token: service_token
      authorities:
        - "*.app"
        - 0.0.0.0
        - "0.0.0.0:8443"
      credentials: <object>
      mapping_rules: <object>
# ...
```

Each element in the **services** array represents a 3scale service.

Table 1.25. **services** object fields

Name	Description	Required
ID	An identifier for this 3scale service, currently not referenced elsewhere.	Yes

Name	Description	Required
token	This **token** can be found in the proxy configuration for your service in System or you can retrieve the it from System with following **curl** command: **curl https://<system_host>/admin/api/services/<service_id>/proxy/configs/production/latest.json?access_token=<access_token>" | jq '.proxy_config.content.backend_authentication_value**	Optional
authorities	An array of strings, each one representing the *Authority* of a *URL* to match. These strings accept glob patterns supporting the asterisk (*), plus sign (+), and question mark (?) matchers.	Yes
credentials	An object defining which kind of credentials to look for and where.	Yes
mapping_rules	An array of objects representing mapping rules and 3scale methods to hit.	Optional

1.20.5.7. The 3scale WebAssembly module credentials object

The **credentials** object is a component of the **service** object. **credentials** specifies which kind of credentials to be looked up and the steps to perform this action.

All fields are optional, but you must specify at least one, **user_key** or **app_id**. The order in which you specify each credential is irrelevant because it is pre-established by the module. Only specify one instance of each credential.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
# ...
    services:
    - credentials:
```

```
        user_key: <array_of_lookup_queries>
        app_id: <array_of_lookup_queries>
        app_key: <array_of_lookup_queries>
# ...
```

Table 1.26. **credentials** object fields

Name	Description	Required
user_key	This is an array of lookup queries that defines a 3scale user key. A user key is commonly known as an API key.	Optional
app_id	This is an array of lookup queries that define a 3scale application identifier. Application identifiers are provided by 3scale or by using an identity provider like Red Hat Single Sign-On (RH-SSO), or OpenID Connect (OIDC). The resolution of the lookup queries specified here, whenever it is successful and resolves to two values, it sets up the **app_id** and the **app_key**.	Optional
app_key	This is an array of lookup queries that define a 3scale application key. Application keys without a resolved **app_id** are useless, so only specify this field when **app_id** has been specified.	Optional

1.20.5.8. The 3scale WebAssembly module lookup queries

The **lookup query** object is part of any of the fields in the **credentials** object. It specifies how a given credential field should be found and processed. When evaluated, a successful resolution means that one or more values were found. A failed resolution means that no values were found.

Arrays of **lookup queries** describe a short-circuit or relationship: a successful resolution of one of the queries stops the evaluation of any remaining queries and assigns the value or values to the specified credential-type. Each query in the array is independent of each other.

A **lookup query** is made up of a single field, a source object, which can be one of a number of source types. See the following example:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
```

```
# ...
  services:
  - credentials:
      user_key:
        - <source_type>: <object>
        - <source_type>: <object>
# ...
      app_id:
        - <source_type>: <object>
# ...
      app_key:
        - <source_type>: <object>
# ...
```

1.20.5.9. The 3scale WebAssembly module source object

A **source** object exists as part of an array of sources within any of the **credentials** object fields. The object field name, referred to as a **source**-type is any one of the following:

- **header**: The lookup query receives HTTP request headers as input.
- **query_string**: The **lookup query** receives the URL query string parameters as input.
- **filter**: The **lookup query** receives filter metadata as input.

All **source**-type objects have at least the following two fields:

Table 1.27. **source-type object fields**

Name	Description	Required
keys	An array of strings, each one a **key**, referring to entries found in the input data.	Yes
ops	An array of **operations** that perform a **key** entry match. The array is a pipeline where operations receive inputs and generate outputs on the next operation. An **operation** failing to provide an output resolves the **lookup query** as failed. The pipeline order of the operations determines the evaluation order.	Optional

The **filter** field name has a required **path** entry to show the path in the metadata you use to look up data.

When a **key** matches the input data, the rest of the keys are not evaluated and the source resolution algorithm jumps to executing the **operations** (**ops**) specified, if any. If no **ops** are specified, the result value of the matching **key**, if any, is returned.

Operations provide a way to specify certain conditions and transformations for inputs you have after

the first phase looks up a **key**. Use **operations** when you need to transform, decode, and assert properties, however they do not provide a mature language to deal with all needs and lack *Turing-completeness*.

A stack stored the outputs of **operations**. When evaluated, the **lookup query** finishes by assigning the value or values at the bottom of the stack, depending on how many values the credential consumes.

1.20.5.10. The 3scale WebAssembly module operations object

Each element in the **ops** array belonging to a specific **source type** is an **operation** object that either applies transformations to values or performs tests. The field name to use for such an object is the name of the **operation** itself, and any values are the parameters to the **operation**, which could be structure objects, for example, maps with fields and values, lists, or strings.

Most **operations** attend to one or more inputs, and produce one or more outputs. When they consume inputs or produce outputs, they work with a stack of values: each value consumed by the operations is popped from the stack of values and initially populated with any **source** matches. The values outputted by them are pushed to the stack. Other **operations** do not consume or produce outputs other than asserting certain properties, but they inspect a stack of values.

NOTE

When resolution finishes, the values picked up by the next step, such as assigning the values to be an **app_id**, **app_key**, or **user_key**, are taken from the bottom values of the stack.

There are a few different **operations** categories:

- **decode**: These transform an input value by decoding it to get a different format.
- **string**: These take a string value as input and perform transformations and checks on it.
- **stack**: These take a set of values in the input and perform multiple stack transformations and selection of specific positions in the stack.
- **check**: These assert properties about sets of operations in a side-effect free way.
- **control**: These perform operations that allow for modifying the evaluation flow.
- **format**: These parse the format-specific structure of input values and look up values in it.

All operations are specified by the name identifiers as strings.

Additional resources

- Available operations

1.20.5.11. The 3scale WebAssembly module mapping_rules object

The **mapping_rules** object is part of the **service** object. It specifies a set of REST path patterns and related 3scale metrics and count increments to use when the patterns match.

You need the value if no dynamic configuration is provided in the **system** top-level object. If the object is provided in addition to the **system** top-level entry, then the **mapping_rules** object is evaluated first.

mapping_rules is an array object. Each element of that array is a **mapping_rule** object. The evaluated matching mapping rules on an incoming request provide the set of 3scale **methods** for authorization and reporting to the *APIManager*. When multiple matching rules refer to the same **methods**, there is a summation of **deltas** when calling into 3scale. For example, if two rules increase the *Hits* method twice with **deltas** of 1 and 3, a single method entry for Hits reporting to 3scale has a **delta** of 4.

1.20.5.12. The 3scale WebAssembly module mapping_rule object

The **mapping_rule** object is part of an array in the **mapping_rules** object.

The **mapping_rule** object fields specify the following information:

- The *HTTP request method* to match.
- A pattern to match the path against.
- The 3scale methods to report along with the amount to report. The order in which you specify the fields determines the evaluation order.

Table 1.28. **mapping_rule** object fields

Name	Description	Required
method	Specifies a string representing an HTTP request method, also known as verb. Values accepted match the any one of the accepted HTTP method names, case-insensitive. A special value of any matches any method.	Yes
pattern	The pattern to match the HTTP request's URI path component. This pattern follows the same syntax as documented by 3scale. It allows wildcards (use of the asterisk (*) character) using any sequence of characters between braces such as **{this}**.	Yes

Name	Description	Required
usages	A list of **usage** objects. When the rule matches, all methods with their **deltas** are added to the list of methods sent to 3scale for authorization and reporting. Embed the **usages** object with the following required fields: ● **name**: The **method** system name to report. ● **delta**: For how much to increase that **method** by.	Yes
last	Whether the successful matching of this rule should stop the evaluation of more mapping rules.	Optional Boolean. The default is **false**

The following example is independent of existing hierarchies between methods in 3scale. That is, anything run on the 3scale side will not affect this. For example, the *Hits* metric might be a parent of them all, so it stores 4 hits due to the sum of all reported methods in the authorized request and calls the 3scale **Authrep** API endpoint.

The example below uses a **GET** request to a path, **/products/1/sold**, that matches all the rules.

mapping_rules GET request example

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  pluginConfig:
# ...
    mapping_rules:
      - method: GET
        pattern: /
        usages:
          - name: hits
            delta: 1
      - method: GET
        pattern: /products/
        usages:
          - name: products
            delta: 1
      - method: ANY
        pattern: /products/{id}/sold
        usages:
          - name: sales
```

```
          delta: 1
        - name: products
          delta: 1
# ...
```

All **usages** get added to the request the module performs to 3scale with usage data as follows:

- Hits: 1
- products: 2
- sales: 1

1.20.6. The 3scale WebAssembly module examples for credentials use cases

You will spend most of your time applying configuration steps to obtain credentials in the requests to your services.

The following are **credentials** examples, which you can modify to adapt to specific use cases.

You can combine them all, although when you specify multiple source objects with their own **lookup queries**, they are evaluated in order until one of them successfully resolves.

1.20.6.1. API key (user_key) in query string parameters

The following example looks up a **user_key** in a query string parameter or header of the same name:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
# ...
    services:
# ...
      credentials:
        user_key:
          - query_string:
              keys:
                - <user_key>
          - header:
              keys:
                - <user_key>
# ...
```

1.20.6.2. Application ID and key

The following example looks up **app_key** and **app_id** credentials in a query or headers.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
```

```
# ...
  services:
# ...
    credentials:
      app_id:
        - query_string:
            keys:
              - <app_id>
        - header:
            keys:
              - <app_id>
      app_key:
        - query_string:
            keys:
              - <app_key>
        - header:
            keys:
              - <app_key>
# ...
```

1.20.6.3. Authorization header

A request includes an **app_id** and **app_key** in an **authorization** header. If there is at least one or two values outputted at the end, then you can assign the **app_key**.

The resolution here assigns the **app_key** if there is one or two outputted at the end.

The **authorization** header specifies a value with the type of authorization and its value is encoded as **Base64**. This means you can split the value by a space character, take the second output and then split it again using a colon (:) as the separator. For example, if you use this format **app_id:app_key**, the header looks like the following example for **credential**:

```
aladdin:opensesame:  Authorization: Basic YWxhZGRpbjpvcGVuc2VzYW1l
```

You must use lower case header field names as shown in the following example:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
# ...
  services:
# ...
    credentials:
      app_id:
        - header:
            keys:
              - authorization
            ops:
              - split:
                  separator: " "
                  max: 2
              - length:
                  min: 2
```

```
            - drop:
                head: 1
            - base64_urlsafe
            - split:
                max: 2
        app_key:
          - header:
              keys:
            - app_key
# ...
```

The previous example use case looks at the headers for an **authorization**:

1. It takes its string value and split it by a space, checking that it generates at least two values of a **credential**-type and the **credential** itself, then dropping the **credential**-type.

2. It then decodes the second value containing the data it needs, and splits it by using a colon (:) character to have an operations stack including first the **app_id**, then the **app_key**, if it exists.

   a. If **app_key** does not exist in the authorization header then its specific sources are checked, for example, the header with the key **app_key** in this case.

3. To add extra conditions to **credentials**, allow **Basic** authorizations, where **app_id** is either **aladdin** or **admin**, or any **app_id** being at least 8 characters in length.

4. **app_key** must contain a value and have a minimum of 64 characters as shown in the following example:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
# ...
    services:
# ...
      credentials:
        app_id:
          - header:
              keys:
                - authorization
              ops:
                - split:
                    separator: " "
                    max: 2
                - length:
                    min: 2
                - reverse
                - glob:
                  - Basic
                - drop:
                    tail: 1
                - base64_urlsafe
                - split:
                    max: 2
                 - test:
```

```
                if:
                  length:
                    min: 2
                then:
                  - strlen:
                      max: 63
                  - or:
                      - strlen:
                          min: 1
                      - drop:
                          tail: 1
            - assert:
              - and:
                - reverse
                - or:
                  - strlen:
                      min: 8
                  - glob:
                    - aladdin
                    - admin
# ...
```

5. After picking up the **authorization** header value, you get a **Basic credential**-type by reversing the stack so that the type is placed on top.

6. Run a glob match on it. When it validates, and the credential is decoded and split, you get the **app_id** at the bottom of the stack, and potentially the **app_key** at the top.

7. Run a **test:** if there are two values in the stack, meaning an **app_key** was acquired.

   a. Ensure the string length is between 1 and 63, including **app_id** and **app_key**. If the key's length is zero, drop it and continue as if no key exists. If there was only an **app_id** and no **app_key**, the missing else branch indicates a successful test and evaluation continues.

The last operation, **assert**, indicates that no side-effects make it into the stack. You can then modify the stack:

1. Reverse the stack to have the **app_id** at the top.

   a. Whether or not an **app_key** is present, reversing the stack ensures **app_id** is at the top.

2. Use **and** to preserve the contents of the stack across tests.
   Then use one of the following possibilities:

   - Make sure **app_id** has a string length of at least 8.

   - Make sure **app_id** matches either **aladdin** or **admin**.

1.20.6.4. OpenID Connect (OIDC) use case

For Service Mesh and the 3scale Istio adapter, you must deploy a **RequestAuthentication** as shown in the following example, filling in your own workload data and **jwtRules**:

```
apiVersion: security.istio.io/v1beta1
kind: RequestAuthentication
```

```
metadata:
  name: jwt-example
  namespace: bookinfo
spec:
  selector:
    matchLabels:
      app: productpage
  jwtRules:
  - issuer: >-
      http://keycloak-keycloak.34.242.107.254.nip.io/auth/realms/3scale-keycloak
    jwksUri: >-
      http://keycloak-keycloak.34.242.107.254.nip.io/auth/realms/3scale-keycloak/protocol/openid-
connect/certs
```

When you apply the **RequestAuthentication**, it configures **Envoy** with a native plugin to validate **JWT** tokens. The proxy validates everything before running the module so any requests that fail do not make it to the 3scale WebAssembly module.

When a **JWT** token is validated, the proxy stores its contents in an internal metadata object, with an entry whose key depends on the specific configuration of the plugin. This use case gives you the ability to look up structure objects with a single entry containing an unknown key name.

The 3scale **app_id** for OIDC matches the OAuth **client_id**. This is found in the **azp** or **aud** fields of **JWT** tokens.

To get **app_id** field from Envoy's native **JWT** authentication filter, see the following example:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
# ...
    services:
# ...
      credentials:
        app_id:
          - filter:
              path:
                - envoy.filters.http.jwt_authn
                - "0"
              keys:
                - azp
                - aud
              ops:
                - take:
                    head: 1
# ...
```

The example instructs the module to use the **filter** source type to look up filter metadata for an object from the **Envoy**-specific **JWT** authentication native plugin. This plugin includes the **JWT** token as part of a structure object with a single entry and a preconfigured name. Use **0** to specify that you will only access the single entry.

The resulting value is a structure for which you will resolve two fields:

- **azp**: The value where **app_id** is found.
- **aud**: The value where this information can also be found.

The operation ensures only one value is held for assignment.

1.20.6.5. Picking up the JWT token from a header

Some setups might have validation processes for **JWT** tokens where the validated token would reach this module via a header in JSON format.

To get the **app_id**, see the following example:

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
# ...
    services:
# ...
      credentials:
        app_id:
          - header:
              keys:
                - x-jwt-payload
              ops:
                - base64_urlsafe
                - json:
                  - keys:
                    - azp
                    - aud
                - take:
                    head: 1
# ,,,
```

1.20.7. 3scale WebAssembly module minimal working configuration

The following is an example of a 3scale WebAssembly module minimal working configuration. You can copy and paste this and edit it to work with your own configuration.

```
apiVersion: extensions.istio.io/v1alpha1
kind: WasmPlugin
metadata:
  name: <threescale_wasm_plugin_name>
spec:
  url: oci://registry.redhat.io/3scale-amp2/3scale-auth-wasm-rhel8:0.0.3
  imagePullSecret: <optional_pull_secret_resource>
  phase: AUTHZ
  priority: 100
  selector:
    labels:
      app: <product_page>
  pluginConfig:
    api: v1
```

```
system:
  name: <system_name>
  upstream:
    name: outbound|443||multitenant.3scale.net
    url: https://istiodevel-admin.3scale.net/
    timeout: 5000
  token: <token>
backend:
  name: <backend_name>
  upstream:
    name: outbound|443||su1.3scale.net
    url: https://su1.3scale.net/
    timeout: 5000
  extensions:
  - no_body
services:
- id: '2555417834780'
  authorities:
  - "*"
  credentials:
    user_key:
      - query_string:
          keys:
            - <user_key>
      - header:
          keys:
            - <user_key>
    app_id:
      - query_string:
          keys:
            - <app_id>
      - header:
          keys:
            - <app_id>
    app_key:
      - query_string:
          keys:
            - <app_key>
      - header:
          keys:
            - <app_key>
```

1.21. USING THE 3SCALE ISTIO ADAPTER

The 3scale Istio Adapter is an optional adapter that allows you to label a service running within the Red Hat OpenShift Service Mesh and integrate that service with the 3scale API Management solution. It is not required for Red Hat OpenShift Service Mesh.

IMPORTANT

You can only use the 3scale Istio adapter with Red Hat OpenShift Service Mesh versions 2.0 and below. The Mixer component was deprecated in release 2.0 and removed in release 2.1. For Red Hat OpenShift Service Mesh versions 2.1.0 and later you should use the 3scale WebAssembly module.

If you want to enable 3scale backend cache with the 3scale Istio adapter, you must also enable Mixer policy and Mixer telemetry. See Deploying the Red Hat OpenShift Service Mesh control plane.

1.21.1. Integrate the 3scale adapter with Red Hat OpenShift Service Mesh

You can use these examples to configure requests to your services using the 3scale Istio Adapter.

Prerequisites

- Red Hat OpenShift Service Mesh version 2.x
- A working 3scale account (SaaS or 3scale 2.9 On-Premises)
- Enabling backend cache requires 3scale 2.9 or greater
- Red Hat OpenShift Service Mesh prerequisites
- Ensure Mixer policy enforcement is enabled. Update Mixer policy enforcement section provides instructions to check the current Mixer policy enforcement status and enable policy enforcement.
- Mixer policy and telemetry must be enabled if you are using a mixer plugin.
    - You will need to properly configure the Service Mesh Control Plane (SMCP) when upgrading.

NOTE

To configure the 3scale Istio Adapter, refer to Red Hat OpenShift Service Mesh custom resources for instructions on adding adapter parameters to the custom resource file.

NOTE

Pay particular attention to the **kind: handler** resource. You must update this with your 3scale account credentials. You can optionally add a **service_id** to a handler, but this is kept for backwards compatibility only, since it would render the handler only useful for one service in your 3scale account. If you add **service_id** to a handler, enabling 3scale for other services requires you to create more handlers with different **service_ids**.

Use a single handler per 3scale account by following the steps below:

Procedure

1. Create a handler for your 3scale account and specify your account credentials. Omit any service identifier.

```
apiVersion: "config.istio.io/v1alpha2"
```

```
kind: handler
metadata:
 name: threescale
spec:
 adapter: threescale
 params:
   system_url: "https://<organization>-admin.3scale.net/"
   access_token: "<ACCESS_TOKEN>"
 connection:
   address: "threescale-istio-adapter:3333"
```

Optionally, you can provide a **backend_url** field within the *params* section to override the URL provided by the 3scale configuration. This may be useful if the adapter runs on the same cluster as the 3scale on-premise instance, and you wish to leverage the internal cluster DNS.

2. Edit or patch the Deployment resource of any services belonging to your 3scale account as follows:

   a. Add the **"service-mesh.3scale.net/service-id"** label with a value corresponding to a valid **service_id**.

   b. Add the **"service-mesh.3scale.net/credentials"** label with its value being the *name of the handler resource* from step 1.

3. Do step 2 to link it to your 3scale account credentials and to its service identifier, whenever you intend to add more services.

4. Modify the rule configuration with your 3scale configuration to dispatch the rule to the threescale handler.

   Rule configuration example

```
apiVersion: "config.istio.io/v1alpha2"
kind: rule
metadata:
  name: threescale
spec:
  match: destination.labels["service-mesh.3scale.net"] == "true"
  actions:
    - handler: threescale.handler
      instances:
        - threescale-authorization.instance
```

1.21.1.1. Generating 3scale custom resources

The adapter includes a tool that allows you to generate the **handler**, **instance**, and **rule** custom resources.

Table 1.29. Usage

Option	Description	Required	Default value
-h, --help	Produces help output for available options	No	

Option	Description	Required	Default value
--name	Unique name for this URL, token pair	Yes	
-n, --namespace	Namespace to generate templates	No	istio-system
-t, --token	3scale access token	Yes	
-u, --url	3scale Admin Portal URL	Yes	
--backend-url	3scale backend URL. If set, it overrides the value that is read from system configuration	No	
-s, --service	3scale API/Service ID	No	
--auth	3scale authentication pattern to specify (1=API Key, 2=App Id/App Key, 3=OIDC)	No	Hybrid
-o, --output	File to save produced manifests to	No	Standard output
--version	Outputs the CLI version and exits immediately	No	

1.21.1.1.1. Generate templates from URL examples

NOTE

- Run the following commands via **oc exec** from the 3scale adapter container image in Generating manifests from a deployed adapter .
- Use the **3scale-config-gen** command to help avoid YAML syntax and indentation errors.
- You can omit the **--service** if you use the annotations.
- This command must be invoked from within the container image via **oc exec**.

Procedure

- Use the **3scale-config-gen** command to autogenerate templates files allowing the token, URL pair to be shared by multiple services as a single handler:

```
$ 3scale-config-gen --name=admin-credentials --url="https://<organization>-
```

```
admin.3scale.net:443" --token="[redacted]"
```

- The following example generates the templates with the service ID embedded in the handler:

```
$ 3scale-config-gen --url="https://<organization>-admin.3scale.net" --name="my-unique-id" --
service="123456789" --token="[redacted]"
```

Additional resources

- Tokens.

1.21.1.2. Generating manifests from a deployed adapter

NOTE

- **NAME** is an identifier you use to identify with the service you are managing with 3scale.
- The **CREDENTIALS_NAME** reference is an identifier that corresponds to the **match** section in the rule configuration. This is automatically set to the **NAME** identifier if you are using the CLI tool.
- Its value does not need to be anything specific: the label value should just match the contents of the rule. See Routing service traffic through the adapter for more information.

1. Run this command to generate manifests from a deployed adapter in the **istio-system** namespace:

```
$ export NS="istio-system" URL="https://replaceme-admin.3scale.net:443" NAME="name"
TOKEN="token"
oc exec -n ${NS} $(oc get po -n ${NS} -o jsonpath='{.items[?
(@.metadata.labels.app=="3scale-istio-adapter")].metadata.name}') \
-it -- ./3scale-config-gen \
--url ${URL} --name ${NAME} --token ${TOKEN} -n ${NS}
```

2. This will produce sample output to the terminal. Edit these samples if required and create the objects using the **oc create** command.
3. When the request reaches the adapter, the adapter needs to know how the service maps to an API on 3scale. You can provide this information in two ways:
   a. Label the workload (recommended)
   b. Hard code the handler as **service_id**
4. Update the workload with the required annotations:

NOTE

You only need to update the service ID provided in this example if it is not already embedded in the handler. **The setting in the handler takes precedence**

```
$ export CREDENTIALS_NAME="replace-me"
export SERVICE_ID="replace-me"
export DEPLOYMENT="replace-me"
patch="$(oc get deployment "${DEPLOYMENT}"
patch="$(oc get deployment "${DEPLOYMENT}" --template='{"spec":{"template":{"metadata":
{"labels":{ {{ range $k,$v := .spec.template.metadata.labels }}"{{ $k }}":"{{ $v }}",{{ end
}}"service-mesh.3scale.net/service-id":""${SERVICE_ID}""","service-
mesh.3scale.net/credentials":""${CREDENTIALS_NAME}""}}}}}' )"
oc patch deployment "${DEPLOYMENT}" --patch ""${patch}""
```

1.21.1.3. Routing service traffic through the adapter

Follow these steps to drive traffic for your service through the 3scale adapter.

Prerequisites

- Credentials and service ID from your 3scale administrator.

Procedure

1. Match the rule **destination.labels["service-mesh.3scale.net/credentials"] == "threescale"** that you previously created in the configuration, in the **kind: rule** resource.
2. Add the above label to **PodTemplateSpec** on the Deployment of the target workload to integrate a service. the value, **threescale**, refers to the name of the generated handler. This handler stores the access token required to call 3scale.
3. Add the **destination.labels["service-mesh.3scale.net/service-id"] == "replace-me"** label to the workload to pass the service ID to the adapter via the instance at request time.

1.21.2. Configure the integration settings in 3scale

Follow this procedure to configure the 3scale integration settings.

NOTE

For 3scale SaaS customers, Red Hat OpenShift Service Mesh is enabled as part of the Early Access program.

Procedure

1. Navigate to **[your_API_name] → Integration**
2. Click **Settings**.
3. Select the **Istio** option under *Deployment*.
   - The **API Key (user_key)** option under *Authentication* is selected by default.
4. Click **Update Product** to save your selection.
5. Click **Configuration**.
6. Click **Update Configuration**.

1.21.3. Caching behavior

Responses from 3scale System APIs are cached by default within the adapter. Entries will be purged from the cache when they become older than the **cacheTTLSeconds** value. Also by default, automatic refreshing of cached entries will be attempted seconds before they expire, based on the **cacheRefreshSeconds** value. You can disable automatic refreshing by setting this value higher than the **cacheTTLSeconds** value.

Caching can be disabled entirely by setting **cacheEntriesMax** to a non-positive value.

By using the refreshing process, cached values whose hosts become unreachable will be retried before eventually being purged when past their expiry.

1.21.4. Authenticating requests

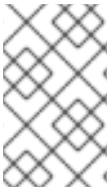
This release supports the following authentication methods:

- **Standard API Keys**: single randomized strings or hashes acting as an identifier and a secret token.
- **Application identifier and key pairs** immutable identifier and mutable secret key strings.
- **OpenID authentication method**: client ID string parsed from the JSON Web Token.

1.21.4.1. Applying authentication patterns

Modify the **instance** custom resource, as illustrated in the following authentication method examples, to configure authentication behavior. You can accept the authentication credentials from:

- Request headers
- Request parameters
- Both request headers and query parameters



NOTE

When specifying values from headers, they must be lower case. For example, if you want to send a header as **User-Key**, this must be referenced in the configuration as **request.headers["user-key"]**.

1.21.4.1.1. API key authentication method

Service Mesh looks for the API key in query parameters and request headers as specified in the **user** option in the **subject** custom resource parameter. It checks the values in the order given in the custom resource file. You can restrict the search for the API key to either query parameters or request headers by omitting the unwanted option.

In this example, Service Mesh looks for the API key in the **user_key** query parameter. If the API key is not in the query parameter, Service Mesh then checks the **user-key** header.

API key authentication method example

```
apiVersion: "config.istio.io/v1alpha2"
kind: instance
```

```
metadata:
  name: threescale-authorization
  namespace: istio-system
spec:
  template: authorization
  params:
    subject:
      user: request.query_params["user_key"] | request.headers["user-key"] | ""
    action:
      path: request.url_path
      method: request.method | "get"
```

If you want the adapter to examine a different query parameter or request header, change the name as appropriate. For example, to check for the API key in a query parameter named “key”, change **request.query_params["user_key"]** to **request.query_params["key"]**.

1.21.4.1.2. Application ID and application key pair authentication method

Service Mesh looks for the application ID and application key in query parameters and request headers, as specified in the **properties** option in the **subject** custom resource parameter. The application key is optional. It checks the values in the order given in the custom resource file. You can restrict the search for the credentials to either query parameters or request headers by not including the unwanted option.

In this example, Service Mesh looks for the application ID and application key in the query parameters first, moving on to the request headers if needed.

Application ID and application key pair authentication method example

```
apiVersion: "config.istio.io/v1alpha2"
kind: instance
metadata:
  name: threescale-authorization
  namespace: istio-system
spec:
  template: authorization
  params:
    subject:
        app_id: request.query_params["app_id"] | request.headers["app-id"] | ""
        app_key: request.query_params["app_key"] | request.headers["app-key"] | ""
    action:
      path: request.url_path
      method: request.method | "get"
```

If you want the adapter to examine a different query parameter or request header, change the name as appropriate. For example, to check for the application ID in a query parameter named **identification**, change **request.query_params["app_id"]** to **request.query_params["identification"]**.

1.21.4.1.3. OpenID authentication method

To use the *OpenID Connect (OIDC) authentication method* , use the **properties** value on the **subject** field to set **client_id**, and optionally **app_key**.

You can manipulate this object using the methods described previously. In the example configuration shown below, the client identifier (application ID) is parsed from the JSON Web Token (JWT) under the label *azp*. You can modify this as needed.

OpenID authentication method example

```
apiVersion: "config.istio.io/v1alpha2"
kind: instance
metadata:
  name: threescale-authorization
spec:
  template: threescale-authorization
  params:
    subject:
      properties:
        app_key: request.query_params["app_key"] | request.headers["app-key"] | ""
        client_id: request.auth.claims["azp"] | ""
      action:
        path: request.url_path
        method: request.method | "get"
        service: destination.labels["service-mesh.3scale.net/service-id"] | ""
```

For this integration to work correctly, OIDC must still be done in 3scale for the client to be created in the identity provider (IdP). You should create a Request authorization for the service you want to protect in the same namespace as that service. The JWT is passed in the **Authorization** header of the request.

In the sample **RequestAuthentication** defined below, replace **issuer**, **jwksUri**, and **selector** as appropriate.

OpenID Policy example

```
apiVersion: security.istio.io/v1beta1
kind: RequestAuthentication
metadata:
  name: jwt-example
  namespace: bookinfo
spec:
  selector:
    matchLabels:
      app: productpage
  jwtRules:
  - issuer: >-
      http://keycloak-keycloak.34.242.107.254.nip.io/auth/realms/3scale-keycloak
    jwksUri: >-
      http://keycloak-keycloak.34.242.107.254.nip.io/auth/realms/3scale-keycloak/protocol/openid-
connect/certs
```

1.21.4.1.4. Hybrid authentication method

You can choose to not enforce a particular authentication method and accept any valid credentials for either method. If both an API key and an application ID/application key pair are provided, Service Mesh uses the API key.

In this example, Service Mesh checks for an API key in the query parameters, then the request headers. If there is no API key, it then checks for an application ID and key in the query parameters, then the request headers.

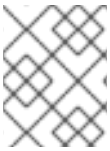
Hybrid authentication method example

-

```
apiVersion: "config.istio.io/v1alpha2"
kind: instance
metadata:
  name: threescale-authorization
spec:
  template: authorization
  params:
    subject:
      user: request.query_params["user_key"] | request.headers["user-key"] |
      properties:
        app_id: request.query_params["app_id"] | request.headers["app-id"] | ""
        app_key: request.query_params["app_key"] | request.headers["app-key"] | ""
        client_id: request.auth.claims["azp"] | ""
    action:
      path: request.url_path
      method: request.method | "get"
      service: destination.labels["service-mesh.3scale.net/service-id"] | ""
```

1.21.5. 3scale Adapter metrics

The adapter, by default reports various Prometheus metrics that are exposed on port **8080** at the **/metrics** endpoint. These metrics provide insight into how the interactions between the adapter and 3scale are performing. The service is labeled to be automatically discovered and scraped by Prometheus.



NOTE

There are incompatible changes in the 3scale Istio Adapter metrics since the previous releases in Service Mesh 1.x.

In Prometheus, metrics have been renamed with one addition for the backend cache, so that the following metrics exist as of Service Mesh 2.0:

Table 1.30. Prometheus metrics

Metric	Type	Description
threescale_latency	Histogram	Request latency between adapter and 3scale.
threescale_http_total	Counter	HTTP Status response codes for requests to 3scale backend.
threescale_system_cache_hits	Counter	Total number of requests to the 3scale system fetched from the configuration cache.
threescale_backend_cache_hits	Counter	Total number of requests to 3scale backend fetched from the backend cache.

1.21.6. 3scale backend cache

The 3scale backend cache provides an authorization and reporting cache for clients of the 3scale Service Management API. This cache is embedded in the adapter to enable lower latencies in responses in certain situations assuming the administrator is willing to accept the trade-offs.

NOTE

3scale backend cache is disabled by default. 3scale backend cache functionality trades inaccuracy in rate limiting and potential loss of hits since the last flush was performed for low latency and higher consumption of resources in the processor and memory.

1.21.6.1. Advantages of enabling backend cache

The following are advantages to enabling the backend cache:

- Enable the backend cache when you find latencies are high while accessing services managed by the 3scale Istio Adapter.
- Enabling the backend cache will stop the adapter from continually checking with the 3scale API manager for request authorizations, which will lower the latency.
  - This creates an in-memory cache of 3scale authorizations for the 3scale Istio Adapter to store and reuse before attempting to contact the 3scale API manager for authorizations. Authorizations will then take much less time to be granted or denied.
- Backend caching is useful in cases when you are hosting the 3scale API manager in another geographical location from the service mesh running the 3scale Istio Adapter.
  - This is generally the case with the 3scale Hosted (SaaS) platform, but also if a user hosts their 3scale API manager in another cluster located in a different geographical location, in a different availability zone, or in any case where the network overhead to reach the 3scale API manager is noticeable.

1.21.6.2. Trade-offs for having lower latencies

The following are trade-offs for having lower latencies:

- Each 3scale adapter's authorization state updates every time a flush happens.
  - This means two or more instances of the adapter will introduce more inaccuracy between flushing periods.
  - There is a greater chance of too many requests being granted that exceed limits and introduce erratic behavior, which leads to some requests going through and some not, depending on which adapter processes each request.
- An adapter cache that cannot flush its data and update its authorization information risks shut down or crashing without reporting its information to the API manager.
- A fail open or fail closed policy will be applied when an adapter cache cannot determine whether a request must be granted or denied, possibly due to network connectivity issues in contacting the API manager.
- When cache misses occur, typically right after booting the adapter or after a long period of no connectivity, latencies will grow in order to query the API manager.

- An adapter cache must do much more work on computing authorizations than it would without an enabled cache, which will tax processor resources.
- Memory requirements will grow proportionally to the combination of the amount of limits, applications, and services managed by the cache.

1.21.6.3. Backend cache configuration settings

The following points explain the backend cache configuration settings:

- Find the settings to configure the backend cache in the 3scale configuration options.
- The last 3 settings control enabling of backend cache:
  - **PARAM_USE_CACHE_BACKEND** - set to true to enable backend cache.
  - **PARAM_BACKEND_CACHE_FLUSH_INTERVAL_SECONDS** - sets time in seconds between consecutive attempts to flush cache data to the API manager.
  - **PARAM_BACKEND_CACHE_POLICY_FAIL_CLOSED** - set whether or not to allow/open or deny/close requests to the services when there is not enough cached data and the 3scale API manager cannot be reached.

1.21.7. 3scale Istio Adapter APIcast emulation

The 3scale Istio Adapter performs as APIcast would when the following conditions occur:

- When a request cannot match any mapping rule defined, the returned HTTP code is 404 Not Found. This was previously 403 Forbidden.
- When a request is denied because it goes over limits, the returned HTTP code is 429 Too Many Requests. This was previously 403 Forbidden.
- When generating default templates via the CLI, it will use underscores rather than dashes for the headers, for example: **user_key** rather than **user-key**.

1.21.8. 3scale Istio adapter verification

You might want to check whether the 3scale Istio adapter is working as expected. If your adapter is not working, use the following steps to help troubleshoot the problem.

Procedure

1. Ensure the *3scale-adapter* pod is running in the Service Mesh control plane namespace:

```
$ oc get pods -n istio-system
```

2. Check that the *3scale-adapter* pod has printed out information about itself booting up, such as its version:

```
$ oc logs istio-system
```

3. When performing requests to the services protected by the 3scale adapter integration, always try requests that lack the right credentials and ensure they fail. Check the 3scale adapter logs to gather additional information.

Additional resources

- Inspecting pod and container logs.

1.21.9. 3scale Istio adapter troubleshooting checklist

As the administrator installing the 3scale Istio adapter, there are a number of scenarios that might be causing your integration to not function properly. Use the following list to troubleshoot your installation:

- Incorrect YAML indentation.
- Missing YAML sections.
- Forgot to apply the changes in the YAML to the cluster.
- Forgot to label the service workloads with the **service-mesh.3scale.net/credentials** key.
- Forgot to label the service workloads with **service-mesh.3scale.net/service-id** when using handlers that do not contain a **service_id** so they are reusable per account.
- The *Rule* custom resource points to the wrong handler or instance custom resources, or the references lack the corresponding namespace suffix.
- The *Rule* custom resource **match** section cannot possibly match the service you are configuring, or it points to a destination workload that is not currently running or does not exist.
- Wrong access token or URL for the 3scale Admin Portal in the handler.
- The *Instance* custom resource's **params/subject/properties** section fails to list the right parameters for **app_id**, **app_key**, or **client_id**, either because they specify the wrong location such as the query parameters, headers, and authorization claims, or the parameter names do not match the requests used for testing.
- Failing to use the configuration generator without realizing that it actually lives in the adapter container image and needs **oc exec** to invoke it.

1.22. TROUBLESHOOTING YOUR SERVICE MESH

This section describes how to identify and resolve common problems in Red Hat OpenShift Service Mesh. Use the following sections to help troubleshoot and debug problems when deploying Red Hat OpenShift Service Mesh on Red Hat OpenShift Service on AWS.

1.22.1. Understanding Service Mesh versions

In order to understand what version of Red Hat OpenShift Service Mesh you have deployed on your system, you need to understand how each of the component versions is managed.

- **Operator** version - The most current Operator version is 2.6.11. The Operator version number only indicates the version of the currently installed Operator. Because the Red Hat OpenShift Service Mesh Operator supports multiple versions of the Service Mesh control plane, the version of the Operator does not determine the version of your deployed **ServiceMeshControlPlane** resources.

IMPORTANT

Upgrading to the latest Operator version automatically applies patch updates, but does not automatically upgrade your Service Mesh control plane to the latest minor version.

- **ServiceMeshControlPlane** version - The **ServiceMeshControlPlane** version determines what version of Red Hat OpenShift Service Mesh you are using. The value of the **spec.version** field in the **ServiceMeshControlPlane** resource controls the architecture and configuration settings that are used to install and deploy Red Hat OpenShift Service Mesh. When you create the Service Mesh control plane you can set the version in one of two ways:
  - To configure in the Form View, select the version from the **Control Plane Version** menu.
  - To configure in the YAML View, set the value for **spec.version** in the YAML file.

Operator Lifecycle Manager (OLM) does not manage Service Mesh control plane upgrades, so the version number for your Operator and **ServiceMeshControlPlane** (SMCP) may not match, unless you have manually upgraded your SMCP.

1.22.2. Troubleshooting Operator installation

1.22.2.1. Validating Operator installation

When you install the Red Hat OpenShift Service Mesh Operators, OpenShift automatically creates the following objects as part of a successful Operator installation:

- config maps
- custom resource definitions
- deployments
- pods
- replica sets
- roles
- role bindings
- secrets
- service accounts
- services

From the Red Hat OpenShift Service on AWS console

You can verify that the Operator pods are available and running by using the Red Hat OpenShift Service on AWS console.

1. Navigate to **Workloads → Pods**.
2. Select the **openshift-operators** namespace.

3. Verify that the following pods exist and have a status of **running**:
   - **istio-operator**
   - **jaeger-operator**
   - **kiali-operator**
4. Select the **openshift-operators-redhat** namespace.
5. Verify that the **elasticsearch-operator** pod exists and has a status of **running**.

From the command line

1. Verify the Operator pods are available and running in the **openshift-operators** namespace with the following command:

```
$ oc get pods -n openshift-operators
```

Example output

```
NAME                                READY   STATUS    RESTARTS   AGE
istio-operator-bb49787db-zgr87      1/1     Running   0          15s
jaeger-operator-7d5c4f57d8-9xphf    1/1     Running   0          2m42s
kiali-operator-f9c8d84f4-7xh2v      1/1     Running   0          64s
```

2. Verify the Elasticsearch operator with the following command:

```
$ oc get pods -n openshift-operators-redhat
```

Example output

```
NAME                                      READY   STATUS    RESTARTS   AGE
elasticsearch-operator-d4f59b968-796vq    1/1     Running   0          15s
```

1.22.2.2. Troubleshooting service mesh Operators

If you experience Operator issues:

- Verify your Operator subscription status.
- Verify that you did not install a community version of the Operator, instead of the supported Red Hat version.
- Verify that you have the **cluster-admin** role to install Red Hat OpenShift Service Mesh.
- Check for any errors in the Operator pod logs if the issue is related to installation of Operators.

NOTE

You can install Operators only through the OpenShift console, the software catalog is not accessible from the command line.

1.22.2.2.1. Viewing Operator pod logs

You can view Operator logs by using the **oc logs** command. Red Hat may request logs to help resolve support cases.

Procedure

- To view Operator pod logs, enter the command:

```
$ oc logs -n openshift-operators <podName>
```

  For example,

```
$ oc logs -n openshift-operators istio-operator-bb49787db-zgr87
```

1.22.3. Troubleshooting the control plane

The Service Mesh *control plane* is composed of Istiod, which consolidates several previous control plane components (Citadel, Galley, Pilot) into a single binary. Deploying the **ServiceMeshControlPlane** also creates the other components that make up Red Hat OpenShift Service Mesh as described in the architecture topic.

1.22.3.1. Validating the Service Mesh control plane installation

When you create the Service Mesh control plane, the Service Mesh Operator uses the parameters that you have specified in the **ServiceMeshControlPlane** resource file to do the following:

- Creates the Istio components and deploys the following pods:
  - **istiod**
  - **istio-ingressgateway**
  - **istio-egressgateway**
  - **grafana**
  - **prometheus**
- Calls the Kiali Operator to create Kaili deployment based on configuration in either the SMCP or the Kiali custom resource.

  NOTE

  You view the Kiali components under the Kiali Operator, not the Service Mesh Operator.

- Calls the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator to create Distributed Tracing Platform (Jaeger) components based on configuration in either the SMCP or the Jaeger custom resource.

NOTE

You view the Jaeger components under the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator and the Elasticsearch components under the Red Hat Elasticsearch Operator, not the Service Mesh Operator.

From the Red Hat OpenShift Service on AWS console

You can verify the Service Mesh control plane installation in the Red Hat OpenShift Service on AWS web console.

1. Navigate to **Ecosystem → Installed Operators**.
2. Select the **istio-system** namespace.
3. Select the Red Hat OpenShift Service Mesh Operator.
   a. Click the **Istio Service Mesh Control Plane**tab.
   b. Click the name of your control plane, for example **basic**.
   c. To view the resources created by the deployment, click the **Resources** tab. You can use the filter to narrow your view, for example, to check that all the **Pods** have a status of **running**.
   d. If the SMCP status indicates any problems, check the **status:** output in the YAML file for more information.
4. Navigate back to **Ecosystem → Installed Operators**.
5. Select the OpenShift Elasticsearch Operator.
   a. Click the **Elasticsearch** tab.
   b. Click the name of the deployment, for example **elasticsearch**.
   c. To view the resources created by the deployment, click the **Resources** tab. .
   d. If the **Status** column any problems, check the **status:** output on the **YAML** tab for more information.
6. Navigate back to **Ecosystem → Installed Operators**.
7. Select the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator.
   a. Click the **Jaeger** tab.
   b. Click the name of your deployment, for example **jaeger**.
   c. To view the resources created by the deployment, click the **Resources** tab.
   d. If the **Status** column indicates any problems, check the **status:** output on the **YAML** tab for more information.
8. Navigate to **Ecosystem → Installed Operators**.
9. Select the Kiali Operator.

a. Click the **Istio Service Mesh Control Plane** tab.

b. Click the name of your deployment, for example **kiali**.

c. To view the resources created by the deployment, click the **Resources** tab.

d. If the **Status** column any problems, check the **status:** output on the **YAML** tab for more information.

From the command line

1. Run the following command to see if the Service Mesh control plane pods are available and running, where **istio-system** is the namespace where you installed the SMCP.

```
$ oc get pods -n istio-system
```

Example output

```
NAME                                    READY   STATUS    RESTARTS   AGE
grafana-6776785cfc-6fz7t                2/2     Running   0          102s
istio-egressgateway-5f49dd99-l9ppq      1/1     Running   0          103s
istio-ingressgateway-6dc885c48-jjd8r    1/1     Running   0          103s
istiod-basic-6c9cc55998-wg4zq           1/1     Running   0          2m14s
jaeger-6865d5d8bf-zrfss                 2/2     Running   0          100s
kiali-579799fbb7-8mwc8                  1/1     Running   0          46s
prometheus-5c579dfb-6qhjk               2/2     Running   0          115s
```

2. Check the status of the Service Mesh control plane deployment by using the following command. Replace **istio-system** with the namespace where you deployed the SMCP.

```
$ oc get smcp -n istio-system
```

The installation has finished successfully when the STATUS column is **ComponentsReady**.

Example output

```
NAME    READY   STATUS            PROFILES      VERSION   AGE
basic   10/10   ComponentsReady   ["default"]   2.1.3     4m2s
```

If you have modified and redeployed your Service Mesh control plane, the status should read **UpdateSuccessful**.

Example output

```
NAME           READY     STATUS            TEMPLATE   VERSION   AGE
basic-install  10/10     UpdateSuccessful  default    v1.1      3d16h
```

3. If the SMCP status indicates anything other than **ComponentsReady** check the **status:** output in the SCMP resource for more information.

```
$ oc describe smcp <smcp-name> -n <controlplane-namespace>
```

Example output

Example output

```
$ oc describe smcp basic -n istio-system
```

4. Check the status of the Jaeger deployment with the following command, where **istio-system** is the namespace where you deployed the SMCP.

```
$ oc get jaeger -n istio-system
```

Example output

```
NAME     STATUS    VERSION   STRATEGY   STORAGE   AGE
jaeger   Running   1.30.0    allinone   memory    15m
```

5. Check the status of the Kiali deployment with the following command, where **istio-system** is the namespace where you deployed the SMCP.

```
$ oc get kiali -n istio-system
```

Example output

```
NAME    AGE
kiali   15m
```

1.22.3.1.1. Accessing the Kiali console

You can view your application's topology, health, and metrics in the Kiali console. If your service is experiencing problems, the Kiali console lets you view the data flow through your service. You can view insights about the mesh components at different levels, including abstract applications, services, and workloads. Kiali also provides an interactive graph view of your namespace in real time.

To access the Kiali console you must have Red Hat OpenShift Service Mesh installed, Kiali installed and configured.

The installation process creates a route to access the Kiali console.

If you know the URL for the Kiali console, you can access it directly. If you do not know the URL, use the following directions.

Procedure for administrators

1. Log in to the Red Hat OpenShift Service on AWS web console with an administrator role.
2. Click **Home** → **Projects**.
3. On the **Projects** page, if necessary, use the filter to find the name of your project.
4. Click the name of your project, for example, **bookinfo**.
5. On the **Project details** page, in the **Launcher** section, click the **Kiali** link.
6. Log in to the Kiali console with the same user name and password that you use to access the Red Hat OpenShift Service on AWS console.

When you first log in to the Kiali Console, you see the **Overview** page which displays all the namespaces in your service mesh that you have permission to view.

If you are validating the console installation and namespaces have not yet been added to the mesh, there might not be any data to display other than **istio-system**.

Procedure for developers

1. Log in to the Red Hat OpenShift Service on AWS web console with a developer role.
2. Click **Project**.
3. On the **Project Details** page, if necessary, use the filter to find the name of your project.
4. Click the name of your project, for example, **bookinfo**.
5. On the **Project** page, in the **Launcher** section, click the **Kiali** link.
6. Click **Log In With OpenShift**

1.22.3.1.2. Accessing the Jaeger console

To access the Jaeger console you must have Red Hat OpenShift Service Mesh installed, Red Hat OpenShift Distributed Tracing Platform (Jaeger) installed and configured.

The installation process creates a route to access the Jaeger console.

If you know the URL for the Jaeger console, you can access it directly. If you do not know the URL, use the following directions.

> **IMPORTANT**
>
> Starting with Red Hat OpenShift Service Mesh 2.5, Red Hat OpenShift Distributed Tracing Platform (Jaeger) and OpenShift Elasticsearch Operator have been deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for this feature during the current release lifecycle, but this feature will no longer receive enhancements and will be removed. As an alternative to Red Hat OpenShift Distributed Tracing Platform (Jaeger), you can use Red Hat OpenShift Distributed Tracing Platform instead.

Procedure from OpenShift console

1. Log in to the Red Hat OpenShift Service on AWS web console as a user with cluster-admin rights. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.
2. Navigate to **Networking** → **Routes**.
3. On the **Routes** page, select the Service Mesh control plane project, for example **istio-system**, from the **Namespace** menu.
   The **Location** column displays the linked address for each route.
4. If necessary, use the filter to find the **jaeger** route. Click the route **Location** to launch the console.
5. Click **Log In With OpenShift**

Procedure from Kiali console

1. Launch the Kiali console.
2. Click **Distributed Tracing** in the left navigation pane.
3. Click **Log In With OpenShift**

Procedure from the CLI

1. Log in to the Red Hat OpenShift Service on AWS CLI as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.

```
$ oc login --username=<NAMEOFUSER> https://<HOSTNAME>:6443
```

2. To query for details of the route using the command line, enter the following command. In this example, **istio-system** is the Service Mesh control plane namespace.

```
$ oc get route -n istio-system jaeger -o jsonpath='{.spec.host}'
```

3. Launch a browser and navigate to **https://<JAEGER_URL>**, where **<JAEGER_URL>** is the route that you discovered in the previous step.
4. Log in using the same user name and password that you use to access the Red Hat OpenShift Service on AWS console.
5. If you have added services to the service mesh and have generated traces, you can use the filters and **Find Traces** button to search your trace data.
   If you are validating the console installation, there is no trace data to display.

1.22.3.2. Troubleshooting the Service Mesh control plane

If you are experiencing issues while deploying the Service Mesh control plane,

- Ensure that the **ServiceMeshControlPlane** resource is installed in a project that is separate from your services and Operators. This documentation uses the **istio-system** project as an example, but you can deploy your control plane in any project as long as it is separate from the project that contains your Operators and services.
- Ensure that the **ServiceMeshControlPlane** and **Jaeger** custom resources are deployed in the same project. For example, use the **istio-system** project for both.

1.22.4. Troubleshooting the data plane

The *data plane* is a set of intelligent proxies that intercept and control all inbound and outbound network communications between services in the service mesh.

Red Hat OpenShift Service Mesh relies on a proxy sidecar within the application's pod to provide service mesh capabilities to the application.

1.22.4.1. Troubleshooting sidecar injection

Red Hat OpenShift Service Mesh does not automatically inject proxy sidecars to pods. You must opt in to sidecar injection.

1.22.4.1.1. Troubleshooting Istio sidecar injection

Check to see if automatic injection is enabled in the Deployment for your application. If automatic injection for the Envoy proxy is enabled, there should be a **sidecar.istio.io/inject:"true"** annotation in the **Deployment** resource under **spec.template.metadata.annotations**.

1.22.4.1.2. Troubleshooting Jaeger agent sidecar injection

Check to see if automatic injection is enabled in the Deployment for your application. If automatic injection for the Jaeger agent is enabled, there should be a **sidecar.jaegertracing.io/inject:"true"** annotation in the **Deployment** resource.

For more information about sidecar injection, see Enabling automatic injection

1.23. TROUBLESHOOTING ENVOY PROXY

The Envoy proxy intercepts all inbound and outbound traffic for all services in the service mesh. Envoy also collects and reports telemetry on the service mesh. Envoy is deployed as a sidecar to the relevant service in the same pod.

1.23.1. Enabling Envoy access logs

Envoy access logs are useful in diagnosing traffic failures and flows, and help with end-to-end traffic flow analysis.

To enable access logging for all istio-proxy containers, edit the **ServiceMeshControlPlane** (SMCP) object to add a file name for the logging output.

Procedure

1. Log in to the OpenShift Container Platform CLI as a user with the cluster-admin role. Enter the following command. Then, enter your username and password when prompted.

```
$ oc login --username=<NAMEOFUSER> https://<HOSTNAME>:6443
```

2. Change to the project where you installed the Service Mesh control plane, for example **istio-system**.

```
$ oc project istio-system
```

3. Edit the **ServiceMeshControlPlane** file.

```
$ oc edit smcp <smcp_name>
```

4. As show in the following example, use **name** to specify the file name for the proxy log. If you do not specify a value for **name**, no log entries will be written.

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
```

```
  name: basic
  namespace: istio-system
spec:
  proxy:
    accessLogging:
      file:
        name: /dev/stdout     #file name
```

1.23.2. Getting support

If you experience difficulty with a procedure described in this documentation, or with Red Hat OpenShift Service on AWS in general, visit the Red Hat Customer Portal .

From the Customer Portal, you can:

- Search or browse through the Red Hat Knowledgebase of articles and solutions relating to Red Hat products.
- Submit a support case to Red Hat Support.
- Access other product documentation.

To identify issues with your cluster, you can use Red Hat Lightspeed in OpenShift Cluster Manager. Red Hat Lightspeed provides details about issues and, if available, information on how to solve a problem.

If you have a suggestion for improving this documentation or have found an error, submit a Jira issue for the most relevant documentation component. Please provide specific details, such as the section name and Red Hat OpenShift Service on AWS version.

1.23.2.1. About the Red Hat Knowledgebase

The Red Hat Knowledgebase provides rich content aimed at helping you make the most of Red Hat's products and technologies. The Red Hat Knowledgebase consists of articles, product documentation, and videos outlining best practices on installing, configuring, and using Red Hat products. In addition, you can search for solutions to known issues, each providing concise root cause descriptions and remedial steps.

1.23.2.2. Searching the Red Hat Knowledgebase

In the event of an Red Hat OpenShift Service on AWS issue, you can perform an initial search to determine if a solution already exists within the Red Hat Knowledgebase.

Prerequisites

- You have a Red Hat Customer Portal account.

Procedure

1. Log in to the Red Hat Customer Portal .
2. Click **Search**.
3. In the search field, input keywords and strings relating to the problem, including:

- Red Hat OpenShift Service on AWS components (such as **etcd**)
- Related procedure (such as **installation**)
- Warnings, error messages, and other outputs related to explicit failures

4. Click the **Enter** key.
5. Optional: Select the **Red Hat OpenShift Service on AWS**product filter.
6. Optional: Select the **Documentation** content type filter.

1.23.2.3. Submitting a support case

Submit a support case to Red Hat Support to get help with issues you encounter with Red Hat OpenShift Service on AWS.

Prerequisites

- You have access to the cluster as a user with the **dedicated-admin** role.
- You have installed the OpenShift CLI (**oc**).
- You have access to the Red Hat OpenShift Cluster Manager.

Procedure

1. Log in to the **Customer Support** page of the Red Hat Customer Portal.
2. Click **Get support**.
3. On the **Cases** tab of the **Customer Support** page:
   a. Optional: Change the pre-filled account and owner details if needed.
   b. Select the appropriate category for your issue, such as **Bug or Defect**, and click **Continue**.
4. Enter the following information:
   a. In the **Summary** field, enter a concise but descriptive problem summary and further details about the symptoms being experienced, as well as your expectations.
   b. Select **Red Hat OpenShift Service on AWS**from the **Product** drop-down menu.
5. Review the list of suggested Red Hat Knowledgebase solutions for a potential match against the problem that is being reported. If the suggested articles do not address the issue, click **Continue**.
6. Review the updated list of suggested Red Hat Knowledgebase solutions for a potential match against the problem that is being reported. The list is refined as you provide more information during the case creation process. If the suggested articles do not address the issue, click **Continue**.
7. Ensure that the account information presented is as expected, and if not, amend accordingly.
8. Check that the autofilled Red Hat OpenShift Service on AWS Cluster ID is correct. If it is not, manually obtain your cluster ID.

- To manually obtain your cluster ID using the Red Hat OpenShift Service on AWS web console:
  a. Navigate to **Home → Overview**.
  b. Find the value in the **Cluster ID** field of the **Details** section.
- Alternatively, it is possible to open a new support case through the Red Hat OpenShift Service on AWS web console and have your cluster ID autofilled.
  a. From the toolbar, navigate to **(?) Help → Open Support Case**.
  b. The **Cluster ID** value is autofilled.
- To obtain your cluster ID using the OpenShift CLI (**oc**), run the following command:

```
$ oc get clusterversion -o jsonpath='{.items[].spec.clusterID}{"\n"}'
```

9. Complete the following questions where prompted and then click **Continue**:
   - What are you experiencing? What are you expecting to happen?
   - Define the value or impact to you or the business.
   - Where are you experiencing this behavior? What environment?
   - When does this behavior occur? Frequency? Repeatedly? At certain times?
10. Upload relevant diagnostic data files and click **Continue**.
11. Input relevant case management details and click **Continue**.
12. Preview the case details and click **Submit**.

1.24. SERVICE MESH CONTROL PLANE CONFIGURATION REFERENCE

You can customize your Red Hat OpenShift Service Mesh by modifying the default **ServiceMeshControlPlane** (SMCP) resource or by creating a completely custom SMCP resource. This reference section documents the configuration options available for the SMCP resource.

1.24.1. Service Mesh Control plane parameters

The following table lists the top-level parameters for the **ServiceMeshControlPlane** resource.

Table 1.31. ServiceMeshControlPlane resource parameters

Name	Description	Type

Name	Description	Type
apiVersion	APIVersion defines the versioned schema of this representation of an object. Servers convert recognized schemas to the latest internal value, and may reject unrecognized values. The value for the **ServiceMeshControlPlane** version 2.0 is **maistra.io/v2**.	The value for **ServiceMeshControlPlane** version 2.0 is **maistra.io/v2**.
kind	Kind is a string value that represents the REST resource this object represents.	**ServiceMeshControlPlane** is the only valid value for a ServiceMeshControlPlane.
metadata	Metadata about this **ServiceMeshControlPlane** instance. You can provide a name for your Service Mesh control plane installation to keep track of your work, for example, **basic**.	string
spec	The specification of the desired state of this **ServiceMeshControlPlane**. This includes the configuration options for all components that comprise the Service Mesh control plane.	For more information, see Table 2.
status	The current status of this **ServiceMeshControlPlane** and the components that comprise the Service Mesh control plane.	For more information, see Table 3.

The following table lists the specifications for the **ServiceMeshControlPlane** resource. Changing these parameters configures Red Hat OpenShift Service Mesh components.

Table 1.32. **ServiceMeshControlPlane** resource spec

Name	Description	Configurable parameters

Name	Description	Configurable parameters
addons	The **addons** parameter configures additional features beyond core Service Mesh control plane components, such as visualization, or metric storage.	**3scale**, **grafana**, **jaeger**, **kiali**, and **prometheus**.
cluster	The **cluster** parameter sets the general configuration of the cluster (cluster name, network name, multi-cluster, mesh expansion, etc.)	**meshExpansion**, **multiCluster**, **name**, and **network**
gateways	You use the **gateways** parameter to configure ingress and egress gateways for the mesh.	**enabled**, **additionalEgress**, **additionalIngress**, **egress**, **ingress**, and **openshiftRoute**
general	The **general** parameter represents general Service Mesh control plane configuration that does not fit anywhere else.	**logging** and **validationMessages**
policy	You use the **policy** parameter to configure policy checking for the Service Mesh control plane. Policy checking can be enabled by setting **spec.policy.enabled** to **true**.	**mixer remote**, or **type**. **type** can be set to **Istiod**, **Mixer** or **None**.
profiles	You select the **ServiceMeshControlPlane** profile to use for default values using the **profiles** parameter.	**default**
proxy	You use the **proxy** parameter to configure the default behavior for sidecars.	**accessLogging**, **adminPort**, **concurrency**, and **envoyMetricsService**
runtime	You use the **runtime** parameter to configure the Service Mesh control plane components.	**components**, and **defaults**
security	The **security** parameter allows you to configure aspects of security for the Service Mesh control plane.	**certificateAuthority**, **controlPlane**, **identity**, **dataPlane** and **trust**

Name	Description	Configurable parameters
techPreview	The **techPreview** parameter enables early access to features that are in technology preview.	N/A
telemetry	If **spec.mixer.telemetry.enabled** is set to **true**, telemetry is enabled.	**mixer**, **remote**, and **type**. **type** can be set to **Istiod**, **Mixer** or **None**.
tracing	You use the **tracing** parameter to enables distributed tracing for the mesh.	**sampling**, **type**. **type** can be set to **Jaeger** or **None**.
version	You use the **version** parameter to specify what Maistra version of the Service Mesh control plane to install. When creating a **ServiceMeshControlPlane** with an empty version, the admission webhook sets the version to the current version. New **ServiceMeshControlPlanes** with an empty version are set to **v2.0**. Existing **ServiceMeshControlPlanes** with an empty version keep their setting.	string

ControlPlaneStatus represents the current state of your service mesh.

Table 1.33. **ServiceMeshControlPlane** resource **ControlPlaneStatus**

Name	Description	Type
annotations	The **annotations** parameter stores additional, usually redundant status information, such as the number of components deployed by the **ServiceMeshControlPlane**. These statuses are used by the command-line tool, **oc**, which does not yet allow counting objects in JSONPath expressions.	Not configurable

Name	Description	Type
conditions	Represents the latest available observations of the object's current state. **Reconciled** indicates whether the operator has finished reconciling the actual state of deployed components with the configuration in the **ServiceMeshControlPlane** resource. **Installed** indicates whether the Service Mesh control plane has been installed. **Ready** indicates whether all Service Mesh control plane components are ready.	string
components	Shows the status of each deployed Service Mesh control plane component.	string
appliedSpec	The resulting specification of the configuration options after all profiles have been applied.	**ControlPlaneSpec**
appliedValues	The resulting values.yaml used to generate the charts.	**ControlPlaneSpec**
chartVersion	The version of the charts that were last processed for this resource.	string
observedGeneration	The generation observed by the controller during the most recent reconciliation. The information in the status pertains to this particular generation of the object. The **status.conditions** are not up-to-date if the **status.observedGeneration** field does not match **metadata.generation**.	integer
operatorVersion	The version of the operator that last processed this resource.	string
readiness	The readiness status of components & owned resources.	string

This example **ServiceMeshControlPlane** definition contains all of the supported parameters.

Example ServiceMeshControlPlane resource

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  version: v2.6
  proxy:
    runtime:
      container:
        resources:
          requests:
            cpu: 100m
            memory: 128Mi
          limits:
            cpu: 500m
            memory: 128Mi
  tracing:
    type: Jaeger
  gateways:
    ingress: # istio-ingressgateway
      service:
        type: ClusterIP
        ports:
        - name: status-port
          port: 15020
        - name: http2
          port: 80
          targetPort: 8080
        - name: https
          port: 443
          targetPort: 8443
      meshExpansionPorts: []
    egress: # istio-egressgateway
      service:
        type: ClusterIP
        ports:
        - name: status-port
          port: 15020
        - name: http2
          port: 80
          targetPort: 8080
        - name: https
          port: 443
          targetPort: 8443
    additionalIngress:
      some-other-ingress-gateway: {}
    additionalEgress:
      some-other-egress-gateway: {}

  policy:
    type: Mixer
    mixer: # only applies if policy.type: Mixer
      enableChecks: true
      failOpen: false
```

```
telemetry:
  type: Istiod # or Mixer
  mixer: # only applies if telemetry.type: Mixer, for v1 telemetry
    sessionAffinity: false
    batching:
      maxEntries: 100
      maxTime: 1s
    adapters:
      kubernetesenv: true
      stdio:
        enabled: true
        outputAsJSON: true
addons:
  grafana:
    enabled: true
    install:
      config:
        env: {}
        envSecrets: {}
      persistence:
        enabled: true
        storageClassName: ""
        accessMode: ReadWriteOnce
        capacity:
          requests:
            storage: 5Gi
      service:
        ingress:
          contextPath: /grafana
          tls:
            termination: reencrypt
  kiali:
    name: kiali
    enabled: true
    install: # install kiali CR if not present
      dashboard:
        viewOnly: false
        enableGrafana: true
        enableTracing: true
        enablePrometheus: true
    service:
      ingress:
        contextPath: /kiali
  jaeger:
    name: jaeger
    install:
      storage:
        type: Elasticsearch # or Memory
        memory:
          maxTraces: 100000
        elasticsearch:
          nodeCount: 3
          storage: {}
          redundancyPolicy: SingleRedundancy
          indexCleaner: {}
```

```
      ingress: {} # jaeger ingress configuration
  runtime:
    components:
      pilot:
        deployment:
          replicas: 2
        pod:
          affinity: {}
        container:
          resources:
            requests:
              cpu: 100m
              memory: 128Mi
            limits:
              cpu: 500m
              memory: 128Mi
      grafana:
        deployment: {}
        pod: {}
      kiali:
        deployment: {}
        pod: {}
```

1.24.2. spec parameters

1.24.2.1. general parameters

Here is an example that illustrates the **spec.general** parameters for the **ServiceMeshControlPlane** object and a description of the available parameters with appropriate values.

Example general parameters

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  general:
    logging:
      componentLevels: {}
        # misc: error
      logAsJSON: false
    validationMessages: true
```

Table 1.34. Istio general parameters

Parameter	Description	Values	Default value
`logging:`	Use to configure logging for the Service Mesh control plane components.		N/A

Parameter	Description	Values	Default value
logging: componentLevels:	Use to specify the component logging level.	Possible values: **debug**, **info**, **warn**, **error**, **fatal**.	N/A
logging: logAsJSON:	Use to enable or disable JSON logging.	**true**/**false**	N/A
validationMessages :	Use to enable or disable validation messages to the status fields of istio.io resources. This can be useful for detecting configuration errors in resources.	**true**/**false**	N/A

1.24.2.2. profiles parameters

You can create reusable configurations with **ServiceMeshControlPlane** object profiles. If you do not configure the **profile** setting, Red Hat OpenShift Service Mesh uses the default profile.

Here is an example that illustrates the **spec.profiles** parameter for the **ServiceMeshControlPlane** object:

Example profiles parameters

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  profiles:
  - YourProfileName
```

For information about creating profiles, see the Creating control plane profiles .

For more detailed examples of security configuration, see Mutual Transport Layer Security (mTLS) .

1.24.2.3. tracing parameters

The following example illustrates the **spec.tracing** parameters for the **ServiceMeshControlPlane** object, and a description of the available parameters with appropriate values.

Example tracing parameters

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
```

```
  name: basic
spec:
  version: v2.6
  tracing:
    sampling: 100
    type: Jaeger
```

Table 1.35. Istio tracing parameters

Parameter	Description	Values	Default value
`tracing:` `  sampling:`	The sampling rate determines how often the Envoy proxy generates a trace. You use the sampling rate to control what percentage of requests get reported to your tracing system.	Integer values between 0 and 10000 representing increments of 0.01% (0 to 100%). For example, setting the value to **10** samples 0.1% of requests, setting the value to **100** will sample 1% of requests setting the value to **500** samples 5% of requests, and a setting of **10000** samples 100% of requests.	**10000** (100% of traces)
`tracing:` `  type:`	Currently the only tracing type that is supported is **Jaeger**. Jaeger is enabled by default. To disable tracing, set the **type** parameter to **None**.	**None**, **Jaeger**	**Jaeger**

1.24.2.4. version parameter

The Red Hat OpenShift Service Mesh Operator supports installation of different versions of the **ServiceMeshControlPlane**. You use the version parameter to specify what version of the Service Mesh control plane to install. If you do not specify a version parameter when creating your SMCP, the Operator sets the value to the latest version: (2.6). Existing **ServiceMeshControlPlane** objects keep their version setting during upgrades of the Operator.

1.24.2.5. 3scale configuration

The following table explains the parameters for the 3scale Istio Adapter in the **ServiceMeshControlPlane** resource.

Example 3scale parameters

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
```

```
spec:
  addons:
    3Scale:
      enabled: false
      PARAM_THREESCALE_LISTEN_ADDR: 3333
      PARAM_THREESCALE_LOG_LEVEL: info
      PARAM_THREESCALE_LOG_JSON: true
      PARAM_THREESCALE_LOG_GRPC: false
      PARAM_THREESCALE_REPORT_METRICS: true
      PARAM_THREESCALE_METRICS_PORT: 8080
      PARAM_THREESCALE_CACHE_TTL_SECONDS: 300
      PARAM_THREESCALE_CACHE_REFRESH_SECONDS: 180
      PARAM_THREESCALE_CACHE_ENTRIES_MAX: 1000
      PARAM_THREESCALE_CACHE_REFRESH_RETRIES: 1
      PARAM_THREESCALE_ALLOW_INSECURE_CONN: false
      PARAM_THREESCALE_CLIENT_TIMEOUT_SECONDS: 10
      PARAM_THREESCALE_GRPC_CONN_MAX_SECONDS: 60
      PARAM_USE_CACHED_BACKEND: false
      PARAM_BACKEND_CACHE_FLUSH_INTERVAL_SECONDS: 15
      PARAM_BACKEND_CACHE_POLICY_FAIL_CLOSED: true
# ...
```

Table 1.36. 3scale parameters

Parameter	Description	Values	Default value
enabled	Whether to use the 3scale adapter	**true**/**false**	**false**
PARAM_THREESCALE_LISTEN_ADDR	Sets the listen address for the gRPC server	Valid port number	**3333**
PARAM_THREESCALE_LOG_LEVEL	Sets the minimum log output level.	**debug**, **info**, **warn**, **error**, or **none**	**info**
PARAM_THREESCALE_LOG_JSON	Controls whether the log is formatted as JSON	**true**/**false**	**true**
PARAM_THREESCALE_LOG_GRPC	Controls whether the log contains gRPC info	**true**/**false**	**true**
PARAM_THREESCALE_REPORT_METRICS	Controls whether 3scale system and backend metrics are collected and reported to Prometheus	**true**/**false**	**true**
PARAM_THREESCALE_METRICS_PORT	Sets the port that the 3scale /**metrics** endpoint can be scrapped from	Valid port number	**8080**

Parameter	Description	Values	Default value
PARAM_THREESCALE_CACHE_TTL_SECONDS	Time period, in seconds, to wait before purging expired items from the cache	Time period in seconds	**300**
PARAM_THREESCALE_CACHE_REFRESH_SECONDS	Time period before expiry when cache elements are attempted to be refreshed	Time period in seconds	**180**
PARAM_THREESCALE_CACHE_ENTRIES_MAX	Max number of items that can be stored in the cache at any time. Set to **0** to disable caching	Valid number	**1000**
PARAM_THREESCALE_CACHE_REFRESH_RETRIES	The number of times unreachable hosts are retried during a cache update loop	Valid number	**1**
PARAM_THREESCALE_ALLOW_INSECURE_CONN	Allow to skip certificate verification when calling **3scale** APIs. Enabling this is not recommended.	**true/false**	**false**
PARAM_THREESCALE_CLIENT_TIMEOUT_SECONDS	Sets the number of seconds to wait before terminating requests to 3scale System and Backend	Time period in seconds	**10**
PARAM_THREESCALE_GRPC_CONN_MAX_SECONDS	Sets the maximum amount of seconds (+/- 10% jitter) a connection may exist before it is closed	Time period in seconds	60
PARAM_USE_CACHE_BACKEND	If true, attempt to create an in-memory apisonator cache for authorization requests	**true/false**	**false**
PARAM_BACKEND_CACHE_FLUSH_INTERVAL_SECONDS	If the backend cache is enabled, this sets the interval in seconds for flushing the cache against 3scale	Time period in seconds	15

Parameter	Description	Values	Default value
PARAM_BACKEND_CACHE_POLICY_FAIL_CLOSED	Whenever the backend cache cannot retrieve authorization data, whether to deny (closed) or allow (open) requests	**true**/**false**	**true**

1.24.3. status parameter

The **status** parameter describes the current state of your service mesh. This information is generated by the Operator and is read-only.

Table 1.37. Istio status parameters

Name	Description	Type
observedGeneration	The generation observed by the controller during the most recent reconciliation. The information in the status pertains to this particular generation of the object. The **status.conditions** are not up-to-date if the **status.observedGeneration** field does not match **metadata.generation**.	integer
annotations	The **annotations** parameter stores additional, usually redundant status information, such as the number of components deployed by the **ServiceMeshControlPlane** object. These statuses are used by the command-line tool, **oc**, which does not yet allow counting objects in JSONPath expressions.	Not configurable
readiness	The readiness status of components and owned resources.	string
operatorVersion	The version of the Operator that last processed this resource.	string

Name	Description	Type
components	Shows the status of each deployed Service Mesh control plane component.	string
appliedSpec	The resulting specification of the configuration options after all profiles have been applied.	**ControlPlaneSpec**
conditions	Represents the latest available observations of the object's current state. **Reconciled** indicates that the Operator has finished reconciling the actual state of deployed components with the configuration in the **ServiceMeshControlPlane** resource. **Installed** indicates that the Service Mesh control plane has been installed. **Ready** indicates that all Service Mesh control plane components are ready.	string
chartVersion	The version of the charts that were last processed for this resource.	string
appliedValues	The resulting **values.yaml** file that was used to generate the charts.	**ControlPlaneSpec**

1.24.4. Additional resources

- For more information about how to configure the features in the **ServiceMeshControlPlane** resource, see the following links:
  - Security
  - Traffic management
  - Metrics and traces

1.25. KIALI CONFIGURATION REFERENCE

When the Service Mesh Operator creates the **ServiceMeshControlPlane** it also processes the Kiali resource. The Kiali Operator then uses this object when creating Kiali instances.

1.25.1. Specifying Kiali configuration in the SMCP

You can configure Kiali under the **addons** section of the **ServiceMeshControlPlane** resource. Kiali is enabled by default. To disable Kiali, set **spec.addons.kiali.enabled** to **false**.

You can specify your Kiali configuration in either of two ways:

- Specify the Kiali configuration in the **ServiceMeshControlPlane** resource under **spec.addons.kiali.install**. This approach has some limitations, because the complete list of Kiali configurations is not available in the SMCP.
- Configure and deploy a Kiali instance and specify the name of the Kiali resource as the value for **spec.addons.kiali.name** in the **ServiceMeshControlPlane** resource. You must create the CR in the same namespace as the Service Mesh control plane, for example, **istio-system**. If a Kiali resource matching the value of **name** exists, the control plane will configure that Kiali resource for use with the control plane. This approach lets you fully customize your Kiali configuration in the Kiali resource. Note that with this approach, various fields in the Kiali resource are overwritten by the Service Mesh Operator, specifically, the **accessible_namespaces** list, as well as the endpoints for Grafana, Prometheus, and tracing.

Example SMCP parameters for Kiali

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  addons:
    kiali:
      name: kiali
      enabled: true
      install:
        dashboard:
          viewOnly: false
          enableGrafana: true
          enableTracing: true
          enablePrometheus: true
        service:
          ingress:
            contextPath: /kiali
```

Table 1.38. **ServiceMeshControlPlane** Kiali parameters

Parameter	Description	Values	Default value

Parameter	Description	Values	Default value
spec: addons: kiali: name:	Name of Kiali custom resource. If a Kiali CR matching the value of **name** exists, the Service Mesh Operator will use that CR for the installation. If no Kiali CR exists, the Operator will create one using this **name** and the configuration options specified in the SMCP.	string	**kiali**
kiali: enabled:	This parameter enables or disables Kiali. Kiali is enabled by default.	**true**/**false**	**true**
kiali: install:	Install a Kiali resource if the named Kiali resource is not present. The **install** section is ignored if **addons.kiali.enabled** is set to **false**.		
kiali: install: dashboard:	Configuration parameters for the dashboards shipped with Kiali.		
kiali: install: dashboard: viewOnly:	This parameter enables or disables view-only mode for the Kiali console. When view-only mode is enabled, users cannot use the Kiali console to make changes to the Service Mesh.	**true**/**false**	**false**
kiali: install: dashboard: enableGrafana:	Grafana endpoint configured based on **spec.addons.grafana** configuration.	**true**/**false**	**true**

Parameter	Description	Values	Default value
kiali: install: dashboard: enablePrometheus:	Prometheus endpoint configured based on **spec.addons.prometheus** configuration.	**true/false**	**true**
kiali: install: dashboard: enableTracing:	Tracing endpoint configured based on Jaeger custom resource configuration.	**true/false**	**true**
kiali: install: service:	Configuration parameters for the Kubernetes service associated with the Kiali installation.		
kiali: install: service: metadata:	Use to specify additional metadata to apply to resources.	N/A	N/A
kiali: install: service: metadata: annotations:	Use to specify additional annotations to apply to the component's service.	string	N/A
kiali: install: service: metadata: labels:	Use to specify additional labels to apply to the component's service.	string	N/A
kiali: install: service: ingress:	Use to specify details for accessing the component's service through an OpenShift Route.	N/A	N/A

Parameter	Description	Values	Default value
kiali: install: service: ingress: metadata: annotations:	Use to specify additional annotations to apply to the component's service ingress.	string	N/A
kiali: install: service: ingress: metadata: labels:	Use to specify additional labels to apply to the component's service ingress.	string	N/A
kiali: install: service: ingress: enabled:	Use to customize an OpenShift Route for the service associated with a component.	**true/false**	**true**
kiali: install: service: ingress: contextPath:	Use to specify the context path to the service.	string	N/A
install: service: ingress: hosts:	Use to specify a single hostname per OpenShift route. An empty hostname implies a default hostname for the Route.	string	N/A
install: service: ingress: tls:	Use to configure the TLS for the OpenShift route.		N/A

Parameter	Description	Values	Default value

`kiali:`
`  install:`
`  service:`
`  nodePort:`
	Use to specify the **nodePort** for the component's service **Values.<component>.service.nodePort.port**	integer	N/A

1.25.2. Specifying Kiali configuration in a Kiali custom resource

You can fully customize your Kiali deployment by configuring Kiali in the Kiali custom resource (CR) rather than in the **ServiceMeshControlPlane** (SMCP) resource. This configuration is sometimes called an "external Kiali" since the configuration is specified outside of the SMCP.

NOTE

You must deploy the **ServiceMeshControlPlane** and Kiali custom resources in the same namespace. For example, **istio-system**.

You can configure and deploy a Kiali instance and then specify the **name** of the Kiali resource as the value for **spec.addons.kiali.name** in the SMCP resource. If a Kiali CR matching the value of **name** exists, the Service Mesh control plane will use the existing installation. This approach lets you fully customize your Kiali configuration.

1.26. JAEGER CONFIGURATION REFERENCE

When the Service Mesh Operator deploys the **ServiceMeshControlPlane** resource, it can also create the resources for distributed tracing. Service Mesh uses Jaeger for distributed tracing.

IMPORTANT

- Jaeger does not use FIPS validated cryptographic modules.
- Starting with Red Hat OpenShift Service Mesh 2.5, Red Hat OpenShift Distributed Tracing Platform (Jaeger) is deprecated and will be removed in a future release. Red Hat will provide bug fixes and support for this feature during the current release lifecycle, but this feature will no longer receive enhancements and will be removed. As an alternative to Red Hat OpenShift Distributed Tracing Platform (Jaeger), you can use Red Hat OpenShift Distributed Tracing Platform instead.

1.26.1. Enabling and disabling tracing

You enable distributed tracing by specifying a tracing type and a sampling rate in the **ServiceMeshControlPlane** resource.

Default all-in-one Jaeger parameters

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
```

```
metadata:
  name: basic
spec:
  version: v2.6
  tracing:
    sampling: 100
    type: Jaeger
```

In Red Hat OpenShift Service Mesh 2.6, the tracing type **Jaeger** is deprecated and disabled by default.

In Red Hat OpenShift Service Mesh 2.5 and earlier, the tracing type **Jaeger** is enabled by default. To disable **Jaeger** tracing, set the **spec.tracing.type** parameter of the **ServiceMeshControlPlane** resource to **None**.

The sampling rate determines how often the Envoy proxy generates a trace. You can use the sampling rate option to control what percentage of requests get reported to your tracing system. You can configure this setting based upon your traffic in the mesh and the amount of tracing data you want to collect. You configure **sampling** as a scaled integer representing 0.01% increments. For example, setting the value to **10** samples 0.1% of traces, setting the value to **500** samples 5% of traces, and a setting of **10000** samples 100% of traces.

NOTE

The SMCP sampling configuration option controls the Envoy sampling rate. You configure the Jaeger trace sampling rate in the Jaeger custom resource.

1.26.2. Specifying Jaeger configuration in the SMCP

You configure Jaeger under the **addons** section of the **ServiceMeshControlPlane** resource. However, there are some limitations to what you can configure in the SMCP.

When the SMCP passes configuration information to the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator, it triggers one of three deployment strategies: **allInOne**, **production**, or **streaming**.

1.26.3. Deploying the distributed tracing platform

The Distributed Tracing Platform (Jaeger) has predefined deployment strategies. You specify a deployment strategy in the Jaeger custom resource (CR) file. When you create an instance of the Distributed Tracing Platform (Jaeger), the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator uses this configuration file to create the objects necessary for the deployment.

The Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator currently supports the following deployment strategies:

- **allInOne** (default) - This strategy is intended for development, testing, and demo purposes and it is not for production use. The main back-end components, Agent, Collector, and Query service, are all packaged into a single executable, which is configured (by default) to use in-memory storage. You can configure this deployment strategy in the SMCP.

NOTE

In-memory storage is not persistent, which means that if the Jaeger instance shuts down, restarts, or is replaced, your trace data will be lost. And in-memory storage cannot be scaled, since each pod has its own memory. For persistent storage, you must use the **production** or **streaming** strategies, which use Elasticsearch as the default storage.

- **production** - The production strategy is intended for production environments, where long term storage of trace data is important, and a more scalable and highly available architecture is required. Each back-end component is therefore deployed separately. The Agent can be injected as a sidecar on the instrumented application. The Query and Collector services are configured with a supported storage type, which is currently Elasticsearch. Multiple instances of each of these components can be provisioned as required for performance and resilience purposes. You can configure this deployment strategy in the SMCP, but in order to be fully customized, you must specify your configuration in the Jaeger CR and link that to the SMCP.
- **streaming** - The streaming strategy is designed to augment the production strategy by providing a streaming capability that sits between the Collector and the Elasticsearch back-end storage. This provides the benefit of reducing the pressure on the back-end storage, under high load situations, and enables other trace post-processing capabilities to tap into the real-time span data directly from the streaming platform (AMQ Streams/ Kafka). You cannot configure this deployment strategy in the SMCP; you must configure a Jaeger CR and link that to the SMCP.

NOTE

The streaming strategy requires an additional Red Hat subscription for AMQ Streams.

1.26.3.1. Default Distributed Tracing Platform (Jaeger) deployment

If you do not specify Jaeger configuration options, the **ServiceMeshControlPlane** resource will use the **allInOne** Jaeger deployment strategy by default. When using the default **allInOne** deployment strategy, set **spec.addons.jaeger.install.storage.type** to **Memory**. You can accept the defaults or specify additional configuration options under **install**.

Control plane default Jaeger parameters (Memory)

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  version: v2.6
  tracing:
    sampling: 10000
    type: Jaeger
  addons:
    jaeger:
      name: jaeger
      install:
        storage:
          type: Memory
```

1.26.3.2. Production Distributed Tracing Platform (Jaeger) deployment (minimal)

To use the default settings for the **production** deployment strategy, set **spec.addons.jaeger.install.storage.type** to **Elasticsearch** and specify additional configuration options under **install**. Note that the SMCP only supports configuring Elasticsearch resources and image name.

Control plane default Jaeger parameters (Elasticsearch)

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  version: v2.6
  tracing:
    sampling: 10000
    type: Jaeger
  addons:
    jaeger:
      name: jaeger  #name of Jaeger CR
      install:
        storage:
          type: Elasticsearch
        ingress:
          enabled: true
  runtime:
    components:
      tracing.jaeger.elasticsearch: # only supports resources and image name
        container:
          resources: {}
```

1.26.3.3. Production Distributed Tracing Platform (Jaeger) deployment (fully customized)

The SMCP supports only minimal Elasticsearch parameters. To fully customize your production environment and access all of the Elasticsearch configuration parameters, use the Jaeger custom resource (CR) to configure Jaeger.

Create and configure your Jaeger instance and set **spec.addons.jaeger.name** to the name of the Jaeger instance, in this example: **MyJaegerInstance**.

Control plane with linked Jaeger production CR

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  version: v2.6
  tracing:
    sampling: 1000
    type: Jaeger
  addons:
    jaeger:
      name: MyJaegerInstance #name of Jaeger CR
```

```
    install:
      storage:
        type: Elasticsearch
      ingress:
        enabled: true
```

1.26.3.4. Streaming Jaeger deployment

To use the **streaming** deployment strategy, you create and configure your Jaeger instance first, then set **spec.addons.jaeger.name** to the name of the Jaeger instance, in this example: **MyJaegerInstance**.

Control plane with linked Jaeger streaming CR

```
apiVersion: maistra.io/v2
kind: ServiceMeshControlPlane
metadata:
  name: basic
spec:
  version: v2.6
  tracing:
    sampling: 1000
    type: Jaeger
  addons:
    jaeger:
      name: MyJaegerInstance  #name of Jaeger CR
```

1.26.4. Specifying Jaeger configuration in a Jaeger custom resource

You can fully customize your Jaeger deployment by configuring Jaeger in the Jaeger custom resource (CR) rather than in the **ServiceMeshControlPlane** (SMCP) resource. This configuration is sometimes referred to as an "external Jaeger" since the configuration is specified outside of the SMCP.

NOTE

You must deploy the SMCP and Jaeger CR in the same namespace. For example, **istio-system**.

You can configure and deploy a standalone Jaeger instance and then specify the **name** of the Jaeger resource as the value for **spec.addons.jaeger.name** in the SMCP resource. If a Jaeger CR matching the value of **name** exists, the Service Mesh control plane will use the existing installation. This approach lets you fully customize your Jaeger configuration.

1.26.4.1. Deployment best practices

- Red Hat OpenShift Distributed Tracing Platform instance names must be unique. If you want to have multiple Red Hat OpenShift Distributed Tracing Platform (Jaeger) instances and are using sidecar injected agents, then the Red Hat OpenShift Distributed Tracing Platform (Jaeger) instances should have unique names, and the injection annotation should explicitly specify the Red Hat OpenShift Distributed Tracing Platform (Jaeger) instance name the tracing data should be reported to.
- If you have a multitenant implementation and tenants are separated by namespaces, deploy a Red Hat OpenShift Distributed Tracing Platform (Jaeger) instance to each tenant namespace.

1.26.4.2. Configuring distributed tracing security for service mesh

The Distributed Tracing Platform (Jaeger) uses OAuth for default authentication. However Red Hat OpenShift Service Mesh uses a secret called **htpasswd** to facilitate communication between dependent services such as Grafana, Kiali, and the Distributed Tracing Platform (Jaeger). When you configure your Distributed Tracing Platform (Jaeger) in the **ServiceMeshControlPlane** the Service Mesh automatically configures security settings to use **htpasswd**.

If you are specifying your Distributed Tracing Platform (Jaeger) configuration in a Jaeger custom resource, you must manually configure the **htpasswd** settings and ensure the **htpasswd** secret is mounted into your Jaeger instance so that Kiali can communicate with it.

1.26.4.2.1. Configuring distributed tracing security for service mesh from the web console

You can modify the Jaeger resource to configure Distributed Tracing Platform (Jaeger) security for use with Service Mesh in the web console.

Prerequisites

- You have access to the cluster as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.
- The Red Hat OpenShift Service Mesh Operator must be installed.
- The **ServiceMeshControlPlane** deployed to the cluster.
- You have access to the Red Hat OpenShift Service on AWS web console.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console as a user with the **cluster-admin** role.
2. Navigate to **Ecosystem → Installed Operators**.
3. Click the **Project** menu and select the project where your **ServiceMeshControlPlane** resource is deployed from the list, for example **istio-system**.
4. Click the **Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator**.
5. On the **Operator Details** page, click the **Jaeger** tab.
6. Click the name of your Jaeger instance.
7. On the Jaeger details page, click the **YAML** tab to modify your configuration.
8. Edit the **Jaeger** custom resource file to add the **htpasswd** configuration as shown in the following example.
   - **spec.ingress.openshift.htpasswdFile**
   - **spec.volumes**
   - **spec.volumeMounts**

   Example Jaeger resource showing htpasswd configuration

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
spec:
  ingress:
    enabled: true
    openshift:
      htpasswdFile: /etc/proxy/htpasswd/auth
      sar: '{"namespace": "istio-system", "resource": "pods", "verb": "get"}'
    options: {}
    resources: {}
    security: oauth-proxy
  volumes:
    - name: secret-htpasswd
      secret:
        secretName: htpasswd
    - configMap:
        defaultMode: 420
        items:
          - key: ca-bundle.crt
            path: tls-ca-bundle.pem
        name: trusted-ca-bundle
        optional: true
      name: trusted-ca-bundle
  volumeMounts:
    - mountPath: /etc/proxy/htpasswd
      name: secret-htpasswd
    - mountPath: /etc/pki/ca-trust/extracted/pem/
      name: trusted-ca-bundle
      readOnly: true
# ...
```

9. Click **Save**.

1.26.4.2.2. Configuring distributed tracing security for service mesh from the command line

You can modify the Jaeger resource to configure Distributed Tracing Platform (Jaeger) security for use with Service Mesh from the command line by running the OpenShift CLI (**oc**).

Prerequisites

- You have access to the cluster as a user with the **cluster-admin** role. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.
- The Red Hat OpenShift Service Mesh Operator must be installed.
- The **ServiceMeshControlPlane** deployed to the cluster.
- You have access to the OpenShift CLI (**oc**) that matches your Red Hat OpenShift Service on AWS version.

Procedure

1. Log in to the OpenShift CLI (**oc**) as a user with the **cluster-admin** role by running the following command. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.

```
$ oc login https://<HOSTNAME>:6443
```

2. Change to the project where you installed the control plane, for example **istio-system**, by entering the following command:

```
$ oc project istio-system
```

3. Run the following command to edit the Jaeger custom resource file:

```
$ oc edit -n openshift-distributed-tracing -f jaeger.yaml
```

4. Edit the **Jaeger** custom resource file to add the **htpasswd** configuration as shown in the following example.

   - **spec.ingress.openshift.htpasswdFile**
   - **spec.volumes**
   - **spec.volumeMounts**

   Example Jaeger resource showing htpasswd configuration

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
spec:
  ingress:
    enabled: true
    openshift:
      htpasswdFile: /etc/proxy/htpasswd/auth
      sar: '{"namespace": "istio-system", "resource": "pods", "verb": "get"}'
    options: {}
    resources: {}
    security: oauth-proxy
  volumes:
    - name: secret-htpasswd
      secret:
        secretName: htpasswd
    - configMap:
        defaultMode: 420
        items:
          - key: ca-bundle.crt
            path: tls-ca-bundle.pem
        name: trusted-ca-bundle
        optional: true
      name: trusted-ca-bundle
  volumeMounts:
    - mountPath: /etc/proxy/htpasswd
      name: secret-htpasswd
    - mountPath: /etc/pki/ca-trust/extracted/pem/
      name: trusted-ca-bundle
      readOnly: true
```

5. Run the following command to watch the progress of the pod deployment:

```
$ oc get pods -n openshift-distributed-tracing
```

1.26.4.3. Distributed tracing default configuration options

The Jaeger custom resource (CR) defines the architecture and settings to be used when creating the Distributed Tracing Platform (Jaeger) resources. You can modify these parameters to customize your Distributed Tracing Platform (Jaeger) implementation to your business needs.

Generic YAML example of the Jaeger CR

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
metadata:
  name: name
spec:
  strategy: <deployment_strategy>
  allInOne:
    options: {}
    resources: {}
  agent:
    options: {}
    resources: {}
  collector:
    options: {}
    resources: {}
  sampling:
    options: {}
  storage:
    type:
    options: {}
  query:
    options: {}
    resources: {}
  ingester:
    options: {}
    resources: {}
  options: {}
```

Table 1.39. Jaeger parameters

Parameter	Description	Values	Default value
apiVersion:	API version to use when creating the object.	**jaegertracing.io/v1**	**jaegertracing.io/v1**
kind:	Defines the kind of Kubernetes object to create.	**jaeger**	

Parameter	Description	Values	Default value
metadata:	Data that helps uniquely identify the object, including a **name** string, **UID**, and optional **namespace**.		Red Hat OpenShift Service on AWS automatically generates the **UID** and completes the **namespace** with the name of the project where the object is created.
name:	Name for the object.	The name of your Distributed Tracing Platform (Jaeger) instance.	**jaeger-all-in-one-inmemory**
spec:	Specification for the object to be created.	Contains all of the configuration parameters for your Distributed Tracing Platform (Jaeger) instance. When a common definition for all Jaeger components is required, it is defined under the **spec** node. When the definition relates to an individual component, it is placed under the **spec/<component>** node.	N/A
strategy:	Jaeger deployment strategy	**allInOne**, **production**, or **streaming**	**allInOne**
allInOne:	Because the **allInOne** image deploys the Agent, Collector, Query, Ingester, and Jaeger UI in a single pod, configuration for this deployment must nest component configuration under the **allInOne** parameter.		
agent:	Configuration options that define the Agent.		

Parameter	Description	Values	Default value
collector:	Configuration options that define the Jaeger Collector.		
sampling:	Configuration options that define the sampling strategies for tracing.		
storage:	Configuration options that define the storage. All storage-related options must be placed under **storage**, rather than under the **allInOne** or other component options.		
query:	Configuration options that define the Query service.		
ingester:	Configuration options that define the Ingester service.		

The following example YAML is the minimum required to create a Red Hat OpenShift Distributed Tracing Platform (Jaeger) deployment using the default settings.

Example minimum required dist-tracing-all-in-one.yaml

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
metadata:
  name: jaeger-all-in-one-inmemory
```

1.26.4.4. Jaeger Collector configuration options

The Jaeger Collector is the component responsible for receiving the spans that were captured by the tracer and writing them to persistent Elasticsearch storage when using the **production** strategy, or to AMQ Streams when using the **streaming** strategy.

The Collectors are stateless and thus many instances of Jaeger Collector can be run in parallel. Collectors require almost no configuration, except for the location of the Elasticsearch cluster.

Table 1.40. Parameters used by the Operator to define the Jaeger Collector

Parameter	Description	Values
`collector:` `  replicas:`	Specifies the number of Collector replicas to create.	Integer, for example, **5**

Table 1.41. Configuration parameters passed to the Collector

Parameter	Description	Values

`spec:`
` collector:`
`  options: {}`
	Configuration options that define the Jaeger Collector.	

`options:`
`  collector:`
`  num-workers:`
	The number of workers pulling from the queue.	Integer, for example, **50**

`options:`
`  collector:`
`  queue-size:`
	The size of the Collector queue.	Integer, for example, **2000**

`options:`
`  kafka:`
`  producer:`
`  topic: jaeger-spans`
	The **topic** parameter identifies the Kafka configuration used by the Collector to produce the messages, and the Ingester to consume the messages.	Label for the producer.

`options:`
`  kafka:`
`  producer:`
`  brokers: my-cluster-kafka-brokers.kafka:9092`
	Identifies the Kafka configuration used by the Collector to produce the messages. If brokers are not specified, and you have AMQ Streams 1.4.0+ installed, the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator will self-provision Kafka.	

`options:` `  log-level:`	Logging level for the Collector.	Possible values: **debug**, **info**, **warn**, **error**, **fatal**, **panic**.

Parameter	Description	Values
options: otlp: enabled: true grpc: host-port: 4317 max-connection-age: 0s max-connection-age-grace: 0s max-message-size: 4194304 tls: enabled: false cert: /path/to/cert.crt cipher-suites: "TLS_AES_256_GCM_SHA384,TLS_CHACHA20_POLY1305_SHA256" client-ca: /path/to/cert.ca reload-interval: 0s min-version: 1.2 max-version: 1.3	To accept OTLP/gRPC, explicitly enable the **otlp**. All the other options are optional.	

Parameter	Description	Values
options: otlp: enabled: true http: cors: allowed-headers: [<header-name>[, <header-name>]*] allowed-origins: * host-port: 4318 max-connection-age: 0s max-connection-age-grace: 0s max-message-size: 4194304 read-timeout: 0s read-header-timeout: 2s idle-timeout: 0s tls: enabled: false cert: /path/to/cert.crt cipher-suites: "TLS_AES_256_GCM_SHA384,TLS_CHACHA20_POLY1305_SHA256" client-ca: /path/to/cert.ca reload-interval: 0s min-version: 1.2 max-version: 1.3	To accept OTLP/HTTP, explicitly enable the **otlp**. All the other options are optional.	

1.26.4.5. Distributed tracing sampling configuration options

The Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator can be used to define sampling strategies that will be supplied to tracers that have been configured to use a remote sampler.

While all traces are generated, only a few are sampled. Sampling a trace marks the trace for further processing and storage.

NOTE

This is not relevant if a trace was started by the Envoy proxy, as the sampling decision is made there. The Jaeger sampling decision is only relevant when the trace is started by an application using the client.

When a service receives a request that contains no trace context, the client starts a new trace, assigns it a random trace ID, and makes a sampling decision based on the currently installed sampling strategy. The sampling decision propagates to all subsequent requests in the trace so that other services are not making the sampling decision again.

Distributed Tracing Platform (Jaeger) libraries support the following samplers:

- **Probabilistic** - The sampler makes a random sampling decision with the probability of sampling equal to the value of the **sampling.param** property. For example, using **sampling.param=0.1** samples approximately 1 in 10 traces.
- **Rate Limiting** - The sampler uses a leaky bucket rate limiter to ensure that traces are sampled with a certain constant rate. For example, using **sampling.param=2.0** samples requests with the rate of 2 traces per second.

Table 1.42. Jaeger sampling options

Parameter	Description	Values	Default value

`spec:`
`sampling:`
`options: {}`
`default_strategy:`
 	
`service_strategy:`
	Configuration options that define the sampling strategies for tracing.		If you do not provide configuration, the Collectors will return the default probabilistic sampling policy with 0.001 (0.1%) probability for all services.

`default_strategy:`
`type:`
`service_strategy:`
`type:`
	Sampling strategy to use. See descriptions above.	Valid values are **probabilistic**, and **ratelimiting**.	**probabilistic**

`default_strategy:`
`param:`
`service_strategy:`
`param:`
	Parameters for the selected sampling strategy.	Decimal and integer values (0, .1, 1, 10)	1

This example defines a default sampling strategy that is probabilistic, with a 50% chance of the trace instances being sampled.

Probabilistic sampling example

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
metadata:
  name: with-sampling
spec:
  sampling:
    options:
      default_strategy:
        type: probabilistic
        param: 0.5
      service_strategies:
        - service: alpha
          type: probabilistic
```

```
        param: 0.8
        operation_strategies:
          - operation: op1
            type: probabilistic
            param: 0.2
          - operation: op2
            type: probabilistic
            param: 0.4
      - service: beta
        type: ratelimiting
        param: 5
```

If there are no user-supplied configurations, the Distributed Tracing Platform (Jaeger) uses the following settings:

Default sampling

```
spec:
  sampling:
    options:
      default_strategy:
        type: probabilistic
        param: 1
```

1.26.4.6. Distributed tracing storage configuration options

You configure storage for the Collector, Ingester, and Query services under **spec.storage**. Multiple instances of each of these components can be provisioned as required for performance and resilience purposes.

Table 1.43. General storage parameters used by the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator to define distributed tracing storage

Parameter	Description	Values	Default value

`spec:`
`  storage:`
`  type:`
	Type of storage to use for the deployment.	**memory** or **elasticsearch**. Memory storage is only appropriate for development, testing, demonstrations, and proof of concept environments as the data does not persist if the pod is shut down. For production environments Distributed Tracing Platform (Jaeger) supports Elasticsearch for persistent storage.	**memory**

Parameter	Description	Values	Default value
storage: secretname:	Name of the secret, for example **tracing-secret**.		N/A
storage: options: {}	Configuration options that define the storage.		

Table 1.44. Elasticsearch index cleaner parameters

Parameter	Description	Values	Default value
storage: esIndexCleaner: enabled:	When using Elasticsearch storage, by default a job is created to clean old traces from the index. This parameter enables or disables the index cleaner job.	**true**/ **false**	**true**
storage: esIndexCleaner: numberOfDays:	Number of days to wait before deleting an index.	Integer value	**7**
storage: esIndexCleaner: schedule:	Defines the schedule for how often to clean the Elasticsearch index.	Cron expression	"55 23 * * *"

1.26.4.6.1. Auto-provisioning an Elasticsearch instance

When you deploy a Jaeger custom resource, the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator uses the OpenShift Elasticsearch Operator to create an Elasticsearch cluster based on the configuration provided in the **storage** section of the custom resource file. The Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator will provision Elasticsearch if the following configurations are set:

- **spec.storage:type** is set to **elasticsearch**
- **spec.storage.elasticsearch.doNotProvision** set to **false**
- **spec.storage.options.es.server-urls** is not defined, that is, there is no connection to an Elasticsearch instance that was not provisioned by the OpenShift Elasticsearch Operator.

When provisioning Elasticsearch, the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator sets the Elasticsearch custom resource **name** to the value of **spec.storage.elasticsearch.name** from the Jaeger custom resource. If you do not specify a value for **spec.storage.elasticsearch.name**, the Operator uses **elasticsearch**.

Restrictions

- You can have only one Distributed Tracing Platform (Jaeger) with self-provisioned Elasticsearch instance per namespace. The Elasticsearch cluster is meant to be dedicated for a single Distributed Tracing Platform (Jaeger) instance.
- There can be only one Elasticsearch per namespace.

NOTE

If you already have installed Elasticsearch as part of OpenShift Logging, the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator can use the installed OpenShift Elasticsearch Operator to provision storage.

The following configuration parameters are for a *self-provisioned* Elasticsearch instance, that is an instance created by the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator using the OpenShift Elasticsearch Operator. You specify configuration options for self-provisioned Elasticsearch under **spec:storage:elasticsearch** in your configuration file.

Table 1.45. Elasticsearch resource configuration parameters

Parameter	Description	Values	Default value

`elasticsearch:`
`  properties:`
`  doNotProvision:`
	Use to specify whether or not an Elasticsearch instance should be provisioned by the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator.	**true**/**false**	**true**

`elasticsearch:`
`  properties:`
`  name:`
	Name of the Elasticsearch instance. The Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator uses the Elasticsearch instance specified in this parameter to connect to Elasticsearch.	string	**elasticsearch**

Parameter	Description	Values	Default value
elasticsearch: nodeCount:	Number of Elasticsearch nodes. For high availability use at least 3 nodes. Do not use 2 nodes as “split brain” problem can happen.	Integer value. For example, Proof of concept = 1, Minimum deployment =3	3
elasticsearch: resources: requests: cpu:	Number of central processing units for requests, based on your environment’s configuration.	Specified in cores or millicores, for example, 200m, 0.5, 1. For example, Proof of concept = 500m, Minimum deployment =1	1
elasticsearch: resources: requests: memory:	Available memory for requests, based on your environment’s configuration.	Specified in bytes, for example, 200Ki, 50Mi, 5Gi. For example, Proof of concept = 1Gi, Minimum deployment = 16Gi*	16Gi
elasticsearch: resources: limits: cpu:	Limit on number of central processing units, based on your environment’s configuration.	Specified in cores or millicores, for example, 200m, 0.5, 1. For example, Proof of concept = 500m, Minimum deployment =1	
elasticsearch: resources: limits: memory:	Available memory limit based on your environment’s configuration.	Specified in bytes, for example, 200Ki, 50Mi, 5Gi. For example, Proof of concept = 1Gi, Minimum deployment = 16Gi*	
elasticsearch: redundancyPolicy:	Data replication policy defines how Elasticsearch shards are replicated across data nodes in the cluster. If not specified, the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator automatically determines the most appropriate replication based on number of nodes.	**ZeroRedundancy**(no replica shards), **SingleRedundancy**(one replica shard), **MultipleRedundancy** (each index is spread over half of the Data nodes), **FullRedundancy** (each index is fully replicated on every Data node in the cluster).	

Parameter	Description	Values	Default value
elasticsearch: useCertManagement:	Use to specify whether or not Distributed Tracing Platform (Jaeger) should use the certificate management feature of the OpenShift Elasticsearch Operator. This feature was added to {logging-title} 5.2 in Red Hat OpenShift Service on AWS 4.7 and is the preferred setting for new Jaeger deployments.	**true/false**	**true**

Each Elasticsearch node can operate with a lower memory setting though this is NOT recommended for production deployments. For production use, you must have no less than 16 Gi allocated to each pod by default, but preferably allocate as much as you can, up to 64 Gi per pod.

Production storage example

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
metadata:
  name: simple-prod
spec:
  strategy: production
  storage:
    type: elasticsearch
    elasticsearch:
      nodeCount: 3
      resources:
        requests:
          cpu: 1
          memory: 16Gi
        limits:
          memory: 16Gi
```

Storage example with persistent storage

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
metadata:
  name: simple-prod
spec:
  strategy: production
  storage:
    type: elasticsearch
    elasticsearch:
      nodeCount: 1
```

```
storage: (1)
  storageClassName: gp2
  size: 5Gi
resources:
  requests:
    cpu: 200m
    memory: 4Gi
  limits:
    memory: 4Gi
redundancyPolicy: ZeroRedundancy
```

(1) Persistent storage configuration. In this case AWS **gp2** with **5Gi** size. When no value is specified, Distributed Tracing Platform (Jaeger) uses **emptyDir**. The OpenShift Elasticsearch Operator provisions **PersistentVolumeClaim** and **PersistentVolume** which are not removed with Distributed Tracing Platform (Jaeger) instance. You can mount the same volumes if you create a Distributed Tracing Platform (Jaeger) instance with the same name and namespace.

1.26.4.6.2. Connecting to an existing Elasticsearch instance

You can use an existing Elasticsearch cluster for storage with Distributed Tracing Platform. An existing Elasticsearch cluster, also known as an *external* Elasticsearch instance, is an instance that was not installed by the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator or by the OpenShift Elasticsearch Operator.

When you deploy a Jaeger custom resource, the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator will not provision Elasticsearch if the following configurations are set:

- **spec.storage.elasticsearch.doNotProvision** set to **true**
- **spec.storage.options.es.server-urls** has a value
- **spec.storage.elasticsearch.name** has a value, or if the Elasticsearch instance name is **elasticsearch**.

The Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator uses the Elasticsearch instance specified in **spec.storage.elasticsearch.name** to connect to Elasticsearch.

Restrictions

- You cannot share or reuse a Red Hat OpenShift Service on AWS logging Elasticsearch instance with Distributed Tracing Platform (Jaeger). The Elasticsearch cluster is meant to be dedicated for a single Distributed Tracing Platform (Jaeger) instance.

The following configuration parameters are for an already existing Elasticsearch instance, also known as an *external* Elasticsearch instance. In this case, you specify configuration options for Elasticsearch under **spec:storage:options:es** in your custom resource file.

Table 1.46. General ES configuration parameters

Parameter	Description	Values	Default value
es: server-urls:	URL of the Elasticsearch instance.	The fully-qualified domain name of the Elasticsearch server.	**http://elasticsearch.<namespace>.svc:9200**
es: max-doc-count:	The maximum document count to return from an Elasticsearch query. This will also apply to aggregations. If you set both **es.max-doc-count** and **es.max-num-spans**, Elasticsearch will use the smaller value of the two.		10000
es: max-num-spans:	[**Deprecated** – Will be removed in a future release, use **es.max-doc-count** instead.] The maximum number of spans to fetch at a time, per query, in Elasticsearch. If you set both **es.max-num-spans** and **es.max-doc-count**, Elasticsearch will use the smaller value of the two.		10000
es: max-span-age:	The maximum lookback for spans in Elasticsearch.		72h0m0s
es: sniffer:	The sniffer configuration for Elasticsearch. The client uses the sniffing process to find all nodes automatically. Disabled by default.	**true**/ **false**	**false**
es: sniffer-tls-enabled:	Option to enable TLS when sniffing an Elasticsearch Cluster. The client uses the sniffing process to find all nodes automatically. Disabled by default	**true**/ **false**	**false**

Parameter	Description	Values	Default value
es: timeout:	Timeout used for queries. When set to zero there is no timeout.		0s
es: username:	The username required by Elasticsearch. The basic authentication also loads CA if it is specified. See also **es.password**.		
es: password:	The password required by Elasticsearch. See also, **es.username**.		
es: version:	The major Elasticsearch version. If not specified, the value will be auto-detected from Elasticsearch.		0

Table 1.47. ES data replication parameters

Parameter	Description	Values	Default value
es: num-replicas:	The number of replicas per index in Elasticsearch.		1
es: num-shards:	The number of shards per index in Elasticsearch.		5

Table 1.48. ES index configuration parameters

Parameter	Description	Values	Default value
es: create-index-templates:	Automatically create index templates at application startup when set to **true**. When templates are installed manually, set to **false**.	**true**/ **false**	**true**

Parameter	Description	Values	Default value
`es:` `  index-prefix:`	Optional prefix for Distributed Tracing Platform (Jaeger) indices. For example, setting this to "production" creates indices named "production-tracing-*".		

Table 1.49. ES bulk processor configuration parameters

Parameter	Description	Values	Default value

`es:`
`  bulk:`
`  actions:`
	The number of requests that can be added to the queue before the bulk processor decides to commit updates to disk.		1000

`es:`
`  bulk:`
`  flush-interval:`
	A **time.Duration** after which bulk requests are committed, regardless of other thresholds. To disable the bulk processor flush interval, set this to zero.		200ms

`es:`
`  bulk:`
`  size:`
	The number of bytes that the bulk requests can take up before the bulk processor decides to commit updates to disk.		5000000

`es:`
`  bulk:`
`  workers:`
	The number of workers that are able to receive and commit bulk requests to Elasticsearch.		1

Table 1.50. ES TLS configuration parameters

Parameter	Description	Values	Default value
es: tls: ca:	Path to a TLS Certification Authority (CA) file used to verify the remote servers.		Will use the system truststore by default.
es: tls: cert:	Path to a TLS Certificate file, used to identify this process to the remote servers.		
es: tls: enabled:	Enable transport layer security (TLS) when talking to the remote servers. Disabled by default.	**true**/ **false**	**false**
es: tls: key:	Path to a TLS Private Key file, used to identify this process to the remote servers.		
es: tls: server-name:	Override the expected TLS server name in the certificate of the remote servers.		
es: token-file:	Path to a file containing the bearer token. This flag also loads the Certification Authority (CA) file if it is specified.		

Table 1.51. ES archive configuration parameters

Parameter	Description	Values	Default value
es-archive: bulk: actions:	The number of requests that can be added to the queue before the bulk processor decides to commit updates to disk.		0

Parameter	Description	Values	Default value
es-archive: bulk: flush-interval:	A **time.Duration** after which bulk requests are committed, regardless of other thresholds. To disable the bulk processor flush interval, set this to zero.		0s
es-archive: bulk: size:	The number of bytes that the bulk requests can take up before the bulk processor decides to commit updates to disk.		0
es-archive: bulk: workers:	The number of workers that are able to receive and commit bulk requests to Elasticsearch.		0
es-archive: create-index-templates:	Automatically create index templates at application startup when set to **true**. When templates are installed manually, set to **false**.	**true**/ **false**	**false**
es-archive: enabled:	Enable extra storage.	**true**/ **false**	**false**
es-archive: index-prefix:	Optional prefix for Distributed Tracing Platform (Jaeger) indices. For example, setting this to "production" creates indices named "production-tracing-*".		
es-archive: max-doc-count:	The maximum document count to return from an Elasticsearch query. This will also apply to aggregations.		0

Parameter	Description	Values	Default value
es-archive: max-num-spans:	[**Deprecated** - Will be removed in a future release, use **es-archive.max-doc-count** instead.] The maximum number of spans to fetch at a time, per query, in Elasticsearch.		0
es-archive: max-span-age:	The maximum lookback for spans in Elasticsearch.		0s
es-archive: num-replicas:	The number of replicas per index in Elasticsearch.		0
es-archive: num-shards:	The number of shards per index in Elasticsearch.		0
es-archive: password:	The password required by Elasticsearch. See also, **es.username**.		
es-archive: server-urls:	The comma-separated list of Elasticsearch servers. Must be specified as fully qualified URLs, for example, **http://localhost:9200**.		
es-archive: sniffer:	The sniffer configuration for Elasticsearch. The client uses the sniffing process to find all nodes automatically. Disabled by default.	**true**/ **false**	**false**
es-archive: sniffer-tls-enabled:	Option to enable TLS when sniffing an Elasticsearch Cluster. The client uses the sniffing process to find all nodes automatically. Disabled by default.	**true**/ **false**	**false**

Parameter	Description	Values	Default value
es-archive: timeout:	Timeout used for queries. When set to zero there is no timeout.		0s
es-archive: tls: ca:	Path to a TLS Certification Authority (CA) file used to verify the remote servers.		Will use the system truststore by default.
es-archive: tls: cert:	Path to a TLS Certificate file, used to identify this process to the remote servers.		
es-archive: tls: enabled:	Enable transport layer security (TLS) when talking to the remote servers. Disabled by default.	**true**/ **false**	**false**
es-archive: tls: key:	Path to a TLS Private Key file, used to identify this process to the remote servers.		
es-archive: tls: server-name:	Override the expected TLS server name in the certificate of the remote servers.		
es-archive: token-file:	Path to a file containing the bearer token. This flag also loads the Certification Authority (CA) file if it is specified.		
es-archive: username:	The username required by Elasticsearch. The basic authentication also loads CA if it is specified. See also **es-archive.password**.		

Parameter	Description	Values	Default value
`es-archive:` `  version:`	The major Elasticsearch version. If not specified, the value will be auto-detected from Elasticsearch.		0

Storage example with volume mounts

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
metadata:
  name: simple-prod
spec:
  strategy: production
  storage:
    type: elasticsearch
    options:
      es:
        server-urls: https://quickstart-es-http.default.svc:9200
        index-prefix: my-prefix
        tls:
          ca: /es/certificates/ca.crt
    secretName: tracing-secret
  volumeMounts:
    - name: certificates
      mountPath: /es/certificates/
      readOnly: true
  volumes:
    - name: certificates
      secret:
        secretName: quickstart-es-http-certs-public
```

The following example shows a Jaeger CR using an external Elasticsearch cluster with TLS CA certificate mounted from a volume and user/password stored in a secret.

External Elasticsearch example

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
metadata:
  name: simple-prod
spec:
  strategy: production
  storage:
    type: elasticsearch
    options:
      es:
        server-urls: https://quickstart-es-http.default.svc:9200 (1)
        index-prefix: my-prefix
        tls: (2)
          ca: /es/certificates/ca.crt
```

```
    secretName: tracing-secret (3)
  volumeMounts: (4)
    - name: certificates
      mountPath: /es/certificates/
      readOnly: true
  volumes:
    - name: certificates
      secret:
        secretName: quickstart-es-http-certs-public
```

1. URL to Elasticsearch service running in default namespace.
2. TLS configuration. In this case only CA certificate, but it can also contain es.tls.key and es.tls.cert when using mutual TLS.
3. Secret which defines environment variables ES_PASSWORD and ES_USERNAME. Created by kubectl create secret generic tracing-secret --from-literal=ES_PASSWORD=changeme --from-literal=ES_USERNAME=elastic
4. Volume mounts and volumes which are mounted into all storage components.

1.26.4.7. Query configuration options

Query is a service that retrieves traces from storage and hosts the user interface to display them.

Table 1.52. Parameters used by the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator to define Query

Parameter	Description	Values	Default value

`spec:`
`  query:`
`  replicas:`
	Specifies the number of Query replicas to create.	Integer, for example, **2**	

Table 1.53. Configuration parameters passed to Query

Parameter	Description	Values	Default value

`spec:`
`  query:`
`  options: {}`
	Configuration options that define the Query service.		

`options:` `  log-level:`	Logging level for Query.	Possible values: **debug**, **info**, **warn**, **error**, **fatal**, **panic**.	

Parameter	Description	Values	Default value

`options:`
`  query:`
`  base-path:`
	The base path for all jaeger-query HTTP routes can be set to a non-root value, for example, **/jaeger** would cause all UI URLs to start with **/jaeger**. This can be useful when running jaeger-query behind a reverse proxy.	/<path>	

Sample Query configuration

```
apiVersion: jaegertracing.io/v1
kind: "Jaeger"
metadata:
  name: "my-jaeger"
spec:
  strategy: allInOne
  allInOne:
    options:
      log-level: debug
      query:
        base-path: /jaeger
```

1.26.4.8. Ingester configuration options

Ingester is a service that reads from a Kafka topic and writes to the Elasticsearch storage backend. If you are using the **allInOne** or **production** deployment strategies, you do not need to configure the Ingester service.

Table 1.54. Jaeger parameters passed to the Ingester

Parameter	Description	Values

`spec:`
`  ingester:`
`  options: {}`
	Configuration options that define the Ingester service.	

`options:` `  deadlockInterval:`	Specifies the interval, in seconds or minutes, that the Ingester must wait for a message before terminating. The deadlock interval is disabled by default (set to **0**), to avoid terminating the Ingester when no messages arrive during system initialization.	Minutes and seconds, for example, **1m0s**. Default value is **0**.

Parameter	Description	Values
options: kafka: consumer: topic:	The **topic** parameter identifies the Kafka configuration used by the collector to produce the messages, and the Ingester to consume the messages.	Label for the consumer. For example, **jaeger-spans**.
options: kafka: consumer: brokers:	Identifies the Kafka configuration used by the Ingester to consume the messages.	Label for the broker, for example, **my-cluster-kafka-brokers.kafka:9092**.
options: log-level:	Logging level for the Ingester.	Possible values: **debug**, **info**, **warn**, **error**, **fatal**, **dpanic**, **panic**.

Streaming Collector and Ingester example

```
apiVersion: jaegertracing.io/v1
kind: Jaeger
metadata:
  name: simple-streaming
spec:
  strategy: streaming
  collector:
    options:
      kafka:
        producer:
          topic: jaeger-spans
          brokers: my-cluster-kafka-brokers.kafka:9092
  ingester:
    options:
      kafka:
        consumer:
          topic: jaeger-spans
          brokers: my-cluster-kafka-brokers.kafka:9092
      ingester:
        deadlockInterval: 5
  storage:
    type: elasticsearch
    options:
      es:
        server-urls: http://elasticsearch:9200
```

1.27. UNINSTALLING SERVICE MESH

To uninstall Red Hat OpenShift Service Mesh from an existing Red Hat OpenShift Service on AWS instance and remove its resources, you must delete the control plane, delete the Operators, and run commands to manually remove some resources.

1.27.1. Removing the Red Hat OpenShift Service Mesh control plane

To uninstall Service Mesh from an existing Red Hat OpenShift Service on AWS instance, first you delete the Service Mesh control plane and the Operators. Then, you run commands to remove residual resources.

1.27.1.1. Removing the Service Mesh control plane using the web console

You can remove the Red Hat OpenShift Service Mesh control plane by using the web console.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. Click the **Project** menu and select the project where you installed the Service Mesh control plane, for example **istio-system**.
3. Navigate to **Ecosystem → Installed Operators**.
4. Click **Service Mesh Control Plane** under **Provided APIs**.
5. Click the **ServiceMeshControlPlane** menu ⋮.
6. Click **Delete Service Mesh Control Plane**
7. Click **Delete** on the confirmation dialog window to remove the **ServiceMeshControlPlane**.

1.27.1.2. Removing the Service Mesh control plane using the CLI

You can remove the Red Hat OpenShift Service Mesh control plane by using the CLI. In this example, **istio-system** is the name of the control plane project.

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI.
2. Run the following command to delete the **ServiceMeshMemberRoll** resource.

```
$ oc delete smmr -n istio-system default
```

3. Run this command to retrieve the name of the installed **ServiceMeshControlPlane**:

```
$ oc get smcp -n istio-system
```

4. Replace **<name_of_custom_resource>** with the output from the previous command, and run this command to remove the custom resource:

```
$ oc delete smcp -n istio-system <name_of_custom_resource>
```

1.27.2. Removing the installed Operators

You must remove the Operators to successfully remove Red Hat OpenShift Service Mesh. After you remove the Red Hat OpenShift Service Mesh Operator, you must remove the Kiali Operator, the Red Hat OpenShift Distributed Tracing Platform (Jaeger) Operator, and the OpenShift Elasticsearch Operator.

1.27.2.1. Removing the Operators

Follow this procedure to remove the Operators that make up Red Hat OpenShift Service Mesh. Repeat the steps for each of the following Operators.

- Red Hat OpenShift Service Mesh
- Kiali
- Red Hat OpenShift Distributed Tracing Platform (Jaeger)
- OpenShift Elasticsearch

Procedure

1. Log in to the Red Hat OpenShift Service on AWS web console.
2. From the **Ecosystem → Installed Operators** page, scroll or type a keyword into the **Filter by name** to find each Operator. Then, click the Operator name.
3. On the **Operator Details** page, select **Uninstall Operator** from the **Actions** menu. Follow the prompts to uninstall each Operator.

1.27.3. Clean up Operator resources

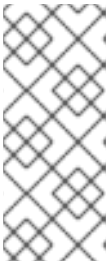
You can manually remove resources left behind after removing the Red Hat OpenShift Service Mesh Operator using the Red Hat OpenShift Service on AWS web console.

Prerequisites

- An account with cluster administration access. If you use Red Hat OpenShift Dedicated, you must have an account with the **dedicated-admin** role.
- Access to the OpenShift CLI (**oc**).

Procedure

1. Log in to the Red Hat OpenShift Service on AWS CLI as a cluster administrator.
2. Run the following commands to clean up resources after uninstalling the Operators. If you intend to keep using Distributed Tracing Platform (Jaeger) as a stand-alone service without service mesh, do not delete the Jaeger resources.



NOTE

The OpenShift Elasticsearch Operator is installed in **openshift-operators-redhat** by default. The other Operators are installed in the **openshift-operators** namespace by default. If you installed the Operators in another namespace, replace **openshift-operators** with the name of the project where the Red Hat OpenShift Service Mesh Operator was installed.

```
$ oc delete svc maistra-admission-controller -n openshift-operators
```

```
$ oc -n openshift-operators delete ds -lmaistra-version
```

```
$ oc delete clusterrole/istio-admin clusterrole/istio-cni clusterrolebinding/istio-cni
```

```
$ oc delete clusterrole istio-view istio-edit
```

```
$ oc delete clusterrole jaegers.jaegertracing.io-v1-admin jaegers.jaegertracing.io-v1-crdview
jaegers.jaegertracing.io-v1-edit jaegers.jaegertracing.io-v1-view
```

```
$ oc delete cm -n openshift-operators maistra-operator-cabundle
```

```
$ oc delete cm -n openshift-operators istio-cni-config istio-cni-config-v2-3
```

```
$ oc delete sa -n openshift-operators istio-cni
```