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Lab Exercise 6- Create POD in Kubernetes

Objective:

- Understand the basic structure and syntax of a Kubernetes Pod definition file (YAML).
- Learn to create, inspect, and delete a Pod in a Kubernetes cluster.

Prerequisites

- Kubernetes Cluster: You need a running Kubernetes cluster. You can set up a local cluster using tools like Minikube or kind, or use a cloud-based Kubernetes service.
- kubectl: Install and configure kubectl to interact with your Kubernetes cluster.
- Basic Knowledge of YAML: Familiarity with YAML format will be helpful as Kubernetes resource definitions are written in YAML.

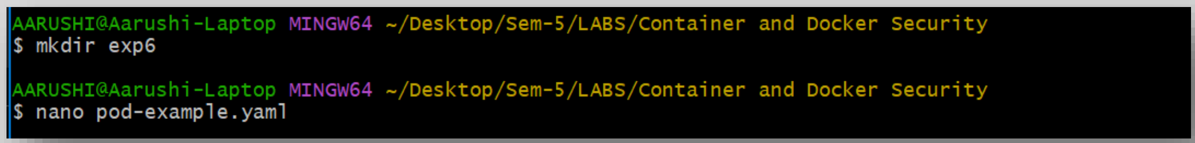
Step-by-Step Guide

Step 1: Create a YAML File for the Pod

We'll create a Pod configuration file named **pod-example.yaml**

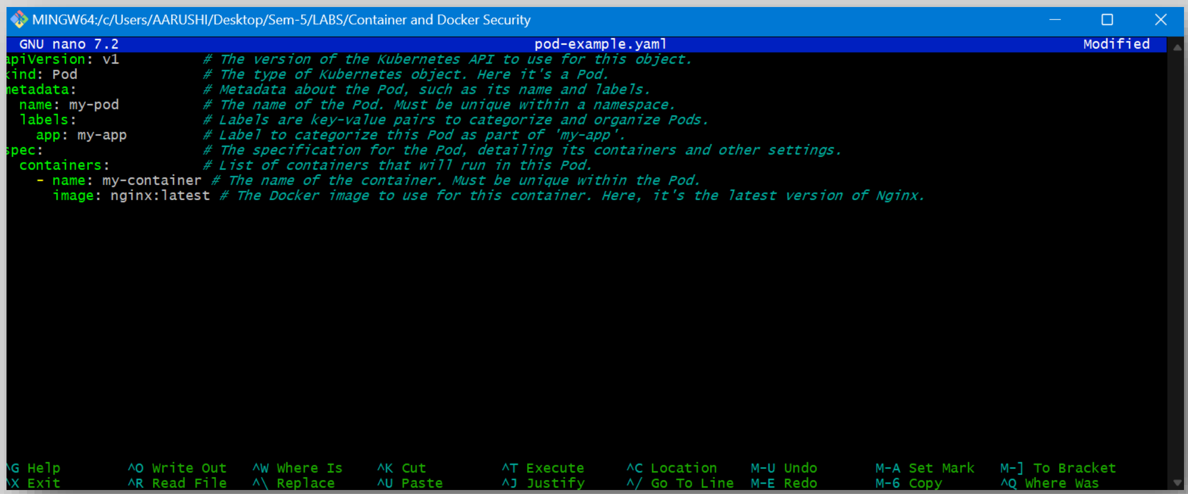
```
apiVersion: v1         # The version of the Kubernetes API to use for this object.
kind: Pod              # The type of Kubernetes object. Here it's a Pod.
metadata:              # Metadata about the Pod, such as its name and labels.
  name: my-pod         # The name of the Pod. Must be unique within a namespace.
```

```
 labels:           # Labels are key-value pairs to categorize and organize Pods.
   app: my-app       # Label to categorize this Pod as part of 'my-app'.
spec:              # The specification for the Pod, detailing its containers and other settings.
 containers:        # List of containers that will run in this Pod.
   - name: my-container # The name of the container. Must be unique within the Pod.
     image: nginx:latest # The Docker image to use for this container. Here, it's the latest
version of Nginx.
```



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security
$ mkdir exp6

AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security
$ nano pod-example.yaml
```



```
MINGW64:/c/Users/AARUSHI/Desktop/Sem-5/LABS/Container and Docker Security
  GNU nano 7.2                                      pod-example.yaml                                      Modified
apiVersion: v1          # The version of the Kubernetes API to use for this object.
kind: Pod               # The type of Kubernetes object. Here it's a Pod.
metadata:               # Metadata about the Pod, such as its name and labels.
  name: my-pod          # The name of the Pod. Must be unique within a namespace.
  labels:               # Labels are key-value pairs to categorize and organize Pods.
    app: my-app         # Label to categorize this Pod as part of 'my-app'.
spec:                   # The specification for the Pod, detailing its containers and other settings.
  containers:           # List of containers that will run in this Pod.
    - name: my-container # The name of the container. Must be unique within the Pod.
      image: nginx:latest # The Docker image to use for this container. Here, it's the latest version of Nginx.
```

Explanation of the YAML File

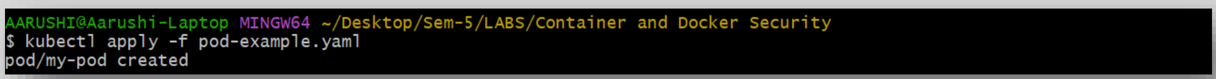
- apiVersion: Specifies the version of the Kubernetes API to use. For Pods, it's typically v1.
- kind: The type of object being created. Here it's a Pod.

- metadata: Provides metadata about the object, including name and labels. The name must be unique within the namespace, and labels help in identifying and organizing Pods.
- spec: Contains the specifications of the Pod, including:
    - containers: Lists all containers that will run inside the Pod. Each container needs:
        - name: A unique name within the Pod.
        - image: The Docker image to use for the container.
        - ports: The ports that this container exposes.
        - env: Environment variables passed to the container.

Step 2: Apply the YAML File to Create the Pod

Use the kubectl apply command to create the Pod based on the YAML configuration file.

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



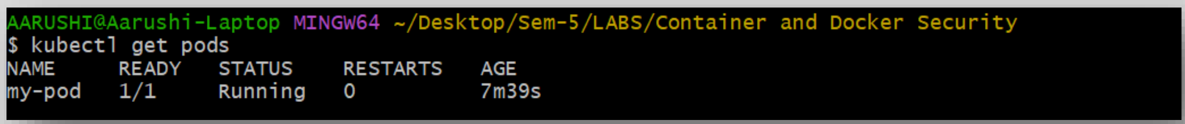
```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security
$ kubectl apply -f pod-example.yaml
pod/my-pod created
```

This command tells Kubernetes to create a Pod as specified in the pod-example.yaml file.

Step 3: Verify the Pod Creation

To check the status of the Pod and ensure it's running, use:

```
kubectl get pods
```

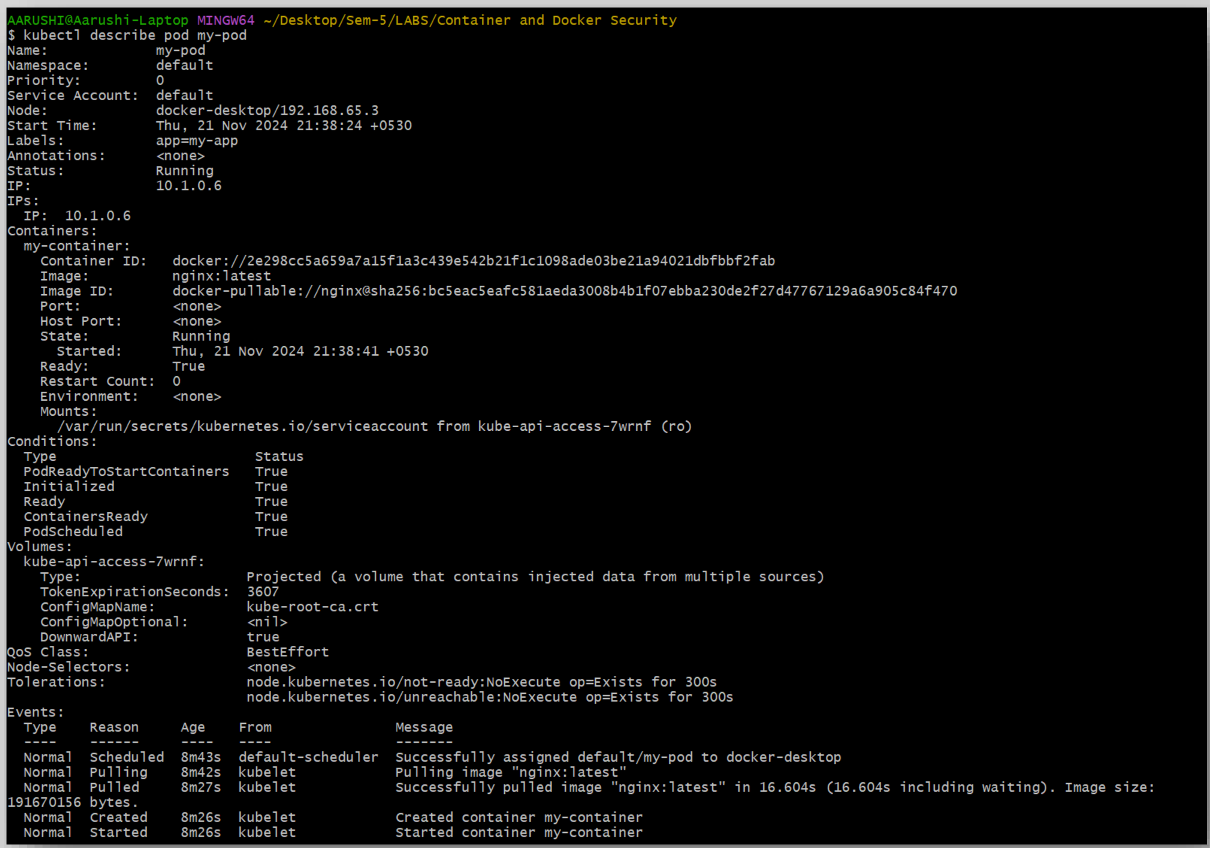


```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security
$ kubectl get pods
NAME     READY   STATUS    RESTARTS   AGE
my-pod   1/1     Running   0          7m39s
```

This command lists all the Pods in the current namespace, showing their status, restart count, and other details.

You can get detailed information about the Pod using:

kubectl describe pod my-pod



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security
$ kubectl describe pod my-pod
Name:             my-pod
Namespace:        default
Priority:         0
Service Account:  default
Node:             docker-desktop/192.168.65.3
Start Time:       Thu, 21 Nov 2024 21:38:24 +0530
Labels:           app=my-app
Annotations:      <none>
Status:           Running
IP:               10.1.0.6
IPs:
  IP:  10.1.0.6
Containers:
  my-container:
    Container ID:   docker://2e298cc5a659a7a15f1a3c439e542b21f1c1098ade03be21a94021dbfbbf2fab
    Image:          nginx:latest
    Image ID:       docker-pullable://nginx@sha256:bc5eac5eafc581aeda3008b4b1f07ebba230de2f27d47767129a6a905c84f470
    Port:           <none>
    Host Port:      <none>
    State:          Running
      Started:      Thu, 21 Nov 2024 21:38:41 +0530
    Ready:          True
    Restart Count:  0
    Environment:    <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-7wrnf (ro)
Conditions:
  Type                        Status
  PodReadyToStartContainers   True
  Initialized                 True
  Ready                       True
  ContainersReady             True
  PodScheduled                True
Volumes:
  kube-api-access-7wrnf:
    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:
  Type    Reason     Age    From               Message
  ----    ------     ----   ----               -------
  Normal  Scheduled  8m43s  default-scheduler  Successfully assigned default/my-pod to docker-desktop
  Normal  Pulling    8m42s  kubelet            Pulling image "nginx:latest"
  Normal  Pulled     8m27s  kubelet            Successfully pulled image "nginx:latest" in 16.604s (16.604s including waiting). Image size:
191670156 bytes.
  Normal  Created    8m26s  kubelet            Created container my-container
  Normal  Started    8m26s  kubelet            Started container my-container
```

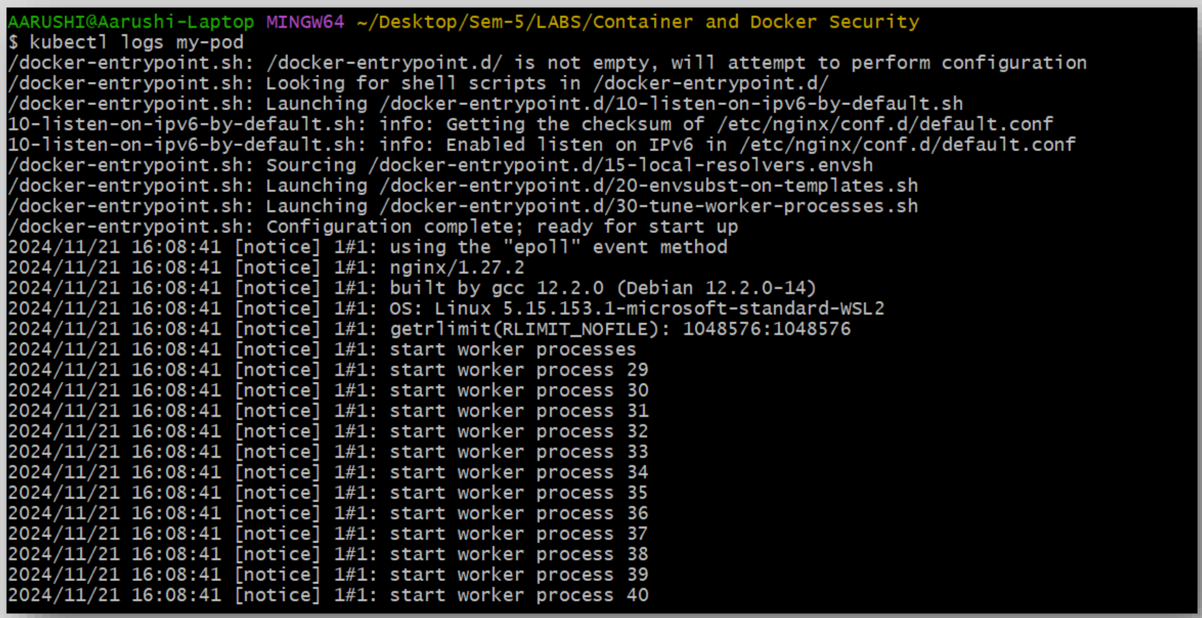
This command provides detailed information about the Pod, including its events, container specifications, and resource usage.

Step 4: Interact with the Pod

You can interact with the running Pod in various ways, such as accessing the logs or executing commands inside the container.

View Logs: To view the logs of the container in the Pod:

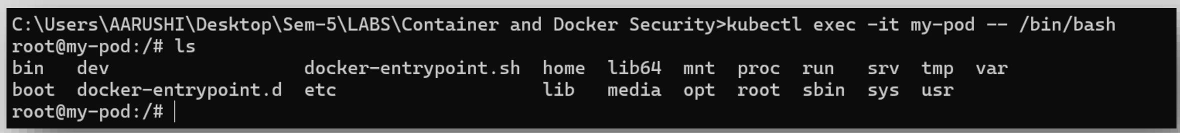
```
kubectl logs my-pod
```



```
AARUSHI@Aarushi-Laptop MINGW64 ~/Desktop/Sem-5/LABS/Container and Docker Security
$ kubectl logs my-pod
/docker-entrypoint.sh: /docker-entrypoint.d/ is not empty, will attempt to perform configuration
/docker-entrypoint.sh: Looking for shell scripts in /docker-entrypoint.d/
/docker-entrypoint.sh: Launching /docker-entrypoint.d/10-listen-on-ipv6-by-default.sh
10-listen-on-ipv6-by-default.sh: info: Getting the checksum of /etc/nginx/conf.d/default.conf
10-listen-on-ipv6-by-default.sh: info: Enabled listen on IPv6 in /etc/nginx/conf.d/default.conf
/docker-entrypoint.sh: Sourcing /docker-entrypoint.d/15-local-resolvers.envsh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/20-envsubst-on-templates.sh
/docker-entrypoint.sh: Launching /docker-entrypoint.d/30-tune-worker-processes.sh
/docker-entrypoint.sh: Configuration complete; ready for start up
2024/11/21 16:08:41 [notice] 1#1: using the "epoll" event method
2024/11/21 16:08:41 [notice] 1#1: nginx/1.27.2
2024/11/21 16:08:41 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2024/11/21 16:08:41 [notice] 1#1: OS: Linux 5.15.153.1-microsoft-standard-WSL2
2024/11/21 16:08:41 [notice] 1#1: getrlimit(RLIMIT_NOFILE): 1048576:1048576
2024/11/21 16:08:41 [notice] 1#1: start worker processes
2024/11/21 16:08:41 [notice] 1#1: start worker process 29
2024/11/21 16:08:41 [notice] 1#1: start worker process 30
2024/11/21 16:08:41 [notice] 1#1: start worker process 31
2024/11/21 16:08:41 [notice] 1#1: start worker process 32
2024/11/21 16:08:41 [notice] 1#1: start worker process 33
2024/11/21 16:08:41 [notice] 1#1: start worker process 34
2024/11/21 16:08:41 [notice] 1#1: start worker process 35
2024/11/21 16:08:41 [notice] 1#1: start worker process 36
2024/11/21 16:08:41 [notice] 1#1: start worker process 37
2024/11/21 16:08:41 [notice] 1#1: start worker process 38
2024/11/21 16:08:41 [notice] 1#1: start worker process 39
2024/11/21 16:08:41 [notice] 1#1: start worker process 40
```

Execute a Command: To run a command inside the container:

```
kubectl exec -it my-pod -- /bin/bash
```



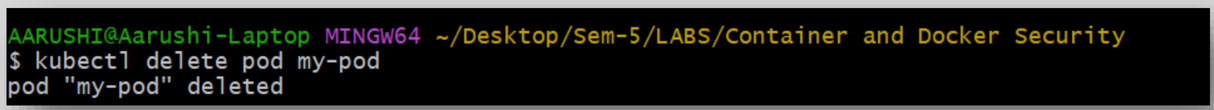
```
C:\Users\AARUSHI\Desktop\Sem-5\LABS\Container and Docker Security>kubectl exec -it my-pod -- /bin/bash
root@my-pod:/# ls
bin   dev                  docker-entrypoint.sh  home  lib64  mnt  proc  run   srv  tmp  var
boot  docker-entrypoint.d  etc                   lib   media  opt  root  sbin  sys  usr
root@my-pod:/# |
```

The -it flag opens an interactive terminal session inside the container, allowing you to run commands.

Step 5: Delete the Pod

To clean up and remove the Pod when you're done, use the following command:

```
kubectl delete pod my-pod
```



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

This command deletes the specified Pod from the cluster.