BACKING UP THE ETCD CLUSTER DATA

TASKS:

1. Backing up the etcd cluster data
2. Creating and verifying the namespaces
3. Generating a certificate and private key in the worker node
4. Upgrading the Kubernetes cluster with the latest version

Setting up the Kubernetes cluster:

1) In the Kubernetes master:

```
sudo kubeadm init

mkdir -p $HOME/.kube

sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config

sudo chown $(id -u):$(id -g) $HOME/.kube/config

kubectl apply -f
https://raw.githubusercontent.com/projectcalico/calico/v3.25.0/
manifests/calico.yaml
```

2) In the Kubernetes worker nodes:

```
kubeadm join 172.31.49.77:6443 --token
5s4u0b.o5aigiolgo1k3s0a \
        --discovery-token-ca-cert-hash
sha256:0c1b16934a3684ced20ff5f424084edb357a9f4ce500fc71
7d3fb1de8912a8f9
```

The Kubernetes cluster is ready:

```
labsuser@master:~$ kubectl get nodes
NAME            STATUS   ROLES                  AGE     VERSION
master          Ready    control-plane,master   7m54s   v1.23.4
worker-node-1   Ready    <none>                 6m58s   v1.23.4
worker-node-2   Ready    <none>                 5m22s   v1.23.4
labsuser@master:~$
```

TASK-1: To back up the etcd cluster data

3) Use the following command to install the etcd-client:

sudo apt install etcd-client

```
labsuser@master:~$ sudo apt install etcd-client
```

List all the pods of the kube-system namespace:

Kubectl get pods -n kube-system

```
labsuser@master:~$ kubectl get pods -n kube-system
NAME                                      READY   STATUS    RESTARTS   AGE
calico-kube-controllers-64cc74d646-n4s24  1/1     Running   0          3m48s
calico-node-4cncz                         1/1     Running   0          3m48s
calico-node-rd8lk                         1/1     Running   0          3m48s
calico-node-v2pkr                         1/1     Running   0          3m48s
coredns-64897985d-dn57v                   1/1     Running   0          11m
coredns-64897985d-dwrp7                   1/1     Running   0          11m
etcd-master                               1/1     Running   0          11m
kube-apiserver-master                     1/1     Running   0          11m
kube-controller-manager-master            1/1     Running   0          11m
kube-proxy-2dphm                          1/1     Running   0          10m
kube-proxy-g6lfr                          1/1     Running   0          8m39s
kube-proxy-g9bqr                          1/1     Running   0          11m
kube-scheduler-master                     1/1     Running   0          11m
labsuser@master:~$
```

Describe the etcd pod of the kube-system namespace and copy the IP address of the --advertise-client-url flag:

kubectl describe pods etcd-master -n kube-system

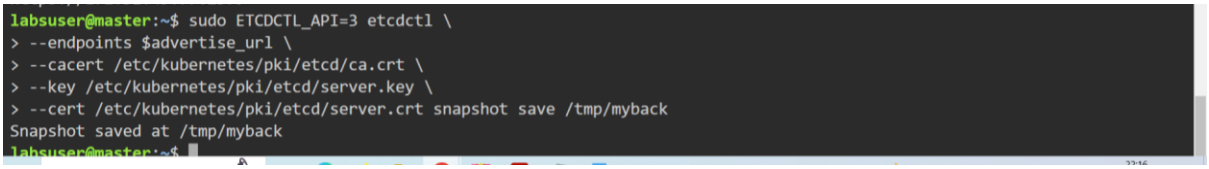
```
labsuser@master:~$ kubectl describe pods etcd-master -n kube-system
Name:                 etcd-master
Namespace:            kube-system
Priority:             2000001000
Priority Class Name:  system-node-critical
Node:                 master/172.31.49.77
Start Time:           Tue, 27 Jun 2023 16:17:16 +0000
Labels:               component=etcd
                      tier=control-plane
Annotations:          kubeadm.kubernetes.io/etcd.advertise-client-urls: https://172.31.49.77:2379
                      kubernetes.io/config.hash: fed1a6c981d1982d0edfa8722eba1917
                      kubernetes.io/config.mirror: fed1a6c981d1982d0edfa8722eba1917
                      kubernetes.io/config.seen: 2023-06-27T16:17:15.470358947Z
                      kubernetes.io/config.source: file
                      seccomp.security.alpha.kubernetes.io/pod: runtime/default
Status:               Running
IP:                   172.31.49.77
IPs:
  IP:           172.31.49.77
Controlled By:  Node/master
Containers:
  etcd:
    Container ID:  docker://ef623e0a5fb3a5e7bfa687325d74049909646 9efa2b41589f27106642d628b54
    Image:         k8s.gcr.io/etcd:3.5.1-0
    Image ID:      docker-pullable://k8s.gcr.io/etcd@sha256:64b9ea357325d5db9f8a723dcf503b5a449177b17ac87d69481e126bb724c263
    Port:          <none>
    Host Port:     <none>
    Command:
      etcd
      --advertise-client-urls=https://172.31.49.77:2379
      --cert-file=/etc/kubernetes/pki/etcd/server.crt
```

Export the advertise-client-url to advertise_url:

```
export advertise_url=https://172.31.49.77:2379
echo $advertise_url
```

Use the following command to save the etcd backup:

```
sudo ETCDCTL_API=3 etcdctl \
--endpoints $advertise_url \
--cacert /etc/kubernetes/pki/etcd/ca.crt \
--key /etc/kubernetes/pki/etcd/server.key \
--cert /etc/kubernetes/pki/etcd/server.crt snapshot save /tmp/myback
```



Use the ls command to check the newly created backup file:

```
ls /tmp
```

Backup is stored in the /tmp/myback file

TASK-2: To create and verify the namespaces

4) Create a namespace by using the following command:

```
kubectl create namespace cep-project2
```

Create a directory cep-project2

```
mkdir cep-project2
cep-project2
```

Created a deployment in the namespace cep-project2:

vi deploy1.yaml

Add the following script inside the file:

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: my-deployment
  namespace: cep-project2
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.14.2
        ports:
        - containerPort: 80
```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: my-deployment
  namespace: cep-project2
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
        - name: my-app-container
          image: nginx
          ports:
            - containerPort: 80
~
~
~
~
~
"deploy1.yaml" 21L, 354C
```

kubectl apply -f deploy1.yaml

```
labsuser@master:~/cep-project2$ ls
deploy1.yaml
labsuser@master:~/cep-project2$ kubectl apply -f deploy1.yaml
```

A deployment with name my-deployment is created in the namespace cep-project2

TASK-3: To generate a certificate and private key:

To generate an RSA private key, run the following command:

sudo openssl genrsa -out user4.key 2048

```
labsuser@master:~/cep-project2$ sudo openssl genrsa -out user4.key 2048
Generating RSA private key, 2048 bit long modulus (2 primes)
.........+++++
.....................................................................................................................
+++++
e is 65537 (0x010001)
```

Use the following command to generate certificate requests:

sudo openssl req -new -key user4.key -out user4.csr

```
labsuser@master:~/cep-project2$ sudo openssl req -new -key user4.key -out user4.csr
You are about to be asked to enter information that will be incorporated
into your certificate request.
What you are about to enter is what is called a Distinguished Name or a DN.
There are quite a few fields but you can leave some blank
For some fields there will be a default value,
If you enter '.', the field will be left blank.
-----
Country Name (2 letter code) [AU]:IN
State or Province Name (full name) [Some-State]:TG
Locality Name (eg, city) []:HY
Organization Name (eg, company) [Internet Widgits Pty Ltd]:cep-project2
Organizational Unit Name (eg, section) []:cep-project2
Common Name (e.g. server FQDN or YOUR name) []:user4
Email Address []:cep-project-2@gmail.com

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
labsuser@master:~/cep-project2$ sudo openssl x509 -req -in user4.csr -CA /etc/kubernetes/pki/ca.crt -CAkey
```

Run the following command to link an identity to a private key using a digital signature:

```
sudo openssl x509 -req -in user4.csr -CA /etc/kubernetes/pki/ca.crt -
CAkey /etc/kubernetes/pki/ca.key -CAcreateserial -out user4.crt -days
500
```

```
labsuser@master:~/cep-project2$ sudo openssl x509 -req -in user4.csr -CA /etc/kubernetes/pki/ca.crt -CAkey /etc/kubernetes/p
ki/ca.key -CAcreateserial -out user4.crt -days 500
Signature ok
subject=C = IN, ST = TG, L = HY, O = cep-project2, OU = cep-project2, CN = user4, emailAddress = cep-project-2@gmail.com
Getting CA Private Key
labsuser@master:~/cep-project2$
```

To create a role, add the following code to the viewaccess.yaml file:

```
vi viewaccess.yaml
```

```
kind: Role
apiVersion: rbac.authorization.k8s.io/v1
metadata:
  namespace: cep-project2
  name: user4
rules:
- apiGroups: ["", "extensions", "apps"]
  resources: ["deployments", "pods", "services"]
  verbs: ["get", "list", "watch"]
```

This script allows only view access to the user4.

```
kind: Role
apiVersion: rbac.authorization.k8s.io/v1
metadata:
   namespace: cep-project2
   name: user4
rules:
- apiGroups: ["", "extensions", "apps"]
  resources: ["deployments", "pods", "services"]
  Verbs: ["get", "list", "watch"]
```

kubectl create -f viewaccess.yaml

```
labsuser@master:~/cep-project2$ kubectl create -f viewaccess.yaml
role.rbac.authorization.k8s.io/user4 created
labsuser@master:~/cep-project2$
```

kubectl get roles -n cep-project2

```
labsuser@master:~$ kubectl get role -n cep-project2
NAME    CREATED AT
user4   2023-06-27T18:50:06Z
labsuser@master:~$
```

A role with the name user4 is created.

Creating a rolebinding

To create a rolebinding, add the following code to the rolebinding.yaml file.

vi rolebinding.yaml

kind: RoleBinding

apiVersion: rbac.authorization.k8s.io/v1

metadata:

name: role-test

namespace: cep-project2

subjects:

- kind: User

name: user4

apiGroup: ""

roleRef:

kind: Role

name: user4-role

apiGroup: ""

Create rolebinding by using the following command:

kubectl create -f rolebinding.yaml

kubectl get rolebinding -n cep-project2

```
labsuser@master:~/cep-project2$ vi rolebinding.yaml
labsuser@master:~/cep-project2$ kubectl create -f rolebinding.yaml
rolebinding.rbac.authorization.k8s.io/role-test created
labsuser@master:~/cep-project2$ kubectl get rolebinding -n cep-project2
NAME        ROLE              AGE
role-test   Role/user4-role   17s
labsuser@master:~/cep-project2$
```

Set credentials to user4:
kubectl config set-credentials user4 –client certificate=/home/labsuser/cep-project2/user4.crt –client key=/home/labsuser/cep-project2/user4.key

Set context to user4:
kubectl config set-context user4-context --cluster=kubernetes --namespace=cep-project2 --user=user4

```
labsuser@master:~/cep-project2$ kubectl config set-context user4-context --cluster=kubernetes --namespace=cep-project2 --use
r=user4
Context "user4-context" created.
labsuser@master:~/cep-project2$
```

Run the following command to display current contexts:
kubectl config get-contexts

```
labsuser@master:~/cep-project2$ kubectl config get-contexts
CURRENT   NAME                          CLUSTER      AUTHINFO           NAMESPACE
*         kubernetes-admin@kubernetes   kubernetes   kubernetes-admin
          user4-context                 kubernetes   user4              cep-project2
labsuser@master:~/cep-project2$
```

Copying the config file to the client machine

Copy the config file from the master node in the home directory.

cd ..
cat .kube/config

```
labsuser@master:~/cep-project2$ cd ..
labsuser@master:~$ cat .kube/config
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data: LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSUMvakNDQWVhZ0F3SUJBZ0lCQURBTkJna3Foa2lHOXcwQkFRc0ZB
REFWTVJNd0VRWURWUVFERXdwcmRXSmwKY201bGRHVnpNQjRYRFRJek1EWXlPREUwTWpNek1sb1hEVE16TURZeU5URTBNak16TWxvd0ZURVRNQkVHQTFVRQpBeE1L
YTNWaVpYSnVaWFJsY3pDQ0FTSXdEUVlKS29aSWh2Y05BUUVCQlFBRGdnRVBBRENDQVFvQ2dnRUJBTmp0CkdtR2pocHZvVU9rM1JuWXlHelQzeU5zUnpyS0RjaHBw
Y2hJNG1zM1lNQUFIamhrdlR1eXlVREJPZlY2cTQrei8KS0hyTkFldy9aYTJEWkVTYzEyenk3bCtZV0N6ZEJUMEI1WldUdTZoUFVSUXdoYUhLcFI1b2JvaHI3TzlY
Y0hDQgpQMTloVVhyV1I0eGk3MHViWTZvcjFmVi8xVzJxMFNRYUFINWhKdzdFK3RwMU1tT1JNaGVwQWRxeDhGajc0bmhnClExWG04KzhkQVVyLzdzOUEzbEtiVXd0
U0J5bW9NMlJVYmlKbWRpRmJOS3hBdDkrbkQwTXJCTGNQUkZCUXhjTDAKcDdZT2hmL2t5S0RramttSEU5d2lweEFYblhEdk9XTU1NT2F0OEVSMXN3emxjSHVVbThM
bG9UUmpHRndoQWJqUApIci9UTEZuOHN5dDRMQXdmbXBNQ0F3RUFBYU5aTUZjd0RnWURWUjBQQVFIL0JBUURBZ0trTUE4R0ExVWRFd0VCCi93UUZNQU1CQWY4d0hR
WURWUjBPQkJZRUZLcEpneG4wNDhLQ1AyQ0NJTjNaTEd1aUsvbnlNQlVHQTFVZEVRUU8KTUF5Q0NtdDFZbVZ5Ym1WMFpYTXdEUVlKS29aSWh2Y05BUUVMQlFBRGdn
RUJBQjh2ZFgwbjdxclNiR1ZyM3JPeQoybjQyMHZQd0I1b0VWMUJ5eENRQWdxTjk4RVJ5RzVvQ0QxVDRpUEFvc05nMHR4ME1MaFNqc2NQQlpPbWJxWnMzCmVLYUFv
YVR4WUFWUDBoWTM4OG1HVGkwenBDNWVtc2xicTRsMk1Fc2tpelcyN0c5c3lpNmU4Y2dld1Rob0hETksKYkpSWkFxUmYwdmkyaml4ZXJUUnMvMkNuNitIcEdjSnA4
ZWE3VVJOMzMvbjBtNGE4NVlRQ3RxZ241TkZjNXVtcQpsMXRzQ3haZDFtcERZZ0dkdG9jZTRMbzBRUTMyWGNQenJjMERIeEE4bmtyWjVrTm9lWE04dk9aYUZTVG9T
YjdHClJNeUV2Sk50YjF5N1I2MHVkbGM2QTdSY29qYm5aRkxxOHhuRngvZjNaMGg5Y1hab3VjbTYzWXB6eU5hYy9WbDkKckRrPQotLS0tLUVORCBDRVJUSUZJQ0FU
RS0tLS0tCg==
    server: https://172.31.49.77:6443
  name: kubernetes
contexts:
- context:
    cluster: kubernetes
    user: kubernetes-admin
  name: kubernetes-admin@kubernetes
- context:
```

Paste the copied config file into the client machine:
Create a myconf file inside the worker node and paste the contents of the .kube/config file inside the myconf file

vi myconf

```
labsuser@worker-node-2:~$ vi myconf
labsuser@worker-node-2:~$ cat myconf
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data: LS0tLS1CRUdJTiBDRVJUSUZJQ0FURS0tLS0tCk1JSUMvakNDQWVhZ0F3SUJBZ0lCQURBTkJna3Foa2lHOXcwQkFRc0ZB
REFWTVJNd0VRWURWUVFERXdwcmRXSmwKY201bGRHVnpNQjRYRFRJek1EWXlPREUwTWpNek1sb1hEVE16TURZeU5URTBNak16TWxvd0ZURVRNQkVHQTFVRQpBeE1L
YTNWaVpYSnVaWFJsY3pDQ0FTSXdEUVlKS29aSWh2Y05BUUVCQlFBRGdnRVBBRENDQVFvQ2dnRUJBTmp0CkdtR2pocHZvVU9rM1JuWXlHelQzeU5zUnpyS0RjaHBw
Y2hJNG1zM1lNQUFIamhrdlR1eXlVREJPZlY2cTQrei8KS0hyTkFldy9aYTJEWkVTYzEyenk3bCtZV0N6ZEJUMEI1WldUdTZoUFVSUXdoYUhLcFI1b2JvaHI3TzlY
Y0hDQgpQMTloVVhyV1I0eGk3MHViWTZvcjFmVi8xVzJxMFNRYUFINWhKdzdFK3RwMU1tT1JNaGVwQWRxeDhGajc0bmhnClExWG04KzhkQVVyLzdzOUEzbEtiVXd0
U0J5bW9NMlJVYmlKbWRpRmJOS3hBdDkrbkQwTXJCTGNQUkZCUXhjTDAKcDdZT2hmL2t5S0RramttSEU5d2lweEFYblhEdk9XTU1NT2F0OEVSMXN3emxjSHVVbThM
bG9UUmpHRndoQWJqUApIci9UTEZuOHN5dDRMQXdmbXBNQ0F3RUFBYU5aTUZjd0RnWURWUjBQQVFIL0JBUURBZ0trTUE4R0ExVWRFd0VCCi93UUZNQU1CQWY4d0hR
WURWUjBPQkJZRUZLcEpneG4wNDhLQ1AyQ0NJTjNaTEd1aUsvbnlNQlVHQTFVZEVRUU8KTUF5Q0NtdDFZbVZ5Ym1WMFpYTXdEUVlKS29aSWh2Y05BUUVMQlFBRGdn
RUJBQjh2ZFgwbjdxclNiR1ZyM3JPeQoybjQyMHZQd0I1b0VWMUJ5eENRQWdxTjk4RVJ5RzVvQ0QxVDRpUEFvc05nMHR4ME1MaFNqc2NQQlpPbWJxWnMzCmVLYUFv
YVR4WUFWUDBoWTM4OG1HVGkwenBDNWVtc2xicTRsMk1Fc2tpelcyN0c5c3lpNmU4Y2dld1Rob0hETksKYkpSWkFxUmYwdmkyaml4ZXJUUnMvMkNuNitIcEdjSnA4
ZWE3VVJOMzMvbjBtNGE4NVlRQ3RxZ241TkZjNXVtcQpsMXRzQ3haZDFtcERZZ0dkdG9jZTRMbzBRUTMyWGNQenJjMERIeEE4bmtyWjVrTm9lWE04dk9aYUZTVG9T
YjdHClJNeUV2Sk50YjF5N1I2MHVkbGM2QTdSY29qYm5aRkxxOHhuRngvZjNaMGg5Y1hab3VjbTYzWXB6eU5hYy9WbDkKckRrPQotLS0tLUVORCBDRVJUSUZJQ0FU
RS0tLS0tCg==
    server: https://172.31.49.77:6443
  name: kubernetes
contexts:
- context:
    cluster: kubernetes
    user: kubernetes-admin
  name: kubernetes-admin@kubernetes
- context:
```

Copy the crt and key files from the master node to the client node in the /cep-project2 directory.

```
labsuser@master:~$ cd cep-project2
labsuser@master:~/cep-project2$ ls
deploy1.yaml  user4.crt  user4.csr  user4.key  viewaccess.yaml
labsuser@master:~/cep-project2$
```

Inside the worker node:

mkdir cep-project2

cd cep-project2

vi user4.crt

```
labsuser@worker-node-2:~$ mkdir cep-project2
labsuser@worker-node-2:~$ cd cep-project2
labsuser@worker-node-2:~/cep-project2$ ls
labsuser@worker-node-2:~/cep-project2$ vi user4.crt
labsuser@worker-node-2:~/cep-project2$ cat user4.crt
-----BEGIN CERTIFICATE-----
MIIDKjCCAhICFHJsuz0QQTY/+h3XwNt+pSPnSGDpMA0GCSqGSIb3DQEBCwUAMBUx
EzARBgNVBAMTCmt1YmVybmV0ZXMwHhcNMjMwNjI4MTQ0MTEyWhcNMjQxMTA5MTQ0
MTEyWjCBjTELMAkGA1UEBhMCSU4xCzAJBgNVBAgMAlRHMQswCQYDVQQHDAJIWTEV
MBMGA1UECgwMY2VwLXByb2plY3QyMRUwEwYDVQQLDAxjZXAtcHJvamVjdDIxDjAM
BgNVBAMMBXVzZXI0MSYwJAYJKoZIhvcNAQkBFhdjZXAtcHJvamVjdC0yQGdtYWls
LmNvbTCCASIwDQYJKoZIhvcNAQEBBQADggEPADCCAQoCggEBANRQH+0y9t7nrCxX
zKbYICjgy0AQSxVT864O4Y1cnOpYi4U0im0wg1VzevyGZK6eq/3H1uUfqb4NZPLX
5u5+jz7ekKWpjfr/9o7l43oBj+iuuOA/rN803WsL131IshE9dC9l5ujV8N0ebWY4
8XYzVZV+faMS4pycv6liBfvaJvK4khKFLZt9CriuZAWEVlI8wqPThFX/jsDiBHBs
pj4egdbQob7Y9AqCjM51nX9nolbHQZQezDR6xQYG1NrINDFB2DVbYJNCvSNQ7UYd
DielgK/tHbY2XvWxLdkKtl2vwWpbokFvrLJrPrVnrZAZ5Bfs9xpaFUNEuF8uuFzU
Ww8oltECAwEAATANBgkqhkiG9w0BAQsFAAOCAQEApLJI69byiD08RXRyOSWnPjr3
zZS1EjIRMDCoSI5Yt7ZBoulkDjPMy9Nd0fK/8fIcaNP4x8W0/qOGi+eBRTRXUi95
JDK/7+mGK9hyVGuiuUxDRSAubVOhDxi3OiHeupawVLuplr0thYIYkdGHcIYKUZLS
njwdDUSuaSB2JtwjSEGMXE73giMOWwDqM/GiJT4lkdKGU4CiG3xPAXTlJ1umyiYP
OJQWjkAG2Rc/DKK0FzFCUMyXeKfQtWfuYEr5M0BcCGzn4/eKFFLu8Tmg3kRI/cJb
LN5fSBzbjl9qkjGnUIaEfkq+6GxkJryclqfJWMxrjXat71AqGXTVDh9gNBs3qQ==
-----END CERTIFICATE-----
labsuser@worker-node-2:~/cep-project2$
```

vi user4.key

```
labsuser@worker-node-2:~/cep-project2$ vi user4.key
labsuser@worker-node-2:~/cep-project2$ cat user4.key
-----BEGIN RSA PRIVATE KEY-----
MIIEpAIBAAKCAQEA1FAf7TL23uesLFfMptggKODLQBBLFVPzrg7hjVyc6liLhTSK
bTCDVXN6/IZkrp6r/cfW5R+pvg1k8tfm7n6PPt6QpamN+v/2juXjegGP6K644D+s
3zTdawvXfUiyET10L2Xm6NXw3R5tZjjxdjNVlX59oxLinJy/qWIF+9om8riSEoUt
m30KuK5kBYRWUjzCo9OEVf+OwOIEcGymPh6B1tChvtj0CoKMznWdf2eiVsdBlB7M
NHrFBgbU2sg0MUHYNVtgk0K9I1DtRh0OJ6WAr+0dtjZe9bEt2Qq2Xa/BaluiQW+s
sms+tWetkBnkF+z3GloVQ0S4Xy64XNRbDyiW0QIDAQABAoIBAFuEtl5u64+mWcc7
iZIZ87LrQ3G4FEV7TL0o2P0wgMtbo7ilr03l7Zb2EnusCtZiu0zHydA2V9r+txcf
DgKcN28oTT272uHpWAS8/9NlvPzV5Ad2KzSD+zXbguYUYf2geea8jE6tegg2x32a
6irDcg7g2ZNj3p8Xyl5fTKkFnmhdckc4yCRaXxkfyWADx/KRtRmnY5kCgRbYDFMb
SO86Ls8Ibb8TdoS5W42oNL19Hn01CZOmOV79Vi0mwHnxPViNfehS2Bb/0GOdghsk
ruClaLSDTRXTF+Aq140uzZDKrIyQArlYSmdCKl2cDAYM4gV53CY93oXfdQdanxqP
6Whqh6kCgYEA7GJbNN+D/+PFzrEYVbvaRC5TBj+227qPUqW7F7bQORYkdXjbEytD
57x1zFtes+JVkjRup+5UcLkgZ5x56mWqfD8PbwgkSZAT8P3A+hEjKqYgg8MBSVvI
cG8ksG7ZC3gKYOwnmHcB15XYXlScHcdaASM5u8EOxnx22AvK9qx+cU8CgYEA5e5o
8JYbe5Ed/WrGuxjl5SxCQwkpTs4zfiDSZZmjFedyS9mHAekDvVjdqv4jnCtfcgAD
ieI57cTj1qCmDPSLLQE38voFGge4rv8YgyzjuL3g0Cqg7JyVwM13zhQr+LQqXift
J1tb52f/TOS9/KpAjgrBHqmmA82EOA/MsgsXLd8CgYEAw9qKbzhyieYS0rpwyzgm
FC+9ooPP4iak8XlXlsJlq6bo9lv4R92lGbBQec2Knch91fGTbZhOZkc8zhwb91Xc
96zYAMriJgE2RIo7BfaFCKU0c3dy7XEale3AnF57fsEq+DsyY2TXJeSFrUK1RwcR
T7f78dB3iYU+gqris5cf/IkCgYEAh7ZyZh6TVhnPU7ZkWiZV+zBmY97SbNs0dWu2
A5XtNo6HXdGk6DG6rVX4cGbUaecHzOfJLudCPd8Kg7IKkHb+dq/TcCy2Oij4jwGu
XC5wsqgQO44NsdqyYTxlTFOHqKHep/h099fqpOkzPRV+NdXfiHc8iXaksHXrZpOc
xDHbmo0CgYAaIBz7Ow1iEnSafx0HEFDMmHAYil3VrKpsZkZEiSKDWkVtWEQcPwMt
rB3BSySL4KHF+jYDh4aOP3+bd6g2FR7UzxInT9oZlMPRucR493LRrl3G76RLBt7j
7vlFi1i4pZHiEL5JMjiozQS2q+VFHd+gpNx8atJoh+d818LwpDR78w==
-----END RSA PRIVATE KEY-----
labsuser@worker-node-2:~/cep-project2$
```

Run the following commands to verify roles we have generated:

Kubectl get pods -n cep-project2 –kubeconfig=myconf
Kubectl get deployment -n cep-project2 –kubeconfig=myconf

```
labsuser@worker-node-2:~$ kubectl get pods -n cep-project2 --kubeconfig=myconf
NAME                             READY   STATUS    RESTARTS   AGE
my-deployment-9456bbbf9-9gn9p   1/1     Running   0          36m
my-deployment-9456bbbf9-q7npj   1/1     Running   0          36m
my-deployment-9456bbbf9-xglhh   1/1     Running   0          36m
labsuser@worker-node-2:~$ kubectl get deployment -n cep-project2 --kubeconfig=myconf
NAME            READY   UP-TO-DATE   AVAILABLE   AGE
my-deployment   3/3     3            3           37m
labsuser@worker-node-2:~$
```

TASK-4: To upgrade the Kubernetes cluster with the latest

Determining which version to upgrade

Check which version to upgrade using the following command:

sudo apt update

```
labsuser@master:~$ sudo apt update
Hit:1 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal InRelease
Get:2 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates InRelease [114 kB]
Get:3 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-backports InRelease [108 kB]
Get:4 https://download.docker.com/linux/ubuntu focal InRelease [57.7 kB]
Get:5 http://security.ubuntu.com/ubuntu focal-security InRelease [114 kB]
Get:6 http://ppa.launchpad.net/remmina-ppa-team/remmina-next/ubuntu focal InRelease [18.1 kB]
Get:8 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 Packages [2678 kB]
Get:9 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main Translation-en [447 kB]
Get:10 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 DEP-11 Metadata [275 kB]
Get:11 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main DEP-11 48x48 Icons [60.8 kB]
Get:12 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main DEP-11 64x64 Icons [98.3 kB]
Get:13 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/main amd64 c-n-f Metadata [16.9 kB]
Get:14 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 Packages [2045 kB]
Get:15 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted Translation-en [286 kB]
Get:16 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/restricted amd64 c-n-f Metadata [636 B]
Get:17 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 Packages [1076 kB]
Get:18 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe Translation-en [256 kB]
Get:19 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 DEP-11 Metadata [410 kB]
Get:20 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe DEP-11 48x48 Icons [277 kB]
Get:21 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe DEP-11 64x64 Icons [488 kB]
Get:22 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/universe amd64 c-n-f Metadata [25.1 kB]
Get:23 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 Packages [25.2 kB]
Get:24 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse Translation-en [7408 B]
Get:25 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse amd64 DEP-11 Metadata [940 B]
Get:26 http://us-west-2.ec2.archive.ubuntu.com/ubuntu focal-updates/multiverse DEP-11 48x48 Icons [1867 B]
```

Find the latest patch release of kubeadm 1.23 using the OS package manager:

```
sudo apt-cache madison kubeadm
```

```
labsuser@master:~$ sudo apt-cache madison kubeadm
   kubeadm |  1.23.4-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.23.3-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.23.2-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.23.1-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.23.0-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.22.7-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.22.6-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.22.5-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.22.4-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.22.3-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.22.2-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.22.1-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.22.0-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm | 1.21.10-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.9-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.8-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.7-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.6-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.5-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.4-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.3-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.2-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.1-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm |  1.21.0-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubeadm | 1.20.15-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
```

Find the latest patch release of kubectl 1.23 using the OS package manager:

```
sudo apt-cache madison kubectl
```

```
labsuser@master:~$ sudo apt-cache madison kubectl
   kubectl |  1.23.4-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.23.3-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.23.2-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.23.1-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.23.0-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.22.7-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.22.6-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.22.5-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.22.4-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.22.3-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.22.2-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.22.1-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.22.0-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl | 1.21.10-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.9-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.8-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.7-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.6-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.5-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.4-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.3-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.2-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.1-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl |  1.21.0-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
   kubectl | 1.20.15-00 | https://apt.kubernetes.io kubernetes-xenial/main amd64 Packages
```

Verify the kubeadm and kubectl versions of the control plane (master):

kubeadm version

kubectl get nodes

```
labsuser@master:~$ kubeadm version
kubeadm version: &version.Info{Major:"1", Minor:"23", GitVersion:"v1.23.4", GitCommit:"e6c093d87ea4cbb530a7b2ae91e54c0842d83
08a", GitTreeState:"clean", BuildDate:"2022-02-16T12:36:57Z", GoVersion:"go1.17.7", Compiler:"gc", Platform:"linux/amd64"}
labsuser@master:~$ kubectl get nodes
NAME            STATUS   ROLES                  AGE    VERSION
master          Ready    control-plane,master   144m   v1.23.4
worker-node-1   Ready    <none>                 141m   v1.23.4
worker-node-2   Ready    <none>                 141m   v1.23.4
labsuser@master:~$
```

Update and upgrade the repositories using the following commands:

sudo apt update

sudo apt upgrade

Verify the version by using the following command:

kubeadm version

kubectl get nodes

sudo kubeadm upgrade plan

```
labsuser@master:~$ kubeadm version
kubeadm version: &version.Info{Major:"1", Minor:"23", GitVersion:"v1.23.4", GitCommit:"e6c093d87ea4cbb530a7b2ae91e54c0842d83
08a", GitTreeState:"clean", BuildDate:"2022-02-16T12:36:57Z", GoVersion:"go1.17.7", Compiler:"gc", Platform:"linux/amd64"}
labsuser@master:~$ kubectl get nodes
NAME            STATUS   ROLES                  AGE    VERSION
master          Ready    control-plane,master   158m   v1.23.4
worker-node-1   Ready    <none>                 156m   v1.23.4
worker-node-2   Ready    <none>                 155m   v1.23.4
labsuser@master:~$
```

```
labsuser@master:~$ sudo kubeadm upgrade plan
[upgrade/config] Making sure the configuration is correct:
[upgrade/config] Reading configuration from the cluster...
[upgrade/config] FYI: You can look at this config file with 'kubectl -n kube-system get cm kubeadm-config -o yaml'
[preflight] Running pre-flight checks.
[upgrade] Running cluster health checks
[upgrade] Fetching available versions to upgrade to
[upgrade/versions] Cluster version: v1.23.17
[upgrade/versions] kubeadm version: v1.23.4
I0628 17:03:15.728320  245650 version.go:255] remote version is much newer: v1.27.3; falling back to: stable-1.23
[upgrade/versions] Target version: v1.23.17
[upgrade/versions] Latest version in the v1.23 series: v1.23.17

labsuser@master:~$
```

Kubernetes cluster is up to date with the latest version