

KubeCon



CloudNativeCon



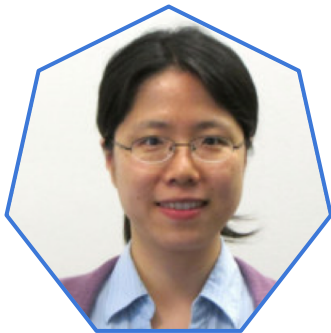
OPEN SOURCE SUMMIT

China 2019

CRD: No Longer Second Class!

Jing Xu (Google) and Xing Yang (OpenSDS)





Google Software Engineer
GKE Storage-lifecycle Team

Kubernetes Sig-Storage:
Snapshot Workgroup Lead

Email: jinxu@google.com



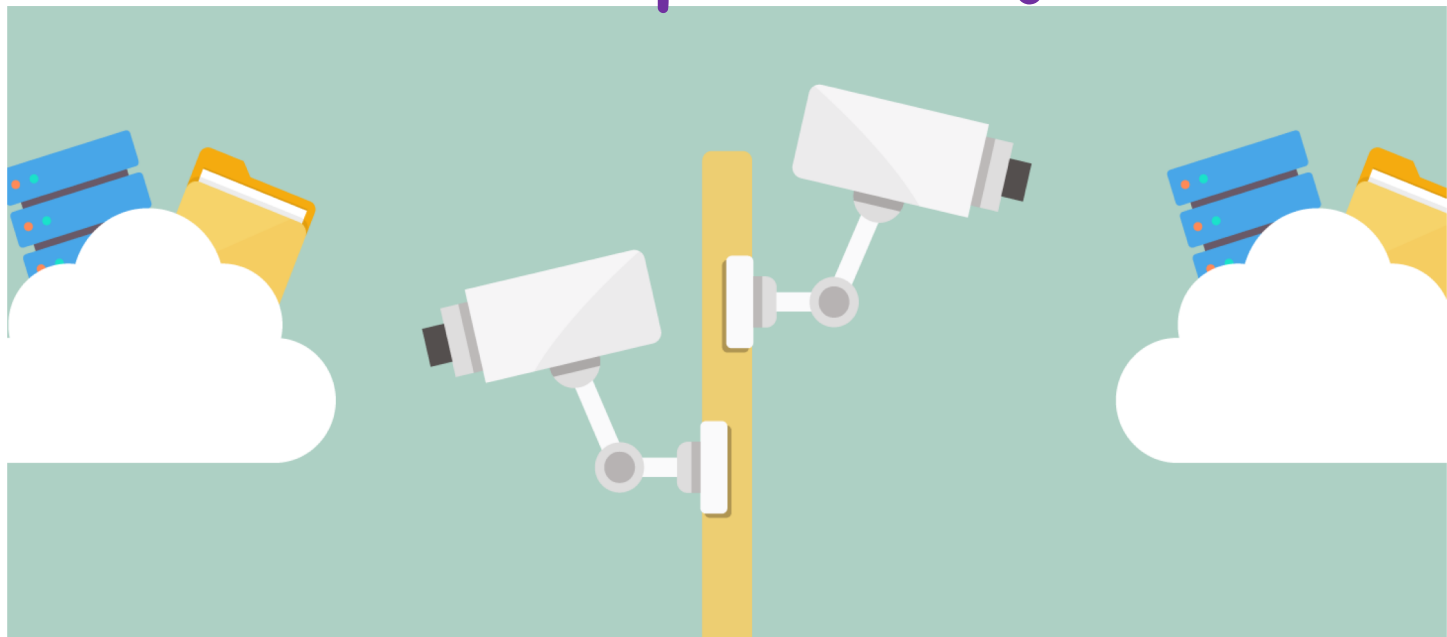
OpenSDS Lead Architect

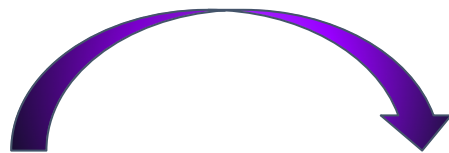
Kubernetes Sig-Storage:
Snapshot Workgroup Lead &
CNCF Storage SIG Tech Lead

xingyang105@gmail.com

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](#)



ddebroy API changes to support CSI migration of inline volumes

15 contributors





PLEASE USE CRD

Architecture Special Interest Group

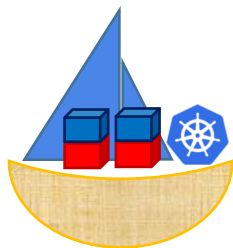


PLEASE USE CRD

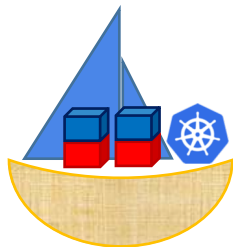
Architecture Special Interest Group



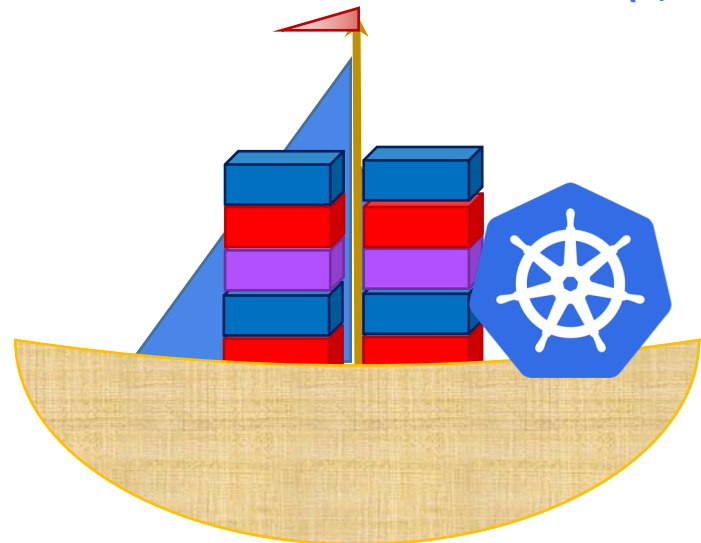
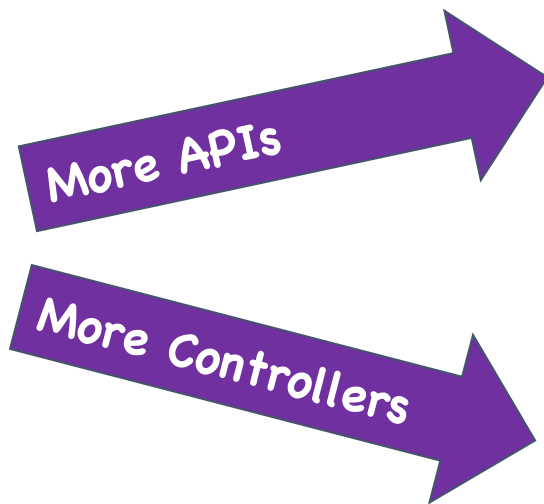
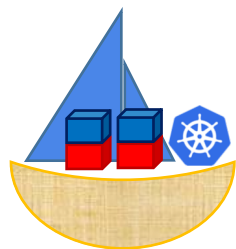
Kubernetes Grows Fast



Kubernetes Grows Fast

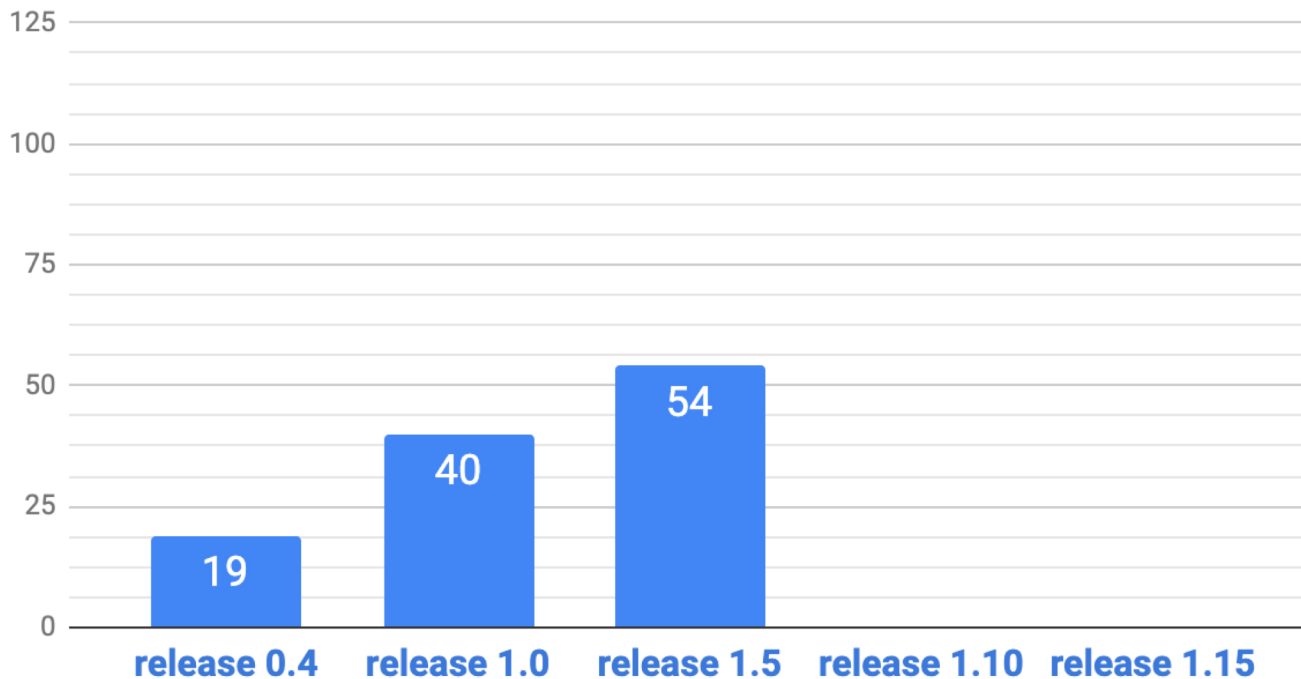


Kubernetes Grows Fast



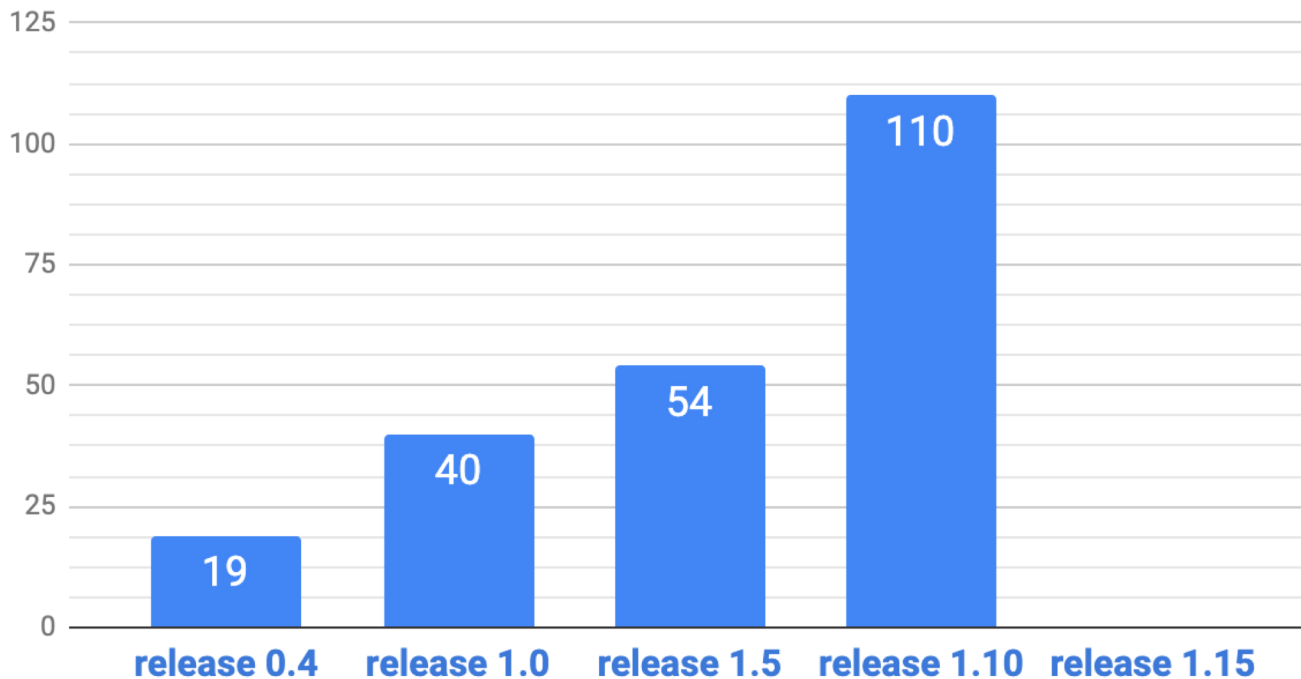
Kubernetes Growth

API Types



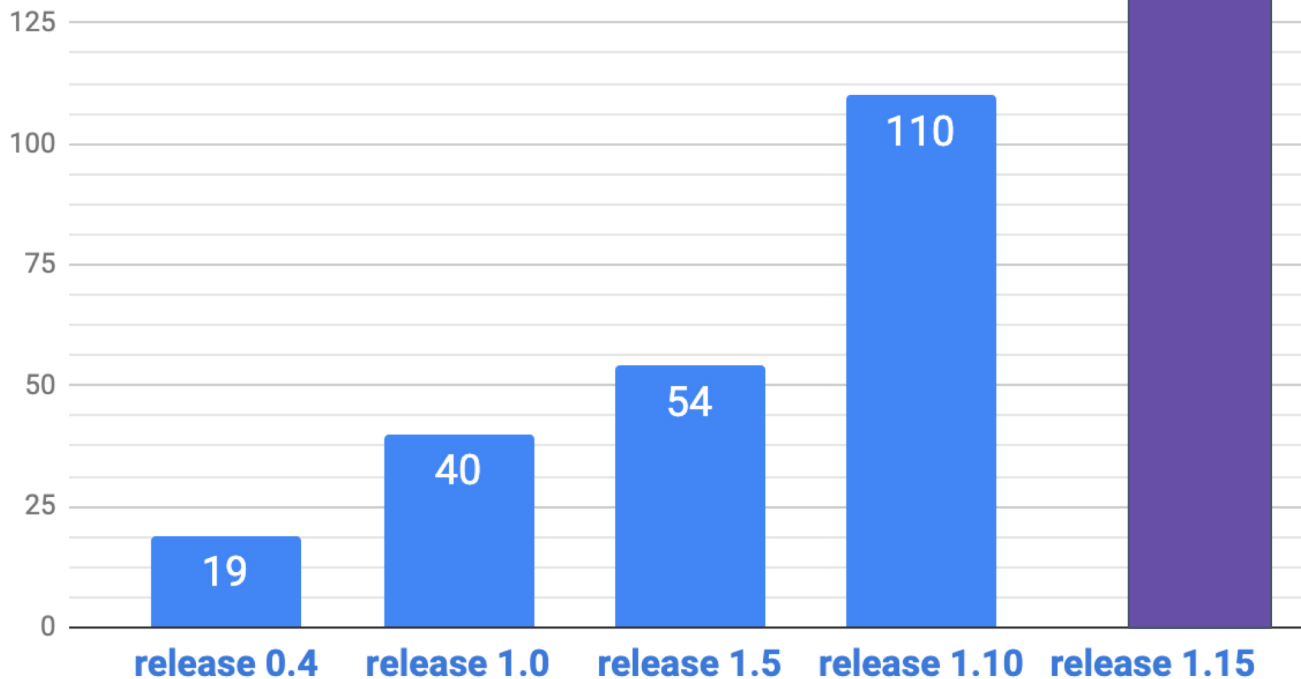
Kubernetes Growth

API Types

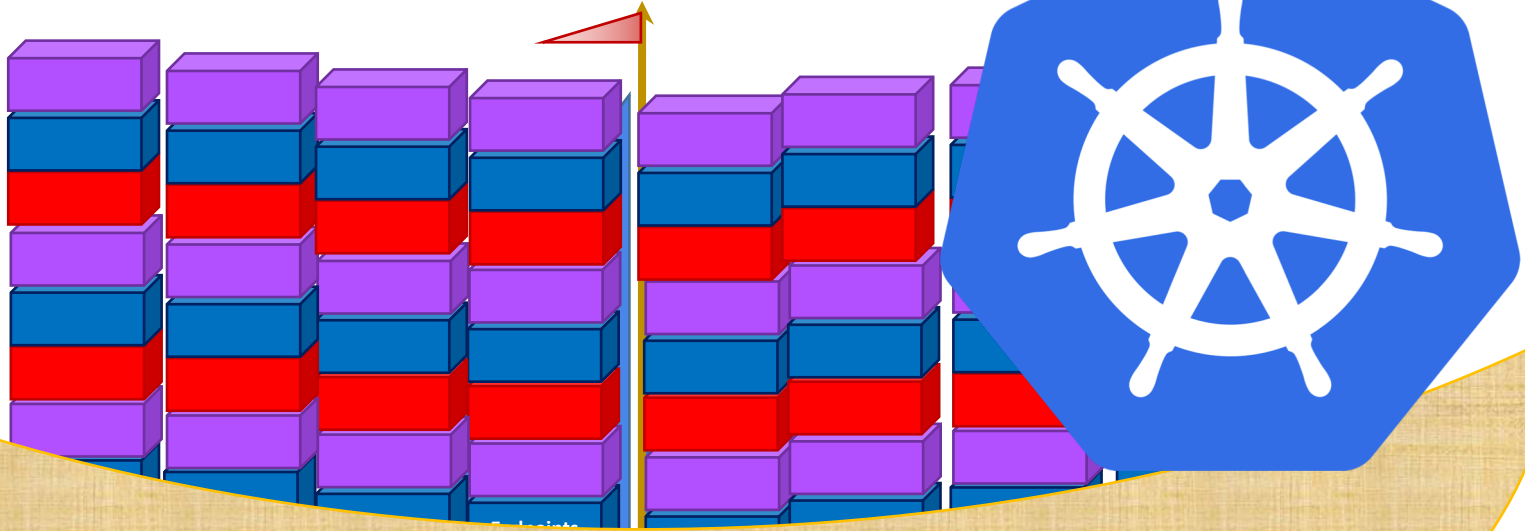


Kubernetes Growth

API Types

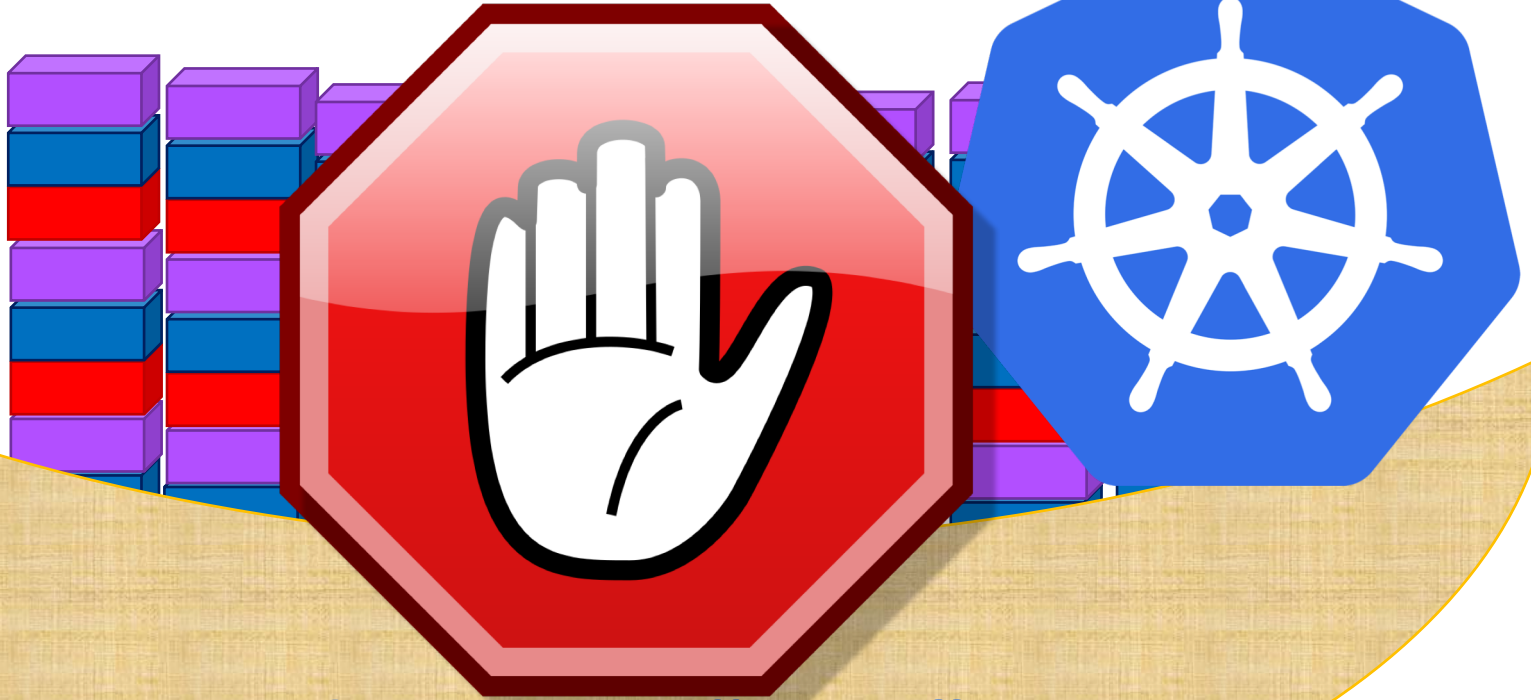


Kubernetes Giant ?



Kubernetes “Core”

Kubernetes Giant ?



Kubernetes “Core”

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

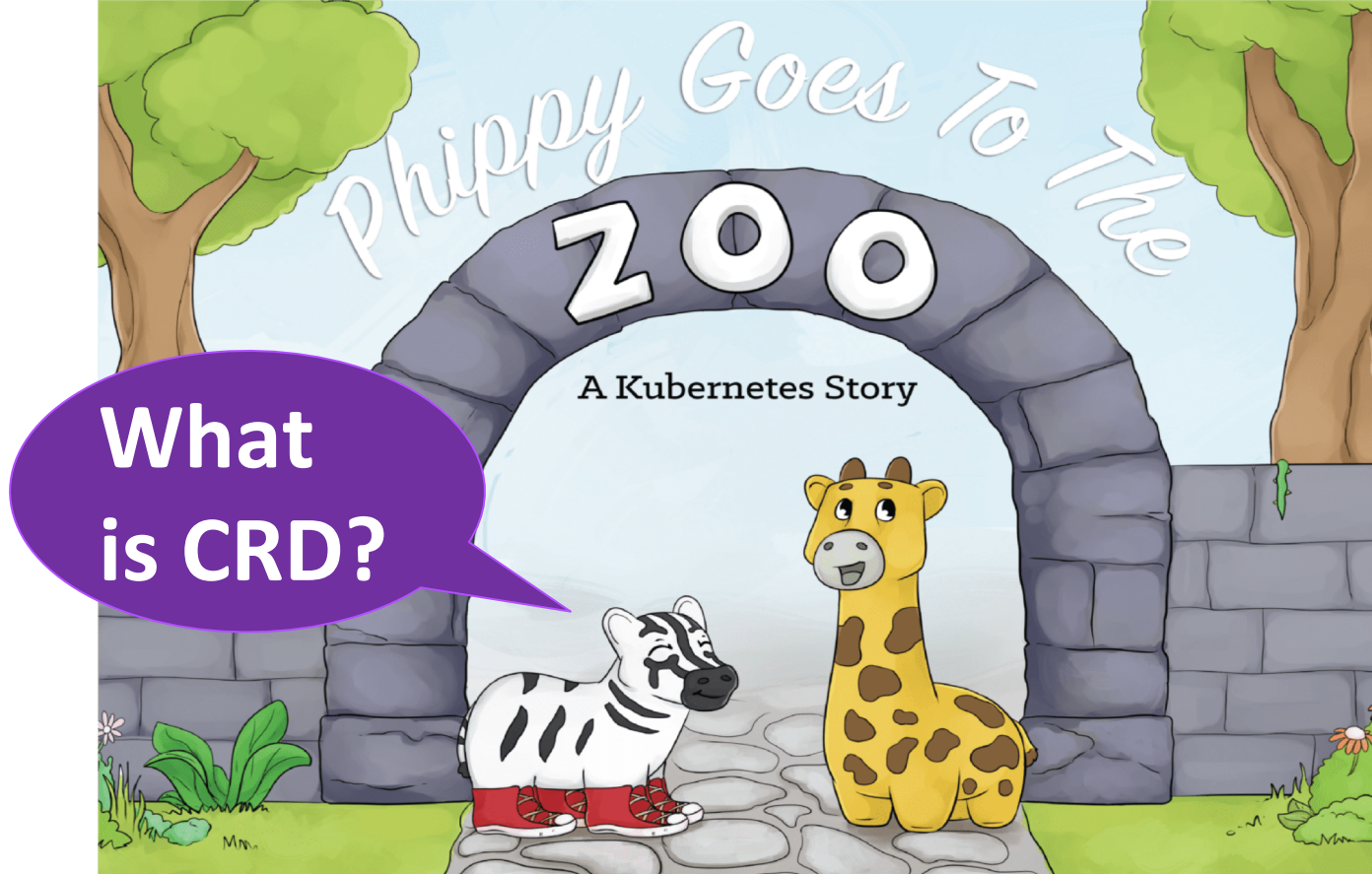


Makes Kubernetes
truly modular,
extensible, and
maintainable with a
minimum “**CORE**”.



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:

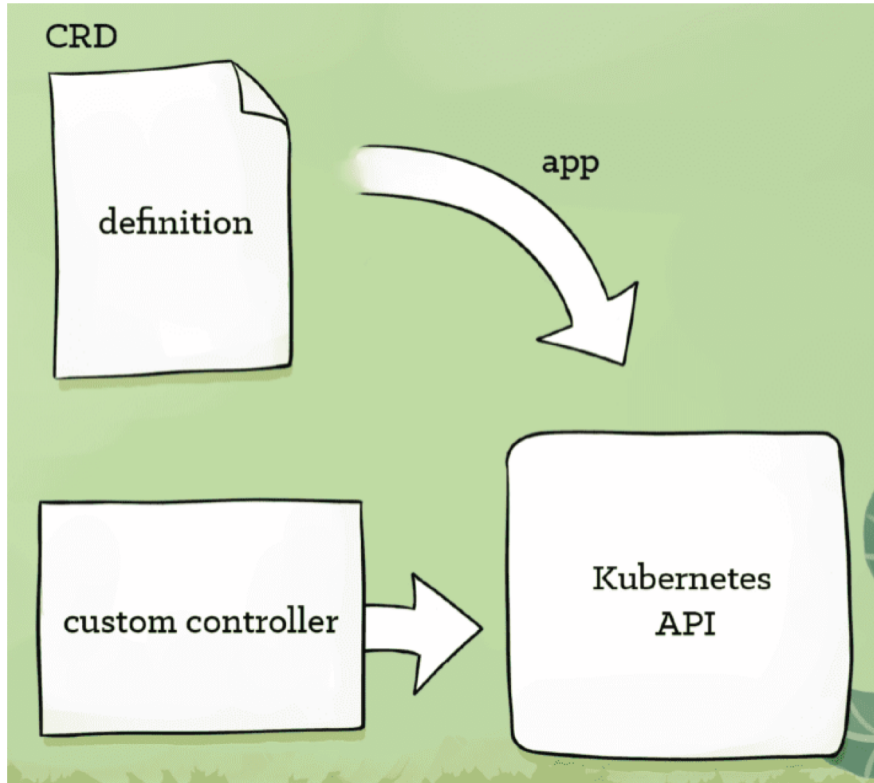


CRD

```
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

Sidecar 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,omi

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

    // Status represents the latest obser
    // +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

..

README.md

deploy: sp

rbac-external-provisioner.yaml

update RE

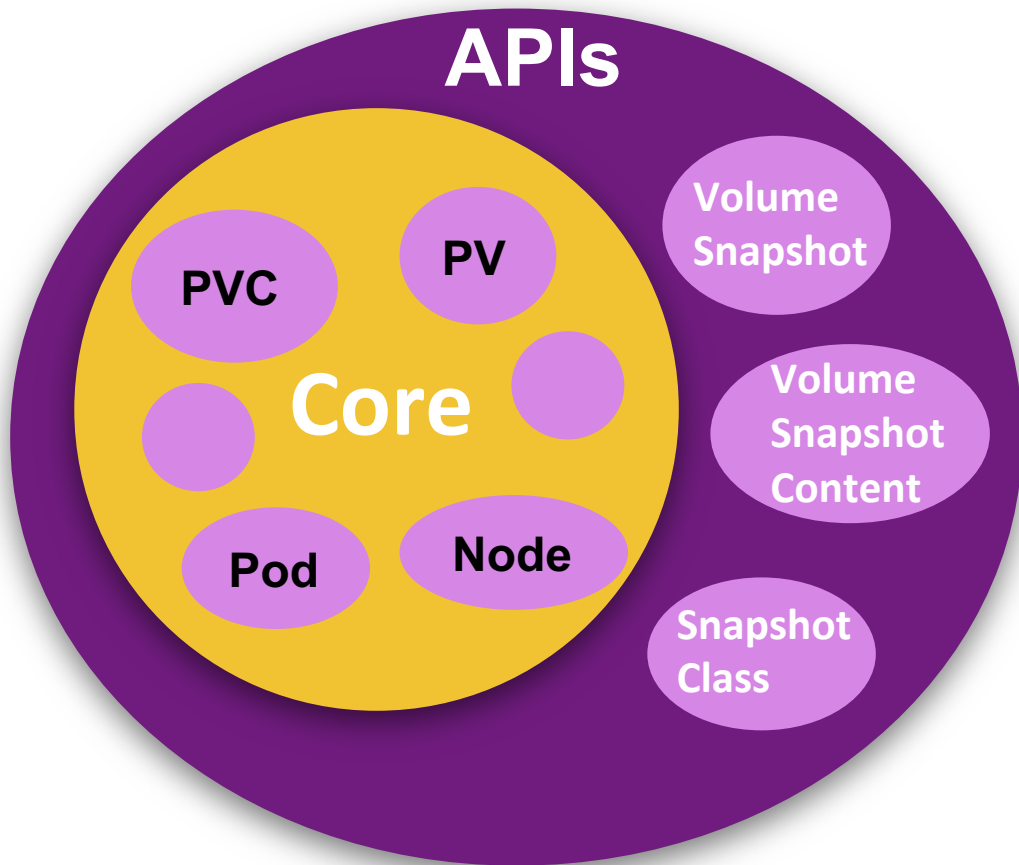
rbac.yaml

Add Delete

setup-csi-snapshotter.yaml

Update de

The Same Old User Experiences

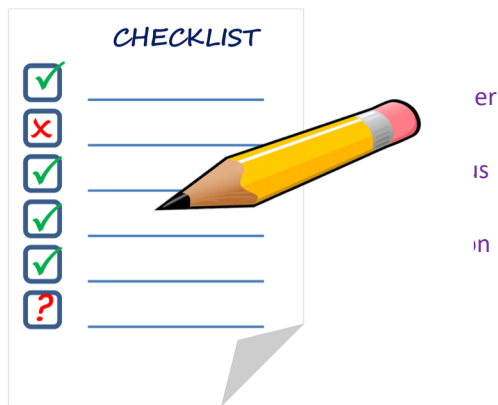


```
kubectl create -f snap.yaml  
kubectl delete -f snap.yaml  
kubectl get volumesnapshot  
kubectl list volumesnapshot
```

...

CRD vs. Native API

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



VolumeSnapshot (CRD) is part of Kubernetes



Sig-Storage Ownership

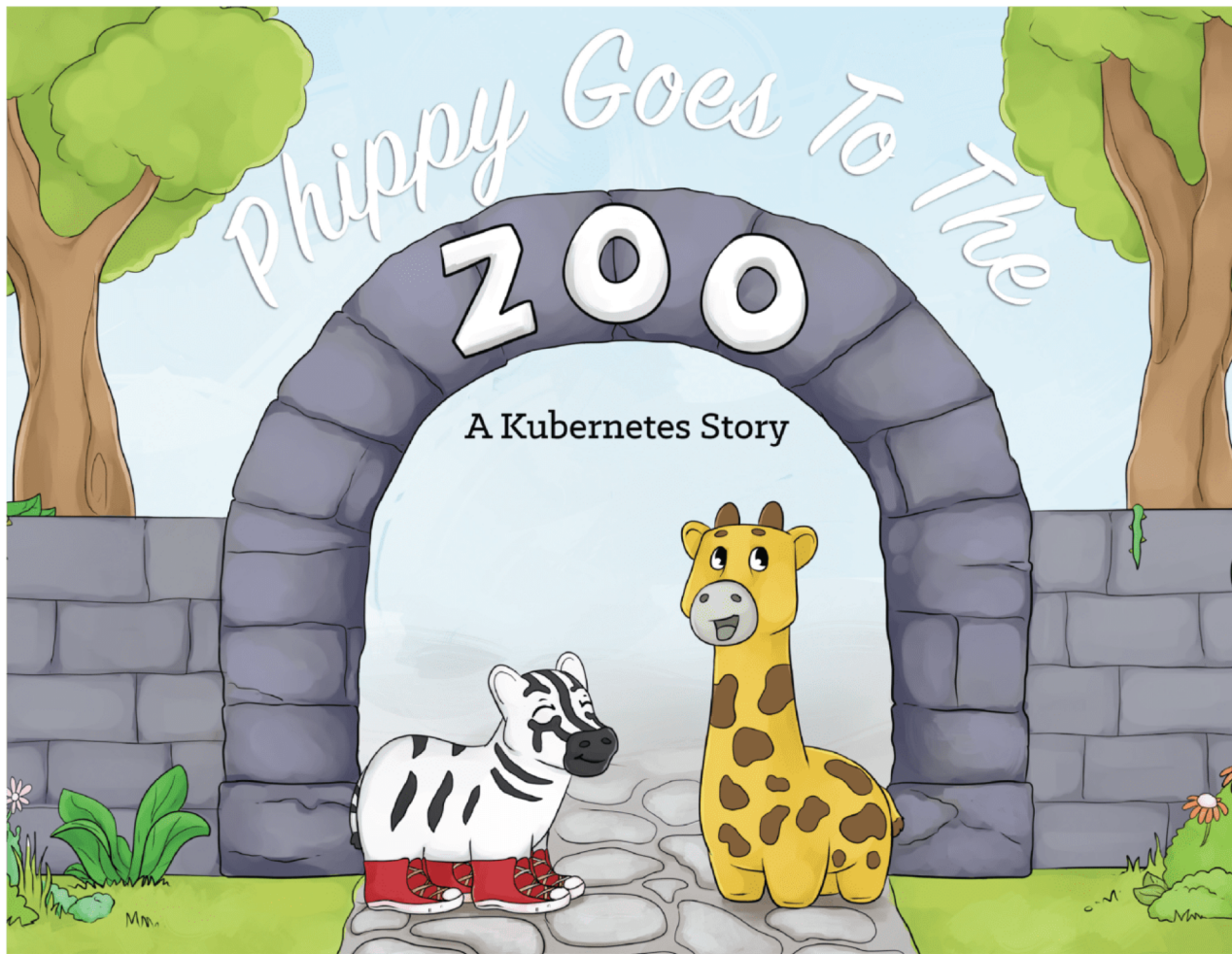


End to End Testing



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 !!!



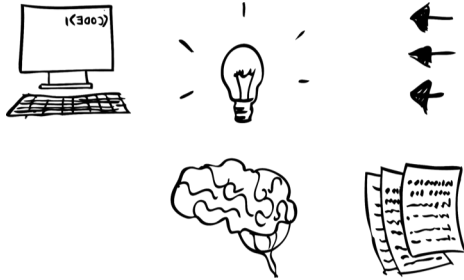
“Little Princess” Qi Qi - “公主仔” 七七

```
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

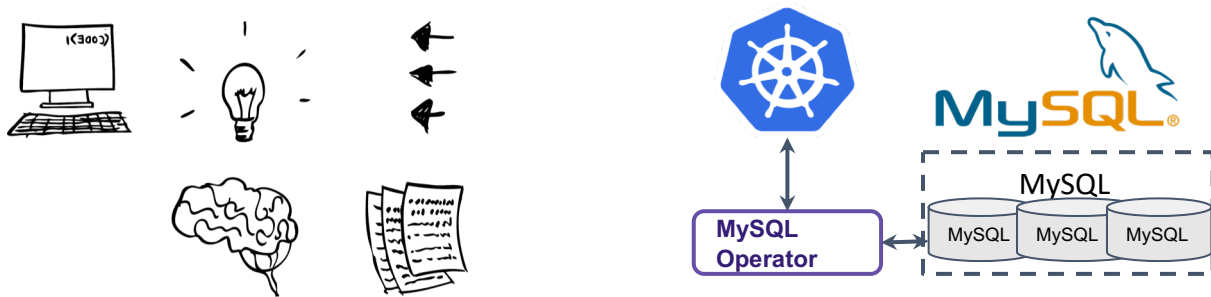


Third Party Resource (TPR)

- Prototyping



CRD's Evolution

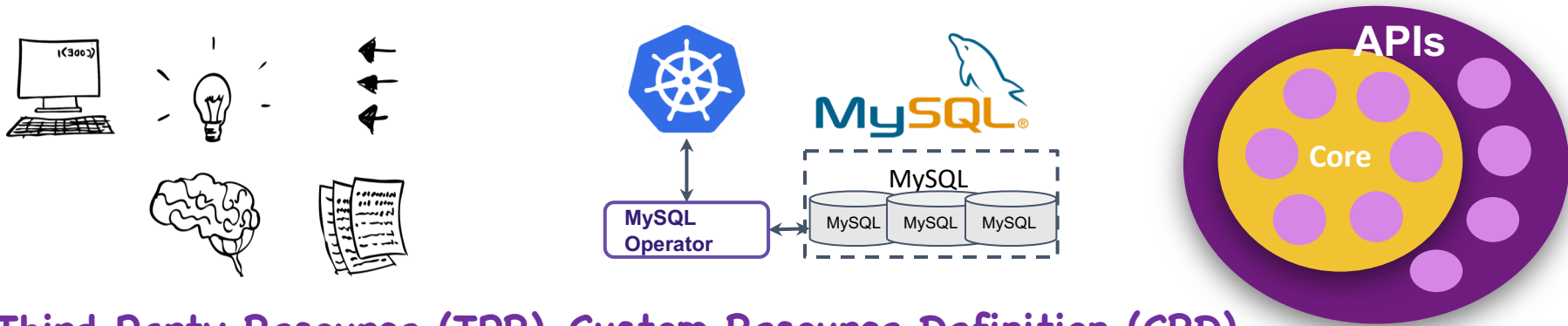


Third Party Resource (TPR) Custom Resource Definition (CRD)

- Prototyping
- Application operator



CRD's Evolution

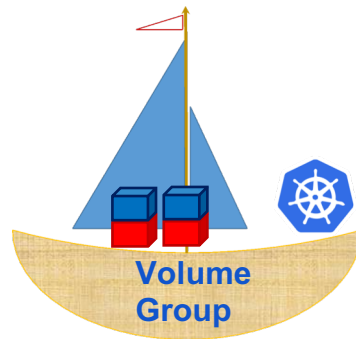
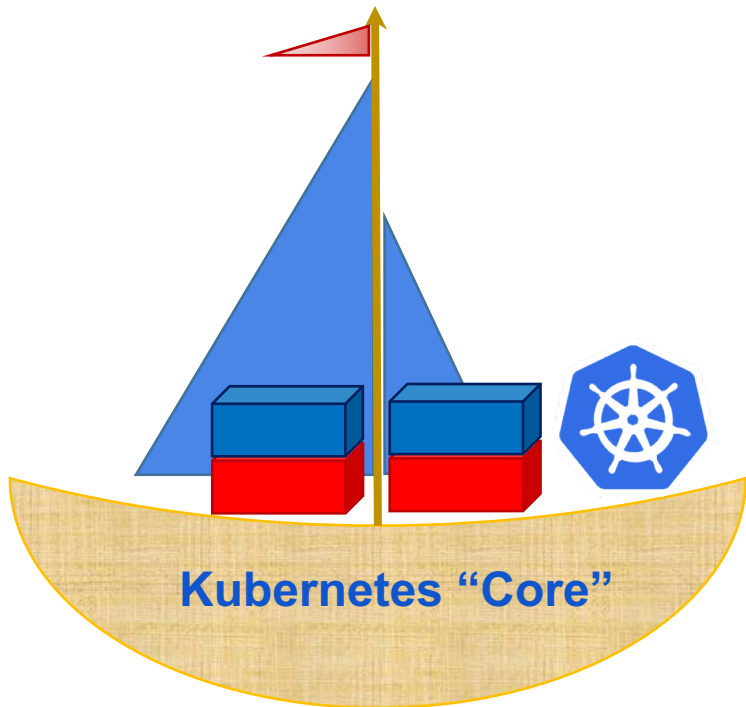
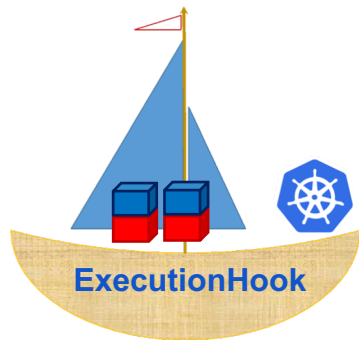
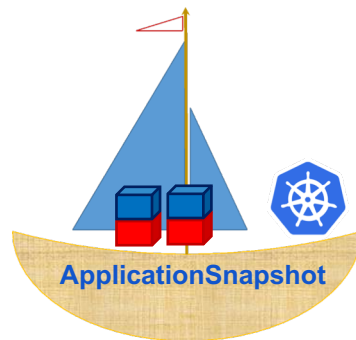


Third Party Resource (TPR) Custom Resource Definition (CRD)

- Prototyping
- Application operator
- Extending Core API

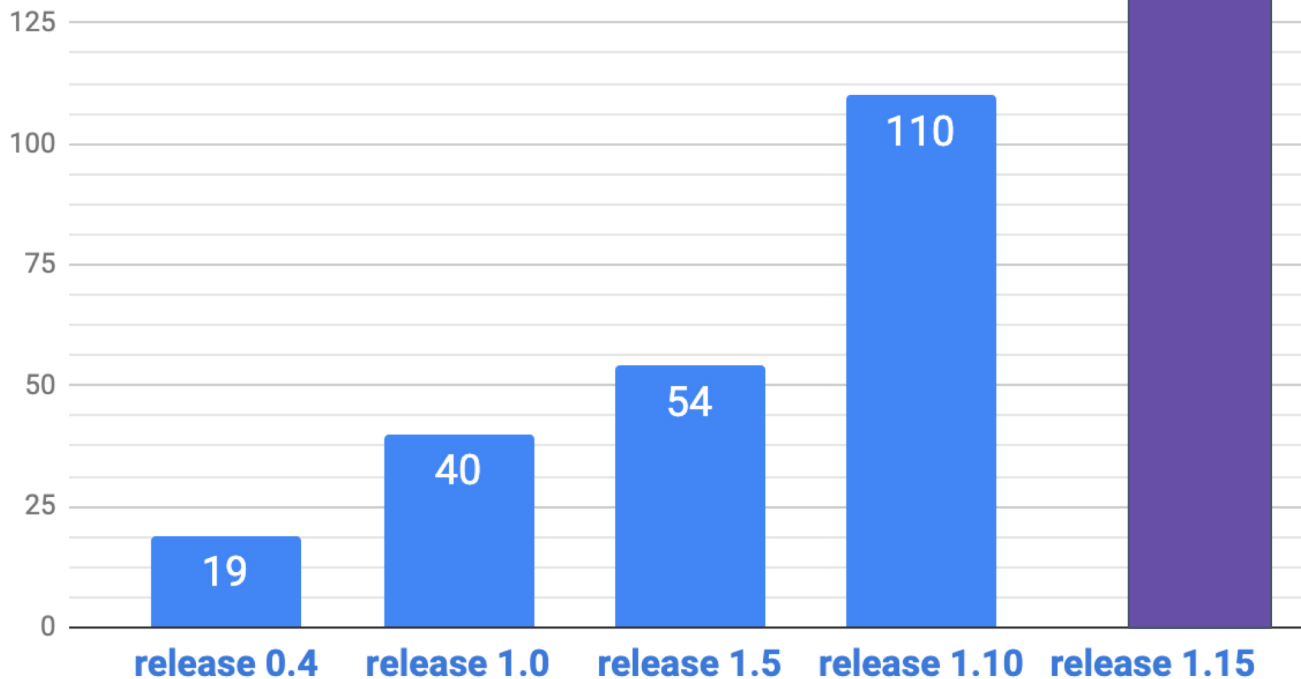


Kubernetes Fleet



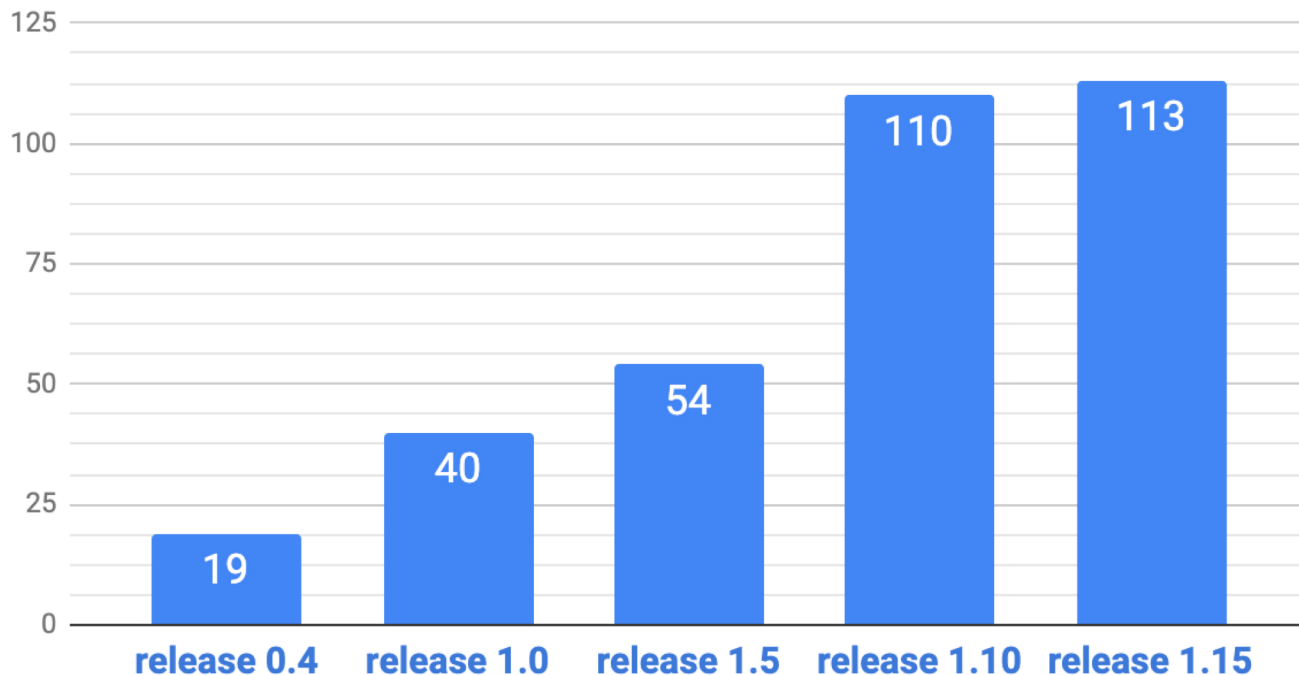
Kubernetes Growth

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

api-machinery

Kubernetes
community



Join us



jingxu97 & xing-yang



slack jinxu & xyang



jinxu@google.com &
xingyang105@gmail.com



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