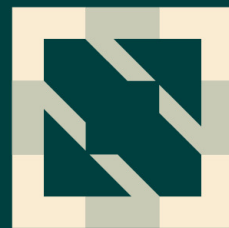




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# What's new on controller-runtime of the day

-- *Siyu Wang*

## Siyu Wang

- Staff Software Engineer @ Alibaba Cloud
- Co-founder and Maintainer of OpenKruise, Koordinator
- Maintainer of Kubernetes controller-runtime

Mainly focuses on cluster management, workloads, exploring AI jobs scheduling on Kubernetes.

# What is controller-runtime

Kubebuilder/OperatorSDK:

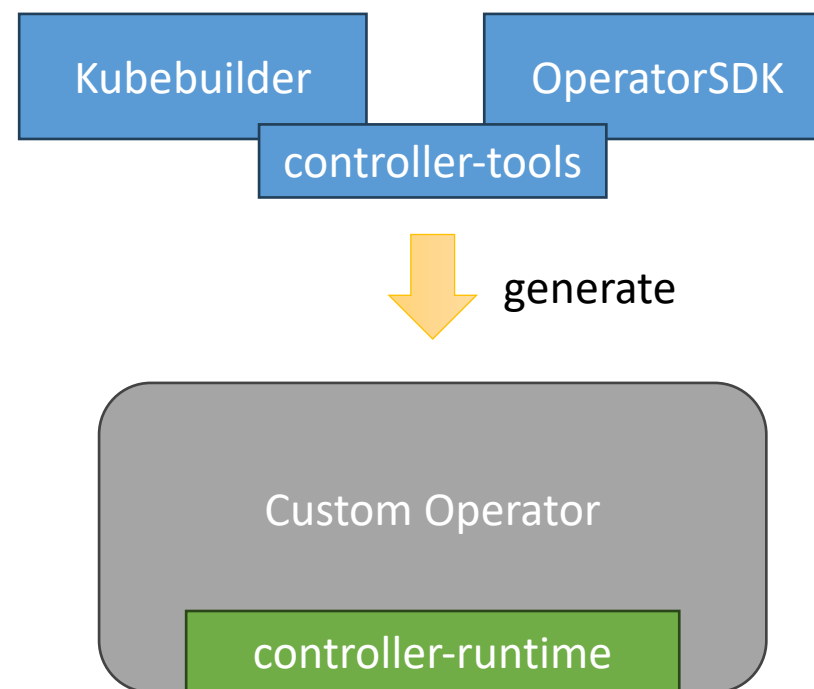
- generate the project and go types for custom resources

controller-tools:

- generate go files, e.g., deepcopy
- generate yaml files, e.g., CRD/Webhook/RBAC definition

**controller-runtime:**

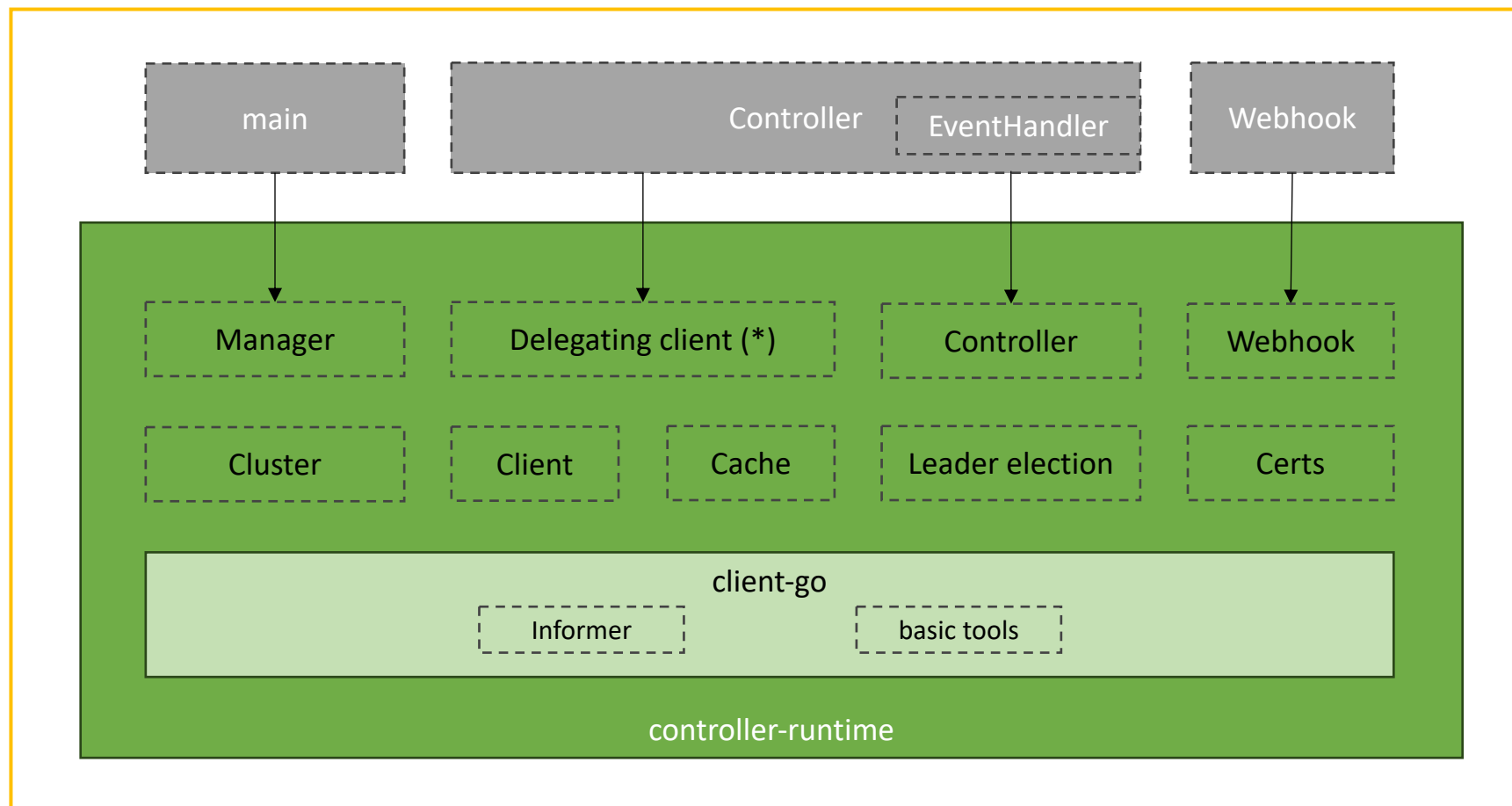
- a set of go libraries for building Controllers/Webhooks
- the core runtime sdk for all Operators



# What is controller-runtime

Core concepts:

- Manager
- Client
- Controller
- Webhook



# Versioning and Compatibility

Kubebuilder	controller-runtime	Kubernetes
v1.x	v0.1.x	v1.13
v2.x	v0.2.x - v0.6.x	v1.14 - v1.18
v3.x	v0.7.x - ?	v1.19 - ?

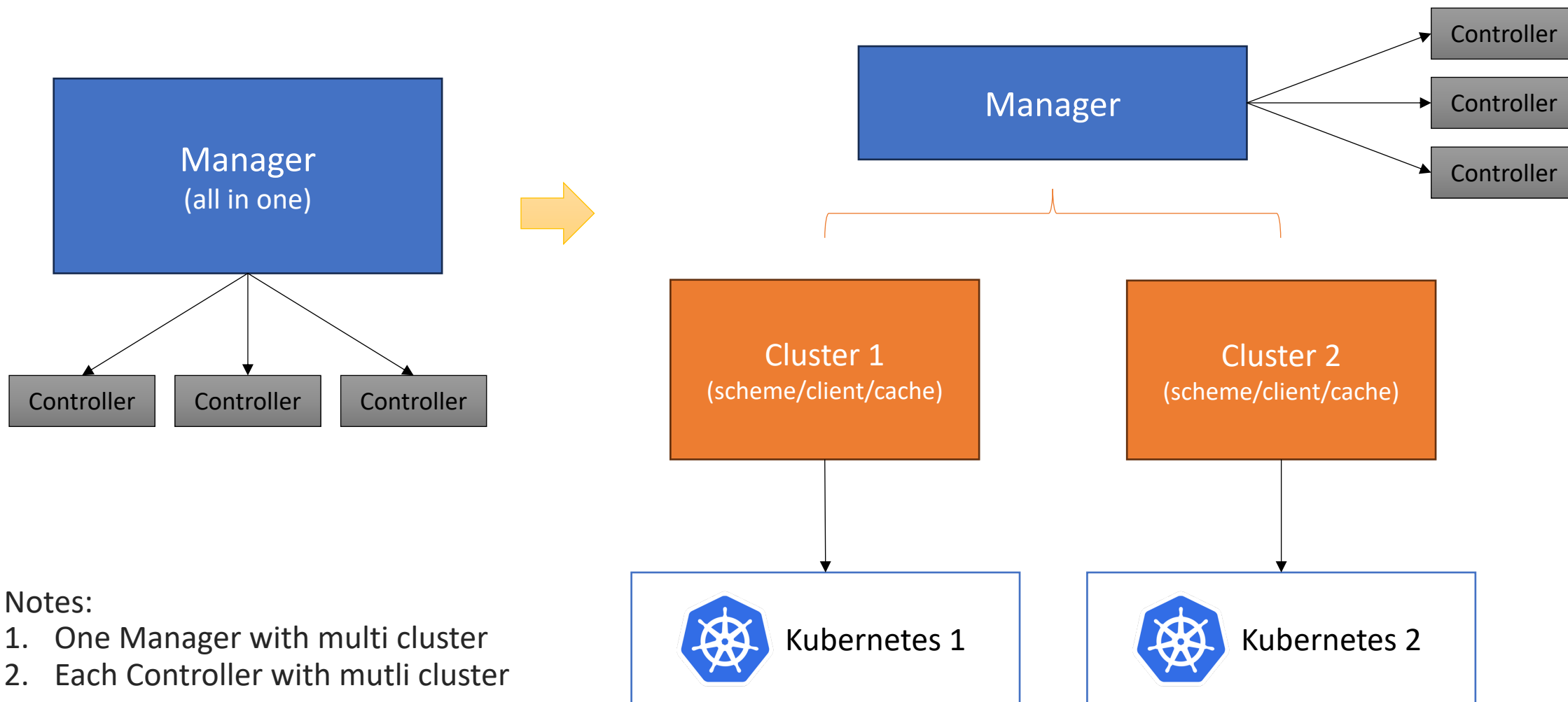
Latest version matched:

- controller-runtime v0.X <-> Kubernetes v0.{X+12}

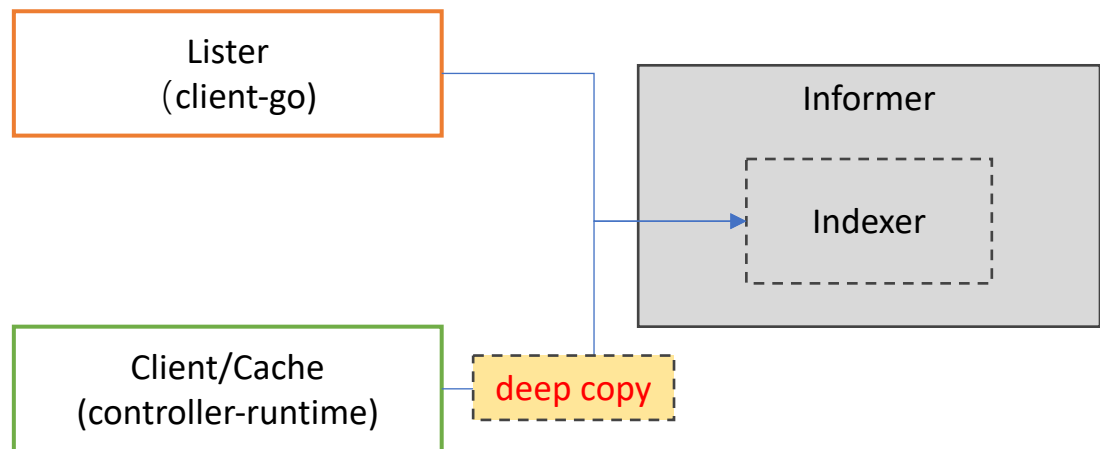
Kubernetes	client-go	controller-runtime
v1.4	v1.4	--
v1.5	v1.5, v2.0	--
v1.6 – v1.13	v3.0 – v10.0	--
v1.14	v11.0	v0.2
v1.15	v12.0, v0.15	v0.3
v1.16-v1.28	v0.16 – v0.28	v0.4 – v0.16



# Section.1 multi cluster



# Section.2 disable deep copy

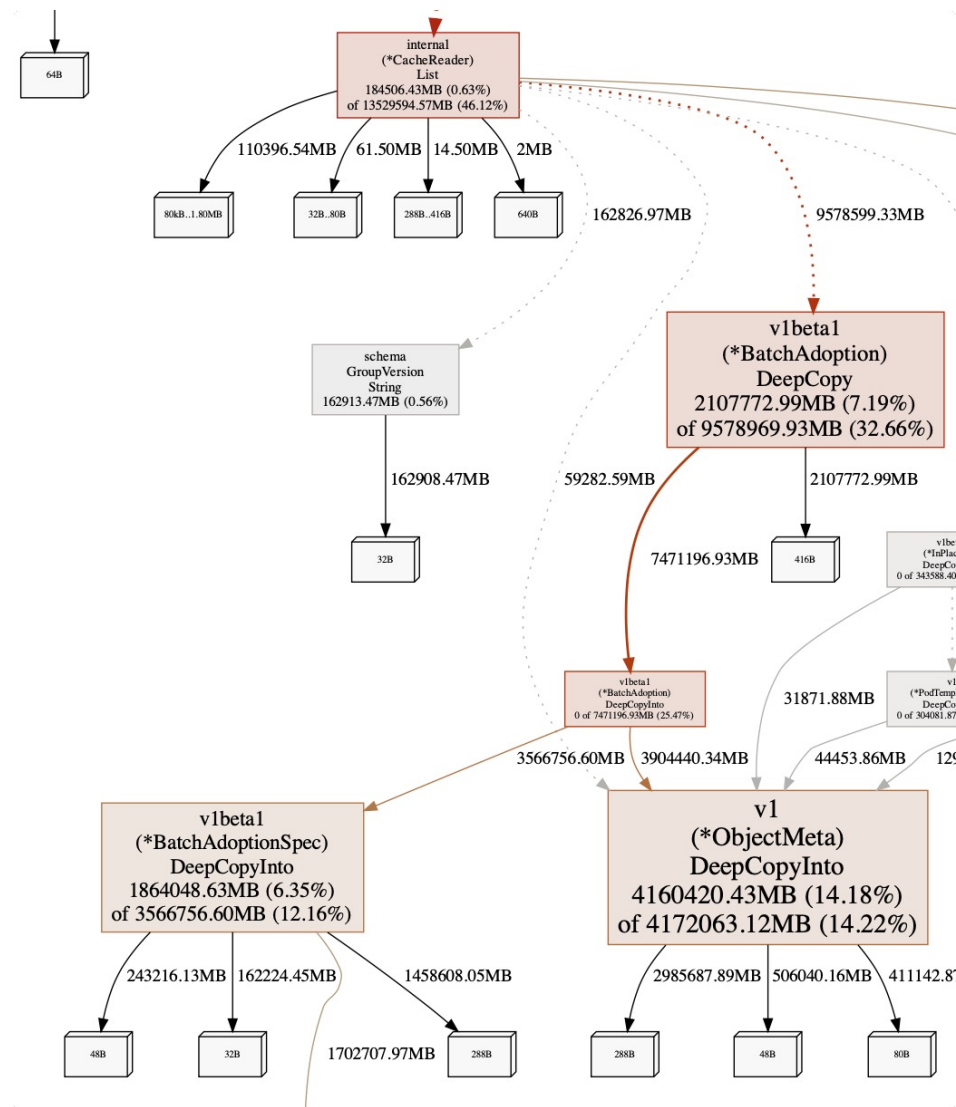


Since v0.10 (cache options refactored in v0.15):

1. DefaultUnsafeDisableDeepCopy
2. UnsafeDisableDeepCopy By Object

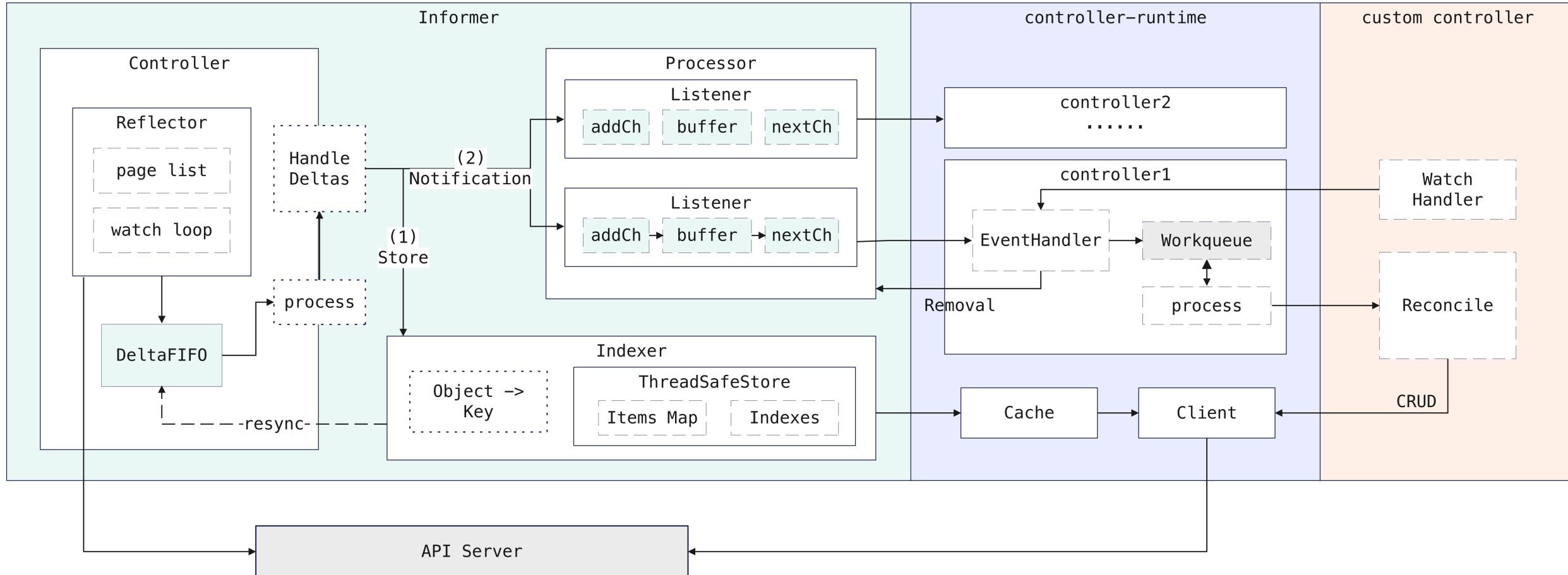
Since v0.14:

1. UnsafeDisableDeepCopyOption





# Section.3 Cache overview



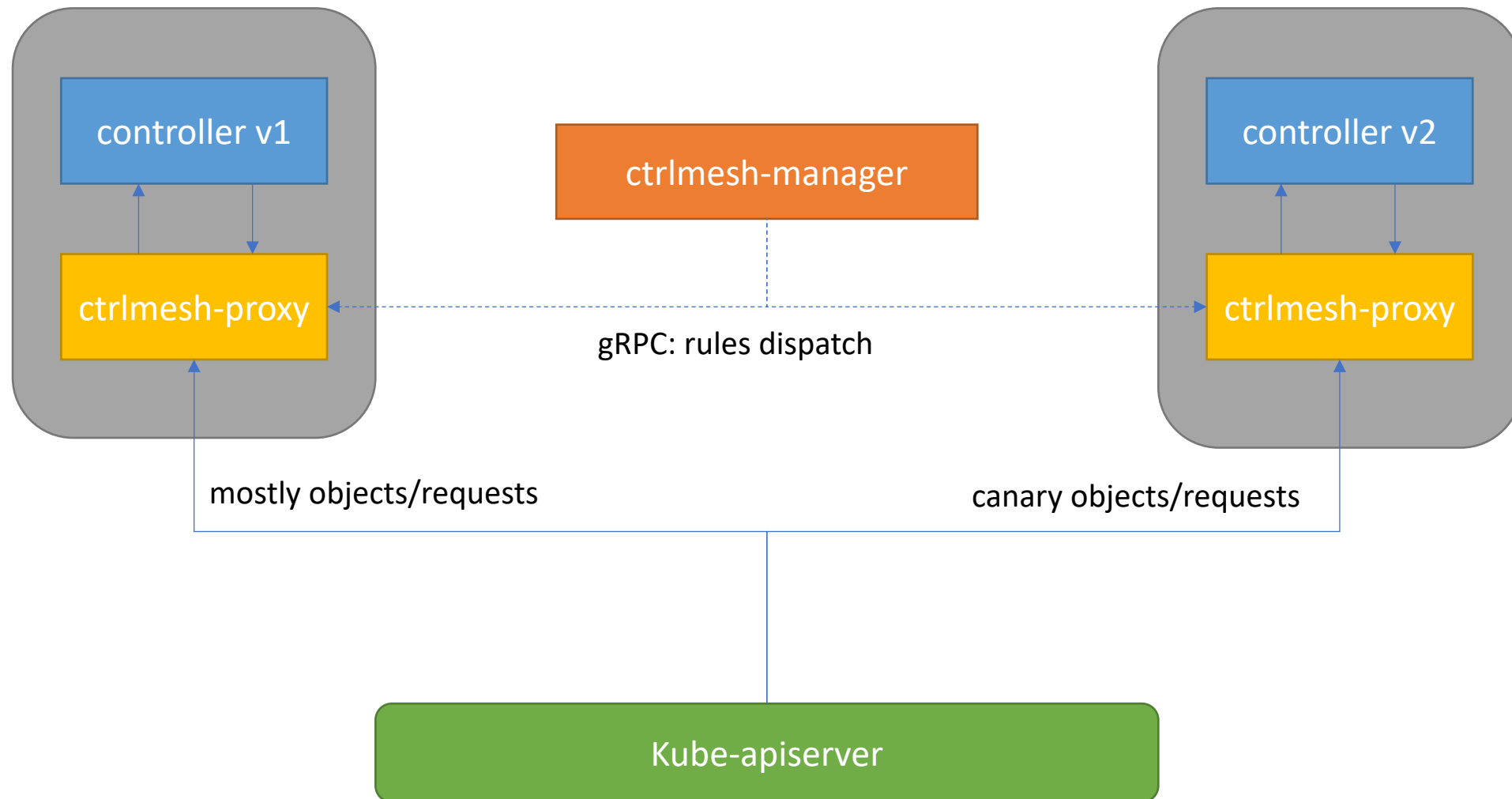
- Transform objects to save on RAM cost
- Removal of event handlers
- Dynamic watches and controllers

# Section.4 More: ControllerMesh (alpha)

- Canary update: the controllers can be updated in canary progress instead of one time replace.
- Fault injection: it helps developers to verify their reconcile logic in some fault scenarios.
- Flexible isolation: limits resources of which namespaces can be queried by a controller.
- Client-side rate-limit and blown.

<https://github.com/openkruise/controllermesh>

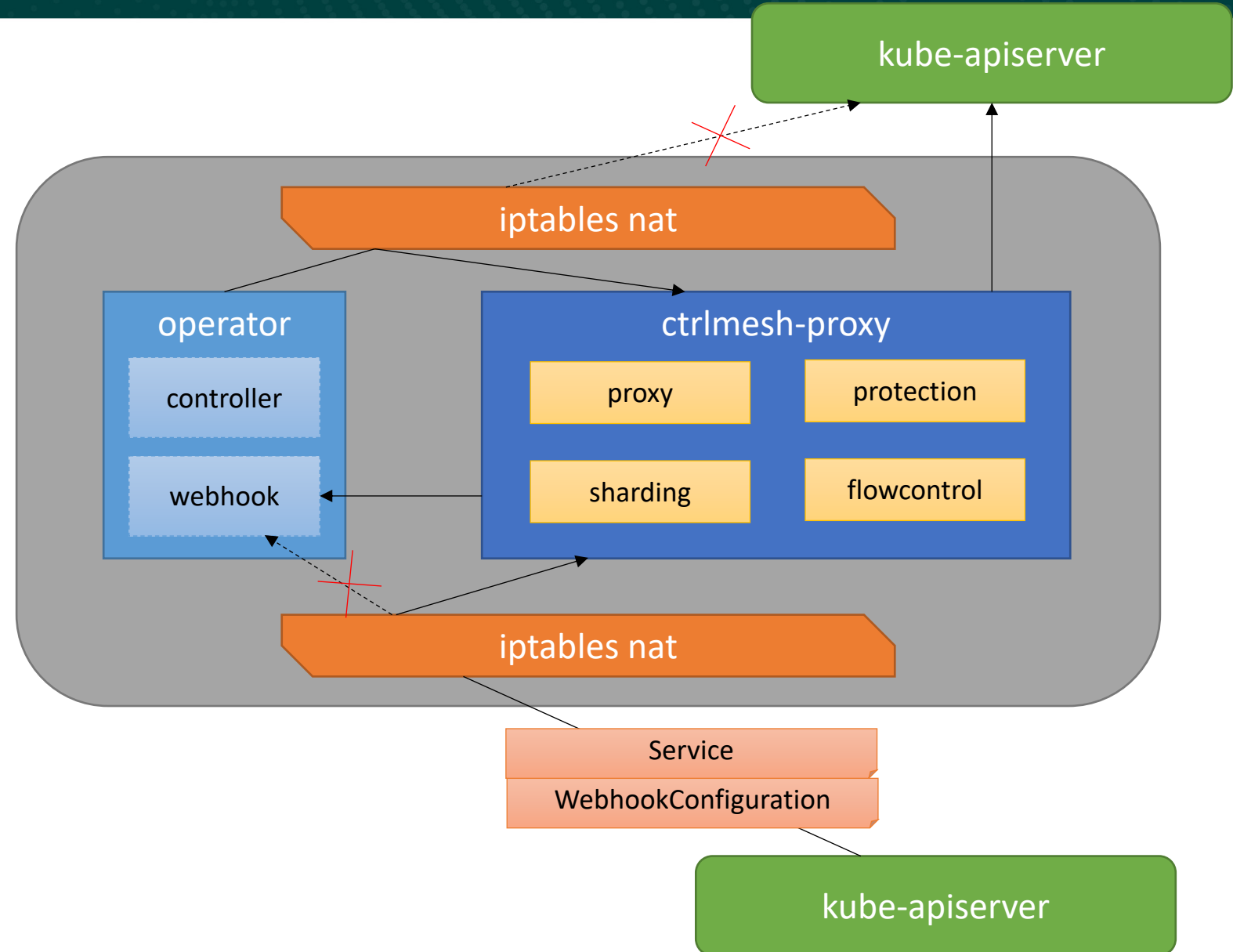
# Section.4 More: ControllerMesh (alpha)



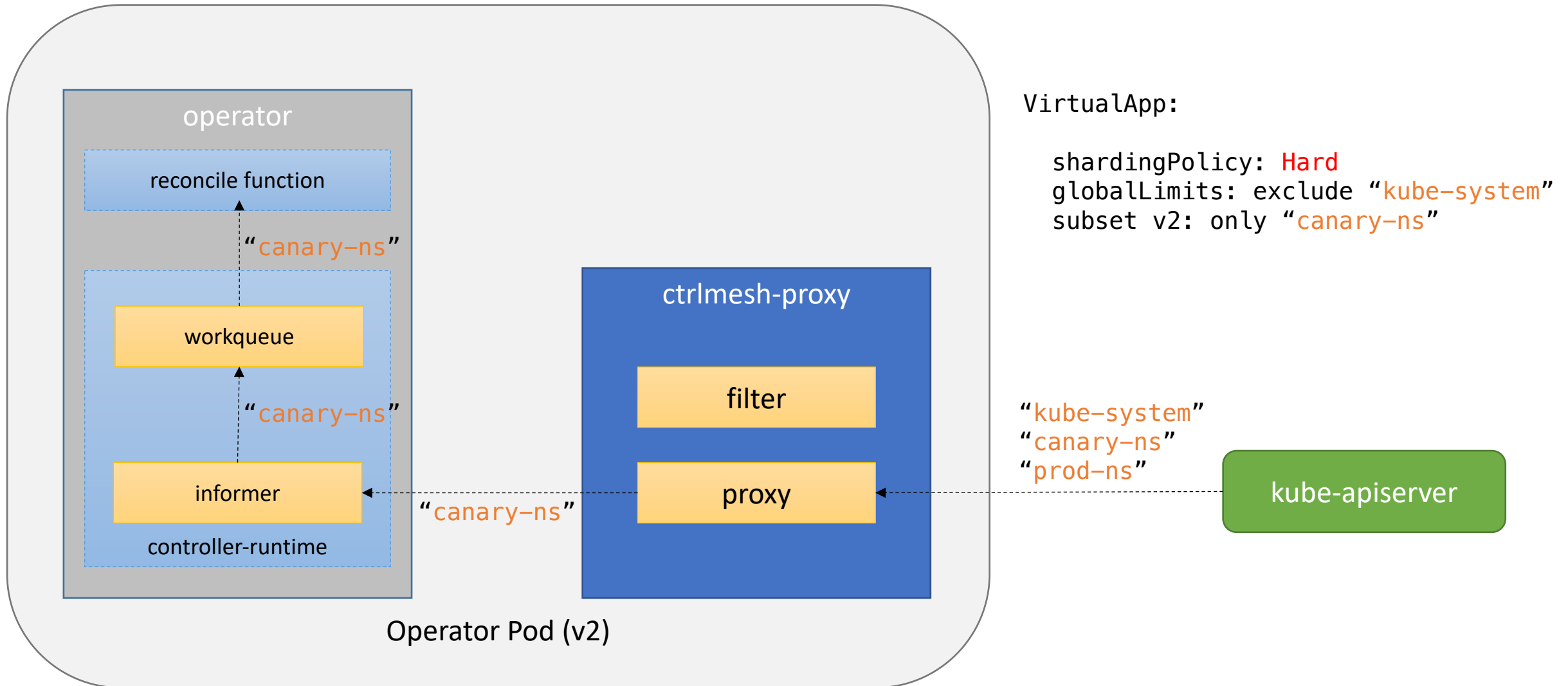
# Section.4 More: ControllerMesh (alpha)

Transparent proxy:

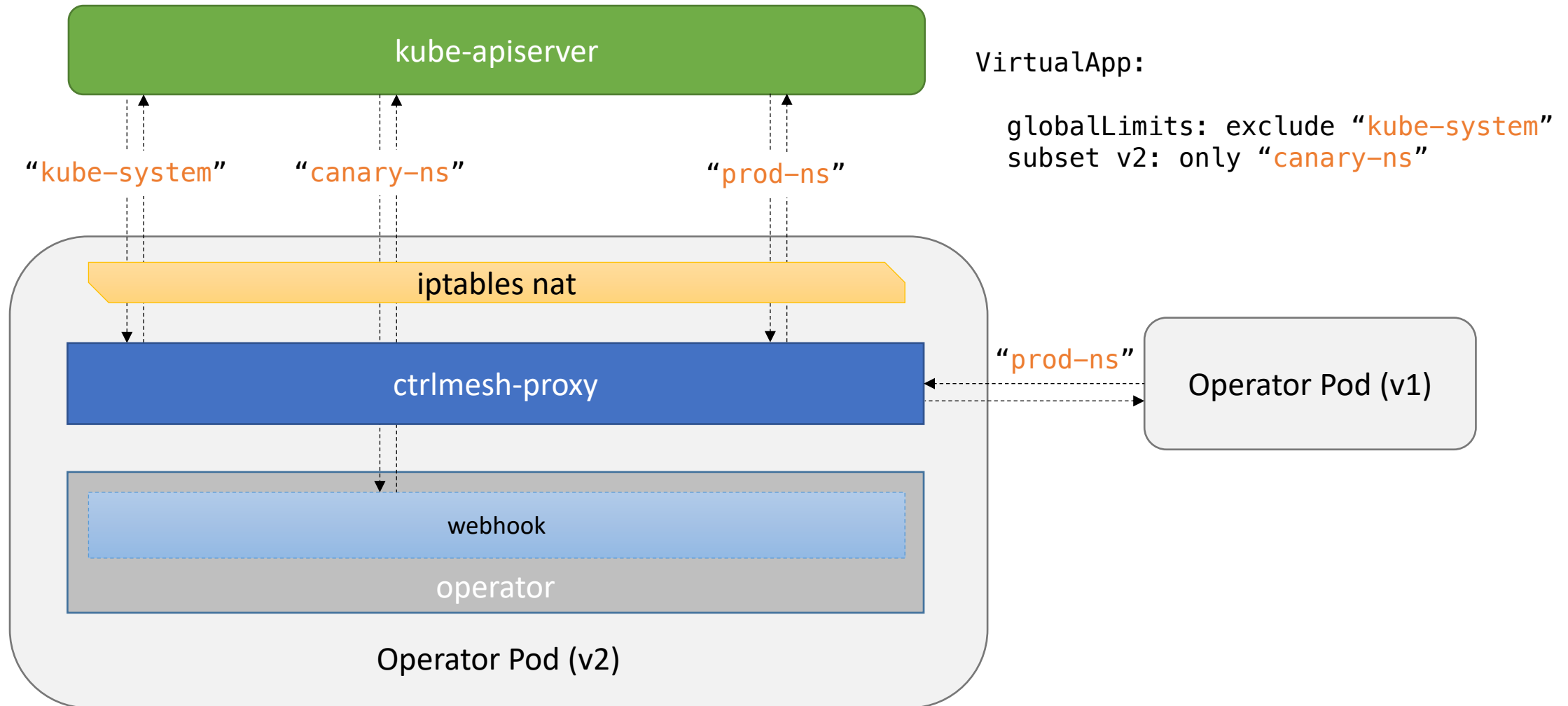
- Router
- Filter
- Circuit breaker
- Monitor



# Section.4 More: ControllerMesh (alpha)



# Section.4 More: ControllerMesh (alpha)





# Section.4 More: ControllerMesh (alpha)

```
apiVersion: ctrlmesh.kruise.io/v1alpha1
kind: VirtualApp
metadata:
  name: test-operator
  # ...
spec:
  selector:
    matchLabels:
      component: test-operator
  configuration:
    controller:
      leaderElectionName: test-operator
  webhook:
    certDir: /tmp/webhook-certs
    port: 9443
```

```
route:
  globalLimits:
    - namespaceSelector:
        ...
  subRules:
    - name: canary-rule
      match:
        - namespaceSelector:
            matchLabels:
              ns-type: canary-1
        - namespaceRegex: "^canary.*"
        - objectSelector:
            ...
  subsets:
    - name: v2
      labels:
        version: v2
      routeRules:
        - canary-rule
```

# Section.4 More: ControllerMesh (alpha)

```
apiVersion: ctrlmesh.kruise.io/v1alpha1
kind: TrafficPolicy
metadata:
  name: test-operator-policy
  # ...
spec:
  targetVirtualApps:
  - name: test-operator
  circuitBreaking:
    apiServer:
      resourceRules:
        apiGroups:
        - ""
        resources:
        - secret
        verbs:
        - "*"
        namespaces:
        - "kube-system"
```

```
rateLimiting:
  ratePolicies:
  - rules:
      resourceRules:
        apiGroups:
        - ""
        resources:
        - pods
        verbs:
        - update
        - patch
        namespaces:
        - "*"
      maxInFlight: 100
      bucket:
        qps: 30
        burst: 50
      exponentialBackoff:
        baseDelayInMillisecond: 10
        maxDelayInMillisecond: 3000
        continuouslyFailureTimes: 3
```

# Section.4 More: ControllerMesh (alpha)

What's more it can do:

- Fault injection:
  - Mock response for specific group/version/resources via Proxy.
- Observability:
  - Trace connection, RT, flow, error between Operator and APIServer via Proxy.

# Thanks

WeChat:



## Q&A