Practical-10

Aim: Orchestration of ML project containers using Kubernetes.

The objective of this lab is to introduce you to the fundamentals of orchestrating applications with Kubernetes. You will learn how to define, deploy, and manage containerized applications using Kubernetes manifests.

Step 1: Verify Kubernetes Cluster

Ensure your Kubernetes cluster is up and running by checking the cluster nodes:

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl get nodes
NAME             STATUS   ROLES           AGE   VERSION
docker-desktop   Ready    control-plane   29m   v1.28.2
```

Step 2: Define a Deployment using YAML manifest and apply the deployment to your cluster:

ml-deployment.yaml

Practical 10 > ml-deployment.yaml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ml-deployment
spec:
  replicas: 3
  selector:
    matchLabels:
      app: ml-app
  template:
    metadata:
      labels:
        app: ml-app
    spec:
      containers:
      - name: ml-container
        image: pr10
        ports:
        - containerPort: 8080

```

Apply the deployment:

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl apply -f ml-deployment.yaml
deployment.apps/ml-deployment created
```

Step 3: Describe Deployment

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl describe deployment ml-deployment
Name:                   ml-deployment
Namespace:              default
CreationTimestamp:      Fri, 01 Dec 2023 12:35:33 +0530
Labels:                 <none>
Annotations:            deployment.kubernetes.io/revision: 1
Selector:               app=ml-app
Replicas:               3 desired | 3 updated | 3 total | 0 available | 3 unavailable
StrategyType:           RollingUpdate
MinReadySeconds:        0
RollingUpdateStrategy:  25% max unavailable, 25% max surge
Pod Template:
  Labels:  app=ml-app
  Containers:
   ml-container:
    Image:        pr10
    Port:         8080/TCP
    Host Port:    0/TCP
    Environment:  <none>
    Mounts:       <none>
  Volumes:        <none>
Conditions:
  Type           Status  Reason
  ----           ------  ------
  Available      False   MinimumReplicasUnavailable
  Progressing    True    ReplicaSetUpdated
OldReplicaSets:  <none>
NewReplicaSet:   ml-deployment-74b4ddfb79 (3/3 replicas created)
Events:
  Type    Reason             Age   From                   Message
  ----    ------             ----  ----                   -------
  Normal  ScalingReplicaSet  7s    deployment-controller  Scaled up replica set ml-deployment-74b4ddfb79 to 3
```

Step 4: Expose Service

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl expose deployment ml-deployment --type=NodePort --port=80
service/ml-deployment exposed
```

Step 5: Access the Service

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl get svc ml-deployment
NAME            TYPE       CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
ml-deployment   NodePort   10.101.148.165   <none>        80:32175/TCP   16s
```

Step 6: Scale Deployment

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl scale deployment ml-deployment --replicas=5
deployment.apps/ml-deployment scaled
```

Step 7: Update Deployment

ml-deployment.yaml

Practical 10 > ml-deployment.yaml

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: ml-deployment
spec:
  replicas: 3
  selector:
    matchLabels:
      app: ml-app
  template:
    metadata:
      labels:
        app: ml-app
    spec:
      containers:
      - name: ml-container
        image: pr10_1
        ports:
        - containerPort: 8080

```

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl apply -f ml-deployment.yaml
deployment.apps/ml-deployment configured
```

Step 8: Rollout Status

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl rollout status deployment ml-deployment
Waiting for deployment "ml-deployment" rollout to finish: 1 old replicas are pending termination...
```

Step 9: Rollback Deployment

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl rollout undo deployment ml-deployment
deployment.apps/ml-deployment rolled back
```

Step 10: Delete Resources

```
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl delete deployment ml-deployment
deployment.apps "ml-deployment" deleted
PS C:\Users\Nakul\Downloads\MLOPs\Practicals\Practical 10> kubectl delete svc ml-deployment
service "ml-deployment" deleted
```