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September 2021

Exam Updates



20% - Application Design and Build

- Define, build and modify container images
- Understand Jobs and CronJobs
- Understand multi-container Pod design patterns (e.g. sidecar, init and others)
- Utilize persistent and ephemeral volumes

20% - Application Deployment

- Use Kubernetes primitives to implement common deployment strategies (e.g. blue/green or canary)
- Understand Deployments and how to perform rolling updates
- Use the Helm package manager to deploy existing packages

15% - Application observability and maintenance

- Understand API deprecations
- Implement probes and health checks
- Use provided tools to monitor Kubernetes applications
- Utilize container logs
- Debugging in Kubernetes

25% - Application Environment, Configuration and Security

- Discover and use resources that extend Kubernetes (CRD)
- Understand authentication, authorization and admission control (CKA)
 - Understanding and defining resource requirements, limits and quotas
 - Understand ConfigMaps
 - Create & consume Secrets
 - Understand ServiceAccounts
 - Understand SecurityContexts

20% - Services & Networking

- Demonstrate basic understanding of NetworkPolicies
- Provide and troubleshoot access to applications via services
- Use Ingress rules to expose applications

13% - Core Concepts

- Understand Kubernetes API primitives
- Create and configure basic Pods

10% Multi-Container Pods

- Understand Multi-Container Pod design patterns (e.g. ambassador, adapter, sidecar)

20% - Pod Design

- Understand Deployments and how to perform rolling updates
- Understand Deployments and how to perform rollbacks
- Understand Jobs and CronJobs
- Understand how to use Labels, Selectors, and Annotations

8% - State Persistence

- Understand PersistentVolumeClaims for storage

18% - Configuration

- Understand ConfigMaps
- Understand SecurityContexts
- Define an application's resource requirements
- Create & consume Secrets
- Understand ServiceAccounts

18% - Observability

- Understand LivenessProbes and ReadinessProbes
- Understand container logging
- Understand how to monitor applications in Kubernetes
- Understand debugging in Kubernetes

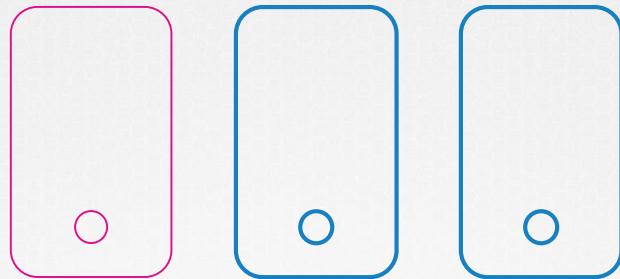
13% - Services & Networking

- Understand Services
- Demonstrate basic understanding of NetworkPolicies

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SECURITY PRIMITIVES

|Secure Hosts



- Password based authentication disabled
- SSH Key based authentication

Secure Kubernetes

kube-apiserver

Who can access?

What can they do?

I Authentication

Who can access?

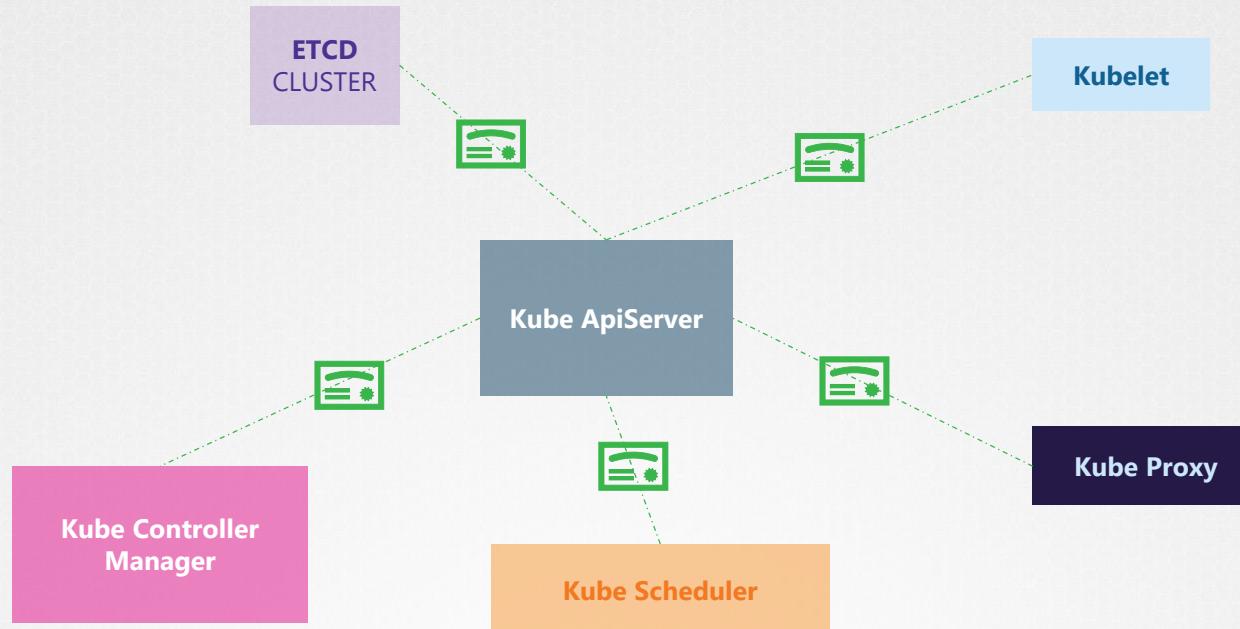
- Files – Username and Passwords
- Files – Username and Tokens
- Certificates
- External Authentication providers - LDAP
- Service Accounts

Authorization

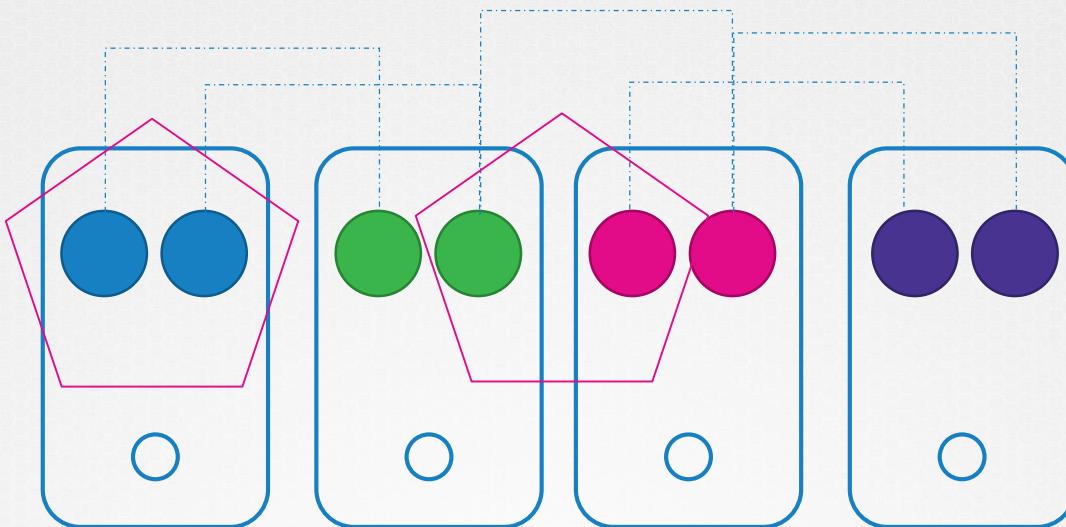
What can they do?

- RBAC Authorization
- ABAC Authorization
- Node Authorization
- Webhook Mode

TLS Certificates



| Network Policies



AUTHENTICATION

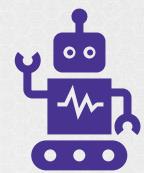


Admins

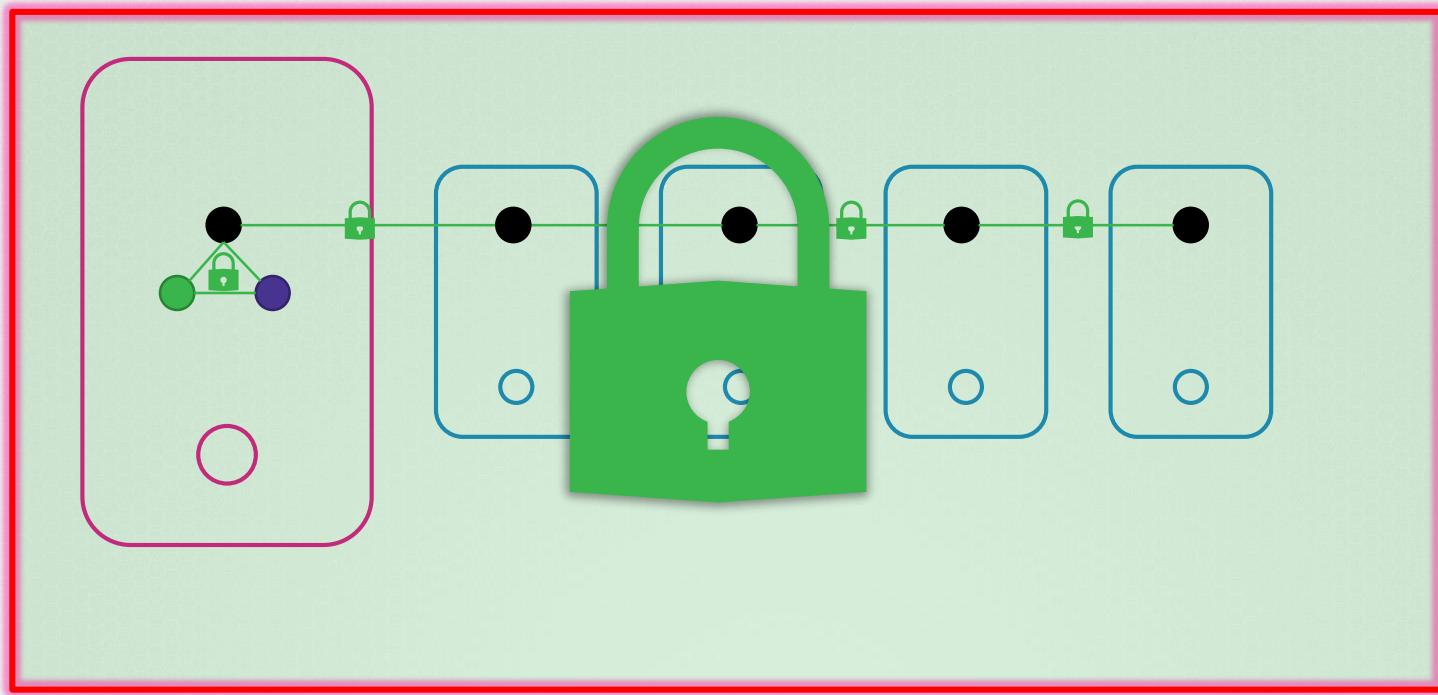
Developers



End Users



Bots



Accounts



Admins



Developers

User



Bots

Service Accounts

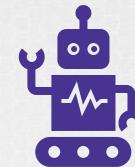
Accounts



Admins



Developers



Bots

User

```
▶ kubectl create user user1  
user1 Created
```



Service Accounts

```
▶ kubectl create serviceaccount sa1  
Service Account sa1 Created
```



```
▶ kubectl list users  
Username  
user1  
user2
```



```
▶ kubectl list serviceaccount  
ServiceAccount  
sa1
```



Accounts

User



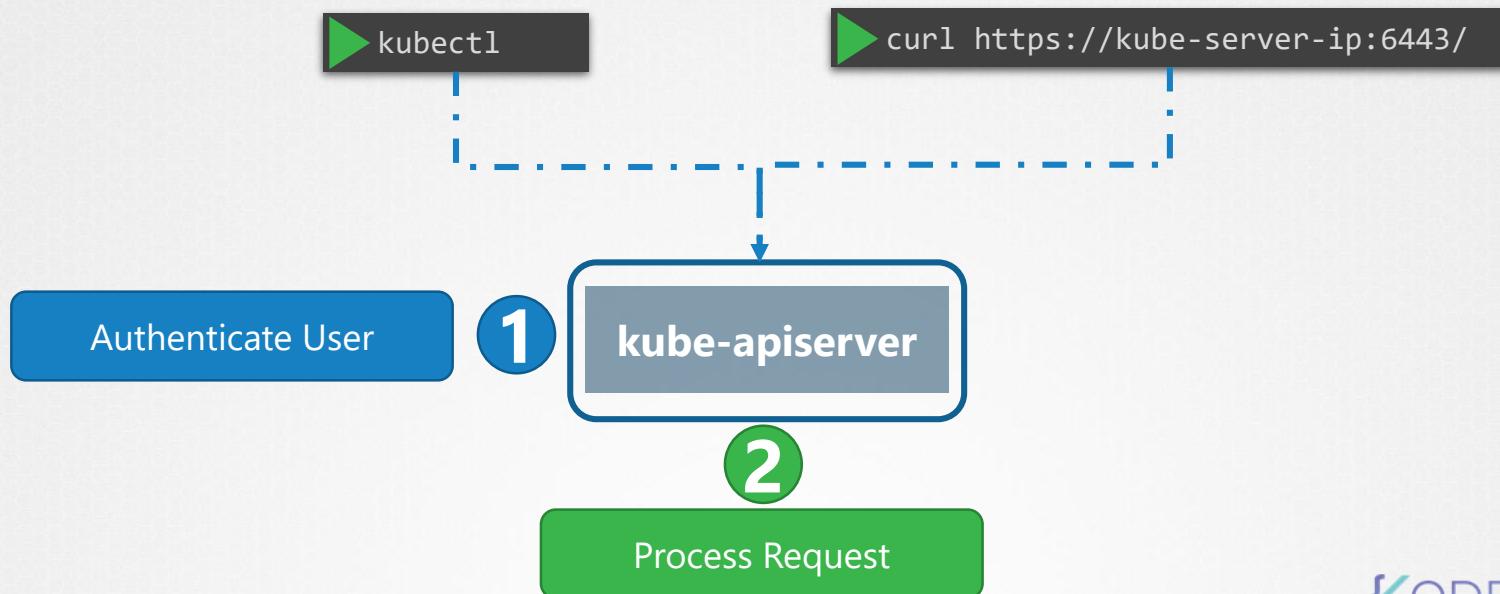
Admins



Developers

▶ kubectl

▶ curl https://kube-server-ip:6443/

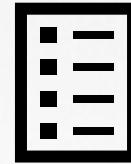
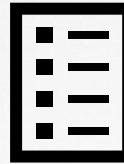


Auth Mechanisms

kube-apiserver

Static Password File

Static Token File



Auth Mechanisms - Basic

kube-apiserver

--basic-auth-file=user-details.csv

kube-apiserver.service

```
ExecStart=/usr/local/bin/kube-apiserver \
--advertise-address=${INTERNAL_IP} \
--allow-privileged=true \
--apiserver-count=3 \
--authorization-mode=Node,RBAC \
--bind-address=0.0.0.0 \
--enable-swagger-ui=true \
--etcd-servers=https://127.0.0.1:2379 \
--event-ttl=1h \
--runtime-config=api/all \
--service-cluster-ip-range=10.32.0.0/24 \
--service-node-port-range=30000-32767 \
--v=2
```

user-details.csv

```
password123,user1,u0001
password123,user2,u0002
password123,user3,u0003
password123,user4,u0004
password123,user5,u0005
```

Note: Showing fewer options for simplicity

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Kube-api Server Configuration

kube-apiserver.service

```
ExecStart=/usr/local/bin/kube-apiserver \
--advertise-address=${INTERNAL_IP} \
--allow-privileged=true \
--apiserver-count=3 \
--authorization-mode=Node,RBAC \
--bind-address=0.0.0.0 \
--enable-swagger-ui=true \
--etcd-servers=https://127.0.0.1:2379 \
--event-ttl=1h \
--runtime-config=api/all \
--service-cluster-ip-range=10.32.0.0/24 \
--service-node-port-range=30000-32767 \
--v=2
--basic-auth-file=user-details.csv
```

/etc/kubernetes/manifests/kube-apiserver.yaml

```
apiVersion: v1
kind: Pod
metadata:
  creationTimestamp: null
  name: kube-apiserver
  namespace: kube-system
spec:
  containers:
  - command:
    - kube-apiserver
    - --authorization-mode=Node, RBAC
    - --advertise-address=172.17.0.107
    - --allow-privileged=true
    - --enable-admission-plugins=NodeRestriction
    - --enable-bootstrap-token-auth=true
    image: k8s.gcr.io/kube-apiserver-amd64:v1.11.3
    name: kube-apiserver
```

Note: Showing fewer options for simplicity

Authenticate User

```
curl -v -k https://master-node-ip:6443/api/v1/pods -u "user1:password123"
```

```
{  
    "kind": "PodList",  
    "apiVersion": "v1",  
    "metadata": {  
        "selfLink": "/api/v1/pods",  
        "resourceVersion": "3594"  
    },  
    "items": [  
        {  
            "metadata": {  
                "name": "nginx-64f497f8fd-krkg6",  
                "generateName": "nginx-64f497f8fd-",  
                "namespace": "default",  
                "selfLink": "/api/v1/namespaces/default/pods/nginx-64f497f8fd-krkg6",  
                "uid": "77dd7dfb-2914-11e9-b468-0242ac11006b",  
                "resourceVersion": "3569",  
                "creationTimestamp": "2019-02-05T07:05:49Z",  
                "labels": {  
                    "pod-template-hash": "2090539498",  
                    "run": "nginx"  
                }  
            }  
        }  
    ]  
}
```

Auth Mechanisms - Basic

Static Password File

user-details.csv

```
password123,user1,u0001,group1  
password123,user2,u0002,group1  
password123,user3,u0003,group2  
password123,user4,u0004,group2  
password123,user5,u0005,group2
```

Static Token File

user-token-details.csv

```
KpjCVbI7rCFAHYPkByTIzRb7gu1cUc4B,user10,u0010,group1  
rJjncHmvtxHc6M1WQddhtvNyyhgTdxSC,user11,u0011,group1  
mjpOFIEiFOKL9toikaRNtt59ePtczZSq,user12,u0012,group2  
PG41IXhs7QjqwWkmBkvgGT9gloYUqZij,user13,u0013,group2
```

--token-auth-file=user-details.csv

```
curl -v -k https://master-node-ip:6443/api/v1/pods --header "Authorization: Bearer KpjCVbI7rCFAHYPkBzRb7gu1cUc4B"
```

Note: Showing fewer options for simplicity

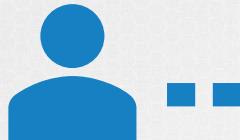
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| Note

- This is not a recommended authentication mechanism
- Consider volume mount while providing the auth file in a kubeadm setup
- Setup Role Based Authorization for the new users

Security KUBECONFIG





```
▶ curl https://my-kube-playground:6443/api/v1/pods \
  --key admin.key
  --cert admin.crt
  --cacert ca.crt
```

```
{
  "kind": "PodList",
  "apiVersion": "v1",
  "metadata": {
    "selfLink": "/api/v1/pods",
  },
  "items": []
}
```

```
▶ kubectl get pods
  --server my-kube-playground:6443
  --client-key admin.key
  --client-certificate admin.crt
  --certificate-authority ca.crt
```

```
No resources found.
```

```
$HOME/.kube/config
```

KubeConfig File

```
--server my-kube-playground:6443  
--client-key admin.key  
--client-certificate admin.crt  
--certificate-authority ca.crt
```

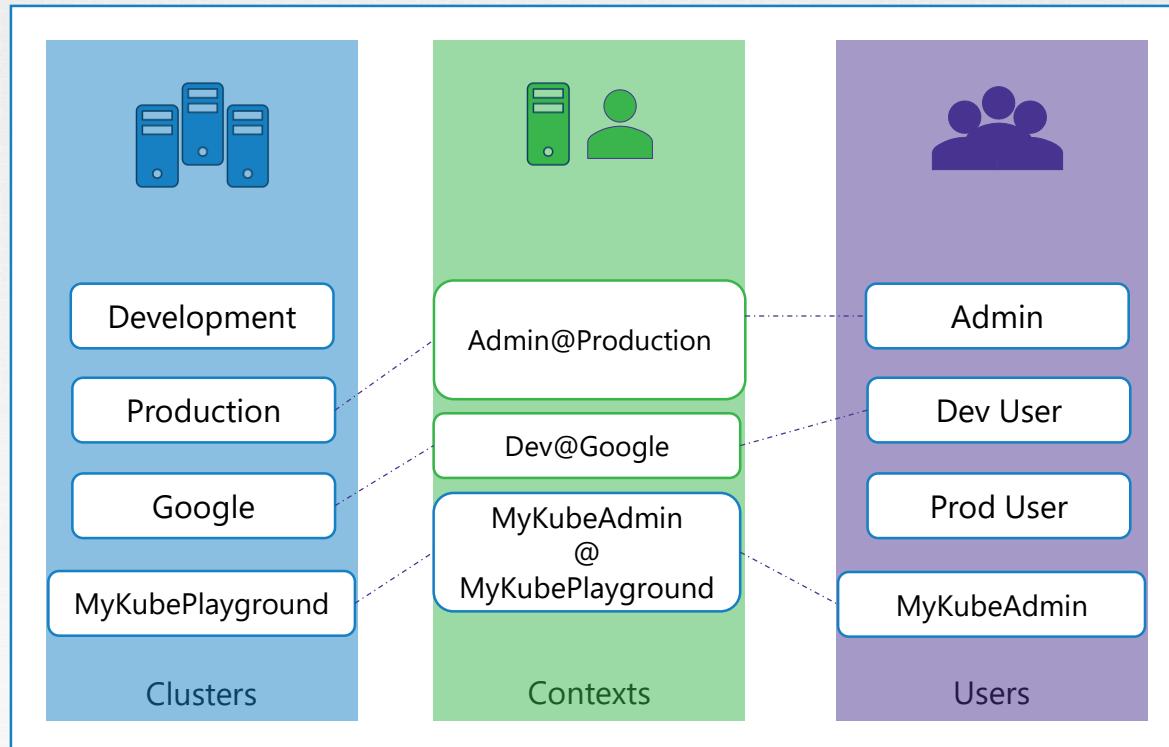
```
▶ kubectl get pods  
--kubeconfig config
```

```
No resources found.
```

| KubeConfig File

\$HOME/.kube/config

```
--server my-kube-playground:6443  
--client-key admin.key  
--client-certificate admin.crt  
--certificate-authority ca.crt
```



KubeConfig File

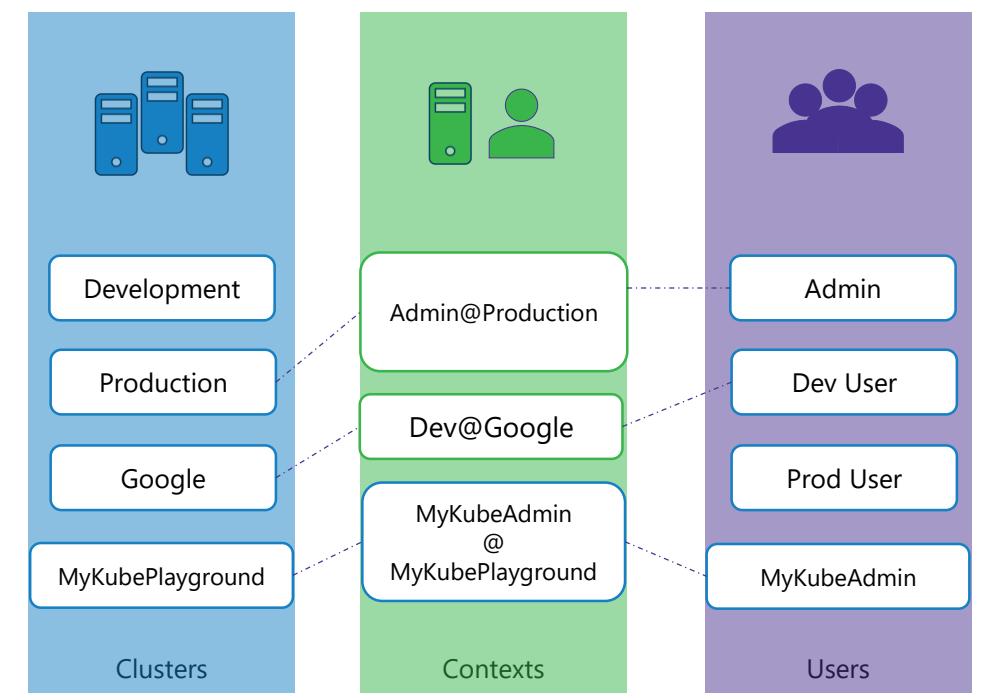
```
apiVersion: v1
kind: Config

clusters:
- name: my-kube-playground
  cluster:
    certificate-authority: ca.crt
    server: https://my-kube-playground:6443

contexts:
- name: my-kube-admin@my-kube-playground
  context:
    cluster:
    user:
      name: my-kube-admin

users:
- name: my-kube-admin
  user:
    client-certificate: admin.crt
    client-key: admin.key
```

\$HOME/.kube/config



KubeConfig File

```
apiVersion: v1
kind: Config

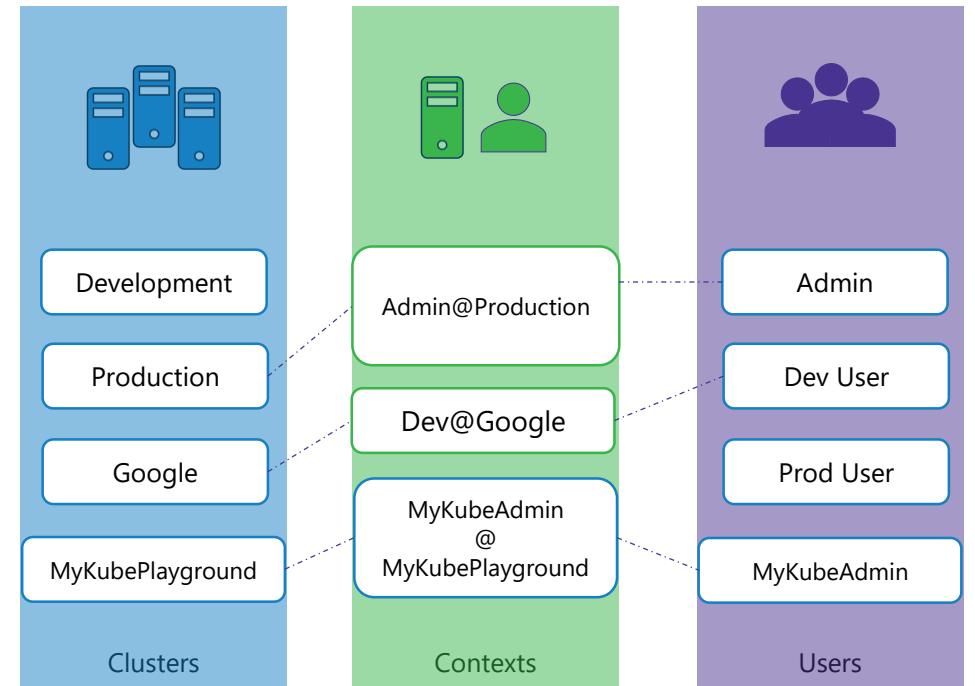
current-context: dev-user@google

clusters:
- name: my-kube-playground    (values hidden...)
- name: development
- name: production
- name: google

contexts:
- name: my-kube-admin@my-kube-playground
- name: dev-user@google
- name: prod-user@production

users:
- name: my-kube-admin
- name: admin
- name: dev-user
- name: prod-user
```

\$HOME/.kube/config



| Kubectl config

```
▶ kubectl config view
```

```
apiVersion: v1

kind: Config
current-context: kubernetes-admin@kubernetes

clusters:
- cluster:
  certificate-authority-data: REDACTED
  server: https://172.17.0.5:6443
  name: kubernetes

contexts:
- context:
  cluster: kubernetes
  user: kubernetes-admin
  name: kubernetes-admin@kubernetes

users:
- name: kubernetes-admin
  user:
    client-certificate-data: REDACTED
    client-key-data: REDACTED
```

```
▶ kubectl config view -kubeconfig=my-custom-config
```

```
apiVersion: v1

kind: Config
current-context: my-kube-admin@my-kube-playground

clusters:
- name: my-kube-playground
- name: development
- name: production

contexts:
- name: my-kube-admin@my-kube-playground
- Name: prod-user@production

users:
- name: my-kube-admin
- name: prod-user
```

| Kubectl config

```
▶ kubectl config view
```

```
apiVersion: v1

kind: Config
current-context: my-kube-admin@my-kube-playground

clusters:
- name: my-kube-playground
- name: development
- name: production

contexts:
- name: my-kube-admin@my-kube-playground
- Name: prod-user@production

users:
- name: my-kube-admin
- name: prod-user
```

```
▶ kubectl config use-context prod-user@production
```

```
apiVersion: v1

kind: Config
current-context: prod-user@production

clusters:
- name: my-kube-playground
- name: development
- name: production

contexts:
- name: my-kube-admin@my-kube-playground
- Name: prod-user@production

users:
- name: my-kube-admin
- name: prod-user
```

| Kubectl config

```
▶ kubectl config -h
```

Available Commands:

current-context	Displays the current-context
delete-cluster	Delete the specified cluster from the kubeconfig
delete-context	Delete the specified context from the kubeconfig
get-clusters	Display clusters defined in the kubeconfig
get-contexts	Describe one or many contexts
rename-context	Renames a context from the kubeconfig file.
set	Sets an individual value in a kubeconfig file
set-cluster	Sets a cluster entry in kubeconfig
set-context	Sets a context entry in kubeconfig
set-credentials	Sets a user entry in kubeconfig
unset	Unsets an individual value in a kubeconfig file
use-context	Sets the current-context in a kubeconfig file
view	Display merged kubeconfig settings or a specified kubeconfig file

Namespaces

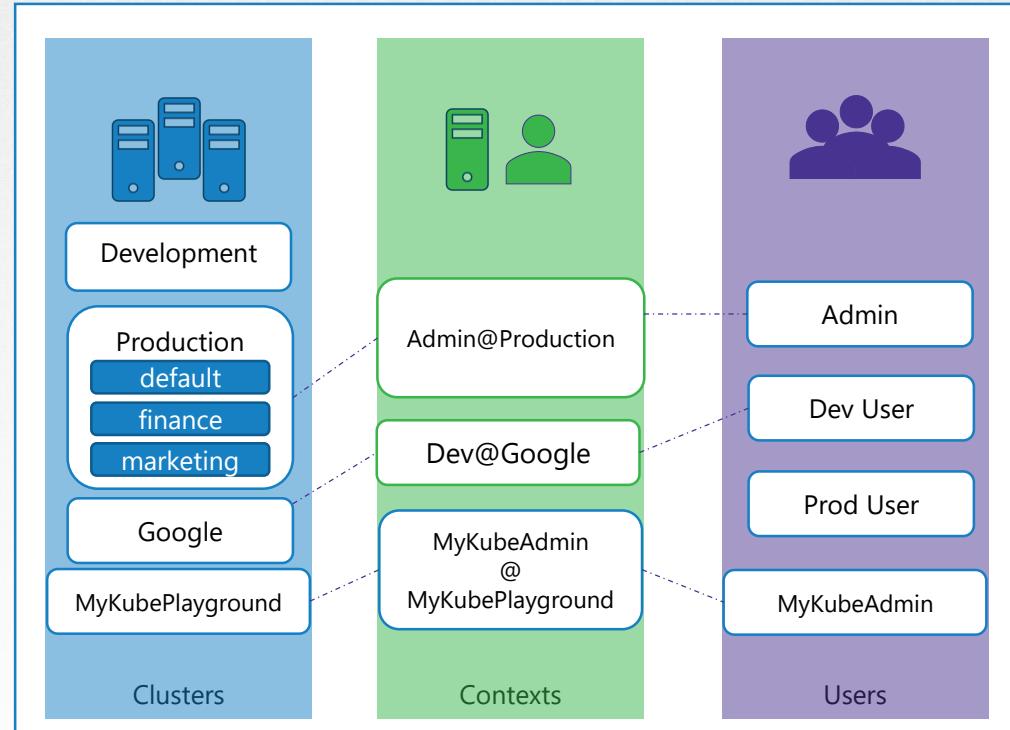
```
apiVersion: v1
kind: Config

clusters:
- name: production
  cluster:
    certificate-authority: ca.crt
    server: https://172.17.0.51:6443

contexts:
- name: admin@production
  context:
    cluster: production
    user: admin
    namespace: finance

users:
- name: admin
  user:
    client-certificate: admin.crt
    client-key: admin.key
```

\$HOME/.kube/config



Certificates in KubeConfig

```
apiVersion: v1
kind: Config

clusters:
- name: production
  cluster:
    certificate-authority: /etc/kubernetes/pki/ca.crt
    server: https://172.17.0.51:6443

contexts:
- name: admin@production
  context:
    cluster: production
    user: admin
    namespace: finance

users:
- name: admin
  user:
    client-certificate: /etc/kubernetes/pki/users/admin.crt
    client-key: /etc/kubernetes/pki/users/admin.key
```

Certificates in KubeConfig

```
apiVersion: v1
kind: Config

clusters:
- name: production
  cluster:
    certificate-authority: /etc/kubernetes/pki/ca.crt

    certificate-authority-data:
```

-----BEGIN CERTIFICATE-----
MIICWDCCAUAQAwEzERMA8GA1UEAwIBmV3LXVzZXIwggEiMA0G
AQAA4IBDwAsggEKAOIBAQDO0WJW+DXsAJSIrjpNo5vRIBplnzg+6
lFc27t+1eEnON5Muq99NevmMEOnrDUO/thyVqP2w2XNIDRXjYyF40
y3BihB93MJ7oql3UTvZ8TELqyaDknR1/jv/SxgXkok0ABUTpWMx4
IF5nxAttMVkDPQ7Nb ezRG43b+QW1VGR/z6DWOfJnbfez0taAydGLT
EcCXAwqChjBLkz2BHP R4J89D6Xb8k39pu6jpyngV6uP0tIb0zpqnW
j2qEL+hZEWkkFz801NNtyT5LxMqENDCnIgwC4GZiRGbrAgMBAAGgA
9w0BAQsFAAOCAQEAS9is6C1uxTuF5BBYSU7QFQHuza1NxAdYsaORR
hOK4a2zyNy i4400ijyaD6tUW8DSxkr8BLK8Kg3srRetJql5rLZy9
P9NL+aDRSxROVsQxBaB2nWeYpM5cJ5TF531esNSNMLQ2++RMnjDQJ7
Wr2EUM6UawzykrdHImwTv2mlMY0R+DntV1Yie+0H9/YElt+FSGjh
413E/y3qL71WfAcuH3OsVpUUnQISMdQs0qWCsbE56CC5DhPGZIpUl
vwQ07jG+hpknxmuFAeXxgUwodAlaJ7ju/TDIcw==
-----END CERTIFICATE-----

Private Repository

```
▶ docker login private-registry.io
```

```
Login with your Docker ID to push and pull images from Docker Hub. If you don't have a Docker ID, head over to  
https://hub.docker.com to create one.
```

```
Username: registry-user
```

```
Password:
```

```
WARNING! Your password will be stored unencrypted in /home/vagrant/.docker/config.json.
```

```
Login Succeeded
```

```
▶ docker run private-registry.io/apps/internal-app
```

Private Repository

```
▶ docker login private-registry.io
```

```
▶ docker run private-registry.io/apps/internal-app
```

nginx-pod.yaml

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
spec:
  containers:
  - name: nginx
    image:
  imagePullSecrets:
  - name: regcred
```

```
▶ kubectl create secret docker-registry regcred \
  --docker-server= private-registry.io \
  --docker-username= registry-user \
  --docker-password= registry-password \
  --docker-email= registry-user@org.com
```


API Groups

Pre-Requisite

curl https://kube-master:6443/version

```
{  
  "major": "1",  
  "minor": "13",  
  "gitVersion": "v1.13.0",  
  "gitCommit": "ddf47ac13c1a9483ea035a79cd7c10005ff21a6d",  
  "gitTreeState": "clean",  
  "buildDate": "2018-12-03T20:56:12Z",  
  "goVersion": "go1.11.2",  
  "compiler": "gc",  
  "platform": "linux/amd64"  
}
```

curl https://kube-master:6443/api/v1/pods

```
{  
  "kind": "PodList",  
  "apiVersion": "v1",  
  "metadata": {  
    "selfLink": "/api/v1/pods",  
    "resourceVersion": "153068"  
  },  
  "items": [  
    {  
      "metadata": {  
        "name": "nginx-5c7588df-ghsbd",  
        "generateName": "nginx-5c7588df-",  
        "namespace": "default",  
        "creationTimestamp": "2019-03-20T10:57:48Z",  
        "labels": {  
          "app": "nginx",  
          "pod-template-hash": "5c7588df"  
        },  
        "ownerReferences": [  
          {  
            "apiVersion": "apps/v1",  
            "kind": "ReplicaSet",  
            "name": "nginx-5c7588df",  
            "uid": "398ce179-4af9-11e9-beb6-020d3114c7a7",  
            "controller": true,  
            "blockOwnerDeletion": true  
          }  
        ]  
      },  
    }  
  ],  
  "version": "v1",  
  "serverAddressByClient": "https://kube-master:6443",  
  "allowWatchOnDelete": true  
}
```

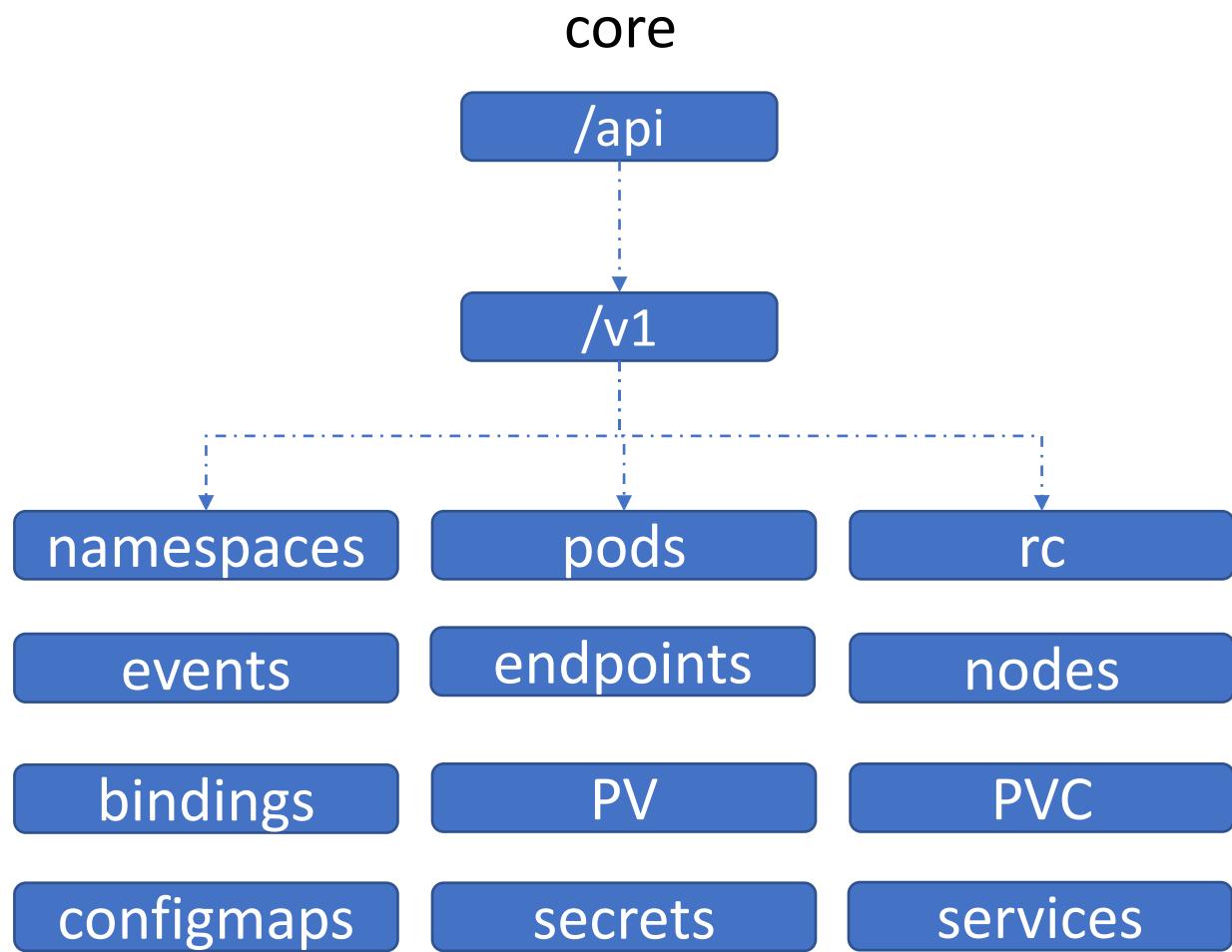
[/metrics](#)[/healthz](#)[/version](#)[/api](#)[/apis](#)[/logs](#)

core

named

/api

/apis



named

/apis

API Groups

/apps /extensions /networking.k8s.io /storage.k8s.io /authentication.k8s.io /certificates.k8s.io

/v1

/deployments

/replicasets

/statefulsets

/v1

/networkpolicies

/v1

/certificatesigningrequests

Resources

list

get

create

delete

update

watch

Verbs

Pod v1 core

kubectl example

curl example

Group

Version

core

v1

⚠ Warning:

It is recommended that users create Pods only through a Controller, and not directly. See Controllers: Deploy

ⓘ Appears In:

- PodList [core/v1]

Field

Description

apiVersion

APIVersion defines the versioned schema of this representation of an object. Servers should c

string

https://git.k8s.io/community/contributors/devel/api-conventions.md#resources

Overview

WORKLOADS APIs

Container v1 core

CronJob v1beta1 batch

DaemonSet v1 apps

Deployment v1 apps

Job v1 batch

Pod v1 core

Write Operations

Read Operations

Status Operations

Proxy Operations

Misc Operations

ReplicaSet v1 apps

ReplicationController v1 core

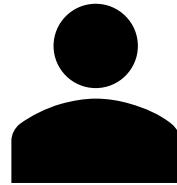
StatefulSet v1 apps

curl http://localhost:6443 -k

```
{  
  "paths": [  
    "/api",  
    "/api/v1",  
    "/apis",  
    "/apis/",  
    "/healthz",  
    "/logs",  
    "/metrics",  
    "/openapi/v2",  
    "/swagger-2.0.0.json",
```

```
curl http://localhost:6443/apis -k | grep "name"
```

```
"name": "extensions",
"name": "apps",
"name": "events.k8s.io",
"name": "authentication.k8s.io",
"name": "authorization.k8s.io",
"name": "autoscaling",
"name": "batch",
"name": "certificates.k8s.io",
"name": "networking.k8s.io",
"name": "policy",
"name": "rbac.authorization.k8s.io",
"name": "storage.k8s.io",
"name": "admissionregistration.k8s.io",
"name": "apiextensions.k8s.io",
"name": "scheduling.k8s.io",
```



Kube API Server



```
▶ curl http://localhost:6443 -k
{
    "kind": "Status",
    "apiVersion": "v1",
    "metadata": {

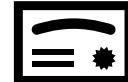
    },
    "status": "Failure",
    "message": "forbidden: User \\"system:anonymous\\" cannot get path \"/\"",
    "reason": "Forbidden",
    "details": {

    },
    "code": 403
}
```

```
▶ curl http://localhost:6443 -k
--key admin.key
--cert admin.crt
--cacert ca.crt
```

```
{
    "paths": [
        "/api",
        "/api/v1",
        "/apis",
        "/apis/",
        "/healthz",
        "/logs",
        "/metrics"
    ]
}
```

kubectl proxy



```
▶ kubectl proxy
Starting to serve on 127.0.0.1:8001
```

```
▶ curl http://localhost:8001 -k
{
  "paths": [
    "/api",
    "/api/v1",
    "/apis",
    "/apis/",
    "/healthz",
    "/logs",
    "/metrics",
    "/openapi/v2",
    "/swagger-2.0.0.json",
```

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API Versions



API

named

/apis

API Groups

/apps /extensions /networking.k8s.io /storage.k8s.io /authentication.k8s.io /certificates.k8s.io

/v1

/v1

/v1

Versions

/deployments

/replicasets

Resources

list

get

create

delete

update

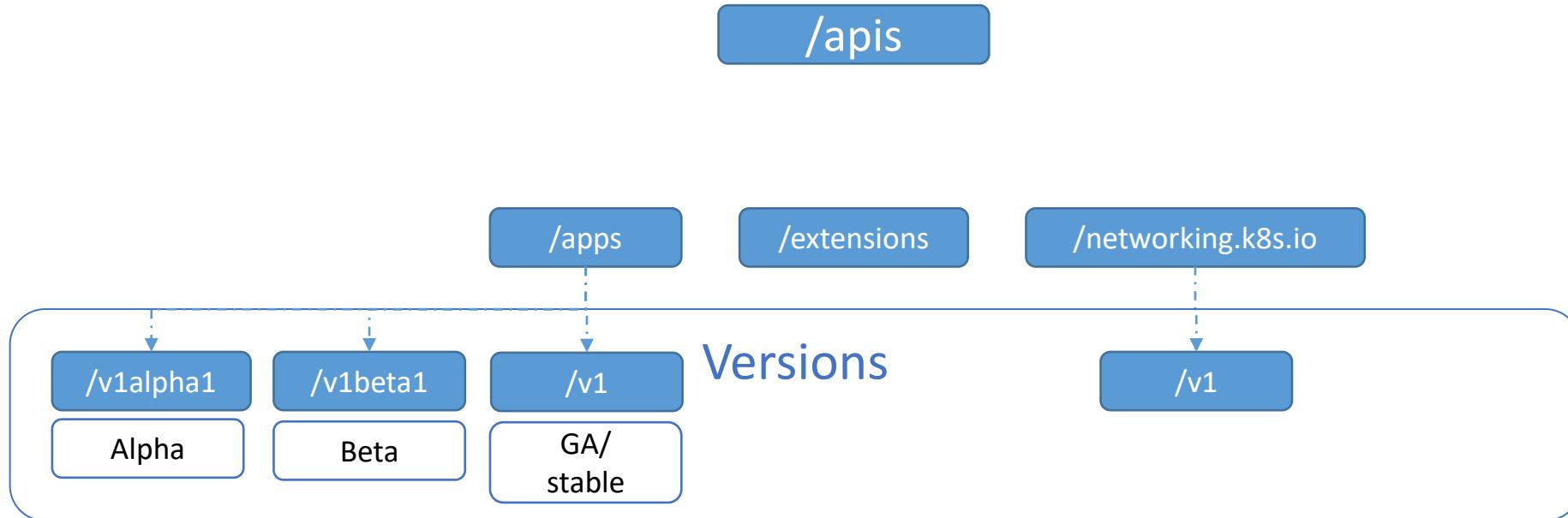
watch

/networkpolicies

/certificatesigningrequests

Verbs

API



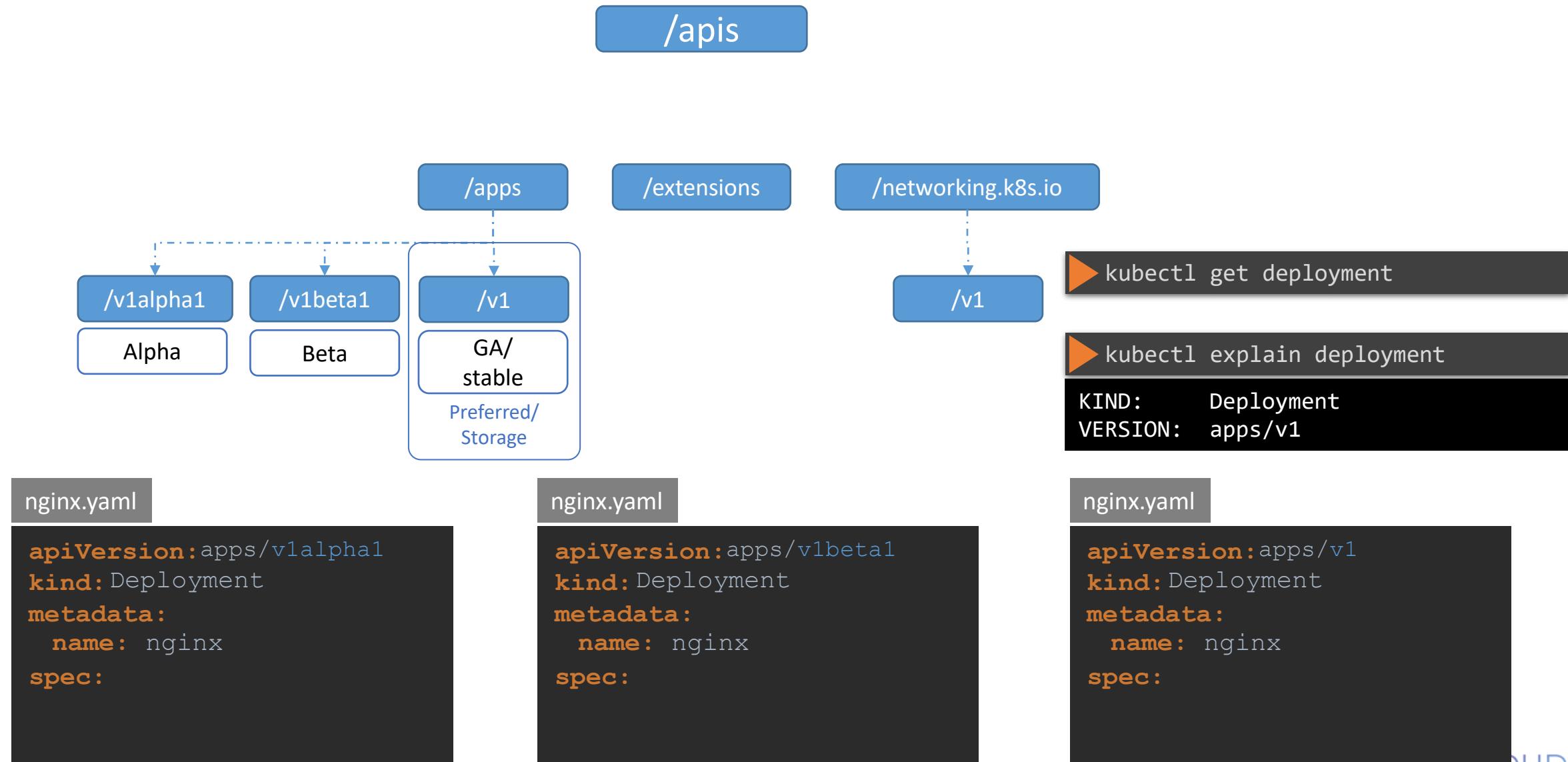
API Groups

API

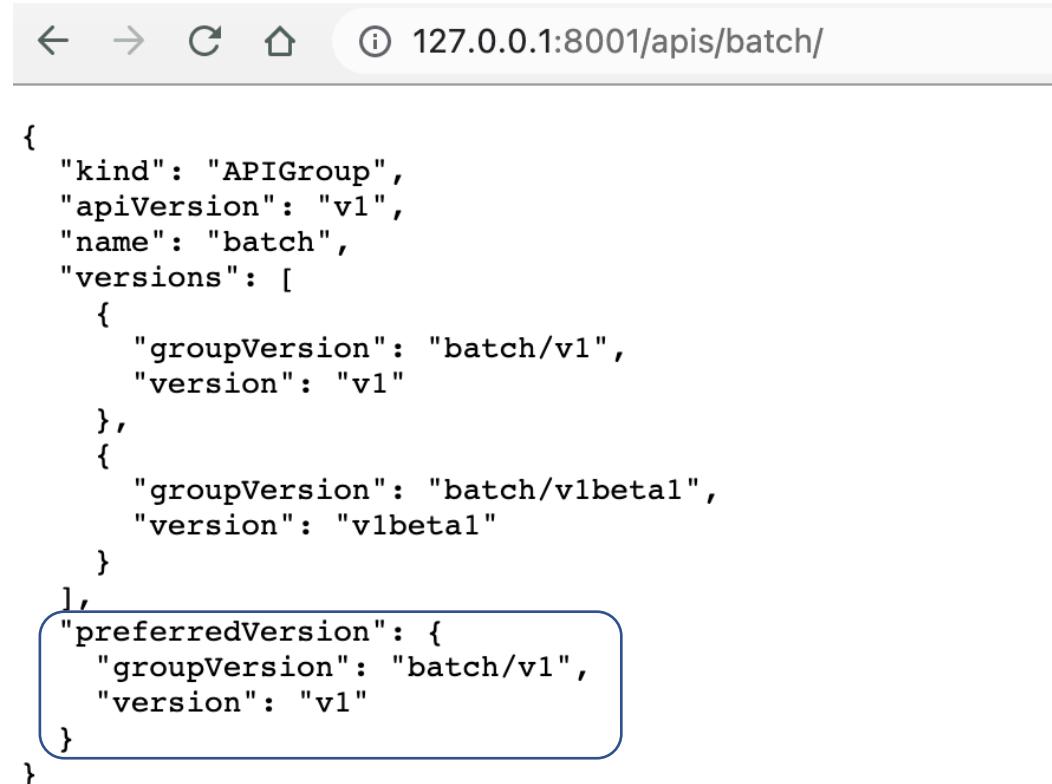
The API Groups and their versions are summarized in the following table.

	Group	Version	
	admissionregistration.k8s.io	v1	server.k8s.io
	apiextensions.k8s.io	v1	
	apiregistration.k8s.io	v1	
	/v1alpha1		pha1
Alpha	apps	v1	er.k8s.io/v1alpha1
	authentication.k8s.io	v1	
	authorization.k8s.io	v1	
	autoscaling	v1, v2beta2, v2beta1	
	batch	v1, v1beta1	
	certificates.k8s.io	v1	
Version Name	coordination.k8s.io	v1	
	core	v1	
	discovery.k8s.io	v1, v1beta1	
Enabled	events.k8s.io	v1, v1beta1	sts
	flowcontrol.apiserver.k8s.io	v1beta1	
	internal.apiserver.k8s.io	v1alpha1	
Tests	networking.k8s.io	v1	
	node.k8s.io	v1, v1beta1, v1alpha1	any
	policy	v1, v1beta1	
Reliability	rbac.authorization.k8s.io	v1, v1alpha1	
	scheduling.k8s.io	v1, v1alpha1	
Support	storage.k8s.io	v1, v1beta1, v1alpha1	
Audience			

API



Preferred Version



A screenshot of a web browser window displaying a JSON response from a Kubernetes API endpoint. The URL in the address bar is `127.0.0.1:8001/apis/batch/`. The JSON content shows the configuration for the `batch` API group:

```
{  
  "kind": "APIGroup",  
  "apiVersion": "v1",  
  "name": "batch",  
  "versions": [  
    {  
      "groupVersion": "batch/v1",  
      "version": "v1"  
    },  
    {  
      "groupVersion": "batch/v1beta1",  
      "version": "v1beta1"  
    }  
,  
    {  
      "preferredVersion": {  
        "groupVersion": "batch/v1",  
        "version": "v1"  
      }  
    }  
]
```

The `preferredVersion` field is highlighted with a blue rounded rectangle.

Storage Version

```
▶ ETCDCTL_API=3 etcdctl  
--endpoints=https://[127.0.0.1]:2379  
--cacert=/etc/kubernetes/pki/etcd/ca.crt  
--cert=/etc/kubernetes/pki/etcd/server.crt  
--key=/etc/kubernetes/pki/etcd/server.key  
get "/registry/deployments/default/blue" --print-value-only
```

k8s

apps/v1
Deployment

blue default "*\$cf8dcd55-8819-4be2-85e7-bb71665c2ddf2ZB
successfully progressed" 2

Enabling/Disabling API groups

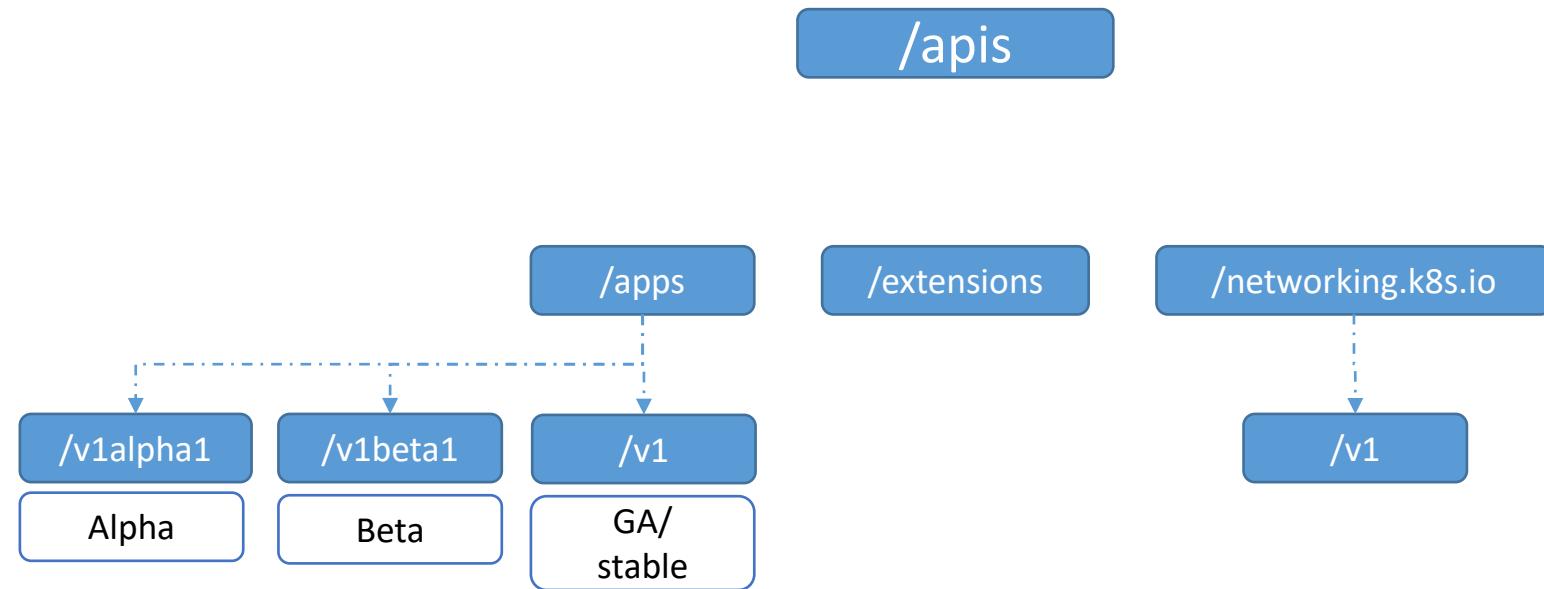
```
ExecStart=/usr/local/bin/kube-apiserver \
--advertise-address=${INTERNAL_IP} \
--allow-privileged=true \
--apiserver-count=3 \
--authorization-mode=Node,RBAC \
--bind-address=0.0.0.0 \
--enable-swagger-ui=true \
--etcd-cafile=/var/lib/kubernetes/ca.pem \
--etcd-certfile=/var/lib/kubernetes/apiserver-etcd-client.crt \
--etcd-keyfile=/var/lib/kubernetes/apiserver-etcd-client.key \
--etcd-servers=https://127.0.0.1:2379 \
--event-ttl=1h \
--kubelet-certificate-authority=/var/lib/kubernetes/ca.pem \
--kubelet-client-certificate=/var/lib/kubernetes/apiserver-etcd-client.crt \
--kubelet-client-key=/var/lib/kubernetes/apiserver-etcd-client.key \
--kubelet-https=true \
--runtime-config=batch/v2alpha1 \
--service-account-key-file=/var/lib/kubernetes/service-account.pem \
--service-cluster-ip-range=10.32.0.0/24 \
--service-node-port-range=30000-32767 \
--client-ca-file=/var/lib/kubernetes/ca.pem \
--tls-cert-file=/var/lib/kubernetes/apiserver.crt \
--tls-private-key-file=/var/lib/kubernetes/apiserver.key \
--v=2
```

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API Deprecations



API



API

/apis

/kodekloud.com

/v1alpha1

/course

/webinar

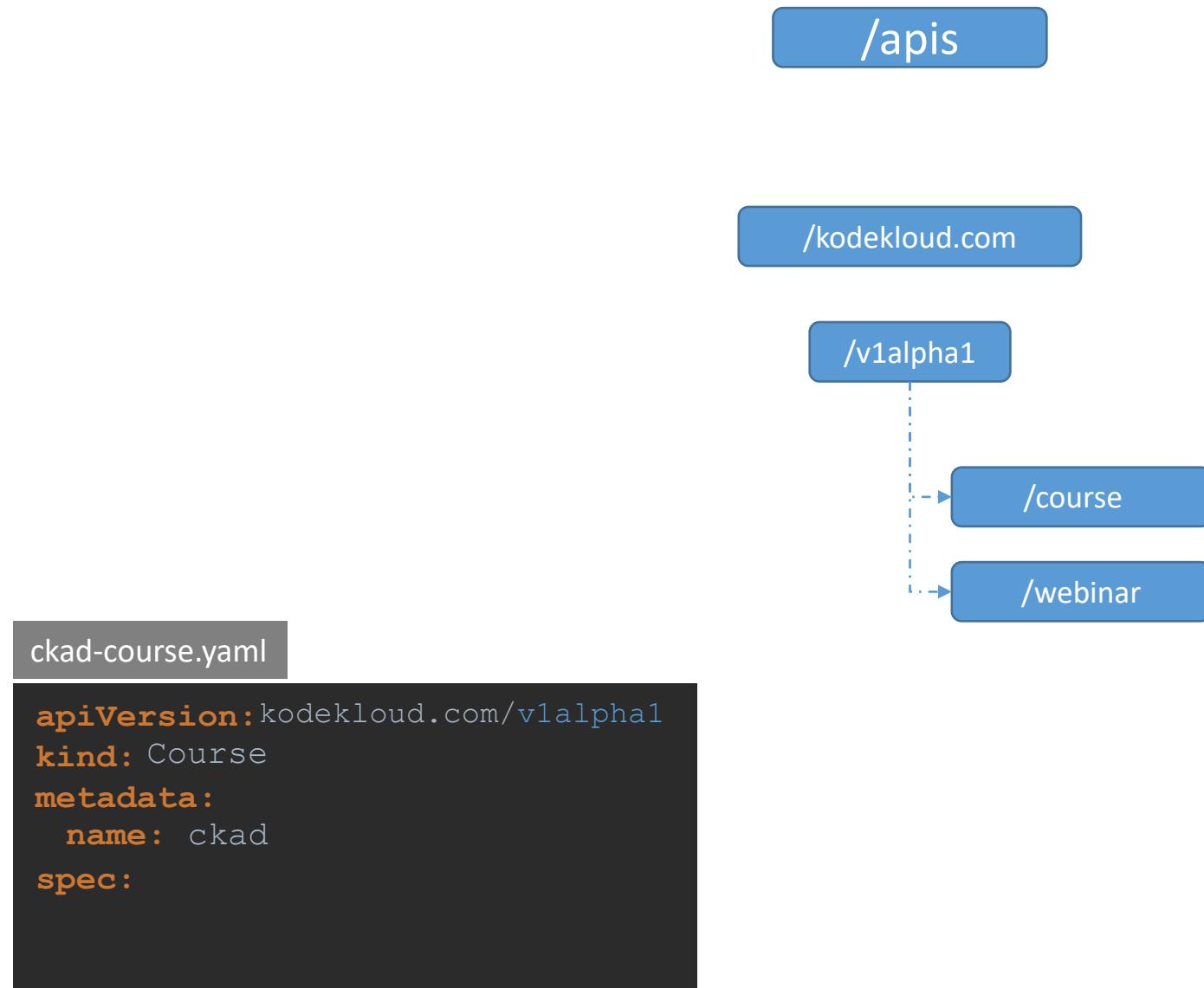
ckad-course.yaml

```
apiVersion: kodekloud.com/v1alpha1
kind: Course
metadata:
  name: ckad
spec:
```

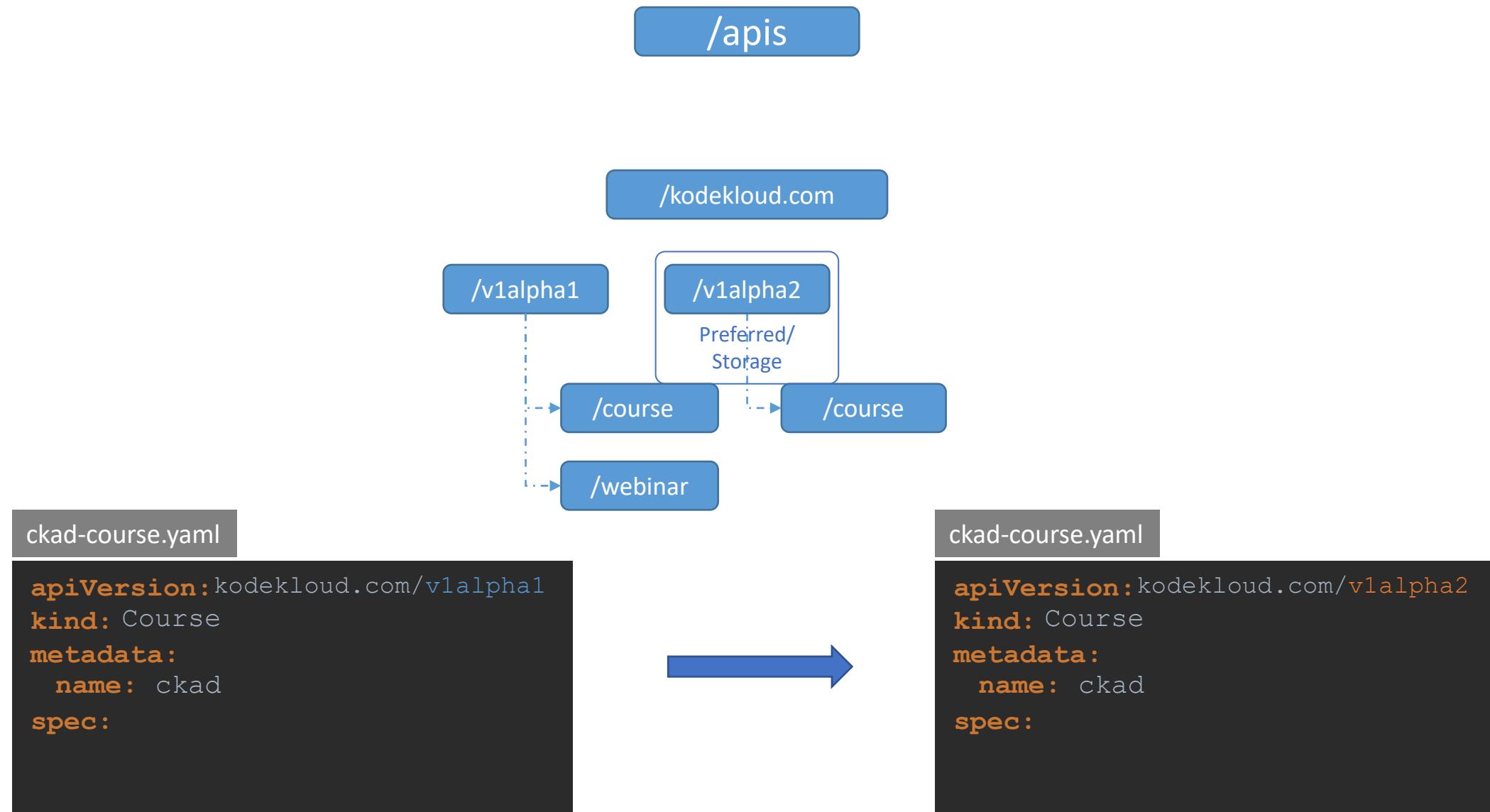
API Deprecation Policy Rule #1

API elements may only be removed by incrementing the version of the API group.

API



API



API Deprecation Policy Rule #2

API objects must be able to round-trip between API versions in a given release without information loss, with the exception of whole REST resources that do not exist in some versions.

ckad-course.yaml

```
apiVersion: kodekloud.com/v1alpha1
kind: Course
metadata:
  name: ckad
spec:
  type: video
duration:
```

ckad-course.yaml

```
apiVersion: kodekloud.com/v1alpha2
kind: Course
metadata:
  name: ckad
spec:
  type: video
duration:
```

ckad-course.yaml

```
apiVersion: kodekloud.com/v1alpha1
kind: Course
metadata:
  name: ckad
spec:
  type: video
duration:
```



API

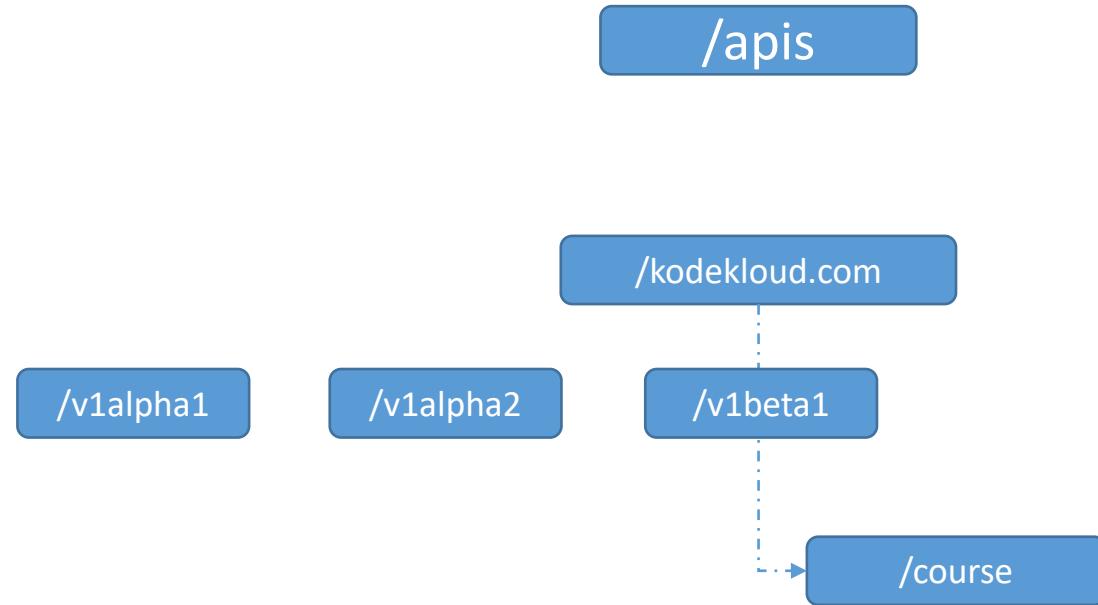
/apis

/kodekloud.com

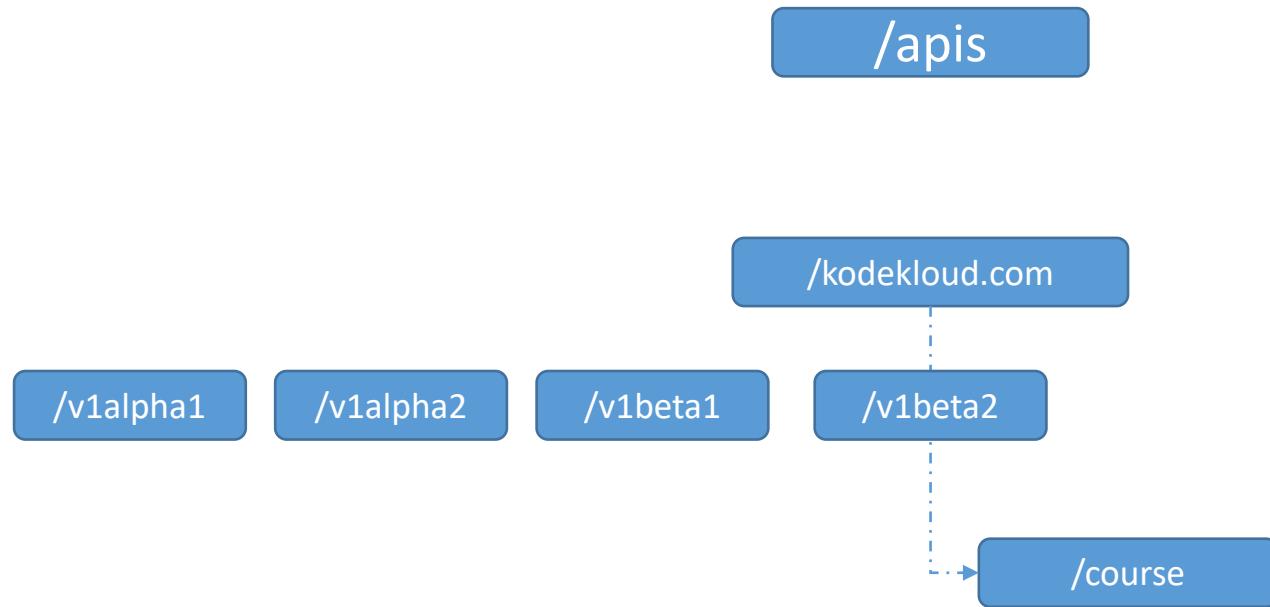
/v1alpha1

/v1alpha2

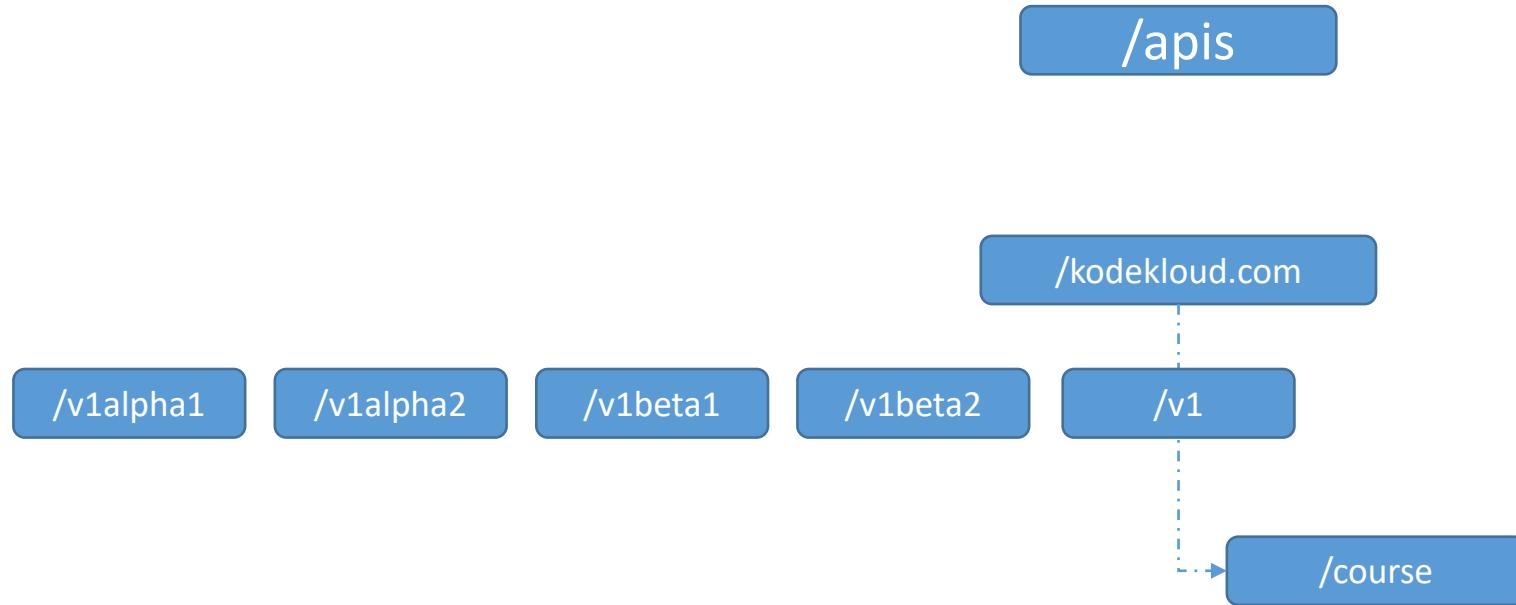
API



API



API



API

API Group
Version

Preferred/
storage
version

/v1alpha1

x

Kubernetes
Release
Version

API

API Group
Version

Preferred/
storage
version

Kubernetes
Release
Version

/v1alpha2

/v1alpha1

$X + 1$

X

API Deprecation Policy Rule #4a

Other than the most recent API versions in each track, older API versions must be supported after their announced deprecation for a duration of no less than:

- **GA: 12 months or 3 releases (whichever is longer)**
- **Beta: 9 months or 3 releases (whichever is longer)**
- **Alpha: 0 releases**

API

API Group
Version

Preferred/
storage
version

/v1alpha2

/v1alpha1

X + 1

X

Kubernetes
Release
Version

Changelog since v1.12.0

Action Required

- kube-apiserver: the deprecated `--etcd-quorum-read` flag has been removed, and quorum reads now always read data from etcd. ([#69527](#), [@liggitt](#))
- Moved `staging/src/k8s.io/client-go/tools/bootstrap` to `staging/src/k8s...` ([#67356](#), [@yliaog](#))
- [action required] kubeadm: The `v1alpha2` config API has been removed. ([#69055](#), [@fabriziof](#))
 - Please convert your `v1alpha2` configuration files to `v1alpha3` using the `kubeadm config migrate` command of kubeadm v1.12.x

API

API Group
Version

Preferred/
storage
version

Kubernetes
Release
Version

/v1beta1

$X + 2$

/v1alpha2

$X + 1$

/v1alpha1

X

API Deprecation Policy Rule #4a

Other than the most recent API versions in each track, older API versions must be supported after their announced deprecation for a duration of no less than:

- **GA: 12 months or 3 releases (whichever is longer)**
- **Beta: 9 months or 3 releases (whichever is longer)**
- **Alpha: 0 releases**

API

API Group
Version

Preferred/
storage
version

Kubernetes
Release
Version

/v1beta1

$X + 2$

/v1alpha2

$X + 1$

/v1alpha1

X

API

API Group
Version

Preferred/
storage
version

Kubernetes
Release
Version

/v1beta2

X + 3

/v1beta1

X + 2

/v1alpha2

X + 1

/v1alpha1

X

API

API Group
Version

/v1beta2

Preferred/
storage
version

/v1beta1

(Deprecated)

/v1beta1

/v1alpha2

/v1alpha1

X + 3

X + 2

X + 1

X

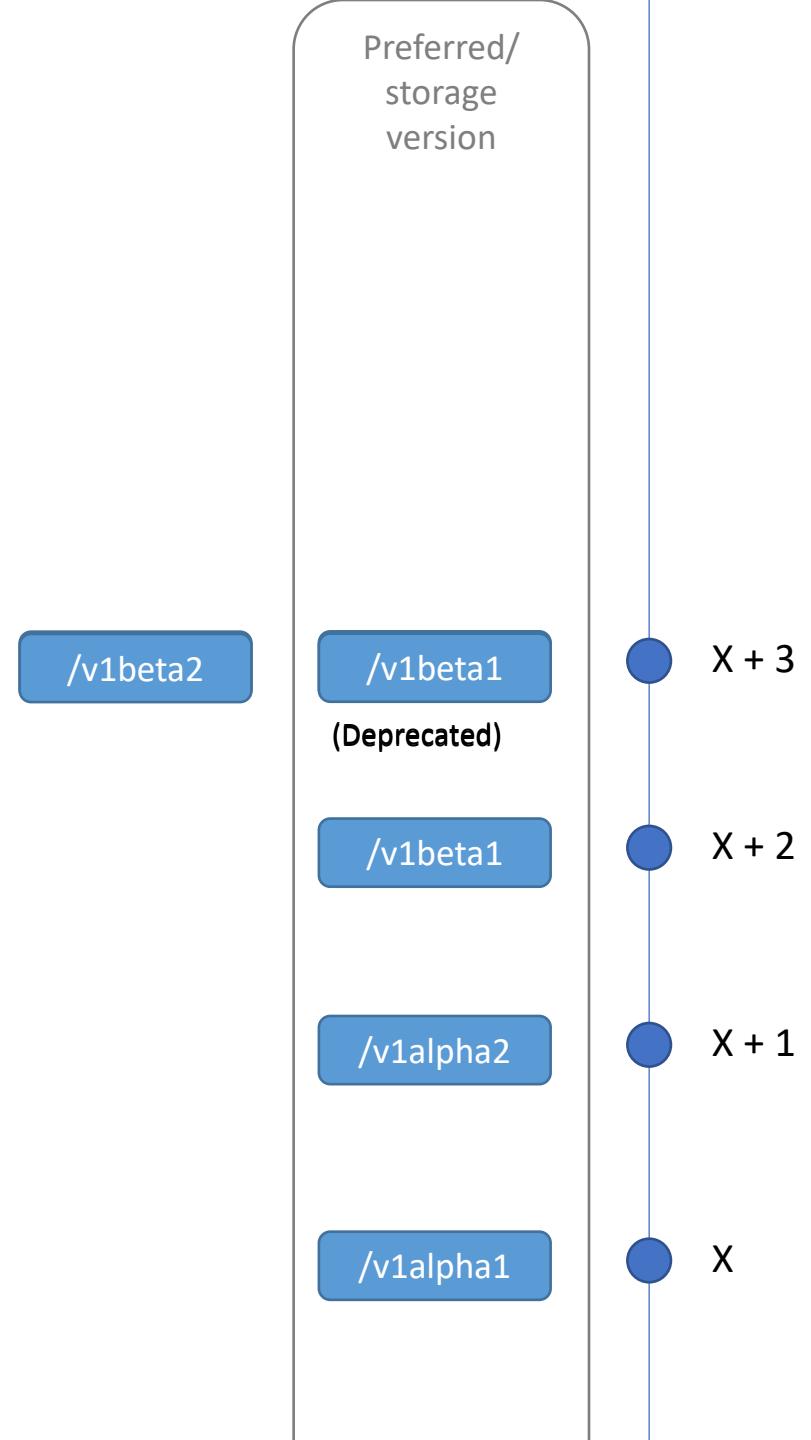
Kubernetes
Release
Version

API Deprecation Policy Rule #4b

**The "preferred" API version and the "storage version" for a given group
may not advance until after a release has been made that supports
both the new version and the previous version**

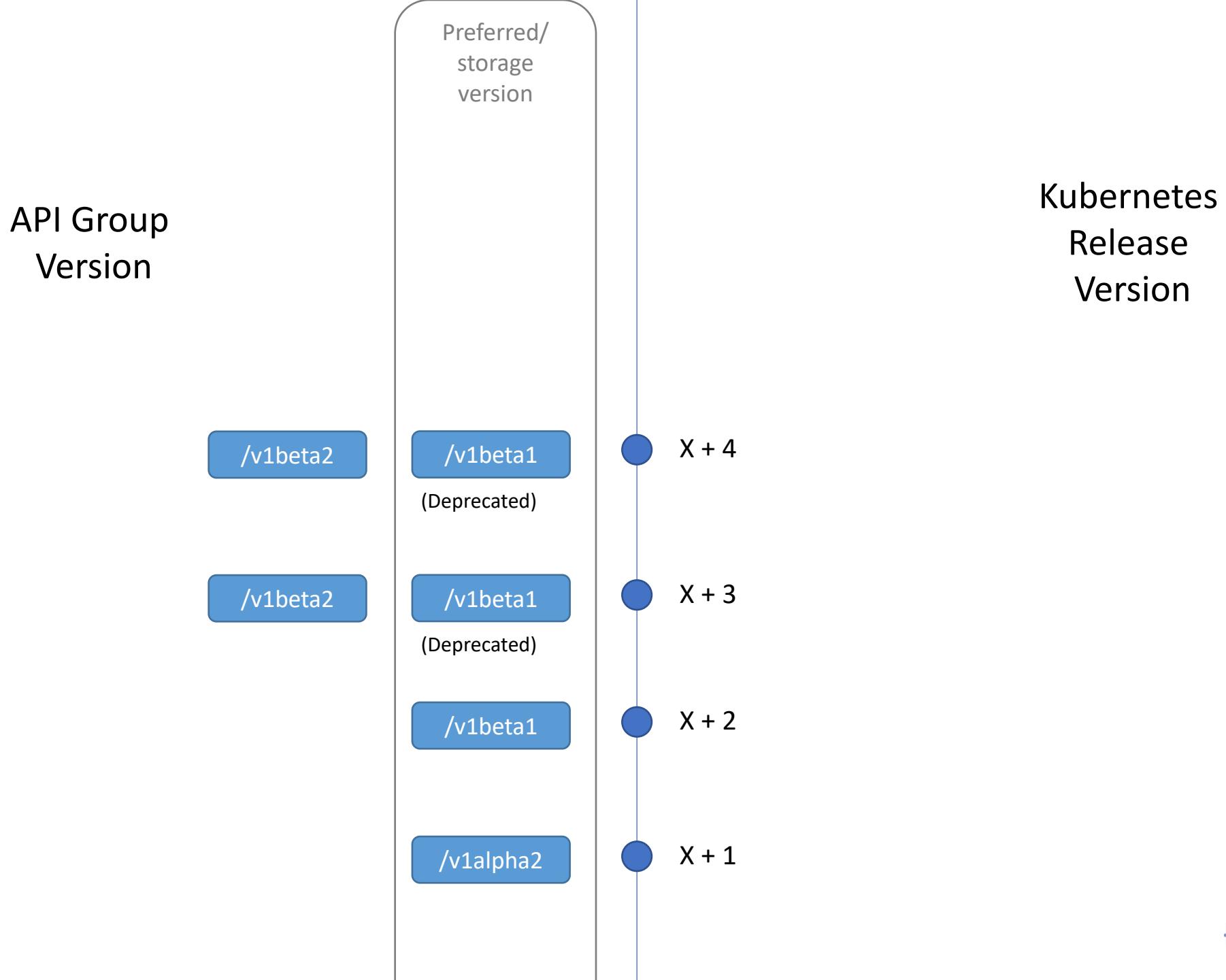
API

API Group
Version

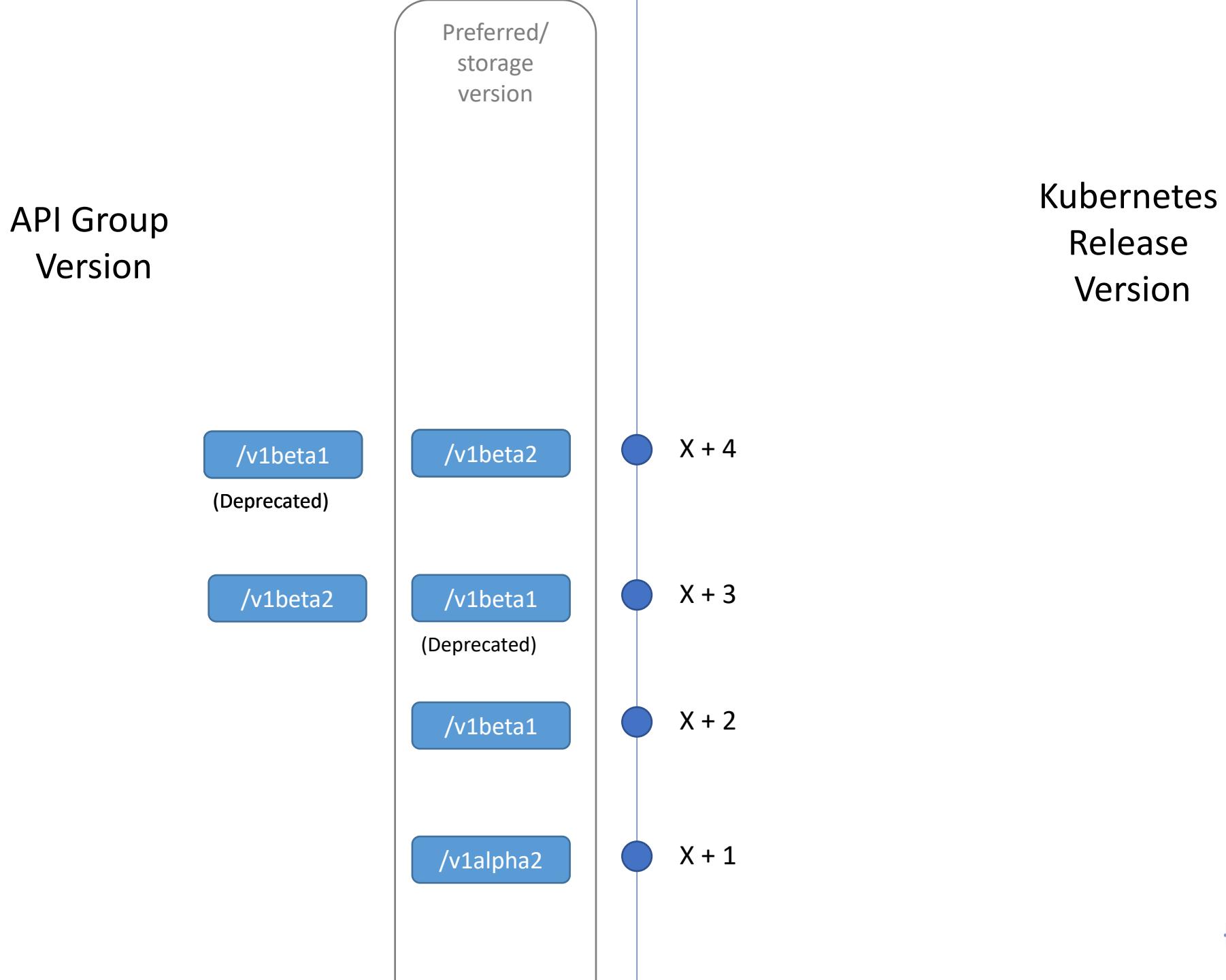


Kubernetes
Release
Version

API



API

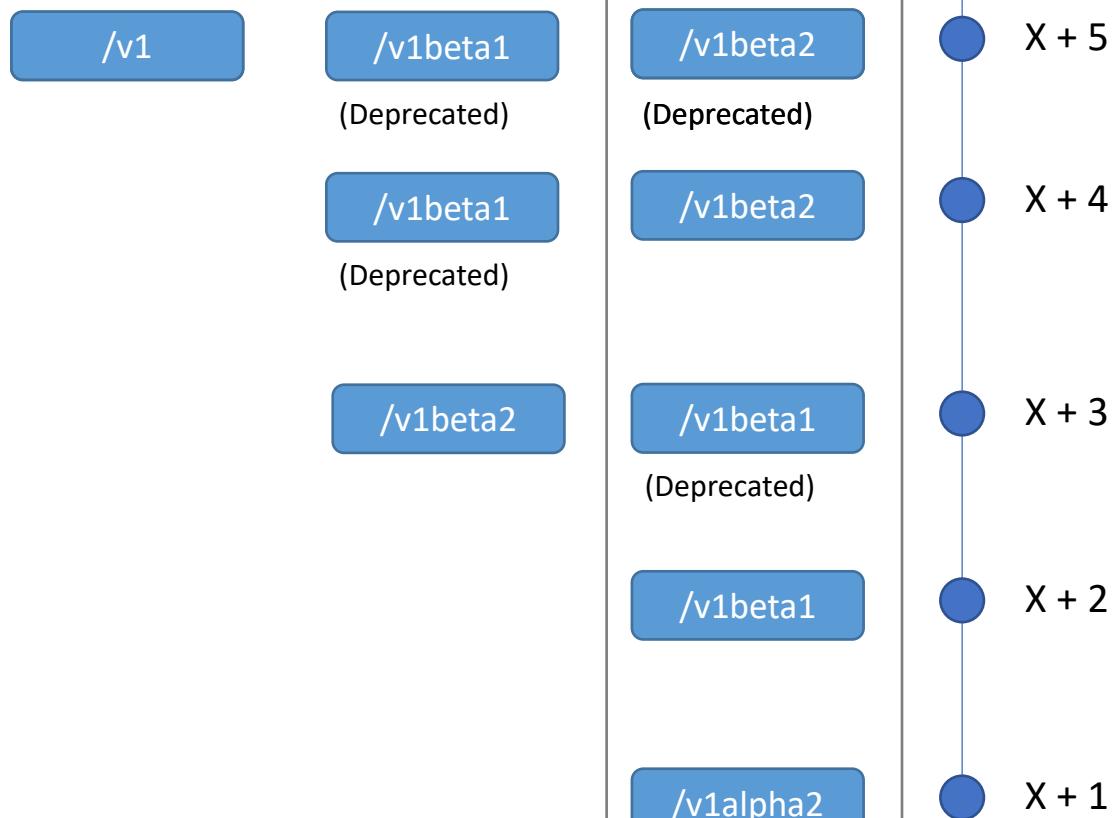


API

API Group
Version

Preferred/
storage
version

Kubernetes
Release
Version

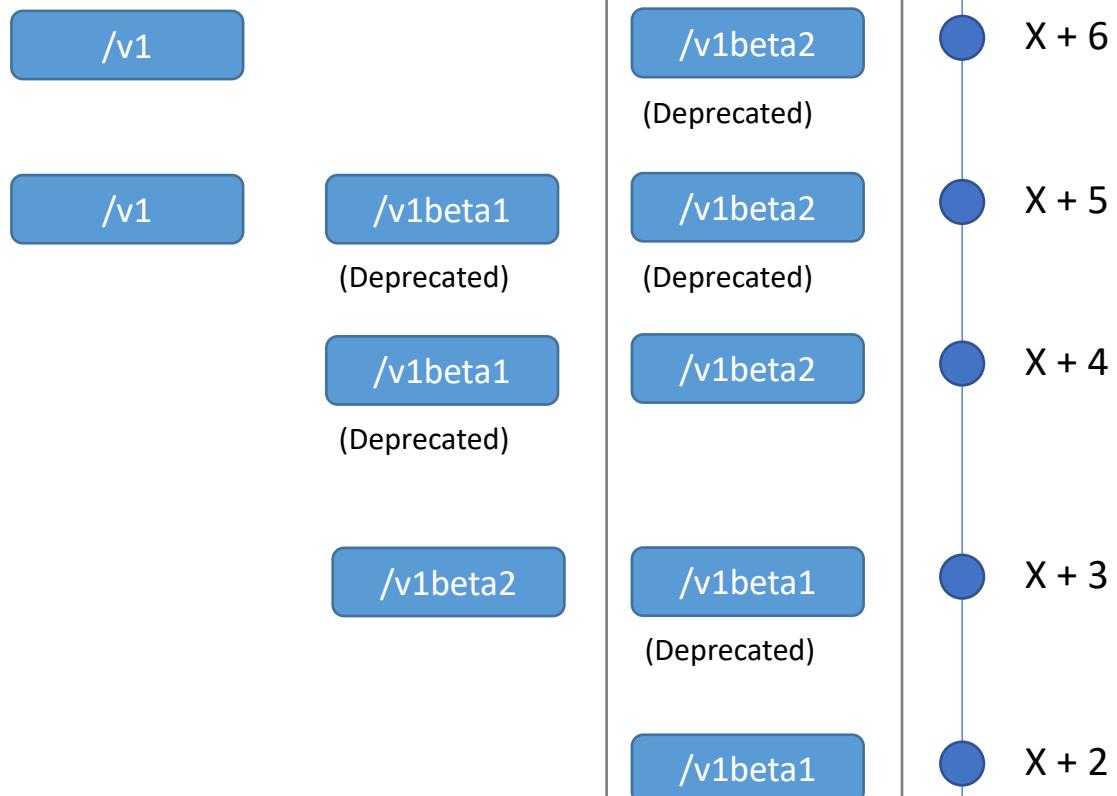


API

API Group
Version

Preferred/
storage
version

Kubernetes
Release
Version

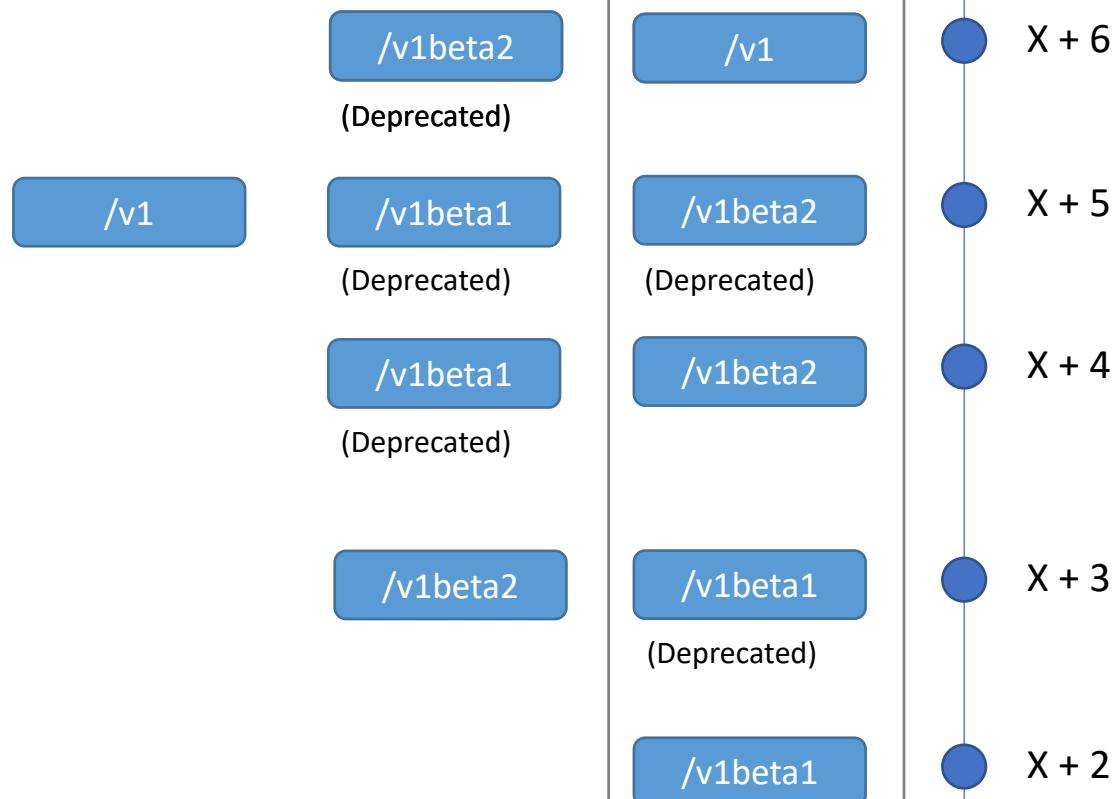


API

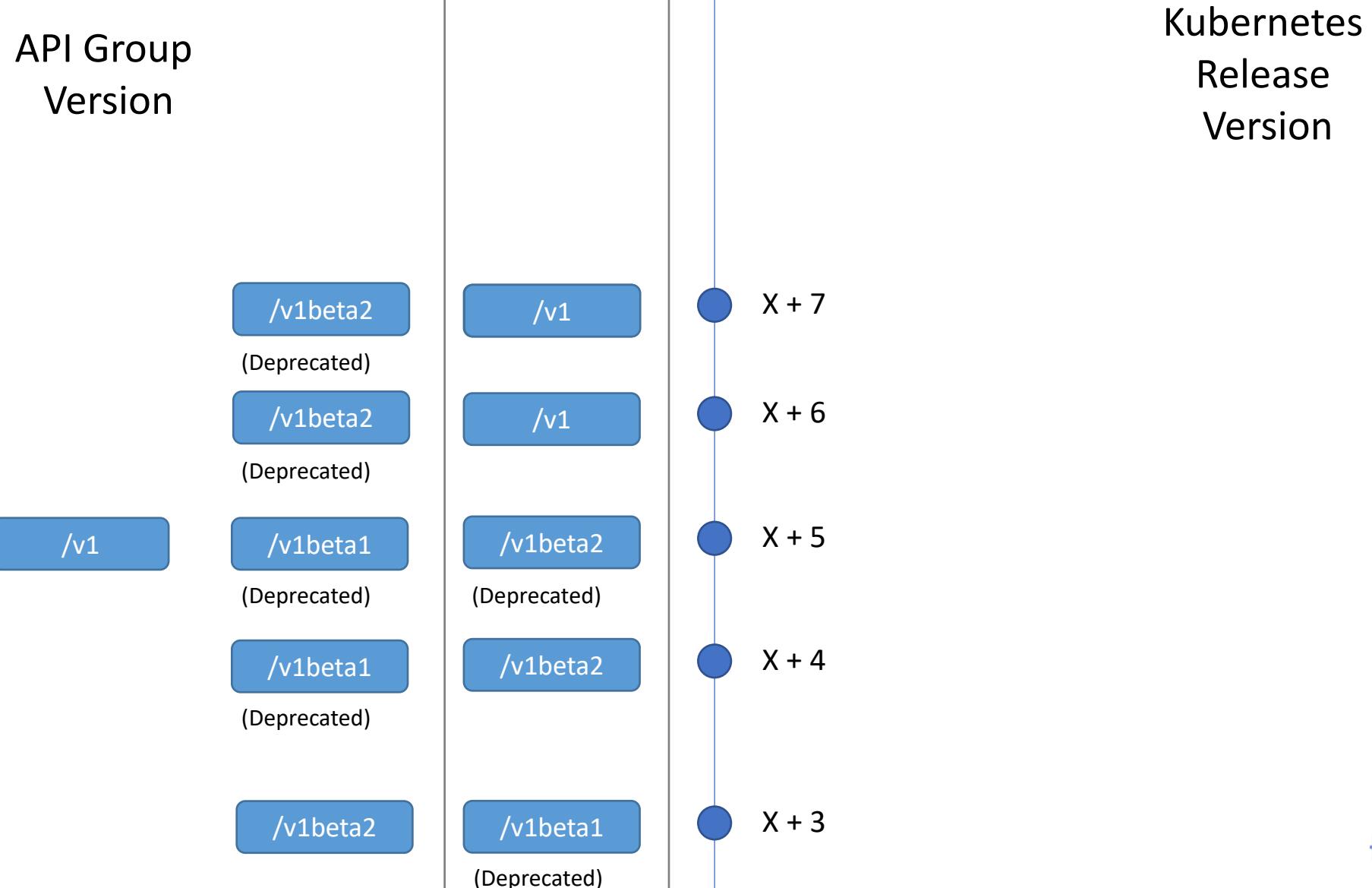
API Group
Version

Preferred/
storage
version

Kubernetes
Release
Version



API

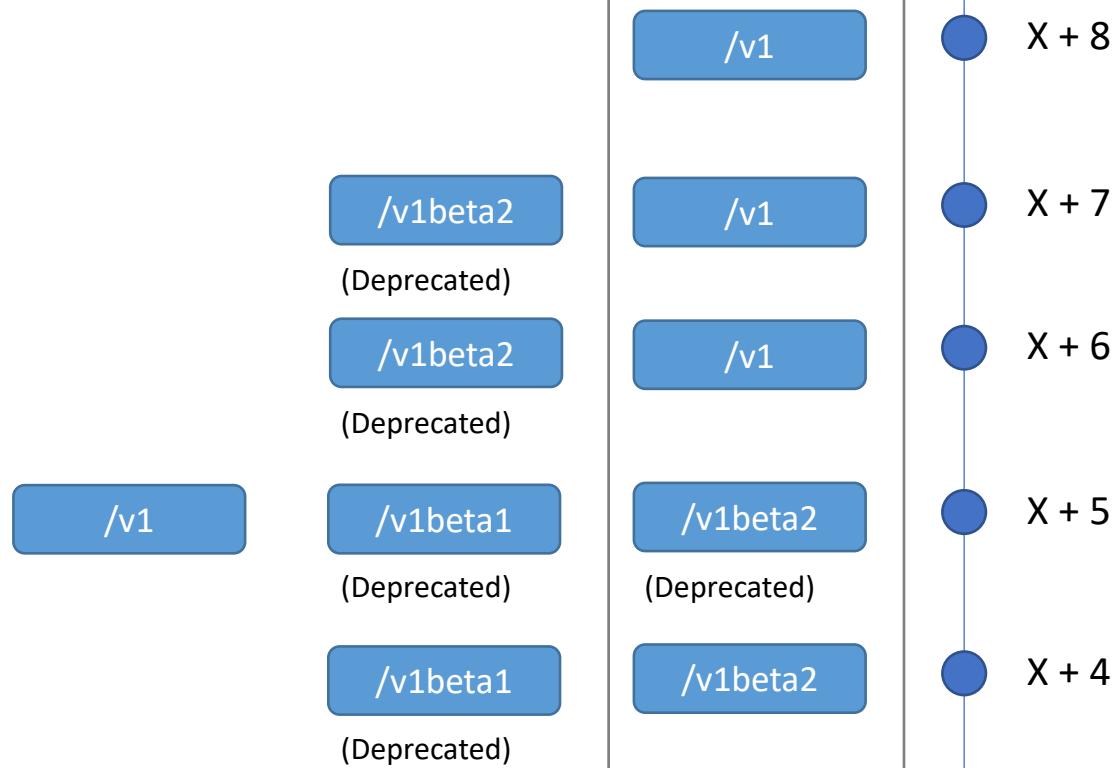


API

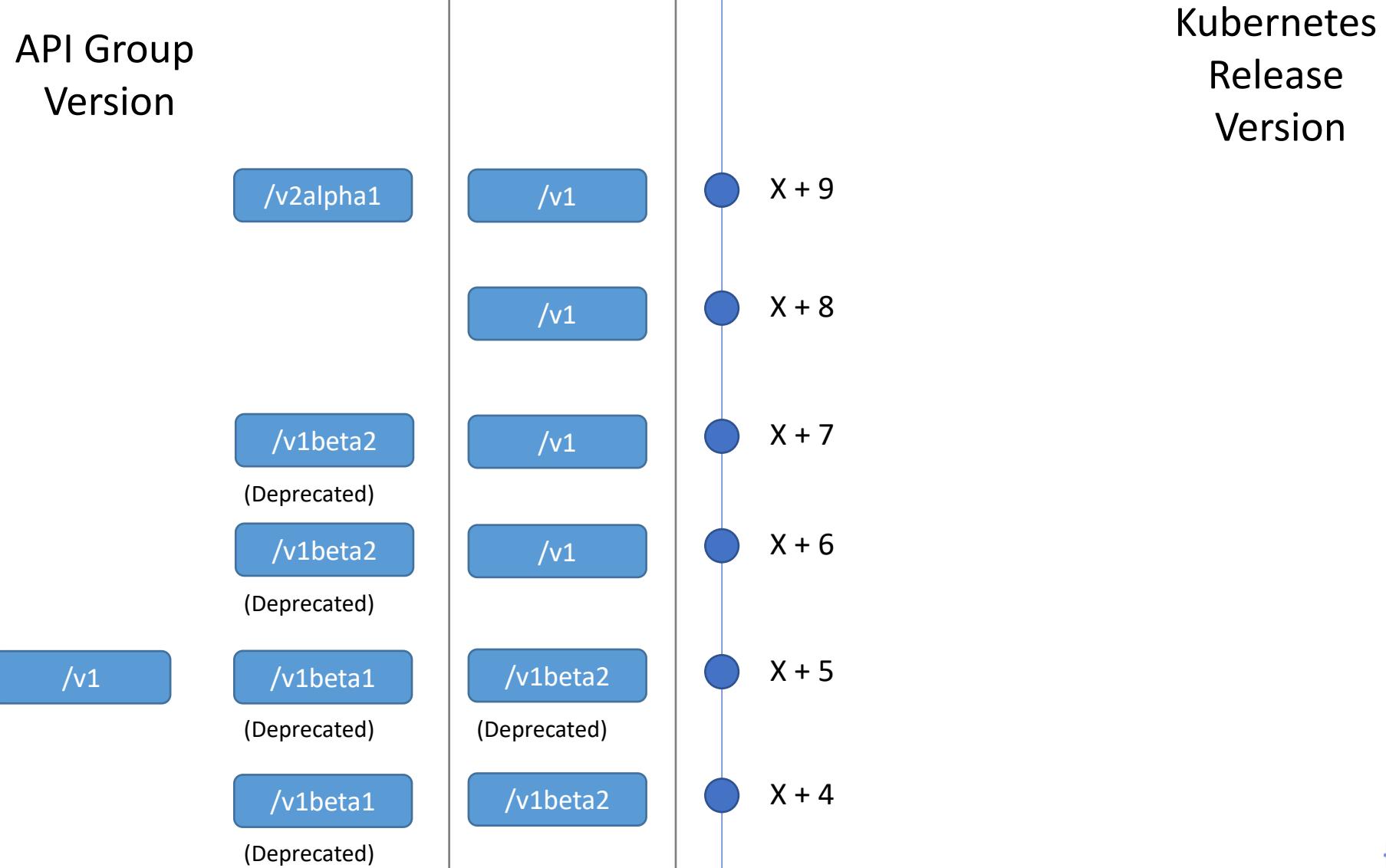
API Group
Version

Preferred/
storage
version

Kubernetes
Release
Version



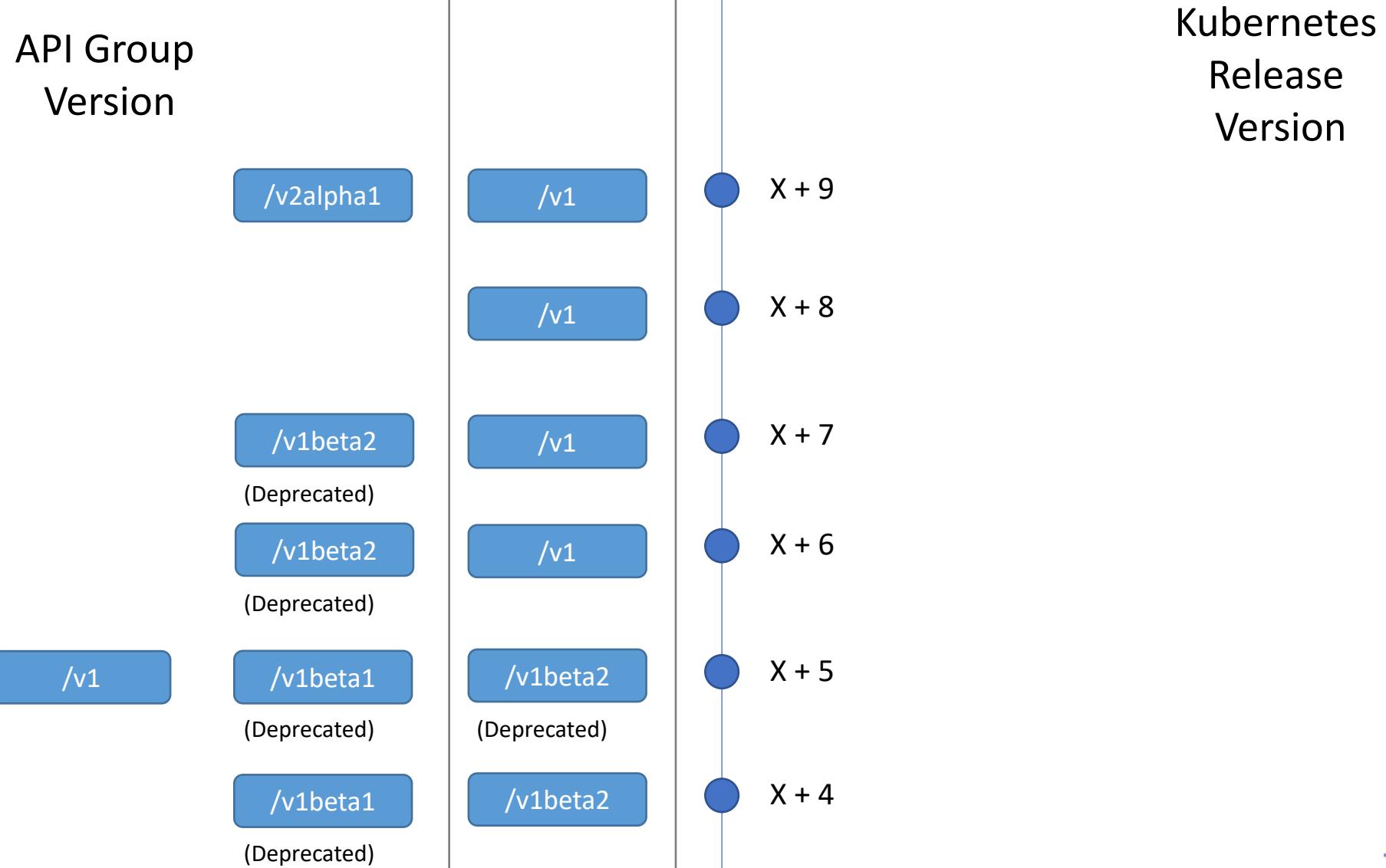
API



API Deprecation Policy Rule #3

An API version in a given track may not be deprecated until a new API version at least as stable is released.

API



Kubectl Convert

nginx.yaml

```
apiVersion: apps/v1beta1
kind: Deployment
metadata:
  name: nginx
spec:
```



nginx.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx
spec:
```

```
▶ kubectl convert -f <old-file> --output-version <new-api>
```

```
▶ kubectl convert -f nginx.yaml --output-version apps/v1
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  creationTimestamp: null
  labels:
    app: nginx
  name: nginx
```

Installing Kubectl Convert

Install `kubectl convert` plugin

A plugin for Kubernetes command-line tool `kubectl`, which allows you to convert manifests between different API versions. This can be particularly helpful to migrate manifests to a non-deprecated api version with newer Kubernetes release. For more info, visit [migrate to non deprecated apis](#)

1. Download the latest release with the command:

```
curl -LO https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl-convert
```

2. Validate the binary (optional)

Download the `kubectl-convert` checksum file:

```
curl -LO "https://dl.k8s.io/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl-convert.sha256"
```

Validate the `kubectl-convert` binary against the checksum file:

```
echo "<kubectl-convert.sha256> kubectl-convert" | sha256sum --check
```

<https://kubernetes.io/docs/tasks/tools/install-kubectl-linux/#install-kubectl-convert-plugin>

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Custom Resource Definitions (CRD)



Resource

```
deployment.yml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: myapp-deployment
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        type: front-end
    spec:
      containers:
      - image: nginx
replicas: 3
selector:
  matchLabels:
    type: front-end
```

Controller

```
deployment_controller.go
package deployment

var controllerKind =
  apps.SchemeGroupVersion.WithKind("Deployment")

//< Code hidden >
// Run begins watching and syncing.
func (dc *DeploymentController) Run(workers int,
  stopCh <-chan struct{})

//< Code hidden >
// Add ReplicaSet
func (dc *DeploymentController) addReplicaSet(obj
  interface{})

//< A lot of code hidden >
```



```
> kubectl create -f deployment.yml
```

```
deployment "myapp-deployment" created
```

```
> kubectl get deployments
```

NAME	DESIRED	CURRENT	UP-TO-DATE	AVAILABLE	AGE
myapp-deployment	3	3	3	3	21s

```
> kubectl delete -f deployment.yml
```

```
deployment "myapp-deployment" deleted
```

Resource

ReplicaSet

Deployment

Job

CronJob

Statefulset

Namespace

Controller

ReplicaSet

Deployment

Job

CronJob

Statefulset

Namespace

ETCD

CustomResource

```
flightticket.yml
apiVersion: flights.com/v1
kind: FlightTicket
metadata:
  name: my-flight-ticket
spec:
  from: Mumbai
  to: London
  number: 2
```

```
> kubectl create -f flightticket.yml
flightticket "my-flight-ticket" created
```

```
> kubectl get flightticket
NAME      STATUS
my-flight-ticket  Pending
```

```
> kubectl delete -f flightticket.yml
flightticket "my-flight-ticket" deleted
```

CustomController

```
flightticket_controller.go
package flightticket

var controllerKind =
apps.SchemeGroupVersion.WithKind("FlightTicket")

//< Code hidden >

// Run begins watching and syncing.
func (dc *FlightTicketController) Run(workers int,
stopCh <-chan struct{}) {
    //< Code hidden >
    // Call BookFlightAPIReplicaSet
    func (dc *FlightTicketController) callBookFlightAPI(obj
interface{}) {
        //< A lot of code hidden >
    }
}
```



API
<https://book-flight.com/api>



CustomResource

```
flightticket.yml
apiVersion: flights.com/v1
kind: FlightTicket
metadata:
  name: my-flight-ticket
spec:
  from: Mumbai
  to: London
  number: 2
```

```
> kubectl create -f flightticket.yml
no matches for kind "FlightTicket" in version "flights.com/v1"
```

```
> kubectl api-resources
NAME      SHORTNAMES   APIGROUP      NAMESPACED      KIND
bindings   ft           flights.com   true          Binding
flighthickets
```

```
> kubectl get ft
NAME          AGE
my-flight-ticket  24m
```

Custom Resource Definition (CRD)

```
flightticket-custom-definition.yml
apiVersion: apiextensions.k8s.io/v1
kind: CustomResourceDefinition
metadata:
  name: flighttickets.flights.com
spec:
  scope: Namespaced
  group: flights.com
  names:
    kind: FlightTicket
    singular: flightticket
    plural: flighttickets
    shortNames:
      - ft
  versions:
    - name: v1
      served: true
      storage: true
    schema:
      openAPIV3Schema:
```

CustomResource

```
flightticket.yml
```

```
apiVersion: flights.com/v1
kind: FlightTicket
metadata:
  name: my-flight-ticket
spec:
  from: Mumbai
  to: London
  number: 2
```

```
> kubectl create -f flightticket.yml
```

```
flightticket "my-flight-ticket" created
```

```
> kubectl get flightticket
```

NAME	STATUS
my-flight-ticket	Pending

```
> kubectl delete -f flightticket.yml
```

```
flightticket "my-flight-ticket" deleted
```

```
plural: flighttickets
shortNames:
  - ft
versions:
  - name: v1
    served: true
    storage: true
schema:
  openAPIV3Schema:
    type: object
    properties:
      spec:
        type: object
        properties:
          from:
            type: string
          to:
            type: string
          number:
            type: integer
            minimum: 1
            maximum: 10
```

```
> kubectl create -f flightticket-custom-definition.yml
```

```
customresourcedefinition created
```

{KODE{LOUD

Custom Controllers



CustomResource

```
flightticket.yml
apiVersion: flights.com/v1
kind: FlightTicket
metadata:
  name: my-flight-ticket
spec:
  from: Mumbai
  to: London
  number: 2
```

```
> kubectl create -f flightticket.yml
flightticket "my-flight-ticket" created
```

```
> kubectl get flightticket
NAME           STATUS
my-flight-ticket  Pending
```

CustomController



```
flightticket_controller.go
package flightticket

var controllerKind =
apps.SchemeGroupVersion.WithKind("FlightTicket")

//< Code hidden >

// Run begins watching and syncing.
func (dc *FlightTicketController) Run(workers int,
stopCh <-chan struct{}) {
    //< Code hidden >
    // Call BookFlightAPIReplicaSet
    func (dc *FlightTicketController) callBookFlightAPI(obj
interface{}) {
        //< A lot of code hidden >
    }
}
```



API
<https://book-flight.com/api>



Custom Controller

[kubernetes / sample-controller](https://github.com/kubernetes/sample-controller) Public

Code Issues 2 Pull requests Actions Projects Wiki Security Insights

master 15 branches 725 tags Go to file Add file Code

File	Description	Last Commit
.github	delete all duplicate empty blanks	3 years ago
artifacts/examples	Change apiversion of CRD from v1beta1 to v1	5 months ago
docs	delete all duplicate empty blanks	3 years ago
hack	generated: Run hack/update-gofmt.sh	2 months ago
pkg	generated: Run hack/update-gofmt.sh	2 months ago
CONTRIBUTING.md	delete all duplicate empty blanks	3 years ago
LICENSE	Add sample CustomResourceDefinition controller	4 years ago
OWNERS	Revert "Merge pull request #93156 from logicalhan/triage-api-machi..."	15 months ago
README.md	Change apiversion of CRD from v1beta1 to v1	5 months ago
SECURITY_CONTACTS	update security contacts for apimachinery repos	16 months ago
code-of-conduct.md	Add code-of-conduct.md to staging repos	4 years ago
controller.go	Fix double formatting on error message	17 days ago
controller_test.go	fix static check failures in staging pkg	2 years ago
go.mod	Merge pull request #105372 from MadhavJivrajani/vendor-clock-utils	12 days ago
go.sum	Merge pull request #105372 from MadhavJivrajani/vendor-clock-utils	12 days ago
main.go	switch over k/k to use klog v2	2 years ago

About

Repository for sample controller.
Complements sample-apiserver

k8s-staging

Readme Apache-2.0 License

Releases

725 tags

Packages

No packages published

Contributors 152

+ 141 contributors

Languages

<https://github.com/kubernetes/sample-controller>

Custom Controller

```
> go  
Go is a tool for managing Go source code.  
go <command> [arguments]
```

```
> git clone https://github.com/kubernetes/sample-controller.git  
Cloning into 'sample-controller'...  
Resolving deltas: 100% (15787/15787), done.
```

```
> cd sample-controller
```

Customize controller.go with our custom logic

```
> go build -o sample-controller .  
go: downloading k8s.io/client-go v0.0.0-20211001003700-dbfa30b9d908  
go: downloading golang.org/x/text v0.3.6
```

```
> ./sample-controller -kubeconfig=$HOME/.kube/config  
I1013 02:11:07.489479 40117 controller.go:115] Setting up event handlers  
I1013 02:11:07.489701 40117 controller.go:156] Starting FlightTicket controller
```

```
controller.go  
package flightticket  
  
var controllerKind =  
    apps.SchemeGroupVersion.WithKind("FlightTicket")  
  
//< Code hidden >  
  
// Run begins watching and syncing.  
func (dc *FlightTicketController) Run(workers int,  
stopCh <-chan struct{})  
  
//< Code hidden >  
// Call BookFlightAPIReplicaSet  
func (dc *FlightTicketController) callBookFlightAPI(obj  
interface{})  
  
//< A lot of code hidden >
```

Custom Controller



```
controller.go
package flightticket

var controllerKind =
apps.SchemeGroupVersion.WithKind("FlightTicket")

//< Code hidden >

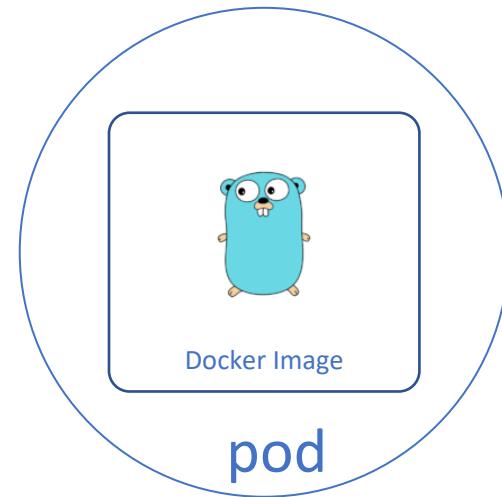
// Run begins watching and syncing.
func (dc *FlightTicketController) Run(workers int, stopCh <-chan
struct{}{})

//< Code hidden >
// Call BookFlightAPIReplicaSet
func (dc *FlightTicketController) callBookFlightAPI(obj
interface{}{})

//< A lot of code hidden >
```

Docker Image

Custom Controller



{KODE{LOUD



Operator Framework

CustomResource Definition (CRD)

```
flightticket-custom-definition.yaml
apiVersion: apiextensions.k8s.io/v1
kind: CustomResourceDefinition
metadata:
  name: flighttickets.flights.com
spec:
  scope: Namespaced
  group: flights.com
  names:
    kind: FlightTicket
    singular: flightticket
    plural: flighttickets
    shortnames:
      - ft
  versions:
    - name: v1
      served: true
      storage: true
```

CustomController

```
flightticket_controller.go
package flightticket

var controllerKind =
    apps.SchemeGroupVersion.WithKind("FlightTicket")

//< Code hidden >

// Run begins watching and syncing.
func (dc *FlightTicketController) Run(workers int,
stopCh <-chan struct{})

//< Code hidden >
// Call BookFlightAPIReplicaSet
func (dc *FlightTicketController) callBookFlightAPI(obj
interface{})

//< A lot of code hidden >
```

CustomResource Definition (CRD)

```
flightticket-custom-definition.yaml
apiVersion: apiextensions.k8s.io/v1
kind: CustomResourceDefinition
metadata:
  name: flighttickets.flights.com
spec:
  scope: Namespaced
  group: flights.com
  names:
    kind: FlightTicket
    singular: flightticket
    plural: flighttickets
    shortnames:
      - ft
  versions:
    - name: v1
      served: true
      storage: true
```

CustomController

```
flightticket_controller.go
package flightticket

var controllerKind =
apps.SchemeGroupVersion.WithKind("FlightTicket")

//< Code hidden >

// Run begins watching and syncing.
func (dc *FlightTicketController) Run(workers int,
stopCh <-chan struct{}) {
    //< Code hidden >
    // Call BookFlightAPIReplicaSet
    func (dc *FlightTicketController) callBookFlightAPI(obj
interface{}) {
        //< A lot of code hidden >
    }
}
```

Operator Framework

```
> kubectl create -f flight-operator.yaml
```

CustomResource Definition (CRD)

EtcdCluster

EtcdBackup

EtcdRestore

CustomController

ETCD Controller

Backup Operator

Restore Operator

Operator Framework

Welcome to OperatorHub.io

OperatorHub.io is a new home for the Kubernetes community to share Operators. Find an existing Operator or list your own today.

CATEGORIES

209 ITEMS

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- Big Data
- Cloud Provider
- Database
- Developer Tools
- Drivers and plugins
- Integration & Delivery
- Logging & Tracing
- Modernization & Migration
- Monitoring
- Networking
- OpenShift Optional
- Security
- Storage
- Streaming & Messaging

PROVIDER

 Absa Group (1) aiven (1) alauda (1) Alibaba Cloud (1) Altinity (1)[Show 139 more](#)

CAPABILITY LEVEL

 Basic Install (96) Seamless Upgrades (49) Full Lifecycle (34)

 Aiven Operator provided by aiven Manage your https://aiven.io resources with Kubernetes.	 Akka Cluster Operator provided by Lightbend, Inc. Run Akka Cluster applications on Kubernetes.	 Altinity ClickHouse Operator provided by Altinity ClickHouse Operator manages full lifecycle of ClickHouse	 Alvearie Imaging Ingestion Operator provided by Alvearie The Alvearie Imaging Ingestion provides a collection of	 Anchore Engine Operator provided by Anchore Inc. Anchore Engine - container image scanning service for policy-based security, best-
 Apache Spark Operator provided by radanalytics.io An operator for managing the Apache Spark clusters and intelligent applications tha	 API Operator for Kubernetes provided by WSO2 API Operator provides a fully automated experience for	 APIcast provided by Red Hat APIcast is an API gateway built on top of NGINX. It is part of the 3scale API Management	 Apicurio Registry Operator provided by Apicurio Deploy and manage Apicurio Registry on Kubernetes.	 APIMatic Operator provided by APIMatic.io Generate client SDKs and interactive Documentation for your APIs in minutes
 Appdynamics Operator provided by AppDynamics LLC End to end monitoring of applications on Kubernetes and OpenShift clusters with	 Application Services Metering Operator provided by Red Hat Collect the core usage of products from the Application	 Appranix CPS Operator provided by Appranix, Inc The Appranix CPS operator enables you to back up and restore your	 Appsody Operator provided by Appsody Deploys Appsody based applications	 Aqua Security Operator provided by Aqua Security, Inc. The Aqua Security Operator runs within a Openshift cluster and provides a means to



etcd

0.9.4 provided by CNCF



Home > etc

etcd

The etcd Operator
etcd is a distributed system
handles leadership election

Reading time: 1 min

Communication

\$ kubectl get pods
\$ etcdctl

Or directly to the

\$ etcdctl

Install on Kubernetes

1. Install Operator Lifecycle Manager (OLM), a tool to help manage the Operators running on your cluster.

```
$ curl -sL https://github.com/operator-framework/operator-lifecycle-manager/releases/download/v0.19.1/install.sh | bash -s v0.19.1
```



2. Install the operator by running the following command:

[What happens when I execute this command?](#)

```
$ kubectl create -f https://operatorhub.io/install/etcd.yaml
```



This Operator will be installed in the "my-etcd" namespace and will be usable from this namespace only.

3. After install, watch your operator come up using next command.

```
$ kubectl get csv -n my-etcd
```



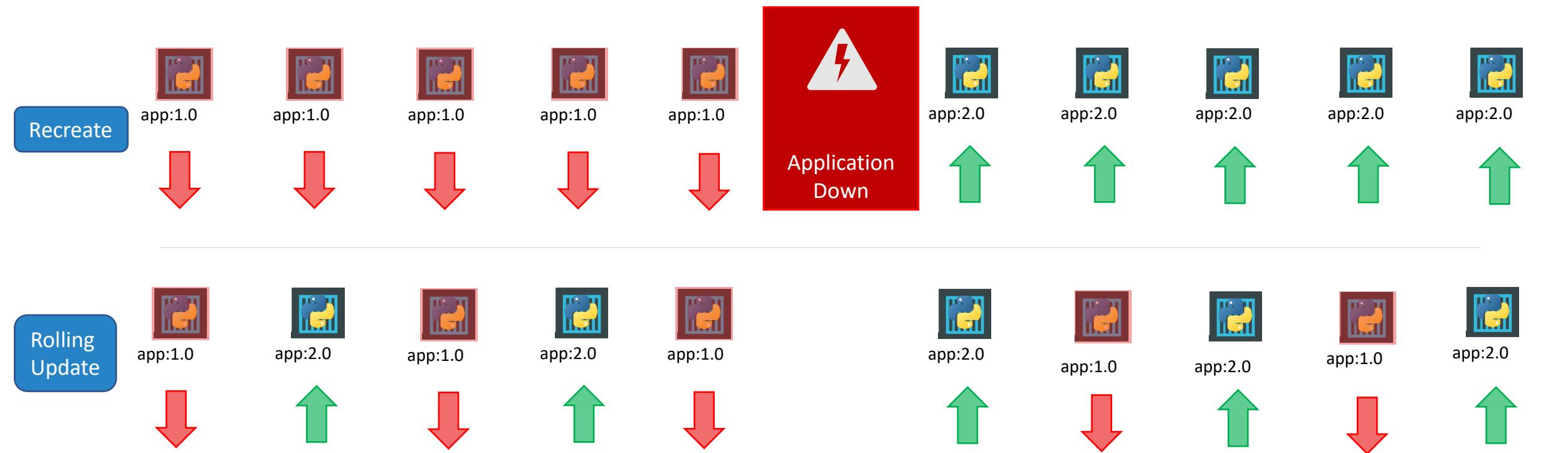
To use it, checkout the custom resource definitions (CRDs) introduced by this operator to start using it.

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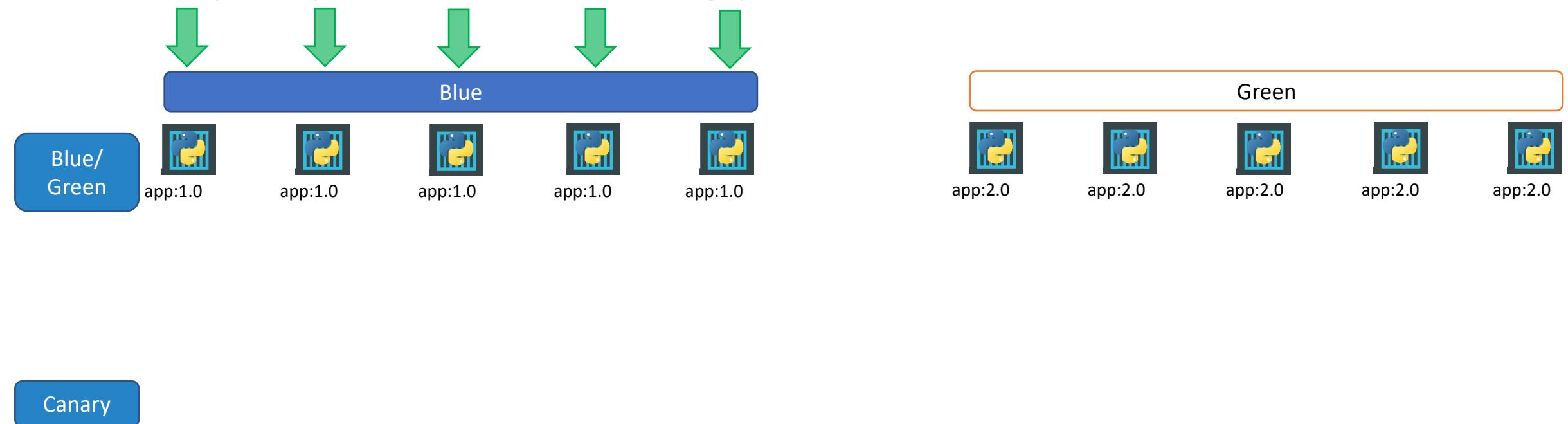
Blue/Green Deployments



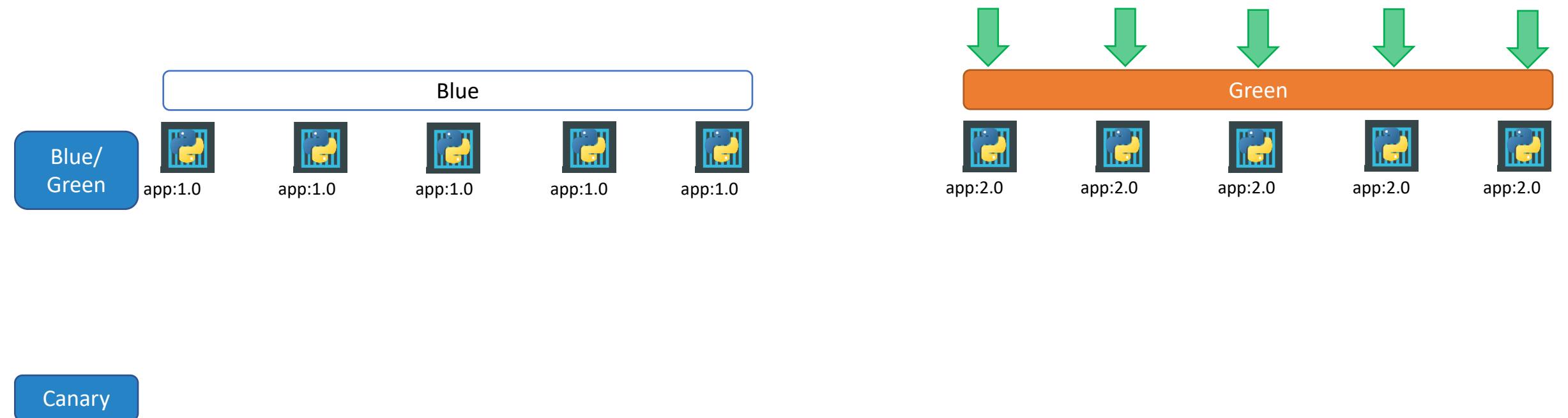
Deployment Strategy



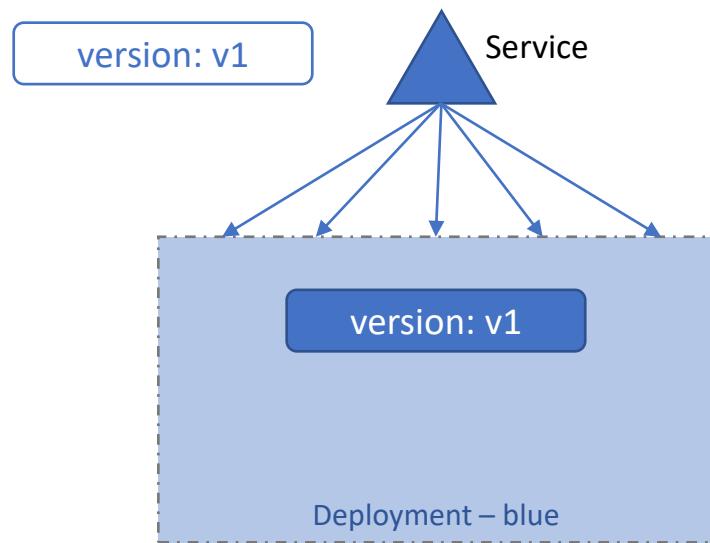
Deployment Strategy



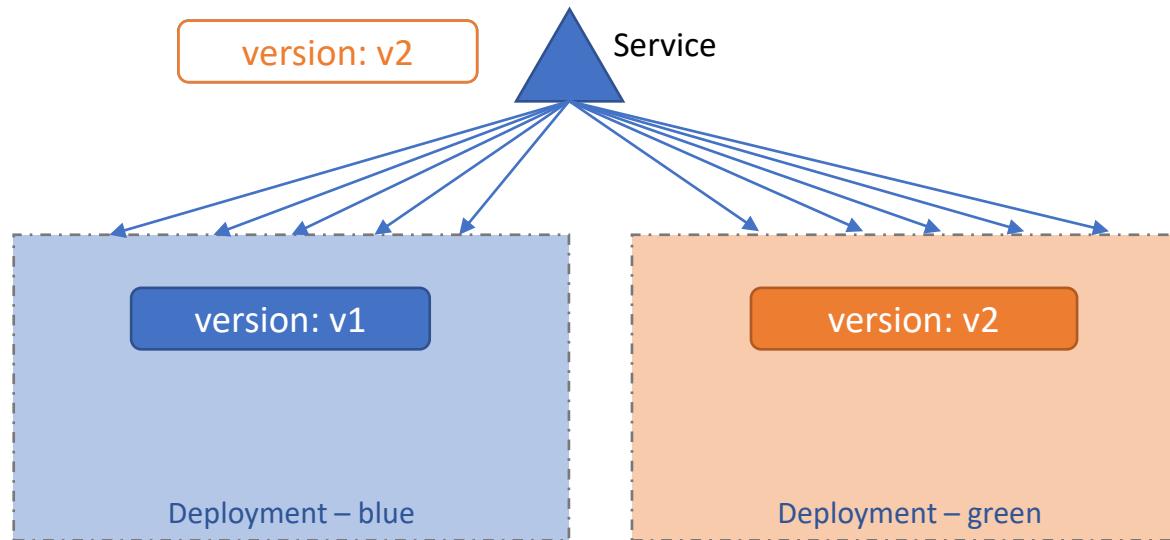
Deployment Strategy



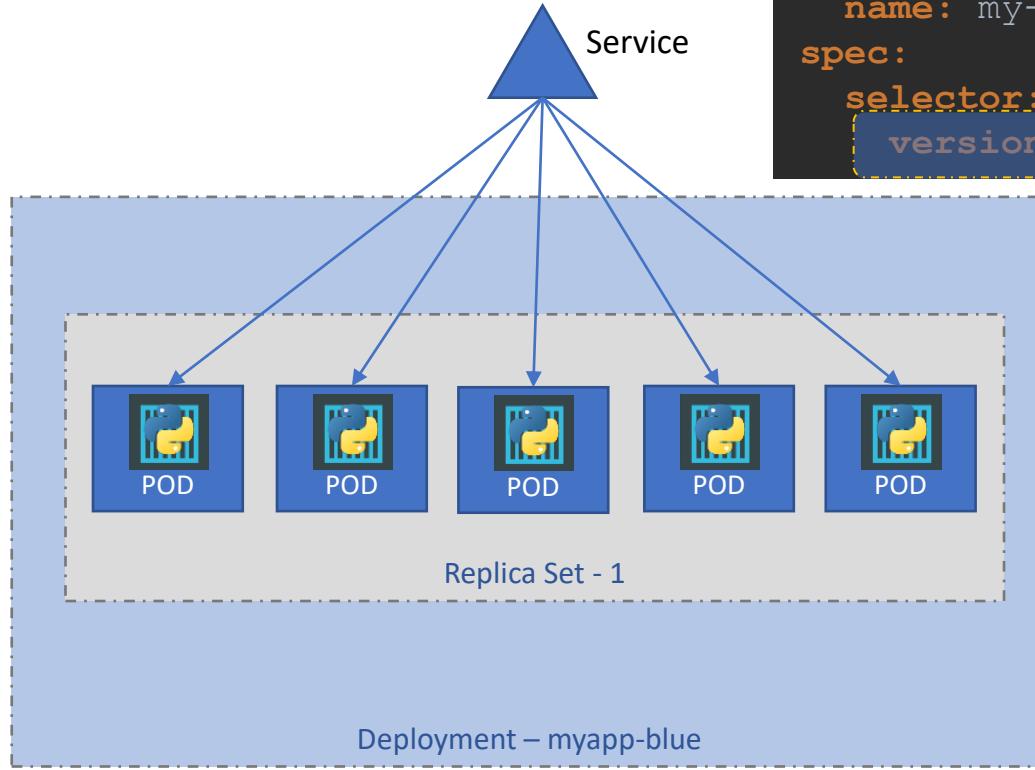
Blue/Green



Blue/Green



Blue/Green



```
service-definition.yaml
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  selector:
    version: v1
```

```
myapp-blue.yml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: myapp-blue
  labels:
    app: myapp
    type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        version: v1
```

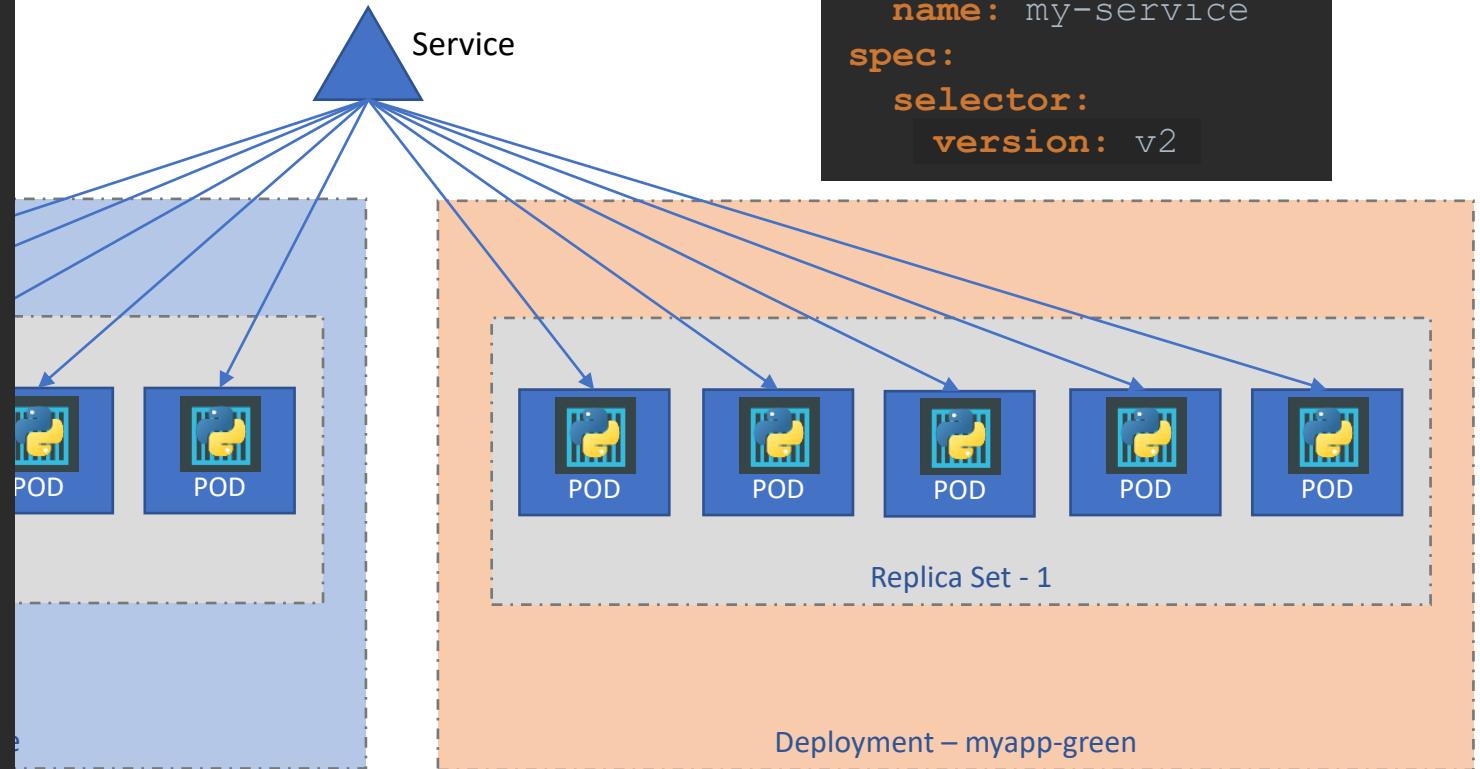
```
spec:
  containers:
  - name: app-container
    image: myapp-image:1.0
  replicas: 5
  selector:
    matchLabels:
      type: front-end
```

```
myapp-green.yml
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: myapp-green
  labels:
    app: myapp
    type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        version: v2
    spec:
      containers:
        - name: app-container
          image: myapp-image:2.0
  replicas: 5
  selector:
    matchLabels:
      type: front-end
```

```
service-definition.yaml
```

```
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  selector:
    version: v2
```



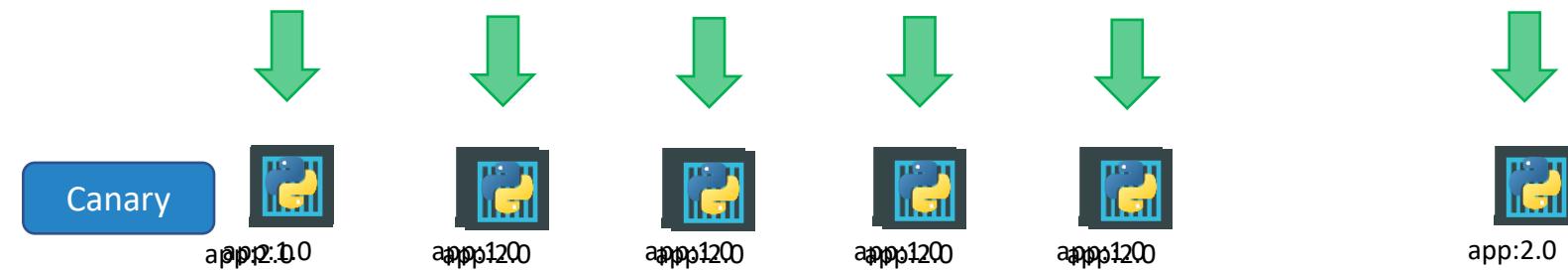
{KODE{LOUD



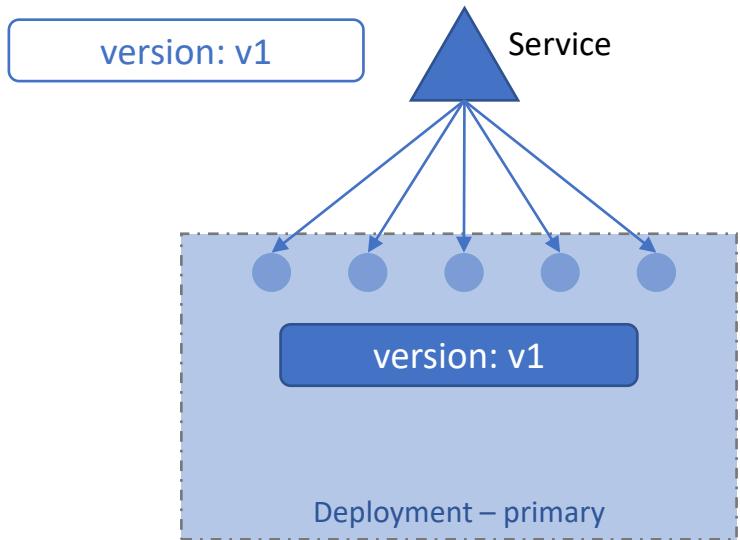
Canary Updates



Deployment Strategy

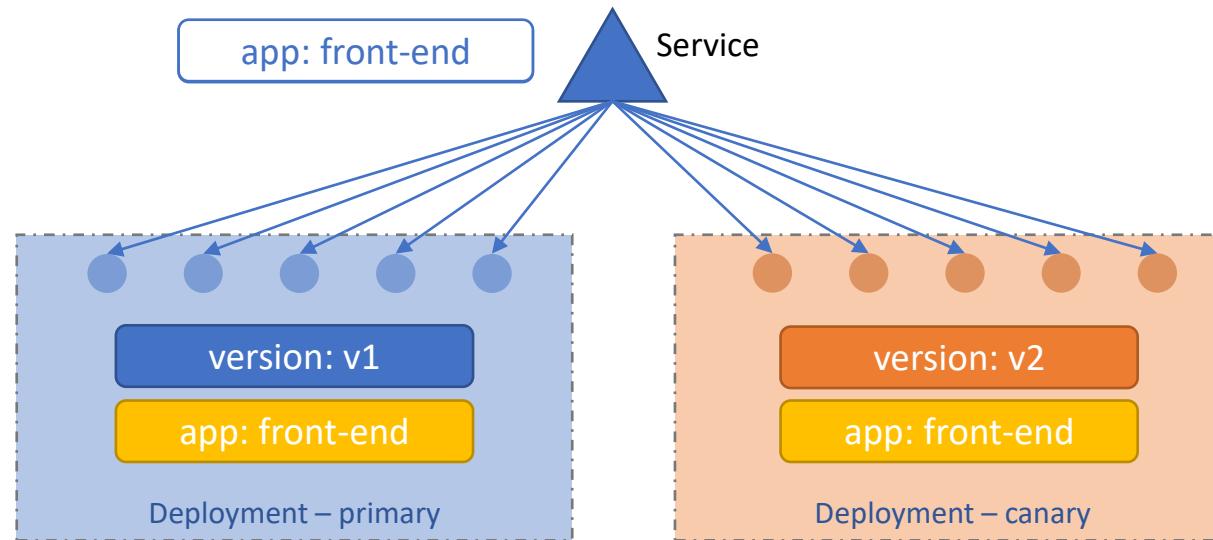


Canary



Canary

1. Route traffic to both versions
2. Route a small percentage of traffic to Version 2



80%

50%

myapp-primary.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: myapp-primary
  labels:
    app: myapp
    type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        version: v1
        app: front-end
    spec:
      containers:
        - name: app-container
          image: myapp-image:1.0
replicas: 5
selector:
  matchLabels:
    type: front-end
```

service-definition.yaml

```
apiVersion: v1
kind: Service
metadata:
  name: my-service
spec:
  selector:
    app: front-end
```

myapp-canary.yaml

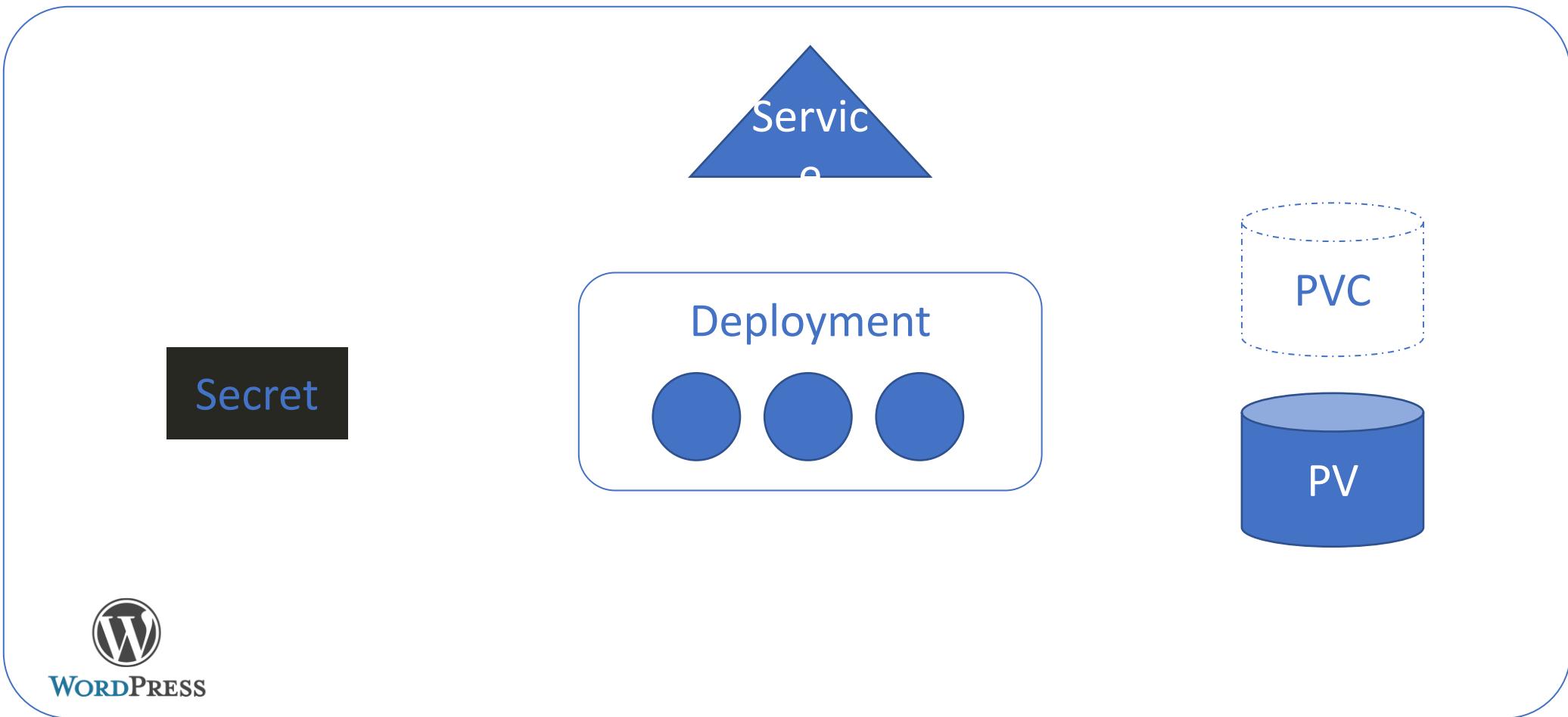
```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: myapp-canary
  labels:
    app: myapp
    type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        version: v2
        app: front-end
    spec:
      containers:
        - name: app-container
          image: myapp-image:2.0
replicas: 1
selector:
  matchLabels:
    type: front-end
```

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Introduction

WordPress



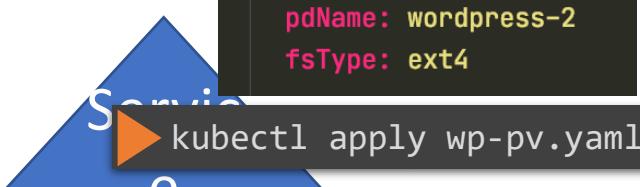
WordPress

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: wordpress
  labels:
    app: wordpress
spec:
  selector:
    matchLabels:
      app: wordpress
      tier: frontend
  strategy:
    type: Recreate
  template:
    metadata:
      labels:
        app: wordpress
        tier: frontend
    spec:
      containers:
        - image: wordpress:4.8-apache
          name: wordpress
```

▶ `kubectl apply wp-deploy.yaml`

```
apiVersion: v1
kind: Secret
metadata:
  name: wordpress-admin-password
data:
  key: CajhWVUxSdzI2Qzg0SERXhBQTvRQ1FzN2JE9PQ==
```

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: wordpress-pv
spec:
  capacity:
    storage: 20Gi
  accessModes:
    - ReadWriteOnce
  gcePersistentDisk:
    pdName: wordpress-2
    fsType: ext4
```



▶ `kubectl apply wp-pv.yaml`

```
apiVersion: v1
kind: Service
metadata:
  name: wordpress
  labels:
    app: wordpress
spec:
  ports:
    - port: 80
  selector:
    app: wordpress
    tier: frontend
  type: LoadBalancer
```

▶ `kubectl apply wp-svc.yaml`

Deployment



▶ `kubectl delete wp-svc.yaml`

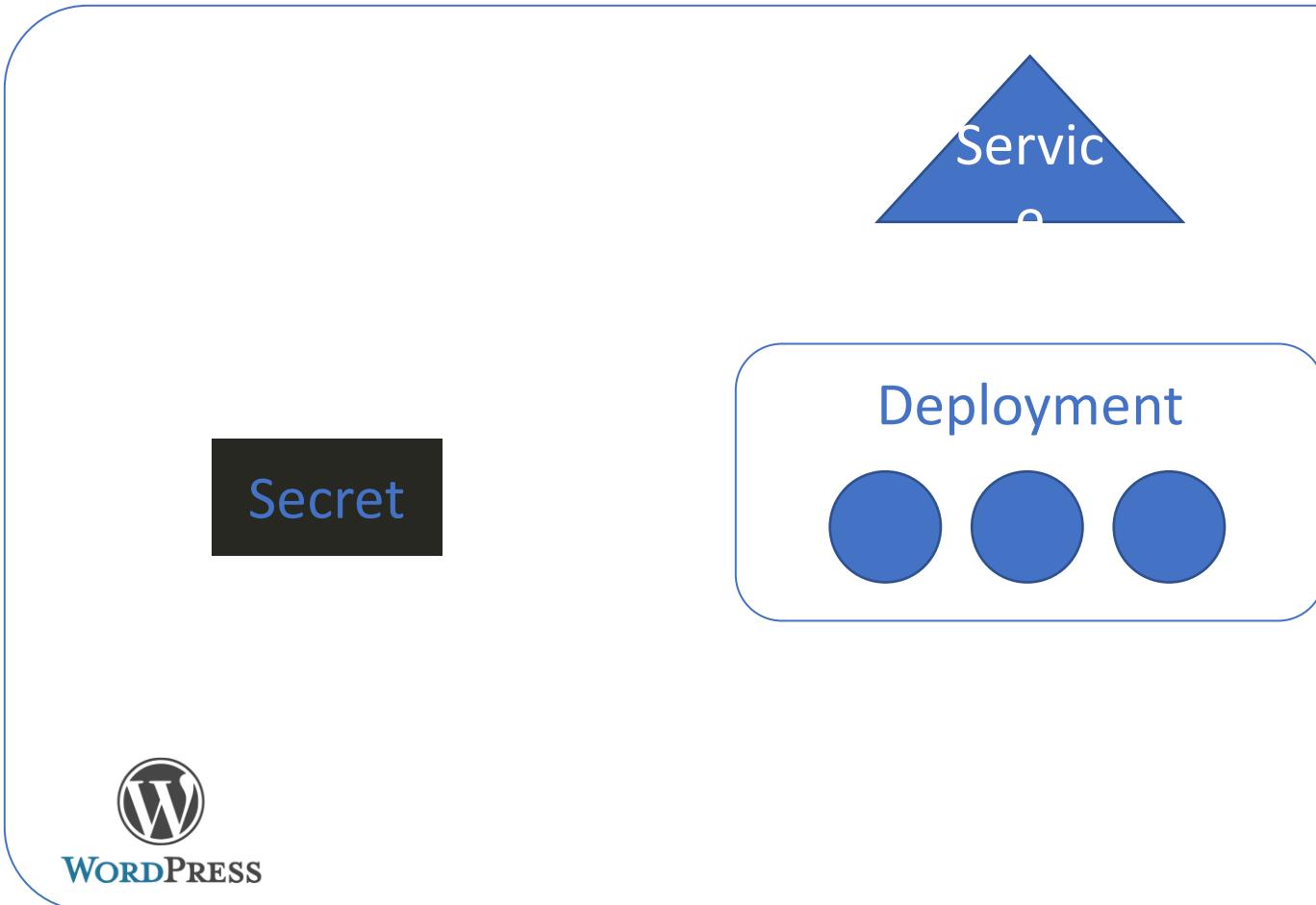
▶ `kubectl delete wp-deploy.yaml`

▶ `kubectl delete wp-svc.yaml`

```
PVC
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: wp-pv-claim
  labels:
    app: wordpress
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 20Gi
```

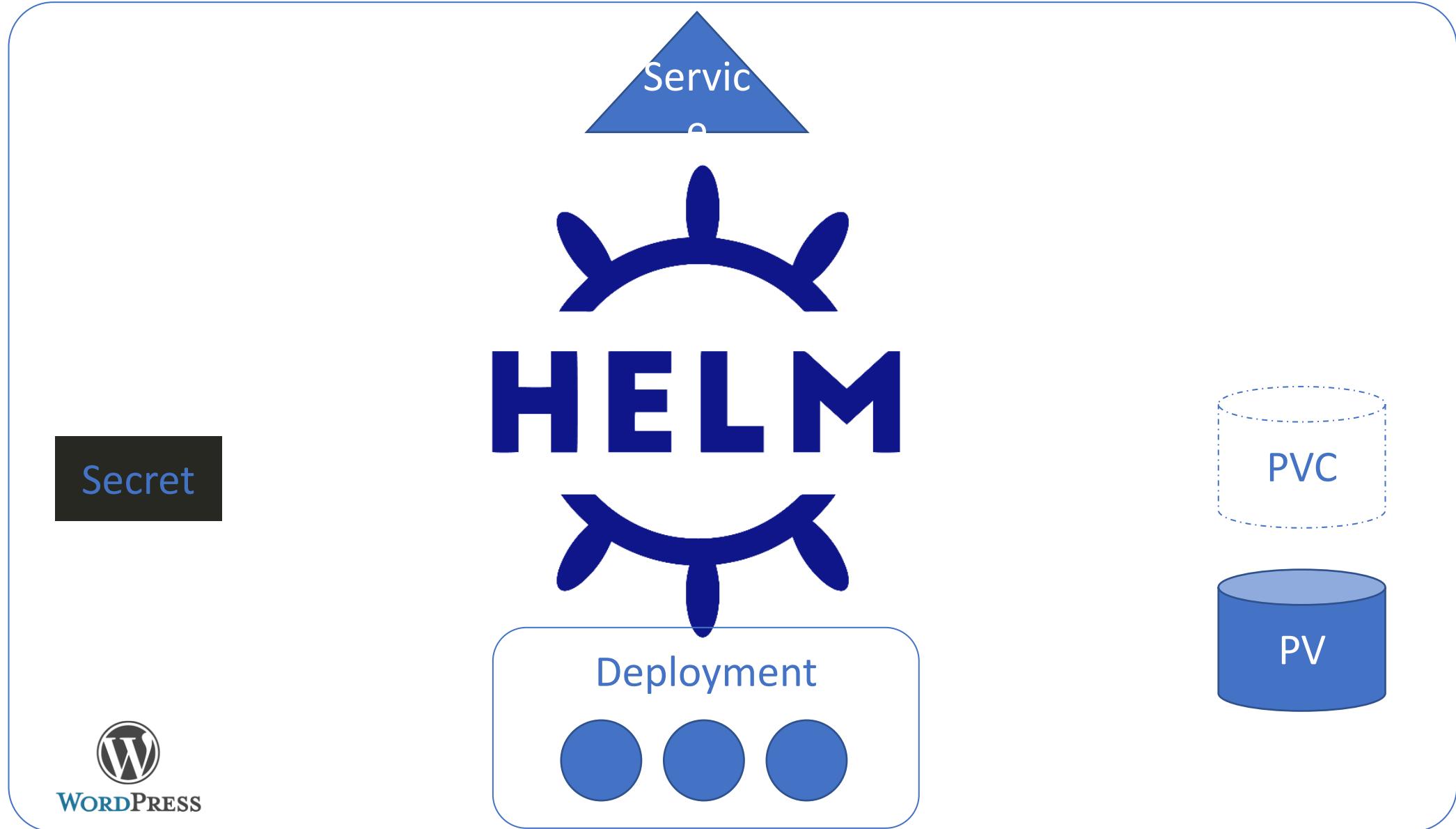
▶ `kubectl apply wp-pvc.yaml`

WordPress



```
app: wordpress
spec:
  selector:
    matchLabels:
      app: wordpress
      tier: frontend
  strategy:
    type: Recreate
  template:
    metadata:
      labels:
        app: wordpress
        tier: frontend
    spec:
      containers:
        - image: wordpress:4.8-apache
          name: wordpress
apiVersion: v1
kind: Secret
metadata:
  name: wordpress-admin-password
data:
  key: CajhWVUxSdzI2Qzg0SERXhBQTvRQ1FzN2JE9PQ==
apiVersion: v1
kind: PersistentVolume
metadata:
  name: wordpress-pv
spec:
  capacity:
    storage: 20Gi
  accessModes:
    - ReadWriteOnce
  gcePersistentDisk:
    pdName: wordpress-2
    fsType: ext4
    labels:
      app: wordpress
```

LOUD





INSTALL

Helm

```
▶ helm install wordpress ...
```

```
▶ helm upgrade wordpress ...
```

```
▶ helm rollback wordpress ...
```

```
▶ helm uninstall wordpress ...
```

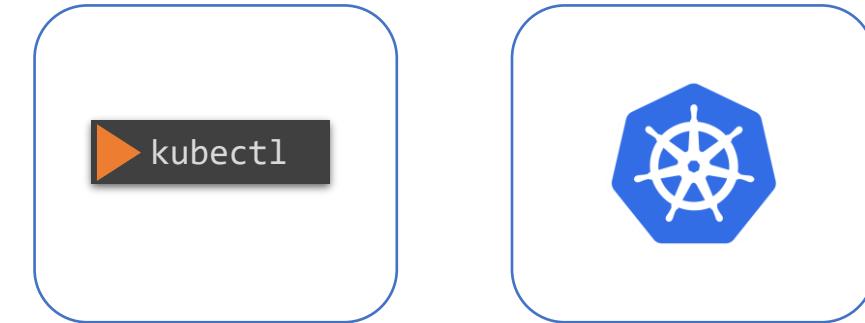
```
YML values.yaml ×  
40  
41     ## User of the application  
42     ## ref: https://github.com/bitnami/bitnami-docker-wordpress  
43     ##  
44     wordpressUsername: user  
45  
46     ## Application password  
47     ## Defaults to a random 10-character alphanumeric string  
48     ## ref: https://github.com/bitnami/bitnami-docker-wordpress  
49     ##  
50     # wordpressPassword:  
51  
52     ## Admin email  
53     ## ref: https://github.com/bitnami/bitnami-docker-wordpress  
54     ##  
55     wordpressEmail: user@example.com  
56  
57     ## First name  
58     ## ref: https://github.com/bitnami/bitnami-docker-wordpress  
59     ##  
60     wordpressFirstName: FirstName  
61  
62     ## Last name  
63     ## ref: https://github.com/bitnami/bitnami-docker-wordpress  
64     ##  
65     wordpressLastName: LastName
```

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Install

Install



```
▶ sudo snap install helm --classic
```

```
▶ curl https://baltocdn.com/helm/signing.asc | sudo apt-key add -
  sudo apt-get install apt-transport-https --yes
  echo "deb https://baltocdn.com/helm/stable/debian/ all main" | sudo tee /etc/apt/sources.list.d/helm-stable-debian.list
  sudo apt-get update
  sudo apt-get install helm
```

```
▶ pkg install helm
```

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Concepts

templates/deployment.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: wordpress
  labels:
    app: wordpress
spec:
  selector:
    matchLabels:
      app: wordpress
      tier: frontend
  strategy:
    type: Recreate
  template:
    metadata:
      labels:
        app: wordpress
        tier: frontend
    spec:
      containers:
        - image: {{ .Values.image }}
          name: wordpress
```

templates/secret.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: wordpress-admin-password
data:
  key: {{ .Values.passwordEncoded }}
```

templates/pv.yaml

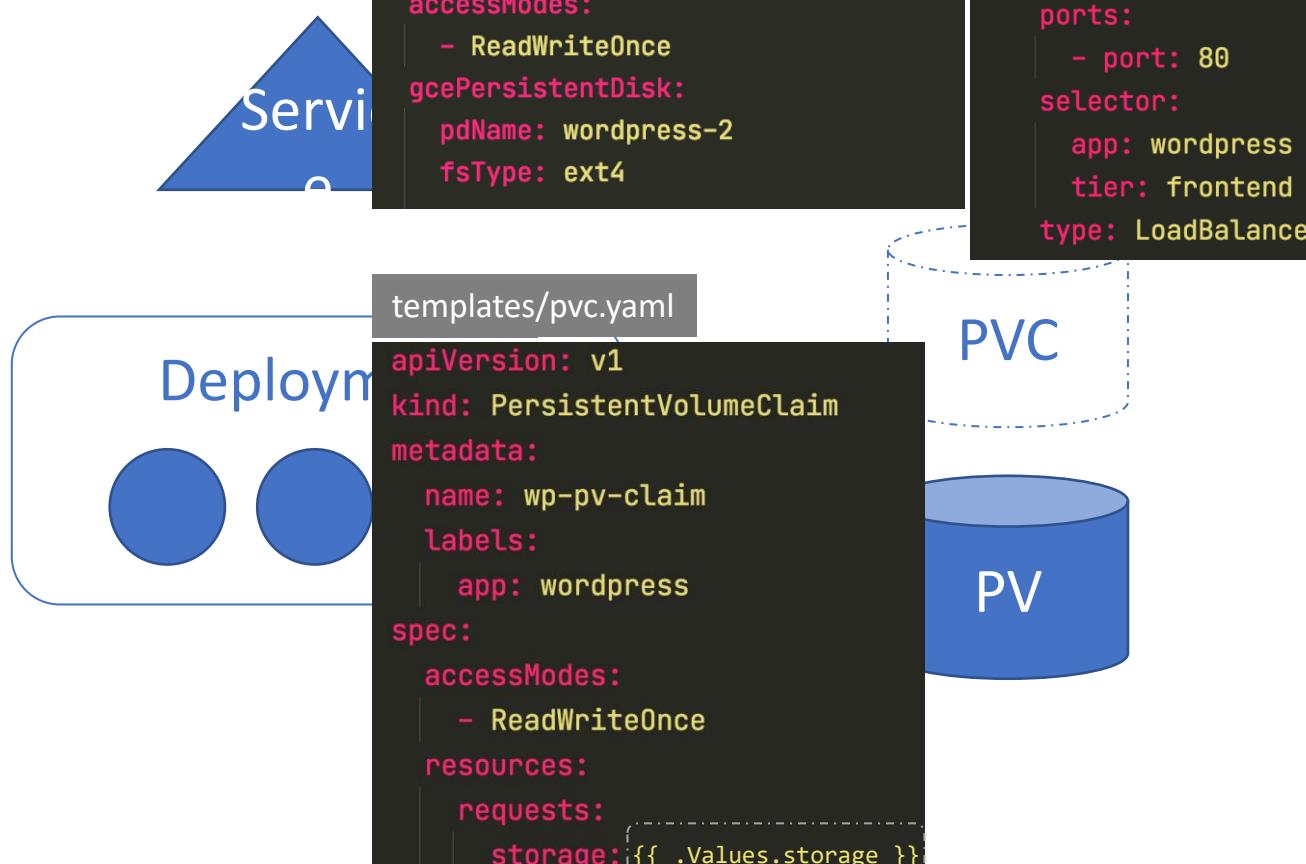
```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: wordpress-pv
spec:
  capacity:
    storage: {{ .Values.storage }}
  accessModes:
    - ReadWriteOnce
  gcePersistentDisk:
    pdName: wordpress-2
    fsType: ext4
```

templates/service.yaml

```
apiVersion: v1
kind: Service
metadata:
  name: wordpress
  labels:
    app: wordpress
spec:
  ports:
    - port: 80
  selector:
    app: wordpress
    tier: frontend
  type: LoadBalancer
```

templates/pvc.yaml

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: wp-pv-claim
  labels:
    app: wordpress
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: {{ .Values.storage }}
```



values.yaml

```
image: wordpress:4.8-apache
storage: 20Gi
passwordEncoded: CajhWVUxSdzI2Qzg6
```

templates/deployment.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: wordpress
  labels:
    app: wordpress
spec:
  selector:
    matchLabels:
      app: wordpress
      tier: frontend
  strategy:
    type: Recreate
  template:
    metadata:
      labels:
        app: wordpress
        tier: frontend
    spec:
      containers:
        - image: {{ .Values.image }}
          name: wordpress
```

templates/secret.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: wordpress-admin-password
data:
  key: {{ .Values.passwordEncoded }}
```

templates/pv.yaml

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: wordpress-pv
spec:
  capacity:
    storage: {{ .Values.storage }}
  accessModes:
    - ReadWriteOnce
  gcePersistentDisk:
    pdName: wordpress-2
    fsType: ext4
```

templates/service.yaml

```
v1
ce
dpress
rdpress
80
rdpress
rontend
type: LoadBalancer
```

templates/pvc.yaml

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: wp-pv-claim
  labels:
    app: wordpress
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: {{ .Values.storage }}
```

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```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: wordpress
  labels:
    app: wordpress
spec:
  selector:
    matchLabels:
      app: wordpress
      tier: frontend
  strategy:
    type: RollingUpdate
    rollingUpdate:
      maxSurge: 1
      maxUnavailable: 1
  template:
    metadata:
      labels:
        app: wordpress
        tier: frontend
    spec:
      containers:
        - name: wordpress
          image: wordpress:4.8-apache
          ports:
            - containerPort: 80
          volumeMounts:
            - name: wordpress-pv
              mountPath: /var/www/html
      volumes:
        - name: wordpress-pv
          persistentVolumeClaim:
            claimName: wordpress-pv
```

```
apiVersion: v1
kind: Secret
metadata:
  name: wordpress-admin-password
data:
  key: CajhWVUxSdzI2Qzg0SERXhBQTWrQ1FzN2JE9PQ==
```

values.yaml

```
image: wordpress:4.8-apache
storage: 20Gi
passwordEncoded: CajhWVUxSdzI2Qzg0SERXhBQTWrQ1FzN2JE9PQ==
```



templates/deployment.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: wordpress
  labels:
    app: wordpress
spec:
  selector:
    matchLabels:
      app: wordpress
      tier: frontend
  strategy:
    type: Recreate
  template:
    metadata:
      labels:
        app: wordpress
        tier: frontend
    spec:
      containers:
        - image: {{ .Values.image }}
          name: wordpress
      volumes:
        - name: wp-pv-claim
          persistentVolumeClaim:
            claimName: wp-pv-claim
```

templates/secret.yaml

```
apiVersion: v1
kind: Secret
metadata:
  name: wordpress-admin-password
data:
  key: {{ .Values.passwordEncoded }}
```

```
templates/pv.yaml
apiVersion: v1
kind: PersistentVolume
metadata:
  name: wordpress-pv
spec:
  capacity:
    storage: {{ .Values.storage }}
  accessModes:
    - ReadWriteOnce
  gcePersistentDisk:
    pdName: wordpress-2
    fsType: ext4
```

templates/pvc.yaml

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: wp-pv-claim
  labels:
    app: wordpress
spec:
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: {{ .Values.storage }}
```

Helm Chart

Chart.yaml

```
apiVersion: v2
name: Wordpress
version: 9.0.3
description: Web publishing platform for building blogs and websites.
keywords:
  - wordpress
  - cms
  - blog
  - http
  - web
  - application
  - php
home: http://www.wordpress.com/
sources:
  - https://github.com/bitnami/bitnami-docker-wordpress
maintainers:
  - email: containers@bitnami.com
    name: Bitnami
```



Templates

values.yaml

Chart.yaml

Repository

<https://artifacthub.io/>

The screenshot shows the homepage of the ArtifactHub repository. At the top, there is a navigation bar with the ArtifactHUB logo, STATISTICS, SIGN UP, SIGN IN, and a settings icon. The main heading "Find, install and publish Kubernetes packages" is prominently displayed. Below it is a search bar with the placeholder "Search packages" and a tip: "Tip: Use multiple words to refine your search. Example: [kafka operator](#)". There are also links for "browse all packages" and sample queries like "Helm Charts provided by Bitnami" and "OPA policies with MIT license". At the bottom, two large statistics are shown: 5756 packages and 91774 releases.

STATS SIGN UP SIGN IN

Find, install and publish
Kubernetes packages

Search packages

Tip: Use **multiple words** to refine your search. Example: [kafka operator](#)

You can also [browse all packages](#) - or - try one of the sample queries:

[Packages of any kind related to etcd](#) [Packages with Apache-2.0 license](#) [Official Prometheus packages](#)

[Helm Charts provided by Bitnami](#) [OPA policies with MIT license](#)

5756 | 91774

PACKAGES | RELEASES

Helm Search

▶ helm search hub wordpress

```
https://hub.helm.sh/charts/kube-wordpress/wordp... 0  
https://hub.helm.sh/charts/groundhog2k/wordpress  0.  
https://hub.helm.sh/charts/bitnami-aks/wordpress  12
```



The screenshot shows the Bitnami Helm Charts landing page. At the top, there's a navigation bar with the Bitnami logo, followed by links for Applications, Kubernetes, Developers, and Company. A green "Sign In" button is on the far right. Below the navigation is a large blue header section with the title "Helm Charts" and a subtext: "Find your favorite application in our catalog and launch it." It also mentions "Learn more about the [benefits of the Bitnami Application Catalog](#)". The main content area has a white background with a large orange diagonal shape on the right.

▶ helm repo add bitnami <https://charts.bitnami.com/bitnami>

▶ helm search repo wordpress

NAME	CHART VERSION	APP VERSION	DESCRIPTION
bitnami/wordpress	12.1.14	5.8.1	Web publishing platform for building blogs and ...

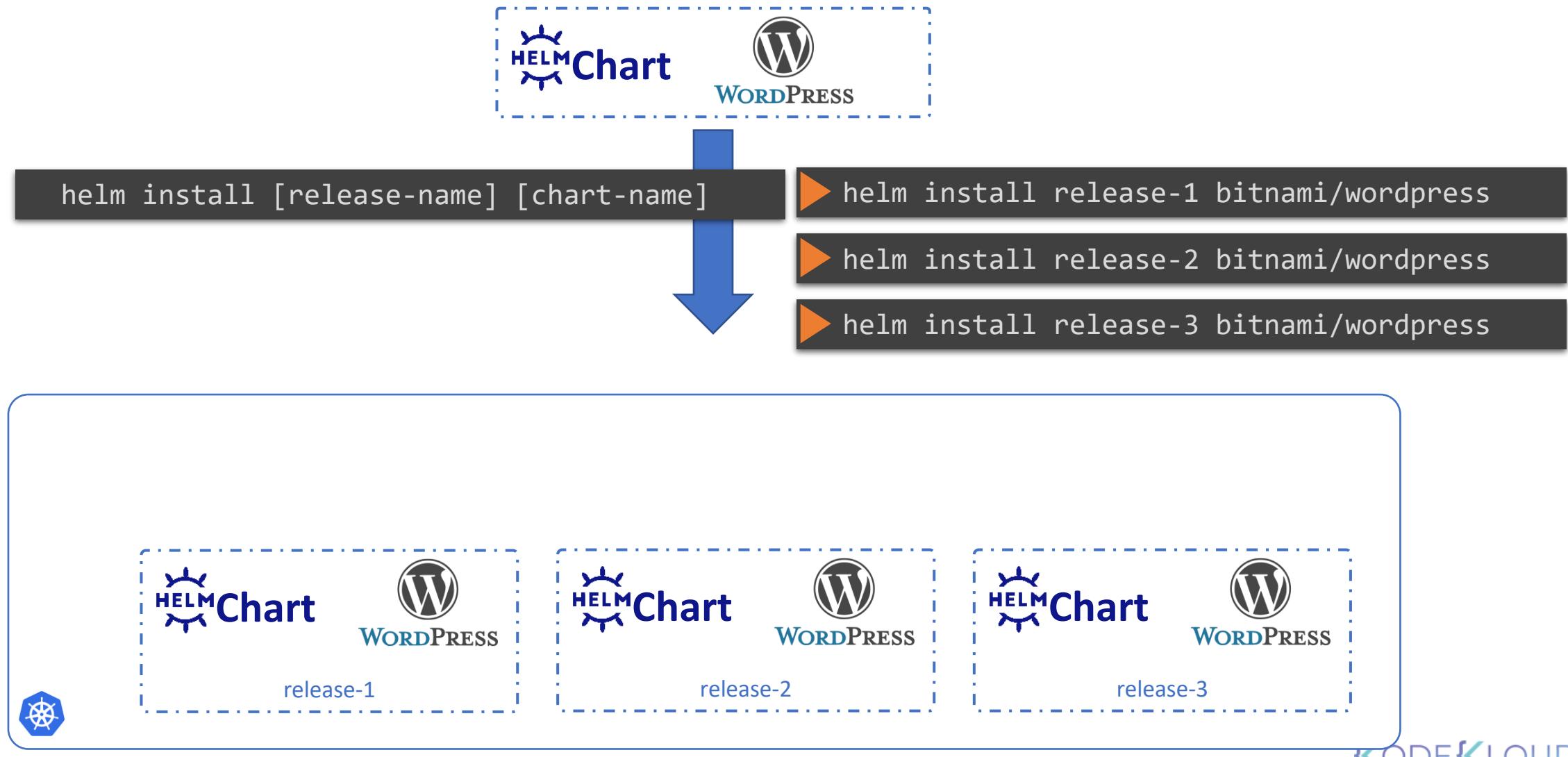


This screenshot shows the Bitnami Application Catalog search results for "WordPress". At the top, there's a search bar with the placeholder "Search applications" and a dropdown menu showing suggestions like "WordPress", "MongoDB", and "TensorFlow". Below the search bar is a table with columns for NAME, CHART VERSION, APP VERSION, and DESCRIPTION. The first result is "bitnami/wordpress" with version 12.1.14 and app version 5.8.1, described as a "Web publishing platform for building blogs and ...". To the right of the table are two buttons: "Win / Mac / Linux" and "Virtual Machines". Below the table, there are four cards with icons and names: "Wordpress" (blue hexagon icon), "Joomla!" (red hexagon icon), "DokuWiki" (green hexagon icon), and "WordPress" (blue hexagon icon). Each card has a "Wiki" link, a rating of 4.5 stars, and a "Blog" link.

▶ helm repo list

NAME	URL
bitnami	https://charts.bitnami.com/bitnami

Release



Helm commands

```
▶ helm list
```

NAME	NAMESPACE	REVISION	UPDATED	STATUS	CHART	APP VERSION
my-release	default	1	2021-05-30 09:52:38.33818569 -0400 EDT	deployed	wordpress-11.0.12	5.7.2

```
▶ helm uninstall my-release
```

```
▶ helm pull --untar bitnami/wordpress
```

```
▶ ls wordpress
```

```
Chart.lock    README.md    ci          values.schema.json  
Chart.yaml   charts       templates    values.yaml
```

```
▶ helm install release-4 ./wordpress
```