



KubeCon



CloudNativeCon

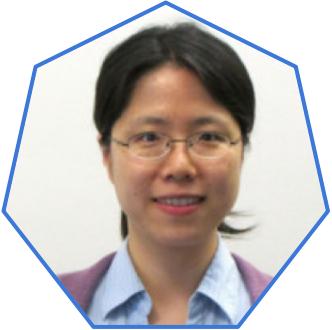


OPEN SOURCE SUMMIT

China 2019

# CRD: No Longer Second Class!

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Google Software Engineer  
GKE Storage-lifecycle Team

Kubernetes Sig-Storage:  
Snapshot Workgroup Lead

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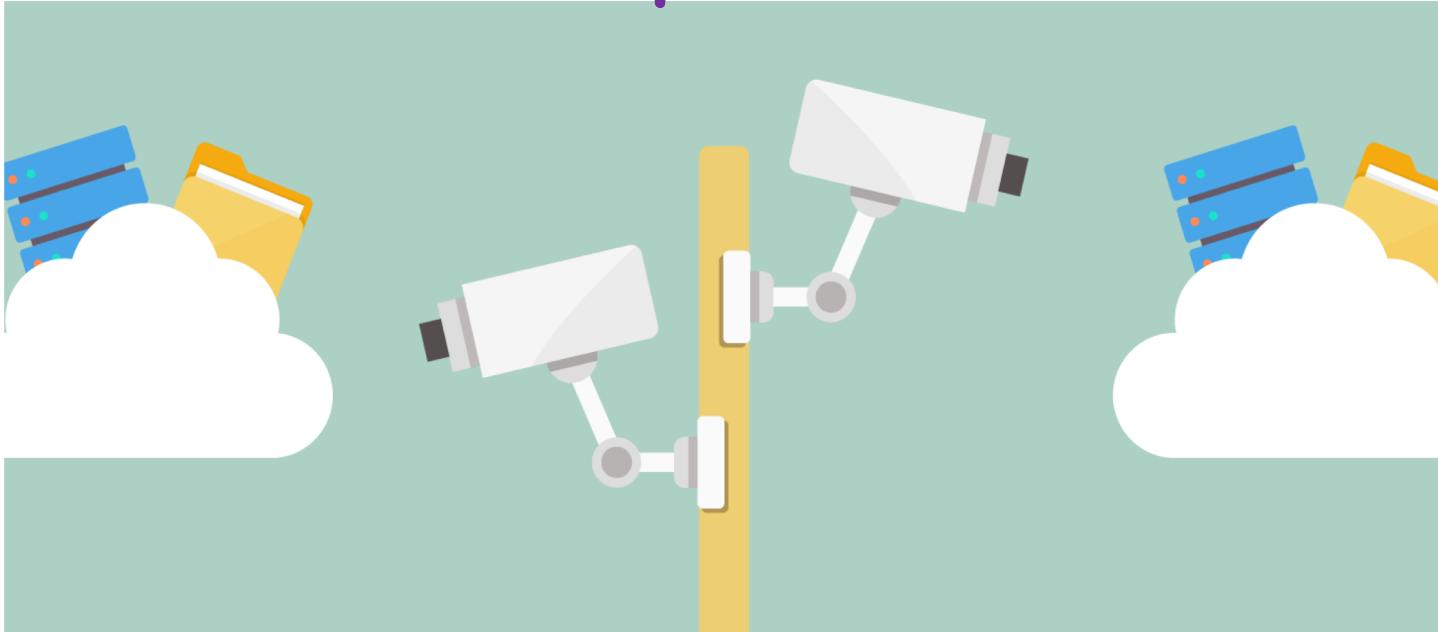
OpenSDS Lead Architect

Kubernetes Sig-Storage:  
Snapshot Workgroup Lead &  
CNCF Storage SIG Tech Lead

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# Our CRD Journey Begins...

## Volume Snapshot Project



# API Core

```
type VolumeSnapshot struct {  
    metav1.TypeMeta  
    metav1.ObjectMeta  
    Spec VolumeSnapshotSpec  
    Status VolumeSnapshotStatus  
}
```

[kubernetes / kubernetes](#)

[Code](#)

[Issues 2,092](#)

[Pull requests 1,058](#)

[Actions](#)

Branch: [master](#) [kubernetes / pkg / apis / storage / types.go](#)

 [ddebro](#) API changes to support CSI migration of inline volumes

[15 contributors](#)





PLEASE USE CRD

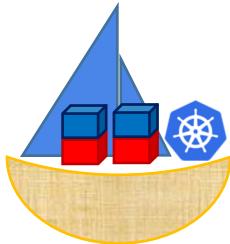
Architecture Special Interest Group



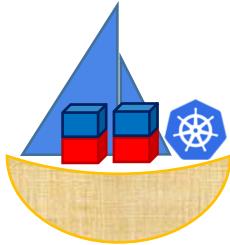
Architecture Special Interest Group



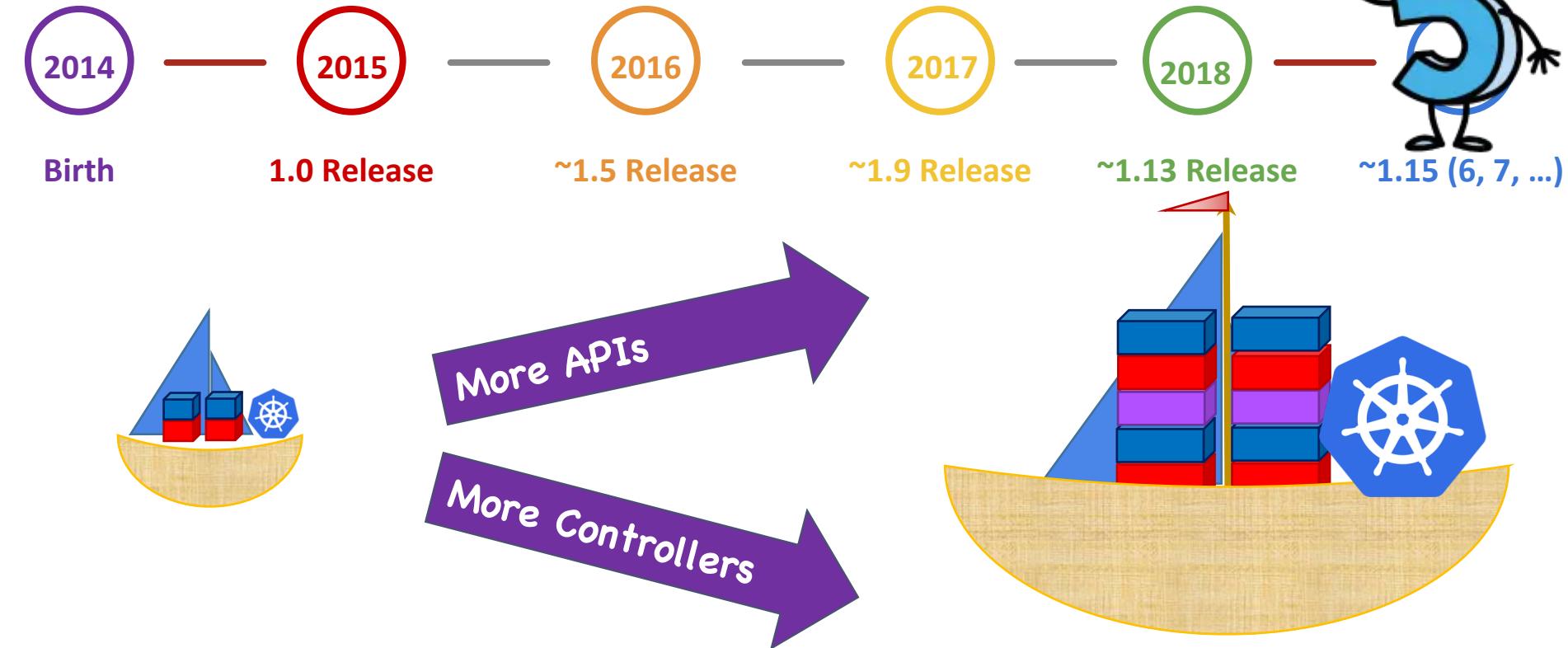
# Kubernetes Grows Fast



# Kubernetes Grows Fast

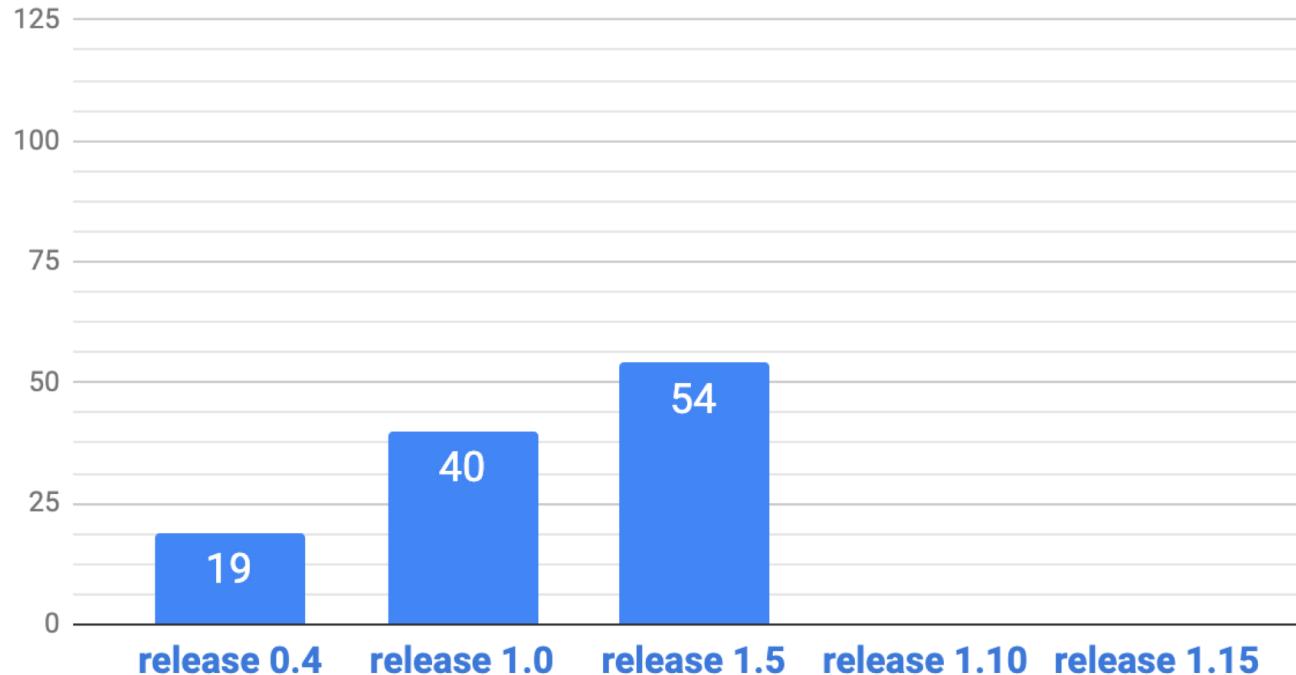


# Kubernetes Grows Fast



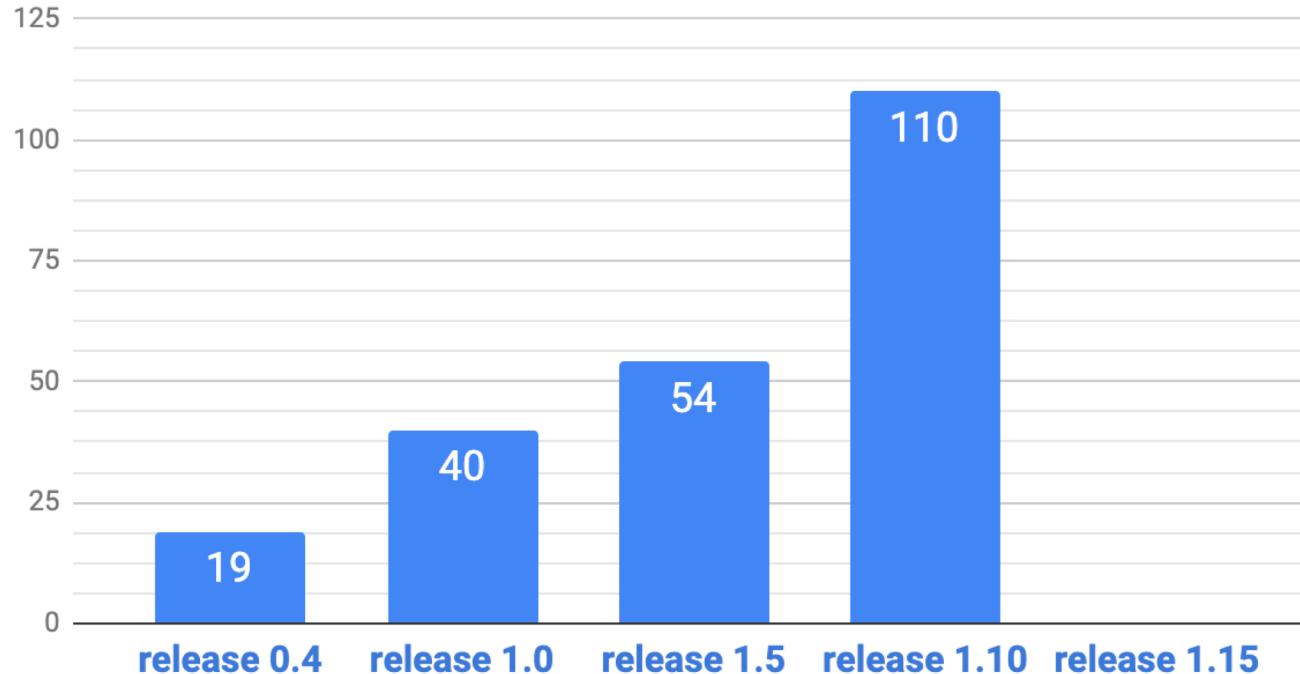
# Kubernetes Growth

## API Types #



# Kubernetes Growth

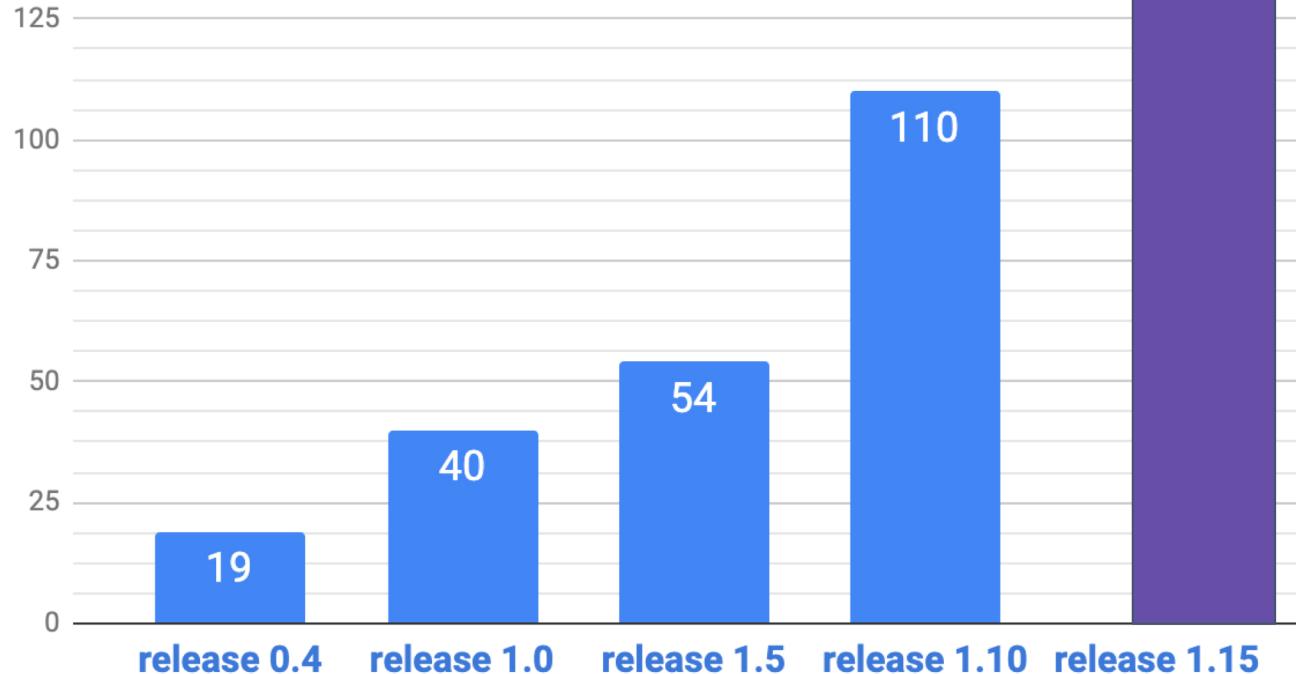
## API Types #



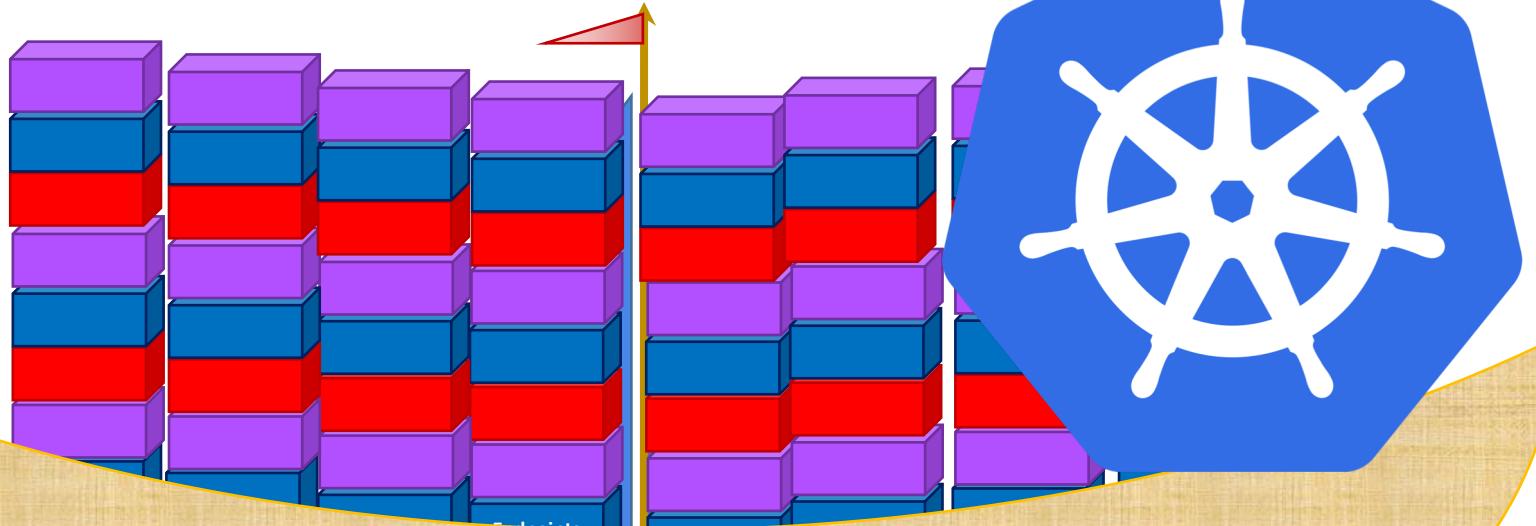
# Kubernetes Growth



## API Types #

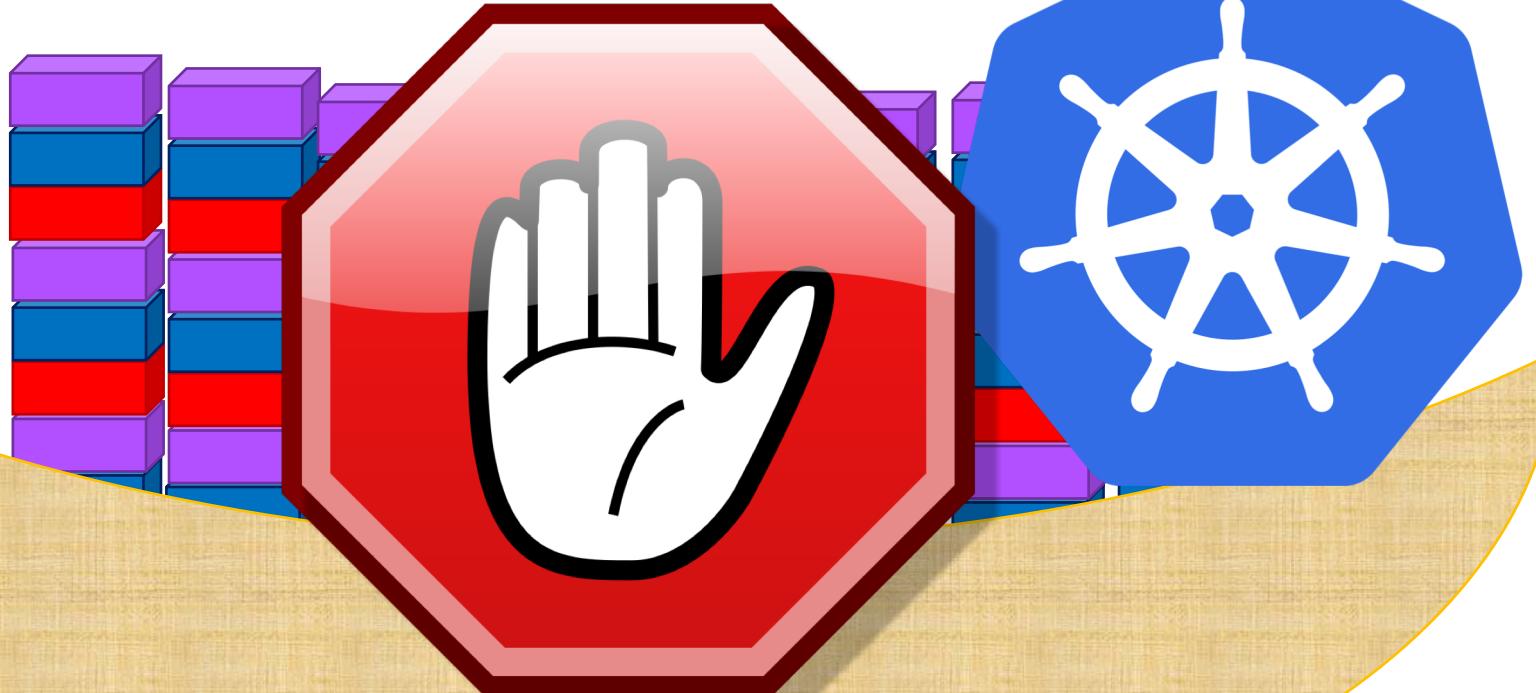


# Kubernetes Giant ?



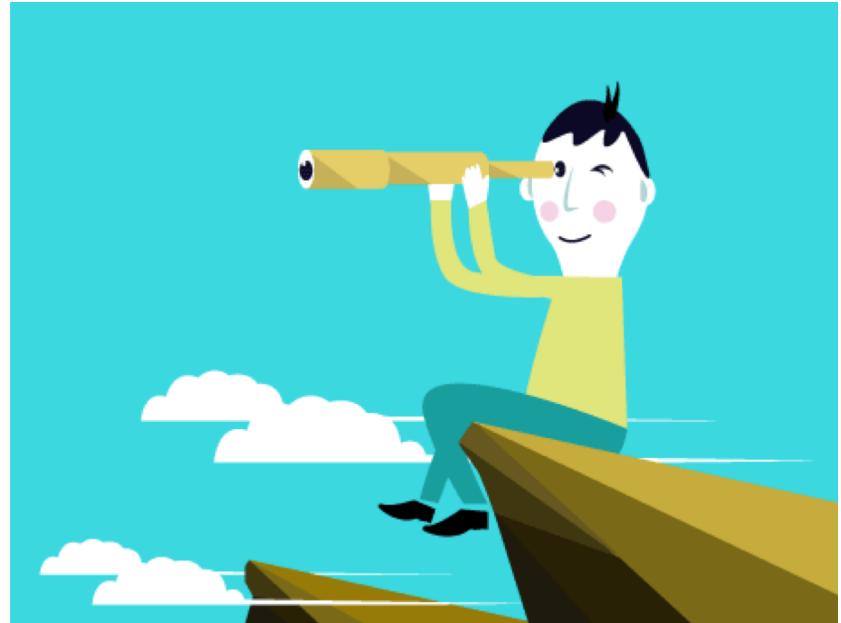
Kubernetes “Core”

# Kubernetes Giant ?

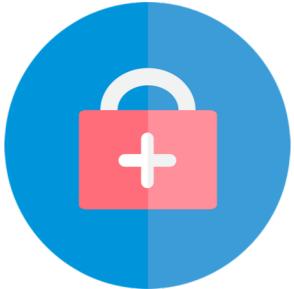


Kubernetes “Core”

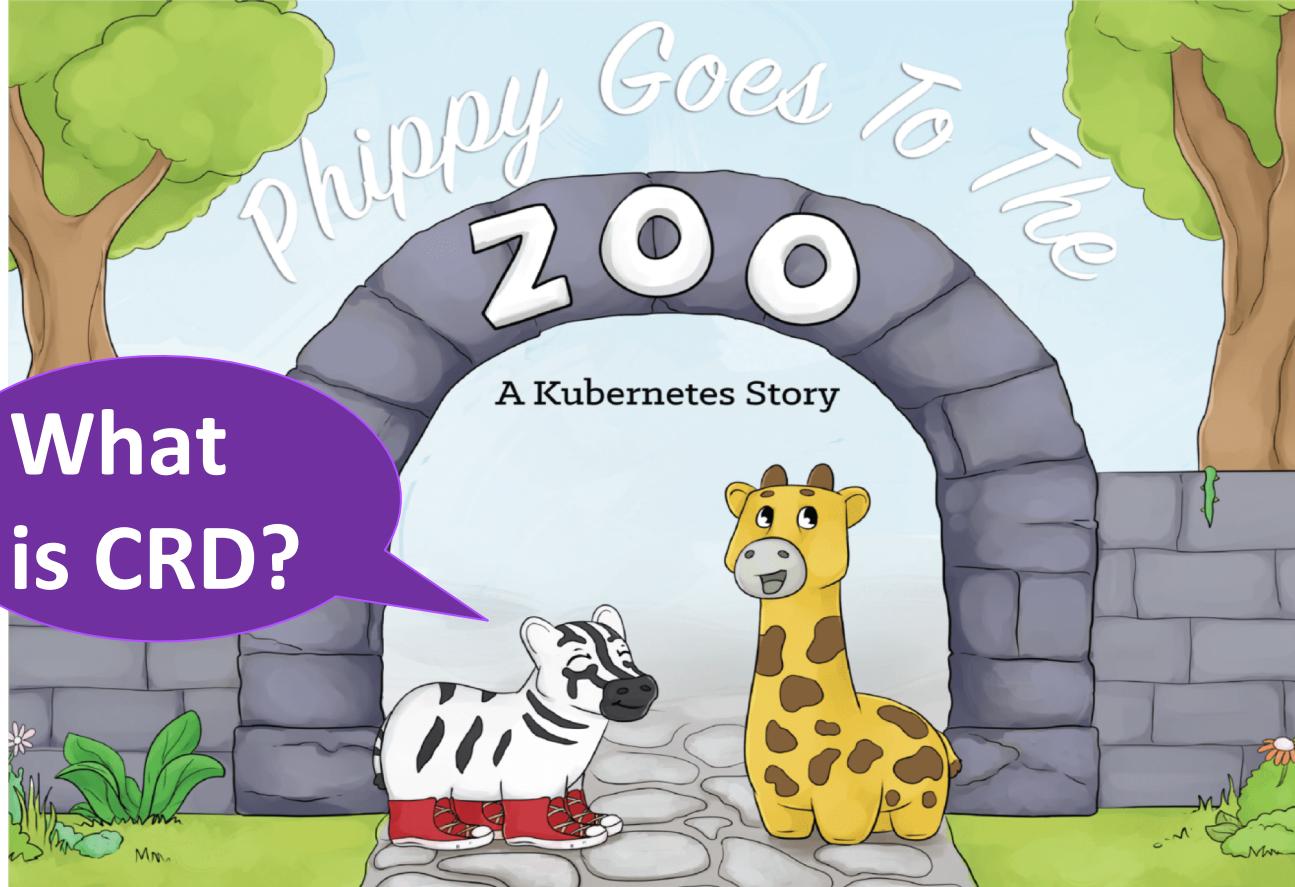
Makes Kubernetes  
truly modular,  
extensible, and  
maintainable with a  
minimum “**CORE**”.



Makes Kubernetes  
truly modular,  
extensible, and  
maintainable with a  
minimum “**CORE**”.



**CRD Comes to the Rescue?**



# Kubernetes Children's Book

# CRD Explained



Kubernetes API Zoo

# CRD Explained

**R = Resource**

pod, statefulset, persistentvolume, ...

**CR = Custom Resources**

pot, statelessset, nonpersistentvolume, ...

**CRD = Custom Resources Definition**



**Kubernetes API Zoo**

# Example:

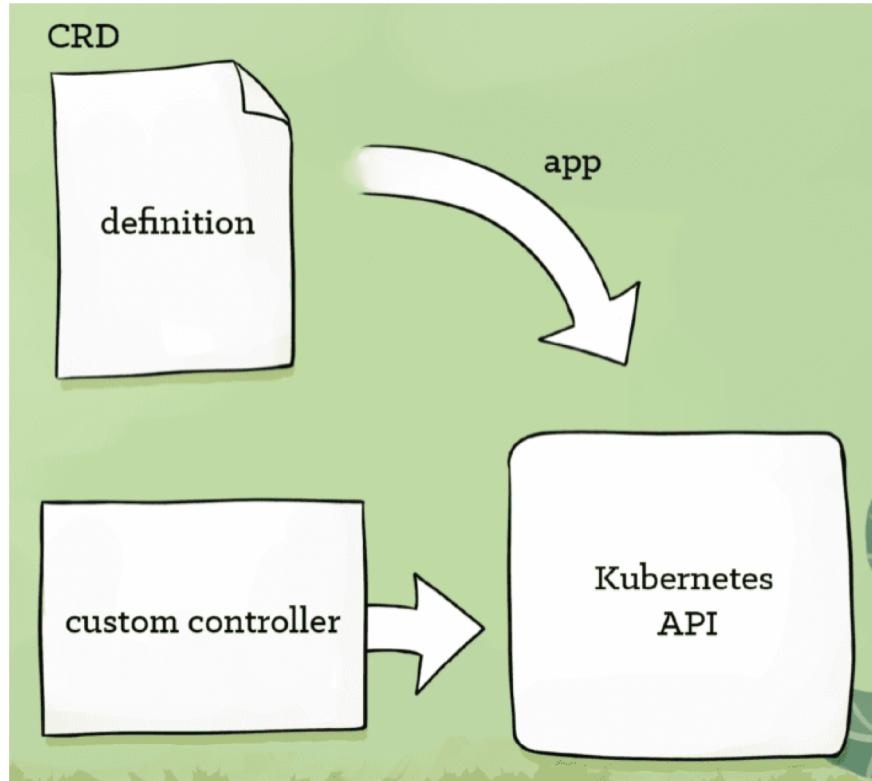


CRD

```
apiVersion: apiextensions.k8s.io/v1beta1
kind: CustomResourceDefinition
metadata:
  name: pandas.animals.zoo.k8s.io
spec:
  scope: Namespaced
  group: animals.zoo.k8s.io
  version: v1alpha1
  names:
    kind: Panda
    plural: pandas
```

CR

```
apiVersion:animals.zoo.k8s.io/v1alpha1
kind: Panda
metadata:
  name: qiqi
spec:
  birthDay: 7/17/2018
  birthPlace: Shanghai
  birthWeight: 6
```



CRD  
+ Custom Controller

---

= Declarative API

# Back to Our CRD Journey ...

# Back to Our CRD Journey ...

kubernetes-csi / external-snapshotter



Unwatch ▾

8

Star

30

Fork

31

Code

Issues 11

Pull requests 3

Projects 0

Wiki

Security

Insights

Settings

Sidecar container that watches Kubernetes Snapshot CRD objects and triggers CreateSnapshot/DeleteSnapshot against a CSI endpoint.

Edit

# Back to Our CRD Journey ...

kubernetes-csi / external-snapshotter



Unwatch ▾

8

★ Star

30

Fork

31

Code

Issues 11

Pull requests 3

Projects 0

Wiki

Security

Insights

Settings

Sidcar container that watches Kubernetes Snapshot CRD objects and triggers CreateSnapshot/DeleteSnapshot against a CSI endpoint.

Edit

## CRD

```
type VolumeSnapshot struct {
    metav1.TypeMeta `json:",inline"`
    // Standard object's metadata.
    // More info: https://git.k8s.io/comm
    // +optional
    metav1.ObjectMeta `json:"metadata,omitempty"`

    // Spec defines the desired character
    Spec VolumeSnapshotSpec `json:"spec"`

    // Status represents the latest observ
    // +optional
    Status VolumeSnapshotStatus `json:"st
}
```

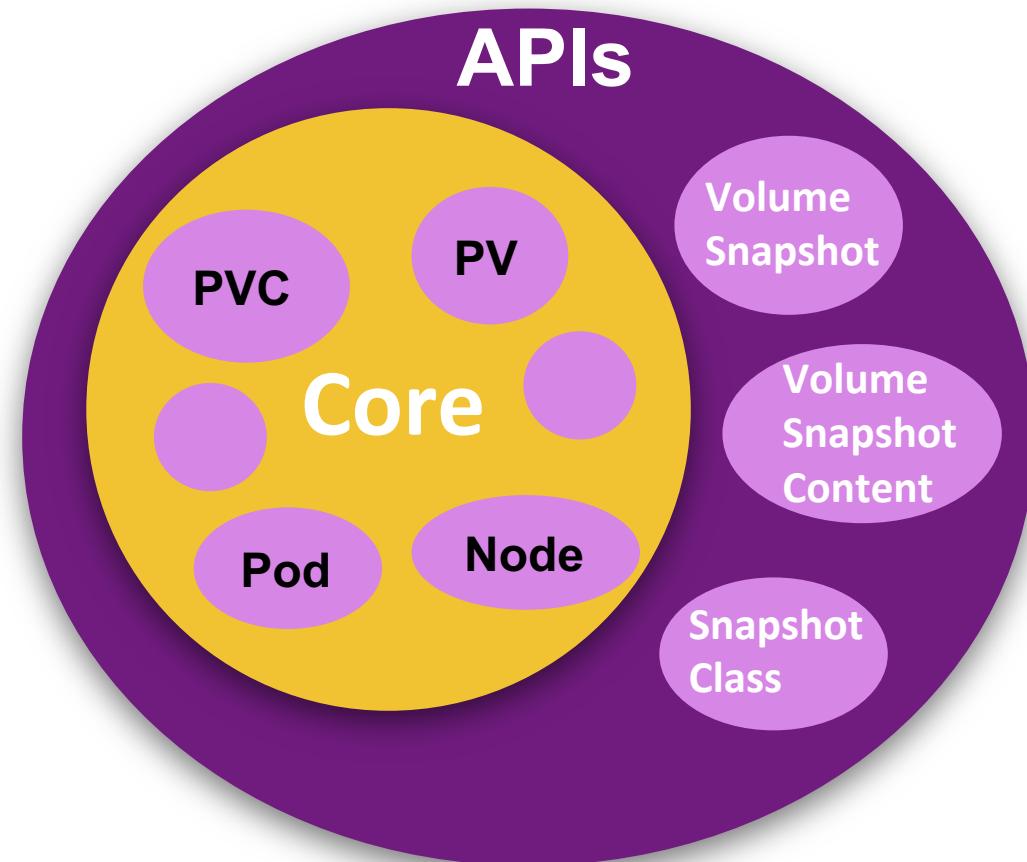
## Controller

```
func NewCSISnapshotController(
    clientset clientset.Interface,
    client kubernetes.Interface,
    snapshotterName string,
    volumeSnapshotInformer storageinformer
    volumeSnapshotContentInformer storagei
    volumeSnapshotClassInformer storageinf
    pvcInformer coreinformers.PersistentVo
    createSnapshotContentRetryCount int,
    createSnapshotContentInterval time.Dur
    snapshotter snapshotter.Snapshotter,
    timeout time.Duration,
    resyncPeriod time.Duration,
    snapshotNamePrefix string,
    snapshotNameUUIDLength int,
) *csiSnapshotController {
```

## Deployment

Branch: master	external-snapshotter / deploy
 xing-yang	Update deployment images to v1.1.0
..	
<a href="#">README.md</a>	deploy: sp
<a href="#">rbac-external-provisioner.yaml</a>	update RE
<a href="#">rbac.yaml</a>	Add Delete
<a href="#">setup-csi-snapshotter.yaml</a>	Update de

# The Same Old User Experiences

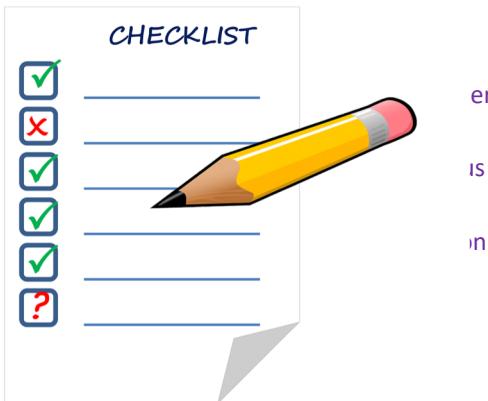


`kubectl create -f snap.yaml`  
`kubectl delete -f snap.yaml`  
`kubectl get volumesnapshot`  
`kubectl list volumesnapshot`

...

# CRD vs. Native API

- CRD is Beta
- GA targeting in 1.16/1.17
- Feature Parity



er

is

in



# VolumeSnapshot (CRD) is part of Kubernetes



Sig-Storage Ownership

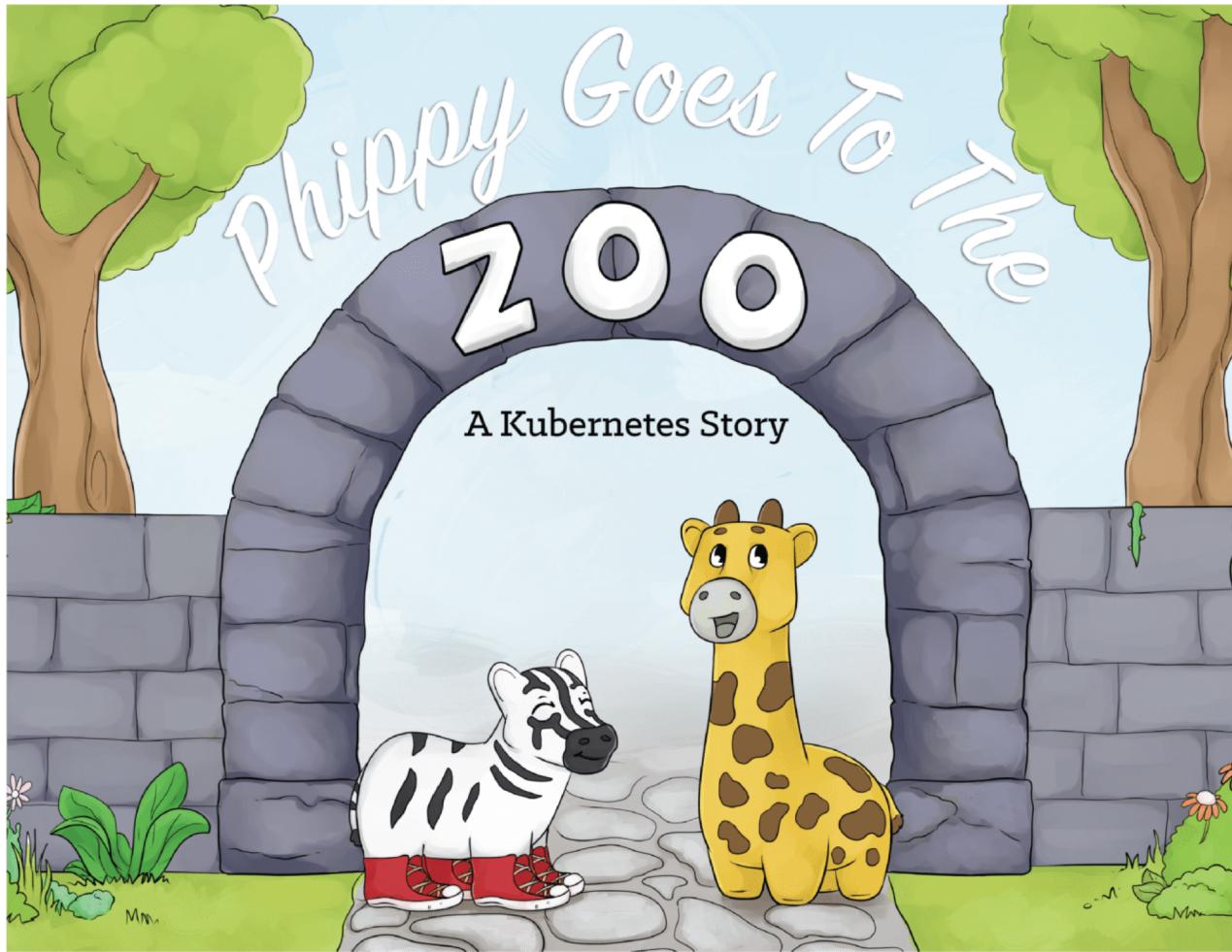


End to End Testing



Official Documentation

I want to  
create  
CRD for



# Build CRD



1. Create a project with

```
kubebuilder init
```

2. Define a new API with

```
kubebuilder create api
```

3. Build and run the provided main function with

```
make install & make run
```

# How to Build Panda CRD and Controller in two minutes !!!



Ti Gong

"Little Princess" Qi Qi - "公主仔" 七七

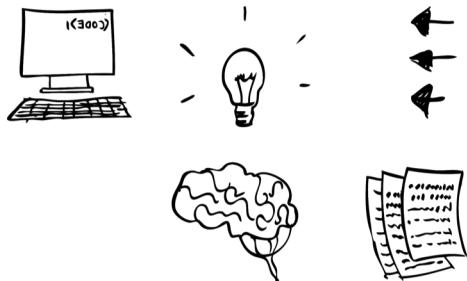
root@ubuntu: ~/go/src/k8s.io (ssh)

root@ubuntu:~/go/src/k8s.io# ./test\_panda.sh

root@ubuntu: ~/go/src/k8s.io (ssh)

→ k8s.io cd ~/go/src/k8s.io/zoo

# CRD's Evolution

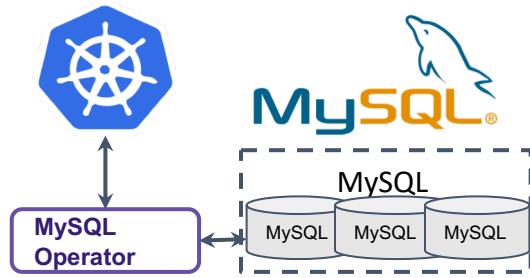
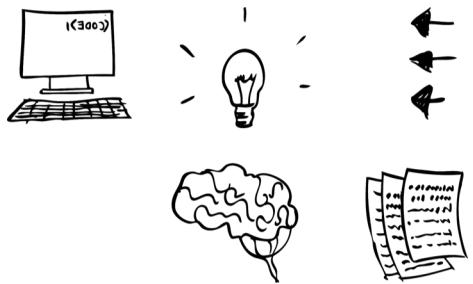


## Third Party Resource (TPR)

- Prototyping



# CRD's Evolution

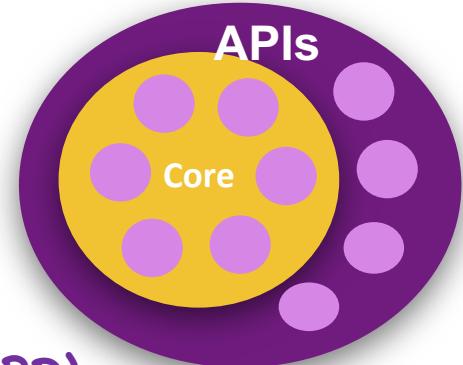
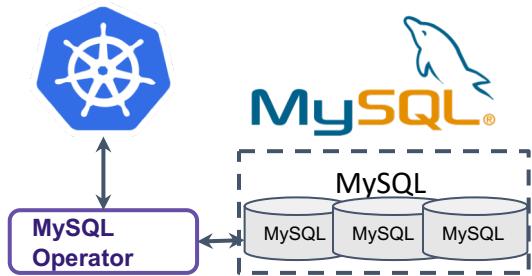
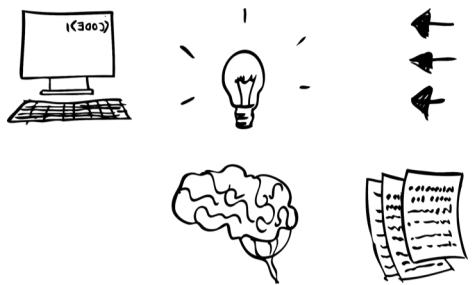


## Third Party Resource (TPR) Custom Resource Definition (CRD)

- Prototyping
- Application operator



# CRD's Evolution

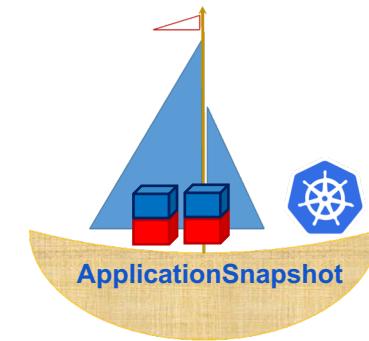
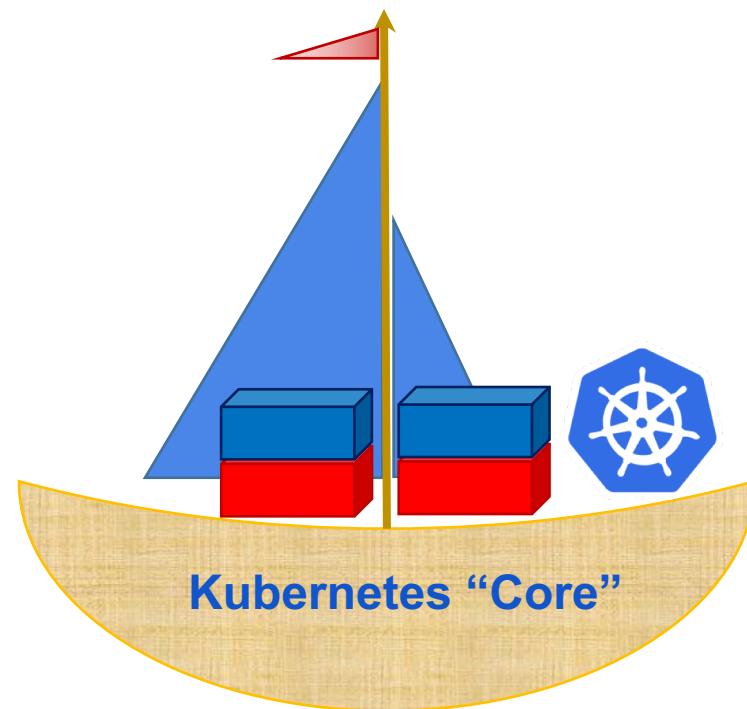
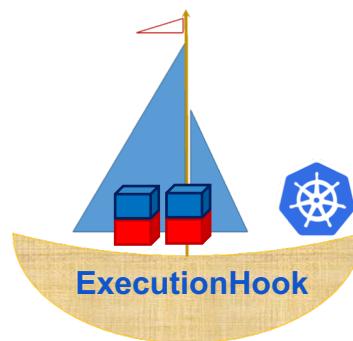
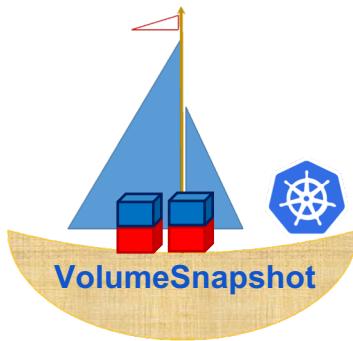


## Third Party Resource (TPR) Custom Resource Definition (CRD)

- Prototyping
- Application operator
- Extending Core API



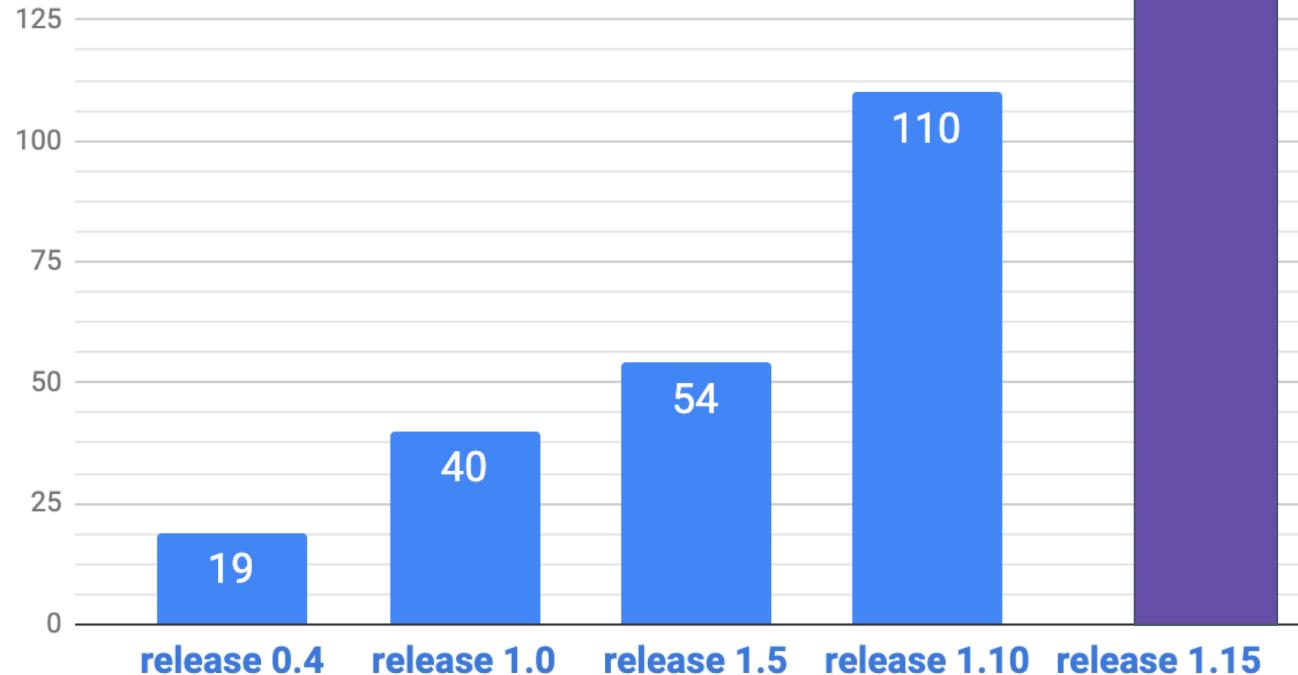
# Kubernetes Fleet



# Kubernetes Growth

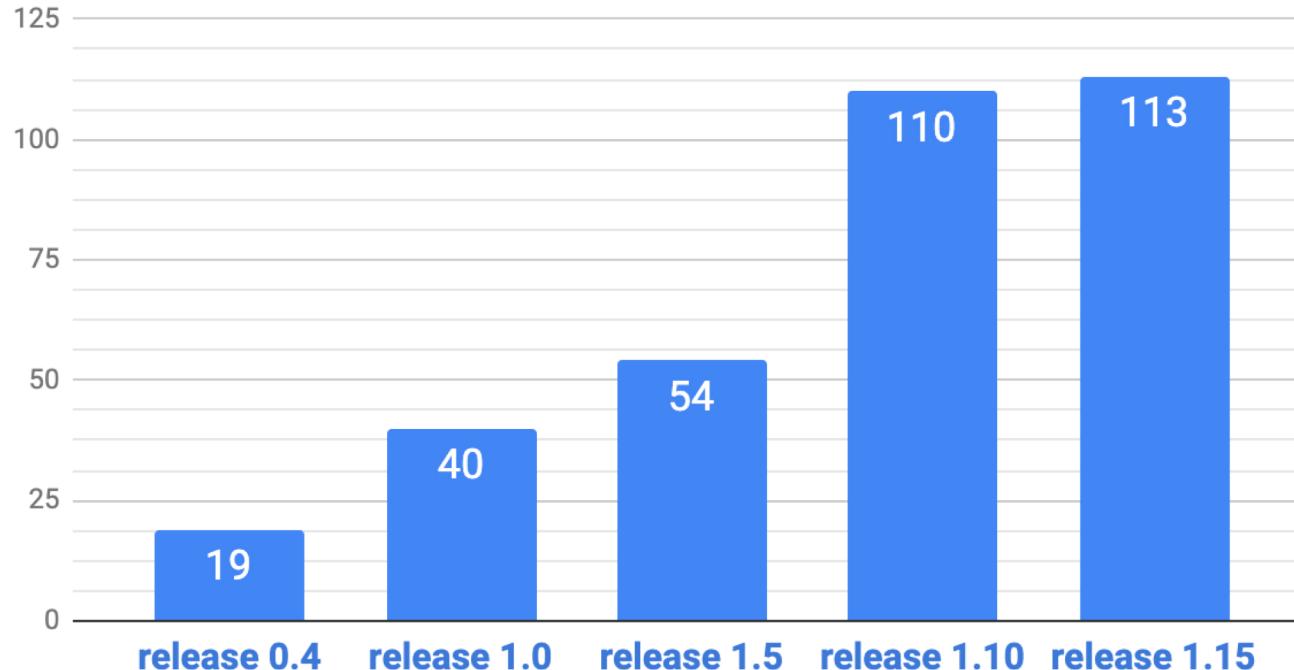


## API Types #



# Kubernetes Growth

## API Types #



# We Have a Vision

*"Everything is CRD*

*... except things to run CRD"*

Tim Hockin

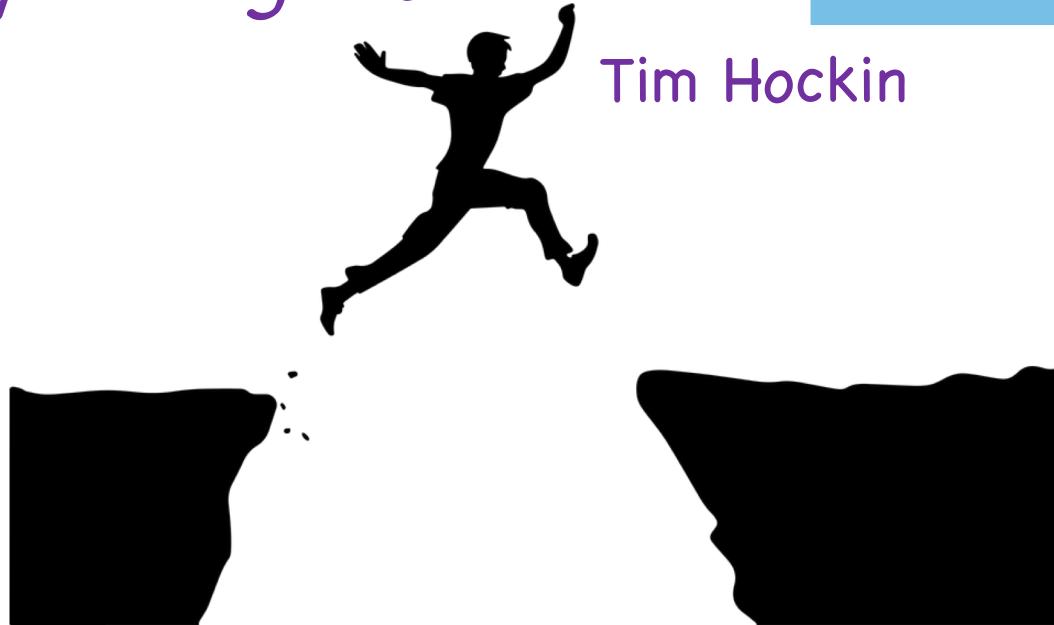


# We Have a Vision

*"Everything is CRD*

*... except things to run CRD"*

Tim Hockin



# Resources

- **CRD**
  - Kubernetes.io <https://kubernetes.io/docs/concepts/extend-kubernetes/api-extension/custom-resources/>
- **CRD Tools**
  - Kubebuilder book <https://book.kubebuilder.io/>
  - Operator SDK <https://github.com/operator-framework/operator-sdk>
  - MetaController <https://metacontroller.app/>
- **VolumeSnapshot**
  - Snapshotter Repo <https://github.com/kubernetes-csi/external-snapshotter>
  - Kubernetes.io <https://kubernetes.io/docs/concepts/storage/volume-snapshots/>

# Acknowledgement

sig-architecture



sig-storage



**TEAMWORK**



Kubernetes  
community



api-machinery

# Join us



jingxu97 & xing-yang



jinxu & xyang



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xingyang105@gmail.com



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