Lesson 02 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 (refer to Demo 01 from Lesson 01 for setting up a cluster)

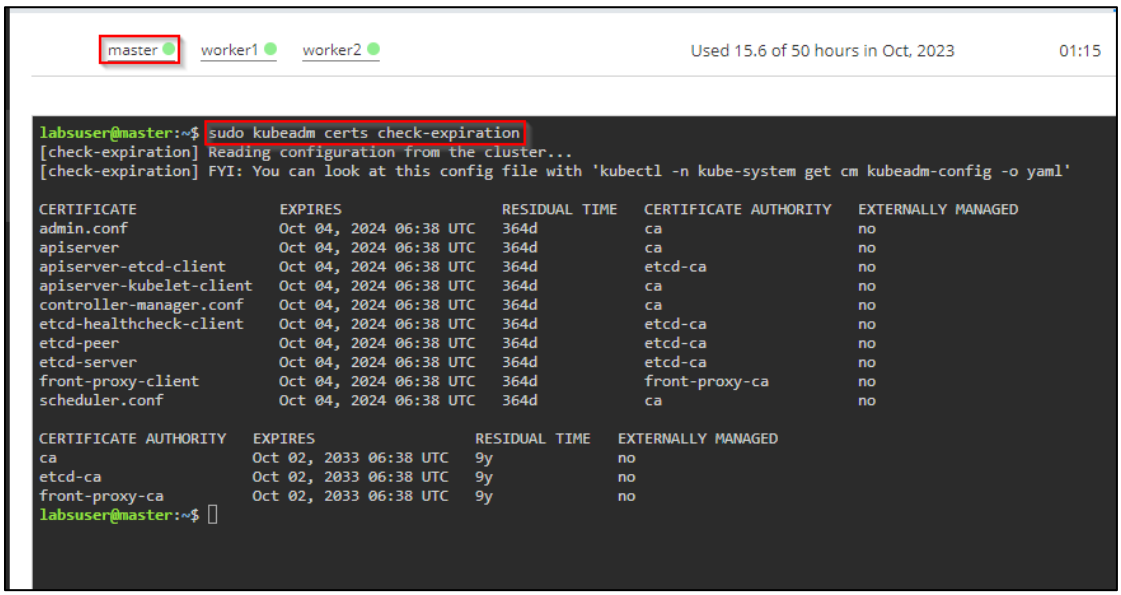
Steps to be followed:

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 Run the following command to check the expiration date of the certificate as a regular user:

sudo kubeadm certs check-expiration



1.2 Run the following command to review cluster information on the master node:
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'

CERTIFICATE                EXPIRES                  RESIDUAL TIME   CERTIFICATE AUTHORITY   EXTERNALLY MANAGED
admin.conf                 Oct 04, 2024 06:38 UTC   364d            ca                      no
apiserver                  Oct 04, 2024 06:38 UTC   364d            ca                      no
apiserver-etcd-client      Oct 04, 2024 06:38 UTC   364d            etcd-ca                 no
apiserver-kubelet-client   Oct 04, 2024 06:38 UTC   364d            ca                      no
controller-manager.conf    Oct 04, 2024 06:38 UTC   364d            ca                      no
etcd-healthcheck-client    Oct 04, 2024 06:38 UTC   364d            etcd-ca                 no
etcd-peer                  Oct 04, 2024 06:38 UTC   364d            etcd-ca                 no
etcd-server                Oct 04, 2024 06:38 UTC   364d            etcd-ca                 no
front-proxy-client         Oct 04, 2024 06:38 UTC   364d            front-proxy-ca          no
scheduler.conf             Oct 04, 2024 06:38 UTC   364d            ca                      no

CERTIFICATE AUTHORITY   EXPIRES                  RESIDUAL TIME   EXTERNALLY MANAGED
ca                      Oct 02, 2033 06:38 UTC   9y              no
etcd-ca                 Oct 02, 2033 06:38 UTC   9y              no
front-proxy-ca          Oct 02, 2033 06:38 UTC   9y              no
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:~$
```

1.3 Run the following command to view complete cluster information on the master node:
kubectl cluster-info dump


```
            },
            "schedulerName": "default-scheduler",
            "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": {
            "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 Run the following command to create a namespace:
kubectl create namespace firstnamespace

```
CERTIFICATE                EXPIRES                  RESIDUAL TIME   CERTIFICATE AUTHORITY   EXTERNALLY MANAGED
admin.conf                 Oct 04, 2024 06:38 UTC   364d            ca                      no
apiserver                  Oct 04, 2024 06:38 UTC   364d            ca                      no
apiserver-etcd-client      Oct 04, 2024 06:38 UTC   364d            etcd-ca                 no
apiserver-kubelet-client   Oct 04, 2024 06:38 UTC   364d            ca                      no
controller-manager.conf    Oct 04, 2024 06:38 UTC   364d            ca                      no
etcd-healthcheck-client    Oct 04, 2024 06:38 UTC   364d            etcd-ca                 no
etcd-peer                  Oct 04, 2024 06:38 UTC   364d            etcd-ca                 no
etcd-server                Oct 04, 2024 06:38 UTC   364d            etcd-ca                 no
front-proxy-client         Oct 04, 2024 06:38 UTC   364d            front-proxy-ca          no
scheduler.conf             Oct 04, 2024 06:38 UTC   364d            ca                      no

CERTIFICATE AUTHORITY   EXPIRES                  RESIDUAL TIME   EXTERNALLY MANAGED
ca                      Oct 02, 2033 06:38 UTC   9y              no
etcd-ca                 Oct 02, 2033 06:38 UTC   9y              no
front-proxy-ca          Oct 02, 2033 06:38 UTC   9y              no
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
kube-public       Active   26h
kube-system       Active   26h
quotaz            Active   21h
labsuser@master:~$
```

Step 3: Access clusters using the Kubernetes API

3.1 Run the following command to view the cluster configuration:
kubectl config view

```
default           Active   91m
firstnamespace    Active   2m11s
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
  user:
    client-certificate-data: DATA+OMITTED
    client-key-data: DATA+OMITTED
labsuser@master:~$
```

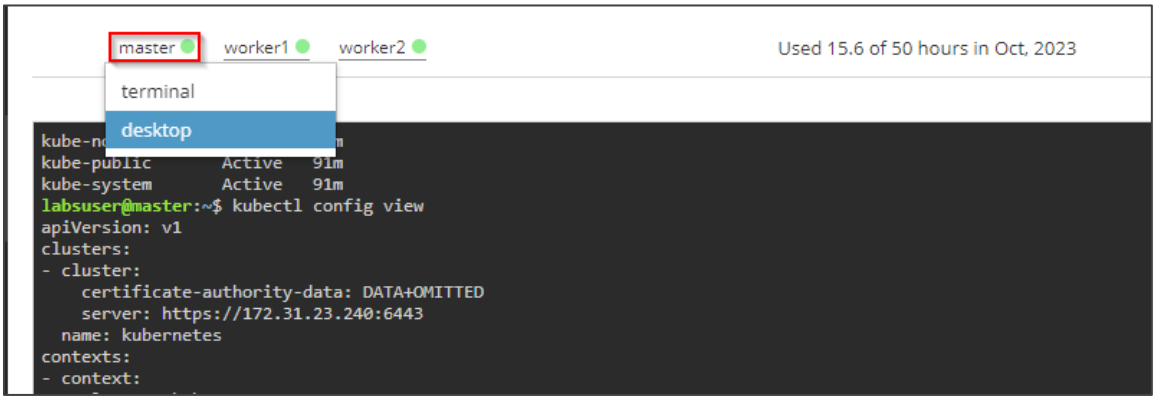
3.2 Run the following command to view the current cluster:
kubectl config current-context

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

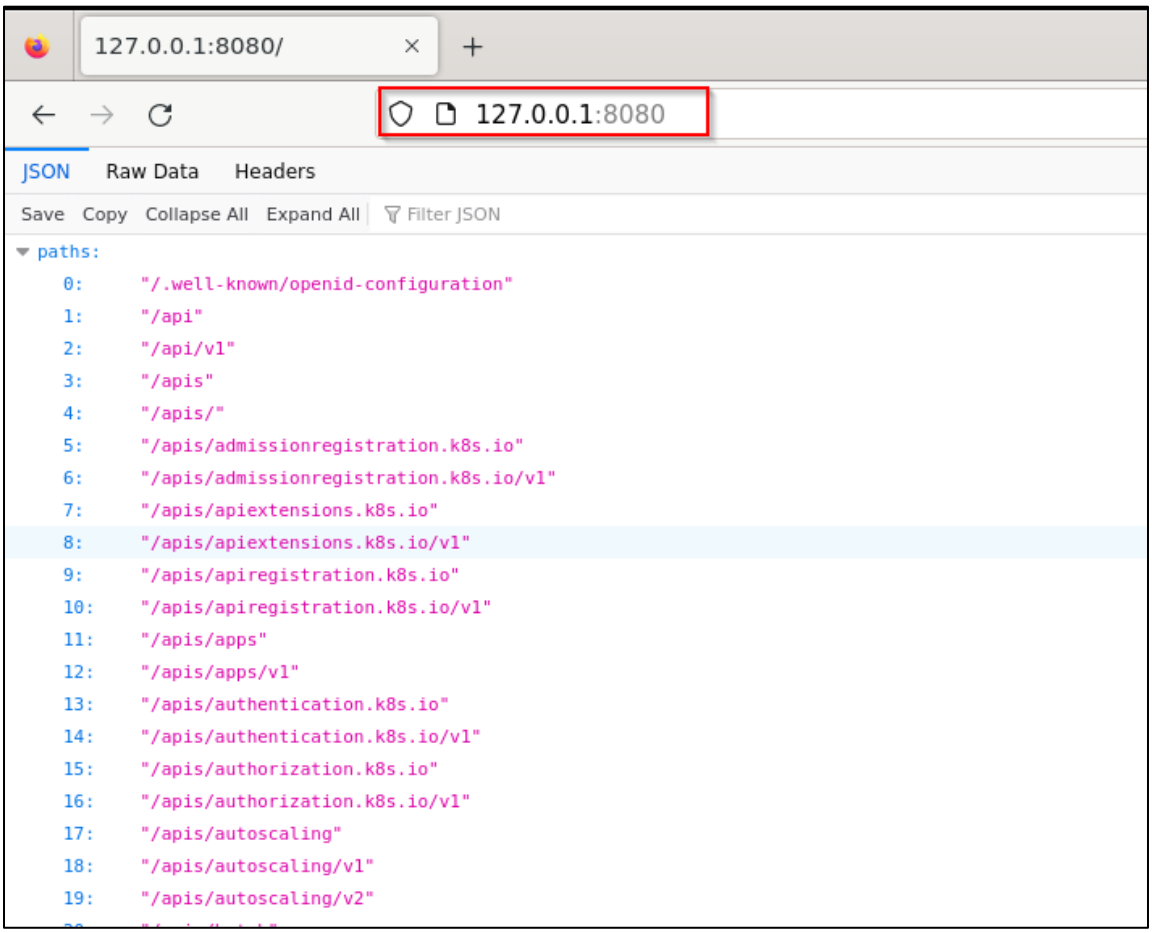
3.3 Execute and copy the **127.0.0.1:8080** port to identify the API server, as shown in the screenshot below:
kubectl proxy --port=8080

```
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
  user:
    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 Select the **master** tab and choose the **desktop** option in the lab environment



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.