

DAY-3 AND DAY4

NAVEEN S

Kubernetes

Backend-Pandas and flask in python

Docker Build & Run Documentation

1. Verify File Structure

ls

Lists files in the current directory (should include Dockerfile, app.py, docker-compose.yml, requirements.txt, etc.).

2. Create or Edit CSV File

nano products.csv

Opens the products.csv file in the nano editor to add or modify product data.

3. Verify CSV File Content

cat products.csv

Displays the contents of products.csv to confirm the data.

4. Build Docker Image Without Cache

sudo docker build --no-cache -t backend:latest .

Builds a fresh Docker image, ensuring all changes are included. The --no-cache flag forces a rebuild of every layer.

5. Run the Docker Container

sudo docker run -d -p 7000:7000 backend:latest

Runs the container in detached mode and maps host port 7000 to container port 7000.

6. Check Container Logs

sudo docker logs <container_id>

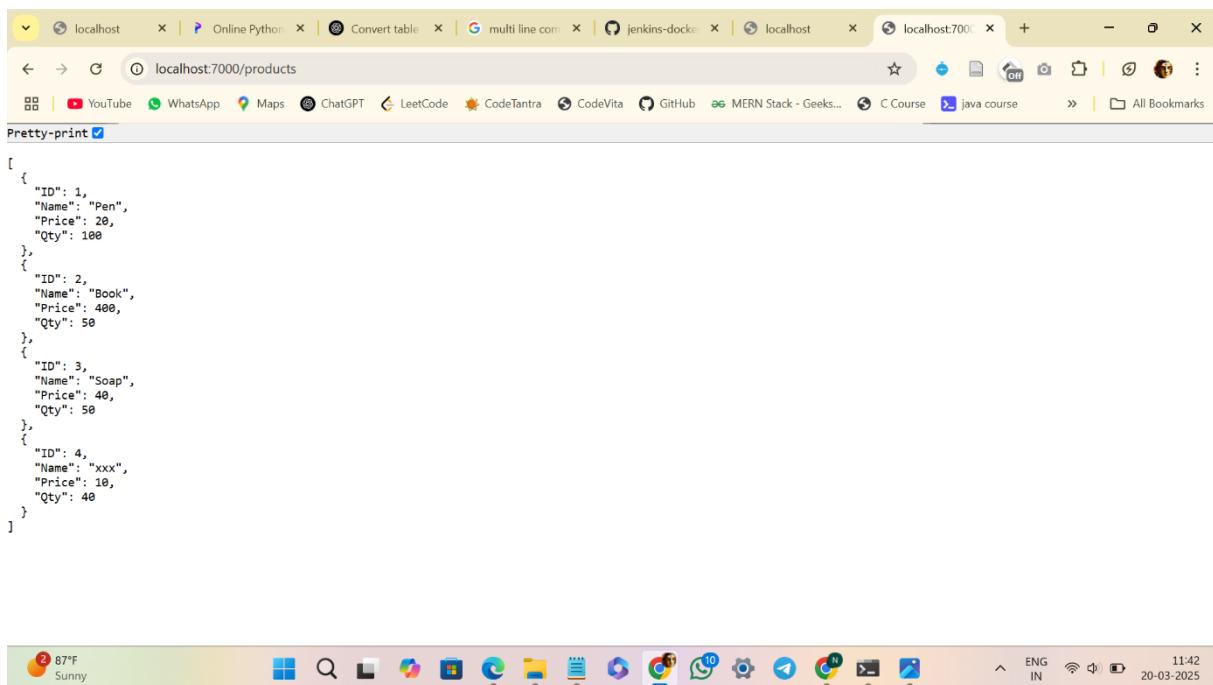
Replace <container_id> with the actual container ID to view the running application's logs.

This message is shown once a day. To disable it please create the /home/naveen/.hushlogin file.
naveen@LAPTOP-MR5RNM1C:~\$ mkdir e-commerce-app
naveen@LAPTOP-MR5RNM1C:~\$ cd e-commerce-app
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app\$ mkdir frontend
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app\$ mkdir backend
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app\$ cd backend
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ touch products.csv
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ ls
products.csv
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ nano products.csv
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ nano products.csv
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ cat products.csv
ID,Name,Price,Qty
1,Pen,20,100
2,Book,400,50
3,Soup,40,50
4,xxx,10,40
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ nano app.py
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ python3 --version
Python 3.12.3
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ python3 app.py
ID,Name,Price,Qty
1,Pen,20,100
2,Book,400,50
3,Soup,40,50
4,xxx,10,40
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend\$ |

82°F Mostly sunny 10:07 ENG IN 20-03-2025

```
[notice] To update, run: pip install --upgrade pip
--> Removed intermediate container e354e302d8bb
--> 7a55e333b412
Step 5/7 : COPY .
--> 8b4aec3e6cd9
Step 6/7 : EXPOSE 7000
--> Running in 2abddf50f6e4
--> Removed intermediate container 2abddf50f6e4
--> 8fa6409719f1
Step 7/7 : CMD ["python", "app.py"]
--> Running in 6e98361be001
--> Removed intermediate container 6e98361be001
--> c77526b3d8ca
Successfully built c77526b3d8ca
Successfully tagged backend:latest
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend$ nano app.py
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend$ docker run -p 7000:7000 backend
Traceback (most recent call last):
  File "/app/app.py", line 1, in <module>
    app = Flask(__name__)
      ^^^^^^
NameError: name 'Flask' is not defined
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend$ sudo docker run
-p 7000:7000 backend
Traceback (most recent call last):
  File "/app/app.py", line 1, in <module>
    app = Flask(__name__)
      ^^^^^^
NameError: name 'Flask' is not defined
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend$ nano app.py
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/backend$ docker build -t backend:latest .
DEPRECATION: The legacy builder is deprecated and will be removed in a future release.
Install the buildx component to build images with BuildKit:
```

92°F Sunny 13:41 ENG IN 20-03-2025



```
[{"ID": 1, "Name": "Pen", "Price": 20, "Qty": 100}, {"ID": 2, "Name": "Book", "Price": 400, "Qty": 50}, {"ID": 3, "Name": "Soap", "Price": 40, "Qty": 50}, {"ID": 4, "Name": "xxx", "Price": 10, "Qty": 40}]
```

Creating a container for frontend

Below is the concise documentation content for your frontend Docker build:

Frontend Docker Build Documentation

1. Navigate to the Frontend Directory

```
cd frontend/
```

Changes directory to the frontend folder where your files are located.

2. Create or Edit the HTML File

```
nano index.html
```

Opens the index.html file in the nano editor for creating or modifying the webpage content.

3. Create or Edit the Dockerfile

nano Dockerfile

Opens the Dockerfile in the nano editor to set up instructions for building the Docker image.

4. Dockerfile Content

FROM nginx:alpine

COPY index.html /usr/share/nginx/html/index.html

Specifies the base image as nginx:alpine and copies your index.html to the default Nginx HTML directory.

5. Build the Docker Image

sudo docker build -t frontend:latest .

Builds the Docker image for the frontend. The command pulls the necessary Nginx image, executes the copy command, and tags the image as frontend:latest.

```
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/backend$ nano app.py
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/backend$ nano Dockerfile
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/backend$ cd ..
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app$ cd frontend
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/frontend$ nano index.html
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/frontend$ nano Dockerfile
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/frontend$ cat Dockerfile
FROM nginx:alpine
COPY index.html /usr/share/nginx/html/index.html
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/frontend$ sudo docker build -t frontend:latest .
[sudo] password for naveen:
DEPRECATED: The legacy builder is deprecated and will be removed in a future release.
Install the buildx component to build images with BuildKit:
https://docs.docker.com/go/buildx/
Sending build context to Docker daemon 3.584kB
Step 1/2 : FROM nginx:alpine
alpine: Pulling from library/nginx
f18232174bc9: Pull complete
ccc35e35d420: Pull complete
43f2ec460bdf: Pull complete
984583bcf083: Pull complete
8d27c072a58f: Pull complete
ab3286a73463: Pull complete
6d79cc6084d4: Pull complete
0c7e4c092ab7: Pull complete
Digest: sha256:4ff102c5d78d254a6f0da062b3cf39eaf07f01eec0927fd21e219d0af8bc0591
Status: Downloaded newer image for nginx:alpine
--> 1ff4bb4faebc
Step 2/2 : COPY index.html /usr/share/nginx/html/index.html
--> 22b1e32a7347
Successfully built 22b1e32a7347
Successfully tagged frontend:latest
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/frontend$ cd ..
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app$ mkdir k8s
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app$ cd k8s
naveen@LAPTOP-MR5RNMIC:~/e-commerce-app/k8s$ nano backend-deployment.yaml
```

Kubernets Deployment YAML files

Below is a brief, step-by-step description for setting up your Kubernetes deployments for both backend and frontend:

1. Organize Project Structure

- Create a Kubernetes Folder:
- mkdir k8s

This creates a separate folder (k8s) to store all your Kubernetes configuration files.

- Navigate to the Kubernetes Directory:
- cd k8s/

Move into the k8s directory to work on deployment files.

```
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ nano frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ nano backend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ nano backend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ rm backend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ nano frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ rm frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ ls
backend-deployment.yaml  frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ nano service.yaml
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ cat service.yaml
apiVersion: v1
kind: Service
metadata:
  name: backend-service
spec:
  selector:
    app: backend
  ports:
  - protocol: TCP
    port: 7000
    targetPort: 7000
  type: ClusterIP

apiVersion: v1
kind: Service
metadata:
  name: frontend-service
spec:
  selector:
    app: frontend
  ports:
  - protocol: TCP
    port: 3000
    targetPort: 3000
  type: NodePort
naveen@LAPTOP-MR5RNM1C:~/e-commerce-app/k8s$ |
```

2. Create Backend Deployment Configuration

- Create/Edit the Backend Deployment File:
- nano backend-deployment.yaml

Opens the file in the nano editor to add deployment configuration for the backend.

- Backend Deployment File Content:
- apiVersion: apps/v1
- kind: Deployment
- metadata:
- name: backend
- spec:
- replicas: 1
- selector:
- matchLabels:

- app: backend
- template:
- metadata:
- labels:
- app: backend
- spec:
- containers:
- - name: backend
- image: backend:latest
- ports:
- - containerPort: 7000

This file defines a Kubernetes Deployment for your backend application:

- apiVersion & kind: Specifies the resource type.
- metadata: Names the deployment as backend.
- spec.replicas: Sets the number of pod replicas.
- selector & template.metadata.labels: Ensure that the Deployment manages pods with the label app: backend.
- spec.template.spec.containers: Specifies the container details, including the Docker image (backend:latest) and the port (7000) that the container exposes.

```

Get:10 http://security.ubuntu.com/ubuntu noble-security/main Translation-en [130 kB]
Get:11 http://security.ubuntu.com/ubuntu noble-security/main amd64 Components [8956 B]
Get:12 http://security.ubuntu.com/ubuntu noble-security/main amd64 c-n-f Metadata [6936 B]
Get:13 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packages [820 kB]
Get:14 http://archive.ubuntu.com/ubuntu noble-updates/main Translation-en [209 kB]
Get:15 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Components [151 kB]
Get:16 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 c-n-f Metadata [13.5 kB]
Get:17 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [1040 kB]
Get:18 http://security.ubuntu.com/ubuntu noble-security/universe Translation-en [177 kB]
Get:19 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Components [51.9 kB]
Get:20 http://security.ubuntu.com/ubuntu noble-security/universe amd64 c-n-f Metadata [16.9 kB]
Get:21 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Components [212 B]
Get:22 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Components [208 B]
Get:23 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [364 kB]
Get:24 http://archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f Metadata [25.8 kB]
Get:25 http://archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Components [212 B]
Get:26 http://archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [940 B]
Get:27 http://archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [208 B]
Get:28 http://archive.ubuntu.com/ubuntu noble-backports/universe amd64 Components [19.9 kB]
Get:29 http://archive.ubuntu.com/ubuntu noble-backports/restricted amd64 Components [216 B]
Get:30 http://archive.ubuntu.com/ubuntu noble-backports/multiverse amd64 Components [212 B]
Fetched 5009 kB in 4s (1277 kB/s)
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
56 packages can be upgraded. Run 'apt list --upgradable' to see them.
naveen@LAPTOP-MR5RNMIC:/e-commerce-app/k8s$ dockerimage il
dockerimage: command not found
naveen@LAPTOP-MR5RNMIC:/e-commerce-app/k8s$ sudo apt install docker.io -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
docker.io is already the newest version (26.1.3-0ubuntu1~24.04.1).
0 upgraded, 0 newly installed, 0 to remove and 56 not upgraded.
naveen@LAPTOP-MR5RNMIC:/e-commerce-app/k8s$ docker --version
Docker Version 26.1.3, build 26.1.3-0ubuntu1~24.04.1
naveen@LAPTOP-MR5RNMIC:/e-commerce-app/k8s$ |

```

3. Create Frontend Deployment Configuration

- Create/Edit the Frontend Deployment File:
- nano frontend-deployment.yaml

Opens the file in nano to add deployment configuration for the frontend.

- Frontend Deployment File Content:
- apiVersion: apps/v1
- kind: Deployment
- metadata:
- name: frontend
- spec:
- replicas: 1
- selector:
- matchLabels:
- app: frontend
- template:
- metadata:
- labels:
- app: frontend
- spec:
- containers:
- - name: frontend
- image: frontend:latest
- ports:
- - containerPort: 7500

This file defines a Kubernetes Deployment for your frontend application:

- metadata: Names the deployment as frontend.
- selector & template.metadata.labels: Ensure that the Deployment manages pods with the label app: frontend.
- Container Specification: Sets the container to use the Docker image (frontend:latest) and exposes port 7500.

Summary

- Directory Setup:
Organized your project by creating a k8s directory for Kubernetes configuration files.
- Backend Deployment:
Created backend-deployment.yaml to deploy the backend container (using port 7000).
- Frontend Deployment:
Created frontend-deployment.yaml to deploy the frontend container (using port 7500).

This documentation provides a brief and clear outline of your Kubernetes deployment process for both backend and frontend components.

Below is a step-by-step description for setting up Kubernetes Services for your backend and frontend applications using the provided YAML configuration:

1. Create a Service Configuration File

- **Command to Create/Edit the File:**
- nano service.yaml

This command opens a text editor (nano) to create or edit the service configuration file where you'll define both backend and frontend services.

2. Define the Backend Service

Paste the following YAML snippet for the backend service into your service.yaml file:

```
apiVersion: v1
kind: Service
metadata:
  name: backend-service
spec:
  selector:
    app: backend
  ports:
    - protocol: TCP
      port: 7000
      targetPort: 7000
  type: ClusterIP
```

Explanation:

- **apiVersion: v1**
Specifies the API version used to create the Service.
- **kind: Service**
Indicates that the resource being created is a Service.
- **metadata.name: backend-service**
Sets the name of the service to backend-service.
- **spec.selector:**
Matches pods that have the label app: backend. This ensures the service routes traffic to the correct backend pods.
- **spec.ports:**

Defines the port configuration:

- **protocol:** TCP – The network protocol used.
- **port:** 7000 – The port on which the service is exposed within the cluster.
- **targetPort:** 7000 – The port on the pod to which traffic will be directed.
- **type: ClusterIP**

Creates an internal service, exposing it only within the cluster.

```
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ nano frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ nano backend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ nano backend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ rm backend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ nano frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ nano frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ rm frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ ls
backend-deployment.yaml  frontend-deployment.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ nano service.yaml
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ cat service.yaml
apiVersion: v1
kind: Service
metadata:
  name: backend-service
spec:
  selector:
    app: backend
  ports:
    - protocol: TCP
      port: 7000
      targetPort: 7000
  type: ClusterIP

apiVersion: v1
kind: Service
metadata:
  name: frontend-service
spec:
  selector:
    app: frontend
  ports:
    - protocol: TCP
      port: 3000
      targetPort: 3000
  type: NodePort
naveen@LAPTOP-MR5RNM1C:/e-commerce-app/k8s$ |
```

3. Define the Frontend Service

Below the backend service configuration in the same file, add the following YAML snippet for the frontend service:

```
apiVersion: v1
kind: Service
metadata:
  name: frontend-service
spec:
  selector:
    app: frontend
  ports:
    - protocol: TCP
      port: 7500
      targetPort: 7500
  type: NodePort
```

Explanation:

- **metadata.name: frontend-service**
Names the service frontend-service.
 - **spec.selector:**
Matches pods with the label app: frontend so that this service routes traffic to your frontend pods.
 - **spec.ports:**
Defines the ports:
 - **protocol:** TCP – Uses the TCP protocol.
 - **port:** 7500 – The port exposed by the service inside the cluster.
 - **targetPort:** 7500 – The port on the frontend pod that will handle the incoming traffic.
 - **type: NodePort**
Exposes the service on a port on each node's IP, allowing external access to the frontend application.
-

4. Save and Exit

- **In nano:** Press Ctrl+O to write the changes, then Enter to confirm. Press Ctrl+X to exit the editor.
-

5. Apply the Service Configuration

- **Command to Apply the YAML File:**
- `kubectl apply -f service.yaml`

This command tells Kubernetes to create or update the services as defined in the service.yaml file.

6. Verify the Services

- **Command to Check Services:**
- `kubectl get services`

This command lists all services in the current namespace, confirming that both backend-service and frontend-service have been created and are running with the correct configuration.

Summary

- **Backend Service:**
Uses ClusterIP to expose the backend on port 7000 internally. It routes traffic to pods labeled app: backend.
- **Frontend Service:**

Uses NodePort to expose the frontend externally on port 7500, routing traffic to pods labeled app: frontend.

This detailed step-by-step guide covers creating a configuration file, defining services for both backend and frontend applications, applying the configuration with kubectl, and verifying that the services are correctly deployed.

Below is a step-by-step explanation for the provided ConfigMap YAML configuration:

1. Purpose of the ConfigMap

- **Objective:**

The ConfigMap stores configuration data (in this case, a file path) that can be consumed by the backend application without hardcoding values into the container image.

2. YAML Breakdown

```
apiVersion: v1
```

```
kind: ConfigMap
```

```
metadata:
```

```
  name: backend-config
```

```
data:
```

```
  DATABASE_FILE: "/backend/products.csv"
```

- **apiVersion: v1**

Specifies the API version for the ConfigMap resource.

- **kind: ConfigMap**

Indicates that the resource being created is a ConfigMap.

- **metadata:**

- **name: backend-config**

Sets the name of the ConfigMap to backend-config. This is how you will reference it in other configurations (like a Deployment).

- **data:**

- **DATABASE_FILE:**

Defines a key called DATABASE_FILE with a value of "/backend/products.csv". This key-value pair is the configuration data your backend application can use to locate the products CSV file.

3. Creating the ConfigMap File

- **Command to Create/Edit the ConfigMap File:**
- `nano backend-config.yaml`

Opens the nano text editor to create or modify the file containing the ConfigMap definition.

- **Paste the YAML Content:**

Insert the above YAML content into the file and save it.

4. Applying the ConfigMap

- **Command to Create the ConfigMap in Kubernetes:**
- `kubectl apply -f backend-config.yaml`

This command tells Kubernetes to create or update the ConfigMap using the configuration specified in the YAML file.

5. Using the ConfigMap in Your Application

- **Reference in a Pod or Deployment:**

You can reference the backend-config ConfigMap in your Deployment YAML to inject the DATABASE_FILE variable into your container. For example, under the container spec, you could add:

- `env:`
- `- name: DATABASE_FILE`
- `valueFrom:`
- `configMapKeyRef:`
- `name: backend-config`
- `key: DATABASE_FILE`

This makes the DATABASE_FILE environment variable available to your application at runtime, with the value /backend/products.csv.

Summary

- **What it Does:**
The ConfigMap named backend-config stores a key-value pair where DATABASE_FILE points to the CSV file location.
- **Why It's Useful:**
It decouples configuration from the container image, making it easier to update configuration without rebuilding the image.
- **How to Apply:**
Create the YAML file, then run `kubectl apply -f backend-config.yaml` to deploy the configuration in your cluster.

This explanation covers the configuration's intent, its components, how to create and apply it, and how to integrate it into your application's deployment.

Below is a step-by-step description of the commands you executed and what each step accomplished:

1. Change Directory to the Kubernetes Folder

```
cd ~/e-commerce/k8s
```

Navigates to the k8s directory where you keep your Kubernetes configuration and installation files.

2. Download kubectl

```
curl -LO "https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl"
```

This command downloads the latest stable version of the kubectl binary for Linux (amd64).

3. Make kubectl Executable

```
chmod +x kubectl
```

Gives the downloaded kubectl binary execute permissions so it can run.

4. Move kubectl to a Directory in Your PATH

```
sudo mv kubectl /usr/local/bin/
```

Moves the kubectl binary to /usr/local/bin, allowing you to run it from anywhere in your terminal.

5. Verify kubectl Installation

```
kubectl version --client
```

Checks the installed version of kubectl to confirm the installation was successful.

6. Download minikube

```
curl -LO https://storage.googleapis.com/minikube/releases/latest/minikube-linux-amd64
```

Downloads the latest minikube binary, which will be used to run a local Kubernetes cluster.

7. Make minikube Executable

```
chmod +x minikube-linux-amd64
```

Sets the executable permission on the minikube binary.

8. Move minikube to a Directory in Your PATH

```
sudo mv minikube-linux-amd64 /usr/local/bin/minikube
```

Moves the minikube binary to /usr/local/bin and renames it to minikube so it can be executed easily.

Note:

An error like mv: missing destination file operand occurs if there's no space between the source and destination. Ensure you separate the source file (minikube-linux-amd64) and the destination (/usr/local/bin/minikube) with a space.

9. Start Minikube

minikube start

Initiates the minikube local Kubernetes cluster using Docker as the driver. During this process, minikube pulls necessary images and preloads Kubernetes components.

10. Verify Minikube Installation

minikube version

Displays the minikube version information to confirm that minikube is properly installed and running.

This complete sequence sets up both kubectl and minikube on your system, allowing you to manage and run a local Kubernetes cluster.

```
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 ::::8080          ::::*
LISTEN    163/java
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 <PID>
naveen@LAPTOP-MR5RN1C:~$ ls
docker-python-app e-commerce-app
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 163
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 ::::8080          ::::*
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 1435
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 ::::8080          ::::*
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 1605
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 ::::8080          ::::*
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 1764
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 ::::8080          ::::*
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 1930
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 ::::8080          ::::*
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 2093
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
naveen@LAPTOP-MR5RN1C:~$ sudo apt update
Ign:1 https://pkg.jenkins.io/debian-stable binary/ InRelease
Hit:2 https://pkg.jenkins.io/debian-stable binary/ Release
Hit:3 http://archive.ubuntu.com/ubuntu noble InRelease
Get:5 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:6 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:7 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [671 kB]
Get:8 http://archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:9 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [922 kB]
```

```

naveen@LAPTOP-MR5RNM1C ~
minikube version: v1.35.0
commit: dd5d320e41b5451cdf3c01891bc4e13d189586ed-dirty
naveen@LAPTOP-MR5RNM1C:~$ curl -LO "https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kube-ctl"
  % Total    % Received % Xferd  Average Speed   Time     Time   Current
          Dload  Upload Total   Spent   Left  Speed
100  138  100  138    0      0  171   0:--:-- --:--:--:--:--:-- 171
100 54.6M  100 54.6M    0      0  4119k   0 0:00:13  0:00:13 --:--:-- 4792k
naveen@LAPTOP-MR5RNM1C:~$ chmod +x kube-ctl
naveen@LAPTOP-MR5RNM1C:~$ sudo mv kube-ctl /usr/local/bin/
naveen@LAPTOP-MR5RNM1C:~$ kubectl version --client
Client Version: v1.32.3
Kustomize Version: v5.5.0
naveen@LAPTOP-MR5RNM1C:~$ minikube start
  minikube v1.35.0 on Ubuntu 24.04 (amd64)
  Automatically selected the docker driver. Other choices: none, ssh
  Using Docker driver with root privileges
  Starting "minikube" primary control-plane node in "minikube" cluster
  Pulling base image v0.0.46 ...
  Downloading Kubernetes v1.32.0 preload ...
  > gcr.io/k8s-minikube/kicbase...: 500.31 MiB / 500.31 MiB 100.00% 480.37
  > preloaded-images-k8s-v18-v1...: 333.57 MiB / 333.57 MiB 100.00% 278.66
  Creating docker container (CPUs=2, Memory=2200MB) ...
  Preparing Kubernetes v1.32.0 on Docker 27.4.1 ...
  • 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
naveen@LAPTOP-MR5RNM1C:~$ |

```

To stop all processes utilizing port **8080**, follow these detailed steps:

Step 1: Identify the Process Using Port 8080

Run the following command to check which process is using port **8080**:

```
sudo netstat -tulnp | grep ":8080"
```

Explanation:

- **sudo** → Runs the command with root privileges.
- **netstat -tulnp** → Displays active network connections.
 - **-t** → TCP connections.
 - **-u** → UDP connections.
 - **-l** → Listening sockets.
 - **-n** → Show numerical addresses instead of resolving hostnames.
 - **-p** → Show the process ID (PID) and program name.
- **| grep ":8080"** → Filters the output to show only lines with port **8080**.

Example Output:

```
tcp      0    0.0.0.0:8080      0.0.0.0:*      LISTEN    12345/nginx
```

Here, **12345** is the **PID** of the process using port **8080**.

Step 2: Kill the Process

Once you have the **PID**, replace <PID> with the actual process ID and run:

```
sudo kill -9 12345
```

Explanation:

- kill -9 → Forcefully terminates the process.
- 12345 → The process ID (PID) obtained from the previous step.

The screenshot shows a terminal window titled 'naveen@LAPTOP-MR5RN1C ~'. The user runs several commands to identify and kill a Java process. First, they check netstat to find the PID of the process using port 8080. Then, they use sudo kill -9 to terminate the process. Finally, they run netstat again to verify that the port is now free. The terminal also shows apt update activity at the bottom.

```
Total reclaimed space: 1.401GB
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 :::8080          :::*
      LISTEN    163/java
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 <PID>
naveen@LAPTOP-MR5RN1C:~$ ls
docker-python-app  e-commerce-app
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 163
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 :::8080          :::*          LISTEN    1435/java
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 1435
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 :::8080          :::*          LISTEN    1605/java
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 1605
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 :::8080          :::*          LISTEN    1764/java
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 1764
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 :::8080          :::*          LISTEN    1930/java
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 1930
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
tcp6      0      0 :::8080          :::*          LISTEN    2093/java
naveen@LAPTOP-MR5RN1C:~$ sudo kill -9 2093
naveen@LAPTOP-MR5RN1C:~$ sudo netstat -tulnp | grep ":8080"
naveen@LAPTOP-MR5RN1C:~$ sudo apt update
Ign:1 https://pkg.jenkins.io/debian-stable binary/ InRelease
Hit:2 https://pkg.jenkins.io/debian-stable binary/ Release
Hit:3 http://archive.ubuntu.com/ubuntu noble InRelease
Get:5 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:6 http://archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:7 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [671 kB]
Get:8 http://archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:9 http://archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [922 kB]
```

Step 3: Verify If Port 8080 Is Free

After killing the process, run:

```
sudo netstat -tulnp | grep ":8080"
```

If no output is shown, the port is free.

Alternative: Kill All Processes Using 8080 in One Command

If multiple processes are using port 8080, you can terminate them all at once:

```
sudo kill -9 $(sudo netstat -tulnp | grep ":8080" | awk '{print $7}' | cut -d'/' -f1)
```

Explanation:

- awk '{print \$7}' → Extracts the PID/ProgramName column.
- cut -d'/' -f1 → Extracts only the PID.
- kill -9 (...) → Kills all matching PIDs.

Step 4: Restart the Service (Optional)

If you need to restart the application that was using port 8080, use:

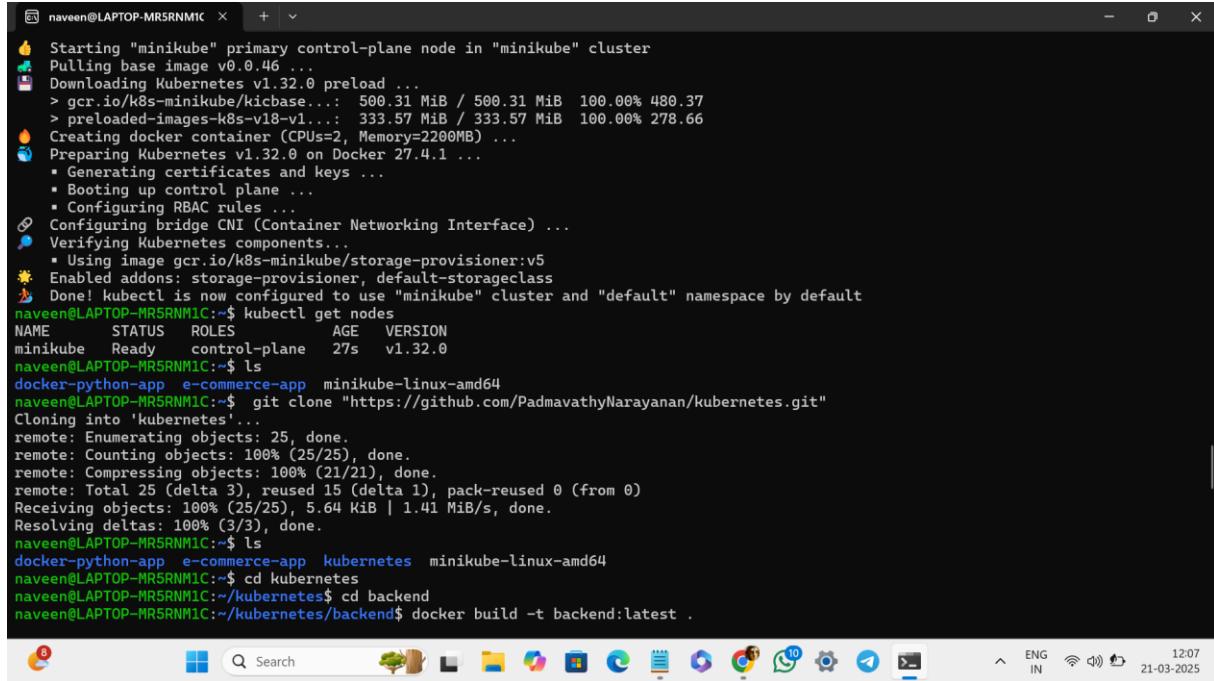
```
sudo systemctl restart <service-name>
```

Replace <service-name> with the actual service (e.g., nginx, apache2, docker, etc.).

Let me know if you need more details! 

```
naveen@LAPTOP-MR5RNMIC:~$ kubectl get pods
NAME        READY   STATUS    RESTARTS   AGE
backend-dfd8d5579-9k2vc  1/1     Running   0          2m12s
frontend-6cf7c46-bsvnd  1/1     Running   0          105s
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl get svc
NAME         TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE
backend-service ClusterIP  10.99.1.149   <none>        5000/TCP    76s
frontend-service NodePort   10.104.110.231  <none>        3000:30591/TCP 76s
kubernetes   ClusterIP  10.96.0.1     <none>        443/TCP     5h22m
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl run test-pod --image=alpine --restart=Never -it -- sh
If you don't see a command prompt, try pressing enter.
/ # apk add curl
fetch https://dl-cdn.alpinelinux.org/alpine/v3.21/main/x86_64/APKINDEX.tar.gz
fetch https://dl-cdn.alpinelinux.org/alpine/v3.21/community/x86_64/APKINDEX.tar.gz
(1/9) Installing brotli-libs (1.1.0-r2)
(2/9) Installing c-ares (1.34.3-r0)
(3/9) Installing libunistring (1.2-r0)
(4/9) Installing libidn2 (2.3.7-r0)
(5/9) Installing nghttp2-libs (1.64.0-r0)
(6/9) Installing libpsl (0.21.5-r3)
(7/9) Installing zstd-libs (1.5.6-r2)
(8/9) Installing libcurl (8.12.1-r1)
(9/9) Installing curl (8.12.1-r1)
Executing busybox-1.37.0-r12.trigger
OK: 12 MiB in 24 packages
/ # curl http://backend-service:5000/products
[{"id":1,"name":"Smartphone","price":299.99},{"id":2,"name":"Laptop","price":799.99},{"id":3,"name":"Headphones","price":49.99},{"id":4,"name":"Tablet","price":199.99}]
/ # exit
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ minikube service frontend-service --url
http://127.0.0.1:40571
! Because you are using a Docker driver on linux, the terminal needs to be open to run it.
```

```
naveen@LAPTOP-MR5RNMIC:~$ kubectl get pods
NAME        READY   STATUS    RESTARTS   AGE
backend-dfd8d5579-9k2vc  1/1     Running   0          2m12s
frontend-6cf7c46-bsvnd  1/1     Running   0          105s
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl get svc
NAME         TYPE      CLUSTER-IP      EXTERNAL-IP      PORT(S)      AGE
backend-service ClusterIP  10.99.1.149   <none>        5000/TCP    76s
frontend-service NodePort   10.104.110.231  <none>        3000:30591/TCP 76s
kubernetes   ClusterIP  10.96.0.1     <none>        443/TCP     5h22m
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl run test-pod --image=alpine --restart=Never -it -- sh
If you don't see a command prompt, try pressing enter.
/ # apk add curl
fetch https://dl-cdn.alpinelinux.org/alpine/v3.21/main/x86_64/APKINDEX.tar.gz
fetch https://dl-cdn.alpinelinux.org/alpine/v3.21/community/x86_64/APKINDEX.tar.gz
(1/9) Installing brotli-libs (1.1.0-r2)
(2/9) Installing c-ares (1.34.3-r0)
(3/9) Installing libunistring (1.2-r0)
(4/9) Installing libidn2 (2.3.7-r0)
(5/9) Installing nghttp2-libs (1.64.0-r0)
(6/9) Installing libpsl (0.21.5-r3)
(7/9) Installing zstd-libs (1.5.6-r2)
(8/9) Installing libcurl (8.12.1-r1)
(9/9) Installing curl (8.12.1-r1)
Executing busybox-1.37.0-r12.trigger
OK: 12 MiB in 24 packages
/ # curl http://backend-service:5000/products
[{"id":1,"name":"Smartphone","price":299.99},{"id":2,"name":"Laptop","price":799.99},{"id":3,"name":"Headphones","price":49.99},{"id":4,"name":"Tablet","price":199.99}]
/ # exit
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ minikube service frontend-service --url
http://127.0.0.1:40571
! Because you are using a Docker driver on linux, the terminal needs to be open to run it.
```



```
naveen@LAPTOP-MR5RNMIC ~ + 
Starting "minikube" primary control-plane node in "minikube" cluster
Pulling base image v0.0.46 ...
Downloading Kubernetes v1.32.0 preload ...
> gcr.io/k8s-minikube/kicbase...: 500.31 MiB / 500.31 MiB 100.00% 480.37
> preloaded-images-k8s-v18-v1...: 333.57 MiB / 333.57 MiB 100.00% 278.66
Creating docker container (CPUs=2, Memory=2200MB) ...
Preparing Kubernetes v1.32.0 on Docker 27.4.1 ...
  • 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
naveen@LAPTOP-MR5RNMIC:~$ kubectl get nodes
NAME     STATUS   ROLES    AGE     VERSION
minikube   Ready    control-plane   27s    v1.32.0
naveen@LAPTOP-MR5RNMIC:~$ ls
docker-python-app e-commerce-app minikube-linux-amd64
naveen@LAPTOP-MR5RNMIC:~$ git clone "https://github.com/PadmavathyNarayanan/kubernetes.git"
Cloning into 'kubernetes'...
remote: Enumerating objects: 25, done.
remote: Counting objects: 100% (25/25), done.
remote: Compressing objects: 100% (21/21), done.
remote: Total 25 (delta 3), reused 15 (delta 1), pack-reused 0 (from 0)
Receiving objects: 100% (25/25), 5.64 KiB | 1.41 MiB/s, done.
Resolving deltas: 100% (3/3), done.
naveen@LAPTOP-MR5RNMIC:~$ ls
docker-python-app e-commerce-app kubernetes minikube-linux-amd64
naveen@LAPTOP-MR5RNMIC:~$ cd kubernetes
naveen@LAPTOP-MR5RNMIC:~/kubernetes$ cd backend
naveen@LAPTOP-MR5RNMIC:~/kubernetes/backend$ docker build -t backend:latest .
```

Here's a step-by-step breakdown of the commands you provided:

1. Set up Docker to use Minikube's Docker daemon:

```
eval $(minikube docker-env)
```

This command sets the environment variables so Docker can build images directly inside Minikube's virtual machine, instead of your local Docker daemon.

2. Build the backend Docker image:

```
cd backend
```

```
docker build -t backend:latest .
```

This command builds the backend Docker image from the Dockerfile in the backend folder and tags it as backend:latest.

3. Verify backend image exists:

```
docker images | grep backend
```

This checks if the backend:latest image exists in your local Docker registry.

4. Load the backend image into Minikube:

```
minikube image load backend:latest
```

This command loads the backend:latest image into Minikube's Docker daemon so it can be used by Kubernetes.

5. Build the frontend Docker image:

```
cd ..\frontend  
docker build -t frontend:latest .
```

This builds the frontend Docker image from the Dockerfile in the frontend folder and tags it as frontend:latest.

6. Verify frontend image exists:

```
docker images | grep frontend
```

This checks if the frontend:latest image exists in your local Docker registry.

7. Load the frontend image into Minikube:

```
minikube image load frontend:latest
```

This loads the frontend:latest image into Minikube's Docker daemon.

8. Apply Kubernetes configurations for the backend, frontend, and services:

```
kubectl apply -f k8s/backend-deployment.yaml  
kubectl apply -f k8s/frontend-deployment.yaml  
kubectl apply -f k8s/service.yaml  
kubectl apply -f k8s/configmap.yaml
```

These commands apply the Kubernetes configuration files for deploying the backend, frontend, services, and config maps. The deployment.yaml files describe how to run the containers, and service.yaml defines how they interact.

9. Check the status of pods and services:

```
kubectl get pods  
kubectl get svc
```

These commands list all the pods (containers) running and services exposed in your Kubernetes cluster.

10. Access the frontend service URL:

```
minikube service frontend-service --url
```

This provides the external URL of the frontend service running in Minikube.

11. Get node details to confirm the cluster's node setup:

```
kubectl get nodes -o wide
```

This command provides a detailed list of the nodes in your Kubernetes cluster.

12. Test the backend by creating a temporary pod:

```
kubectl run test-pod --image=alpine --restart=Never -it -- sh  
apk add curl # Install curl if not available  
curl http://backend-service:5000/products
```

- `kubectl run` creates a test pod using the alpine image (a lightweight Linux container).
 - `apk add curl` installs curl inside the pod to make HTTP requests.

```
naveen@LAPTOP-MR5RNMIC:~/kubernetes/frontend$ docker images | grep frontend
frontend          latest        96194bbe0ed4  52 minutes ago  47.9MB
naveen@LAPTOP-MR5RNMIC:~/kubernetes/frontend$ minikube image load frontend:latest
naveen@LAPTOP-MR5RNMIC:~/kubernetes/frontend$ kubectl delete -f backend-deployment.yaml
error: the path "backend-deployment.yaml" does not exist
naveen@LAPTOP-MR5RNMIC:~/kubernetes/frontend$ cd ..
naveen@LAPTOP-MR5RNMIC:~/kubernetes$ cd k8s
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl delete -f backend-deployment.yaml
deployment.apps "backend" deleted
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl apply -f backend-deployment.yaml
deployment.apps/backend created
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl delete -f frontend-deployment.yaml
deployment.apps "frontend" deleted
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl apply -f frontend-deployment.yaml
deployment.apps/frontend created
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl delete -f service.yaml
service "backend-service" deleted
service "frontend-service" deleted
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl apply -f service.yaml
service/backend-service created
service/frontend-service created
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl delete -f configmap.yaml
configmap "backend-config" deleted
naveen@LAPTOP-MR5RNMIC:~/kubernetes/k8s$ kubectl apply -f configmap.yaml
configmap/backend-config created
```

- curl http://backend-service:5000/products makes an HTTP request to the backend service at port 5000 to check if it returns the products data.

This is a quick overview of the deployment and testing process! Let me know if you need more details on any step.



Welcome to Our Store

Loading...

