Kubernetes(K8s)

Agenda

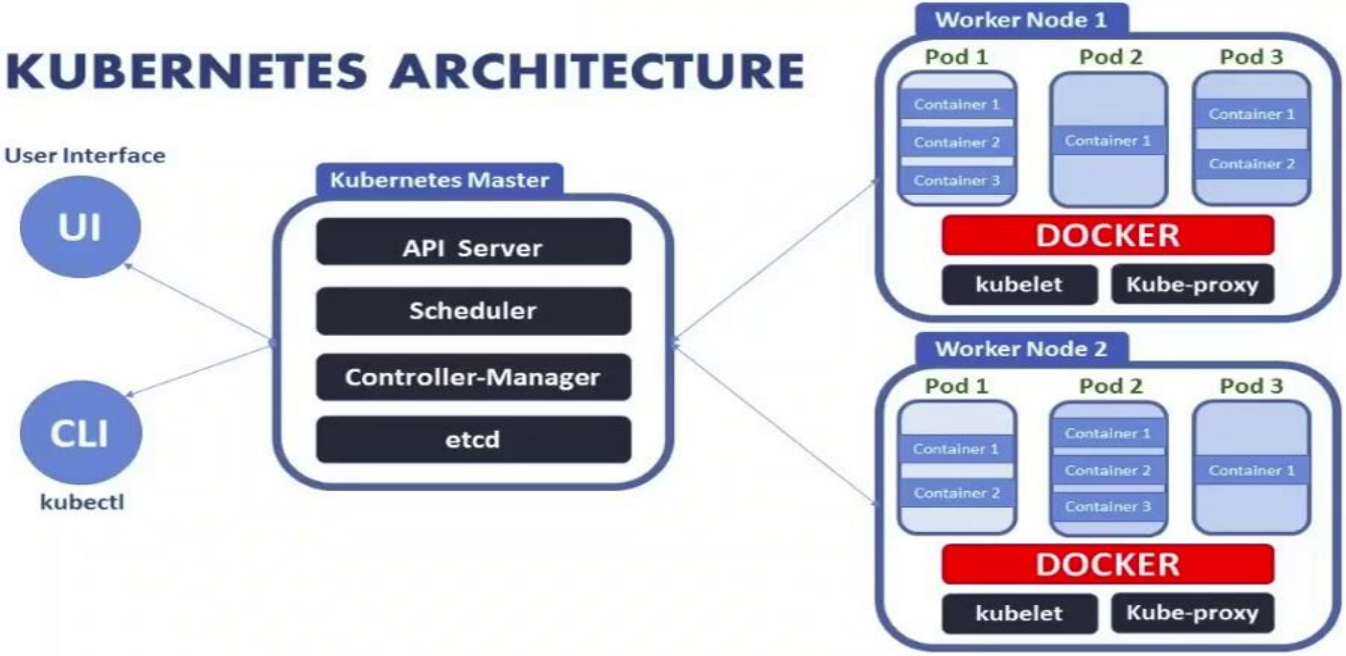
- What is Kubernetes (K8s)?
- Docker Swarm vs Kubernetes
- Architecture and components
  - Master Server Components
  - Node Server Components
- Installation of kubectl and Minicube
- Objects and other components
- Working with Kubernetes

What is Kubernetes (K8s)?

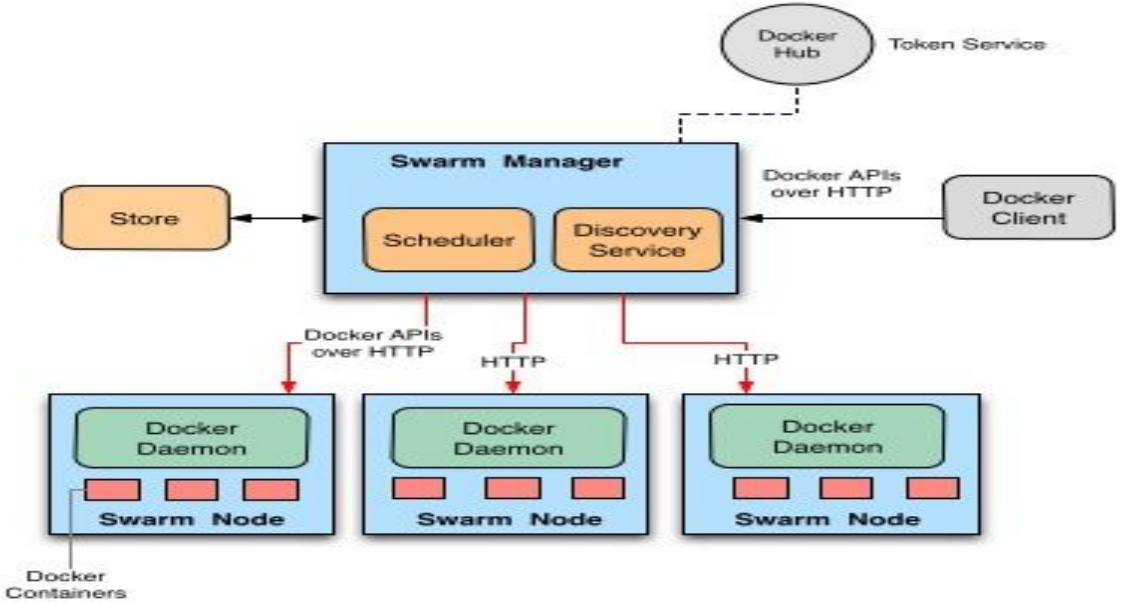
- Kubernetes is a portable, extensible, open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation.
- Kubernetes services, support, and tools are widely available.
- The name Kubernetes originates from Greek, meaning helmsman or pilot.
- Google open-sourced the Kubernetes project in 2014.

Docker Swarm	Kubernetes
Docker Swarm provides limited functionality.	Kubernetes is backed by the Cloud Native Computing Foundation (CNCF).
Docker Swarm has limited fault tolerance.	Kubernetes is an open source and modular tool that works with any OS
Docker Swarm have smaller community and project as compared to Kubernetes community	Kubernetes have an impressively huge community among container orchestration tools.
In Docker Swarm, services can be scaled manually.	Kubernetes provides easy service organization with pods
Docker Swarm is easy to install with a fast setup. It is simpler to deploy and Swarm mode is included in the Docker engine.	Kubernetes installation can be quite complex with steep learning curve
Docker Swarm smoothly integrates with Docker Compose and Docker CLI.	It is Incompatible with existing Docker CLI and Compose tools need seperate tool set

Architecture of K8s



Architecture of Docker Swarm



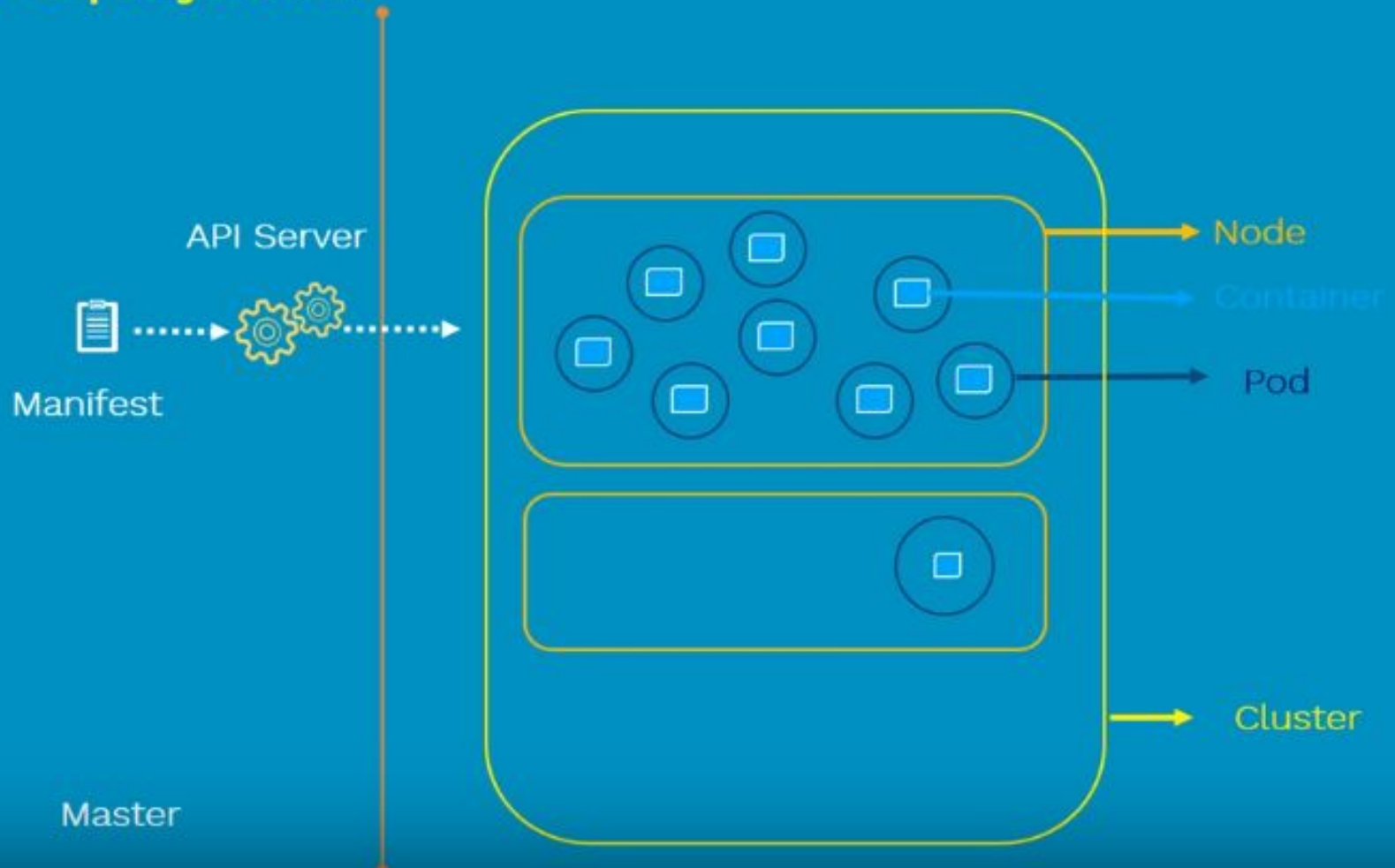
Install and Configure K8s

1. Play-with- k8s
2. Minikube
3. kudeadm
4. Google Kubernates Engine
5. Amazon EKS
6. Azure Kubernates Services

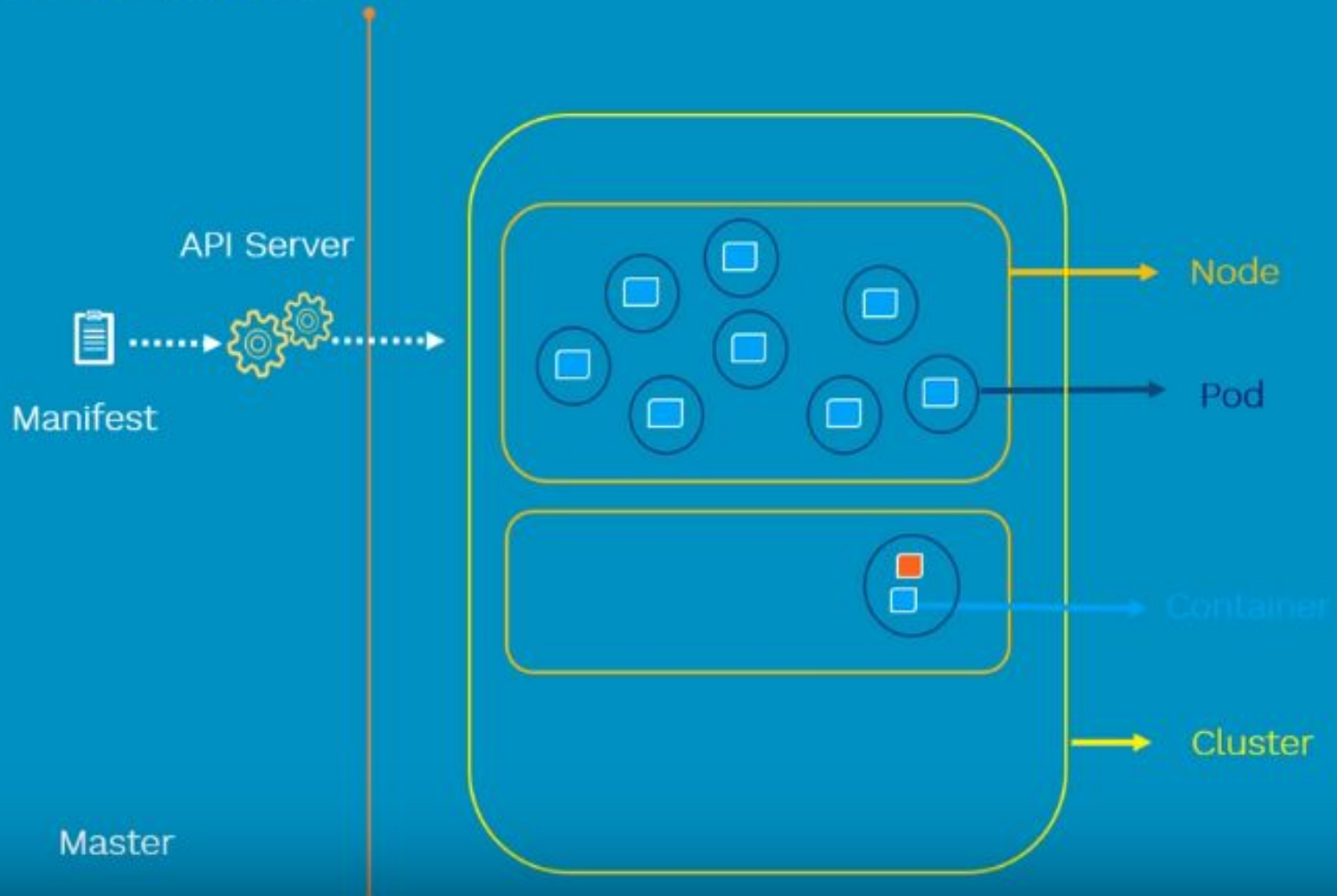
Pods

1. What is pod?
2. Multi-container pod
3. Pod life cycle
4. Pod deployment and networking
5. Intra-pod and Inter pod Communication
6. Pod manifests - demo

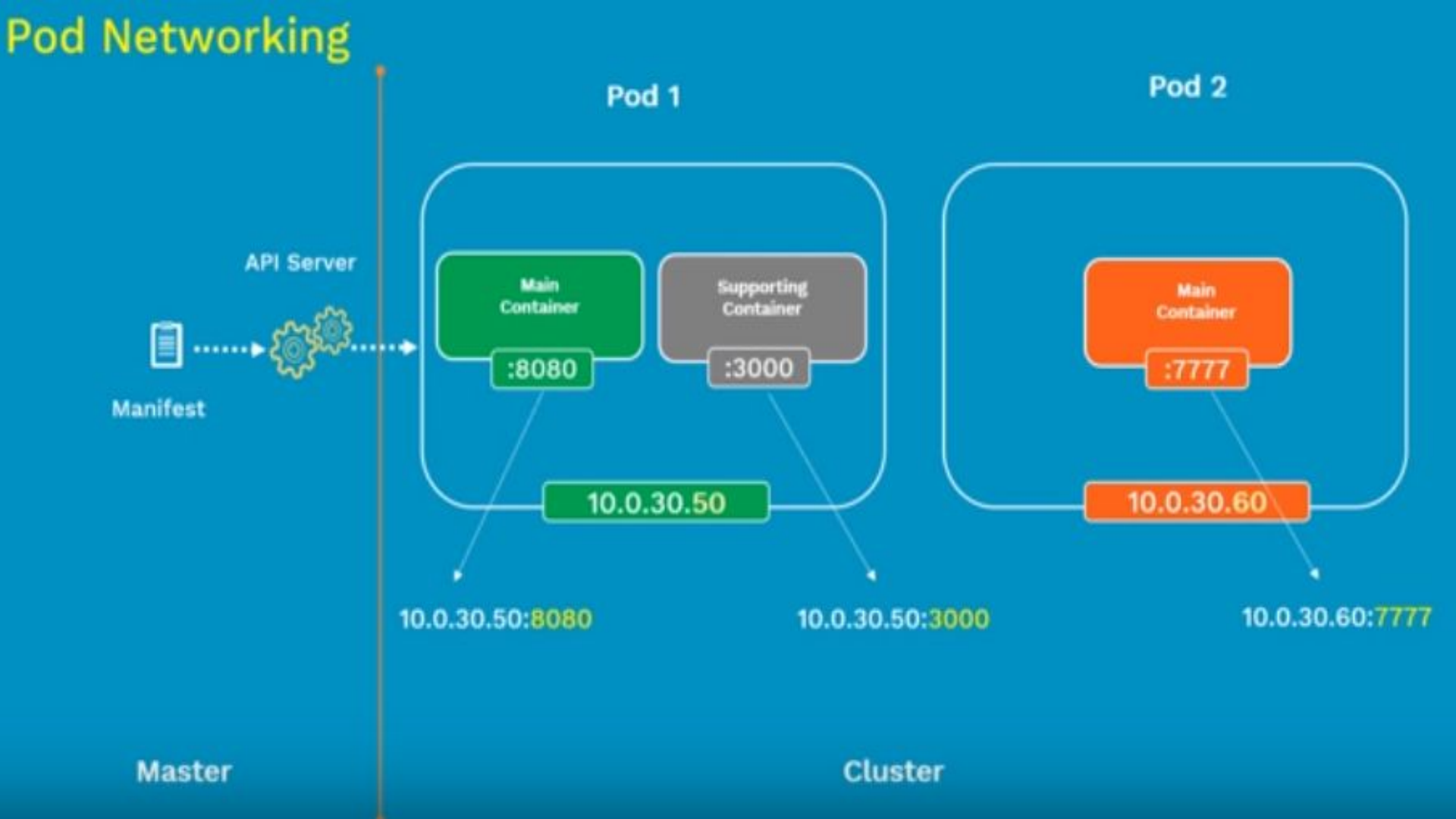
Pod Deployment



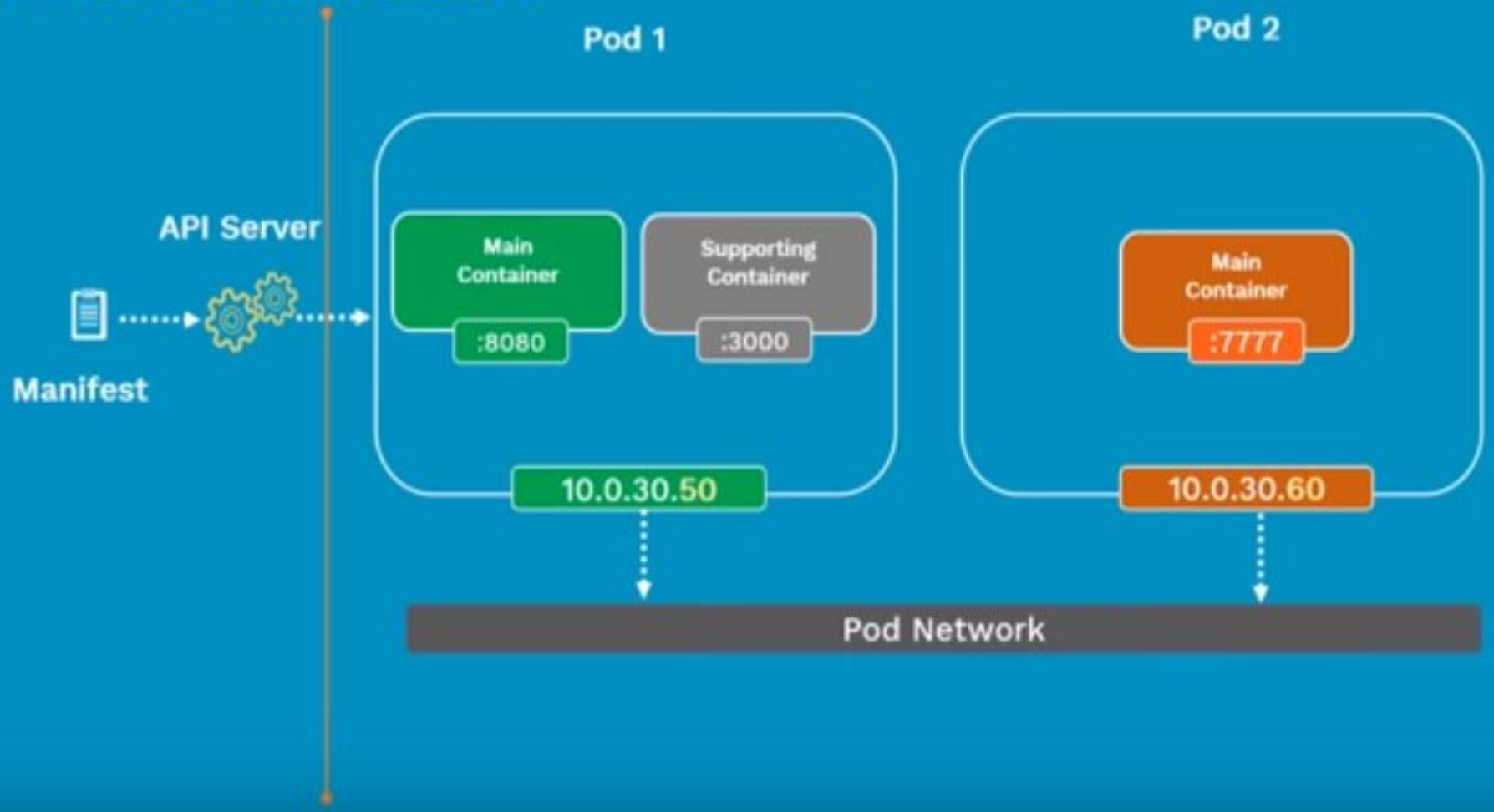
Multi-Container



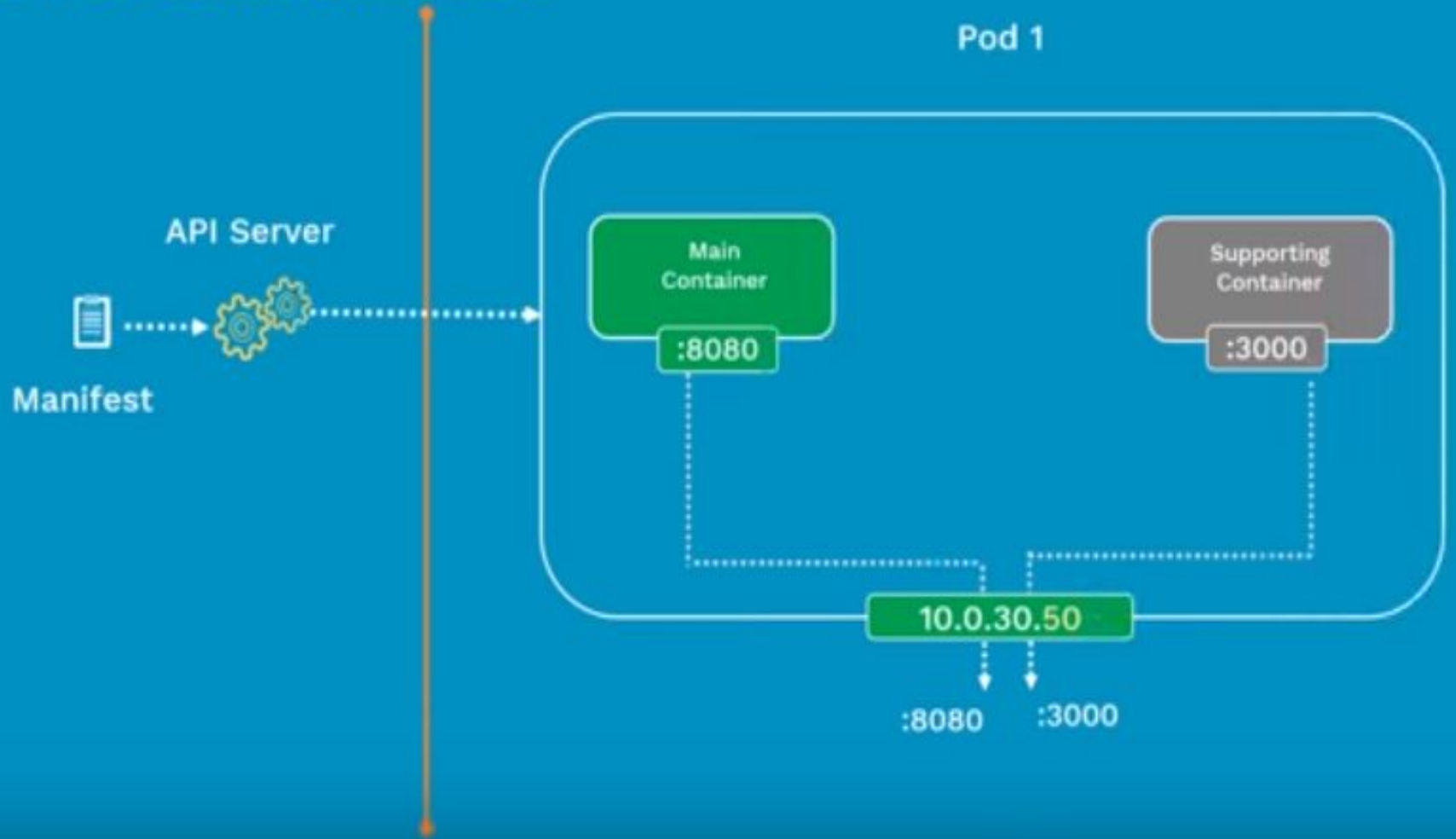
Pod Networking



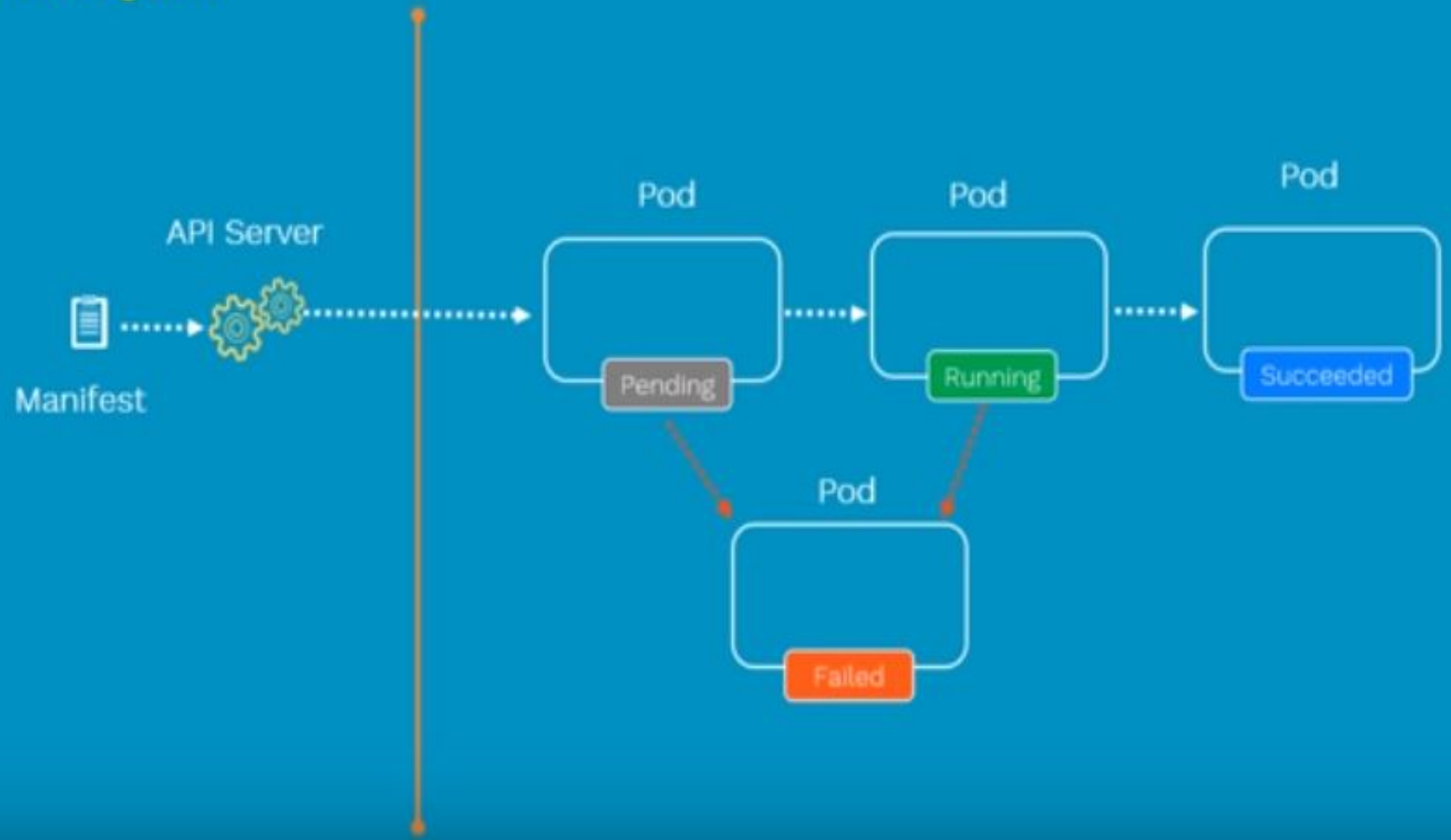
Inter-Pod communication



Intra-Pod communication



Pod lifecycle



Pod - Config

```yaml
# nginx-pod.yaml
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
  labels:
    app: nginx
    tier: dev
spec:
  containers:
  - name: nginx-container
    image: nginx
```

Kind	apiVersion
Pod	v1
ReplicationController	V1
Service	v1
ReplicaSet	apps/v1
Deployment	apps/v1
DaemonSet	apps/v1
Job	batch/v1

Alpha ---> Beta ---> Stable

Pod – Create & Display

```
[schalla@master ~]$ kubectl create -f nginx-pod.yaml
pod/nginx-pod created
```

```
[schalla@master ~]$ kubectl get pod
NAME        READY   STATUS    RESTARTS   AGE
nginx-pod   1/1     Running   0          2m
```

```
[schalla@master ~]$ kubectl get pod -o wide
NAME        READY   STATUS    RESTARTS   AGE   IP           NODE    NOMINATED NODE
nginx-pod   1/1     Running   0          8m    10.240.1.26  node1   <none>
```

```
[schalla@master ~]$ kubectl get pod nginx-pod -o yaml
apiVersion: v1
```

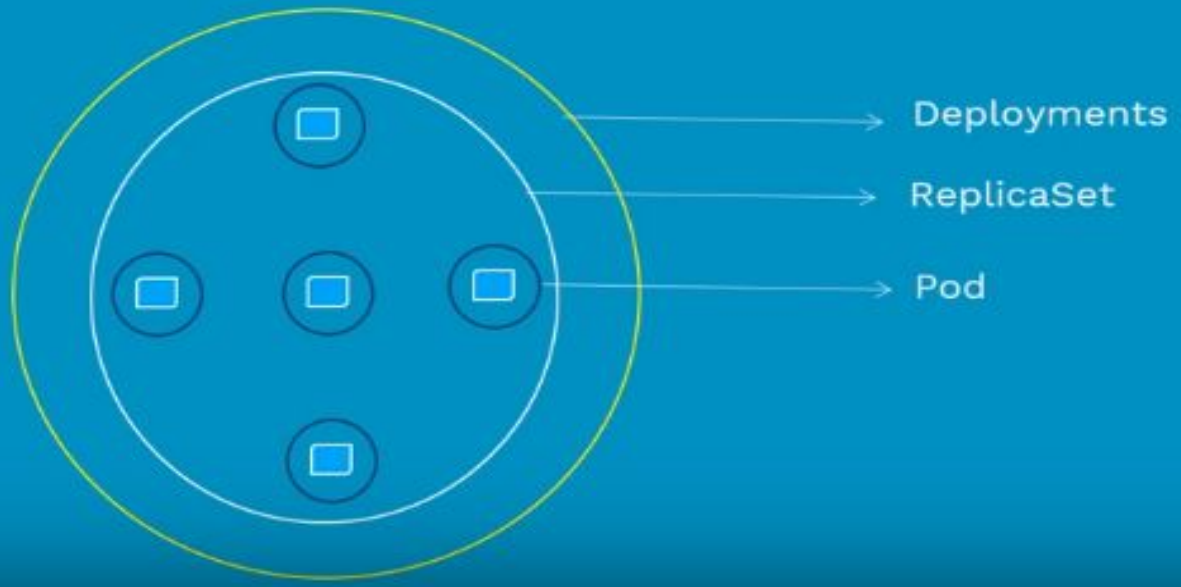
Pod - Describe

```
[schalla@master ~]$ kubectl describe pod nginx-pod        # Display all details and events of a p
Name:               nginx-pod
Namespace:          default
Priority:           0
PriorityClassName:  <none>
Node:               node1/10.128.0.5
Start Time:         Tue, 28 Aug 2018 07:06:55 +0000
Labels:             app=nginx
                    tier=dev
Annotations:        <none>
Status:             Running
IP:                 10.240.1.26
Containers:
  nginx-container:
.........
Events:
  Type    Reason     Age   From               Message
  ----    ------     ----  ----               -------
  Normal  Scheduled  14m   default-scheduler  Successfully assigned default/nginx-pod to node1
```

```
[schalla@master ~]$ kubectl exec -it nginx-pod -- /bin/sh #Getting a shell to running cont
# hostname
nginx-pod
# exit
```

Deployments

Updates & Rollbacks



Deployment Types

- Recreate
- RollingUpdate (Ramped or Incremental)
- Canary
- Blue / Green

Deployments - Manifest file

```yaml
# Deployment
#controllers/nginx-deploy.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deploy
  labels:
    app: nginx-app
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx-app
  template:
    metadata:
      labels:
        app: nginx-app
    spec:
      containers:
      - name: nginx-container
        image: nginx:1.7.9
        ports:
        - containerPort: 80
```

Deployments – Create & Display

```
[srinath@master ~]$  kubectl create -f nginx-deploy.yaml
deployment.apps/nginx-deployment created
```

```
[srinath@master ~]$ kubectl get deploy -l app=nginx-app
NAME                DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment    3         3         3            3           1m
```

```
[srinath@master ~]$ kubectl get rs -l app=nginx-app
NAME                          DESIRED   CURRENT   READY     AGE
nginx-deployment-c75f4bb64    3         3         3         3m
```

```
[srinath@master ~]$ kubectl get po -l app=nginx-app
NAME                                READY     STATUS    RESTARTS   AGE
nginx-deployment-c75f4bb64-h7hph    1/1       Running   0          8m
nginx-deployment-c75f4bb64-pbmj4    1/1       Running   0          8m
nginx-deployment-c75f4bb64-sr4vt    1/1       Running   0          8m
```

Deployments – Describe

```
[srinath@master ~]$ kubectl describe deploy nginx-deployment

Name:                   nginx-deployment
Namespace:              default
CreationTimestamp:      Wed, 29 Aug 2018 11:39:31 +0000
Labels:                 app=nginx-app
Annotations:            deployment.kubernetes.io/revision=1
Selector:               app=nginx-app
Replicas:               3 desired | 3 updated | 3 total | 3 available | 0 unavailable
StrategyType:           RollingUpdate
MinReadySeconds:        0
RollingUpdateStrategy:  25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=nginx-app
  Containers:
   nginx-container:
    Image:        nginx:1.7.9
    Port:         80/TCP
...
...
Conditions:
  Type           Status  Reason
  ----           ------  ------
  Available      True    MinimumReplicasAvailable
  Progressing    True    NewReplicaSetAvailable
OldReplicaSets:  <none>
NewReplicaSet:   nginx-deployment-c75f4bb64 (3/3 replicas created)
Events:
  Type    Reason             Age   From                   Message
  ----    ------             ----  ----                   -------
  Normal  ScalingReplicaSet  13m   deployment-controller  Scaled up replica set nginx-deployment-c75f4bb64 to 3
```

Deployments – Update Deployment

```
[srinath@master ~]$ kubectl set image deploy nginx-deployment nginx-container=nginx:1.9.1
deployment.extensions/nginx-deployment image updated
```

```
[srinath@master ~]$ kubectl edit deploy nginx-deployment
deployment.extensions/nginx-deployment image updated
```

```
[srinath@master ~]$ kubectl rollout status deployment/nginx-deployment
Waiting for deployment "nginx-deployment" rollout to finish: 1 old replicas are pending termination...
Waiting for deployment "nginx-deployment" rollout to finish: 1 old replicas are pending termination...
deployment "nginx-deployment" successfully rolled out
```

```
[srinath@master ~]$ kubectl get deploy
NAME               DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment   3         3         3            3           48m
```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Deployments – Rollback Deployment

```
[srinath@master ~]$ kubectl set image deploy nginx-deployment nginx-container=nginx:1.91 --record
deployment.extensions/nginx-deployment image updated
```

```
[srinath@master ~]$ kubectl rollout status deployment/nginx-deployment
Waiting for deployment "nginx-deployment" rollout to finish: 1 out of 3 new replicas have been updated...
```

```
[srinath@master ~]$ kubect rollout history deployment/nginx-deployment
deployments "nginx-deployment"
REVISION  CHANGE-CAUSE
1  kubectl create --filename=nginx-deploy.yaml --record=true
2  kubectl set image deploy nginx-deployment nginx-container=nginx:1.91 --record=true
```

```
[srinath@master ~]$ kubectl rollout undo deployment/nginx-deployment
deployment.extensions/nginx-deployment
```

```
[srinath@master ~]$ kubectl rollout status deployment/nginx-deployment
deployment "nginx-deployment" successfully rolled out
```


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Deployments – Scaling up

```
[srinath@master ~]$ kubectl scale deployment nginx-deployment --replicas=5
deployment.extensions/nginx-deployment scaled
```

```
[srinath@master ~]$ kubectl get deploy
NAME                DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment    5         5         5            5           20m
```

```
[srinath@master ~]$ kubectl get po
NAME                                READY     STATUS    RESTARTS   AGE
nginx-deployment-c75f4bb64-8dcmw    1/1       Running   0          3m
nginx-deployment-c75f4bb64-8dlb9    1/1       Running   0          21m
nginx-deployment-c75f4bb64-fxlrw    1/1       Running   0          3m
nginx-deployment-c75f4bb64-kxvtx    1/1       Running   0          3m
nginx-deployment-c75f4bb64-r6pjl    1/1       Running   0          3m
```


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Deployments – Scaling down

```
[srinath@master ~]$ kubectl scale deployment nginx-deployment --replicas=1
deployment.extensions/nginx-deployment scaled
```

```
[srinath@master ~]$ kubectl get deploy
NAME                DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment    1         1         1            1           24m
```

```
[srinath@master ~]$  kubectl get po -l app=nginx-app
NAME                                READY     STATUS    RESTARTS   AGE
nginx-deployment-c75f4bb64-h7hph    1/1       Running   0          8m
```

Deployments – Delete

Press Esc to exit full screen

```
[srinath@master ~]$ kubectl delete -f nginx-deploy.yaml
deployment.apps "nginx-deployment" deleted
```

```
[srinath@master ~]$ kubectl get po -l app=nginx-app
No resources found
```


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Thank you