Application Containerization and Orchestration Lab

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Batch – DevOps B4

Lab Exercise 10– Creating Deployment in Kubernetes

Below is a lab exercise that demonstrates how to create and manage a Deployment in Kubernetes.

Step 1: Run the service "service-web.yaml" having label 'web'

service-web.yaml

```yaml
apiVersion: v1
kind: Service
metadata:
  name: my-service-web
spec:
  selector:
    app: web
  ports:
  - protocol: TCP
    port: 80
    nodePort: 30002
  type: NodePort
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl apply -f service-web.yaml
service/my-service-web created
```

Step 2: Create a Deployment Configuration File

Create a file named deployment.yaml with the following configuration:

Link of file: (Copy following code from my GitHub repo)

https://github.com/hkshitesh/ACO-LAB-2021-25/blob/main/scripts/deployment.yaml

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: apache-deployment
  labels:
    app: web
spec:
  replicas: 10
  selector:
    matchLabels:
      app: web
  template:
    metadata:
      labels:
        app: web
    spec:
      containers:
      - name: httpd
        image: httpd
```

Step 3: Apply the Deployment Configuration

Apply the configuration to create the Deployment:

```
kubectl apply -f deployment.yaml
```

deployment.yaml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: my-deployment
  labels:
    app: web
spec:
  replicas: 10
  selector:
    matchLabels:
      app: web
  template:
    metadata:
      labels:
        app: web
    spec:
      containers:
      - name: mynginx-server
        image: nginx
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl apply -f deployment.yaml
deployment.apps/my-deployment created
```

Step 4: View the Deployment and Pods

View the created Deployment and the associated Pods:

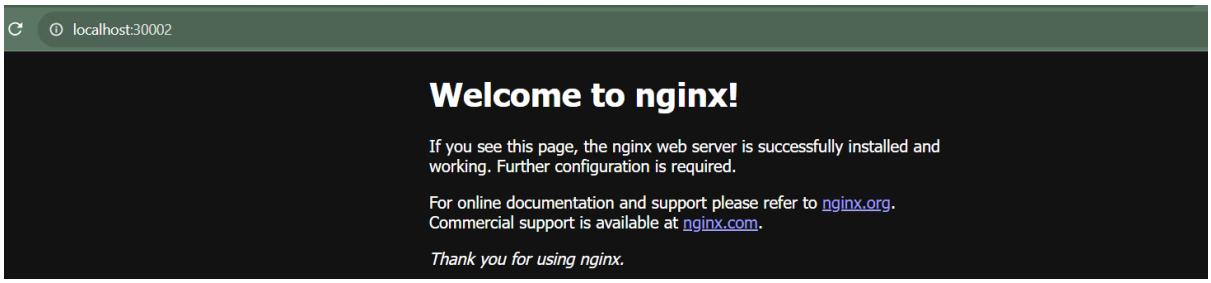
```
kubectl get deployments

kubectl get pods
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get deployments
NAME            READY   UP-TO-DATE   AVAILABLE   AGE
my-deployment   10/10   10           10          14m
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get pods
NAME                             READY   STATUS    RESTARTS   AGE
my-deployment-7b7867f57f-654zr   1/1     Running   0          82s
my-deployment-7b7867f57f-84ks2   1/1     Running   0          82s
my-deployment-7b7867f57f-9d69j   1/1     Running   0          82s
my-deployment-7b7867f57f-dbrm7   1/1     Running   0          82s
my-deployment-7b7867f57f-hlfht   1/1     Running   0          82s
my-deployment-7b7867f57f-hrx62   1/1     Running   0          82s
my-deployment-7b7867f57f-jsj96   1/1     Running   0          82s
my-deployment-7b7867f57f-r97nb   1/1     Running   0          82s
my-deployment-7b7867f57f-rcj7b   1/1     Running   0          82s
my-deployment-7b7867f57f-vnhw7   1/1     Running   0          82s
```

Step 5: Accessing the application running in the pods

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ curl localhost:30002
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```



Step 6: Changing the server from nginx to Apache

```
! deployment.yaml
 1   apiVersion: apps/v1
 2   kind: Deployment
 3   metadata:
 4     name: my-deployment
 5     labels:
 6       app: web
 7   spec:
 8     replicas: 10
 9     selector:
10       matchLabels:
11         app: web
12     template:
13       metadata:
14         labels:
15           app: web
16       spec:
17         containers:
18         - name: mynginx-server
19           image: httpd
```

Step 7: Apply the changes made in deployment.yaml file using

```
kubectl apply -f deployment.yaml
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl apply -f deployment.yaml
deployment.apps/my-deployment configured
```

Step 8: Check the newly pods being created

Old pods are created and new pods are created. User traffic moves to Apache server pods from Nginx server pods once all the desired number of pods of Apache server are being created.

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get pods
NAME                                READY   STATUS              RESTARTS   AGE
my-deployment-5f65794467-4wm98      0/1     ContainerCreating   0          24s
my-deployment-5f65794467-69jpf      0/1     ContainerCreating   0          24s
my-deployment-5f65794467-cmf8n      0/1     ContainerCreating   0          24s
my-deployment-5f65794467-hdn4q      0/1     ContainerCreating   0          24s
my-deployment-5f65794467-vncdf      0/1     ContainerCreating   0          24s
my-deployment-7b7867f57f-654zr      1/1     Running             0          28m
my-deployment-7b7867f57f-84ks2      1/1     Running             0          28m
my-deployment-7b7867f57f-9d69j      1/1     Running             0          28m
my-deployment-7b7867f57f-dbrm7      1/1     Running             0          28m
my-deployment-7b7867f57f-hlfht      1/1     Running             0          28m
my-deployment-7b7867f57f-hrx62      1/1     Running             0          28m
my-deployment-7b7867f57f-jsj96      1/1     Running             0          28m
my-deployment-7b7867f57f-r97nb      1/1     Running             0          28m
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get all
NAME                                READY   STATUS              RESTARTS   AGE
pod/my-deployment-5f65794467-4wm98      0/1     ContainerCreating   0          52s
pod/my-deployment-5f65794467-69jpf      0/1     ContainerCreating   0          52s
pod/my-deployment-5f65794467-cmf8n      0/1     ContainerCreating   0          52s
pod/my-deployment-5f65794467-hdn4q      0/1     ContainerCreating   0          52s
pod/my-deployment-5f65794467-vncdf      0/1     ContainerCreating   0          52s
pod/my-deployment-7b7867f57f-654zr      1/1     Running             0          29m
pod/my-deployment-7b7867f57f-84ks2      1/1     Running             0          29m
pod/my-deployment-7b7867f57f-9d69j      1/1     Running             0          29m
pod/my-deployment-7b7867f57f-dbrm7      1/1     Running             0          29m
pod/my-deployment-7b7867f57f-hlfht      1/1     Running             0          29m
pod/my-deployment-7b7867f57f-hrx62      1/1     Running             0          29m
pod/my-deployment-7b7867f57f-jsj96      1/1     Running             0          29m
pod/my-deployment-7b7867f57f-r97nb      1/1     Running             0          29m

NAME                     TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
service/kubernetes       ClusterIP   10.96.0.1        <none>        443/TCP        18d
service/my-service-web   NodePort    10.105.146.135   <none>        80:30002/TCP   29m

NAME                            READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-deployment   8/10    5            8           29m

NAME                                       DESIRED   CURRENT   READY   AGE
replicaset.apps/my-deployment-5f65794467   5         5         0       52s
replicaset.apps/my-deployment-7b7867f57f   8         8         8       29m
```

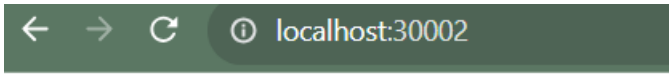
(In this image above, pods of nginx server have been reduced to 8 from 10 and pods of Apache server has increased to 5).

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
my-deployment-5f65794467-4spmq      1/1     Running   0          50s
my-deployment-5f65794467-4wm98      1/1     Running   0          3m44s
my-deployment-5f65794467-5qpnt      1/1     Running   0          43s
my-deployment-5f65794467-69jpf      1/1     Running   0          3m44s
my-deployment-5f65794467-8bt6k      1/1     Running   0          33s
my-deployment-5f65794467-cmf8n      1/1     Running   0          3m44s
my-deployment-5f65794467-hdn4q      1/1     Running   0          3m44s
my-deployment-5f65794467-kfk75      1/1     Running   0          38s
my-deployment-5f65794467-mgzxp      1/1     Running   0          58s
my-deployment-5f65794467-vncdf      1/1     Running   0          3m44s

91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get all
NAME                                    READY   STATUS    RESTARTS   AGE
pod/my-deployment-5f65794467-4spmq      1/1     Running   0          56s
pod/my-deployment-5f65794467-4wm98      1/1     Running   0          3m50s
pod/my-deployment-5f65794467-5qpnt      1/1     Running   0          49s
pod/my-deployment-5f65794467-69jpf      1/1     Running   0          3m50s
pod/my-deployment-5f65794467-8bt6k      1/1     Running   0          39s
pod/my-deployment-5f65794467-cmf8n      1/1     Running   0          3m50s
pod/my-deployment-5f65794467-hdn4q      1/1     Running   0          3m50s
pod/my-deployment-5f65794467-kfk75      1/1     Running   0          44s
pod/my-deployment-5f65794467-mgzxp      1/1     Running   0          64s
pod/my-deployment-5f65794467-vncdf      1/1     Running   0          3m50s

NAME                     TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
service/kubernetes       ClusterIP   10.96.0.1        <none>        443/TCP        18d
service/my-service-web   NodePort    10.105.146.135   <none>        80:30002/TCP   32m

NAME                                READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-deployment       10/10   10           10          32m

NAME                                           DESIRED   CURRENT   READY   AGE
replicaset.apps/my-deployment-5f65794467       10        10        10      3m50s
replicaset.apps/my-deployment-7b7867f57f       0         0         0       32m
```

Finally the Apache server pods increases to 10 (as required) and all the pods of Nginx server goes down.

Step 9: Access the Apache server application running on the same port 30002 after all its pods are created

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ curl localhost:30002
<html><body><h1>It works!</h1></body></html>
```



It works!

Step 10: Roll back to the previous version (i.e. running the pods of nginx again)

kubectl rollout undo deployment <name_of_deployment>

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl rollout undo deployment my-deployment
deployment.apps/my-deployment rolled back
```

Since we rolled back to the previous version, the number of pods of Apache server must decrease and that of Nginx server must increase.

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get all
NAME                                    READY   STATUS              RESTARTS   AGE
pod/my-deployment-5f65794467-4spmq      1/1     Running             0          19m
pod/my-deployment-5f65794467-4wm98      1/1     Running             0          22m
pod/my-deployment-5f65794467-5qpnt      1/1     Running             0          18m
pod/my-deployment-5f65794467-69jpf      1/1     Running             0          22m
pod/my-deployment-5f65794467-mgzxp      1/1     Running             0          19m
pod/my-deployment-5f65794467-vncdf      1/1     Running             0          22m
pod/my-deployment-7b7867f57f-4ksks      0/1     ContainerCreating   0          18s
pod/my-deployment-7b7867f57f-cjzv9      0/1     ContainerCreating   0          18s
pod/my-deployment-7b7867f57f-m4gg2      0/1     ContainerCreating   0          4s
pod/my-deployment-7b7867f57f-pps6l      1/1     Running             0          18s
pod/my-deployment-7b7867f57f-rjfnd      1/1     Running             0          18s
pod/my-deployment-7b7867f57f-vv5zm      0/1     ContainerCreating   0          18s
pod/my-deployment-7b7867f57f-xfpqh      0/1     ContainerCreating   0          9s

NAME                     TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
service/kubernetes       ClusterIP   10.96.0.1        <none>        443/TCP        18d
service/my-service-web   NodePort    10.105.146.135   <none>        80:30002/TCP   50m

NAME                            READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-deployment   8/10    7            8           50m

NAME                                       DESIRED   CURRENT   READY   AGE
replicaset.apps/my-deployment-5f65794467   6         6         6       22m
replicaset.apps/my-deployment-7b7867f57f   7         7         2       50m
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get pods
NAME                             READY   STATUS              RESTARTS   AGE
my-deployment-5f65794467-4spmq   1/1     Running             0          19m
my-deployment-5f65794467-4wm98   1/1     Running             0          22m
my-deployment-5f65794467-5qpnt   1/1     Running             0          19m
my-deployment-5f65794467-mgzxp   1/1     Running             0          19m
my-deployment-5f65794467-vncdf   1/1     Running             0          22m
my-deployment-7b7867f57f-4ksks   1/1     Running             0          23s
my-deployment-7b7867f57f-cjzv9   0/1     ContainerCreating   0          23s
my-deployment-7b7867f57f-cmxz9   0/1     ContainerCreating   0          4s
my-deployment-7b7867f57f-m4gg2   0/1     ContainerCreating   0          9s
my-deployment-7b7867f57f-pps6l   1/1     Running             0          23s
my-deployment-7b7867f57f-rjfnd   1/1     Running             0          23s
my-deployment-7b7867f57f-vv5zm   0/1     ContainerCreating   0          23s
my-deployment-7b7867f57f-xfpqh   0/1     ContainerCreating   0          14s
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get all
NAME                                 READY   STATUS              RESTARTS   AGE
pod/my-deployment-5f65794467-4spmq   1/1     Running             0          19m
pod/my-deployment-5f65794467-5qpnt   1/1     Running             0          19m
pod/my-deployment-5f65794467-mgzxp   1/1     Running             0          19m
pod/my-deployment-5f65794467-vncdf   1/1     Running             0          22m
pod/my-deployment-7b7867f57f-4ksks   1/1     Running             0          26s
pod/my-deployment-7b7867f57f-76mlf   0/1     ContainerCreating   0          2s
pod/my-deployment-7b7867f57f-cjzv9   1/1     Running             0          26s
pod/my-deployment-7b7867f57f-cmxz9   0/1     ContainerCreating   0          7s
pod/my-deployment-7b7867f57f-m4gg2   0/1     ContainerCreating   0          12s
pod/my-deployment-7b7867f57f-pps6l   1/1     Running             0          26s
pod/my-deployment-7b7867f57f-rjfnd   1/1     Running             0          26s
pod/my-deployment-7b7867f57f-vv5zm   0/1     ContainerCreating   0          26s
pod/my-deployment-7b7867f57f-xfpqh   0/1     ContainerCreating   0          17s

NAME                     TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)        AGE
service/kubernetes       ClusterIP   10.96.0.1       <none>        443/TCP        18d
service/my-service-web   NodePort    10.105.146.135  <none>        80:30002/TCP   51m

NAME                            READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-deployment   8/10    9            8           50m

NAME                                       DESIRED   CURRENT   READY   AGE
replicaset.apps/my-deployment-5f65794467   4         4         4       22m
replicaset.apps/my-deployment-7b7867f57f   9         9         4       50m
```

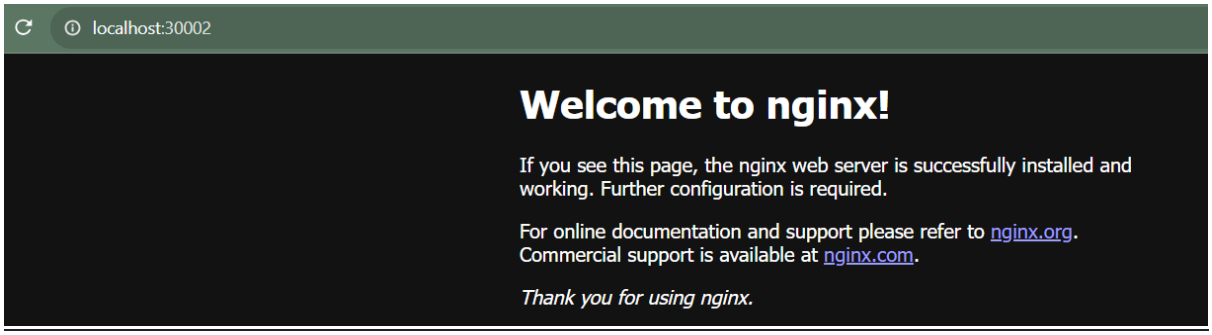
```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get all
NAME                                 READY   STATUS              RESTARTS   AGE
pod/my-deployment-5f65794467-4spmq   1/1     Terminating         0          19m
pod/my-deployment-5f65794467-5qpnt   1/1     Running             0          19m
pod/my-deployment-5f65794467-mgzxp   1/1     Running             0          19m
pod/my-deployment-7b7867f57f-4ksks   1/1     Running             0          34s
pod/my-deployment-7b7867f57f-76mlf   0/1     ContainerCreating   0          10s
pod/my-deployment-7b7867f57f-cjzv9   1/1     Running             0          34s
pod/my-deployment-7b7867f57f-cmxz9   0/1     ContainerCreating   0          15s
pod/my-deployment-7b7867f57f-m4gg2   0/1     ContainerCreating   0          20s
pod/my-deployment-7b7867f57f-pps6l   1/1     Running             0          34s
pod/my-deployment-7b7867f57f-rjfnd   1/1     Running             0          34s
pod/my-deployment-7b7867f57f-vv5zm   1/1     Running             0          34s
pod/my-deployment-7b7867f57f-xfpqh   1/1     Running             0          25s
pod/my-deployment-7b7867f57f-xpvdl   0/1     ContainerCreating   0          6s

NAME                     TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
service/kubernetes       ClusterIP   10.96.0.1        <none>        443/TCP        18d
service/my-service-web   NodePort    10.105.146.135   <none>        80:30002/TCP   51m

NAME                            READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-deployment   8/10    10           8           50m

NAME                                       DESIRED   CURRENT   READY   AGE
replicaset.apps/my-deployment-5f65794467   2         2         2       22m
replicaset.apps/my-deployment-7b7867f57f   10        10        6       50m
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get all
NAME                                 READY   STATUS    RESTARTS   AGE
pod/my-deployment-7b7867f57f-4ksks   1/1     Running   0          53s
pod/my-deployment-7b7867f57f-76mlf   1/1     Running   0          29s
pod/my-deployment-7b7867f57f-cjzv9   1/1     Running   0          53s
pod/my-deployment-7b7867f57f-cmxz9   1/1     Running   0          34s
pod/my-deployment-7b7867f57f-m4gg2   1/1     Running   0          39s
pod/my-deployment-7b7867f57f-pps6l   1/1     Running   0          53s
pod/my-deployment-7b7867f57f-rjfnd   1/1     Running   0          53s
pod/my-deployment-7b7867f57f-vv5zm   1/1     Running   0          53s
pod/my-deployment-7b7867f57f-xfpqh   1/1     Running   0          44s
pod/my-deployment-7b7867f57f-xpvdl   1/1     Running   0          25s

NAME                     TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
service/kubernetes       ClusterIP   10.96.0.1        <none>        443/TCP        18d
service/my-service-web   NodePort    10.105.146.135   <none>        80:30002/TCP   51m

NAME                            READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/my-deployment   10/10   10           10          51m

NAME                                       DESIRED   CURRENT   READY   AGE
replicaset.apps/my-deployment-5f65794467   0         0         0       22m
replicaset.apps/my-deployment-7b7867f57f   10        10        10      51m
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get pods
NAME                             READY   STATUS    RESTARTS   AGE
my-deployment-7b7867f57f-4ksks   1/1     Running   0          58s
my-deployment-7b7867f57f-76mlf   1/1     Running   0          34s
my-deployment-7b7867f57f-cjzv9   1/1     Running   0          58s
my-deployment-7b7867f57f-cmxz9   1/1     Running   0          39s
my-deployment-7b7867f57f-m4gg2   1/1     Running   0          44s
my-deployment-7b7867f57f-pps6l   1/1     Running   0          58s
my-deployment-7b7867f57f-rjfnd   1/1     Running   0          58s
my-deployment-7b7867f57f-vv5zm   1/1     Running   0          58s
my-deployment-7b7867f57f-xfpqh   1/1     Running   0          49s
my-deployment-7b7867f57f-xpvdl   1/1     Running   0          30s
```

Step11: Access the server again running on port '30002'

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ curl localhost:30002
<!DOCTYPE html>
<html>
<head>
<title>Welcome to nginx!</title>
<style>
html { color-scheme: light dark; }
body { width: 35em; margin: 0 auto;
font-family: Tahoma, Verdana, Arial, sans-serif; }
</style>
</head>
<body>
<h1>Welcome to nginx!</h1>
<p>If you see this page, the nginx web server is successfully installed and
working. Further configuration is required.</p>

<p>For online documentation and support please refer to
<a href="http://nginx.org/">nginx.org</a>.<br/>
Commercial support is available at
<a href="http://nginx.com/">nginx.com</a>.</p>

<p><em>Thank you for using nginx.</em></p>
</body>
</html>
```



Step 12: Delete the Deployment

Delete the Deployment:

```
kubectl delete deployment my-deployment
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl delete deployment my-deployment
deployment.apps "my-deployment" deleted
```

```
91983@DELL MINGW64 ~/OneDrive/Desktop/SEM5/Kubernetes (main)
$ kubectl get deployments
No resources found in default namespace.
```

Conclusion

This exercise demonstrated how to create, manage, and update a Deployment in Kubernetes. You learned how to scale the Deployment, update the image, and perform a rolling update to the Deployment. Experiment further with different configurations and update strategies to deepen your understanding of managing Deployments in Kubernetes.