
ORACLE®

Microservices at Scale

Next Steps with Kubernetes and Istio

Jesse Butler
Cloud Native Advocate
Oracle Cloud Native Labs

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About Me

- Oracle via Sun Microsystems
- Responsible for Docker on Solaris, later on Oracle Linux
- Some work with Open Containers and CNCF WGs
- Now a Cloud Native Advocate @ Oracle Cloud

- @jlb13 on Twitter

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About OCI

- Next-generation Cloud Infrastructure
- Highly performant, very affordable
- Managed Cloud Native Services
  - OKE & OCIR at the core
  - Many managed services in the pipeline

- Check out OCI: https://cloud.oracle.com/tryit

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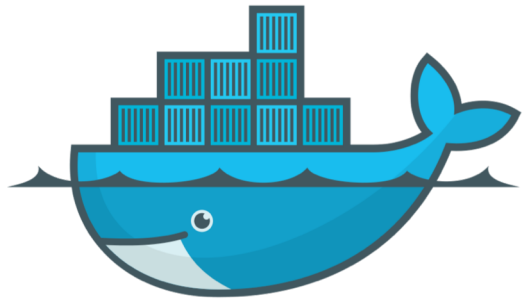
Level Set

- Containers in Production
- Microservices
- Docker, Kubernetes



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Monolithic Applications

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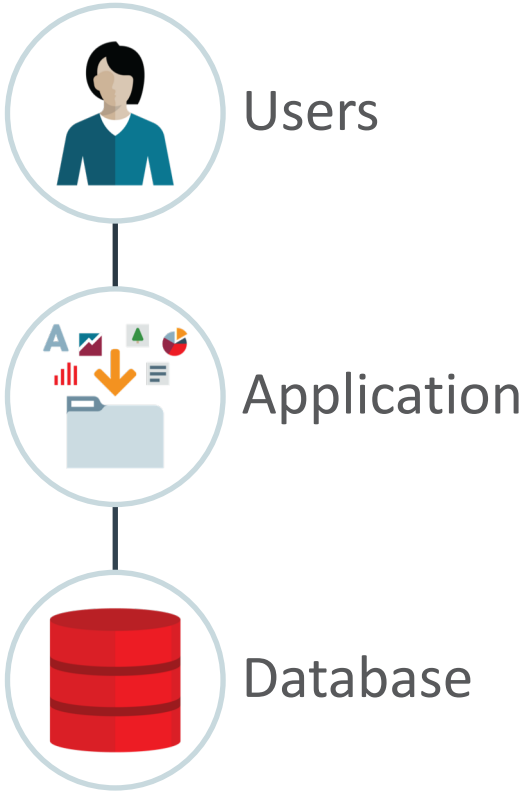
Monolithic Applications



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Microservices

- Microservices are the de facto standard for cloud native software
- Microservices allow development teams to deploy portable and scalable applications

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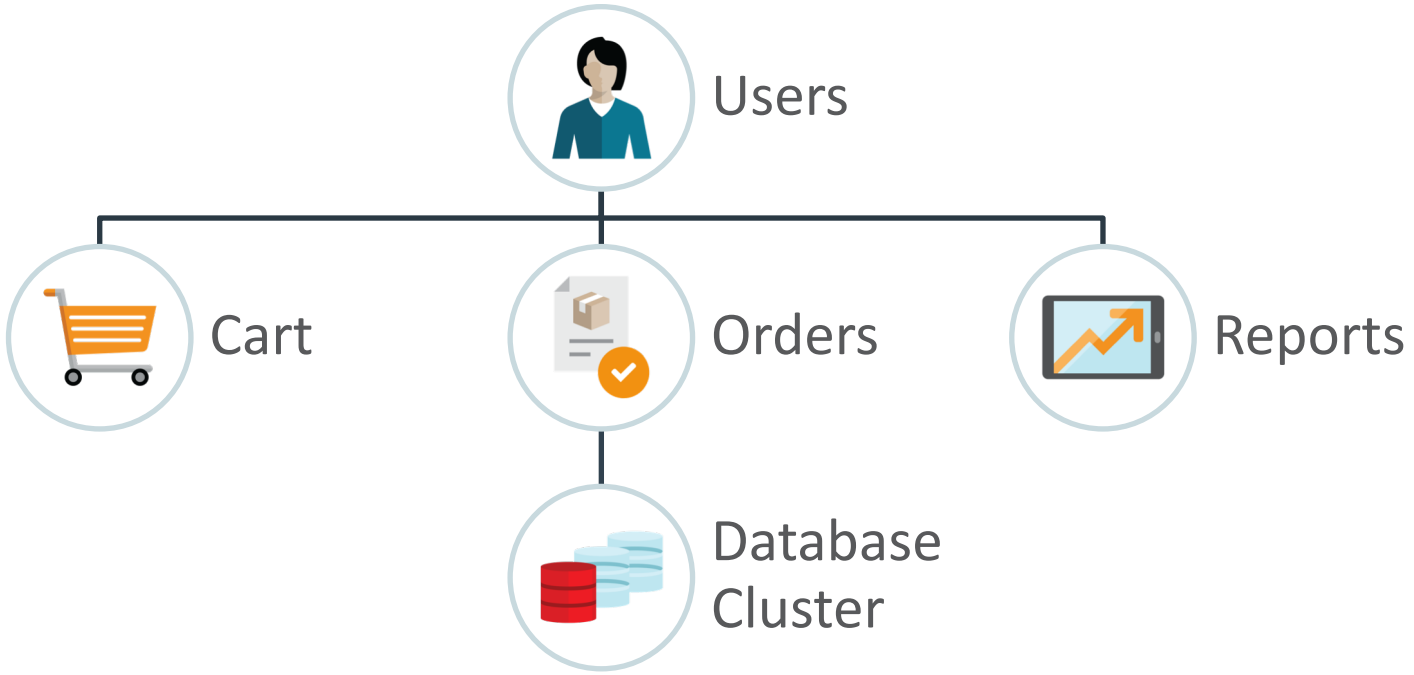
Microservices



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Microservices

- Microservices can put a significant burden on Ops and DevOps teams

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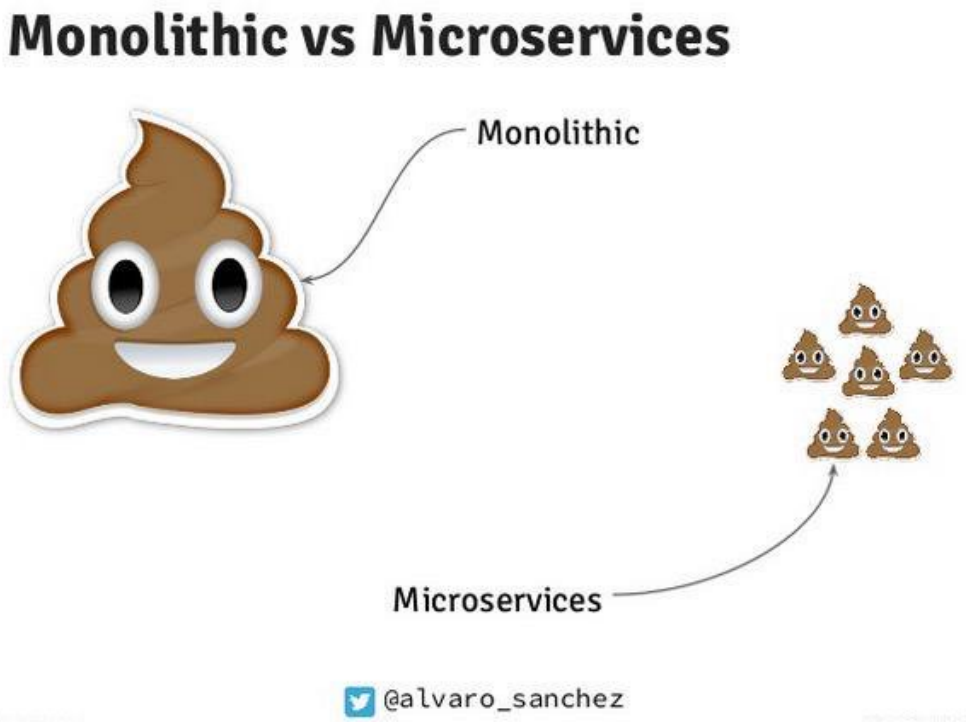
Microservices

- Or, put another way



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Let’s Talk About Istio

Istio a service mesh that allows us to connect, secure, control and observe services at scale, often requiring no service code modification

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The Old World

- Once upon a time, proprietary systems and software were bundled and sold as a unit
- This created independent silos per vendor, each with ecosystems of tools and service vendors
- Systems analysts surfaced system data and implemented improvements

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More Recent History

- There were a lot of moving parts in the typical Old World IT organization
- The advent of web applications made time to market a far more sensitive metric
- DevOps arose as a means of reducing friction between where software is created and where it is deployed

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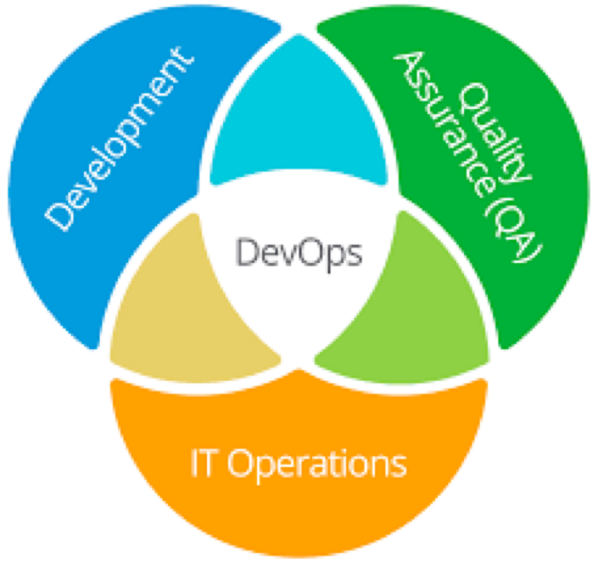
Advent of DevOps

- DevOps brings the concerns of development and operations closer together
- Ideally we preserve meaningful historical expertise from both high level disciplines
- DevOps is as much a cultural shift as it is technical



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DevOps, Mother of Invention

- Microservices
- CI / CD
- Cloud Adoption
- Containers

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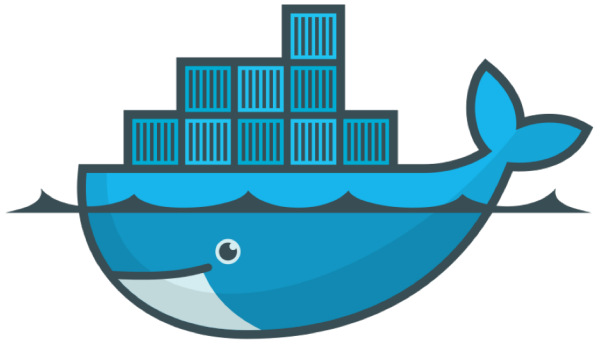
Docker

- Docker changed the way we build and ship software
- Application and host are decoupled, making application services portable
- Containers are an implementation detail, but a critical one



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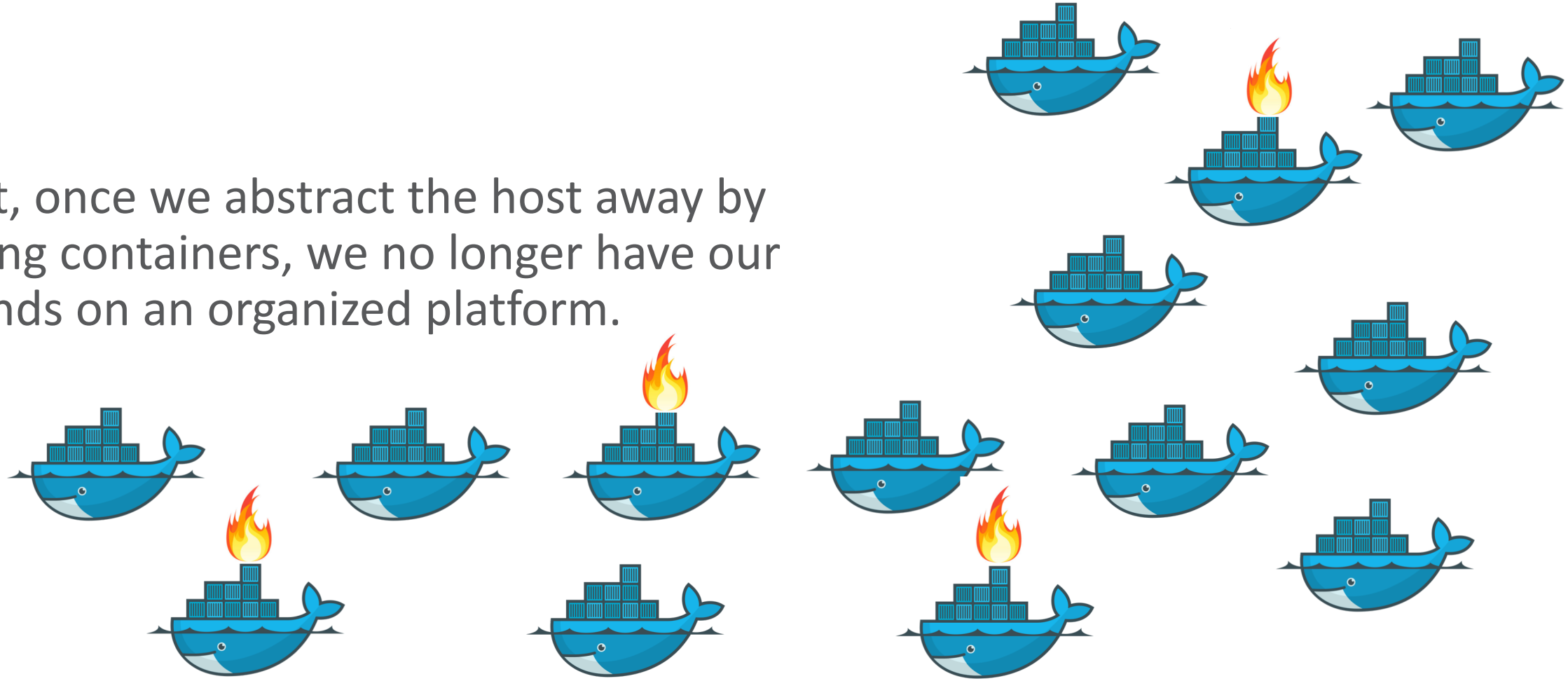
Docker Is a Start

But, once we abstract the host away by using containers, we no longer have our hands on an organized platform.



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Kubernetes

Kubernetes provides abstractions for deploying software in containers at scale

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Kubernetes as a Platform

- Infrastructure resource abstraction
- Cluster software where one or more masters control worker nodes
- Scheduler deploys work to the nodes
- Work is deployed in groups of containers

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Migration from the Old World…

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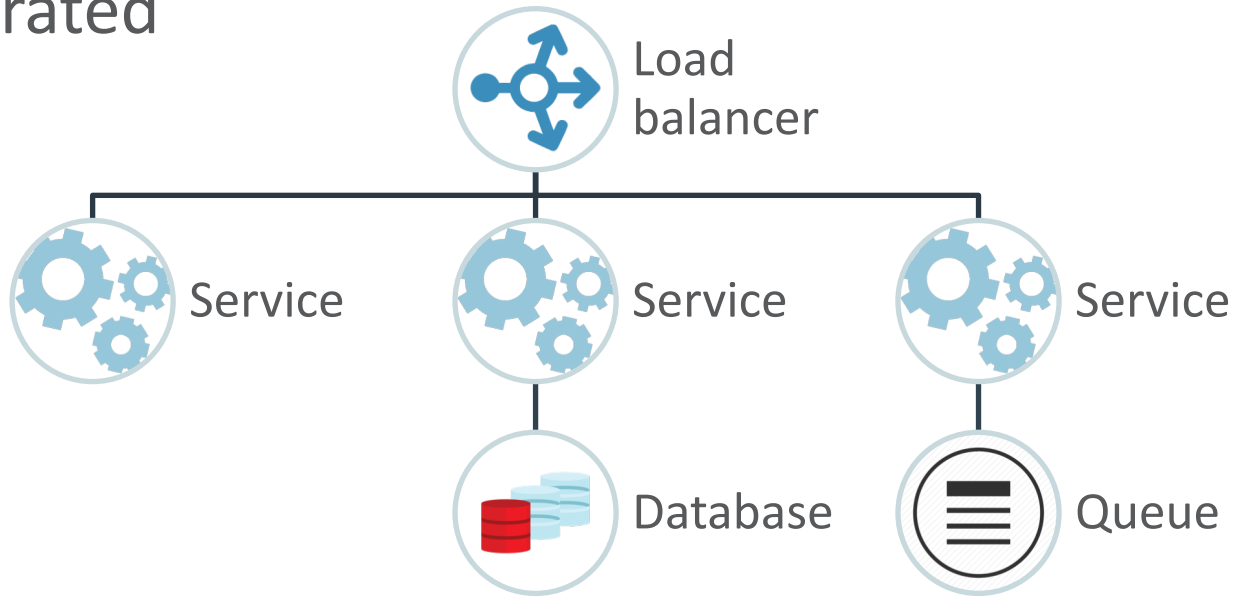
…to Cloud Native Kubernetes Hotness

- Microservices running in orchestrated containers
- Everybody's happy
- What happens now?



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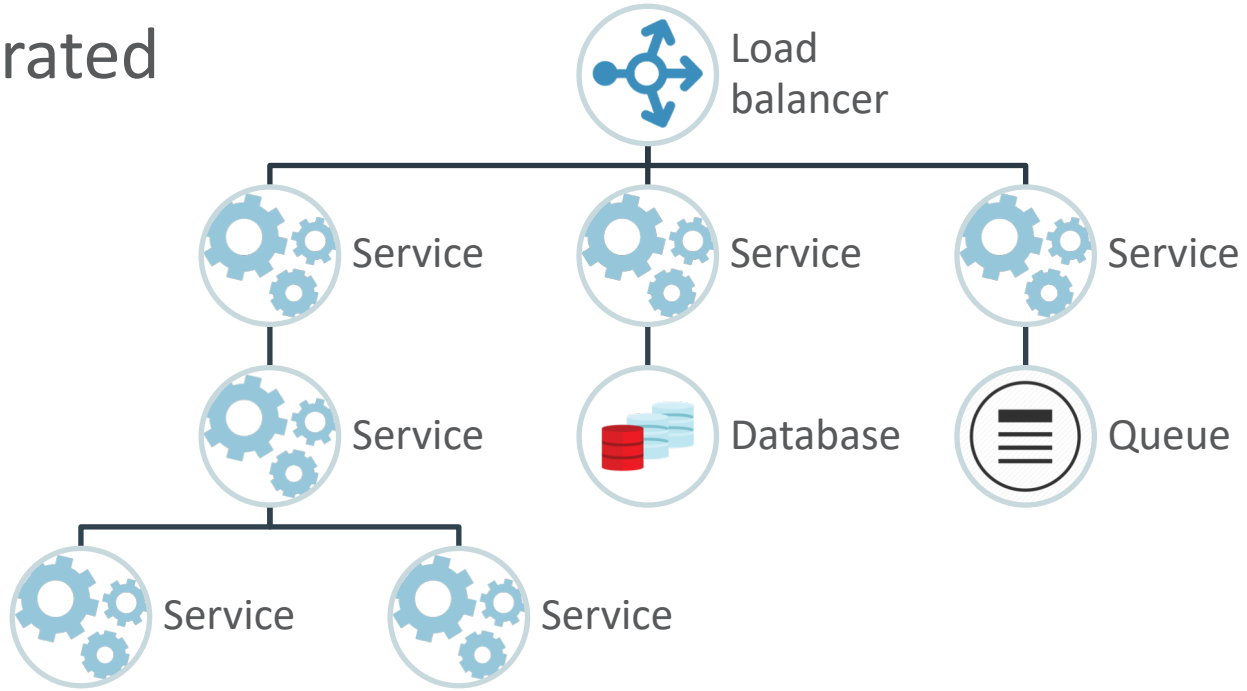

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Day Two

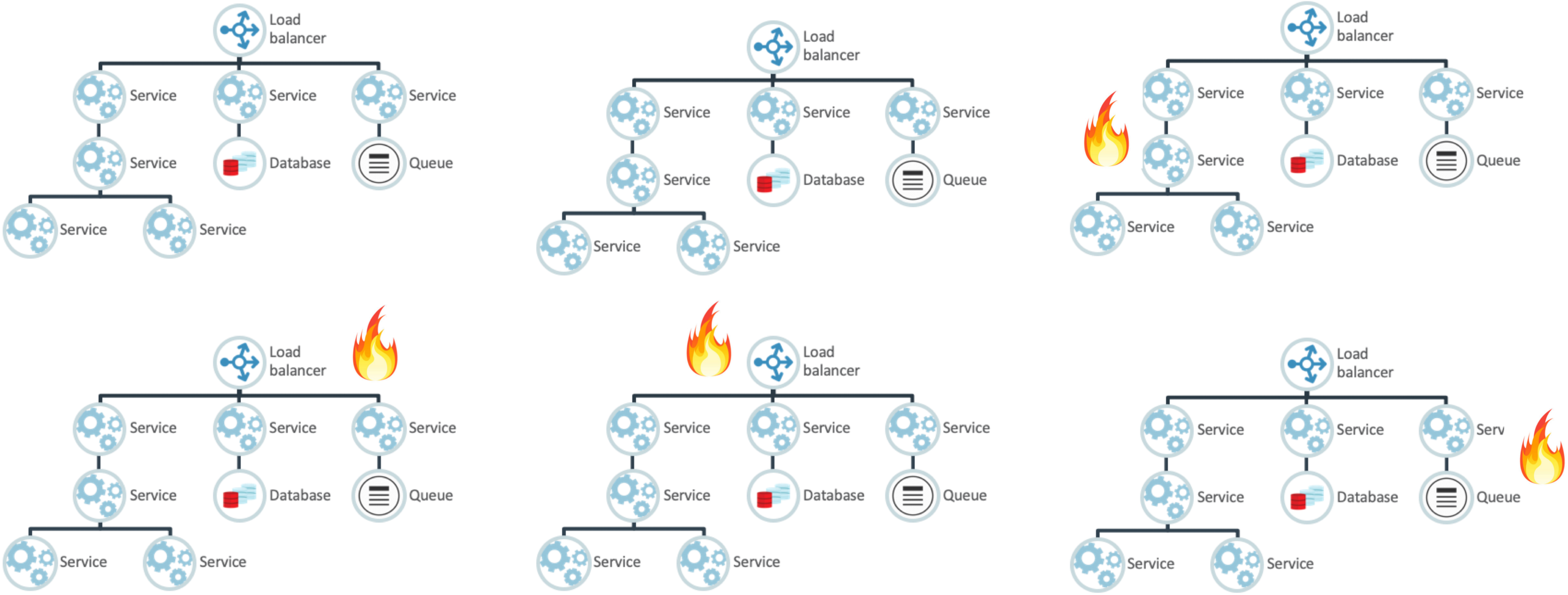

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Table Stakes for Services at Cloud Scale

- We require a method to simply and repeatably deploy software, and simply and recoverably modify deployments
- We require telemetry, observability, and diagnosability for our software if we hope to run at cloud scale

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Day 2 Solutions

- Ingress and Traffic Management
- Tracing and Observability
- Metrics and Analytics
- Identity and Security

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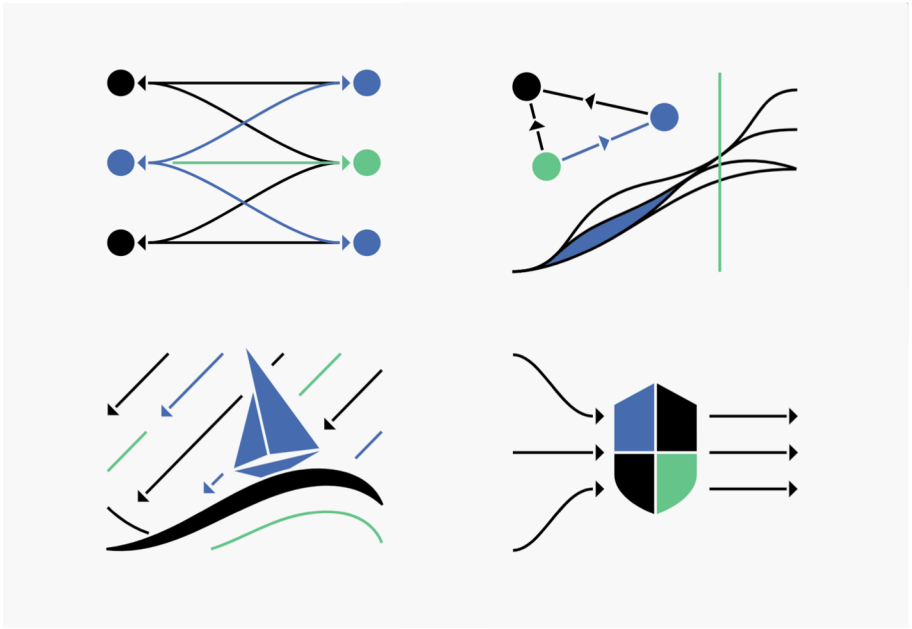
Abstract Requirements

- Traffic Management
- Observability
- Security
- Policy



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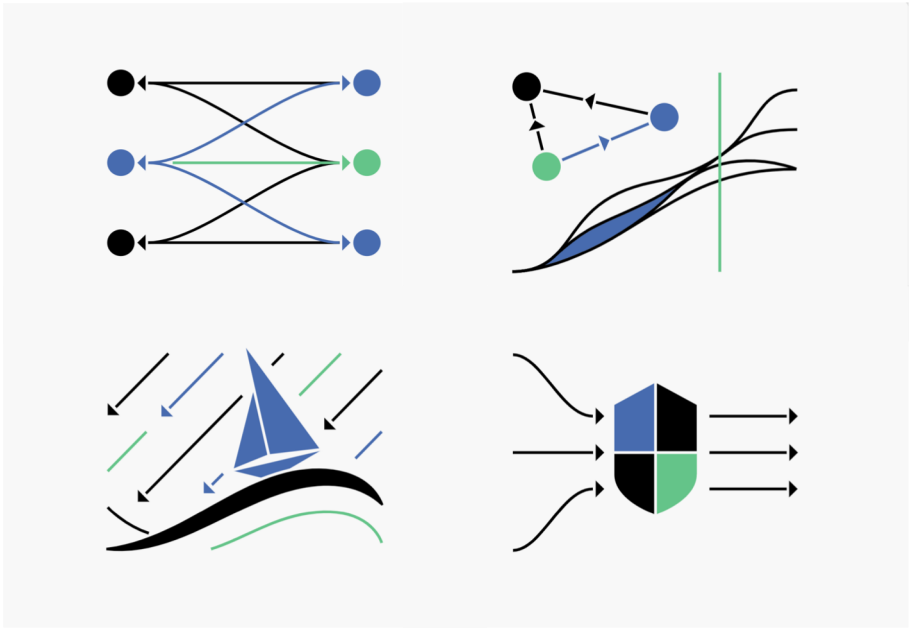
Hard Things are Hard

These are Hard Problems™, and some software may address one of them well.

Service mesh addresses them all.



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What Is a Service Mesh?

- Infrastructure layer for controlling and monitoring service-to-service traffic
- A data plane deployed alongside application services, and a control plane used to manage the mesh

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Service Mesh

- Provides DevOps teams a stable and extensible platform to monitor and maintain deployed services
- For the most part, invisible to development teams

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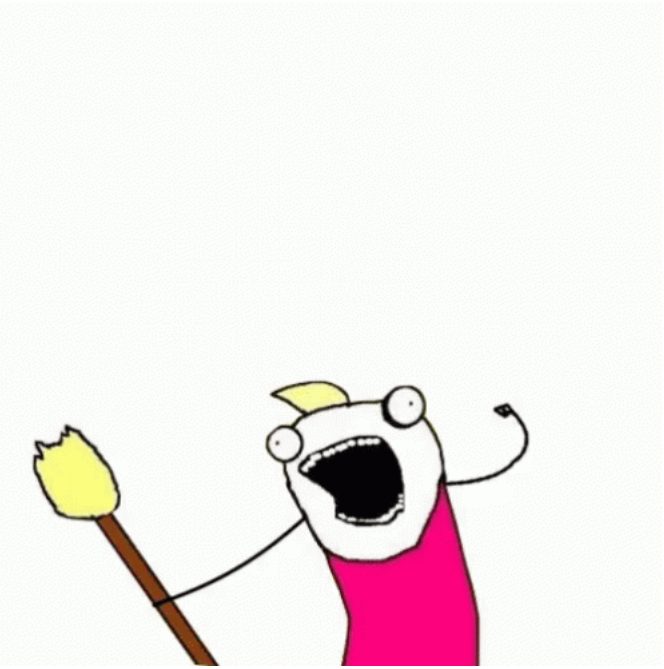
Service Mesh

- This is not a new solution which solves all the world's problems, but a different way to apply existing solutions
- Enables integration of existing (as well as future) best-in-class solutions for All The Things



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Let’s Get Back To Istio

Istio a service mesh that allows us to connect, secure, control and observe services at scale, often requiring no service code modification.

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Istio Features

- Traffic Management
  - Fine-grained control with rich routing rules, retries, failovers, and fault injection
- Observability
  - Automatic metrics, logs, and traces for all traffic within a cluster, including cluster ingress and egress

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Istio Features

- Security
  - Strong identity-based AuthN and AuthZ layer, secure by default for ingress, egress and service-to-service traffic
- Policy
  - Extensible policy engine supporting access controls, rate limits and quotas

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Sidecar Proxy

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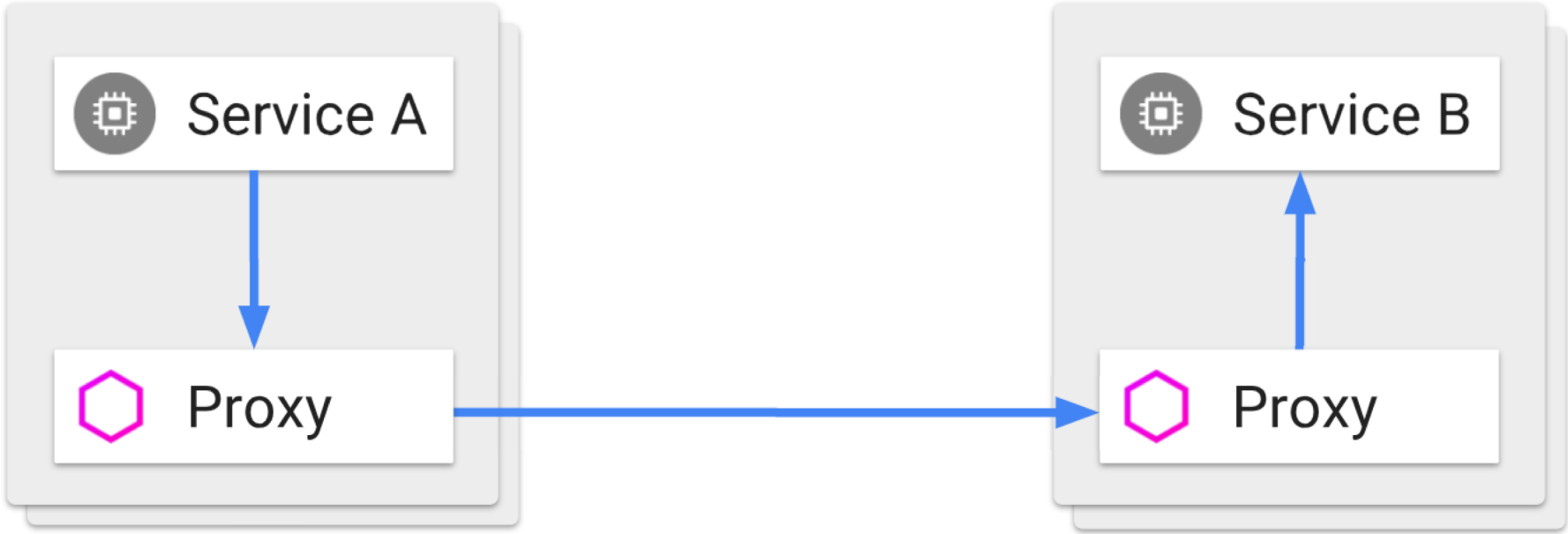
Sidecar Proxy



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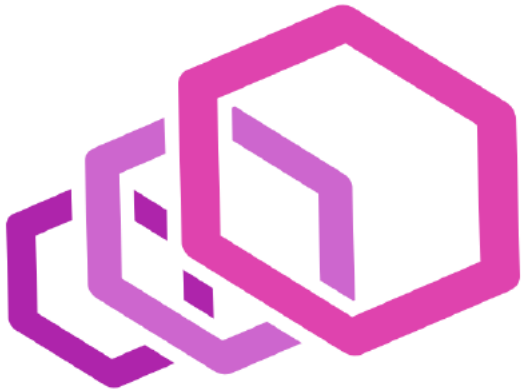
Envoy

High performance proxy which mediates inbound and outbound traffic.



- Dynamic service discovery
- Load balancing
- TLS termination
- HTTP/2 and gRPC proxies
- Circuit breakers
- Health checks
- Split traffic
- Fault injection
- Rich metrics

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Istio Components

- Envoy
  - Sidecar proxy
- Pilot
  - Propagates rules to sidecars
- Mixer
  - Enforces access control, collects telemetry data
- Citadel
  - Service-to-service and end-user AuthN and AuthZ

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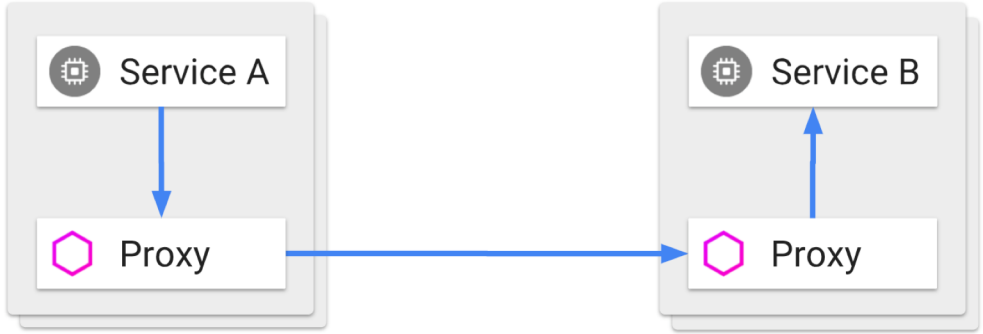
Istio Architecture



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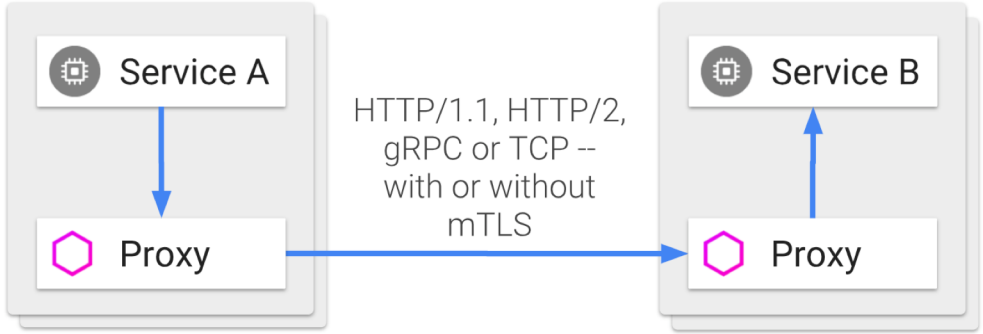
Istio Architecture



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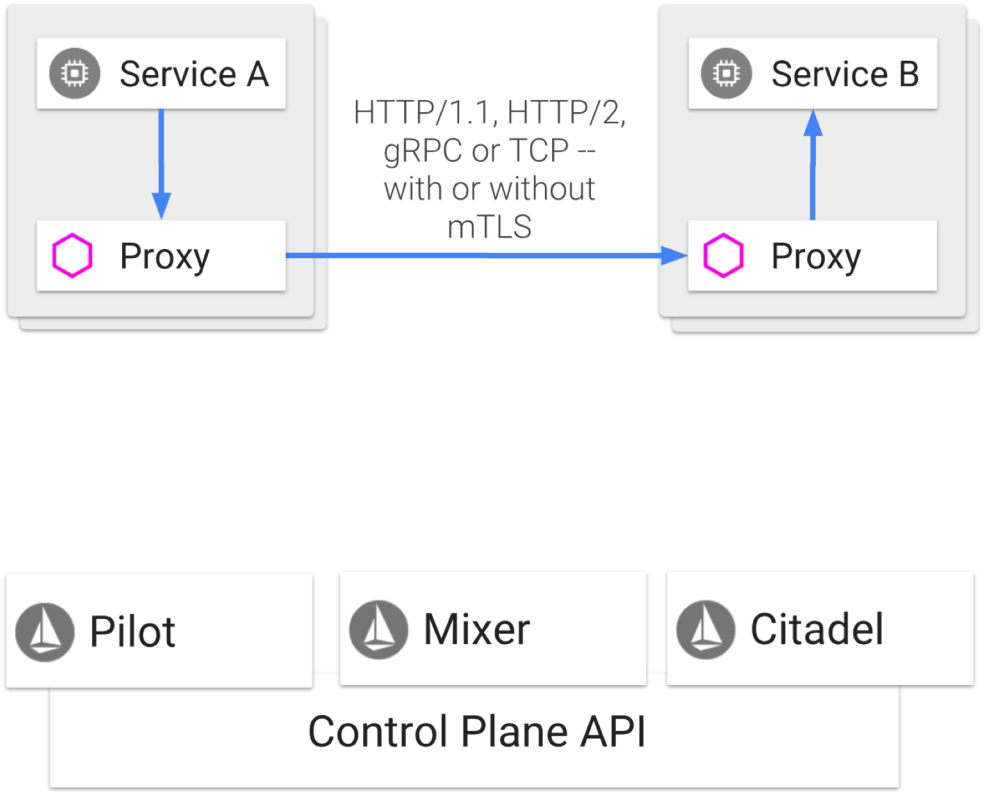
Istio Architecture



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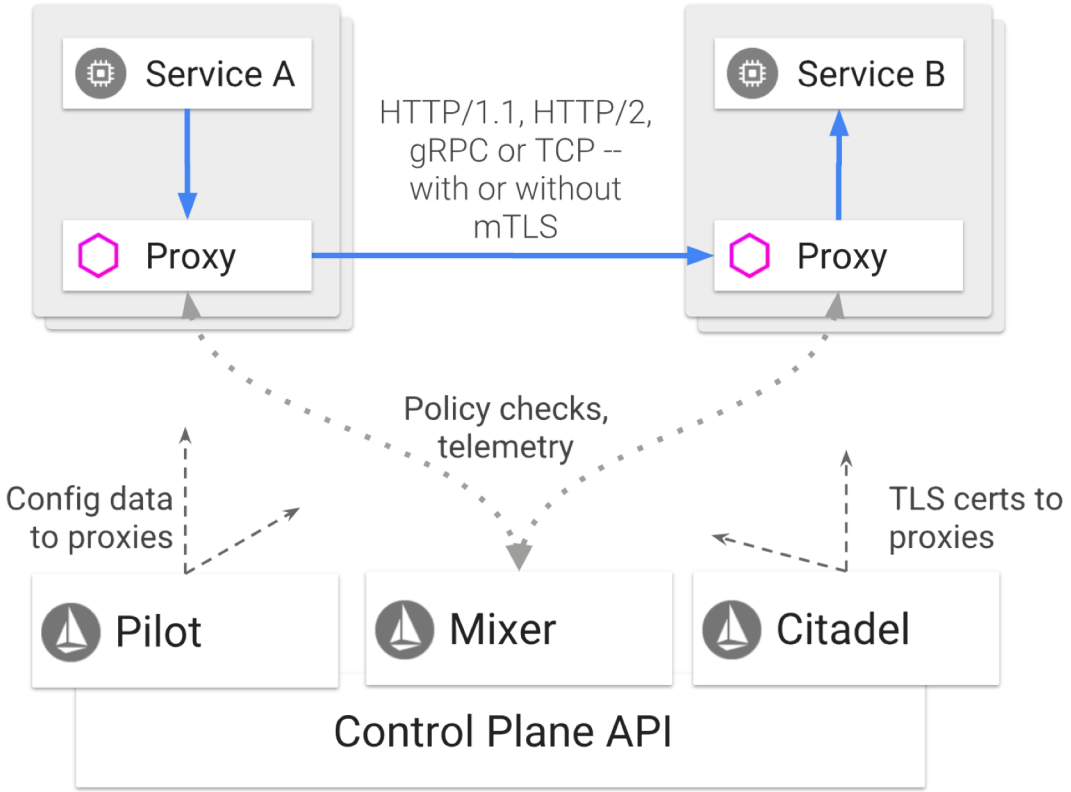
Istio Architecture



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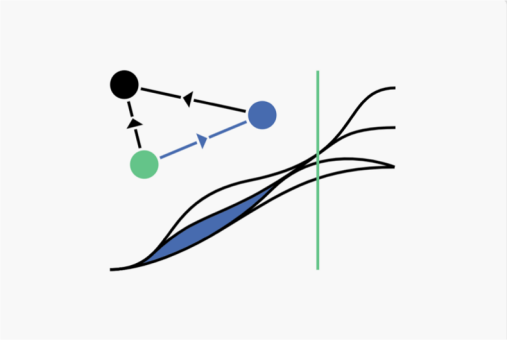
Telemetry

- Istio's Mixer is stateless and does not manage any persistent storage of its own
- Capable of accumulating a large amount of transient ephemeral state
- Designed to be a highly reliable, goal is > 99.999% uptime for any individual instance
- Many adapters available: Prometheus, Cloud providers, Datadog, Solarwinds…



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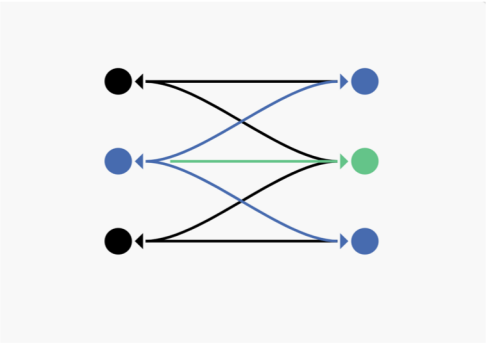
Traffic Management

- Integrated Ingress and Egress
- Error handling, retries, circuit breaking
- Application knowledge can be leveraged for intelligent routing
- Fault injection for end-to-end testing



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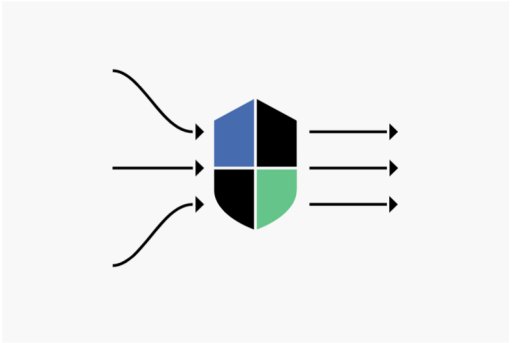
Performance and Scalability

- Code level micro-benchmarks
- Synthetic end-to-end benchmarks across various scenarios
- Realistic complex app end-to-end benchmarks across various settings
- Automation to ensure performance doesn't regress



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Security

- Traffic encryption to defend against the man-in-the-middle attacks
- Mutual TLS and fine-grained access policies to provide flexible access control
- Auditing tools to monitor all of it

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Service Mesh Adoption

- Service mesh provides features that make life easier for DevOps and Ops teams
- Benefits are becoming apparent to developers, simplified services allowing the mesh to take are of things like retries, circuit breakers, etc
- Istio is a great place to start
- https://cloudnative.oracle.com/learn.html has an Istio 101 Tutorial if you are interested!

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Questions?

Thank you!

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- Backup

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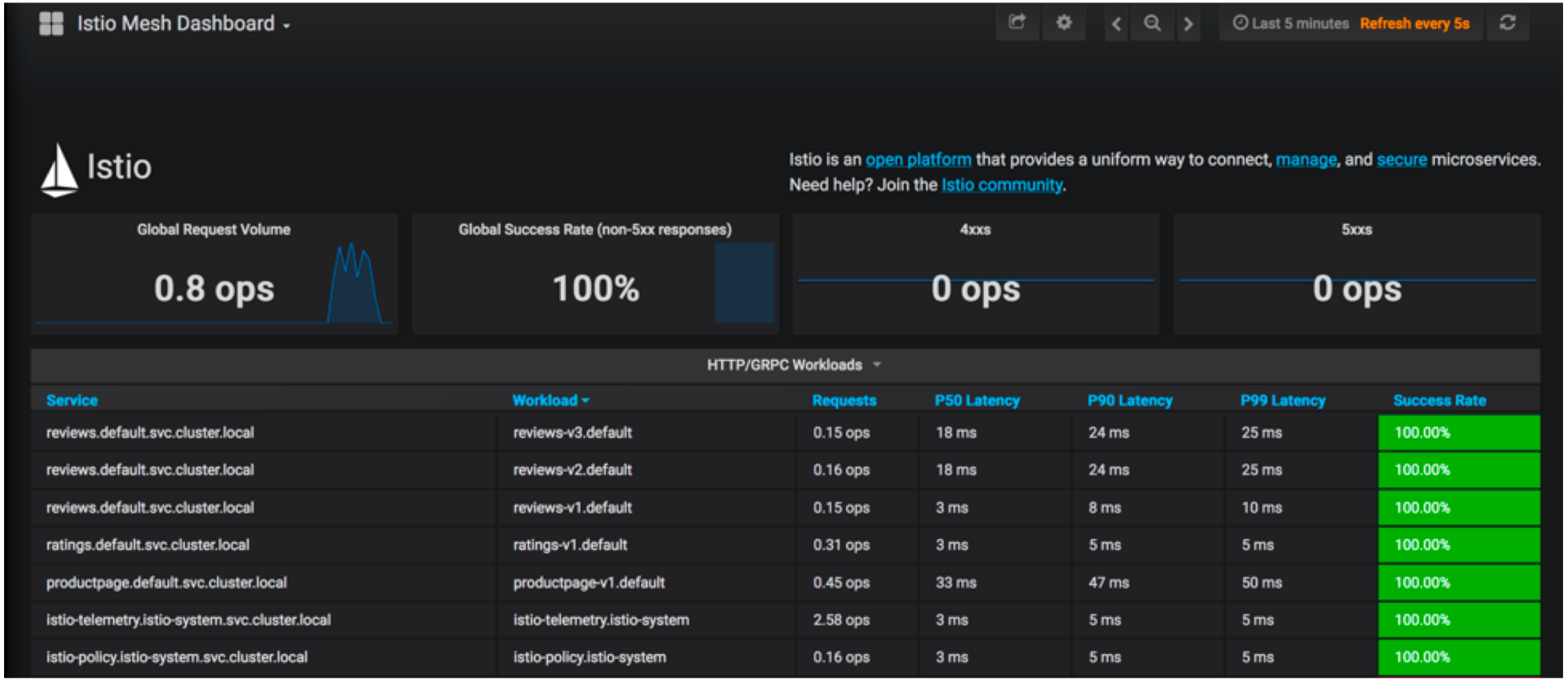
Grafana Istio Mesh Dashboard



Service	Workload	Requests	P50 Latency	P90 Latency	P99 Latency	Success Rate
reviews.default.svc.cluster.local	reviews-v3.default	0.15 ops	18 ms	24 ms	25 ms	100.00%
reviews.default.svc.cluster.local	reviews-v2.default	0.16 ops	18 ms	24 ms	25 ms	100.00%
reviews.default.svc.cluster.local	reviews-v1.default	0.15 ops	3 ms	8 ms	10 ms	100.00%
ratings.default.svc.cluster.local	ratings-v1.default	0.31 ops	3 ms	5 ms	5 ms	100.00%
productpage.default.svc.cluster.local	productpage-v1.default	0.45 ops	33 ms	47 ms	50 ms	100.00%
istio-telemetry.istio-system.svc.cluster.local	istio-telemetry.istio-system	2.58 ops	3 ms	5 ms	5 ms	100.00%
istio-policy.istio-system.svc.cluster.local	istio-policy.istio-system	0.16 ops	3 ms	5 ms	5 ms	100.00%

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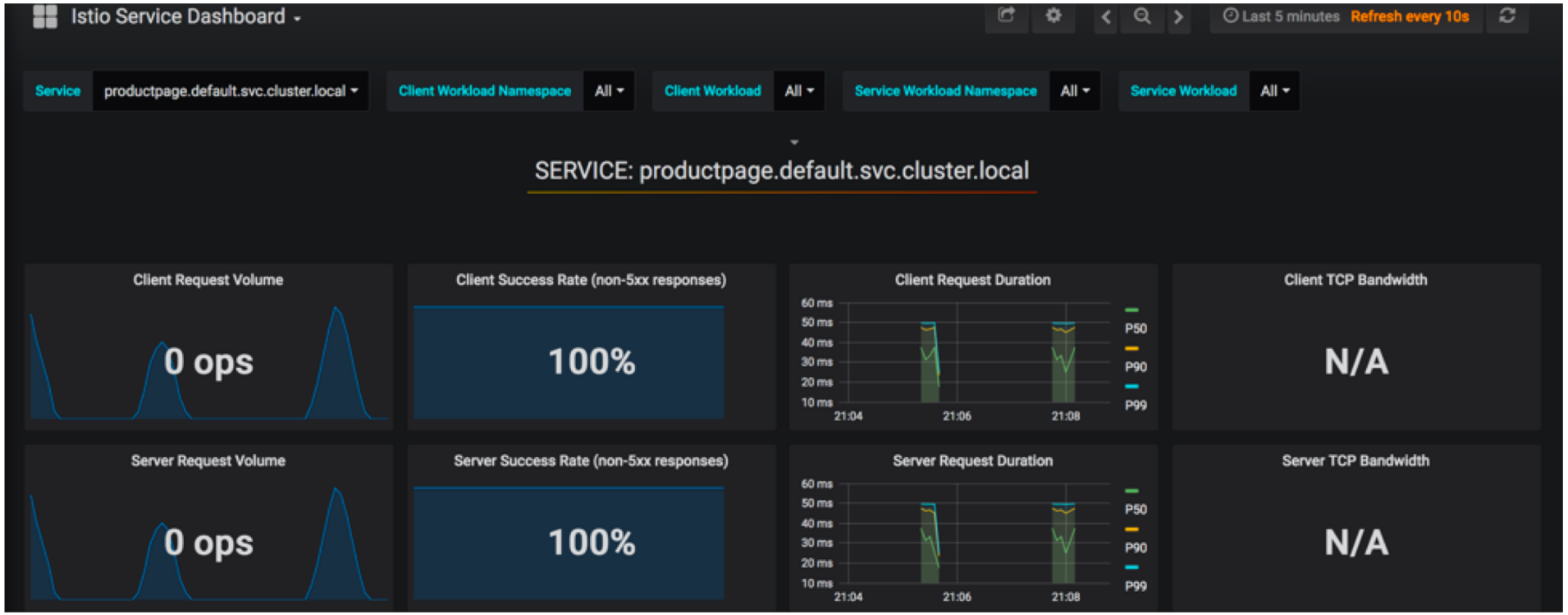
Service Dashboard



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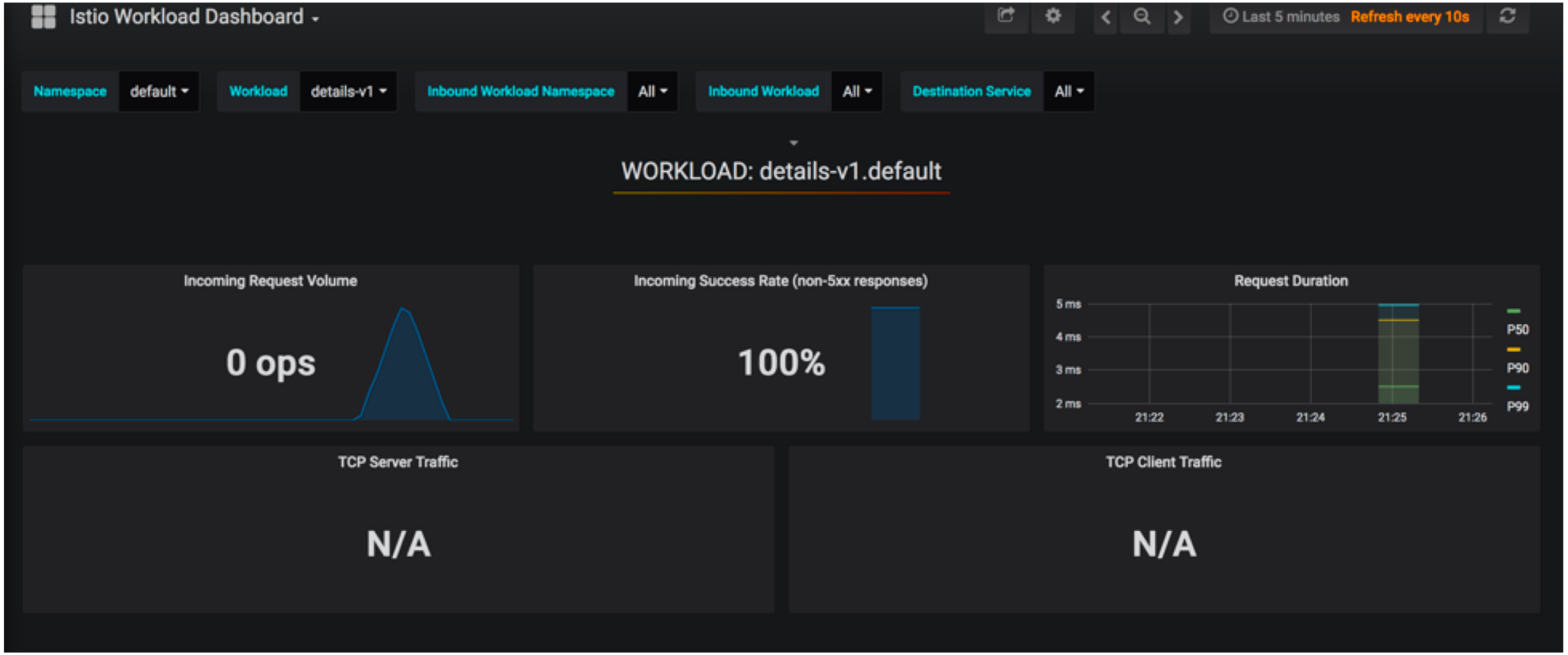
Workload Dashboard



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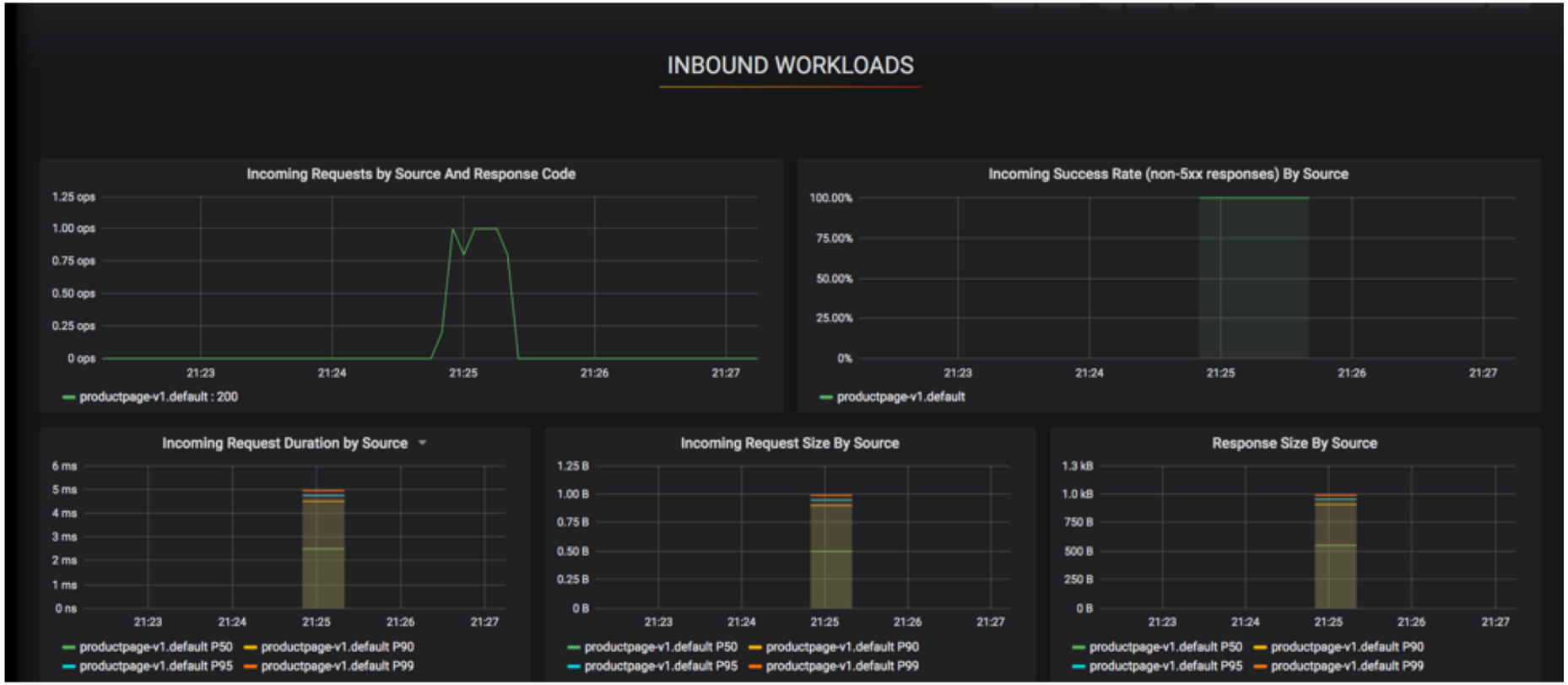
Inbound Workload



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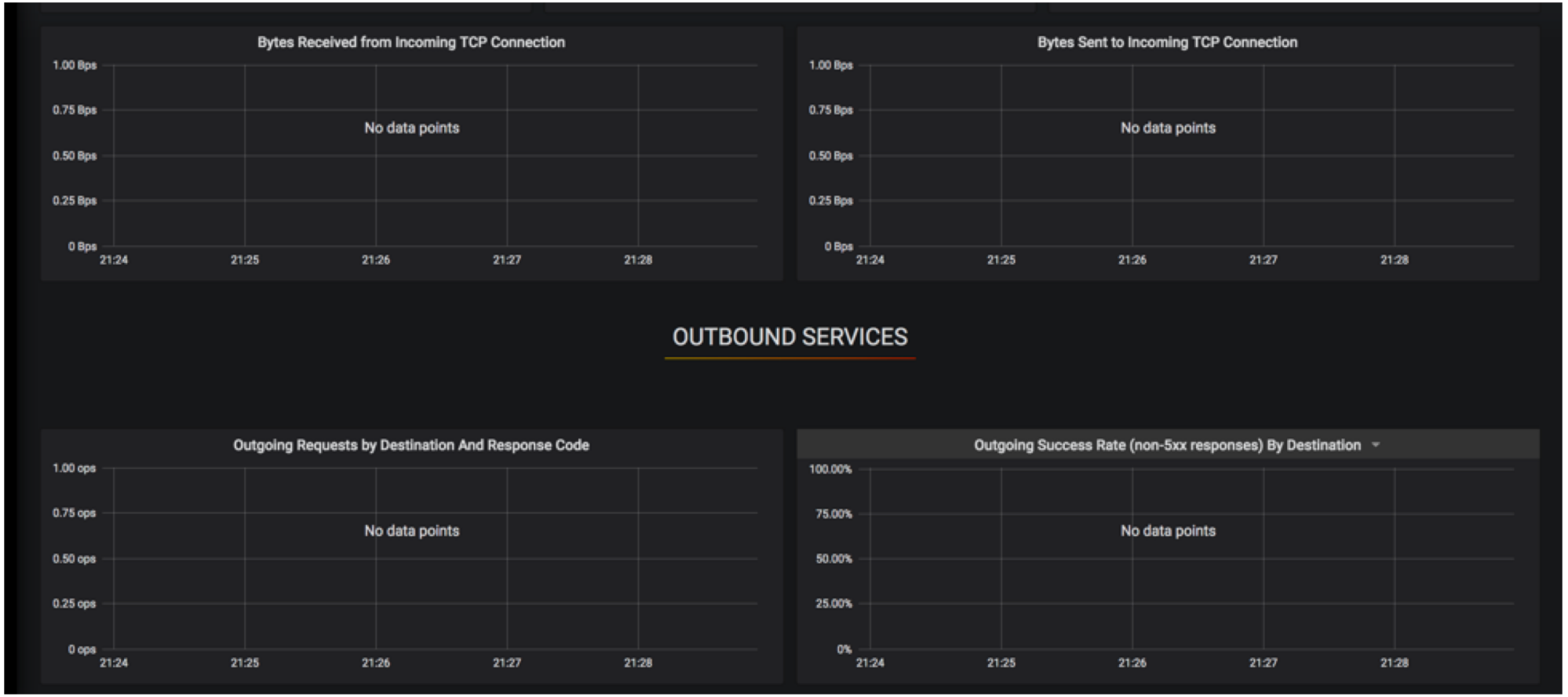
Outbound Workload



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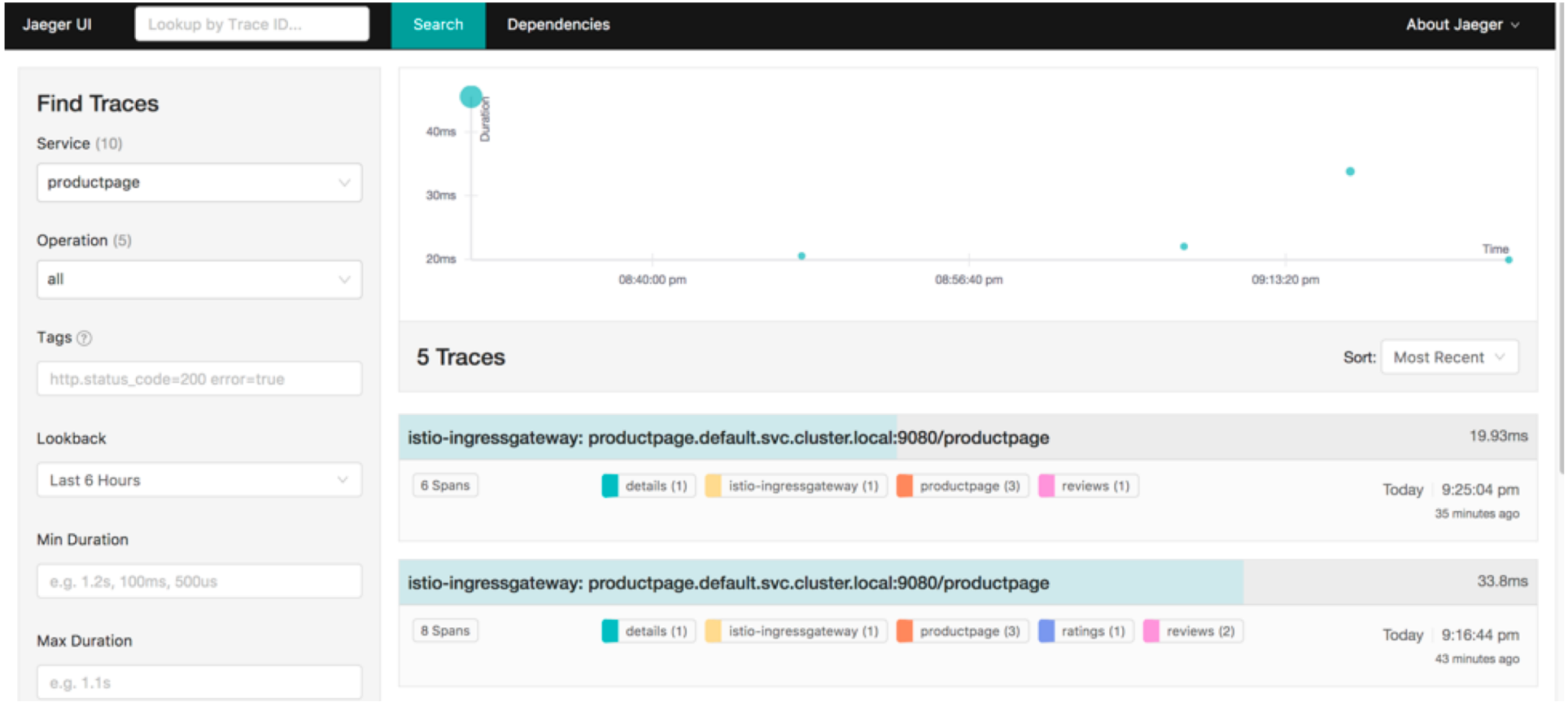
Service Tracing



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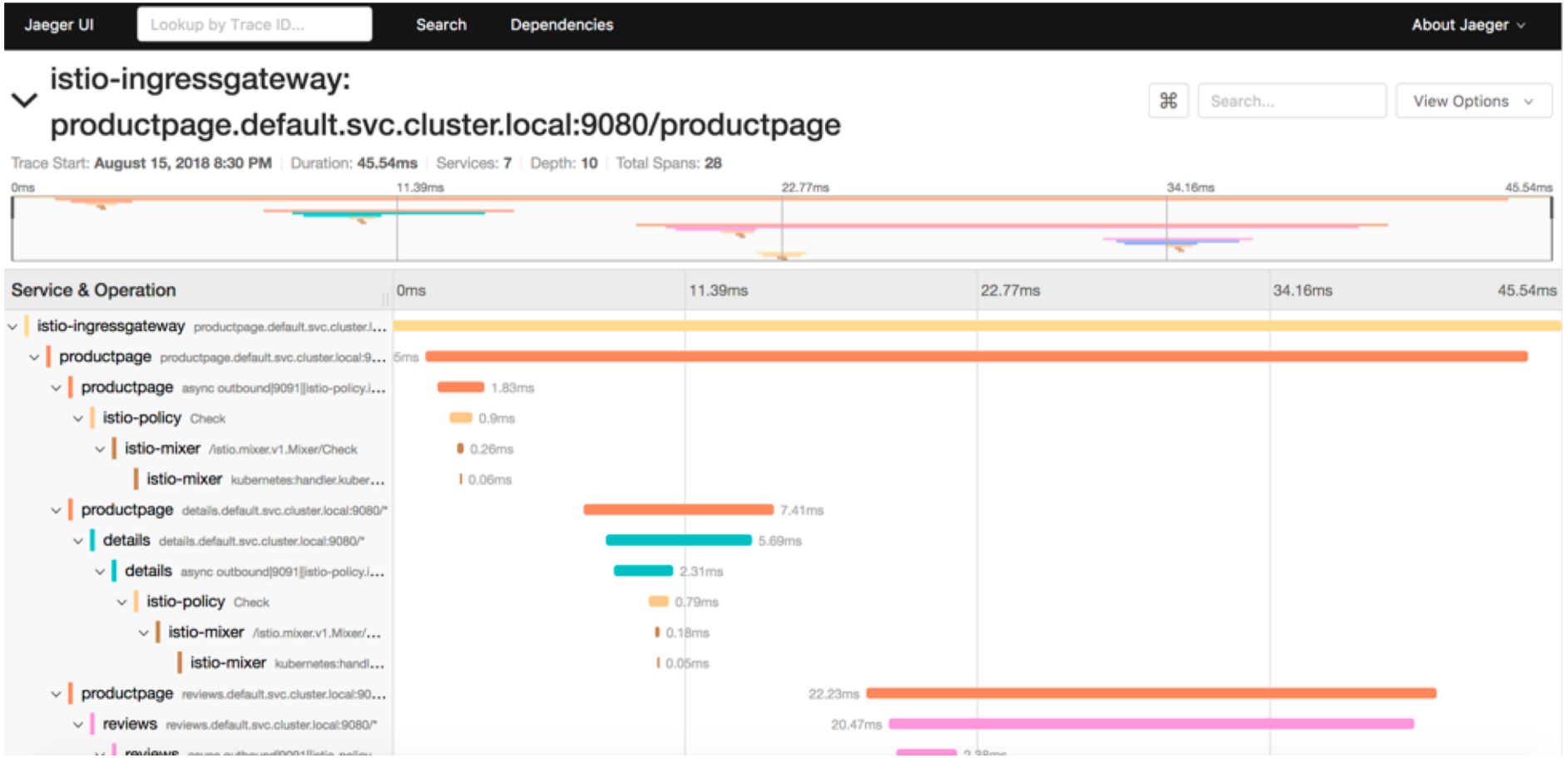
Service Drilldown



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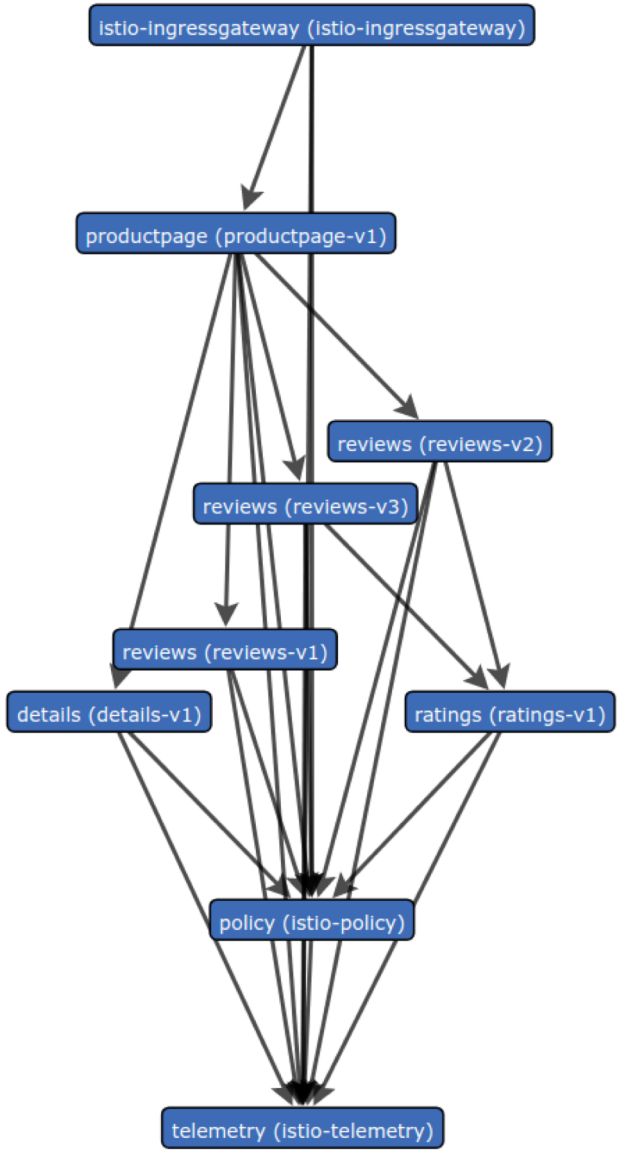
Service Graph



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