Kubernetes Retail Application Deployment Documentation

Step 1: Check Kubernetes Cluster

Command:

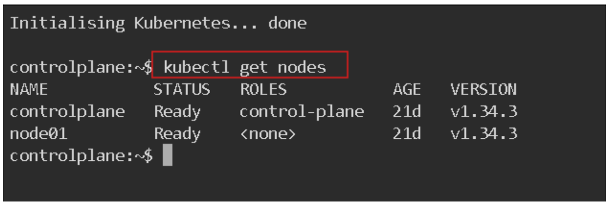
kubectl get nodes

Explanation:

This command checks whether the Kubernetes cluster is running properly. All worker nodes must show the status as **Ready** before proceeding.

If nodes are not ready, the deployments may fail because Kubernetes will not schedule pods on unhealthy nodes.

Image:



```
Initialising Kubernetes... done

controlplane:~$ kubectl get nodes
NAME           STATUS   ROLES           AGE   VERSION
controlplane   Ready    control-plane   21d   v1.34.3
node01         Ready    <none>          21d   v1.34.3
controlplane:~$
```

Screenshot showing all nodes in Ready state.

Or

Step 1: Clone the Repository

Command:

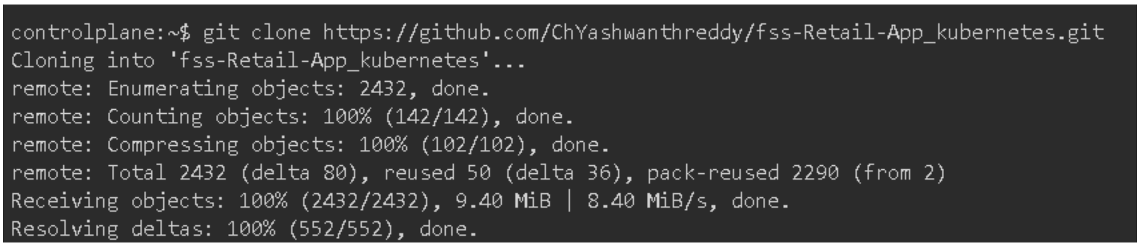
git clone https://github.com/ChYashwanthreddy/fss-Retail-App_kubernetes.git

Explanation:

This command downloads the Retail Kubernetes project from GitHub to the local system.

All required Kubernetes YAML files are already present inside the repository.
This saves time compared to manually creating each YAML file.

Image:



```
controlplane:~$ git clone https://github.com/ChYashwanthreddy/fss-Retail-App_kubernetes.git
Cloning into 'fss-Retail-App_kubernetes'...
remote: Enumerating objects: 2432, done.
remote: Counting objects: 100% (142/142), done.
remote: Compressing objects: 100% (102/102), done.
remote: Total 2432 (delta 80), reused 50 (delta 36), pack-reused 2290 (from 2)
Receiving objects: 100% (2432/2432), 9.40 MiB | 8.40 MiB/s, done.
Resolving deltas: 100% (552/552), done.
```

Screenshot showing repository cloned successfully.

Step 2: Create Namespace

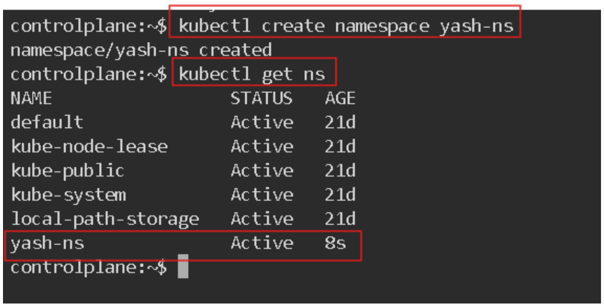
Command:

kubectl create namespace yash-ns
kubectl get ns

Explanation:

We create a namespace called **yash-ns** to logically separate the Retail application resources from other applications running in the cluster.
After creating it, we verify that it appears in the namespace list.

Image:



```
controlplane:~$ kubectl create namespace yash-ns
namespace/yash-ns created
controlplane:~$ kubectl get ns
NAME                 STATUS   AGE
default              Active   21d
kube-node-lease      Active   21d
kube-public          Active   21d
kube-system          Active   21d
local-path-storage   Active   21d
yash-ns              Active   8s
controlplane:~$
```

Screenshot showing yash-ns in namespace list.

Step 3: Create Working Directory

Command:

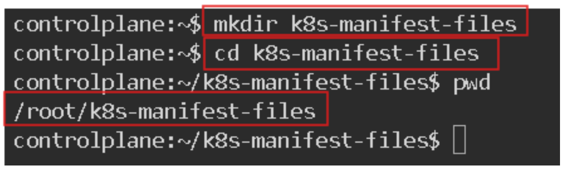
mkdir k8s-manifest-files

navigate to directory cd k8s-manifest-files
pwd

Explanation:

We create a dedicated folder named **k8s-manifest-files** to store all Kubernetes YAML configuration files related to the Retail project. This keeps our project structured and organized.

Image:



```
controlplane:~$ mkdir k8s-manifest-files
controlplane:~$ cd k8s-manifest-files
controlplane:~/k8s-manifest-files$ pwd
/root/k8s-manifest-files
controlplane:~/k8s-manifest-files$ 
```

Screenshot showing directory creation and current path.

YAML Files Creation and Deployment Order

The files are created and applied in the following correct order:

1. ConfigMap
2. Secret
3. MongoDB Deployment
4. MongoDB Service
5. Retail App Deployment
6. Retail App Service

This order is important because deployments depend on ConfigMap and Secret.

Step 4: Create ConfigMap

Command:

```
vi configmap.yaml
```

YAML Content:

```
apiVersion: v1
kind: ConfigMap
metadata:
  name: retail-app-config
  namespace: yash-ns
data:
  MONGODB_URI: "mongodb://mongodb:27017/myDatabase"
  SESSION_SECRET: "1234"
  PORT: "3130"
  MONGO_INITDB_DATABASE: "myDatabase"
```

Save and verify:Esc → :wq

```
cat configmap.yaml
```

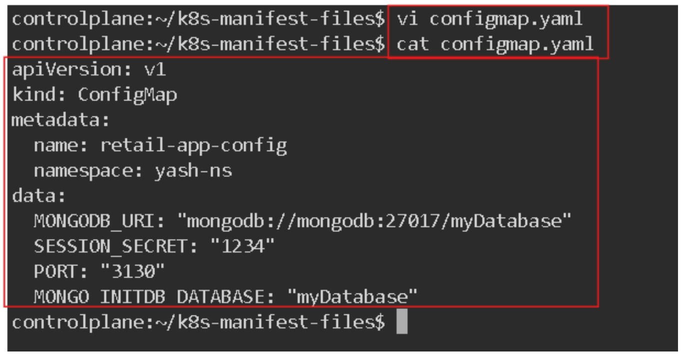
Explanation:

ConfigMap stores non-sensitive configuration values such as:

- Database connection string
- Application port
- Session secret

It separates configuration from application code, which is a best practice in Kubernetes.

Image:

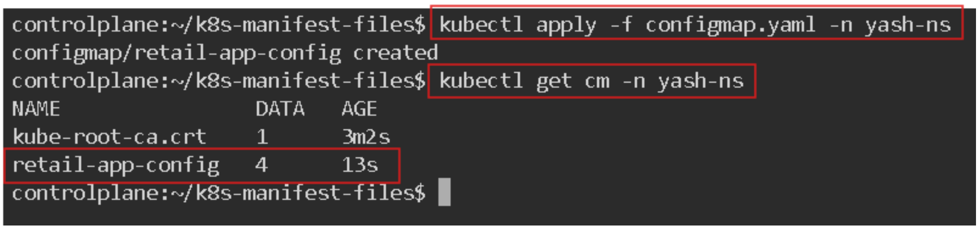


```
controlplane:~/k8s-manifest-files$ vi configmap.yaml
controlplane:~/k8s-manifest-files$ cat configmap.yaml
apiVersion: v1
kind: ConfigMap
metadata:
  name: retail-app-config
  namespace: yash-ns
data:
  MONGODB_URI: "mongodb://mongodb:27017/myDatabase"
  SESSION_SECRET: "1234"
  PORT: "3130"
  MONGO_INITDB_DATABASE: "myDatabase"
controlplane:~/k8s-manifest-files$
```

Apply ConfigMap

kubectl apply -f configmap.yaml -n yash-ns
kubectl get cm -n yash-ns

Image:



```
controlplane:~/k8s-manifest-files$ kubectl apply -f configmap.yaml -n yash-ns
configmap/retail-app-config created
controlplane:~/k8s-manifest-files$ kubectl get cm -n yash-ns
NAME               DATA   AGE
kube-root-ca.crt   1      3m2s
retail-app-config  4      13s
controlplane:~/k8s-manifest-files$
```

Screenshot showing ConfigMap created successfully.

Step 5: Create Secret

Before creating the Secret file, sensitive values must be encoded.

Encode Secret Values

Command:

echo -n "your_email_user" | base64
echo -n "your_email_password" | base64

echo -n "chagantyteja2502@gmail.com" | base64

echo -n "yxoq bjuk rdnt alzp" | base64

Explanation:

- echo -n prints the value without adding a newline.
- base64 converts the value into encoded format.
- Kubernetes Secret requires Base64 encoded values.

Example:

echo -n "chagantyteja2502@gmail.com" | base64

Output:

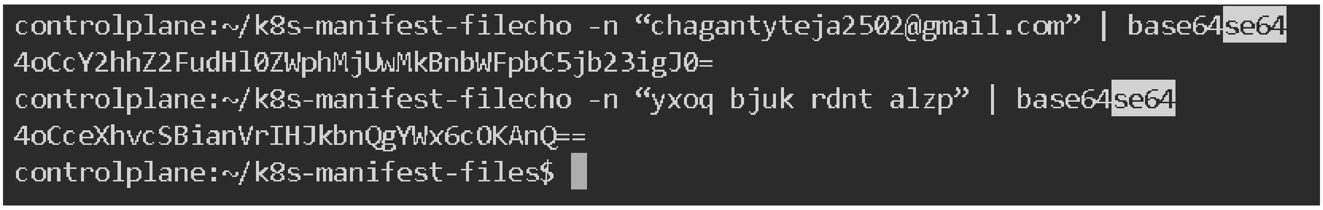
4oCcY2hhZ2FudHl0ZWphMjUwMkBnbWFpbC5jb23igJ0=

echo -n "yxoq bjuk rdnt alzp" | base64

Output:

4oCceXhvcSBianVrIHJkbnQgYWx6cOKAnQ==

Image:



```
controlplane:~/k8s-manifest-filecho -n "chagantyteja2502@gmail.com" | base64se64
4oCcY2hhZ2FudHl0ZWphMjUwMkBnbWFpbC5jb23igJ0=
controlplane:~/k8s-manifest-filecho -n "yxoq bjuk rdnt alzp" | base64se64
4oCceXhvcSBianVrIHJkbnQgYWx6cOKAnQ==
controlplane:~/k8s-manifest-files$ 
```

Create Secret File

Command:

```
vi secret.yaml
```

YAML Content:

```
apiVersion: v1
kind: Secret
metadata:
  name: retail-app-secret
  namespace: yash-ns
type: Opaque
data:
  EMAIL_USER: 4oCcY2hhZ2FudHl0ZWphMjUwMkBnbWFpbC5jb23igJ0=
  EMAIL_PASS: 4oCceXhvcSBianVrIHJkbnQgYWx6cOKAnQ==
```

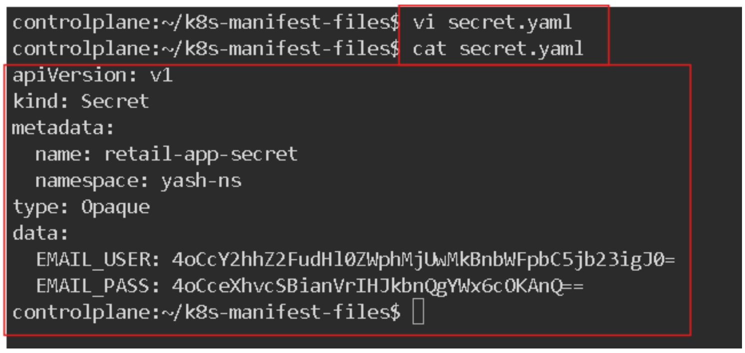
Save and verify:

```
Esc → :wq
cat secret.yaml
```

Explanation:

The Secret file securely stores sensitive information such as email credentials.
The application will read these values securely during runtime.

Image:

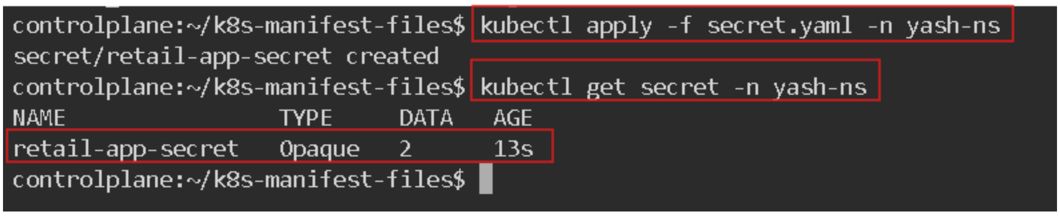


```
controlplane:~/k8s-manifest-files$ vi secret.yaml
controlplane:~/k8s-manifest-files$ cat secret.yaml
apiVersion: v1
kind: Secret
metadata:
  name: retail-app-secret
  namespace: yash-ns
type: Opaque
data:
  EMAIL_USER: 4oCcY2hhZ2FudHl0ZWphMjUwMkBnbWFpbC5jb23igJ0=
  EMAIL_PASS: 4oCceXhvcSBianVrIHJkbnQgYWx6cOKAnQ==
controlplane:~/k8s-manifest-files$ 
```

Apply Secret

```
kubectl apply -f secret.yaml -n yash-ns
kubectl get secret -n yash-ns
```

Image:



```
controlplane:~/k8s-manifest-files$ kubectl apply -f secret.yaml -n yash-ns
secret/retail-app-secret created
controlplane:~/k8s-manifest-files$ kubectl get secret -n yash-ns
NAME                TYPE     DATA   AGE
retail-app-secret   Opaque   2      13s
controlplane:~/k8s-manifest-files$ 
```

Screenshot showing Secret created.

Step 6: Create MongoDB Deployment

Command:

```
vi retail-mongodb-deployment.yaml
```

YAML Content:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: retail-mongodb
  namespace: yash-ns
spec:
  replicas: 1
  selector:
    matchLabels:
      app: mongodb
  template:
    metadata:
      labels:
        app: mongodb
    spec:
      containers:
      - name: mongodb
        image: mongo:latest
        ports:
        - containerPort: 27017
        env:
        - name: MONGO_INITDB_DATABASE
          valueFrom:
            configMapKeyRef:
              name: retail-app-config
              key: MONGO_INITDB_DATABASE
```

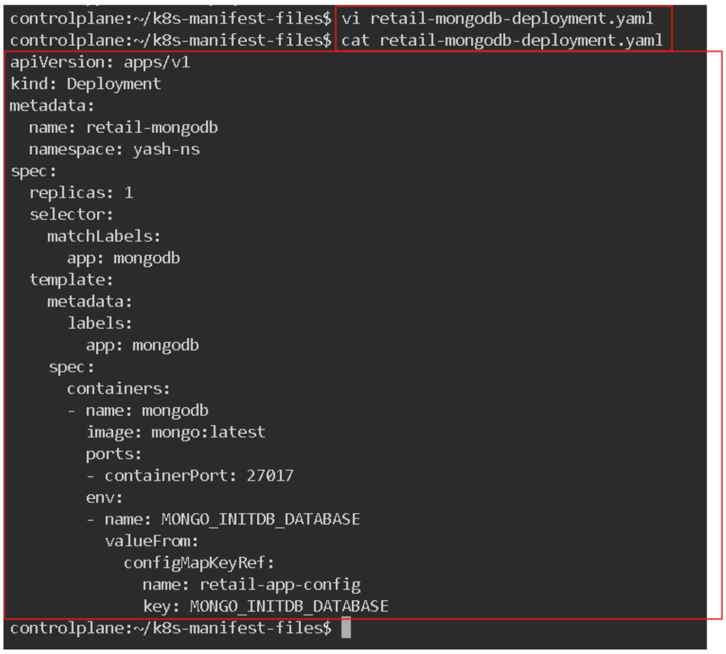
Save and verify:

```
Esc → :wq
cat retail-mongodb-deployment.yaml
```

Explanation:

This file defines the MongoDB deployment.
It creates one MongoDB pod inside the namespace.
It also reads the database name from the ConfigMap.

Image:



```
controlplane:~/k8s-manifest-files$ vi retail-mongodb-deployment.yaml
controlplane:~/k8s-manifest-files$ cat retail-mongodb-deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: retail-mongodb
  namespace: yash-ns
spec:
  replicas: 1
  selector:
    matchLabels:
      app: mongodb
  template:
    metadata:
      labels:
        app: mongodb
    spec:
      containers:
      - name: mongodb
        image: mongo:latest
        ports:
        - containerPort: 27017
        env:
        - name: MONGO_INITDB_DATABASE
          valueFrom:
            configMapKeyRef:
              name: retail-app-config
              key: MONGO_INITDB_DATABASE
controlplane:~/k8s-manifest-files$
```

Apply MongoDB Deployment

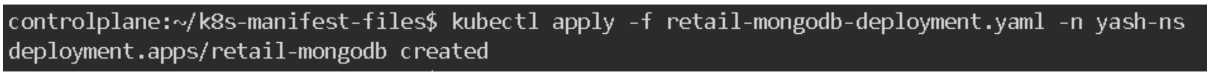
kubectl apply -f retail-mongodb-deployment.yaml -n yash-ns

Explanation:

Kubernetes creates:

- Deployment
- ReplicaSet
- Pod

Image:



```
controlplane:~/k8s-manifest-files$ kubectl apply -f retail-mongodb-deployment.yaml -n yash-ns
deployment.apps/retail-mongodb created
```

Screenshot showing MongoDB pod created

Step 7: Create MongoDB Service

Command:

vi retail-mongodb-svc.yaml

YAML Content:

```
apiVersion: v1
kind: Service
metadata:
  name: mongodb
  namespace: yash-ns
spec:
  selector:
    app: mongodb
  ports:
    - port: 27017
```

targetPort: 27017
protocol: TCP

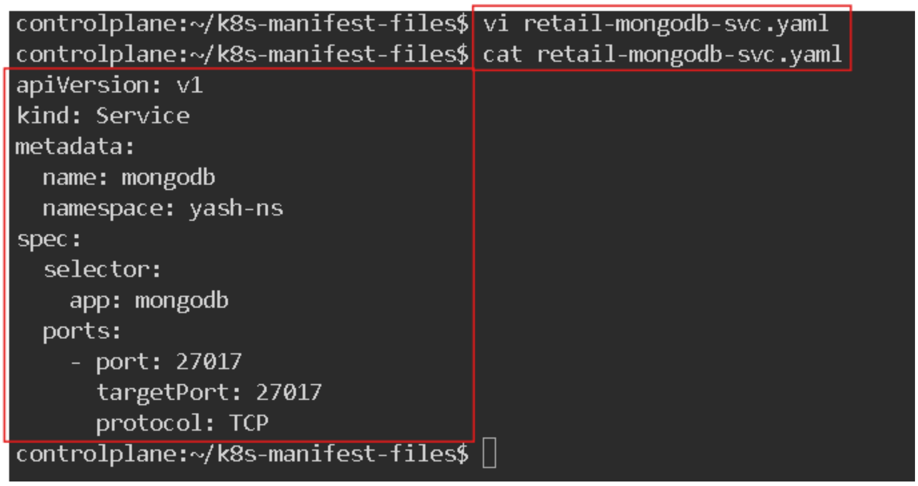
Save and verify:

Esc → :wq
cat retail-mongodb-svc.yaml

Explanation:

This service exposes MongoDB internally within the cluster. Other pods can connect to MongoDB using the service name mongodb.

Image:

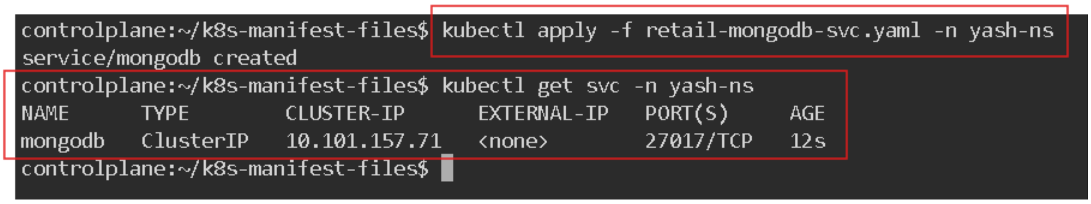


```
controlplane:~/k8s-manifest-files$ vi retail-mongodb-svc.yaml
controlplane:~/k8s-manifest-files$ cat retail-mongodb-svc.yaml
apiVersion: v1
kind: Service
metadata:
  name: mongodb
  namespace: yash-ns
spec:
  selector:
    app: mongodb
  ports:
    - port: 27017
      targetPort: 27017
      protocol: TCP
controlplane:~/k8s-manifest-files$
```

Apply MongoDB Service

kubectl apply -f retail-mongodb-svc.yaml -n yash-ns
kubectl get svc -n yash-ns

Image:



```
controlplane:~/k8s-manifest-files$ kubectl apply -f retail-mongodb-svc.yaml -n yash-ns
service/mongodb created
controlplane:~/k8s-manifest-files$ kubectl get svc -n yash-ns
NAME      TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)     AGE
mongodb   ClusterIP   10.101.157.71   <none>        27017/TCP   12s
controlplane:~/k8s-manifest-files$
```

Screenshot showing MongoDB service created.

Step 8: Create Retail App Deployment

Command:

```
vi retail-app-deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: yash-deployment
  namespace: yash-ns
spec:
  replicas: 4
  selector:
    matchLabels:
      app: retail
  template:
    metadata:
      labels:
        app: retail
    spec:
      containers:
      - name: retail-container
        image: saiteja2502/userprofileretail:latest
        ports:
        - containerPort: 3130
        env:
```

```yaml
- name: MONGODB_URI
  valueFrom:
    configMapKeyRef:
      name: retail-app-config
      key: MONGODB_URI
- name: SESSION_SECRET
  valueFrom:
    configMapKeyRef:
      name: retail-app-config
      key: SESSION_SECRET
- name: PORT
  valueFrom:
    configMapKeyRef:
      name: retail-app-config
      key: PORT
- name: EMAIL_USER
  valueFrom:
    secretKeyRef:
      name: retail-app-secret
      key: EMAIL_USER
- name: EMAIL_PASS
  valueFrom:
    secretKeyRef:
      name: retail-app-secret
```

key: EMAIL_PASS

Save and verify:

Esc → :wq
cat retail-app-deployment.yaml

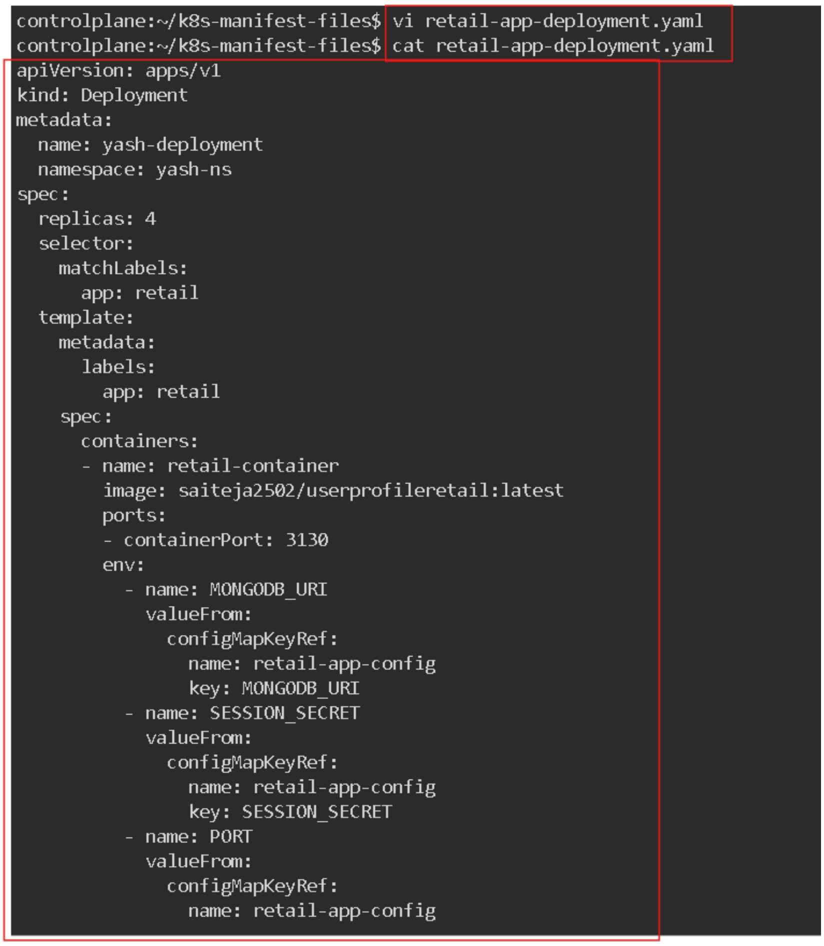
Explanation:

This deployment creates 4 replicas of the Retail application.
It reads:

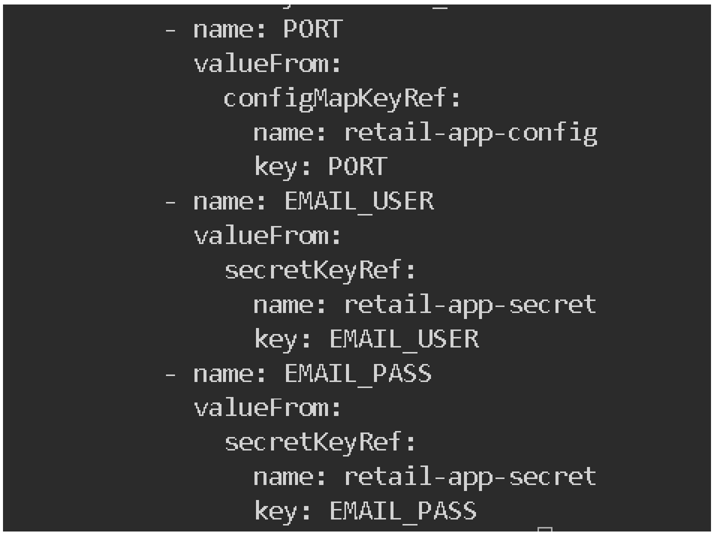
- Database connection from ConfigMap
- Email credentials from Secret

Since both already exist, pods will start successfully.

Image:



```
controlplane:~/k8s-manifest-files$ vi retail-app-deployment.yaml
controlplane:~/k8s-manifest-files$ cat retail-app-deployment.yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: yash-deployment
  namespace: yash-ns
spec:
  replicas: 4
  selector:
    matchLabels:
      app: retail
  template:
    metadata:
      labels:
        app: retail
    spec:
      containers:
      - name: retail-container
        image: saiteja2502/userprofileretail:latest
        ports:
        - containerPort: 3130
        env:
          - name: MONGODB_URI
            valueFrom:
              configMapKeyRef:
                name: retail-app-config
                key: MONGODB_URI
          - name: SESSION_SECRET
            valueFrom:
              configMapKeyRef:
                name: retail-app-config
                key: SESSION_SECRET
          - name: PORT
            valueFrom:
              configMapKeyRef:
                name: retail-app-config
```

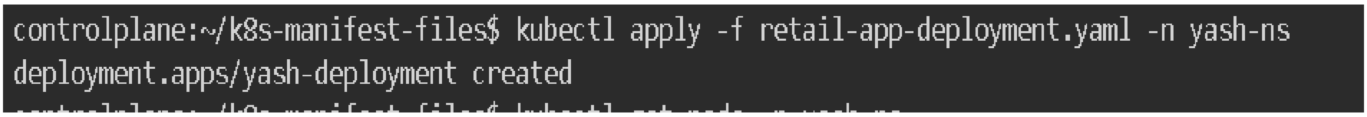


```
        - name: PORT
          valueFrom:
            configMapKeyRef:
              name: retail-app-config
              key: PORT
        - name: EMAIL_USER
          valueFrom:
            secretKeyRef:
              name: retail-app-secret
              key: EMAIL_USER
        - name: EMAIL_PASS
          valueFrom:
            secretKeyRef:
              name: retail-app-secret
              key: EMAIL_PASS
```

Apply Retail App Deployment

kubectl apply -f retail-app-deployment.yaml -n yash-ns

Image:



```
controlplane:~/k8s-manifest-files$ kubectl apply -f retail-app-deployment.yaml -n yash-ns
deployment.apps/yash-deployment created
```

Screenshot showing Deployment Created

Step 9: Create Retail Application Service

Command:

vi retail-app-svc.yaml

apiVersion: v1

kind: Service

metadata:

  name: retail-service

  namespace: yash-ns

spec:

```
  type: LoadBalancer
  ports:
    - port: 3130
      targetPort: 3130
      protocol: TCP
  selector:
    app: retail
```

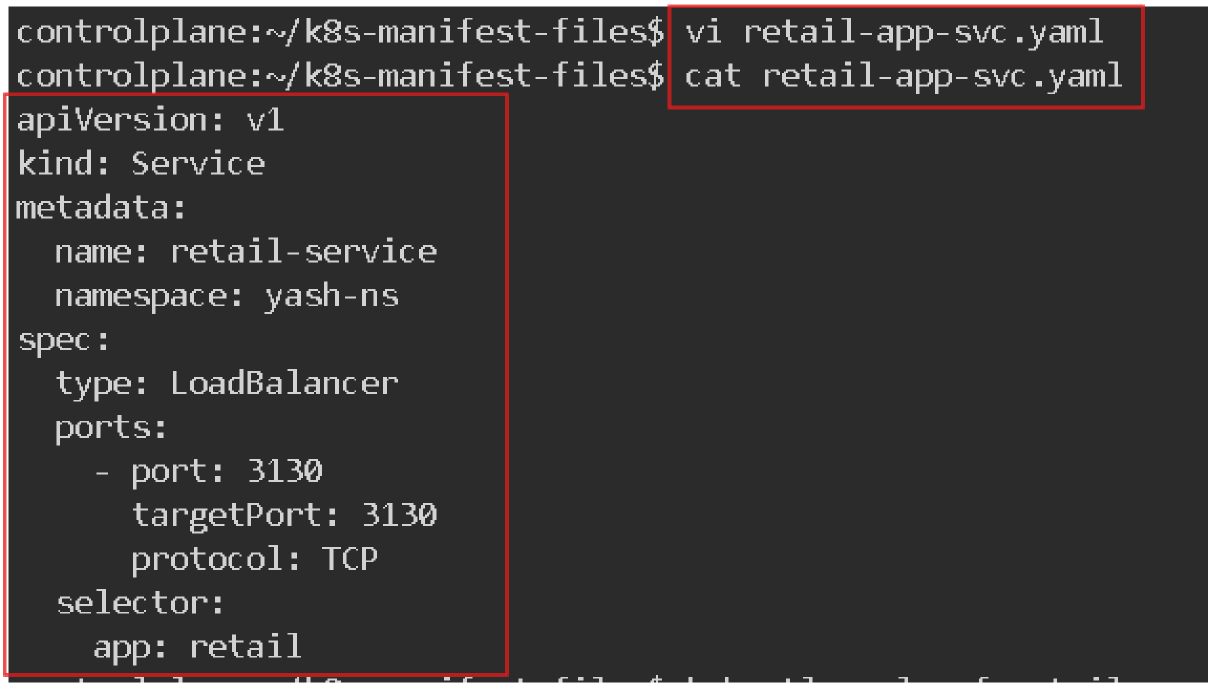
Save and verify:

```
Esc → :wq
cat retail-app-svc.yaml
```

Explanation:

This service exposes the Retail application externally using a LoadBalancer.

Image:



```
controlplane:~/k8s-manifest-files$ vi retail-app-svc.yaml
controlplane:~/k8s-manifest-files$ cat retail-app-svc.yaml
apiVersion: v1
kind: Service
metadata:
  name: retail-service
  namespace: yash-ns
spec:
  type: LoadBalancer
  ports:
    - port: 3130
      targetPort: 3130
      protocol: TCP
  selector:
    app: retail
```

Apply Retail App Service

kubectl apply -f retail-app-svc.yaml -n yash-ns
kubectl get svc -n yash-ns

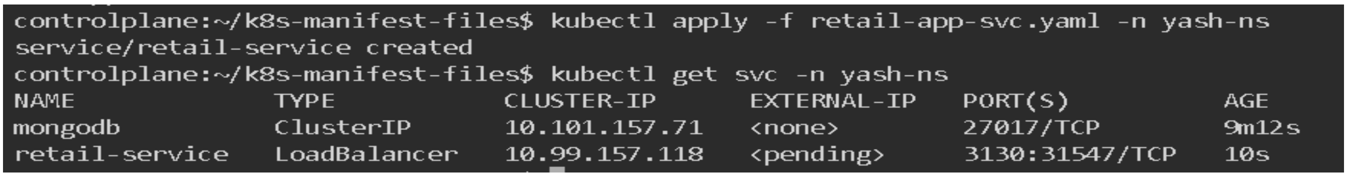
Explanation:

Kubernetes creates a LoadBalancer service and generates an **EXTERNAL-IP**.We observe that the EXTERNAL-IP remains <pending>.

This happens because Killercoda is not integrated with any cloud provider. Therefore, Kubernetes cannot provision an external load balancer.

As a result, the application cannot be accessed using a public IP in Killercoda.

Image:



```
controlplane:~/k8s-manifest-files$ kubectl apply -f retail-app-svc.yaml -n yash-ns
service/retail-service created
controlplane:~/k8s-manifest-files$ kubectl get svc -n yash-ns
NAME             TYPE           CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
mongodb          ClusterIP      10.101.157.71   <none>        27017/TCP        9m12s
retail-service   LoadBalancer   10.99.157.118   <pending>     3130:31547/TCP   10s
```

Final Verification

Command:

kubectl get all -n yash-ns

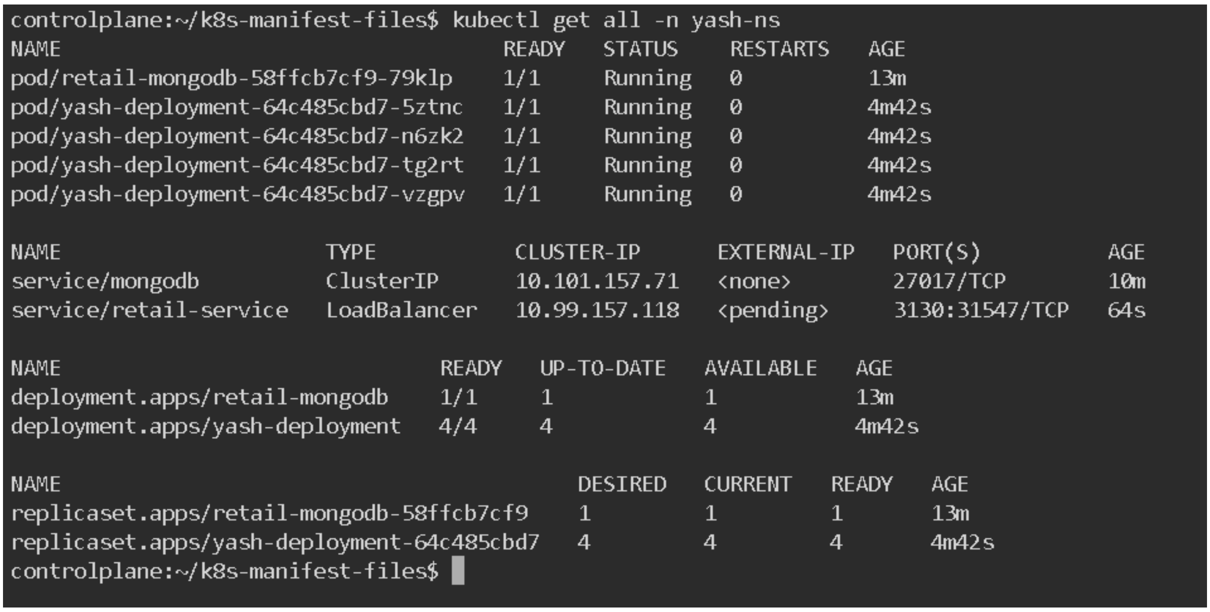
Explanation:

This command displays:

- Pods
- Services
- Deployments
- ReplicaSets

All pods should be in **Running** state.

Image:



```
controlplane:~/k8s-manifest-files$ kubectl get all -n yash-ns
NAME                                   READY   STATUS    RESTARTS   AGE
pod/retail-mongodb-58ffcb7cf9-79klp    1/1     Running   0          13m
pod/yash-deployment-64c485cbd7-5ztnc   1/1     Running   0          4m42s
pod/yash-deployment-64c485cbd7-n6zk2   1/1     Running   0          4m42s
pod/yash-deployment-64c485cbd7-tg2rt   1/1     Running   0          4m42s
pod/yash-deployment-64c485cbd7-vzgpv   1/1     Running   0          4m42s

NAME                     TYPE           CLUSTER-IP      EXTERNAL-IP   PORT(S)          AGE
service/mongodb          ClusterIP      10.101.157.71   <none>        27017/TCP        10m
service/retail-service   LoadBalancer   10.99.157.118   <pending>     3130:31547/TCP   64s

NAME                              READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/retail-mongodb    1/1     1            1           13m
deployment.apps/yash-deployment   4/4     4            4           4m42s

NAME                                         DESIRED   CURRENT   READY   AGE
replicaset.apps/retail-mongodb-58ffcb7cf9    1         1         1       13m
replicaset.apps/yash-deployment-64c485cbd7   4         4         4       4m42s
controlplane:~/k8s-manifest-files$ 
```

Verify Node Details

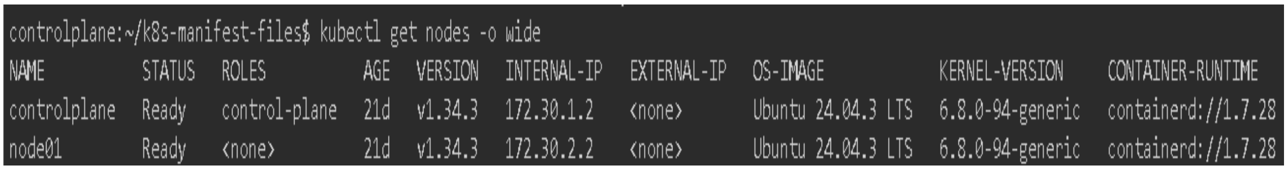
Command:

kubectl get nodes -o wide

Explanation:

This command displays detailed information about all nodes in the Kubernetes cluster.

Image:



```
controlplane:~/k8s-manifest-files$ kubectl get nodes -o wide
NAME           STATUS   ROLES           AGE   VERSION   INTERNAL-IP   EXTERNAL-IP   OS-IMAGE             KERNEL-VERSION     CONTAINER-RUNTIME
controlplane   Ready    control-plane   21d   v1.34.3   172.30.1.2    <none>        Ubuntu 24.04.3 LTS   6.8.0-94-generic   containerd://1.7.28
node01         Ready    <none>          21d   v1.34.3   172.30.2.2    <none>        Ubuntu 24.04.3 LTS   6.8.0-94-generic   containerd://1.7.28
```

LoadBalancer will Not Work in Killercoda

In this project, we initially created the Retail service using:

```
type: LoadBalancer
```

A LoadBalancer service works only when Kubernetes is integrated with a cloud provider such as:

- AWS
- Azure
- Google Cloud

These cloud providers automatically create an external load balancer and assign a public IP address.

However, Killercoda is a lab-based container environment.
It does not have integration with any cloud provider.

Because of this:

- EXTERNAL-IP remains <pending>
- No public IP is generated
- The application cannot be accessed using LoadBalancer

That is why LoadBalancer did not give correct web access in Killercoda.

It Works in AWS EC2 (Real Cloud Environment)

To Access Application in Browser

Command:

```
kubectl get svc -n yash-ns
```

Copy the EXTERNAL-IP and open:

```
http://<EXTERNAL-IP>:3130
```