SAHASRAN M – 22CSR167 III CSE C

DevOps Day 4 Task – Kubernetes, Namespace:

Kubernetes (K8s)

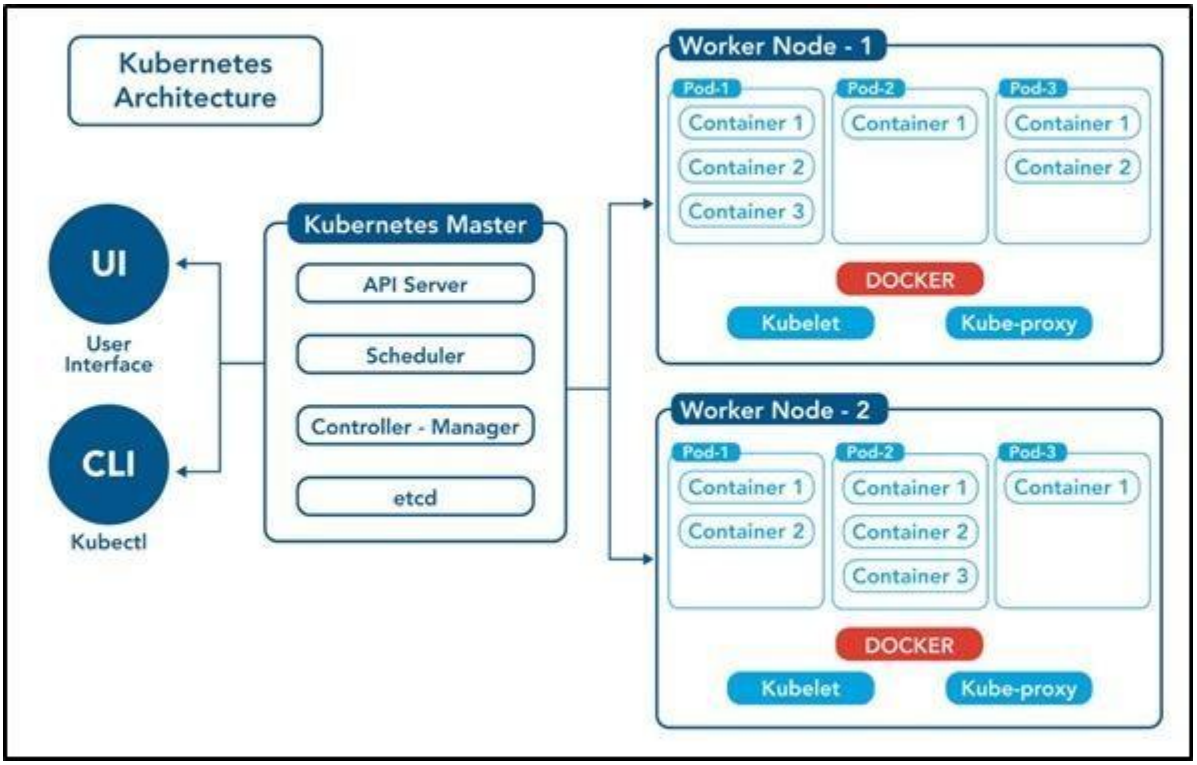
Kubernetes is an open source container orchestration engine for automating deployment, scaling, and management of containerized applications. The open source project is hosted by the Cloud Native Computing Foundation (CNCF).

It provides a scalable and resilient framework for automating the deployment, scaling, and management of applications across clusters of servers.

A SMALL HISTORY OF K8S:

- In the early 2000s, Google started developing a system called Borg to manage their internal containerized applications.
- Borg enabled Google to run applications at scale, providing features such as automatic scaling, service discovery, and fault tolerance.
- In 2014, Google open-sourced a version of Borg called Kubernetes.
- Kubernetes was donated to the Cloud Native Computing Foundation (CNCF), a neutral home for open-source cloud-native projects, in July 2015.

- Kubernetes 1.8 added significant enhancements for storage, security, and networking. Key features included the stable release of the stateful sets API, expanded support for volume plugins, and improvements in security policies.
- Check URL: https://kubernetes.io/releases/ for more release details.



Control Plane /Master Node

The control plane's components make global decisions about the cluster (for example, scheduling), as well as detecting and responding to cluster events (for example, starting up a new pod when a deployment's replicas field is unsatisfied).

Control plane components can be run on any machine in the cluster. Do not run user containers on this machine.

Node Components / Worker Nodes

Node components run on every node, maintaining running pods and providing the Kubernetes runtime environment.

1. Master Node: The master node is responsible for managing the cluster and coordinating the overall state of the system. It includes the following components:

a. API Server: The API server is the central control point for all interactions with the cluster. It exposes the Kubernetes API and handles requests from users and other components.

b. Scheduler: The scheduler is responsible for assigning workloads (pods) to individual worker nodes based on resource requirements, constraints, and other policies.

c. Controller Manager: The controller manager runs various controllers that monitor the cluster state and drive it towards the desired state. Examples include the replication controller, node controller, and service controller.

d. etcd: etcd is a distributed key-value store used by Kubernetes to store cluster state and configuration data.

1. Pod: The basic building block of Kubernetes. A pod represents a single instance of a running process within the cluster. It can

encapsulate one or more containers that share the same network and storage resource

1. Create a pod using run command

```
$ kubectl run <pod-name> --image=<image-name> --port=<containerport>
$ kubectl run my-pod --image=nginx --port=80
```

2. View all the pods

(In default namespace)

```
$ kubectl get pods
```

(In All namespace)

```
$ kubectl get pods -A
# For a specific namespace
$ kubectl get pods -n kube-system

# For a specific type
$ kubectl get pods <pod-name>
$ kubectl get pods <pod-name> -o wide
$ kubectl get pods <pod-name>  -o yaml
$ kubectl get pods <pod-name>  -o json
```

3. Describe a pod (View Pod details)

```
$ kubectl describe pod <pod-name>
$ kubectl describe pod my-pod
```

4. View Logs of a pod

```
$ kubectl logs <pod-name>
$ kubectl logs my-pod
```

5. Execute any command inside Pod (Inside Pod OS) $ kubectl exec <pod-name> -- <command> kubectl exec -it my-pod

[4:34 PM, 3/20/2025] +91 90928 13114: Namespace (short name = ns):

namespace is a virtual cluster or logical partition within a cluster that provides a way to organize and isolate resources. It allows multiple teams or projects to share the same physical cluster while maintaining resource separation and access control.

[4:34 PM, 3/20/2025] +91 90928 13114: # To create a namespace:

```
$ kubectl create namespace <namespace-name>
$ kubectl create ns my-bank
```

```
# To switch to a specific namespace: (make this as default type) $ kubectl config set-context --current --namespace=<namespace-name> # To list all namespaces:
$ kubectl get namespaces
# To get resources within a specific namespace:
$ kubectl get <resource-type> -n <namespace-name>
$ kubectl get deploy -n my-bank
$ kubectl get deploy --namespace my-bank
$ kubectl get all --namespace my-bank
# To delete a namespace and all associated resources:
$ kubectl delete namespace <namespace-name>
$ kubectl delete ns my-bank
```

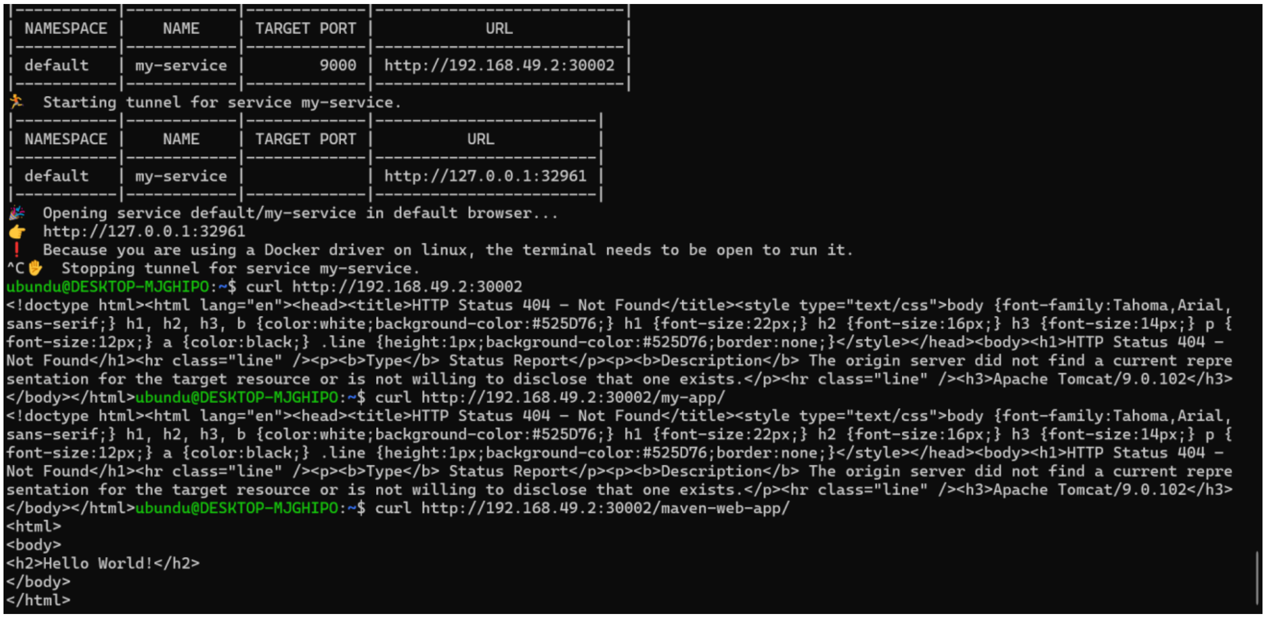
Deployment.yml

```
apiVersion: apps/v1
kind: Deployment metadata:
  name:   my-deploy
labels:     name: my-
deploy spec:
  replicas: 1
selector:
matchLabels:
      apptype: web-backend
strategy:
    type: RollingUpdate
template:
metadata:       labels:
        apptype: web-backend
spec:
      containers:
- name: maven-web-app         image:
  aswinprabusiva/webapp1:latest         ports:

- containerPort: 8000


---
```

```
apiVersion: v1 kind:
Service metadata:
name: my-service
labels:    app: my-
service spec:   type:
NodePort   ports:
- port: 8000
targetPort: 8080
nodePort: 30007
```



```
|-----------|------------|-------------|---------------------------|
| NAMESPACE |    NAME    | TARGET PORT |            URL            |
|-----------|------------|-------------|---------------------------|
| default   | my-service |        9000 | http://192.168.49.2:30002 |
|-----------|------------|-------------|---------------------------|
🏃  Starting tunnel for service my-service.
|-----------|------------|-------------|------------------------|
| NAMESPACE |    NAME    | TARGET PORT |          URL           |
|-----------|------------|-------------|------------------------|
| default   | my-service |             | http://127.0.0.1:32961 |
|-----------|------------|-------------|------------------------|
🎉  Opening service default/my-service in default browser...
👉  http://127.0.0.1:32961
❗  Because you are using a Docker driver on linux, the terminal needs to be open to run it.
^C✋  Stopping tunnel for service my-service.
ubundu@DESKTOP-MJGHIPO:~$ curl http://192.168.49.2:30002
<!doctype html><html lang="en"><head><title>HTTP Status 404 – Not Found</title><style type="text/css">body {font-family:Tahoma,Arial,
sans-serif;} h1, h2, h3, b {color:white;background-color:#525D76;} h1 {font-size:22px;} h2 {font-size:16px;} h3 {font-size:14px;} p {
font-size:12px;} a {color:black;} .line {height:1px;background-color:#525D76;border:none;}</style></head><body><h1>HTTP Status 404 –
Not Found</h1><hr class="line" /><p><b>Type</b> Status Report</p><p><b>Description</b> The origin server did not find a current repre
sentation for the target resource or is not willing to disclose that one exists.</p><hr class="line" /><h3>Apache Tomcat/9.0.102</h3>
</body></html>ubundu@DESKTOP-MJGHIPO:~$ curl http://192.168.49.2:30002/my-app/
<!doctype html><html lang="en"><head><title>HTTP Status 404 – Not Found</title><style type="text/css">body {font-family:Tahoma,Arial,
sans-serif;} h1, h2, h3, b {color:white;background-color:#525D76;} h1 {font-size:22px;} h2 {font-size:16px;} h3 {font-size:14px;} p {
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sentation for the target resource or is not willing to disclose that one exists.</p><hr class="line" /><h3>Apache Tomcat/9.0.102</h3>
</body></html>ubundu@DESKTOP-MJGHIPO:~$ curl http://192.168.49.2:30002/maven-web-app/
<html>
<body>
<h2>Hello World!</h2>
</body>
</html>
```
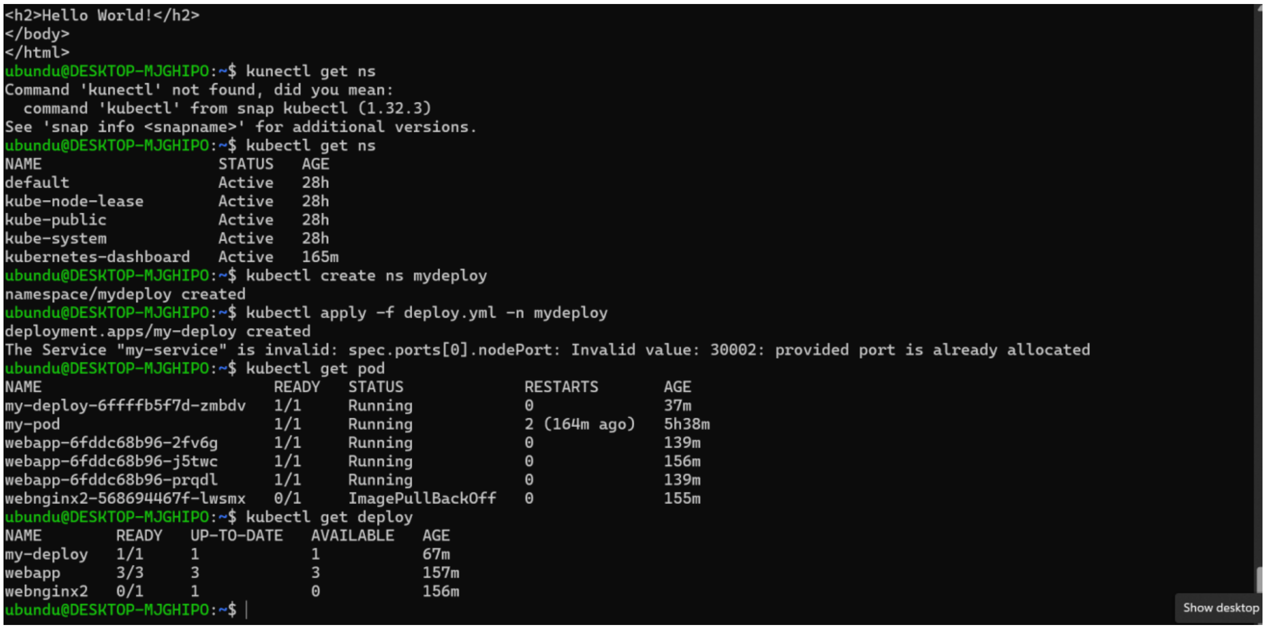
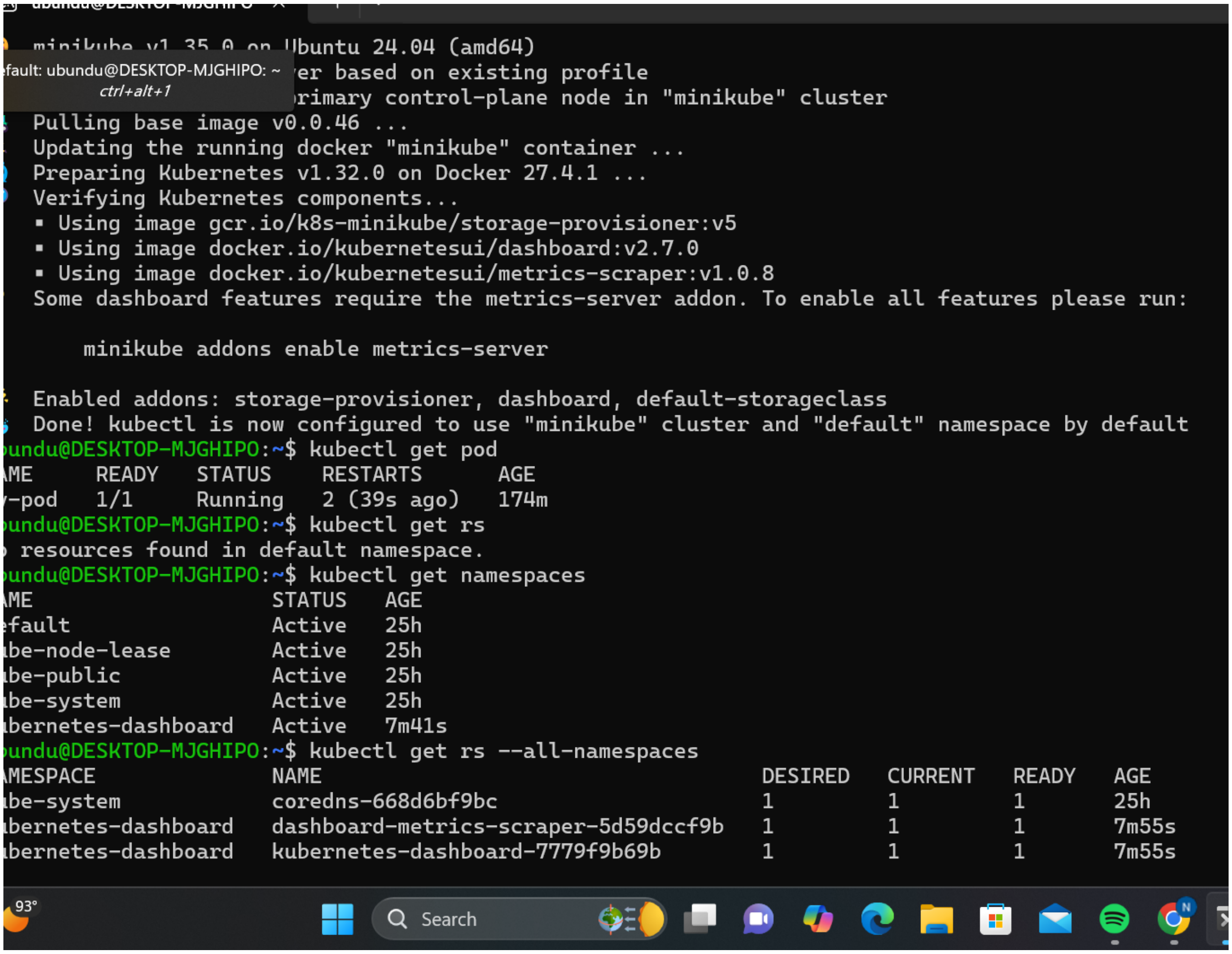



```
<h2>Hello World!</h2>
</body>
</html>
ubundu@DESKTOP-MJGHIPO:~$ kunectl get ns
Command 'kunectl' not found, did you mean:
  command 'kubectl' from snap kubectl (1.32.3)
See 'snap info <snapname>' for additional versions.
ubundu@DESKTOP-MJGHIPO:~$ kubectl get ns
NAME                   STATUS   AGE
default                Active   28h
kube-node-lease        Active   28h
kube-public            Active   28h
kube-system            Active   28h
kubernetes-dashboard   Active   165m
ubundu@DESKTOP-MJGHIPO:~$ kubectl create ns mydeploy
namespace/mydeploy created
ubundu@DESKTOP-MJGHIPO:~$ kubectl apply -f deploy.yml -n mydeploy
deployment.apps/my-deploy created
The Service "my-service" is invalid: spec.ports[0].nodePort: Invalid value: 30002: provided port is already allocated
ubundu@DESKTOP-MJGHIPO:~$ kubectl get pod
NAME                         READY   STATUS             RESTARTS       AGE
my-deploy-6ffffb5f7d-zmbdv   1/1     Running            0              37m
my-pod                       1/1     Running            2 (164m ago)   5h38m
webapp-6fddc68b96-2fv6g      1/1     Running            0              139m
webapp-6fddc68b96-j5twc      1/1     Running            0              156m
webapp-6fddc68b96-prqdl      1/1     Running            0              139m
webnginx2-568694467f-lwsmx   0/1     ImagePullBackOff   0              155m
ubundu@DESKTOP-MJGHIPO:~$ kubectl get deploy
NAME        READY   UP-TO-DATE   AVAILABLE   AGE
my-deploy   1/1     1            1           67m
webapp      3/3     3            3           157m
webnginx2   0/1     1            0           156m
ubundu@DESKTOP-MJGHIPO:~$ |
```



```
  minikube v1.35.0 on Ubuntu 24.04 (amd64)
                    ver based on existing profile
                    primary control-plane node in "minikube" cluster
  Pulling base image v0.0.46 ...
  Updating the running docker "minikube" container ...
  Preparing Kubernetes v1.32.0 on Docker 27.4.1 ...
  Verifying Kubernetes components...
  ▪ Using image gcr.io/k8s-minikube/storage-provisioner:v5
  ▪ Using image docker.io/kubernetesui/dashboard:v2.7.0
  ▪ Using image docker.io/kubernetesui/metrics-scraper:v1.0.8
  Some dashboard features require the metrics-server addon. To enable all features please run:

      minikube addons enable metrics-server

  Enabled addons: storage-provisioner, dashboard, default-storageclass
  Done! kubectl is now configured to use "minikube" cluster and "default" namespace by default
oundu@DESKTOP-MJGHIPO:~$ kubectl get pod
AME      READY   STATUS    RESTARTS     AGE
-pod    1/1     Running   2 (39s ago)   174m
oundu@DESKTOP-MJGHIPO:~$ kubectl get rs
 resources found in default namespace.
oundu@DESKTOP-MJGHIPO:~$ kubectl get namespaces
AME                   STATUS   AGE
efault                Active   25h
ube-node-lease        Active   25h
ube-public            Active   25h
ube-system            Active   25h
ubernetes-dashboard   Active   7m41s
oundu@DESKTOP-MJGHIPO:~$ kubectl get rs --all-namespaces
AMESPACE              NAME                                   DESIRED   CURRENT   READY   AGE
ube-system            coredns-668d6bf9bc                     1         1         1       25h
ubernetes-dashboard   dashboard-metrics-scraper-5d59dccf9b   1         1         1       7m55s
ubernetes-dashboard   kubernetes-dashboard-7779f9b69b        1         1         1       7m55s
```