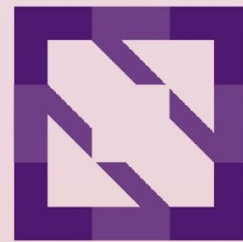




KubeCon



CloudNativeCon

North America 2023



Journey Through Time!

**Understanding etcd Revisions &
Resource Versions in Kubernetes**

Journey Through Time!

**Understanding etcd Revisions &
Resource Versions in Kubernetes**

Who Am I?

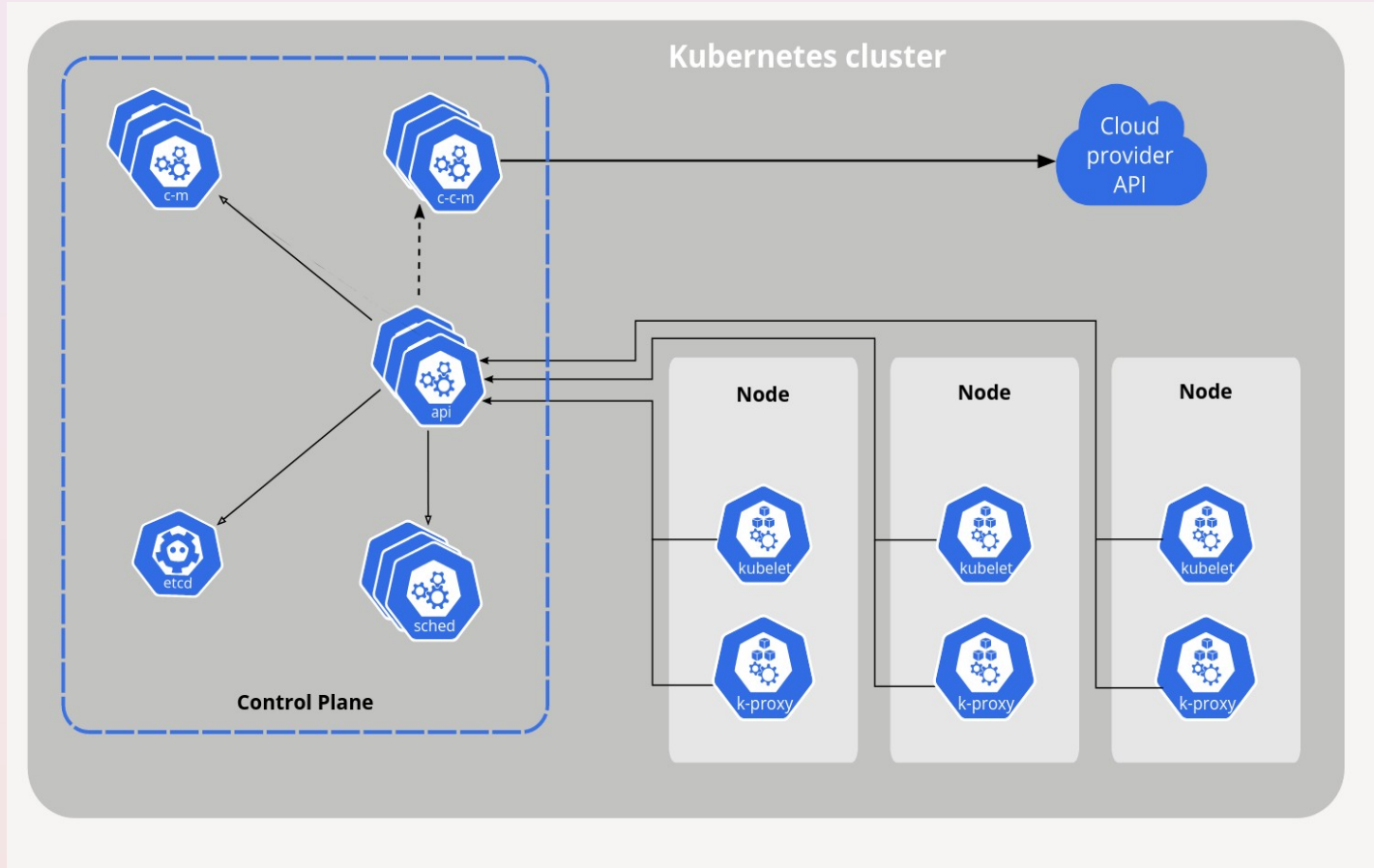


**What are we going to
explore today?**

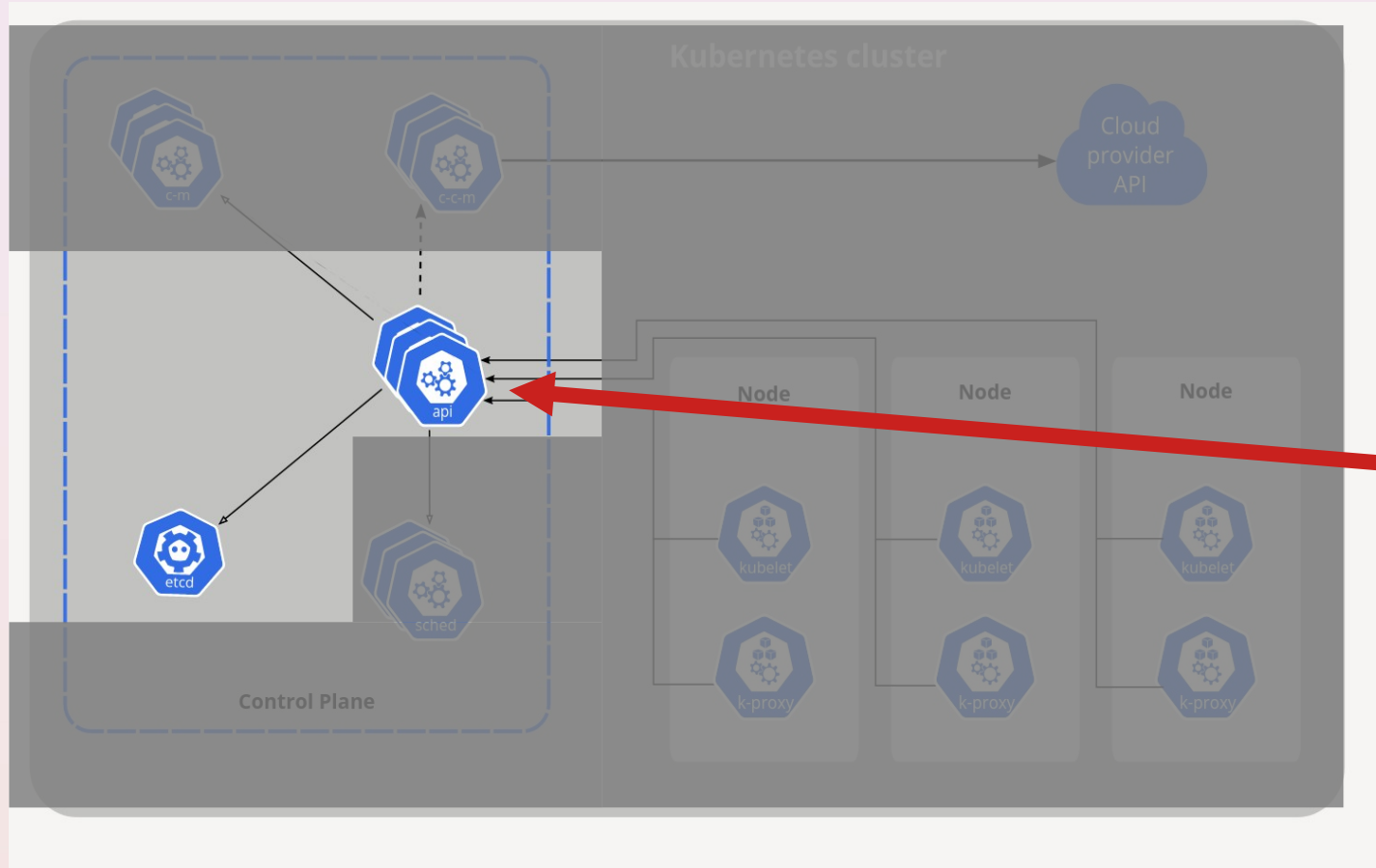
What are we going to explore today?

How the whole concept of “*ResourceVersions*” in Kubernetes Object’s maps to “*Revisions*” in etcd!

Kubernetes



Kubernetes



Rest API
(kubectl, Web UI, ...)

etcd



etcd



A distributed, reliable key-value store for the most critical data of a distributed system

So, we'll travel ...

From

```
psaggu@omega:~$ kubectl get deployment nginx-deployment -o yaml
```

```
apiVersion: apps/v1
```

```
kind: Deployment
```

```
metadata:
```

```
  annotations:
```

```
    deployment.kubernetes.io/revision: "1"
```

```
    kubectl.kubernetes.io/last-applied-configuration: |
```

```
      {"apiVersion":"apps/v1","kind":"Deployment","metadata":{"annotations":{},"labels":{"app":"nginx"},"name":"nginx-deployment","namespace":"default"},"spec":{"replicas":3,"selector":{"matchLabels":{"app":"nginx"}},"template":{"metadata":{"labels":{"app":"nginx"}},"spec":{"containers":[{"image":"nginx:1.14.2","name":"nginx","ports":[{"containerPort":80}]}]}}}}
```

```
  creationTimestamp: "2023-11-06T11:29:47Z"
```

```
  generation: 1
```

```
  labels:
```

```
    app: nginx
```

```
  name: nginx-deployment
```

```
  namespace: default
```

```
  resourceVersion: "1833"
```

```
  uid: f0179a4e-d2f4-4701-8ad7-c9029eebb629
```



To

```
root@tt-etc-d-control-plane:/# e get /registry/deployments/default --prefix -w json --keys-only | jq '.kvs[].key|
=@base64d'
```

```
{
  "header": {
    "cluster_id": 14358680983224840000,
    "member_id": 1033796535975940100,
    "revision": 3985,
    "raft_term": 3
  },
  "kvs": [
    {
      "key": "/registry/deployments/default/nginx-deployment",
      "create_revision": 1734,
      "mod_revision": 1833,
      "version": 7
    }
  ],
  "count": 1
}
```



etcd: Revisions

etcd: Revisions

**Revisions act as snapshots of
object states in the key-value store!**

**I want to show how data is stored inside etcd
(with an example)!**

Set up!

Set up!

```
$ docker run -d --name test-etcd-container \  
--network app-tier \  
--publish 2379:2379 \  
--publish 2380:2380 \  
--env ALLOW_NONE_AUTHENTICATION=yes \  
--env ETCD_ADVERTISE_CLIENT_URLS=http://etcd-server:2379 \  
bitnami/etcd:latest
```

```
$ docker exec -it --user root test-etcd-container bash
```

```
#
```

Set up!

```
$ docker run -d --name test-etcd-container \  
--network app-tier \  
--publish 2379:2379 \  
--publish 2380:2380 \  
--env ALLOW_NONE_AUTHENTICATION=yes \  
--env ETCD_ADVERTISE_CLIENT_URLS=http://etcd-server:2379 \  
bitnami/etcd:latest
```

```
$ docker exec -it --user root test-etcd-container bash
```

```
#
```

Set up!

```
// adding tools to the container!
```

```
# apt update && apt install curl
```

```
# URL=https://github.com/stedolan/jq/releases/download/jq-1.7/jq-linux64
```

```
# curl -L -o /tmp/jq $URL && cd /tmp/ && chmod +x jq
```

```
# export PATH=$PWD:$PATH
```

Set up!

```
// adding tools to the container!
```

```
# apt update && apt install curl
```

```
# URL=https://github.com/stedolan/jq/releases/download/jq-1.7/jq-linux64
```

```
# curl -L -o /tmp/jq $URL && cd /tmp/ && chmod +x jq
```

```
# export PATH=$PWD:$PATH
```

Set up!

```
// adding tools to the container!
```

```
# apt update && apt install curl
```

```
# URL=https://github.com/stedolan/jq/releases/download/jq-1.7/jq-linux64
```

```
# curl -L -o /tmp/jq $URL && cd /tmp/ && chmod +x jq
```

```
# export PATH=$PWD:$PATH
```

Set up!

```
// adding tools to the container!  
  
# apt update && apt install curl  
  
# URL=https://github.com/stedolan/jq/releases/download/jq-1.7/jq-  
linux64  
  
# curl -L -o /tmp/jq $URL && cd /tmp/ && chmod +x jq  
  
# export PATH=$PWD:$PATH
```


Interacting with etcd!

```
# export ETCDCTL_API=3
```

```
# etcdctl version
```

```
etcdctl version: 3.5.10
```

```
API version: 3.5
```

Interacting with etcd!

```
# etcdctl endpoint status -w json | jq .
```

```
[  
  {  
    "Endpoint": "127.0.0.1:2379",  
    "Status": {  
      "header": {  
        "cluster_id": 14841639068965178418,  
        "member_id": 10276657743932975437,  
        "revision": 1,  
      }, ...  
    }  
  }, ...  
]
```

...

Interacting with etcd (create)

```
# for i in {1..5}; do etcdctl put foo${i} bar${i}; done
```

OK

OK

OK

OK

OK

Interacting with etcd (retrieve)

```
# etcdctl get .
```

Interacting with etcd (retrieve)

```
# etcdctl get . -w json | jq .
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 6,  
    "raft_term": 3  
  }  
}
```

Interacting with etcd (retrieve)

```
// retrieve data
```

```
# etcdctl get --prefix foo -w json |  
jq .
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 6,  
    "raft_term": 3  
  },
```

```
  "kvs": [  
    {  
      "key": "Zm9vMQ==",  
      "create_revision": 2,  
      "mod_revision": 2,  
      "version": 1,  
      "value": "YmFyMQ=="  
    },  
    ...  
  ],  
  "count": 5
```

```
}
```

Interacting with etcd (retrieve)

```
// retrieve data
```

```
# etcdctl get --prefix foo -w json |  
jq '.kvs[].key|=@base64d|.kvs[].value|  
=@base64d'
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 6,  
    "raft_term": 3  
  },  
  },
```

```
{  
  "key": "foo1",  
  "create_revision": 2,  
  "mod_revision": 2,  
  "version": 1,  
  "value": "bar1"  
},  
...  
...  
],  
"count": 5
```

```
}
```

Interacting with etcd (retrieve)

```
// retrieve data
```

```
# etcdctl get --prefix foo -w json |  
jq '.kvs[].key|=@base64d|.kvs[].value|  
=@base64d'
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 6,  
    "raft_term": 3  
  },
```

```
"kvs": [  
  {  
    "key": "foo2",  
    "create_revision": 3,  
    "mod_revision": 3,  
    "version": 1,  
    "value": "bar2"  
  }, ...  
],  
"count": 5  
}
```


Interacting with etcd (retrieve)

```
// retrieve data
```

```
# etcdctl get --prefix foo -w json |  
jq '.kvs[].key|=@base64d|.kvs[].value|  
=@base64d'
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 6,  
    "raft_term": 3  
  },  
  "kvs": [  
    {  
      "key": "foo3",  
      "create_revision": 4,  
      "mod_revision": 4,  
      "version": 1,  
      "value": "bar3"  
    }, ...  
  ],  
  "count": 5  
}
```

```
"kvs": [  
  {  
    "key": "foo3",  
    "create_revision": 4,  
    "mod_revision": 4,  
    "version": 1,  
    "value": "bar3"  
  }, ...  
],  
"count": 5  
}
```

Interacting with etcd (retrieve)

```
// retrieve data
```

```
# etcdctl get --prefix foo -w json |  
jq '.kvs[].key|=@base64d|.kvs[].value|  
=@base64d'
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 6,  
    "raft_term": 3  
  },  
  "kvs": [  
    {  
      "key": "foo4",  
      "create_revision": 5,  
      "mod_revision": 5,  
      "version": 1,  
      "value": "bar4"  
    }, ...  
  ],  
  "count": 5  
}
```

```
"kvs": [  
  {  
    "key": "foo4",  
    "create_revision": 5,  
    "mod_revision": 5,  
    "version": 1,  
    "value": "bar4"  
  }, ...  
],  
"count": 5  
}
```

Interacting with etcd (retrieve)

```
// retrieve data
```

```
# etcdctl get --prefix foo -w json |  
jq '.kvs[].key|=@base64d|.kvs[].value|  
=@base64d'
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 6,  
    "raft_term": 3  
  },
```

```
"kvs": [  
  {  
    "key": "foo5",  
    "create_revision": 6,  
    "mod_revision": 6,  
    "version": 1,  
    "value": "bar5"  
  }, ...  
],  
"count": 5  
}
```

Interacting with etcd (delete)

```
# etcdctl del foo1 -w json
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 7,  
    "raft_term": 3  
  },  
  "deleted": 1  
}
```

Interacting with etcd (delete)

```
// delete data
```

```
# etcdctl get --prefix foo --keys-only
```

```
foo2
```

```
foo3
```

```
foo4
```

```
foo5
```

Time Travel (to the past)!
Read past version of keys

Travelling ...

```
// track past revisions, time travel!
```

```
# etcdctl get foo1 --rev 7 -w json | jq .
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 7,  
    "raft_term": 3  
  }  
}
```

Travelling ...

```
// track back revisions, time travel!  
  
# etcdctl get foo1 --rev 6 -w json | jq  
' .kvs[].key|=@base64d|.kvs[].value|  
=@base64d'  
  
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 7,  
    "raft_term": 3  
  },
```

```
    "kvs": [  
      {  
        "key": "foo1",  
        "create_revision": 2,  
        "mod_revision": 2,  
        "version": 1,  
        "value": "bar1"  
      }  
    ],  
    "count": 1  
  }  
}
```


Let's Recreate the Deleted Key (foo1)

Let's Recreate the Deleted Key (foo1)

```
# etcdctl put foo1 bar1-new -w json | jq .
```

```
{  
  "header": {  
    "cluster_id": 14841639068965178418,  
    "member_id": 10276657743932975437,  
    "revision": 8,  
    "raft_term": 3  
  }  
}
```

Inspect raw database of etcd!

```
// Inspect the raw database content!!
```

```
$ git clone https://github.com/etcd-io/etcd.git
```

```
$ cd etcd/tools/etcd-dump-db
```

```
$ go build .
```

```
$ docker cp test-etcd-container:/bitnami/etcd/data/member/snap/db .
```

```
Successfully copied 16.8MB to /home/user/etcd/tools/etcd-dump-db/.
```

Inspect raw database of etcd!

```
// Inspect the raw database content!!
```

```
$ git clone https://github.com/etcd-io/etcd.git
```

```
$ cd etcd/tools/etcd-dump-db
```

```
$ go build .
```

```
$ docker cp test-etcd-container:/bitnami/etcd/data/member/snap/db .
```

```
Successfully copied 16.8MB to /home/user/etcd/tools/etcd-dump-db/.
```

Inspect raw database of etcd!

```
// Inspect the raw database content!!
```

```
$ git clone https://github.com/etcd-io/etcd.git
```

```
$ cd etcd/tools/etcd-dump-db
```

```
$ go build .
```

```
$ docker cp test-etcd-container:/bitnami/etcd/data/member/snap/db .
```

```
Successfully copied 16.8MB to /home/user/etcd/tools/etcd-dump-db/.
```

Inspect raw database of etcd!

```
// Inspect the raw database content!!
```

```
$ ./etcd-dump-db iterate-bucket db key --decode
```

```
rev={main:8 sub:0}, value=[key "foo1" | val "bar1-new" | created 8 | mod 8 | ver 1]
```

```
rev={main:7 sub:0}, value=[key "foo1" | val "" | created 0 | mod 0 | ver 0]
```

```
rev={main:6 sub:0}, value=[key "foo5" | val "bar5" | created 6 | mod 6 | ver 1]
```

```
rev={main:5 sub:0}, value=[key "foo4" | val "bar4" | created 5 | mod 5 | ver 1]
```

```
rev={main:4 sub:0}, value=[key "foo3" | val "bar3" | created 4 | mod 4 | ver 1]
```

```
rev={main:3 sub:0}, value=[key "foo2" | val "bar2" | created 3 | mod 3 | ver 1]
```

```
rev={main:2 sub:0}, value=[key "foo1" | val "bar1" | created 2 | mod 2 | ver 1]
```

Compact raw database of etcd!

```
// compact the raw database content!!
```

```
# etcdctl compact 8 --physical
```

```
compacted revision 8
```

Compact raw database of etcd!

```
// Refresh the db copy, inspect the raw database content again!
```

```
$ docker cp test-etcd-container:/bitnami/etcd/data/member/snap/db .
```

Successfully copied 16.8MB to /home/psaggu/etcd/tools/etcd-dump-db/.

```
$ ./etcd-dump-db iterate-bucket db key --decode
```

```
rev={main:8 sub:0}, value=[key "foo1" | val "bar1-new" | created 8 | mod 8 | ver 1]  
rev={main:6 sub:0}, value=[key "foo5" | val "bar5" | created 6 | mod 6 | ver 1]  
rev={main:5 sub:0}, value=[key "foo4" | val "bar4" | created 5 | mod 5 | ver 1]  
rev={main:4 sub:0}, value=[key "foo3" | val "bar3" | created 4 | mod 4 | ver 1]  
rev={main:3 sub:0}, value=[key "foo2" | val "bar2" | created 3 | mod 3 | ver 1]
```


Watch!!

Watch!!

```
// terminal 1 (for CRUD)
```

```
#
```

```
// terminal 2 (running watch)
```

```
#
```

Watch!!

```
// terminal 1 (for CRUD)
```

```
#
```

```
// terminal 2 (running watch)
```

```
# etcdctl watch foo1 -w json |  
jq '.Events[].kv.key|=@base64d'  
|.Events[].kv.value|=@base64d'
```

Watch!

```
// terminal 1 (for CRUD)
```

```
# etcdctl put foo1 bar1-update1
```

```
OK
```

```
// terminal 2 (running watch)
```

```
# etcdctl watch foo1 -w json | jq '.Events[].kv.key|  
=@base64d|.Events[].kv.value|=@base64d'
```

```
{  
  "Header": {...  
    "revision": 9,  
    ...},  
  "Events": [  
    {  
      "kv": {  
        "key": "foo1",  
        "create_revision": 8,  
        "mod_revision": 9,  
        "version": 2,  
        "value": "bar1-update1"  
      }  
    }  
  ]  
}
```

Watch!

```
// terminal 1 (for CRUD)
```

```
# etcdctl put foo1 bar1-update2
```

```
OK
```

```
// terminal 2 (running watch)
```

```
# etcdctl watch foo1 -w json | jq '.Events[].kv.key|  
=@base64d|.Events[].kv.value|=@base64d'
```

```
{  
  "Header": {...  
    "revision": 10,  
    ...},  
  "Events": [  
    {  
      "kv": {  
        "key": "foo1",  
        "create_revision": 8,  
        "mod_revision": 10,  
        "version": 3,  
        "value": "bar1-update2"  
      }  
    }  
  ]  
}
```

Watch!

```
// terminal 1 (for CRUD)
```

```
# etcdctl del foo1
```

```
1
```

```
// terminal 2 (running watch)
```

```
# etcdctl watch foo1 -w json | jq '.Events[].kv.key|  
=@base64d|.Events[].kv.value|=@base64d'
```

```
{  
  "Header": {...  
    "revision": 11,  
    ...},  
  "Events": [  
    {  
      "type": 1,  
      "kv": {  
        "key": "foo1",  
        "mod_revision": 11,  
        "value": ""  
      }  
    }  
  ]  
}
```

Tying it all together ...

Creating a kubernetes cluster!

```
$ kind create cluster --name test-k8s-cluster
```

```
// compile etcdctl and copy into kind cluster
```

```
$ cd etcd/etcdctl
```

```
$ GOOS=linux go build .
```

```
$ docker cp etcdctl test-k8s-cluster-control-plane:/usr/local/bin
```

```
$ kubectl apply -f
```

```
https://raw.githubusercontent.com/kubernetes/website/main/content/en/examples/controllers/nginx-deployment.yaml
```


Creating a kubernetes cluster!

```
$ kind create cluster --name test-k8s-cluster
```

```
// compile etcdctl and copy into kind cluster
```

```
$ cd etcd/etcdctl
```

```
$ GOOS=linux go build .
```

```
$ docker cp etcdctl test-k8s-cluster-control-plane:/usr/local/bin
```

```
$ kubectl apply -f
```

```
https://raw.githubusercontent.com/kubernetes/website/main/content/en/examples/controllers/nginx-deployment.yaml
```

Creating a kubernetes cluster!

```
$ kind create cluster --name test-k8s-cluster  
// compile etcdctl and copy into kind cluster  
$ cd etcd/etcdctl  
$ GOOS=linux go build .  
$ docker cp etcdctl test-k8s-cluster-control-plane:/usr/local/bin  
  
$ kubectl apply -f  
https://raw.githubusercontent.com/kubernetes/website/main/content/  
en/examples/controllers/nginx-deployment.yaml
```

Inspecting Kubernetes objects (ResourceVersion)

```
$ kubectl get deployments -n default -o json
```

```
{
  "apiVersion": "v1",
  "items": [
    {
      "apiVersion": "apps/v1",
      "kind": "Deployment",
      "metadata": {
        "annotations": {
          "deployment.kubernetes.io/revision":
"1",
        },
        "creationTimestamp": "2023-11-07T11:49:42Z",
        "generation": 1,
```

```
      "labels": {
        "app": "nginx"
      },
      "name": "nginx-deployment",
      "namespace": "default",
      "resourceVersion": "1626",
      "uid": "9cb205a4-cc5f-4bbb-9b24-
7f78157d2837"
    },
```

Inspecting Kubernetes objects (Revisions)

```
$ docker exec -it test-k8s-cluster-control-plane bash
```

```
// inside exec-ed container
```

```
# apt-get update && apt-get install jq -y
```

```
# alias e="etcdctl --endpoints 127.0.0.1:2379  
--cert=/etc/kubernetes/pki/etcd/server.crt  
--key=/etc/kubernetes/pki/etcd/server.key  
--cacert=/etc/kubernetes/pki/etcd/ca.crt"
```

Inspecting Kubernetes objects (Revisions)

```
$ docker exec -it test-k8s-cluster-control-plane bash
```

```
// inside exec-ed container
```

```
# apt-get update && apt-get install jq -y
```

```
# alias e="etcdctl --endpoints 127.0.0.1:2379  
--cert=/etc/kubernetes/pki/etcd/server.crt  
--key=/etc/kubernetes/pki/etcd/server.key  
--cacert=/etc/kubernetes/pki/etcd/ca.crt"
```

Inspecting Kubernetes objects (Revisions)

```
$ docker exec -it test-k8s-cluster-control-plane bash
```

```
// inside exec-ed container
```

```
# apt-get update && apt-get install jq -y
```

```
# alias e="etcdctl --endpoints 127.0.0.1:2379  
--cert=/etc/kubernetes/pki/etcd/server.crt  
--key=/etc/kubernetes/pki/etcd/server.key  
--cacert=/etc/kubernetes/pki/etcd/ca.crt"
```

Inspecting Kubernetes objects (Revisions)

```
# e get /registry/deployments/default --  
prefix -w json --keys-only | jq  
' .kvs[].key |= @base64d'
```

```
{  
  "header": {  
    "cluster_id": 14358680983224840000,  
    "member_id": 1033796535975940100,  
    "revision": 2174,  
    "raft_term": 2  
  },  

```

```
"kvs": [  
  {  
    "key":  
    "/registry/deployments/default/nginx-  
    deployment",  
    "create_revision": 1533,  
    "mod_revision": 1626,  
    "version": 7  
  }  
],  
  "count": 1  
}
```

etcd (*mod_revision*) ==
Kubernetes Object (*ResourceVersion*)

Inspecting Kubernetes objects (ResourceVersion)

```
$ kubectl get deployments -n default -o json
```

```
{
  "apiVersion": "v1",
  "items": [
    {
      "apiVersion": "apps/v1",
      "kind": "Deployment",
      "metadata": {
        "annotations": {
          "deployment.kubernetes.io/revision":
"1",
        },
        "creationTimestamp": "2023-11-07T11:49:42Z",
        "generation": 1,
```

```
      "labels": {
        "app": "nginx"
      },
      "name": "nginx-deployment",
      "namespace": "default",
      "resourceVersion": "1626",
      "uid": "9cb205a4-cc5f-4bbb-9b24-
7f78157d2837"
    },
```

Watch!

```
// terminal 1 (kubectl watch)

# kubectl get deploy -n default -w -v9 -o json
--output-watch-events |
jq'|.type,.object.metadata.labels,.
object.metadata.resourceVersion'
```

```
// terminal 2 (etcd watch)

# nextRev=$(expr $(e get
/registry/deployments/default -w json |
jq '.header.revision') + 1)

# e watch /registry/deployments/default
--prefix -w json --rev ${nextRev} | jq
'.Events[].kv.key|=@base64d
|.Events[].kv.value|=@base64d'
```

Watch!

```
$ kubectl get deploy -n default -w -v9 -o json --output-watch-events | jq  
'|.|.type,.object.metadata.labels,.object.metadata.resourceVersion'
```

```
I1107 12:06:00.095348      3263 loader.go:373] Config loaded from file:  
/etc/kubernetes/admin.conf
```

```
I1107 12:06:00.099449      3263 round_trippers.go:466] curl -v -XGET -H "Accept:  
application/json" -H "User-Agent: kubectl/v1.27.1 (linux/amd64) kubernetes/4c94112"  
'https://test-k8s-cluster-control-plane:6443/apis/apps/v1/namespaces/default/deployments?  
limit=500'
```

```
"ADDED"
```

```
{
```

```
  "app": "nginx"
```

```
}
```

```
"2966"
```

Watch!

```
# e watch /registry/deployments/default --prefix -w json --rev ${nextRev} | jq '.Events[].kv.key|  
=@base64d|.Events[].kv.value|=@base64d'
```

```
{  
  "Header": { "revision": 2966, },  
  "Events": [  
    {  
      "kv": {  
        "key": "/registry/deployments/default/nginx-deployment",  
        "create_revision": 2966,  
        "mod_revision": 2966,  
        "version": 1,  
        "value": "k8s\u0000\n\u0015\n\u0007apps/v1\u0012\nDeployment\u00120\r\n0\n ..."  
      }  
    }, ...  
  ]  
}
```

Watch!

```
$ kubectl get deploy -n default -w -v9 -o json --output-watch-events | jq  
'|.type,.object.metadata.labels,.object.metadata.resourceVersion'
```

```
I1107 12:06:00.095348      3263 loader.go:373] Config loaded from file: /etc/kubernetes/admin.conf  
I1107 12:06:00.099449      3263 round_tripper.go:466] curl -v -XGET -H "Accept: application/json" -H  
"User-Agent: kubectl/v1.27.1 (linux/amd64) kubernetes/4c94112" 'https://test-k8s-cluster-control-  
plane:6443/apis/apps/v1/namespaces/default/deployments?limit=500'
```

```
"ADDED"
```

```
{  
  "app": "nginx"  
}  
"2966"
```

```
"MODIFIED"
```

```
{  
  "app": "nginx"  
}  
"2968"
```

Watch!

```
# e watch /registry/deployments/default --prefix -w json --rev ${nextRev} | jq '.Events[].kv.key|  
=@base64d|.Events[].kv.value|=@base64d'
```

```
{  
  "Header": { "revision": 2968, },  
  "Events": [  
    {  
      "kv": {  
        "key": "/registry/deployments/default/nginx-deployment",  
        "create_revision": 2966,  
        "mod_revision": 2968,  
        "version": 2,  
        "value": "k8s\u0000\n\u0015\n\u0007apps/v1\u0012\nDeployment\u00120\r\n0\n ..."  
      }  
    }, ...  
  ]  
}
```

Kubernetes etcd Registry dump!

```
$ docker cp  
test-k8s-cluster-control-plane:/var/lib/etcd/member/snap/db db  
$ ./etcd-dump-db iterate-bucket db key --decode
```

Kubernetes etcd Registry dump!


```
$ docker cp  
test-k8s-cluster-control-plane:/var/lib/etcd/member/snap/db db  
  
$ ./etcd-dump-db iterate-bucket db key --decode
```


[illegible]

Watch!

```
rev={main:3013 sub:0}, value={key "/registry/deployments/default/nginx-deployment" | val "k8s\x00\n\x15\n\aapps/v1\x12\nDeployment\x12\xf2\x13\n\xe3\x0f\n\x10nginx-deployment\x12\x00\x1a\ndefault\" \x00*$d14b8d8d-fe05-4b22-b836-617758f31d592\x008\x01B\b\b\xe2W\xaa\x06\x10\x00Z\xf\n\x03app\x12\x05nginxb&\n!deployment.kubernetes.io/revision\x12\x011b\x9c\x03\n0kubectl.kubernetes.io/last-applied-configuration\x12\xe7\x02{\"apiVersion\":\"apps/v1\", \"kind\": \"Deployment\", \"metadata\": {\"annotations\": {}, \"labels\": {\"app\": \"nginx\"}, \"name\": \"nginx-deployment\", \"namespace\": \"default\"}, \"spec\": {\"replicas\": 3, \"selector\": {\"matchLabels\": {\"app\": \"nginx\"}}, \"template\": {\"metadata\": {\"labels\": {\"app\": \"nginx\"}}, \"spec\": {\"containers\": [{\"image\": \"nginx:1.14.2\", \"name\": \"nginx\", \"ports\": [{\"containerPort\": 80}]}]}}}}\n\x8a\x01\xec\x06\n\x19kubectl-client-side-apply\x12\x06Update\x1a\aaapps/v1\" \b\b\xe2W\xaa\x06\x10\x002\bFieldsV1:\xa7\x06\n\xa4\x06{\"f:metadata\": {\"f:annotations\": {\"\": {}}, \"f:kubectl.kubernetes.io/last-applied-configuration\": {}}, \"f:labels\": {\"\": {}}, \"f:app\": {}}, \"f:spec\": {\"f:progressDeadlineSeconds\": {}, \"f:replicas\": {}, \"f:revisionHistoryLimit\": {}, \"f:selector\": {}, \"f:strategy\": {\"f:rollingUpdate\": {\"\": {}}, \"f:maxSurge\": {}, \"f:maxUnavailable\": {}}, \"f:type\": {}}, \"f:template\": {\"f:metadata\": {\"f:labels\": {\"\": {}}, \"f:app\": {}}, \"f:spec\": {\"f:containers\": {\"k:{\"name\": \"nginx\"}\": {\"\": {}}, \"f:image\": {}, \"f:imagePullPolicy\": {}, \"f:name\": {}, \"f:ports\": {\"\": {}}, \"k:{\"containerPort\": 80, \"protocol\": \"TCP\"}\": {\"\": {}}, \"f:containerPort\": {}, \"f:protocol\": {}}, \"f:resources\": {}, \"f:terminationMessagePath\": {}, \"f:terminationMessagePolicy\": {}}, \"f:dnsPolicy\": {}, \"f:restartPolicy\": {}, \"f:schedulerName\": {}, \"f:securityContext\": {}, \"f:terminationGracePeriodSeconds\": {}}}}B\x00\x8a\x01\xc7\x04\n\x17kube-controller-manager\x12\x06Update\x1a\aaapps/v1\" \b\b\xe5W\xaa\x06\x10\x002\bFieldsV1:\xfe\x03\n\xfb\x03{\"f:metadata\": {\"f:annotations\": {\"f:deployment.kubernetes.io/revision\": {}}, \"f:status\": {\"f:availableReplicas\": {}, \"f:conditions\": {\"\": {}}, \"k:{\"type\": \"Available\"}\": {\"\": {}}, \"f:lastTransitionTime\": {}, \"f:lastUpdateTime\": {}, \"f:message\": {}, \"f:reason\": {}, \"f:status\": {}, \"f:type\": {}}, \"k:{\"type\": \"Progressing\"}\": {\"\": {}}, \"f:lastTransitionTime\": {}, \"f:lastUpdateTime\": {}, \"f:message\": {}, \"f:reason\": {}, \"f:status\": {}, \"f:type\": {}}, \"f:observedGeneration\": {}, \"f:readyReplicas\": {}, \"f:replicas\": {}, \"f:updatedReplicas\": {}}}}B\x06status\x12\x8b\x02\b\x03\x12\x0e\n\f\n\x03app\x12\x05nginx\x1a\xc4\x01\n\x1e\n\x00\x12\x00\x1a\x00\" \x00*\x002\x008\x00B\x00Z\xf\n\x03app\x12\x05nginx\x12\xa1\x01\x12\\n\x05nginx\x12\fnginx:1.14.2*\x002\r\n\x00\x10\x00\x18P\" \x03TCP*\x00B\x00j\x14/dev/termination-logrIfNotPresent\x80\x01\x00\x88\x01\x00\x90\x01\x00\xa2\x01\x04File\x1a\x06Always \x1e2\fcClusterFirstB\x00J\x00R\x00X\x00` \x00h\x00r\x00\x82\x01\x00\x8a\x01\x00\x9a\x01\x11default-scheduler\xc2\x01\x00\" \"\n\rRollingUpdate\x12\x16\n\t\b\x01\x10\x00\x1a\x0325%\x12\t\b\x01\x10\x00\x1a\x0325%(\x000n8\x00H\x08\x04\x1a\xfb\x01\b\x01\x10\x03\x18\x03 \x03(\x002e\n\tAvailab\x12\x04True\" \x18MinimumReplicasAvailable*$Deployment has minimum availability.2\b\b\xe5W\xaa\x06\x10\x00:\b\b\xe5W\xaa\x06\x10\x002\x85\x01\n\vProgressing\x12\x04True\" \x16NewReplicaSetAvailable*DReplicaSet \"nginx-deployment-cbdccf466\" has successfully progressed.2\b\b\xe5W\xaa\x06\x10\x00:\b\b\xe2W\xaa\x06\x10\x008\x03\x1a\x00\" \x00\" | created 2966 | mod 2968 | ver 2]
```

Now my watch has ended!

```
rev={main:2968 sub:0},   
value=[key "/registry/deployments/default/nginx-deployment" |  
      val "k8s\x00\n\x15\n\aapps/v1\x12\nDeployment\..." |  
      created 2966 |  
      mod 2968 |  
      ver 2]
```

Now my watch has ended!

```
rev={main:2968 sub:0},
```

```
value=[key "/registry/deployments/default/nginx-deployment" |  
      val "k8s\x00\n\x15\n\aapps/v1\x12\nDeployment\..." |  
      created 2966 |  
      mod 2968 |  
      ver 2]
```



Now my watch has ended!

```
rev={main:2968 sub:0},
```

```
value=[key "/registry/deployments/default/nginx-deployment" |  
      val "k8s\x00\n\x15\n\aapps/v1\x12\nDeployment\..." |  
      created 2966 |  
      mod 2968 |  
      ver 2]
```



Concluding ...

[illegible]

This is what blew my mind! 🤩

- The fact that entire kubernetes cluster is just coming down to this etcd dump.
- All my kubernetes resource objects (namespaces, deploy, pods, CRDs, ...) are all stored in a persistent data storage layer (such as etcd) and that is what I am seeing here in this dump.
- And so, my kubernetes cluster is nothing but a collection of YAML files with all this data stored as multiple revisions in etcd.

Inspiration!

A Journey into the Kubernetes ListerWatcher Rabbit Hole

Michael Gasch
@embano1 | www.mgasch.com
06-2021



https://youtu.be/Z9fwlzy0C_8

Thank you!

Please Scan for Feedback!

