ISTIO with Bookinfo App

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DEVOPS ENTERPRISE SUMMIT

AN IT REVOLUTION EVENT

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Dhanush is working as a Site Reliability Engineer for Cisco DevNet with focus around Cloud Infrastructure Management and Automation. He deeply cares about helping developers and platform team to automate various aspects of DevOps. Dhanush is passionate about Terraform, K8s, Git, Ansible, Docker, Jenkins and puppet. Currently certified in AWS, Kubernetes, Docker and Terraform.

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- What are Micro Services?
- Example Micro Service Architecture
- Challenges of Microservice Architecture
- ISTIO Architecture
- Core features of Istio
- Traffic management
- Demo

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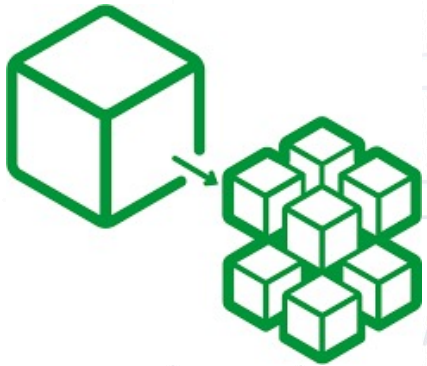
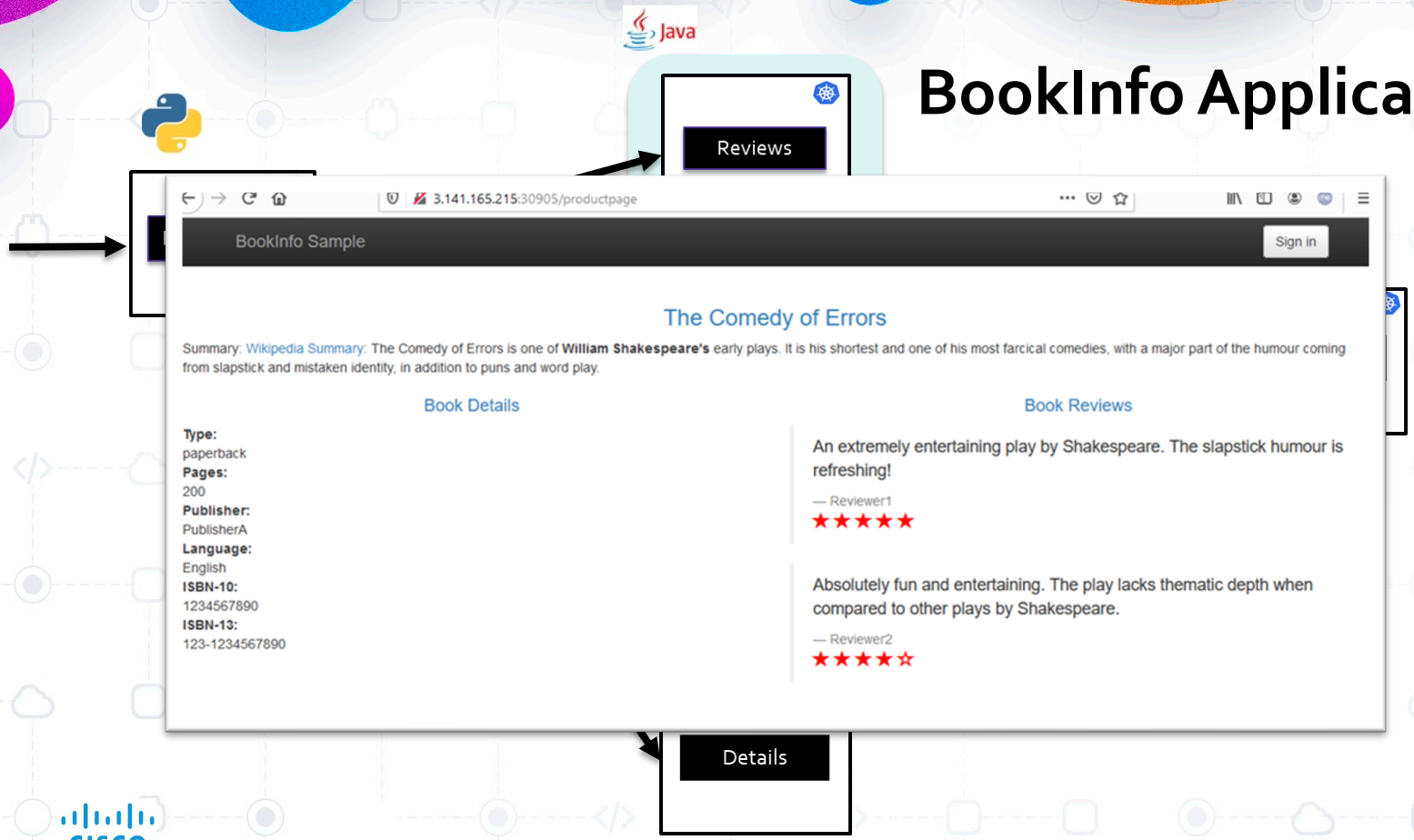
What are Microservices ??

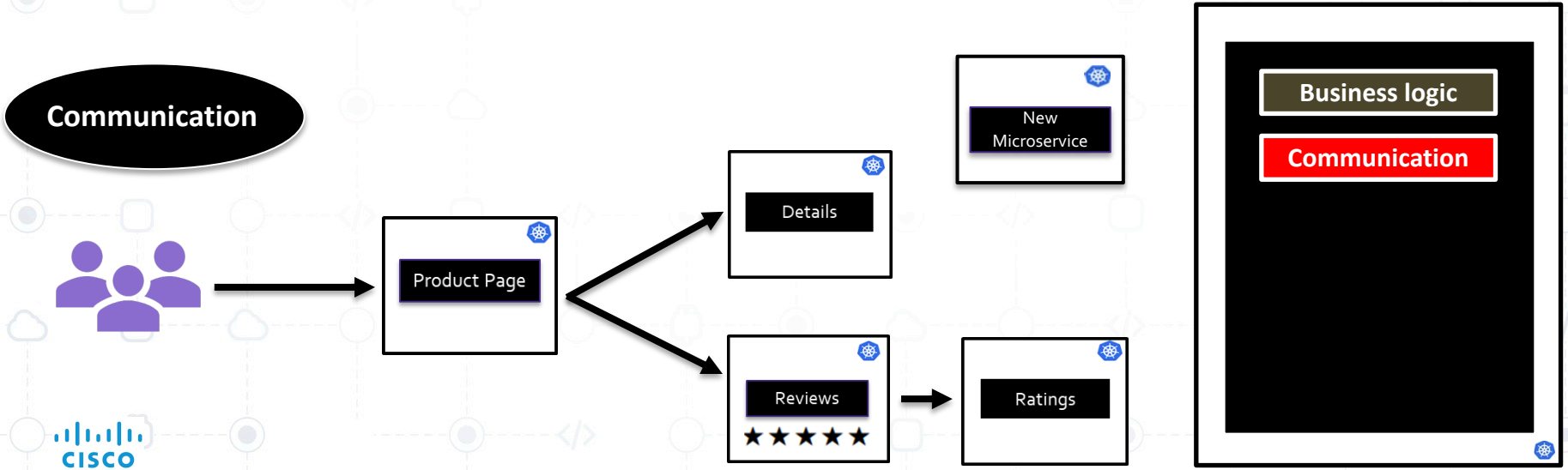
- Microservices are an architectural approach to building applications.
- Single application is composed of many loosely coupled and independently deployable smaller components, or services



BookInfo Application



Challenges of Microservice Architecture



Challenges of Microservice Architecture

Security

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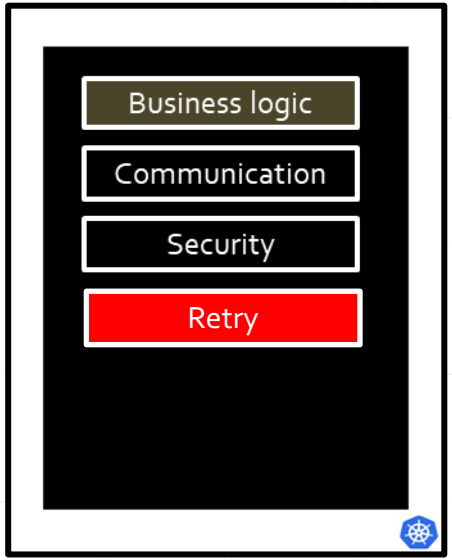
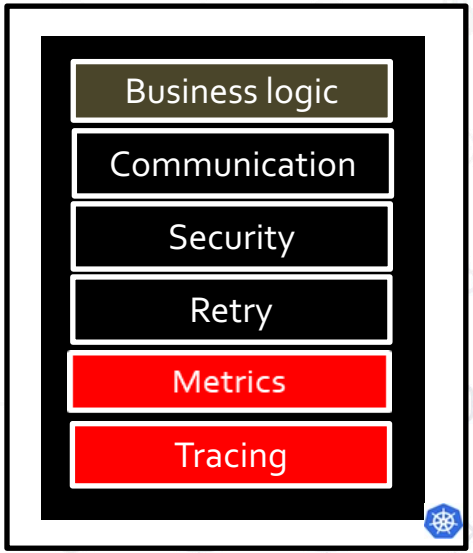
Challenges of Microservice Architecture

Retry Logic



Challenges of Microservice Architecture

Metrics & Tracing



Challenges of Microservice Architecture

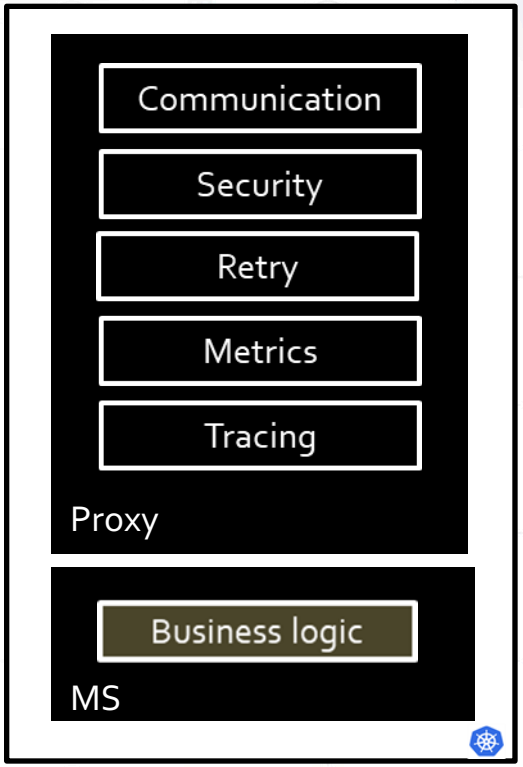
- These Nonbusiness logic must be added to each application
- Developers don't work on actual service/Application logic
- Adds complexity to the services

Solution: Service Mesh with Sidecar Pattern

Sidecar Proxy

Control Plane

- Handles networking logic
- Acts as a Proxy
- Third party Application
- Cluster operators can configure it easily
- Developers can focus on the actual business Logic
- Control Plane injects the Sidecar Proxy



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What is Service Mesh ?? ISTIO ??

Service Mesh is a Pattern

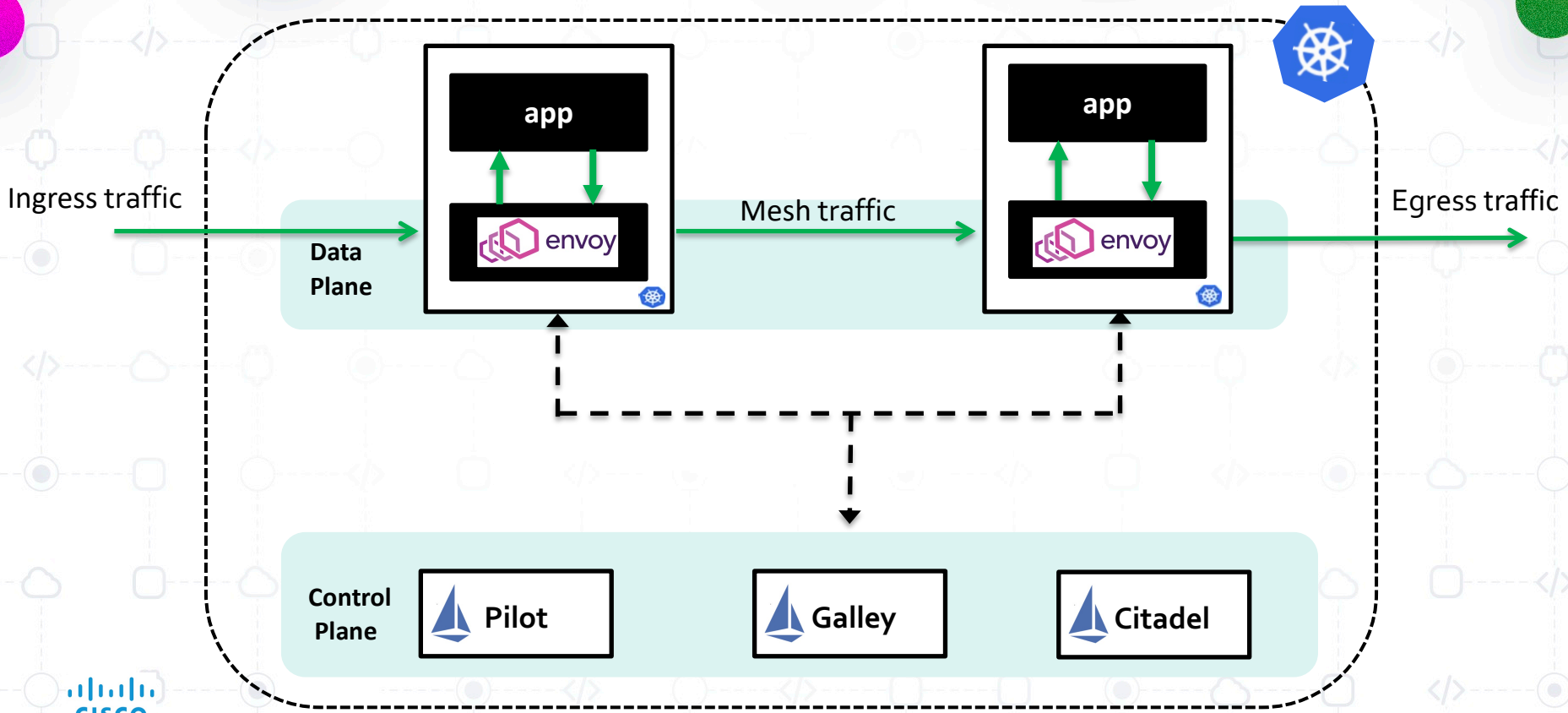
ISTIO is an Implementation

A service mesh is a platform layer on top of the infrastructure layer that enables managed, observable, and secure communication between individual services.

Istio is a configurable, open-source service-mesh layer that connects, monitors, and secures the containers in a Kubernetes cluster.

Note: It overcomes all the challenges we had discussed without any changes to the application code of each microservice.

Istio Architecture



ISTIO core features

- Traffic Management
- Authentication between services
- Authorization between services
- Secure Communication between services
- Observability(tracing, monitoring and logging)

Configure ISTIO

- YAML files
- CustomResourceDefinitions(CRD)
- No need to learn Istio specific language.

ISTIO Installation Configuration Profiles

- default: This is recommended for production deployments and configures the default settings of the IstioOperator API
- demo: This is to play around with Istio and for learning purpose, especially when using Minikube or a setup that has limited resources
- minimal: It contains a minimum number of features just to support traffic management.
- external: used for configuring a remote cluster that is managed by an external control plane or by a control plane in a primary cluster of a multicluster mesh
- empty: deploys nothing. This can be useful as a base profile for custom configuration
- preview: the preview profile contains features that are experimental

Traffic management API resources

- Gateway
- Virtual Service
- DestinationRule

ISTIO Gateway

Gateways are primarily used to manage ingress traffic, but we can also configure egress gateways.

```
apiVersion: networking.istio.io/v1alpha3
kind: Gateway
metadata:
  name: bookinfo-gateway
spec:
  selector:
    istio: ingressgateway # use istio default controller
  servers:
  - port:
      number: 80
      name: http
      protocol: HTTP
    hosts:
    - "*"
```

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ISTIO Virtual Service

- Istio VirtualService is one level higher than Kubernetes service. A VirtualService defines a set of traffic routing rules to apply when a host is addressed.
- It can be used to apply traffic routing, fault injection, retries , redirect, rewrite and many other configurations to services.

```
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: reviews-route
spec:
  hosts:
  - reviews.prod.svc.cluster.local
  http:
  - name: "reviews-v2-routes"
    match:
    - uri:
        prefix: "/wpcatalog"
    - uri:
        prefix: "/consumercatalog"
    rewrite:
      uri: "/newcatalog"
    route:
    - destination:
        host: reviews.prod.svc.cluster.local
        subset: v2
  - name: "reviews-v1-route"
    route:
    - destination:
        host: reviews.prod.svc.cluster.local
        subset: v1
```

ISTIO DestinationRule

DestinationRule defines policies that apply to traffic intended for a service after routing has occurred.

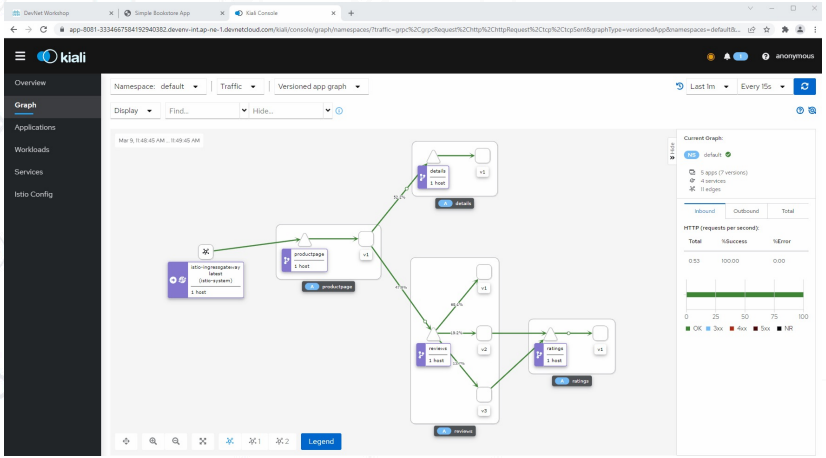
```
apiVersion: networking.istio.io/v1alpha3
kind: DestinationRule
metadata:
  name: productpage
spec:
  host: productpage
  subsets:
  - name: v1
    labels:
      version: v1
---
apiVersion: networking.istio.io/v1alpha3
kind: DestinationRule
metadata:
  name: reviews
spec:
  host: reviews
  subsets:
  - name: v1
    labels:
      version: v1
  - name: v2
    labels:
      version: v2
  - name: v3
    labels:
      version: v3
---
```

Traffic Management

- Routing to a specific version.
- Traffic Splitting.
- User Identity-Based Routing.

Routing to a specific version

Requests can be routed dynamically to multiple versions of microservice. In order to route to one version only, we can apply virtual services that sets the default version of microservice.




```
dhanushgowda91@master-node:~/Istio/istio-1.11.2$ cat samples/bookinfo/networking/virtual-service-all-v1.yaml
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: productpage
spec:
  hosts:
  - productpage
  http:
  - route:
    - destination:
        host: productpage
        subset: v1
---
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: reviews
spec:
  hosts:
  - reviews
  http:
  - route:
    - destination:
        host: reviews
        subset: v1
---
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: ratings
spec:
  hosts:
  - ratings
  http:
  - route:
    - destination:
        host: ratings
        subset: v1
---
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: details
spec:
  hosts:
  - details
  http:
  - route:
    - destination:
        host: details
        subset: v1
---
```

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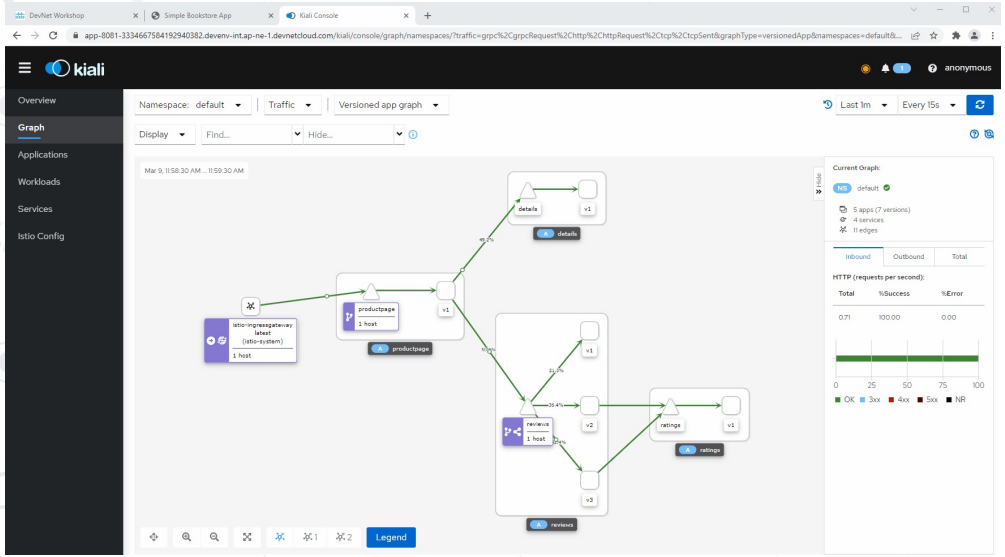
Traffic shifting

Traffic can be shifted from one version to another version of microservice. A common use case is to migrate traffic gradually from an older version to a new one




```
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: reviews
spec:
  hosts:
    - reviews
  http:
  - route:
    - destination:
        host: reviews
        subset: v2
      weight: 50
    - destination:
        host: reviews
        subset: v3
      weight: 50
```

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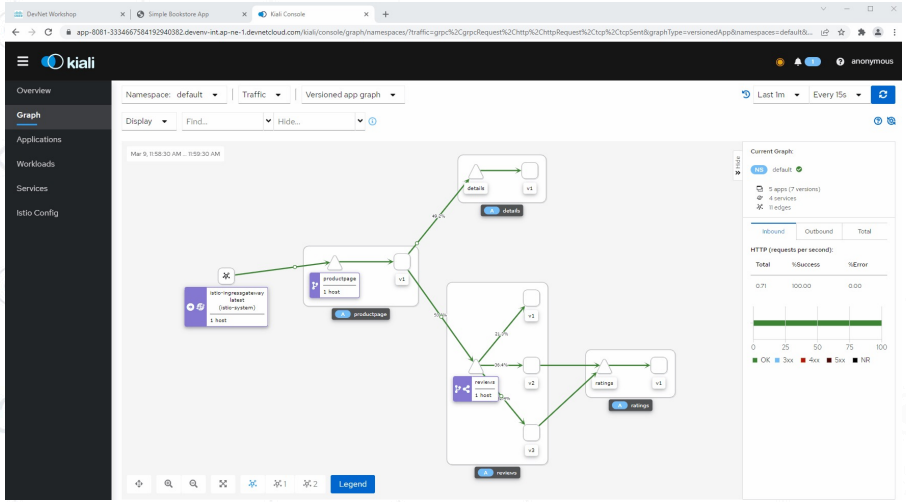
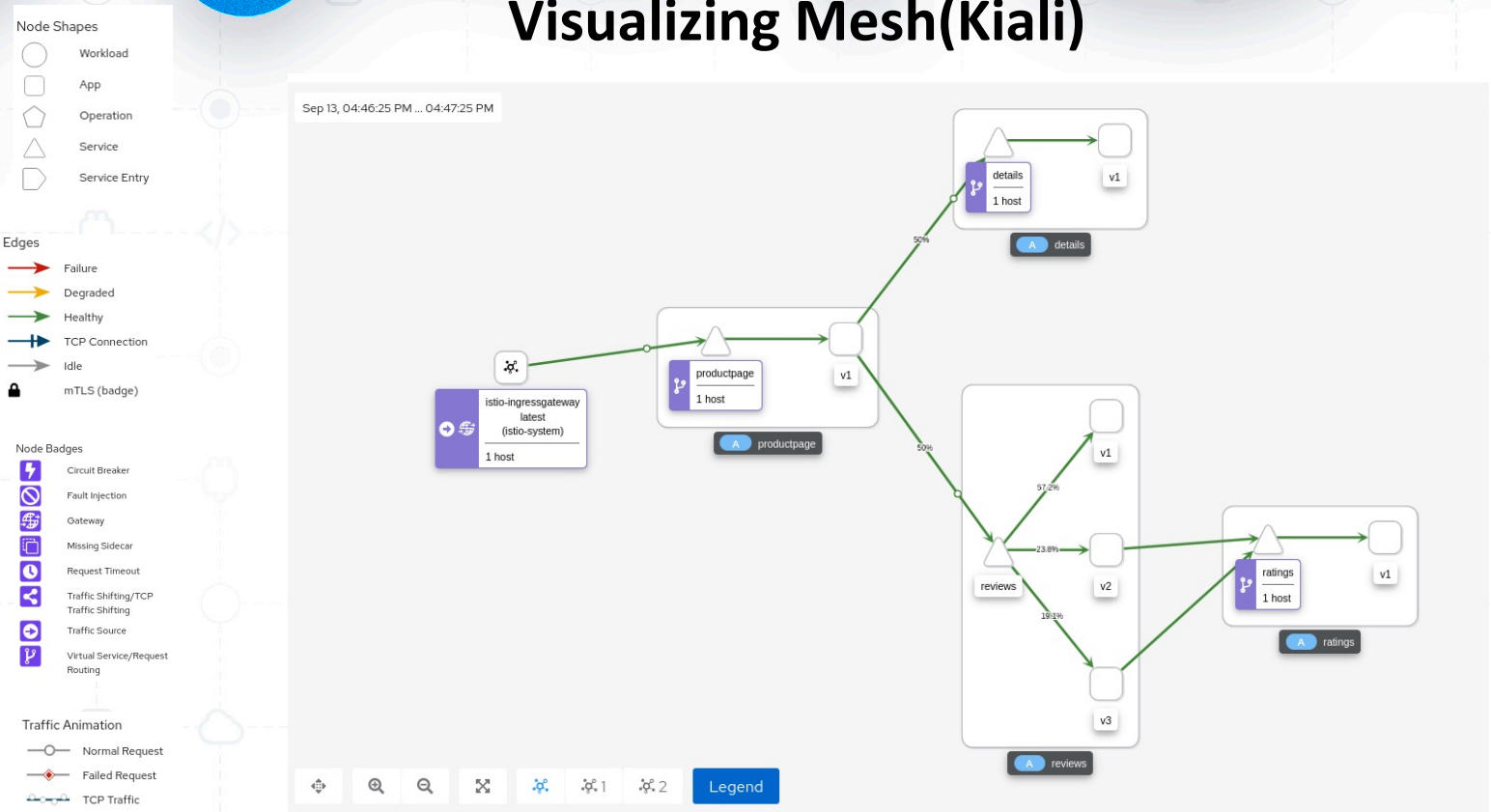
User Identity-Based Routing

Traffic from a specific user can be routed to a specific micro service version. In the screenshot shown traffic from user Jason will be routed to a service reviews v2 and rest all the traffic routed to v1.Use case is to route traffic for users from different browser agents like **Mozilla Firefox/IE/Safari** to different version of microservices.




```
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: v1
```

Visualizing Mesh(Kiali)



- ISTIO Installation
- Bookinfo app deployment
- Visualizing mesh using Kiali
- Traffic management

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Continue your learning journey

- https://istio.io
- https://github.com/istio/istio
- https://developer.cisco.com


ThankYou!