Project 01 - 1 Hour

Deploying a Scalable Web Application with Persistent Storage and Advanced Automation

Objective:

Deploy a scalable web application using Docker Swarm and Kubernetes, ensuring data persistence using a single shared volume, and automate the process using advanced shell scripting.

Overview:

1. **Step 1**: Set up Docker Swarm and create a service.
2. **Step 2**: Set up Kubernetes using Minikube.
3. **Step 3**: Deploy a web application using Docker Compose.
4. **Step 4**: Use a single shared volume across multiple containers.
5. **Step 5**: Automate the entire process using advanced shell scripting.

Step 1: Set up Docker Swarm and Create a Service

1.1 Initialize Docker Swarm

```
# Initialize Docker Swarm
docker swarm init
```

1.2 Create a Docker Swarm Service

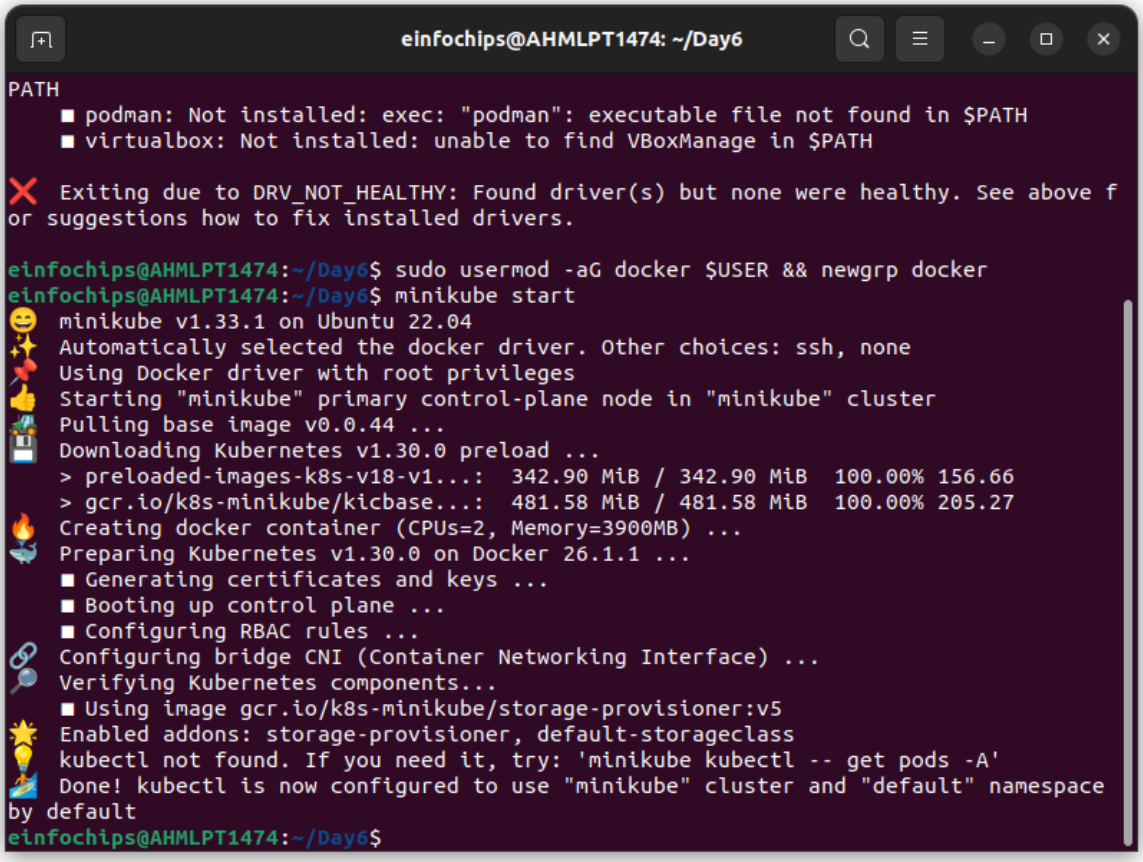
```
# Create a simple Nginx service in Docker Swarm
docker service create --name nginx-service --publish 8080:80 nginx
```

```
einfochips@AHMLPT1474: ~/Day6
einfochips@AHMLPT1474:~/Day6$ sudo docker swarm init
Swarm initialized: current node (8p1fosf53vzc0pozmkfa8fgks) is now a manager.

To add a worker to this swarm, run the following command:

    docker swarm join --token SWMTKN-1-1ne8tnjudxl8rah8kvwee61ih7p0bf9j0kehkycn5
cfbr9uhan-3cpr2k9a8pxpaouc8rku5j0bz 192.168.232.24:2377

To add a manager to this swarm, run 'docker swarm join-token manager' and follow
 the instructions.

einfochips@AHMLPT1474:~/Day6$ sudo dokcer service create --name nginx-service --
publish 8080:80 nginx
sudo: dokcer: command not found
einfochips@AHMLPT1474:~/Day6$ sudo docker service create --name nginx-service --
publish 8080:80 nginx
nk1egja7zwdzszm7t1vinru18
overall progress: 1 out of 1 tasks
1/1: running
verify: Waiting 1 seconds to verify that tasks are stable...
```

Step 2: Set up Kubernetes Using Minikube

2.1 Start Minikube

```
# Start Minikube
minikube start
```



2.2 Deploy a Web App on Kubernetes

Create a deployment file named webapp-deployment.yaml:

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: webapp
spec:
  replicas: 3
  selector:
    matchLabels:
      app: webapp
  template:
    metadata:
      labels:
        app: webapp
    spec:
      containers:
      - name: webapp
        image: nginx
      ports:
```

- containerPort: 80

```
einfochips@AHMLPT1474: ~/Day6
einfochips@AHMLPT1474:~$ cd Day6
einfochips@AHMLPT1474:~/Day6$ nano webapp-deployment.yaml
einfochips@AHMLPT1474:~/Day6$ sudo snap install kubectl --classic
[sudo] password for einfochips:
kubectl 1.30.2 from Canonical** installed
einfochips@AHMLPT1474:~/Day6$ kubectl version --client
Client Version: v1.30.2
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
einfochips@AHMLPT1474:~/Day6$ kubectl cluster -info
error: unknown command "cluster" for "kubectl"

Did you mean this?
        cluster-info
einfochips@AHMLPT1474:~/Day6$ kubectl cluster-info
E0715 12:39:59.920644   16066 memcache.go:265] couldn't get current server API g
roup list: Get "https://192.168.49.2:8443/api?timeout=32s": dial tcp 192.168.49.
2:8443: connect: no route to host
E0715 12:40:02.992605   16066 memcache.go:265] couldn't get current server API g
roup list: Get "https://192.168.49.2:8443/api?timeout=32s": dial tcp 192.168.49.
2:8443: connect: no route to host
E0715 12:40:06.064406   16066 memcache.go:265] couldn't get current server API g
roup list: Get "https://192.168.49.2:8443/api?timeout=32s": dial tcp 192.168.49.
2:8443: connect: no route to host
E0715 12:40:09.136068   16066 memcache.go:265] couldn't get current server API g
```

Apply the deployment:

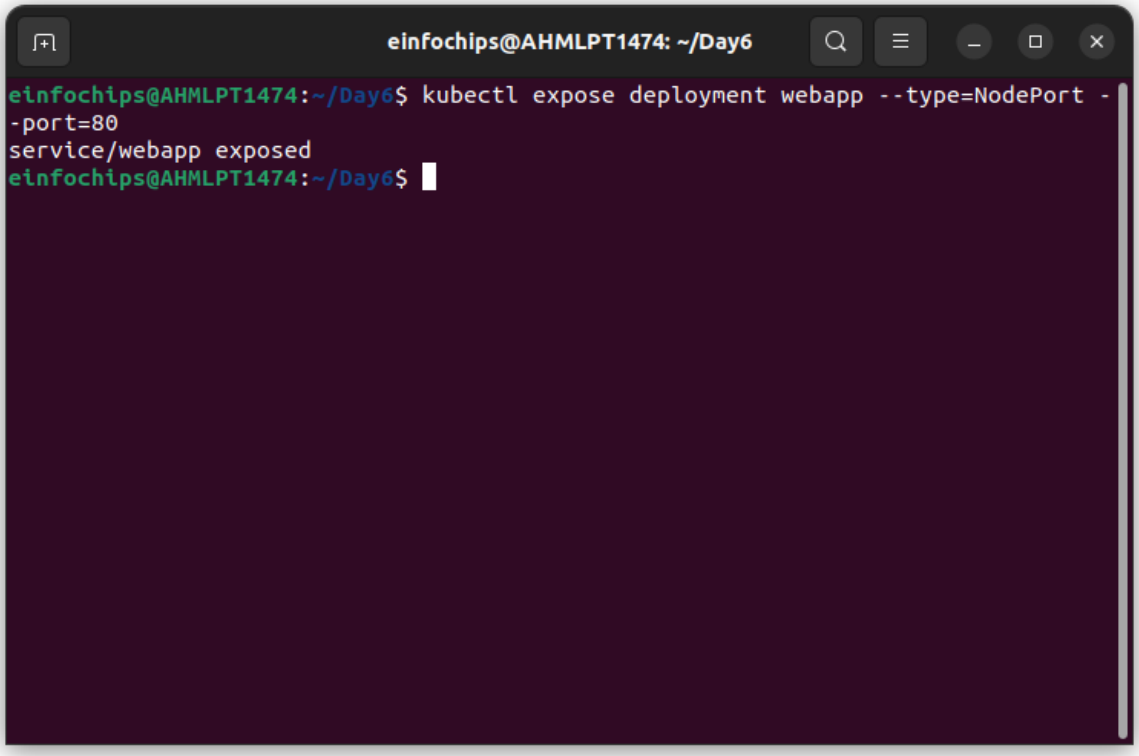
kubectl apply -f webapp-deployment.yaml

```
einfochips@AHMLPT1474: ~/Day6
einfochips@AHMLPT1474:~/Day6$ kubectl apply -f webapp-deployment.yaml
error: error validating "webapp-deployment.yaml": error validating data: failed
to download openapi: Get "https://192.168.49.2:8443/openapi/v2?timeout=32s": dia
l tcp 192.168.49.2:8443: connect: no route to host; if you choose to ignore thes
e errors, turn validation off with --validate=false
einfochips@AHMLPT1474:~/Day6$ sudo spt-get install virtualbox virtualbox-ext-pac
k
sudo: spt-get: command not found
einfochips@AHMLPT1474:~/Day6$ sudo apt-get install virtualbox virtualbox-ext-pac
k
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
E: Unable to locate package virtualbox
E: Unable to locate package virtualbox-ext-pack
einfochips@AHMLPT1474:~/Day6$ kubectl apply -f webapp-deployment.yaml
error: error validating "webapp-deployment.yaml": error validating data: failed
to download openapi: Get "https://192.168.49.2:8443/openapi/v2?timeout=32s": dia
l tcp 192.168.49.2:8443: connect: no route to host; if you choose to ignore thes
e errors, turn validation off with --validate=false
einfochips@AHMLPT1474:~/Day6$
```

```
einfochips@AHMLPT1474: ~/Day6
    "kind": "ReplicaSetList",
    "apiVersion": "apps/v1",
    "metadata": {
        "resourceVersion": "626"
    },
    "items": []
}
{
    "kind": "PodList",
    "apiVersion": "v1",
    "metadata": {
        "resourceVersion": "626"
    },
    "items": []
}
einfochips@AHMLPT1474:~/Day6$ kubectl cluster-info
Kubernetes control plane is running at https://192.168.49.2:8443
CoreDNS is running at https://192.168.49.2:8443/api/v1/namespaces/kube-system/se
rvices/kube-dns:dns/proxy

To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
einfochips@AHMLPT1474:~/Day6$ kubectl apply -f webapp-deployment.yaml
deployment.apps/webapp created
einfochips@AHMLPT1474:~/Day6$
```

2.3 Expose the Deployment

kubectl expose deployment webapp --type=NodePort --port=80



Step 3: Deploy a Web Application Using Docker Compose

3.1 Create a docker-compose.yml File

```
version: '3'
services:
  web:
    image: nginx
    ports:
      - "8080:80"
    volumes:
      - webdata:/usr/share/nginx/html

volumes:
  webdata:
```

3.2 Deploy the Web Application

```
# Deploy using Docker Compose
docker-compose up -d
```

Step 4: Use a Single Shared Volume Across Multiple Containers

4.1 Update docker-compose.yml to Use a Shared Volume

```
version: '3'
services:
  web1:
    image: nginx
    ports:
      - "8081:80"
    volumes:
      - shareddata:/usr/share/nginx/html
  web2:
    image: nginx
    ports:
      - "8082:80"
    volumes:
      - shareddata:/usr/share/nginx/html

volumes:
  shareddata:
```

4.2 Deploy with Docker Compose

```
# Deploy using Docker Compose
docker-compose up -d
```

Step 5: Automate the Entire Process Using Advanced Shell Scripting

5.1 Create a Shell Script deploy.sh

```
#!/bin/bash

# Initialize Docker Swarm
docker swarm init

# Create Docker Swarm Service
docker service create --name nginx-service --publish 8080:80 nginx

# Start Minikube
minikube start

# Create Kubernetes Deployment
kubectl apply -f webapp-deployment.yaml

# Expose the Deployment
kubectl expose deployment webapp --type=NodePort --port=80
```

```
# Deploy Web App Using Docker Compose
docker-compose -f docker-compose-single-volume.yml up -d

echo "Deployment completed successfully!"
```

5.2 Make the Script Executable

```
# Make the script executable
chmod +x deploy.sh
```

5.3 Run the Script

```
# Run the deployment script
./deploy.sh
```