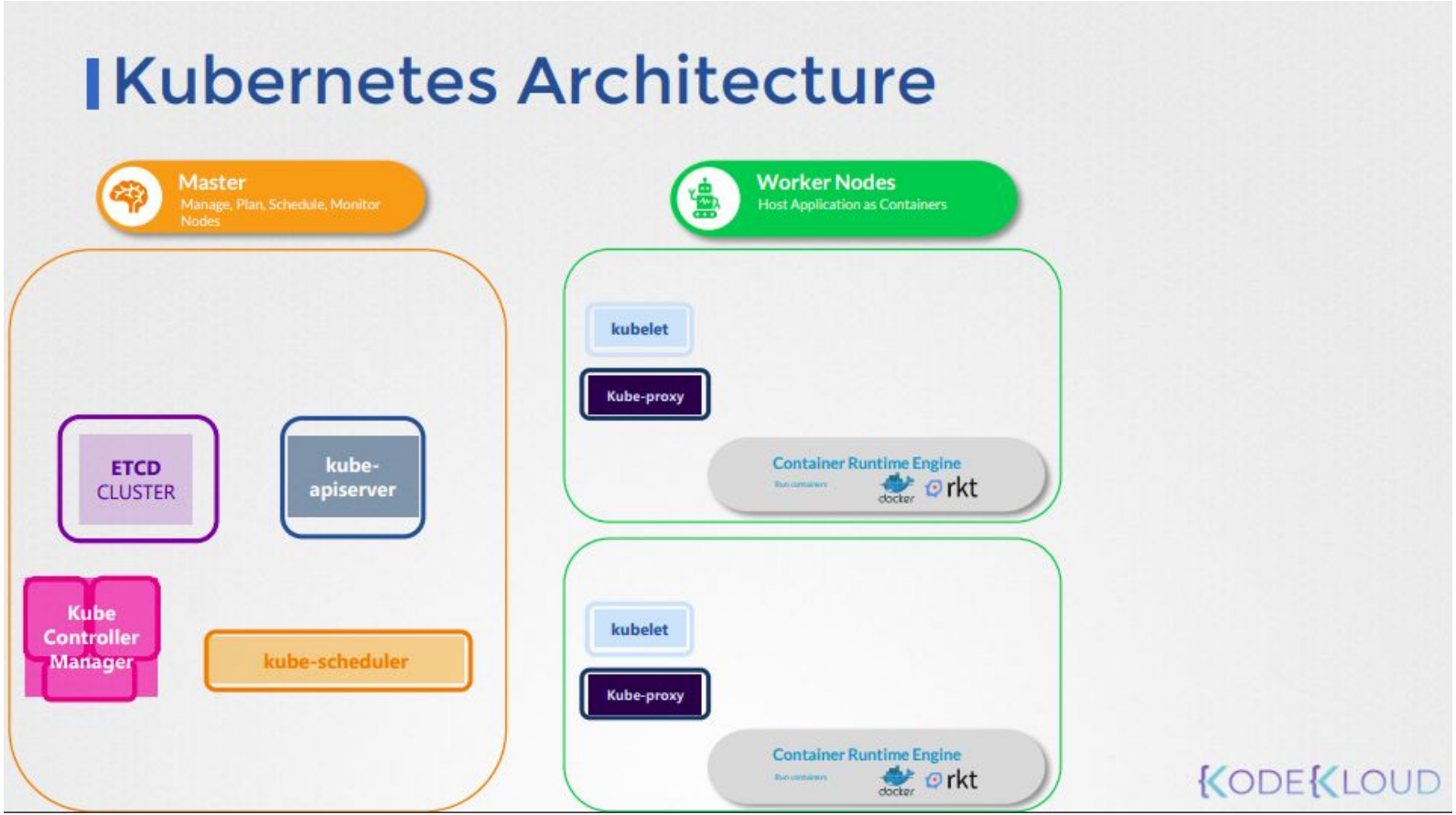
Agenda

- Architecture
- Pods
- ReplicaSets
- Deployments

KUBERNETES ARCHITECTURE

KODEKLOUD

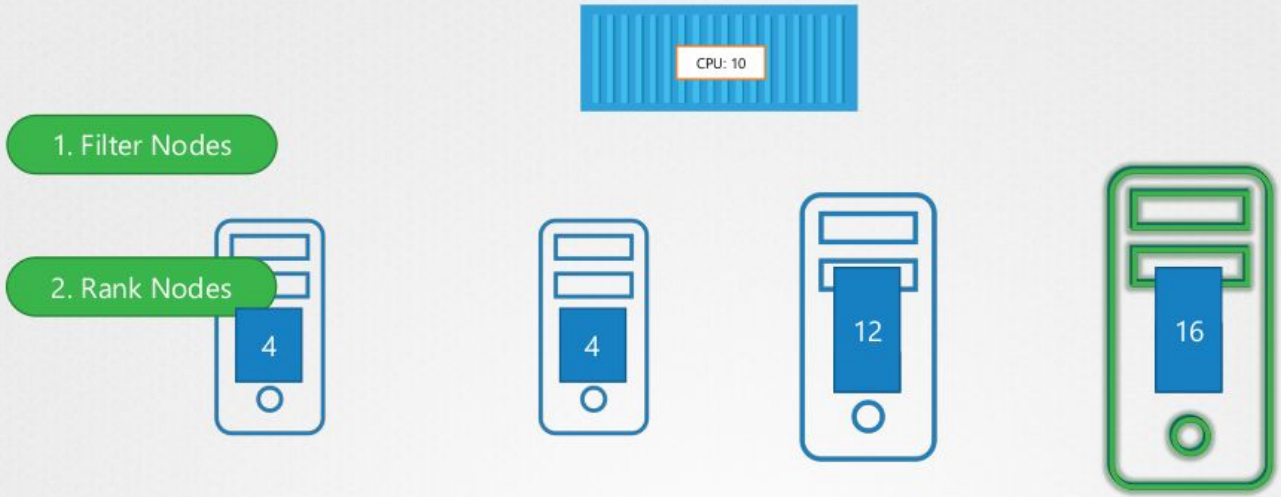
Kubernetes Architecture



KODEKLOUD

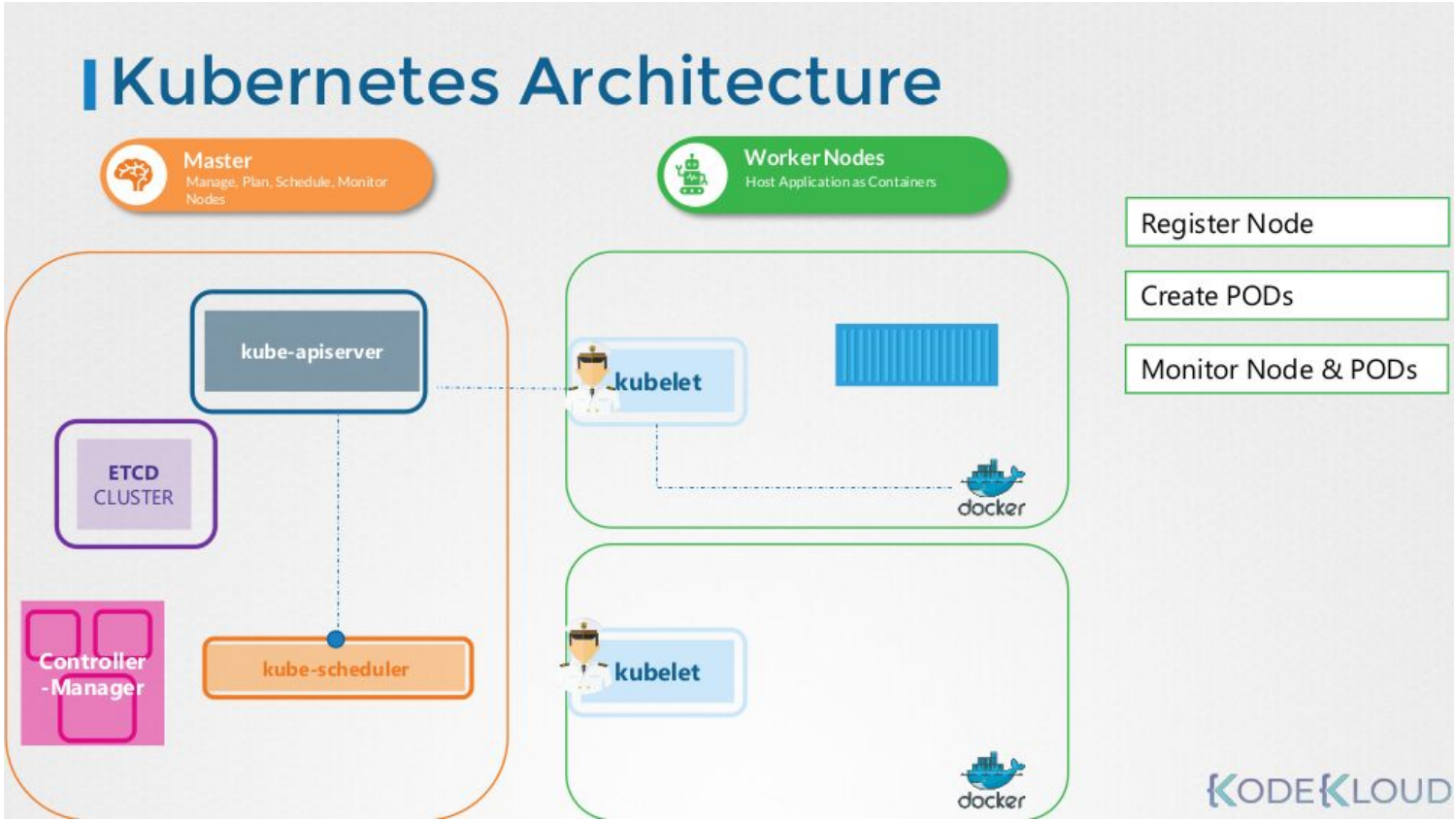

ETCD is a distributed reliable key-value store that is Simple, Secure & Fast

Kube-Scheduler

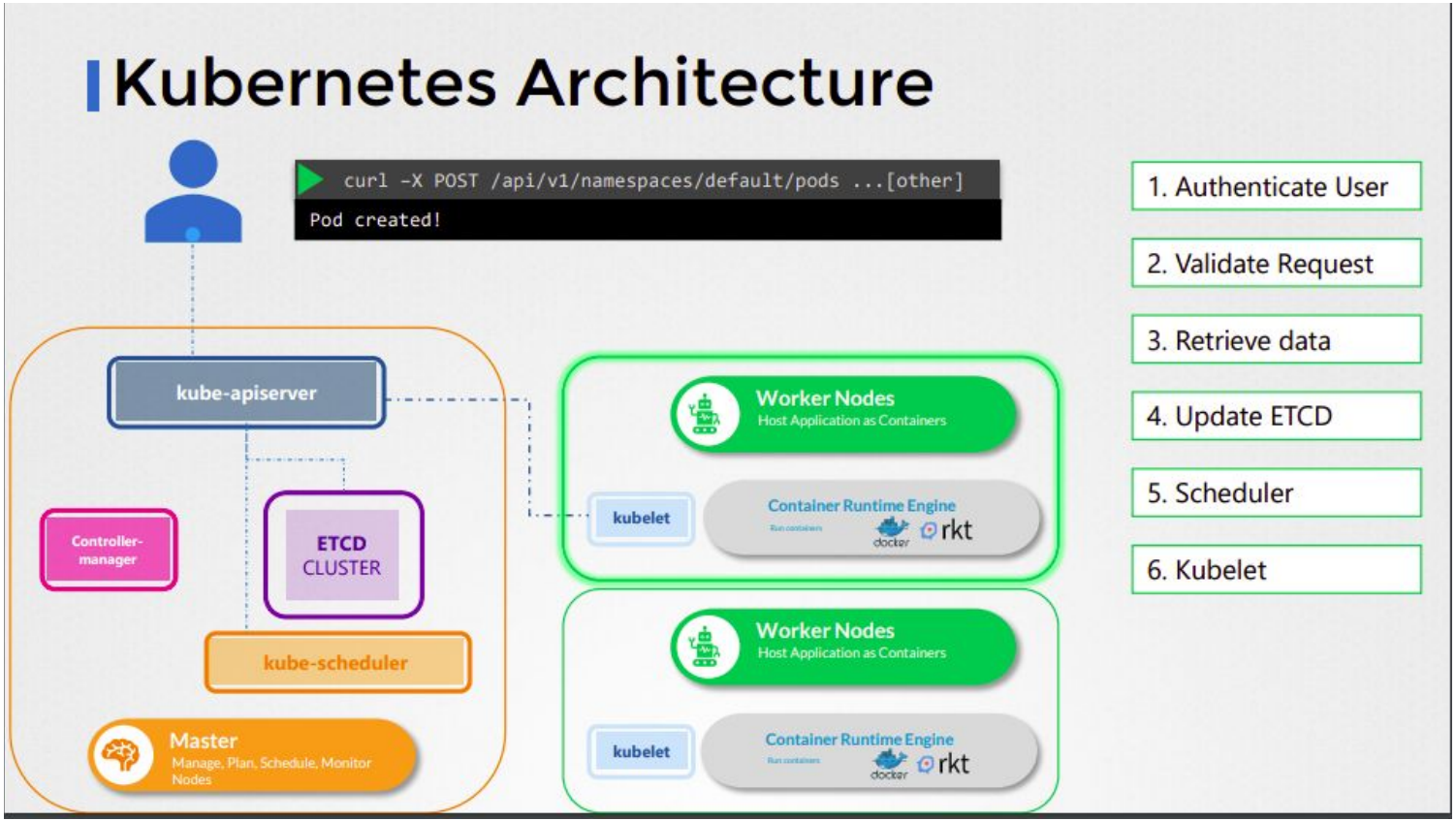


KODEKLOUD

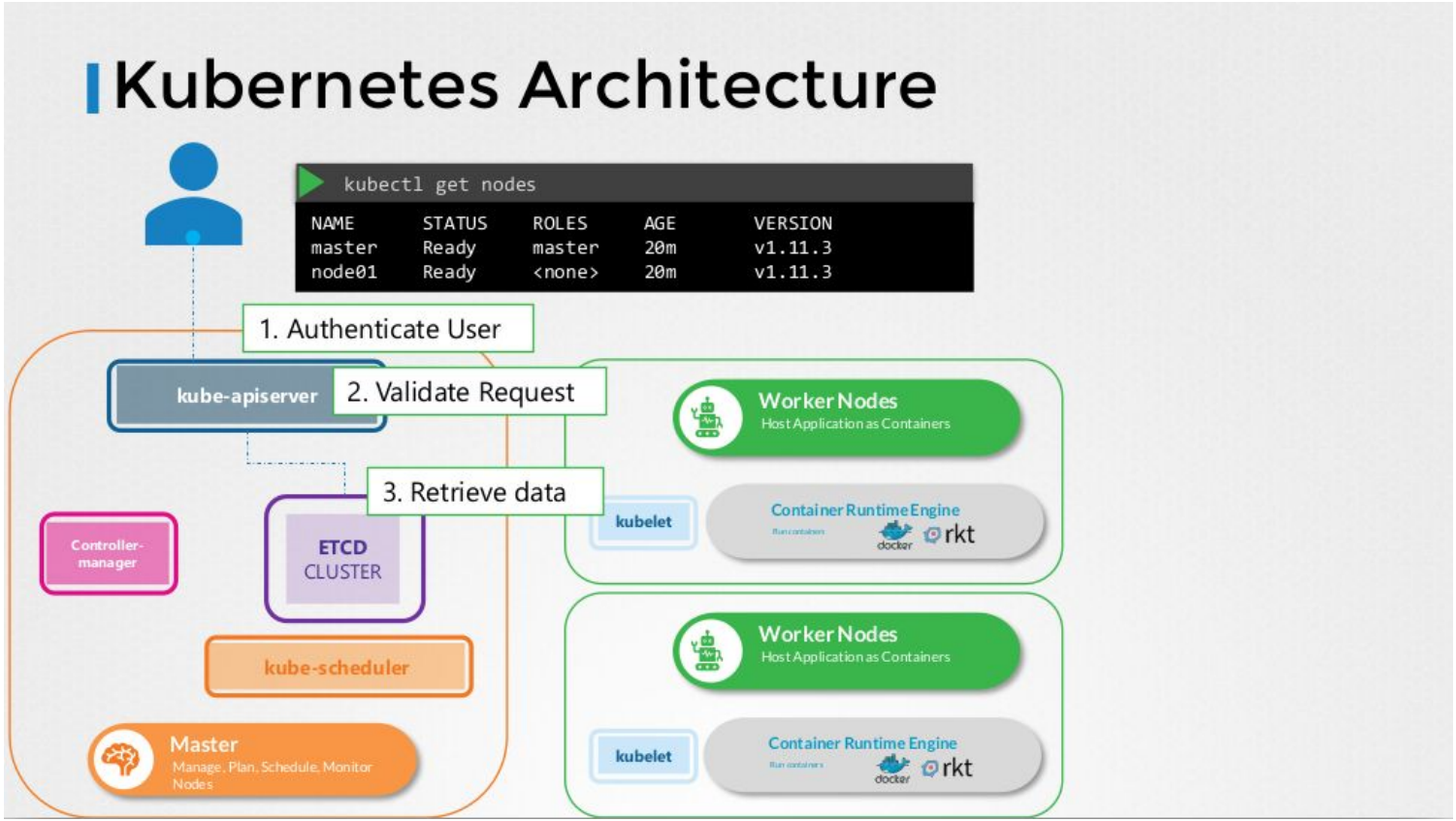
Kubernetes Architecture



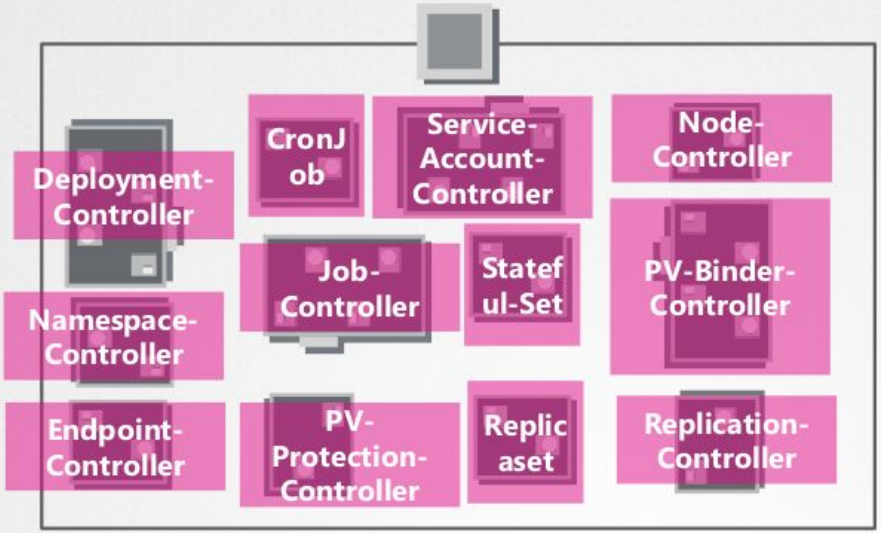
Kubernetes Architecture



Kubernetes Architecture



Controller



Watch Status

Remediate Situation

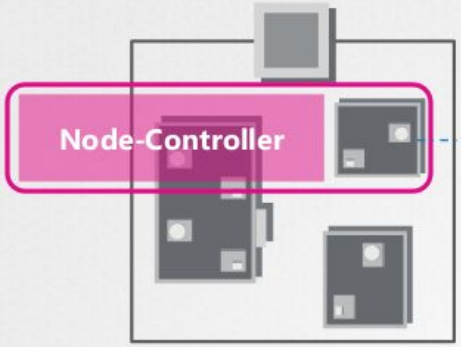
Node Monitor Period = 5s

Node Monitor Grace Period = 40s

POD Eviction Timeout = 5m

KODEKLOUD

Controller



kube-apiserver

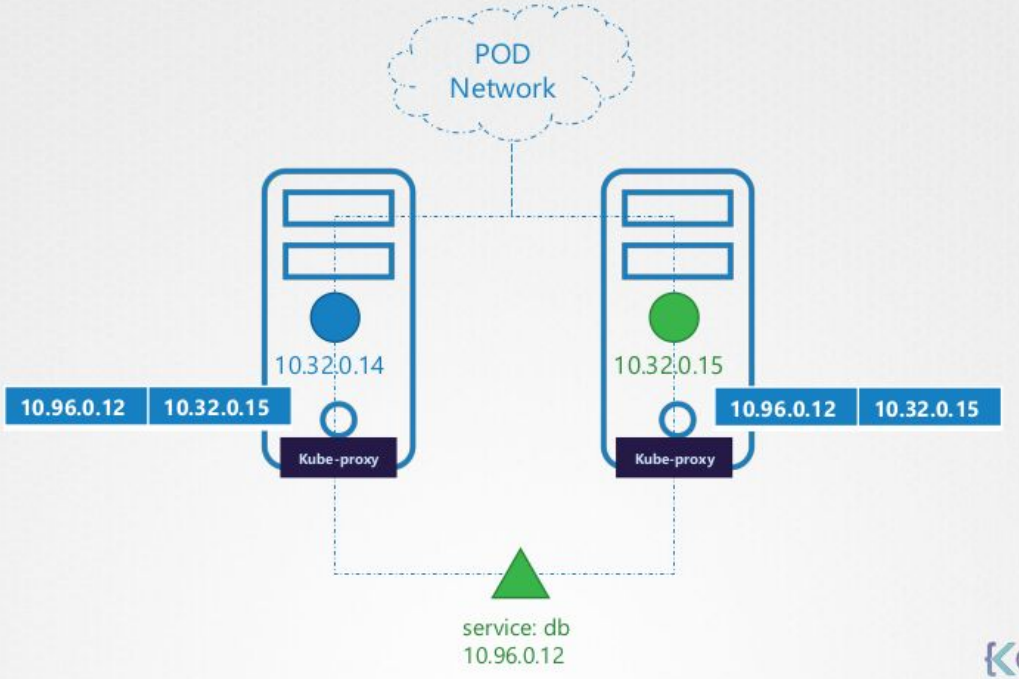
- Watch Status
- Remediate Situation
- Node Monitor Period = 5s
- Node Monitor Grade Period = 40s
- POD Eviction Timeout = 5m

UNREACHABLE

```
kubectl get nodes
NAME       STATUS     ROLES    AGE   VERSION
worker-1   Ready      <none>   8d    v1.13.0
worker-2   NotReady   <none>   8d    v1.13.0
```

DE{KLOUD

Kube-proxy



KODEKLOUD

View api-server - kubeadm

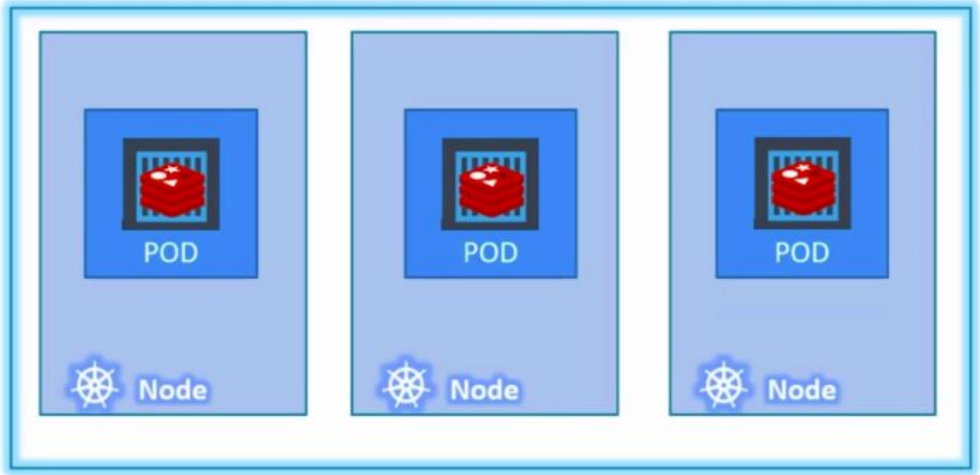
```
kubectl get pods -n kube-system
```

NAMESPACE	NAME	READY	STATUS	RESTARTS	AGE
kube-system	coredns-78fcdf6894-hwrq9	1/1	Running	0	16m
kube-system	coredns-78fcdf6894-rzhjr	1/1	Running	0	16m
kube-system	etcd-master	1/1	Running	0	15m
kube-system	kube-apiserver-master	1/1	Running	0	15m
kube-system	kube-controller-manager-master	1/1	Running	0	15m
kube-system	kube-proxy-lzt6f	1/1	Running	0	16m
kube-system	kube-proxy-zm5qd	1/1	Running	0	16m
kube-system	kube-scheduler-master	1/1	Running	0	15m
kube-system	weave-net-29z42	2/2	Running	1	16m
kube-system	weave-net-snmdl	2/2	Running	1	16m

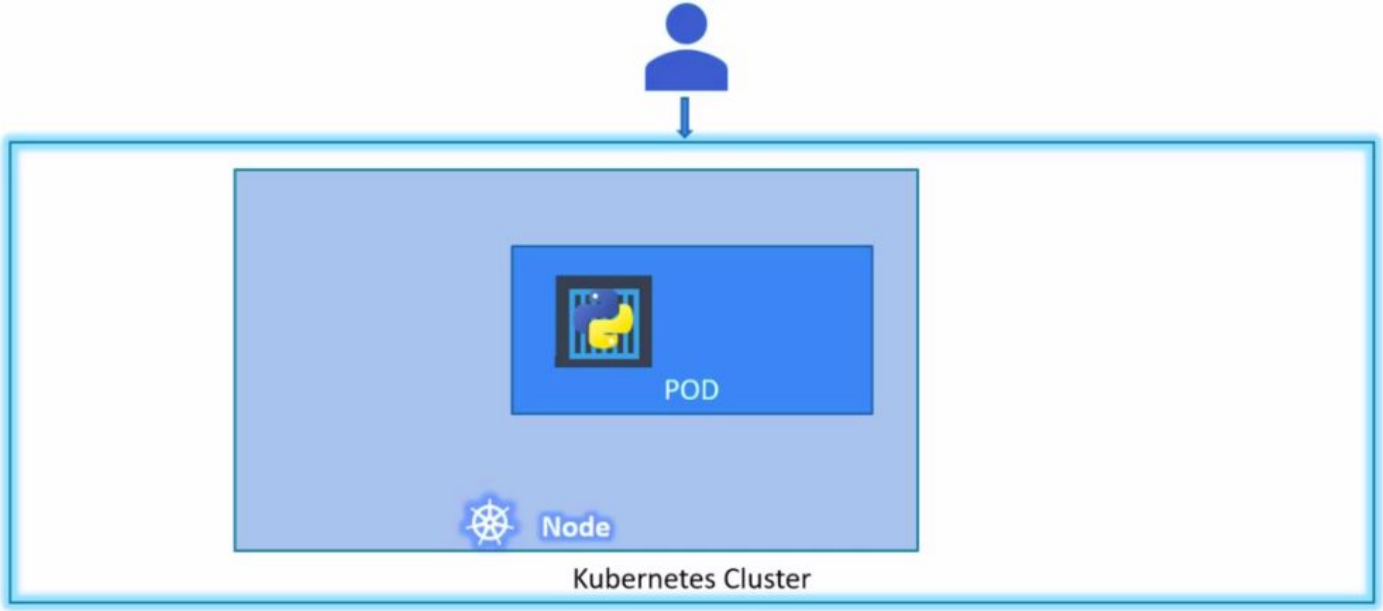
KODEKLOUD

POD

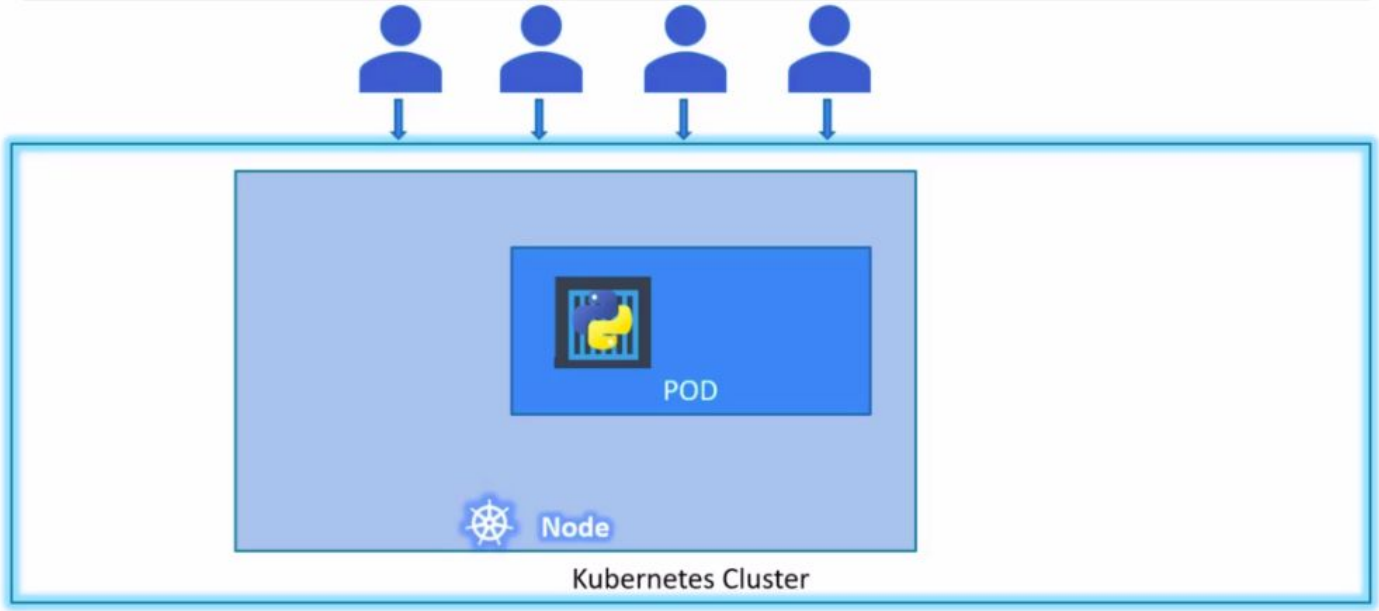
POD



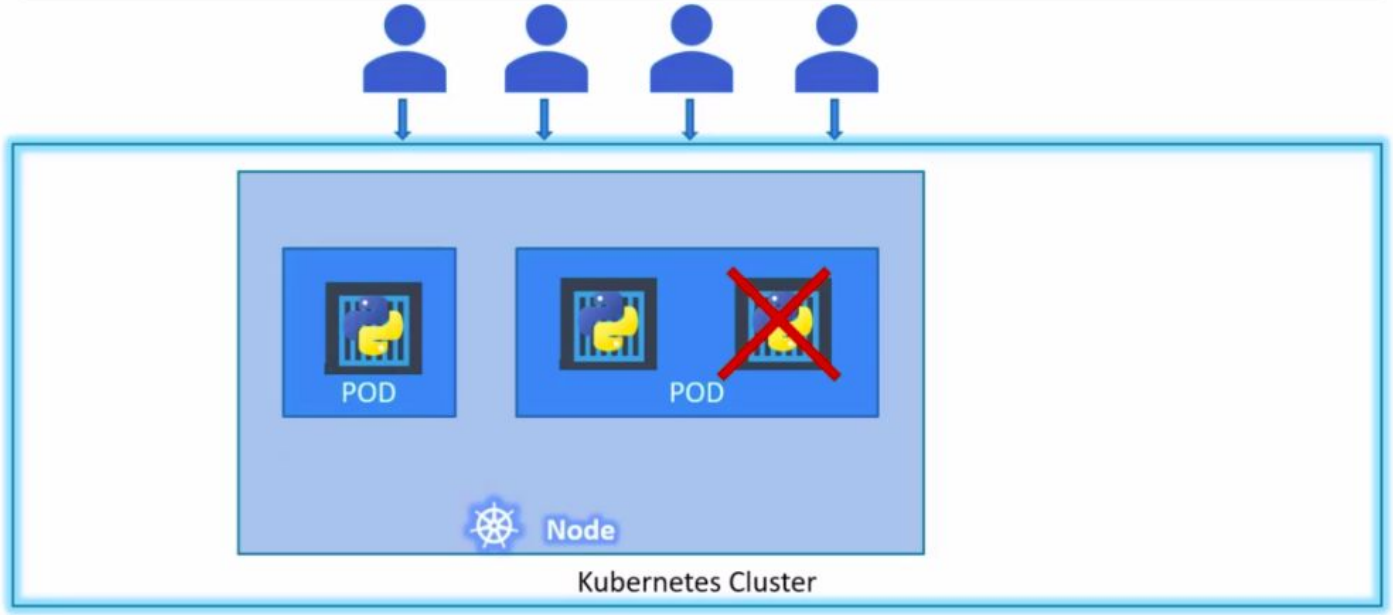
POD



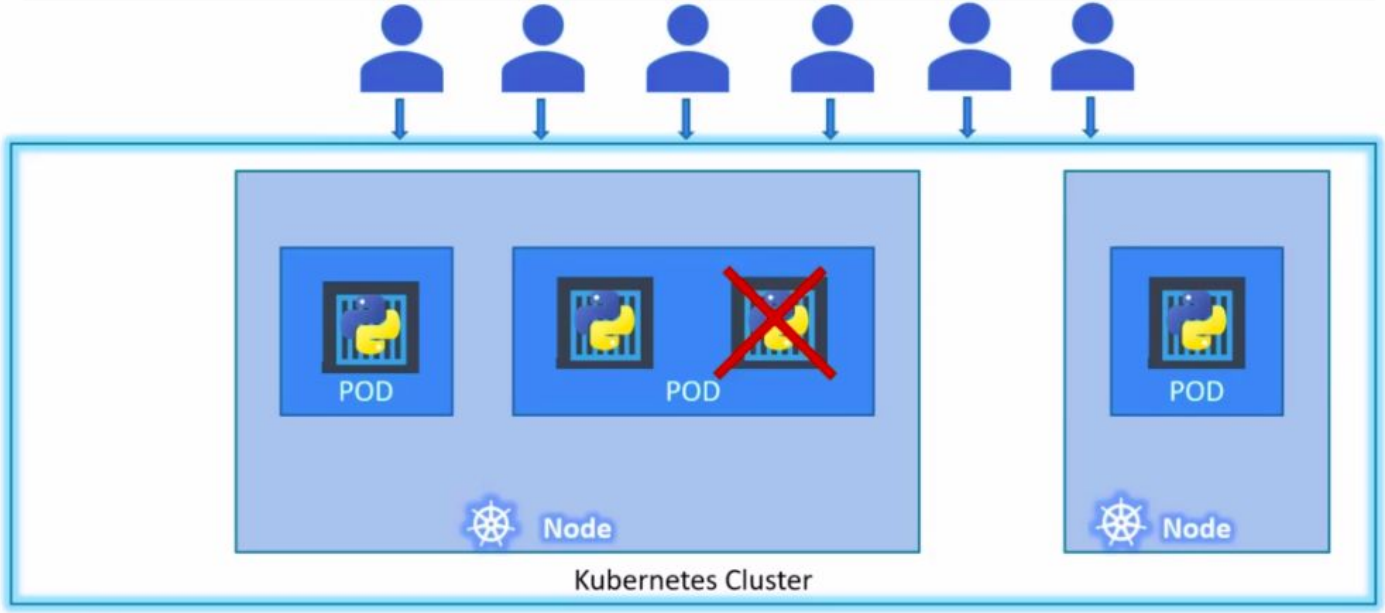
POD



POD



POD



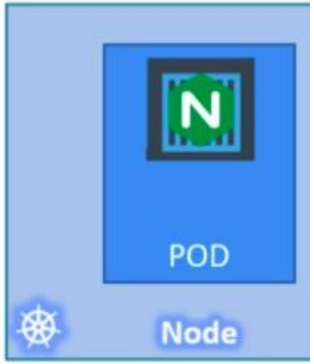
Multi-Container PODs

kubectl

```
kubectl run nginx --image nginx
```

```
kubectl get pods
NAME    READY   STATUS              RESTARTS   AGE
nginx   0/1     ContainerCreating   0          6s
```

```
NAME    READY   STATUS    RESTARTS   AGE
nginx   1/1     Running   0          34s
```



YAML in Kubernetes

pod-definition.yml

```
apiVersion:
kind:
metadata:



spec:
```

YAML in Kubernetes

pod-definition.yml

```yaml
apiVersion: v1
kind:
metadata:



spec:
```

Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

YAML in Kubernetes

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: myapp-pod
  labels:
      app: myapp

spec:
```

Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

YAML in Kubernetes

pod-definition.yml

```
apiVersion: v1
kind: Pod
metadata:
  name: myapp-pod
  labels:
    app: myapp
spec:
```

String

String

Dictionary

Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

YAML in Kubernetes

pod-definition.yml

```
apiVersion: v1
kind: Pod
metadata:
        name: myapp-pod
        labels:
            app: myapp
spec:
```

Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

YAML in Kubernetes

pod-definition.yml

```
apiVersion: v1
kind: Pod
metadata:
  name: myapp-pod
    labels:
        app: myapp
spec:
```

Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

YAML in Kubernetes

pod-definition.yml

```
apiVersion: v1
kind: Pod
metadata:
name: myapp-pod
labels:
    app: myapp
spec:
```

Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

YAML in Kubernetes

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: myapp-pod
  labels:
    app: myapp
    type: front-end
spec:
  containers:
    - name: nginx-container
      image: nginx
```

Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

YAML in Kubernetes

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: myapp-pod
  labels:
    app: myapp
    type: front-end
spec:
  containers:
    - name: nginx-container
      image: nginx
```

List/Array

Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

YAML in Kubernetes

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: myapp-pod
  labels:
    app: myapp
    type: front-end
spec:
  containers:
    - name: nginx-container
      image: nginx
```

```
kubectl create -f pod-definition.yml
```

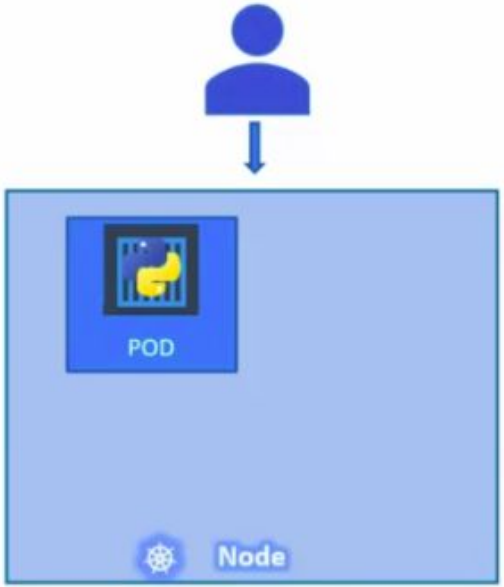
Kind	Version
POD	v1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1

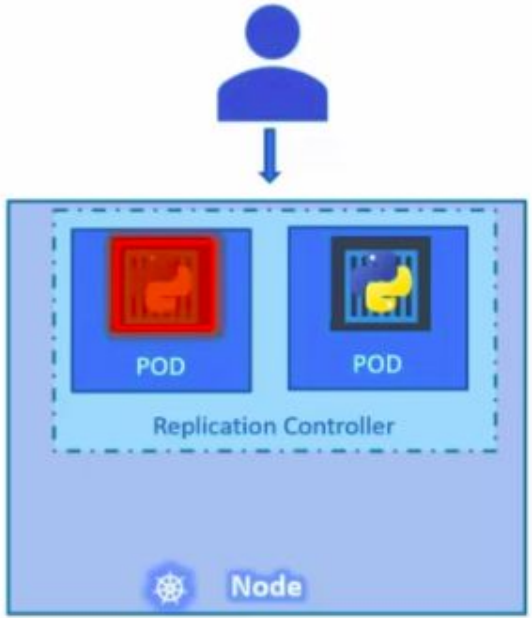
Commands

```
> kubectl get pods
NAME            READY     STATUS    RESTARTS   AGE
myapp-pod       1/1       Running   0          20s
```

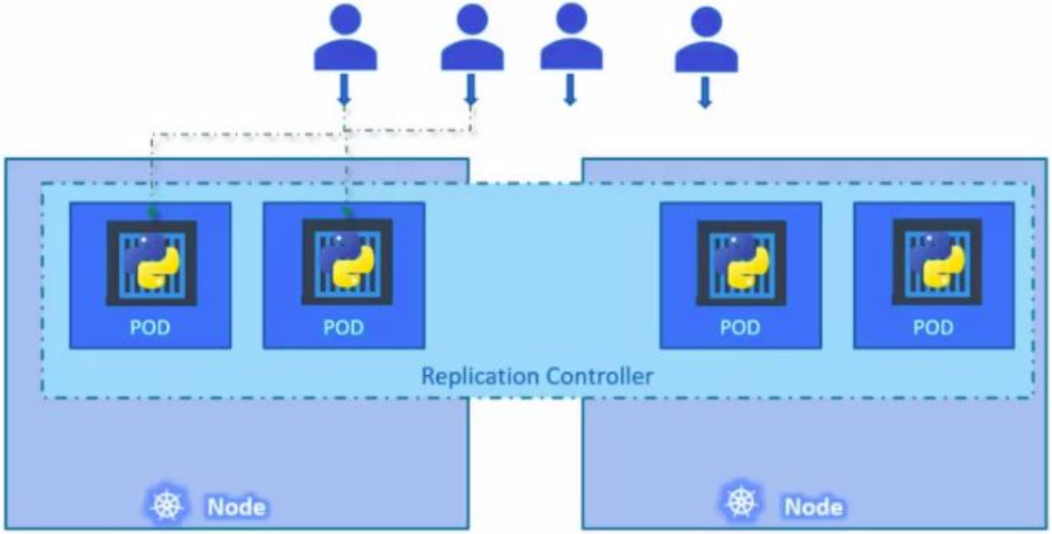
```
> kubectl describe pod myapp-pod
Name:         myapp-pod
Namespace:    default
Node:         minikube/192.168.99.100
Start Time:   Sat, 03 Mar 2018 14:26:14 +0800
Labels:       app=myapp
              name=myapp-pod
Annotations:  <none>
Status:       Running
IP:           172.17.0.24
Containers:
  nginx:
    Container ID:   docker://830bb56c8c42a86b4bb70e9c1488fae1bc38663e4918b6c2f5a783e7688b8c9d
    Image:          nginx
    Image ID:       docker-pullable://nginx@sha256:4771d09578c7c6a65299e110b3ee1c0a2592f5ea2618d23e4ffe7a4cab1ce5de
    Port:           <none>
    State:          Running
      Started:      Sat, 03 Mar 2018 14:26:21 +0800
    Ready:          True
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from default-token-x95w7 (ro)
Conditions:
  Type           Status
  Initialized    True
  Ready          True
  PodScheduled   True
Events:
  Type    Reason                 Age   From               Message
  ----    ------                 ----  ----               -------
  Normal  Scheduled              34s   default-scheduler  Successfully assigned myapp-pod to minikube
  Normal  SuccessfulMountVolume  33s   kubelet, minikube  MountVolume.SetUp succeeded for volume "default-token-x95w7"
  Normal  Pulling                33s   kubelet, minikube  pulling image "nginx"
  Normal  Pulled                 27s   kubelet, minikube  Successfully pulled image "nginx"
  Normal  Created                27s   kubelet, minikube  Created container
  Normal  Started                27s   kubelet, minikube  Started container
```

High Availability





Load Balancing & Scaling



replicaset-definition.yml

```yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myapp-replicaset
  labels:
      app: myapp
      type: front-end
spec:
  template:
```

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod

metadata:
 name: myapp-pod
 labels:
    app: myapp
    type: front-end
spec:
  containers:
  - name: nginx-container
    image: nginx
```

replicaset-definition.yml

```yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myapp-replicaset
  labels:
      app: myapp
      type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        app: myapp
        type: front-end
    spec:
      containers:
      - name: nginx-container
        image: nginx
```

POD

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod
```

replicaset-definition.yml

```yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myapp-replicaset
  labels:
      app: myapp
      type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        app: myapp
        type: front-end
    spec:
      containers:
      - name: nginx-container
        image: nginx

  replicas: 3
  selector:
    matchLabels:
      type: front-end
```

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod
```

replicaset-definition.yml

```yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myapp-replicaset
  labels:
      app: myapp
      type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        app: myapp
        type: front-end
    spec:
      containers:
      - name: nginx-container
        image: nginx

  replicas: 3
  selector:
    matchLabels:
      type: front-end
```

pod-definition.yml

```yaml
apiVersion: v1
kind: Pod
```

```
> kubectl create -f replicaset-definition.yml
replicaset "myapp-replicaset" deleted
```

```
> kubectl get replicaset
NAME            DESIRED   CURRENT   READY     AGE
myapp-replicaset   3         3         3         19s
```

```
> kubectl get pods
NAME                      READY     STATUS    RESTARTS   AGE
myapp-replicaset-9dd19    1/1       Running   0          45s
myapp-replicaset-9jtpx    1/1       Running   0          45s
myapp-replicaset-hq84m    1/1       Running   0          45s
```

Scale

```
> kubectl replace -f replicaset-definition.yml
```

```
> kubectl scale --replicas=6 -f replicaset-definition.yml
```

```
> kubectl scale --replicas=6 replicaset myapp-replicaset
```

TYPE NAME

replicaset-definition.yml

```
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myapp-replicaset
  labels:
      app: myapp
      type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        app: myapp
        type: front-end
    spec:
      containers:
      - name: nginx-container
        image: nginx
  replicas: 6
  selector:
    matchLabels:
      type: front-end
```

commands

```
> kubectl create -f replicaset-definition.yml
```

```
> kubectl get replicaset
```

```
> kubectl delete replicaset myapp-replicaset
```

*Also deletes all underlying PODs

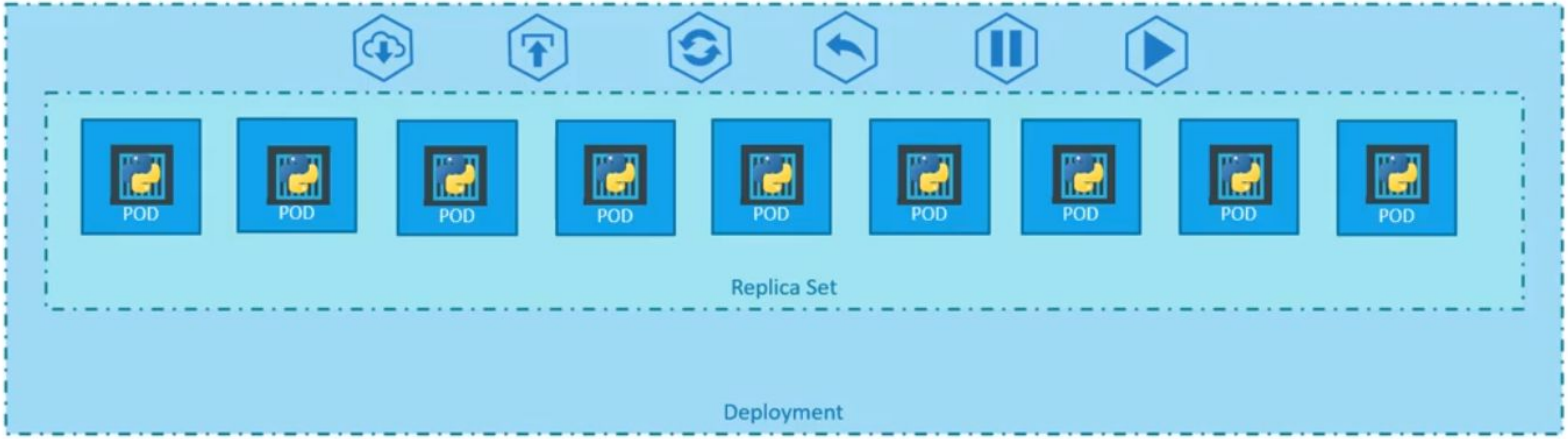
```
> kubectl replace -f replicaset-definition.yml
```

```
> kubectl scale -replicas=6 -f replicaset-definition.yml
```

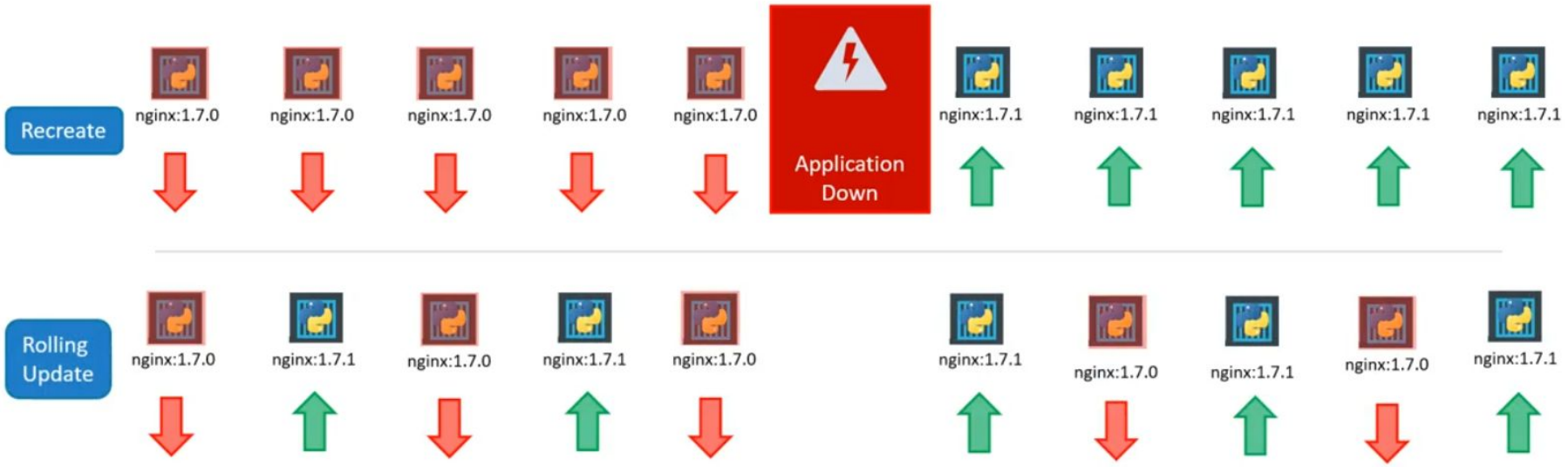
Deployment

Deployment


v1
v2


POD
POD
POD
POD
POD
POD
POD
POD
POD
Replica Set
Deployment

Deployment Strategy



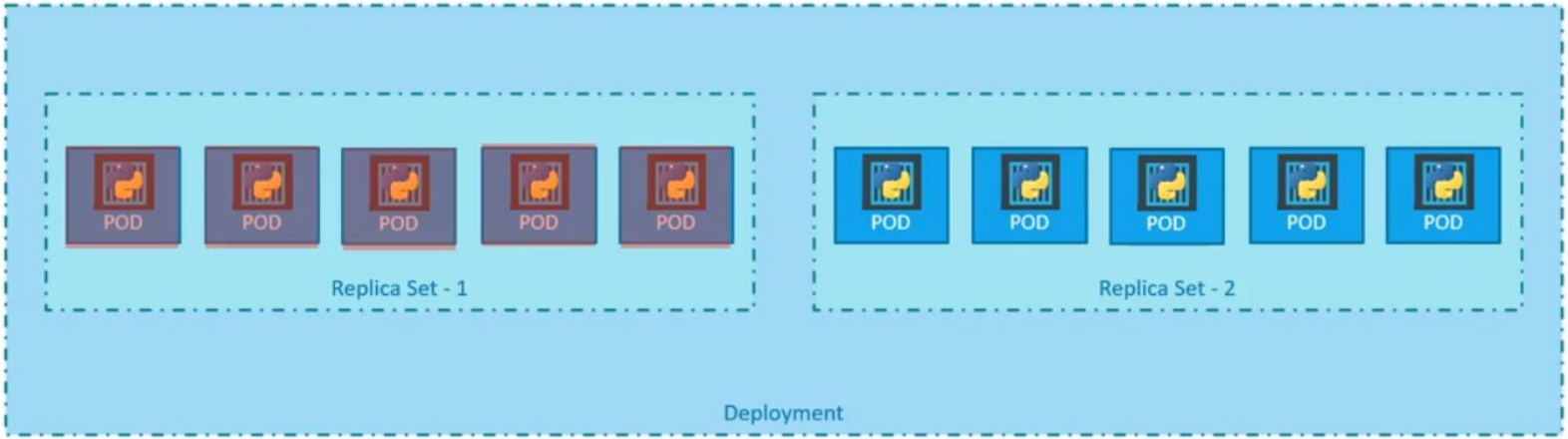
```
C:\Kubernetes>kubectl describe deployment myapp-deployment
Name:                   myapp-deployment
Namespace:              default
CreationTimestamp:      Sat, 03 Mar 2018 17:01:55 +0800
Labels:                 app=myapp
                        type=front-end
Annotations:            deployment.kubernetes.io/revision=2
                        kubectl.kubernetes.io/last-applied-configuration={"apiVersion":"apps/v1","kind":"Deployment","me
s\\Google...
                        kubernetes.io/change-cause=kubectl apply --filename=d:\Mumshad Files\Google Drive\Udemy\Kubernet
Selector:               type=front-end
Replicas:               5 desired | 5 updated | 5 total | 5 available | 0 unavailable
StrategyType:           Recreate
MinReadySeconds:        0
Pod Template:
  Labels:  app=myapp
           type=front-end
  Containers:
   nginx-container:
    Image:        nginx:1.7.1
    Port:         <none>
    Environment:  <none>
    Mounts:       <none>
  Volumes:        <none>
Conditions:
  Type           Status  Reason
  ----           ------  ------
  Available      True    MinimumReplicasAvailable
  Progressing    True    NewReplicaSetAvailable
OldReplicaSets:  <none>
NewReplicaSet:   myapp-deployment-54c7d6ccc (5/5 replicas created)
Events:
  Type    Reason             Age   From                   Message
  ----    ------             ----  ----                   -------
  Normal  ScalingReplicaSet  11m   deployment-controller  Scaled up replica set myapp-deployment-6795844b58 to 5
  Normal  ScalingReplicaSet  1m    deployment-controller  Scaled down replica set myapp-deployment-6795844b58 to 0
  Normal  ScalingReplicaSet  56s   deployment-controller  Scaled up replica set myapp-deployment-54c7d6ccc to 5
```

```
C:\Kubernetes>kubectl describe deployment myapp-deployment
Name:                   myapp-deployment
Namespace:              default
CreationTimestamp:      Sat, 03 Mar 2018 17:16:53 +0800
Labels:                 app=myapp
                        type=front-end
Annotations:            deployment.kubernetes.io/revision=2
                        kubectl.kubernetes.io/last-applied-configuration={"apiVersion":"apps/v1","kind":"Deployment","metadata
Files\\Google...
                        kubernetes.io/change-cause=kubectl apply --filename=d:\Mumshad Files\Google Drive\Udemy\Kubernetes\De
Selector:               type=front-end
Replicas:               5 desired | 5 updated | 6 total | 4 available | 2 unavailable
StrategyType:           RollingUpdate
MinReadySeconds:        0
RollingUpdateStrategy:  25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=myapp
           type=front-end
  Containers:
   nginx-container:
    Image:        nginx
    Port:         <none>
    Environment:  <none>
    Mounts:       <none>
  Volumes:        <none>
Conditions:
  Type           Status  Reason
  ----           ------  ------
  Available      True    MinimumReplicasAvailable
  Progressing    True    ReplicaSetUpdated
OldReplicaSets:  myapp-deployment-67c749c58c (1/1 replicas created)
NewReplicaSet:   myapp-deployment-7d57dbdb8d (5/5 replicas created)
Events:
  Type    Reason             Age   From                   Message
  ----    ------             ----  ----                   -------
  Normal  ScalingReplicaSet  1m    deployment-controller  Scaled up replica set myapp-deployment-67c749c58c to 5
  Normal  ScalingReplicaSet  1s    deployment-controller  Scaled up replica set myapp-deployment-7d57dbdb8d to 2
  Normal  ScalingReplicaSet  1s    deployment-controller  Scaled down replica set myapp-deployment-67c749c58c to 4
  Normal  ScalingReplicaSet  1s    deployment-controller  Scaled up replica set myapp-deployment-7d57dbdb8d to 3
  Normal  ScalingReplicaSet  0s    deployment-controller  Scaled down replica set myapp-deployment-67c749c58c to 3
  Normal  ScalingReplicaSet  0s    deployment-controller  Scaled up replica set myapp-deployment-7d57dbdb8d to 4
  Normal  ScalingReplicaSet  0s    deployment-controller  Scaled down replica set myapp-deployment-67c749c58c to 2
  Normal  ScalingReplicaSet  0s    deployment-controller  Scaled up replica set myapp-deployment-7d57dbdb8d to 5
  Normal  ScalingReplicaSet  0s    deployment-controller  Scaled down replica set myapp-deployment-67c749c58c to 1
```

Recreate

RollingUpdate

Upgrades

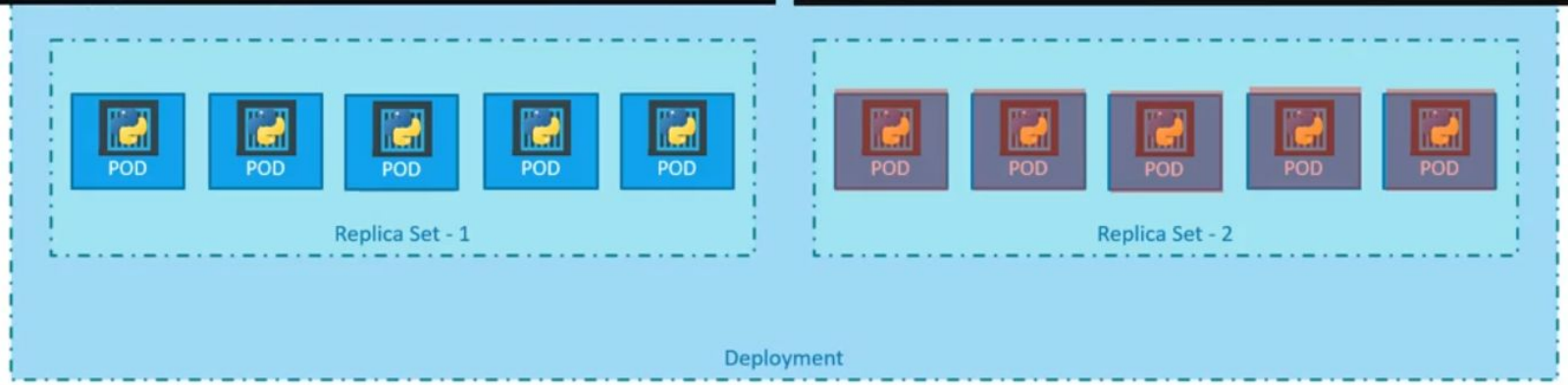



```
> kubectl get replicasets
NAME                          DESIRED   CURRENT   READY     AGE
myapp-deployment-67c749c58c   0         0         0         22m
myapp-deployment-7d57dbdb8d   5         5         5         20m
```

Rollback

```
> kubectl get replicasets
NAME                          DESIRED   CURRENT   READY   AGE
myapp-deployment-67c749c58c   0         0         0       22m
myapp-deployment-7d57dbdb8d   5         5         5       20m
```

```
> kubectl get replicasets
NAME                          DESIRED   CURRENT   READY   AGE
myapp-deployment-67c749c58c   5         5         5       22m
myapp-deployment-7d57dbdb8d   0         0         0       20m
```




```
> kubectl rollout undo deployment/myapp-deployment
deployment "myapp-deployment" rolled back
```

Kubectl apply

```
> kubectl apply -f deployment-definition.yml
deployment "myapp-deployment" configured
```

```
> kubectl set image deployment/myapp-deployment \
                  nginx=nginx:1.9.1
deployment "myapp-deployment" image is updated
```

deployment-definition.yml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: myapp-deployment
  labels:
      app: myapp
      type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
         app: myapp
         type: front-end
    spec:
      containers:
      - name: nginx-container
        image: nginx:1.7.1
  replicas: 3
  selector:
    matchLabels:
       type: front-end
```

Summarize Commands

Create	`> kubectl create -f deployment-definition.yml`
Get	`> kubectl get deployments`
Update	`> kubectl apply -f deployment-definition.yml`
	`> kubectl set image deployment/myapp-deployment nginx=nginx:1.9.1`
Status	`> kubectl rollout status deployment/myapp-deployment`
	`> kubectl rollout history deployment/myapp-deployment`
Rollback	`> kubectl rollout undo deployment/myapp-deployment`

References:

- https://www.udemy.com/course/certified-kubernetes-administrator-with-practice-tests
- https://www.udemy.com/course/certified-kubernetes-application-developer
- https://kubernetes.io/docs