Kubernetes - Istio

Implementation Blue Green Deployment with Istio

Alan Adi Prastyo
alan.prasetyo@i-3.co.id

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About Me

Alan Adi Prastyo

Linux Geek, Kubernetes & Openshift Enthusiast

RHCSA, RHCE, RHCSA in Openstack, Red Hat Certified Specialist in Openshift Administration, MTCNA, Certified Openstack Administration (COA), DevOps Foundation Certified, 3Scale.

Senior Consultant - PT Inovasi Informatika Indonesia (I3)

Agenda

✓ Monolith & Microservices apps

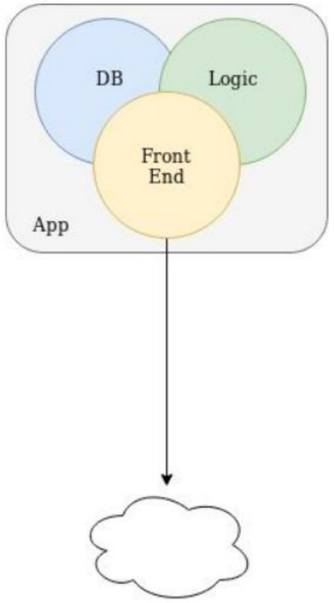
✓ Istio Architecture & Introduction

✓ Blue Green Deployment

✓ Demo

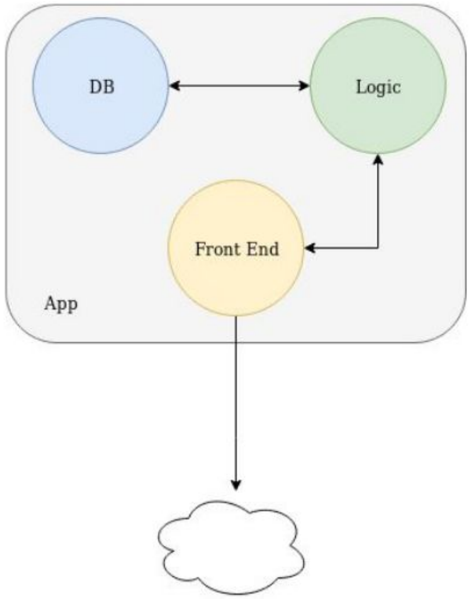
Remember the monolith?

- Strong Coupling between different modules causing anti-patterns in communicating between different modules
- Difficulties in Scaling
- Updating to new version requires complete re-install
- Problem in one module can cause the whole application to crash
- Difficult to move to a new framework or technology



Microservices Architecture

- API contract between different modules/service ensures that each module can be developed and maintained independently
- Each service can be scaled independently
- Updating to new version requires only updates to a specific services
- Allows for easier CI/CD



Success !

- Gained development velocity!
- Easy testing because of abstractions!
- Scale services independently!

Evolution of the Ecosystem

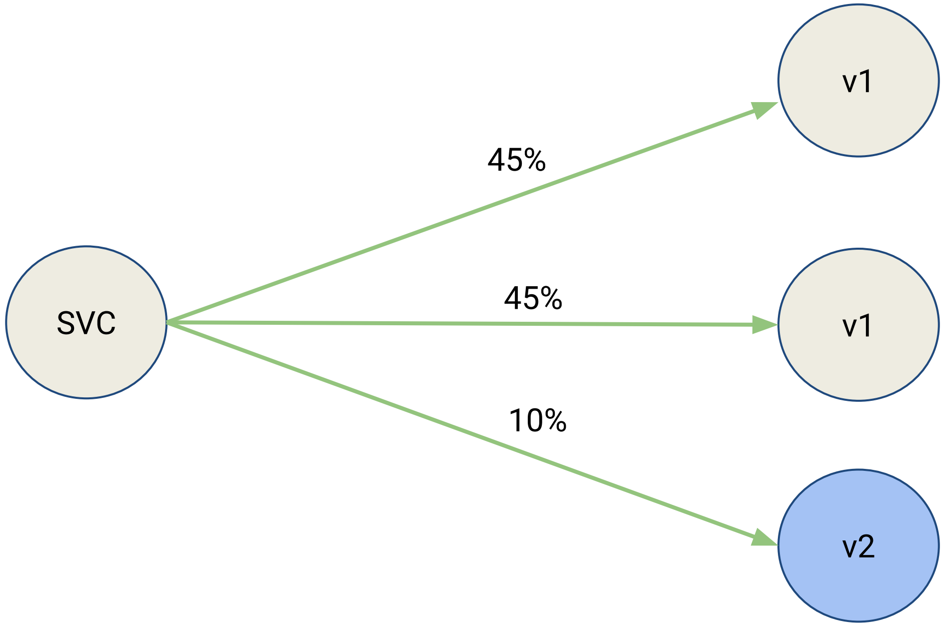
docker

LXC

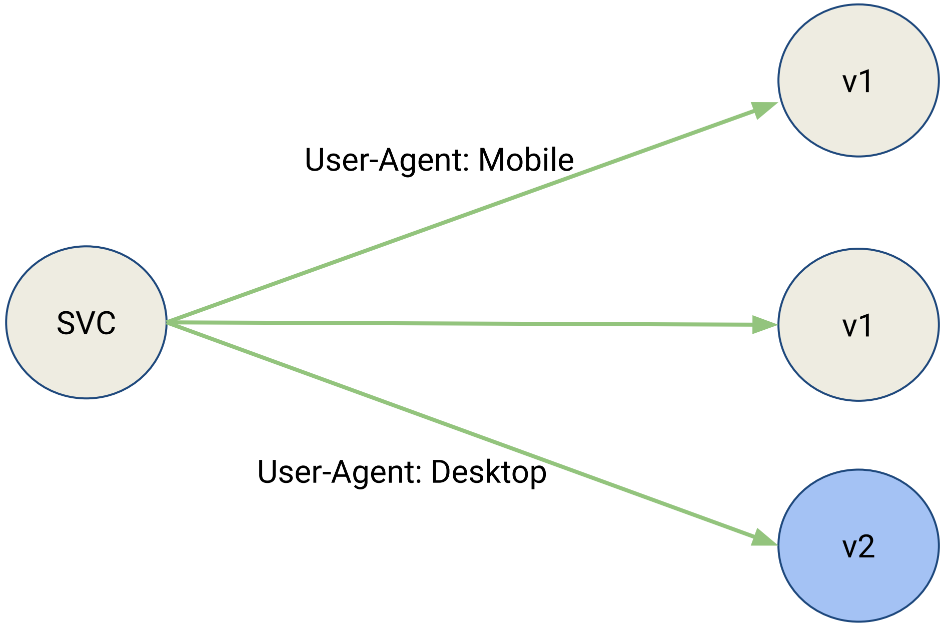
kubernetes

OPENSHIFT

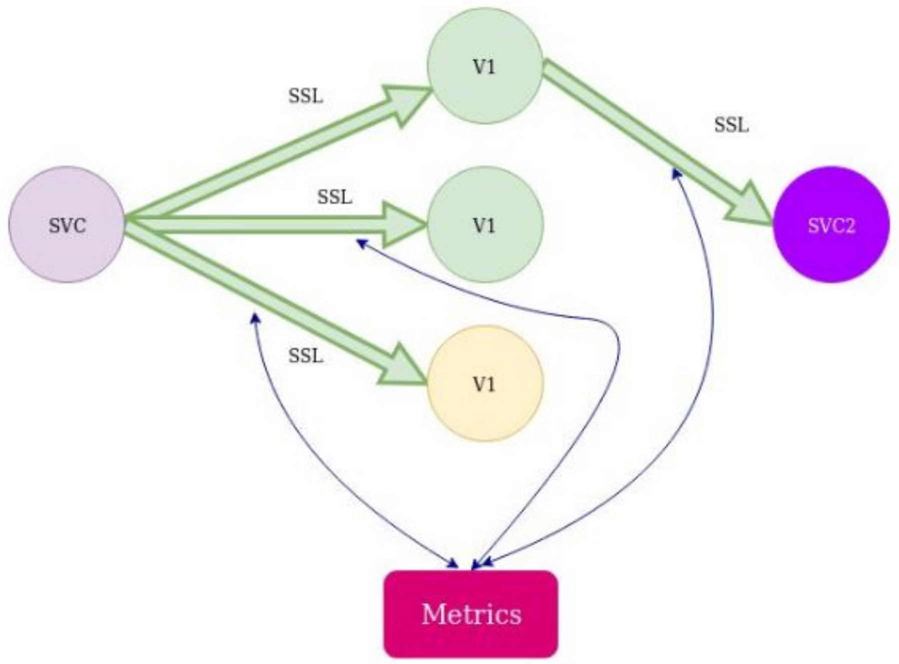
Challenges with the Microservices Architecture



Challenges with the Microservices Architecture



Challenges with the Microservices Architecture



At what cost?

- Replaced a reliable in-process call with an unreliable RPC
- ease to change apps version with a complicated change app version.
- Secure in-process communication is replaced by the insecure network.
- Latency went up

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Can we fix it?

- Add the blue green deployment method
- Add entry-exit traces
- Secure inter-service connections with strong authentication

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Services Mesh

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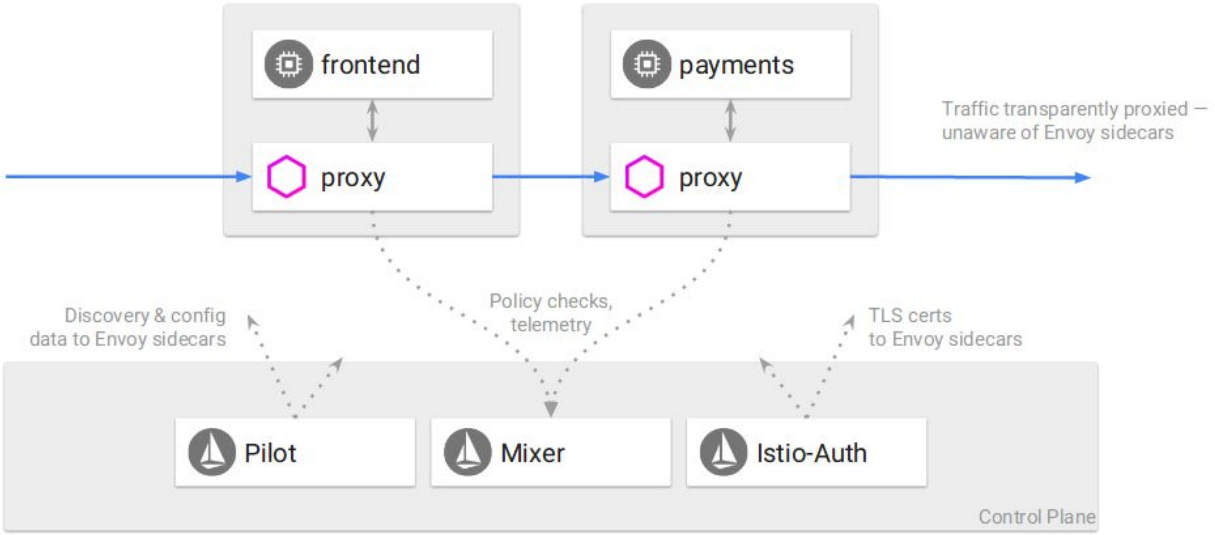
Istio - Service Mesh

A complete framework for **connecting, securing, managing** and **monitoring** services

Istio Architecture


frontend
payments
proxy
proxy
Traffic transparently proxied — unaware of Envoy sidecars
Discovery & config data to Envoy sidecars
Policy checks, telemetry
TLS certs to Envoy sidecars
Pilot
Mixer
Istio-Auth
Control Plane

Istio Architecture

An Istio service mesh is logically split into a data plane and a control plane.

- The **data plane** is composed of a set of intelligent proxie (Envoy) deployed as sidecars. These proxies mediate and control all network communication between microservices along with Mixer, a general-purpose policy and telemetry hub.

- The **control plane** manages and configures the proxies to route traffic. Additionally, the control plane configures Mixers to enforce policies and collect telemetry.

Istio - Sidecar Injection

Sidecar describes the configuration of the sidecar proxy that mediates inbound and outbound communication to the workload instance it is attached to. By default, Istio will program all sidecar proxies in the mesh with the necessary configuration required to reach every workload instance in the mesh, as well as accept traffic on all the ports associated with the workload.

https://istio.io/docs/reference/config/networking/v1alpha3/sidecar/

Istio - Gateway

```yaml
apiVersion: networking.istio.io/v1alpha3
kind: Gateway
metadata:
  name: httpbin-gateway
spec:
  selector:
    istio: ingressgateway
  servers:
  - port:
      number: 80
      name: http
      protocol: HTTP
    hosts:
    - "httpbin.example.com"
```

Gateway describes a load balancer operating at the edge of the mesh receiving incoming or outgoing HTTP/TCP connections.

Istio - VirtualService

```
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: reviews-route
spec:
  - route:
    - destination:
        host: reviews.prod.svc.cluster.local
        subset: v2
      weight: 25

    - destination:
        host: reviews.prod.svc.cluster.local
        subset: v1
      weight: 75
```

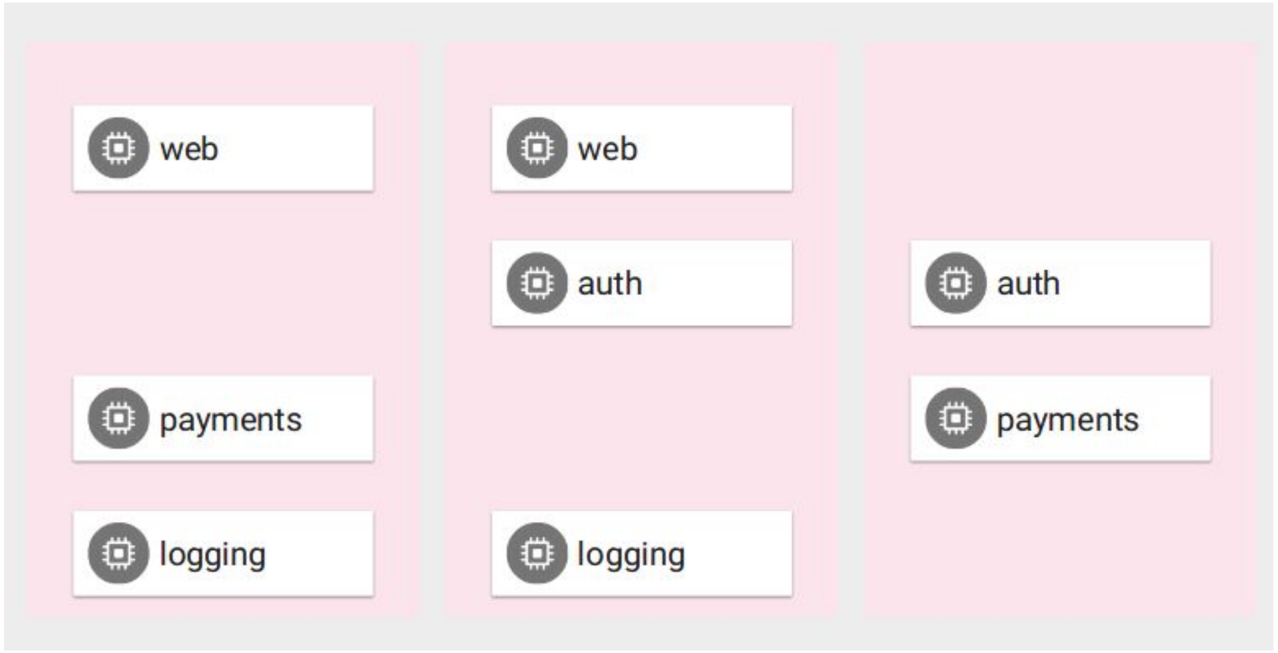
A **VirtualService** defines a set of traffic routing rules to apply when a host is addressed. Each routing rule defines matching criteria for traffic of a specific protocol. If the traffic is matched, then it is sent to a named destination service (or subset/version of it) defined in the registry.

Istio - DestinationRule

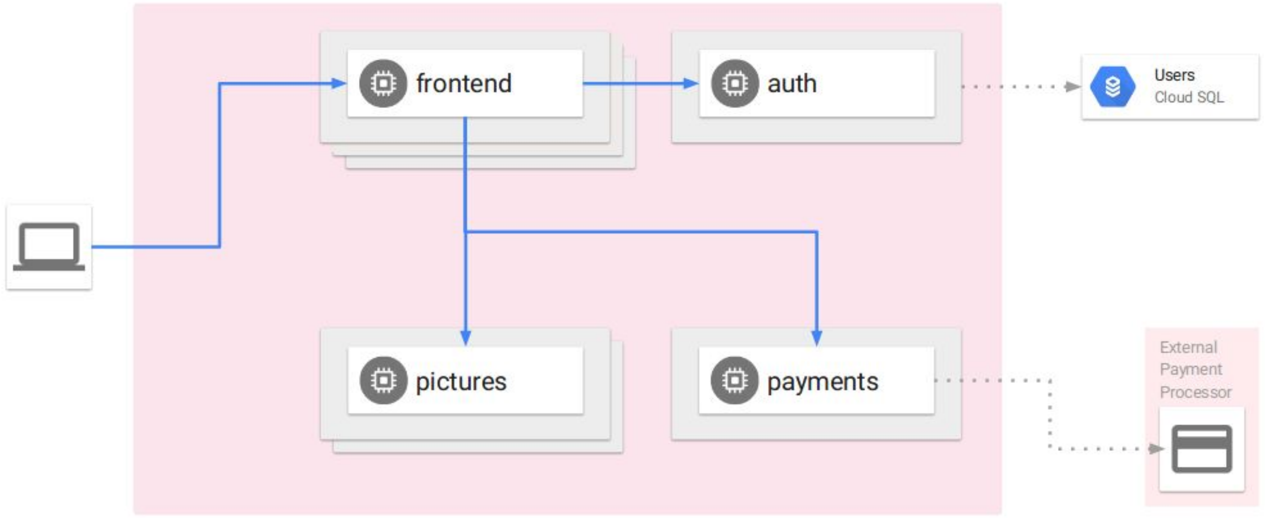
```
apiVersion: networking.istio.io/v1alpha3
kind: DestinationRule
metadata:
  name: bookinfo-ratings
spec:
  host: ratings.prod.svc.cluster.local
  trafficPolicy:
    loadBalancer:
      simple: LEAST_CONN
```

DestinationRule defines policies that apply to traffic intended for a service after routing has occurred. These rules specify configuration for load balancing, connection pool size from the sidecar, and outlier detection settings to detect and evict unhealthy hosts from the load balancing pool.

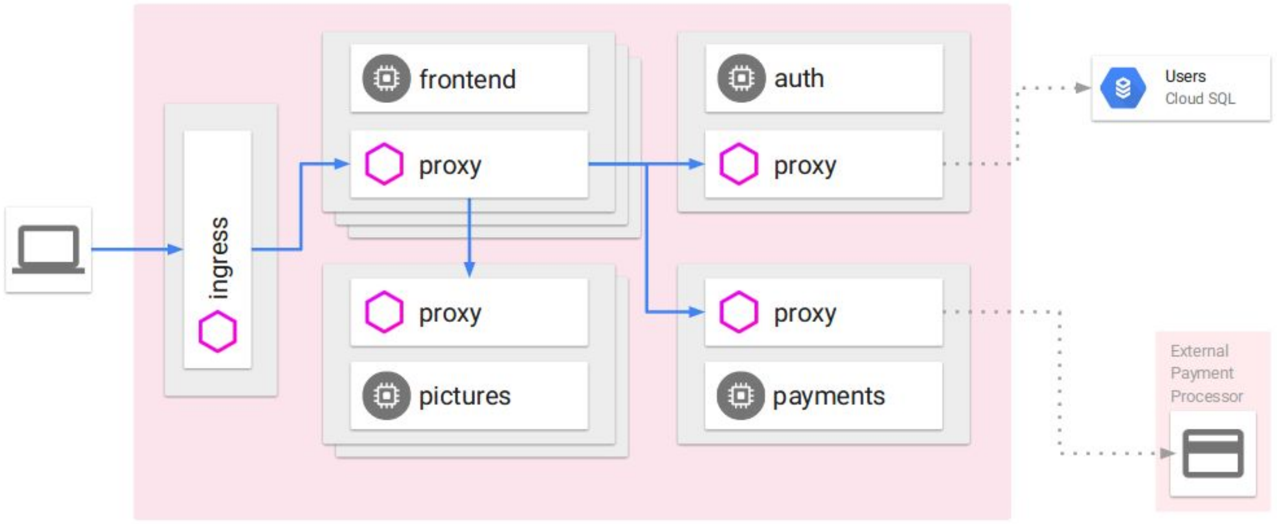
Kubernetes provides service abstraction



Weaving the mesh



Weaving the mesh



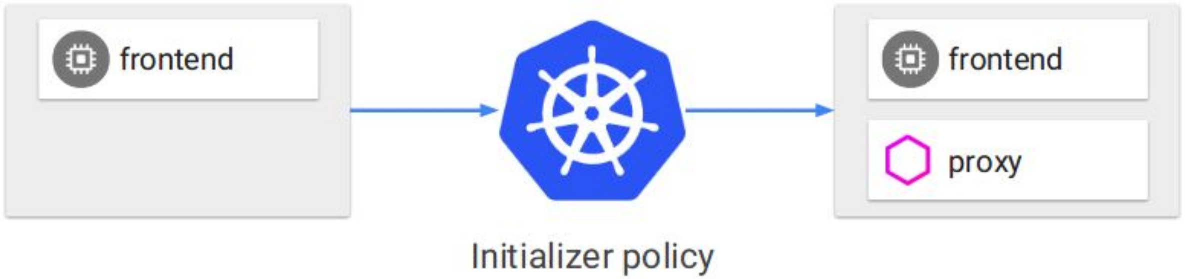
The sidecar proxy: Envoy

- A C++ based L4/L7 proxy
- Low memory footprint
- Battle-tested @ Lyft
  - 100+ services
  - 10,000+ VMs
  - 2M req/s
- An awesome team willing to work with the community!

Injection

```
spec:
  containers:
  - image: frontend:latest
```

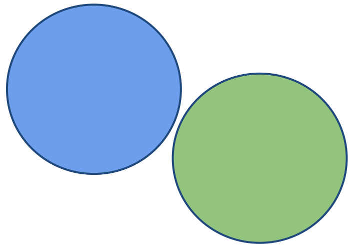
```
spec:
  containers:
  - image: frontend:latest
  - image: istio/proxy
```



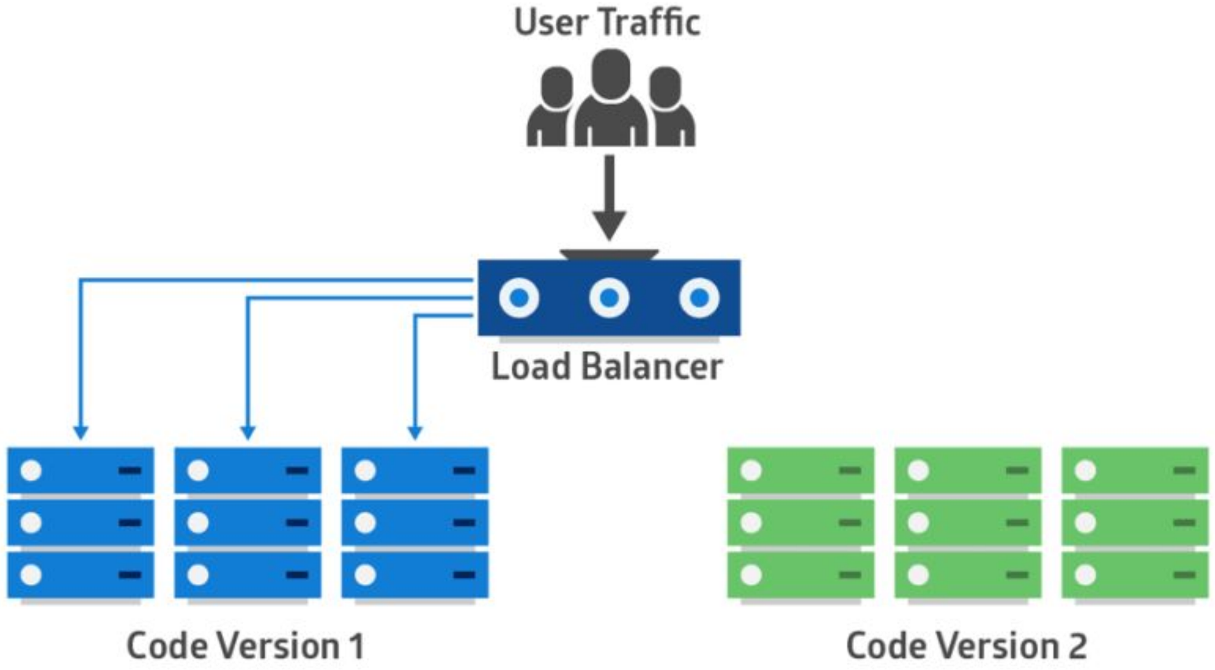
```
initImage: docker.io/istio/proxy_init
 proxyImage: docker.io/istio/proxy
```

Blue Green Deployment

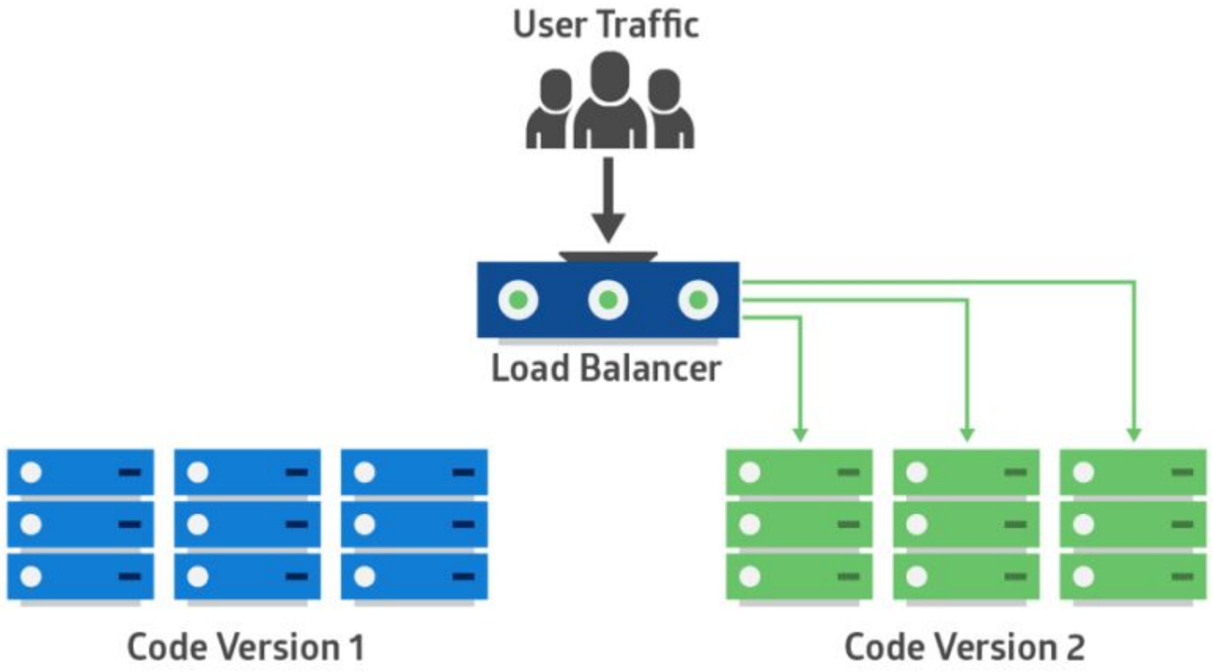
Blue-green deployment is a technique that reduces downtime and risk by running two identical production environments called Blue and Green.



Blue Green Deployment



Blue Green Deployment



DEMO

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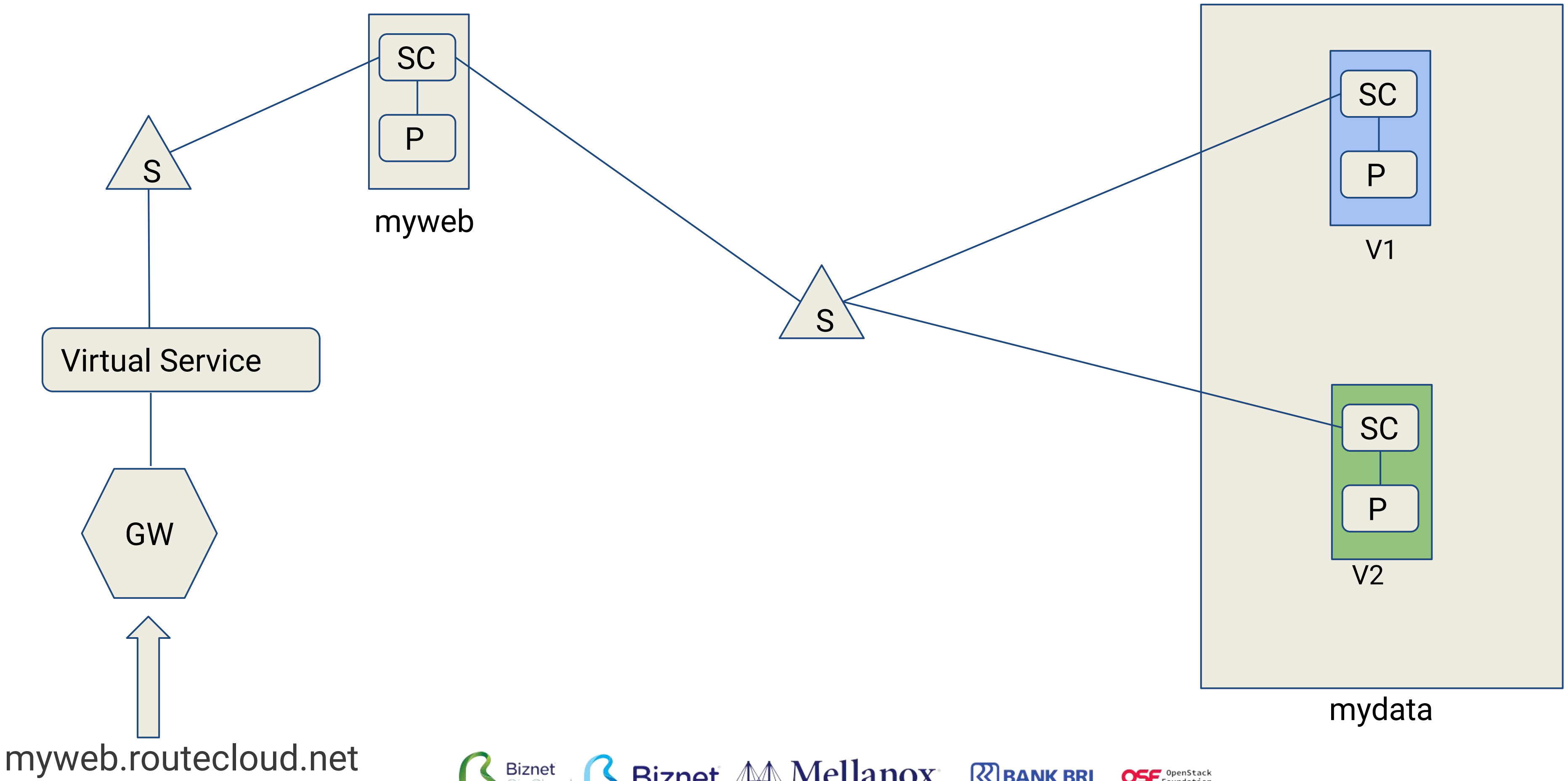
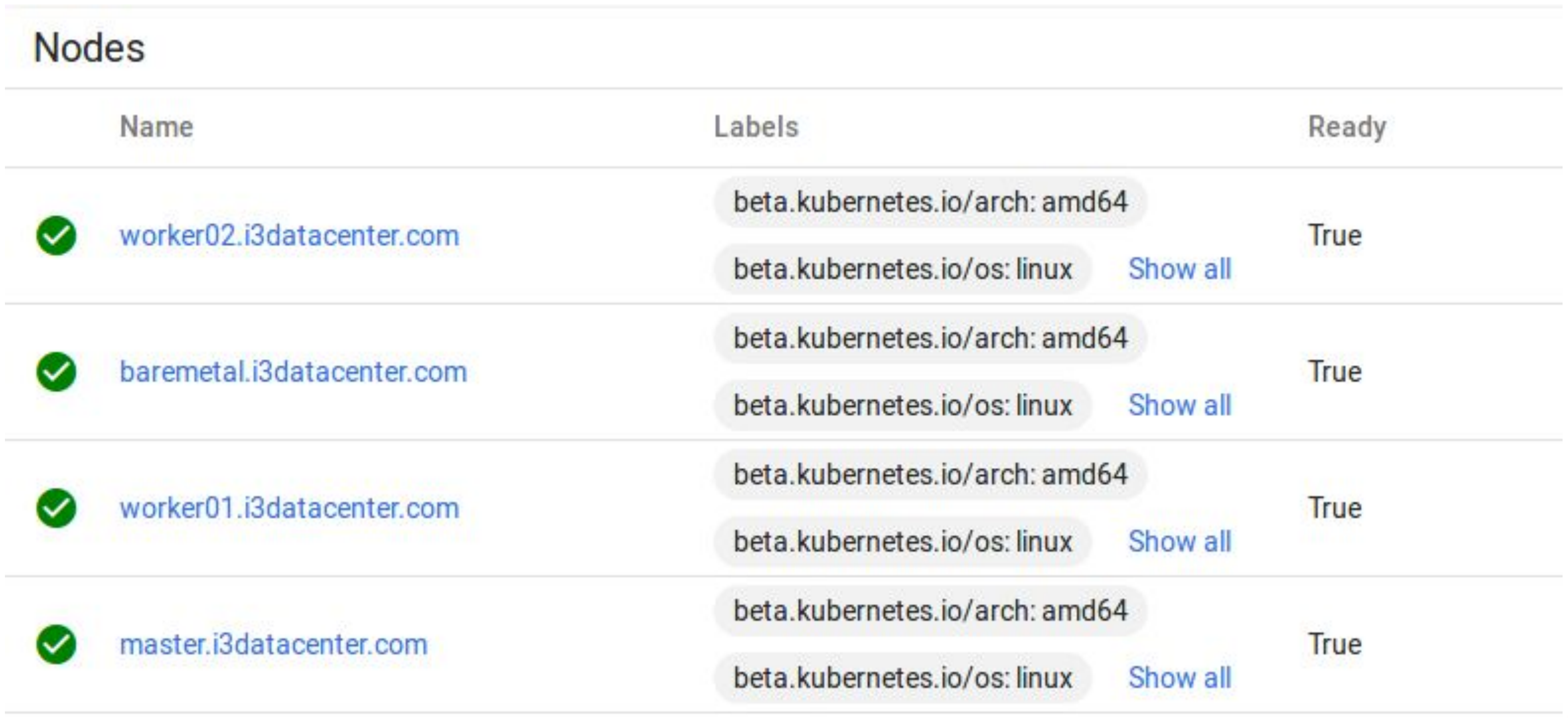
Skema Demo


SC
P
myweb
S
Virtual Service
GW
myweb.routecloud.net
S
SC
P
V1
SC
P
V2
mydata

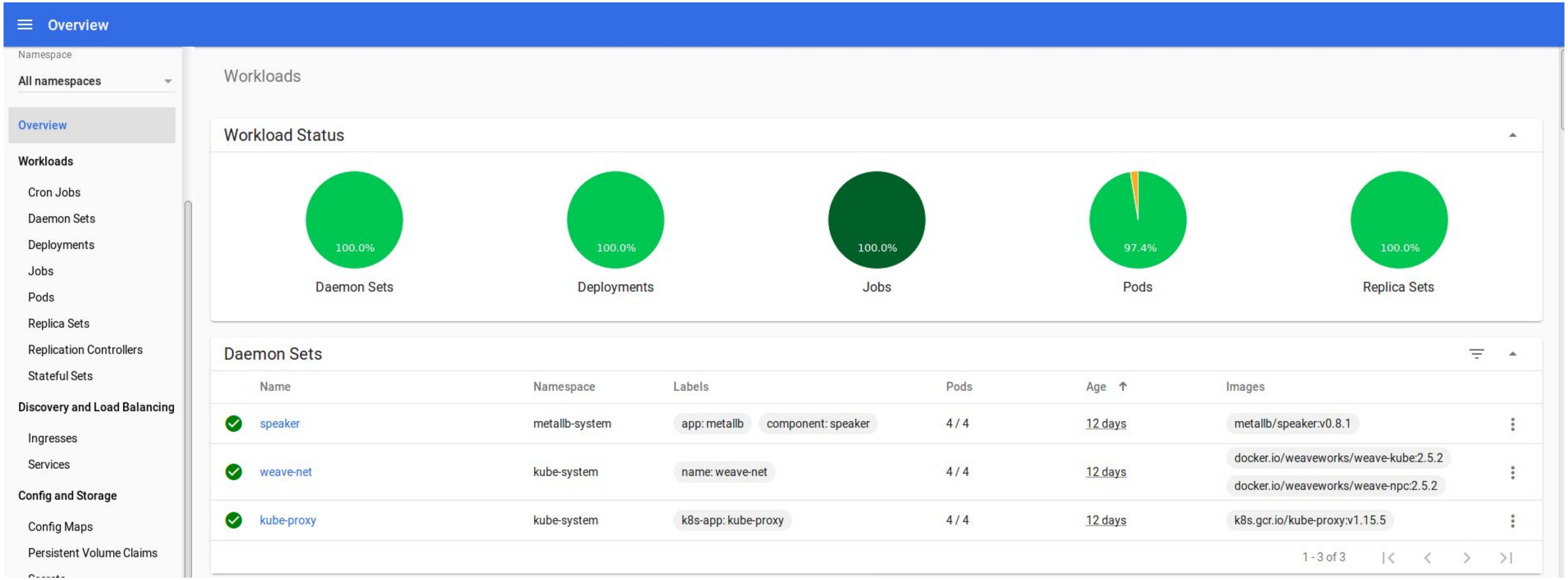
Kubernetes Environment



Nodes

	Name	Labels		Ready
✓	worker02.i3datacenter.com	beta.kubernetes.io/arch: amd64 beta.kubernetes.io/os: linux	Show all	True
✓	baremetal.i3datacenter.com	beta.kubernetes.io/arch: amd64 beta.kubernetes.io/os: linux	Show all	True
✓	worker01.i3datacenter.com	beta.kubernetes.io/arch: amd64 beta.kubernetes.io/os: linux	Show all	True
✓	master.i3datacenter.com	beta.kubernetes.io/arch: amd64 beta.kubernetes.io/os: linux	Show all	True

Kubernetes Environment



Workloads

Workload Status

Daemon Sets	Deployments	Jobs	Pods	Replica Sets
100.0%	100.0%	100.0%	97.4%	100.0%

Daemon Sets

	Name	Namespace	Labels	Pods	Age	Images
✓	speaker	metallb-system	app: metallb, component: speaker	4 / 4	12 days	metallb/speaker:v0.8.1
✓	weave-net	kube-system	name: weave-net	4 / 4	12 days	docker.io/weaveworks/weave-kube:2.5.2, docker.io/weaveworks/weave-npc:2.5.2
✓	kube-proxy	kube-system	k8s-app: kube-proxy	4 / 4	12 days	k8s.gcr.io/kube-proxy:v1.15.5

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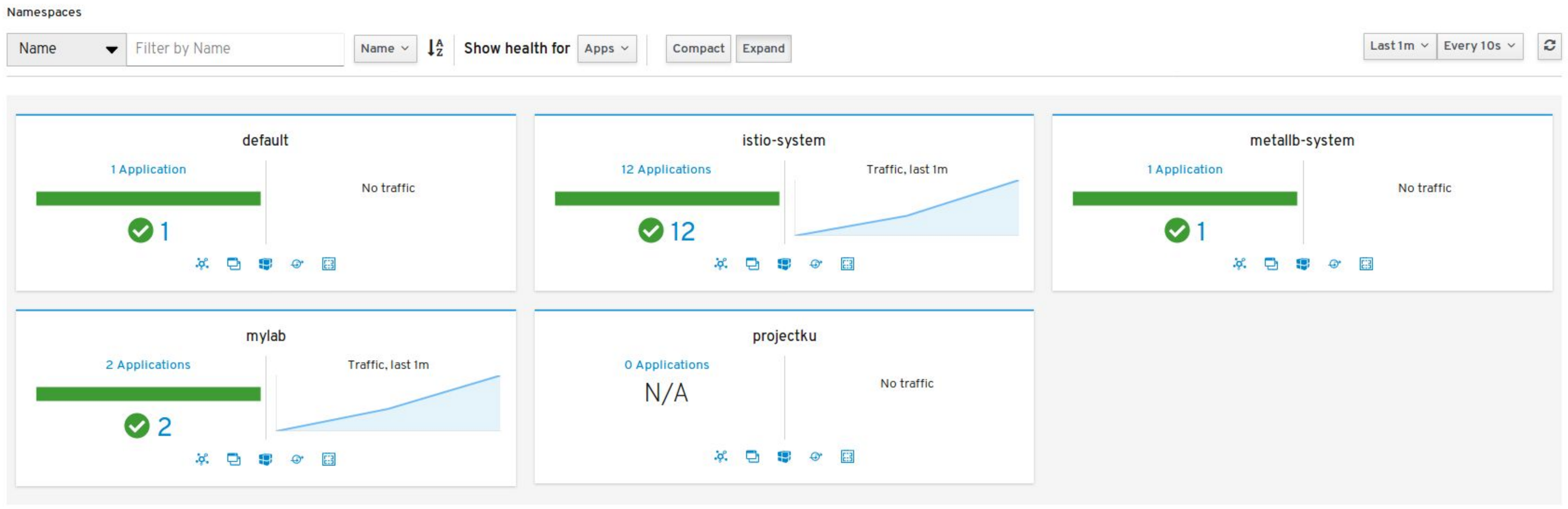
Istio Environment - Kiali



Namespaces

Name | Filter by Name | Name | Show health for Apps | Compact | Expand | Last 1m | Every 10s

default
1 Application
✓ 1
No traffic

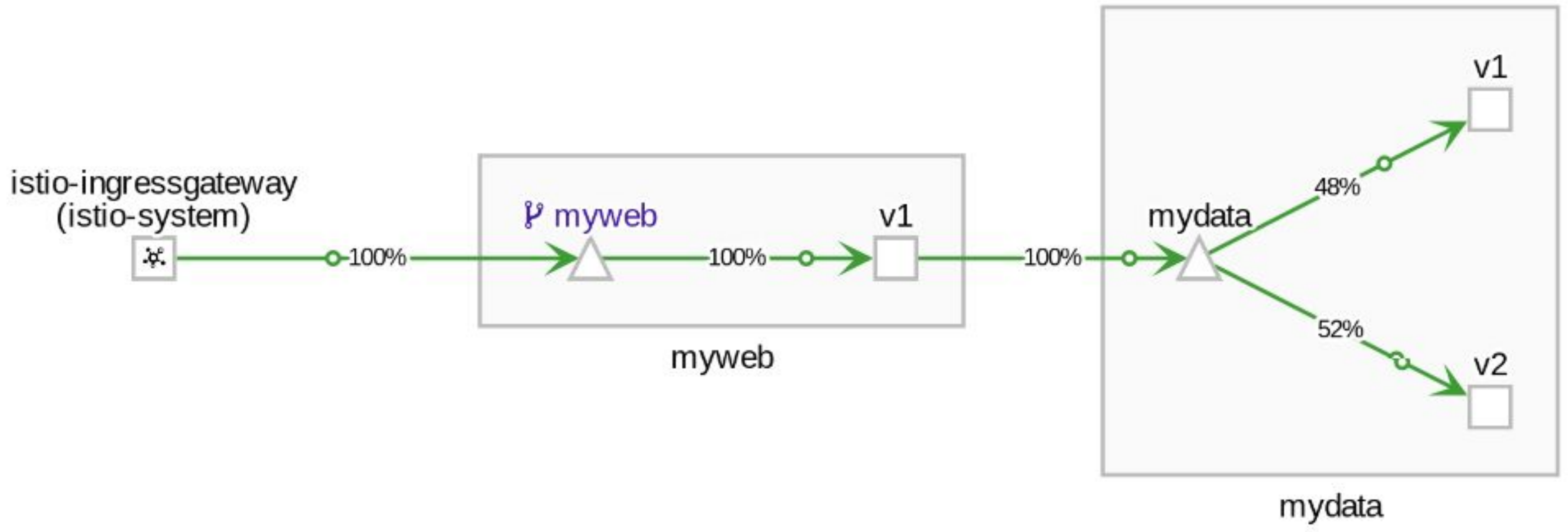
istio-system
12 Applications
✓ 12
Traffic, last 1m

metallb-system
1 Application
✓ 1
No traffic

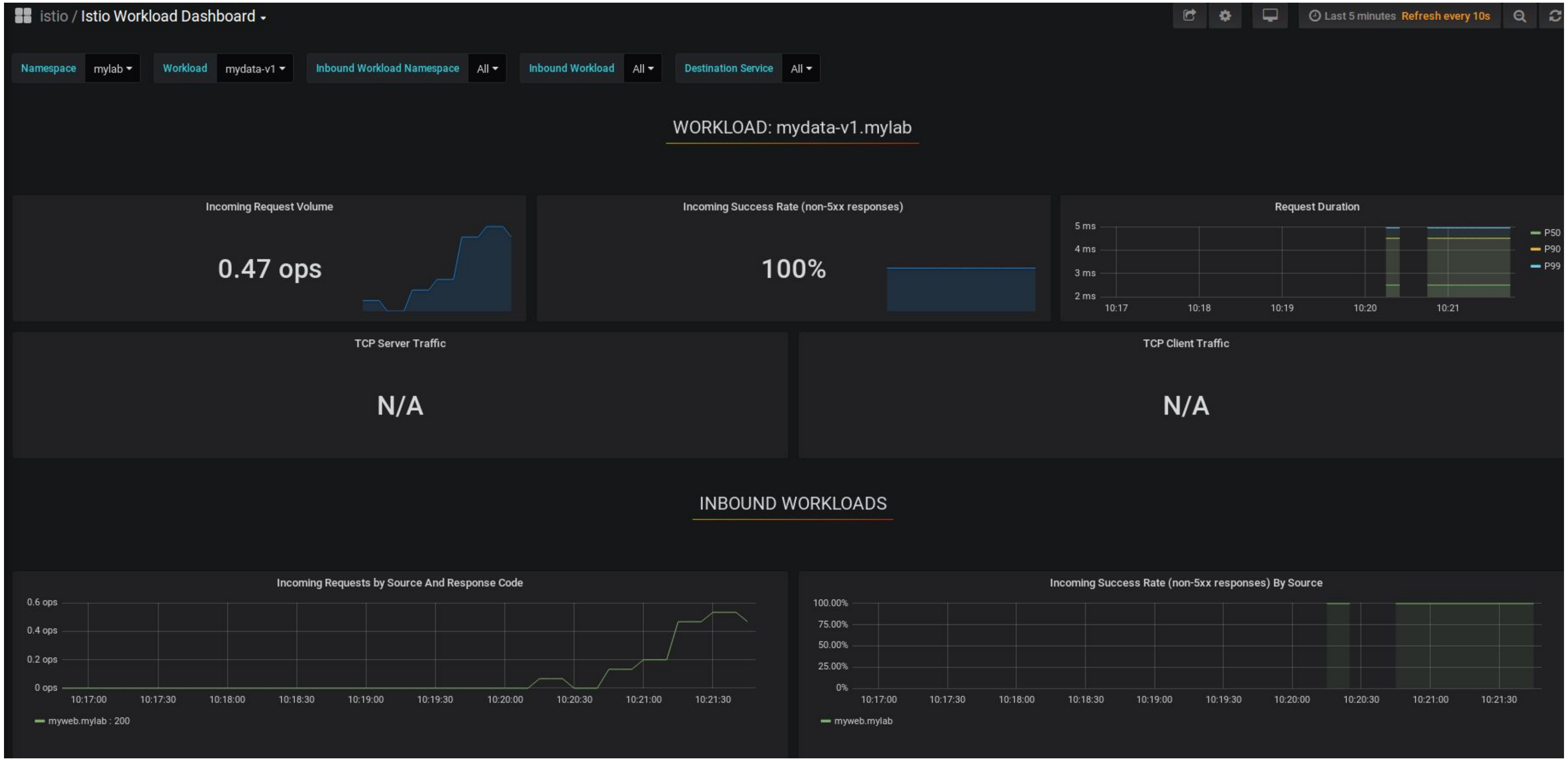
mylab
2 Applications
✓ 2
Traffic, last 1m

projectku
0 Applications
N/A
No traffic

Istio Environment - Kiali



Istio Environment - Kiali



istio / Istio Workload Dashboard
Last 5 minutes Refresh every 10s
Namespace mylab
Workload mydata-v1
Inbound Workload Namespace All
Inbound Workload All
Destination Service All
WORKLOAD: mydata-v1.mylab
Incoming Request Volume
0.47 ops
Incoming Success Rate (non-5xx responses)
100%
Request Duration
P50
P90
P99
TCP Server Traffic
N/A
TCP Client Traffic
N/A
INBOUND WORKLOADS
Incoming Requests by Source And Response Code
myweb.mylab : 200
Incoming Success Rate (non-5xx responses) By Source
myweb.mylab

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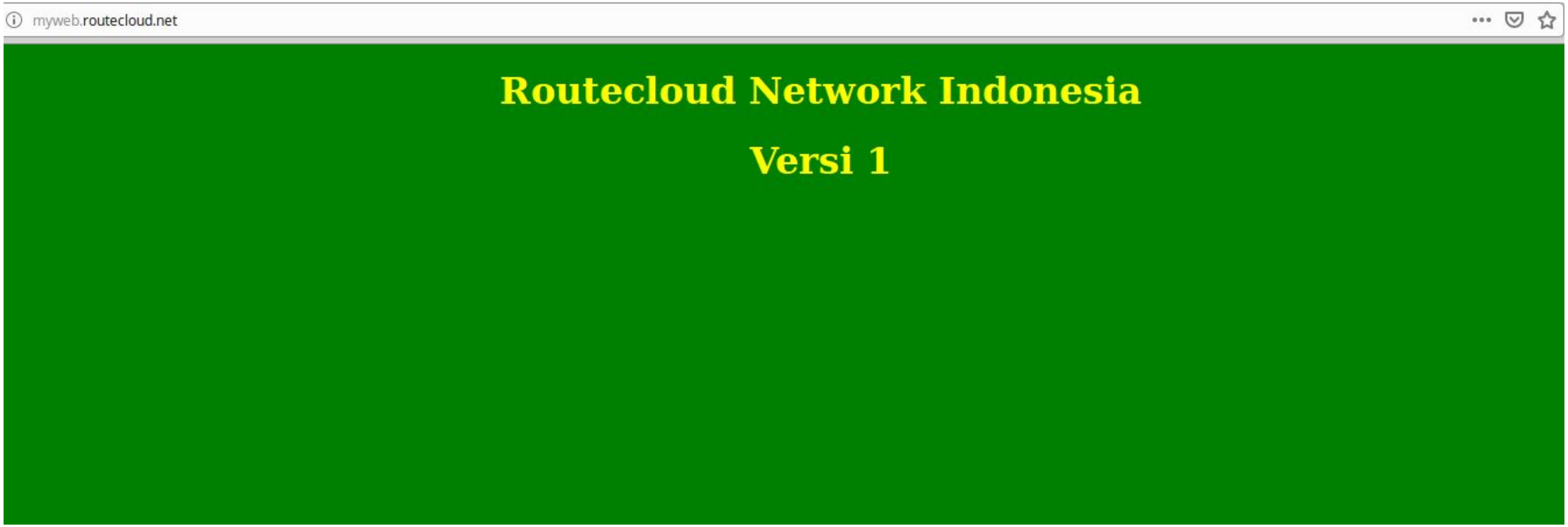
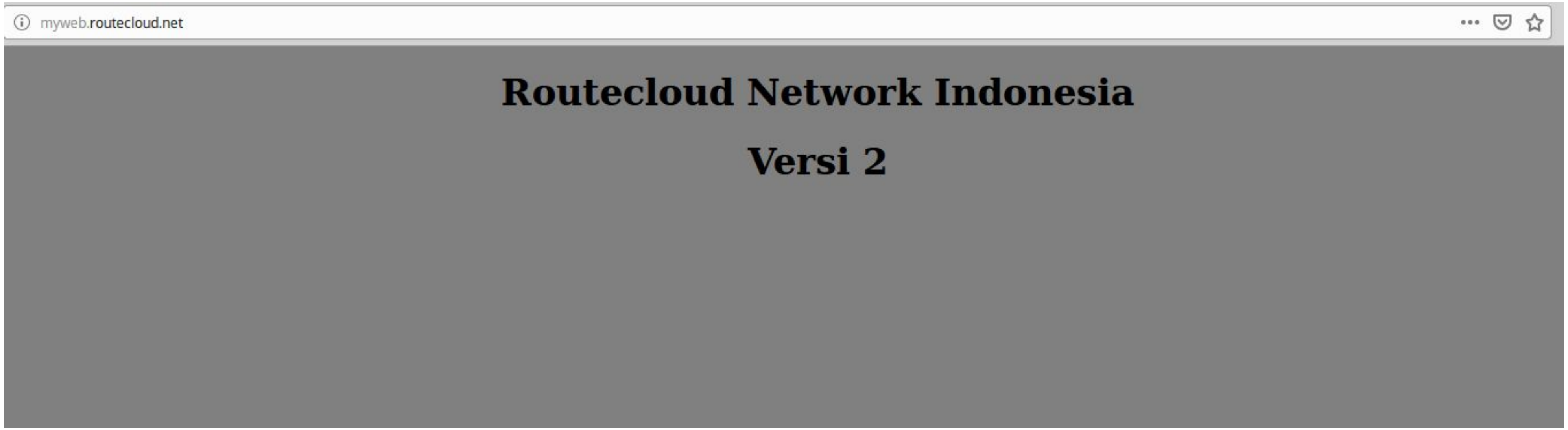
Result Demo


myweb.routecloud.net

Routecloud Network Indonesia

Versi 1

Result Demo


myweb.routecloud.net

Routecloud Network Indonesia

Versi 2

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Thank you!

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Getting Started Istio

- Prepare your kubernetes
- Prepare your isito
  https://istio.io/docs/setup/
- Prepare your apps

My Repo:
https://github.com/alanadiprastyo/demo-k8s-istio-indonesiaOpenInfraDays2019.git

Demo:
https://www.youtube.com/watch?v=fPNMei5G7lM

LinkedIn:
https://www.linkedin.com/in/alan-adi-prastyo/