Kubernetes Lab Exercises

Exercise 1: Setting Up Your Kubernetes Cluster

- kubectl version –client

```
C:\Users\Yashvi>kubectl version --client
Client Version: v1.32.2
Kustomize Version: v5.5.0
```

- minikube version

```
C:\Users\Yashvi>minikube version
minikube version: v1.36.0
commit: f8f52f5de11fc6ad8244afac475e1d0f96841df1-dirty
```

- minikube start --driver=docker

```
C:\Users\Yashvi>minikube start --driver=docker
* minikube v1.36.0 on Microsoft Windows 11 Home Single Language 10.0.26100.4946 Build
26100.4946
* Using the docker driver based on user configuration
* Using Docker Desktop driver with root privileges
* Starting "minikube" primary control-plane node in "minikube" cluster
* Pulling base image v0.0.47 ...
* Downloading Kubernetes v1.33.1 preload ...
    > gcr.io/k8s-minikube/kicbase...:  502.26 MiB / 502.26 MiB  100.00% 810.85
    > preloaded-images-k8s-v18-v1...:  347.04 MiB / 347.04 MiB  100.00% 428.89
* Creating docker container (CPUs=2, Memory=3900MB) ...
! Failing to connect to https://registry.k8s.io/ from inside the minikube container
* To pull new external images, you may need to configure a proxy: https://minikube.sig
s.k8s.io/docs/reference/networking/proxy/
* Preparing Kubernetes v1.33.1 on Docker 28.1.1 ...
  - Generating certificates and keys ...
  - Booting up control plane ...
  - Configuring RBAC rules ...
* Configuring bridge CNI (Container Networking Interface) ...
* Verifying Kubernetes components...
  - Using image gcr.io/k8s-minikube/storage-provisioner:v5
* Enabled addons: storage-provisioner, default-storageclass
* Done! kubectl is now configured to use "minikube" cluster and "default" namespace by
 default
```

- kubectl cluster-info

```
C:\Users\Yashvi>kubectl cluster-info
Kubernetes control plane is running at https://127.0.0.1:56506
CoreDNS is running at https://127.0.0.1:56506/api/v1/namespaces/kube-system/services/
kube-dns:dns/proxy

To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
```

- kubectl get nodes

```
C:\Users\Yashvi>kubectl get nodes
NAME       STATUS   ROLES           AGE    VERSION
minikube   Ready    control-plane   4m6s   v1.33.1

C:\Users\Yashvi>kubectl get pods -A
NAMESPACE     NAME                               READY   STATUS    RESTARTS        AGE
kube-system   coredns-674b8bbfcf-nrkjc           1/1     Running   0               4m11s
kube-system   etcd-minikube                      1/1     Running   0               4m17s
kube-system   kube-apiserver-minikube            1/1     Running   0               4m18s
kube-system   kube-controller-manager-minikube   1/1     Running   0               4m17s
kube-system   kube-proxy-zc67p                   1/1     Running   0               4m11s
kube-system   kube-scheduler-minikube            1/1     Running   0               4m17s
kube-system   storage-provisioner                1/1     Running   1 (3m49s ago)   4m15s
```

Exercise 2: Creating and Managing Pods

- kubectl run my-nginx --image=nginx --restart=Never

```
C:\Users\Yashvi>kubectl run my-nginx --image=nginx --restart=Never
pod/my-nginx created
```

- kubectl get pods

```
C:\Users\Yashvi>kubectl get pods
NAME       READY   STATUS    RESTARTS   AGE
my-nginx   1/1     Running   0          9m43s
```

- kubectl logs my-nginx

```
C:\Users\Yashvi>kubectl logs my-nginx
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/08/24 20:16:41 [notice] 1#1: using the "epoll" event method
2025/08/24 20:16:41 [notice] 1#1: nginx/1.29.1
2025/08/24 20:16:41 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14+deb12u1)
2025/08/24 20:16:41 [notice] 1#1: OS: Linux 6.6.87.2-microsoft-standard-WSL2
2025/08/24 20:16:41 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/08/24 20:16:41 [notice] 1#1: start worker processes
2025/08/24 20:16:41 [notice] 1#1: start worker process 29
2025/08/24 20:16:41 [notice] 1#1: start worker process 30
2025/08/24 20:16:41 [notice] 1#1: start worker process 31
2025/08/24 20:16:41 [notice] 1#1: start worker process 32
2025/08/24 20:16:41 [notice] 1#1: start worker process 33
2025/08/24 20:16:41 [notice] 1#1: start worker process 34
2025/08/24 20:16:41 [notice] 1#1: start worker process 35
2025/08/24 20:16:41 [notice] 1#1: start worker process 36
2025/08/24 20:16:41 [notice] 1#1: start worker process 37
2025/08/24 20:16:41 [notice] 1#1: start worker process 38
2025/08/24 20:16:41 [notice] 1#1: start worker process 39
2025/08/24 20:16:41 [notice] 1#1: start worker process 40
2025/08/24 20:16:41 [notice] 1#1: start worker process 41
2025/08/24 20:16:41 [notice] 1#1: start worker process 42
2025/08/24 20:16:41 [notice] 1#1: start worker process 43
2025/08/24 20:16:41 [notice] 1#1: start worker process 44
```

- kubectl expose pod my-nginx --type=NodePort --port=80

```
C:\Users\Yashvi>kubectl expose pod my-nginx --type=NodePort --port=80
service/my-nginx exposed
```

```
C:\Users\Yashvi>kubectl get svc
NAME         TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
kubernetes   ClusterIP   10.96.0.1        <none>        443/TCP        78m
my-nginx     NodePort    10.106.170.148   <none>        80:31956/TCP   69s

C:\Users\Yashvi>minikube service my-nginx
|-----------|----------|-------------|---------------------------|
| NAMESPACE |   NAME   | TARGET PORT |            URL            |
|-----------|----------|-------------|---------------------------|
| default   | my-nginx |          80 | http://192.168.49.2:31956 |
|-----------|----------|-------------|---------------------------|
* Starting tunnel for service my-nginx.
|-----------|----------|-------------|------------------------|
| NAMESPACE |   NAME   | TARGET PORT |          URL           |
|-----------|----------|-------------|------------------------|
| default   | my-nginx |             | http://127.0.0.1:49684 |
|-----------|----------|-------------|------------------------|
* Opening service default/my-nginx in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to run it.
```

Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

- kubectl delete pod my-nginx

```
C:\Users\Yashvi>kubectl delete pod my-nginx
pod "my-nginx" deleted

C:\Users\Yashvi>kubectl get pods
No resources found in default namespace.
```

Exercise 3: Working with Deployments

- kubectl create deployment nginx-deployment --image=nginx

```
C:\Users\Yashvi>kubectl create deployment nginx-deployment --image=nginx
deployment.apps/nginx-deployment created
```

- kubectl get deployments

```
C:\Users\Yashvi>kubectl get deployments
NAME               READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment   1/1     1            1           103s

C:\Users\Yashvi>kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
my-nginx                            1/1     Running   0          3m54s
nginx-deployment-6cfb98644c-nx8vr   1/1     Running   0          109s
```

- kubectl scale deployment nginx-deployment --replicas=3

```
C:\Users\Yashvi>kubectl scale deployment nginx-deployment --replicas=3
deployment.apps/nginx-deployment scaled
```

- kubectl get pods

```
C:\Users\Yashvi>kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
my-nginx                            1/1     Running   0          6m57s
nginx-deployment-6cfb98644c-44l5p   1/1     Running   0          81s
nginx-deployment-6cfb98644c-gq4jb   1/1     Running   0          81s
nginx-deployment-6cfb98644c-nx8vr   1/1     Running   0          4m52s
```

- kubectl set image deployment/nginx-deployment nginx=nginx:1.21

```
C:\Users\Yashvi>kubectl set image deployment/nginx-deployment nginx=nginx:1.21
deployment.apps/nginx-deployment image updated
```

- kubectl rollout status deployment/nginx-deployment

```
C:\Users\Yashvi>kubectl rollout status deployment/nginx-deployment
deployment "nginx-deployment" successfully rolled out
```

Exercise 4: Sharing Images

- kubectl expose deployment nginx-deployment --port=80 --target-port=80 \
--type=ClusterIP

```
C:\Users\Yashvi>kubectl expose deployment nginx-deployment --port=80 --target-port=80
--type=ClusterIP
service/nginx-deployment exposed
```

- kubectl expose deployment nginx-deployment --port=80 --target-port=80 --type=NodePort --name=nginx-nodeport

```
C:\Users\Yashvi>kubectl expose deployment nginx-deployment --port=80 --target-port=80
--type=NodePort --name=nginx-nodeport
service/nginx-nodeport exposed
```

- kubectl get svc

```
C:\Users\Yashvi>kubectl get svc
NAME              TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)        AGE
kubernetes        ClusterIP   10.96.0.1        <none>        443/TCP        103m
my-nginx          NodePort    10.106.170.148   <none>        80:31956/TCP   26m
nginx-deployment  ClusterIP   10.109.12.22     <none>        80/TCP         6m5s
nginx-nodeport    NodePort    10.111.155.250   <none>        80:32246/TCP   5s
```

- minikube service nginx-nodeport

```
C:\Users\Yashvi>minikube service nginx-nodeport
|-----------|----------------|-------------|---------------------------|
| NAMESPACE |      NAME      | TARGET PORT |            URL            |
|-----------|----------------|-------------|---------------------------|
| default   | nginx-nodeport |          80 | http://192.168.49.2:32246 |
|-----------|----------------|-------------|---------------------------|
* Starting tunnel for service nginx-nodeport.
|-----------|----------------|-------------|------------------------|
| NAMESPACE |      NAME      | TARGET PORT |          URL           |
|-----------|----------------|-------------|------------------------|
| default   | nginx-nodeport |             | http://127.0.0.1:57162 |
|-----------|----------------|-------------|------------------------|
* Opening service default/nginx-nodeport in default browser...
! Because you are using a Docker driver on windows, the terminal needs to be open to
run it.
```

Welcome to nginx!

If you see this page, the nginx web server is successfully installed and working. Further configuration is required.

For online documentation and support please refer to nginx.org.
Commercial support is available at nginx.com.

Thank you for using nginx.

Exercise 5: ConfigMaps and Secrets

- kubectl create configmap my-config ^
  --from-literal=APP_COLOR=blue ^
  --from-literal=APP_MODE=production

```
C:\Users\Yashvi>kubectl create configmap my-config ^
More?   --from-literal=APP_COLOR=blue ^
More?   --from-literal=APP_MODE=production
configmap/my-config created
```

```
C:\Users\Yashvi>kubectl get configmap my-config -o yaml
apiVersion: v1
data:
  APP_COLOR: blue
  APP_MODE: production
kind: ConfigMap
metadata:
  creationTimestamp: "2025-08-24T21:07:13Z"
  name: my-config
  namespace: default
  resourceVersion: "6100"
  uid: 71905be5-6c07-45c5-a662-43a88bb21e0f
```

- kubectl apply -f pod-configmap.yaml

```yaml
! pod-configmap.yaml > apiVersion
      io.k8s.api.core.v1.Pod (v1@pod.json)
1   apiVersion: v1
2   kind: Pod
3   metadata:
4     name: configmap-pod
5   spec:
6     containers:
7     - name: myapp
8       image: nginx
9       envFrom:
10      - configMapRef:
11          name: my-config
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl apply -f pod-configmap.yaml
pod/configmap-pod created
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
configmap-pod                       1/1     Running   0          4m31s
my-nginx                            1/1     Running   0          15h
nginx-deployment-88d8df67f-jdxgg    1/1     Running   0          15h
nginx-deployment-88d8df67f-lcmrr    1/1     Running   0          15h
nginx-deployment-88d8df67f-zk4ps    1/1     Running   0          15h
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl exec -it configmap-pod -- sh -c "env | grep APP_"
APP_MODE=production
APP_COLOR=blue
```

- kubectl create secret generic my-secret ^
  --from-literal=DB_USER=admin ^
  --from-literal=DB_PASS=password123

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
kubectl create secret generic my-secret --from-literal=DB_USER=admin --from-
literal=DB_PASS=password123
secret/my-secret created
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl get secret my-secret -o yaml
apiVersion: v1
data:
  DB_PASS: cGFzc3dvcmQxMjM=
  DB_USER: YWRtaW4=
kind: Secret
metadata:
  creationTimestamp: "2025-08-25T11:58:33Z"
  name: my-secret
  namespace: default
  resourceVersion: "14520"
  uid: 5f745ae2-7838-489b-9bbe-27ad1db05ff0
type: Opaque
```

- kubectl apply -f pod-secret.yaml

pod-secret.yaml > apiVersion
io.k8s.api.core.v1.Pod (v1@pod.json)

```yaml
apiVersion: v1
kind: Pod
metadata:
  name: secret-pod
spec:
  containers:
  - name: myapp
    image: nginx
    env:
    - name: DB_USER
      valueFrom:
        secretKeyRef:
          name: my-secret
          key: DB_USER
    - name: DB_PASS
      valueFrom:
        secretKeyRef:
          name: my-secret
          key: DB_PASS
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl apply -f pod-secret.yaml
pod/secret-pod created
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl exec -it secret-pod -- env | Select-String "DB_"

DB_USER=admin
DB_PASS=password123
```

Exercise 6: Persistent Volumes (PVs) and Persistent Volume Claims (PVCs)

- kubectl apply -f pv.yaml

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl apply -f pv.yaml
persistentvolume/demo-pv created
```

```yaml
! pv.yaml > apiVersion
      io.k8s.api.core.v1.PersistentVolume (v1@persistentvolume.json)
1   apiVersion: v1
2   kind: PersistentVolume
3   metadata:
4     name: demo-pv
5   spec:
6     capacity:
7       storage: 1Gi
8     accessModes:
9       - ReadWriteOnce
10    persistentVolumeReclaimPolicy: Retain
11    hostPath:
12      path: "/mnt/data"
```

- kubectl apply -f pvc.yaml

```yaml
! pvc.yaml > apiVersion
      io.k8s.api.core.v1.PersistentVolumeClaim (v1@persistentvolumeclaim.json)
1   apiVersion: v1
2   kind: PersistentVolumeClaim
3   metadata:
4     name: demo-pvc
5   spec:
6     accessModes:
7       - ReadWriteOnce
8     resources:
9       requests:
10        storage: 500Mi
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl apply -f pvc.yaml
persistentvolumeclaim/demo-pvc created
```

- kubectl apply -f pod-pvc.yaml

```yaml
! pod-pvc.yaml > apiVersion
      io.k8s.api.core.v1.Pod (v1@pod.json)
1   apiVersion: v1
2   kind: Pod
3   metadata:
4     name: pvc-pod
5   spec:
6     containers:
7       - name: app
8         image: busybox
9         command: [ "sh", "-c", "sleep 3600" ]
10        volumeMounts:
11          - mountPath: "/data"
12            name: demo-storage
13    volumes:
14      - name: demo-storage
15        persistentVolumeClaim:
16          claimName: demo-pvc
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl apply -f pod-pvc.yaml
pod/pvc-pod created
```

- kubectl exec -it pvc-pod -- sh
  / # echo "Hello Kubernetes" > /data/test.txt
  / # cat /data/test.txt

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl exec -it pvc-pod -- sh
/ # echo "Hello Kubernetes" > /data/test.txt
/ # cat /data/test.txt
Hello Kubernetes
/ # exit
```

- kubectl delete pod pvc-pod
  kubectl apply -f pod-pvc.yaml

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl delete pod pvc-pod
pod "pvc-pod" deleted
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl apply -f pod-pvc.yaml
pod/pvc-pod created
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl exec -it pvc-pod -- sh
/ # cat /data/test.txt
Hello Kubernetes
/ #
```

Exercise 7: StatefulSets

- kubectl apply -f mysql-statefulset.yaml

mysql-statefulset.yaml > {} spec
io.k8s.api.apps.v1.StatefulSet (v1@statefulset.json) | io.k8s.api.core.v1.Service (v1@service.json)

```yaml
apiVersion: v1
kind: Service
metadata:
  name: mysql
  labels:
    app: mysql
spec:
  ports:
    - port: 3306
      name: mysql
  clusterIP: None
  selector:
    app: mysql
---
apiVersion: apps/v1
kind: StatefulSet
metadata:
  name: mysql
spec:
  serviceName: mysql
  replicas: 3
  selector:
    matchLabels:
      app: mysql
  template:
    metadata:
      labels:
        app: mysql
    spec:
      containers:
        - name: mysql
          image: mysql:8.0
          ports:
            - containerPort: 3306
              name: mysql
          env:
            - name: MYSQL_ROOT_PASSWORD
              value: "mypassword"
          volumeMounts:
            - name: mysql-persistent-storage
              mountPath: /var/lib/mysql
  volumeClaimTemplates:
    - metadata:
        name: mysql-persistent-storage
      spec:
        accessModes: [ "ReadWriteOnce" ]
        resources:
          requests:
            storage: 1Gi

```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl apply -f mysql-statefulset.yaml
service/mysql created
statefulset.apps/mysql created
```

- kubectl get statefulsets

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl get statefulsets
NAME    READY   AGE
mysql   0/3     73s
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl describe statefulset mysql
Name:               mysql
Namespace:          default
CreationTimestamp:  Mon, 25 Aug 2025 18:40:38 +0530
Selector:           app=mysql
Labels:             <none>
Annotations:        <none>
Replicas:           3 desired | 1 total
Update Strategy:    RollingUpdate
  Partition:        0
Pods Status:        0 Running / 1 Waiting / 0 Succeeded / 0 Failed
Pod Template:
  Labels:  app=mysql
  Containers:
   mysql:
    Image:      mysql:8.0
    Port:       3306/TCP
    Host Port:  0/TCP
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl get pods -l app=mysql
NAME      READY   STATUS              RESTARTS   AGE
mysql-0   0/1     ContainerCreating   0          3m29s
```

- kubectl exec -it mysql-0 -c mysql -- mysql -u root -p

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl exec -it mysql-0 -c mysql -- mysql -u root -p
Enter password:
Welcome to the MySQL monitor.  Commands end with ; or \g.
Your MySQL connection id is 9
Server version: 8.0.43 MySQL Community Server - GPL

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affiliates. Other names may be trademarks of their respective
owners.

Type 'help;' or '\h' for help. Type '\c' to clear the current input stateme
nt.

mysql>
```

Exercise 8: Docker Compose Basics

nginx-deployment.yaml > {} spec > {} template > {}
io.k8s.api.apps.v1.Deployment (v1@deployment.json)

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
spec:
  replicas: 1
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx
        ports:
        - containerPort: 80
        resources:
          requests:
            cpu: "100m"
          limits:
            cpu: "200m"
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl set image deployment/nginx-deployment nginx=nginx:1.25
deployment.apps/nginx-deployment image updated
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl scale deployment nginx-deployment --replicas=3
deployment.apps/nginx-deployment scaled
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl get deployment
NAME               READY   UP-TO-DATE   AVAILABLE   AGE
nginx-deployment   3/3     1            3           17h
```

- minikube addons enable metrics-server

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 minikube addons enable metrics-server
💡  metrics-server is an addon maintained by Kubernetes. For any concerns c
ontact minikube on GitHub.
You can view the list of minikube maintainers at: https://github.com/kubern
etes/minikube/blob/master/OWNERS
    ▪ Using image registry.k8s.io/metrics-server/metrics-server:v0.7.2
🌟  The 'metrics-server' addon is enabled
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl get deployment metrics-server -n kube-system
NAME             READY   UP-TO-DATE   AVAILABLE   AGE
metrics-server   0/1     1            0           81s
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl top nodes
NAME       CPU(cores)   CPU(%)   MEMORY(bytes)   MEMORY(%)
minikube   250m         1%       2254Mi          29%
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
 kubectl top pods
NAME                                CPU(cores)   MEMORY(bytes)
configmap-pod                       0m           13Mi
my-nginx                            0m           12Mi
mysql-0                             9m           460Mi
mysql-1                             9m           456Mi
mysql-2                             9m           456Mi
nginx-deployment-5c989f4f99-b88tw   0m           13Mi
nginx-deployment-5c989f4f99-pl25b   0m           13Mi
nginx-deployment-5c989f4f99-rjxbg   0m           13Mi
pvc-pod                             0m           0Mi
secret-pod                          0m           15Mi
```

- kubectl autoscale deployment nginx-deployment ^
  --cpu-percent=50 ^
  --min=1 ^
  --max=5

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
kubectl autoscale deployment nginx-deployment --cpu-percent=50 --min=1 --max
=5
horizontalpodautoscaler.autoscaling/nginx-deployment autoscaled
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>  kubectl get hpa
NAME               REFERENCE                     TARGETS              MINPODS   MAXPODS   REPLICAS   AGE
nginx-deployment   Deployment/nginx-deployment   cpu: <unknown>/50%   1         5         3          75s
```

- kubectl run -i --tty load-generator --image=busybox /bin/sh
  / # while true; do wget -q -O- http://nginx-deployment; done

```
<!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>
^C
/ # exit
Session ended, resume using 'kubectl attach load-generator -c load-generator -i -t' command whe
n the pod is running
```

```
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice> kubectl get hpa
NAME               REFERENCE                     TARGETS             MINPODS   MAXPODS   REPLICAS   AGE
nginx-deployment   Deployment/nginx-deployment   cpu: <unknown>/50%   1         5         3          11m
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice> kubectl get pods
NAME                                READY   STATUS    RESTARTS        AGE
configmap-pod                       1/1     Running   0               139m
load-generator                      1/1     Running   1 (2m40s ago)   4m9s
my-nginx                            1/1     Running   0               17h
mysql-0                             1/1     Running   0               53m
mysql-1                             1/1     Running   0               48m
mysql-2                             1/1     Running   0               48m
nginx-deployment-5c989f4f99-b88tw   1/1     Running   0               20m
nginx-deployment-5c989f4f99-pl25b   1/1     Running   0               20m
nginx-deployment-5c989f4f99-rjxbg   1/1     Running   0               22m
pvc-pod                             1/1     Running   0               58m
secret-pod                          1/1     Running   0               117m
PS C:\Users\Yashvi\Desktop\Training Notes\DevOps_Notes\Kubernetes-Practice>
```

Exercise 9: Helm Basics

- choco install kubernetes-helm

```
PS C:\Windows\system32> choco install kubernetes-helm
Chocolatey v2.5.0
Installing the following packages:
kubernetes-helm
By installing, you accept licenses for the packages.
Downloading package from source 'https://community.chocolatey.org/api/v2/'
Progress: Downloading kubernetes-helm 3.18.5... 100%

kubernetes-helm v3.18.5 [Approved]
kubernetes-helm package files install completed. Performing other installation steps.
The package kubernetes-helm wants to run 'chocolateyInstall.ps1'.
Note: If you don't run this script, the installation will fail.
Note: To confirm automatically next time, use '-y' or consider:
choco feature enable -n allowGlobalConfirmation
Do you want to run the script?([Y]es/[A]ll scripts/[N]o/[P]rint): y

Downloading kubernetes-helm 64 bit
  from 'https://get.helm.sh/helm-v3.18.5-windows-amd64.zip'
Progress: 100% - Completed download of C:\Users\Yashvi\AppData\Local\Temp\chocolatey\
kubernetes-helm\3.18.5\helm-v3.18.5-windows-amd64.zip (17.59 MB).
Download of helm-v3.18.5-windows-amd64.zip (17.59 MB) completed.
Hashes match.
Extracting C:\Users\Yashvi\AppData\Local\Temp\chocolatey\kubernetes-helm\3.18.5\helm-
v3.18.5-windows-amd64.zip to C:\ProgramData\chocolatey\lib\kubernetes-helm\tools...
C:\ProgramData\chocolatey\lib\kubernetes-helm\tools
 ShimGen has successfully created a shim for helm.exe
 The install of kubernetes-helm was successful.
  Deployed to 'C:\ProgramData\chocolatey\lib\kubernetes-helm\tools'

Chocolatey installed 1/1 packages.
 See the log for details (C:\ProgramData\chocolatey\logs\chocolatey.log).
```

- helm repo add bitnami https://charts.bitnami.com/bitnami

```
C:\Users\Yashvi>helm repo add bitnami https://charts.bitnami.com/bitnami
"bitnami" has been added to your repositories

C:\Users\Yashvi>helm repo update
Hang tight while we grab the latest from your chart repositories...
...Successfully got an update from the "bitnami" chart repository
Update Complete. ⎈Happy Helming!⎈

C:\Users\Yashvi>helm repo list
NAME    URL
bitnami https://charts.bitnami.com/bitnami
```

- helm install my-nginx-release bitnami/nginx

```
C:\Users\Yashvi>helm install my-nginx-release bitnami/nginx
NAME: my-nginx-release
LAST DEPLOYED: Mon Aug 25 20:27:34 2025
NAMESPACE: default
STATUS: deployed
REVISION: 1
TEST SUITE: None
NOTES:
CHART NAME: nginx
CHART VERSION: 21.1.23
APP VERSION: 1.29.1
```

- helm list

```
C:\Users\Yashvi>helm list
NAME                    NAMESPACE       REVISION        UPDATED
                      STATUS          CHART           APP VERSION
my-nginx-release        default         1               2025-08-25 20:27:34.52
3555 +0530 IST        deployed        nginx-21.1.23   1.29.1

C:\Users\Yashvi>kubectl get svc
NAME               TYPE           CLUSTER-IP       EXTERNAL-IP   PORT(S)
               AGE
kubernetes         ClusterIP      10.96.0.1        <none>        443/TCP
               19h
my-nginx           NodePort       10.106.170.148   <none>        80:31956/TCP
               18h
my-nginx-release   LoadBalancer   10.97.63.29      <pending>     80:30597/TCP,
443:30334/TCP   2m35s
mysql              ClusterIP      None             <none>        3306/TCP
               109m
nginx-deployment   ClusterIP      10.109.12.22     <none>        80/TCP
               18h
nginx-nodeport     NodePort       10.111.155.250   <none>        80:32246/TCP
               18h

C:\Users\Yashvi>kubectl get pods
NAME                                READY   STATUS     RESTARTS        AGE
configmap-pod                       1/1     Running    1 (9m21s ago)   3h15m
load-generator                      1/1     Running    2 (9m21s ago)   60m
my-nginx                            0/1     Error      0               18h
my-nginx-release-7bf7c646fc-sz9bd   0/1     Init:0/1   0               2m42s
mysql-0                             1/1     Running    1 (9m21s ago)   109m
mysql-1                             1/1     Running    1 (9m21s ago)   104m
mysql-2                             1/1     Running    1 (9m21s ago)   104m
nginx-deployment-5c989f4f99-b88tw   1/1     Running    1 (9m21s ago)   76m
nginx-deployment-5c989f4f99-pl25b   1/1     Running    1 (9m21s ago)   76m
nginx-deployment-5c989f4f99-rjxbg   1/1     Running    1 (9m21s ago)   78m
pvc-pod                             1/1     Running    2 (9m21s ago)   114m
secret-pod                          1/1     Running    1 (9m21s ago)   173m
```

Exercise 10: Debugging and Troubleshooting

- kubectl describe pod my-nginx-release

```
C:\Users\Yashvi>kubectl describe pod my-nginx-release
Name:             my-nginx-release-7bf7c646fc-sz9bd
Namespace:        default
Priority:         0
Service Account:  my-nginx-release
Node:             minikube/192.168.49.2
Start Time:       Mon, 25 Aug 2025 20:27:35 +0530
Labels:           app.kubernetes.io/instance=my-nginx-release
                  app.kubernetes.io/managed-by=Helm
                  app.kubernetes.io/name=nginx
                  app.kubernetes.io/version=1.29.1
                  helm.sh/chart=nginx-21.1.23
                  pod-template-hash=7bf7c646fc
Annotations:      <none>
Status:           Running
IP:               10.244.0.35
IPs:
  IP:           10.244.0.35
Controlled By:  ReplicaSet/my-nginx-release-7bf7c646fc
Init Containers:
  preserve-logs-symlinks:
    Container ID:    docker://4bdfed8216d9eb7f4925c3c7c7ccc441e2e44b912d611c76f1b88bf88601b66f
    Image:           docker.io/bitnami/nginx:1.29.1-debian-12-r0
    Image ID:        docker-pullable://bitnami/nginx@sha256:b2e803958eda5723aae1e36ed0e418f6e0c79e7ce890820eba9cad8
5a6381286
    Port:            <none>
    Host Port:       <none>
    SeccompProfile:  RuntimeDefault
    Command:
      /bin/bash
    Args:
      -ec
      #!/bin/bash
      . /opt/bitnami/scripts/libfs.sh
      # We copy the logs folder because it has symlinks to stdout and stderr
      if ! is_dir_empty /opt/bitnami/nginx/logs; then
        cp -r /opt/bitnami/nginx/logs /emptydir/app-logs-dir
      fi

    State:          Terminated
      Reason:       Completed
```

- kubectl get nodes

  kubectl get pods -o wide

```
C:\Users\Yashvi>kubectl get nodes
NAME       STATUS   ROLES           AGE   VERSION
minikube   Ready    control-plane   19h   v1.33.1

C:\Users\Yashvi>kubectl get pods -o wide
NAME                                READY   STATUS    RESTARTS      AGE     IP            NODE       NOMINATED NODE   READINES
S GATES
configmap-pod                       1/1     Running   1 (17m ago)   3h23m   10.244.0.29   minikube   <none>           <none>
load-generator                      1/1     Running   2 (17m ago)   68m     10.244.0.23   minikube   <none>           <none>
my-nginx                            0/1     Error     0             18h     <none>        minikube   <none>           <none>
my-nginx-release-7bf7c646fc-sz9bd   1/1     Running   0             11m     10.244.0.35   minikube   <none>           <none>
mysql-0                             1/1     Running   1 (17m ago)   117m    10.244.0.27   minikube   <none>           <none>
mysql-1                             1/1     Running   1 (17m ago)   113m    10.244.0.28   minikube   <none>           <none>
mysql-2                             1/1     Running   1 (17m ago)   113m    10.244.0.32   minikube   <none>           <none>
nginx-deployment-5c989f4f99-b88tw   1/1     Running   1 (17m ago)   84m     10.244.0.33   minikube   <none>           <none>
nginx-deployment-5c989f4f99-pl25b   1/1     Running   1 (17m ago)   84m     10.244.0.34   minikube   <none>           <none>
nginx-deployment-5c989f4f99-rjxbg   1/1     Running   1 (17m ago)   87m     10.244.0.24   minikube   <none>           <none>
pvc-pod                             1/1     Running   2 (17m ago)   122m    10.244.0.30   minikube   <none>           <none>
secret-pod                          1/1     Running   1 (17m ago)   3h1m    10.244.0.25   minikube   <none>           <none>
```

- kubectl get events --sort-by=.metadata.creationTimestamp

```
C:\Users\Yashvi>kubectl get events --sort-by=.metadata.creationTimestamp
LAST SEEN   TYPE      REASON                          OBJECT
   MESSAGE
66m         Normal    Pulling                         pod/pvc-pod
   Pulling image "busybox"
65m         Normal    Started                         pod/pvc-pod
   Started container app
65m         Normal    Created                         pod/pvc-pod
   Created container: app
90m         Normal    SuccessfulCreate                replicaset/nginx-deployment-5c989f4f99
   Created pod: nginx-deployment-5c989f4f99-rjxbg
90m         Normal    Scheduled                       pod/nginx-deployment-5c989f4f99-rjxbg
   Successfully assigned default/nginx-deployment-5c989f4f99-rjxbg to minikube
90m         Normal    ScalingReplicaSet               deployment/nginx-deployment
   Scaled up replica set nginx-deployment-5c989f4f99 from 0 to 1
90m         Normal    Pulling                         pod/nginx-deployment-5c989f4f99-rjxbg
   Pulling image "nginx:1.25"
88m         Normal    Killing                         pod/nginx-deployment-88d8df67f-jdxgg
   Stopping container nginx
88m         Normal    Scheduled                       pod/nginx-deployment-5c989f4f99-pl25b
   Successfully assigned default/nginx-deployment-5c989f4f99-pl25b to minikube
88m         Normal    SuccessfulCreate                replicaset/nginx-deployment-5c989f4f99
   Created pod: nginx-deployment-5c989f4f99-pl25b
88m         Normal    SuccessfulDelete                replicaset/nginx-deployment-88d8df67f
   Deleted pod: nginx-deployment-88d8df67f-jdxgg
88m         Normal    Started                         pod/nginx-deployment-5c989f4f99-rjxbg
   Started container nginx
88m         Normal    Created                         pod/nginx-deployment-5c989f4f99-rjxbg
   Created container: nginx
88m         Normal    Pulled                          pod/nginx-deployment-5c989f4f99-rjxbg
   Successfully pulled image "nginx:1.25" in 2m3.67s (2m3.67s including waiting). Image size:
 187659947 bytes.
88m         Normal    ScalingReplicaSet               deployment/nginx-deployment
   Scaled down replica set nginx-deployment-88d8df67f from 3 to 2
88m         Normal    ScalingReplicaSet               deployment/nginx-deployment
   Scaled up replica set nginx-deployment-5c989f4f99 from 1 to 2
88m         Normal    Pulling                         pod/nginx-deployment-5c989f4f99-pl25b
   Pulling image "nginx:1.25"
88m         Normal    ScalingReplicaSet               deployment/nginx-deployment
   Scaled down replica set nginx-deployment-88d8df67f from 2 to 1
```

- kubectl logs my-nginx

```
C:\Users\Yashvi>kubectl logs my-nginx
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform
configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.
sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/de
fault.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/
default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/08/24 20:35:39 [notice] 1#1: using the "epoll" event method
2025/08/24 20:35:39 [notice] 1#1: nginx/1.29.1
2025/08/24 20:35:39 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14+deb12u1)
2025/08/24 20:35:39 [notice] 1#1: OS: Linux 6.6.87.2-microsoft-standard-WSL2
2025/08/24 20:35:39 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/08/24 20:35:39 [notice] 1#1: start worker processes
2025/08/24 20:35:39 [notice] 1#1: start worker process 29
2025/08/24 20:35:39 [notice] 1#1: start worker process 30
2025/08/24 20:35:39 [notice] 1#1: start worker process 31
2025/08/24 20:35:39 [notice] 1#1: start worker process 32
2025/08/24 20:35:39 [notice] 1#1: start worker process 33
2025/08/24 20:35:39 [notice] 1#1: start worker process 34
2025/08/24 20:35:39 [notice] 1#1: start worker process 35
2025/08/24 20:35:39 [notice] 1#1: start worker process 36
2025/08/24 20:35:39 [notice] 1#1: start worker process 37
2025/08/24 20:35:39 [notice] 1#1: start worker process 38
2025/08/24 20:35:39 [notice] 1#1: start worker process 39
2025/08/24 20:35:39 [notice] 1#1: start worker process 40
2025/08/24 20:35:39 [notice] 1#1: start worker process 41
2025/08/24 20:35:39 [notice] 1#1: start worker process 42
2025/08/24 20:35:39 [notice] 1#1: start worker process 43
2025/08/24 20:35:39 [notice] 1#1: start worker process 44
```

- kubectl logs deployment/nginx-deployment

```
C:\Users\Yashvi>kubectl logs deployment/nginx-deployment
Found 3 pods, using pod/nginx-deployment-5c989f4f99-rjxbg
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform
configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.
sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/de
fault.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/
default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2025/08/25 14:51:34 [notice] 1#1: using the "epoll" event method
2025/08/25 14:51:34 [notice] 1#1: nginx/1.25.5
2025/08/25 14:51:34 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2025/08/25 14:51:34 [notice] 1#1: OS: Linux 6.6.87.2-microsoft-standard-WSL2
2025/08/25 14:51:34 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2025/08/25 14:51:34 [notice] 1#1: start worker processes
2025/08/25 14:51:34 [notice] 1#1: start worker process 29
2025/08/25 14:51:34 [notice] 1#1: start worker process 30
2025/08/25 14:51:34 [notice] 1#1: start worker process 31
2025/08/25 14:51:34 [notice] 1#1: start worker process 32
2025/08/25 14:51:34 [notice] 1#1: start worker process 33
2025/08/25 14:51:34 [notice] 1#1: start worker process 34
2025/08/25 14:51:34 [notice] 1#1: start worker process 35
2025/08/25 14:51:34 [notice] 1#1: start worker process 36
2025/08/25 14:51:34 [notice] 1#1: start worker process 37
2025/08/25 14:51:34 [notice] 1#1: start worker process 38
2025/08/25 14:51:34 [notice] 1#1: start worker process 39
2025/08/25 14:51:34 [notice] 1#1: start worker process 40
2025/08/25 14:51:34 [notice] 1#1: start worker process 41
2025/08/25 14:51:34 [notice] 1#1: start worker process 42
2025/08/25 14:51:34 [notice] 1#1: start worker process 43
2025/08/25 14:51:34 [notice] 1#1: start worker process 44
```

- kubectl logs mysql-0 -c mysql

```
C:\Users\Yashvi>kubectl logs mysql-0 -c mysql
2025-08-25 14:51:24+00:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 8.0.43-1.el9 started.
2025-08-25 14:51:27+00:00 [Note] [Entrypoint]: Switching to dedicated user 'mysql'
2025-08-25 14:51:27+00:00 [Note] [Entrypoint]: Entrypoint script for MySQL Server 8.0.43-1.el9 started.
'/var/lib/mysql/mysql.sock' -> '/var/run/mysqld/mysqld.sock'
2025-08-25T14:51:30.289103Z 0 [Warning] [MY-011068] [Server] The syntax '--skip-host-cache' is deprecat
ed and will be removed in a future release. Please use SET GLOBAL host_cache_size=0 instead.
2025-08-25T14:51:30.357787Z 0 [System] [MY-010116] [Server] /usr/sbin/mysqld (mysqld 8.0.43) starting a
s process 1
2025-08-25T14:51:30.464450Z 1 [System] [MY-013576] [InnoDB] InnoDB initialization has started.
2025-08-25T14:51:31.217755Z 1 [System] [MY-013577] [InnoDB] InnoDB initialization has ended.
2025-08-25T14:51:31.409011Z 0 [System] [MY-010229] [Server] Starting XA crash recovery...
2025-08-25T14:51:31.428470Z 0 [System] [MY-010232] [Server] XA crash recovery finished.
2025-08-25T14:51:31.569374Z 0 [Warning] [MY-010068] [Server] CA certificate ca.pem is self signed.
2025-08-25T14:51:31.569457Z 0 [System] [MY-013602] [Server] Channel mysql_main configured to support TL
S. Encrypted connections are now supported for this channel.
2025-08-25T14:51:31.576335Z 0 [Warning] [MY-011810] [Server] Insecure configuration for --pid-file: Loc
ation '/var/run/mysqld' in the path is accessible to all OS users. Consider choosing a different direct
ory.
2025-08-25T14:51:31.604104Z 0 [System] [MY-011323] [Server] X Plugin ready for connections. Bind-addres
s: '::' port: 33060, socket: /var/run/mysqld/mysqlx.sock
2025-08-25T14:51:31.604495Z 0 [System] [MY-010931] [Server] /usr/sbin/mysqld: ready for connections. Ve
rsion: '8.0.43'  socket: '/var/run/mysqld/mysqld.sock'  port: 3306  MySQL Community Server - GPL.
```