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Lab Exercise 9- Managing Namespaces in Kubernetes

Step 1: Understand Namespaces

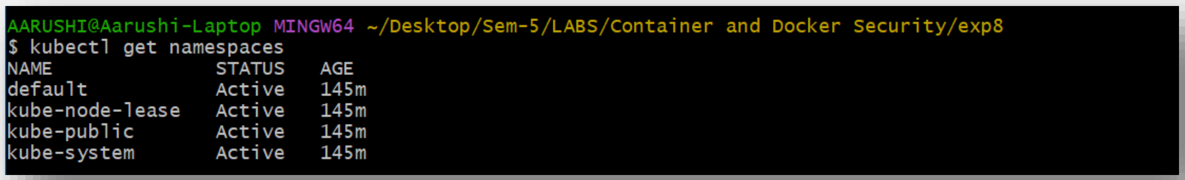
Namespaces provide a mechanism for scoping resources in a cluster. Namespaces can be used to:

- 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
```



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp8
$ kubectl get namespaces
NAME              STATUS   AGE
default           Active   145m
kube-node-lease   Active   145m
kube-public       Active   145m
kube-system       Active   145m
```

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

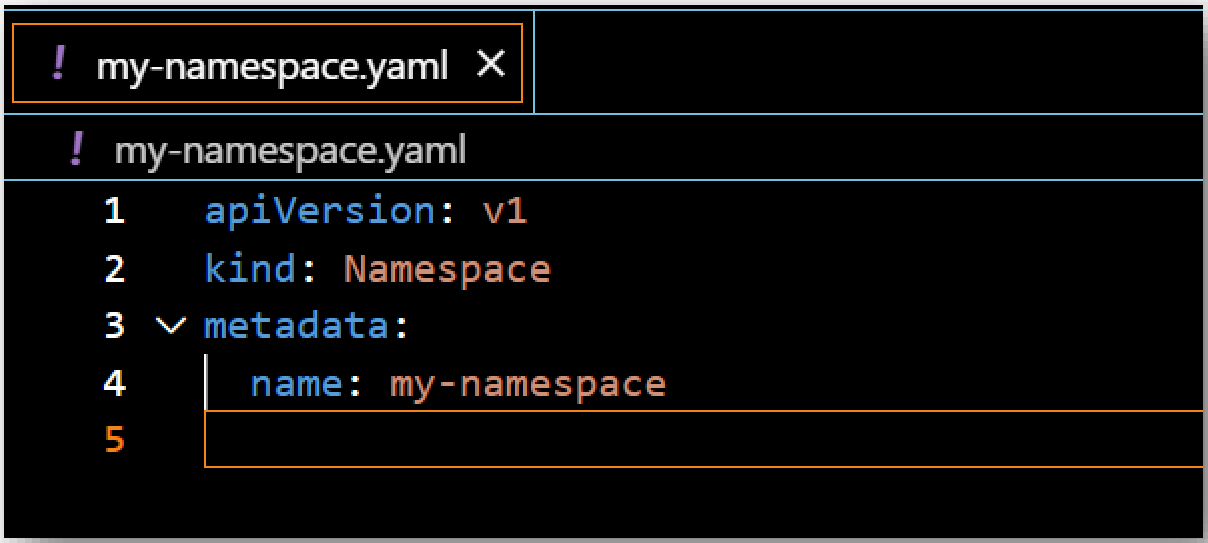
Step 3: Create a Namespace

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:

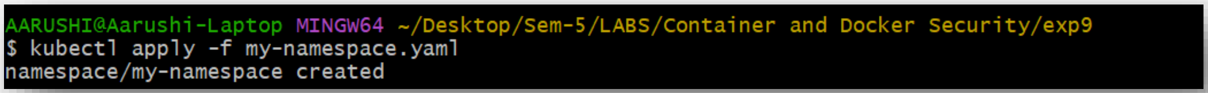
```
apiVersion: v1
kind: Namespace
metadata:
  name: my-namespace
```



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

Apply this YAML to create the namespace:

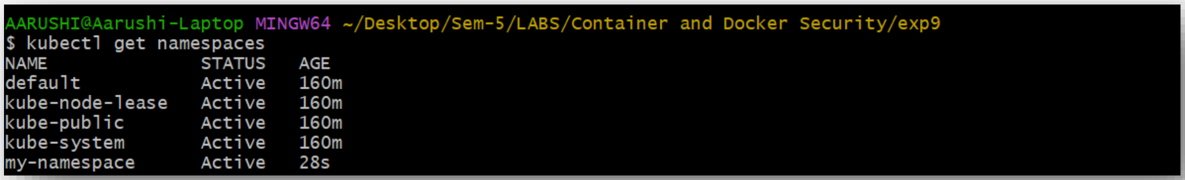
```
kubectl apply -f my-namespace.yaml
```



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl apply -f my-namespace.yaml
namespace/my-namespace created
```

Verify that the namespace is created:

```
kubectl get namespaces
```



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl get namespaces
NAME              STATUS   AGE
default           Active   160m
kube-node-lease   Active   160m
kube-public       Active   160m
kube-system       Active   160m
my-namespace      Active   28s
```

You should see my-namespace listed in the output.

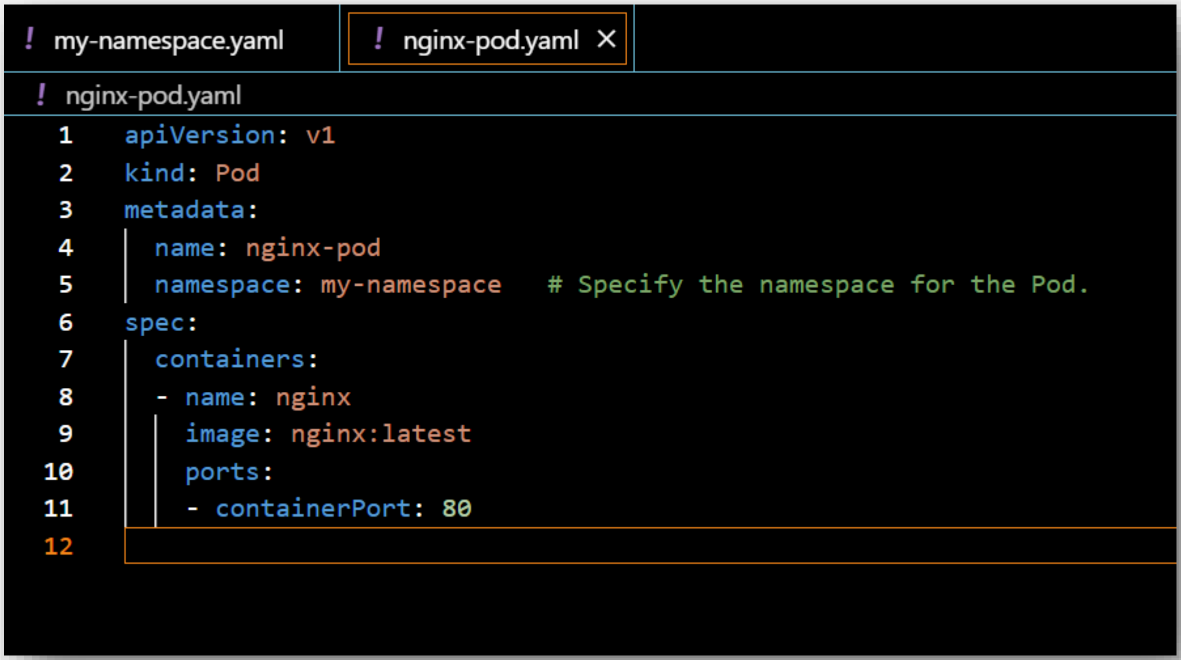
Step 4: Deploy Resources in a Namespace

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:

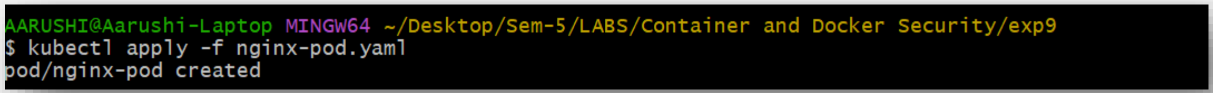
```
apiVersion: v1
kind: Pod
metadata:
  name: nginx-pod
  namespace: my-namespace   # Specify the namespace for the Pod.
spec:
  containers:
  - name: nginx
    image: nginx:latest
    ports:
    - containerPort: 80
```



```yaml
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:

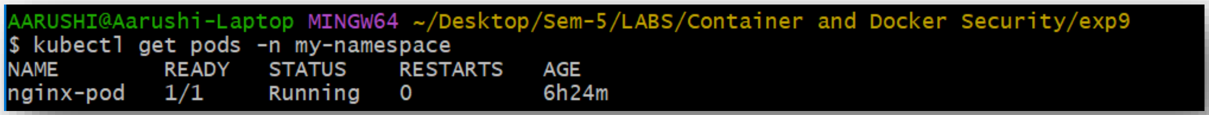
kubectl apply -f nginx-pod.yaml



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl apply -f nginx-pod.yaml
pod/nginx-pod created
```

Check the status of the Pod within the namespace:

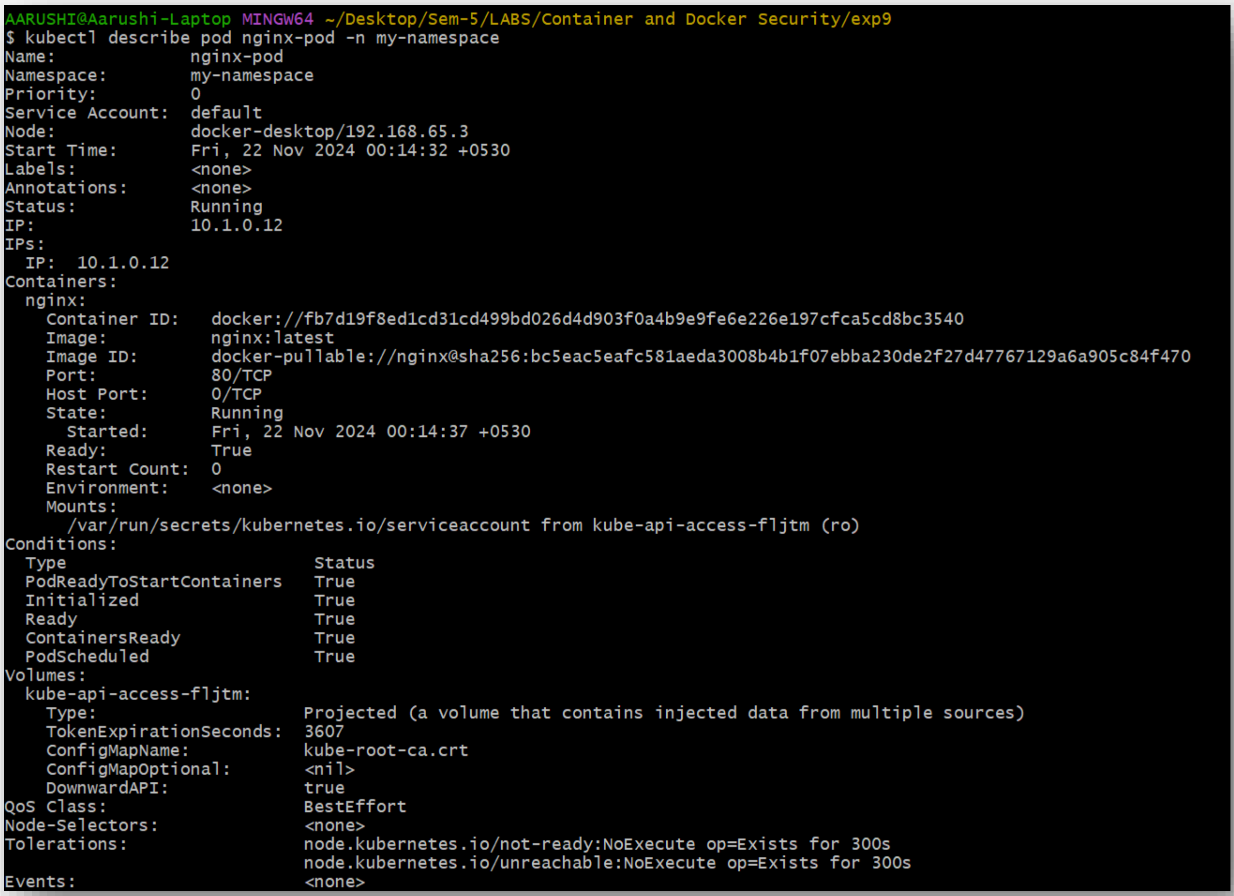
kubectl get pods -n my-namespace



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl get pods -n my-namespace
NAME        READY   STATUS    RESTARTS   AGE
nginx-pod   1/1     Running   0          6h24m
```

To describe the Pod and see detailed information:

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

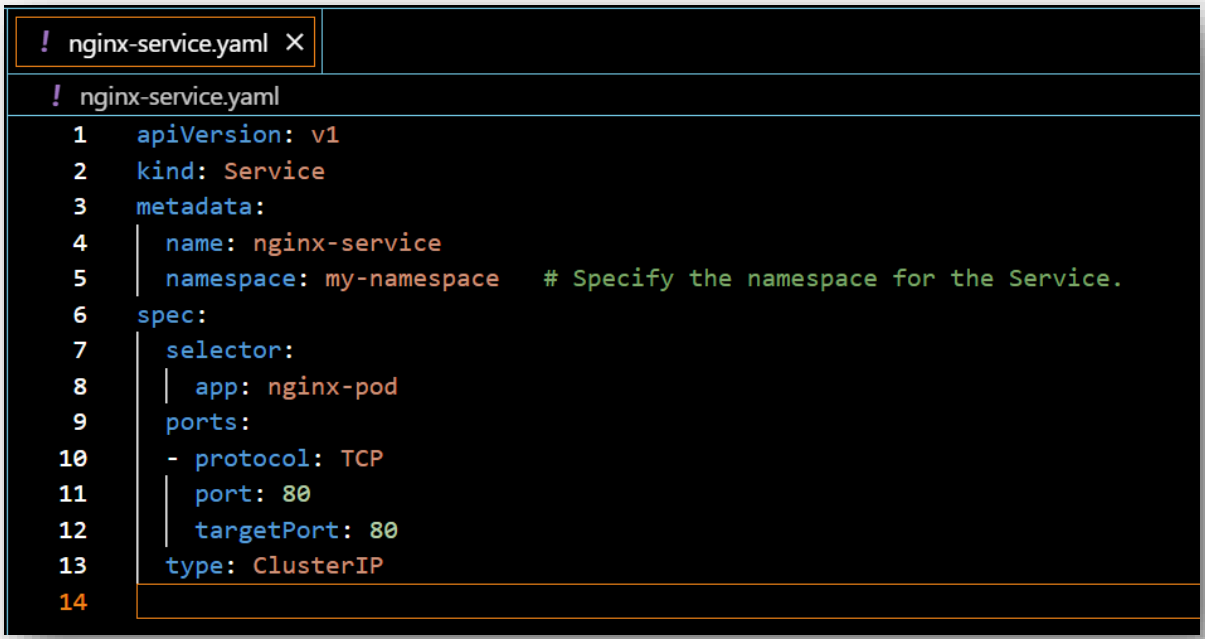


```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl describe pod nginx-pod -n my-namespace
Name:             nginx-pod
Namespace:        my-namespace
Priority:         0
Service Account:  default
Node:             docker-desktop/192.168.65.3
Start Time:       Fri, 22 Nov 2024 00:14:32 +0530
Labels:           <none>
Annotations:      <none>
Status:           Running
IP:               10.1.0.12
IPs:
  IP:  10.1.0.12
Containers:
  nginx:
    Container ID:   docker://fb7d19f8ed1cd31cd499bd026d4d903f0a4b9e9fe6e226e197cfca5cd8bc3540
    Image:          nginx:latest
    Image ID:       docker-pullable://nginx@sha256:bc5eac5eafc581aeda3008b4b1f07ebba230de2f27d47767129a6a905c84f470
    Port:           80/TCP
    Host Port:      0/TCP
    State:          Running
      Started:      Fri, 22 Nov 2024 00:14:37 +0530
    Ready:          True
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-fljtm (ro)
Conditions:
  Type                        Status
  PodReadyToStartContainers   True
  Initialized                 True
  Ready                       True
  ContainersReady             True
  PodScheduled                True
Volumes:
  kube-api-access-fljtm:
    Type:                    Projected (a volume that contains injected data from multiple sources)
    TokenExpirationSeconds:  3607
    ConfigMapName:           kube-root-ca.crt
    ConfigMapOptional:       <nil>
    DownwardAPI:             true
QoS Class:                   BestEffort
Node-Selectors:              <none>
Tolerations:                 node.kubernetes.io/not-ready:NoExecute op=Exists for 300s
                             node.kubernetes.io/unreachable:NoExecute op=Exists for 300s
Events:                      <none>
```

Create a Service in the Namespace

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

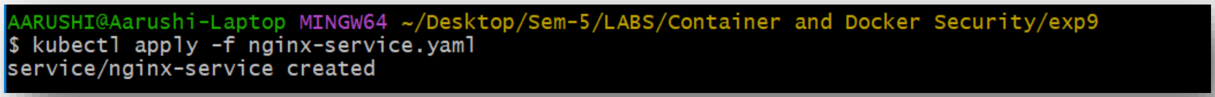
```
apiVersion: v1
kind: Service
metadata:
  name: nginx-service
  namespace: my-namespace   # Specify the namespace for the Service.
spec:
  selector:
    app: nginx-pod
  ports:
  - protocol: TCP
    port: 80
    targetPort: 80
  type: ClusterIP
```



```yaml
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:

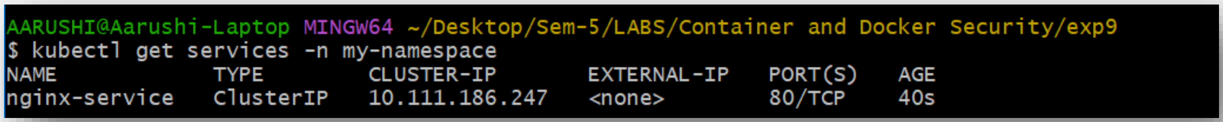
```
kubectl apply -f nginx-service.yaml
```



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl apply -f nginx-service.yaml
service/nginx-service created
```

Check the status of the Service within the namespace:

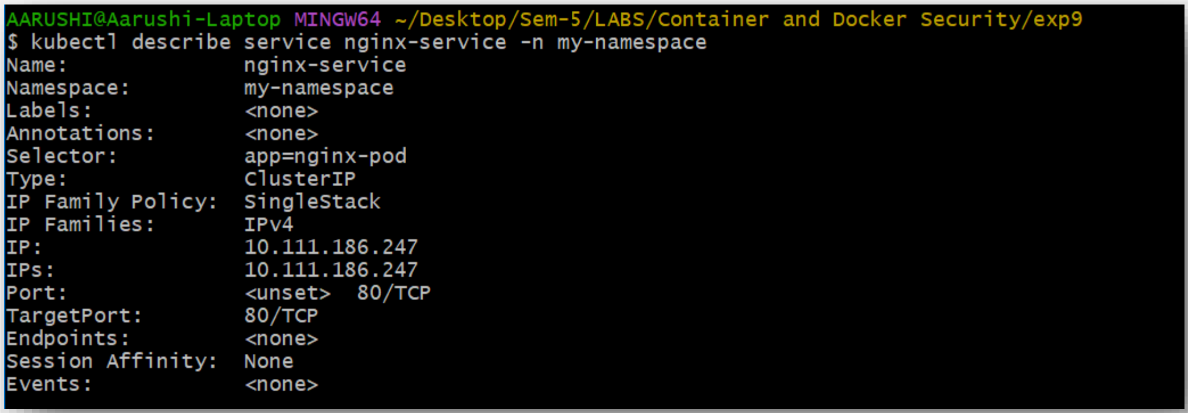
kubectl get services -n my-namespace



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl get services -n my-namespace
NAME            TYPE        CLUSTER-IP       EXTERNAL-IP   PORT(S)   AGE
nginx-service   ClusterIP   10.111.186.247   <none>        80/TCP    40s
```

To describe the Service and see detailed information:

kubectl describe service nginx-service -n my-namespace



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ 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:                10.111.186.247
IPs:               10.111.186.247
Port:              <unset>  80/TCP
TargetPort:        80/TCP
Endpoints:         <none>
Session Affinity:  None
Events:            <none>
```

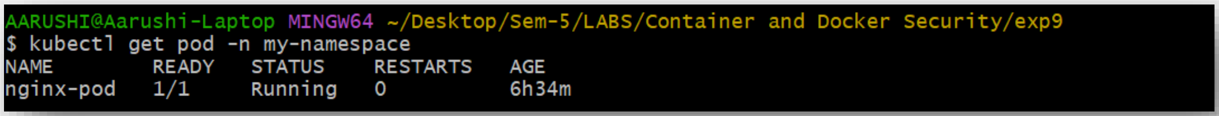
Step 5: Switching Context Between Namespaces

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

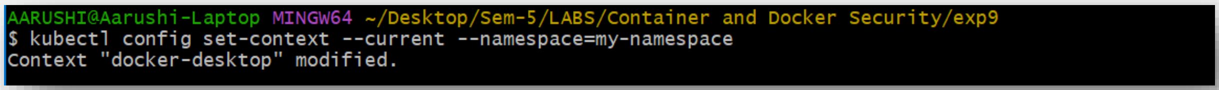


```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl get pod -n my-namespace
NAME        READY   STATUS    RESTARTS   AGE
nginx-pod   1/1     Running   0          6h34m
```

Set Default Namespace for kubectl Commands

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

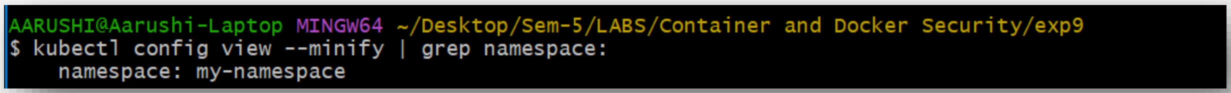
kubectl config set-context --current --namespace=my-namespace



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl config set-context --current --namespace=my-namespace
Context "docker-desktop" modified.
```

Verify the current context's namespace:

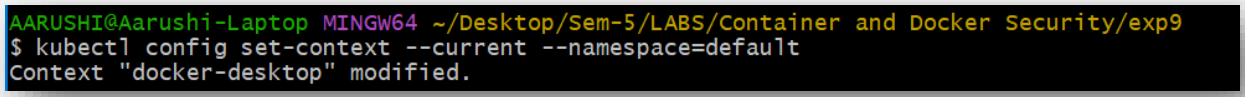
kubectl config view --minify | grep namespace:



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl config view --minify | grep namespace:
    namespace: my-namespace
```

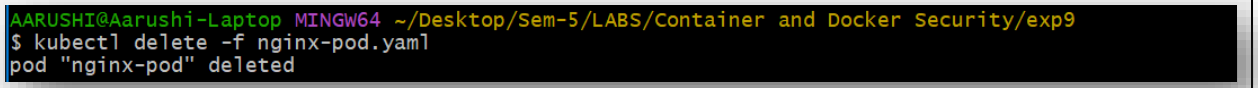
Step 6: Clean Up Resources

To delete the resources and the namespace you created:



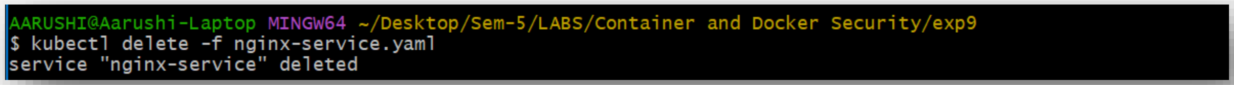
```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl config set-context --current --namespace=default
Context "docker-desktop" modified.
```

kubectl delete -f nginx-pod.yaml



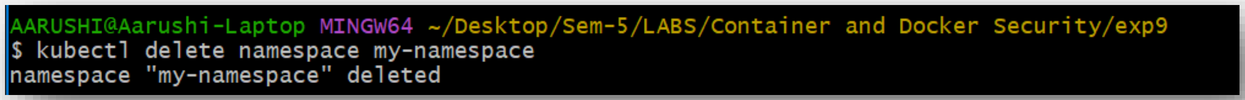
```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl delete -f nginx-pod.yaml
pod "nginx-pod" deleted
```

kubectl delete -f nginx-service.yaml



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl delete -f nginx-service.yaml
service "nginx-service" deleted
```

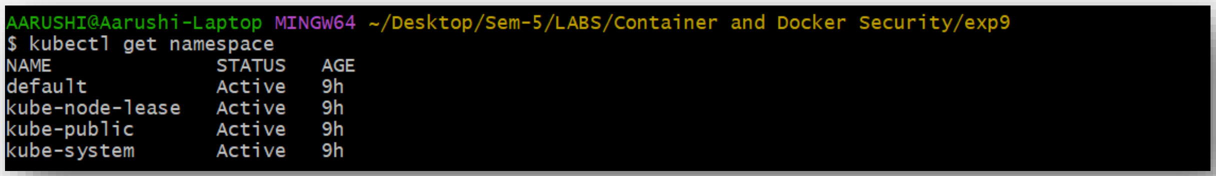
kubectl delete namespace my-namespace



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl delete namespace my-namespace
namespace "my-namespace" deleted
```

Ensure that the namespace and all its resources are deleted:

kubectl get namespaces



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security/exp9
$ kubectl get namespace
NAME              STATUS   AGE
default           Active   9h
kube-node-lease   Active   9h
kube-public       Active   9h
kube-system       Active   9h
```