Kubernetes_3 notes

This one manifest file will create both service and pod
We already demonstrated LoadBalancer service

Kubernetes NodePort service

```
---
apiVersion: v1
kind: Pod
metadata:
   name: javawebapp
   labels:
      app: javawebapp
spec:
   containers:
      - name: javawebappcontainer
        image: hacker123shiva/springbt-in-docker:latest
        ports:
          - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
   name: javawebappsvc
spec:
   type: NodePort
   selector:
      app: javawebapp
   ports:
      - port: 80
        targetPort: 8080
...


ubuntu@ip-172-31-9-165:~$ vi k8s-pod-svc-manifest-NodePort.yml
ubuntu@ip-172-31-9-165:~$ cat k8s-pod-svc-manifest-NodePort.yml
---
apiVersion: v1
kind: Pod
metadata:
   name: javawebapp
   labels:
      app: javawebapp
spec:
   containers:
      - name: javawebappcontainer
        image: hacker123shiva/springbt-in-docker:latest
        ports:
          - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
   name: javawebappsvc
spec:
   type: NodePort
```

```
  selector:
    app: javawebapp
  ports:
    - port: 80
      targetPort: 8080
...
```

```
ubuntu@ip-172-31-9-165:~$ ls -l
total 34160
drwxr-xr-x 3 ubuntu ubuntu     4096 May 16 18:46 aws
-rw-rw-r-- 1 ubuntu ubuntu 34958926 May 17 23:42 eksctl.tar.gz
-rw-rw-r-- 1 ubuntu ubuntu      458 May 18 22:39 k8s-pod-manifest-new.yml
-rw-rw-r-- 1 ubuntu ubuntu      229 May 18 21:29 k8s-pod-manifest.yml
-rw-rw-r-- 1 ubuntu ubuntu      457 May 24 14:50 k8s-pod-svc-manifest-NodePort.yml
-rw-rw-r-- 1 ubuntu ubuntu      195 May 18 22:05 k8s-service-manifest.yml
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-NodePort.yml
```

```
eksctl create cluster --name my-eks-cluster --region ca-central-1 --node-type t2.medium --zones ca-central-1a,ca-central-1b
```


```
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-NodePort.yml
pod/javawebapp created
service/javawebappsvc created

ubuntu@ip-172-31-9-165:~$ kubectl get pod
NAME        READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          75s
```

```
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-NodePort.yml
pod/javawebapp created
service/javawebappsvc created
ubuntu@ip-172-31-9-165:~$ kubectl get pod
NAME        READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          75s
ubuntu@ip-172-31-9-165:~$ kubectl get service
NAME            TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)        AGE
javawebappsvc   NodePort    10.100.17.144   <none>        80:30138/TCP   108s
kubernetes      ClusterIP   10.100.0.1      <none>        443/TCP        9m42s
```

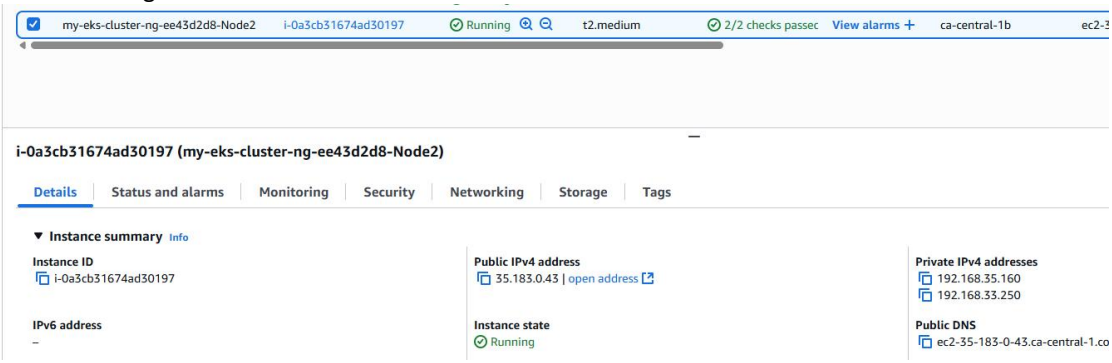
```
2025-05-24 15:24:01 [✔]  EKS cluster "my-eks-cluster" in "ca-central-1" region i
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-NodePort.yml
pod/javawebapp created
service/javawebappsvc created
ubuntu@ip-172-31-9-165:~$ kubectl get pod
NAME         READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          75s
ubuntu@ip-172-31-9-165:~$ kubectl get service
NAME            TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)        AGE
javawebappsvc   NodePort    10.100.17.144   <none>        80:30138/TCP   108s
kubernetes      ClusterIP   10.100.0.1      <none>        443/TCP        9m42s
ubuntu@ip-172-31-9-165:~$
```

ubuntu@ip-172-31-9-165:~$ kubectl get pods -o wide
NAME READY STATUS RESTARTS AGE IP NODE NOMINATED NODE READINESS GATES
javawebapp 1/1 Running 0 36m 192.168.40.10 ip-192-168-35-160.ca-central-1.compute.internal <none> <none>

ubuntu@ip-172-31-9-165:~$ kubectl get service
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE
javawebappsvc NodePort 10.100.17.144 <none> 80:30138/TCP 108s
kubernetes ClusterIP 10.100.0.1 <none> 443/TCP 9m42s

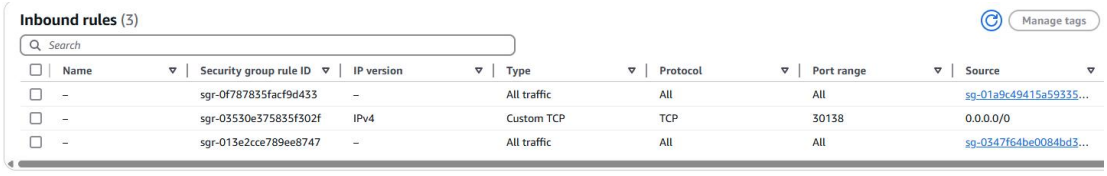
A NodePort# will be assigned automatically

Using NodePort we can access our app with WorkerNode public IP address
Pod is running in Node2

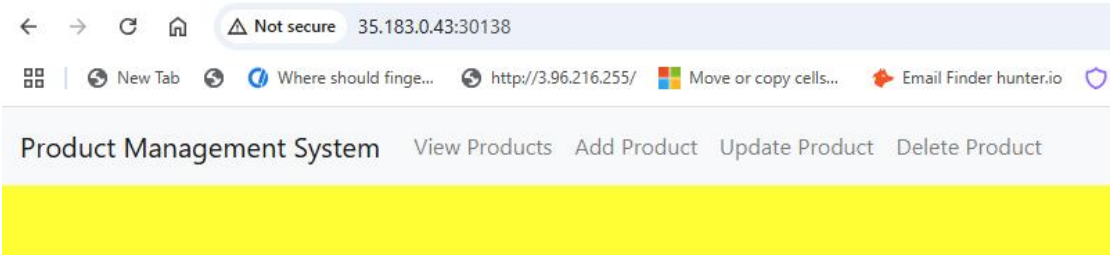


ubuntu@ip-172-31-9-165:~$ kubectl get pods -o wide
NAME READY STATUS RESTARTS AGE IP NODE NOMINATED NODE READINESS GATES
javawebapp 1/1 Running 0 36m 192.168.40.10 ip-192-168-35-160.ca-central-1.compute.internal <none> <none>

So we Add 30138 to Inbound Rules of Node2



We pick the Public IP then add Port#
http://35.183.0.43:30138/



NodePort can also be used to expose Application Pods

ubuntu@ip-172-31-9-165:~$ kubectl delete all --all
pod "javawebapp" deleted
service "javawebappsvc" deleted
service "kubernetes" deleted

ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-NodePort.yml
pod/javawebapp created
service/javawebappsvc created

ubuntu@ip-172-31-9-165:~$ kubectl get svc
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE
javawebappsvc NodePort 10.100.206.94 <none> 80:30447/TCP 48s
kubernetes ClusterIP 10.100.0.1 <none> 443/TCP 119s

This time it is a different port number
javawebappsvc NodePort 10.100.206.94 <none> 80:30447/TCP 48s

```
ubuntu@ip-172-31-9-165:~$ kubectl delete all --all
pod "javawebapp" deleted
service "javawebappsvc" deleted
service "kubernetes" deleted
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods
No resources found in default namespace.
ubuntu@ip-172-31-9-165:~$ kubectl get svc
NAME         TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
kubernetes   ClusterIP   10.100.0.1   <none>        443/TCP   28s
ubuntu@ip-172-31-9-165:~$ ls -l
total 34160
drwxr-xr-x 3 ubuntu ubuntu     4096 May 16 18:46 aws
-rw-rw-r-- 1 ubuntu ubuntu 34958926 May 17 23:42 eksctl.tar.gz
-rw-rw-r-- 1 ubuntu ubuntu      458 May 18 22:39 k8s-pod-manifest-new.yml
-rw-rw-r-- 1 ubuntu ubuntu      229 May 18 21:29 k8s-pod-manifest.yml
-rw-rw-r-- 1 ubuntu ubuntu      454 May 24 15:09 k8s-pod-svc-manifest-NodePort.yml
-rw-rw-r-- 1 ubuntu ubuntu      195 May 18 22:05 k8s-service-manifest.yml
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-NodePort.yml
pod/javawebapp created
service/javawebappsvc created
ubuntu@ip-172-31-9-165:~$ kubectl get svc
NAME            TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)        AGE
javawebappsvc   NodePort    10.100.206.94   <none>        80:30447/TCP   48s
kubernetes      ClusterIP   10.100.0.1      <none>        443/TCP        119s
ubuntu@ip-172-31-9-165:~$
```

NodePort#:
If we don’t specify NodePort number in service-manifest yaml file, then Kubernetes will assign a random NodePort number for the service within the range 30000 to 32767. However, we can specify NodePort number in service-manifest yaml
kubectl apply -f <yaml> ---> Access the application using Public IP of workerNode alongside NodePort number. Also add NodePort number in Security group
Add one extra line
nodePort: 30044

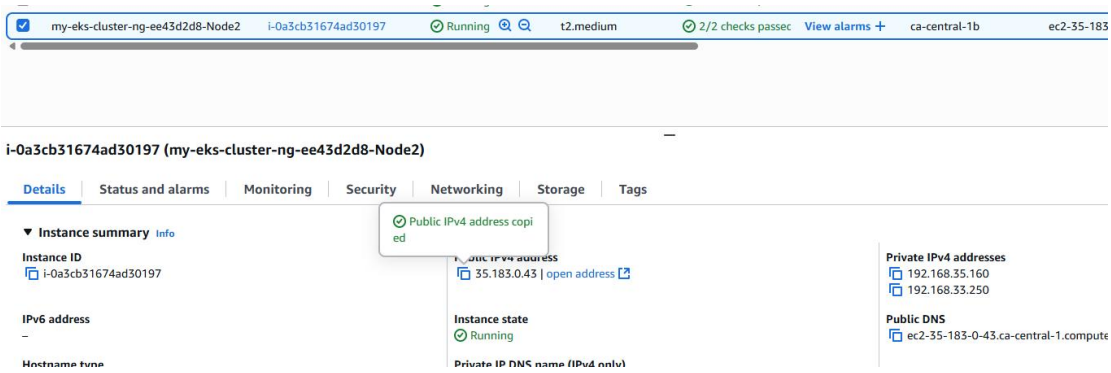
```
---
apiVersion: v1
kind: Pod
metadata:
   name: javawebapp
   labels:
      app: javawebapp
spec:
   containers:
      - name: javawebappcontainer
        image: hacker123shiva/springbt-in-docker:latest
        ports:
          - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
   name: javawebappsvc
spec:
   type: NodePort
   selector:
      app: javawebapp
   ports:
      - port: 80
        targetPort: 8080
        nodePort: 30044
...


ubuntu@ip-172-31-9-165:~$ vi k8s-pod-svc-manifest-NodePort.yml
ubuntu@ip-172-31-9-165:~$ cat k8s-pod-svc-manifest-NodePort.yml
---
apiVersion: v1
kind: Pod
metadata:
   name: javawebapp
   labels:
      app: javawebapp
spec:
   containers:
      - name: javawebappcontainer
        image: hacker123shiva/springbt-in-docker:latest
        ports:
          - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
```

```
  name: javawebappsvc
spec:
  type: NodePort
  selector:
    app: javawebapp
  ports:
    - port: 80
      targetPort: 8080
      nodePort: 30044
...
```

```
...
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-NodePort.yml
pod/javawebapp created
service/javawebappsvc created
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME         READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          8s
ubuntu@ip-172-31-9-165:~$ kubectl get svc
NAME            TYPE        CLUSTER-IP     EXTERNAL-IP   PORT(S)        AGE
javawebappsvc   NodePort    10.100.9.42    <none>        80:30044/TCP   12s
kubernetes      ClusterIP   10.100.0.1     <none>        443/TCP        99s
ubuntu@ip-172-31-9-165:~$
```

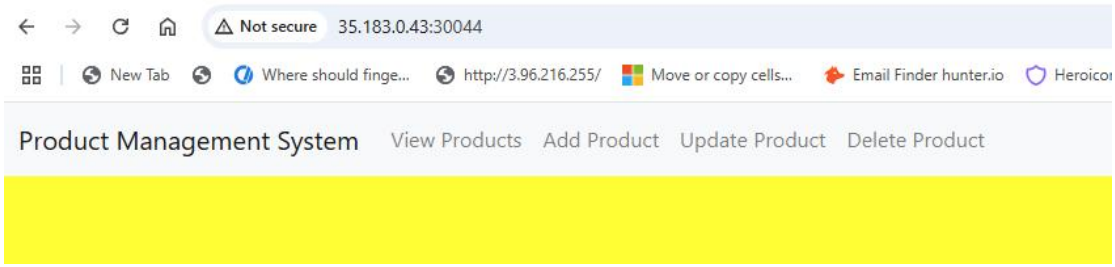
ubuntu@ip-172-31-9-165:~$ kubectl get pods -o wide
NAME READY STATUS RESTARTS AGE IP NODE NOMINATED NODE READINESS GATES
javawebapp 1/1 Running 0 77s 192.168.43.212 ip-192-168-35-160.ca-central-1.compute.internal <none> <none>

192-168-35-160 is in Node2



Security groups

http://35.183.0.43:30044/




```
ubuntu@ip-172-31-9-165:~$ kubectl delete all --all
pod "javawebapp" deleted
service "javawebappsvc" deleted
service "kubernetes" deleted
```

Cluster IP service

```
---
apiVersion: v1
kind: Pod
metadata:
   name: javawebapp
   labels:
      app: javawebapp
spec:
   containers:
      - name: javawebappcontainer
        image: hacker123shiva/springbt-in-docker:latest
        ports:
          - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
   name: javawebappsvc
spec:
   type: ClusterIP
   selector:
      app: javawebapp
   ports:
      - port: 80
        targetPort: 8080
...
```

```
ubuntu@ip-172-31-9-165:~$ vi k8s-pod-svc-manifest-clusterIP.yml
ubuntu@ip-172-31-9-165:~$ cat k8s-pod-svc-manifest-clusterIP.yml
---
apiVersion: v1
kind: Pod
metadata:
   name: javawebapp
   labels:
      app: javawebapp
spec:
   containers:
      - name: javawebappcontainer
        image: hacker123shiva/springbt-in-docker:latest
        ports:
```

```
        - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
   name: javawebappsvc
spec:
   type: ClusterIP
   selector:
      app: javawebapp
   ports:
      - port: 80
        targetPort: 8080
...


ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-clusterIP.yml
pod/javawebapp created
service/javawebappsvc created


ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-clusterIP.yml
pod/javawebapp created
service/javawebappsvc created
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME        READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          30s
ubuntu@ip-172-31-9-165:~$ kubectl get svc
NAME           TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)   AGE
javawebappsvc   ClusterIP   10.100.143.74   <none>        80/TCP    35s
kubernetes     ClusterIP   10.100.0.1      <none>        443/TCP   33m
```

```
ubuntu@ip-172-31-9-165:~$ cat k8s-pod-svc-manifest-clusterIP.yml
---
apiVersion: v1
kind: Pod
metadata:
    name: javawebapp
    labels:
        app: javawebapp
spec:
    containers:
        - name: javawebappcontainer
          image: hacker123shiva/springbt-in-docker:latest
          ports:
            - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
    name: javawebappsvc
spec:
    type: ClusterIP
    selector:
        app: javawebapp
    ports:
        - port: 80
          targetPort: 8080
...
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-manifest-clusterIP.yml
pod/javawebapp created
service/javawebappsvc created
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME         READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          30s
ubuntu@ip-172-31-9-165:~$ kubectl get svc
NAME            TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)   AGE
javawebappsvc   ClusterIP   10.100.143.74   <none>        80/TCP    35s
kubernetes      ClusterIP   10.100.0.1      <none>        443/TCP   33m
ubuntu@ip-172-31-9-165:~$
```

ClusterIP will be used to access our pods within Cluster and one Static IP will be created to access the pods

ClusterIP cannot be access from outside network. So NodePort is required

ubuntu@ip-172-31-9-165:~$ kubectl delete all --all
pod "javawebapp" deleted
service "javawebappsvc" deleted
service "kubernetes" deleted

Kubetnetes Namespaces:
Why we need Namespace? To group the resources
frontend-app-pods --> frontend-app-ns
backend-app-pods --> backend-app-ns
database-pods --> database-ns

ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME   STATUS   AGE
default   Active   4h19m
kube-node-lease   Active   4h19m
kube-public   Active   4h19m
kube-system   Active   4h19m

ubuntu@ip-172-31-9-165:~$ kubectl get pods
No resources found in default namespace.

```
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   4h19m
kube-node-lease   Active   4h19m
kube-public       Active   4h19m
kube-system       Active   4h19m
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods
No resources found in default namespace.
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n kube-system
NAME                              READY   STATUS    RESTARTS   AGE
aws-node-bmdht                    2/2     Running   0          4h14m
aws-node-qg58m                    2/2     Running   0          4h14m
coredns-86d7bdf-bhhxm             1/1     Running   0          4h16m
coredns-86d7bdf-j2wgl             1/1     Running   0          4h16m
kube-proxy-79g5s                  1/1     Running   0          4h14m
kube-proxy-qh6cf                  1/1     Running   0          4h14m
metrics-server-d9fd456dc-27jk9    1/1     Running   0          4h16m
metrics-server-d9fd456dc-zcwkg    1/1     Running   0          4h16m
ubuntu@ip-172-31-9-165:~$
```

ubuntu@ip-172-31-9-165:~$ kubectl get pods -n kube-public
No resources found in kube-public namespace.

ubuntu@ip-172-31-9-165:~$ kubectl create ns my-namespace
namespace/my-namespace created

ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME STATUS AGE
default Active 4h22m
kube-node-lease Active 4h22m
kube-public Active 4h22m
kube-system Active 4h22m
my-namespace Active 24s

```
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n kube-system
NAME                              READY   STATUS    RESTARTS   AGE
aws-node-bmdht                    2/2     Running   0          4h14m
aws-node-qg58m                    2/2     Running   0          4h14m
coredns-86d7bdf-bhhxm             1/1     Running   0          4h16m
coredns-86d7bdf-j2wgl             1/1     Running   0          4h16m
kube-proxy-79g5s                  1/1     Running   0          4h14m
kube-proxy-qh6cf                  1/1     Running   0          4h14m
metrics-server-d9fd456dc-27jk9    1/1     Running   0          4h16m
metrics-server-d9fd456dc-zcwkg    1/1     Running   0          4h16m
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n kube-public
No resources found in kube-public namespace.
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl create ns my-namespace
namespace/my-namespace created
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   4h22m
kube-node-lease   Active   4h22m
kube-public       Active   4h22m
kube-system       Active   4h22m
my-namespace      Active   24s
```

We can create a namespace in Kubernetes cluster: kubectl create ns my-namespace
If needed, we can create multiple namespaces in Kubernetes cluster

To display all the available namespaces --> $ kubectl get ns

To get the pods available in specific namespace

$ kubectl get pods -n <namespace-name>
Ex: to get pods available in kube-system namespace

$ kubectl get pods -n kube-system

We can create a namespace in K8s cluster in 2 ways:
1. Using kubectl create ns command: kubectl create ns my-namespace
2. Using yml file:

-rw-rw-r-- 1 ubuntu ubuntu 195 May 18 22:05 k8s-service-manifest.yml
ubuntu@ip-172-31-9-165:~$ vi k8s-namespace.yml
ubuntu@ip-172-31-9-165:~$ cat k8s-namespace.yml
---
apiVersion: v1
kind: Namespace
metadata:
  name: my-namespace
...

ubuntu@ip-172-31-9-165:~$ cat k8s-namespace.yml
---
apiVersion: v1
kind: Namespace
metadata:

```
   name: my-namespace

...
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-namespace.yml
Warning: resource namespaces/my-namespace is missing the kubectl.kubernetes.io/last-applied-configuration annotation which is required by kubectl apply. kubectl apply should only be used on resources created declaratively by either kubectl create --save-config or kubectl apply. The missing annotation will be patched automatically.
namespace/my-namespace configured

ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   5h1m
kube-node-lease   Active   5h1m
kube-public       Active   5h1m
kube-system       Active   5h1m
my-namespace      Active   38m

ubuntu@ip-172-31-9-165:~$ vi k8s-namespace.yml
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-namespace.yml
namespace/my-namespace-2 created
ubuntu@ip-172-31-9-165:~$ cat k8s-namespace.yml
---
apiVersion: v1
kind: Namespace
metadata:
   name: my-namespace-2

...
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   5h3m
kube-node-lease   Active   5h3m
kube-public       Active   5h3m
kube-system       Active   5h3m
my-namespace      Active   40m
my-namespace-2    Active   15s
```

```
ubuntu@ip-172-31-9-165:~$ vi k8s-namespace.yml
ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-namespace.yml
namespace/my-namespace-2 created
ubuntu@ip-172-31-9-165:~$ cat k8s-namespace.yml
---
apiVersion: v1
kind: Namespace
metadata:
    name: my-namespace-2

...
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   5h3m
kube-node-lease   Active   5h3m
kube-public       Active   5h3m
kube-system       Active   5h3m
my-namespace      Active   40m
my-namespace-2    Active   15s
ubuntu@ip-172-31-9-165:~$
```

ubuntu@ip-172-31-9-165:~$ kubectl delete ns my-namespace
namespace "my-namespace" deleted

ubuntu@ip-172-31-9-165:~$ kubectl delete ns my-namespace
namespace "my-namespace" deleted
ubuntu@ip-172-31-9-165:~$ kubectl delete ns my-namespace-2
namespace "my-namespace-2" deleted
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME STATUS AGE
default Active 5h19m
kube-node-lease Active 5h19m
kube-public Active 5h19m
kube-system Active 5h19m

```
---
apiVersion: v1
kind: Namespace
metadata:
  name: my-namespace-1
---
apiVersion: v1
kind: Pod
metadata:
  name: javawebapp
  namespace: my-namespace-1
  labels:
    app: javawebapp
spec:
  containers:
    - name: javawebappcontainer
      image: hacker123shiva/springbt-in-docker:latest
      ports:
        - containerPort: 8080
```

```
---
apiVersion: v1
kind: Service
metadata:
   name: javawebappsvc
spec:
   type: LoadBalancer
   selector:
      app: javawebapp
   ports:
      - port: 80
        targetPort: 8080
...
ubuntu@ip-172-31-9-165:~$ vi k8s-pod-svc-ns.yml
ubuntu@ip-172-31-9-165:~$ cat k8s-pod-svc-ns.yml
---
apiVersion: v1
kind: Namespace
metadata:
    name: my-namespace-1
---
apiVersion: v1
kind: Pod
metadata:
name: javawebapp
namespace: my-namespace-1
   labels:
      app: javawebapp
spec:
   containers:
      - name: javawebappcontainer
        image: hacker123shiva/springbt-in-docker:latest
        ports:
          - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
   name: javawebappsvc
spec:
   type: LoadBalancer
   selector:
      app: javawebapp
   ports:
      - port: 80
        targetPort: 8080
...

We create another file due to indentation issues
ubuntu@ip-172-31-9-165:~$ cat k8s-pod-svc-ns1.yml
---
apiVersion: v1
kind: Namespace
metadata:
  name: my-namespace-1
---
apiVersion: v1
```

```
kind: Pod
metadata:
  name: javawebapp
  namespace: my-namespace-1
  labels:
    app: javawebapp
spec:
  containers:
    - name: javawebappcontainer
      image: hacker123shiva/springbt-in-docker:latest
      ports:
        - containerPort: 8080
---
apiVersion: v1
kind: Service
metadata:
  name: javawebappsvc
  namespace: my-namespace-1
spec:
  type: LoadBalancer
  selector:
    app: javawebapp
  ports:
    - port: 80
      targetPort: 8080
...


ubuntu@ip-172-31-9-165:~$ kubectl apply -f  k8s-pod-svc-ns1.yml
namespace/my-namespace-1 unchanged
pod/javawebapp created
service/javawebappsvc created


ubuntu@ip-172-31-9-165:~$ kubectl get pods
No resources found in default namespace.
```

This time pods are getting created in a specific namespace and not default namespace

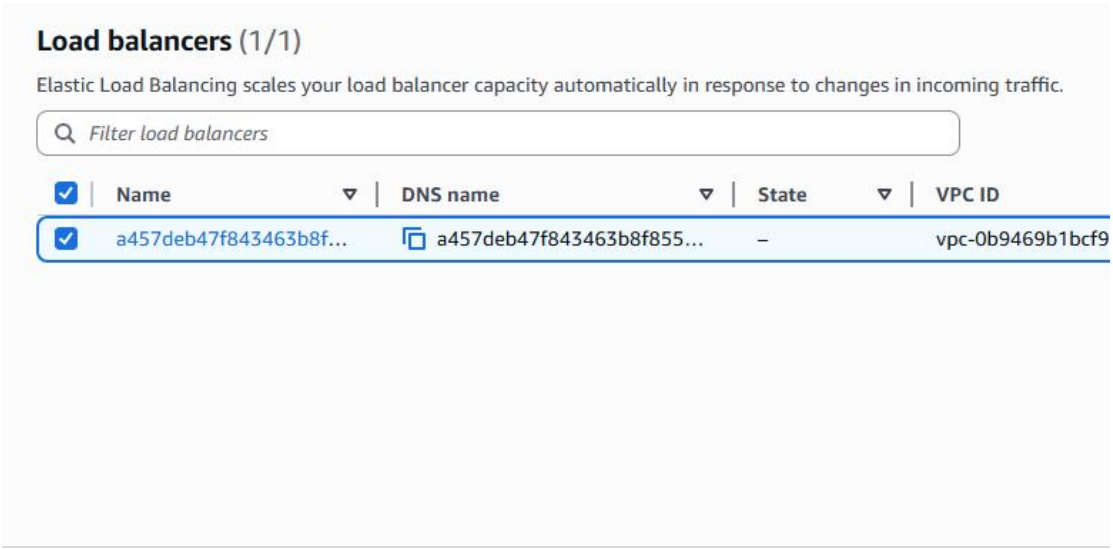
```
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   5h46m
kube-node-lease   Active   5h46m
kube-public       Active   5h46m
kube-system       Active   5h46m
my-namespace-1    Active   18m


ubuntu@ip-172-31-9-165:~$ kubectl get pods -n my-namespace-1
NAME        READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          10m
```

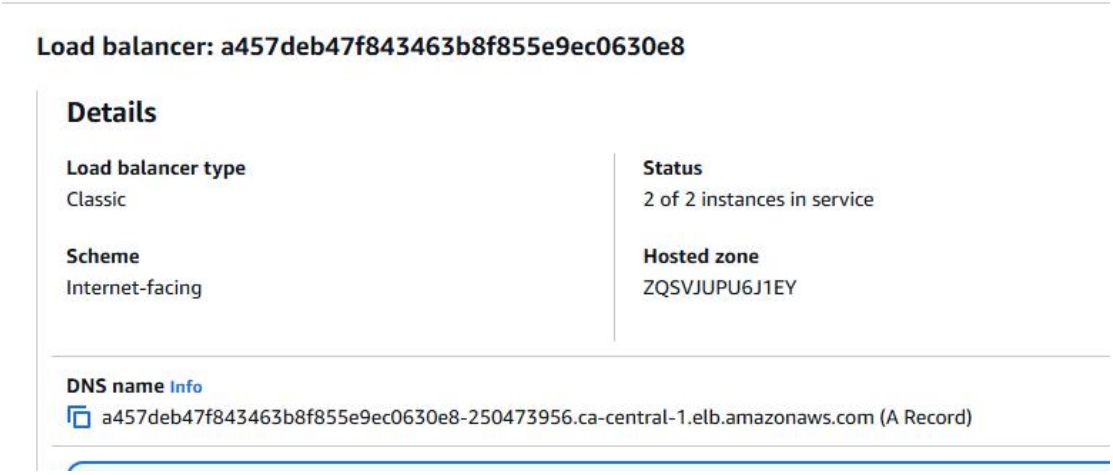
```
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods
No resources found in default namespace.
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   5h46m
kube-node-lease   Active   5h46m
kube-public       Active   5h46m
kube-system       Active   5h46m
my-namespace-1    Active   18m
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n my-namespace-1
NAME         READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          10m
ubuntu@ip-172-31-9-165:~$
```

ubuntu@ip-172-31-9-165:~$ kubectl get svc -n my-namespace-1
NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE
javawebappsvc LoadBalancer 10.100.191.133 a457deb47f843463b8f855e9ec0630e8-250473956.ca-central-1.elb.amazonaws.com 80:30478/TCP 11m

```
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods
No resources found in default namespace.
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   5h46m
kube-node-lease   Active   5h46m
kube-public       Active   5h46m
kube-system       Active   5h46m
my-namespace-1    Active   18m
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n my-namespace-1
NAME         READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          10m
ubuntu@ip-172-31-9-165:~$ kubectl get svc -n my-namespace-1
NAME            TYPE           CLUSTER-IP       EXTERNAL-IP
javawebappsvc   LoadBalancer   10.100.191.133   a457deb47f843463b8f855
ubuntu@ip-172-31-9-165:~$
```

A loadbalancer is created in EC2

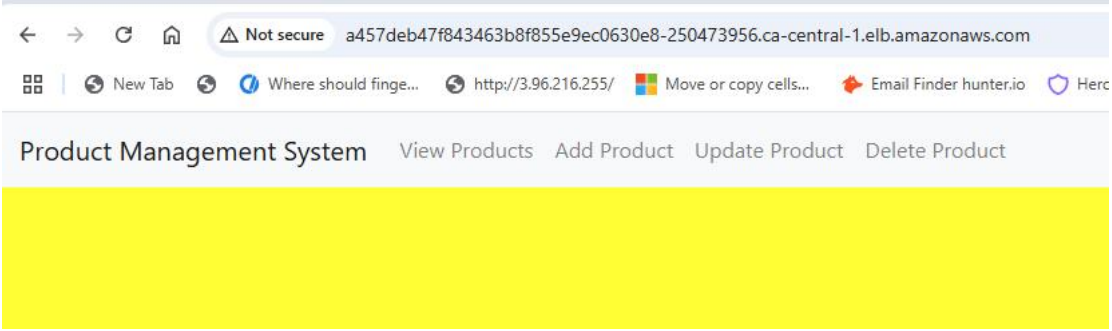




ubuntu@ip-172-31-9-165:~$ kubectl get all -n my-namespace-1
NAME READY STATUS RESTARTS AGE
pod/javawebapp 1/1 Running 0 14m

NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S)
AGE
service/javawebappsvc LoadBalancer 10.100.191.133 a457deb47f843463b8f855e9ec0630e8-
250473956.ca-central-1.elb.amazonaws.com 80:30478/TCP 14m

Open the DNS url
http://a457deb47f843463b8f855e9ec0630e8-250473956.ca-central-1.elb.amazonaws.com/



ubuntu@ip-172-31-9-165:~$ kubectl delete ns my-namespace-1
namespace "my-namespace-1" deleted

ubuntu@ip-172-31-9-165:~$ kubectl get pods -n my-namespace-1
No resources found in my-namespace-1 namespace.

```
ubuntu@ip-172-31-9-165:~$ kubectl get ns
NAME              STATUS   AGE
default           Active   5h46m
kube-node-lease   Active   5h46m
kube-public       Active   5h46m
kube-system       Active   5h46m
my-namespace-1    Active   18m
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n my-namespace-1
NAME         READY   STATUS    RESTARTS   AGE
javawebapp   1/1     Running   0          10m
ubuntu@ip-172-31-9-165:~$ kubectl get svc -n my-namespace-1
NAME            TYPE           CLUSTER-IP       EXTERNAL-IP
javawebappsvc   LoadBalancer   10.100.191.133   a457deb47f843463b8f855e9ec0630e8-2
ubuntu@ip-172-31-9-165:~$ kubectl get all -n my-namespace-2
No resources found in my-namespace-2 namespace.
ubuntu@ip-172-31-9-165:~$ kubectl get all -n my-namespace-1
NAME             READY   STATUS    RESTARTS   AGE
pod/javawebapp   1/1     Running   0          14m

NAME                     TYPE           CLUSTER-IP       EXTERNAL-IP
service/javawebappsvc    LoadBalancer   10.100.191.133   a457deb47f843463b8f855e9ec
ubuntu@ip-172-31-9-165:~$ kubectl delete ns my-namespace-1
namespace "my-namespace-1" deleted
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n my-namespace-1
No resources found in my-namespace-1 namespace.
```

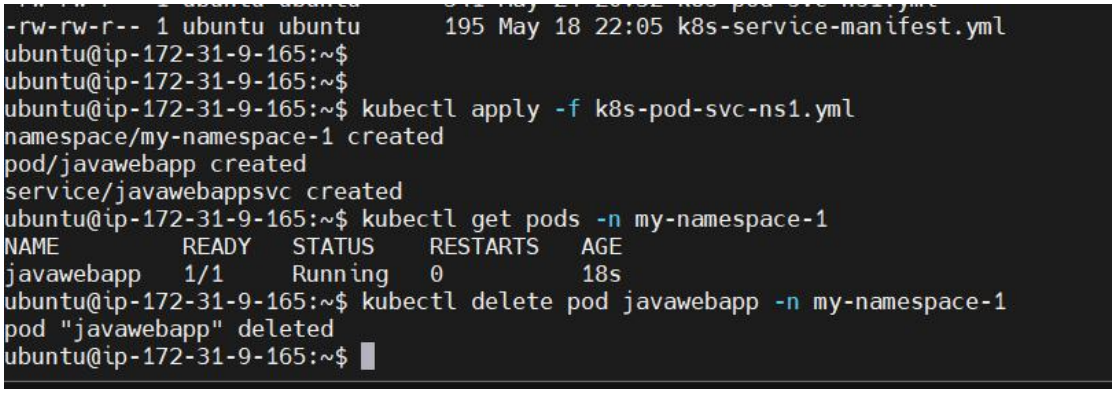
$ kubectl apply -f <yml>
$ kubectl get ns
$ kubectl get pods -n <namepace-name>
$ kubectl get service -n <namepace-name>
$ kubectl get all -n <namepace-name>
$ kubectl delete ns <namepace-name>

Container orchestration --> K8s introduction --> Advantages of K8s --> Architecture --> Components of architecture --> K8s cluster setup --> K8s resources --> POD, Services (ClusterIP, NodePort, LoadBalancer, Namespace)

Advantages of K8s:
Self-healing (if any container/pod gets crashed, it will be replaced by new container)
Load-balancing
Auto-scaling

ubuntu@ip-172-31-9-165:~$ kubectl apply -f k8s-pod-svc-ns1.yml
namespace/my-namespace-1 created
pod/javawebapp created
service/javawebappsvc created
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n my-namespace-1
NAME   READY   STATUS   RESTARTS   AGE
javawebapp   1/1   Running   0   18s

ubuntu@ip-172-31-9-165:~$ kubectl delete pod javawebapp -n my-namespace-1
pod "javawebapp" deleted



Now I have deleted the pod.
ubuntu@ip-172-31-9-165:~$ kubectl get pods -n my-namespace-1
No resources found in my-namespace-1 namespace.

Is it self-healing? No pods are there. No
So far we have created POD directly using POD manifest YML (kind: Pod)
If we create POD directly then we don't get self-healing capability
If POD is damaged/crashed/deleted, then K8s will not create a new POD

In this case, if POD is damaged then our application will be down
Hence we should not create POD directly to deploy our application in K8s and we need to use the concept of K8s resources to create the PODs
If we create POD using K8s resources then Pod lifecycle will be managed by K8s

We have following resources to create PODs ->
1. ReplicationController (outdated)
2. ReplicaSet
3. Deployment
4. DaemonSet
5. StatefulSet

We have to use these methods to obtain the advantages or benefits of K8s

ReplicaSet:
It is one of the K8s resource used to create and manage Pods and ReplicaSet will take care of Pod lifecycle
When Pod is damaged/crashed/deleted, then ReplicaSet will create a new Pod
It will always maintain given number of Pod count for our application
For example, in the manifest file, if we say replicas: 2, it will maintain 2

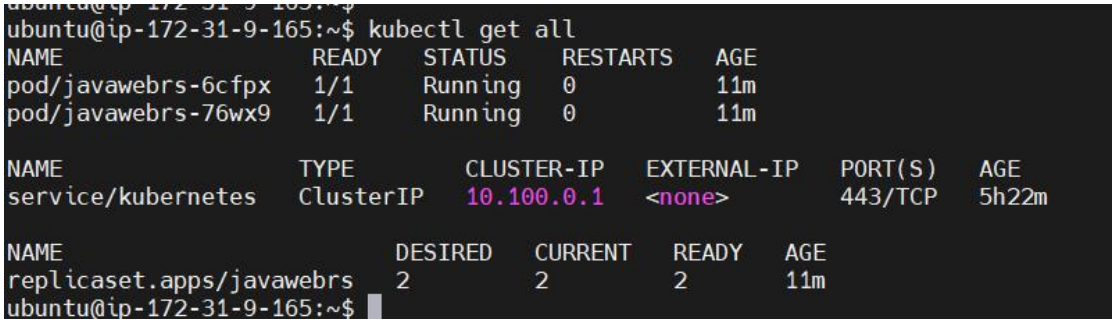
It will help us to achieve high availability for our application. We can also scale-up and scale-down our pod count
replicaSet is a part of apps group
replicas: 2 I want 2 pods running at all the time
We are giving only 2 spacings
matchLabels: replicas for which pod
replicas : 2

$ vi replicaSet.yml

---
apiVersion: apps/v1
kind: ReplicaSet

```
metadata:
  name: javawebrs
spec:
  replicas: 2
  selector:
    matchLabels:
      app: javawebapp
  template:
    metadata:
      name: javawebpod
      labels:
        app: javawebapp
    spec:
      containers:
        - name: javawebappcontainer
          image: hacker123shiva/springbt-in-docker:latest
          ports:
           - containerPort: 8080
...


ubuntu@ip-172-31-9-165:~$ cat replicaSet.yml
---
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: javawebrs
spec:
  replicas: 2
  selector:
    matchLabels:
      app: javawebapp
  template:
    metadata:
      name: javawebpod
      labels:
        app: javawebapp
    spec:
      containers:
        - name: javawebappcontainer
          image: hacker123shiva/springbt-in-docker:latest
          ports:
           - containerPort: 8080
...

ubuntu@ip-172-31-9-165:~$ kubectl apply -f replicaSet.yml
replicaset.apps/javawebrs created

ubuntu@ip-172-31-9-165:~$ kubectl get all
NAME              READY   STATUS    RESTARTS   AGE
pod/javawebrs-6cfpx   1/1     Running   0          11m
pod/javawebrs-76wx9   1/1     Running   0          11m

NAME             TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.100.0.1   <none>        443/TCP   5h22m

NAME                 DESIRED   CURRENT   READY   AGE
```

replicaset.apps/javawebrs 2 2 2 11m



ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME READY STATUS RESTARTS AGE
javawebrs-6cfpx 1/1 Running 0 12m
javawebrs-76wx9 1/1 Running 0 12m

2 pods are there, we specified replicas as 2

ubuntu@ip-172-31-9-165:~$ kubectl get rs
NAME DESIRED CURRENT READY AGE
javawebrs 2 2 2 13m

ubuntu@ip-172-31-9-165:~$ kubectl get all
NAME READY STATUS RESTARTS AGE
pod/javawebrs-6cfpx 1/1 Running 0 11m
pod/javawebrs-76wx9 1/1 Running 0 11m

NAME TYPE CLUSTER-IP EXTERNAL-IP PORT(S) AGE
service/kubernetes ClusterIP 10.100.0.1 <none> 443/TCP 5h22m

NAME DESIRED CURRENT READY AGE
replicaset.apps/javawebrs 2 2 2 11m
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME READY STATUS RESTARTS AGE
javawebrs-6cfpx 1/1 Running 0 12m
javawebrs-76wx9 1/1 Running 0 12m
ubuntu@ip-172-31-9-165:~$ kubectl get rs
NAME DESIRED CURRENT READY AGE
javawebrs 2 2 2 13m
ubuntu@ip-172-31-9-165:~$ kubectl delete pod javawebrs-6cfpx
pod "javawebrs-6cfpx" deleted

ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME READY STATUS RESTARTS AGE
javawebrs-76wx9 1/1 Running 0 14m
javawebrs-rb2kh 1/1 Running 0 24s

We deleted pod "javawebrs-6cfpx" but pod "javawebrs-76wx9" is created. So Self-healing

```
ubuntu@ip-172-31-9-165:~$ kubectl get all
NAME                 READY   STATUS    RESTARTS   AGE
pod/javawebrs-6cfpx   1/1     Running   0          11m
pod/javawebrs-76wx9   1/1     Running   0          11m

NAME                 TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.100.0.1   <none>        443/TCP   5h22m

NAME                           DESIRED   CURRENT   READY   AGE
replicaset.apps/javawebrs   2         2         2       11m
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME              READY   STATUS    RESTARTS   AGE
javawebrs-6cfpx   1/1     Running   0          12m
javawebrs-76wx9   1/1     Running   0          12m
ubuntu@ip-172-31-9-165:~$ kubectl get rs
NAME        DESIRED   CURRENT   READY   AGE
javawebrs   2         2         2       13m
ubuntu@ip-172-31-9-165:~$ kubectl delete pod javawebrs-6cfpx
pod "javawebrs-6cfpx" deleted
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME              READY   STATUS    RESTARTS   AGE
javawebrs-76wx9   1/1     Running   0          14m
javawebrs-rb2kh   1/1     Running   0          24s
ubuntu@ip-172-31-9-165:~$
```

```
ubuntu@ip-172-31-9-165:~$ kubectl delete pod javawebrs-6cfpx
pod "javawebrs-6cfpx" deleted
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME              READY   STATUS    RESTARTS   AGE
javawebrs-76wx9   1/1     Running   0          14m
javawebrs-rb2kh   1/1     Running   0          24s
ubuntu@ip-172-31-9-165:~$ kubectl delete pod javawebrs-76wx9
pod "javawebrs-76wx9" deleted
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME              READY   STATUS    RESTARTS   AGE
javawebrs-mv6qd   1/1     Running   0          5s
javawebrs-rb2kh   1/1     Running   0          7m43s
ubuntu@ip-172-31-9-165:~$
```

On run I am changing replicaSet.yml: replicas to 4

```
---
apiVersion: apps/v1
kind: ReplicaSet
metadata:
  name: javawebrs
spec:
  replicas: 4
  selector:
    matchLabels:
      app: javawebapp
  template:
    metadata:
      name: javawebpod
      labels:
        app: javawebapp
    spec:
      containers:
```

```
      - name: javawebappcontainer
        image: hacker123shiva/springbt-in-docker:latest
        ports:
         - containerPort: 8080
...
```

Not newly created it is only configured
ubuntu@ip-172-31-9-165:~$ vi replicaSet.yml
ubuntu@ip-172-31-9-165:~$ kubectl apply -f replicaSet.yml
replicaset.apps/javawebrs configured

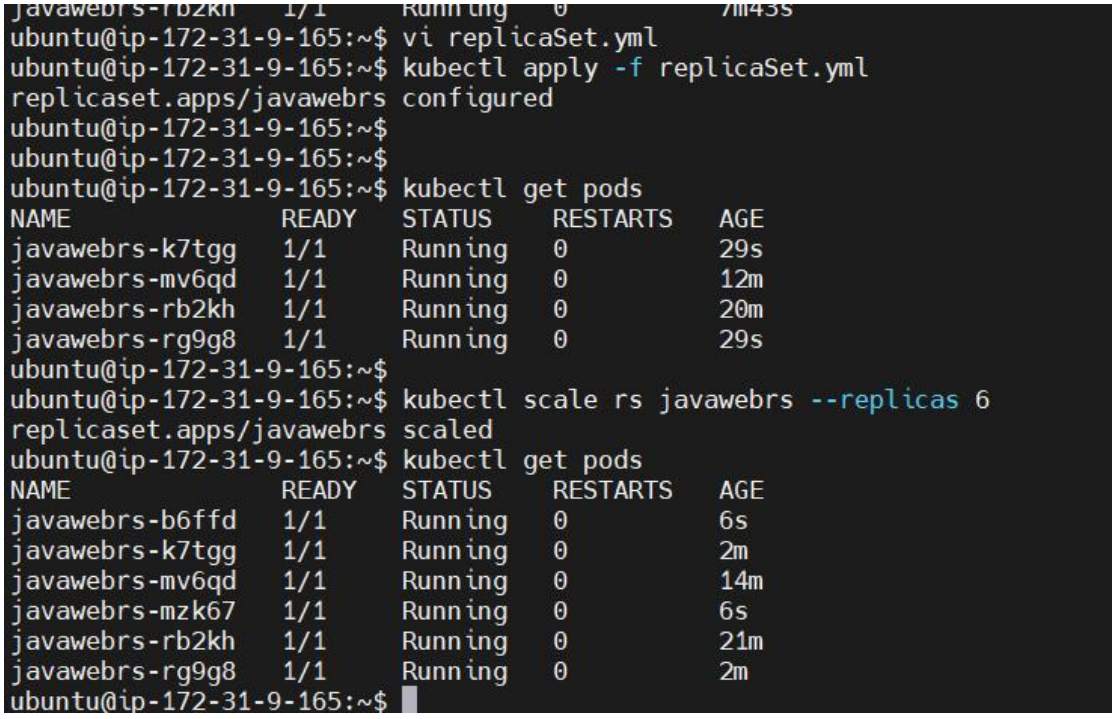
Now we have 4 pods
ubuntu@ip-172-31-9-165:~$ kubectl get pods

NAME	READY	STATUS	RESTARTS	AGE
javawebrs-k7tgg	1/1	Running	0	29s
javawebrs-mv6qd	1/1	Running	0	12m
javawebrs-rb2kh	1/1	Running	0	20m
javawebrs-rg9g8	1/1	Running	0	29s

ubuntu@ip-172-31-9-165:~$ kubectl scale rs javawebrs --replicas 6

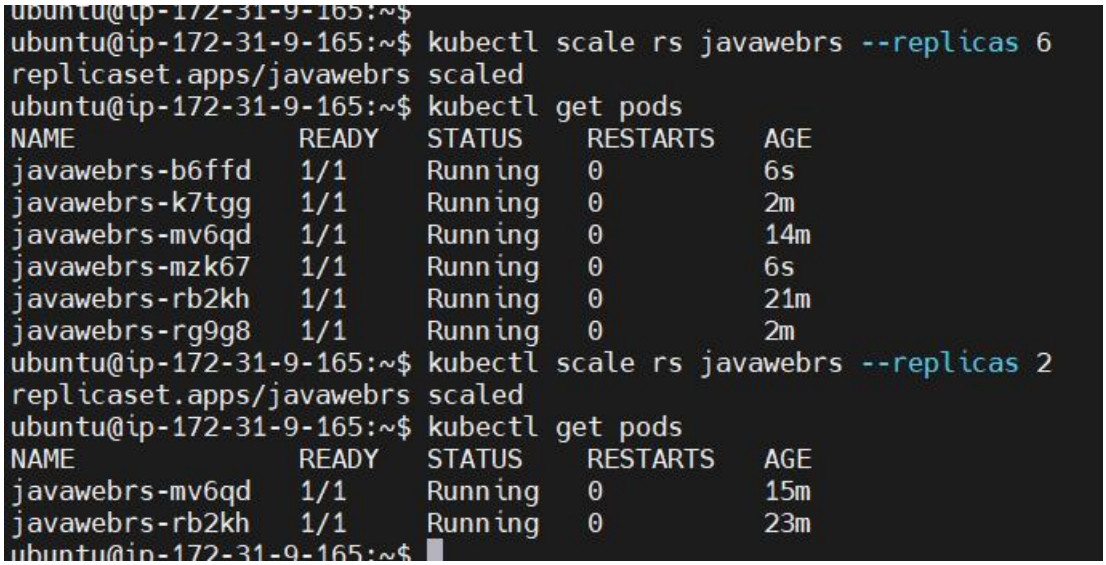
ubuntu@ip-172-31-9-165:~$ kubectl scale rs javawebrs --replicas 6
replicaset.apps/javawebrs scaled
ubuntu@ip-172-31-9-165:~$ kubectl get pods

NAME	READY	STATUS	RESTARTS	AGE
javawebrs-b6ffd	1/1	Running	0	6s
javawebrs-k7tgg	1/1	Running	0	2m
javawebrs-mv6qd	1/1	Running	0	14m
javawebrs-mzk67	1/1	Running	0	6s
javawebrs-rb2kh	1/1	Running	0	21m
javawebrs-rg9g8	1/1	Running	0	2m



Now scaled down to 2

```
ubuntu@ip-172-31-9-165:~$ kubectl scale rs javawebrs --replicas 2
replicaset.apps/javawebrs scaled
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME          READY   STATUS    RESTARTS   AGE
javawebrs-mv6qd   1/1     Running   0          15m
javawebrs-rb2kh   1/1     Running   0          23m
ubuntu@ip-172-31-9-165:~$
```




```
ubuntu@ip-172-31-9-165:~$ kubectl delete rs javawebrs
replicaset.apps "javawebrs" deleted
ubuntu@ip-172-31-9-165:~$ kubectl get pods
No resources found in default namespace.
```

If we want to delete the pods, then we have to delete the resource, which created the pods
$ kubectl delete rs javawebrs

In ReplicaSet, scale up and scale down is a manual process
K8s supports auto-scaling when we use “Deployment” resource to create Pods

K8s Deployment
It is one of the K8s resource/component recommended to deploy our application where Deployment will manage Pod lifecycle
Advantages with K8s deployment
1. Zero downtime
2. Auto scaling
3. Rolling update (it will delete and create new pods one by one) and Rollback

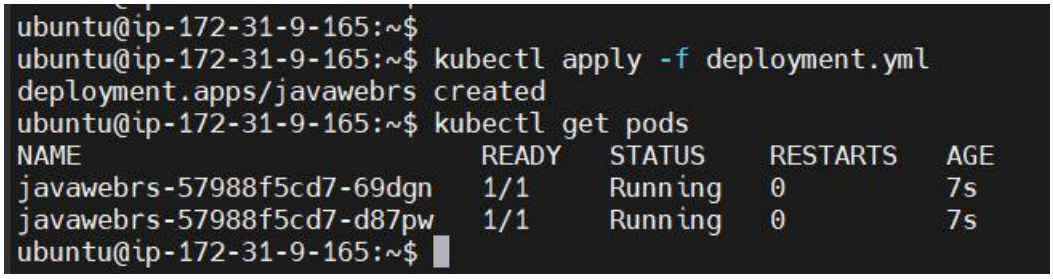
When I deploy application, existing pods (old pods will have old application) should be replaced by new pods with application (new pods will have new application). Rolling update means it will delete one of the old pods then create a new pod, same delete second old one replace with a new pod

We have deployment strategies:
1. Recreate (delete all existing pods and create new pods)
2. Rolling update (it will delete and create new pod one by one)

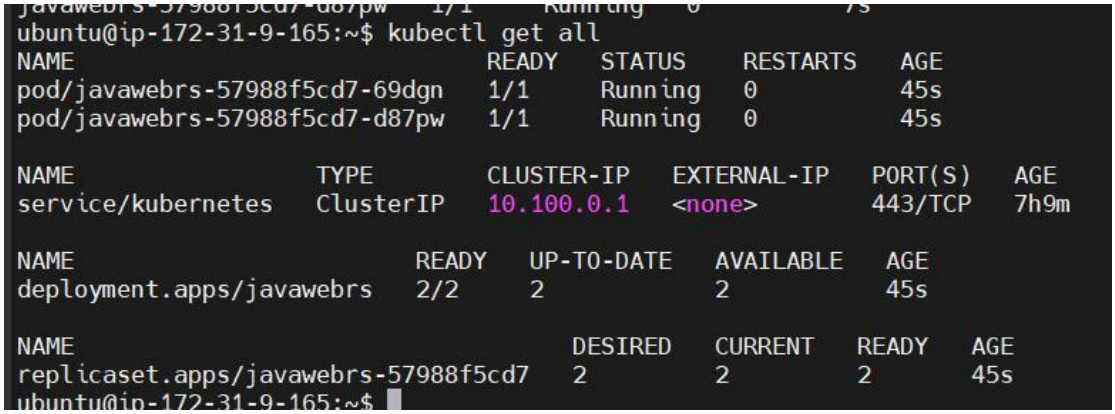
```
ubuntu@ip-172-31-9-165:~$ vi deployment.yml
ubuntu@ip-172-31-9-165:~$ cat deployment.yml
---
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: javawebrs
spec:
  replicas: 2
  strategy:
    type: RollingUpdate
  selector:
    matchLabels:
      app: javawebapp
  template:
    metadata:
      name: javawebpod
      labels:
        app: javawebapp
    spec:
      containers:
        - name: javawebappcontainer
          image: hacker123shiva/springbt-in-docker:latest
          ports:
           - containerPort: 8080
...
```

```
ubuntu@ip-172-31-9-165:~$ kubectl apply -f deployment.yml
deployment.apps/javawebrs created
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME                   READY   STATUS    RESTARTS   AGE
javawebrs-57988f5cd7-69dgn   1/1     Running   0          7s
javawebrs-57988f5cd7-d87pw   1/1     Running   0          7s
```




```
ubuntu@ip-172-31-9-165:~$ kubectl get all
NAME                       READY   STATUS    RESTARTS   AGE
pod/javawebrs-57988f5cd7-69dgn   1/1     Running   0          45s
pod/javawebrs-57988f5cd7-d87pw   1/1     Running   0          45s

NAME                 TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.100.0.1   <none>        443/TCP   7h9m

NAME                       READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/javawebrs   2/2     2            2           45s

NAME                                 DESIRED   CURRENT   READY   AGE
replicaset.apps/javawebrs-57988f5cd7   2         2         2       45s
```



ubuntu@ip-172-31-9-165:~$ kubectl get deployment
NAME READY UP-TO-DATE AVAILABLE AGE
javawebrs 2/2 2 2 92s

Updated yml file
ubuntu@ip-172-31-9-165:~$ cat deployment.yml

```
---
apiVersion: apps/v1
kind: Deployment
metadata:
 name: javawebdeployment
spec:
 replicas: 2
 strategy:
  type: RollingUpdate
 selector:
  matchLabels:
   app: javawebapp
 template:
  metadata:
   name: javawebpod
   labels:
    app: javawebapp
  spec:
   containers:
    - name: javawebappcontainer
      image: hacker123shiva/springbt-in-docker:latest
      ports:
       - containerPort: 8080
...
```

ubuntu@ip-172-31-9-165:~$ kubectl apply -f deployment.yml
deployment.apps/javawebdeployment created
ubuntu@ip-172-31-9-165:~$ kubectl get pods
NAME READY STATUS RESTARTS AGE
javawebdeployment-57988f5cd7-6gnjl 1/1 Running 0 4s
javawebdeployment-57988f5cd7-c4dxc 1/1 Running 0 4s
ubuntu@ip-172-31-9-165:~$ kubectl get deployment
NAME READY UP-TO-DATE AVAILABLE AGE
javawebdeployment 2/2 2 2 12s

```
ubuntu@ip-172-31-9-165:~$ kubectl scale deployment javawebdeployment --replicas 4
deployment.apps/javawebdeployment scaled



ubuntu@ip-172-31-9-165:~$ kubectl get all
NAME                                  READY   STATUS    RESTARTS   AGE
pod/javawebdeployment-57988f5cd7-2ktmv   1/1     Running   0          20s
pod/javawebdeployment-57988f5cd7-6gnjl   1/1     Running   0          65s
pod/javawebdeployment-57988f5cd7-98ggd   1/1     Running   0          20s
pod/javawebdeployment-57988f5cd7-c4dxc   1/1     Running   0          65s

NAME                 TYPE        CLUSTER-IP    EXTERNAL-IP   PORT(S)   AGE
service/kubernetes   ClusterIP   10.100.0.1    <none>        443/TCP   7h12m

NAME                                  READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/javawebdeployment   4/4     4            4           65s

NAME                                            DESIRED   CURRENT   READY   AGE
replicaset.apps/javawebdeployment-57988f5cd7   4         4         4       65s
```

Auto-scaling can be done in two ways: Horizontal scaling and Vertical scaling

To do more work, I have two options, give more pay to existing engineers (Vertical) or hire new engineers (Horizontal)

Vertical scaling, existing engineers should do more work and leads to less productivity so Horizontal scaling is better

Auto-scaling focuses on Horizontal scaling

Horizontal Pod Autoscaling (HPA): it is used to scale up and down number of pods/replicas based on observed metrics (CPU/memory utilization). To achieve autoscaling, we first have to create metric server. HPA will interact with this metric server to identify CPU/memory utilization, based on that Horizontal Autoscaling will be done. Creating new machines is Horizontal

```
kubectl delete all --all
eksctl delete cluster --name my-eks-cluster --region ca-central-1
```