School of Computer Science

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
DEHRADUN, UTTARAKHAND

Containers & Docker Security

Lab File (2022-2026)
5th Semester

Submitted To:

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Batch - 1

EXPERIMENT 9

AIM: Managing Namespaces in Kubernetes

Step 1: Understand Namespaces

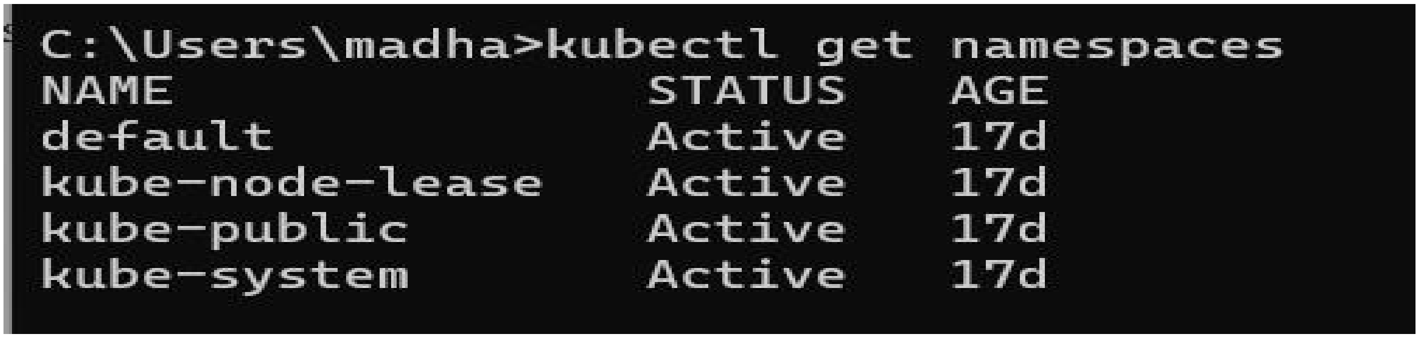
Namespaces provide a mechanism for scoping resources in a cluster. Namespaces can be used to:

- Create environments for different applications or teams.
- Apply policies like resource quotas or network policies on a per-namespace basis.
- Separate operational environments (like development and production).

Step 2: List Existing Namespaces

To list all the namespaces in your Kubernetes cluster:

```
kubectl get namespaces
```



```
C:\Users\madha>kubectl get namespaces
NAME                STATUS   AGE
default             Active   17d
kube-node-lease     Active   17d
kube-public         Active   17d
kube-system         Active   17d
```

You will typically see default namespaces like default, kube-system, and kube-public.

Step 3: Create a Namespace

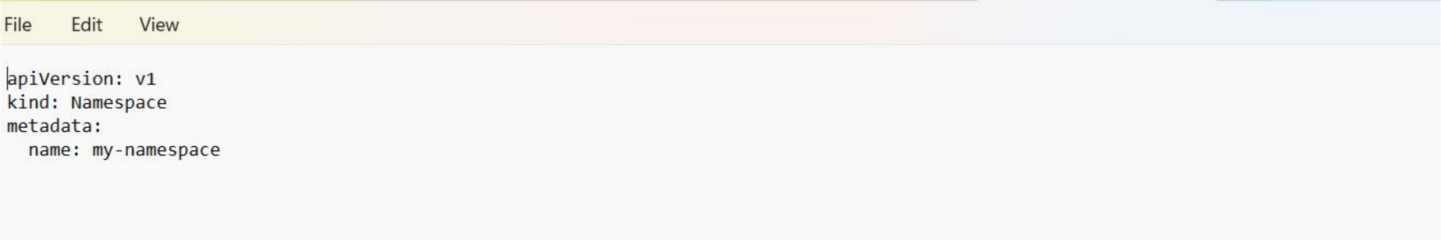
You can create a namespace using a YAML file or directly with the kubectl command.

Using YAML File

Create a file named ***my-namespace.yaml*** with the following content:

```
apiVersion: v1

kind: Namespace
```

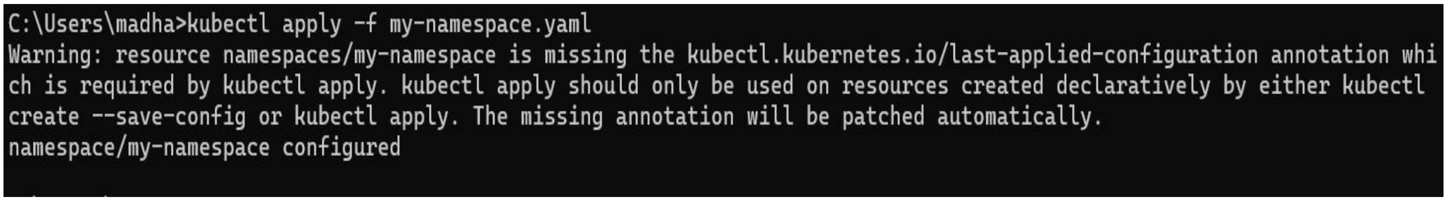
```
metadata:

  name: my-namespace
```



```
apiVersion: v1
kind: Namespace
metadata:
  name: my-namespace
```

Apply this YAML to create the namespace:

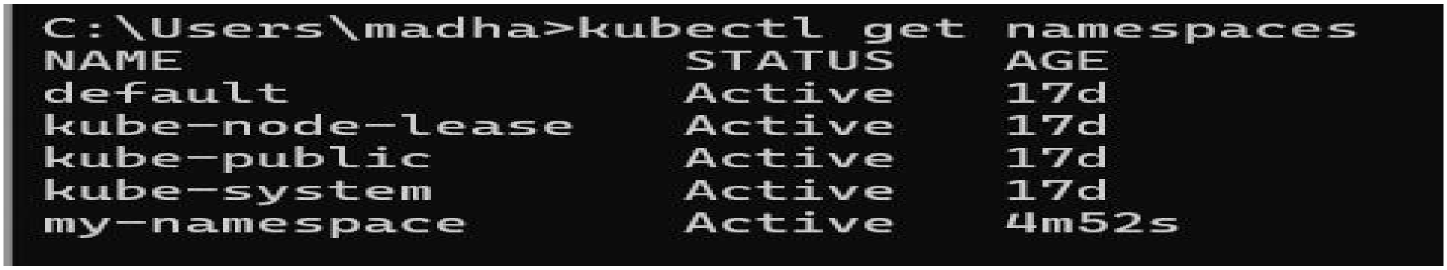
```
kubectl apply -f my-namespace.yaml
```



```
C:\Users\madha>kubectl apply -f my-namespace.yaml
Warning: resource namespaces/my-namespace is missing the kubectl.kubernetes.io/last-applied-configuration annotation whi
ch is required by kubectl apply. kubectl apply should only be used on resources created declaratively by either kubectl
create --save-config or kubectl apply. The missing annotation will be patched automatically.
namespace/my-namespace configured
```

Verify that the namespace is created:

```
kubectl get namespaces
```



```
C:\Users\madha>kubectl get namespaces
NAME                STATUS   AGE
default             Active   17d
kube-node-lease     Active   17d
kube-public         Active   17d
kube-system         Active   17d
my-namespace        Active   4m52s
```

You should see my-namespace listed in the output.

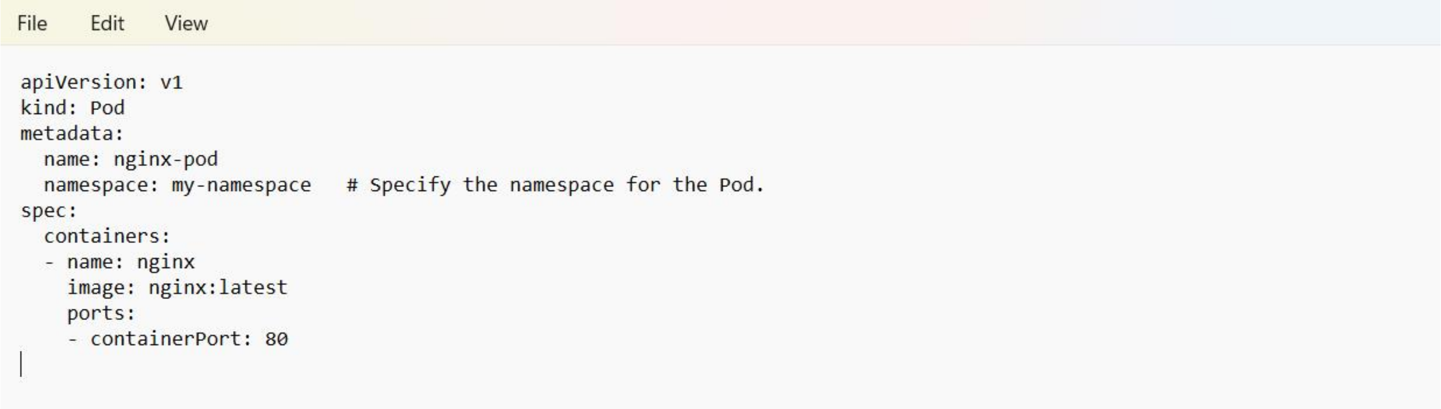
Step 4: Deploy Resources in a Namespace

Create resources such as Pods, Services, or Deployments within the new namespace.

Deploy a Pod in the Namespace

Create a YAML file named ***nginx-pod.yaml*** with the following content:

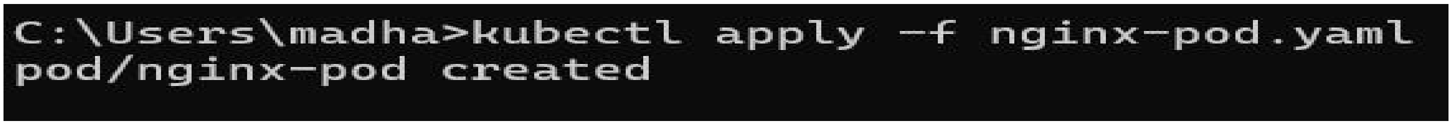
```
apiVersion: v1

kind: Pod

metadata:
  name: nginx-pod

  namespace: my-namespace   # Specify the namespace for the Pod.

spec:

  containers:

  - name: nginx

    image: nginx:latest

    ports:

    - containerPort: 80
```



```
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
  namespace: my-namespace   # Specify the namespace for the Pod.
spec:
  containers:
  - name: nginx
    image: nginx:latest
    ports:
    - containerPort: 80
```

Apply this YAML to create the Pod:

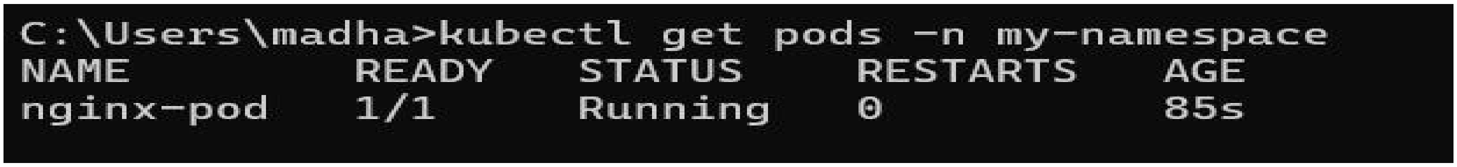
```
kubectl apply -f nginx-pod.yaml
```



```
C:\Users\madha>kubectl apply -f nginx-pod.yaml
pod/nginx-pod created
```

Check the status of the Pod within the namespace:

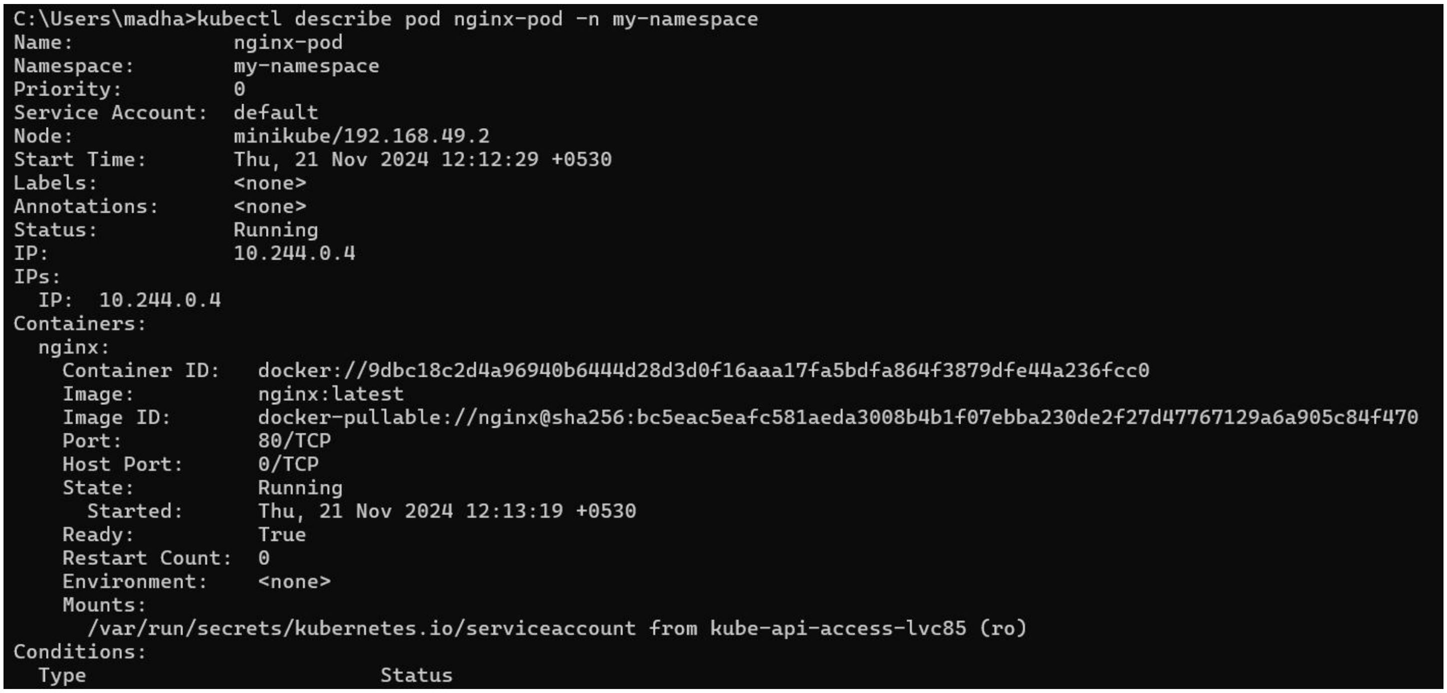
```
kubectl get pods -n my-namespace
```



```
C:\Users\madha>kubectl get pods -n my-namespace
NAME        READY   STATUS    RESTARTS   AGE
nginx-pod   1/1     Running   0          85s
```

To describe the Pod and see detailed information:

```
kubectl describe pod nginx-pod -n my-namespace
```

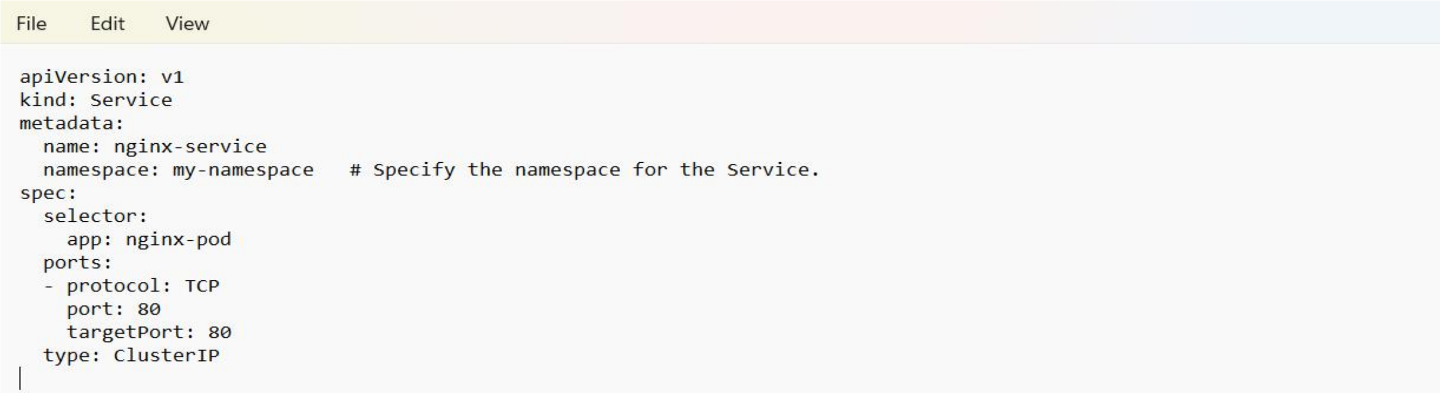


```
C:\Users\madha>kubectl describe pod nginx-pod -n my-namespace
Name:             nginx-pod
Namespace:        my-namespace
Priority:         0
Service Account:  default
Node:             minikube/192.168.49.2
Start Time:       Thu, 21 Nov 2024 12:12:29 +0530
Labels:           <none>
Annotations:      <none>
Status:           Running
IP:               10.244.0.4
IPs:
  IP:  10.244.0.4
Containers:
  nginx:
    Container ID:   docker://9dbc18c2d4a96940b6444d28d3d0f16aaa17fa5bdfa864f3879dfe44a236fcc0
    Image:          nginx:latest
    Image ID:       docker-pullable://nginx@sha256:bc5eac5eafc581aeda3008b4b1f07ebba230de2f27d47767129a6a905c84f470
    Port:           80/TCP
    Host Port:      0/TCP
    State:          Running
      Started:      Thu, 21 Nov 2024 12:13:19 +0530
    Ready:          True
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-lvc85 (ro)
Conditions:
  Type                        Status
```

Create a Service in the Namespace

Create a YAML file named nginx-service.yaml with the following content:

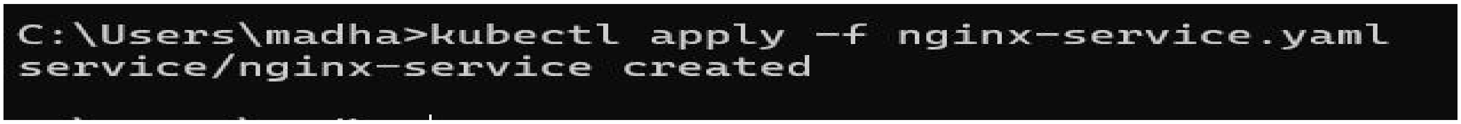
```
apiVersion: v1

kind: Service

metadata:

  name: nginx-service

  namespace: my-namespace   # Specify the namespace for the Service.

spec:

  selector:

    app: nginx-pod

  ports:

  - protocol: TCP

    port: 80

    targetPort: 80

  type: ClusterIP
```



```
apiVersion: v1
kind: Service
metadata:
  name: nginx-service
  namespace: my-namespace   # Specify the namespace for the Service.
spec:
  selector:
    app: nginx-pod
  ports:
  - protocol: TCP
    port: 80
    targetPort: 80
  type: ClusterIP
```

Apply this YAML to create the Service:

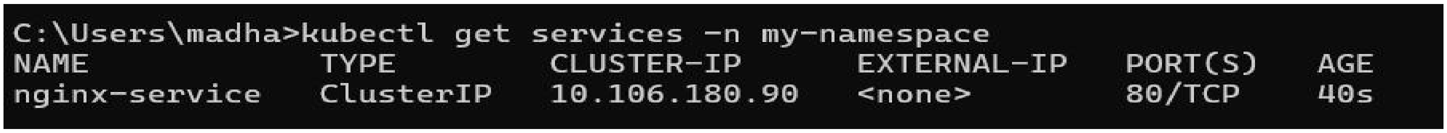
```
kubectl apply -f nginx-service.yaml
```



```
C:\Users\madha>kubectl apply -f nginx-service.yaml
service/nginx-service created
```

Check the status of the Service within the namespace:

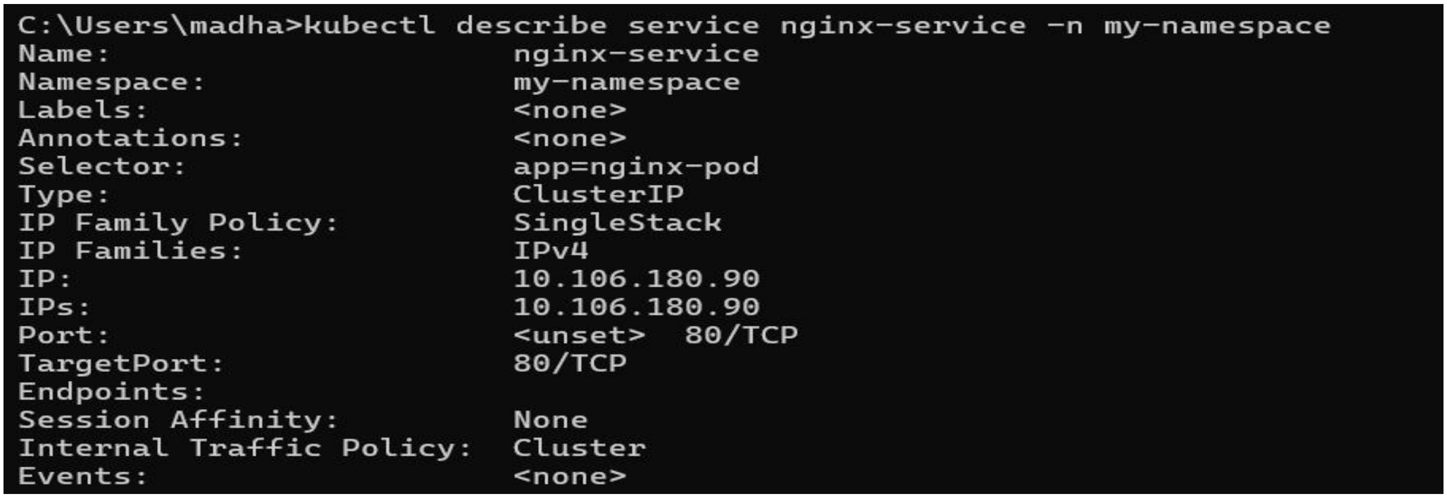
```
kubectl get services -n my-namespace
```



```
C:\Users\madha>kubectl get services -n my-namespace
NAME            TYPE        CLUSTER-IP      EXTERNAL-IP   PORT(S)   AGE
nginx-service   ClusterIP   10.106.180.90   <none>        80/TCP    40s
```

To describe the Service and see detailed information:

```
kubectl describe service nginx-service -n my-namespace
```



```
C:\Users\madha>kubectl describe service nginx-service -n my-namespace
Name:                     nginx-service
Namespace:                my-namespace
Labels:                   <none>
Annotations:              <none>
Selector:                 app=nginx-pod
Type:                     ClusterIP
IP Family Policy:         SingleStack
IP Families:              IPv4
IP:                       10.106.180.90
IPs:                      10.106.180.90
Port:                     <unset>  80/TCP
TargetPort:               80/TCP
Endpoints:
Session Affinity:         None
Internal Traffic Policy:  Cluster
Events:                   <none>
```

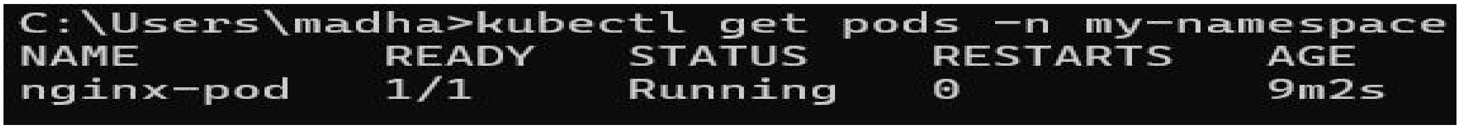
Step 5: Switching Context Between Namespaces

When working with multiple namespaces, you can specify the namespace in kubectl commands or switch the default context.

Specify Namespace in Commands

You can specify the namespace directly in kubectl commands using the -n or --namespace flag:

```
kubectl get pods -n my-namespace
```

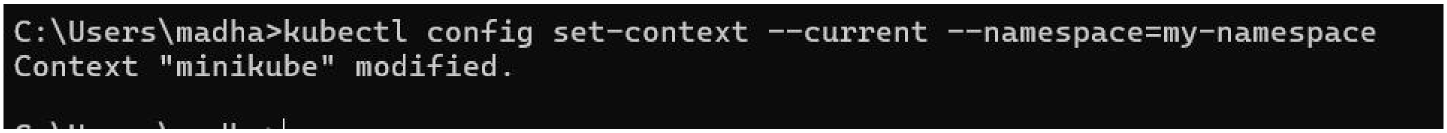


```
C:\Users\madha>kubectl get pods -n my-namespace
NAME         READY   STATUS    RESTARTS   AGE
nginx-pod    1/1     Running   0          9m2s
```

Set Default Namespace for kubectl Commands

To avoid specifying the namespace every time, you can set the default namespace for the current context:

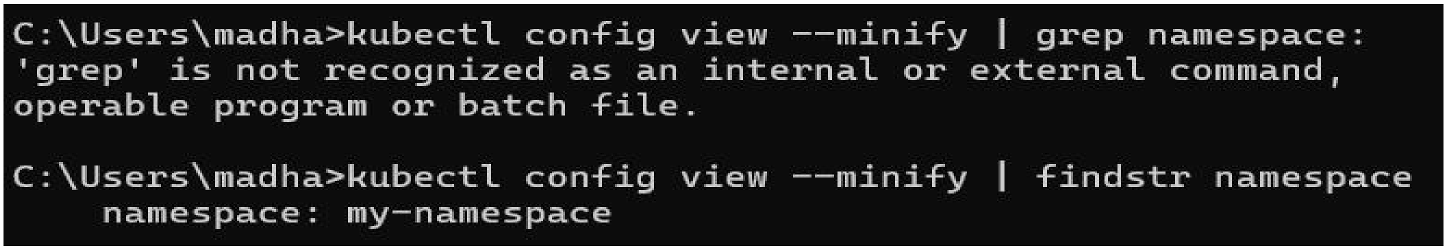
```
kubectl config set-context --current --namespace=my-namespace
```



```
C:\Users\madha>kubectl config set-context --current --namespace=my-namespace
Context "minikube" modified.
```

Verify the current context's namespace:

```
kubectl config view --minify | grep namespace:
```

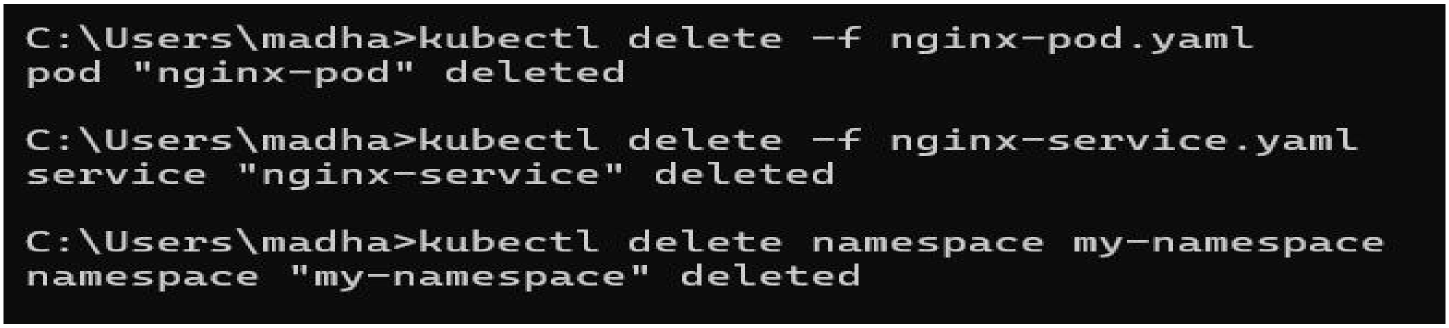


```
C:\Users\madha>kubectl config view --minify | grep namespace:
'grep' is not recognized as an internal or external command,
operable program or batch file.

C:\Users\madha>kubectl config view --minify | findstr namespace
    namespace: my-namespace
```

Step 6: Clean Up Resources

To delete the resources and the namespace you created:

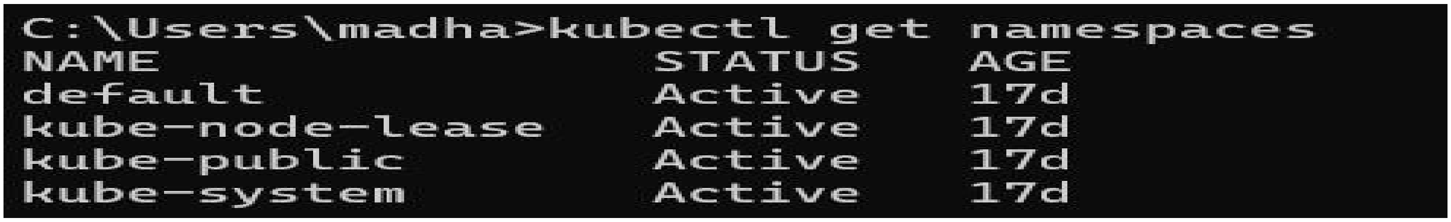
```
kubectl delete -f nginx-pod.yaml

kubectl delete -f nginx-service.yaml

kubectl delete namespace my-namespace
```



```
C:\Users\madha>kubectl delete -f nginx-pod.yaml
pod "nginx-pod" deleted

C:\Users\madha>kubectl delete -f nginx-service.yaml
service "nginx-service" deleted

C:\Users\madha>kubectl delete namespace my-namespace
namespace "my-namespace" deleted
```

Ensure that the namespace and all its resources are deleted:

```
kubectl get namespaces
```



```
C:\Users\madha>kubectl get namespaces
NAME                STATUS   AGE
default             Active   17d
kube-node-lease     Active   17d
kube-public         Active   17d
kube-system         Active   17d
```