

## Lesson 03 Demo 01

# **Managing and Administering a Kubernetes Cluster**

**Objective:** To verify cluster certificates, create a namespace, and access clusters using the Kubernetes API

Tools required: kubeadm, kubectl, kubelet, and containerd

**Prerequisites:** A Kubernetes cluster should already be set up (refer to the steps provided in

Lesson 02, Demo 01 for guidance).

#### Steps to be followed:

- 1. Verify the certificates of the cluster
- 2. Create a namespace
- 3. Access clusters using the Kubernetes API

## Step 1: Verify the certificates of the cluster

1.1 To check the expiration date of the certificate as a regular user, use the following command:

sudo kubeadm certs check-expiration

```
01:15
        master 🌒 worker1 🌑 worker2 🔍
                                                                                             Used 15.6 of 50 hours in Oct. 2023
 .absuser@master:~$ sudo kubeadm certs check-expiration
[check-expiration] Reading configuration from the cluster...
[check-expiration] FYI: You can look at this config file with 'kubectl -n kube-system get cm kubeadm-config -o yaml'
CERTIFICATE
                                  EXPIRES
                                                                  RESIDUAL TIME CERTIFICATE AUTHORITY EXTERNALLY MANAGED
                                  Oct 04, 2024 06:38 UTC
admin.conf
                                  Oct 04, 2024 06:38 UTC
apiserver-etcd-client
                                  Oct 04, 2024 06:38 UTC
                                                                  364d
                                                                                       etcd-ca
apiserver-kubelet-client Oct 04, 2024 06:38 UTC controller-manager.conf Oct 04, 2024 06:38 UTC etcd-healthcheck-client Oct 04, 2024 06:38 UTC
                                                                  364d
                                                                                                                     no
                                                                  364d
                                                                                       etcd-ca
etcd-peer
                                  Oct 04, 2024 06:38 UTC
                                                                  364d
                                                                                     etcd-ca
                                  Oct 04, 2024 06:38 UTC
Oct 04, 2024 06:38 UTC
                                                                  364d
etcd-server
                                                                                       etcd-ca
                                                                                                                      no
front-proxy-client
                                                                                       front-proxy-ca
scheduler.conf
                                  Oct 04, 2024 06:38 UTC
CERTIFICATE AUTHORITY EXPIRES
                                                              RESIDUAL TIME EXTERNALLY MANAGED
                             Oct 02, 2033 06:38 UTC 9y
Oct 02, 2033 06:38 UTC 9y
Oct 02, 2033 06:38 UTC 9y
etcd-ca
front-proxy-ca
labsuser@master:~$ [
                                                                                   no
```



1.2 On the master node, enter the following command to review cluster information: **kubectl cluster-info** 

```
[check-expiration] Reading configuration from the cluster...
[check-expiration] FYI: You can look at this config file with 'kubectl -n kube-system get cm kubeadm-config -o yaml'
                                                                                                 RESIDUAL TIME CERTIFICATE AUTHORITY EXTERNALLY MANAGED
CERTIFICATE
                                           Oct 04, 2024 06:38 UTC
Oct 04, 2024 06:38 UTC
Oct 04, 2024 06:38 UTC
admin.conf
                                                                                               364d
apiserver
apiserver-etcd-client Oct 04, 2024 06:38 UTC 364d apiserver-kubelet-client Oct 04, 2024 06:38 UTC 364d controller-manager.conf Oct 04, 2024 06:38 UTC 364d etcd-healthcheck-client Oct 04, 2024 06:38 UTC 364d etcd-peer Oct 04, 2024 06:38 UTC 364d etcd-server Oct 04, 2024 06:38 UTC 364d front-proxy-client Oct 04, 2024 06:38 UTC 364d scheduler.conf Oct 04, 2024 06:38 UTC 364d
apiserver-etcd-client
                                                                                                                            etcd-ca
                                                                                                                          ca
ca
etcd-ca
etcd-ca
                                                                                               364d
                                                                                               364d
                                                                                                                          etcd-ca
front-proxy-ca
CERTIFICATE AUTHORITY EXPIRES RES.

ca Oct 02, 2033 06:38 UTC 9y
etcd-ca Oct 02, 2033 06:38 UTC 9y
front-proxy-ca Oct 02, 2033 06:38 UTC 9y
                                                                                           RESIDUAL TIME EXTERNALLY MANAGED
 labsuser@master:~$ kubectl cluster-info
       ernetes control plane <mark>is running at htt</mark>ps://172.31.23.240:6443
eDNS is running at https://172.31.23.240:6443/api/v1/namespaces/kube-system/services/kube-dns:dns/proxy
 To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
 labsuser@master:~$
labsuser@master:~$ [
```

1.3 On the master node, enter the following command to view complete cluster information

#### kubectl cluster-info dump

```
"tolerations": [
            "key": "node.kubernetes.io/not-ready",
           "operator": "Exists",
"effect": "NoExecute",
           "tolerationSeconds": 300
            "key": "node.kubernetes.io/unreachable",
           "operator": "Exists",
           "effect": "NoExecute",
            "tolerationSeconds": 300
    "priority": 0,
    "enableServiceLinks": true,
    "preemptionPolicy": "PreemptLowerPriority"
},
"status": {
"ase"
    "phase": "Pending",
    "conditions": [
            "type": "PodScheduled",
            "status": "False",
           "lastProbeTime": null,
           "lastTransitionTime": "2023-10-31T07:38:01Z",
            "reason": "Unschedulable",
```



```
==== END logs for container redis-server of pod default/redis-cache-8478cbdc86-wldjq ====
==== START logs for container test-pod of pod default/test-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
2023/10/31 11:44:30 [notice] 1#1: using the "epoll" event method
2023/10/31 11:44:30 [notice] 1#1: nginx/1.25.3
2023/10/31 11:44:30 [notice] 1#1: built by gcc 12.2.0 (Debian 12.2.0-14)
2023/10/31 11:44:30 [notice] 1#1: OS: Linux 6.2.0-1014-aws
2023/10/31 11:44:30 [notice] 1#1: getrlimit(RLIMIT NOFILE): 1024:524288
2023/10/31 11:44:30 [notice] 1#1: start worker processes
2023/10/31 11:44:30 [notice] 1#1: start worker process 29
2023/10/31 11:44:30 [notice] 1#1: start worker process 30
==== END logs for container test-pod of pod default/test-pod ====
==== START logs for container web-app of pod default/web-server-55f57c89d4-8lnnb ====
==== END logs for container web-app of pod default/web-server-55f57c89d4-8lnnb ====
==== START logs for container web-app of pod default/web-server-55f57c89d4-kh5st ====
==== END logs for container web-app of pod default/web-server-55f57c89d4-kh5st ====
==== START logs for container web-app of pod default/web-server-55f57c89d4-rbxrf ====
==== END logs for container web-app of pod default/web-server-55f57c89d4-rbxrf ====
```

**Note:** You can also export the dump to a file, kubectl cluster-info dump > kubernetes\_cluster\_dump.



## **Step 2: Create a namespace**

2.1 Use the following command to create a namespace: **kubectl create namespace firstnamespace** 

```
CERTIFICATE
                                                                                                                      RESIDUAL TIME CERTIFICATE AUTHORITY EXTERNALLY MANAGED

        CERTIFICATE
        EXPIRES

        admin.conf
        Oct 04, 2024 06:38 UTC

        apiserver
        Oct 04, 2024 06:38 UTC

        apiserver-etcd-client
        Oct 04, 2024 06:38 UTC

        apiserver-kubelet-client
        Oct 04, 2024 06:38 UTC

        controller-manager.conf
        Oct 04, 2024 06:38 UTC

        etcd-healthcheck-client
        Oct 04, 2024 06:38 UTC

        etcd-peer
        Oct 04, 2024 06:38 UTC

        etcd-per
        Oct 04, 2024 06:38 UTC

        oct 04, 2024 06:38 UTC
        Oct 04, 2024 06:38 UTC

                                                                                                                      364d
                                                                                                                      364d
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                                                                                                                                                         etcd-ca
                                                                                                                      364d
                                                                                                                      364d
                                                                                                                      364d
                                                                                                                                                         etcd-ca
                                                                                                                                                         etcd-ca
front-proxy-client
scheduler.conf
                                                       Oct 04, 2024 06:38 UTC
Oct 04, 2024 06:38 UTC
                                                                                                                      364d
                                                                                                                                                          front-proxy-ca
CERTIFICATE AUTHORITY EXPIRES
                                                                                                               RESIDUAL TIME EXTERNALLY MANAGED
                                                    Oct 02, 2033 06:38 UTC 9y
Oct 02, 2033 06:38 UTC 9y
Oct 02, 2033 06:38 UTC 9y
ca
etcd-ca
labsuser@master:~$ kubectl cluster-info
Kubernetes control plane is running at https://172.31.23.240:6443
CoreDNS is running at https://172.31.23.240:6443/api/v1/namespaces/kube-system/services/kube-dns:dns/proxy
 To further debug and diagnose cluster problems, use 'kubectl cluster-info dump'.
 labsuser@master:~$
labsuser@master:~$ kubectl create namespace firstnamespace
 namespace/firstnamespace created labsuser@master:~$ [
```

2.2 Confirm the creation of the new namespace with the following command: kubectl get namespaces

```
labsuser@master:~$ kubernetes cluster dump
kubernetes cluster dump: command not found
labsuser@master:~$ kubectl create namespace firstnamespace
namespace/firstnamespace created
labsuser@master:~$ kubectl get namespaces
NAME
                STATUS AGE
default
                Active 26h
firstnamespace Active 13s
kube-node-lease Active 26h
                Active 26h
kube-public
kube-system
                Active 26h
quotaz
                 Active 21h
labsuser@master:~$
```



# Step 3: Access clusters using the Kubernetes API

3.1 To view the cluster configuration, use the command below: **kubectl config view** 

```
default Active 91m
firstnamespace Active 2m11
kube-node-lease Active 91m
kube-public Active 91m
kube-system Active 91m
                               2m11s
labsuser@master:~$ kubectl config view
apiVersion: v1
clusters:
 - cluster:
    certificate-authority-data: DATA+OMITTED
    server: https://172.31.23.240:6443
  name: kubernetes
contexts:
  context:
    cluster: kubernetes
    user: kubernetes-admin
  name: kubernetes-admin@kubernetes
current-context: kubernetes-admin@kubernetes
kind: Config
preferences: {}
users:
  name: kubernetes-admin
  user:
     client-certificate-data: DATA+OMITTED
     client-key-data: DATA+OMITTED
 labsuser@master:~$
```

3.2 Run the following command to view the current cluster: **kubectl config current-context** 

```
labsuser@master:~$ kubectl config current-context kubernetes-admin@kubernetes
labsuser@master:~$
```



3.3 To identify the API server, execute and copy the **127.0.0.1:8080** port as shown below: **kubectl proxy** --**port=8080** 

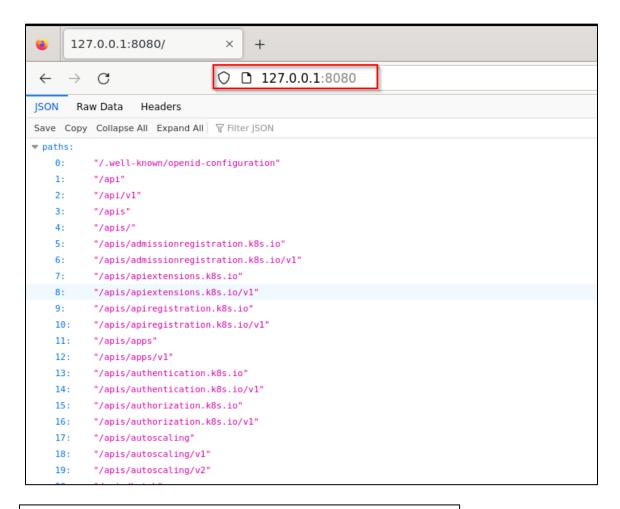
```
kube-node-lease Active
                          91m
kube-public
               Active
                          91m
kube-system
                 Active 91m
labsuser@master:~$ kubectl config view
apiVersion: v1
clusters:
- cluster:
   certificate-authority-data: DATA+OMITTED
   server: https://172.31.23.240:6443
 name: kubernetes
contexts:
context:
   cluster: kubernetes
   user: kubernetes-admin
 name: kubernetes-admin@kubernetes
current-context: kubernetes-admin@kubernetes
kind: Config
preferences: {}
users:
- name: kubernetes-admin
   client-certificate-data: DATA+OMITTED
   client-key-data: DATA+OMITTED
labsuser@master:~$ kubectl proxy --port=8080
Starting to serve on 127.0.0.1:8080
```

3.4 In the lab environment, select the **master** tab and choose the **desktop** option

```
worker1
       master 🔍
                             worker2
                                                                         Used 15.6 of 50 hours in Oct, 2023
        terminal
kube-no desktop
kube-public
                           91m
kube-system
                  Active 91m
labsuser@master:~$ kubectl config view
apiVersion: v1
clusters:
 cluster:
   certificate-authority-data: DATA+OMITTED
   server: https://172.31.23.240:6443
 name: kubernetes
contexts:
 context:
```



3.5 Navigate to the **desktop** tab and open the **Firefox** browser to access the **API server** by typing the IP address and port mentioned in step 3.2 output



**Note:** Use **CTRL+C** in the terminal to exit and stop port forwarding.

By following these steps, you have successfully verified cluster certificates, created a namespace, and accessed the Kubernetes API.