Service Mesh Sharing

Thang Chung – May 2018 – v0.0.1

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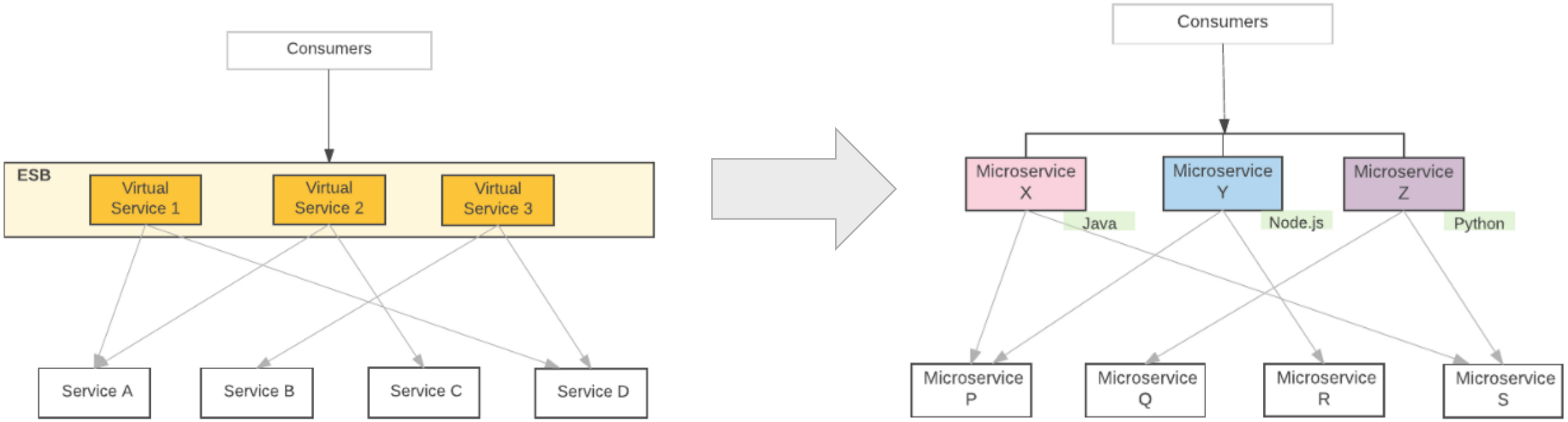
Agenda

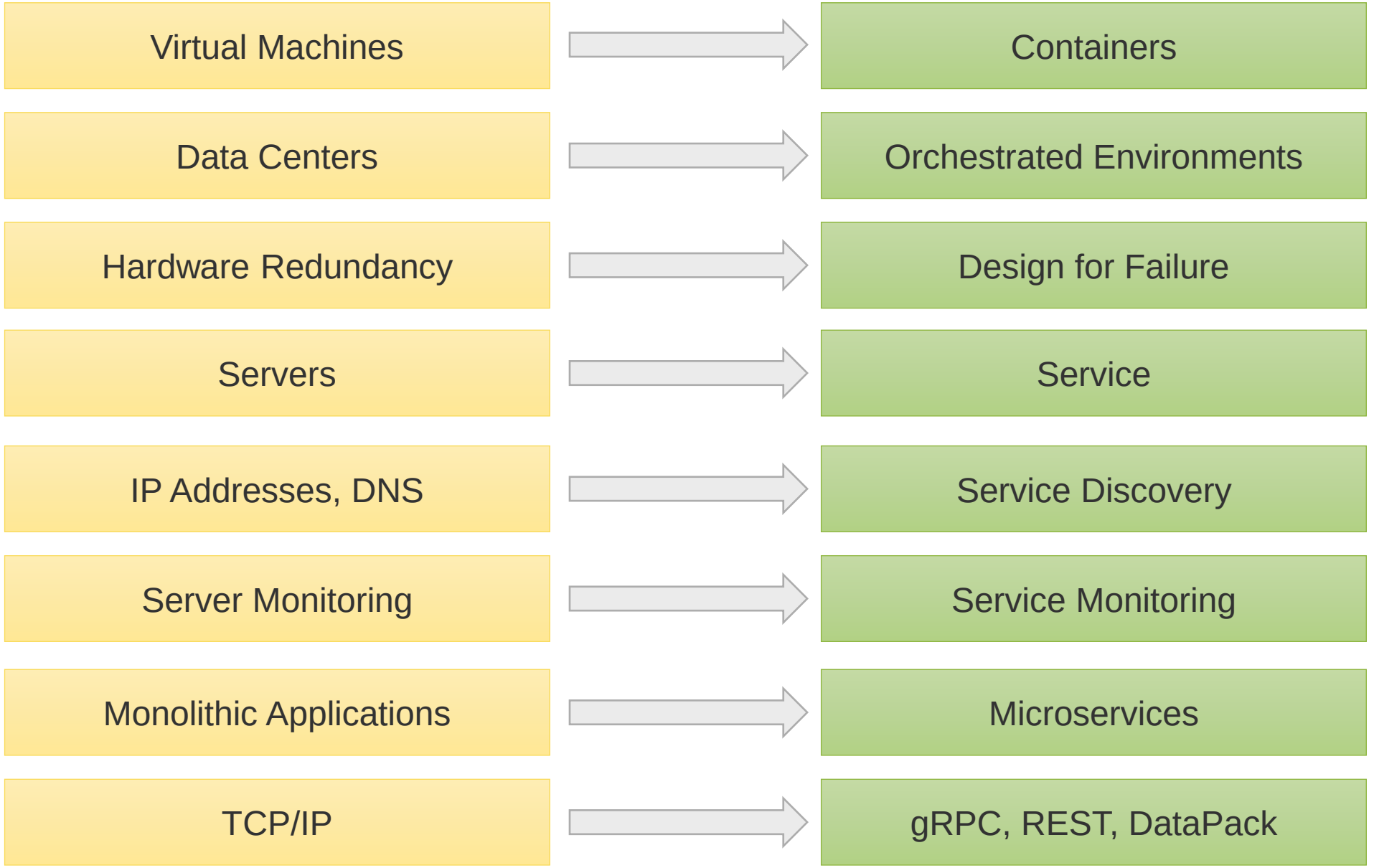
- Before Service Mesh Era
- Service Mesh
- Building Service Mesh for Microservices
- Demo
- Q&A

Before Service Mesh Era

From SOA to MSA pattern



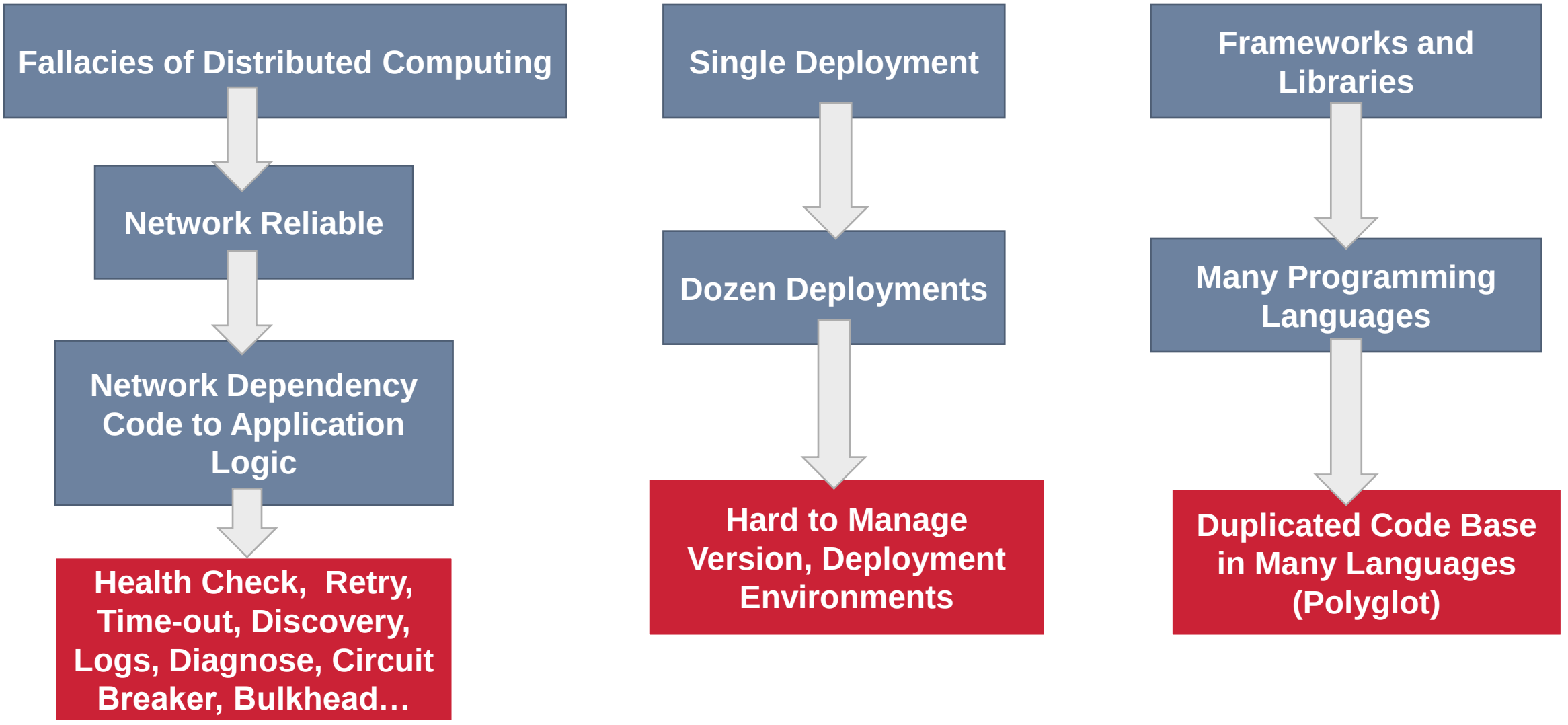
From Server to Service/Container Abstraction



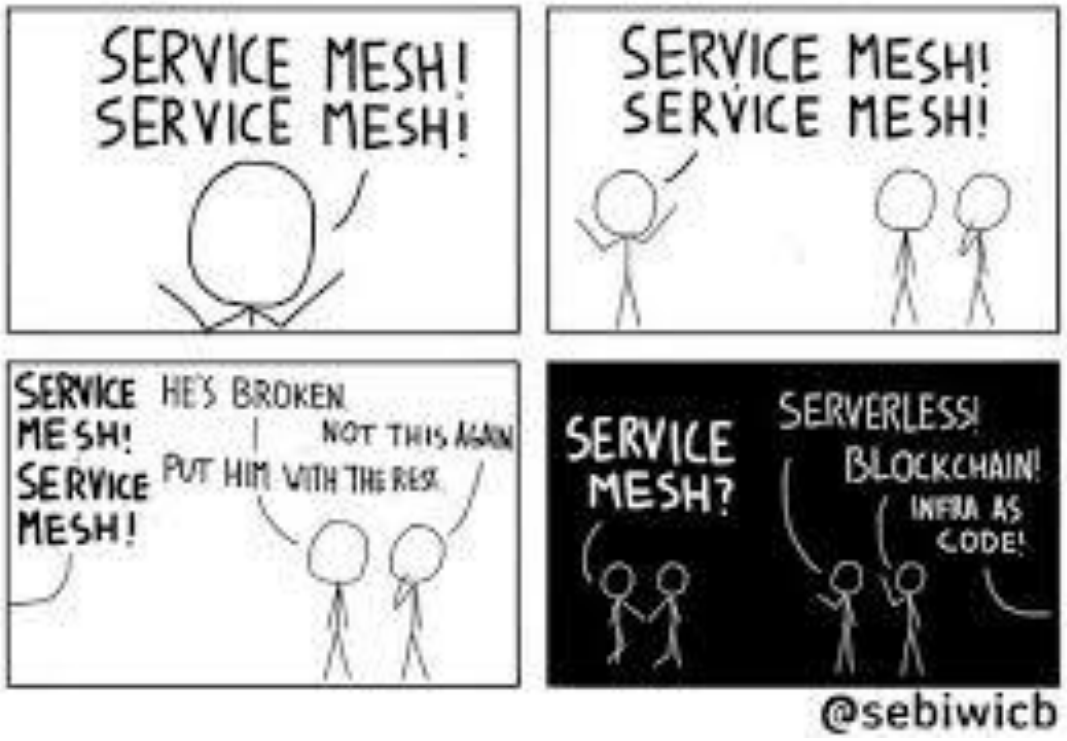
Standard Requirements for MSA

- **Load Balancing**
- **Routing**: path based routing – L7 intelligent proxy
- **Auto Service Discovery**
- **Resiliency for inter-service communications**: circuit-breaking, bulkhead, retries and timeouts, fault injection, fault handling, load balancing and failover, and Rate Limiting.
- **Observability**: metrics, monitoring, distributed logging, and distributed tracing
- **Security**: mTLS and key management
- **Inter-service communication protocols**: HTTP1.x, HTTP2, gRPC, or DataPack protocols
- **Configuration information**
- **Deployment**: native support for containers (Docker) and orchestration layer (Kubernetes, Docker Swarm…)
- **100% Uptime**

Challenge of Going Faster

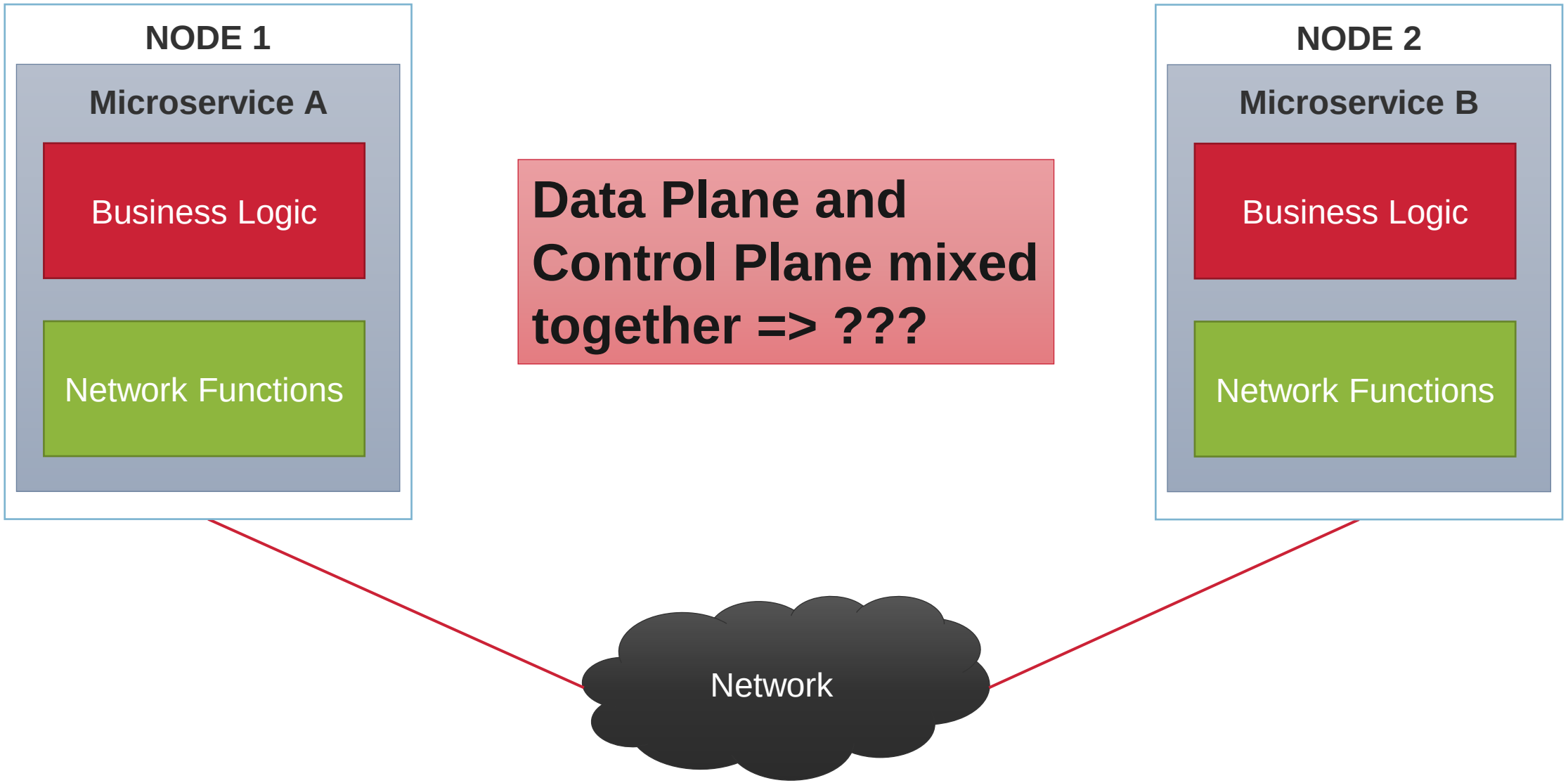


Then what kind of software architecture can help us to sort it out?

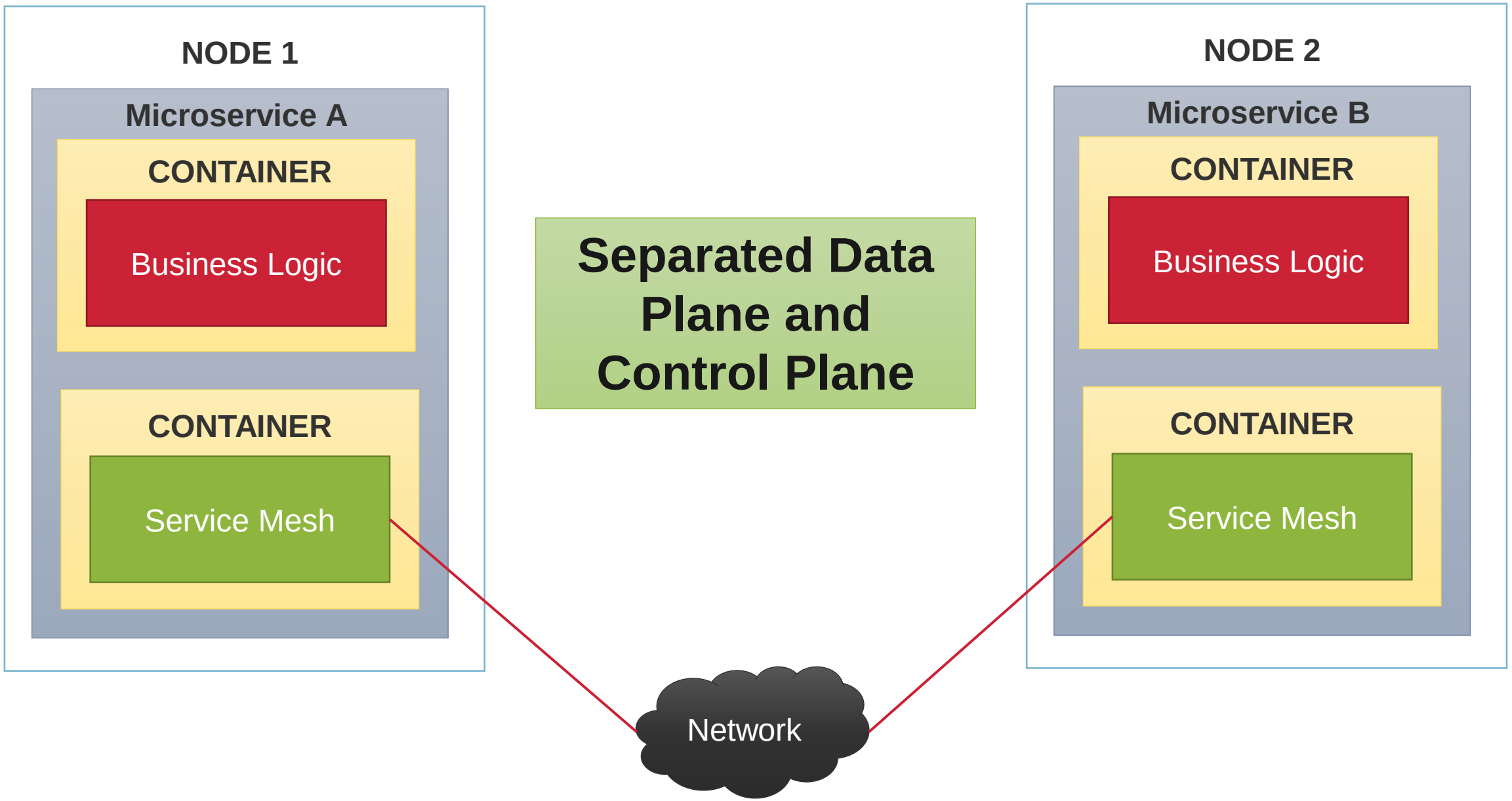


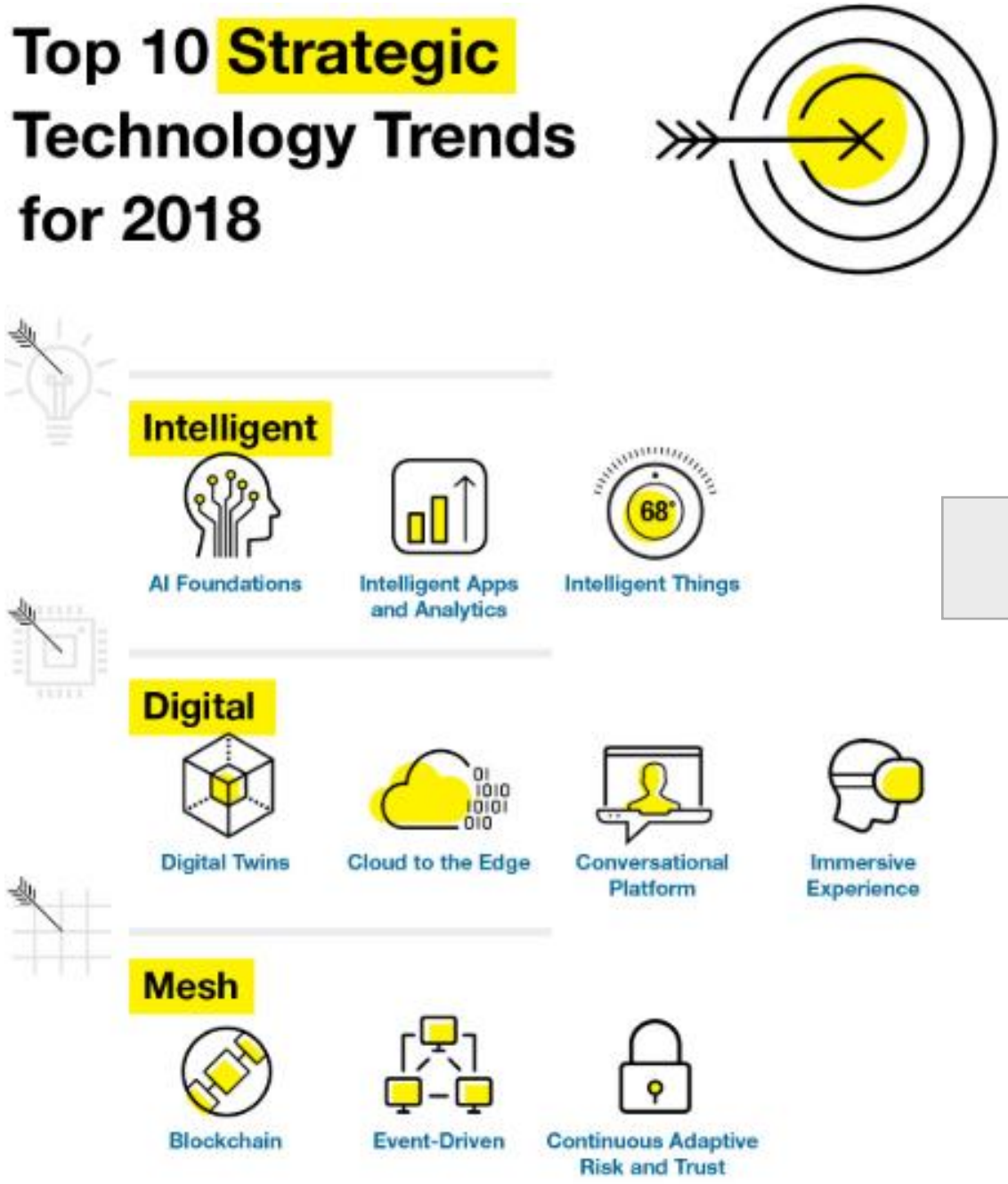
Service Mesh

MSA to Service Mesh



MSA to Service Mesh (cont.)





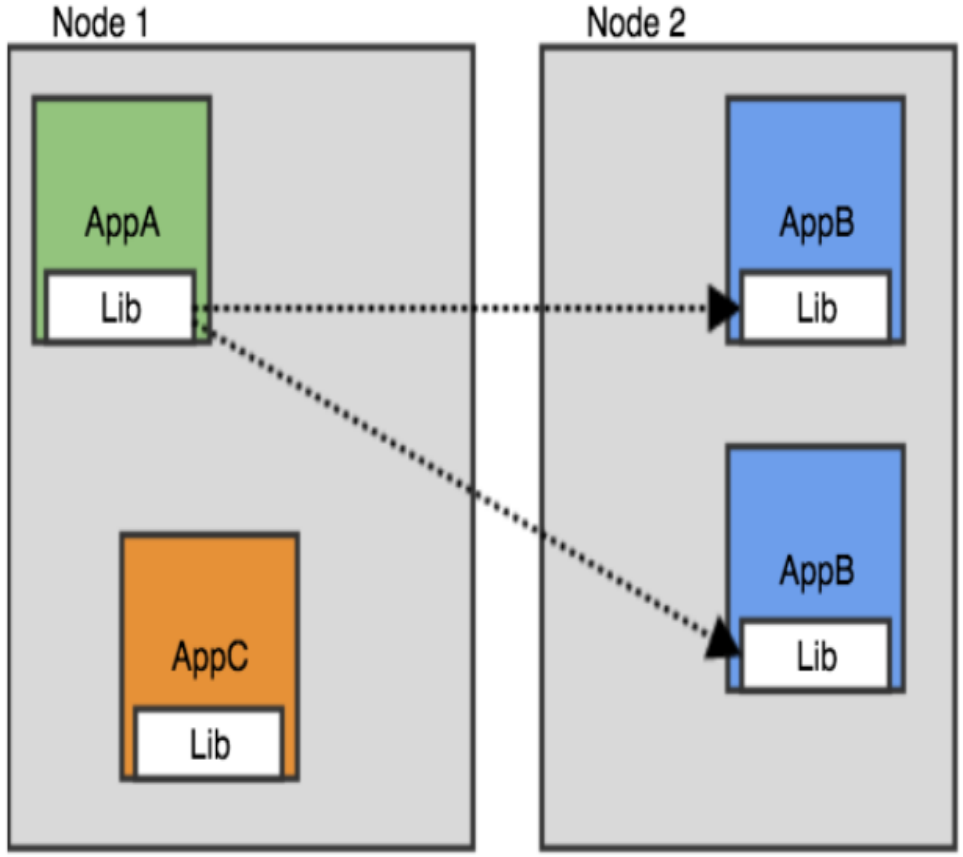
A **SERVICE MESH** offers **consistent discovery**, **security**, **tracing**, **monitoring** and **failure handling** without the need for a shared asset such as an API gateway or ESB.

https://www.thoughtworks.com/radar/techniques/service-mesh

Service Mesh Types

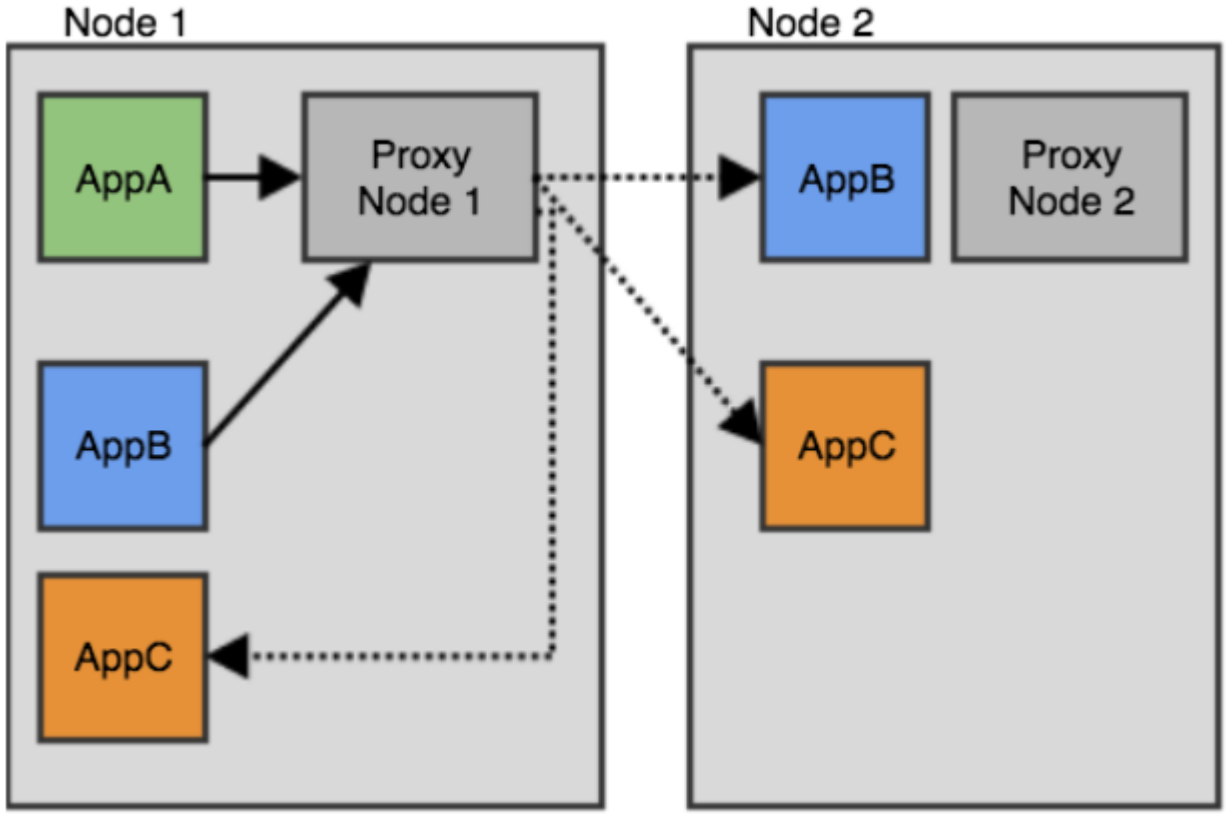
- Library
- Node Agent
- Sidecar

Service Mesh Types - Library



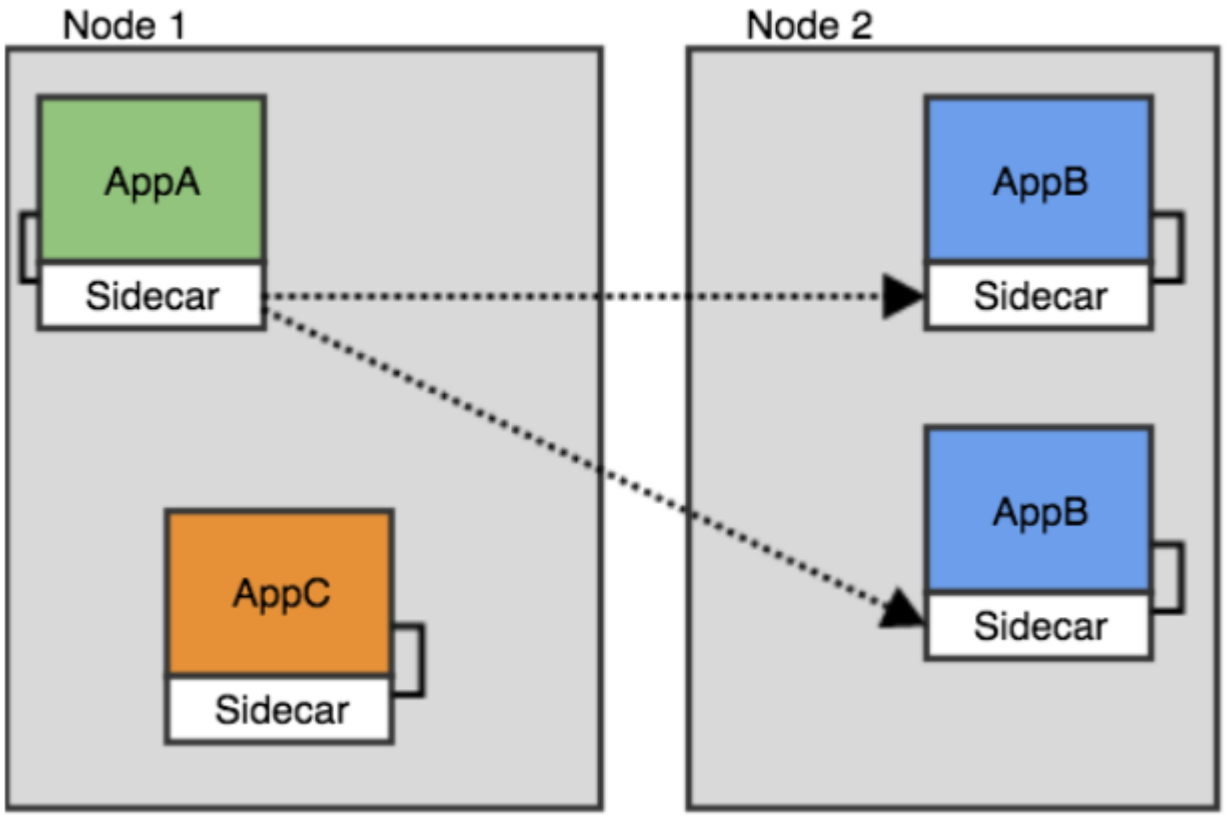
- **Netflix OSS (Hystrix, Ribbon)**, **Twitter Finagle**, **Google Stubby**
- Pros:
  - Simple and straight-forward
  - Work well with one programming language technical stack
  - Don’t care much about co-operate with underlying infrastructure (e.g. Kubernetes, Docker Swarm)
- Cons:
  - Become messy and consume efforts when using many different programming languages (polyglot)
  - Cannot leverage the power of containerized application (Resource Isolation and Dependency Management), orchestration layer (Kubernetes, Docker Swarm)

Service Mesh Types – Node Agent



- **Linkerd** + **Kubernetes**
- Pros:
  - Benefits from sharing is configuration information
  - Containerized Microservices on top of Node Agent or something topologically equivalent
  - Manages the powerful techniques: circuit-breaking, latency-aware load balancing, eventually consistent, service discovery, retries, and deadlines
- Cons:
  - Requires some cooperation from the infrastructure

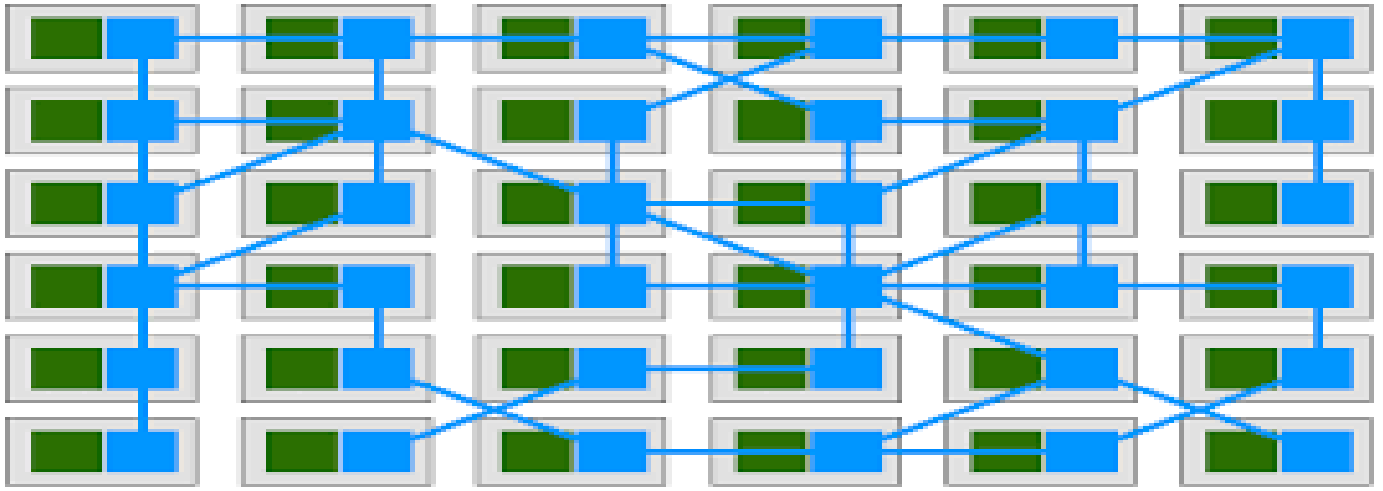
Service Mesh Types – Sidecar



- **Istio + Envoy + Kubernetes, Conduit**
- Pros:
  - Don’t need infrastructure-wide cooperation to deploy that shared agent
  - Security-related aspects - Principle of Least Privilege, e.g. authentication keys, memory and network capabilities
- Cons:
  - Run multiple copies of an identical sidecar
  - Spend more effort computing that reduced configuration for each sidecar.
  - Quite new to the community

Service Mesh - Pros and Cons

- Pros:
  - Commodity features are implemented outside microservice code and be able to reusable.
  - Solves most of the problems in MSA (which we used to have ad-hoc solutions) like distributed tracing, logging, security, access control etc.
  - Freedom when it comes to selecting a microservices implementation language. E.g. PHP, Java, .NET Core, NodeJS, Golang,…
- Cons:
  - Complexity
  - Adding extra hops
  - Immature



Control Plane and Data Plane Competitors

CONTROL PLANE

DATA PLANE

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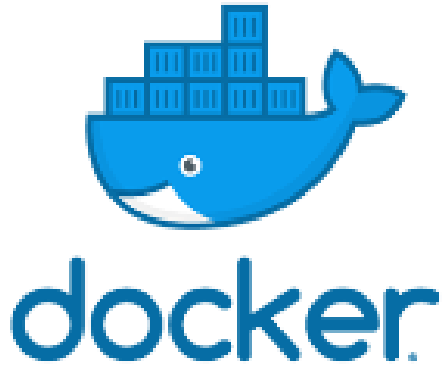
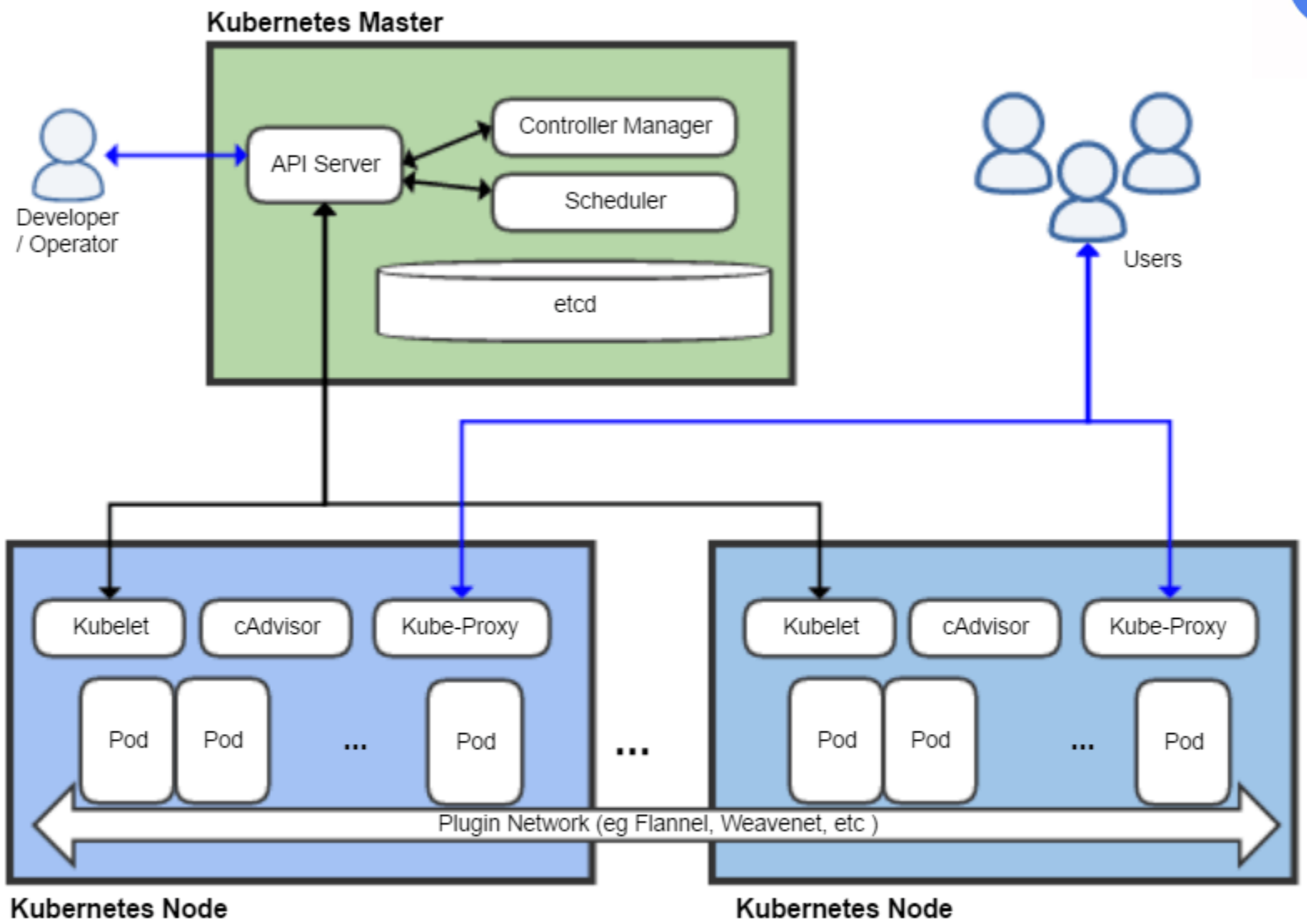
Building Service Mesh for Microservices

Orchestration Layer

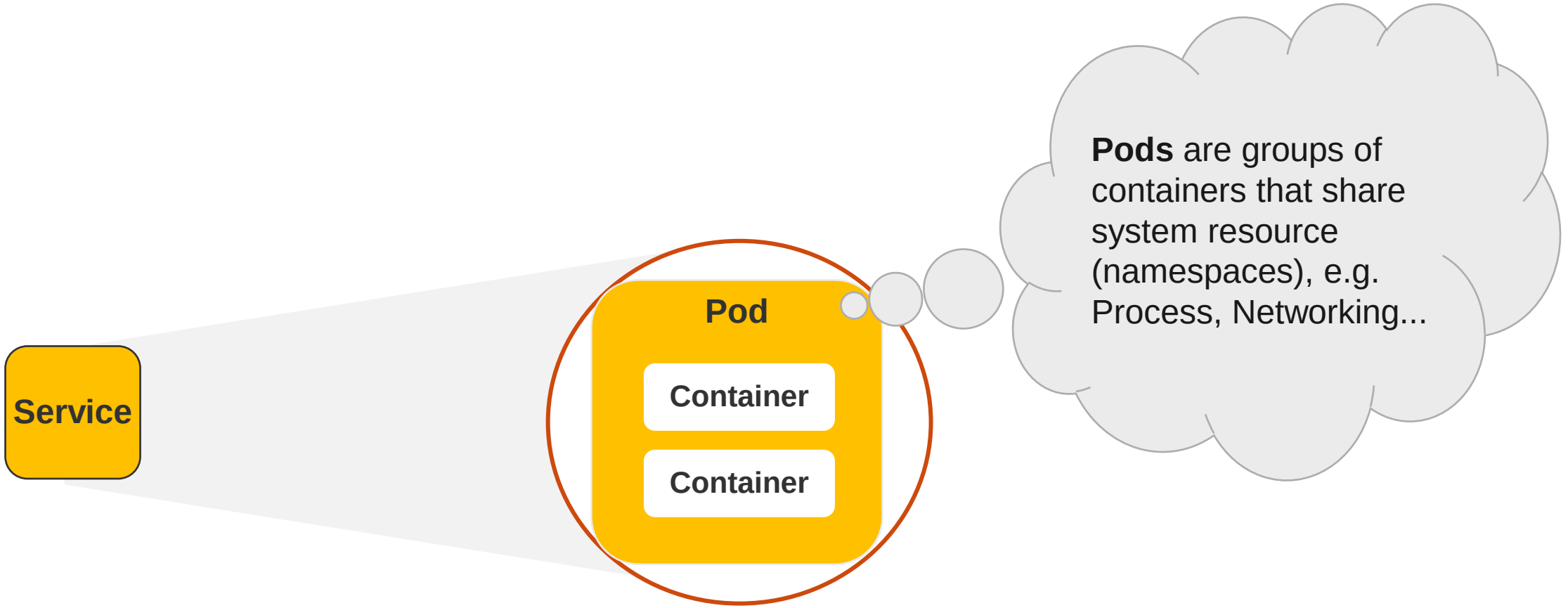


Ambassador

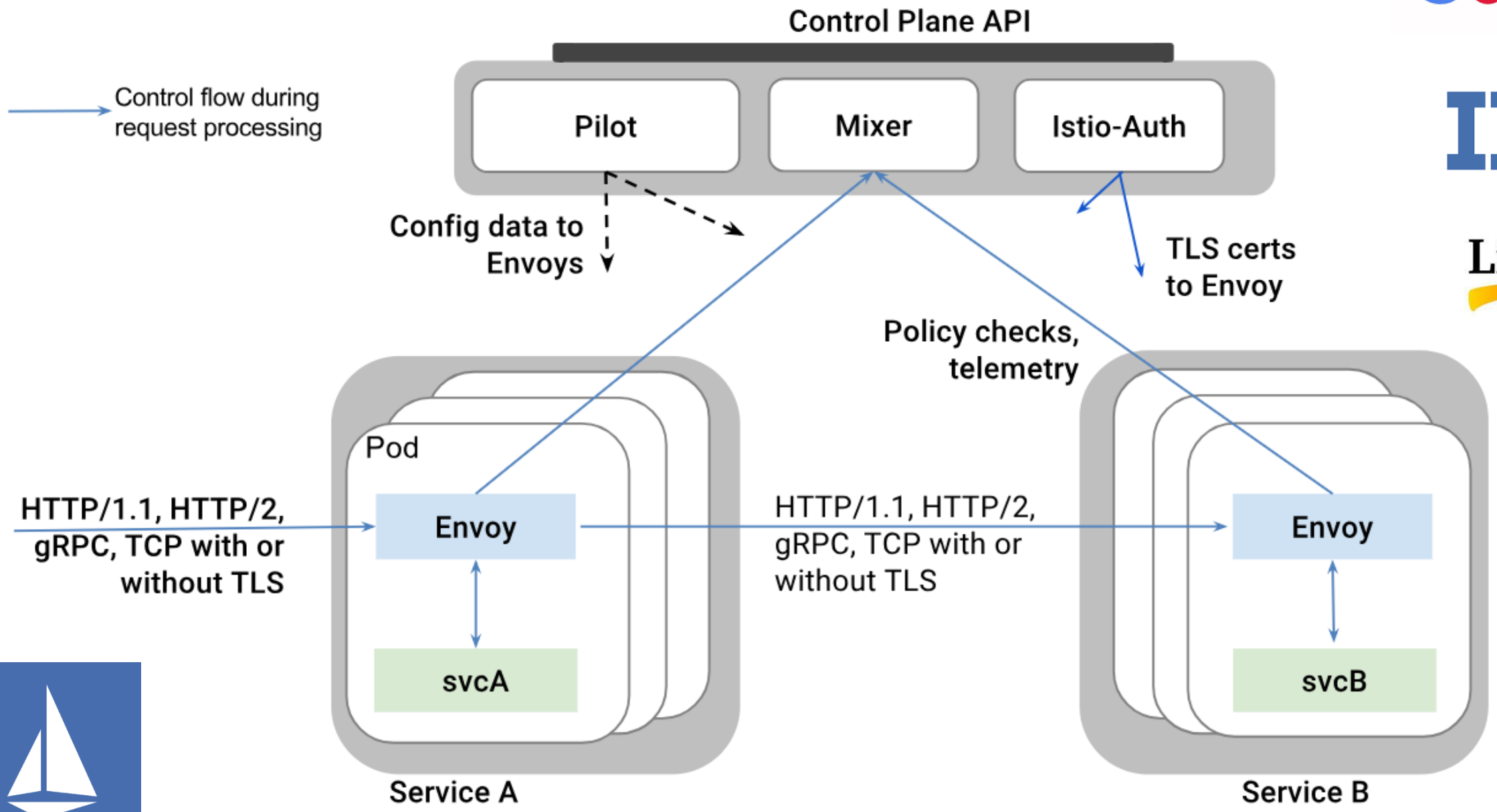
Kubernetes


Kubernetes Master
API Server
Controller Manager
Scheduler
etcd
Developer
/ Operator
Users
Kubelet
cAdvisor
Kube-Proxy
Pod
Pod
...
Pod
...
Kubelet
cAdvisor
Kube-Proxy
Pod
Pod
...
Pod
Plugin Network (eg Flannel, Weavenet, etc)
Kubernetes Node
Kubernetes Node

Kubernetes (cont.)



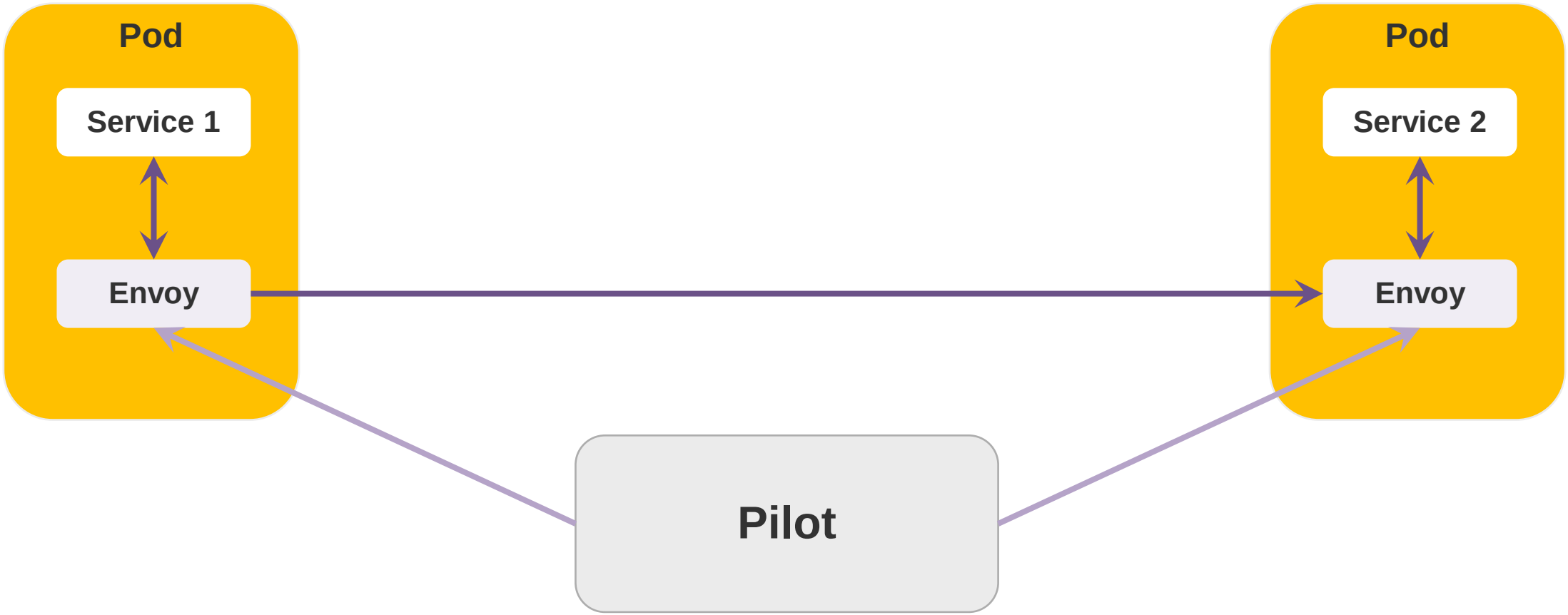
Istio


Control Plane API
Control flow during request processing
Pilot
Mixer
Istio-Auth
Config data to Envoys
TLS certs to Envoy
Policy checks, telemetry
Pod
HTTP/1.1, HTTP/2, gRPC, TCP with or without TLS
Envoy
svcA
HTTP/1.1, HTTP/2, gRPC, TCP with or without TLS
Envoy
svcB
Service A
Service B

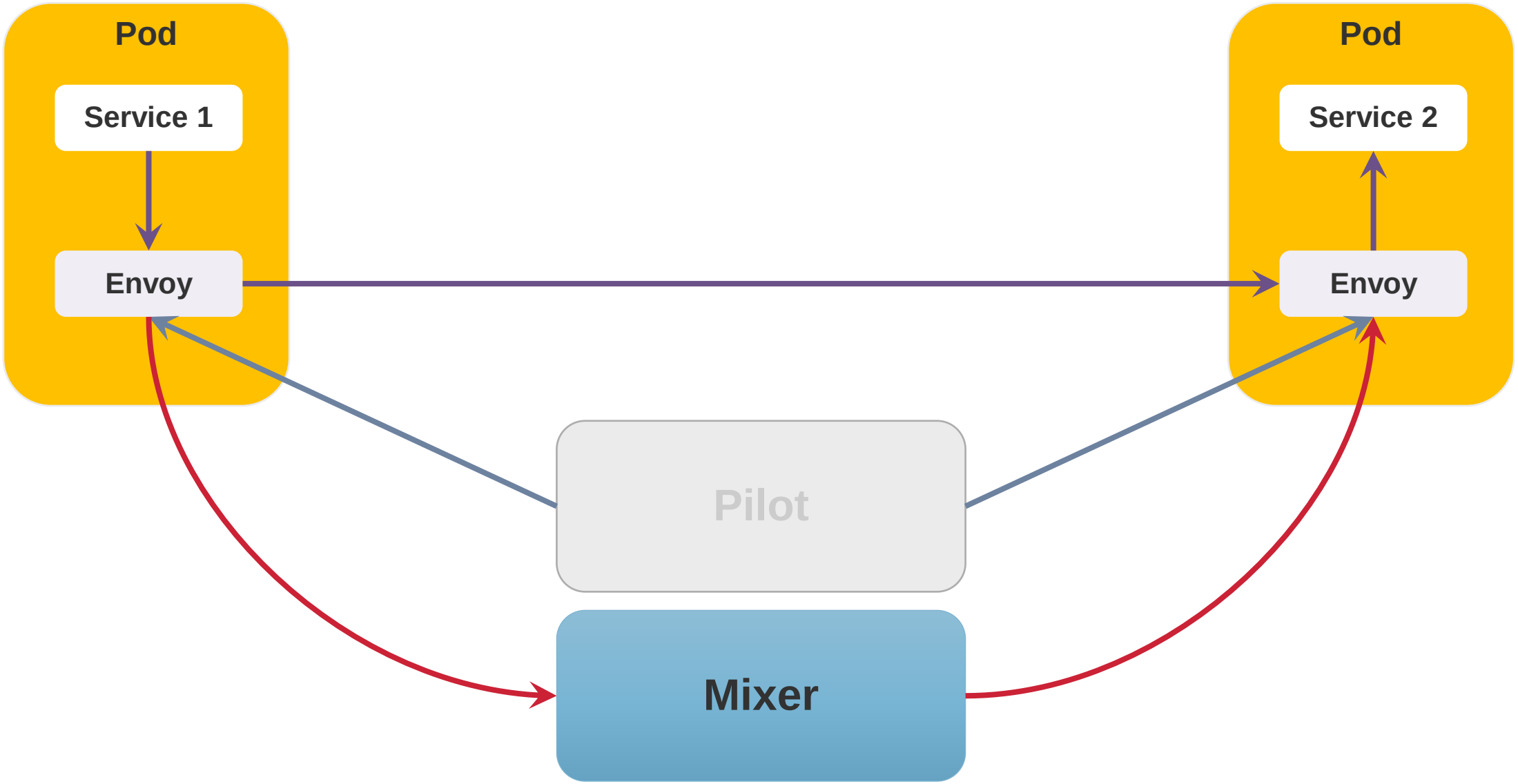
Istio - Sidecar

- **A secondary container in a Pod**
- **Intercept & manages network traffic**
- **Security/Identity**
- **Pluggability**
- **Language Agnostic**

Istio - Pilot



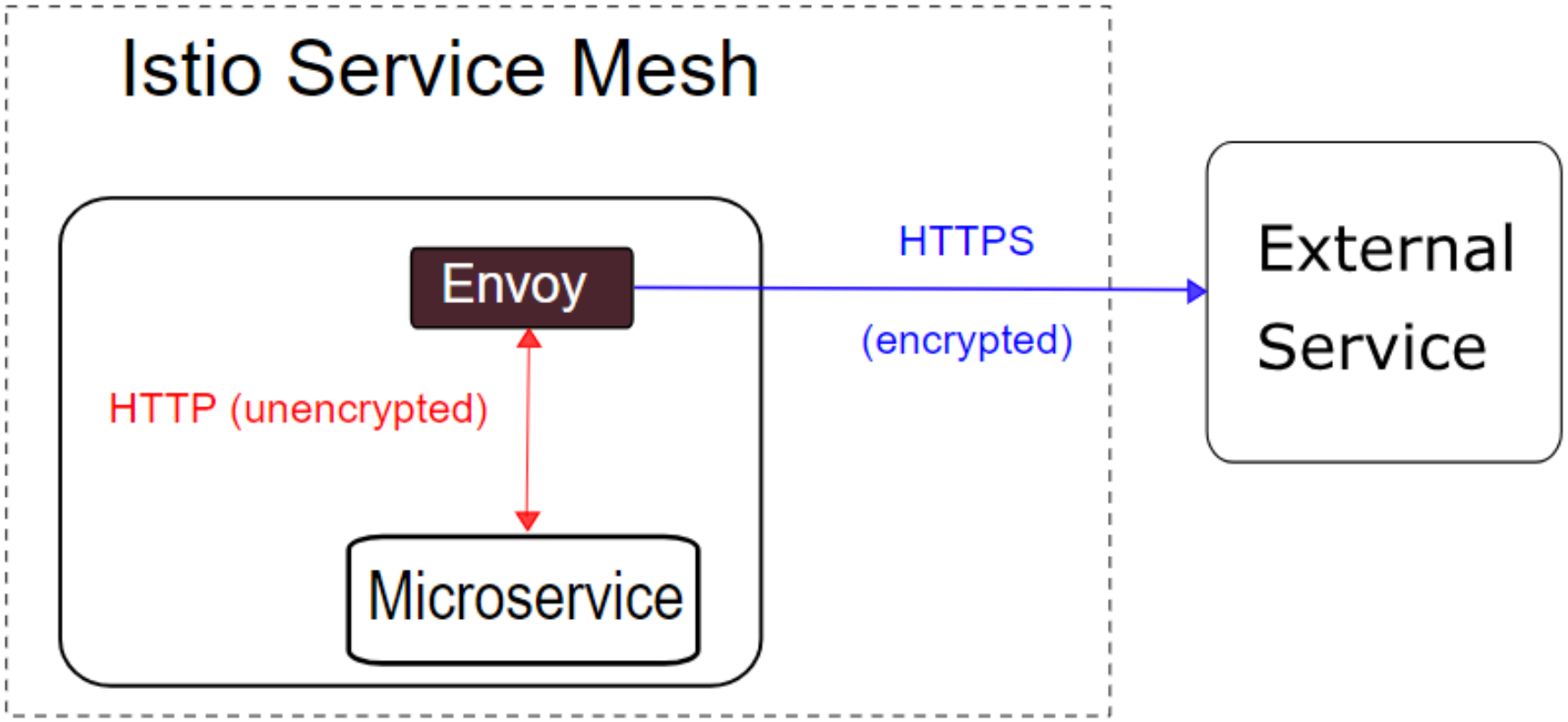
Istio - Mixer



Istio - Auth


Service 1
Service 2
mTLS & Secure Naming
Issue &
Mount Keys
Istio Certificate
Authority
Issue &
Mount Keys

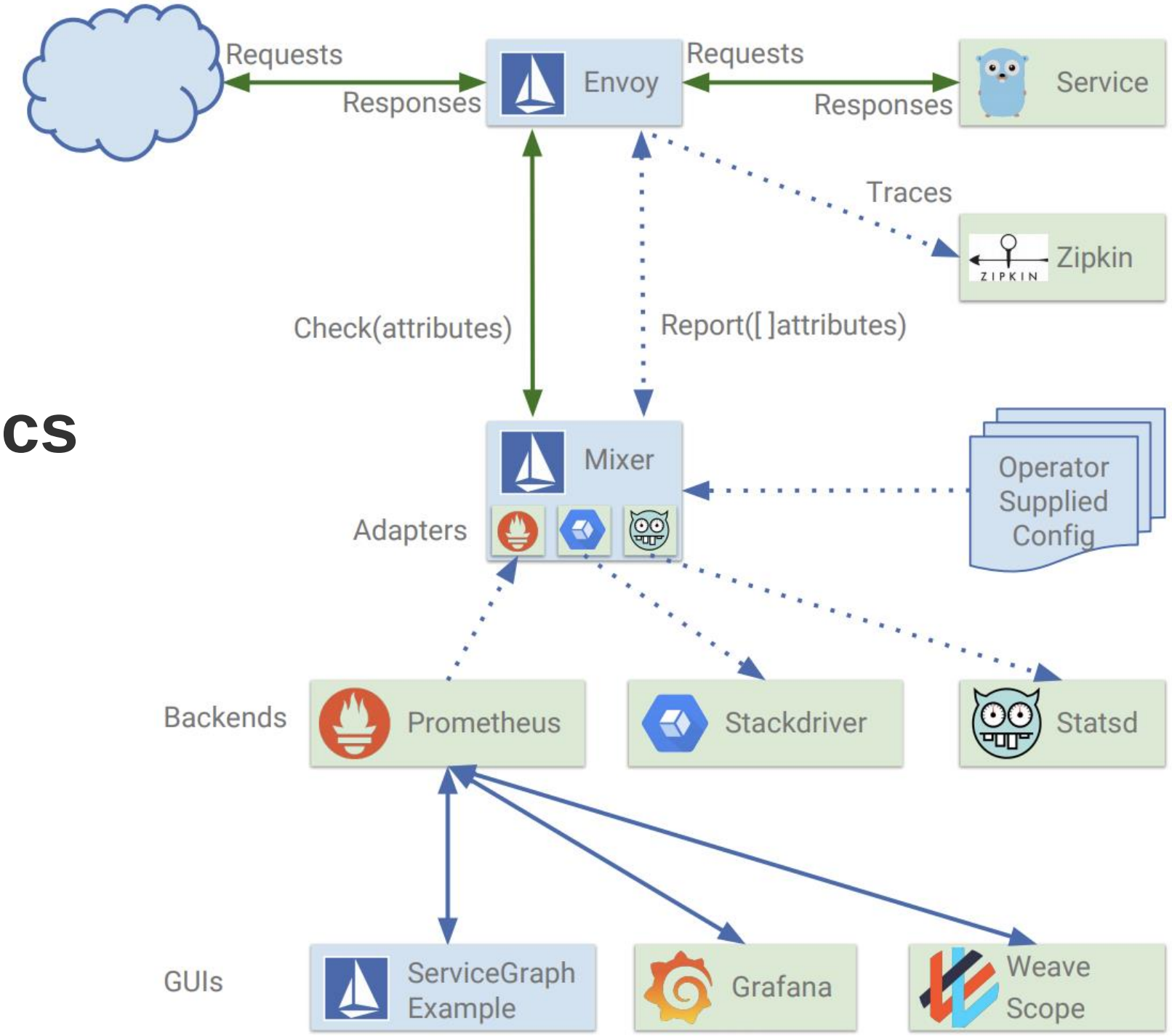
Istio – Auth (cont.)



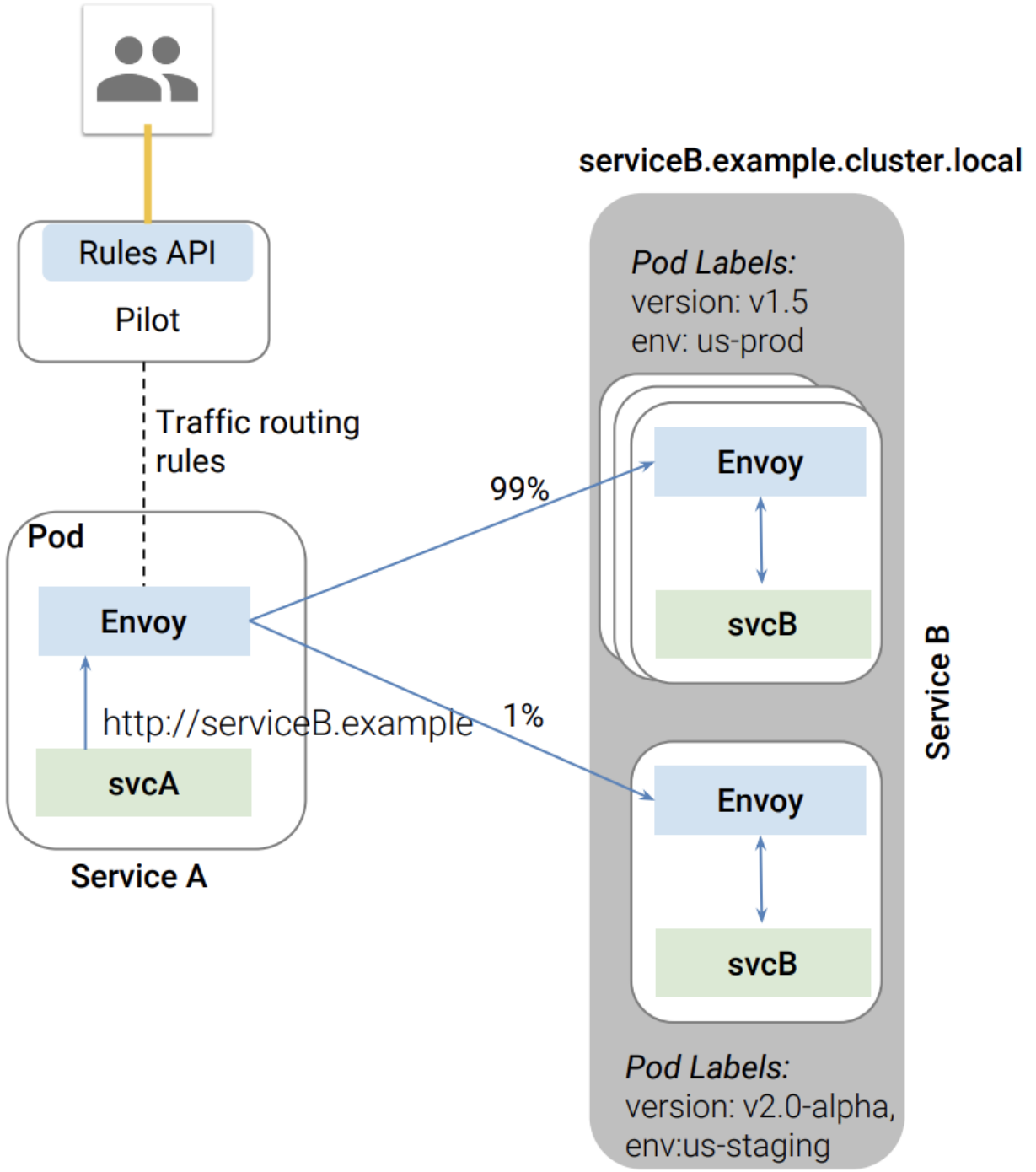
Istio – Key features

- **Automatic Protocol Metrics Collection & Tracing**
- **Mutual TLS Authentication**
- **Circuit Breaking**
- **Failure Injection**
- **Traffic Splitting**

Automatic Protocol Metrics Collection & Tracing



- **Circuit Breaking**
- **Failure Injection**
- **Traffic Splitting**



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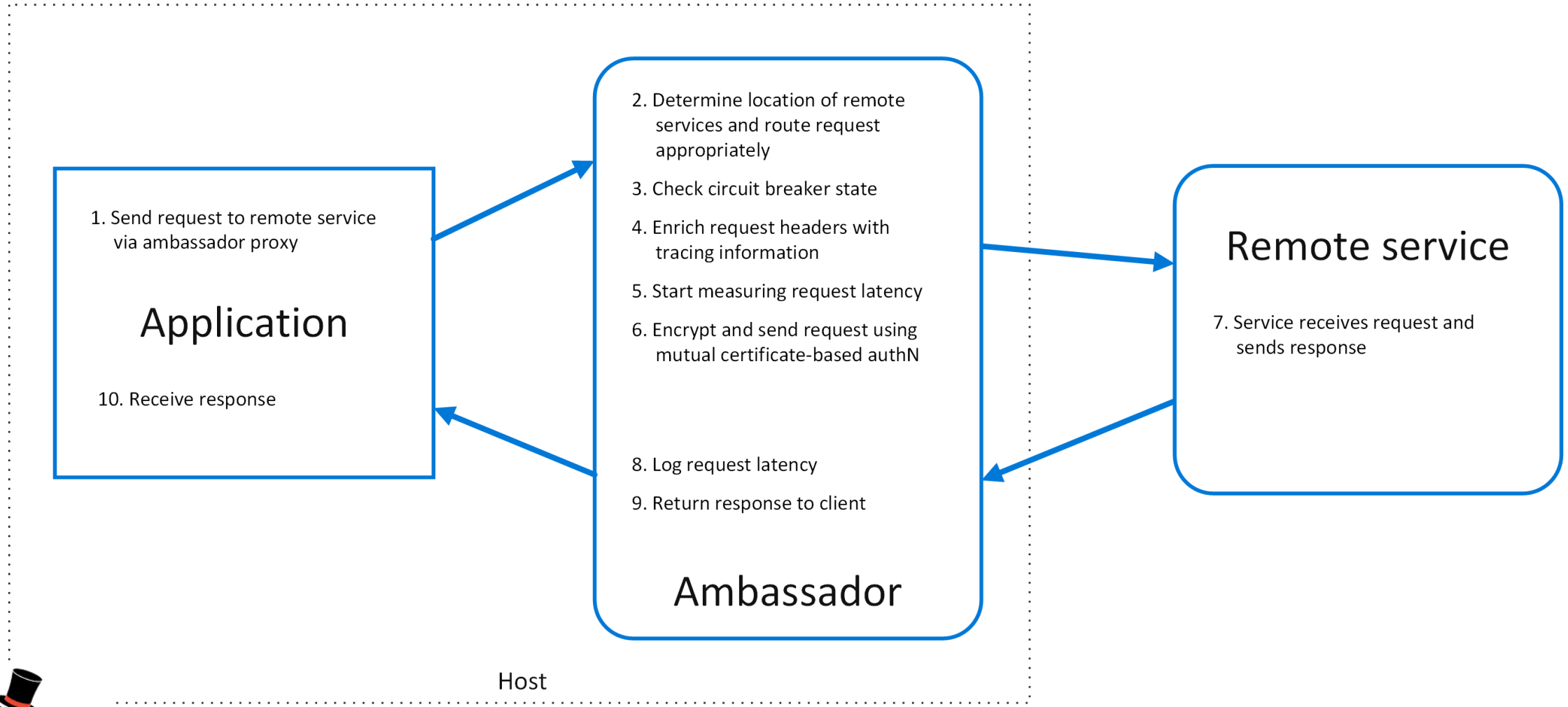
DATAWIRE



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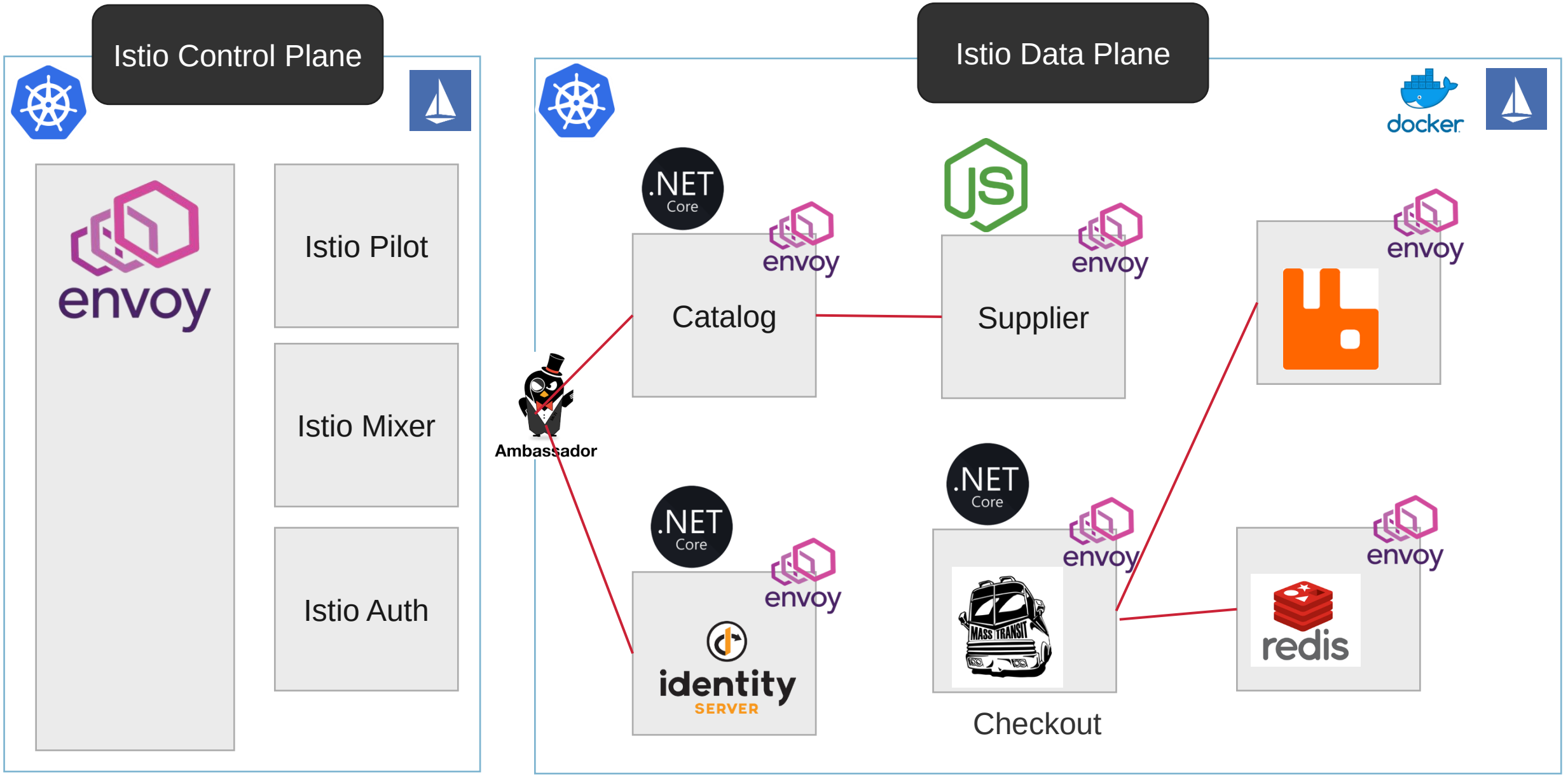
Demo Time

https://github.com/thangchung/shopping-cart-k8s

Shopping Cart Demo



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Q&A

THANK YOU

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