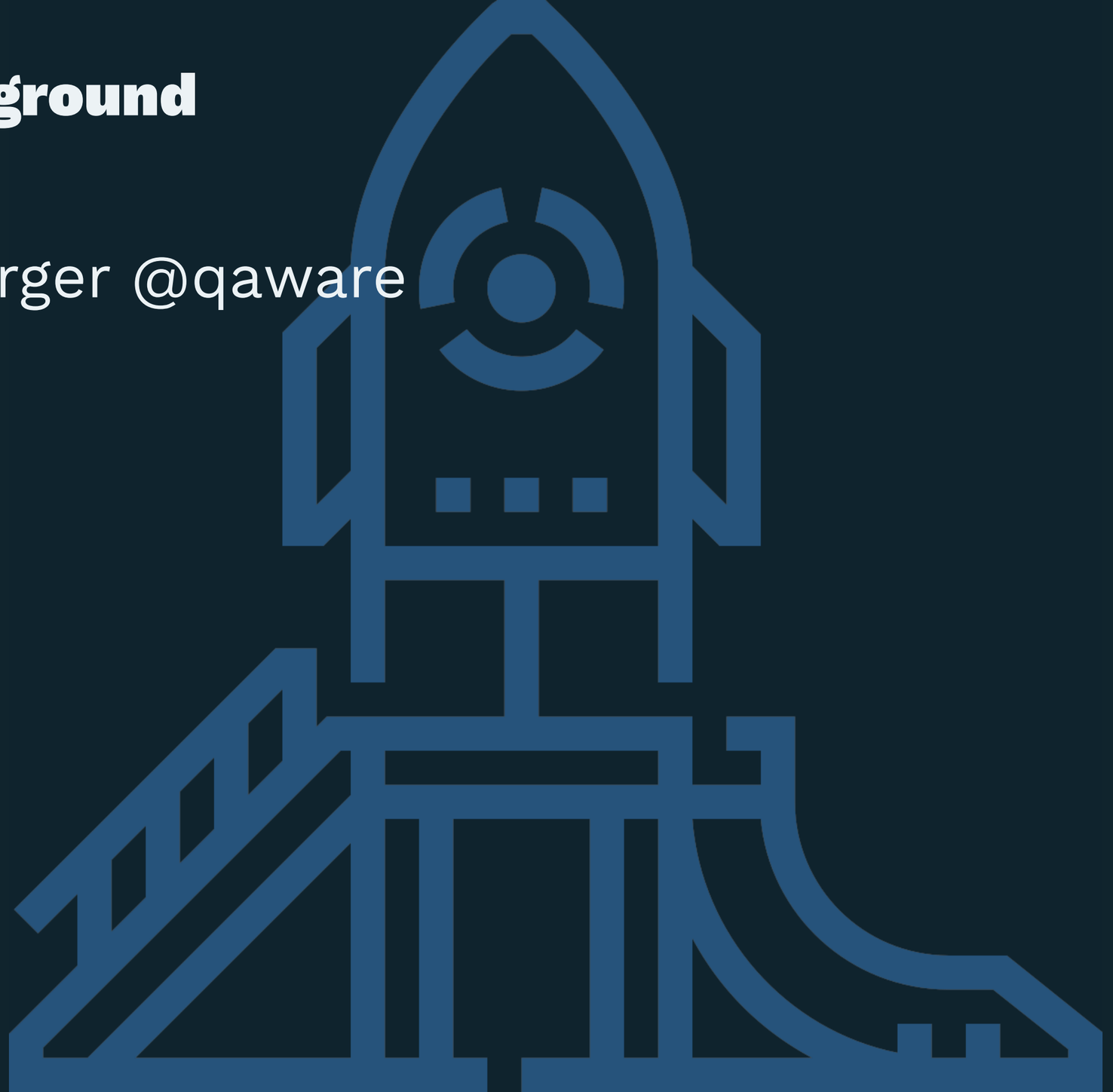
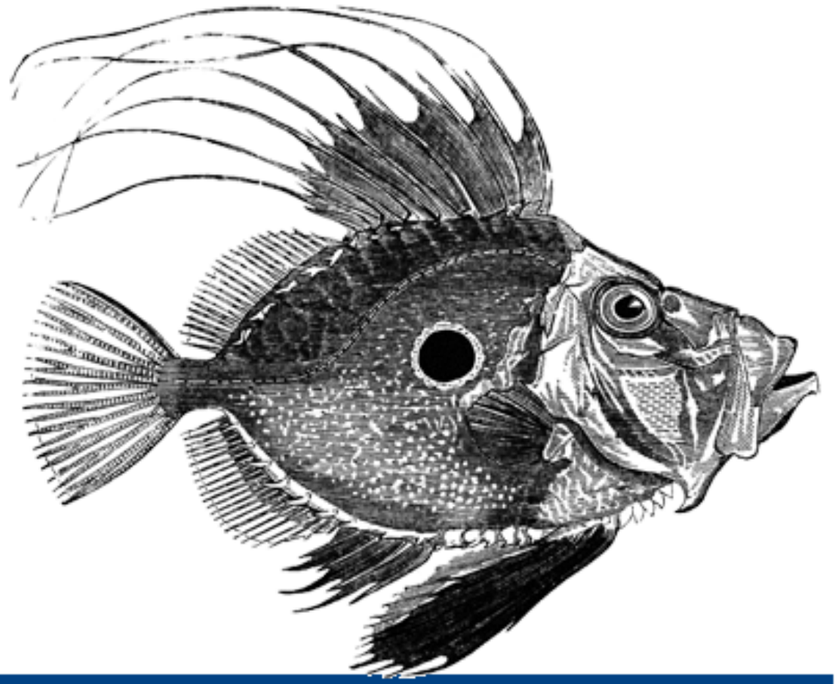
Istio Playground

@adersberger @qaware



Why?

Fight Microservice Obesity



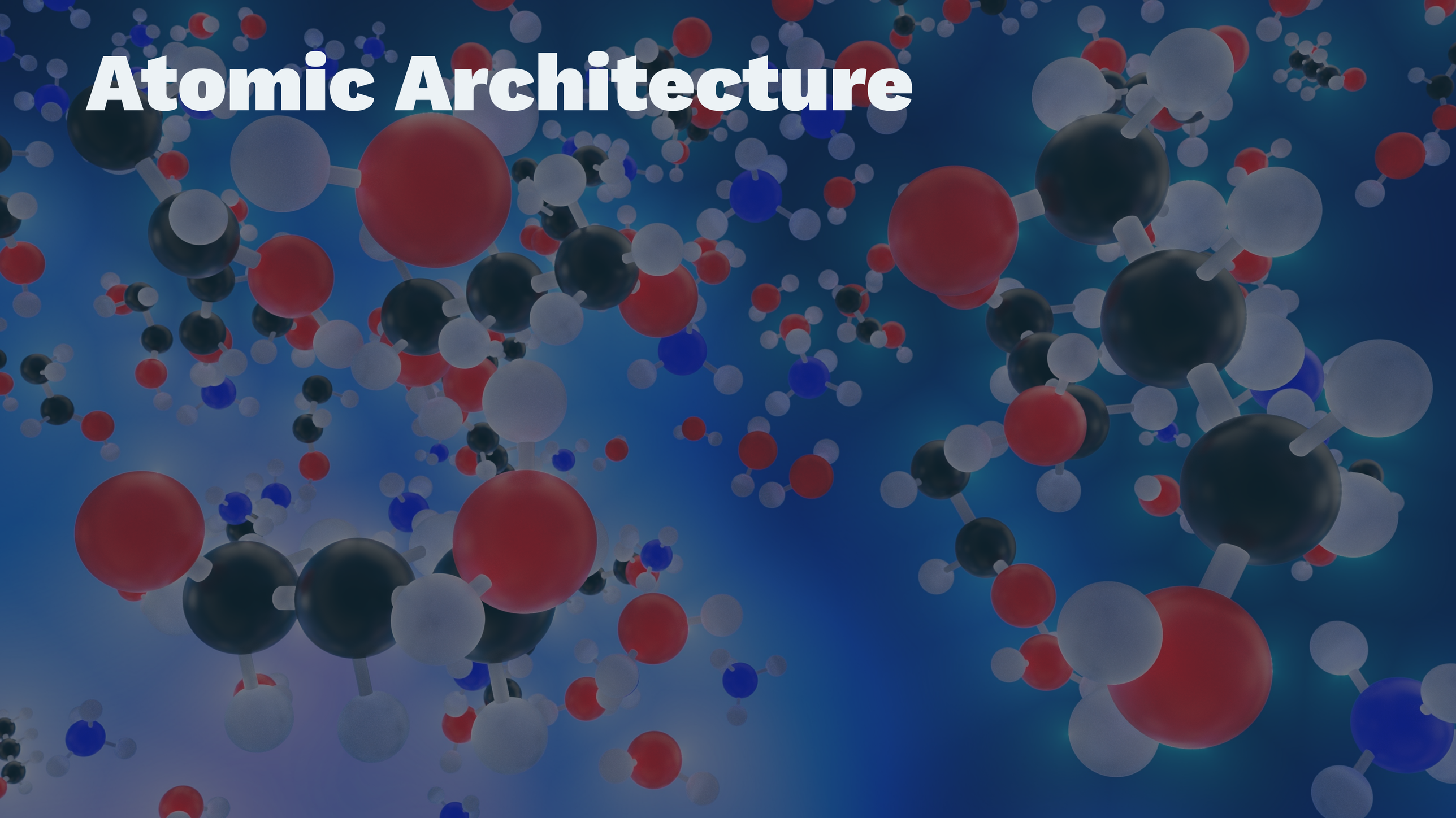
Hype-Driven Software Development

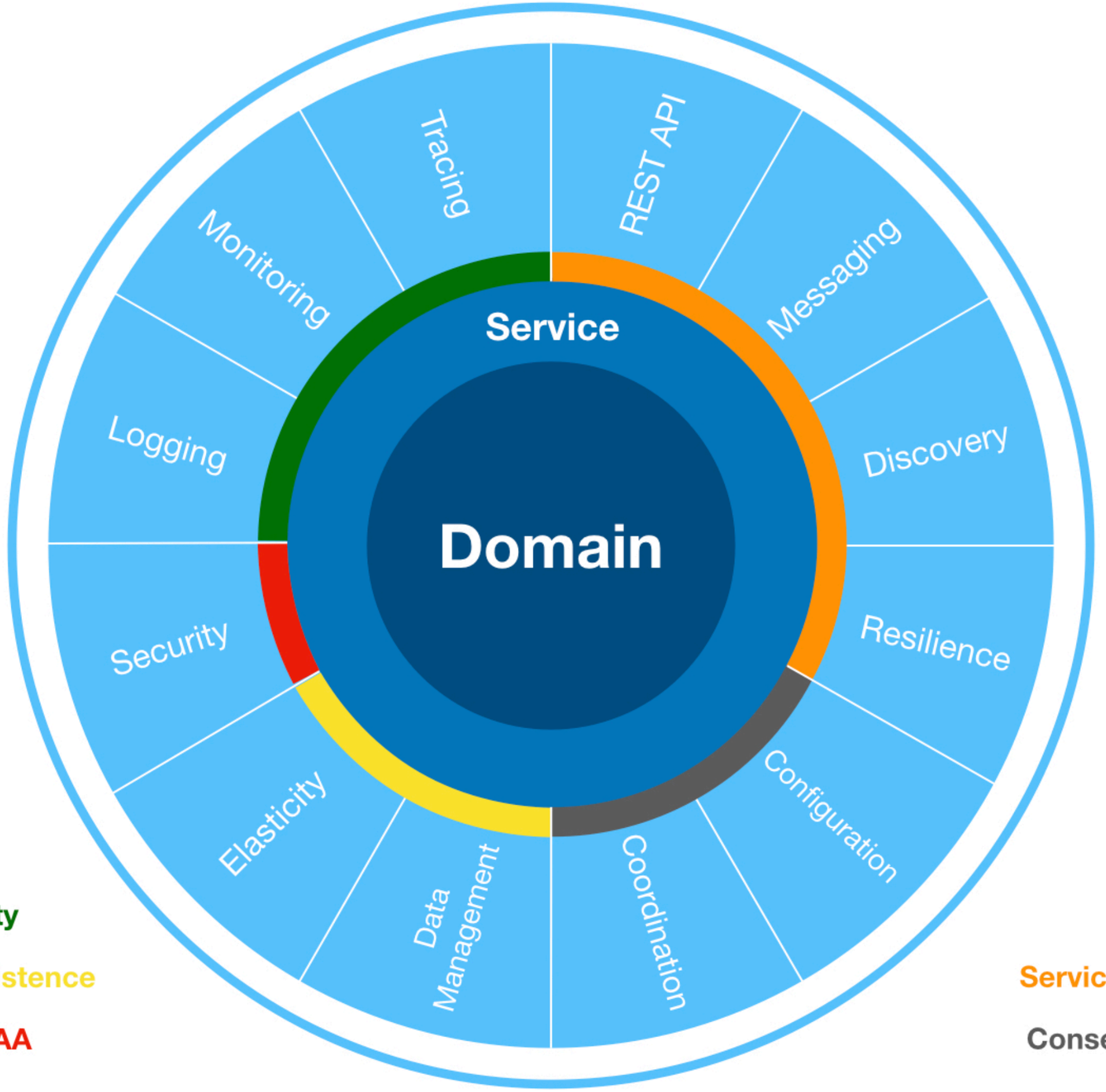
Istio Edition

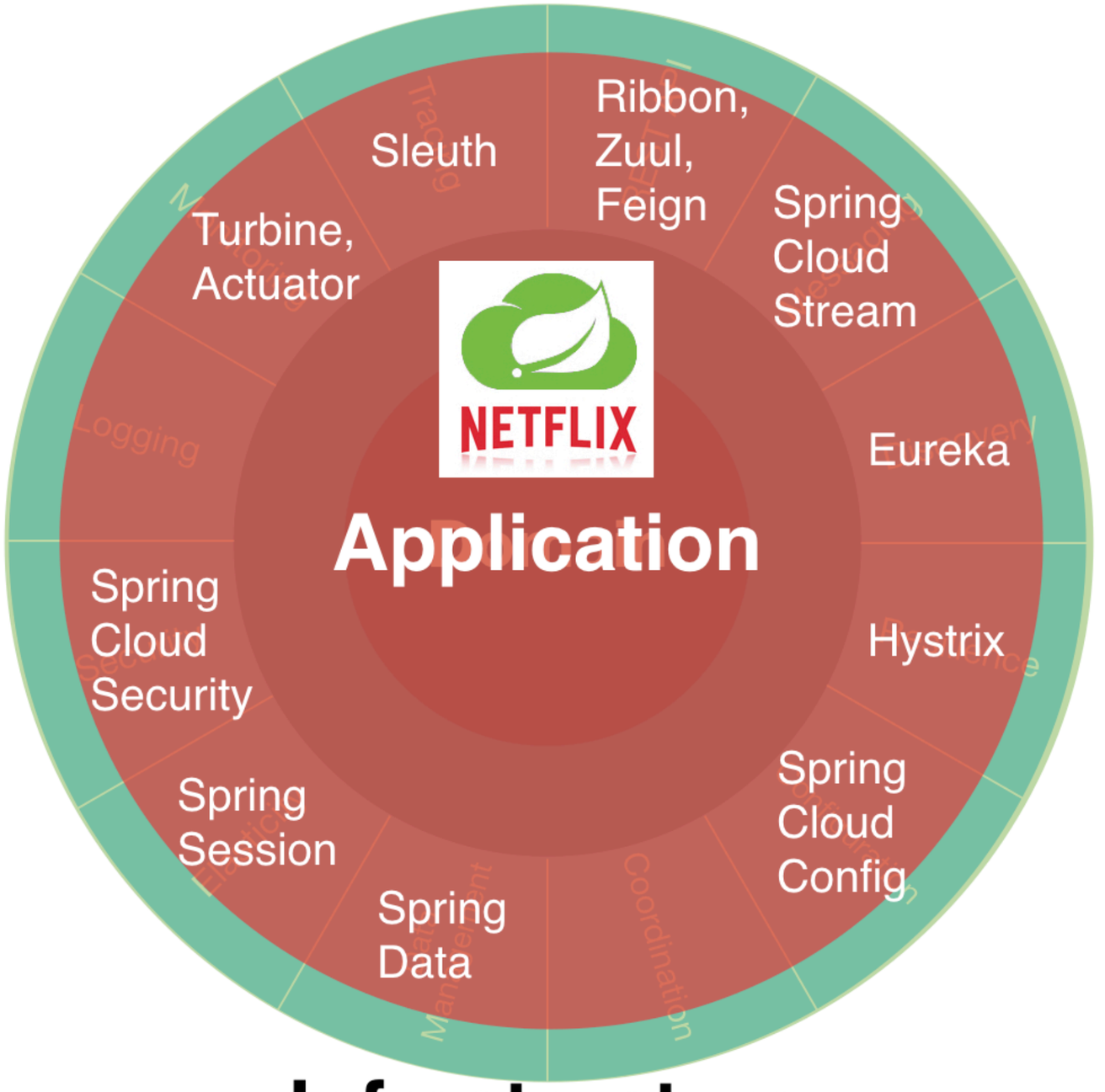
O RLY?

Josef Adersberger

Atomic Architecture

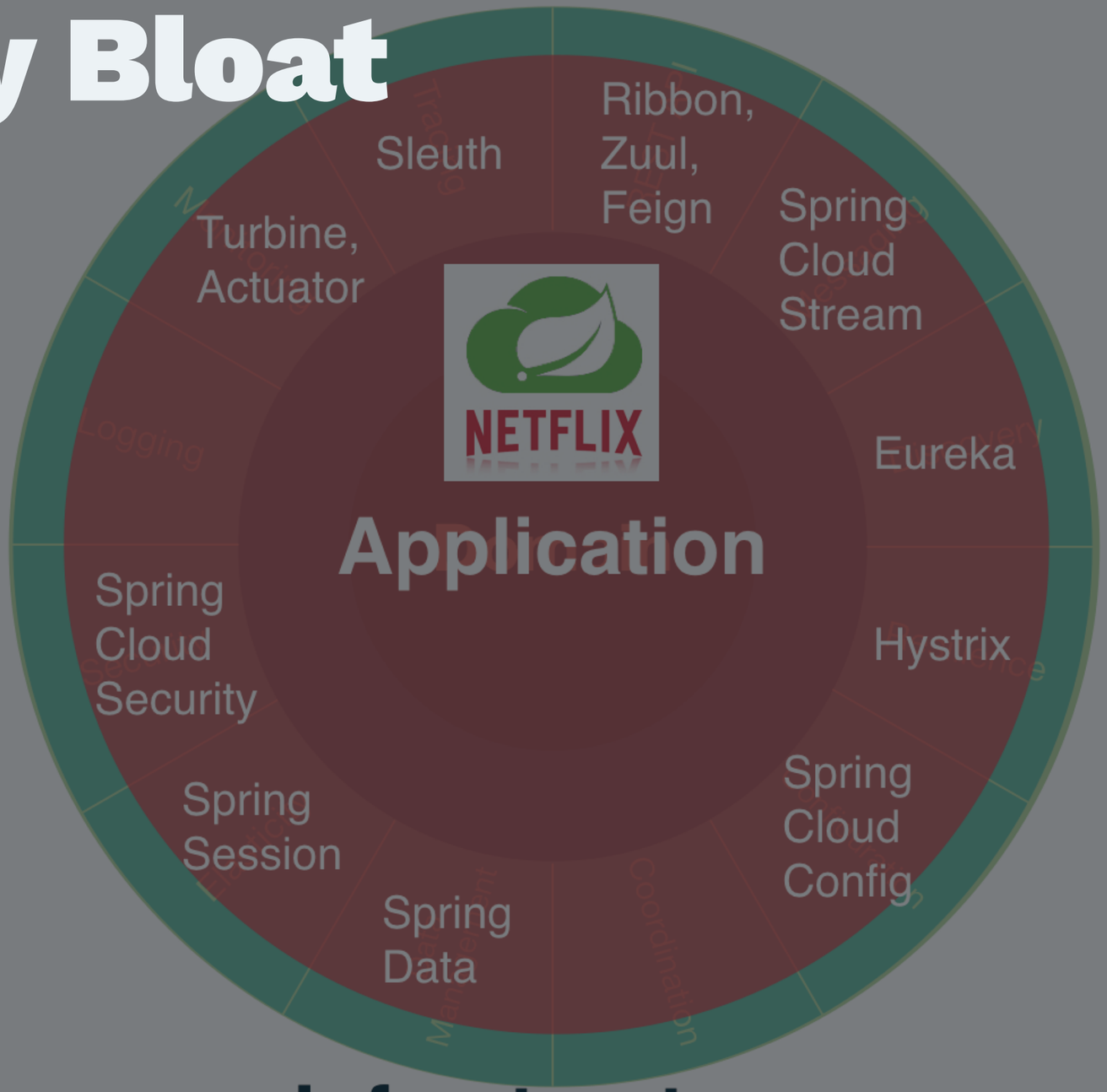



Tracing
REST API
Monitoring
Messaging
Service
Logging
Discovery
Domain
Security
Resilience
Elasticity
Configuration
Data Management
Coordination
Diagnosability
State & Persistence
Security & AAA
Service Exposition
Consens & Config



Infrastructure

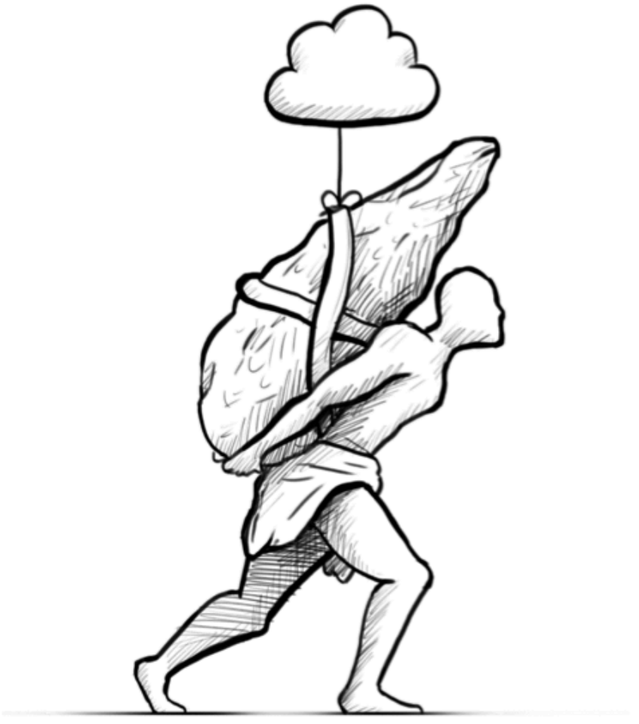
Library Bloat



Infrastructure

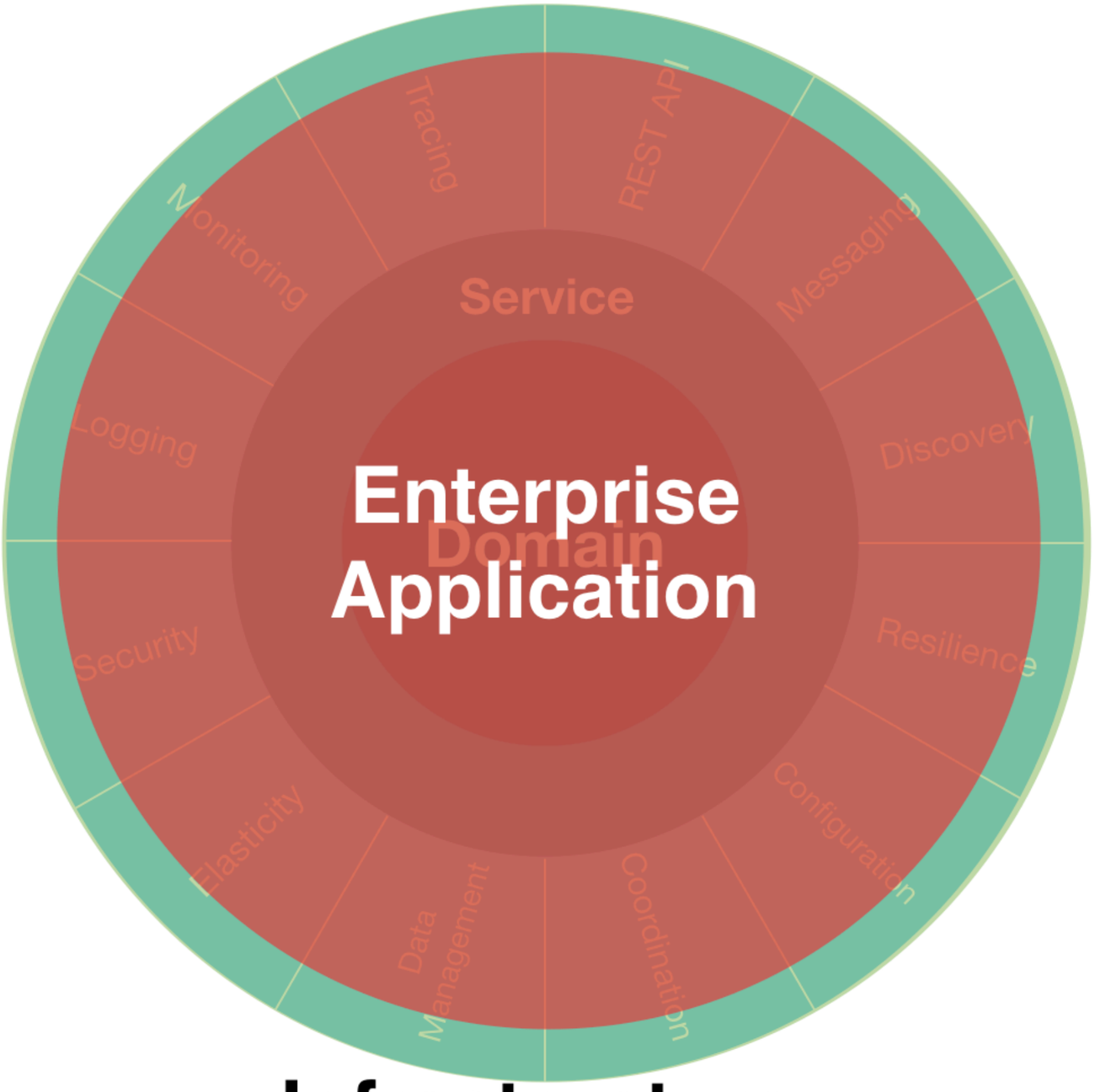
Can we evolve existing enterprise applications into the cloud with reasonable effort?

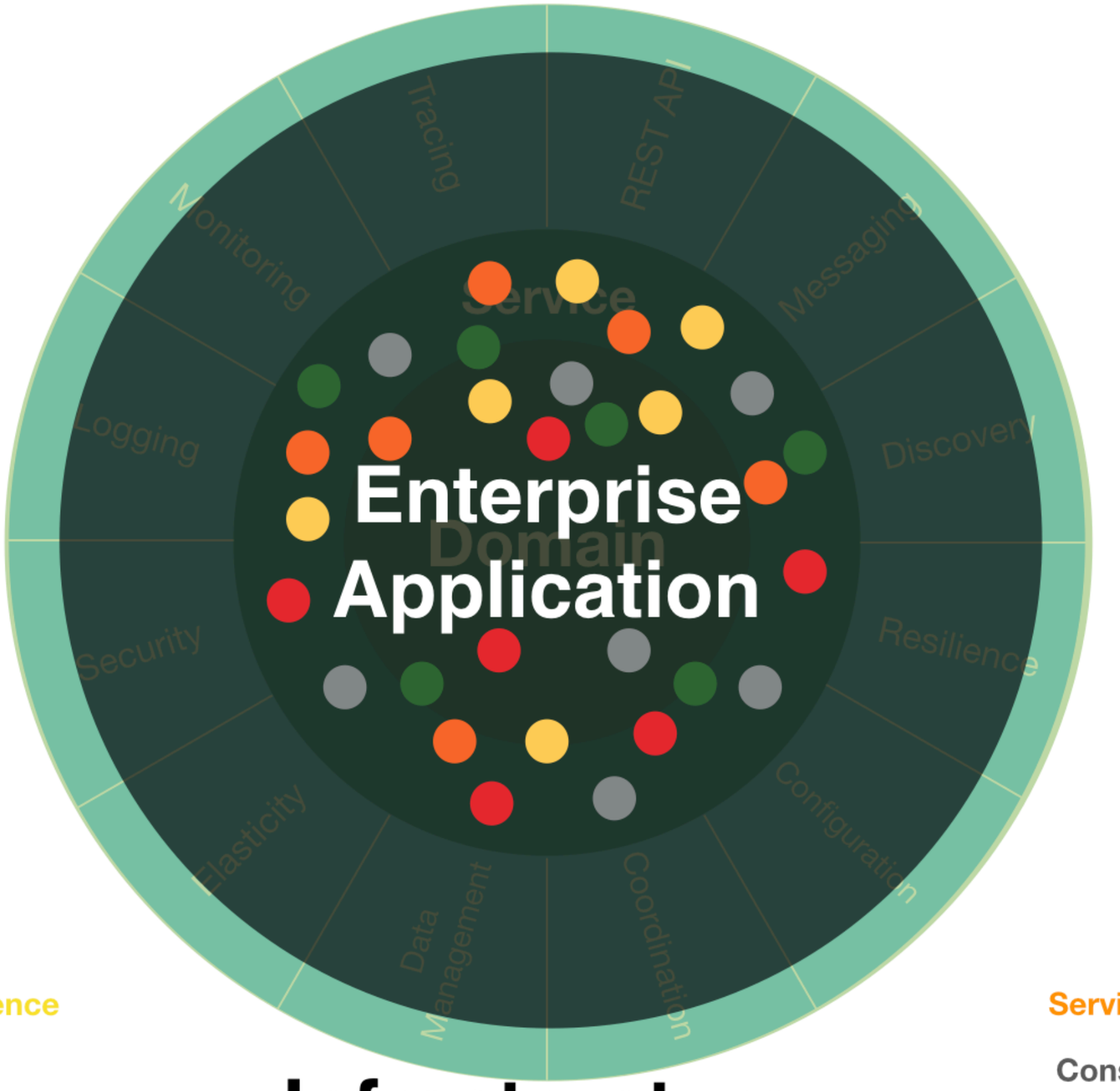
- Monolithic Deployment
- Traditional Infrastructure



- Containerization
- 12-Factor App Principles

- Microservices
- Cloud-native Apps


Tracing
REST API
Monitoring
Messaging
Service
Logging
Discovery
Enterprise
Application
Domain
Security
Resilience
Elasticity
Configuration
Data
Management
Coordination
Infrastructure



Diagnosability

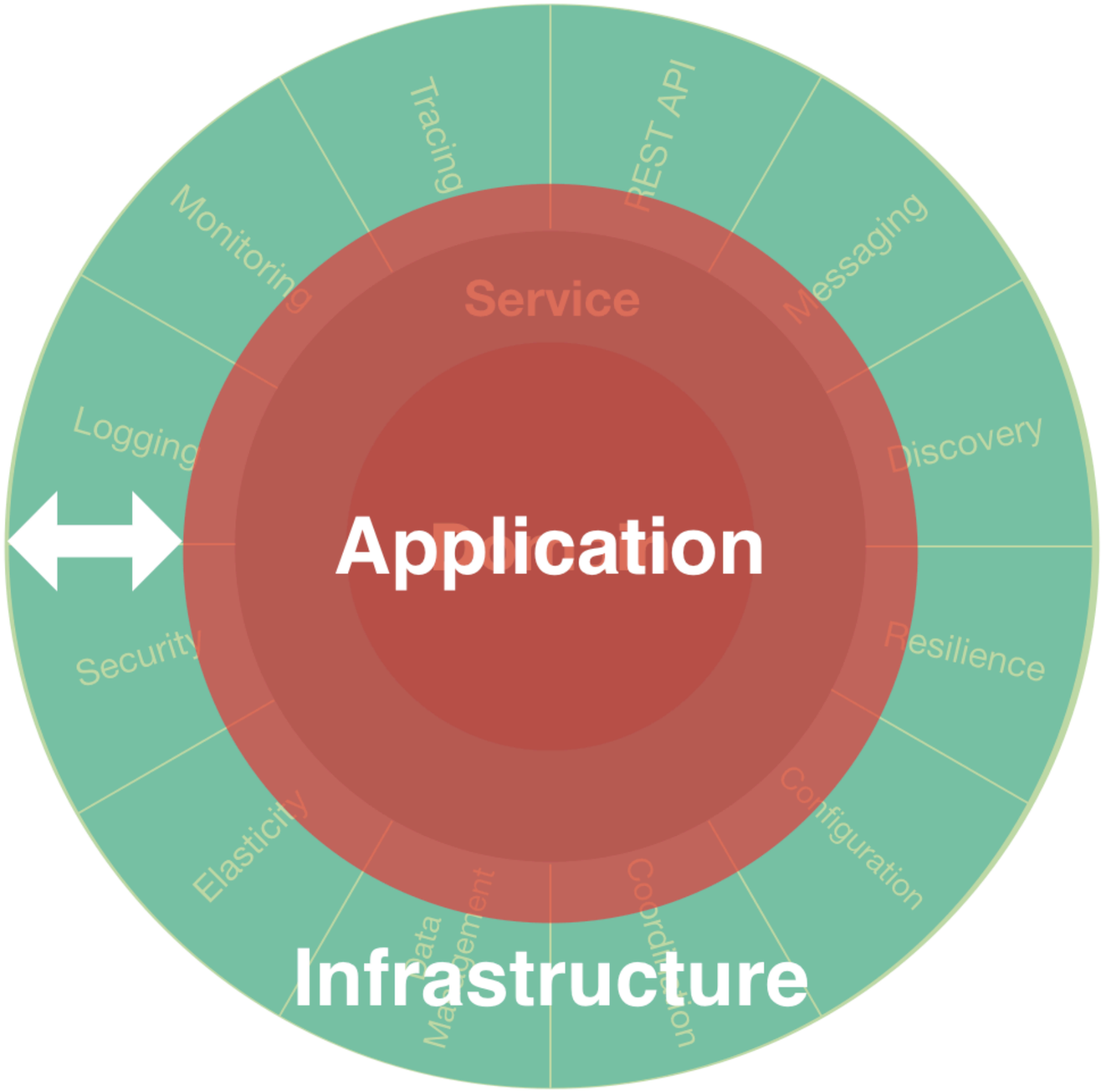
State & Persistence

Security & AAA

Service Exposition

Consens & Config

Infrastructure


Tracing
REST API
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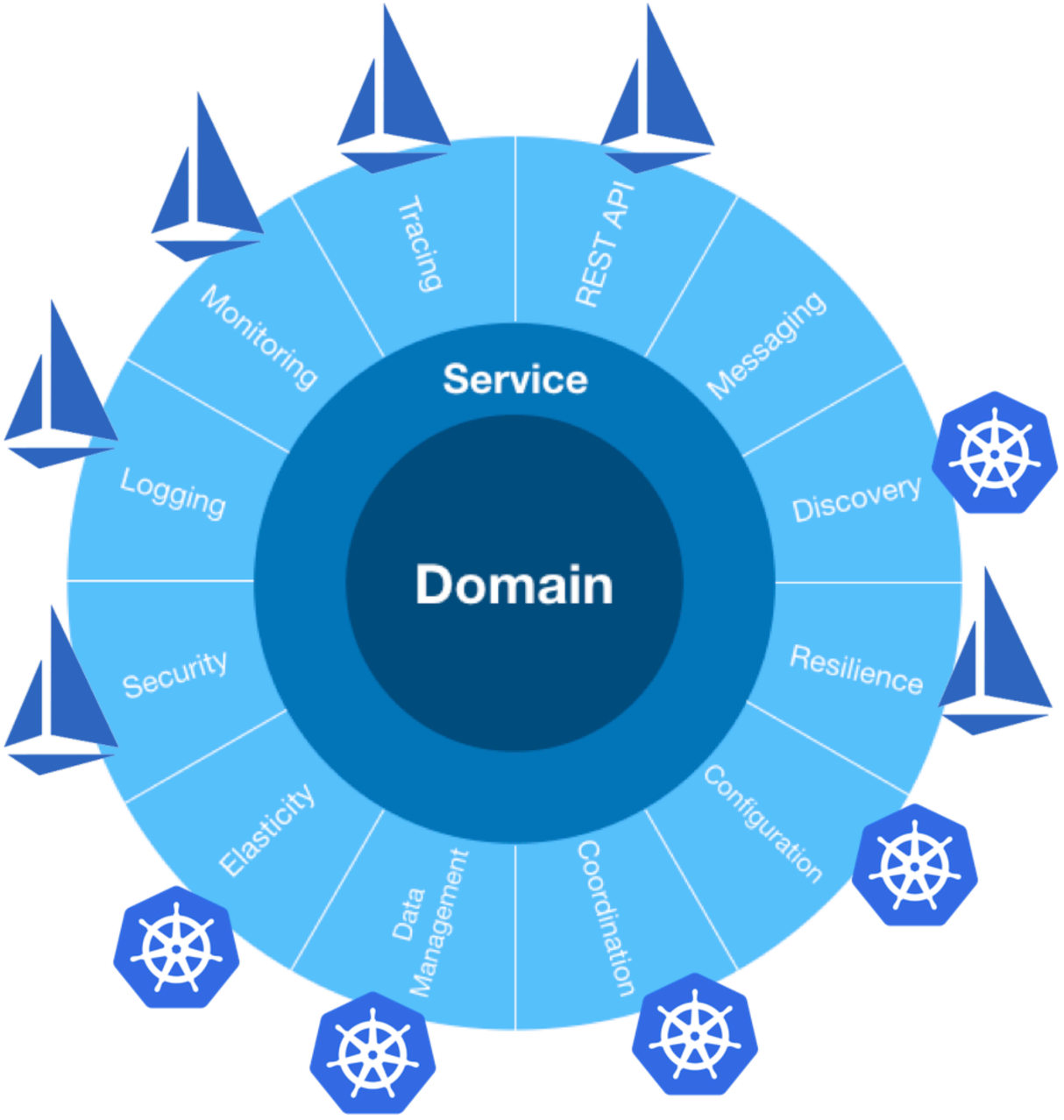
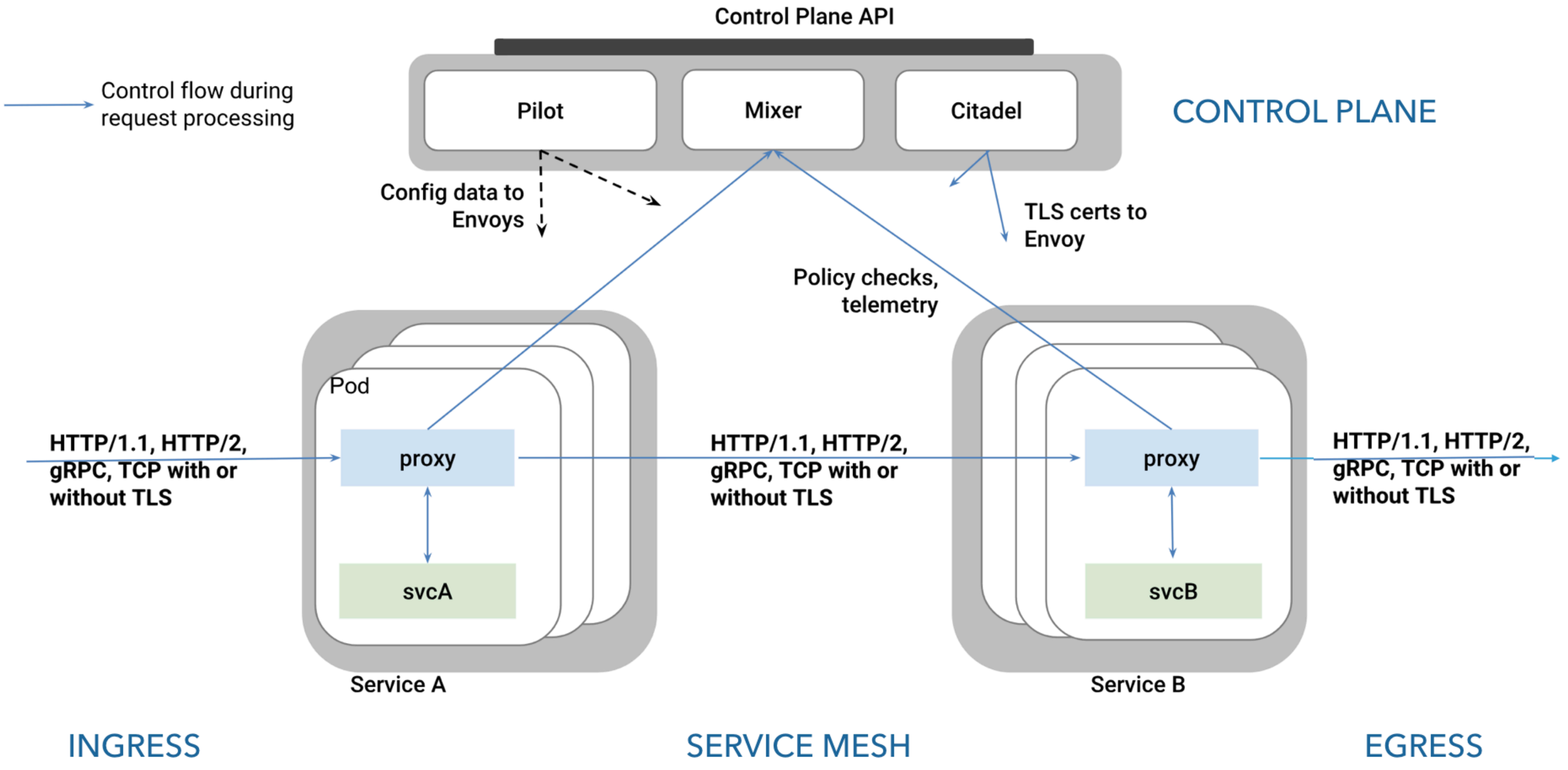
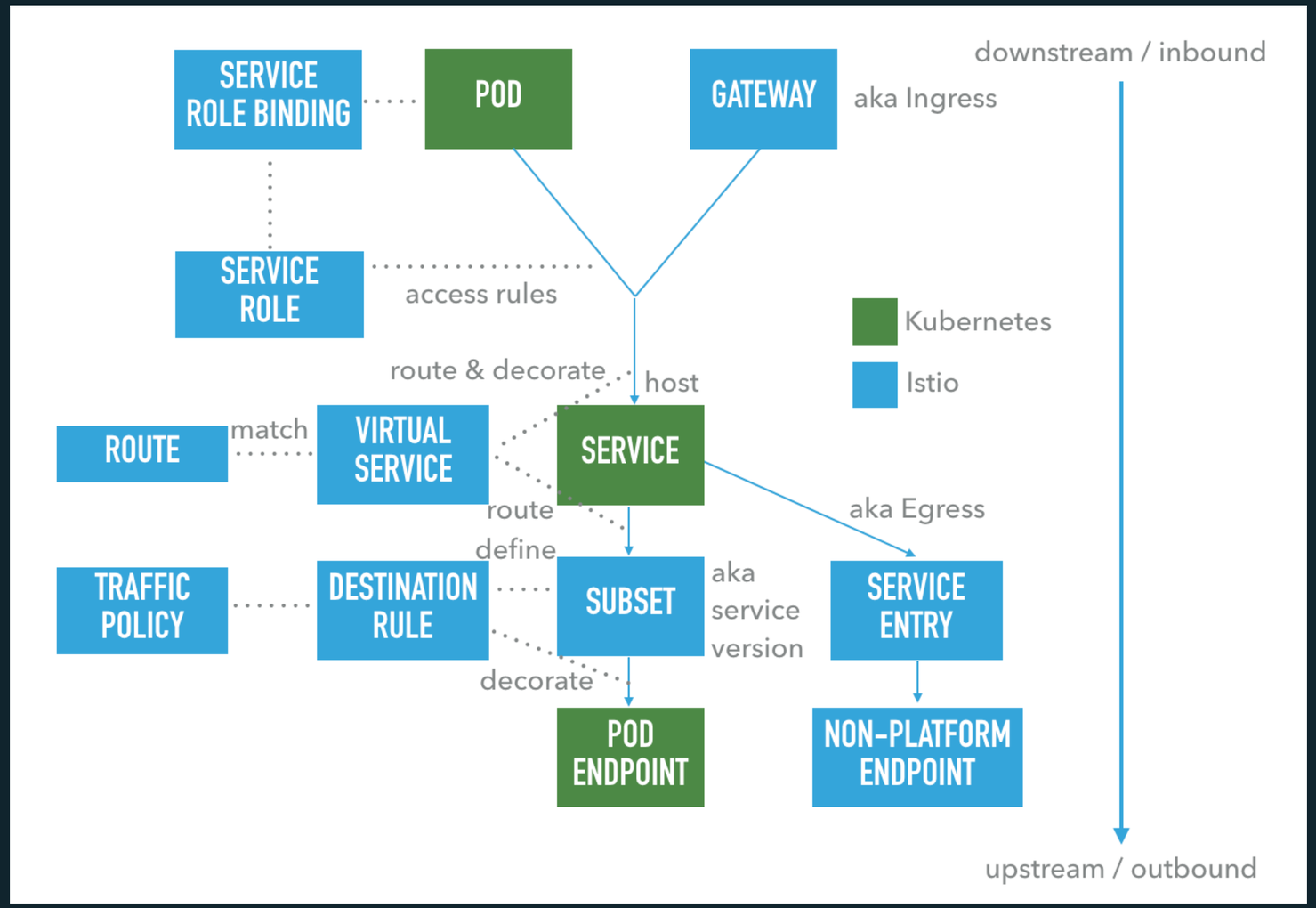
Messaging
Service
Logging
Discovery
Application
Security
Resilience
Elasticity
Configuration
Data Management
Coordination
Infrastructure


Service
Domain
Tracing
REST API
Monitoring
Messaging
Logging
Discovery
Security
Resilience
Elasticity
Configuration
Data Management
Coordination

Setting the Sails with Istio 1.0


Control Plane API
Control flow during request processing
Pilot
Mixer
Citadel
CONTROL PLANE
Config data to Envoys
TLS certs to Envoy
Policy checks, telemetry
Pod
HTTP/1.1, HTTP/2, gRPC, TCP with or without TLS
proxy
svcA
HTTP/1.1, HTTP/2, gRPC, TCP with or without TLS
proxy
svcB
HTTP/1.1, HTTP/2, gRPC, TCP with or without TLS
Service A
Service B
INGRESS
SERVICE MESH
EGRESS

Istio Abstractions



Workshop Prerequisites

— Bash
— git Client
— Text editor (like VS.Code)

Baby Step: Grab the Code

```
git clone https://github.com/adersberger/istio-playground

cd istio-playground/code
```

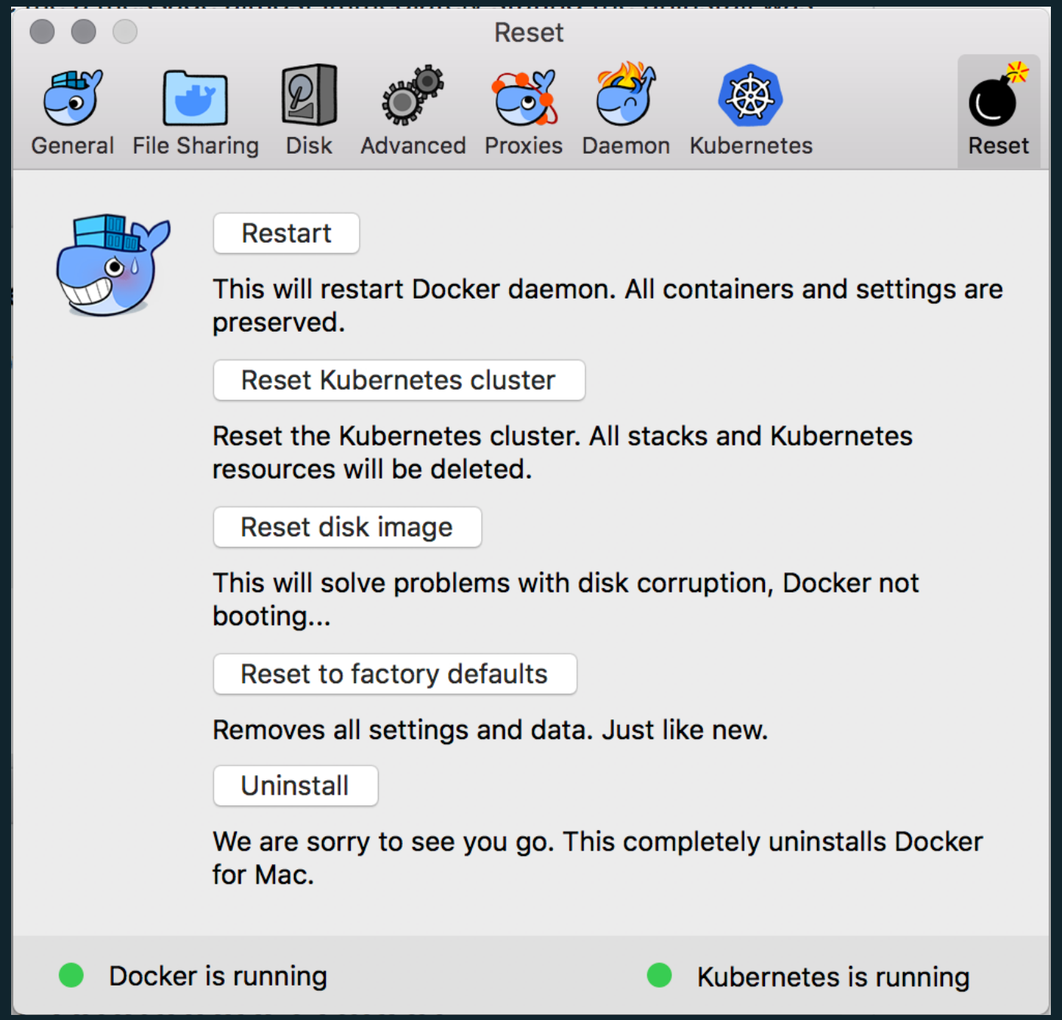
Baby Step: Install a (local) Kubernetes Cluster

https://www.docker.com/community-edition

— Preferences: enable Kubernetes

— Preferences: increase resource usage to 3 cores

The Ultimate Guide to Fix Strange Kubernetes Behavior



Setup Kubernetes Environment

```
# Switch k8s context
kubectl config use-context docker-for-desktop
# Deploy k8s dashboard
kubectl create -f https://raw.githubusercontent.com/kubernetes/dashboard/master/src/deploy/recommended/kubernetes-dashboard.yaml
# Extract id of default service account token (referred as TOKENID)
kubectl describe serviceaccount default
# Grab token and insert it into k8s Dashboard UI auth dialog
kubectl describe secret TOKENID
# Start local proxy
kubectl proxy --port=8001 &
# Open k8s Dashboard
open http://localhost:8001/api/v1/namespaces/kube-system/services/https:kubernetes-dashboard:/proxy/#!/login
```

Deploy Istio

```
curl -L https://git.io/getLatestIstio | sh -
cd istio-1.0.0
export PATH=$PWD/bin:$PATH
istioctl version

# deploy Istio
# (demo setting, default deployment is via Helm)
kubectl apply -f install/kubernetes/istio-demo.yaml
kubectl get pods -n istio-system

# label default namespace to be auto-sidecarred
kubectl label namespace default istio-injection=enabled
kubectl get namespace -L istio-injection
```

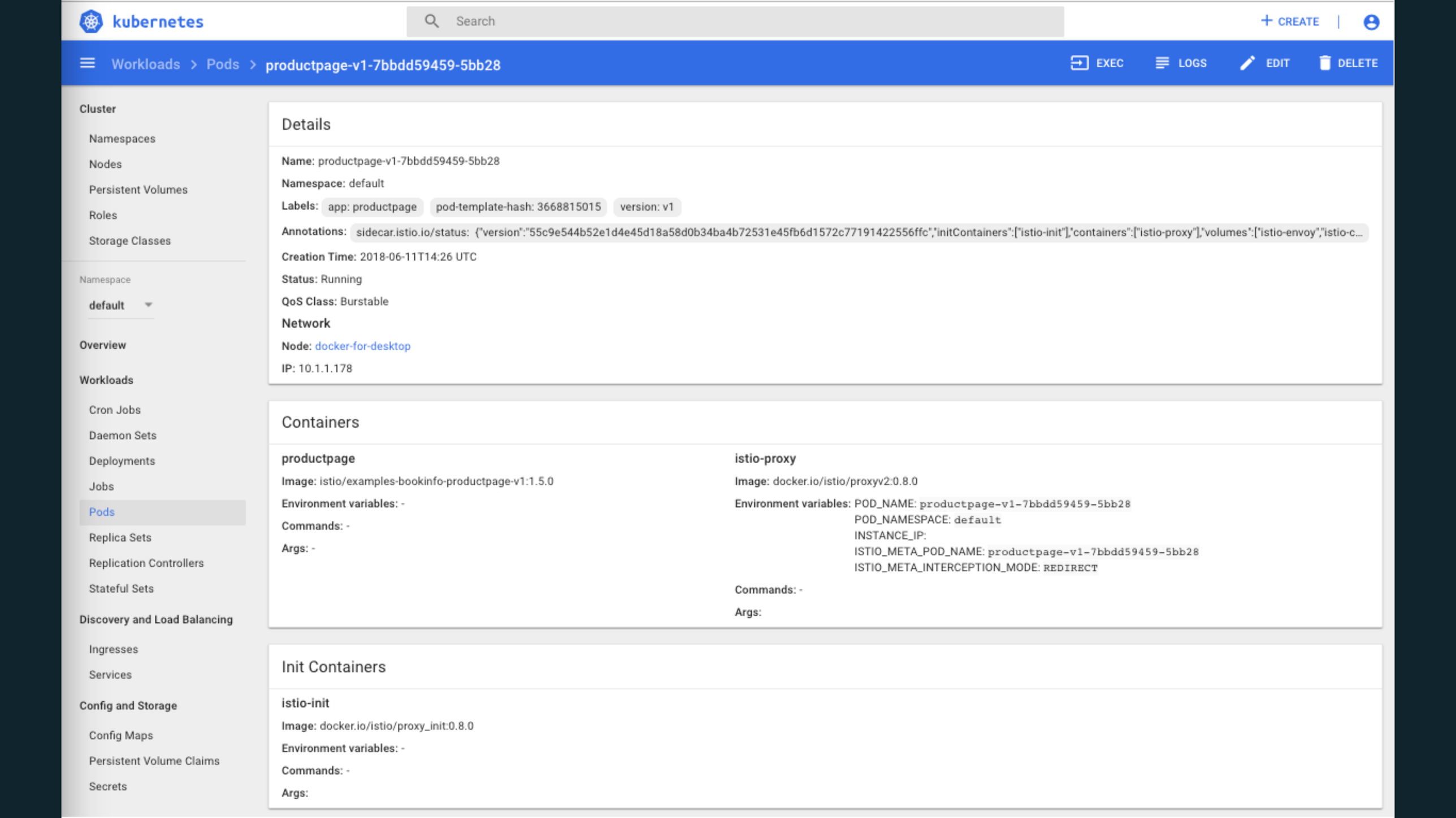
Deploy Sample Application (BookInfo)

```
kubectl apply -f samples/bookinfo/kube/bookinfo.yaml
kubectl get pods
istioctl create -f samples/bookinfo/routing/bookinfo-gateway.yaml
istioctl get gateways
open http://localhost/productpage
```

Deploy Sample Application (BookInfo)

```
kubectl apply -f samples/bookinfo/platform/kube/bookinfo.yaml
kubectl get pods
istioctl create -f samples/bookinfo/networking/bookinfo-gateway.yaml
istioctl get gateways
open http://localhost/productpage
```

Hint: Since Istio release 0.8 you can substitute `istioctl` with `kubectl`. We're still using `istioctl` for clarity purposes.


kubernetes
Search
+ CREATE
Workloads > Pods > productpage-v1-7bbdd59459-5bb28
EXEC
LOGS
EDIT
DELETE
Cluster
Namespaces
Nodes
Persistent Volumes
Roles
Storage Classes
Namespace
default
Overview
Workloads
Cron Jobs
Daemon Sets
Deployments
Jobs
Pods
Replica Sets
Replication Controllers
Stateful Sets
Discovery and Load Balancing
Ingresses
Services
Config and Storage
Config Maps
Persistent Volume Claims
Secrets
Details
Name: productpage-v1-7bbdd59459-5bb28
Namespace: default
Labels: app: productpage pod-template-hash: 3668815015 version: v1
Annotations: sidecar.istio.io/status: {"version":"55c9e544b52e1d4e45d18a58d0b34ba4b72531e45fb6d1572c77191422556ffc","initContainers":["istio-init"],"containers":["istio-proxy"],"volumes":["istio-envoy","istio-c...
Creation Time: 2018-06-11T14:26 UTC
Status: Running
QoS Class: Burstable
Network
Node: docker-for-desktop
IP: 10.1.1.178
Containers
productpage
Image: istio/examples-bookinfo-productpage-v1:1.5.0
Environment variables: -
Commands: -
Args: -
istio-proxy
Image: docker.io/istio/proxyv2:0.8.0
Environment variables: POD_NAME: productpage-v1-7bbdd59459-5bb28
POD_NAMESPACE: default
INSTANCE_IP:
ISTIO_META_POD_NAME: productpage-v1-7bbdd59459-5bb28
ISTIO_META_INTERCEPTION_MODE: REDIRECT
Commands: -
Args:
Init Containers
istio-init
Image: docker.io/istio/proxy_init:0.8.0
Environment variables: -
Commands: -
Args:

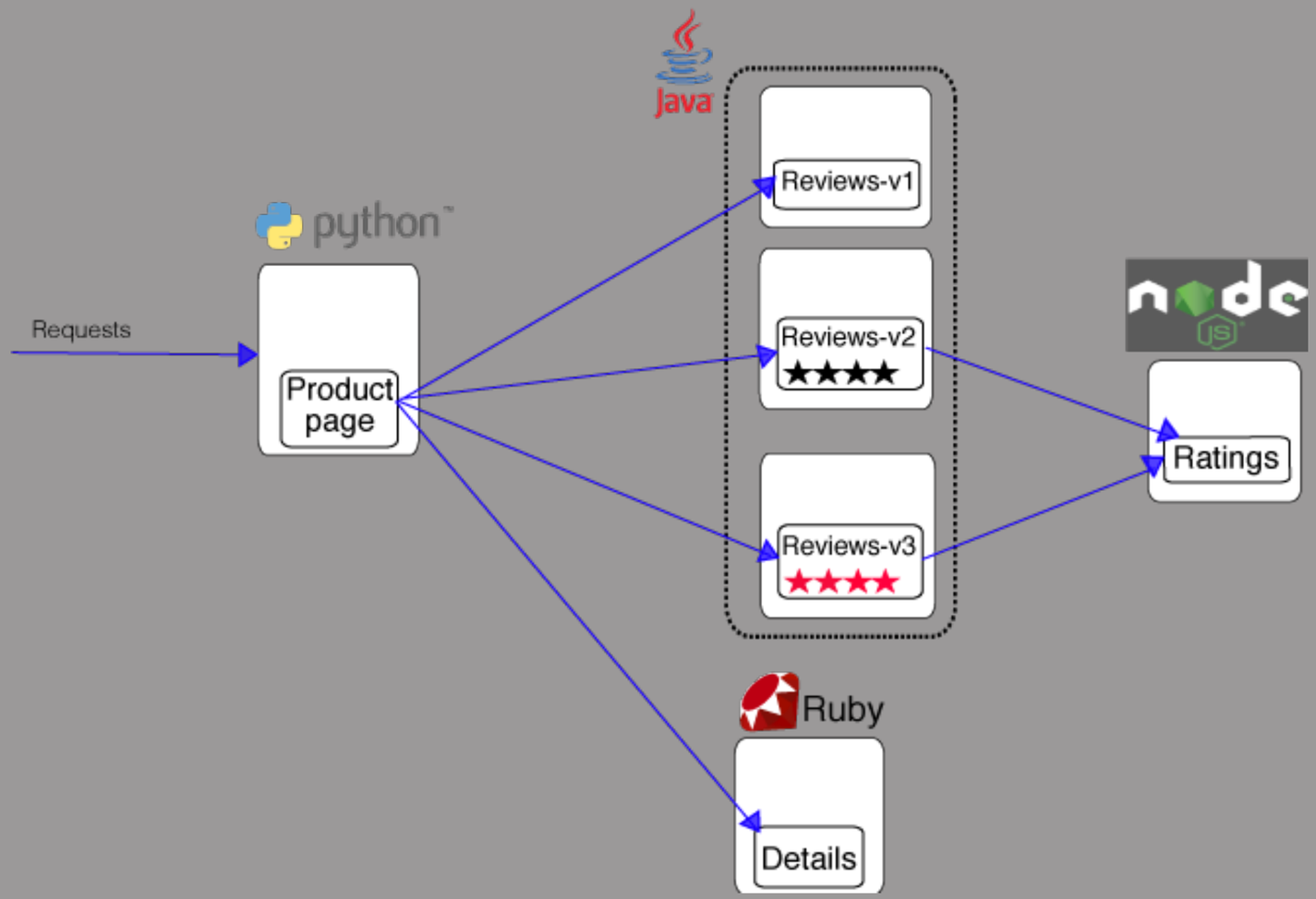
bookinfo-gateway.yaml (1/2)

```yaml
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:
    - "*"
```

bookinfo-gateway.yaml (2/2)

```yaml
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: bookinfo
spec:
  hosts:
  - "*"
  gateways:
  - bookinfo-gateway
  http:
  - match:
    - uri:
        exact: /productpage
    - uri:
        exact: /login
    - uri:
        exact: /logout
    - uri:
        prefix: /api/v1/products
    route:
    - destination:
        host: productpage
        port:
          number: 9080
```

Sample Application: BookInfo[1]



[1] Istio BookInfo Sample (https://istio.io/docs/examples/bookinfo)

Expose Istio Observability Tools

```
#Metrics: Prometheus
kubectl expose deployment prometheus --name=prometheus-expose
  --port=9090 --target-port=9090 --type=LoadBalancer -n=istio-system
open http://localhost:9090/graph?g0.expr=istio_request_count

#Metrics: Grafana
kubectl expose deployment grafana --name=grafana-expose
  --port=3000 --target-port=3000 --type=LoadBalancer -n=istio-system
open http://localhost:3000/d/1/istio-dashboard

#Tracing: Jaeger
kubectl expose deployment istio-tracing --name=tracing-expose
  --port=16686 --target-port=16686 --type=LoadBalancer -n=istio-system
open http://localhost:16686

#Tracing: ServiceGraph
kubectl expose service servicegraph --name=servicegraph-expose
  --port=8088 --target-port=8088 --type=LoadBalancer -n=istio-system
open http://localhost:8088/force/forcegraph.html
open http://localhost:8088/dotviz
```

Deploy Missing Observability Feature: Log Analysis (EFK)

```
cd ..
kubectl apply -f logging-stack.yaml
kubectl get pods -n=logging
kubectl expose deployment kibana --name=kibana-expose
  --port=5601 --target-port=5601 --type=LoadBalancer -n=logging
istioctl create -f fluentd-istio.yaml
```

Deploy Missing Observability Feature: Log Analysis (EFK)

```
open http://localhost:5601/app/kibana
```

— Perform some requests to the BookInfo application

— Use `*` as the index pattern

— Select `@timestamp` as the time filter field name

fluentd-istio.yaml (1/3)

```
# Configuration for logentry instances
apiVersion: "config.istio.io/v1alpha2"
kind: logentry
metadata:
  name: newlog
  namespace: istio-system
spec:
  severity: '"info"'
  timestamp: request.time
  variables:
    source: source.labels["app"] | source.service | "unknown"
    user: source.user | "unknown"
    destination: destination.labels["app"] | destination.service | "unknown"
    responseCode: response.code | 0
    responseSize: response.size | 0
    latency: response.duration | "0ms"
  monitored_resource_type: '"UNSPECIFIED"'
```

fluentd-istio.yaml (2/3)

```
# Configuration for a fluentd handler
apiVersion: "config.istio.io/v1alpha2"
kind: fluentd
metadata:
  name: handler
  namespace: istio-system
spec:
  address: "fluentd-es.logging:24224"
```

fluentd-istio.yaml (3/3)

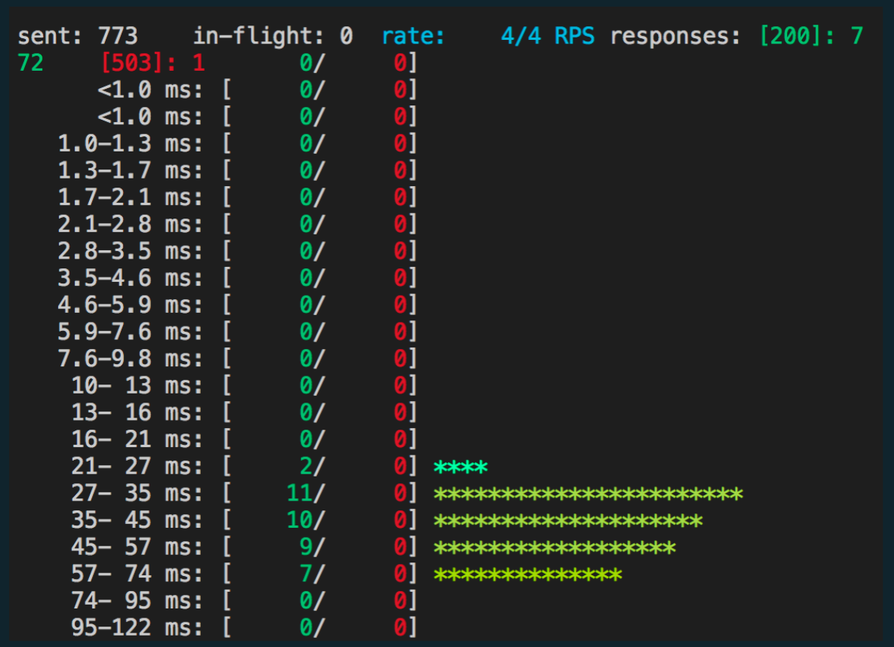
```
# Rule to send logentry instances to the fluentd handler
apiVersion: "config.istio.io/v1alpha2"
kind: rule
metadata:
  name: newlogtofluentd
  namespace: istio-system
spec:
  match: "true" # match for all requests
  actions:
   - handler: handler.fluentd
     instances:
     - newlog.logentry
```

Stimulate!

```
slapper -rate 4 -targets ./target -workers 2 -maxY 15s
```

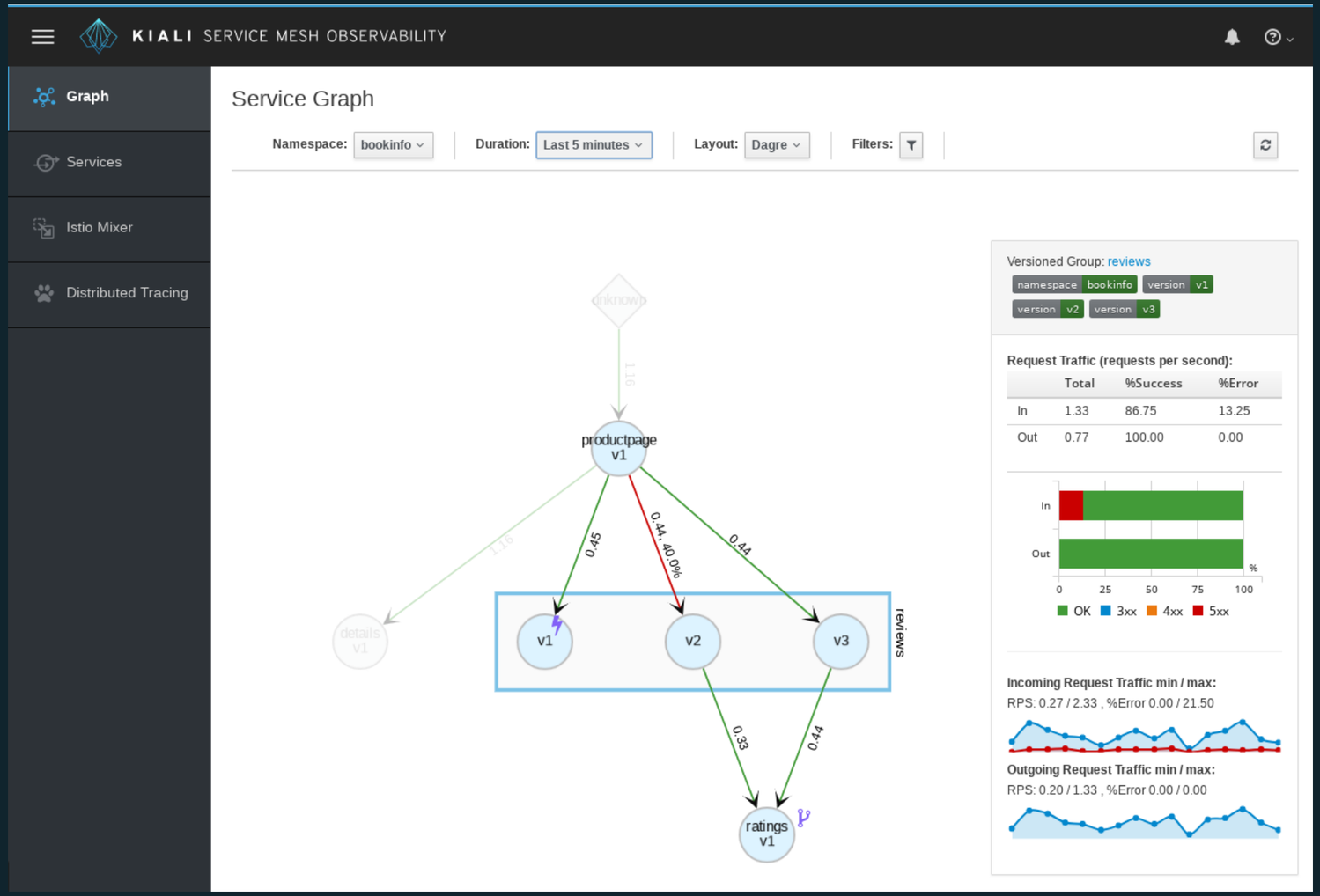
Download from: https://github.com/adersberger/slapper/releases/tag/0.1

Slapper[2] in action

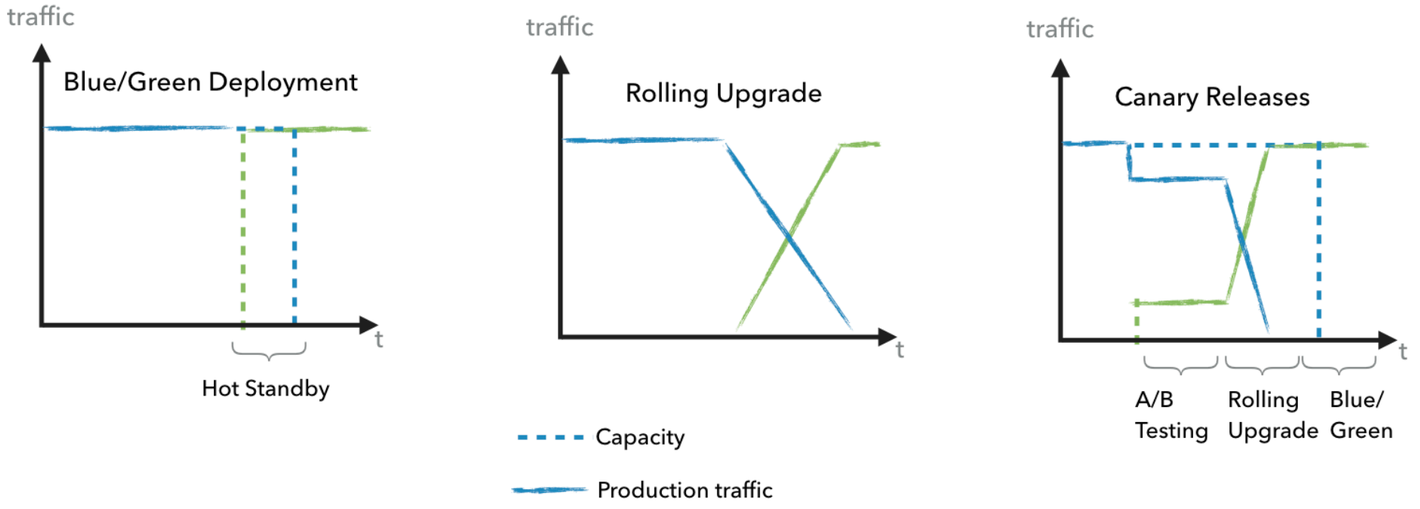


[2] Key bindings:
q, ctrl-c - quit
r - reset stats
k - increase rate by 100 RPS
j - decrease rate by 100 RPS

Observability Outlook: Kiali



Release Patterns



Canary Releases: A/B Testing

```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: v1
```

Canary Releases: A/B Testing

```
istioctl create -f samples/bookinfo/networking/virtual-service-all-v1.yaml

istioctl replace -f samples/bookinfo/networking/virtual-service-reviews-test-v2.yaml

#open BookInfo application and login as user jason (password jason)
open http://localhost/productpage
```

— login as "jason" / "jason" leads to v2 (black stars)

— anonymous user leads to v1 (no stars)

Canary Releases: Rolling Upgrade

```yaml
apiVersion: networking.istio.io/v1alpha3
kind: VirtualService
metadata:
  name: reviews
spec:
  hosts:
    - reviews
  http:
  - route:
    - destination:
        host: reviews
        subset: v1
      weight: 50
    - destination:
        host: reviews
        subset: v3
      weight: 50
```

```
istioctl replace -f samples/bookinfo/networking/virtual-service-reviews-50-v3.yaml
```

Canary Releases: Blue/Green

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

```
istioctl replace -f samples/bookinfo/networking/virtual-service-reviews-v3.yaml
istioctl get routerules
```

Time to Play!

Traffic Management	Resiliency	Security	Observability
Request Routing	Timeouts	mTLS	Metrics
Load Balancing	Circuit Breaker	Role-Based Access Control	Logs
Traffic Shifting	Health Checks (active, passive)	Workload Identity	Traces
Traffic Mirroring	Retries	Authentication Policies	
Service Discovery	Rate Limiting	CORS Handling	
Ingress, Egress	Delay & Fault Injection		
API Specification	Connection Pooling		

https://istio.io/docs/tasks

Thank you!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@adersberger

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