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The Truth About the Service Mesh Data Plane

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About me

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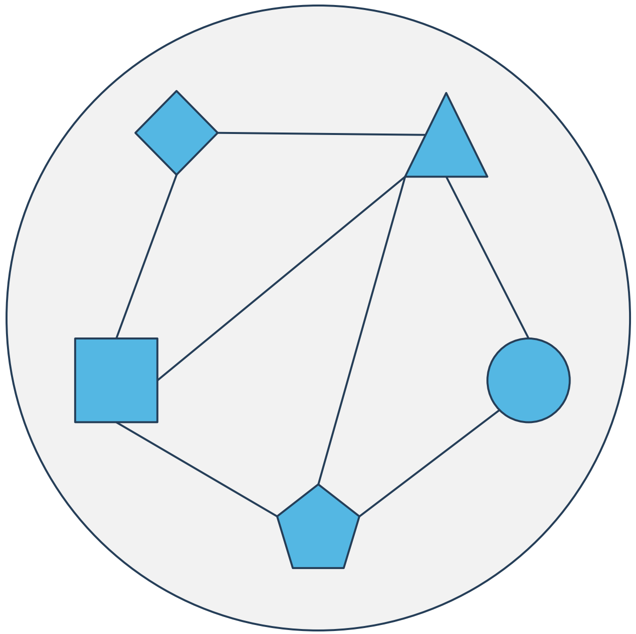
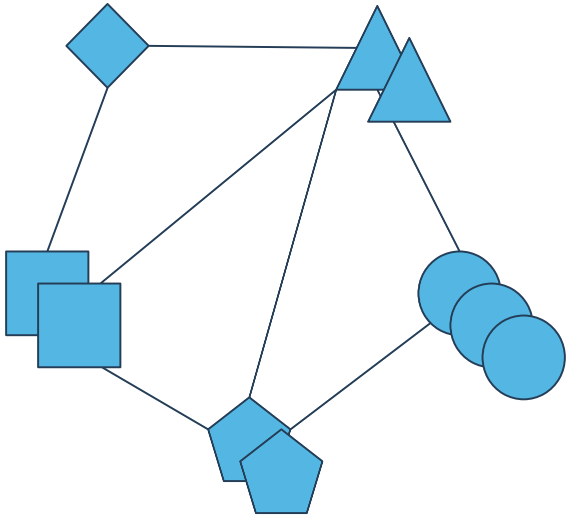
From Monolith to Service Mesh

From Monolith to Microservices

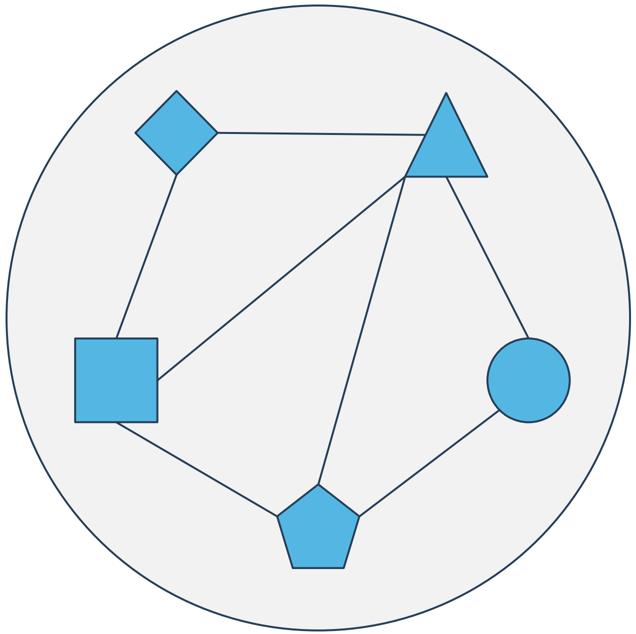


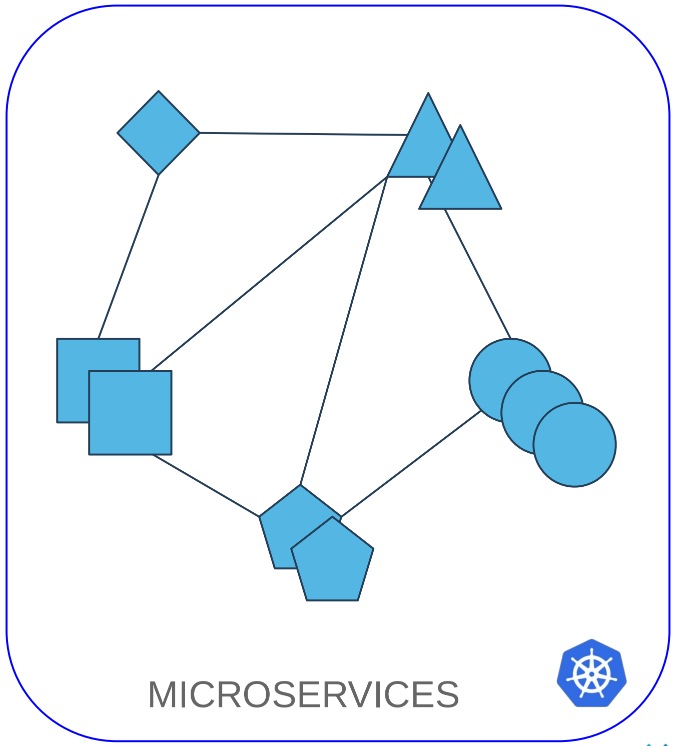
MONOLITH



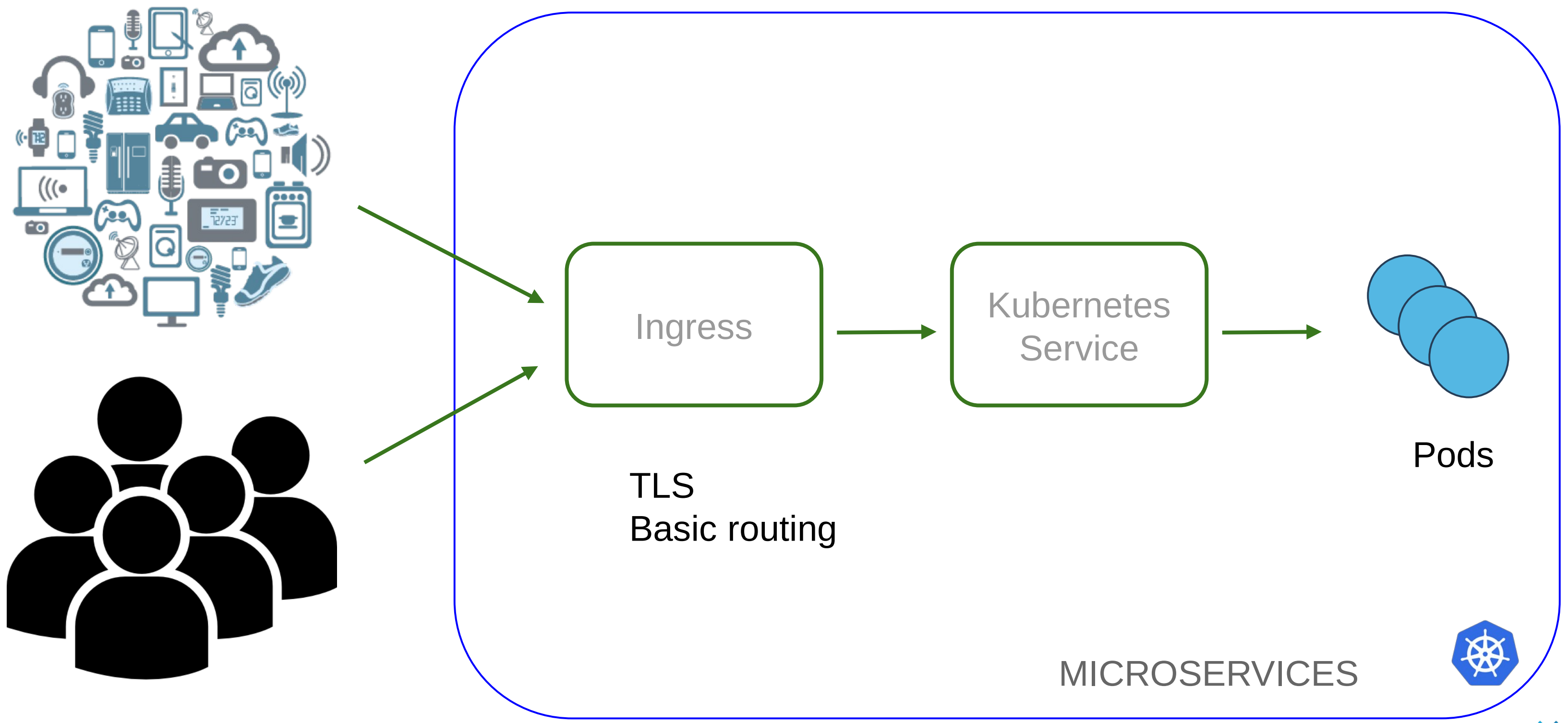
MICROSERVICES

Kubernetes became the most popular platform

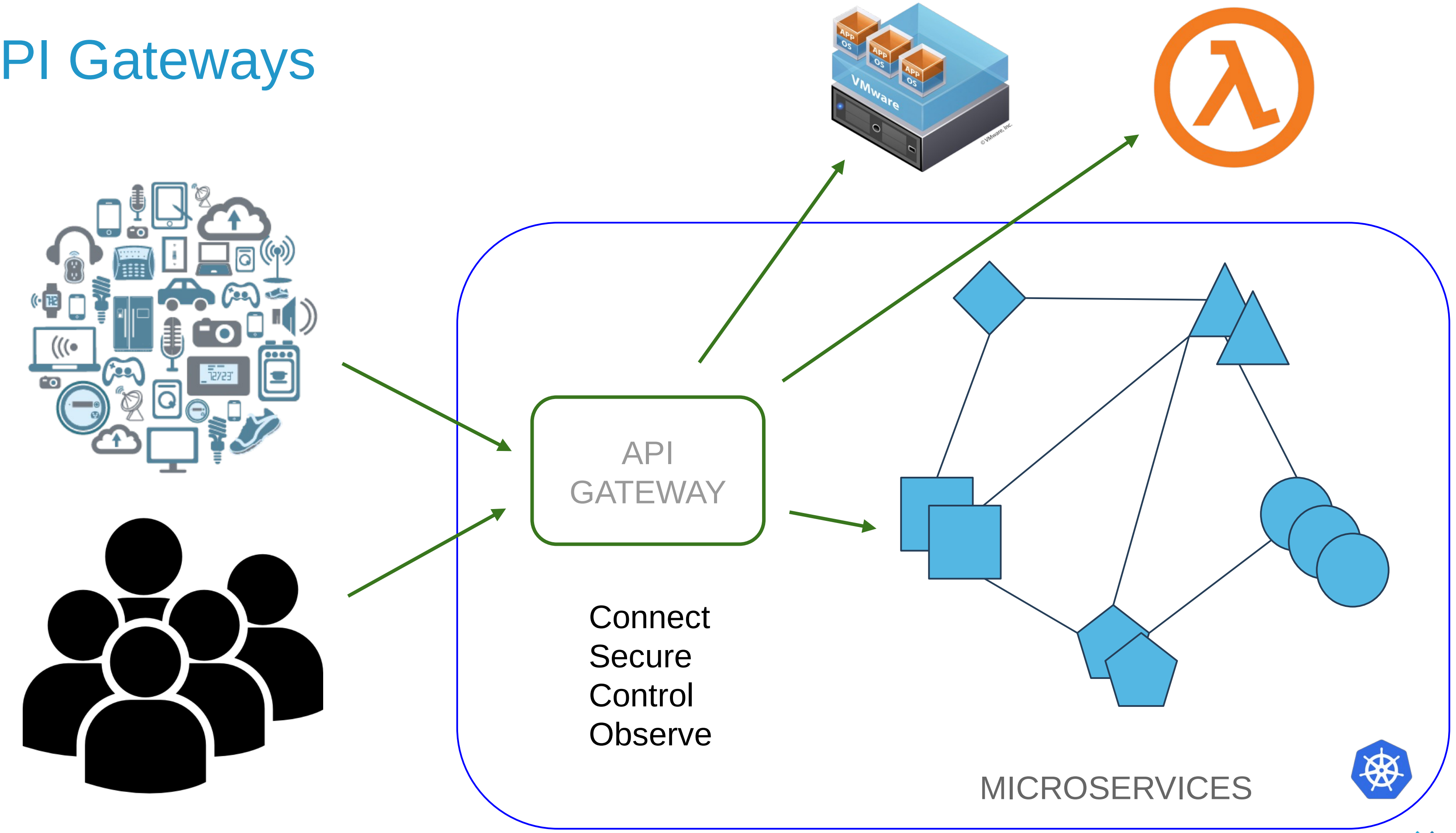




How do you expose your apps ? The Ingress way



API Gateways



Service to Service communication requirements

- Identity Management
- Encryption
- Certificate Management
- Traffic Management
- Health check
- Access Control
- Telemetry
- ...

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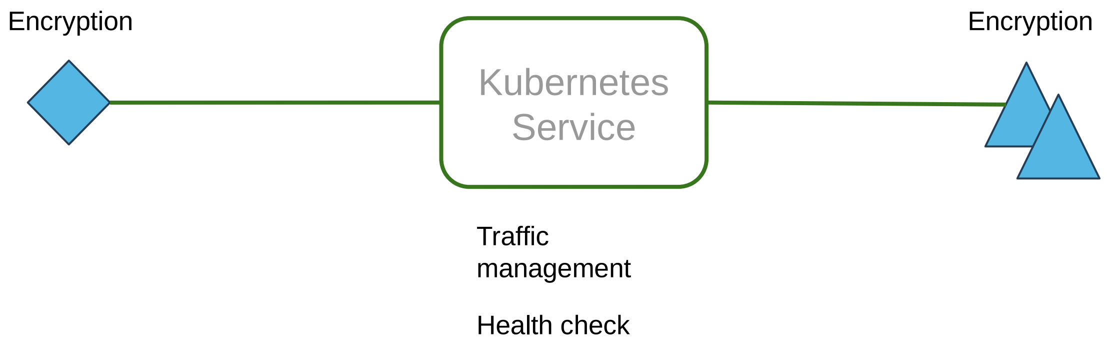
Service to Service communications



Third Party

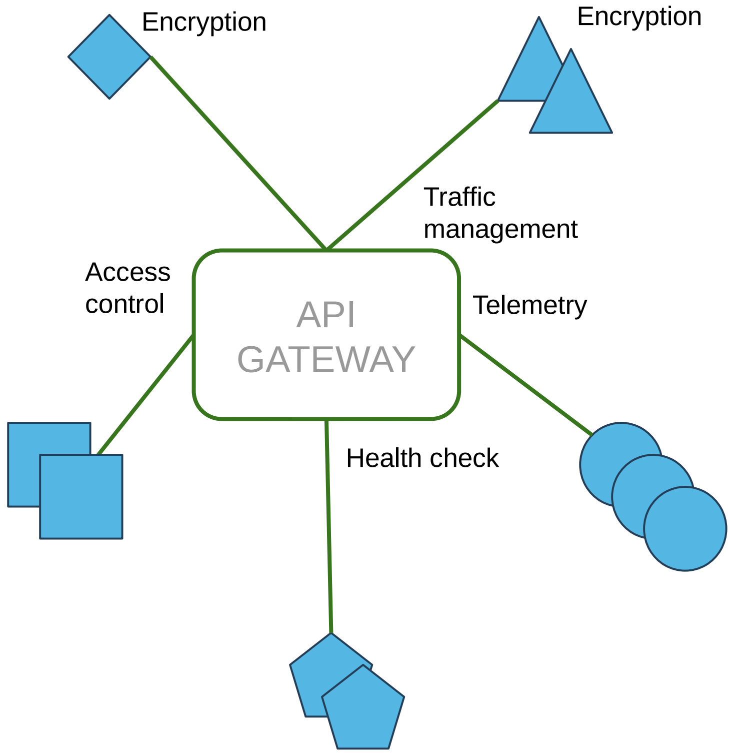
Access control

Identity Management

Certificate management

Telemetry

Service to Service communications

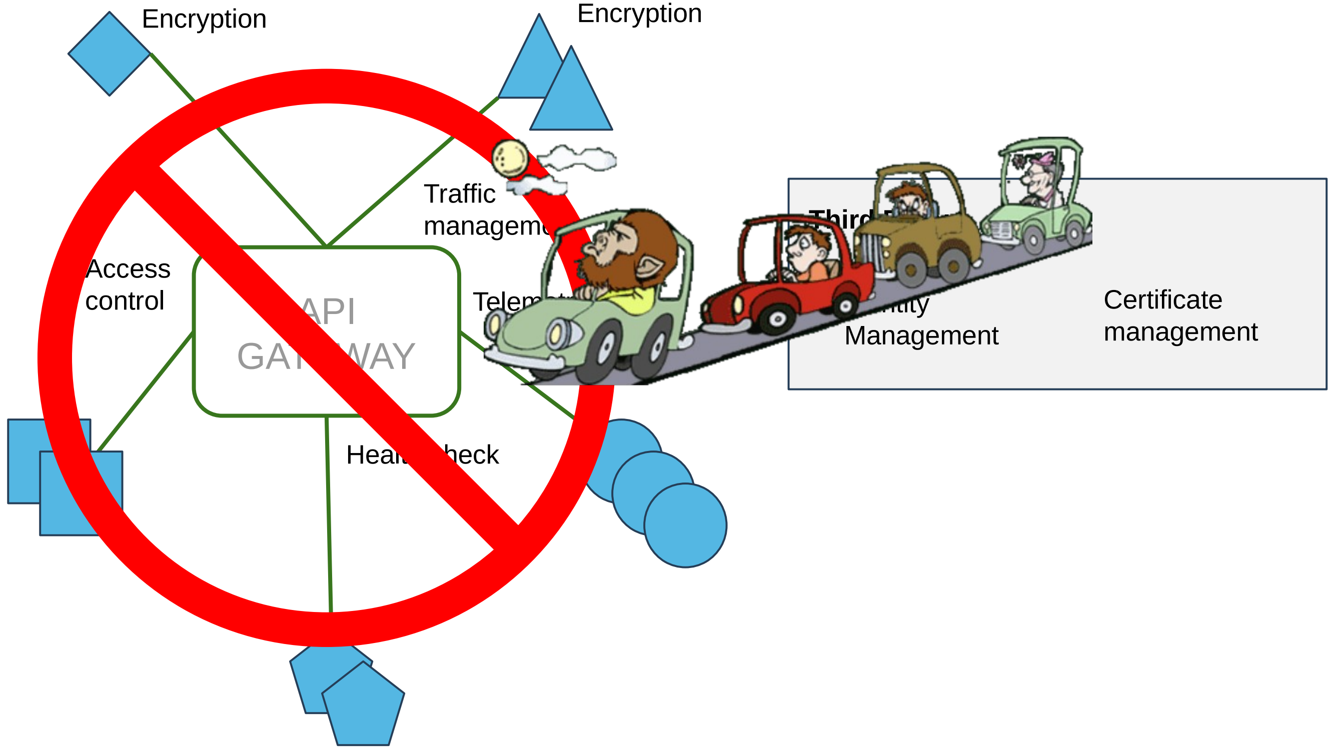


Third Party

Identity Management

Certificate management

Service to Service communications



MICROSERVICES

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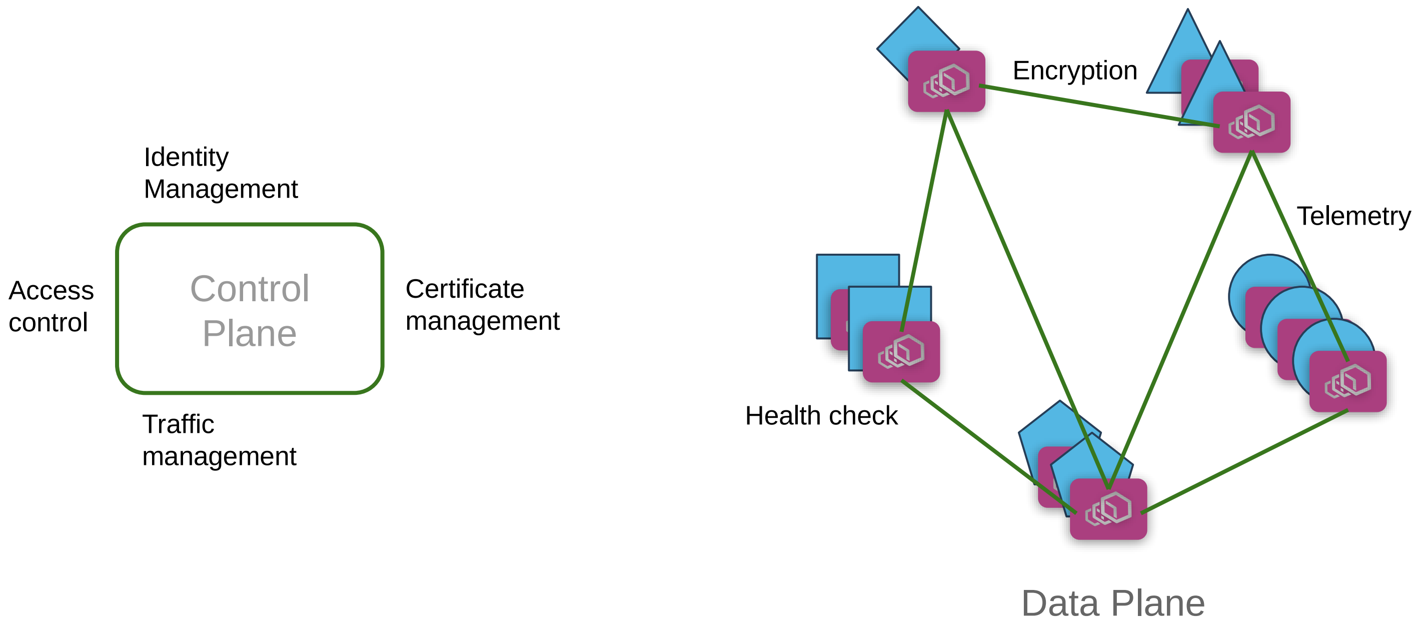
Service to Service communications



SERVICE MESH

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Why Envoy Proxy for Service Mesh Data Plane

- Neutral Foundation (CNCF)
- Large, diverse, vibrant community
- Built ground up for dynamic services environment
- Dynamic configuration, driven by API
- Highly extensible
- L7 filters (HTTP/1, HTTP/2, gRPC, redis, mysql, Kafka, etc)
- Deep signals telemetry out of the box
- Versatile deployment options

airbnb	amazon web services™	Booking.com	cookpad
DigitalOcean	ebay	f5	Google
GO-JEK	GRUBHUB	IBM	Medium
Microsoft	NETFLIX	Pinterest	salesforce
	stripe	Square	Tencent 腾讯
twilio	Uber	verizon✓	vmware®
vsco	YAHOO! JAPAN	yelp	

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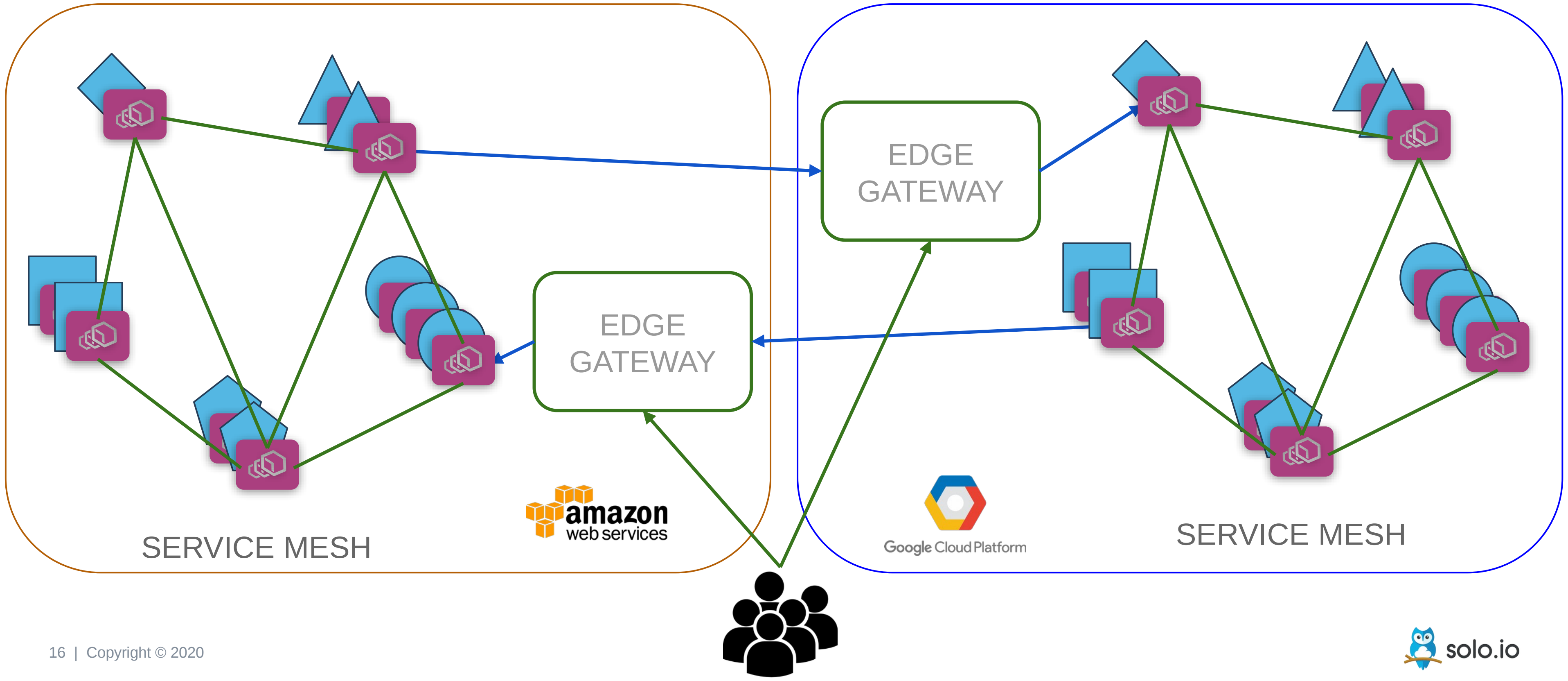
Common challenges with Service Mesh

Adoption challenges

- Which one to choose ?
- Who's going to support it ?
- Fitting with existing services (sidecar lifecycle, race conditions, etc)
- Non container environments / hybrid env ?
- No good way to manage multiple clusters

Multicluster Service Mesh



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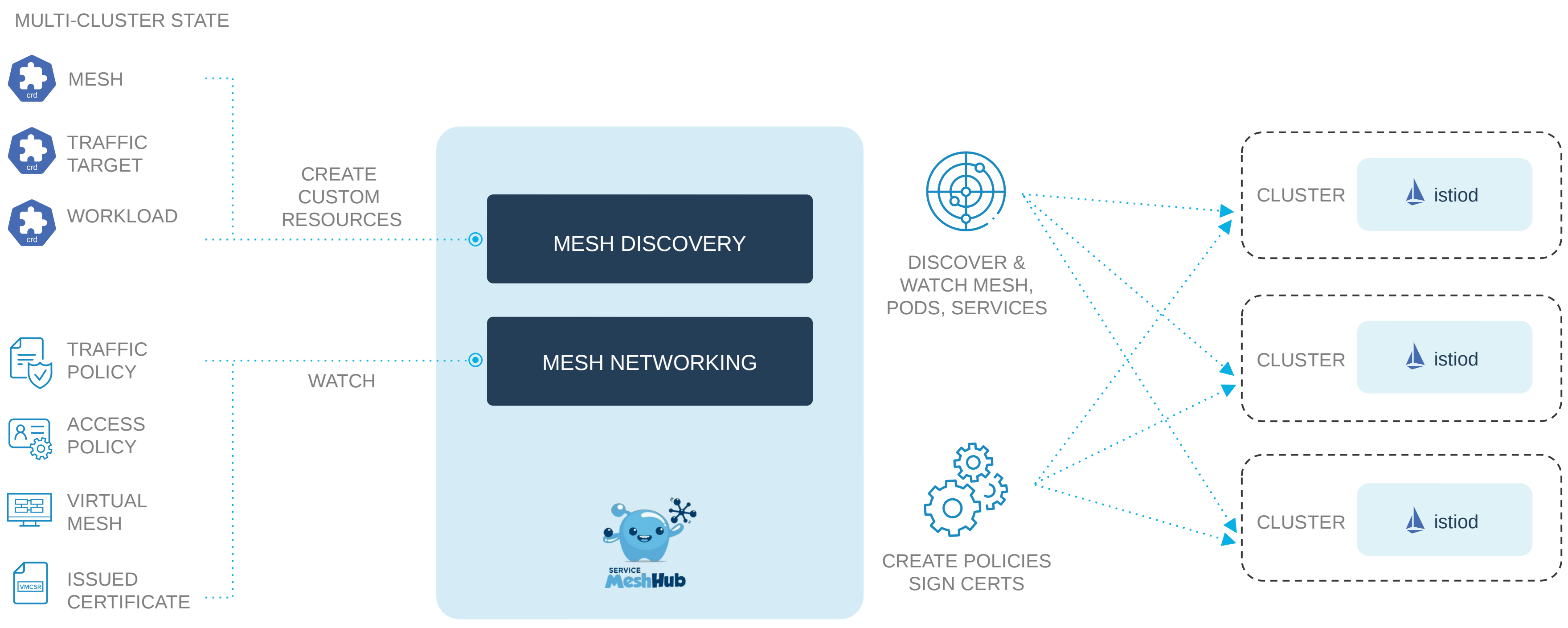
Multicluster Service Mesh challenges

- You need Federated Trust and Identity
- You need to allow communications between clusters
- You need to manage access control globally
- You need to define a Disaster Recovery strategy
- You need to secure the Edge as well
- All of the above is highly complex

Service Mesh Hub

Manage your service mesh deployments across multiple clusters and multiple meshes

Service Mesh Hub is simplifying everything



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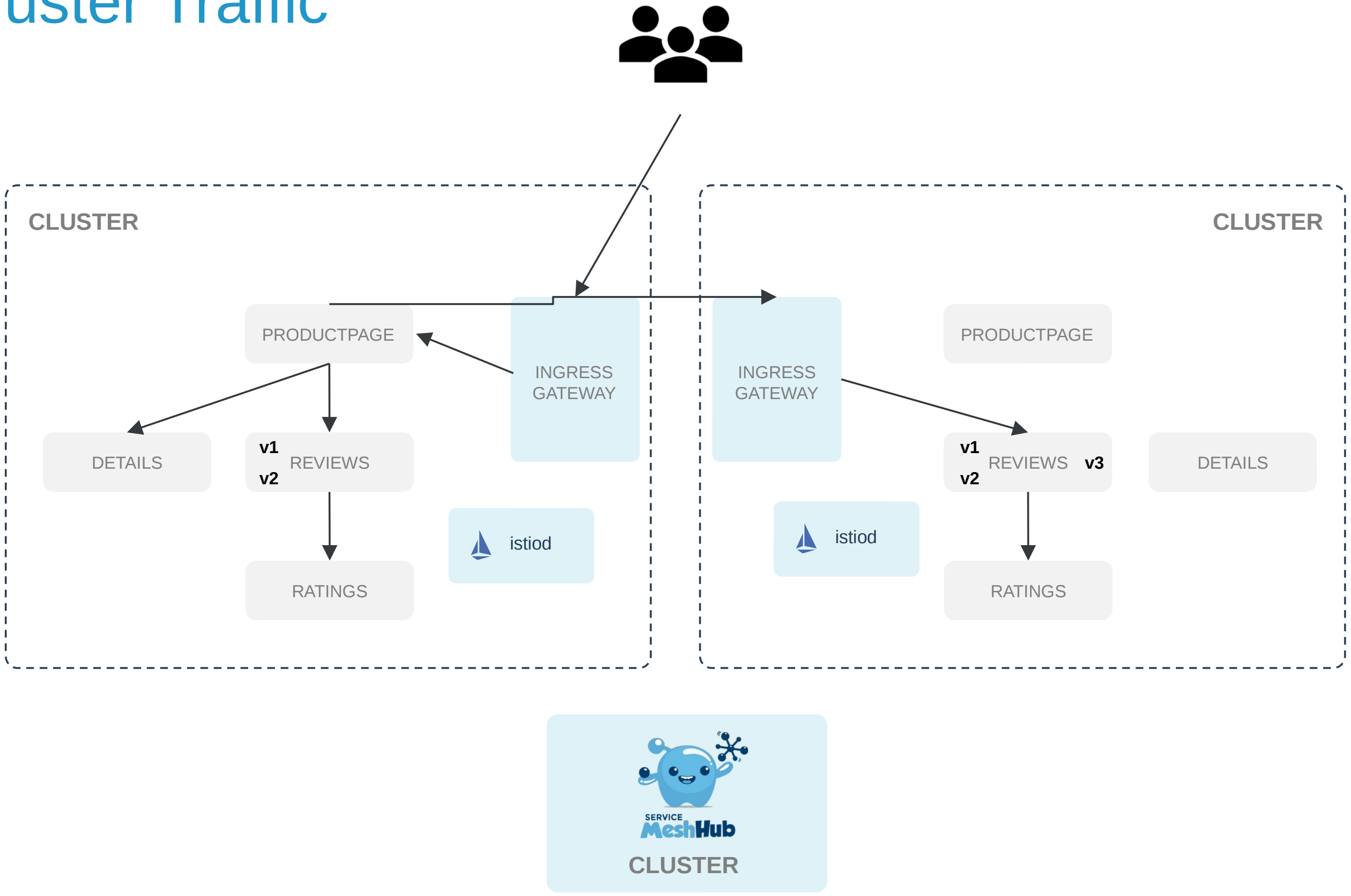
Multi-cluster Traffic



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Traffic Policy

CLUSTER 1

```yaml
apiVersion: networking.smh.solo.io/v1alpha2
kind: TrafficPolicy
metadata:
  namespace: service-mesh-hub
  name: simple
spec:
  destinationSelector:
  - kubeServiceRefs:
      services:
        - clusterName: kind2
          name: reviews
          namespace: default
  trafficShift:
    destinations:
      - kubeService:
          clusterName: kind3
          name: reviews
          namespace: default
          subset:
            version: v3
        weight: 75
      - kubeService:
          clusterName: kind2
          name: reviews
          namespace: default
          subset:
            version: v1
        weight: 15
      - kubeService:
          clusterName: kind2
          name: reviews
          namespace: default
          subset:
            version: v2
        weight: 10
```

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Demo

Service Mesh Hub

CLUSTER 2

```
apiVersion: networking.istio.io/v1beta1
kind: VirtualService
metadata:
   labels:
    cluster.multicluster.solo.io: kind2
    owner.networking.smh.solo.io:
service-mesh-hub
  name: reviews
  namespace: default
spec:
  hosts:
  - reviews.default.svc.cluster.local
  http:
  - route:
    - destination:
        host:
reviews.default.svc.kind3.global
        subset: version-v3
      weight: 75
    - destination:
        host:
reviews.default.svc.cluster.local
        subset: version-v1
      weight: 15
    - destination:
        host:
reviews.default.svc.cluster.local
        subset: version-v2
      weight: 10
```

CLUSTER 2

```
apiVersion: networking.istio.io/v1beta1
kind: DestinationRule
metadata:
  labels:
    cluster.multicluster.solo.io: kind2
    owner.networking.smh.solo.io:
service-mesh-hub
  name: reviews.default.svc.kind3.global
  namespace: istio-system
spec:
  host: reviews.default.svc.kind3.global
  subsets:
  - labels:
      cluster: kind3
    name: version-v3
  - labels:
      cluster: kind3
    name: version-v1
  - labels:
      cluster: kind3
    name: version-v2
  trafficPolicy:
    tls:
      mode: ISTIO_MUTUAL
```

CLUSTER 2

```
apiVersion: networking.istio.io/v1beta1
kind: ServiceEntry
metadata:
  labels:
    cluster.multicluster.solo.io: kind2
    owner.networking.smh.solo.io:
service-mesh-hub
  name: reviews.default.svc.kind3.global
  namespace: istio-system
spec:
  addresses:
  - 253.124.25.94
  endpoints:
  - address: 172.18.0.230
    labels:
      cluster: kind3
    ports:
      http: 15443
  hosts:
  - reviews.default.svc.kind3.global
  location: MESH_INTERNAL
  ports:
  - name: http
    number: 9080
    protocol: TCP
  resolution: DNS
```

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CLUSTER 3

```
apiVersion: networking.istio.io/v1alpha3
kind: EnvoyFilter
metadata:
  labels:
    cluster.multicluster.solo.io: kind3
    owner.networking.smh.solo.io: service-mesh-
hub
  name: virtual-mesh.service-mesh-hub
  namespace: istio-system
spec:
  configPatches:
  - applyTo: NETWORK_FILTER
    match:
      context: GATEWAY
      listener:
        filterChain:
          filter:
            name:
envoy.filters.network.sni_cluster
        portNumber: 15443
    patch:
      operation: INSERT_AFTER
      value:
        name:
envoy.filters.network.tcp_cluster_rewrite
        typed_config:
          '@type':
type.googleapis.com/istio.envoy.config.filter.n
etwork.tcp_cluster_rewrite.v2alpha1.TcpClusterR
ewrite
          cluster_pattern: \.kind3.global$
          cluster_replacement: .cluster.local
  workloadSelector:
    labels:
      istio: ingressgateway
```

CLUSTER 3

```
apiVersion: networking.istio.io/v1beta1
kind: DestinationRule
metadata:
  labels:
    cluster.multicluster.solo.io: kind3
    owner.networking.smh.solo.io:
service-mesh-hub
  name: reviews
  namespace: default
spec:
  host:
reviews.default.svc.cluster.local
  subsets:
  - labels:
      version: v3
    name: version-v3
  - labels:
      version: v1
    name: version-v1
  - labels:
      version: v2
    name: version-v2
  trafficPolicy:
    tls:
      mode: ISTIO_MUTUAL
```

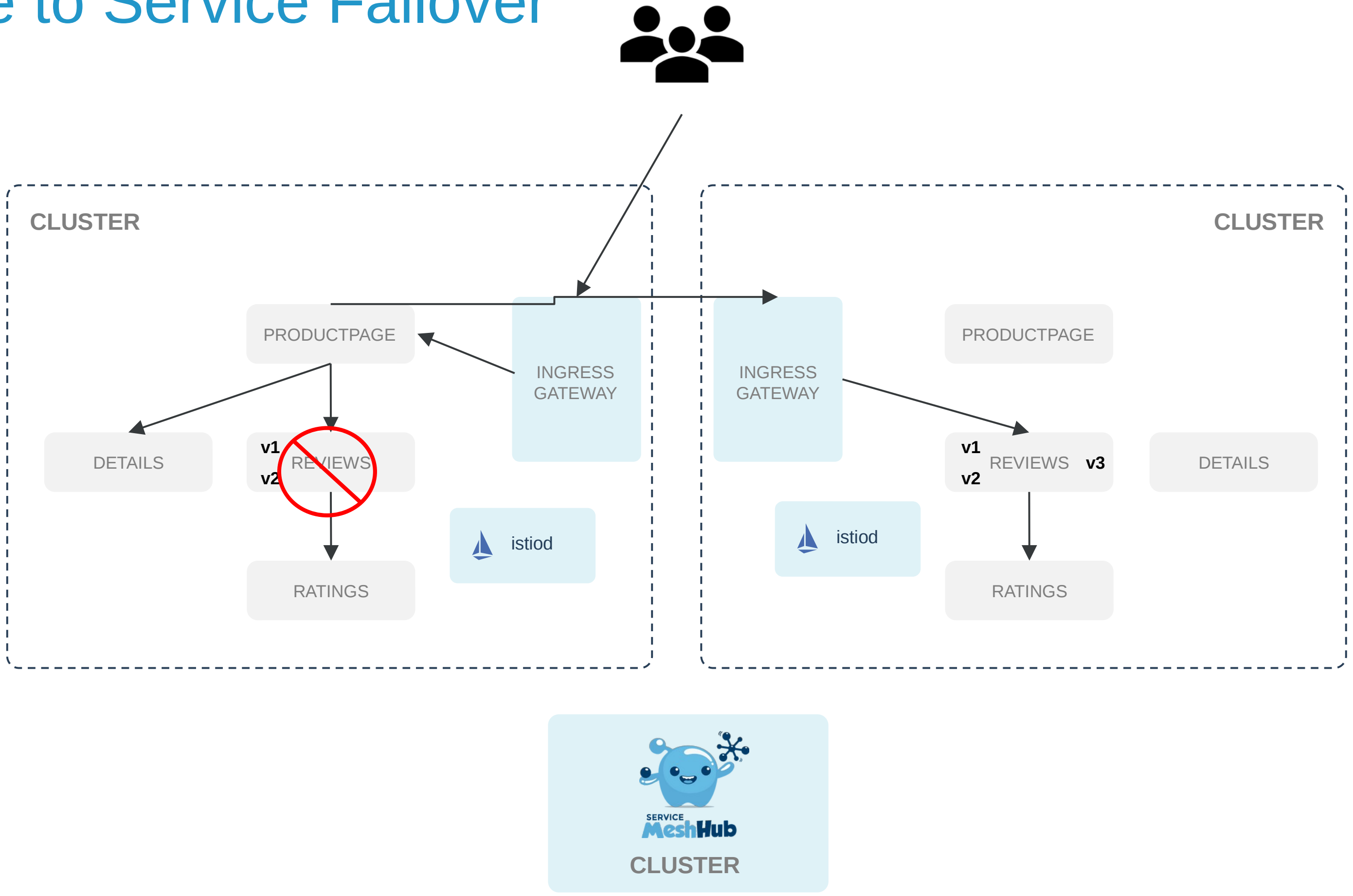
CLUSTER 3

```
apiVersion: v1
kind: Service
metadata:
  labels:
    app: reviews
    service: reviews
  name: reviews
  namespace: default
spec:
  clusterIP: 10.97.193.52
  ports:
  - name: http
    port: 9080
    protocol: TCP
    targetPort: 9080
  selector:
    app: reviews
  sessionAffinity: None
  type: ClusterIP
status:
  loadBalancer: {}
```

CLUSTER 3

```
apiVersion: v1
kind: Pod
metadata:
  labels:
    app: reviews
    istio.io/rev: default
    pod-template-hash: d978546db
    security.istio.io/tlsMode: istio
    service.istio.io/canonical-name: reviews
    service.istio.io/canonical-revision: v3
    version: v3
  name: reviews-v3-d978546db-dj59b
  namespace: default
spec:
...
```

Service to Service Failover



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What’s next ?

Web Assembly

Customize Envoy Proxy with WebAssembly

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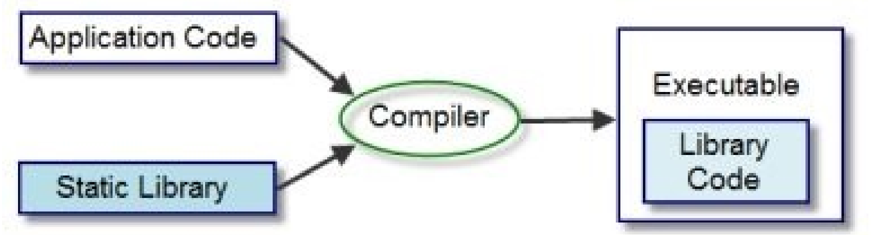
Extending Envoy Proxy - Adding Custom Filters



THE OLD WAY:

- Write filter in C++
- Statically link it to Envoy (requires compiling Envoy)
- Ship and deploy new version of Envoy

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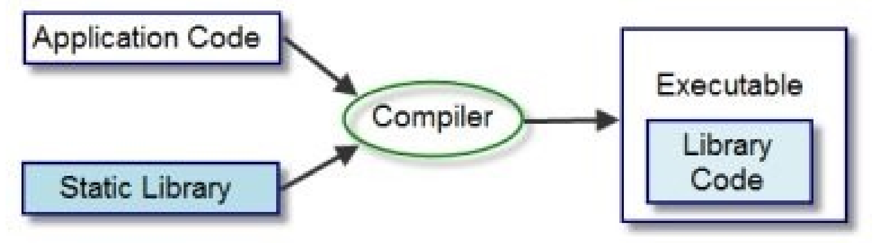
Extending Envoy Proxy - Adding Custom Filters



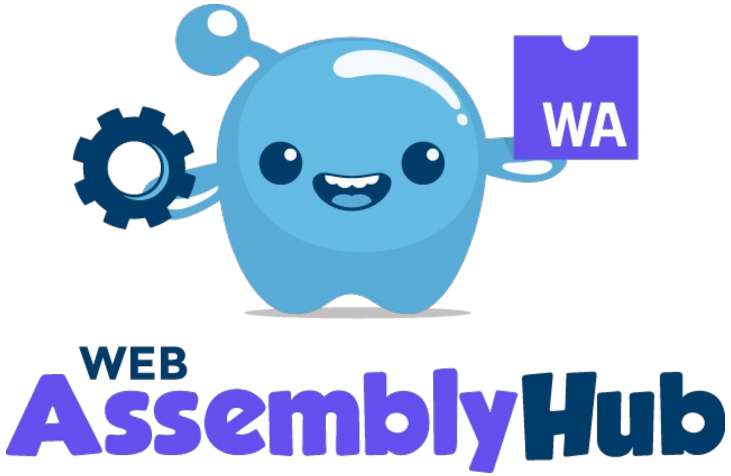
THE OLD WAY:

- Write filter in C++
- Statically link into Envoy (requires compiling Envoy)
- Ship and deploy new version of Envoy

Introducing WebAssembly Hub and `wasme`

Build, Deploy, and Publish

- Write filter in *any language*
- Compile to .wasm module
- Dynamically load in Envoy Proxy during runtime
- Publish and share filters
- With or without Service Mesh



https://webassemblyhub.io

BUILD
WA
PUBLISH
DISCOVER
DEPLOY
AssemblyHub
Explore Modules

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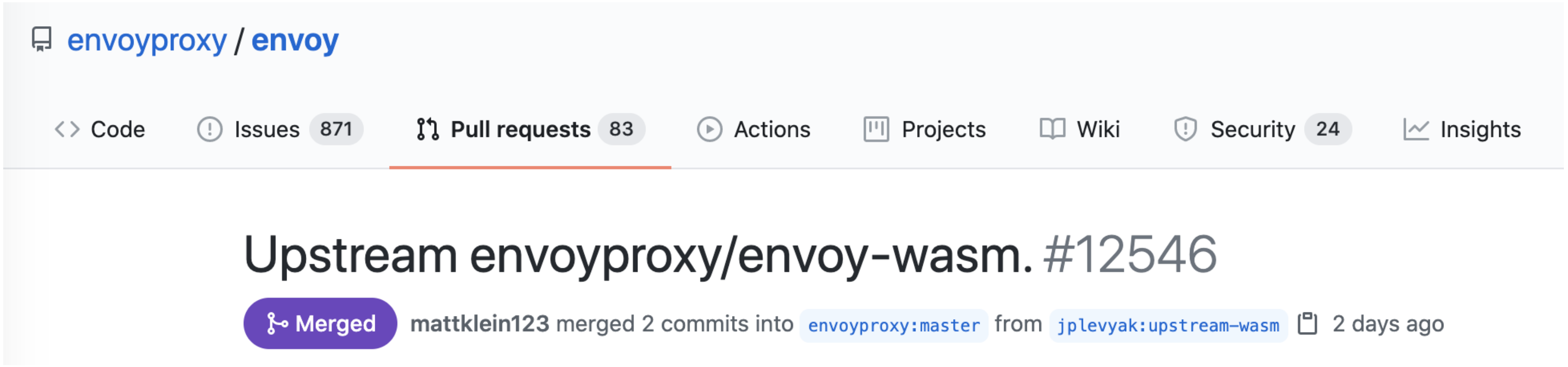
Demo

Web Assembly

Current state of WASM in Envoy

- https://www.solo.io/blog/the-state-of-webassembly-in-envoy-proxy/
- https://github.com/envoyproxy/envoy/pull/12546
- https://www.youtube.com/watch?v=8fty-sqFyoY


envoyproxy / envoy

Upstream envoyproxy/envoy-wasm. #12546

Merged mattklein123 merged 2 commits into envoyproxy:master from jplevyak:upstream-wasm 2 days ago

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Thank you !

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