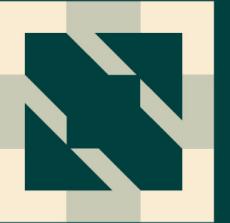




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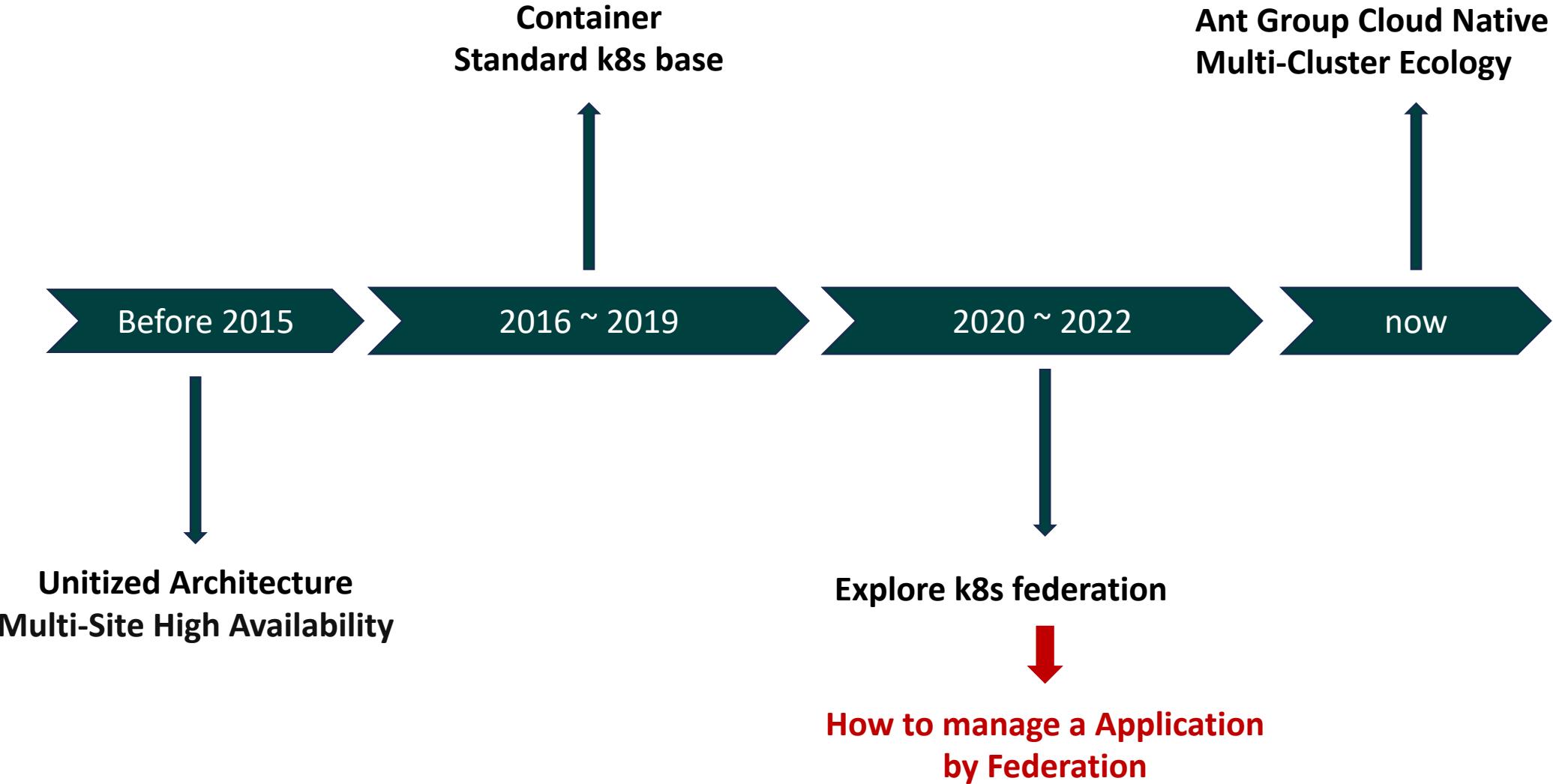
The Evolution of Multi-Cluster in AntGroup

Speakers

Jun Zhang & Yikun Wang



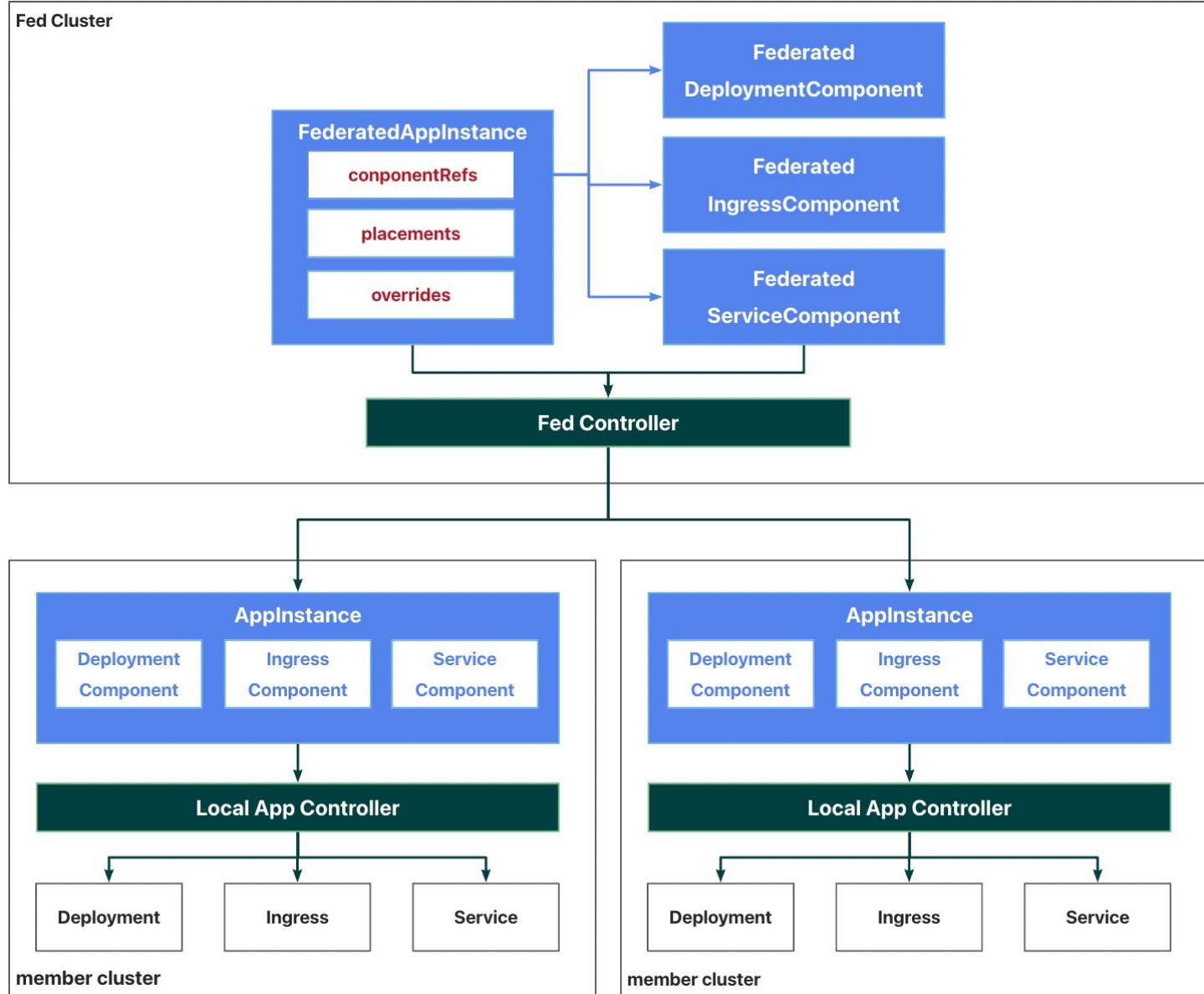
Timeline



We tried Federated App Instance

All-In-One App Module Problem

1. Increased cognitive load
2. Poor Readability
3. Increased complexity

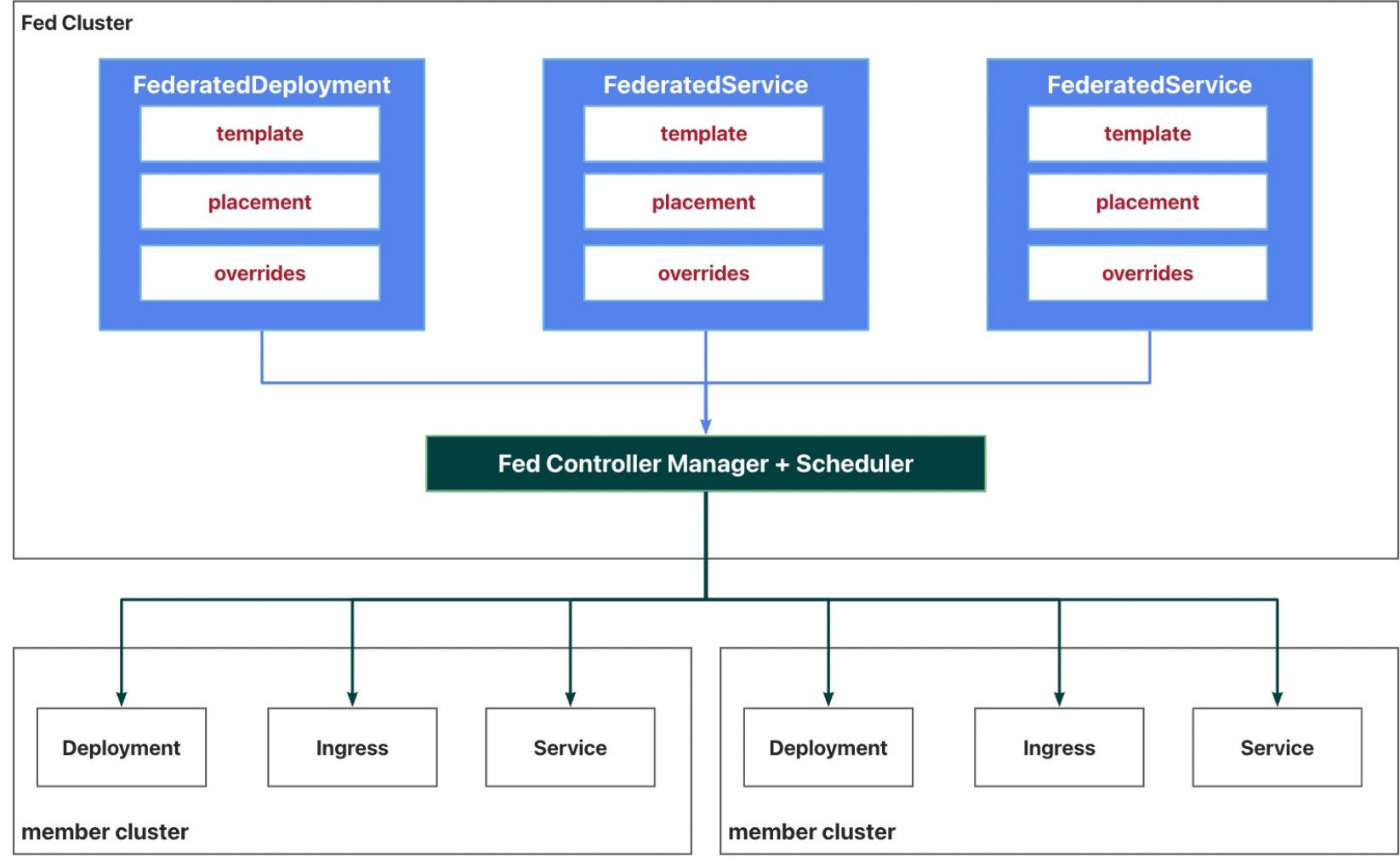


Fedv2 is not good enough

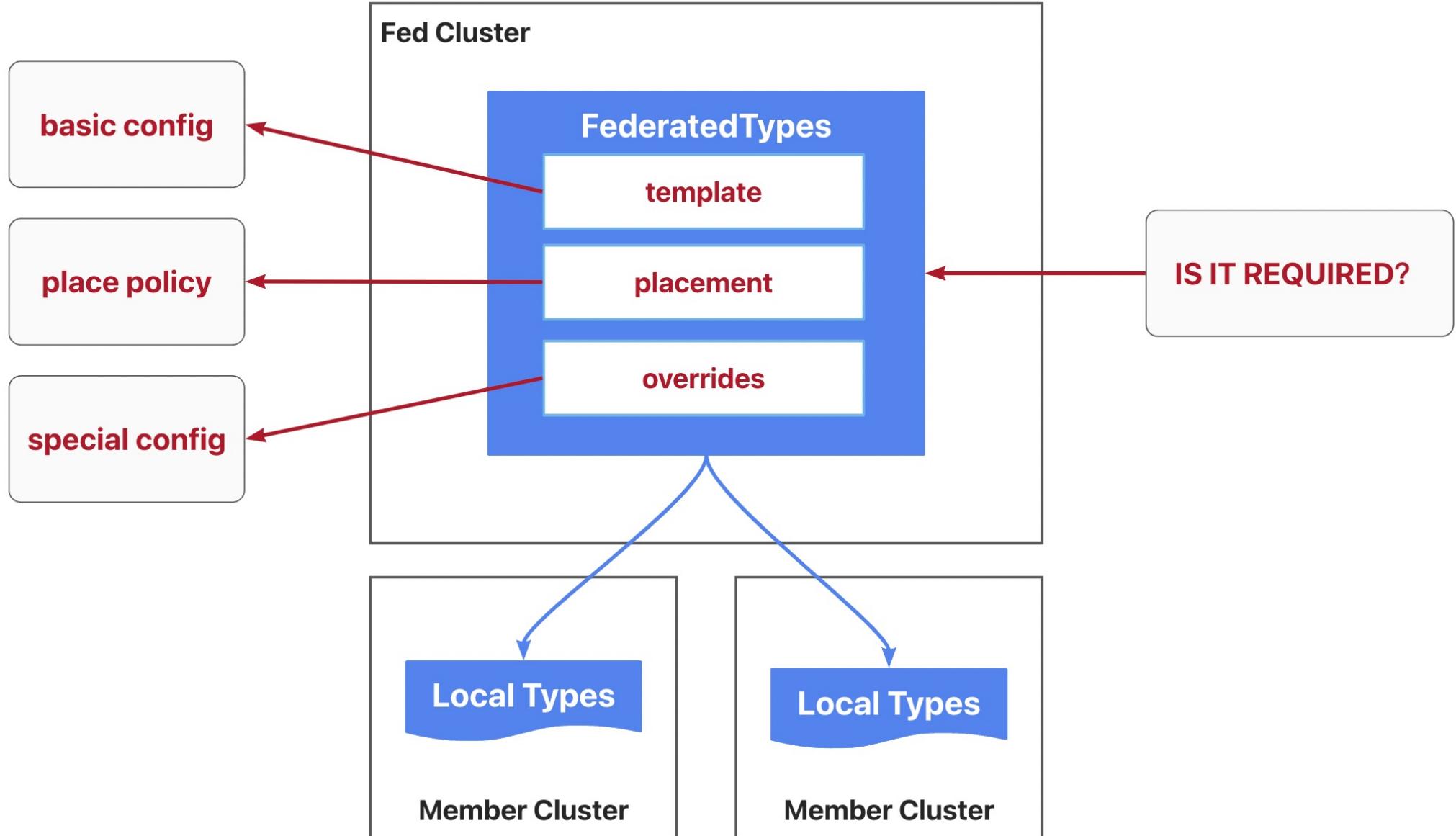
```

apiVersion: types.kubefed.k8s.io/v1beta1
kind: FederatedDeployment
spec:
  template:
    metadata:
      labels:
        app: nginx
    spec:
      replicas: 1
      ...
  placement:
    clusters:
      - name: cluster2
      - name: cluster1
  overrides:
    - clusterName: cluster1
      clusterOverrides:
        - path: spec.replicas
          value: 3
    - clusterName: cluster2
      clusterOverrides:
        - path: spec.replicas
          value: 5

```

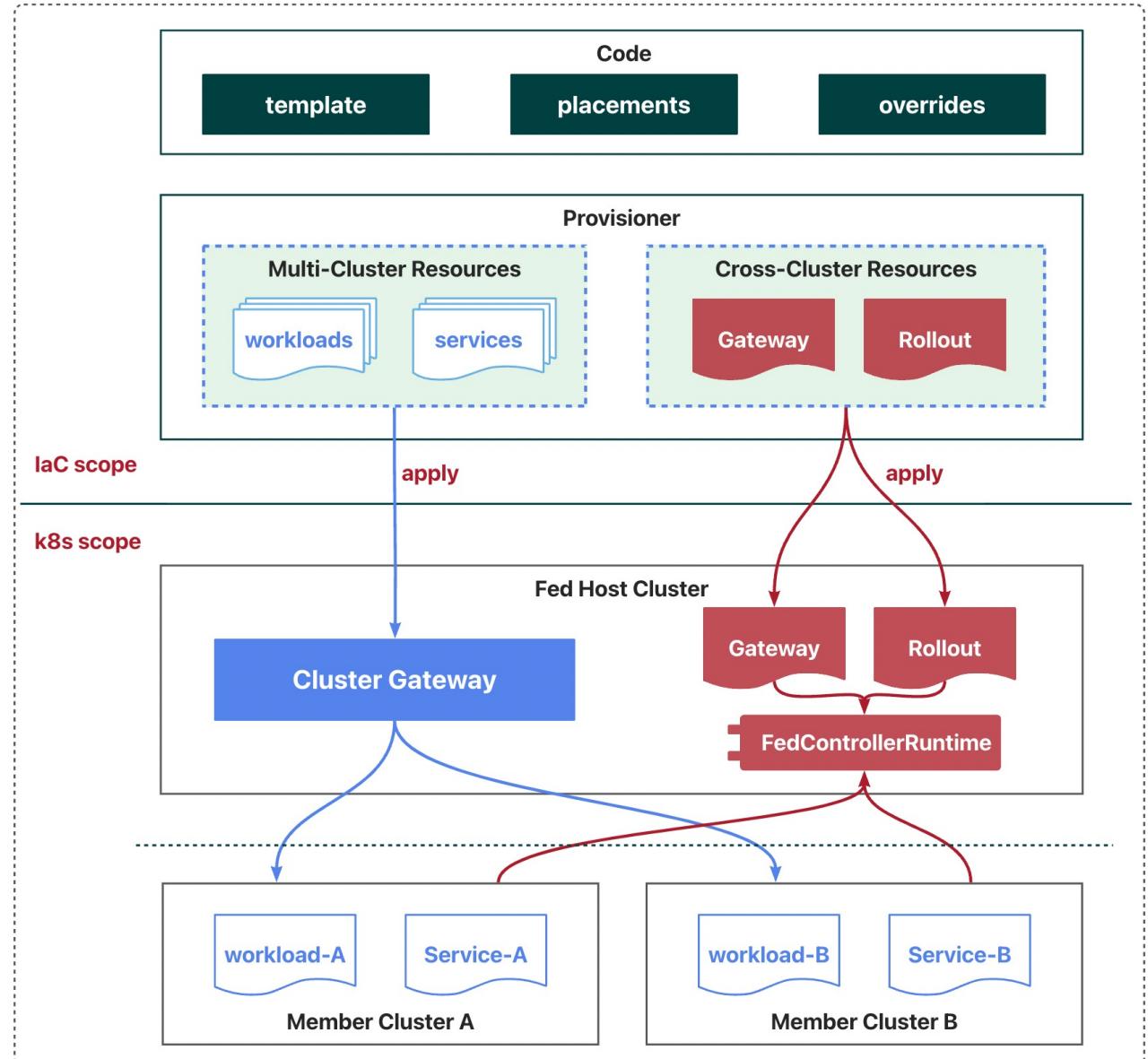


Can we get rid of Federated Types?



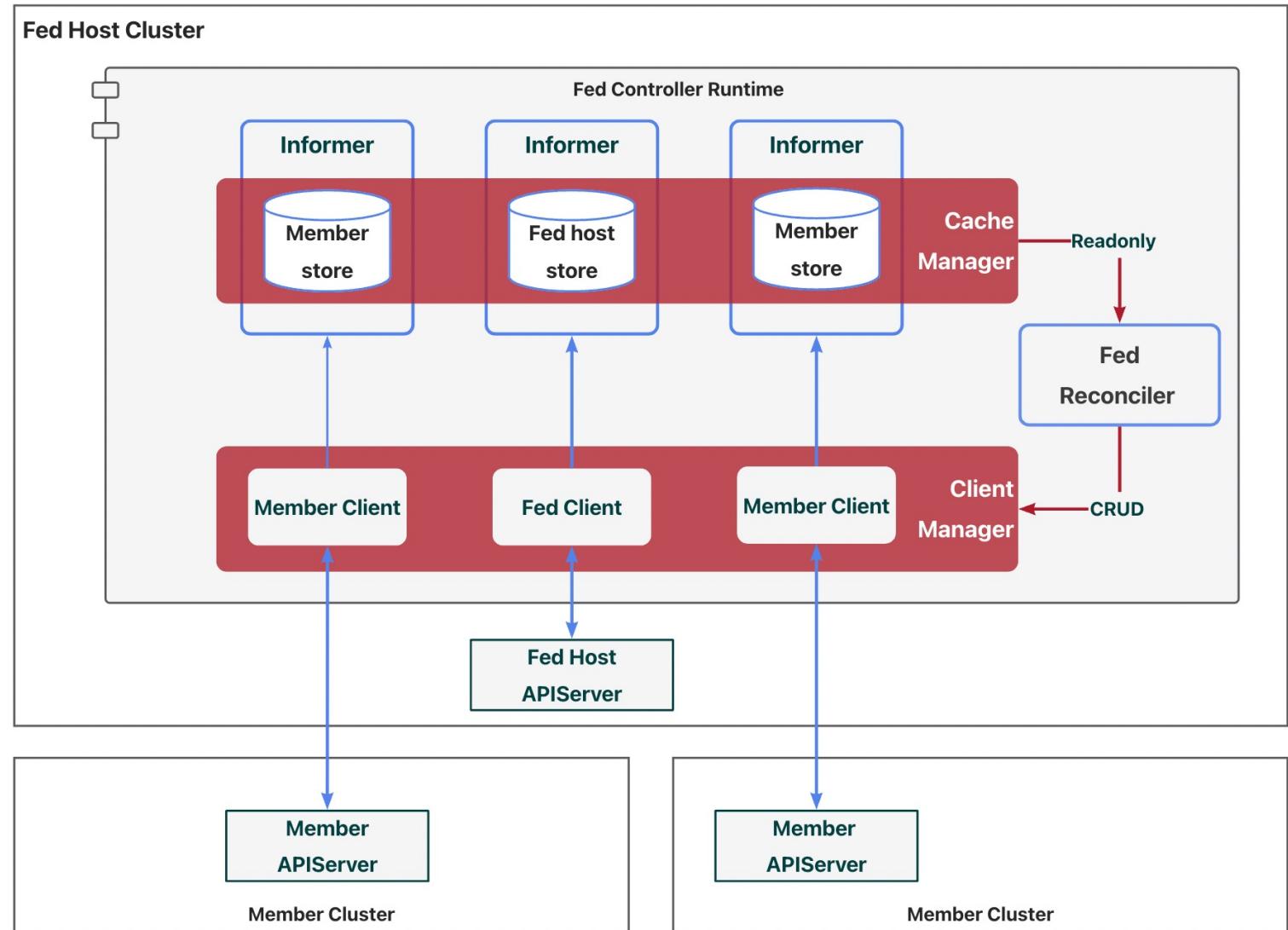
How AntGroup does

- Move **placement** and **override** to IaC scope
- Classify resources into **Two types**
 - Multi-Cluster
 - Cross-Cluster



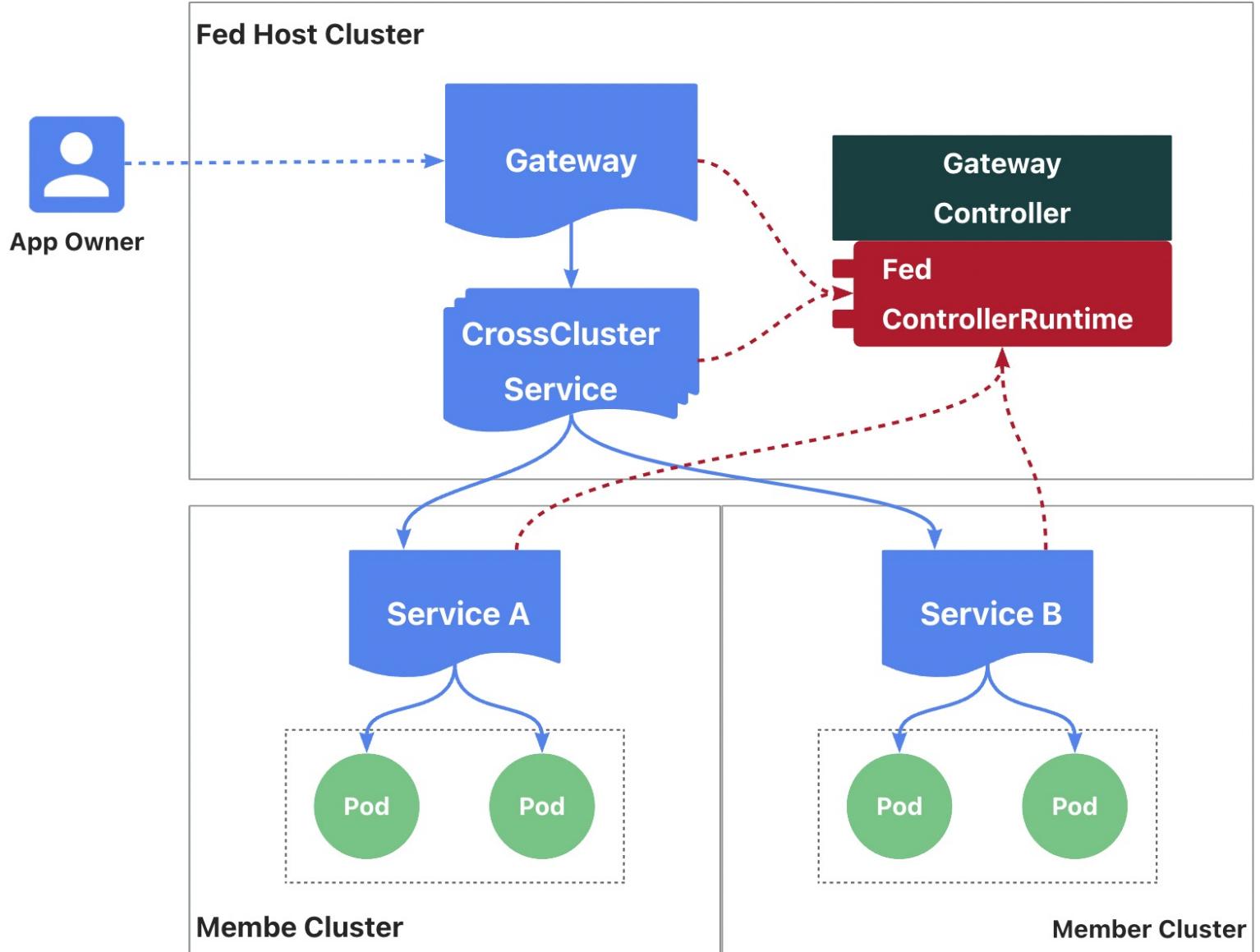
Introduce Fed Controller Runtime

- Unified Client and Cache Interface
- Support **both** federation and member deployment



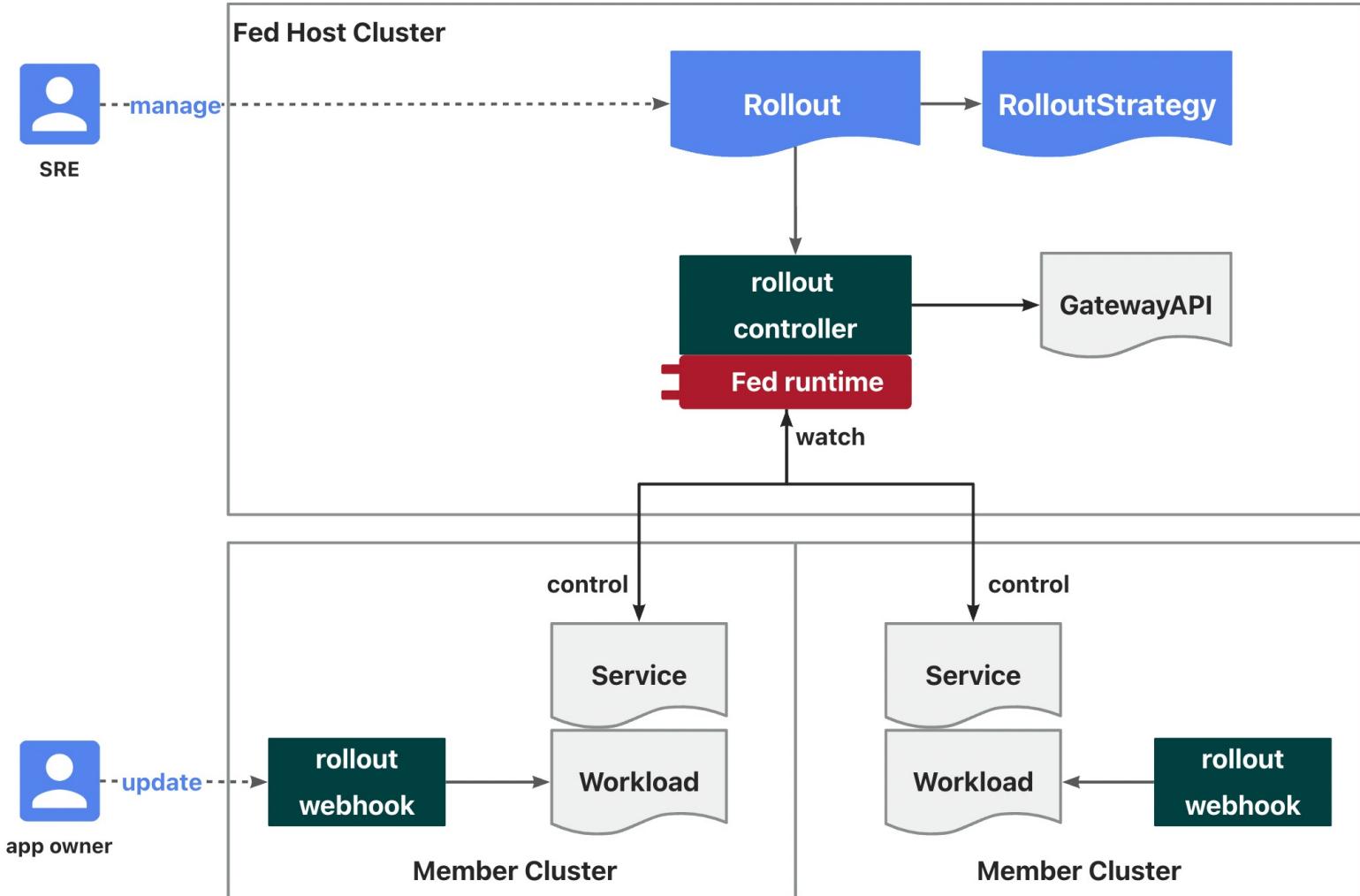
Cross-Cluster Gateway

```
apiVersion: networking.fed.kusionstack.io/v1alpha1
kind: Gateway
spec:
  http:
    - name: "ab-test"
      host: "test.alipay.com"
      path: "/foo"
      route:
        - target:
            name: foo-target
            subset: v1
            weight: 90
        - target:
            name: foo-target
            subset: v2
            weight: 10
---
apiVersion: networking.fed.kusionstack.io/v1alpha1
kind: CrossClusterService
spec:
  targets:
    - name: v1
      backend:
        serviceSelector:
          matchLabels:
            version: v1
    - name: v2
      backend:
        serviceSelector:
          matchLabels:
            version: v2
```



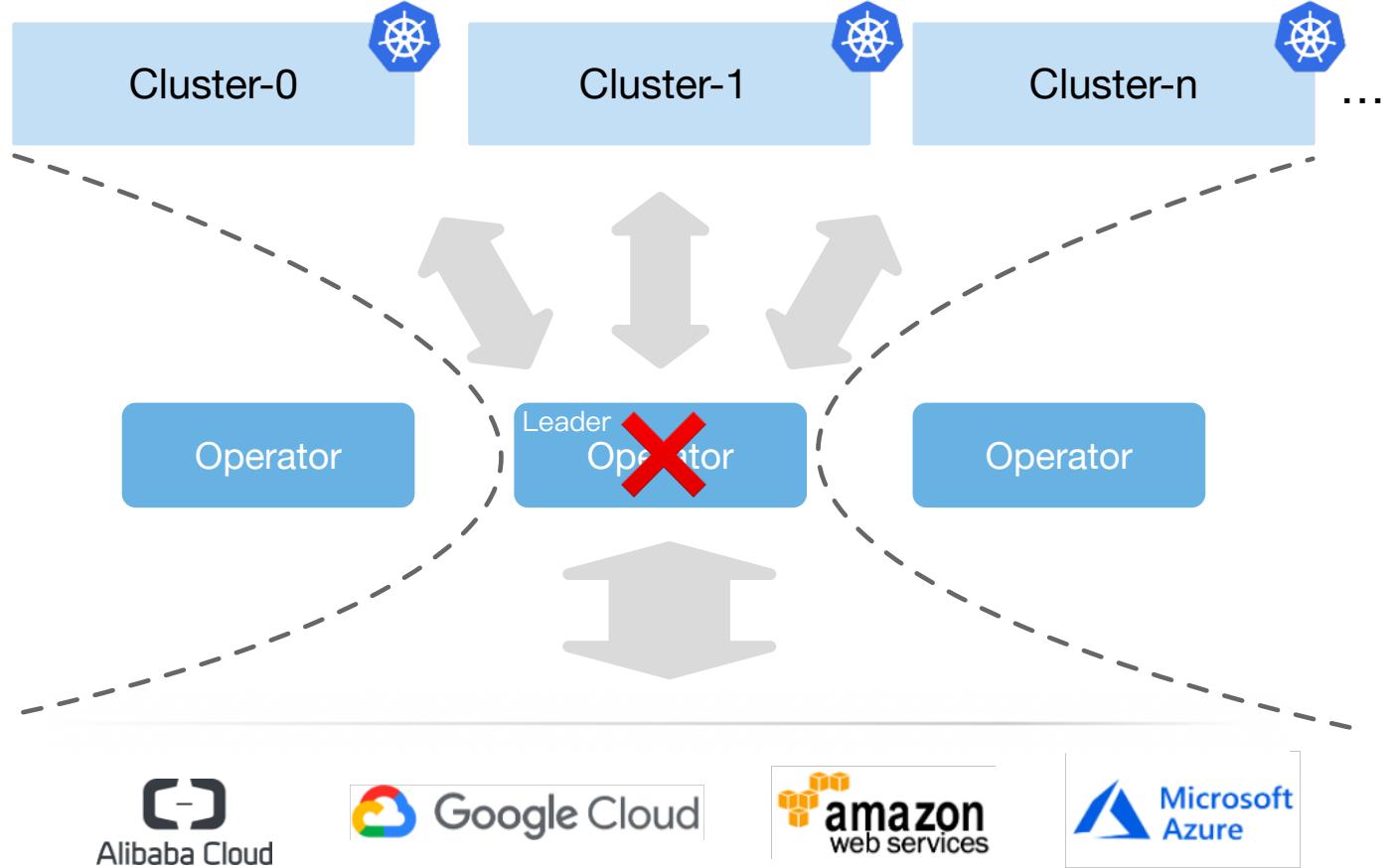
Cross-Cluster Rollout

```
apiVersion: rollout.kusionstack.io/v1alpha1
kind: Rollout
metadata:
  name: test-rollout
  namespace: rollout-system
spec:
  workloadRef:
    apiVersion: apps/v1
    kind: StatefulSet
    match:
      selector:
        matchLabels:
          app.kubernetes.io/instance: test-rollout
          app.kubernetes.io/name: test-rollout
  strategyRef: test-rollout
---
apiVersion: rollout.kusionstack.io/v1alpha1
kind: RolloutStrategy
metadata:
  name: test-rollout
  namespace: rollout-system
batch:
  fastBatch:
    count: 5
    pauseMode: EachBatch
```



Large-scale problem

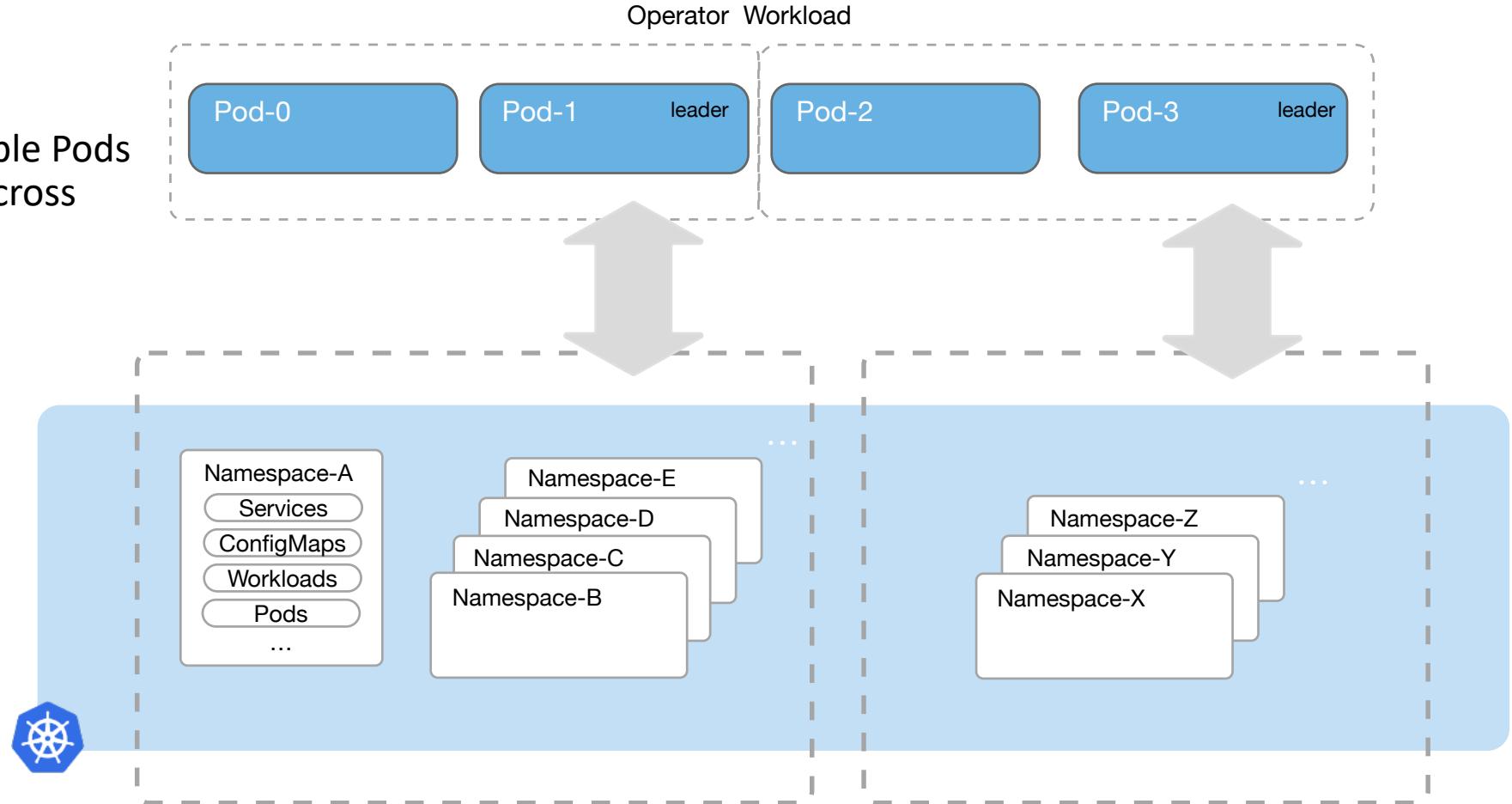
- **High single-node load**
 - More CPU & Memory
 - Decreased reconcile efficiency
 - Long startup time
 - *List 700k pods -> 10min
 - *Too old resource version
- **leader election problem**
 - Inability to canary upgrade & Large blast radius
 - Unable to scale horizontally



What we want

- **Sharding**

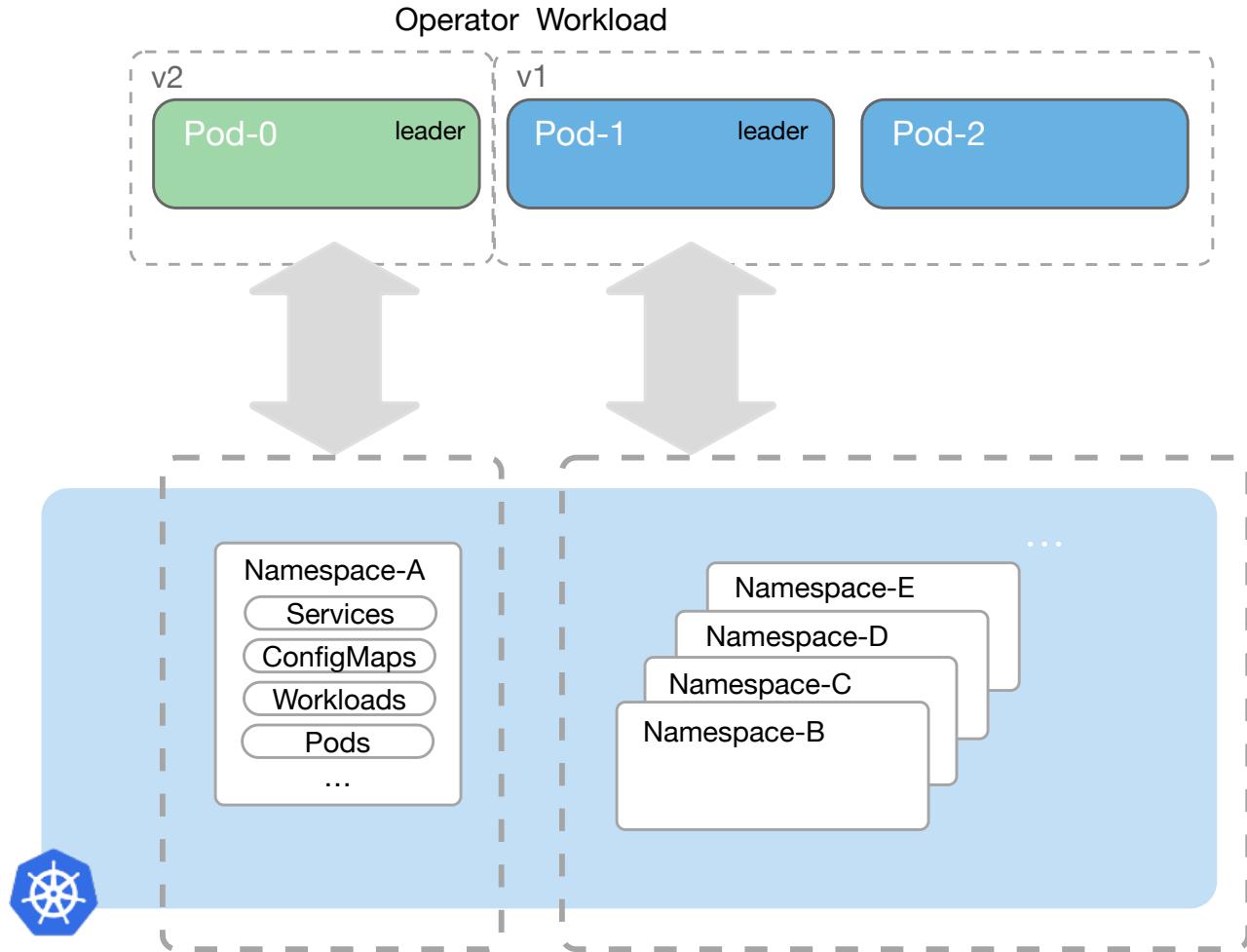
Not just one Leader, but multiple Pods to evenly distribute the load across different partitions.



What we want

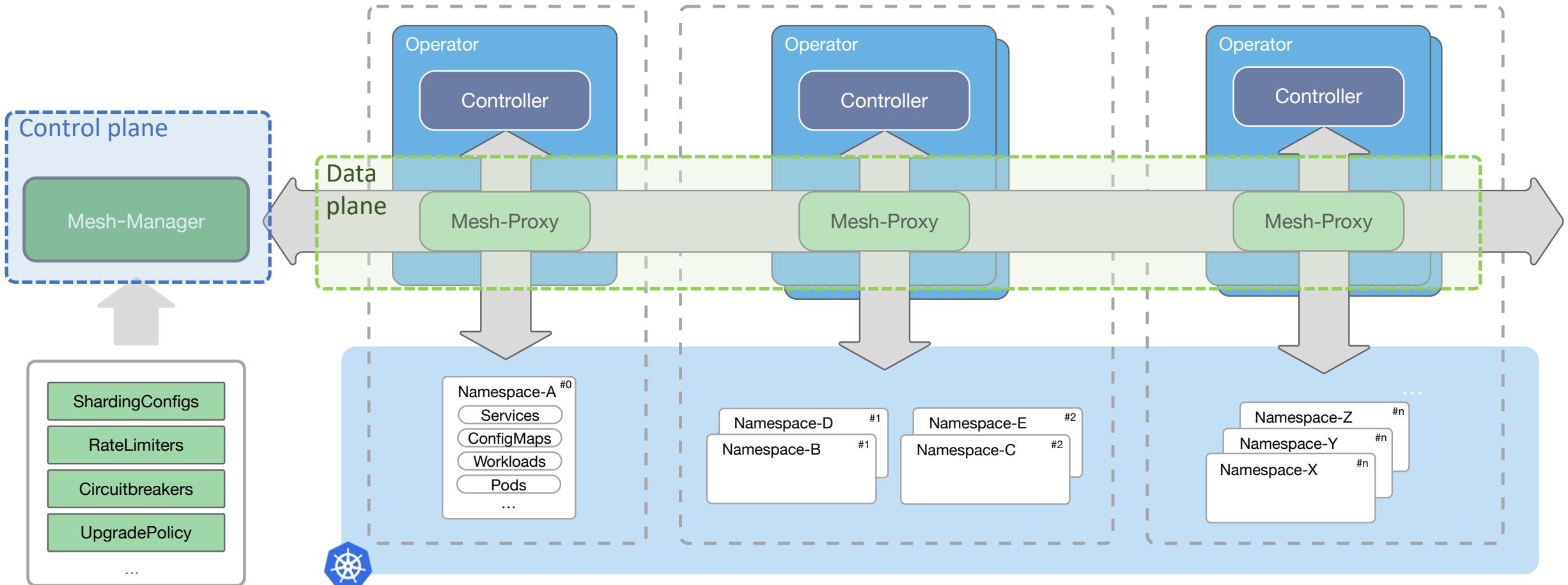
- **Canary Upgrade**

Namespace-level canary upgrades



Controller Mesh

✓ Non-intrusive



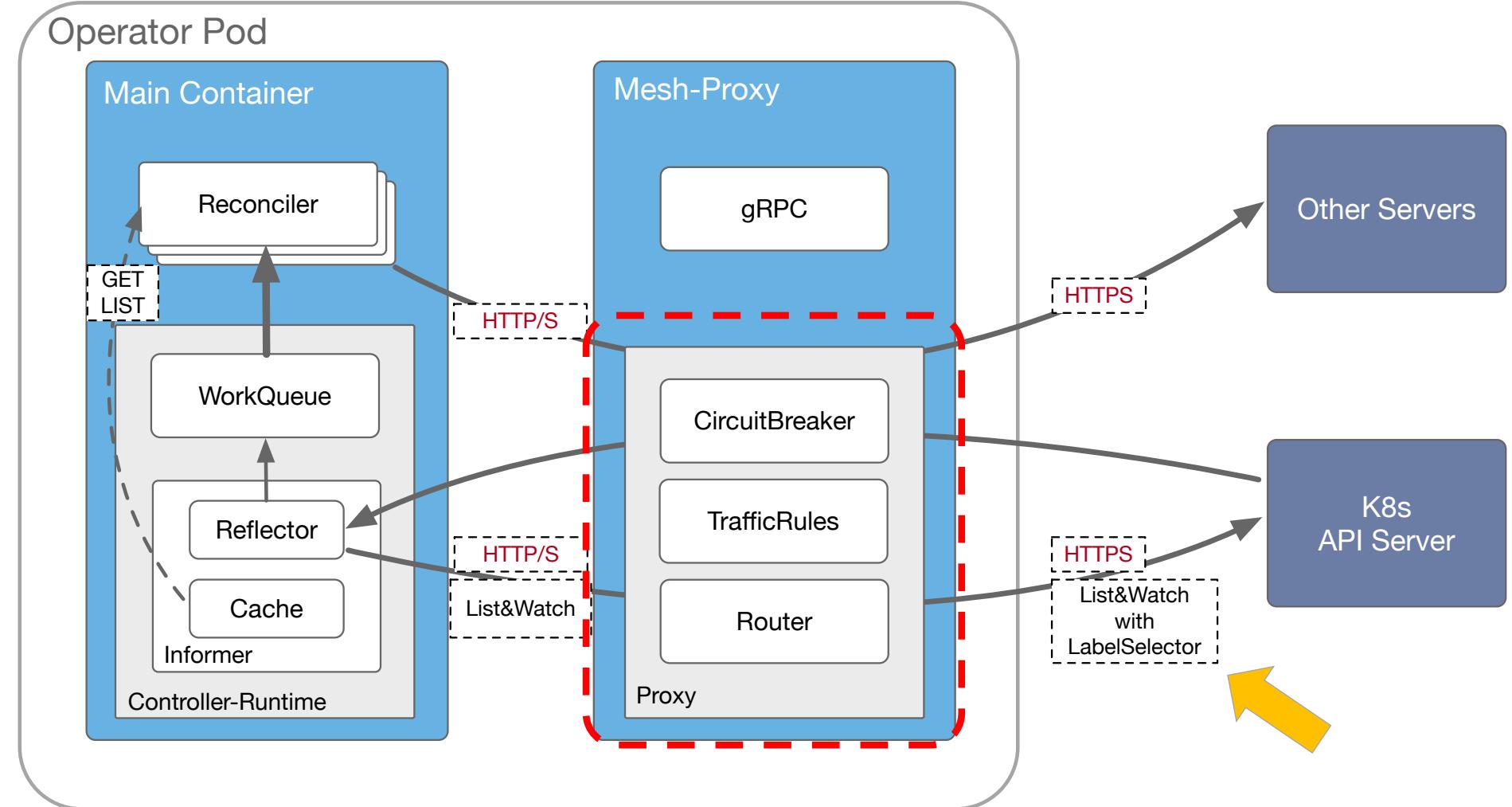
Controller Mesh Proxy

Request proxy

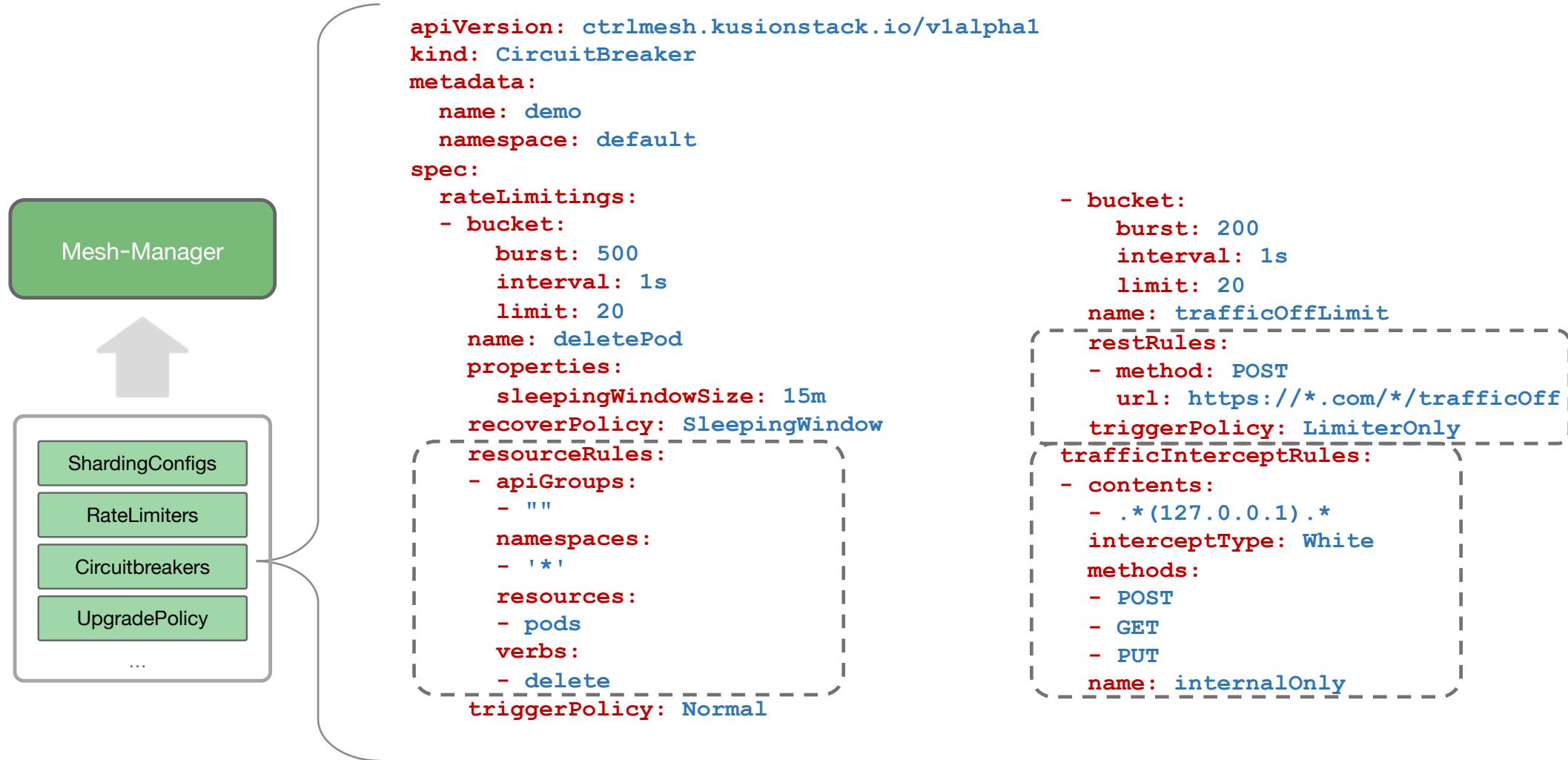
- Circuit breaker & Rate limiter
- Modify req/resp

how to limit resources?

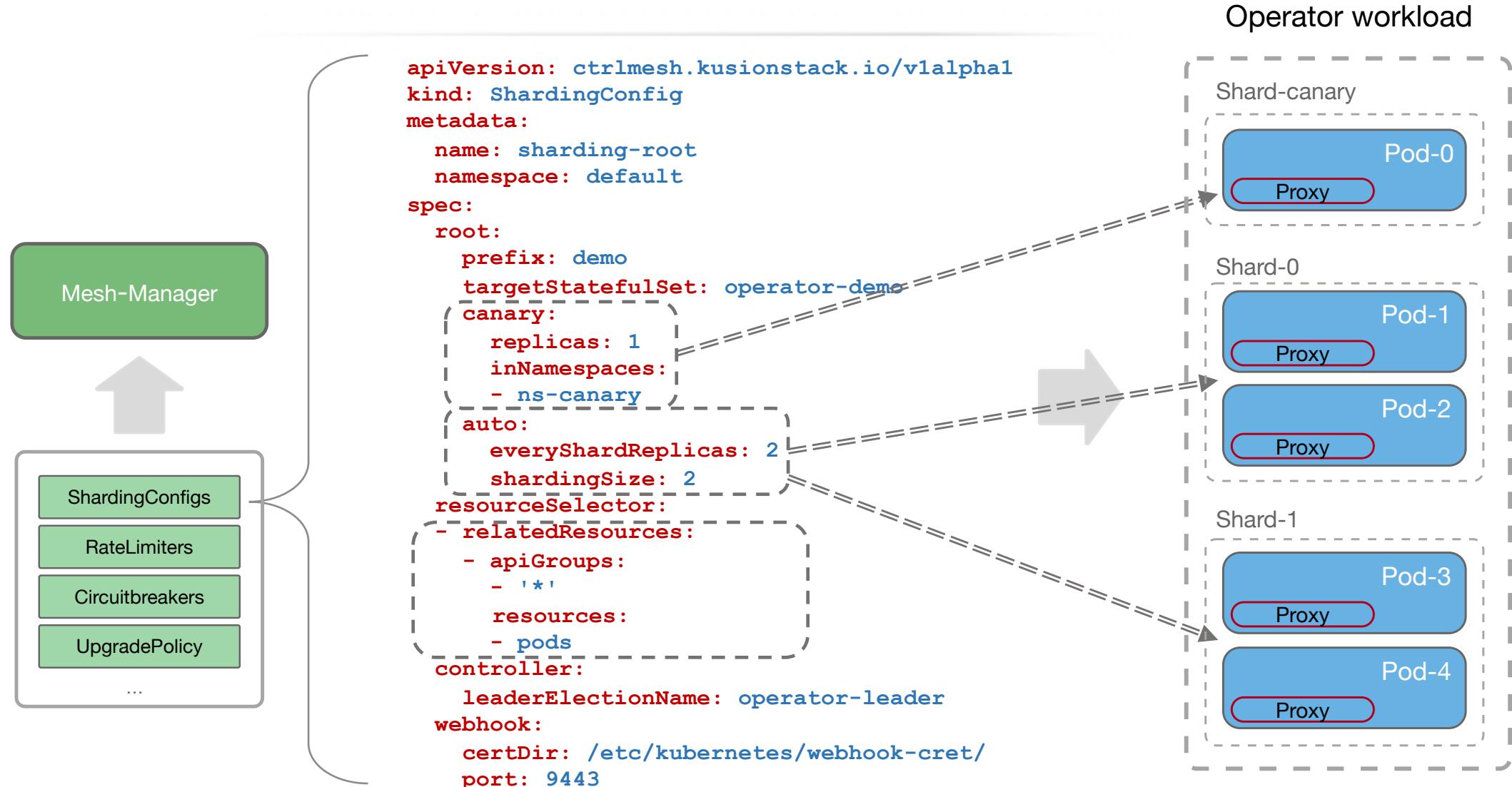
↓
List&Watch with
LabelSelector



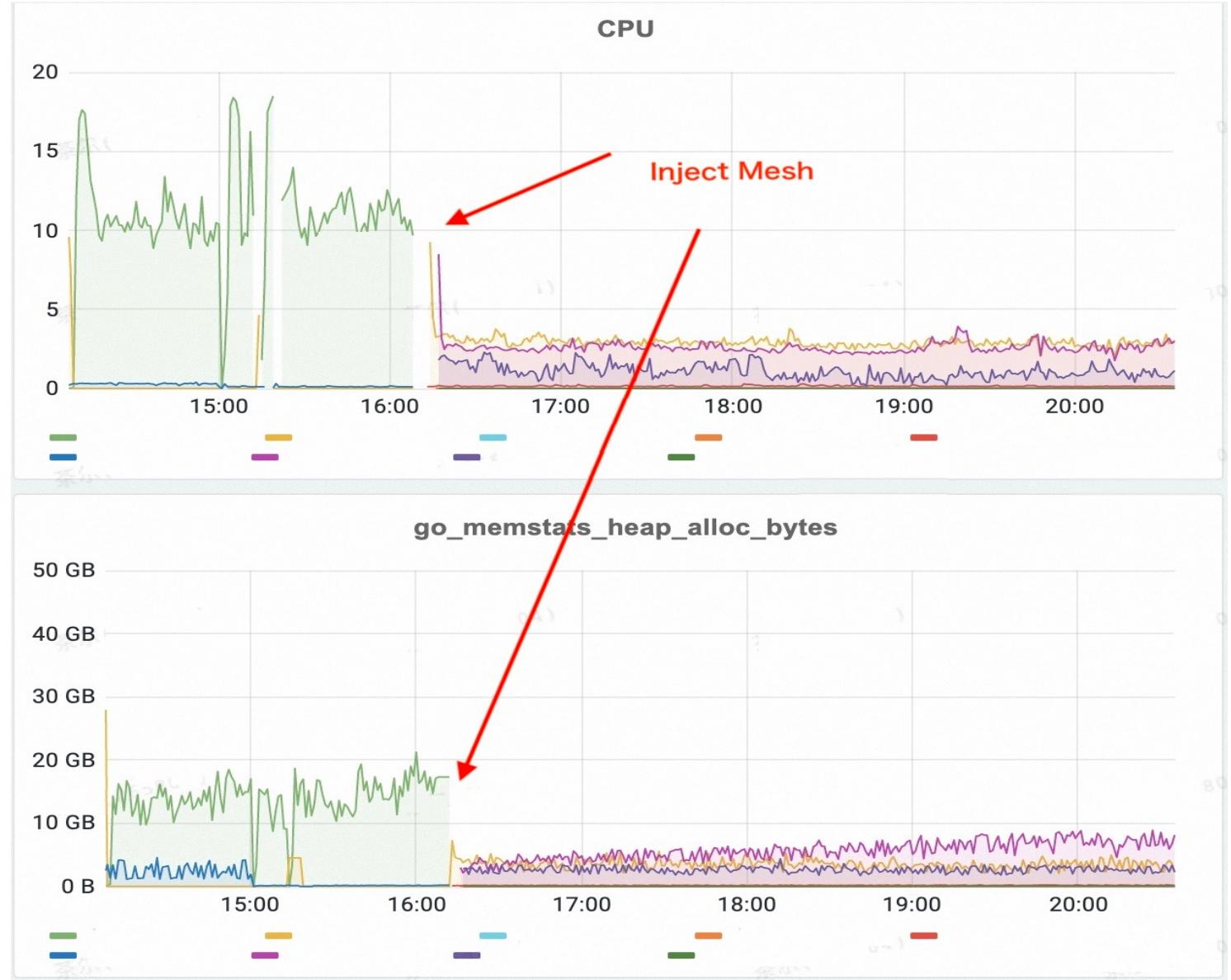
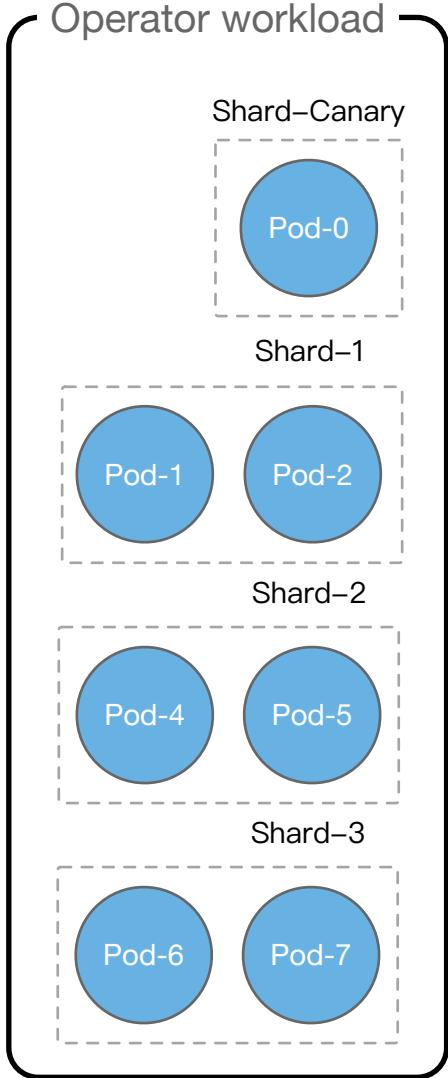
Circuit Breaker



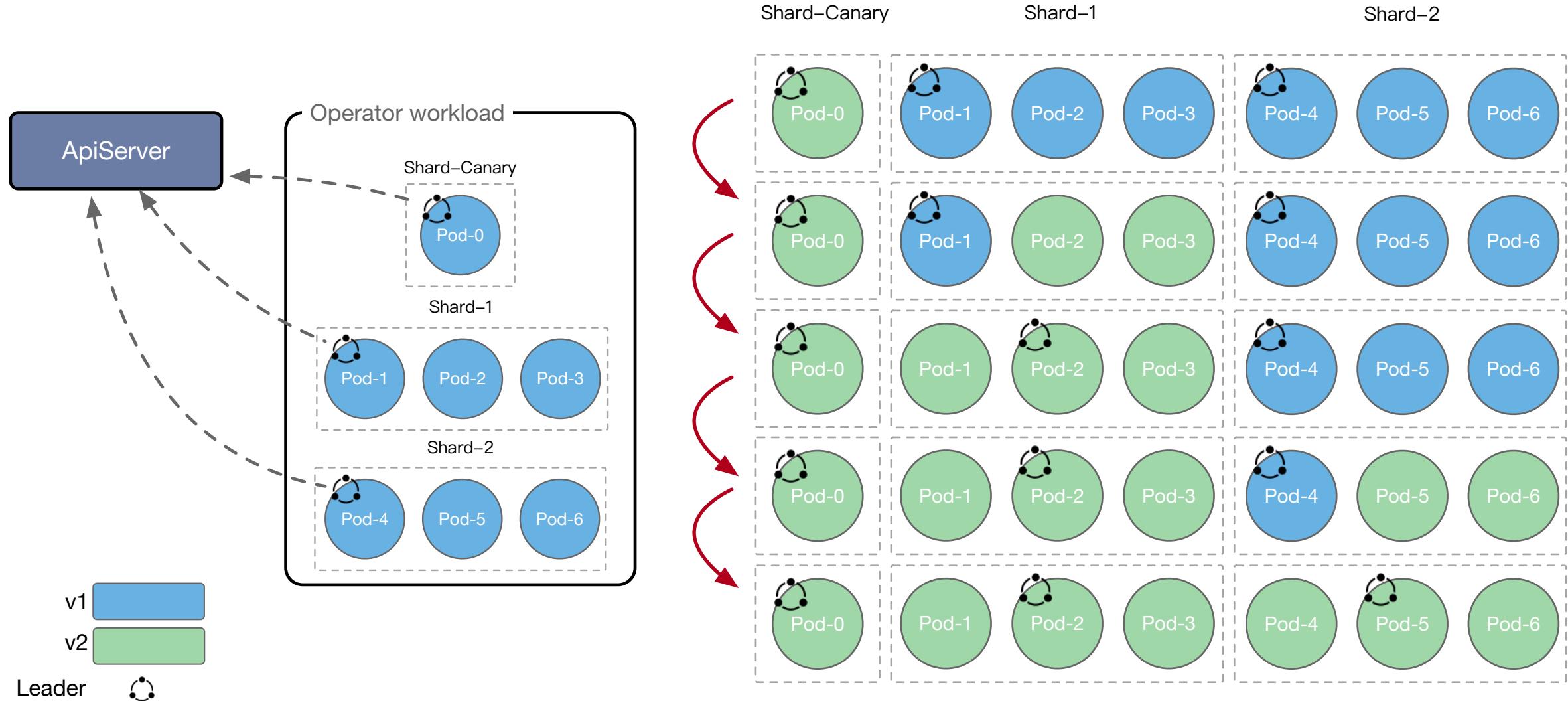
Sharding & Canary



Sharding & Canary



Operator Rolling Upgrade



TODO

- ✓ Sharding
- ✓ Canary upgrade
- ✓ Circuit breaker
- ✓ Rate limiter
- Observability
- Fault injection
- More...



<https://github.com/KusionStack/controller-mesh>

Welcome to Join us !

WebSite:

- <https://kusionstack.io>

Github:

- <https://github.com/KusionStack/operating>
- <https://github.com/KusionStack/controller-mesh>
- <https://github.com/KusionStack/rollout>

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