**Prerequisites**

Make sure you have the following installed:

* Minikube
* kubectl
* Docker

**🏗️ Project Structure**

Assume this layout:

pgsql

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project/

│

├── flask-frontend/

│ ├── app.py

│ ├── requirements.txt

│ └── Dockerfile

│

├── express-backend/

│ ├── index.js

│ ├── package.json

│ └── Dockerfile

│

└── k8s/

├── flask-deployment.yaml

├── express-deployment.yaml

├── flask-service.yaml

└── express-service.yaml

**🐳 Step 1: Start Minikube and Enable Docker Env**

bash

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minikube start

eval $(minikube docker-env)

This allows you to build Docker images directly in the Minikube Docker daemon.

**🧱 Step 2: Build Docker Images**

Navigate to the project/ directory and build the images:

bash

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# From project root

# Flask frontend

docker build -t flask-frontend:latest ./flask-frontend

# Express backend

docker build -t express-backend:latest ./express-backend

**📦 Step 3: Create Kubernetes Deployment YAMLs**

**k8s/express-deployment.yaml**

yaml

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apiVersion: apps/v1

kind: Deployment

metadata:

name: express-backend

spec:

replicas: 1

selector:

matchLabels:

app: express-backend

template:

metadata:

labels:

app: express-backend

spec:

containers:

- name: express-backend

image: express-backend:latest

ports:

- containerPort: 3000

---

apiVersion: v1

kind: Service

metadata:

name: express-service

spec:

selector:

app: express-backend

ports:

- protocol: TCP

port: 3000

targetPort: 3000

**k8s/flask-deployment.yaml**

yaml

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apiVersion: apps/v1

kind: Deployment

metadata:

name: flask-frontend

spec:

replicas: 1

selector:

matchLabels:

app: flask-frontend

template:

metadata:

labels:

app: flask-frontend

spec:

containers:

- name: flask-frontend

image: flask-frontend:latest

ports:

- containerPort: 5000

env:

- name: BACKEND\_URL

value: http://express-service:3000

---

apiVersion: v1

kind: Service

metadata:

name: flask-service

spec:

type: NodePort

selector:

app: flask-frontend

ports:

- protocol: TCP

port: 5000

targetPort: 5000

**🚀 Step 4: Apply Deployments**

bash

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kubectl apply -f k8s/express-deployment.yaml

kubectl apply -f k8s/flask-deployment.yaml

Check that everything is running:

bash

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kubectl get pods

kubectl get services

**🌐 Step 5: Access the Frontend**

To get the URL of your Flask app:

bash

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minikube service flask-service

This will open your browser with the Flask app connected to the Express backend.

**🧹 Optional: Clean Up**

bash

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kubectl delete -f k8s/

minikube stop