What is Service Mesh?
A service mesh is a dedicated infrastructure layer that controls service-to-service communication over a network.

What is Istio?
Istio is a tool to manage the service mesh that simplifies traffic management, observability, security and policy management.

Challenges of Microservices:

- Every growing distributed system, each microservice has its own business logic. Communication for newly created microservice with exiting comes with overhead tasks.
- Security: Cluster is secured with proxy and firewall, but once the intruder enters in the cluster, everything is accessible.
  Every service inside the cluster can talk to any other.
- Lack of metrics for monitoring and logging.

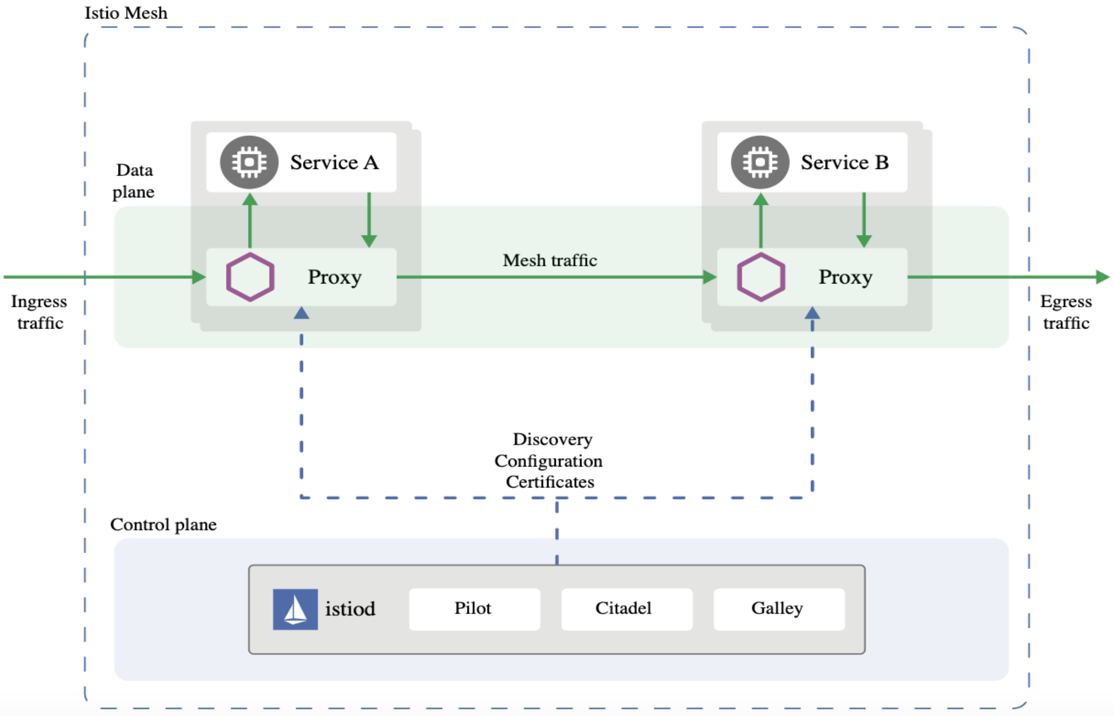
Why Istio?
Istio enables organizations to secure, connect, and monitor microservices, so they can modernize their enterprise apps more swiftly and securely. Istio manages traffic flows between services, enforces access policies, and aggregates telemetry data, all without requiring changes to application code.

Benefits of Using Istio:

- Secure service-to-service communication in a cluster with TLS encryption, strong identity-based authentication, and authorization.
- Automatic load balancing for HTTP, gRPC, WebSocket, and TCP traffic.
- Fine-grained control of traffic behavior with rich routing rules, retries, failovers, and fault injection
- A pluggable policy layer and configuration API supporting access controls, rate limits and quotas.
- Automatic metrics, logs, and traces for all traffic within a cluster, including cluster ingress and egress.

Main focus: It secure microservices and the communication between microservices, traffic management and observability.

Service mesh with sidecar proxy will be placed with all the new and existing microservice.
Control plane injects the sidecar proxy for upcoming and existing microservice in the cluster.



Istio Architecture

As shown in the image above, the control plane takes care of placing the proxy sidecars for each microservices. Proxy then navigates the traffic within the cluster.

About underlying infrastructure:

- Envoy proxies are used in Istio Service Mesh.
- Istiod is the control plane in Istio Service Mesh, it manages and injects envoy proxies into the microservices pods.
- Istiod has all the configuration management, Service discovery so when the new service is deployed it will be automatically discovered in the Isitod.
- Istiod also acts as a certificate manager and allows secure communication between microservices.
- Istiod gathers telemetry data from the envoy proxies.
- Istio Ingress gateway acts as a Nginx Ingress controller in a way. It directs the incoming traffic to internal services.

How to install Istio on K8s cluster?

There are 2 common ways to install the Istio on to the cluster:

- Using Istioctl
- Using Helm

By looking at the future perspective it is recommended to use the Helm installation. As, it can be easily versioned and upgraded.

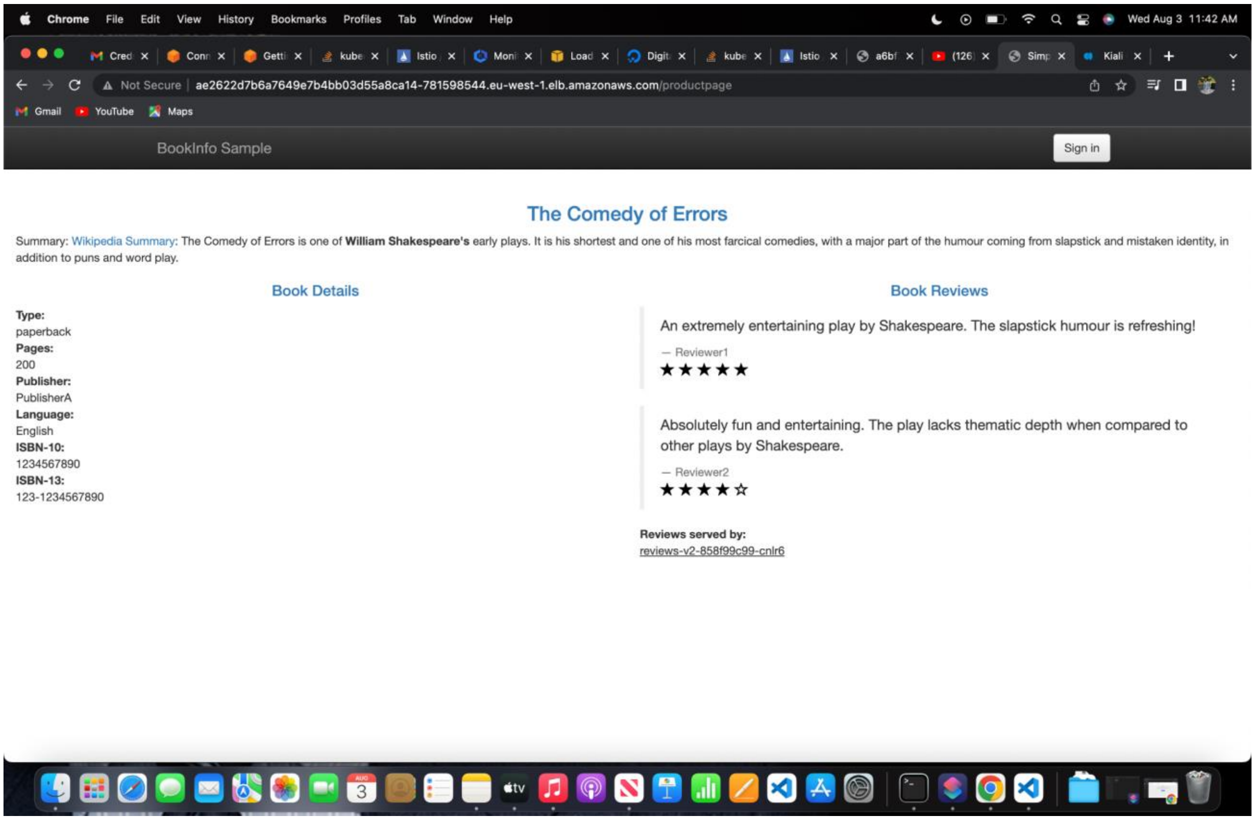
Installation guide using helm: https://istio.io/latest/docs/setup/install/helm/
Installation guide using istioctl: https://istio.io/latest/docs/setup/install/istioctl/

Once the Istio is deployed with the application. You can visualize it over multiple tools such as Grafana and Kiali.
Using Kiali, the entire infrastructure can be visualized and controlled from the Kiali Console. Traffic management, observation and many operations can be performed using Kiali.

Authorization for kiali can be setup using OpenId guide:
https://kiali.io/docs/configuration/authentication/openid/

A demo as shown below:

A sample application is deployed on eks and Istio is deployed along with it.



ae2622d7b6a7649e7b4bb03d55a8ca14-781598544.eu-west-1.elb.amazonaws.com/productpage

The Comedy of Errors

Summary: Wikipedia Summary: The Comedy of Errors is one of **William Shakespeare's** early plays. It is his shortest and one of his most farcical comedies, with a major part of the humour coming from slapstick and mistaken identity, in addition to puns and word play.

Book Details

Type:
paperback
Pages:
200
Publisher:
PublisherA
Language:
English
ISBN-10:
1234567890
ISBN-13:
123-1234567890

Book Reviews

An extremely entertaining play by Shakespeare. The slapstick humour is refreshing!

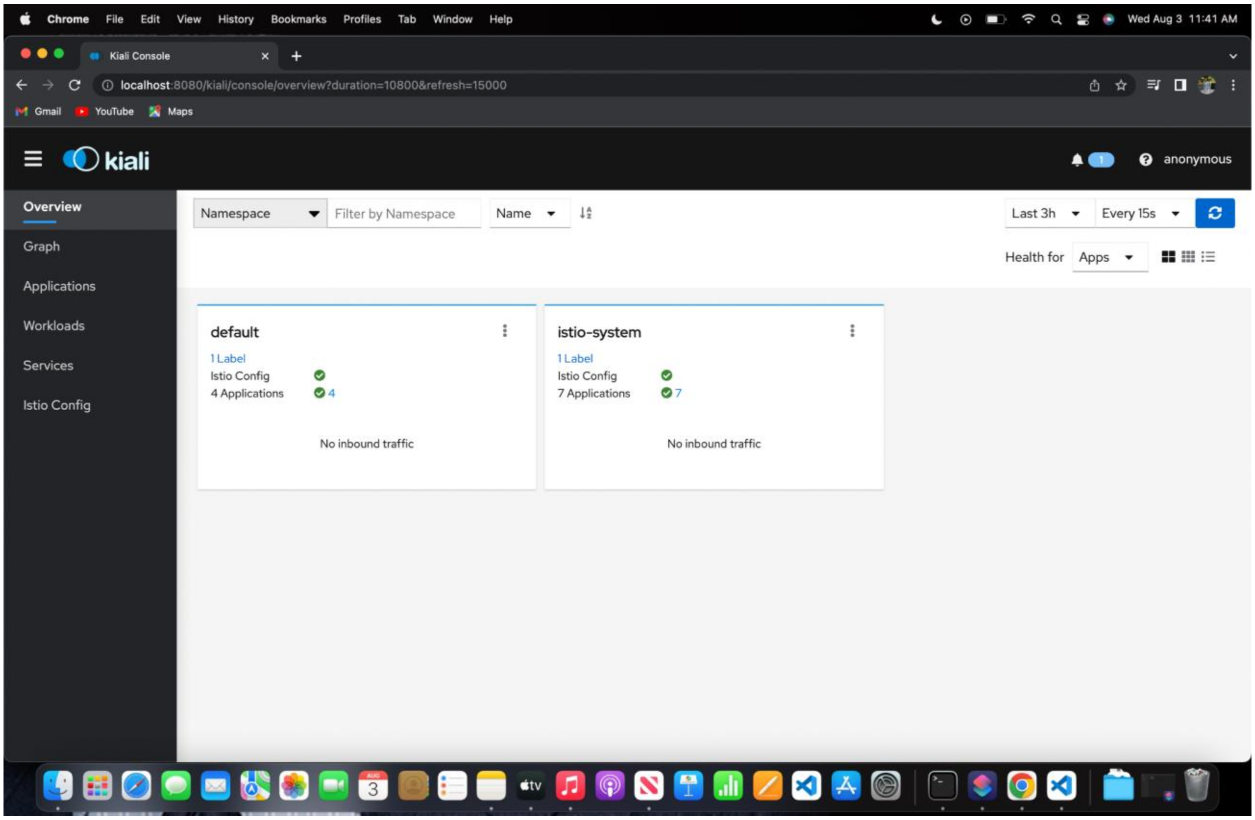
— Reviewer1
★★★★★

Absolutely fun and entertaining. The play lacks thematic depth when compared to other plays by Shakespeare.

— Reviewer2
★★★★☆

Reviews served by:
reviews-v2-858f99c99-cnlr6

The image above shows the front end of the application deployed. It is accessible via AWS ALB.



localhost:8080/kiali/console/overview?duration=10800&refresh=15000

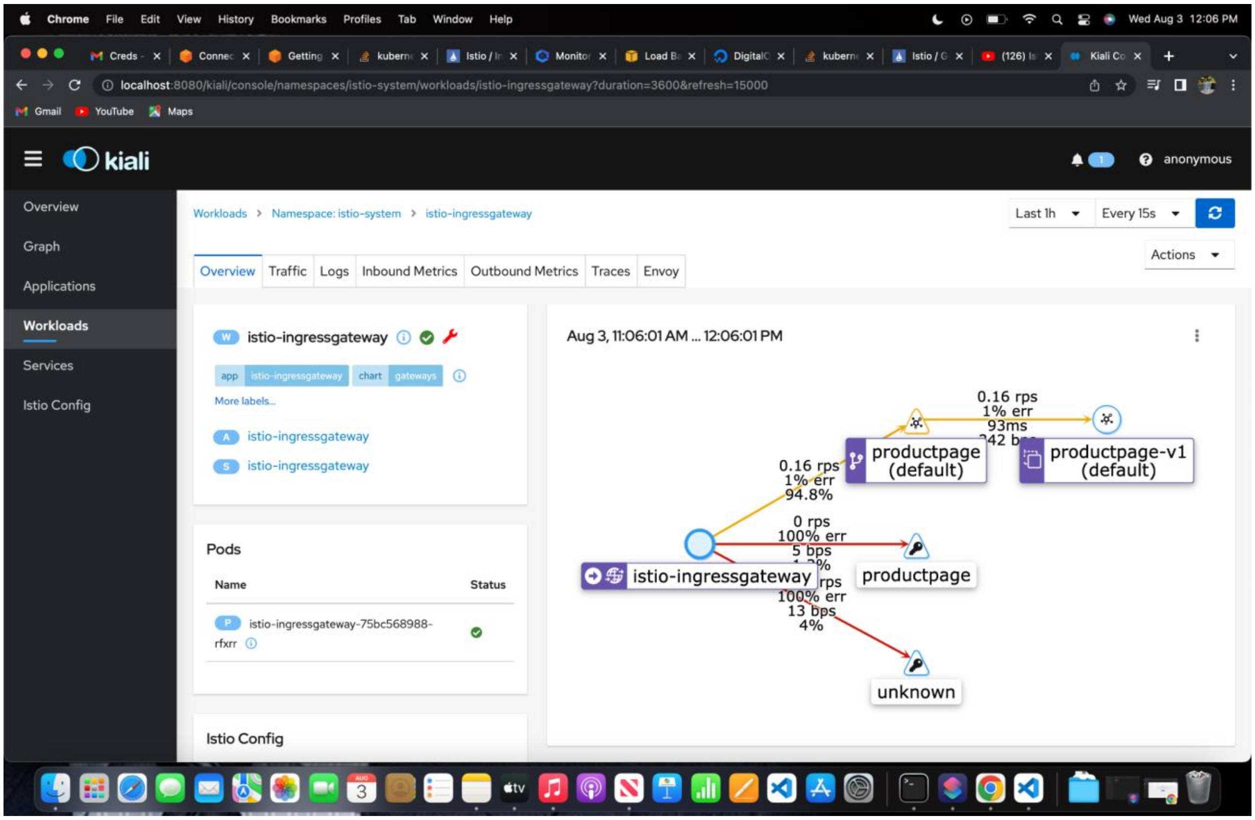
Last 3h | Every 15s

Health for Apps

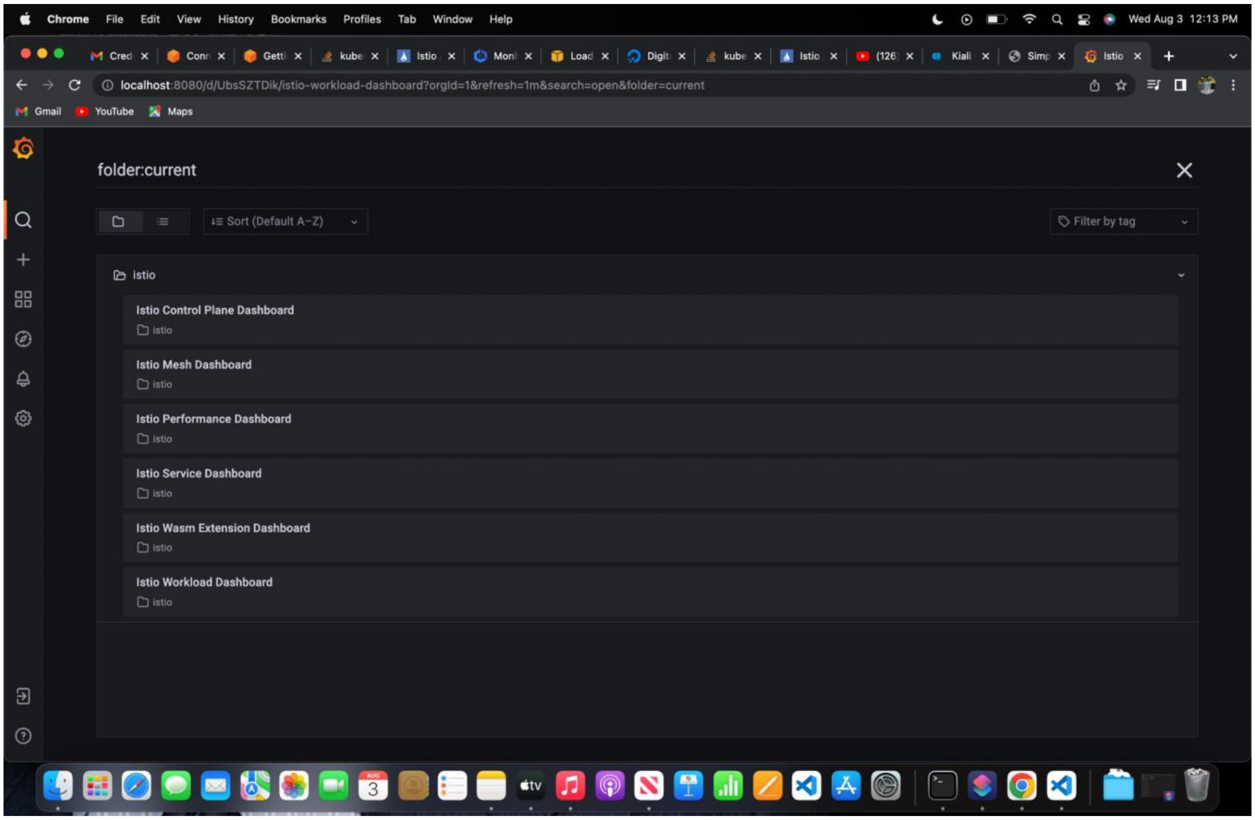
default
1 Label
Istio Config ✓
4 Applications ✓ 4
No inbound traffic

istio-system
1 Label
Istio Config ✓
7 Applications ✓ 7
No inbound traffic

The entire application infrastructure can be visualized in the Kiali visualization tool. Here, it is accessed by port forwarding method on localhost:8080.



The best feature of Kiali is graphs. We can literally check each and every internal connection of the application on the dashboard. Along with it, we can check the traffic flow and the duration of request-response can also be monitored.

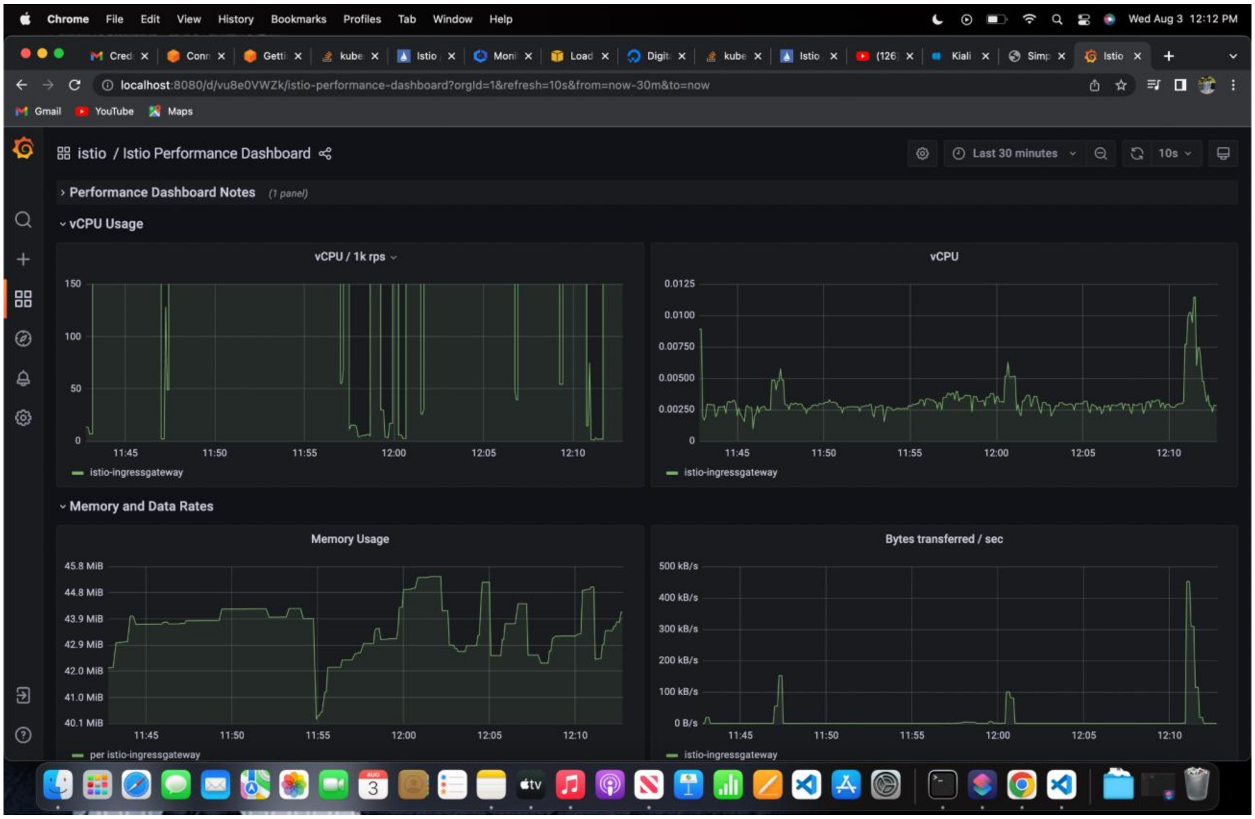


localhost:8080/d/UbsSZTDik/istio-workload-dashboard?orgId=1&refresh=1m&search=open&folder=current

folder:current

istio

- Istio Control Plane Dashboard — istio
- Istio Mesh Dashboard — istio
- Istio Performance Dashboard — istio
- Istio Service Dashboard — istio
- Istio Wasm Extension Dashboard — istio
- Istio Workload Dashboard — istio



localhost:8080/d/vu8e0VWZk/istio-performance-dashboard?orgId=1&refresh=10s&from=now-30m&to=now

istio / Istio Performance Dashboard

› Performance Dashboard Notes *(1 panel)*

⌄ vCPU Usage

⌄ Memory and Data Rates

Grafana is also integrated with the Istio and helps us to monitor the application more closely. For the demo purpose, Grafana is deployed and exposed using a port-forwarding method.
As shown in the images above, a variety of metrics can be pulled from the envoy proxy and can be visualized over the Grafana dashboard.