

kubernetes

Objectives

Kubernetes Overview

Containers – Docker

Container Orchestration?

Demo - Setup Kubernetes

Kubernetes Concepts – PODs | ReplicaSets | Deployment | Services

Networking in Kubernetes

Kubernetes Management - Kubectl

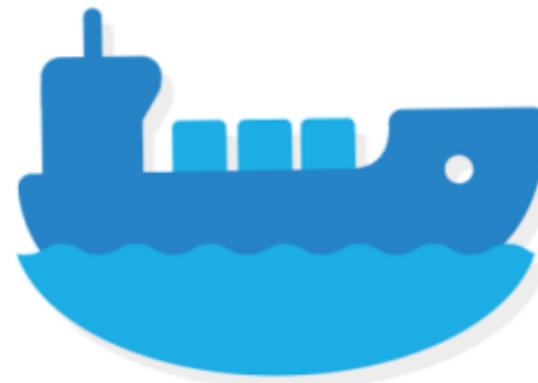
Kubernetes Definition Files - YAML

Kubernetes on Cloud – AWS/GCP

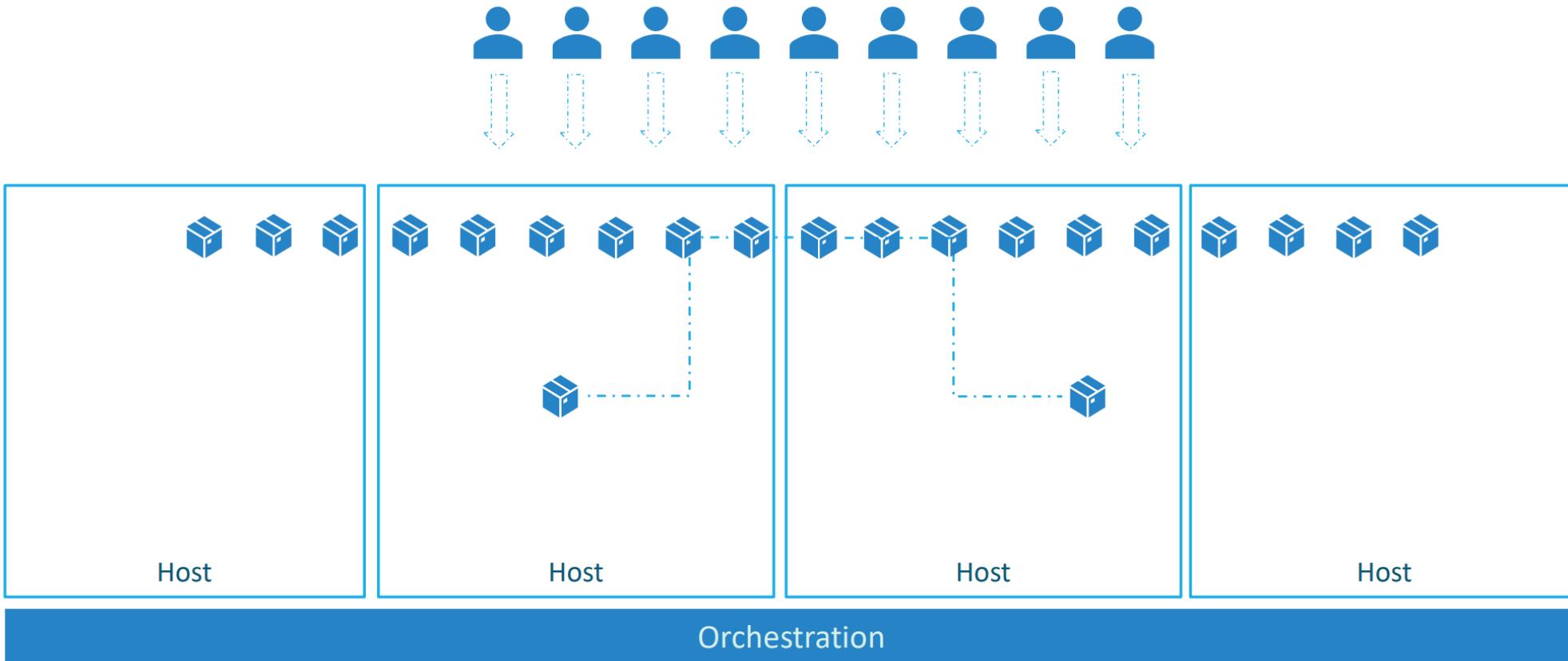
kubernetes or K8s

Container + Orchestration

Container Orchestration



Container Orchestration



Orchestration Technologies



Docker Swarm

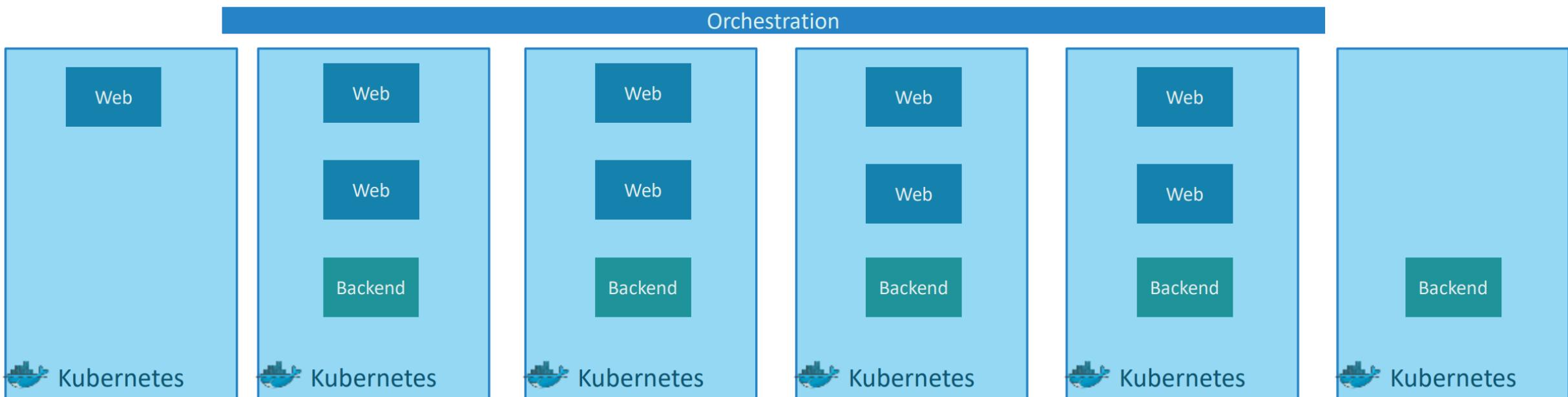


kubernetes

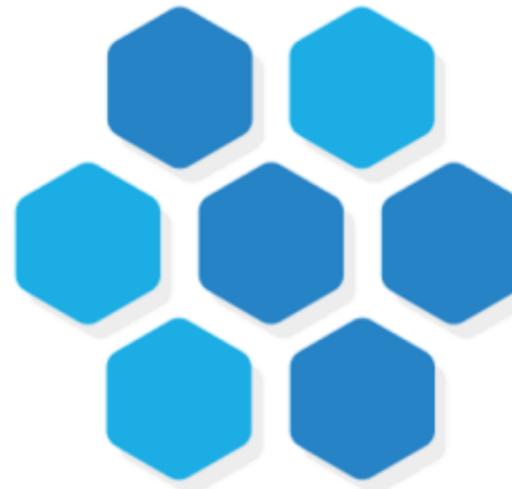


MESOS

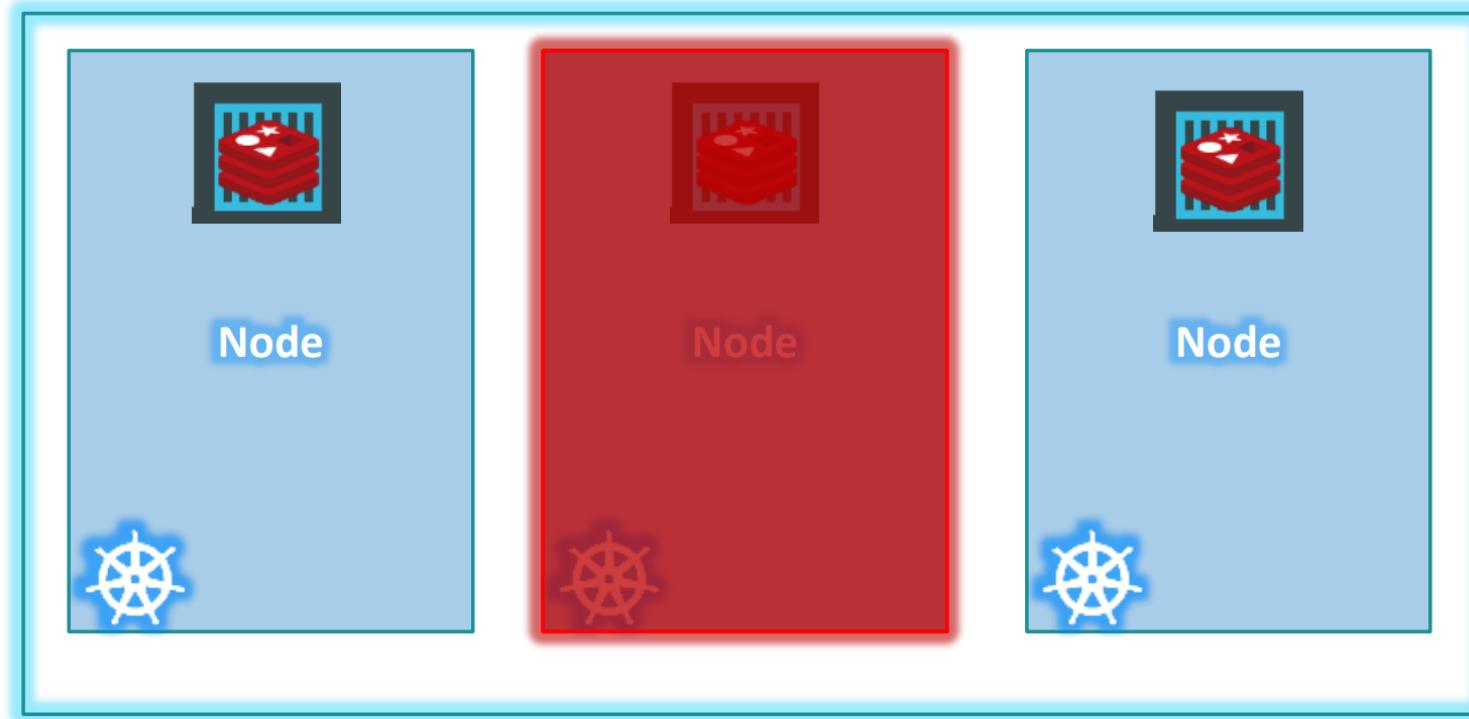
Kubernetes Advantage



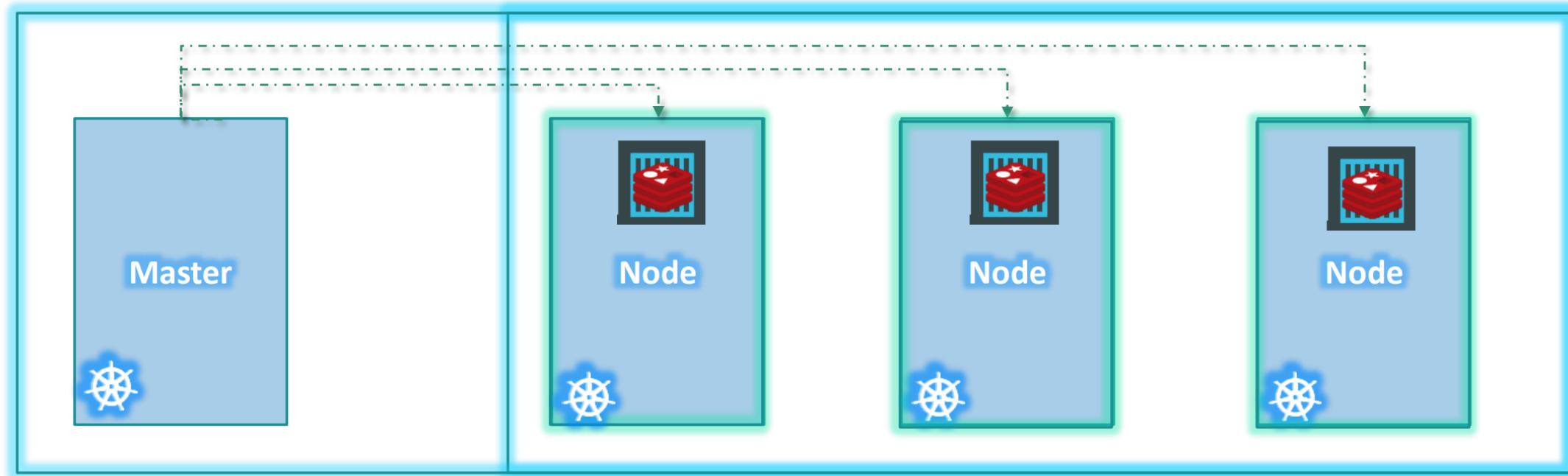
Architecture



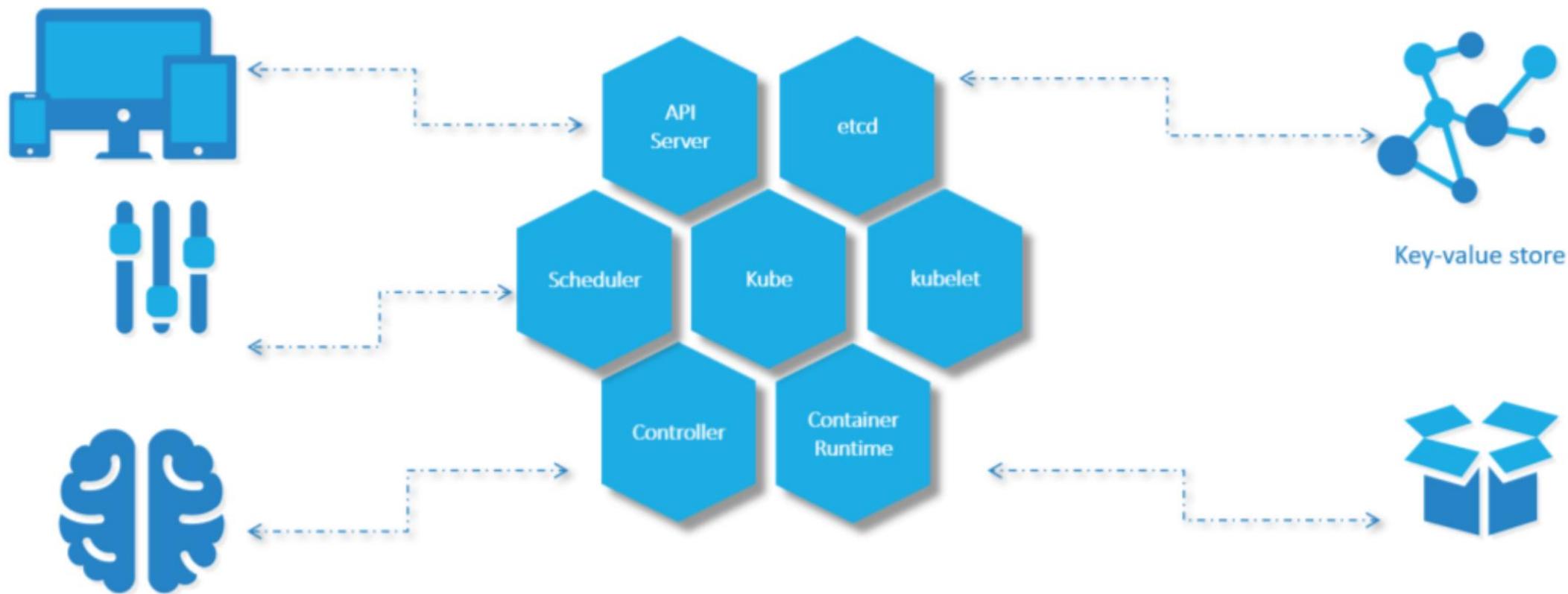
Cluster



Master



Components



Master vs Worker Nodes

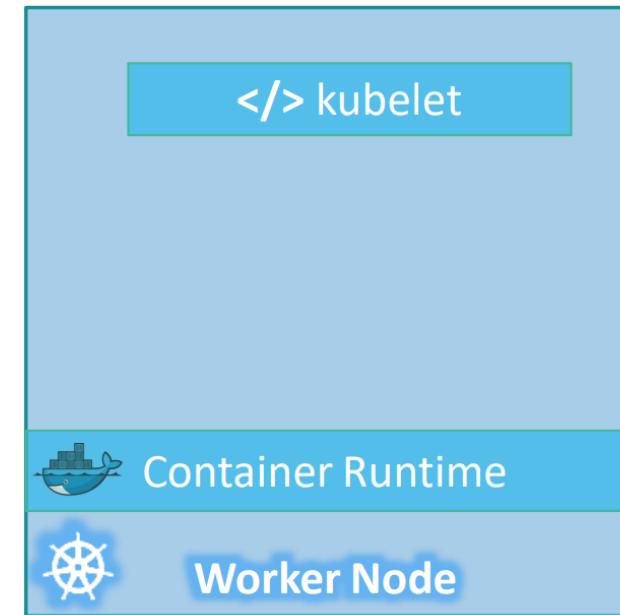
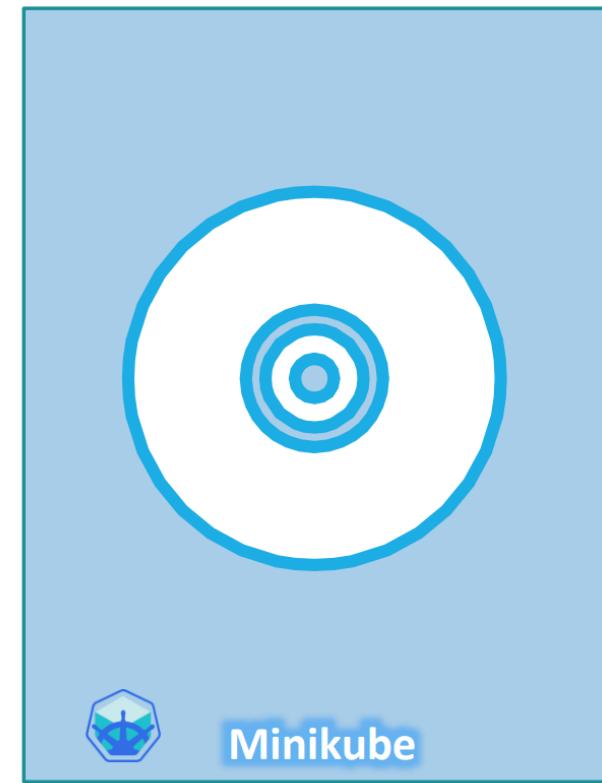
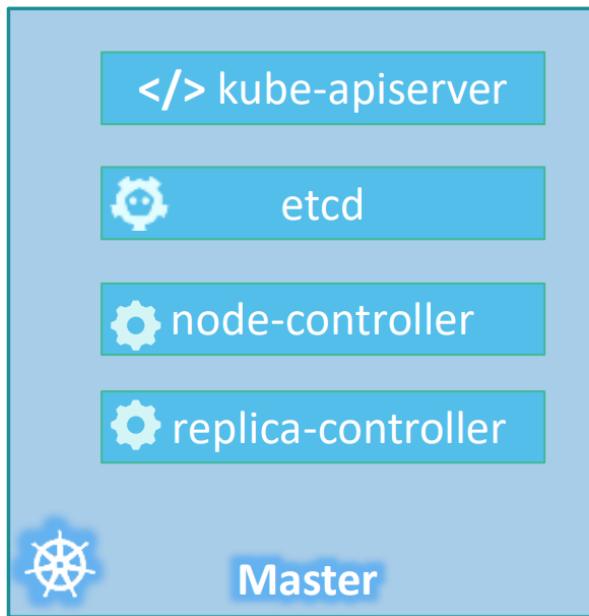


 rkt

 CRI-O

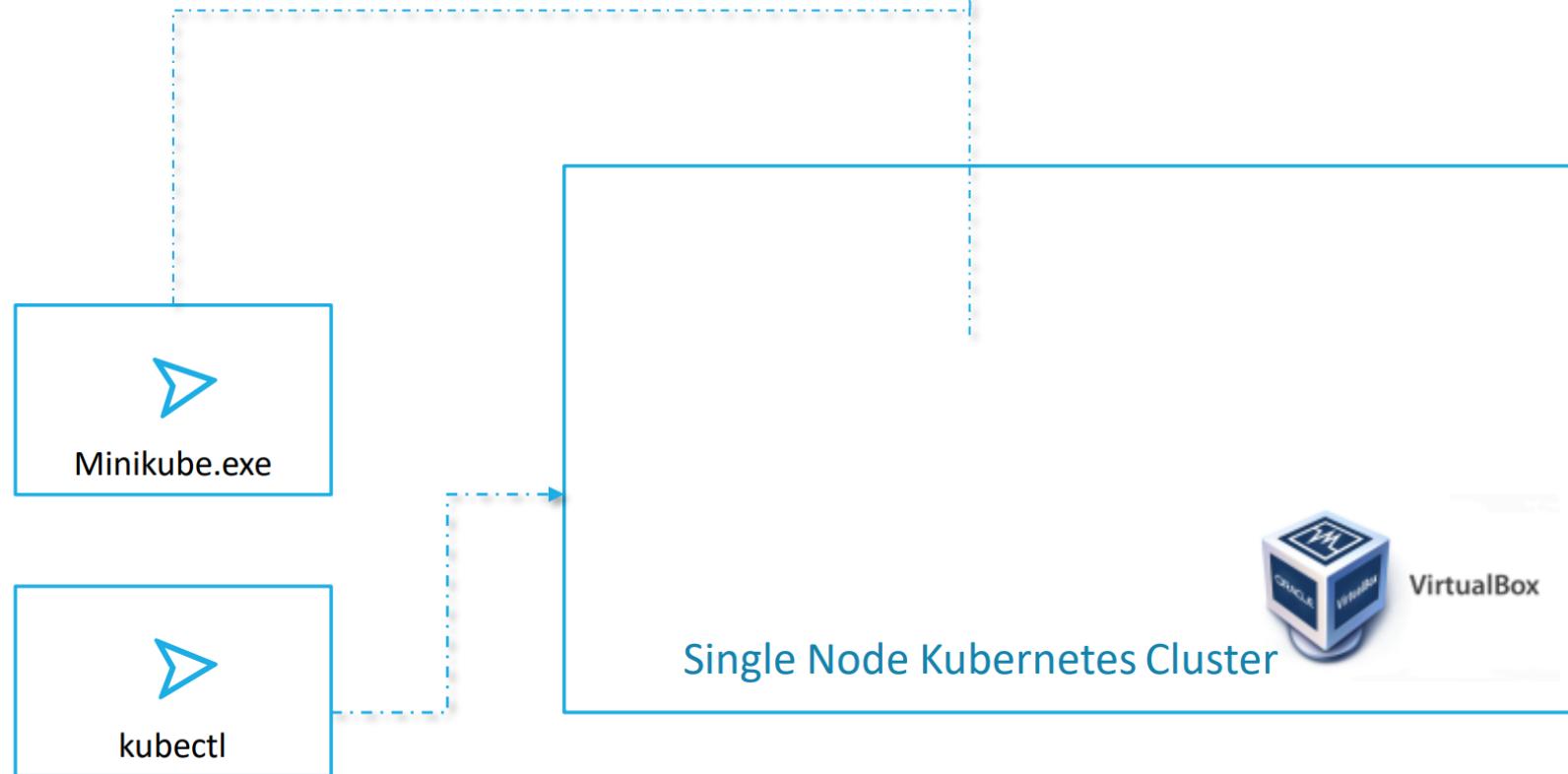


Minikube





Minikube



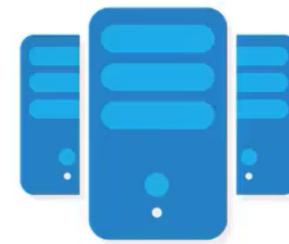
POD



Assumptions

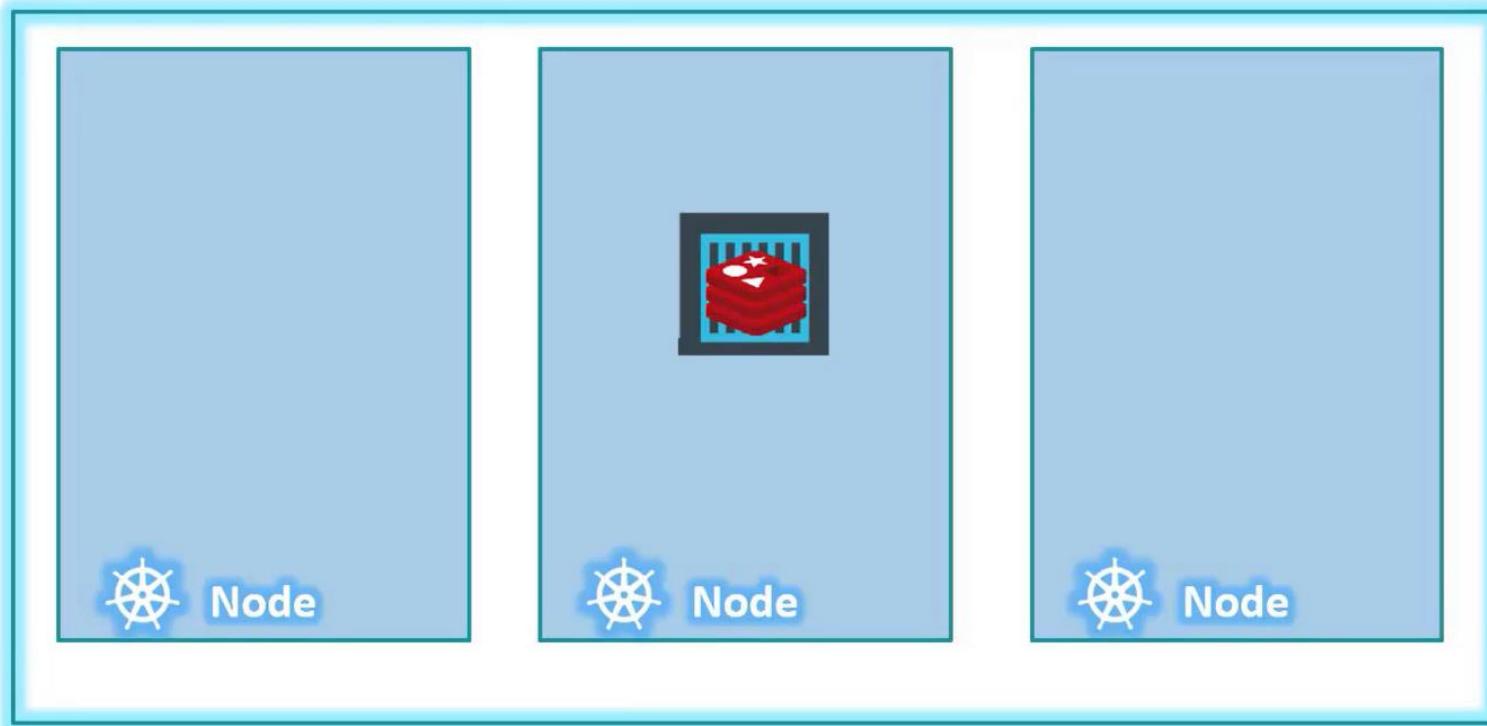


Docker Image

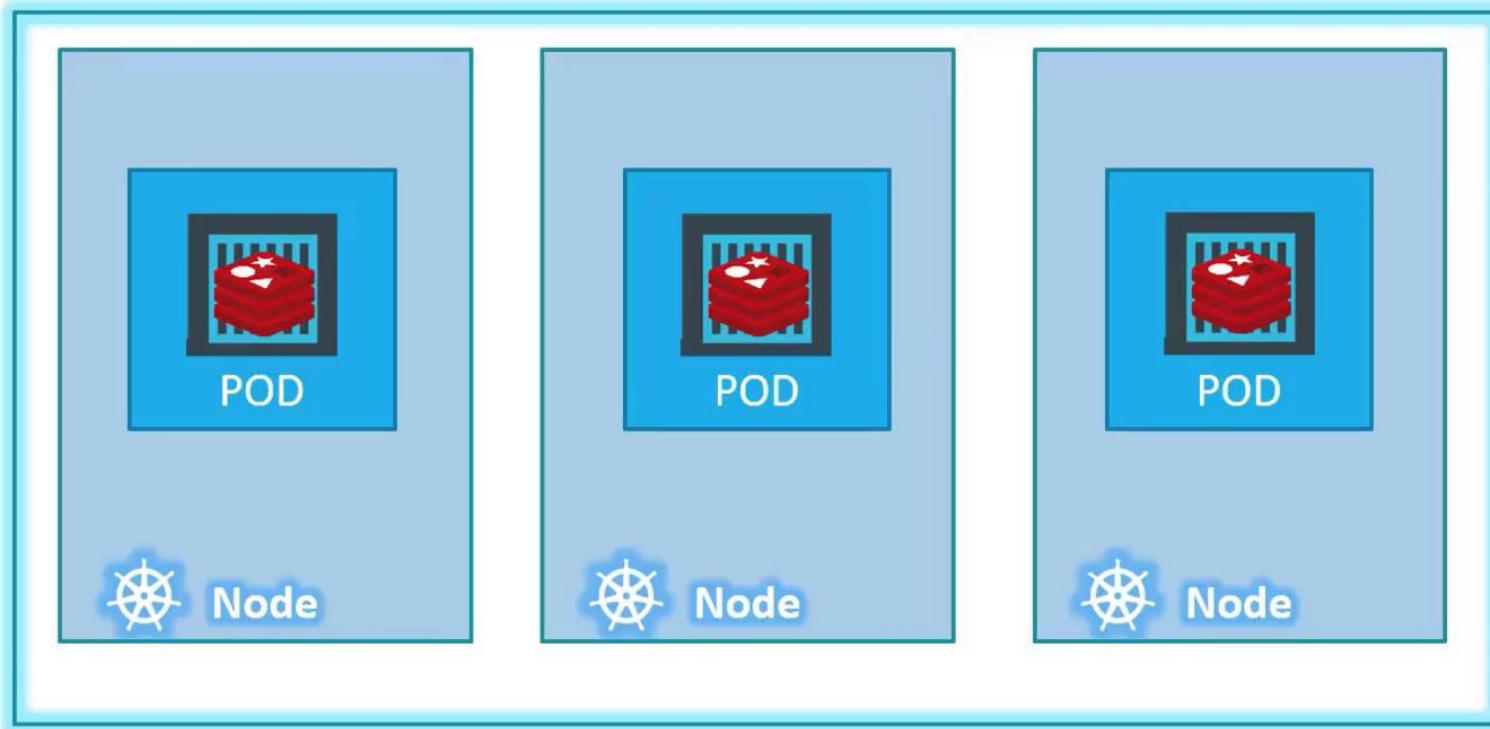


Kubernetes Cluster

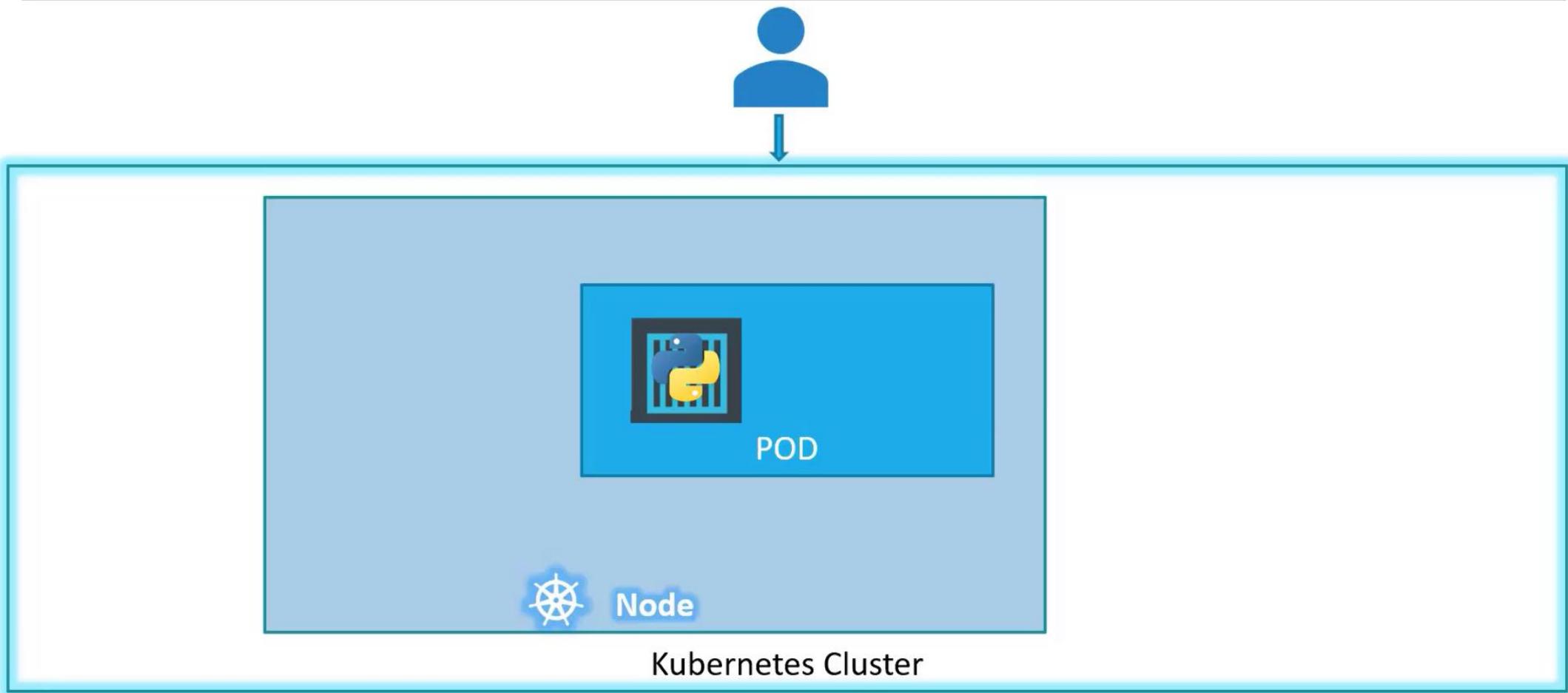
POD



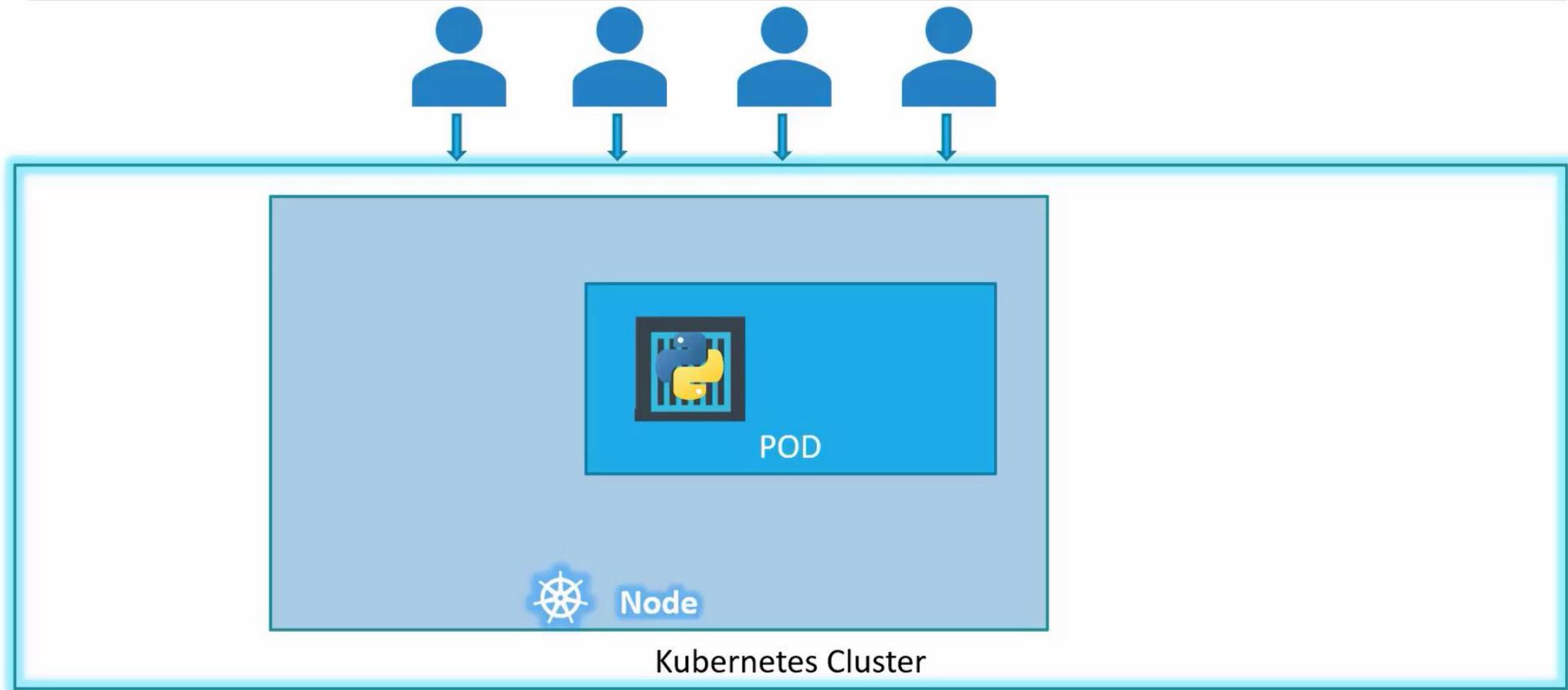
POD



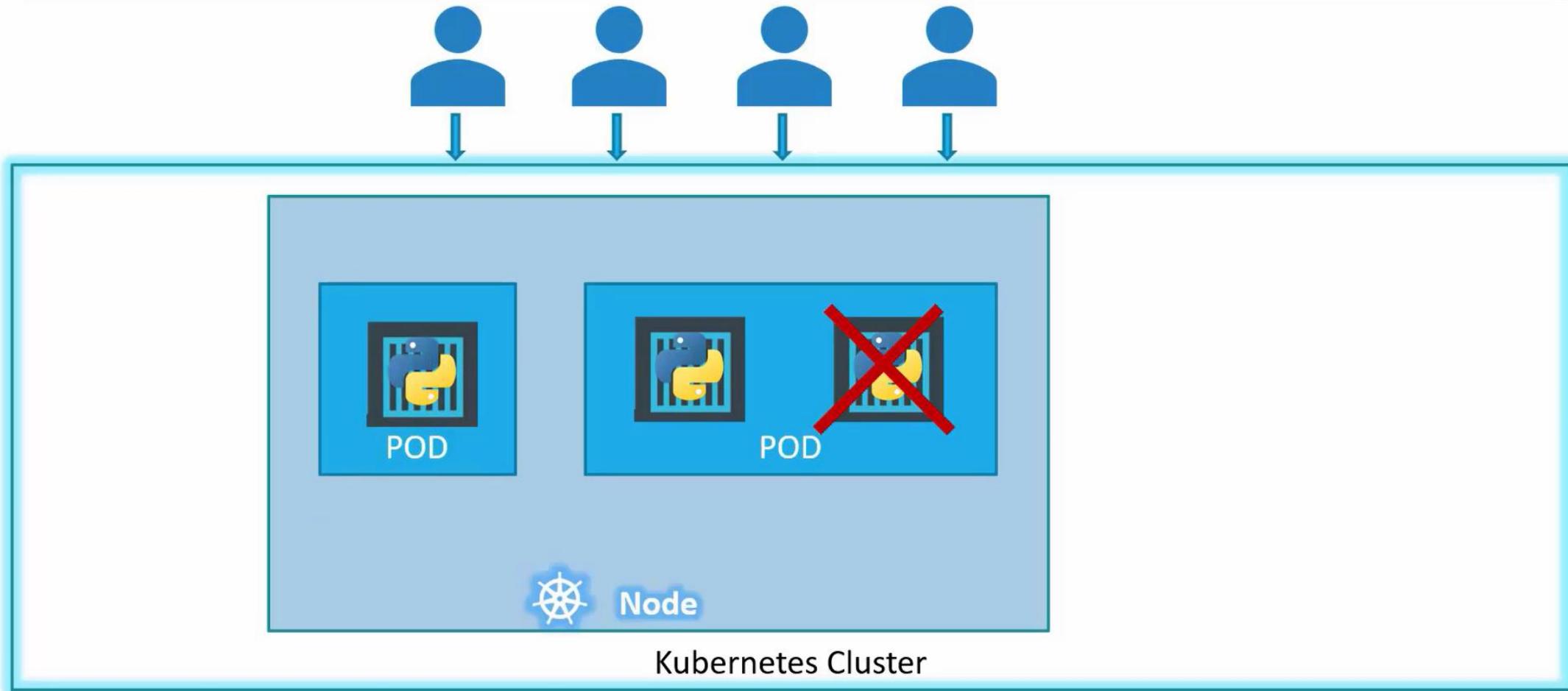
POD



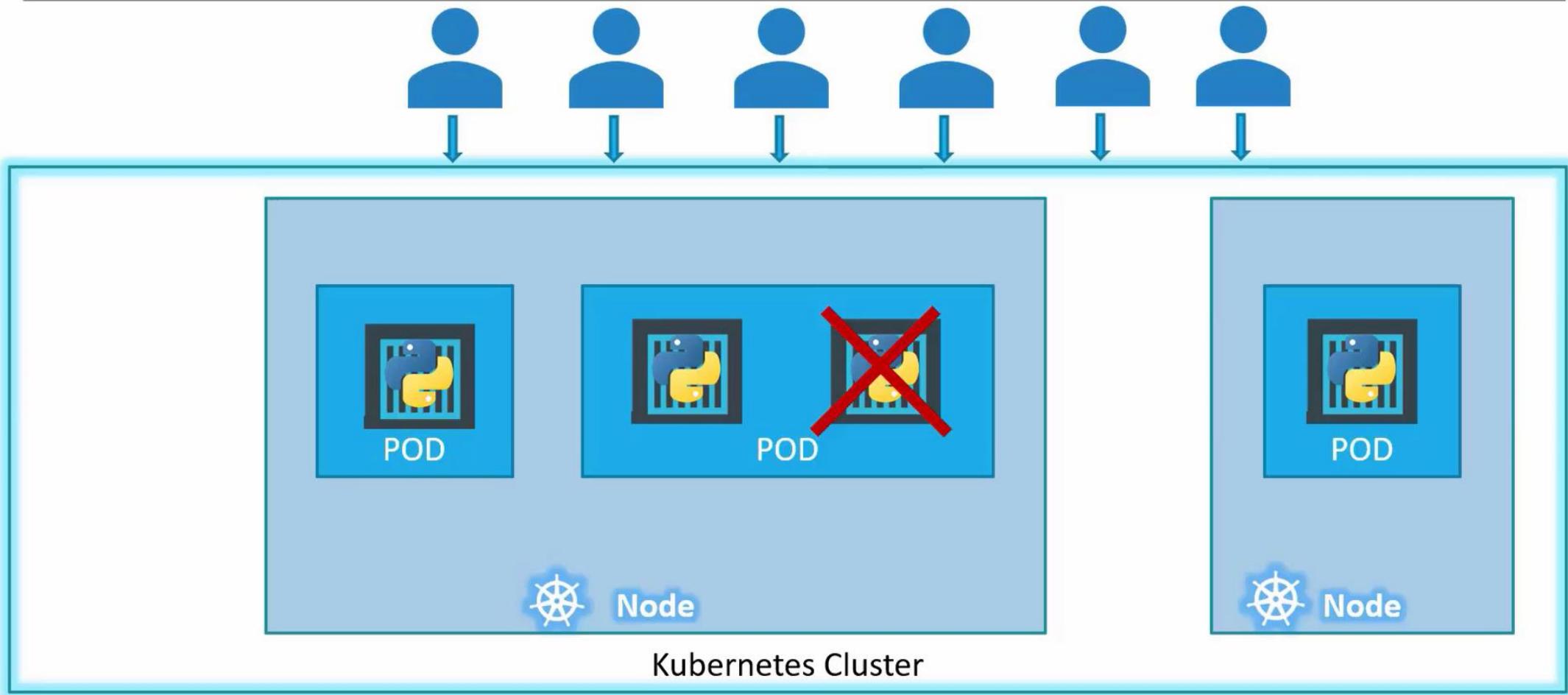
POD



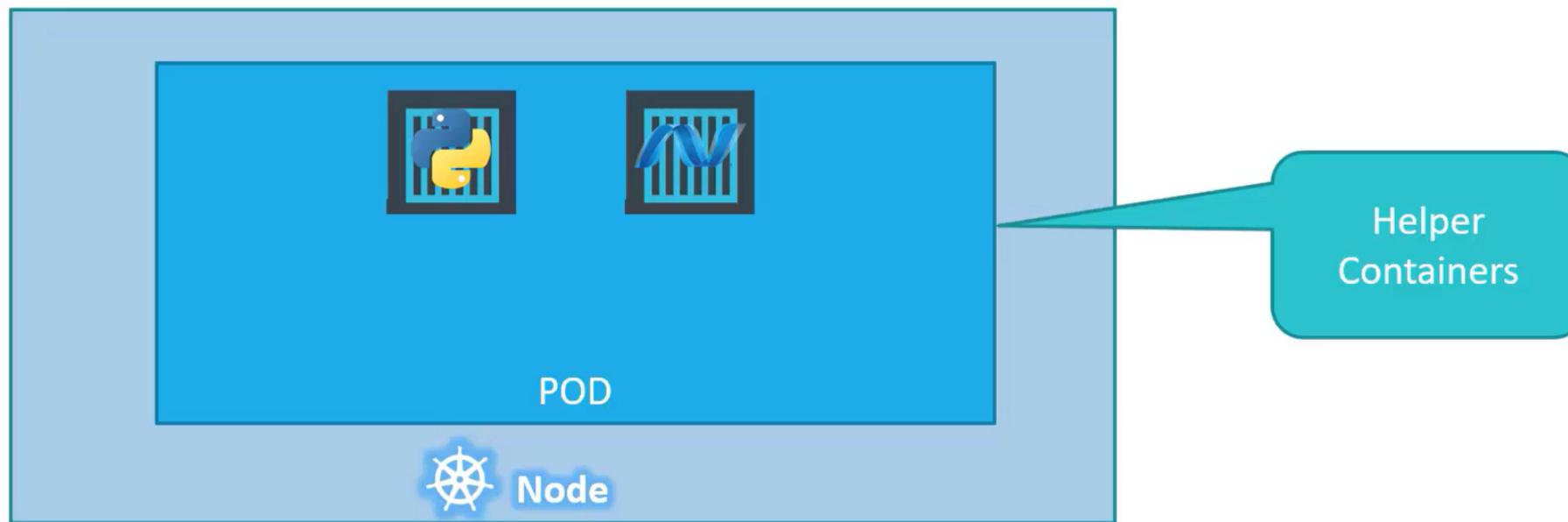
POD



POD



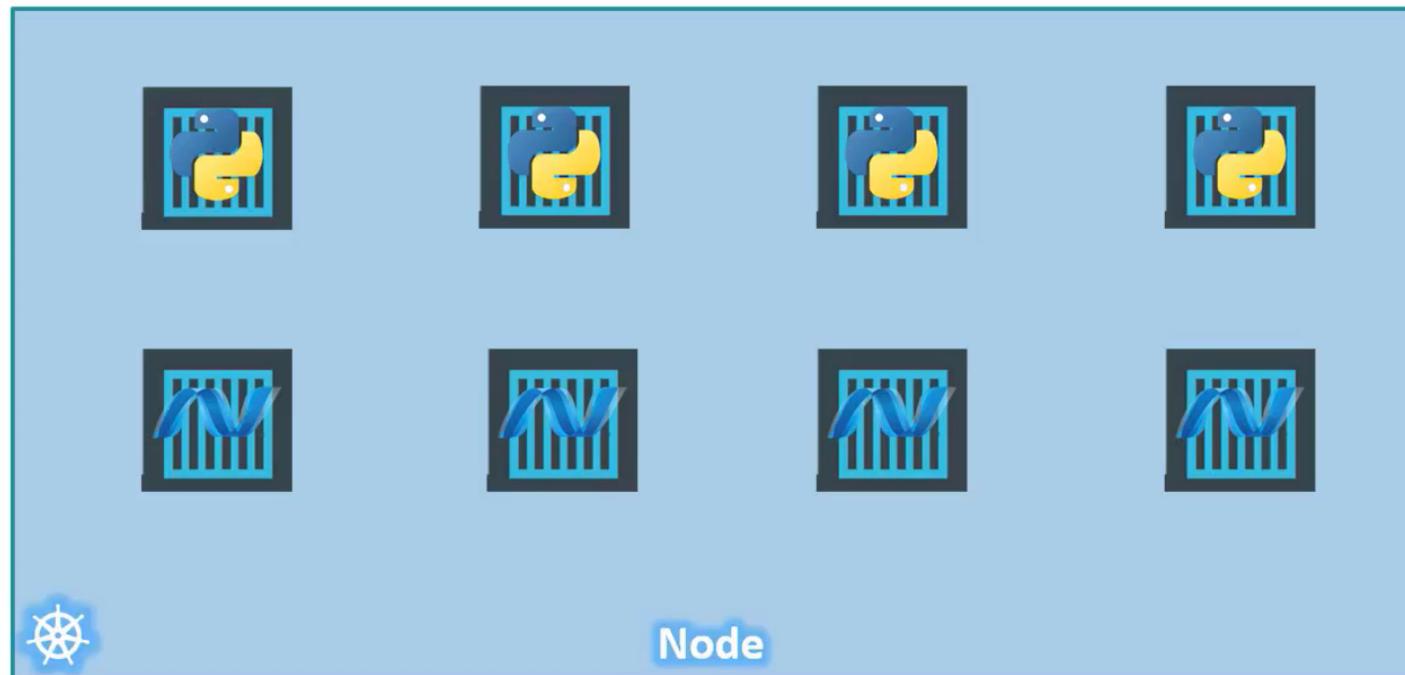
Multi-Container PODs



PODs Again!

```
docker run python-app  
docker run python-app  
docker run python-app  
docker run python-app  
  
docker run helper -link app1  
docker run helper -link app2  
docker run helper -link app3  
docker run helper -link app4
```

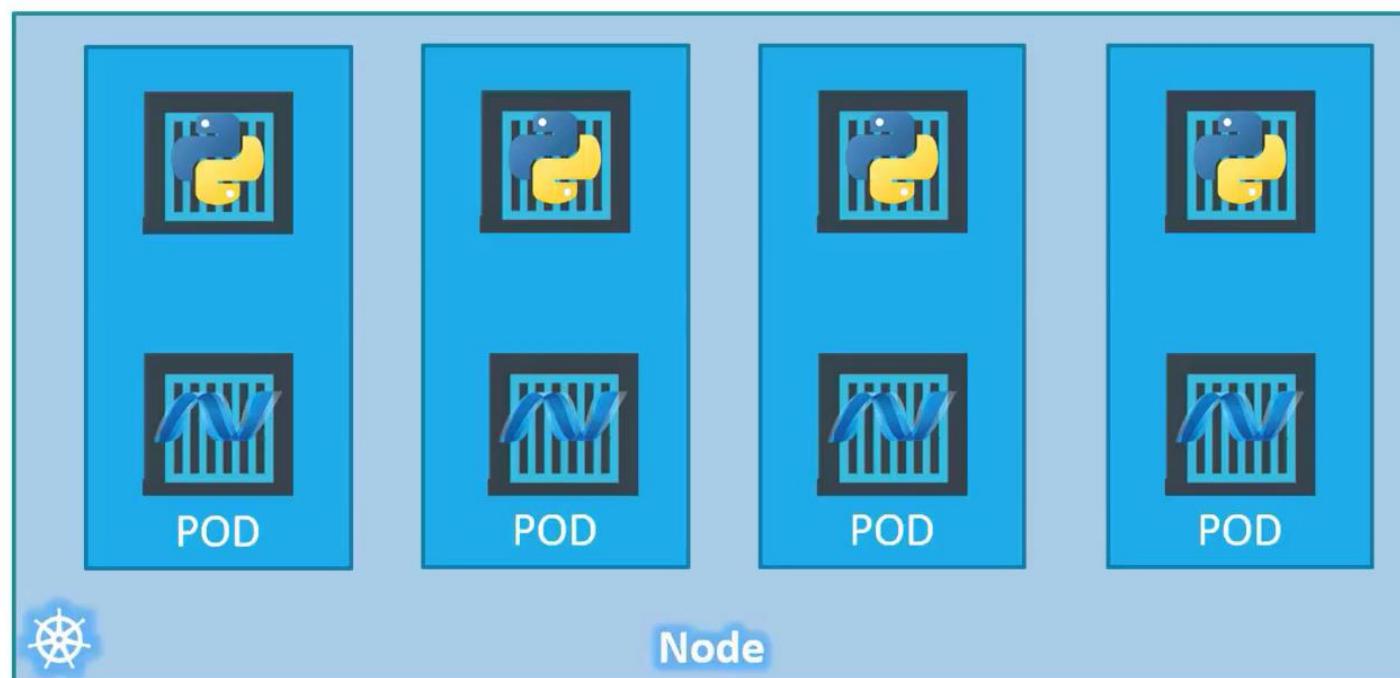
App	Helper	
Python1	App1	
Python2	App2	



PODs Again!

```
docker run python-app  
docker run python-app  
docker run python-app  
docker run python-app  
  
docker run helper -link app1  
docker run helper -link app2  
docker run helper -link app3  
  
docker run helper -link app4
```

App	Helper	Volume
Python1	App1	Vol1
Python2	App2	Vol2



Note: I am avoiding networking and load balancing details to keep explanation simple.

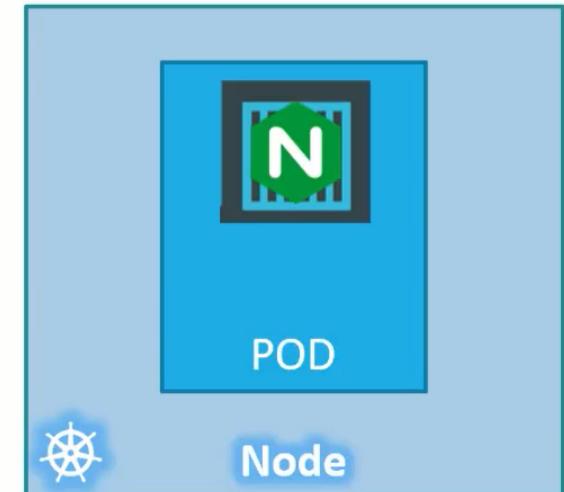
kubectl

```
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



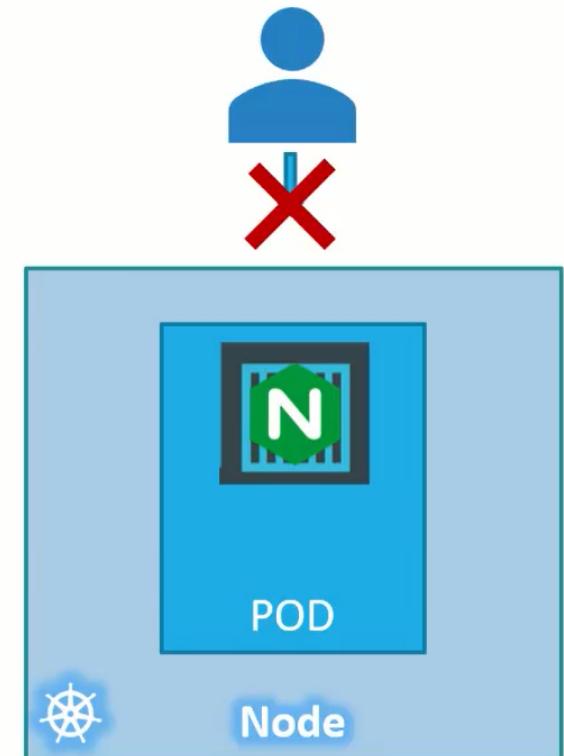
kubectl

```
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



POD

With YAML



YAML in Kubernetes

pod-definition.yml

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

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

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

Commands

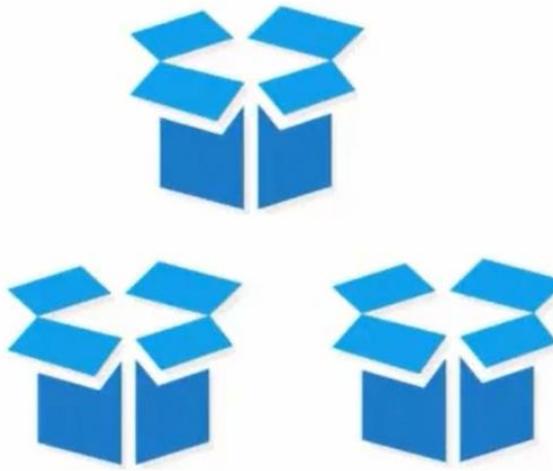
```
> kubectl get pods
```

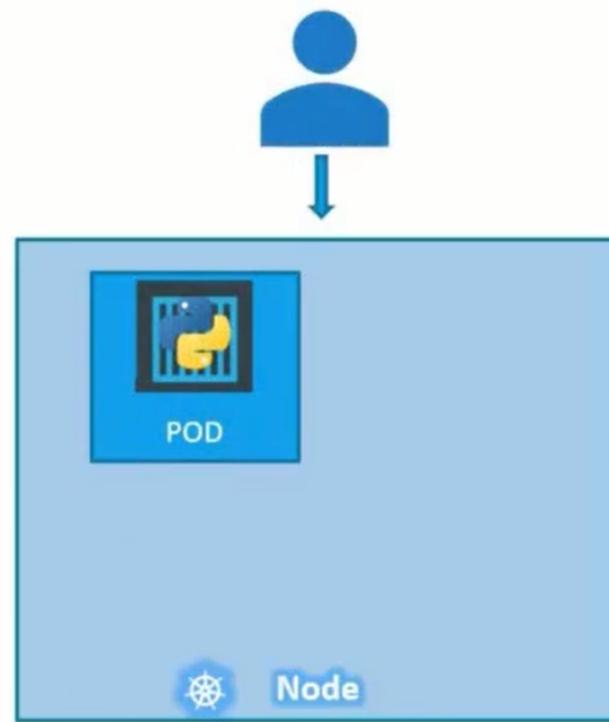
NAME	READY	STATUS	RESTARTS	AGE
myapp-pod	1/1	Running	0	20s

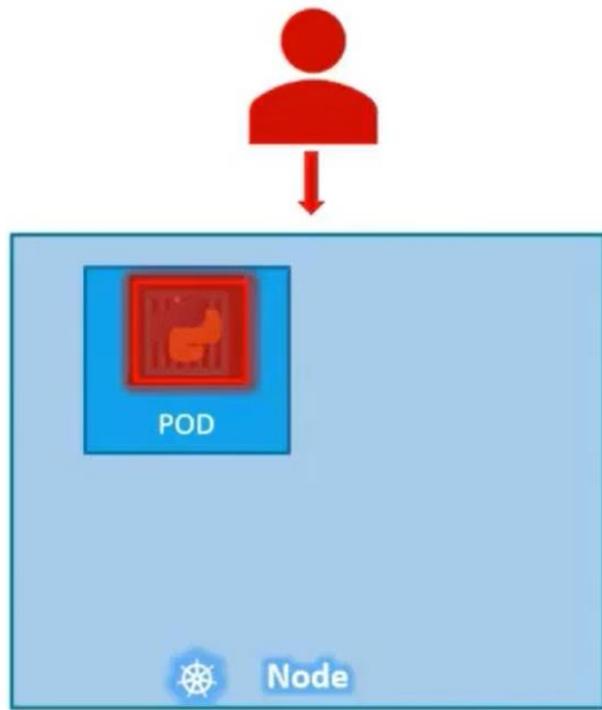
```
> kubectl describe pod myapp-pod
```

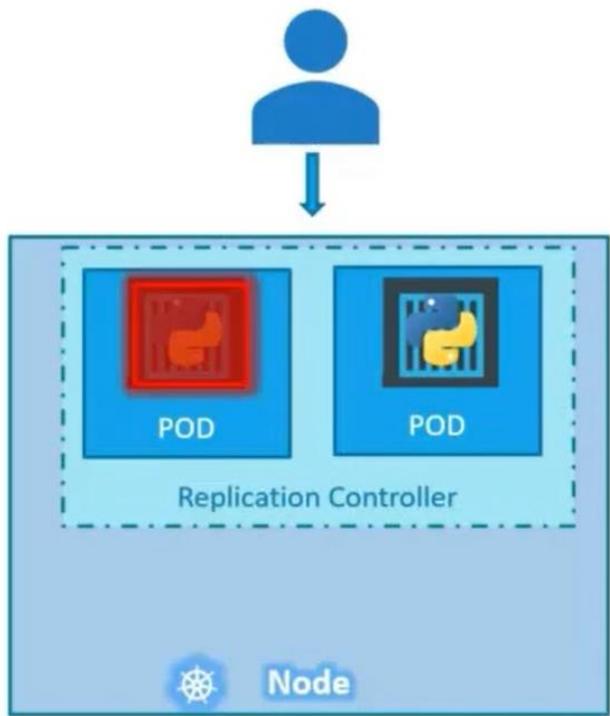
```
Name:           myapp-pod
Namespace:      default
Node:          minikube/192.168.99.100
Start Time:    Sat, 03 Mar 2018 14:26:14 +0800
Labels:         app=myapp
                name=myapp-pod
Annotations:   <none>
Status:        Running
IP:            172.17.0.24
Containers:
  nginx:
    Container 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
```

Replication Controller

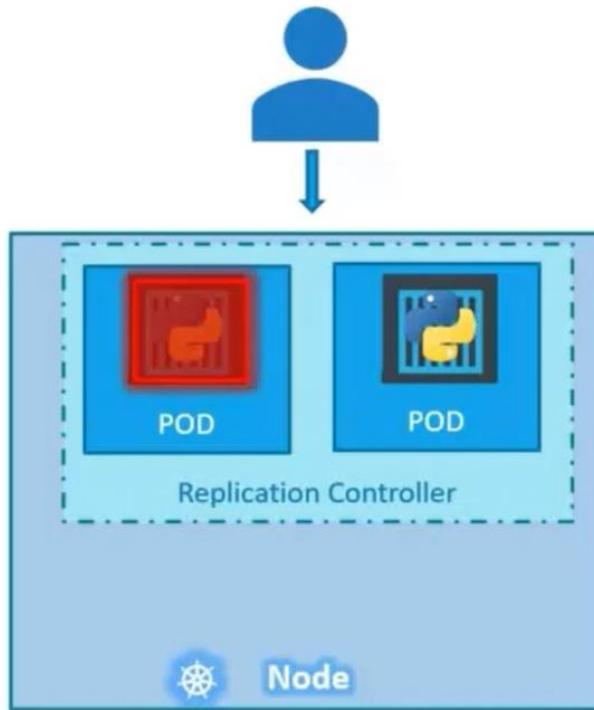




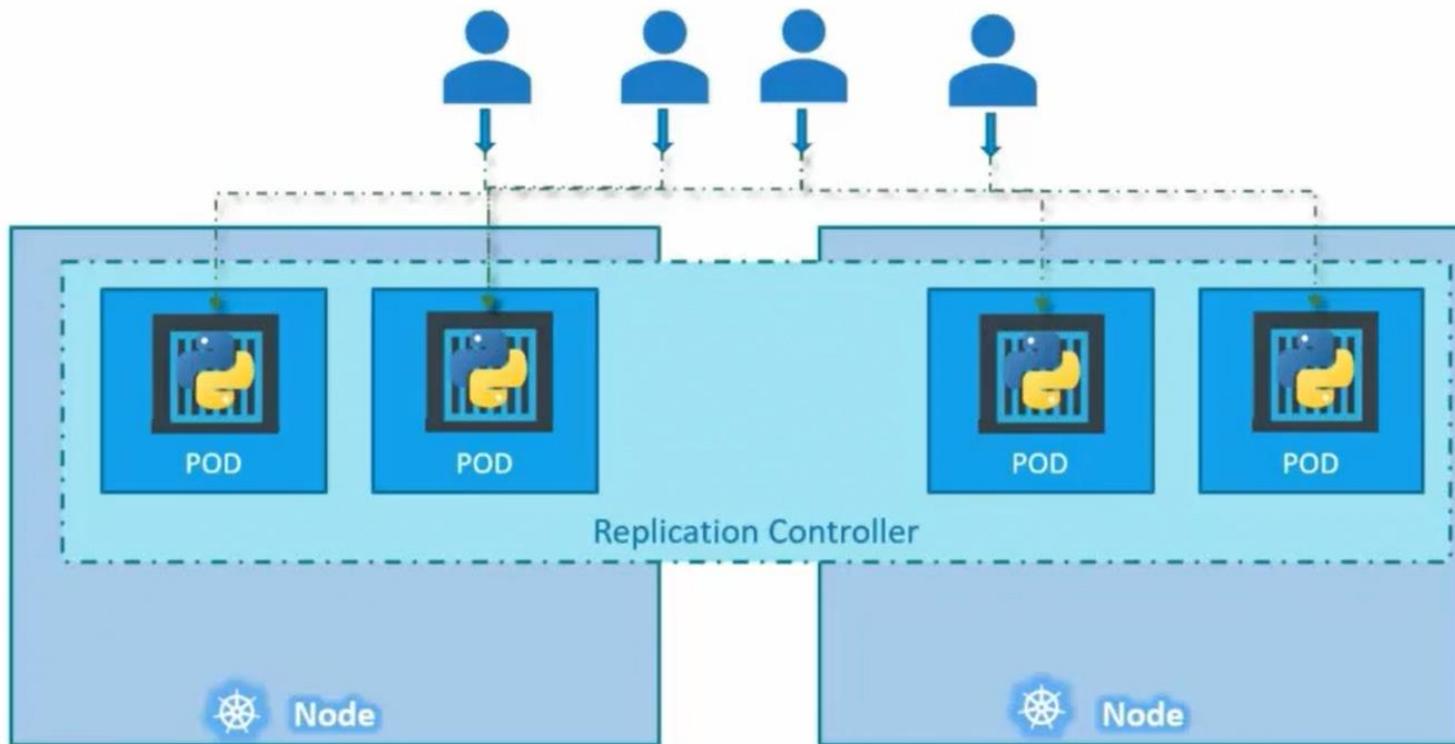




High Availability



Load Balancing & Scaling



```
rc-definition.yml
```

```
apiVersion: v1
kind: ReplicationController
metadata:
  name: myapp-rc
  labels:
    app: myapp
    type: front-end
spec:
  template:
```



POD

```
pod-definition.yml
```

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

rc-definition.yml

```
apiVersion: v1
kind: ReplicationController
metadata:
  name: myapp-rc
  labels:
    app: myapp
    type: front-end
spec:
  template:
    metadata:
      name: myapp-pod
      labels:
        app: myapp
        type: frontPOD
    spec:
      containers:
        - name: nginx-container
          image: nginx
```

pod-definition.yml

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

rc-definition.yml

```
apiVersion: v1
kind: ReplicationController
metadata:
  name: myapp-rc
  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
```

pod-definition.yml

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

```
> kubectl create -f rc-definition.yml
replicationcontroller "myapp-rc" created
```

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

```
> kubectl get pods
```

NAME	READY	STATUS	RESTARTS	AGE
myapp-rc-41vk9	1/1	Running	0	20s
myapp-rc-mc2mf	1/1	Running	0	20s
myapp-rc-px9pz	1/1	Running	0	20s

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

```
pod-definition.yml
```

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

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

```
replicaset "myapp-replicaset" created
```

```
> 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

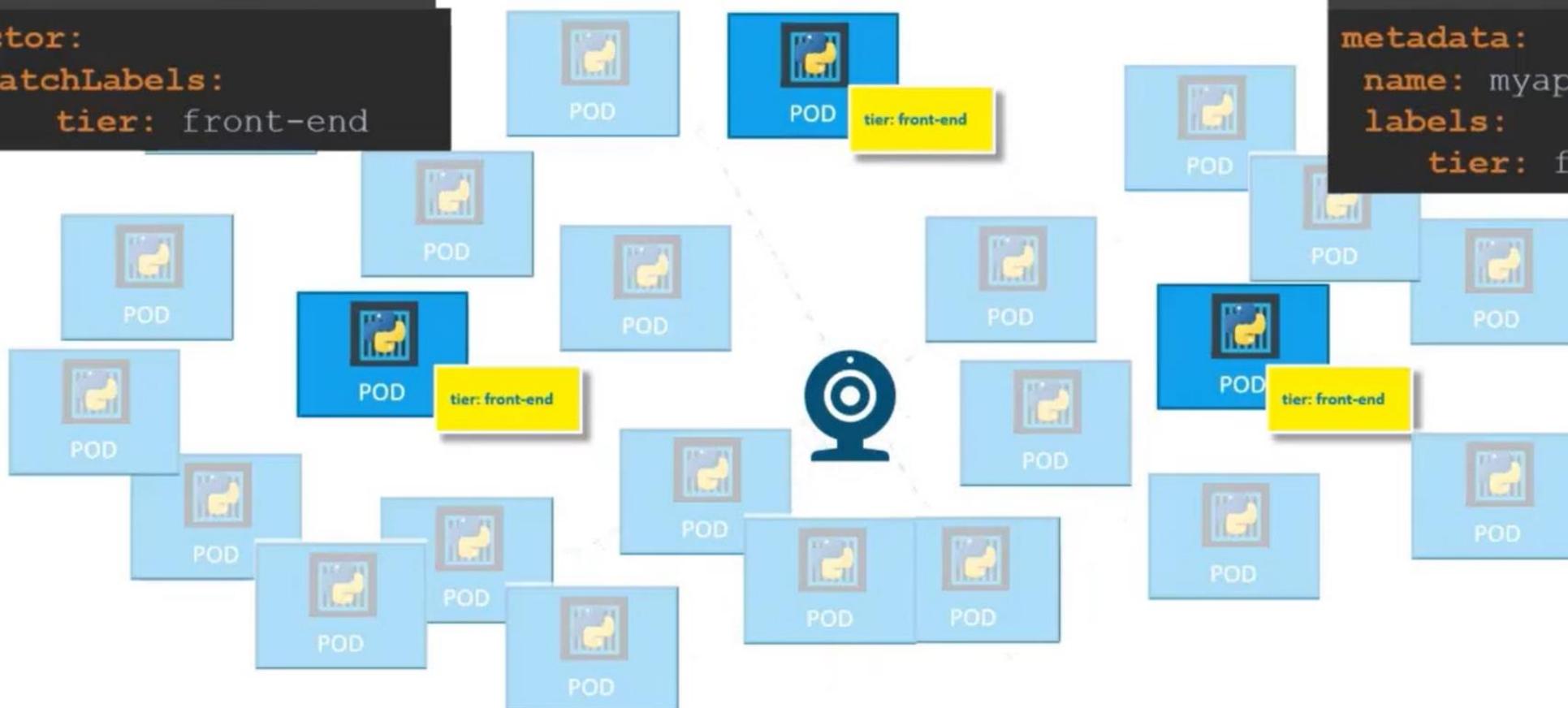
Labels and Selectors



Labels and Selectors

```
replicaset-definition.yml
```

```
selector:  
  matchLabels:  
    tier: front-end
```



```
pod-definition.yml
```

```
metadata:  
  name: myapp-pod  
  labels:  
    tier: front-end
```

Scale

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

```
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
```

Scale

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

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

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



```
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

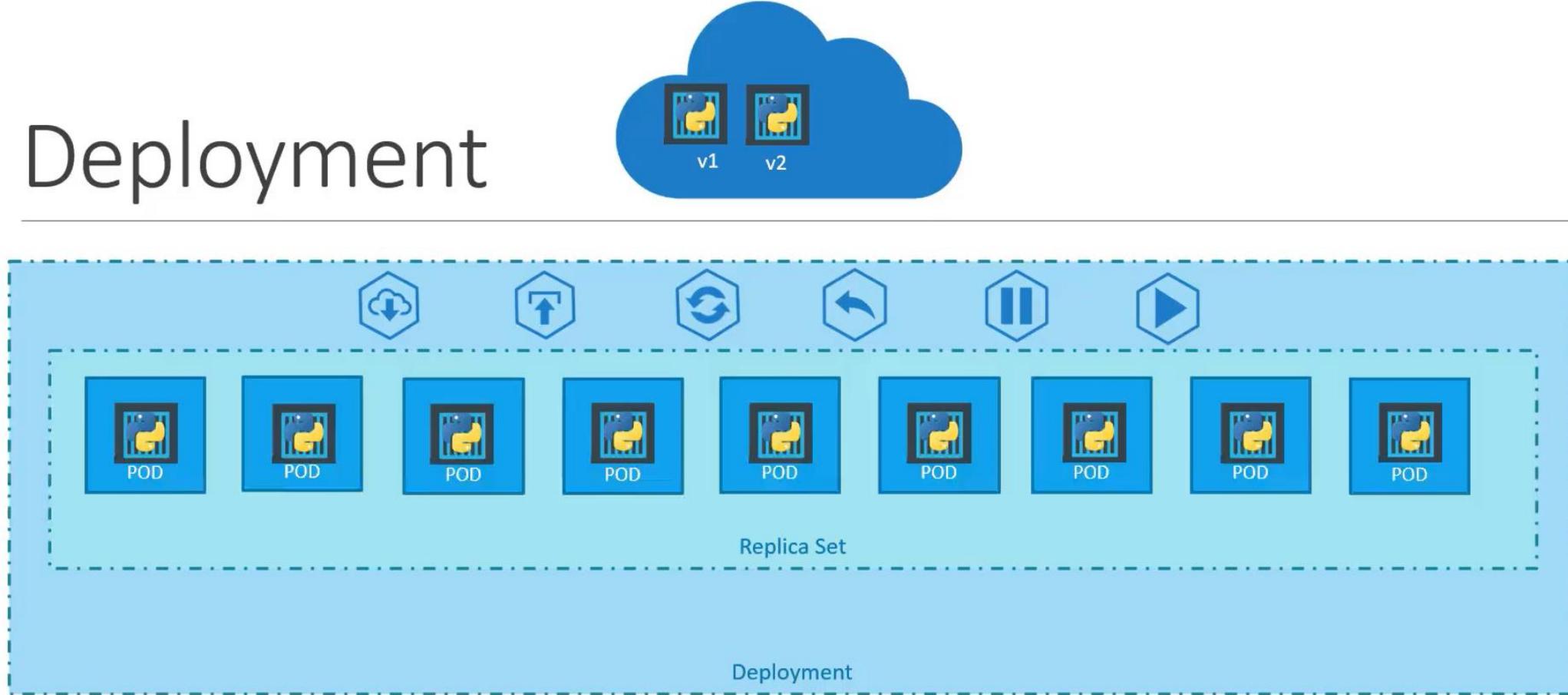
```
> kubectl replace -f replicaset-definition.yml
```

```
> kubectl scale -replicas=6 -f replicaset-defini
```

Deployment



Deployment



Definition

```
> kubectl create -f deployment-definition.yml  
deployment "myapp-deployment" created
```

```
> kubectl get deployments  
NAME      DESIRED   CURRENT   UP-TO-DATE   AVAILABLE   AGE  
myapp-deployment   3          3          3           3          21s
```

```
> kubectl get replicaset  
NAME      DESIRED   CURRENT   READY   AGE  
myapp-deployment-6795844b58   3          3          3          2m
```

```
> kubectl get pods  
NAME          READY   STATUS    RESTARTS   AGE  
myapp-deployment-6795844b58-5rbjl   1/1     Running   0          2m  
myapp-deployment-6795844b58-h4w55   1/1     Running   0          2m  
myapp-deployment-6795844b58-1fjhv   1/1     Running   0          2m
```

`deployment-definition.yml`

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

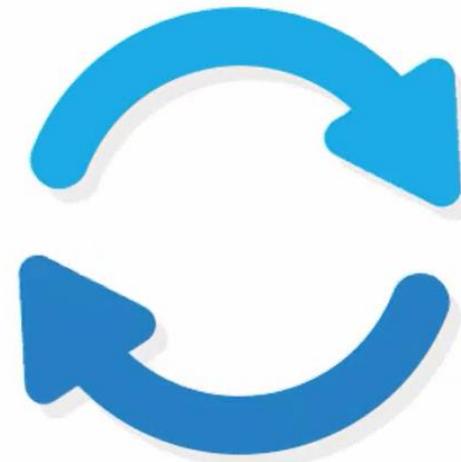
commands

```
> kubectl get all
```

NAME	DESIRED	CURRENT	UP-TO-DATE	AVAILABLE	AGE
deploy/myapp-deployment	3	3	3	3	9h
NAME	DESIRED	CURRENT	READY	AGE	
rs/myapp-deployment-6795844b58	3	3	3	9h	
NAME	READY	STATUS	RESTARTS	AGE	
po/myapp-deployment-6795844b58-5rbjl	1/1	Running	0	9h	
po/myapp-deployment-6795844b58-h4w55	1/1	Running	0	9h	
po/myapp-deployment-6795844b58-lfjhv	1/1	Running	0	9h	

Deployment

Updates and Rollback

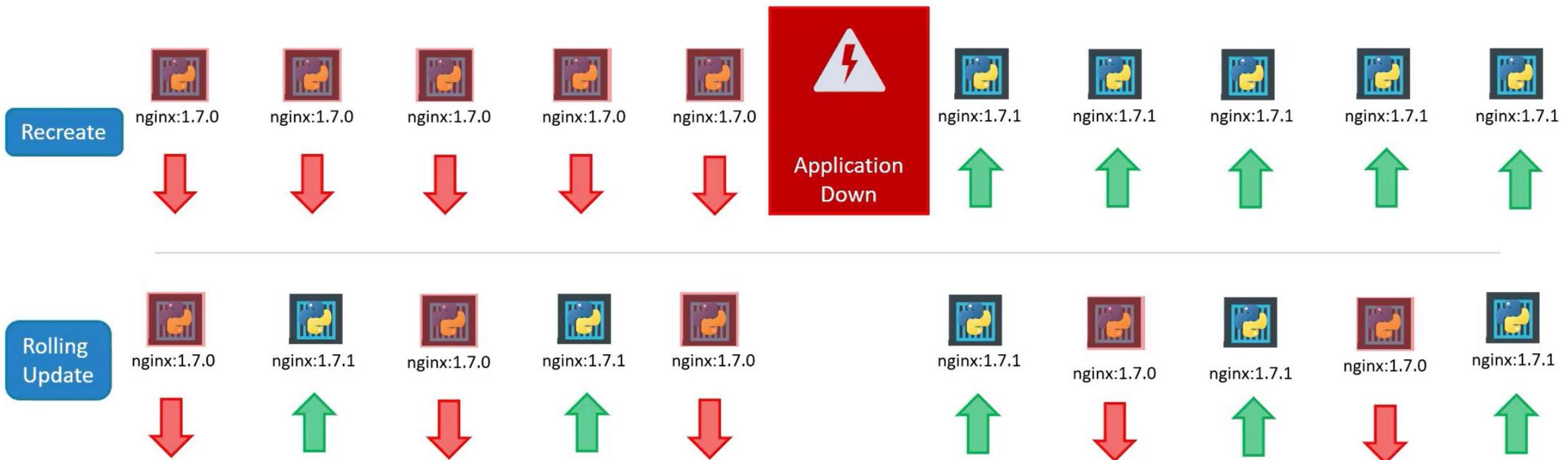


Rollout Command

```
> kubectl rollout status deployment/myapp-deployment
Waiting for rollout to finish: 0 of 10 updated replicas are available...
Waiting for rollout to finish: 1 of 10 updated replicas are available...
Waiting for rollout to finish: 2 of 10 updated replicas are available...
Waiting for rollout to finish: 3 of 10 updated replicas are available...
Waiting for rollout to finish: 4 of 10 updated replicas are available...
Waiting for rollout to finish: 5 of 10 updated replicas are available...
Waiting for rollout to finish: 6 of 10 updated replicas are available...
Waiting for rollout to finish: 7 of 10 updated replicas are available...
Waiting for rollout to finish: 8 of 10 updated replicas are available...
Waiting for rollout to finish: 9 of 10 updated replicas are available...
deployment "myapp-deployment" successfully rolled out
```

```
> kubectl rollout history deployment/myapp-deployment
deployments "myapp-deployment"
REVISION  CHANGE-CAUSE
1          <none>
2          kubectl apply --filename=deployment-definition.yml --record=true
```

Deployment Strategy



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  
  
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
```

```
C:\Kubernetes>kubectl describe deployment myapp-deployment
Name:           myapp-deployment
Namespace:      default
CreationTimestamp: Sat, 03 Mar 2018 17:01:55 +0800
Labels:         app=myapp
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\Kubernetes\...
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
```

Recreate

```
C:\Kubernetes>kubectl describe deployment myapp-deployment
Name:           myapp-deployment
Namespace:      default
CreationTimestamp: Sat, 03 Mar 2018 17:16:53 +0800
Labels:         app=myapp
Annotations:    deployment.kubernetes.io/revision=2
                kubectl.kubernetes.io/last-applied-configuration={"apiVersion":"apps/v1","kind":"Deployment","me...
Files\\Google...
                kubernetes.io/change-cause=kubectl apply --filename=d:\Mumshad Files\Google Drive\Udemy\Kubernetes\...
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
```

RollingUpdate

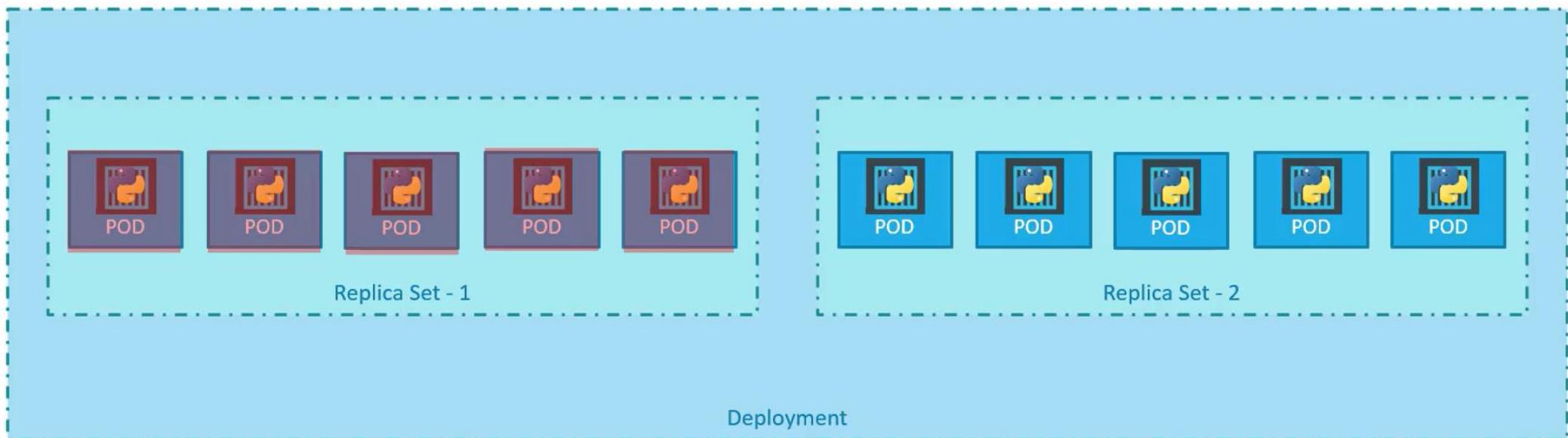
```
C:\Kubernetes>kubectl describe deployment myapp-deployment
Name:           myapp-deployment
Namespace:      default
CreationTimestamp: Sat, 03 Mar 2018 17:01:55 +0800
Labels:         app=myapp
Annotations:    deployment.kubernetes.io/revision=2
                kubectl.kubernetes.io/last-applied-configuration={"apiVersion":"apps/v1","kind":"Deployment","me...
s\Google...
                kubernetes.io/change-cause=kubectl apply --filename=d:\Mumshad Files\Google Drive\Udemy\Kubernetes...
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
```

Recreate

```
C:\Kubernetes>kubectl describe deployment myapp-deployment
Name:           myapp-deployment
Namespace:      default
CreationTimestamp: Sat, 03 Mar 2018 17:16:53 +0800
Labels:         app=myapp
Annotations:    deployment.kubernetes.io/revision=2
                kubectl.kubernetes.io/last-applied-configuration={"apiVersion":"apps/v1","kind":"Deployment","me...
Files\Google...
                kubernetes.io/change-cause=kubectl apply --filename=d:\Mumshad Files\Google Drive\Udemy\Kubernetes...
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
```

RollingUpdate

Upgrades



```
> kubectl get replicsets
```

NAME	DESIRED	CURRENT	READY	AGE
myapp-deployment-67c749c58c	0	0	0	22m
myapp-deployment-7d57dbdb8d	5	5	5	20m

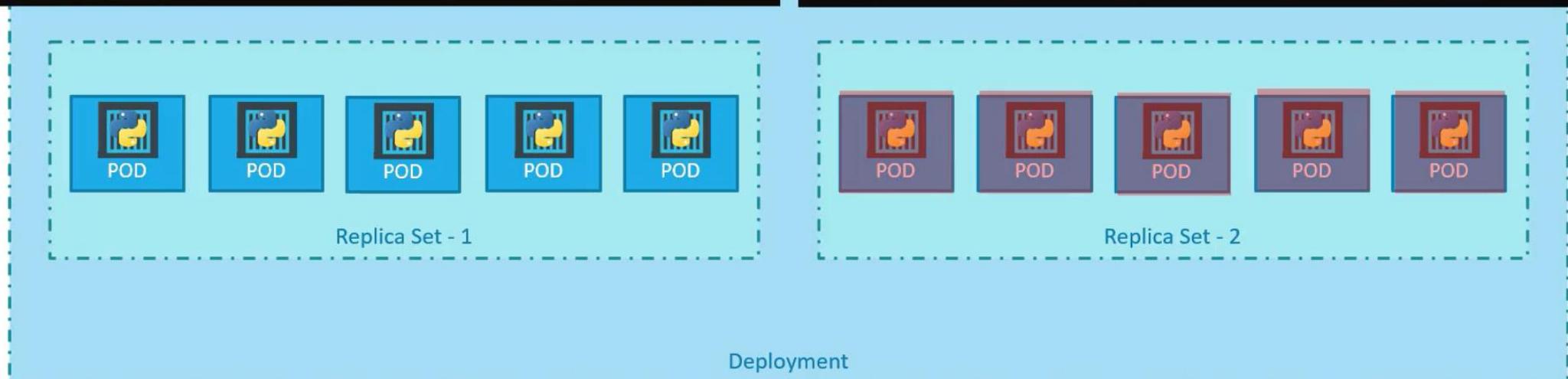
Rollback

```
> kubectl get replicaset
```

NAME	DESIRED	CURRENT	READY	AGE
myapp-deployment-67c749c58c	0	0	0	22m
myapp-deployment-7d57dbdb8d	5	5	5	20m

```
> kubectl get replicaset
```

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
```

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

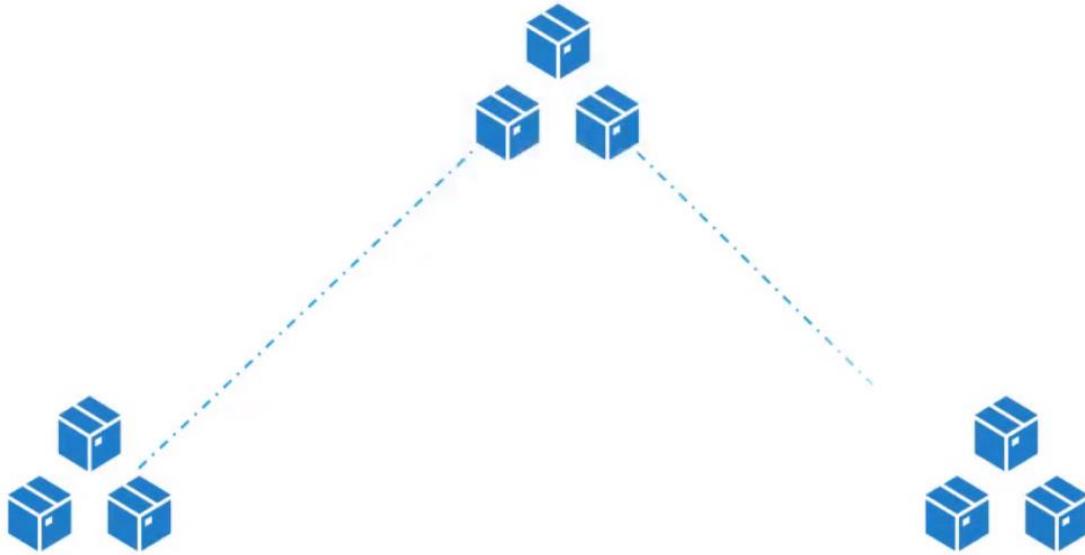
```
> kubectl rollout status deployment/myapp-deployment
```

```
> kubectl rollout history deployment/myapp-deployment
```

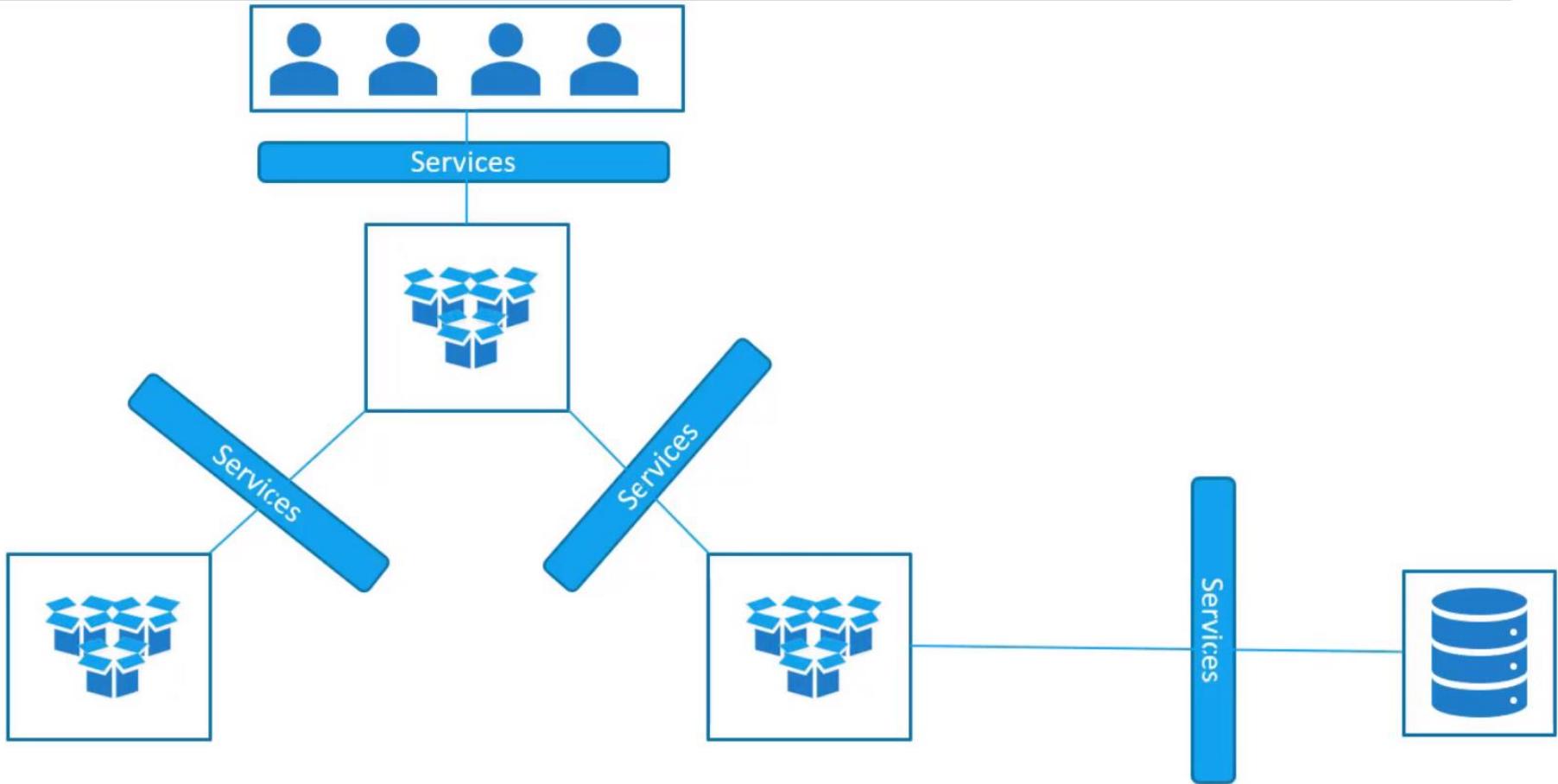
Rollback

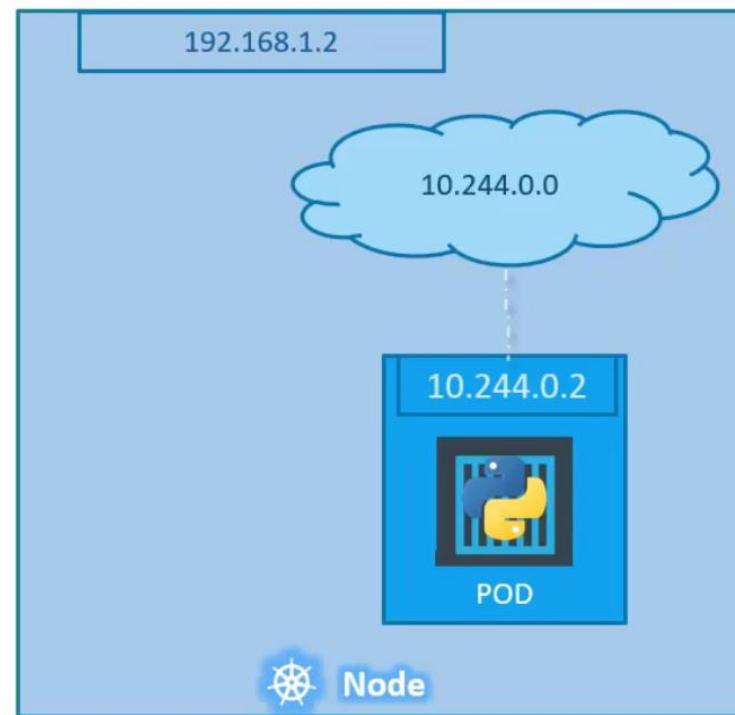
```
> kubectl rollout undo deployment/myapp-deployment
```

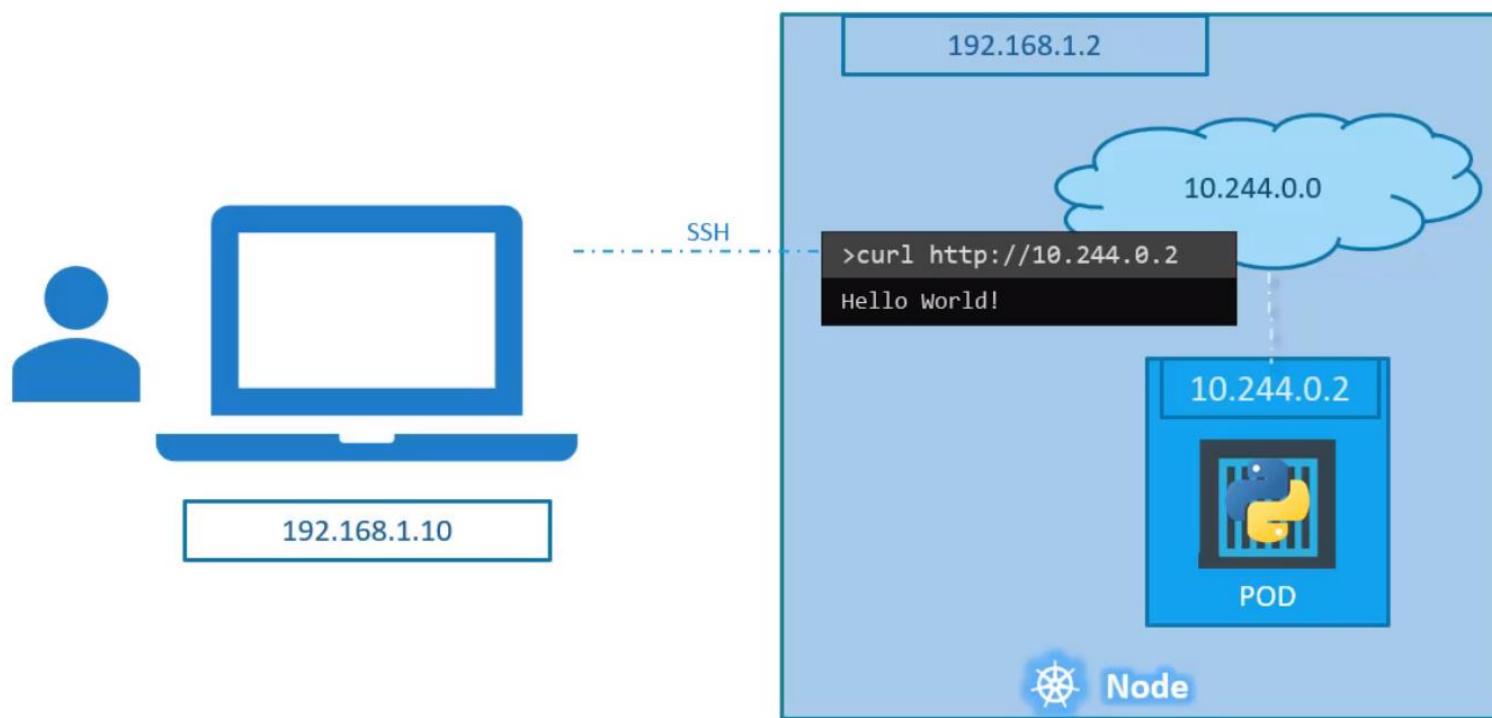
Services



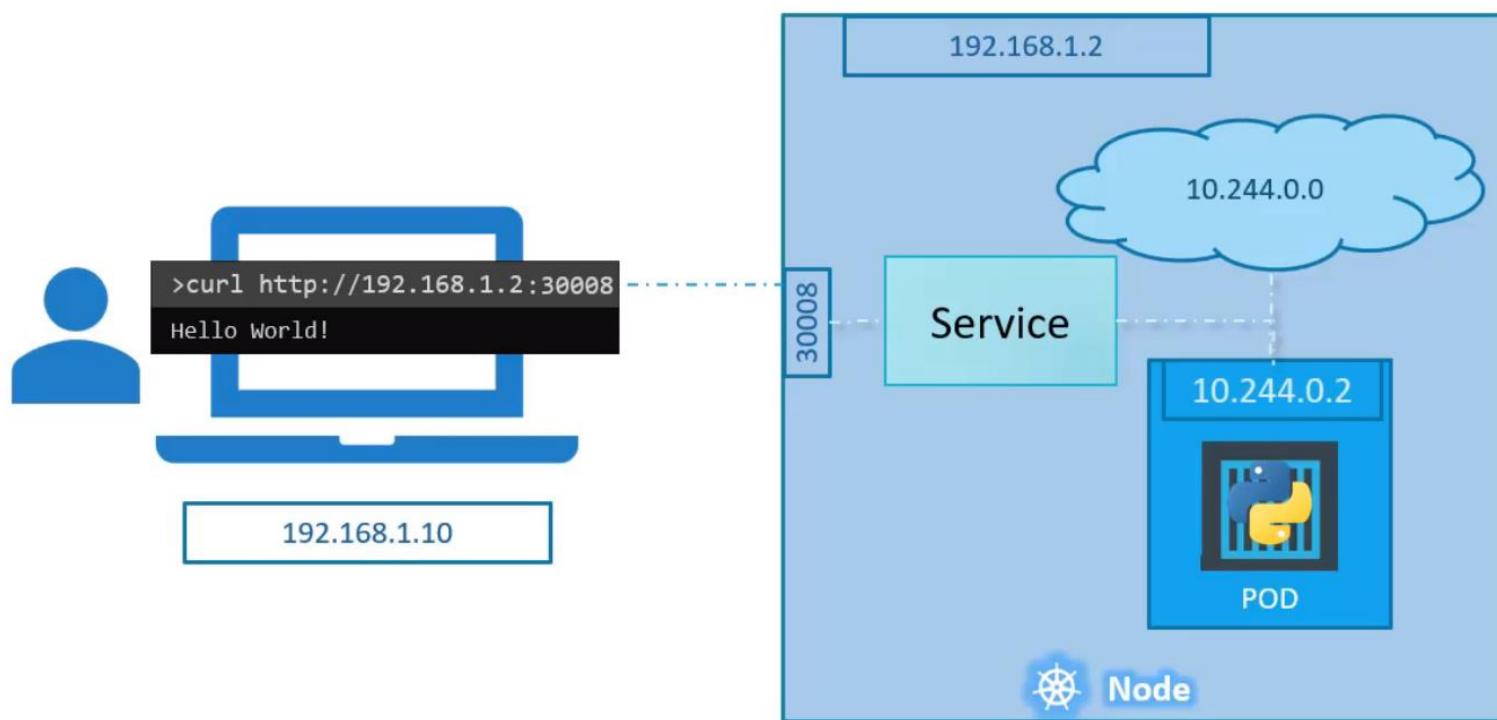
Services







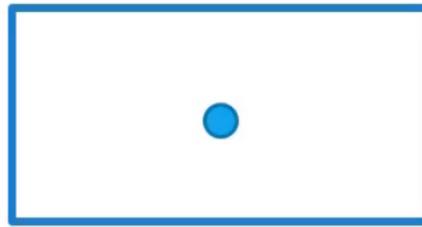
Service



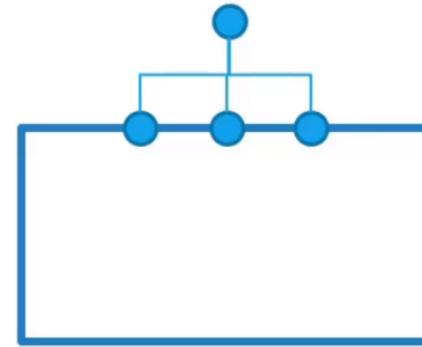
Services Types



NodePort



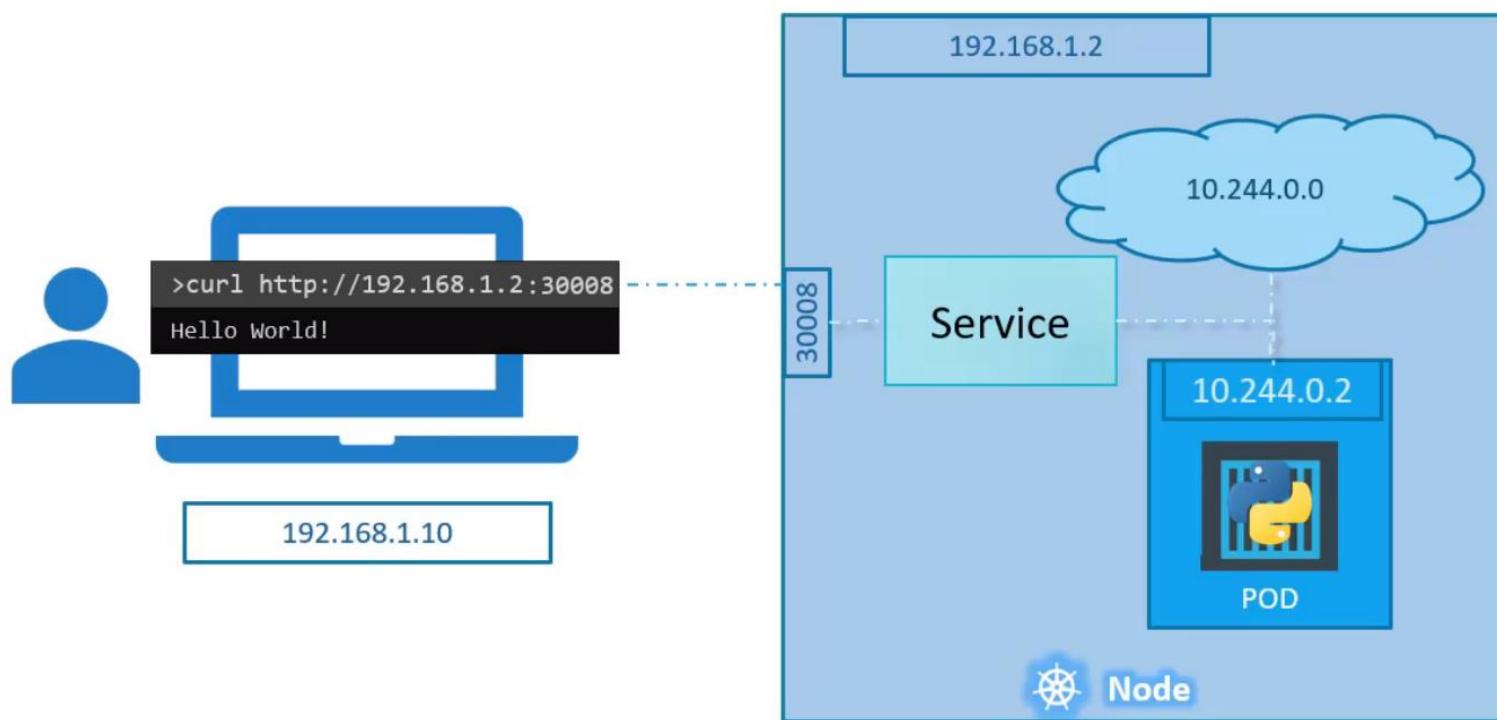
ClusterIP



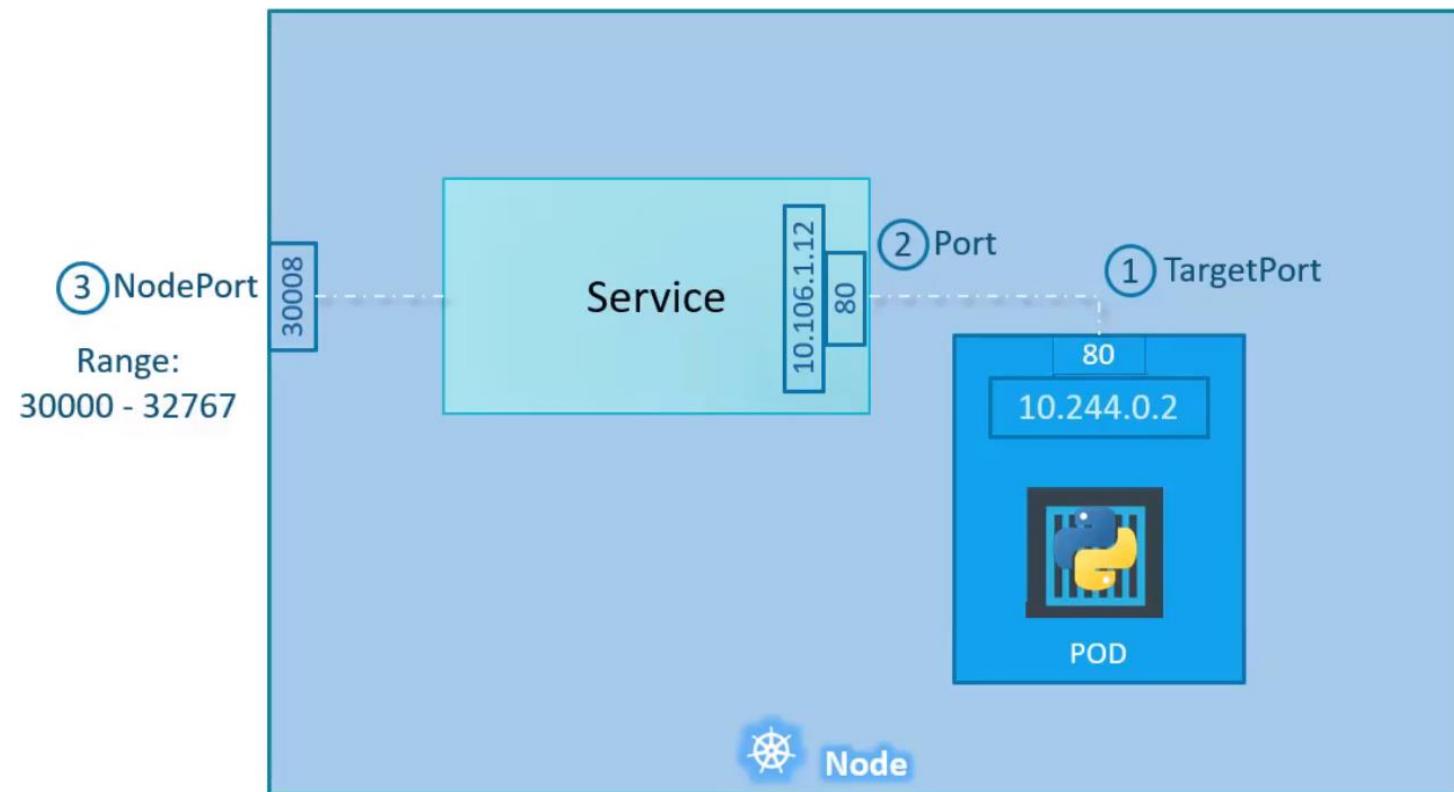
LoadBalancer

NodePort

Service



Service - NodePort



`service-definition.yml`

```
apiVersion: v1
kind: Service
metadata:
  name: myapp-service
spec:
  type: NodePort
  ports:
    - targetPort: 80
      *port: 80
      nodePort: 30008
```

Service - NodePort

```
service-definition.yml
```

```
apiVersion: v1
kind: Service
metadata:
  name: myapp-service
spec:
  type: NodePort
  ports:
    - targetPort: 80
      port: 80
      nodePort: 30008
  selector:
    app: myapp
    type: front-end
```

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

```
service "myapp-service" created
```

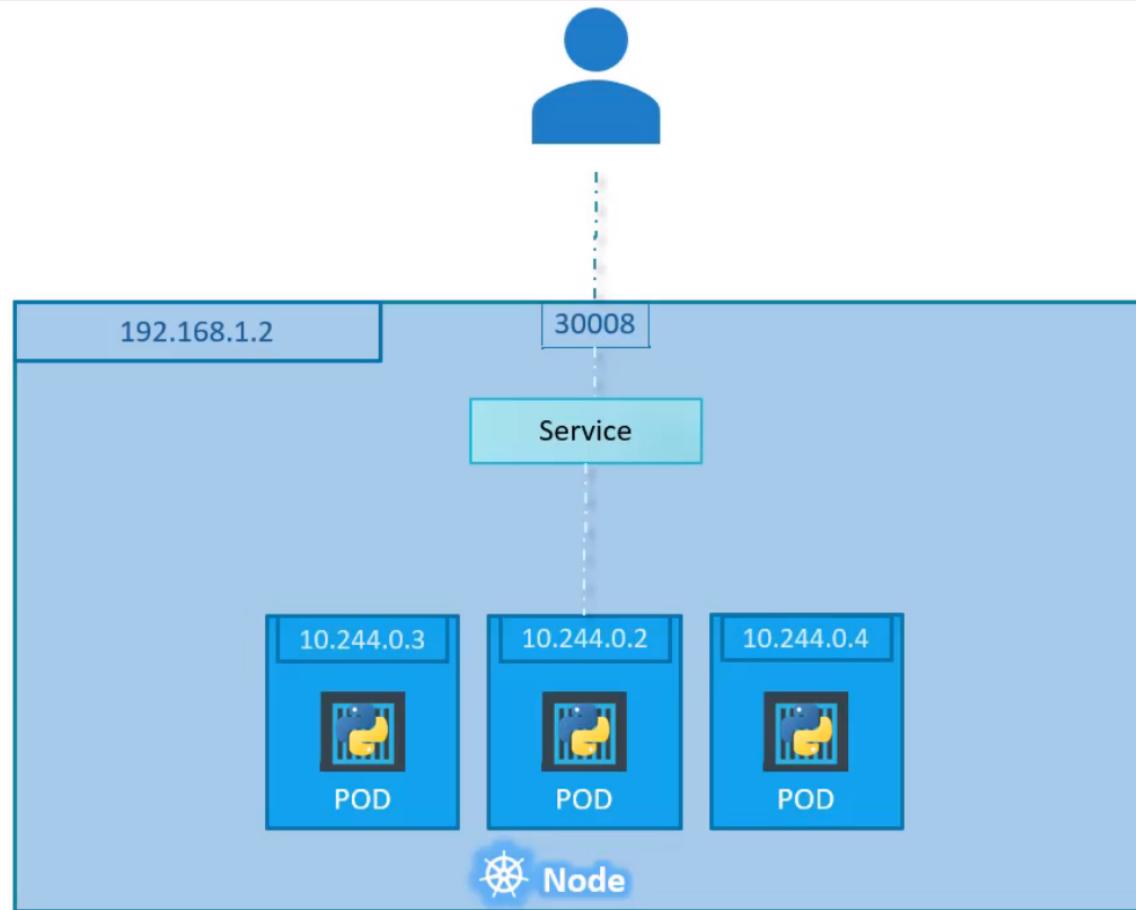
```
> kubectl get services
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP	16d
myapp-service	NodePort	10.106.127.123	<none>	80:30008/TCP	5m

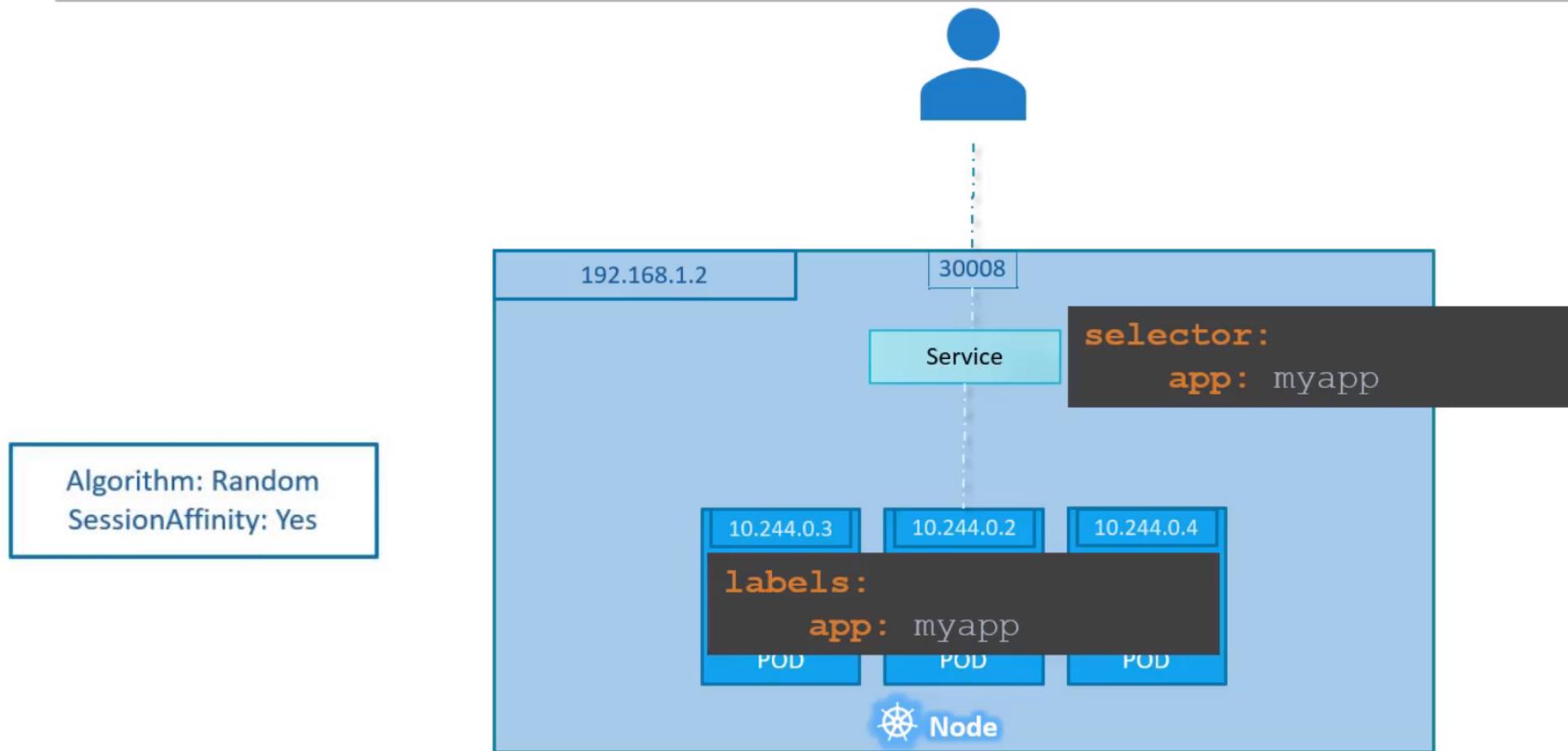
```
> curl http://192.168.1.2:30008
```

```
<html>
<head>
<title>Welcome to nginx!</title>
<style>
  body {
    width: 35em;
    margin: 0 auto;
    font-family: Tahoma, Verdana, Arial, sans-serif;
  }
</style>
</head>
<body>
```

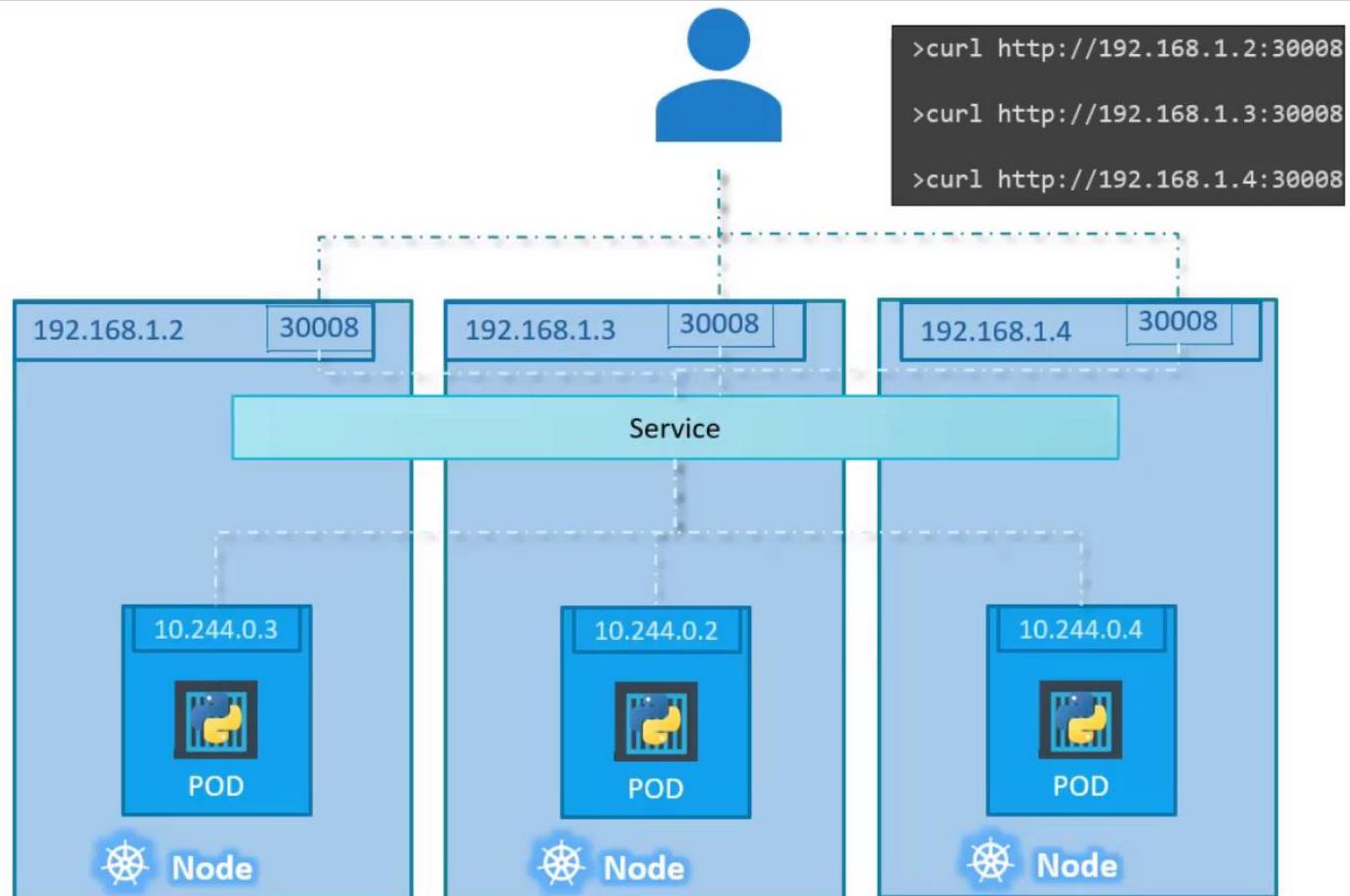
Service - NodePort



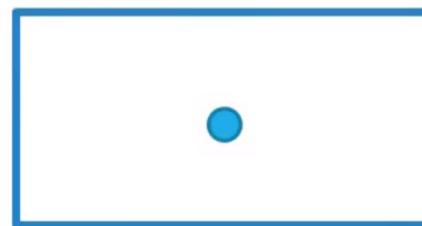
Service - NodePort

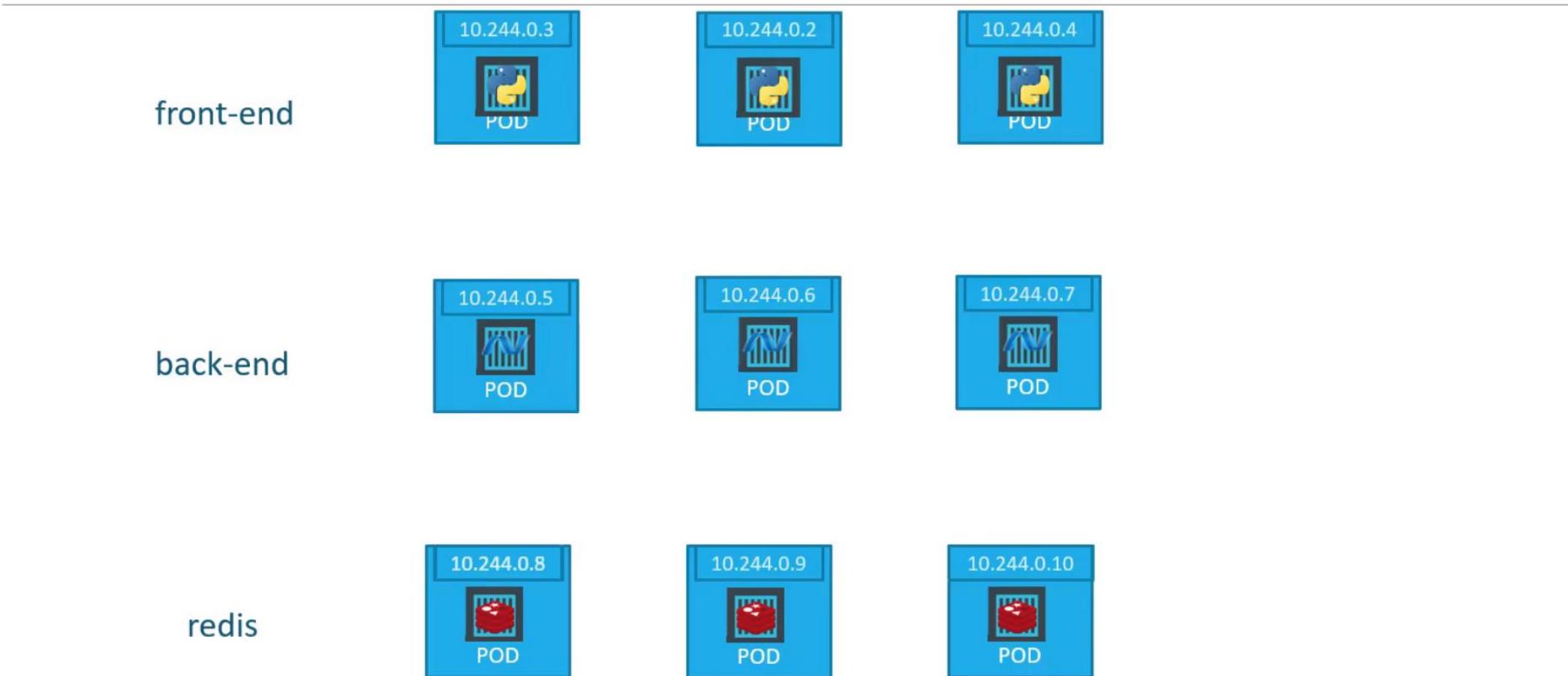


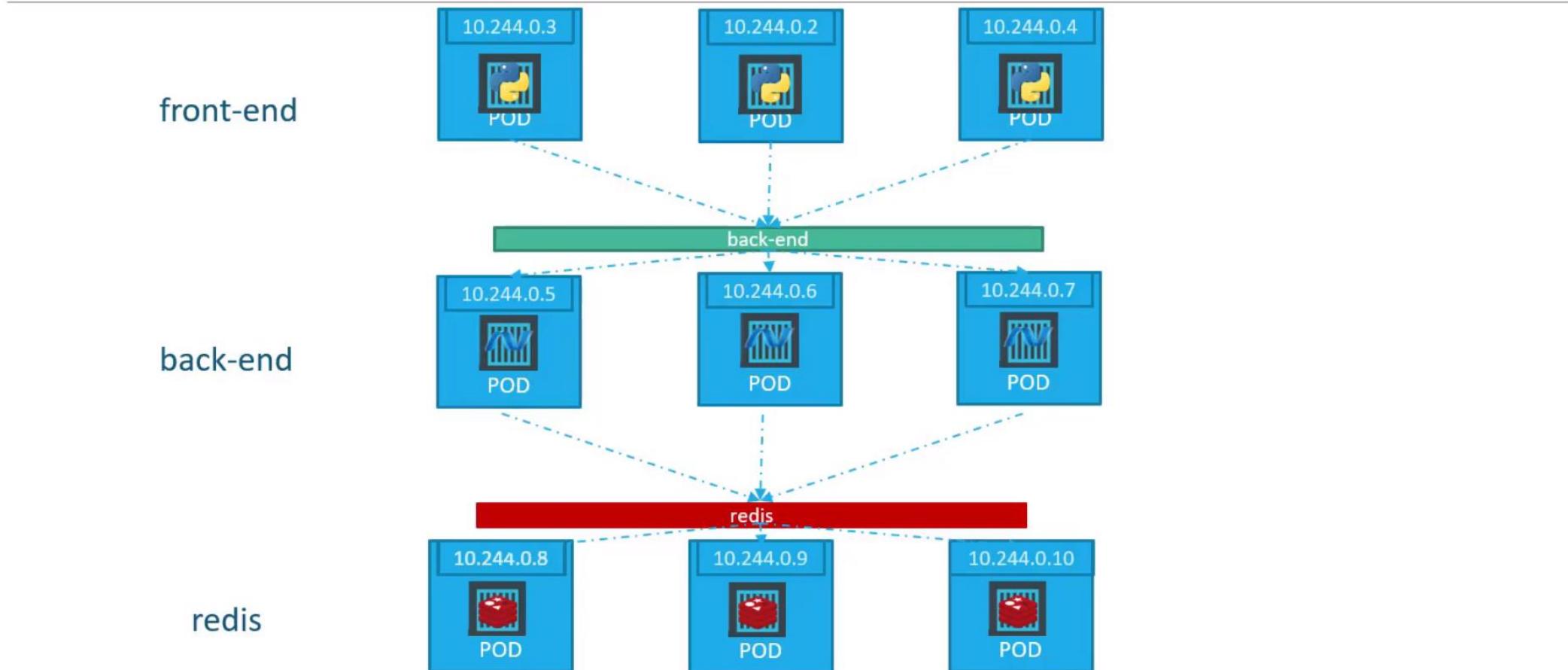
Service - NodePort



ClusterIP







```
service-definition.yml
```

```
apiVersion: v1
kind: Service
metadata:
  name: back-end
spec:
  type: ClusterIP
  ports:
    - targetPort: 80
      port: 80

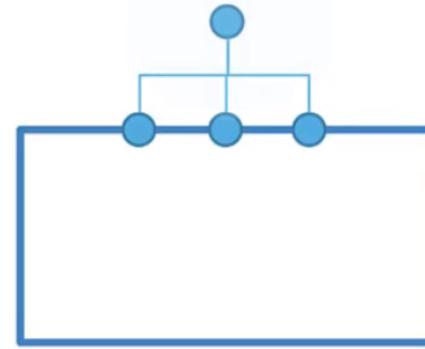
  selector:
    app: myapp
    type: back-end
```

```
> kubectl create -f service-definition.yml
service "back-end" created
```

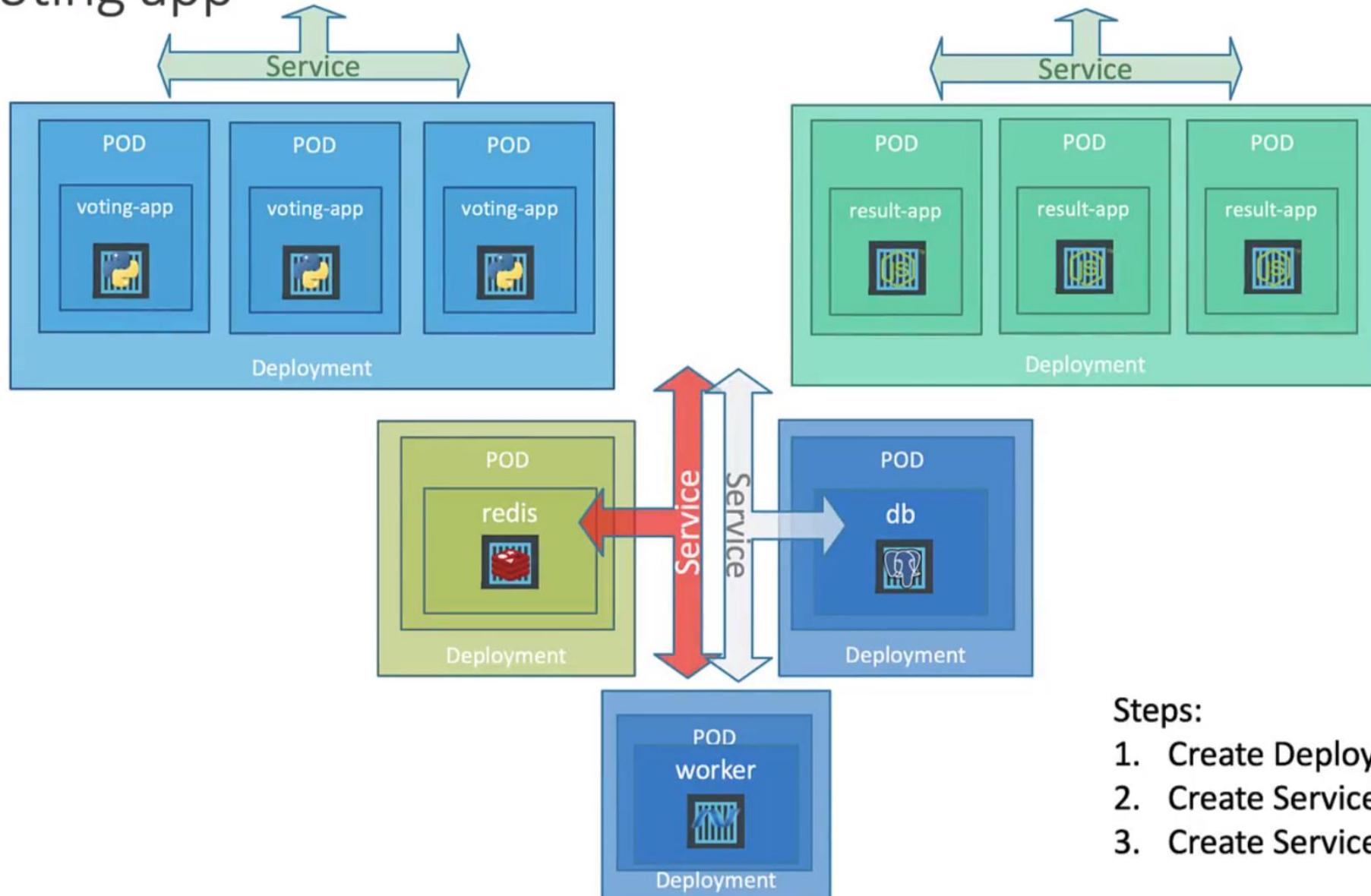
```
> kubectl get services
```

NAME	TYPE	CLUSTER-IP	EXTERNAL-IP	PORT(S)	AGE
kubernetes	ClusterIP	10.96.0.1	<none>	443/TCP	16d
back-end	ClusterIP	10.106.127.123	<none>	80/TCP	2m

Service- Load Balancer



Example voting app



Steps:

1. Create Deployments
2. Create Services (ClusterIP)
3. Create Services (LoadBalancer)

Example voting app



<http://example-vote.com>

<http://example-result.com>

<http://192.168.56.70:30035>

<http://192.168.56.71:30035>

<http://192.168.56.72:30035>

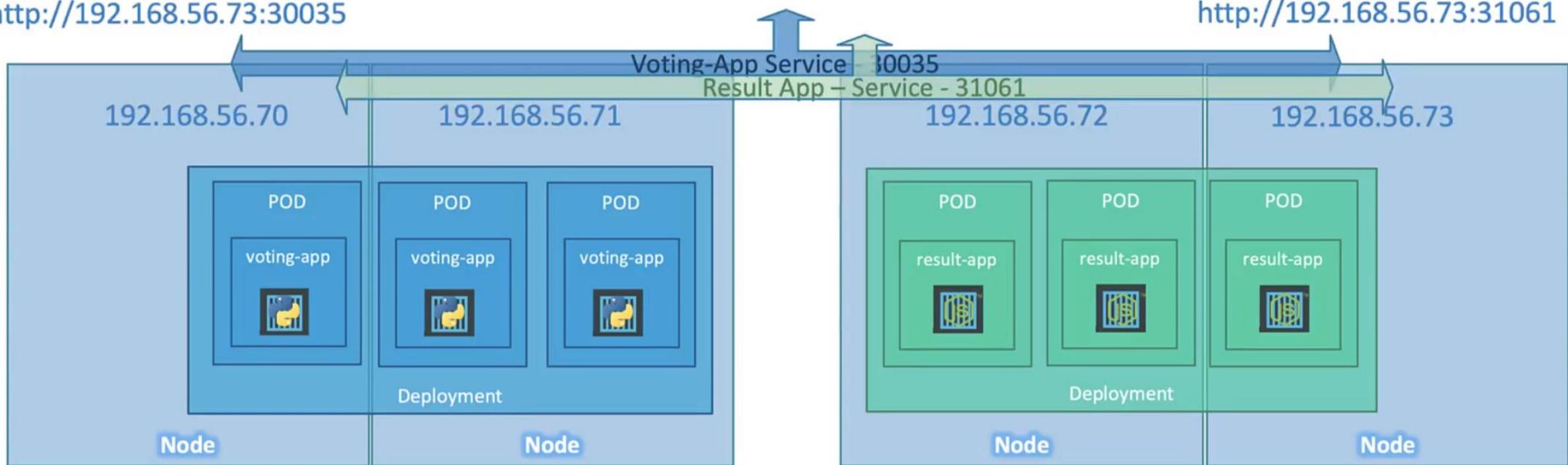
<http://192.168.56.73:30035>

<http://192.168.56.70:31061>

<http://192.168.56.71:31061>

<http://192.168.56.72:31061>

<http://192.168.56.73:31061>



Example voting app



<http://example-vote.com>

<http://example-result.com>

<http://192.168.56.70:30035>

<http://192.168.56.71:30035>

<http://192.168.56.72:30035>

<http://192.168.56.73:30035>

Load Balancer

Voting-App Service - 30035

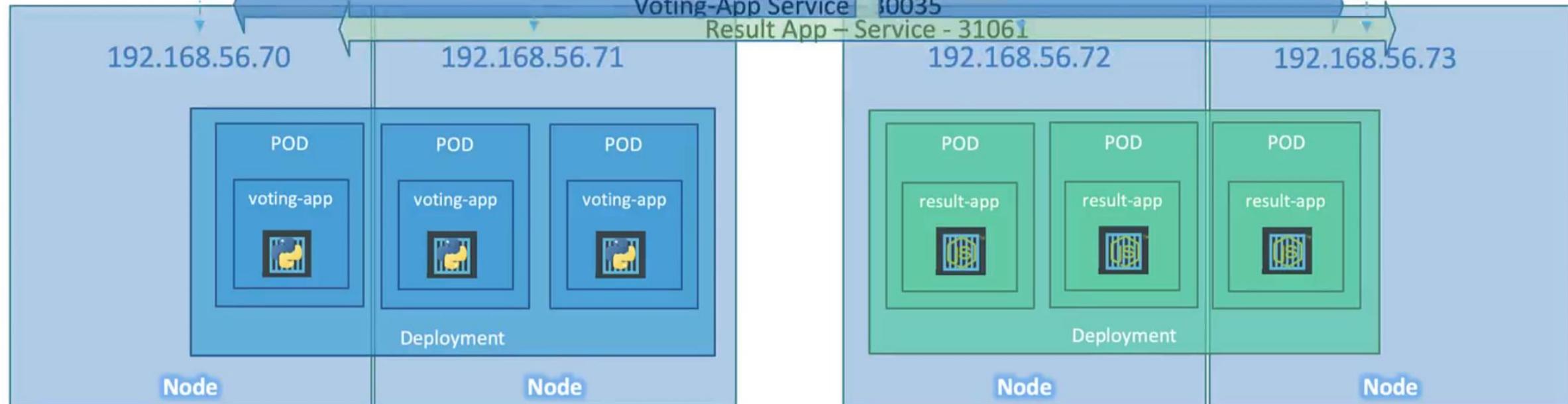
Result App – Service - 31061

<http://192.168.56.70:31061>

<http://192.168.56.71:31061>

<http://192.168.56.72:31061>

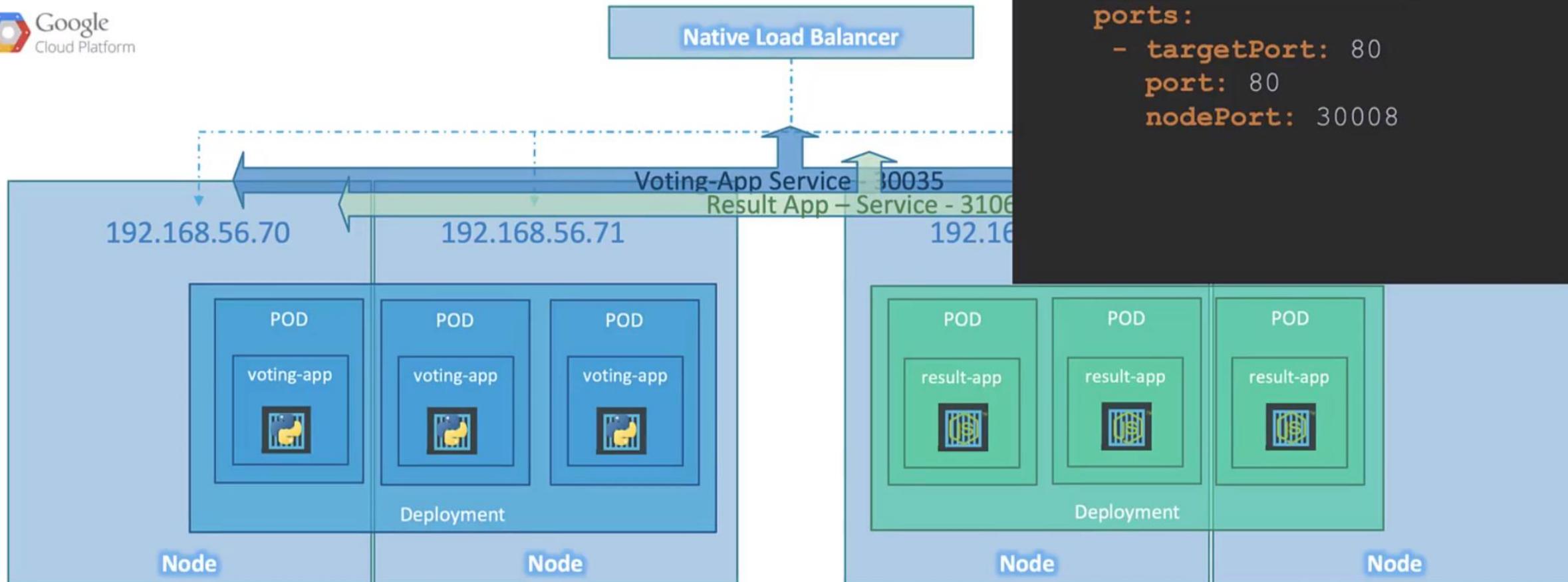
<http://192.168.56.73:31061>



Example voting app



<http://example-vote.com>
<http://example-result.com>



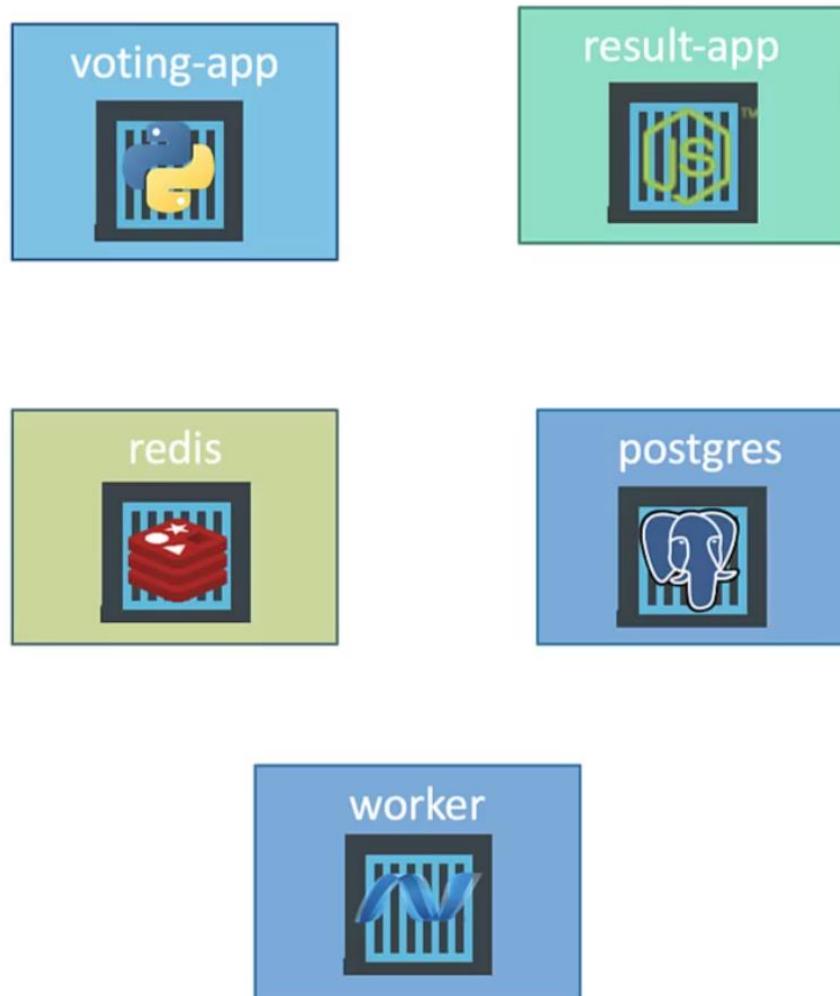
service-definition.yml

```
apiVersion: v1
kind: Service
metadata:
  name: myapp-service
spec:
  type: LoadBalancer
  ports:
    - targetPort: 80
      port: 80
      nodePort: 30008
```

Example voting app

Goals:

1. Deploy Containers
2. Enable Connectivity
3. External Access

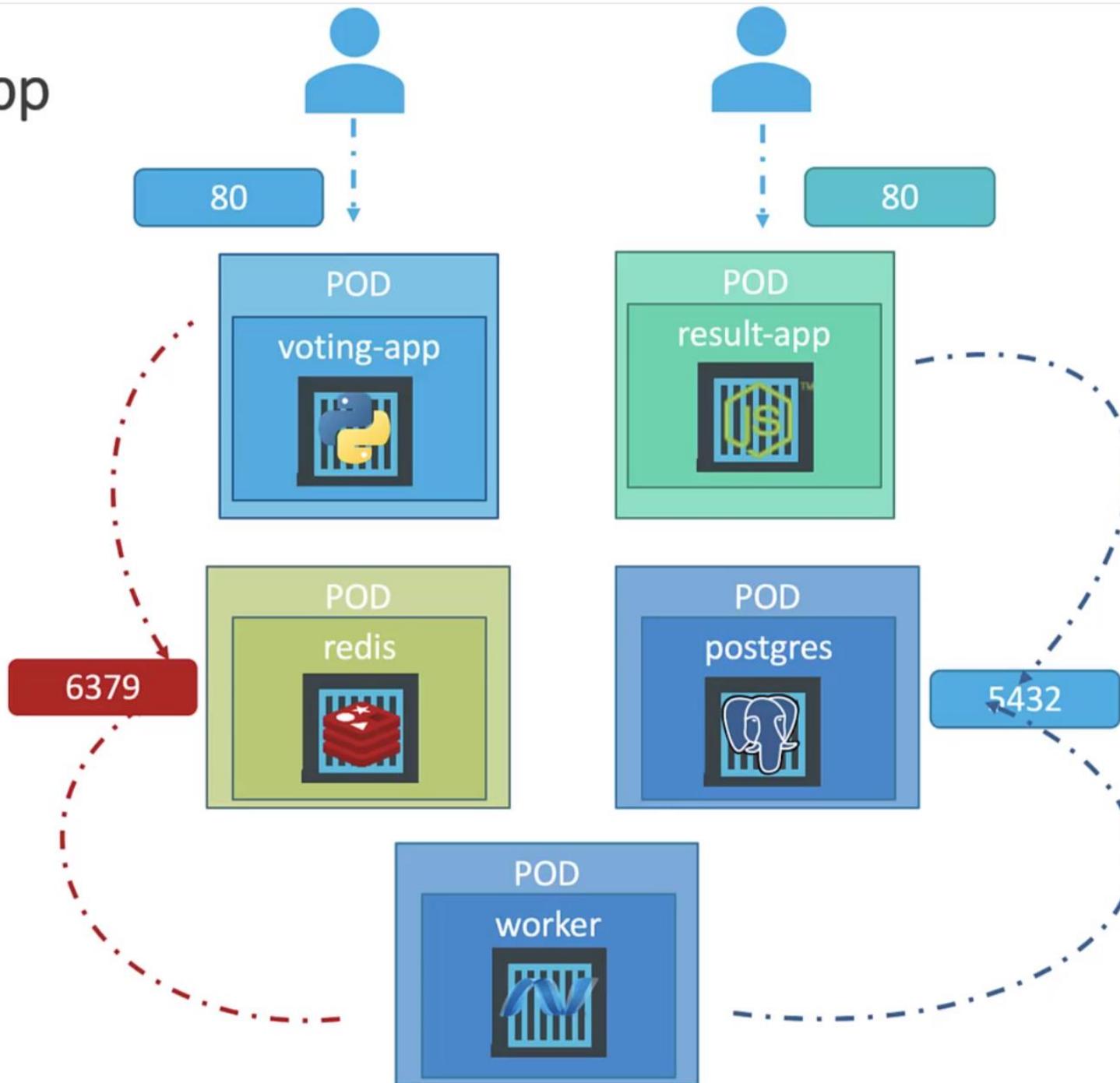


Example voting app

2. Enable Connectivity
3. External Access

Steps:

1. Deploy PODs



Example voting app

app.py

```
app = Flask(__name__)

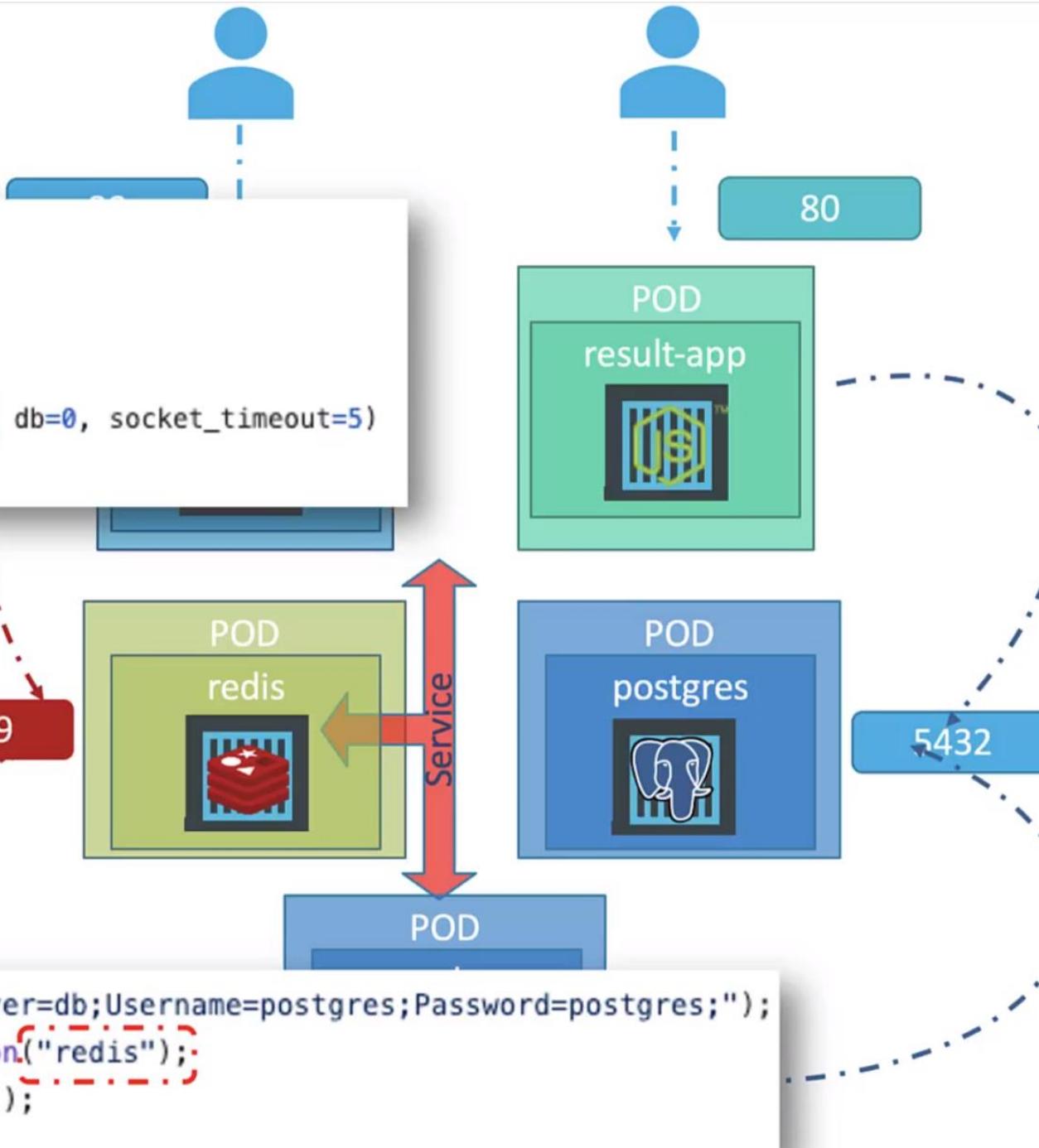
def get_redis():
    if not hasattr(g, 'redis'):
        g.redis = Redis(host="redis", db=0, socket_timeout=5)
    return g.redis
```

Steps:

1. Deploy PODs
2. Create Services (ClusterIP)
 1. redis

program.cs

```
var pgsql = OpenDbConnection("Server=db;Username=postgres;Password=postgres;");
var redisConn = OpenRedisConnection("redis");
var redis = redisConn.GetDatabase();
```



Example voting app

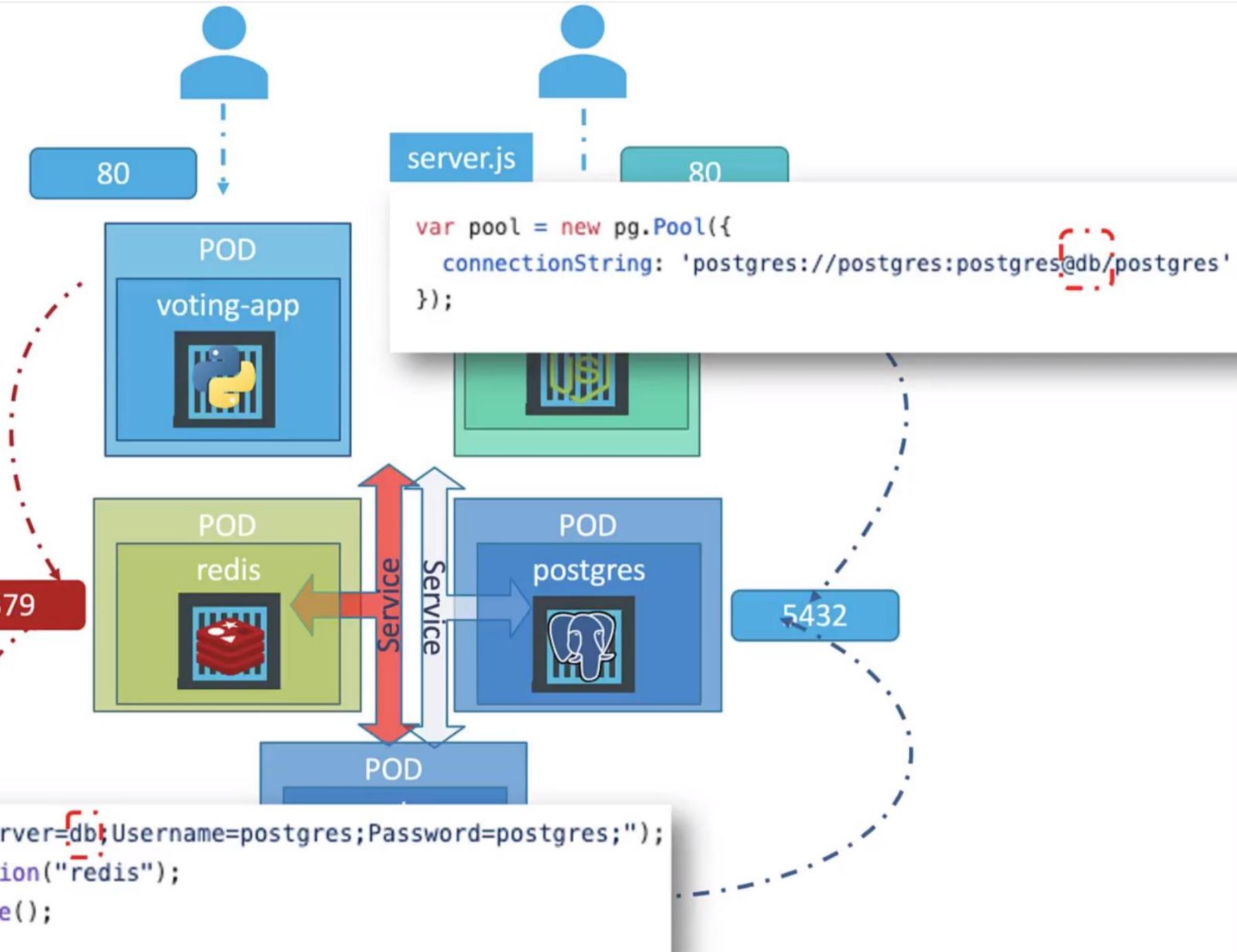
3. External Access

Steps:

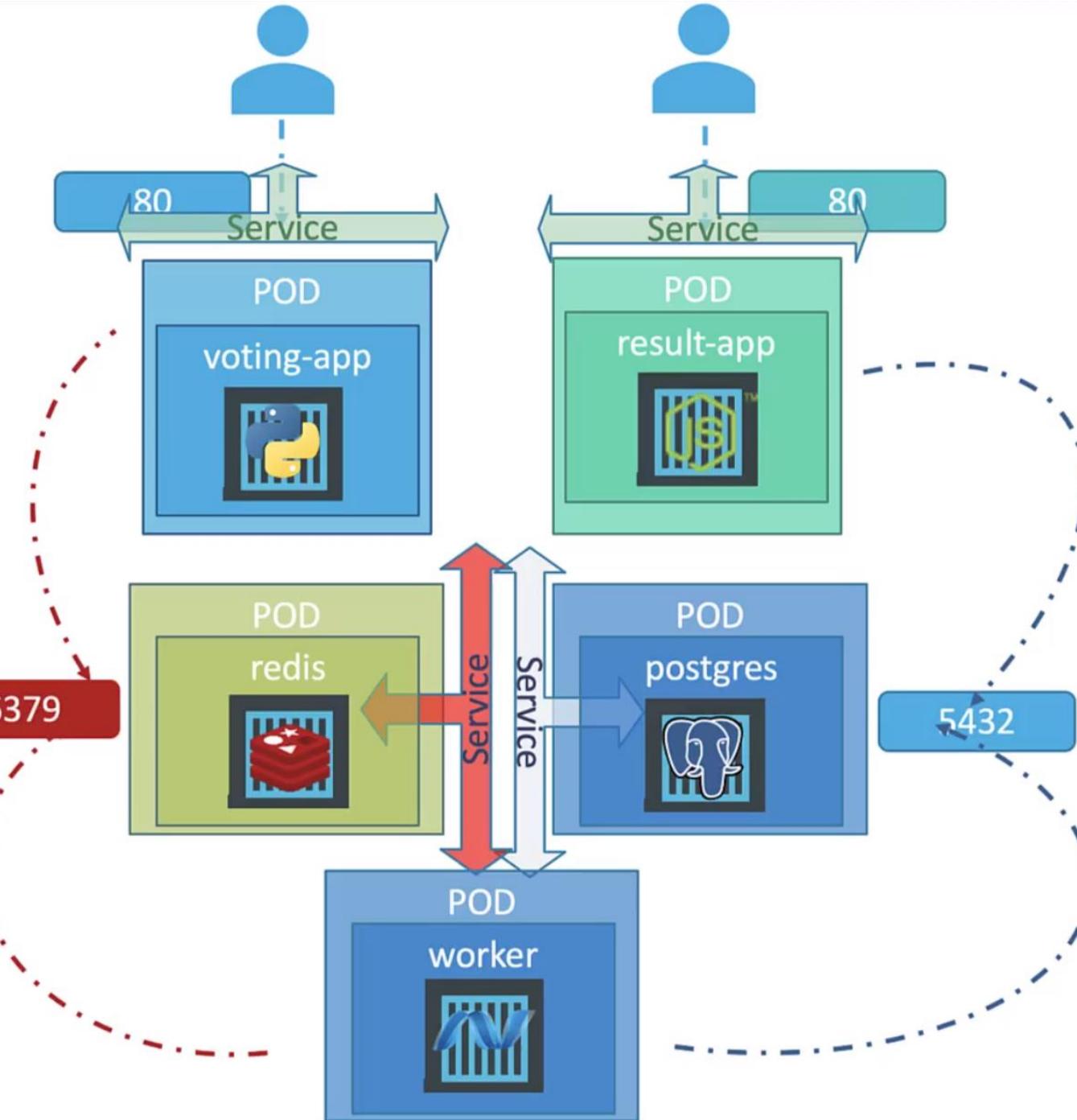
1. Deploy PODs
2. Create Services (ClusterIP)
 1. redis
 2. db

program.cs

```
var pgsql = OpenDbConnection("Server=db;Username=postgres;Password=postgres;");  
var redisConn = OpenRedisConnection("redis");  
var redis = redisConn.GetDatabase();
```



Example voting app



Steps:

1. Deploy PODs
2. Create Services (ClusterIP)
 1. redis
 2. db
3. Create Services (NodePort)
 1. voting-app
 2. result-app