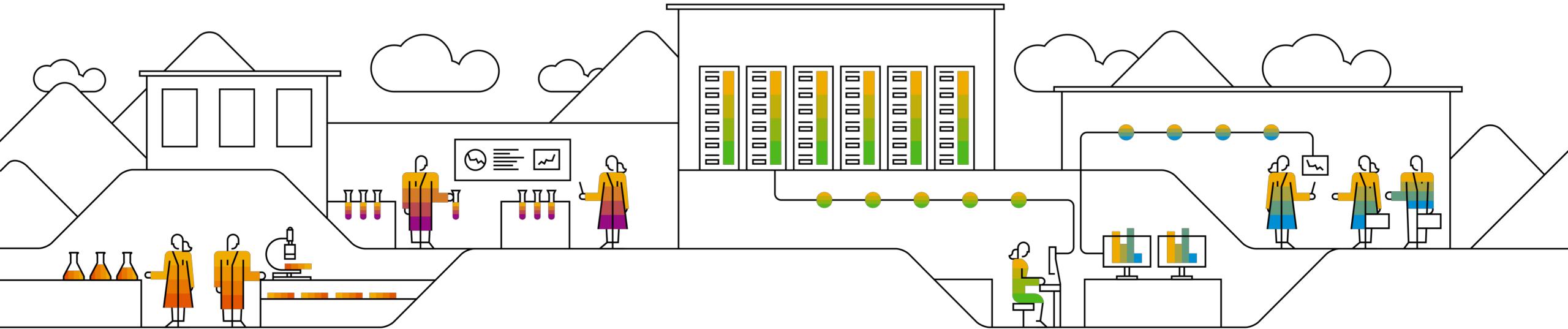




Mateusz Szostok

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101 ways to extend the Kubernetes platform

Mateusz Szostok, SAP

Agenda

- ❑ Introduction to Cloud Native
- ❑ What is the CNCF?
- ❑ Kubernetes Basics
 - Pods
 - Deployments
 - Statefulsets
 - Secrets/ConfigMaps
 - Services
 - LoadBalancing
 - CRD
 - Informers
- ❑ How to extend the Kubernetes?
- ❑ Examples
 - Sample Controller
 - Kubebuilder
 - Operator SDK
 - Metacontroller
 - Knative
 - Controller Runtime
- ❑ Admission Controllers
 - MutatingAdmissionWebhook
 - ValidatingAdmissionWebhook
- ❑ How to handle update properly (relist)
- ❑ Sending Events to CRD
- ❑ Custom indexing
- ❑ Patterns
 - OwnerReference
 - Finalizers

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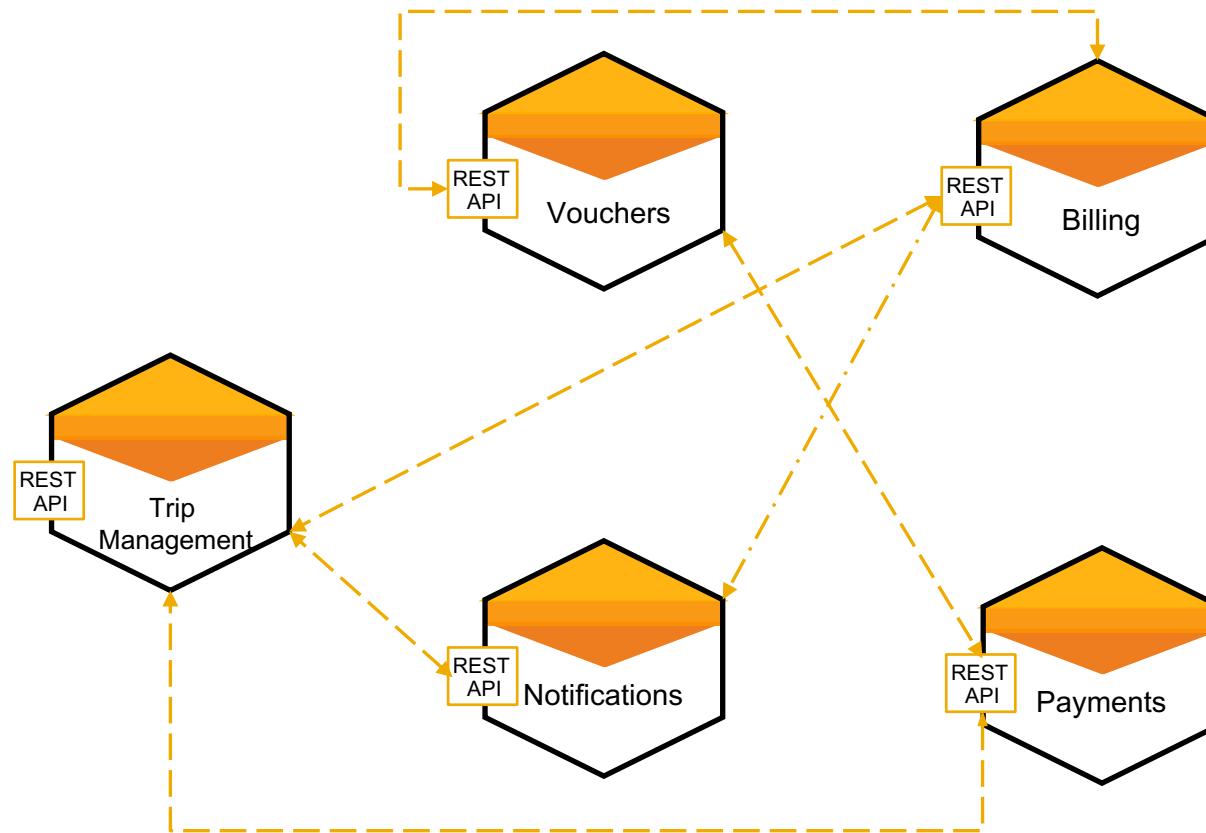
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Agenda

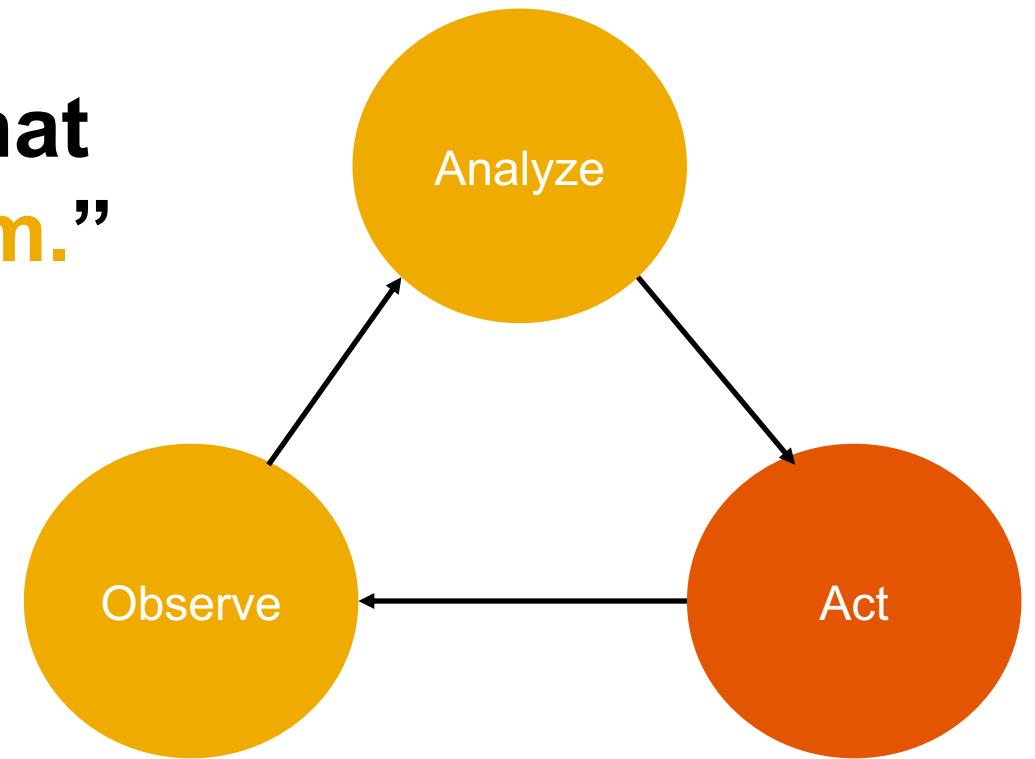
- How to extend the Kubernetes?
- Our demo use-case
- **for ctrl := range []string{“Sample Controller”, “Kubebuilder”}**
 - ctrl.Overview()
 - ctrl.LiveCoding()
 - ctrl.Summary()
- This is just the beginning
- Bonus – tips to save your life 

Communication



Controller pattern – let's have the common understanding

“(..) is a non-terminating loop that regulates the state of the system.”



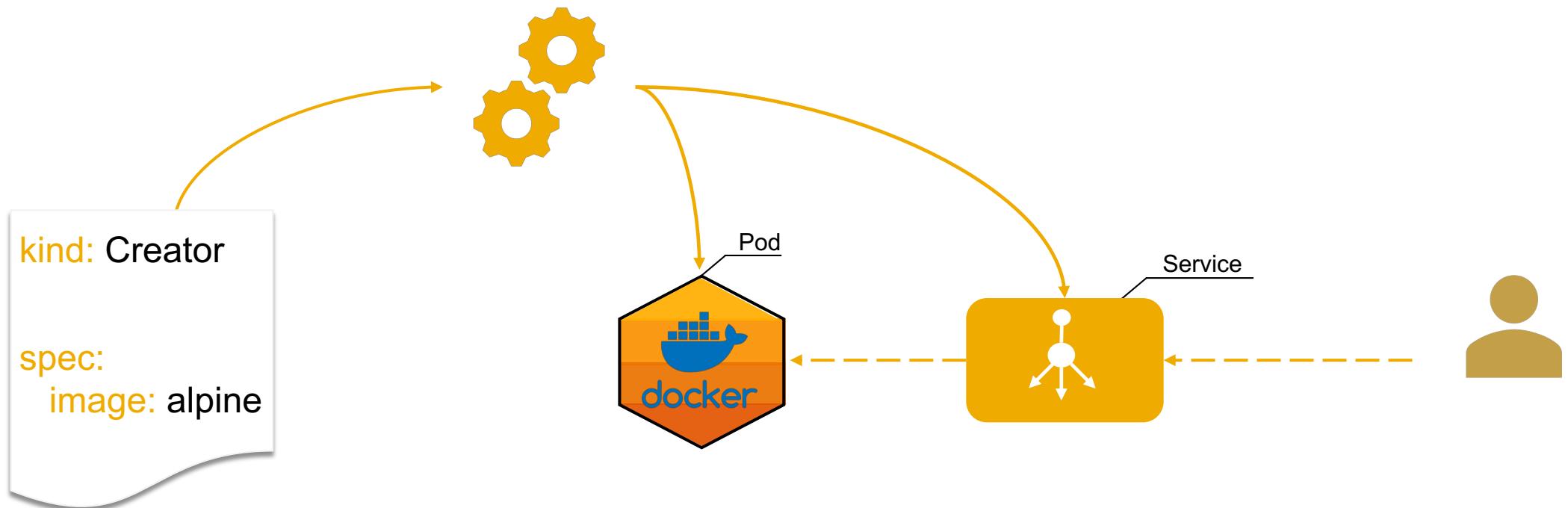
Controller pattern – let's have the common understanding

Kube-controller-manager

- Deployment
- Replicaset
- Service
- Endpoint
- Job
- ResourceQuote
- Statefulset
- ...

```
for {  
    desired := getDesiredState()  
    current := getCurrentState()  
    makeChanges(desired, current)  
}
```

Our use case



Demo time

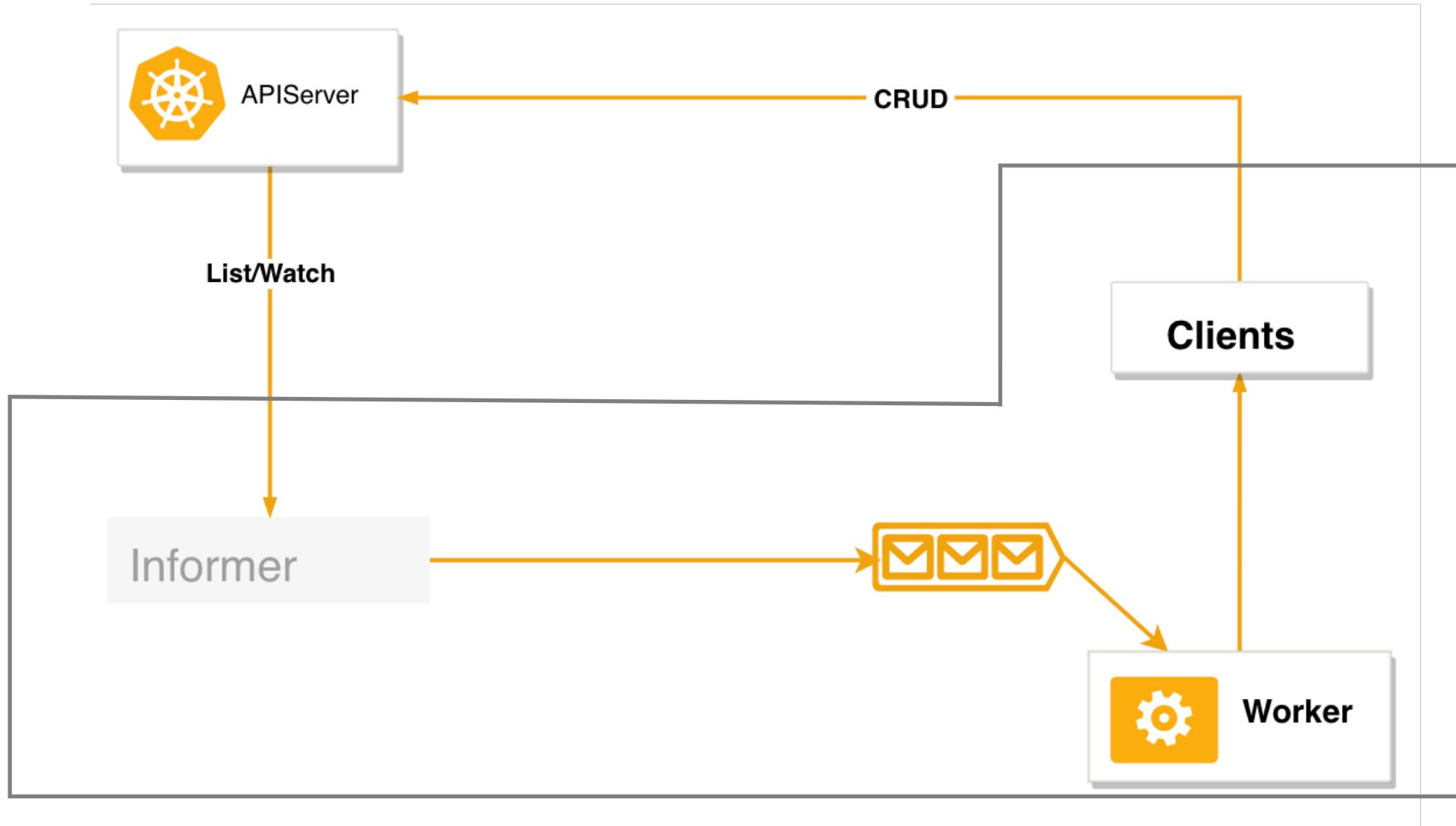


Custom Resource Definition

```
apiVersion: apiextensions.k8s.io/v1beta1
kind: CustomResourceDefinition
metadata:
  name: creators.samplecontroller.k8s.io
spec:
  group: samplecontroller.k8s.io
  version: v1alpha1
  names:
    kind: Creator
    plural: creators
  scope: Namespaced
  validation:
    openAPIV3Schema:
      properties:
        spec:
          properties:
            image:
              type: string
              minLength: 1
```

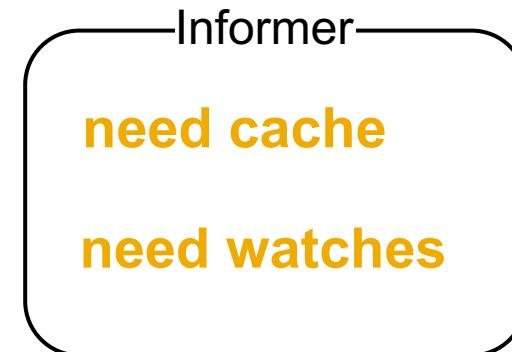
```
apiVersion: samplecontroller.k8s.io/v1alpha1
kind: Creator
metadata:
  name: do-it
spec:
  image: alpine:latest
```

Under the hood

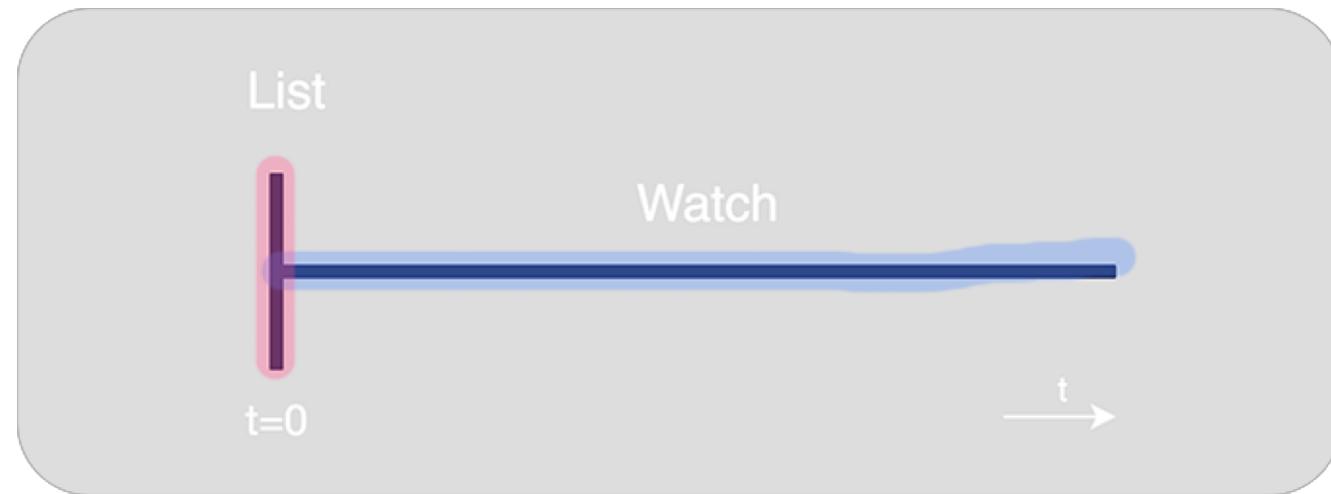


Observer

- Re-listing from API can become expensive
- client.Get() / client.List() multiple times in code
- Want to be notified of object changes

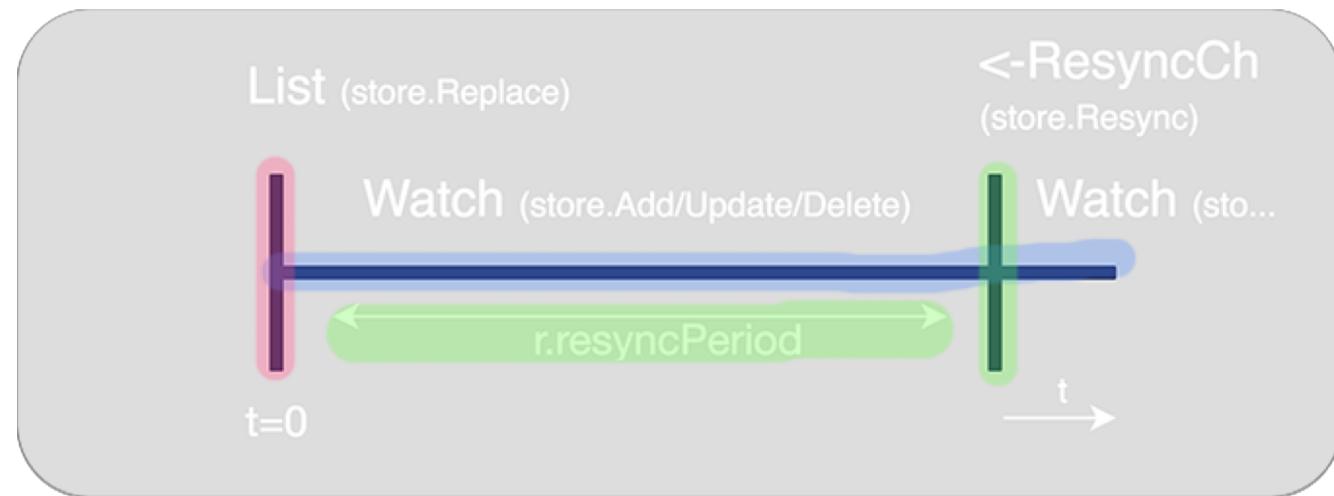


Informer - object cache & event handling



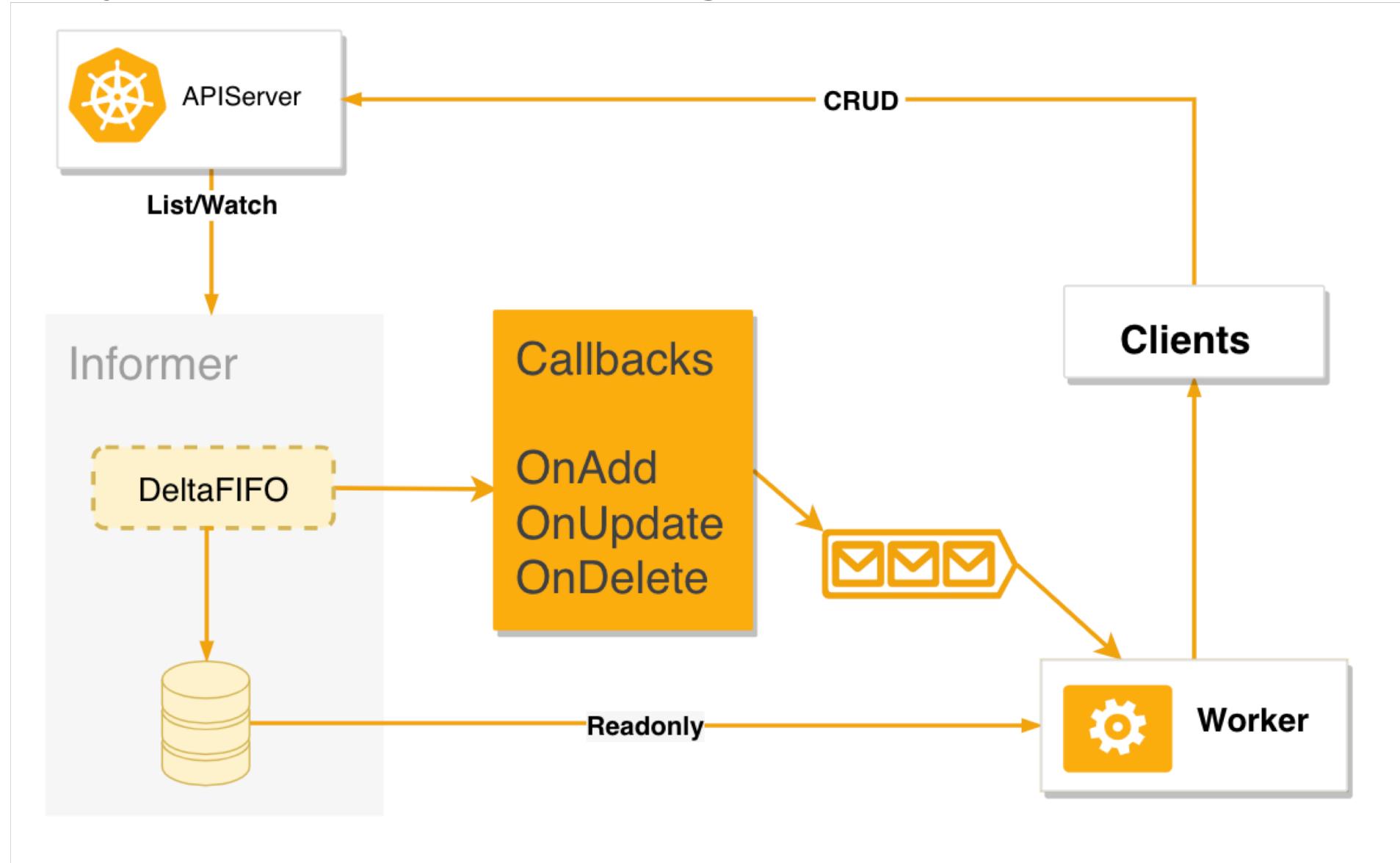
source: <http://borismattijsen.github.io/articles/kubernetes-informers-controllers-reflectors-stores>

Informer - object cache & event handling

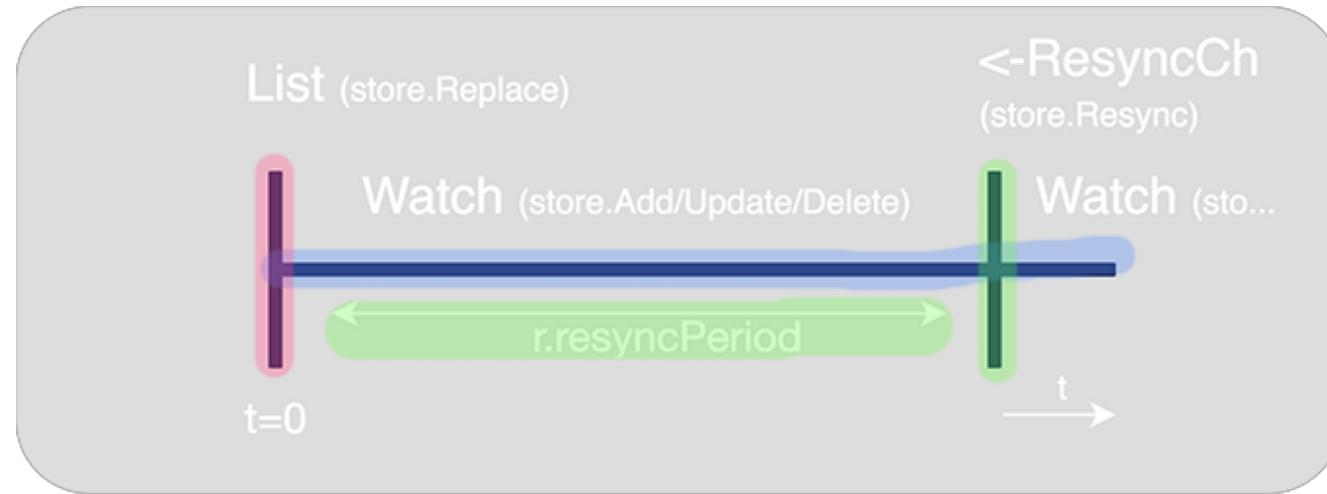


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Informer - object cache & event handling



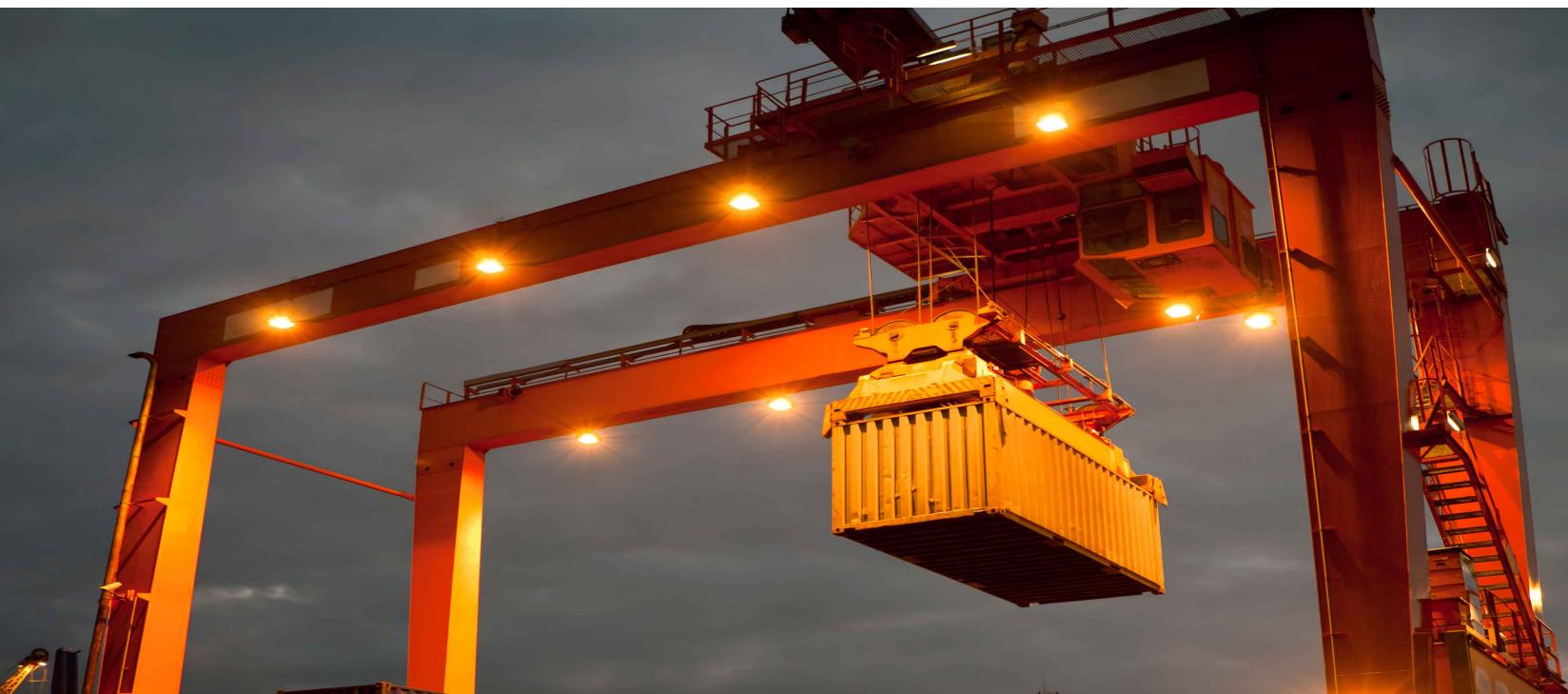
Informer - object cache & event handling



Re-listed objects triggers the update function.

1st approach

Sample Controller



Simplicity



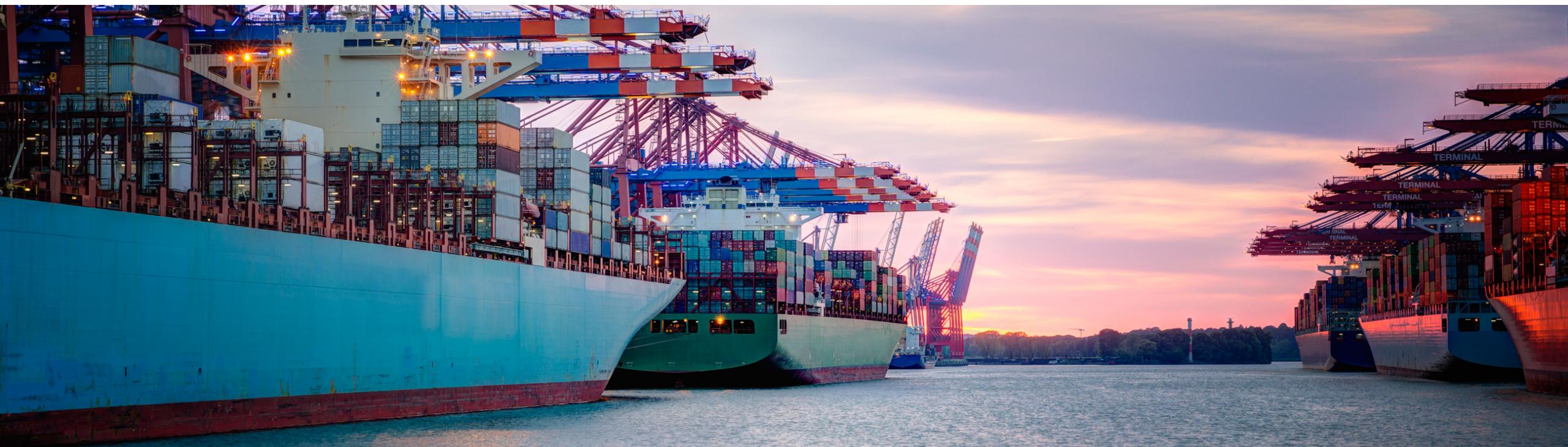
Pros

- Simply – there is no magic

Cons

- Create and maintain your client-sets
- No generics
- Missing auto-updates

2st approach Kubebuilder



Controller that you can "just run"

Pros

- Bootstraps project
- Generate clients and schema validators
- Generic client-sets
- Easy updates
- Testing cases
- Controller Manager Pattern

Cons

- Autogenerate + generic = **magic**

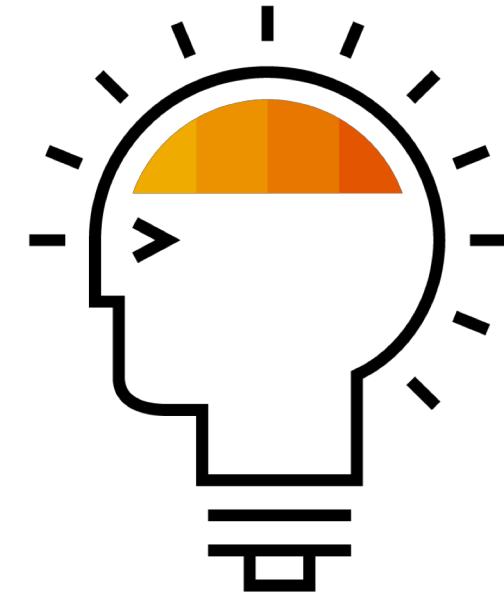


This is just the beginning

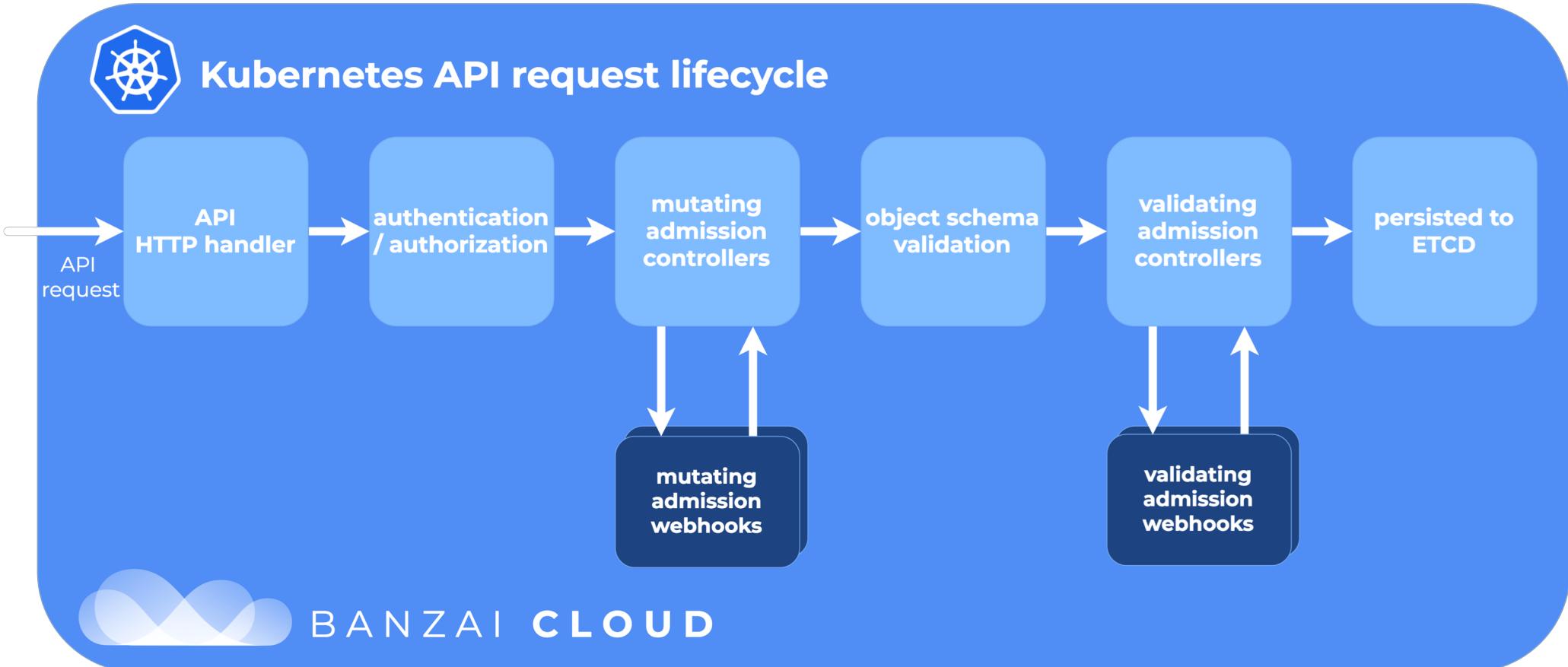
But wait.. there is still something there

- ❑ OperatorSDK
- ❑ Controller-Runtime
- ❑ Knative
- ❑ Metacontroller

- ❑ MutatingAdmissionWebhook
- ❑ ValidatingAdmissionWebhook



Webhooks



Gophers Silesia

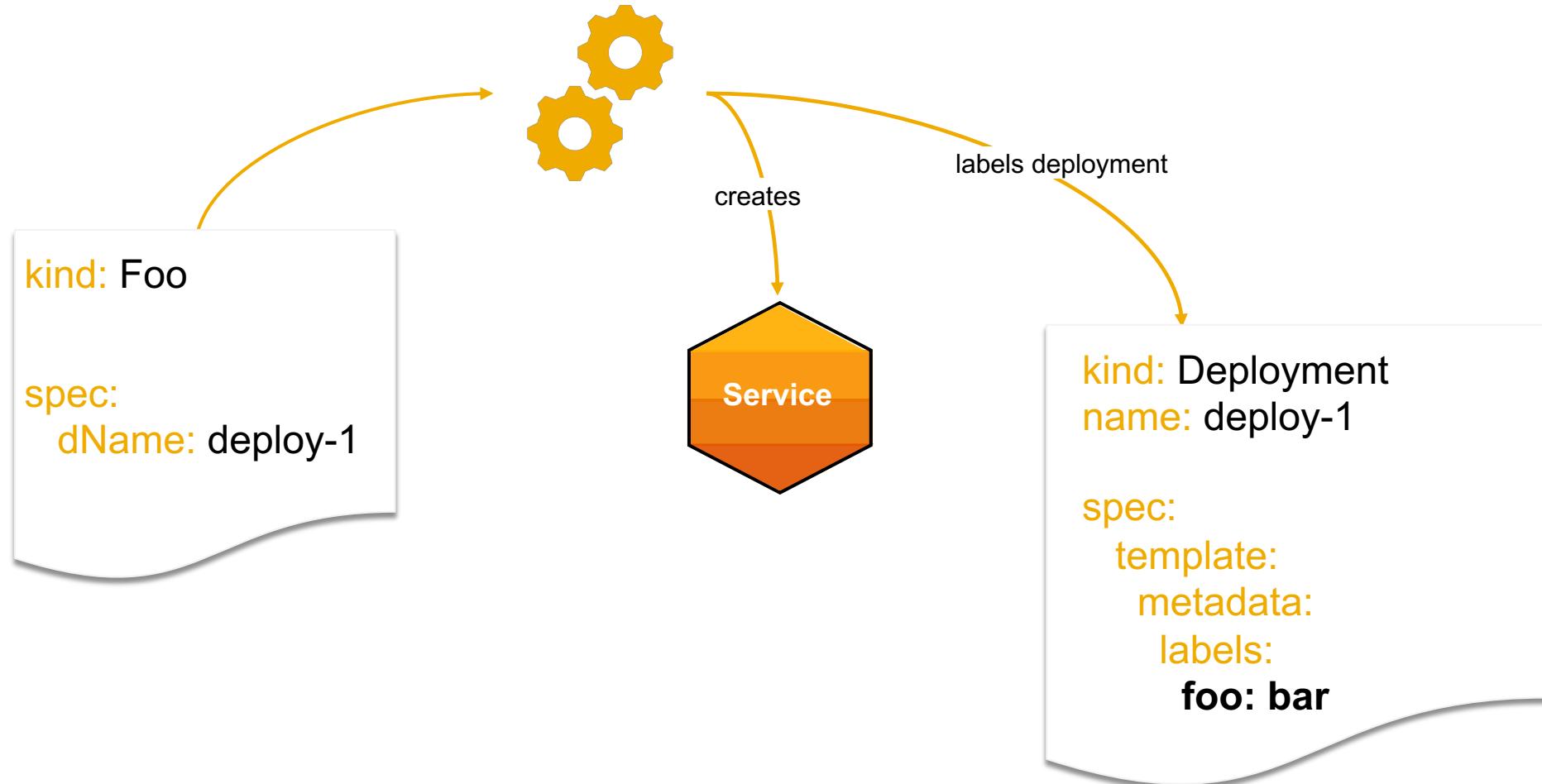
GO & CLOUD NATIVE MEETUP



Bonus – tips & tricks to save your life



Bonus – tips & tricks to save your life

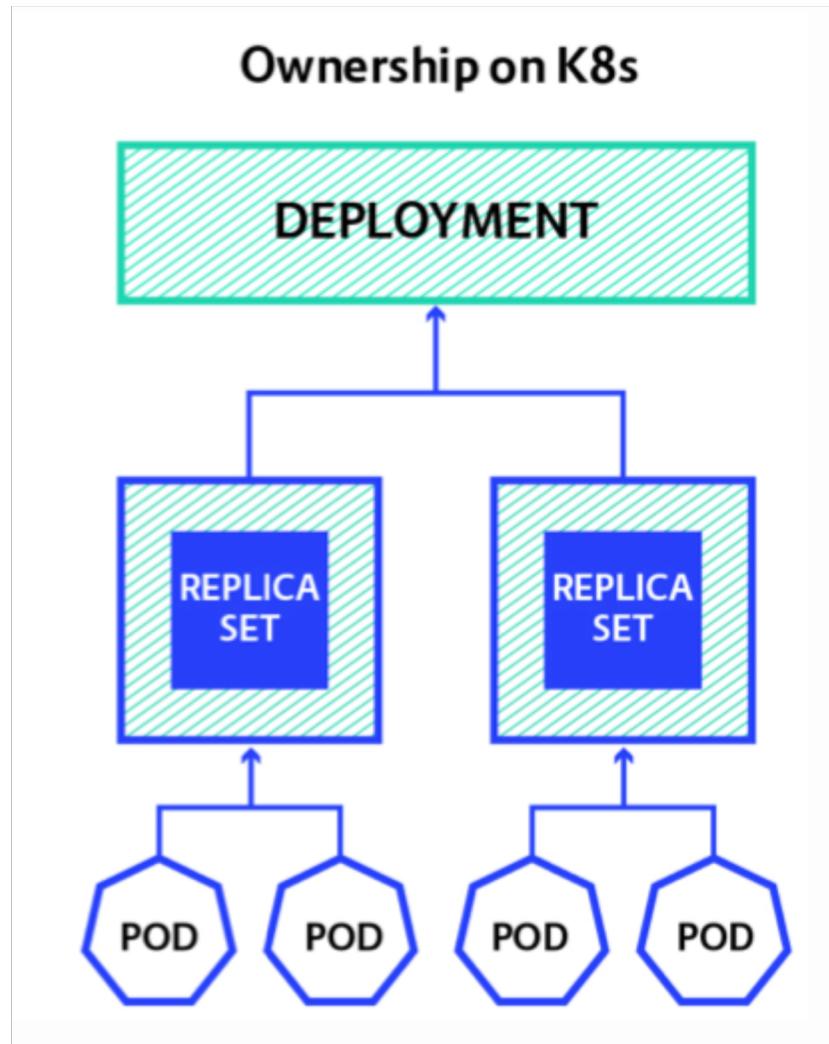


Finalizers

```
apiVersion: samplecontroller.k8s.io/v1alpha1
kind: Foo
metadata:
  name: pico-bello
finalizers:
  - kyma.cx/foo
```

```
apiVersion: samplecontroller.k8s.io/v1alpha1
kind: Foo
metadata:
  name: do-it
finalizers:
  - kyma.cx/foo
deletionGracePeriodSeconds: 0
deletionTimestamp: 2018-11-28T03:50:13Z
```

Owner Reference



```
apiVersion: v1
kind: Pod
metadata:
  name: hakuna-matata
  namespace: system
  ownerReferences:
    - apiVersion: extensions/v1beta1
      blockOwnerDeletion: true
      controller: true
      kind: ReplicaSet
      name: rs-for-hakuna-matata
      uid: 17287eb4-f180-11e8-8e09-000d3a2fa33e
```

Links

Design:

- <https://github.com/kubernetes/community/blob/master/contributors-devel/controllers.md>
- <https://github.com/kubernetes/community/blob/master/contributors-devel/api-conventions.md#types-kinds>
- <https://github.com/kubernetes/community/blob/master/contributors/design-proposals/architecture/principles.md>
- <https://godoc.org/sigs.k8s.io/controller-runtime/pkg>

Controllers:

- <https://github.com/operator-framework/operator-sdk>
- <https://github.com/kubernetes-sigs/kubebuilder>
- <https://github.com/GoogleCloudPlatform/metacontroller>
- <https://github.com/kubernetes-sigs/controller-runtime>
- <https://github.com/kubernetes/sample-controller>



Kelsey Hightower

@kelseyhightower

Obserwuj



Controllers are the foundation of Kubernetes; this is a natural extension. Not sure the "Operators" name will stick, but the pattern will.

„Follow upstream patterns for building your controllers - but remember that there is no singular ,right way’ „

Mateusz Szostok

Q&A



Thank you.

Contact information:

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