Citrix ADC xDS adapter
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Citrix ADC xDS adapter

Citrix ADC xDS-adapter: A way to integrate Citrix ADC with Istio Service Mesh

A service mesh is an infrastructure layer that handles communication between microservices and provides capabilities like service discovery, load balancing, security, and monitoring. Istio is an open source and platform-independent service mesh that connects, monitors, and secures microservices.

Citrix ADC has advanced traffic management capabilities for enhancing application performance and provides comprehensive security. Citrix ADC integrations with Istio allow you to secure and optimize traffic for applications in the service mesh using Citrix ADC features.

The Citrix ADC xDS-adapter is a container for integrating Citrix ADC with service mesh control plane implementations based on xDS APIs (Istio, Consul, and so on). It communicates with the service mesh control plane and listens for updates by acting as a gRPC client to the control plane API server. Based on the updates from the control plane, the Citrix ADC xDS-Adapter generates the equivalent Citrix ADC configuration.

Citrix ADC can be integrated with Istio in the following ways:

- Citrix ADC CPX, MPX, or VPX as an Ingress Gateway to the service mesh.
- Citrix ADC CPX as a sidecar proxy with application containers in the service mesh.
- Citrix ADC CPX as an Egress Gateway for the service mesh.
- Citrix ADC VPX as an Egress Gateway

Citrix ADC as an Ingress Gateway for Istio

An Istio ingress gateway acts as an entry point for the incoming traffic and secures and controls access to the service mesh from outside. It also performs routing and load balancing. Citrix ADC CPX, MPX, or VPX can be deployed as an ingress gateway to the Istio service mesh.

Citrix ADC CPX as a sidecar proxy for Istio

In an Istio service mesh, a sidecar proxy runs alongside application pods and it intercepts and manages incoming and outgoing traffic for applications. Citrix ADC CPX can be deployed as the sidecar proxy in the application pods. A sidecar proxy applies the configured routing policies or rules to the ingress and egress traffic from the pod.

Citrix ADC as an Egress Gateway for Istio

An Egress Gateway defines the traffic exit point from a service mesh. The Citrix ADC as an Egress Gateway performs load balancing, monitoring at the edge of the service mesh. It also provides routing rules to exit the Istio service mesh.
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Citrix ADC VPX as an Egress Gateway

An Egress Gateway defines the traffic exit point from a service mesh. Citrix ADC VPX can be deployed as an Egress Gateway to the Istio service mesh. In this deployment, a Kubernetes pod is deployed with a Citrix ADC xDS-adapter container. The Citrix ADC xDS-adapter container connects to the Istio control plane and reads the egress configuration and then configures the Citrix ADC VPX accordingly.

For information on Citrix ADC xDS-adapter deployment architecture, see Deployment architecture.

Deployment architecture

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The Istio service mesh can be logically divided into control plane and data plane components. The data plane is composed of a set of proxies which manage the network traffic between instances of the service mesh. The control plane generates and deploys the configuration that controls the data plane’s behavior.

For detailed information on Istio architecture and different components, see Istio documentation.

Citrix ADC Integration with Istio control plane components

The Istio control plane is a set of gRPC based services and it pushes configuration changes to clients listening at the data plane. Pilot, Mixer, Galley, and Citadel are important control plane components. Out of these components, the data plane proxy primarily needs to interact with Pilot and Citadel.

Pilot is a gRPC based xDS server and provides configuration data to proxies. Citrix provides an xDS client called xDS-adapter to communicate with the Istio control plane for installing Citrix ADCs in Istio service mesh. It acts as a gRPC client to the control plane API server and listens to updates. Based on the updates from the control plane, Citrix ADC xDS-adapter generates the equivalent Citrix ADC configuration. Then, it configures the Citrix ADC ingress or proxy device accordingly.

Citadel is a control plane service which provides key and certificate management. It is responsible for providing TLS certificates to data plane proxies. Citrix ADC xDS-adapter monitors secrets managed by Citadel, and updates the Citrix ADC proxy with relevant details.

Citrix service mesh solution provides a container, Citrix ADC Metrics Exporter, which collects the statistical data from Citrix ADC Ingress Gateway device and exports it to Prometheus.

Citrix also provides its own in-house solution Citrix ADC Observability Exporter for the telemetry purpose. Citrix ADC CPX running as a sidecar proxy interacts with the Citrix ADC Observability Exporter. Citrix ADC CPX sends metrics and transactions to Citrix ADC Observability Exporter. Citrix ADC Observability Exporter supports endpoints such as Zipkin and Prometheus, and sends the data collected from sidecar proxies to these endpoints in an appropriate format.
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Citrix ADC can be integrated with Istio in three ways:

- Citrix ADC CPX, MPX, or VPX as an Ingress Gateway to the service mesh
- Citrix ADC CPX as a sidecar proxy with application containers in the service mesh
- Citrix ADC CPX as an Egress Gateway for the service mesh

All the modes can be combined to have a unified data plane solution.

**Deploy Citrix ADC as an Ingress Gateway**

An Istio Ingress Gateway acts as an entry point for the incoming traffic to the service mesh. It secures and controls access to the service mesh from outside. You can deploy a Citrix ADC CPX, MPX, or VPX as an ingress Gateway to the Istio service mesh.

**Citrix ADC CPX as an Ingress Gateway**

The Citrix ADC CPX Ingress Gateway is deployed as a set of horizontal scaling Kubernetes pods. Each pod runs a Citrix ADC CPX that controls and routes the incoming requests. Each pod also runs an Citrix ADC xDS-adapter container as a sidecar to the Citrix ADC. The Citrix ADC xDS-adapter container establishes a connection with Istio control plane components, reads the ingress policies applied, and configures the Citrix ADC CPX accordingly.

The following diagram shows a sample deployment of Citrix ADC CPX as an Ingress Gateway.

![Diagram showing Citrix ADC CPX as an Ingress Gateway](image)

For detailed instructions on how to deploy Citrix ADC CPX as an Ingress Gateway, see [Deploying Citrix ADC with Istio](#)

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Citrix ADC MPX or VPX as an Ingress Gateway

Citrix ADC VPX or MPX can be deployed as an Ingress Gateway to the Istio service mesh. In this deployment, a Kubernetes pod is deployed with an Citrix ADC xDS-adapter container. The Citrix ADC xDS-adapter container connects to the Istio control plane and reads the ingress configuration and then configures the Citrix ADC VPX or MPX accordingly.

Note:
For this deployment, establish the connectivity between the concerned Citrix ADC and the cluster nodes.

The following diagram shows a sample deployment of Citrix ADC VPX/MPX as an Ingress Gateway.

For detailed instructions on how to deploy Citrix ADC VPX or MPX as an Ingress Gateway, see Deploying Citrix ADC with Istio.

Deploy Citrix ADC CPXs as sidecars

Citrix ADC CPX can be deployed as a sidecar proxy in application pods. It intercepts all the incoming and outgoing traffic from the application pod and applies the configured routing policies or rules.

In this deployment, each application pod contains a Citrix ADC CPX and an Citrix ADC xDS-adapter container along with the application container.
The Citrix ADC xDS-adapter container listens to updates from the Istio control plane and configures the Citrix ADC CPX instance accordingly.

The following diagram shows a sample deployment of Citrix ADC CPXs as sidecars.

For detailed instructions on how to deploy Citrix ADC CPX as a sidecar, see Deploying Citrix ADC with Istio.

**Deploy Citrix ADC CPX as an Egress Gateway**

An Egress Gateway defines the traffic exit point from a service mesh. Citrix ADC CPX as an Egress Gateway performs load balancing, monitoring at the edge of the service mesh, and provides routing rules to exit the service mesh.

The following diagram shows a sample deployment of Citrix ADC CPX as an Egress Gateway.
Deploy detailed instructions on how to deploy Citrix ADC CPX as an Egress Gateway, see Deploying Citrix ADC with Istio.

**Deploy Citrix ADC VPX as an Egress Gateway**

An Egress Gateway defines the traffic exit point from a service mesh. Citrix ADC VPX can be deployed as an Egress Gateway to the Istio service mesh. In this deployment, a Kubernetes pod is deployed with an Citrix ADC xDS-adapter container. The Citrix ADC xDS-adapter container connects to the Istio control plane and reads the egress configuration and then configures the Citrix ADC VPX accordingly.

**Note:**
For this deployment, establish the connectivity between the concerned Citrix ADC and the cluster nodes.

The following diagram shows a sample deployment of Citrix ADC VPX as an Egress Gateway.
For detailed instructions on how to deploy Citrix ADC VPX as an Egress Gateway, see Deploying Citrix ADC with Istio.

**Helm charts for Citrix ADC integration with Istio**

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The citrix-helm-charts repository contains Helm charts for installing Citrix ADC CPX as Ingress Gateway, Egress Gateway, and sidecar proxy in Istio version 1.6.4.

**Note:**

Helm charts may require access to the kube-system namespace and require cluster wide permissions for full functionality. Install and configure the Helm client and Tiller.

**Helm installation**

For more information, see the Helm Installation Guide.

**Stable charts**

The stable directory contains Helm charts which are created and tested by Citrix.
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Charts

citrix-adc-istio-ingress-gateway: Use this chart to deploy Citrix ADC as an Ingress Gateway in an Istio environment.

citrix-cpx-istio-sidecar-injector: Use this chart to deploy resources responsible for injecting Citrix ADC CPX as a sidecar in Istio Service Mesh.

citrix-adc-istio-egress-gateway: Use this chart to deploy Citrix ADC as an Egress Gateway in an Istio environment.

Documentation

The Helm chart README describes the functionality and the values.yaml file shows the default values.

Citrix ADC CPX licensing

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Citrix ADC CPX supports pool licensing. Citrix ADM can act as your license server to license your Citrix ADC CPX instances. Citrix ADM is available both on-premises and a cloud service as well.

For licensing Citrix ADC CPX, you need to provide required information in the YAML file. This information is required for automatically picking the licensing information. For more information about Citrix ADC CPX licensing, see Citrix ADC CPX Licensing.

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Build the Citrix ADC xDS-adapter

To build the Citrix ADC xDS-adapter container, you need to have the following software installed on your machine:

- Docker
- Make
- Go 1.13 version
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To build images, run the following command:

```make
make build
```

To create the Citrix ADC xDS-adapter container, run the following command:

```make
make docker_build
```

**Testing the Citrix ADC xDS-adapter**

Citrix ADC xDS-adapter is developed to work generically for Ingress and sidecar proxy. So, testing Citrix ADC xDS-adapter in any mode of Citrix ADC CPX is enough. Citrix ADC xDS-adapter’s test coverage primarily focuses on Unit testing of Citrix ADC xDS-adapter code and Integration testing with Citrix ADC.

As a prerequisite for testing Citrix ADC xDS-adapter, run Citrix ADC CPX in the same machine.

Specify the following environment variables before running the test command.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NS_TEST_IP</td>
<td>Citrix ADC management IP</td>
</tr>
<tr>
<td>NS_TEST_NITRO_PORT</td>
<td>Citrix ADC REST API port</td>
</tr>
<tr>
<td>NS_TEST_LOGIN</td>
<td>Citrix ADC user name</td>
</tr>
<tr>
<td>NS_TEST_PASSWORD</td>
<td>Citrix ADC password</td>
</tr>
</tbody>
</table>

Tests with code coverage are invoked with `make utest`. This triggers both unit and integration tests.

```make
make utest
```

You can clean up using the following command:

```make
make clean
```