CRD: No Longer Second Class!

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Our CRD Journey Begins...

Volume Snapshot Project
type VolumeSnapshot struct {
    metav1.TypeMeta
    metav1.ObjectMeta
    Spec VolumeSnapshotSpec
    Status VolumeSnapshotStatus
}
Architecture Special Interest Group

PLEASE USE CRD
Architecture Special Interest Group

PLEASE USE CRD
Kubernetes Grows Fast

- **Birth** (2014)
- **1.0 Release** (2015)
- **~1.5 Release** (2016)
- **~1.9 Release** (2017)
- **~1.13 Release** (2018)
- **~1.15 (6, 7, ...)** (2019)
Kubernetes Grows Fast

- **2014** Birth
- **2015** 1.0 Release
- **2016** ~1.5 Release
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- **2018** ~1.13 Release
- **2019** ~1.15 (6, 7, ...)

HIGH 5
Kubernetes Grows Fast

- **2014**: Birth
- **2015**: 1.0 Release
- **2016**: ~1.5 Release
- **2017**: ~1.9 Release
- **2018**: ~1.13 Release
- **2019**: More APIs, More Controllers

~1.15 (6, 7, ...)

More APIs

More Controllers
Kubernetes Growth

API Types #

release 0.4: 19
release 1.0: 40
release 1.5: 54
release 1.10: non-existent
release 1.15: non-existent
Kubernetes Growth

API Types #

<table>
<thead>
<tr>
<th>Release</th>
<th>API Types #</th>
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<tbody>
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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?
What is CRD?

Kubernetes Children's Book
CRD Explained

Kubernetes API Zoo
CRD Explained

$R = \text{Resource}$
pod, statefulset, persistentvolume, ...

$CR = \text{Custom Resources}$
pot, statelessset, nonpersistentvolume, ...

$CRD = \text{Custom Resources Definition}$
Example:

**CRD**

```yaml
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**

```yaml
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 ...
Sidecar container that watches Kubernetes Snapshot CRD objects and triggers CreateSnapshot/DeleteSnapshot against a CSI endpoint.
Back to Our CRD Journey ...

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

**CRD**

```go
type VolumeSnapshot struct {
  metav1.TypeMeta `json:"",inline`'
  // Standard object's metadata.
  // More info: https://git.k8s.io/community/docs/contributors/best-practices/specs-file
  // +optional
  metav1.ObjectMeta `json:"metadata,om"
  // Spec defines the desired character.
  Spec VolumeSnapshotSpec `json:"spec"
  // +optional
  // Status represents the latest observed state.
  Status VolumeSnapshotStatus `json:"status"
}
```

**Controller**

```go```
func NewCSISnapshotController (
  clientset clientset.Interface,
  clientsetset.Interface,
  snapshottName string,
  volumeSnapshotInformer storageinformerm
  volumeSnapshotClassInformer storagei
  volumeSnapshotContentInformer storagei
  pvCInformer coreinformerm
  PersistentVo
  createSnapshotContentRetryCount int,
  createSnapshotContentInterval time.Dur
  snapshottSnapshotter, SnapshottSnapshotter,
  timeout time.Duration,
  resyncPeriod time.Duration,
  snapshotNamePrefix string,
  snapshotNameUUIDLength int,
  ) *csiSnapshotController {
```
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
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

echo "Hello, world!"
CRD’s Evolution

Third Party Resource (TPR)

- Prototyping

~1.2 Release  ~1.7 Release  ~1.12 Release
CRD’s Evolution

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

- Prototyping
- Application operator

~1.2 Release ~1.7 Release ~1.12 Release
CRD’s Evolution

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

- Prototyping
- Application operator
- Extending Core API

~1.2 Release

~1.7 Release

~1.12 Release
Kubernetes Fleet

- VolumeSnapshot
- ApplicationSnapshot
- ExecutionHook
- Volume Group
Kubernetes Growth

API Types #

- release 0.4: 19
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- release 1.10: 110
- release 1.15: 113
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/](https://kubernetes.io/docs/concepts/extend-kubernetes/api-extension/custom-resources/)

- **CRD Tools**
  - MetaController [https://metacontroller.app/](https://metacontroller.app/)

- **VolumeSnapshot**
  - Snapshotter Repo [https://github.com/kubernetes-csi/external-snapshotter](https://github.com/kubernetes-csi/external-snapshotter)
  - Kubernetes.io [https://kubernetes.io/docs/concepts/storage/volume-snapshots/](https://kubernetes.io/docs/concepts/storage/volume-snapshots/)
Acknowledgement

sig-architecture

sig-storage

TEAMWORK

api-machinery

Kubernetes community
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