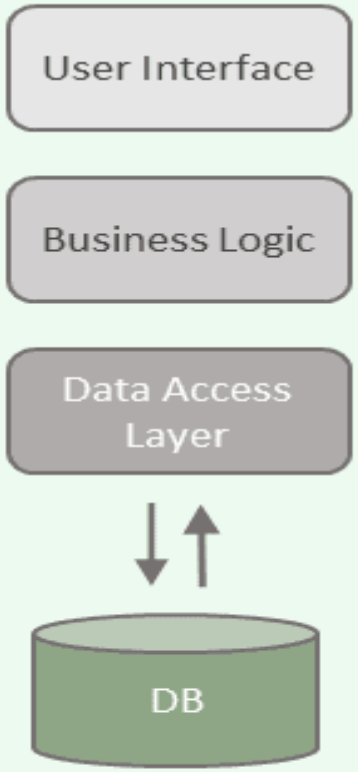
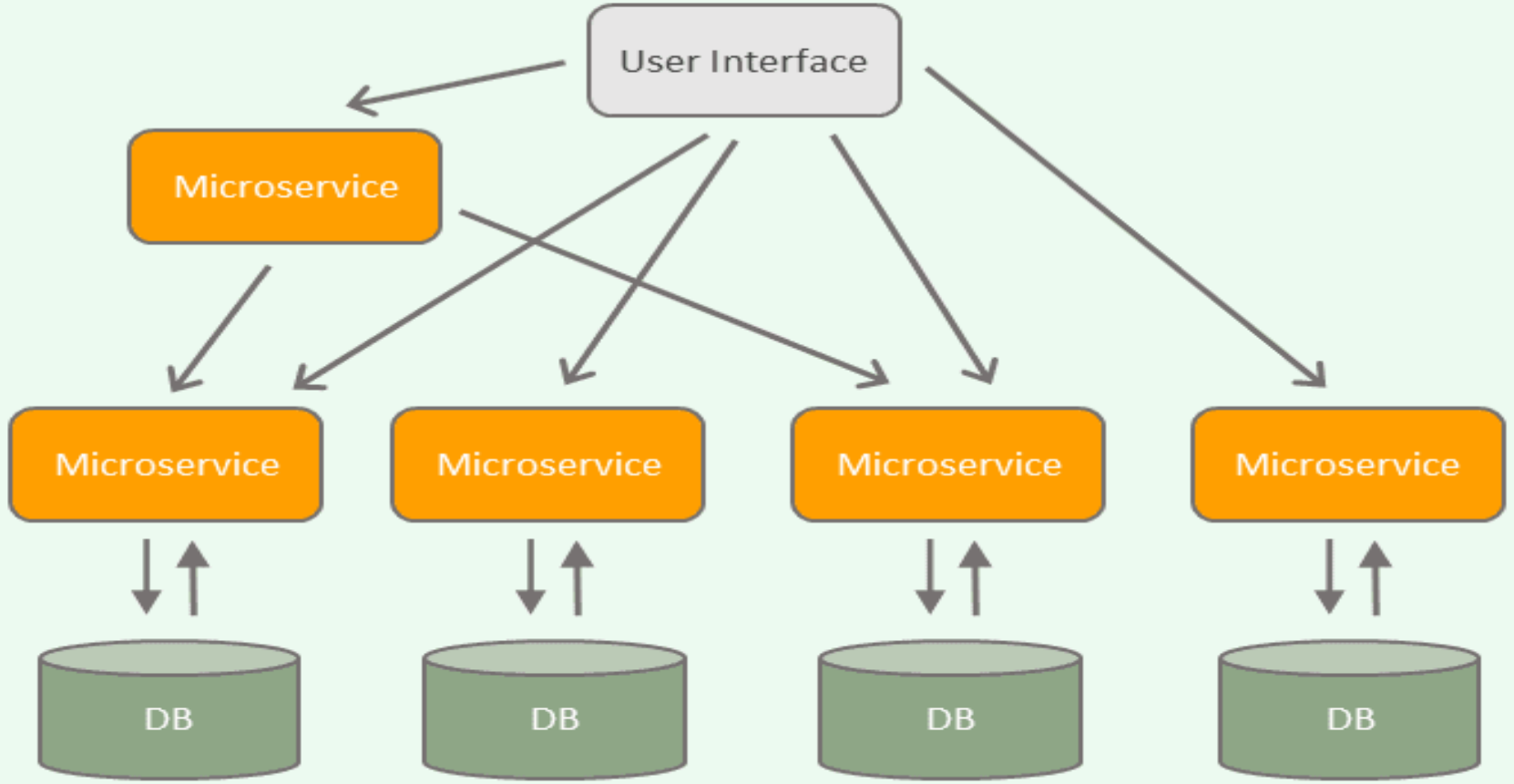
MONOLITHIC ARCHITECTURE



MICROSERVICES ARCHITECTURE

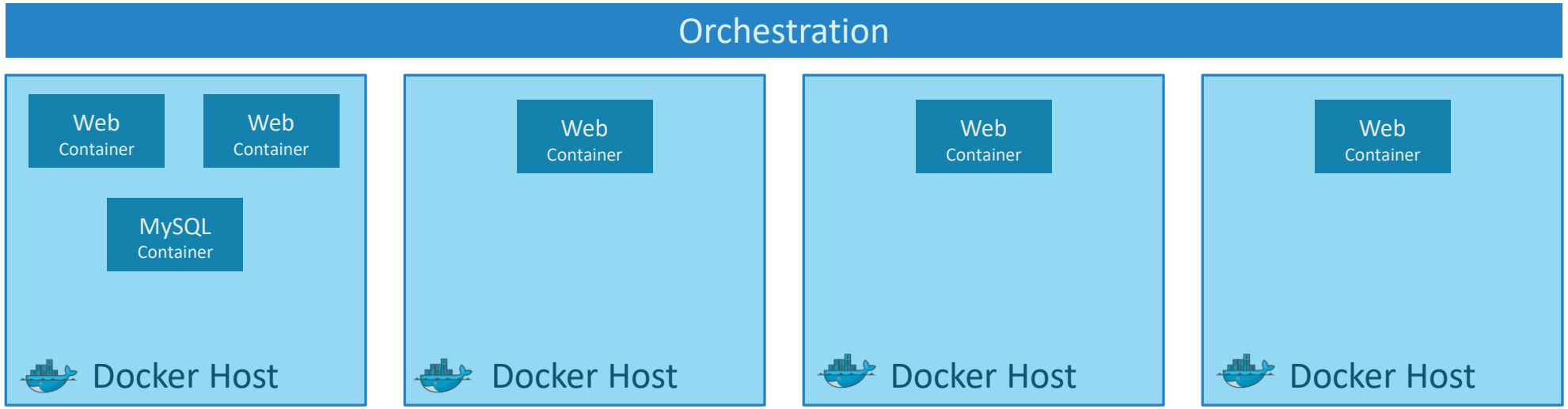


Container Orchestration

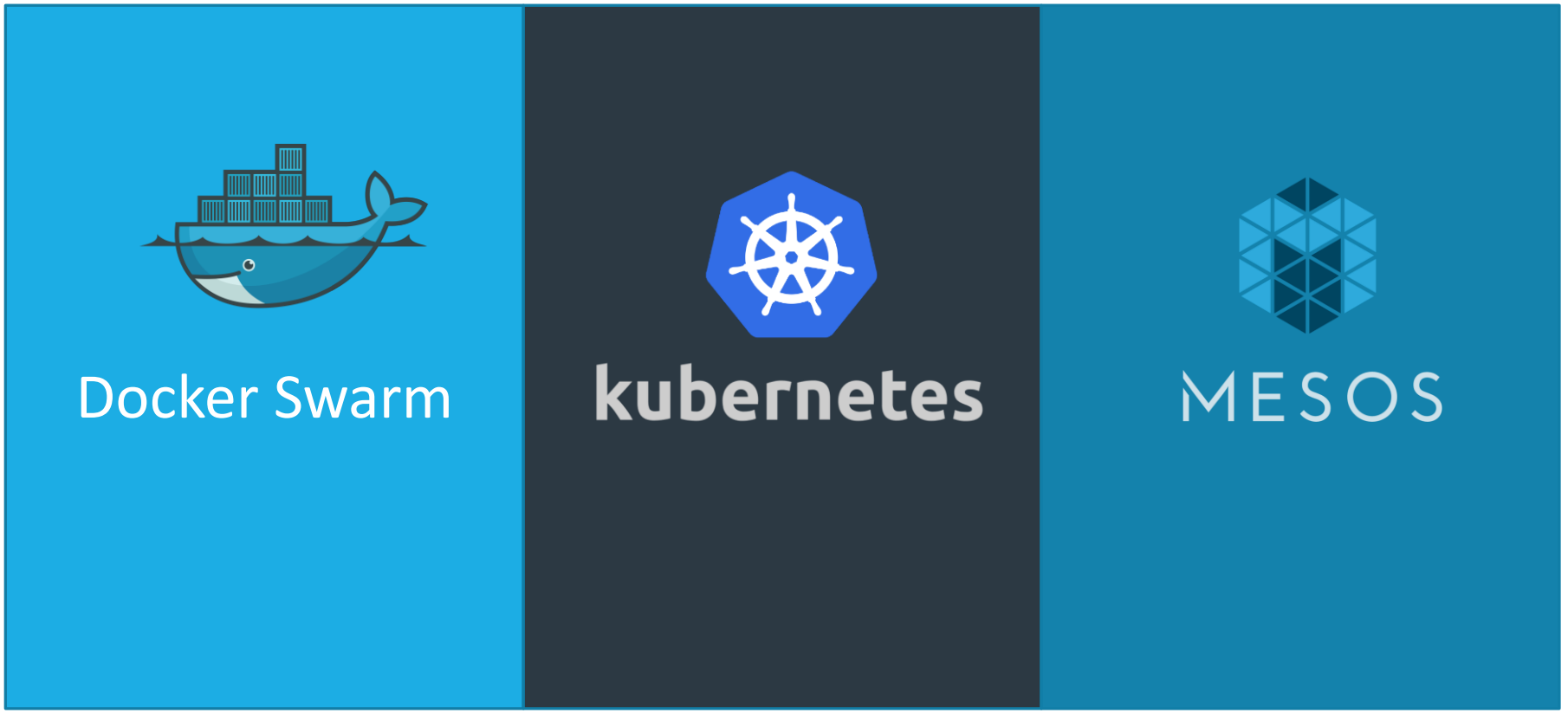
Containers Limitation?

High Availability?
Overlay Network?
Versioning of Application – Rollout, Rollback?
Scaling?
Autoscaling?
Monitoring?
Dependency between containers?

Container orchestration



Orchestration Technologies



What is Kubernetes?

The Kubernetes project was started by Google in 2014.

Kubernetes builds upon a decade and a half of experience that Google has with running production workloads at scale.

Kubernetes can run on a range of platforms, from your laptop, to VMs on a cloud provider, to rack of bare metal servers.

Kubernetes is an open-source platform for automating deployment, scaling, and operations of application containers across clusters of hosts, providing container-centric infrastructure.

portable: with all public, private, hybrid, community cloud

self-healing: auto-placement, auto-restart, auto-replication, auto-scaling

Why Kubernetes

Kubernetes can schedule and run application containers on clusters of physical or virtual machines.

host-centric infrastructure to a **container-centric** infrastructure.

Orchestrator

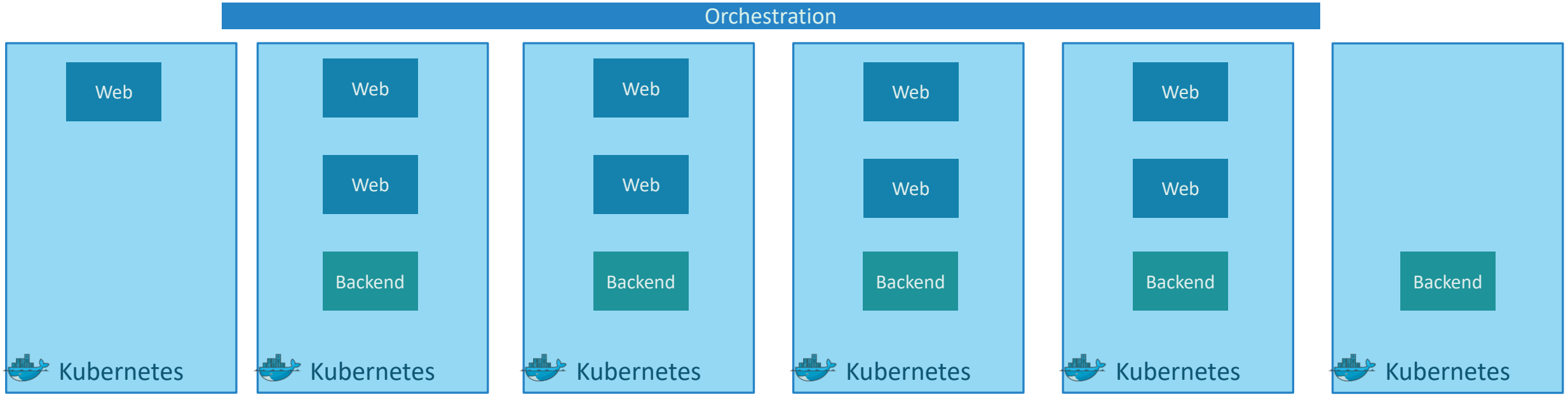
Load balancing

Auto Scaling

Application Health checks

Rolling updates

Kubernetes Advantage



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And that is kubernetes..

Setup

Minikube

Kubeadm

Google Cloud Platform

Amazon Web Services

play-with-k8s.com

Setup Kubernetes

Setup - kubeadm

Kubernetes Cluster

A Kubernetes cluster consists of two types of resources:

Master: Which coordinates with the cluster

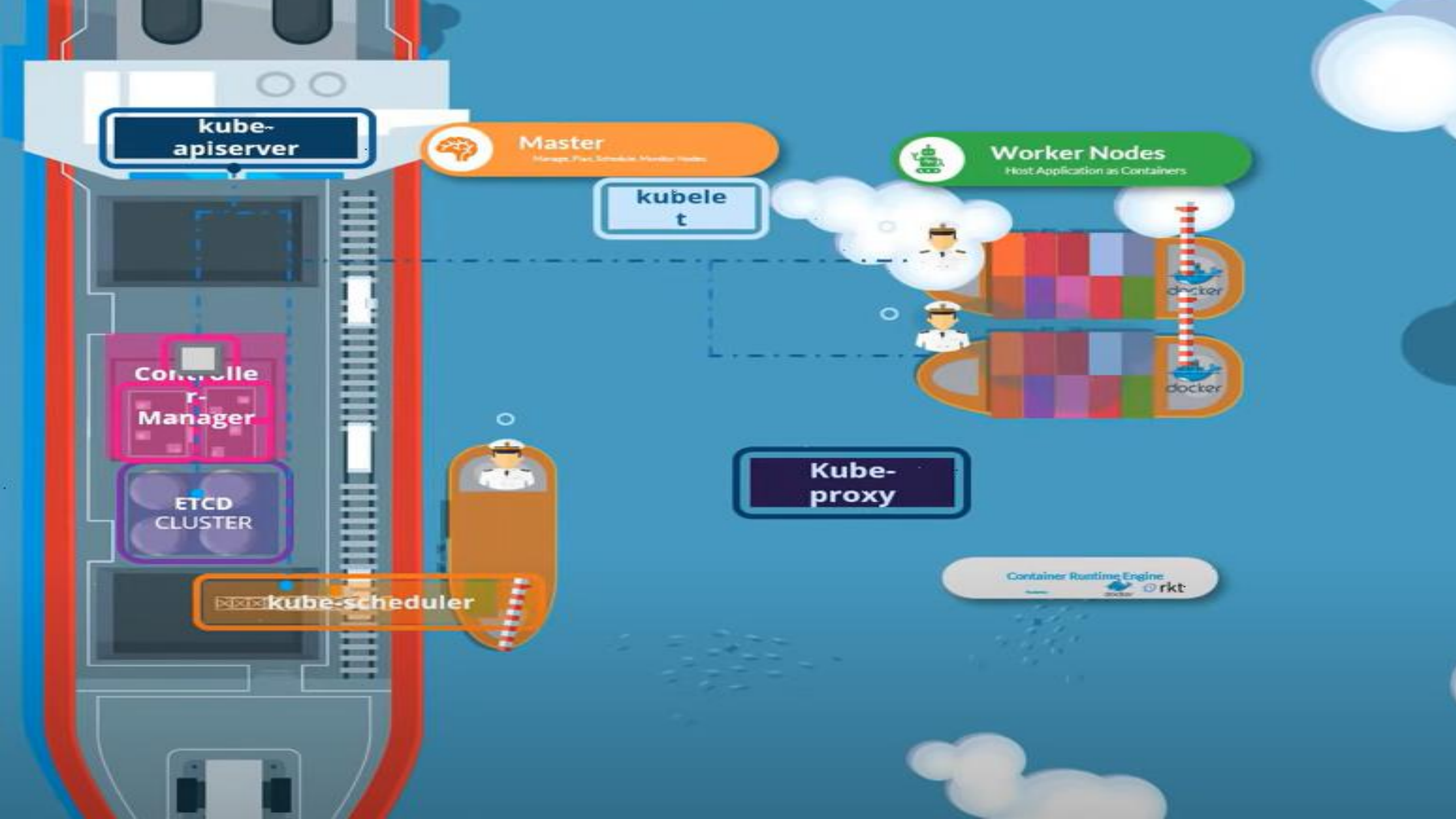
The Master is responsible for managing the cluster. The master coordinates all activities in your cluster, such as scheduling applications, maintaining applications' desired state, scaling applications, and rolling out new updates.

Nodes: Are the workers that run application

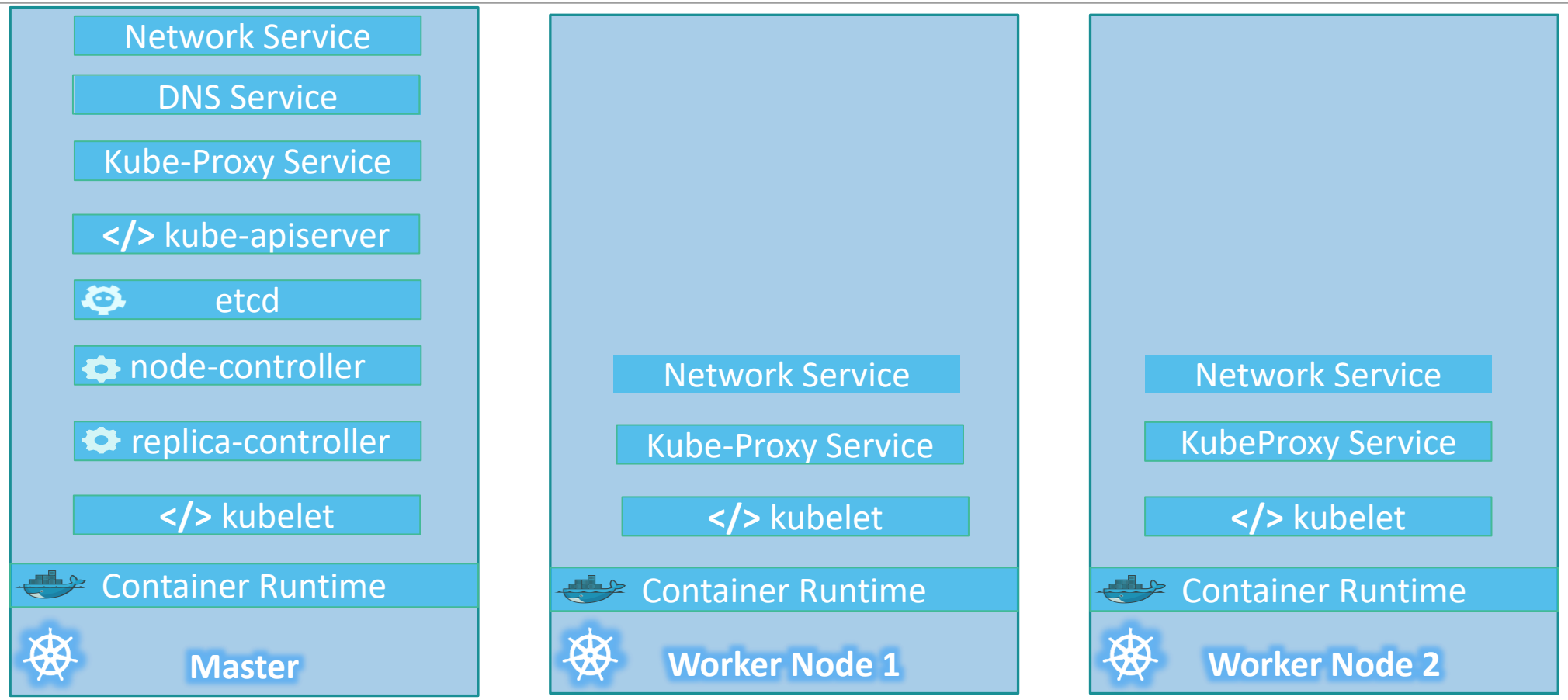
A node is a VM or a physical computer that serves as a worker machine in a Kubernetes cluster.

Masters manage the cluster and the nodes are used to host the running applications.

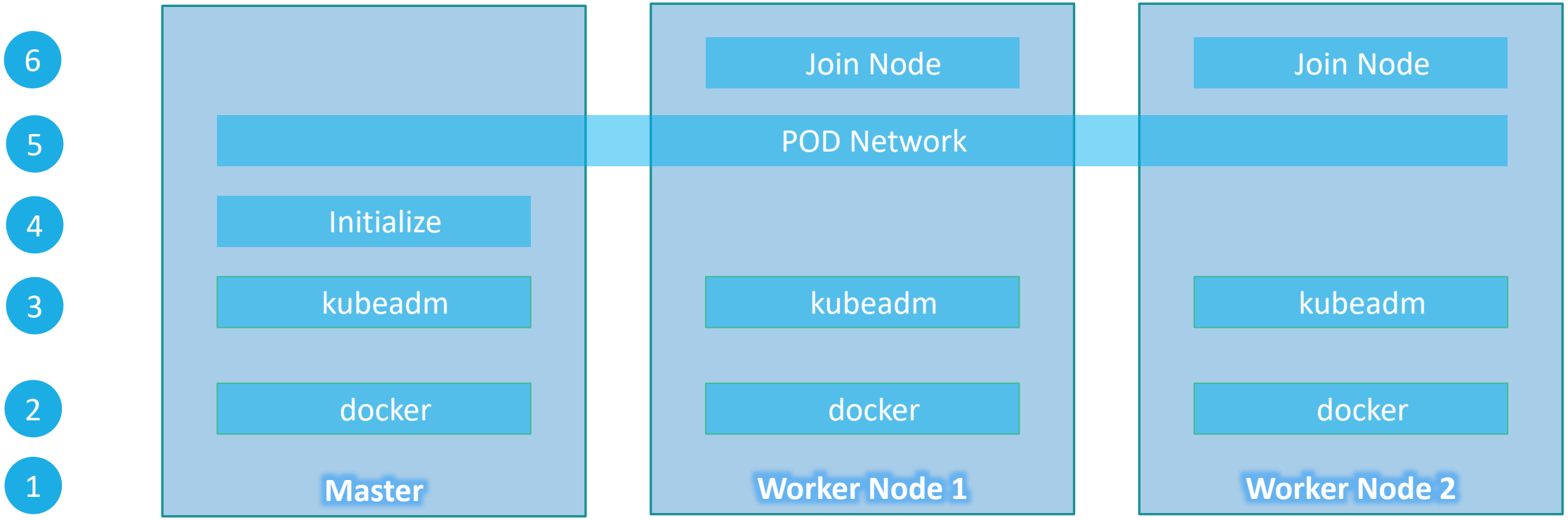
The nodes communicate with the master using the Kubernetes API, which the master exposes.


kube-
apiserver
Master
kubele
t
Worker Nodes
Host Application as Containers
docker
docker
Controlle
r-
Manager
ETCD
CLUSTER
kube-scheduler
Kube-
proxy
Container Runtime Engine
rkt

kubeadm


Network Service
DNS Service
Kube-Proxy Service
</> kube-apiserver
etcd
node-controller
replica-controller
</> kubelet
Container Runtime
Master
Network Service
Kube-Proxy Service
</> kubelet
Container Runtime
Worker Node 1
Network Service
KubeProxy Service
</> kubelet
Container Runtime
Worker Node 2

Steps


6
5
4
3
2
1
Join Node
Join Node
POD Network
Initialize
kubeadm
kubeadm
kubeadm
docker
docker
docker
Master
Worker Node 1
Worker Node 2

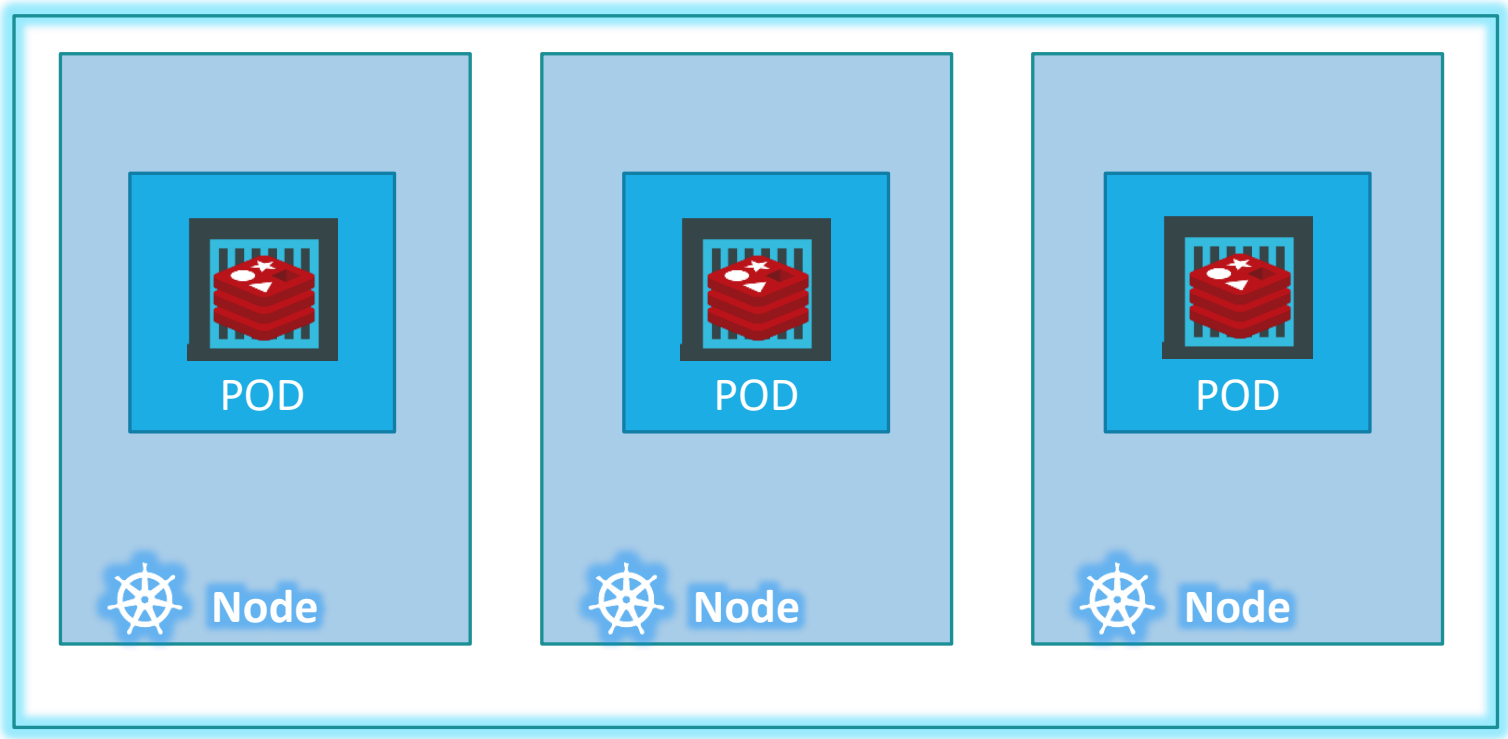
POD

Assumptions

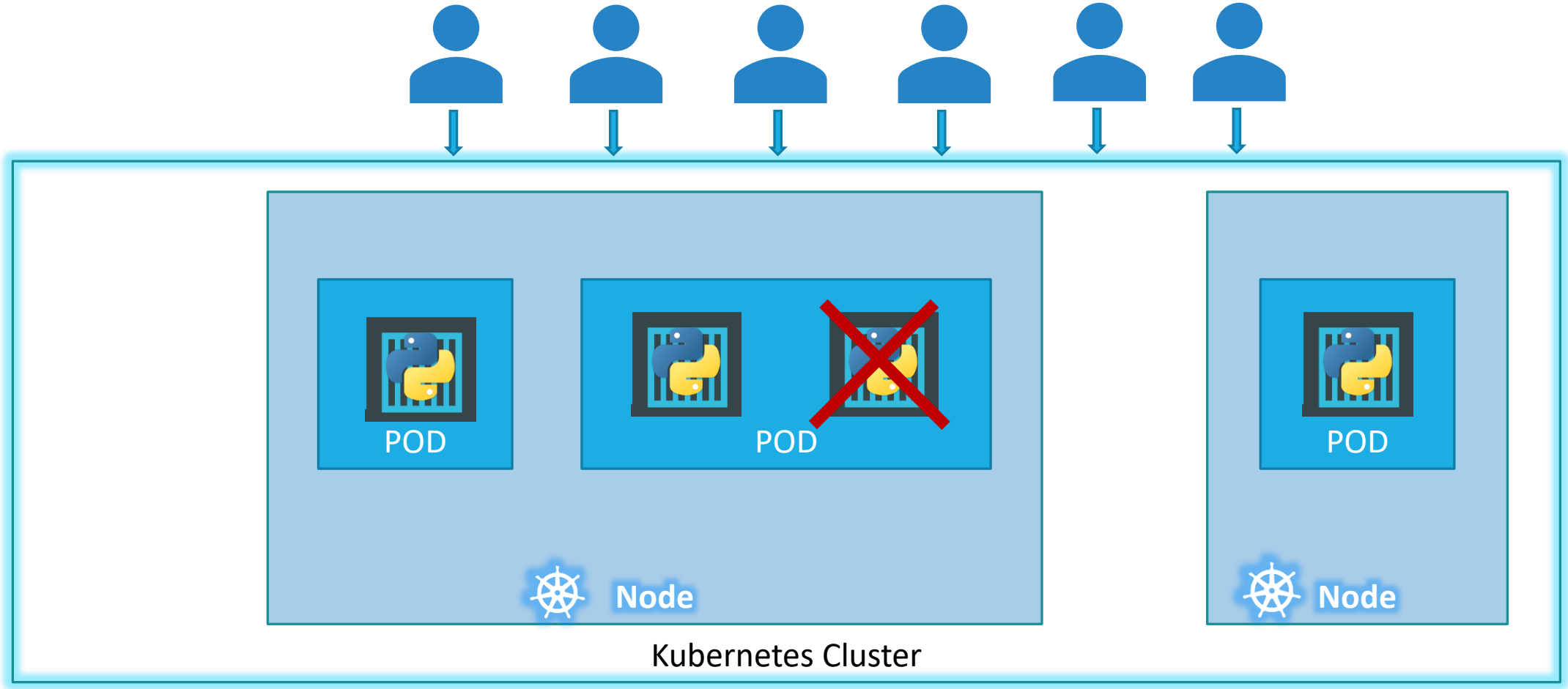
Docker Image

Kubernetes Cluster

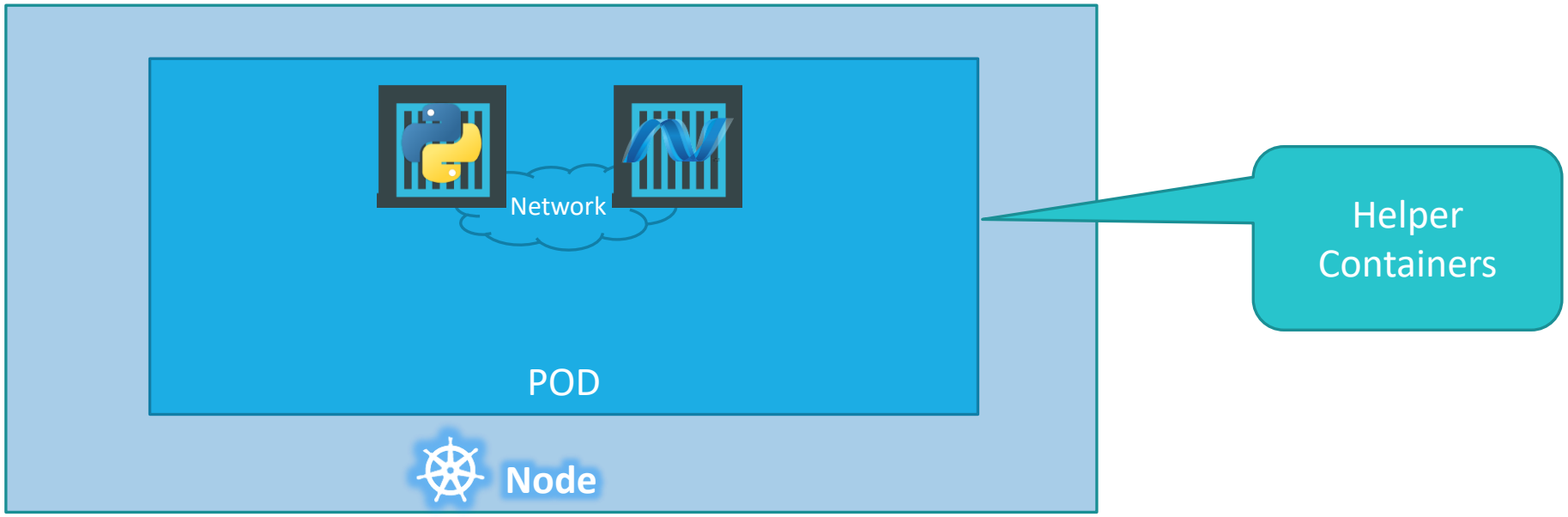
POD



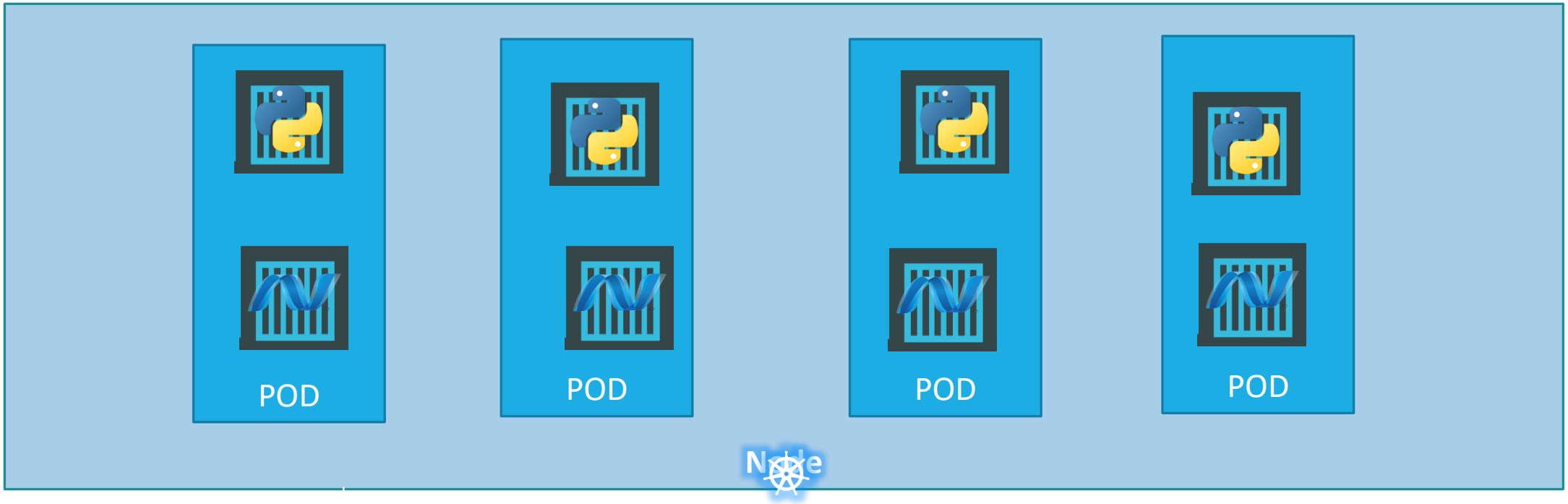
POD



Multi-Container PODs



PODs Again!



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

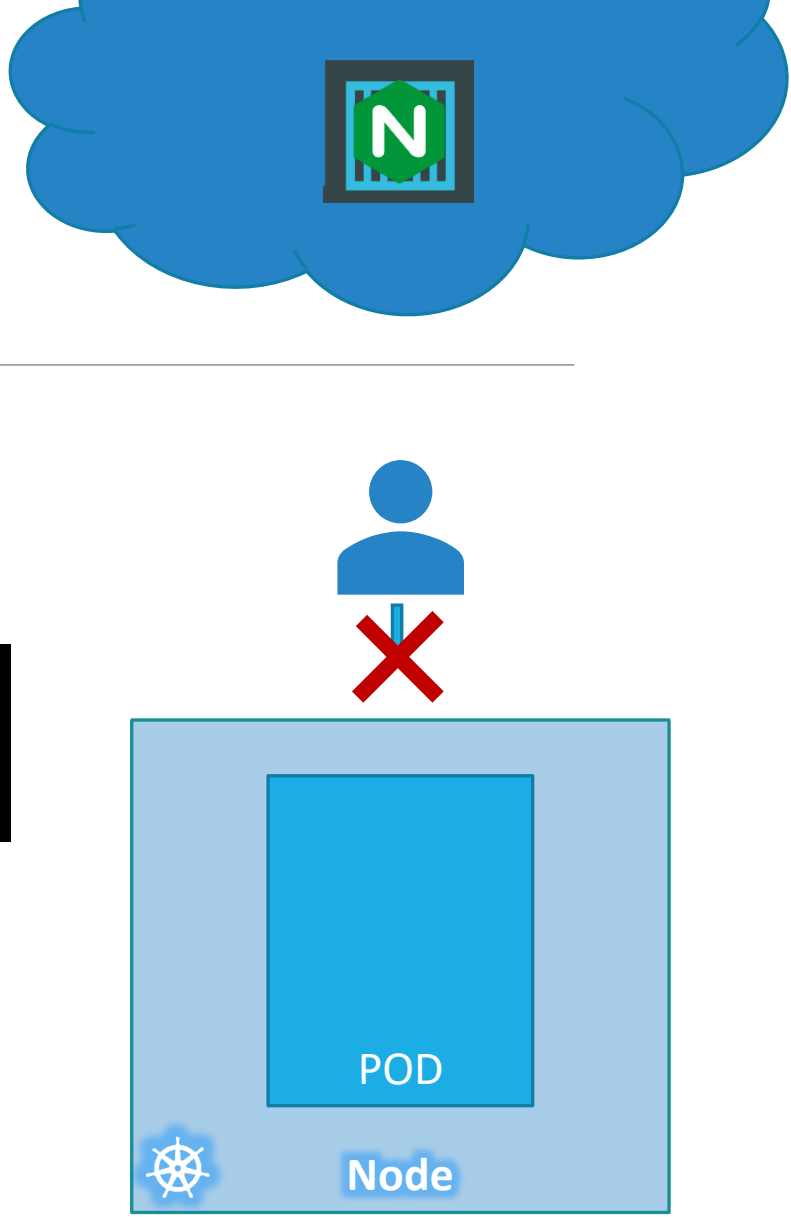
kubectl

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

```
kubectl get pods
```

```
C:\Kubernetes>kubectl get pods
NAME                     READY     STATUS              RESTARTS   AGE
nginx-8586cf59-whssr     0/1       ContainerCreating   0          3s
```

```
C:\Kubernetes>kubectl get pods
NAME                     READY     STATUS    RESTARTS   AGE
nginx-8586cf59-whssr     1/1       Running   0          8s
```



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YAML Introduction

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POD

With YAML

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YAML in Kubernetes

pod-definition.yml

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

String

String

List/Array

1st Item in List

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

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

Commands

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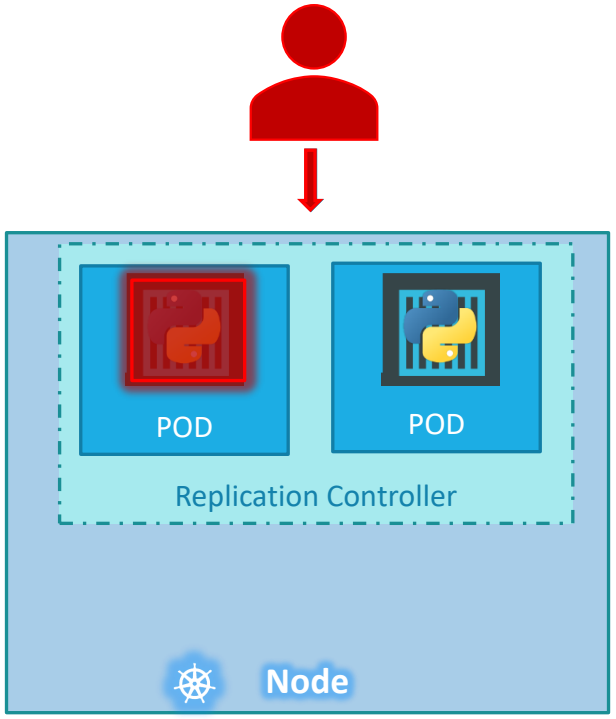
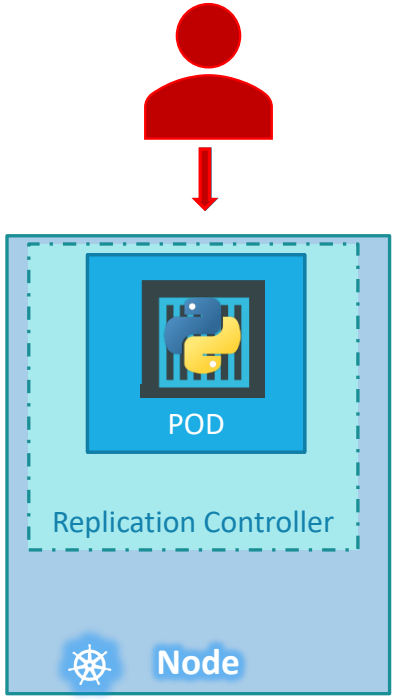
```
> kubectl get pods
NAME            READY     STATUS    RESTARTS   AGE
myapp-pod       1/1       Running   0          20s
```

```
> 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:           10.244.0.24
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
```

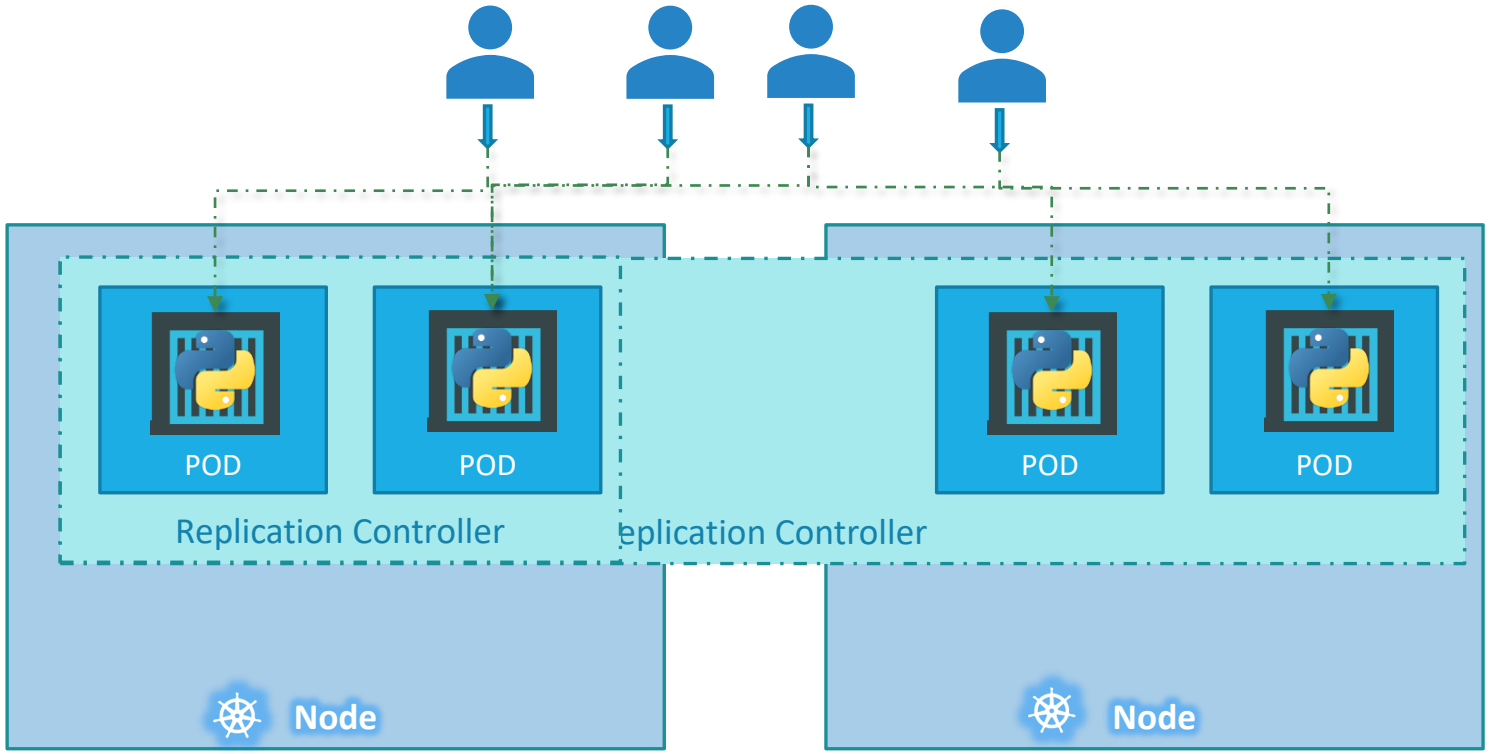
Replication Controller

High Availability





Load Balancing & Scaling



Replication Controller

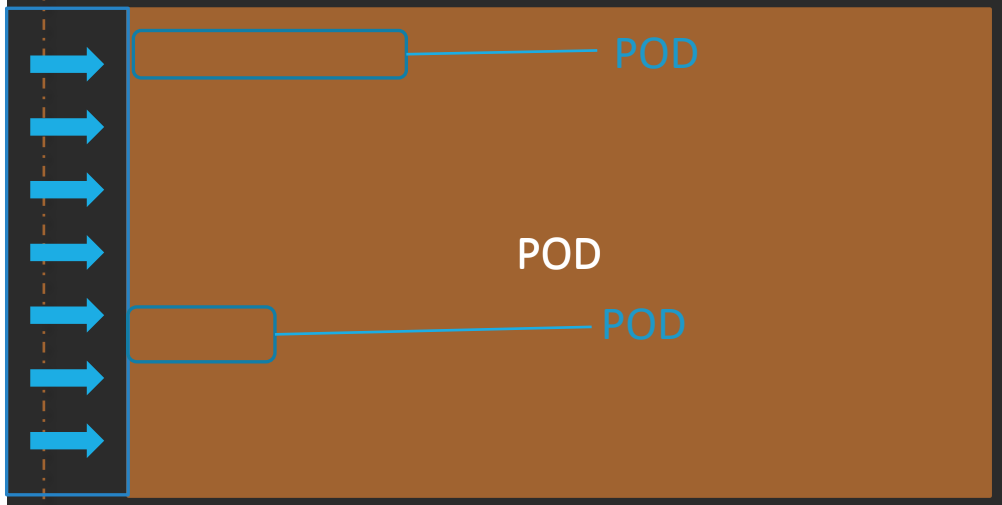
Replica Set

rc-definition.yml

```yaml
apiVersion: v1
kind: ReplicationController
metadata:
  name: myapp-rc
  labels:
      app: myapp
      type: front-end
spec:
  template:
    replicas: 3
```

Replication Controller

Replication Controller



pod-definition.yml

```yaml
apiVersion: v1
kind: Pod

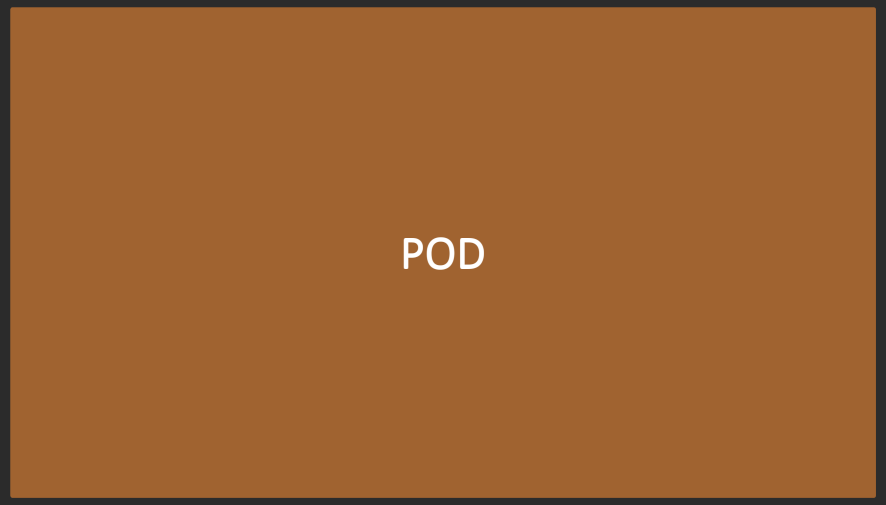
metadata:
  name: myapp-pod
  labels:
     app: myapp
     type: front-end
spec:
  containers:
  - name: nginx-container
    image: nginx
```

```
> kubectl create -f 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-4lvk9   1/1       Running   0          20s
myapp-rc-mc2mf   1/1       Running   0          20s
myapp-rc-px9pz   1/1       Running   0          20s
```

replicaset-definition.yml

```yaml
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: myapp-repl
  labels:
      app: myapp
      type: front-end
spec:
  template:
      
      
  replicas: 3
  selector:
      matchLabels:
          type: front-end
```

```
error: unable to recognize "replicaset-
definition.yml": no matches for /, Kind=ReplicaSet
```

pod-definition.yml

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

```
> 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-9ddl9  1/1       Running   0          45s
myapp-replicaset-9jtpx  1/1       Running   0          45s
myapp-replicaset-hq84m  1/1       Running   0          45s
```

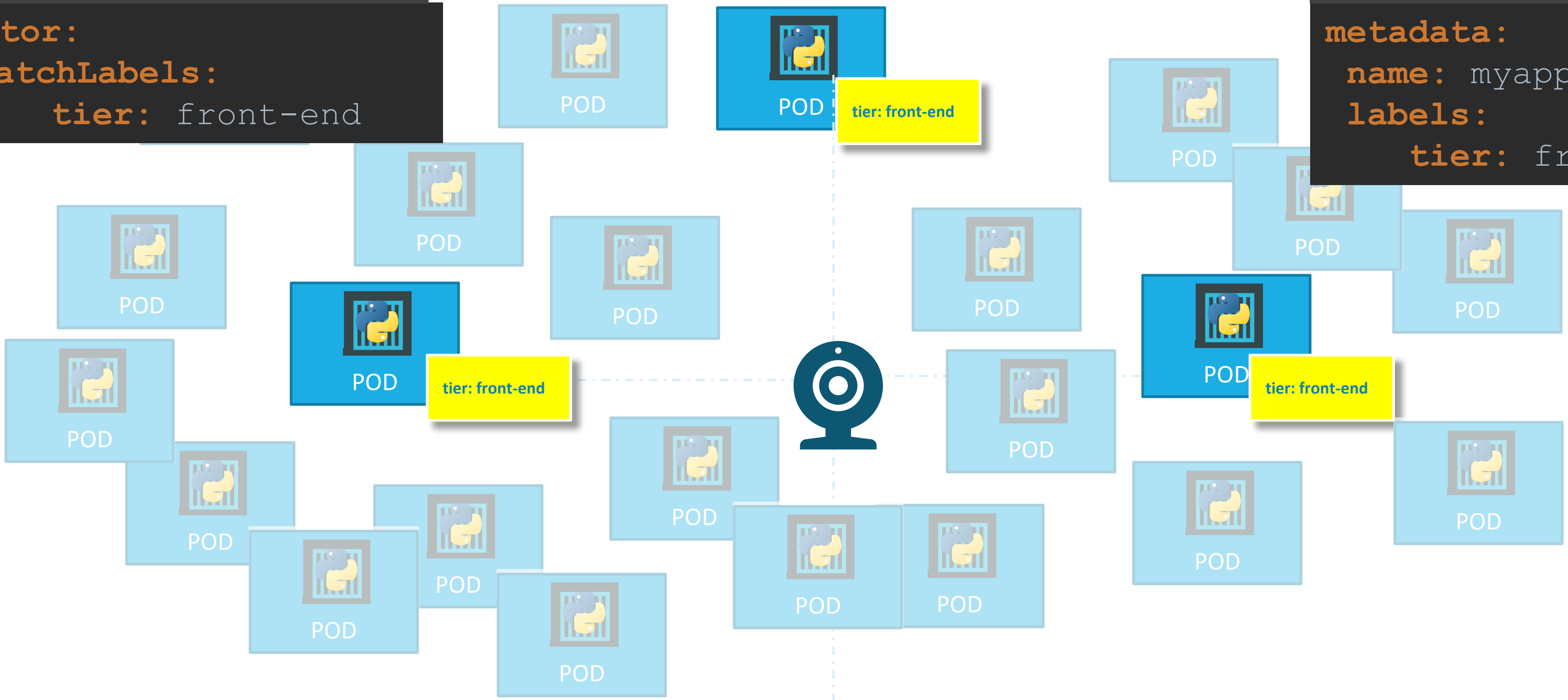
Labels and Selectors

replicaset-definition.yml

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

pod-definition.yml

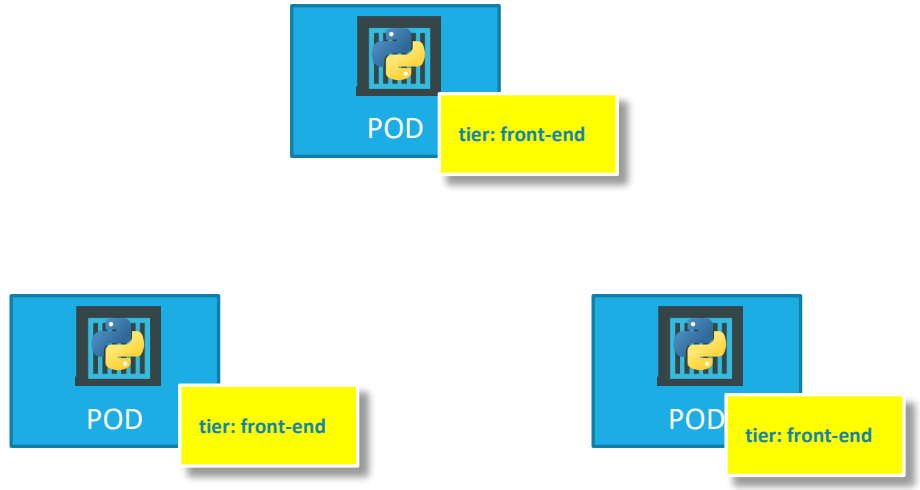
```yaml
metadata:
 name: myapp-pod
 labels:
    tier: front-end
```



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
```

Template



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

```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: 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
```

Demo

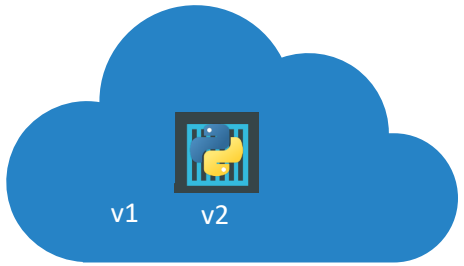
ReplicaSet

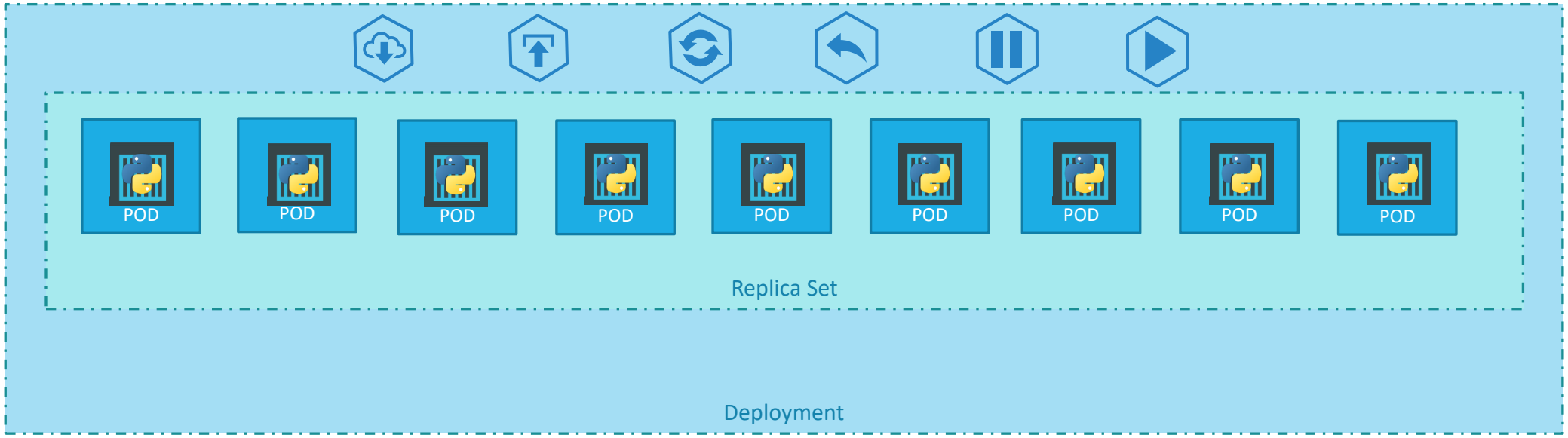
ReplicaSet as an Horizontal Pod Autoscaler Target

https://kubernetes.io/docs/concepts/workloads/controllers/replicaset/#replicaset-as-an-horizontal-pod-autoscaler-target

Deployment

Deployment


v1
v2


POD
POD
POD
POD
POD
POD
POD
POD
POD
Replica Set
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-lfjhv  1/1       Running   0          2m
```

deployment-definition.yml

```yaml
apiVersion: apps/v1
kind: ReplicaSet
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
```

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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
```

Demo

Deployment

Demo

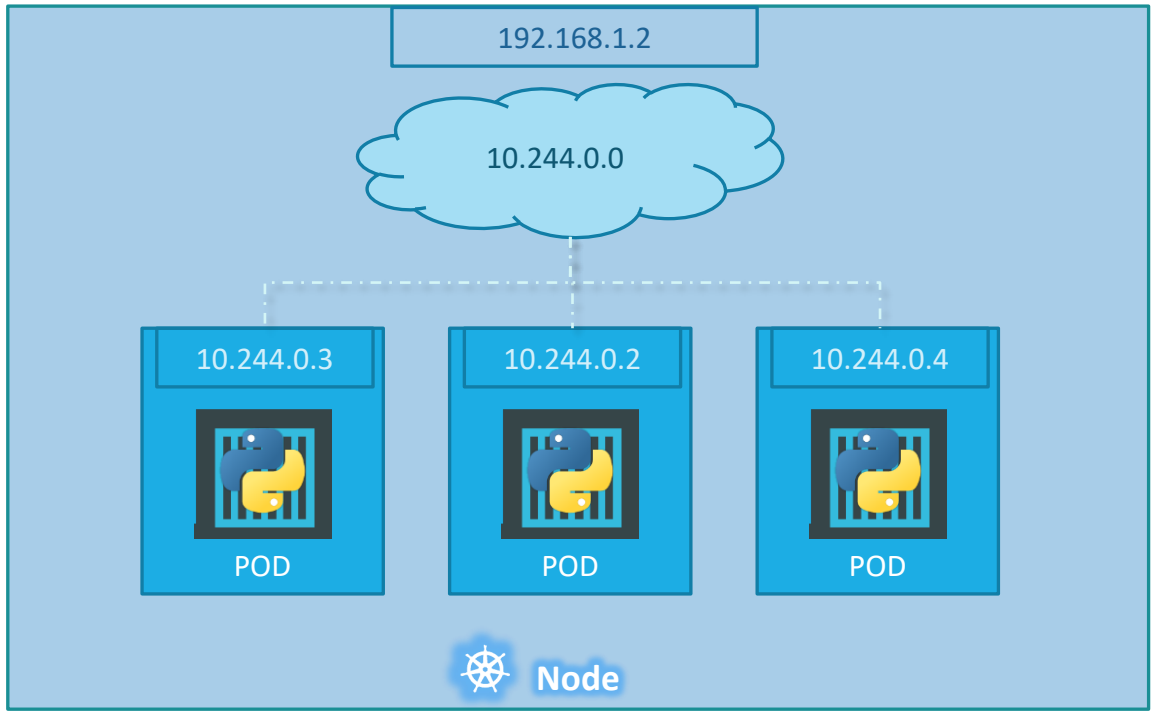
Deployment

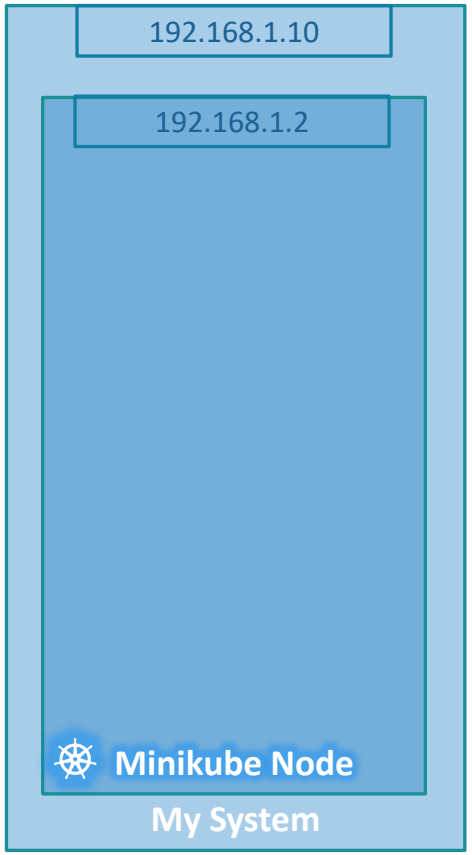
Networking 101

Raman Khanna

Kubernetes Networking - 101

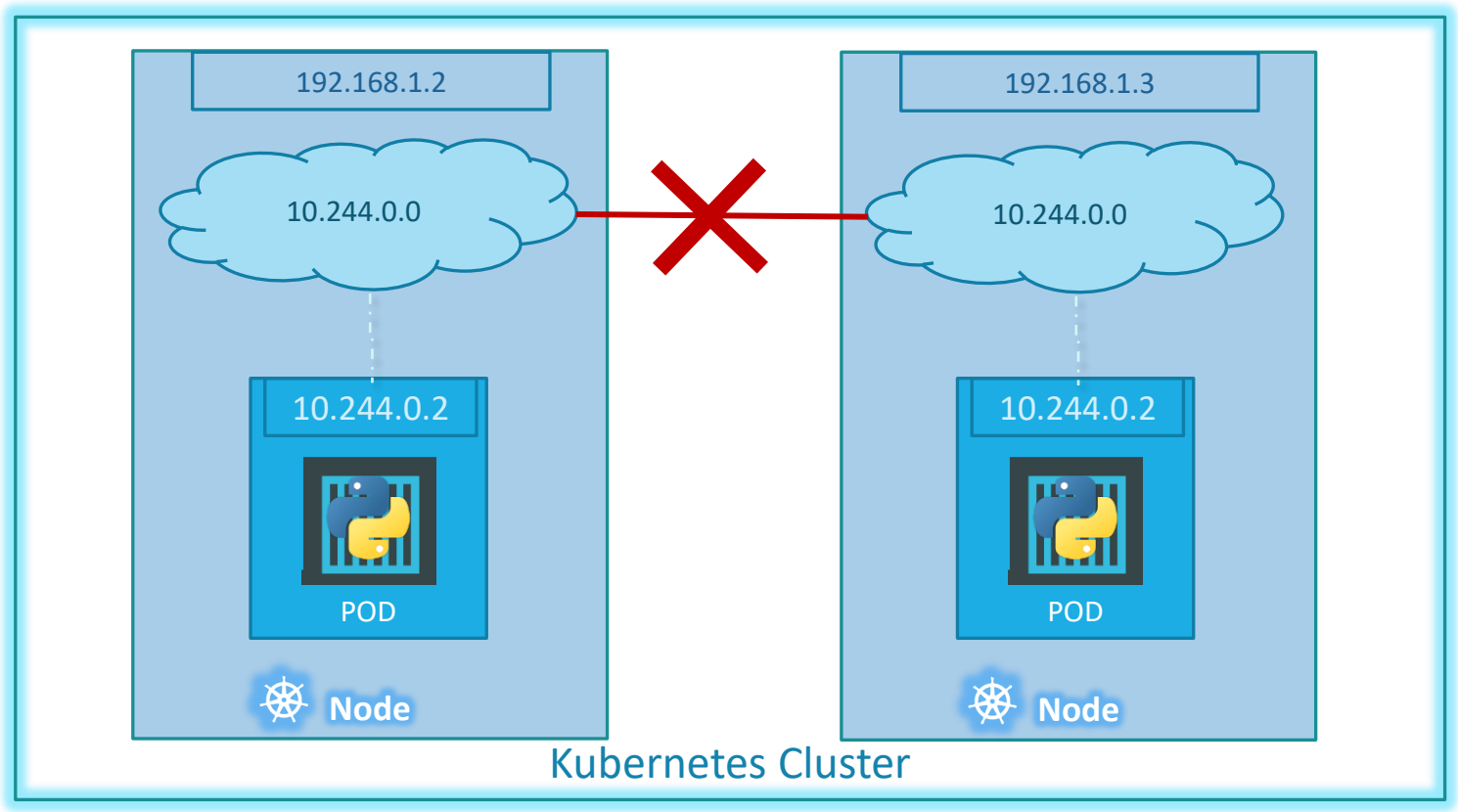
- IP Address is assigned to a POD





Cluster Networking

- All containers/PODs can communicate to one another without NAT
- All nodes can communicate with all containers and vice-versa without NAT

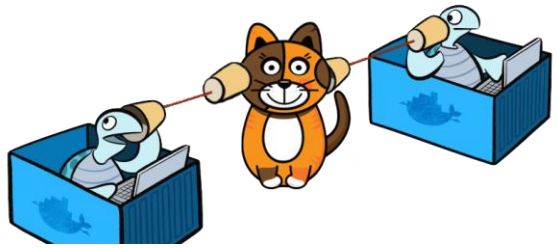



CISCO


cilium


flannel


vmware
NSX



Cluster Networking Setup

(3/4) Installing a pod network

You **MUST** install a pod network add-on so that your pods can communicate with each other.

The network must be deployed before any applications. Also, kube-dns, an internal helper service, will not start up before a network is installed. kubeadm only supports Container Network Interface (CNI) based networks (and does not support kubenet).

Several projects provide Kubernetes pod networks using CNI, some of which also support Network Policy. See the add-ons page for a complete list of available network add-ons. IPv6 support was added in CNI v0.6.0. CNI bridge and local-ipam are the only supported IPv6 network plugins in 1.9.

Note: kubeadm sets up a more secure cluster by default and enforces use of RBAC. Please make sure that the network manifest of choice supports RBAC.

You can install a pod network add-on with the following command:

```
kubectl apply -f <add-on.yaml>
```

NOTE: You can install **only one** pod network per cluster.

Choose one... | Calico | Canal | Flannel | Kube-router | Romana | Weave Net

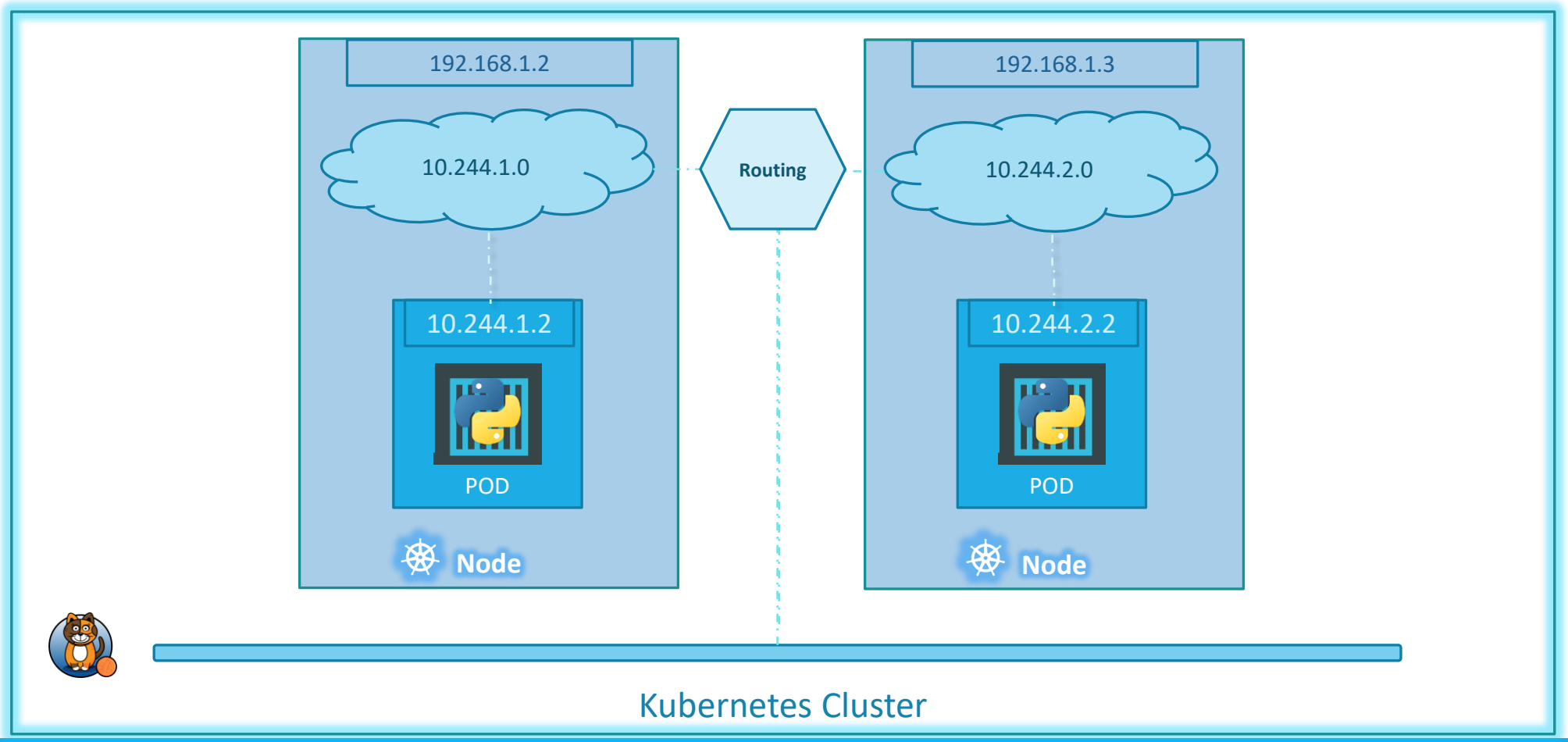
Refer to the Calico documentation for a kubeadm quickstart, a kubeadm installation guide, and other resources.

Note:

- In order for Network Policy to work correctly, you need to pass `--pod-network-cidr=192.168.0.0/16` to `kubeadm init`.
- Calico works on `amd64` only.

```
kubectl apply -f https://docs.projectcalico.org/v3.0/getting-started/kubernetes/installation/hosted/kubeadm/1.7/calico.yaml
```

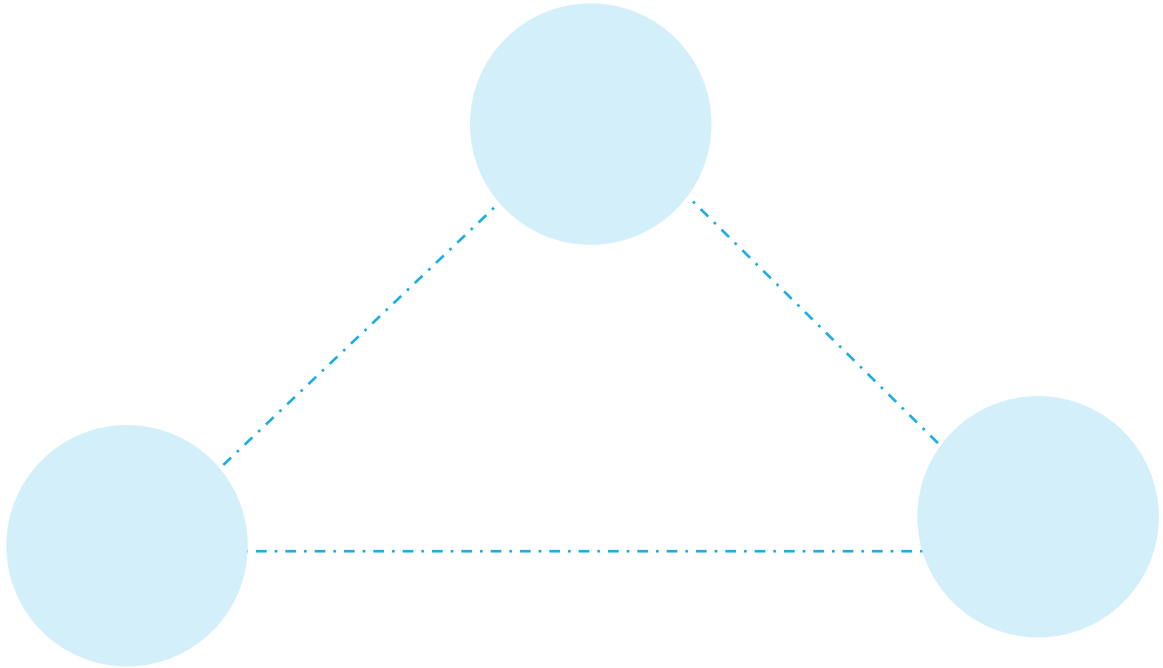
Cluster Networking



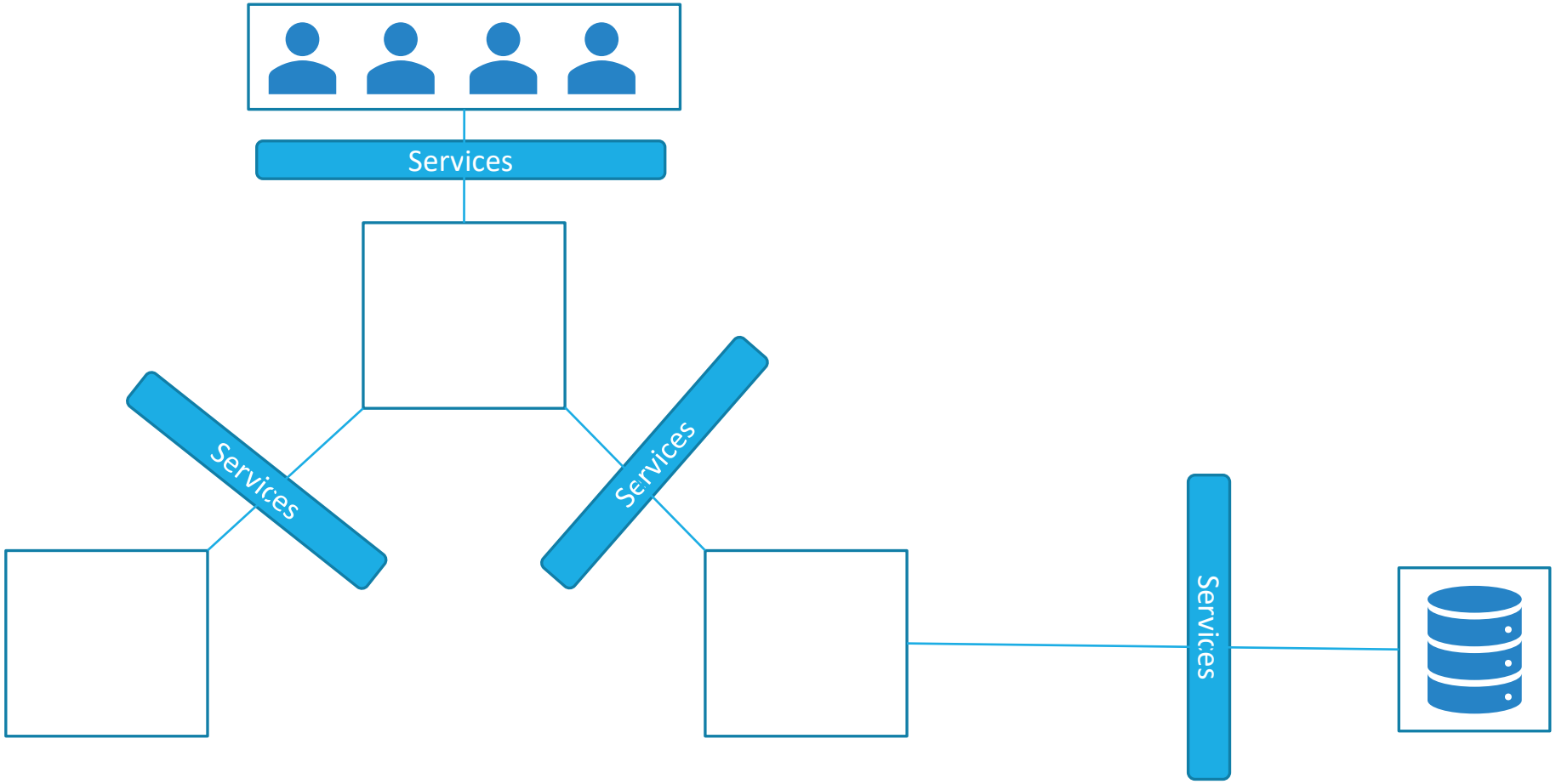
Demo

Networking

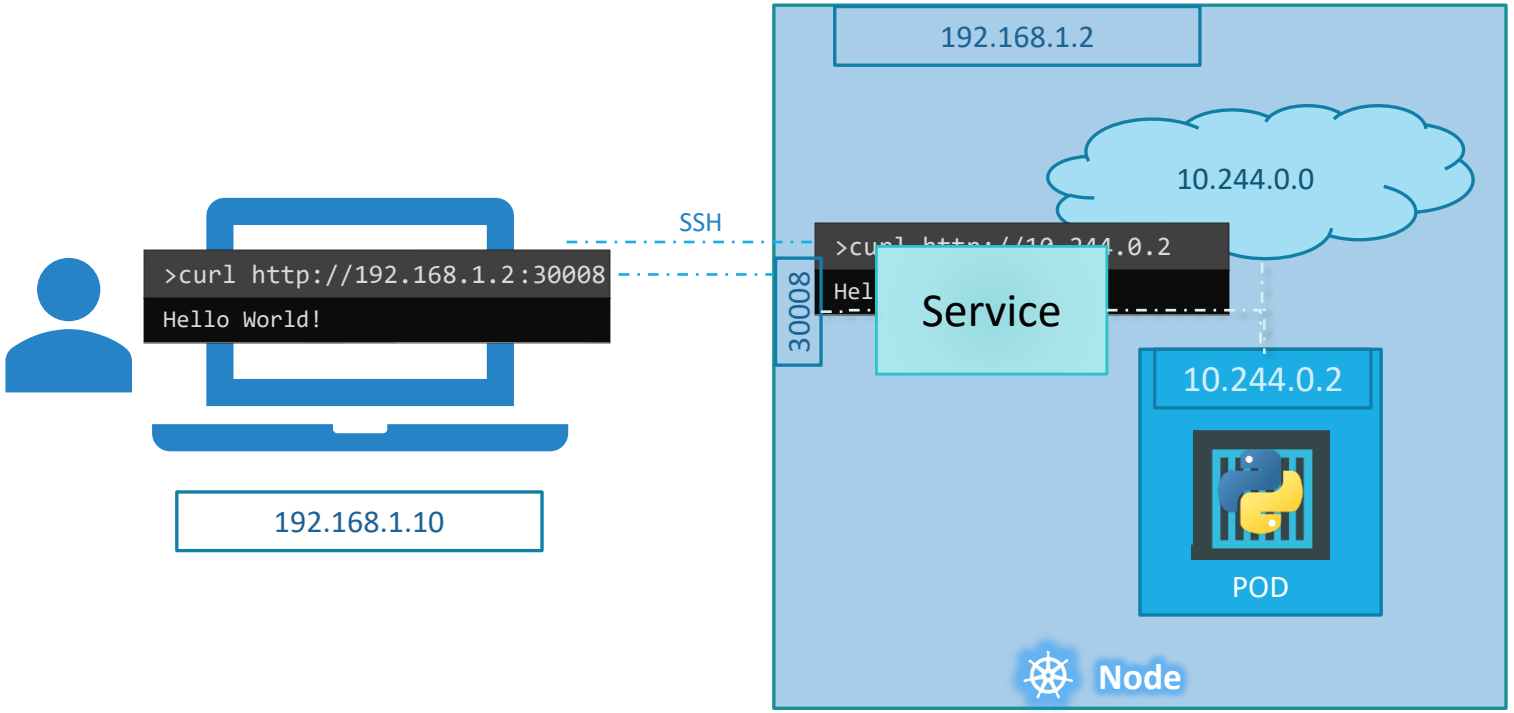
Services



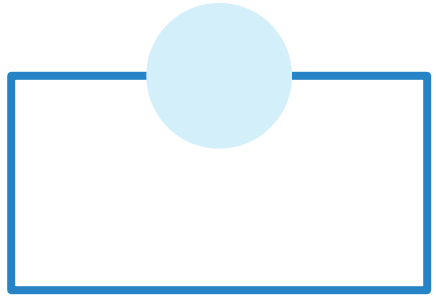
Services



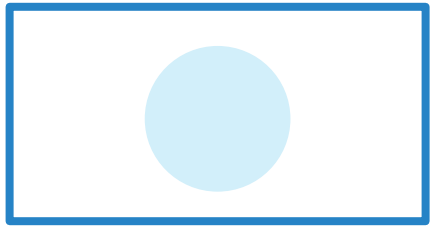
Service


>curl http://192.168.1.2:30008
Hello World!
192.168.1.10
SSH
192.168.1.2
10.244.0.0
30008
Service
10.244.0.2
POD
Node

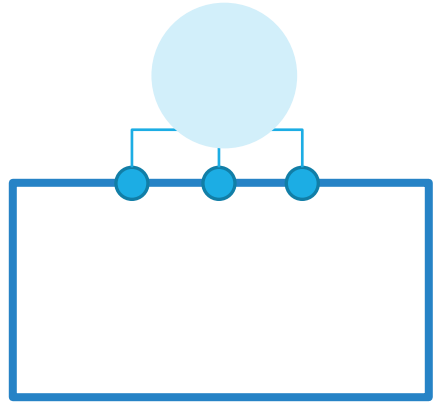
Services Types



NodePort

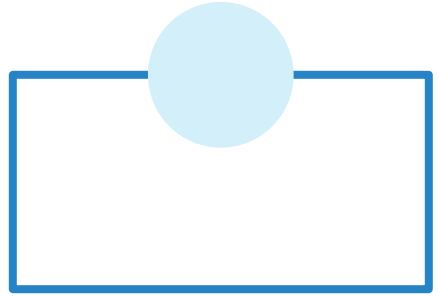


ClusterIP

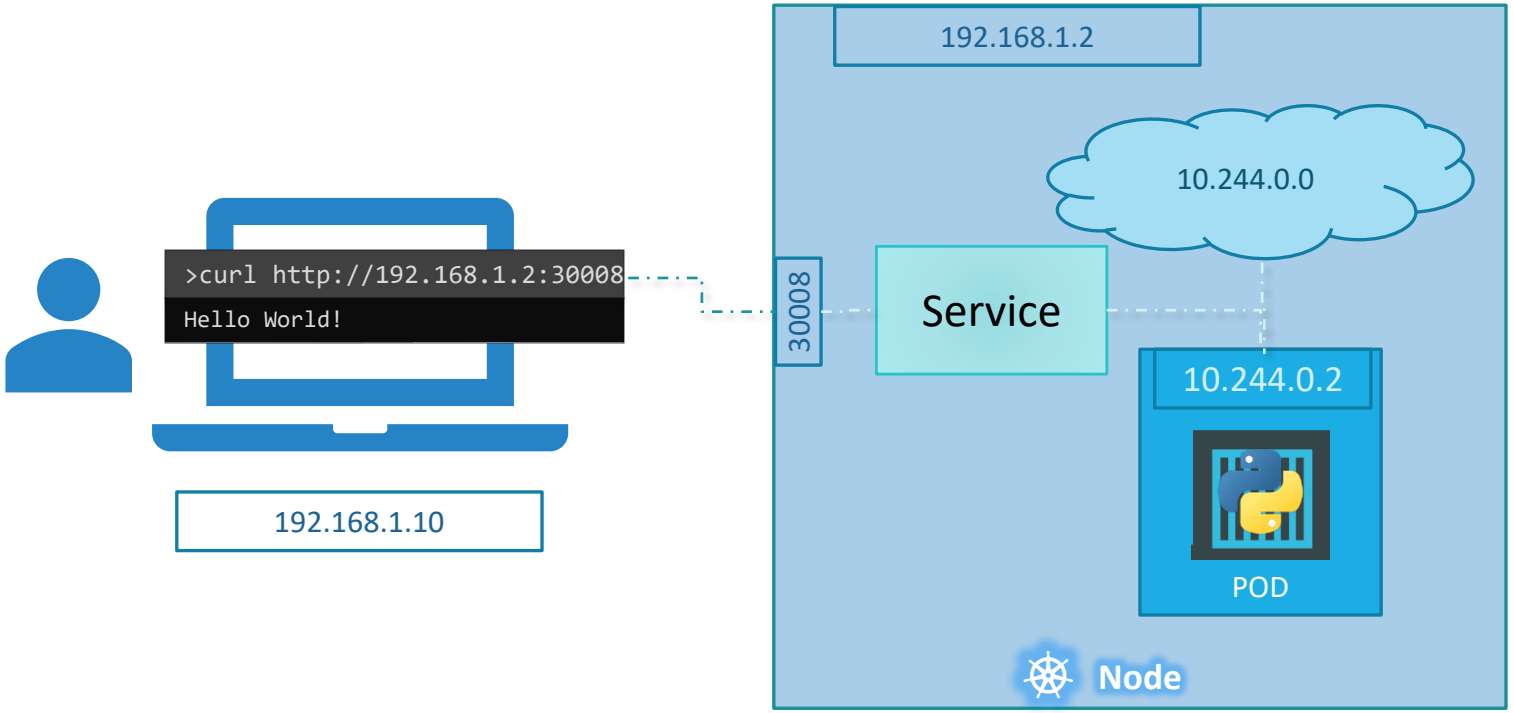


LoadBalancer

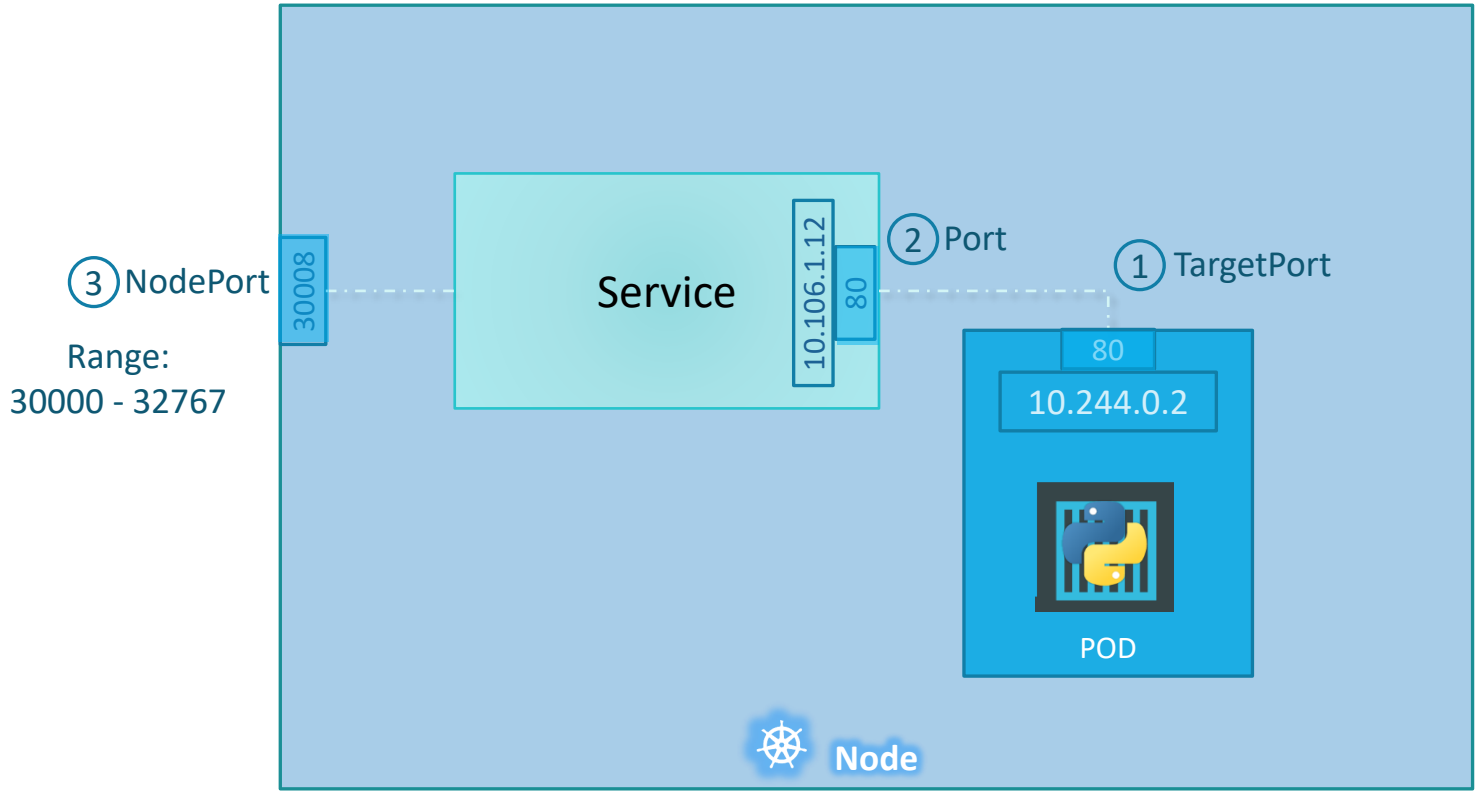
NodePort



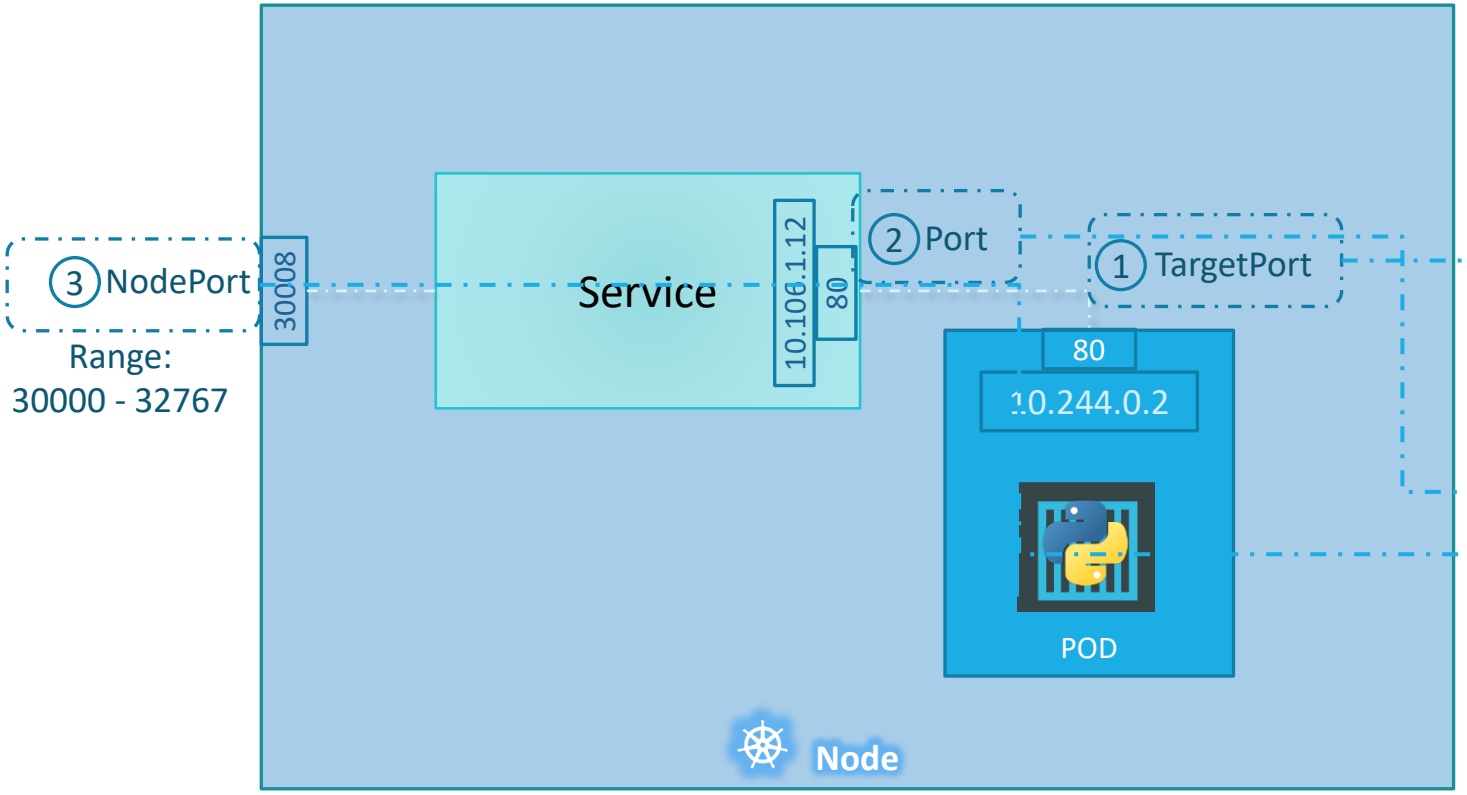
Service - NodePort



Service - NodePort



Service - NodePort



service-definition.yml

```yaml
apiVersion: v1
kind: Service
metadata:
    name: myapp-service

spec:
    type: NodePort
    ports:
      - targetPort: 80
        port: 80
        nodePort: 30008
```

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Service - NodePort

service-definition.yml

```
apiVersion: v1
kind: Service
metadata:
    name: myapp-service

spec:
    type: NodePort
    ports:
     - targetPort: 80
       port: 80
       nodePort: 30008
    selector:
```

pod-definition.yml

```
        app: myapp
```

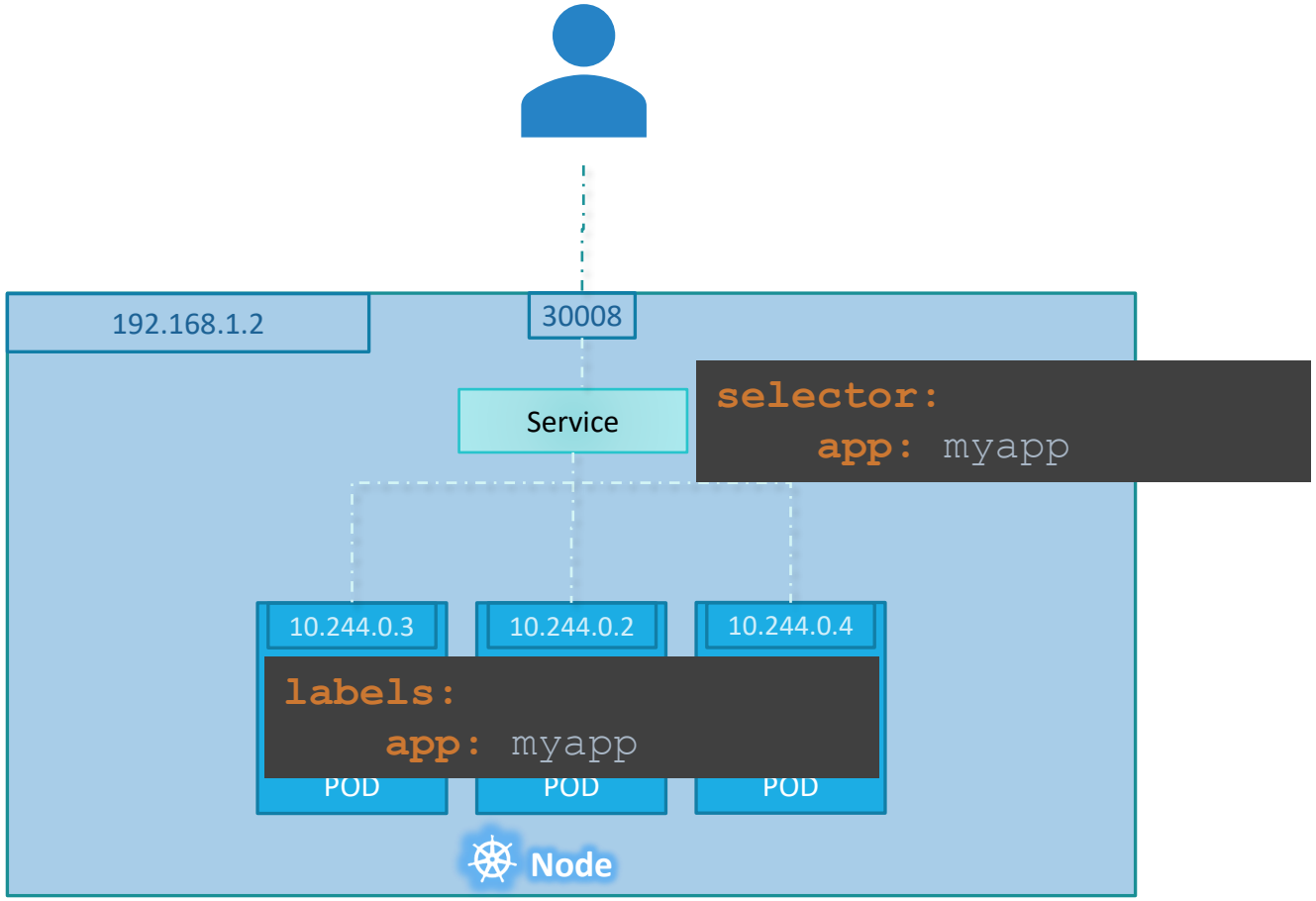
```
> kubectl create -f service-definition.yml
service "myapp-service" created
```

```
> 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
```

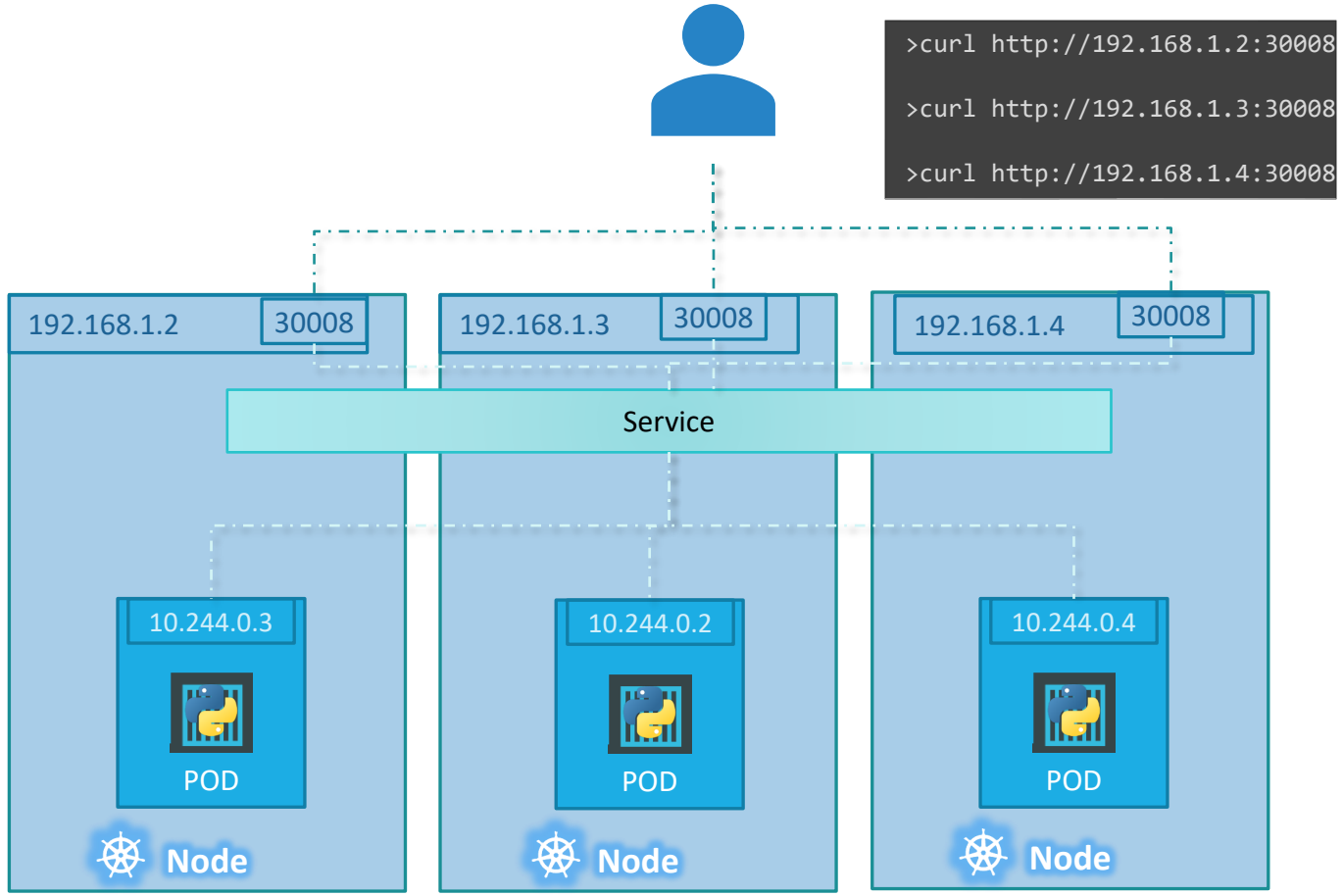
```
> curl http://192.168.1.2:30008
<html>
<head>
<title>Welcome to nginx!</title>
<style>
    body {
        width: 35em;
        margin: 0 auto;
        font-family: Tahoma, Verdana, Arial, sans-serif;
    }
</style>
</head>
<body>
```

Service - NodePort

Algorithm: Random
SessionAffinity: Yes



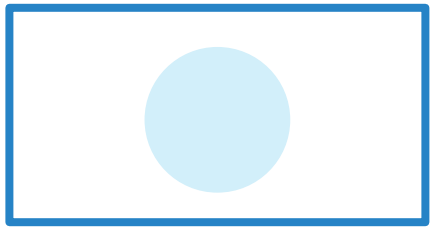
Service - NodePort



Demo

Service - NodePort

ClusterIP

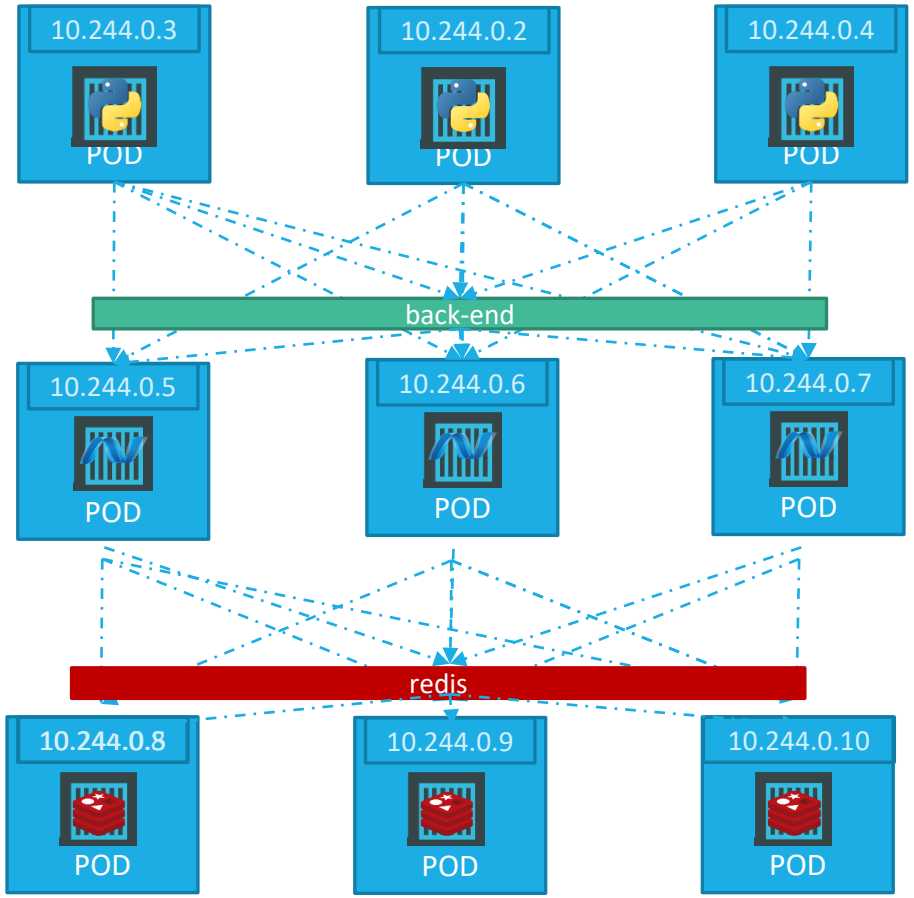


ClusterIP

front-end

back-end

redis



service-definition.yml

```yaml
apiVersion: v1
kind: Service
metadata:
    name: back-end

spec:
    type: ClusterIP
    ports:
     - targetPort: 80
       port: 80

    selector:
```

pod-definition.yml

```yaml
      app: myapp
      type: back-end
spec:
  containers:
  - name: nginx-container
    image: nginx
```

```
> 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
```

Demo

Service - NodePort

References

https://kubernetes.io/docs/concepts/services-networking/dns-pod-service/

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Deployment

Updates and Rollback

Rollout and Versioning

Revision 1


nginx:1.7.0

nginx:1.7.0

nginx:1.7.0

nginx:1.7.0

nginx:1.7.0

nginx:1.7.0

nginx:1.7.0

nginx:1.7.0

nginx:1.7.0

Revision 2


nginx:1.7.1

nginx:1.7.1

nginx:1.7.1

nginx:1.7.1

nginx:1.7.1

nginx:1.7.1

nginx:1.7.1

nginx:1.7.1

nginx:1.7.1

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
```

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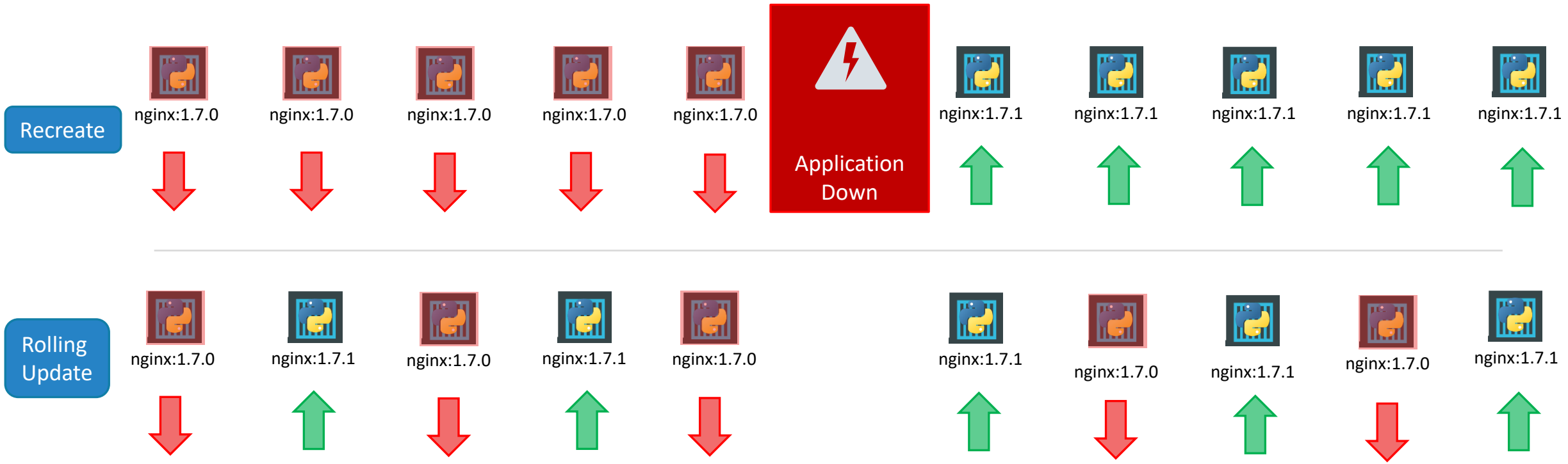
Deployment Strategy



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

```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
```

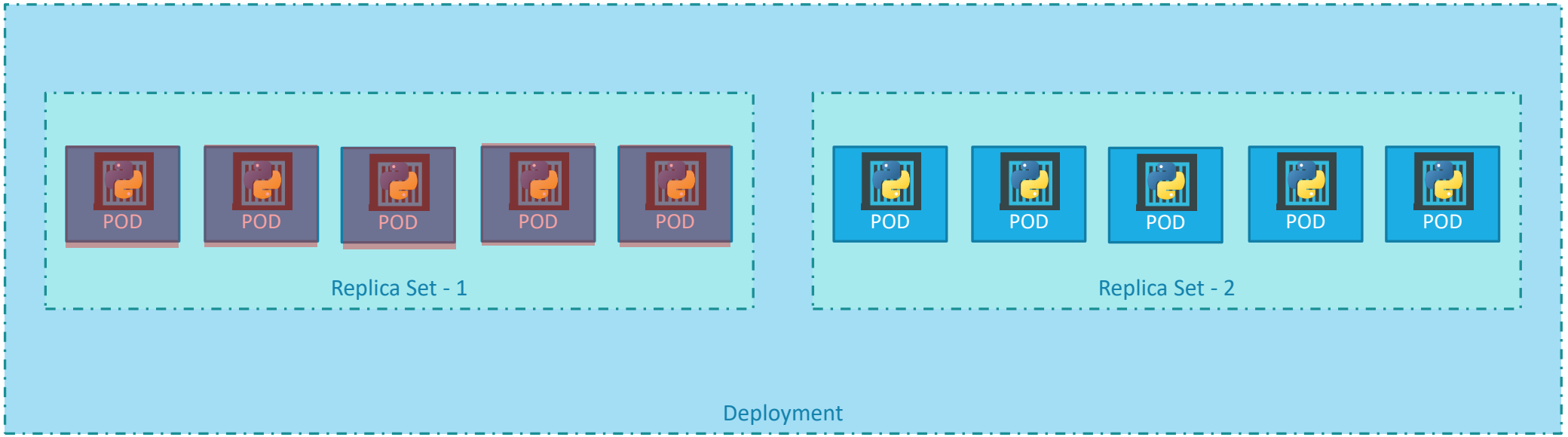
```
C:\Kubernetes>kubectl describe deployment myapp-deployment
Name:                   myapp-deployment
Namespace:              default
CreationTimestamp:      Sat, 03 Mar 2018 17:01:55 +0800
Labels:                 app=myapp
                        type=front-end
Annotations:            deployment.kubernetes.io/revision=2
                        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
```

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
                        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\Der
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

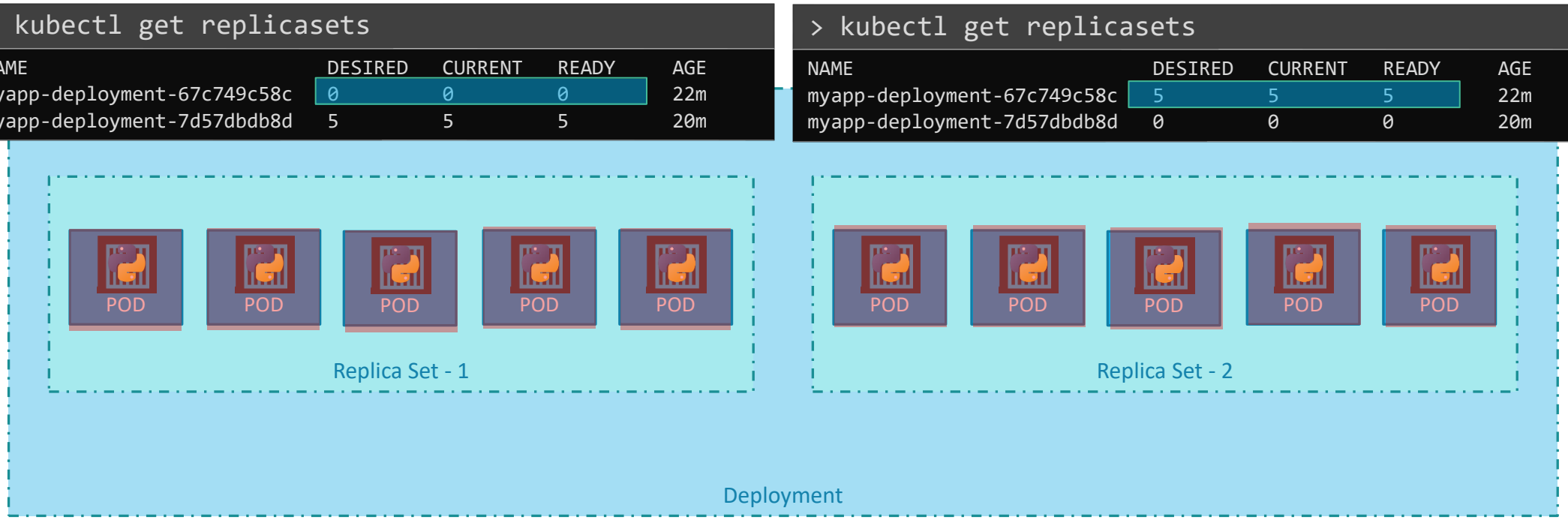



```
> kubectl get replicasets
NAME                          DESIRED   CURRENT   READY     AGE
myapp-deployment-67c749c58c   0         0         0         22m
myapp-deployment-7d57dbdb8d   5         5         5         20m
```

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 run

```
> kubectl run nginx --image=nginx
deployment "nginx" created
```

Summarize Commands

Create

```
> kubectl create –f deployment-definition.yml --record=true
```

Get

```
> kubectl get deployments
```

Update

```
> kubectl apply –f deployment-definition.yml
```

```
> kubectl set image deployment/myapp-deployment nginx=nginx:1.9.1
```

Status

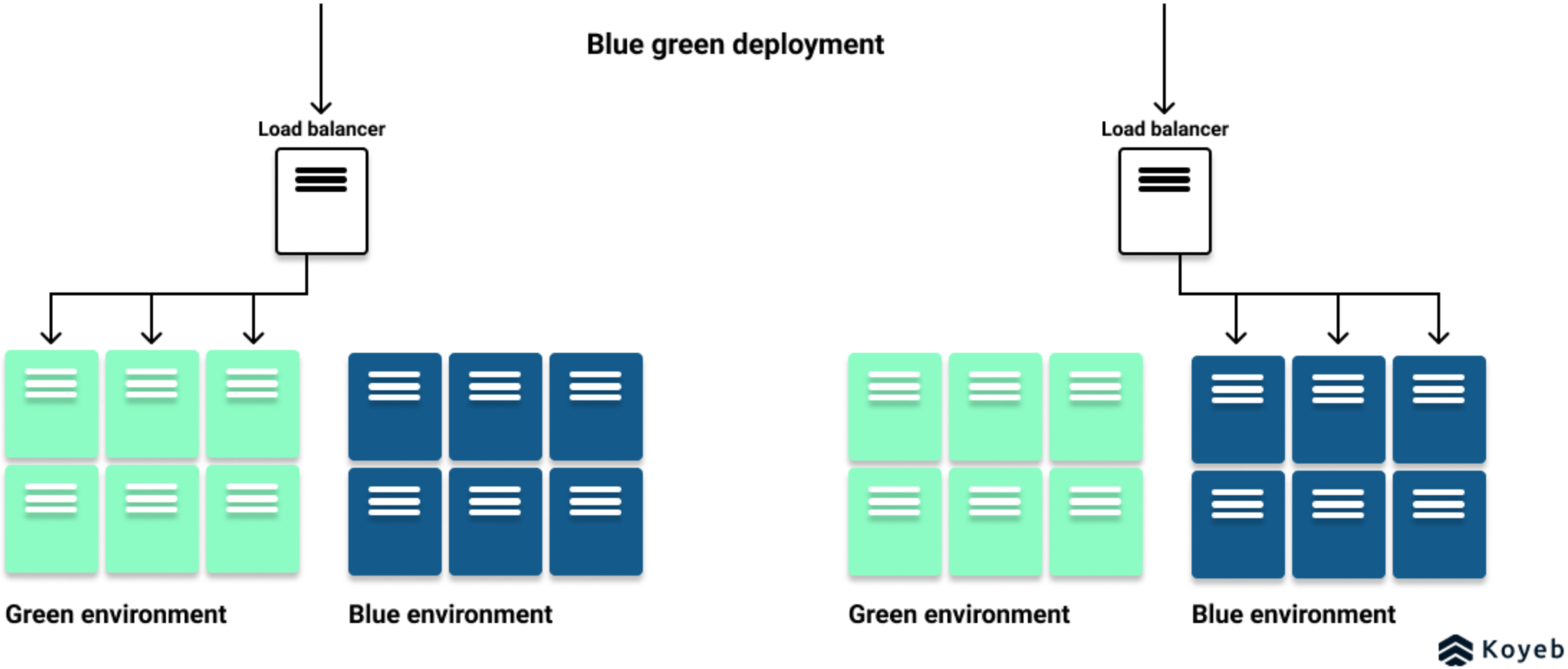
```
> kubectl rollout status deployment/myapp-deployment
```

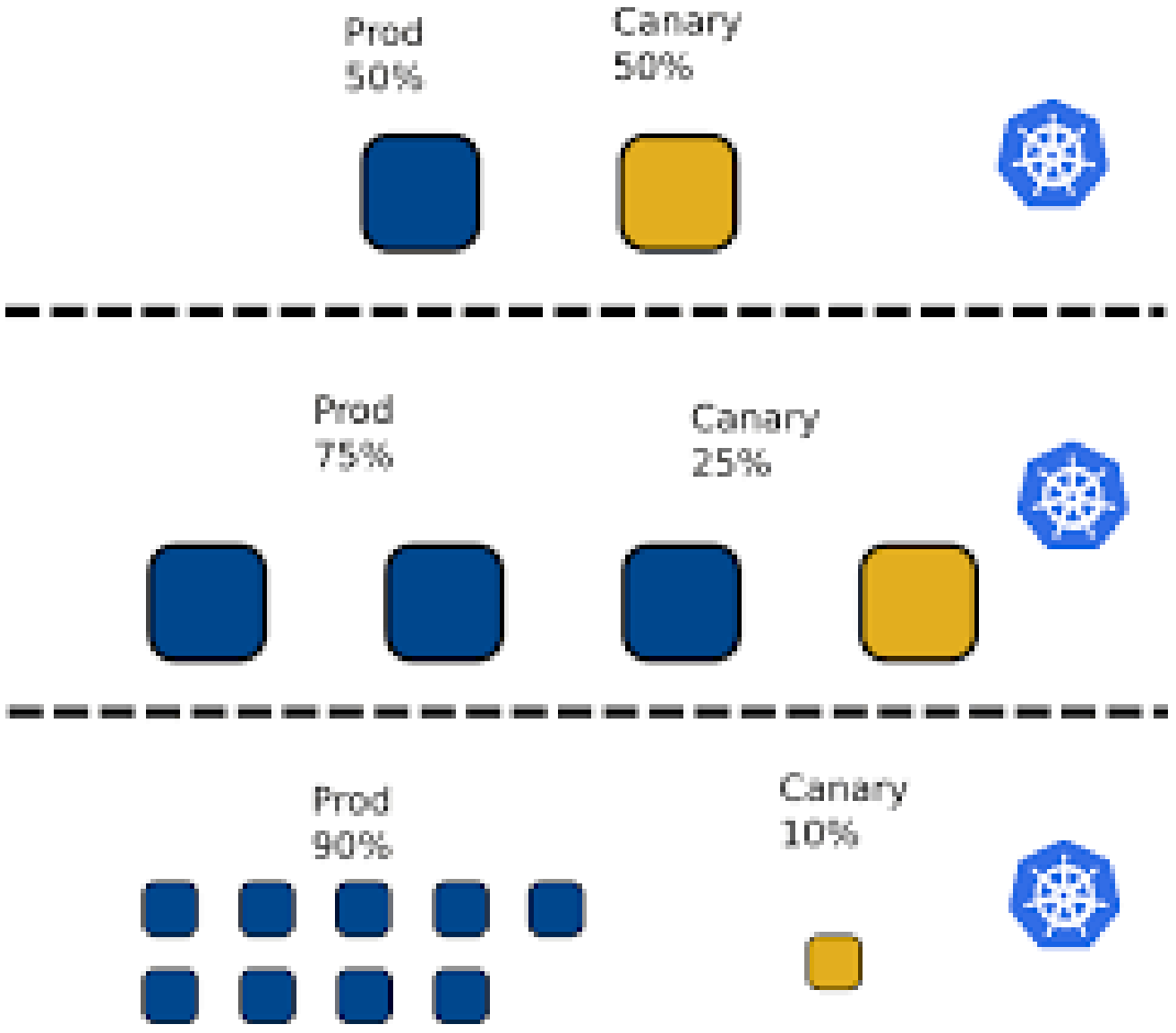
```
> kubectl rollout history deployment/myapp-deployment
```

Rollback

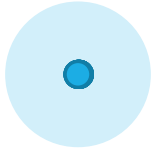
```
> kubectl rollout undo deployment/myapp-deployment
```

Blue green deployment

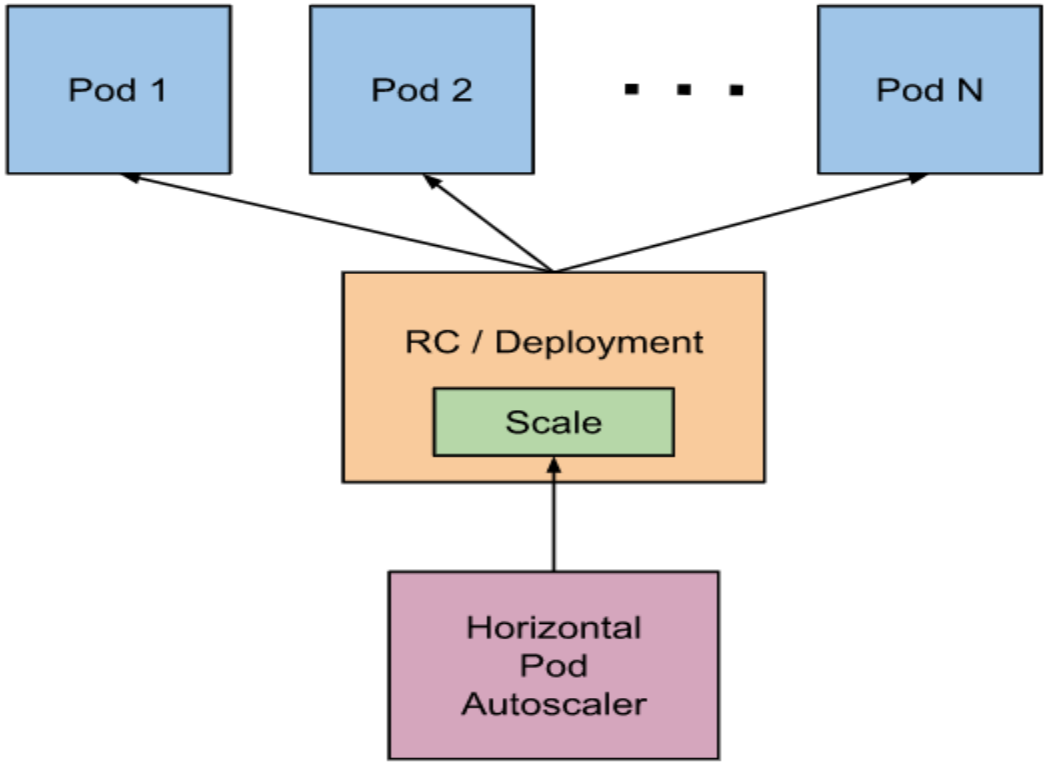



Prod
50%
Canary
50%
Prod
75%
Canary
25%
Prod
90%
Canary
10%

Autoscaling



Autoscaling



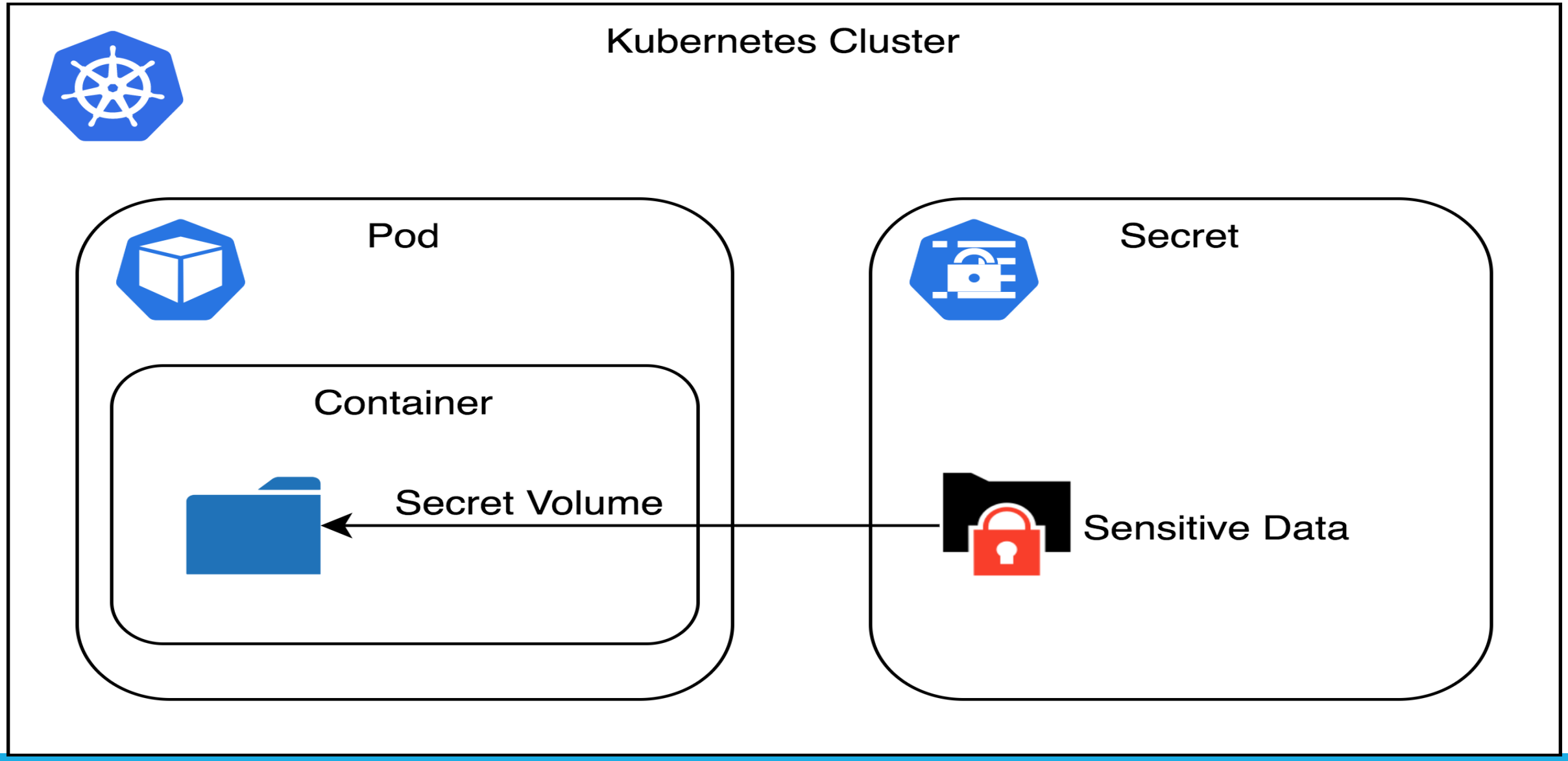
Autoscaling

kubectl autoscale deployment myapp-deployment --cpu-percent=50 --min=1 --max=10

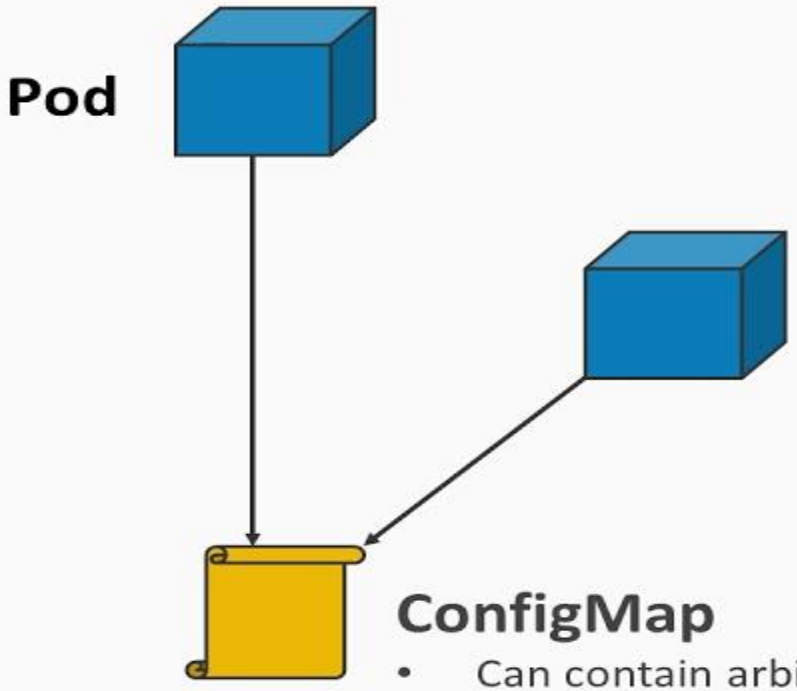
kubectl get hpa

#but you need to set a metric deployment first otherwise it'wont be able to collect the metric

kubectl delete hpa myapp-deployment

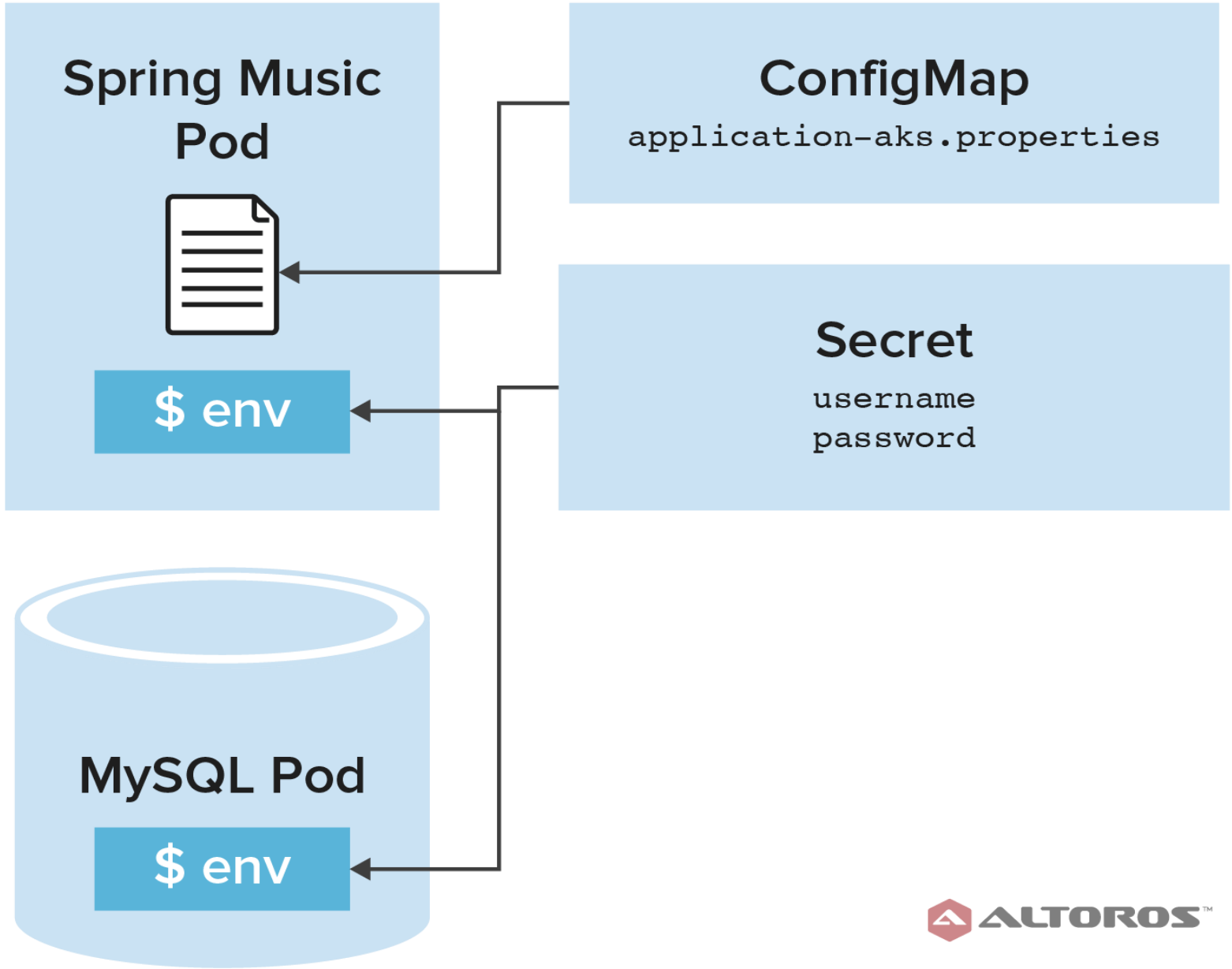

Kubernetes Cluster
Pod
Container
Secret Volume
Secret
Sensitive Data

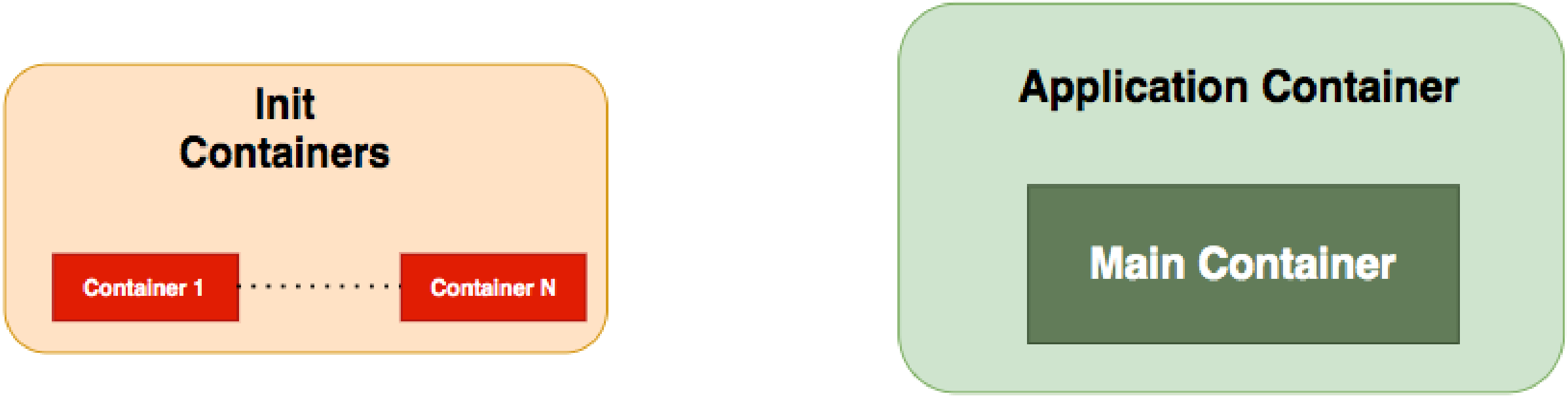
Pod Configuration



ConfigMap

- Can contain arbitrary key/value pairs
- Can be used by multiple Pods at once
- Can be updated independently of the Pod


Spring Music Pod
$ env
ConfigMap
application-aks.properties
Secret
username
password
MySQL Pod
$ env



Main container starts only after Init Container finishes

Pod

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PV and PVC

Persistent Storage in Kubernetes

Persistent Storage

A Persistent Volume (PV) is a piece of storage in the cluster that has been provisioned by an administrator or dynamically provisioned using Storage Classes. It is a resource in the cluster just like a node is a cluster resource. PVs are volume plugins like Volumes but have a lifecycle independent of any individual Pod that uses the PV.

A PersistentVolumeClaim (PVC) is a request for storage by a user. It is similar to a Pod. Pods consume node resources and PVCs consume PV resources. Pods can request specific levels of resources (CPU and Memory). Claims can request specific size and access modes (e.g., they can be mounted ReadWriteOnce, ReadOnlyMany or ReadWriteMany

Access Types and Methods

Volume Plugin	ReadWriteOnce	ReadOnlyMany	ReadWriteMany
AWSElasticBlockStore	✓	-	-
AzureFile	✓	✓	✓
AzureDisk	✓	-	-
CephFS	✓	✓	✓
Cinder	✓	-	-
CSI	depends on the driver	depends on the driver	depends on the driver
FC	✓	✓	-
FlexVolume	✓	✓	depends on the driver
Flocker	✓	-	-
GCEPersistentDisk	✓	✓	-

Persistent Volume

```
apiVersion: v1
kind: PersistentVolume
metadata:
  name: task-pv-volume
  labels:
    type: local
spec:
  storageClassName: manual
  capacity:
    storage: 10Gi
  accessModes:
    - ReadWriteOnce
  hostPath:
    path: "/mnt/data"
```

Persistent Volume Claim

```
apiVersion: v1
kind: PersistentVolumeClaim
metadata:
  name: task-pv-claim
spec:
  storageClassName: manual
  accessModes:
    - ReadWriteOnce
  resources:
    requests:
      storage: 3Gi
```

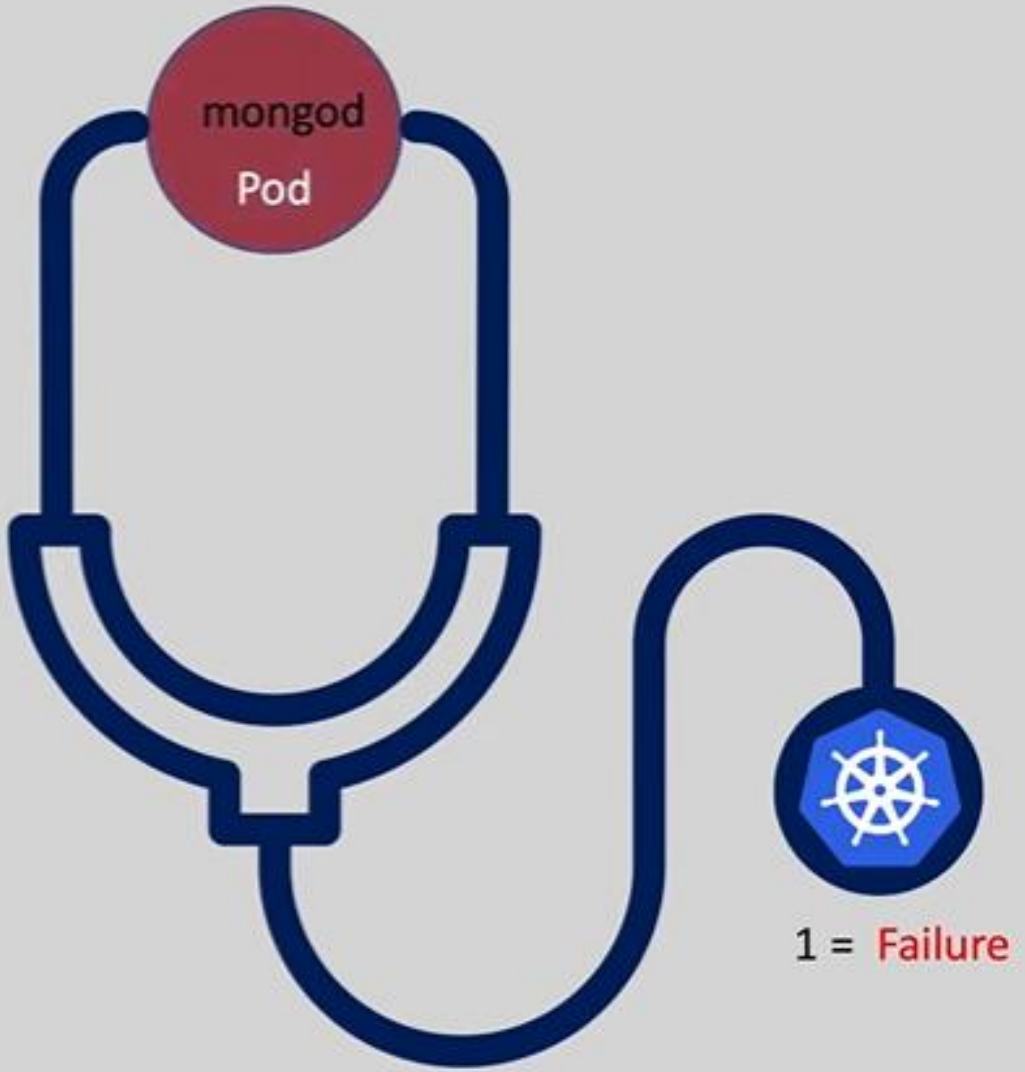
Health-checks

- ✓ Bugs
- ✓ Timeouts while communicating with external service
- ✓ DB Connection failure
- ✓ OutOfMemory Issues
- ✓ Etc..

- Pods get restarted everytime after liveliness probe fails.
- Pods are removed from svc endpoint after readiness probe fails.
- If startup probe fails , container is killed and follows restart policy which is by default = Always

Liveness Probe:

```
livenessProbe:
  exec:
    command:
      - mongo
      - --eval
      - "db.adminCommand('ping')"
```



Probing Mechanisms:

	Exec	HTTP	TCP

Probe	`exec:`
	`  command:`
	`  - mongo`
	`  - --eval`
	`  - "db.adminCommand('ping')"`
		`httpGet:`
		`  path: /health`
		`  port: 8080`
			`tcpSocket:`
			`  port: 8080`

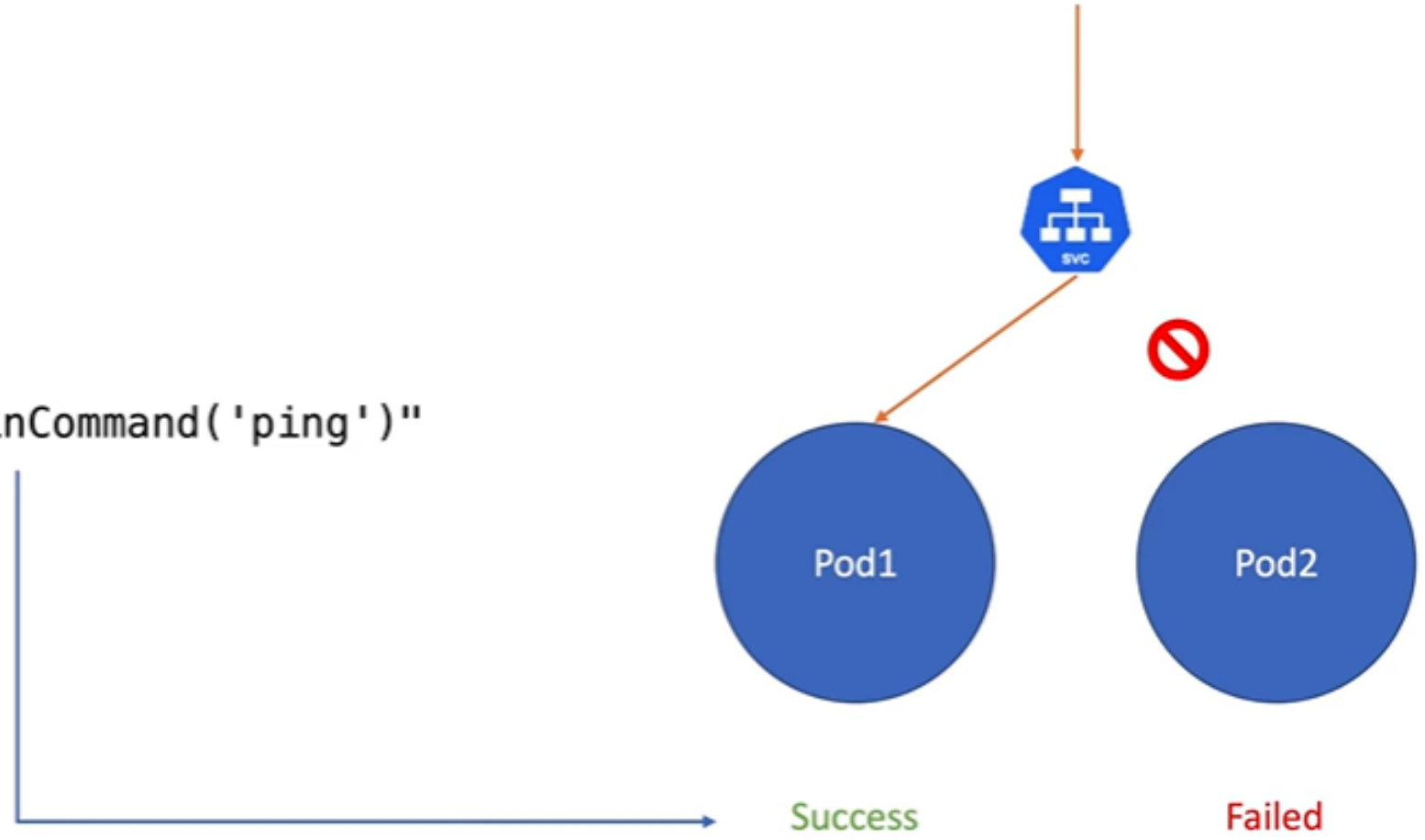
Success	0	200-399	If port accepts traffic
Failure	1	Other than 200-399	If port can't accept traffic

Probing Customization:

	Purpose	Default Value
initialDelaySeconds	Delay to run the probe initially	0 seconds
periodSeconds	How frequently probe should execute after initial delay	10 seconds
timeoutSeconds	Timeout period to mark as failure	1 second
failure/successThreshold	How many times to retry in case of failure	3 times

Readiness Probe:

```
readinessProbe:
  exec:
    command:
      - mongo
      - --eval
      - "db.adminCommand('ping')"
```



Startup Probe:

```
startupProbe:
  exec:
    command:
      - mongo
      - --eval
      - "db.adminCommand('ping')"
```