

Lesson 02 Demo 06

Implementing RBAC Using Namespaces

Objective: To set up and verify role-based access control (RBAC) in Kubernetes using namespaces for secure and efficient user management

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. Create a namespace in the master node
2. Generate an RSA private key and certificate signing request
3. Create a role
4. Create a role binding service
5. Set up credentials for the user
6. Verify the roles

Step 1: Create a namespace in the master node

1.1 Use the following command to create a namespace:

kubectl create namespace role

```
labsuser@master:~$ kubectl create namespace role
namespace/role created
labsuser@master:~$
```

1.2 Create and navigate to the **role** directory with these commands:

```
mkdir role
```

```
cd role
```

```
labsuser@master:~$ kubectl create namespace role
namespace/role created
labsuser@master:~$ mkdir role
labsuser@master:~$ cd role
labsuser@master:~/role$
```

Step 2: Generate an RSA private key and certificate signing request

2.1 Use the following commands to generate a 2048-bit RSA private key and create a CSR:

```
sudo openssl genrsa -out user3.key 2048
```

```
sudo openssl req -new -key user3.key -out user3.csr
```

```
labsuser@master:~/role$ sudo openssl genrsa -out user3.key 2048
labsuser@master:~/role$ sudo openssl req -new -key user3.key -out user3.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]:MH
Locality Name (eg, city) []:au
Organization Name (eg, company) [Internet Widgits Pty Ltd]:role
Organizational Unit Name (eg, section) []:role
Common Name (e.g. server FQDN or YOUR name) []:user3
Email Address []:role@gmail.com

Please enter the following 'extra' attributes
to be sent with your certificate request
A challenge password []:
An optional company name []:
labsuser@master:~/role$
```

2.2 Link an identity to the private key using a digital signature with the following command:

```
sudo openssl x509 -req -in user3.csr -CA /etc/kubernetes/pki/ca.crt -CAkey  
/etc/kubernetes/pki/ca.key -CAcreateserial -out user3.crt -days 500
```

```
Please enter the following 'extra' attributes  
to be sent with your certificate request  
A challenge password []:  
An optional company name []:  
labsuser@master:~/role$ sudo openssl x509 -req -in user3.csr -CA /etc/kubernetes/pki/ca.crt -CAkey /etc/kubernetes/pki/ca.key -CAcreateserial -out user3.crt -days 500  
Certificate request self-signature ok  
subject=C = In, ST = MH, L = au, O = role, OU = role, CN = user3, emailAddress = role@gmail.com  
labsuser@master:~/role$
```

Step 3: Create a role

3.1 Run the following command to create a **role.yaml** file:

```
vi role.yaml
```

```
labsuser@master:~$ vi role.yaml
```

3.2 Add the following code to the **role.yaml** file:

```
kind: Role  
apiVersion: rbac.authorization.k8s.io/v1  
metadata:  
  namespace: role  
  name: user3-role  
rules:  
- apiGroups: ["", "extensions", "apps"]  
  resources: ["deployments", "pods", "services"]  
  verbs: ["get", "list", "watch", "create", "update", "patch", "delete"]
```

```

kind: Role
apiVersion: rbac.authorization.k8s.io/v1
metadata:
  namespace: role
  name: user3-role
rules:
- apiGroups: ["", "extensions", "apps"]
  resources: ["deployments", "pods", "services"]
  verbs: ["get", "list", "watch", "create", "update", "patch", "delete"]
~
~

```

3.3 Create a role with the following commands:

```
kubectl create -f role.yaml
```

```
kubectl get roles -n role
```

```

labsuser@master:~$ vi role.yaml
labsuser@master:~$ kubectl create -f role.yaml
role.rbac.authorization.k8s.io/user3-role created
labsuser@master:~$ kubectl get roles -n role
NAME          CREATED AT
user3-role    2023-10-09T09:25:16Z
labsuser@master:~$

```

Step 4: Create a role binding service

4.1 Run the following command to create a **rolebinding.yaml** file:

```
vi rolebinding.yaml
```

```
labsuser@master:~$ vi rolebinding.yaml
```

4.2 To create a role binding service, add the following code to the **rolebinding.yaml** file:

```
kind: RoleBinding
apiVersion: rbac.authorization.k8s.io/v1
metadata:
  name: role-test
  namespace: role
subjects:
- kind: User
  name: user3
  apiGroup: ""
roleRef:
  kind: Role
  name: user3-role
  apiGroup: ""
```

```
kind: RoleBinding
apiVersion: rbac.authorization.k8s.io/v1
metadata:
  name: role-test
  namespace: role
subjects:
- kind: User
  name: user3
  apiGroup: ""
roleRef:
  kind: Role
  name: user3-role
  apiGroup: ""
```

4.3 Create a role binding with the following commands:

```
kubectl create -f rolebinding.yaml
```

```
kubectl get rolebinding -n role
```

```
labsuser@master:~$ vi rolebinding.yaml
labsuser@master:~$ kubectl create -f rolebinding.yaml
rolebinding.rbac.authorization.k8s.io/role-test created
labsuser@master:~$ kubectl get rolebinding -n role
NAME          ROLE                      AGE
role-test     Role/user3-role          6s
labsuser@master:~$
```

Step 5: Set up credentials for the user

5.1 Assign credentials to user3 using the following command:

```
kubectl config set-credentials user3 --client-certificate=/home/labsuser/role/user3.crt
--client-key=/home/labsuser/role/user3.key
```

```
labsuser@master:~$ kubectl config set-credentials user3 --client-certificate=/home/labsuser/role/user3.crt --client-key=/home/labsuser/role/user3.key
User "user3" set.
labsuser@master:~$
```

5.2 Set the context for user3 using the following command:

```
kubectl config set-context user3-context --cluster=kubernetes --namespace=role --
user=user3
```

```
labsuser@master:~$ kubectl config set-credentials user3 --client-certificate=/home/labsuser/role/user3.crt --client-key=/home/labsuser/role/user3.key
User "user3" set.
labsuser@master:~$ kubectl config set-context user3-context --cluster=kubernetes --namespace=role --user=user3
Context "user3-context" created.
labsuser@master:~$
```

kubect! config get-contexts

CURRENT	NAME	CLUSTER	AUTHINFO	NAMESPACE
*	kubernetes-admin	kubernetes	kubernetes-admin	
	user3-context	kubernetes	user3	role

```
cd ..
```

```
labuser@master:~/r/p16$ cd ..
labuser@master:~$ cat .kube/config
apiVersion: v1
clusters:
- cluster:
    certificate-authority: LS0tLS1CRUdJTI6BRVJUSUZZQ0FURS0tLS0tck11SURVCmVlY2F3U0JlZ0t1J3RUZSv2J8c3Q0doem3RFFZSk1wkl0dmNOQVFfTEJRQzGdGEVUUTJFR0EueVUUKQXhNS2ZuVm
    1aWepLWlSHSGNGQwGdzB5TXpFd01Ea3d0eKuITXpKYUz3MhPlekV3TURZd0S65TBNeKphUTJVeApFekFSQmDOVK3BTVRDbQxQwM1We0dvtJvBaWe13Z2dfau1BMEdDU3FHU011M0RRRUJBUUVBQTRQKR3QzdnlZClkFv
    5PUBURyBwRuRmp2GpxUz2sYm11Qzc4dnhBSmZQmUdschwPY2FQ52ZtK2VaUz11VH0Y0XNUd11NHHBFwj1CKiDhuW9NNNTdpd0wRk0xaaA2amRDQzUcU4V4M03kSFhmTFf0Z1Vjd2k2c2RaMdQK0xR13Zs08NjVg0UF
    dPsdphNBExKz2F0dW1ZlBR0fKl0dVMVJwSk04T11TM3JMN1Ud2FwcUcxwb01CSUxkNC9MVFUvVyyZW1KtW9pclUph1NQb6BKbHZZK9DdkVr0Td0amVsdFpa1V0b3V1ZmNmTD03SG0VDbkDhU015RX15SWttemNHOFdH
    dEPN1Uzsc1BKQZcK1JmWmHYKRMR2RabD63RwVRUjYmMbVklU1H1ZwtqTmhXen1K1MUFkd0FLM1R9Nzc3emFlV8VzZodJ2cQo5MuJnTFB0SERDaE0uQnhncEgzN1Z5c28ZGdQwQdNQKfBR2pXVEJYtUE0R0eWRRERd0
    VCL3dBRUJFSwReFFQCKn11Z1Uk11CQyARUJURQUBUgYtU1wR0EwWREZ1FXQK3VXo2enhSMU9sbV1UuDPtm11S1BwMvNpNTR6QYKQmQvKhSRUeakFANZ2UwcmRXSmcjbTVsZe4kEdmDLBfHU011M0RRRUd0
    d1V0TRJQRfR09dFp0UyV80YgorQkdJwh1aKkNdM1kK1k10dMwH38RTm6SR1N0K0NtUdZb2OGfxceK0aUz0Z11BhUvTFEQQK1QWz1c0F1dHJUC1ZUQJ9Gcdk0a11b3c5Vz2PMK3Y2N01F1ZFRSXC2MTdBUz11Ty1CQm
    8Z7mN1Ym1NmddG6E1bE1aa0FydcFgKjYmVUDR3jHqAVe90UemH1JmVFA3bXZtY05tbZ2RUFZ7jUz1D0BSX1jNG1LH85pd19QZnseFFENDRwJwcmQpJUXUUDdFQ195Qh4Q1L3eFEXFZK0dWmHmzgrM2z0VtW
    e5z1ZHVNEhZ11BUK1Zr2bQdYK0M2Q4ZfH3C19U1BpdEPzLyEtBnp5SHoyc3JJcnRRM1p1eHwXjR0NBET0xEmTK3Mk1VzJqJ0vbmLud1NmQe2SGZuNm0K3dCNHdZwUWjYzC10tLS0tRU5ETENFU1R3Rk
    1DQVRFLS0tLS0k
server: https://172.31.3.59:6443
name: kubernetes
contexts:
- context:
    cluster: kubernetes
    user: kubernetes-admin
name: kubernetes-admin@kubernetes
- context:
    cluster: kubernetes
    namespace: role
    user: user3
name: user3-context
```

5.5 Copy the **config** file as shown below:

```
labsuser@master:~$ cat .kube/config
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data: LS0tLS1CRUdJTiBDRVJUSUZJQ0FURSB0tLS0tCk1JSURCVENDQWlyZ0F3SUJBZ01JRlUzVjBjc0doemd3RFFZSktvWk1odmNOQVFFTEJRQXdGVEVUTUJFR0ExVUUKQXhNS2EzVm
    1aWEP1WlhSbGN6QWVWd2B5TXpFd01Ea3d0ekU1TXpKYUZ3MHPNekV3TURZd0956STBnekphTU0VeApFekFSQmd0Mk1BTVRDbXQ4dW1WkU1VjBlaWE13Z2dFaU1BMEddU3FHU011M0RRRUJBUVNBQTRJQ0R3QXdnZ0VLCKFv
    SUJBURRYbWlRUYpP2GpYU2s2Ym11Qzc4dnhB5mZQWJdsckwPY2FQ52ZtK2VaU21LVHMYXNlUd11NNHBFKjIKcDhuYm9NNITdpd0wK0xaaXAZ2amRDQzhUcU4W0JkSFhmTFF0Z1Vjd2k2c2RmWdQK0xRL3ZsQ0NjVWg0UF
    dDp0pHbXkxZ0F0dWJ2L0tBR0FkL0dWVWJwSkQ4T11TM3JmNn1Ud2FwUcxb01CSUxkNC9WFEwUWVY2W1k1W9pctUphC1NQbDBKbHZZZk90dkVrOTd0amVsdEFpa1V0b3ViZnMwTDJSOGV0dDhoU11SRX1SShEtemMHOFdH
    aEPmNj3cU0KQzcck1JWMMHYkRRM2RsbDE3RmVRUjJHbWVklUWlhZWtqTmRKen1kNUFkd0FLM1R5Nzc3emNFC1V0VzZodU22c05WUJnTFB0SERDaE0wQnhncEgzN1Z5c28xZG4wQWJkQKFR2pXVE3YTUE0R0ExWmRed0
    VCL3dRUF3SUNwREFQCKjN1Z1Uk1CQWY4RUJURBUUgVtU1wR0ExWmREZ1FXQK3SVXo2enhSMU9sbV1wUdPTm1IS1BvNVVpNTR6QVYKQmdOVkhSRUVEakFNZ2dwcmlRSMxjbTV5ZEEdWklBMEddU3FHU011M0RRRUJ0
    d1VBQTRJQKFR0FdaXNQ1VB0VgorQkdjWnJmNn1Ud2FwUcxb01CSUxkNC9WFEwUWVY2W1k1W9pctUphC1NQbDBKbHZZZk90dkVrOTd0amVsdEFpa1V0b3ViZnMwTDJSOGV0dDhoU11SRX1SShEtemMHOFdH
    8zTmhnYmNiNmdeG1E1Baa0FydC9EcFgKYpVUDRJahQ4VE90Um5hN1JmVFA3bXJzY05tb2ZFRUFZyZjU0BKSX1jNGNlN05pd19HQzNseFFENDRwXjcwMQpjUWV0dDdFQ19SQnh4QW13emFXZF100NnMzgrM2JxVTMn
    eEs1ZXVjNEh2N1BUK1ZFcFBqSHZwL0M2Q1Q4ZmFHCi9PU1BpdEplZytEbnp5SHoyc3J3cnRRM1p1eH4wXjZdRnBET0xEtmk3Mk1VzJzQV03vbm1ud11NwQUE2SGZuNm0KS3dCNHdxZWUwYjYzCi0tLS0tRUSETENFU1RJRk
    IDQVRFLS0tLS0K
    server: https://172.31.3.59:6443
    name: kubernetes
contexts:
- context:
    cluster: kubernetes
    user: kubernetes-admin
    name: kubernetes-admin@kubernetes
- context:
    cluster: kubernetes
    namespace: role
    user: user3
    name: user3-context
current-context: kubernetes-admin@kubernetes
kind: Config
preferences: {}
users:
- name: kubernetes-admin
```

5.6 On the client machine, run the following command:

vi myconf

```
labsuser@worker-node-1:~$ vi myconf
```

5.7 Then, paste the copied config file as shown below:

```
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data: LS0tLS1CRUdJTiBDRVJUSUZJQ0FURSB0tLS0tCk1JSURCVENDQWlyZ0F3SUJBZ01JRlUzVjBjc0doemd3RFFZSktvWk1odmNOQVFFTEJRQXdGVEVUTUJFR0ExVUUKQXhNS2EzVm
    1aWEP1WlhSbGN6QWVWd2B5TXpFd01Ea3d0ekU1TXpKYUZ3MHPNekV3TURZd0956STBnekphTU0VeApFekFSQmd0Mk1BTVRDbXQ4dW1WkU1VjBlaWE13Z2dFaU1BMEddU3FHU011M0RRRUJBUVNBQTRJQ0R3QXdnZ0VLCKFv
    SUJBURRYbWlRUYpP2GpYU2s2Ym11Qzc4dnhB5mZQWJdsckwPY2FQ52ZtK2VaU21LVHMYXNlUd11NNHBFKjIKcDhuYm9NNITdpd0wK0xaaXAZ2amRDQzhUcU4W0JkSFhmTFF0Z1Vjd2k2c2RmWdQK0xRL3ZsQ0NjVWg0UF
    dDp0pHbXkxZ0F0dWJ2L0tBR0FkL0dWVWJwSkQ4T11TM3JmNn1Ud2FwUcxb01CSUxkNC9WFEwUWVY2W1k1W9pctUphC1NQbDBKbHZZZk90dkVrOTd0amVsdEFpa1V0b3ViZnMwTDJSOGV0dDhoU11SRX1SShEtemMHOFdH
    aEPmNj3cU0KQzcck1JWMMHYkRRM2RsbDE3RmVRUjJHbWVklUWlhZWtqTmRKen1kNUFkd0FLM1R5Nzc3emNFC1V0VzZodU22c05WUJnTFB0SERDaE0wQnhncEgzN1Z5c28xZG4wQWJkQKFR2pXVE3YTUE0R0ExWmRed0
    VCL3dRUF3SUNwREFQCKjN1Z1Uk1CQWY4RUJURBUUgVtU1wR0ExWmREZ1FXQK3SVXo2enhSMU9sbV1wUdPTm1IS1BvNVVpNTR6QVYKQmdOVkhSRUVEakFNZ2dwcmlRSMxjbTV5ZEEdWklBMEddU3FHU011M0RRRUJ0
    d1VBQTRJQKFR0FdaXNQ1VB0VgorQkdjWnJmNn1Ud2FwUcxb01CSUxkNC9WFEwUWVY2W1k1W9pctUphC1NQbDBKbHZZZk90dkVrOTd0amVsdEFpa1V0b3ViZnMwTDJSOGV0dDhoU11SRX1SShEtemMHOFdH
    8zTmhnYmNiNmdeG1E1Baa0FydC9EcFgKYpVUDRJahQ4VE90Um5hN1JmVFA3bXJzY05tb2ZFRUFZyZjU0BKSX1jNGNlN05pd19HQzNseFFENDRwXjcwMQpjUWV0dDdFQ19SQnh4QW13emFXZF100NnMzgrM2JxVTMn
    eEs1ZXVjNEh2N1BUK1ZFcFBqSHZwL0M2Q1Q4ZmFHCi9PU1BpdEplZytEbnp5SHoyc3J3cnRRM1p1eH4wXjZdRnBET0xEtmk3Mk1VzJzQV03vbm1ud11NwQUE2SGZuNm0KS3dCNHdxZWUwYjYzCi0tLS0tRUSETENFU1RJRk
    IDQVRFLS0tLS0K
    server: https://172.31.3.59:6443
    name: kubernetes
contexts:
- context:
    cluster: kubernetes
    user: kubernetes-admin
    name: kubernetes-admin@kubernetes
- context:
    cluster: kubernetes
    namespace: role
    user: user3
    name: user3-context
current-context: kubernetes-admin@kubernetes
kind: Config
preferences: {}
"myconf" 28L, 5862B
```



```
- name: kubernetes-admin
  user:
    client-certificate-data: LS0tLS1CRUdJTiBDRVJUSUZ0Q0FURS0tLS0tCj1SURJVEN0QWhtZ0F3SUJBZ0lJWFbXl05wTiszTEl3RFFZSktsVmk1odmNOQVFfTEJ0Q0dGVVUJURFR0E
xVUUKQXhNS2EzZm1aEj1W1hSbG96QW9GdzB5TjR0Y3d0e1E0TKRCYUz3MhLOREv3TVRZd050VXpOREShTURReApGekFhQmd0VkcjBb1REbk41YzNSbGJUCkR2NE4wM1hKek1Sa3dGd1lEVlF
RREv4QnJkV0p5Y201bGRhNmpM0ZrCmJXbHNSUjCSWpBTKJna3Foa2ZlH0XcwQkFRRUZBU9Q0Q0VE4QU1J3SUJ0Z0tDQVFfFQXVCTE1Sdzg2VmrRl0lJ3SUKOTdDbjNlQW5aZlJYngxSksxSFUxWp
3UzUyQmtkbnYUHRMVGNSG1IaXk3WEVlWm1KNHE2dXRrR253cHNLdApLQXdNRVc0S0ZVYUR6ZVc1YVAzV3U1WFmWbWpTjXp4SnJ6VcxPbn3sdHBTREN5ZDNYV1A1NkVEeBjV1RvUDBzCj1wXh
1bU1ZaM44Z2NGNEtqdE43WHI5T2g3eE5sMy94VVC2ZDAwCVR5R1BBL2xoSEQvWt15TThc1U3NpYcmMKMhVwMk3vYw1L0DRUbm03a3pSaHh6eXR1cHhRM2Q2UzZ4dndPwTBFbE1DdHNTi8wNEV
PenRYZjdLWmRkVTVIqgo2S0R5Q0MU3QySF6bHFVK3Q1Mm1MxVWVkoV2trQjVRdzZW50FiVmRyTG93cxhZ22VvTFY2dmpKRW92TuxnCj1UODJkU1EQVFBQm8xwXdwREFFQmd0VkhROE1BZjzh
FQkFNQ0hQXdfDd1lEV1IwEjBd3d0Z1lJ3S3dzQk3RVUgKQXkjd08RWRURUjBUQVFI0JBSXdbREFFmQmd0VkhTTUWHREFXZ0lUcmRTdWt1ZSs1L3BFWHmWbYU1U0cUNGVQpHMEFQmdncwHraUc
5dzBCQVfzRkFBT0NBUBVbQkP5ZWzdkv5b25NSXh3Q29pWctTY19D50Jusmt1VU91cE15CjRFBGhudmozMU56VVB6eWwNnZmTGM2NjVNM05TOVd5ZWk0TGTENN0xUT1p3L0VjQVRWdzYwYzhvFh
HaF3U3eUQKUTB50GNDJUDZ1cH0hVjB5KytKs1dKYzN0TVc2b1lVZkpocEFntjNIR2HkbnhNqYmNDNqTFNRYR2VBbH2GKzY2MwpuNDJmQTAzT2pWV1hwGZMemZIUH2XWVzbjBNVEFTUXLRcnBxMwt
FRKFBT2N0NdQaEhneEkrR2V4dm5zSU1OCit5Qm5ueUM3e1pGcW9sZF1o3pWz3LQ529KQ212RkphcTvwZ3F4LzI2QjJmdHh3Ued3VGfH0Gy5ZTUyU31sR0IKTzgxL2Zq1hpYjZ6bitpChpdlW
XUJkVNU5G0Wd1ZUF2e1p5Z04zd2pYek1hGk1VHc9PQotLS0tLUVORCBDRVJUSUZ0Q0FURS0tLS0tCg==
    client-key-data: LS0tLS1CRUdJTiB0EgUJF3VkcFURS0tLS0tLQpNSU1f3d3QkFBS0NBUBVbQkP5ZWzdkv5b25NSXh3Q29pWctTY19D50Jusmt1VU91cE15CjRFBGhudmozMU56VVB6eWwNnZmTGM2NjVNM05TOVd5ZWk0TGTENN0xUT1p3L0VjQVRWdzYwYzhvFh
HaF3U3eUQKUTB50GNDJUDZ1cH0hVjB5KytKs1dKYzN0TVc2b1lVZkpocEFntjNIR2HkbnhNqYmNDNqTFNRYR2VBbH2GKzY2MwpuNDJmQTAzT2pWV1hwGZMemZIUH2XWVzbjBNVEFTUXLRcnBxMwt
FRKFBT2N0NdQaEhneEkrR2V4dm5zSU1OCit5Qm5ueUM3e1pGcW9sZF1o3pWz3LQ529KQ212RkphcTvwZ3F4LzI2QjJmdHh3Ued3VGfH0Gy5ZTUyU31sR0IKTzgxL2Zq1hpYjZ6bitpChpdlW
XUJkVNU5G0Wd1ZUF2e1p5Z04zd2pYek1hGk1VHc9PQotLS0tLUVORCBDRVJUSUZ0Q0FURS0tLS0tCg==
    client-key-data: LS0tLS1CRUdJTiB0EgUJF3VkcFURS0tLS0tLQpNSU1f3d3QkFBS0NBUBVbQkP5ZWzdkv5b25NSXh3Q29pWctTY19D50Jusmt1VU91cE15CjRFBGhudmozMU56VVB6eWwNnZmTGM2NjVNM05TOVd5ZWk0TGTENN0xUT1p3L0VjQVRWdzYwYzhvFh
HaF3U3eUQKUTB50GNDJUDZ1cH0hVjB5KytKs1dKYzN0TVc2b1lVZkpocEFntjNIR2HkbnhNqYmNDNqTFNRYR2VBbH2GKzY2MwpuNDJmQTAzT2pWV1hwGZMemZIUH2XWVzbjBNVEFTUXLRcnBxMwt
FRKFBT2N0NdQaEhneEkrR2V4dm5zSU1OCit5Qm5ueUM3e1pGcW9sZF1o3pWz3LQ529KQ212RkphcTvwZ3F4LzI2QjJmdHh3Ued3VGfH0Gy5ZTUyU31sR0IKTzgxL2Zq1hpYjZ6bitpChpdlW
XUJkVNU5G0Wd1ZUF2e1p5Z04zd2pYek1hGk1VHc9PQotLS0tLUVORCBDRVJUSUZ0Q0FURS0tLS0tCg==
```

5.8 Copy the **.cert** and **.key** files from the master node to the client node in the **/role** directory using the following commands:

cd role

ls -a

```
labsuser@master:~$ cd role
labsuser@master:~/role$ ls -a
. .. role.yaml rolebinding.yaml user3.crt user3.csr user3.key
labsuser@master:~/role$
```

5.9 On the client machine, display the contents of the **myconf** file using the **cat** command:

cat myconf

```

labuser@worker-node-1:~$ vi myconf
labuser@worker-node-1:~$ cat myconf
apiVersion: v1
clusters:
- cluster:
    certificate-authority-data: LS0tLS1CRUdJStI1BDRfVUJUSUJQ08FRS0tLS0tCk1lSURCVENDQmlyZ0F3SUJBZ0l1Rmhwd1owNDRvazR3RFFZSktsVWk1odnNOQVFfTEJRQXGVEVUTUjFR0EXWUkQXhNSZezVm1aW
    B5TXp0d0t1EWNkczB0TURAUz3MhpNekV3TURNeE16UXlNRlphTUJVeApFekFSQmdQxk0JBTVR0bXQwM1w6WtVjBaMe132Z2daU1BMEddU3FHU0l1M0RRRUJBUVBQTRQjQkR3QXdnZ0VlCKFvSjUJBUURFUEM2UmZrVmtabTg
    U3hdh8Z00pVhWkCwF1NDNl1M0aV0eVU0l1M3Mgk0jndEJ6td0Kzdzj54TEra3BaNk5NR2s3Bw0J0l1MaGk1Undcdz1FdVR4NUHjT204R2S2VZj2tGmVZ2ENZgP1TyZQ2m1F0DUU1T05sZG9F4p3iNg4vCb3iOXfCW
    tyXXVZdz120TdrB0k3ZWhUnVxbU4wCmtD0p6U0Z1V1k1Gc1MvRENYRmVxbk0sT5tISUeDdK1rSulh1QY0Z8tSSW0NSVdEe1FJ5WlCa2duamfyM2ZZUGIKRUFzEm1UY31hV3kGOEYj0dFueVR6VEFSKZVQ0tmdmZkHJFQ3d
    Yk0v0l1TndrckhsApKwJdVj1tZHFBDJ30XNqkHdCgxm5M2b0u3QwMlQkFBR2pXVjTUE0R0EXvMR0eVCL3DRRUF3SUNwREFQKjN1tZ1Uk1CQW4RUJURUJ0wR0EXvTUIwR0EXvWREZ1FXQkUTVhzRm1jQR1QUF0F
    Q9vQmQ0d0VhSRUvEakFN22dkmZcxSmxg1jVtZedwkl1BMEduJ3FHU0l1M0RRRUJBD10BTRQJkFRQVVMl1QxatCrUp0bcZvgdJ4cnVBVctgTEJ3Hdu0WfM3MwFUEXu1tA1cEN6c1iNhpY2pm5sZpm6YmM03ByUmrGdFp1
    PVyVZ22tdk0jdXhSTVPZX1vY1Z1N2k0bTFGaD2BTT1HdHxUmlTfUjZ5Z25aWefGRNj1aVdx2gxahQkAdRYn031dGV0v3FUTHNMYkdlUGNyOwF1Q3UwHf0ZwRkQWf2eTkzc1m5wJGbnFRk1dqFRY1d0R2xzVnV1M0pp5
    NwMEF0R2Rc1QZVgRq4BV10YUjUrnafYXqcyNmluaEgV0v4SUDmVFZKU8hNwccmQtSmNlpZTVtQZ1jsbE1rNFNPtQ1RmpdZtBC80SmZCUjW3N3FafJ3kak9yWVZYQ089L1U3H11rMTNMU0m5SbVK0TZQTmZ0vBnR3V
    U1R3Rk1QZVRF1S0tLS0K
    server: //172.31.9.126:6443
name: kubernetess
contexts:
- context:
    cluster: kubernetess
    user: kubernetess-admin

```

5.10 Navigate to the **/role** directory and list its contents using the following commands:

cd role

ls -a

```
- name: user3
  user:
    client-certificate: /home/labsuser/role/user3.crt
    client-key: /home/labsuser/role/user3.key
labsuser@master:~$ cd role
labsuser@master:~/role$ ls -a
.  ..  role.yaml  rolebinding.yaml  user3.crt  user3.csr  user3.key
labsuser@master:~/role$
```

- 5.11 View the **user3.crt** file on the master node using the command below and then copy the code as shown in the screenshot:

cat user3.crt

```
labsuser@master:~/role$ ls -a
.  ..  role.yaml  rolebinding.yaml  user3.crt  user3.csr  user3.key
labsuser@master:~/role$ cat user3.crt
-----BEGIN CERTIFICATE-----
MIIDEDCAfGCFAN6Ihq8da3fSwcd6FS2cu1edHwrMA0GCSqGSIb3DQEBCwUAMBUx
EzARBgNVBAMTCmt1YmVybmV0ZXNwHhcNMjMDEwMDc0NTUyWhcNMjUwMjIxMDc0
NTUyWjB0MQswCQYDVQGEWJTTjELMAkGA1UECAwCTUgxSzA3BgNVBACMAmF1MQ0w
CwYDVQQKDARyb2x1MQ0wCwYDVQQLDARyb2x1MQ0wDAYDVQQDDAV1c2VyMzEdMBsG
CSqGSIb3DQEJARYOcm9sZUBnbWFPbC5jb20wggEiMA0GCSqGSIb3DQEBAQUAA4IB
DwAwggEKAoIBAQCQ+CysJMa67v+Qx/K/8pscd3uCG9uSYJKzc95gw24f7LIaV1s
e1i6ZDyLrRjpUGUWfVcz0pqyR0nc4UQjwx70nPjDwxQTbODsuMb4WoYiC+YJDHw
OsQWkgcVOAnW3YmmZI1JrUkKpEmL6lNmNzCjQXq574MQGJOwaWJowxP1V0SZii9
AsTy7d6T/rrjZWLE/dsrVcEQr0mV/1a133i567DZatQI98+hL+xs523P464MJfNA6
9VOx7rmdWYyNbWoDKKAwF6KP0nZvVscTCnJzb6jnIT/5GjybpqhNSiAoIn16oJWw
/h2ntK3a1fhIq2sMJWUZahowinthsg6U1f3v1AgMBAAEwDQYJKoZIhvcNAQELBQAD
ggEBAASqE5HQLm1jSxTDJp7raBGrwryRq3ur0m2I/sN9ZYdICcJqIu1r5wF64Ic7
B4SKCENC7XCICsPBGJxsMqDf4RAvgw1DIp7zDXan7vy2T3V9zyIGHznMEZKTQ1hO
YtV5CKZ64m0vLSYmwbkKPwtKX9c8Z1E2/Z9QXWnzEwcFg0hNdMPIzvW4BNegAhG+
x0f1Z12zD1s3duhwKbdV+Z3rAQxhd0AhrJh7njfzF198agVJ5McETDqWEGCPjoV
p4JDpz/UYE50JhJWoh2s8vjAsMHZM0DjhADxc3WyoGE/X/D1d2tNpaEffPbo8t6
9IA+Cpe8BpR2rv0xrZgh+VPAkQ=
-----END CERTIFICATE-----
labsuser@master:~/role$
```

- 5.12 On **worker-node-1**, enter the following commands and then paste the copied code into the **/role** directory:

mkdir role

cd role

vi user3.crt

cat user3.crt

```
labsuser@worker-node-1:~$ mkdir role
```

```
labsuser@worker-node-1:~$ cd role
```

```
labsuser@worker-node-1:~/role$ vi user3.crt
```

```
labsuser@worker-node-1:~/role$ cat user3.crt
```

```
-----BEGIN CERTIFICATE-----
```

```
MIIDEDCCAFgCFB33h0jrkBm6ZabYuEpjFC1pkrQwMA0GCSqGSIb3DQEBCwUAMBUx
EzARBgNVBAMTCmt1YmVybmV0ZXNwHhcNMjMxMDA5MDc1MTMzWhcNMjUwMjIwMDc1
MTMzWjB0MQswCQYDVQQGEwJJbjEELMAkGA1UECAwCTUgxSzAJBgNVBACMAmF1MQ0w
CwYDVQQKDARyb2x1MQ0wCwYDVQQQLDARyb2x1MQ4wDAYDVQQDDAV1c2VyMzEdMBsG
CSqGSIb3DQEJARYOc9sZUBnbWFPbC5jb20wgGEiMA0GCSqGSIb3DQEBAQUAA4IB
DwAwggEKAoIBAQC72oaDdx8wRSjC45cpekGQt4s9oL4fnICpsqM76978mQOGboKV
zqasrTyPQLzIYX9PH2R4+liMv/gE2uUjBGqm5pTbpwcV8E6nzSa6t0z4hZ4+5h9a
0gJ/S/2ssFKaCcFb24hhf7R9MtJ8hEUfzPLFCGejBVBV71+s9z9zIRJBkQxGrGrm
e2AV0mVbPssAEwX0mboA/iM5u+zxQ1Tp2dMKCc4mcoPe/J8n/l+3UJo+7zIjaSxd
qFaAdx5dxa7qHP7z+/Vkf064ipQQsiVBpfv0KzaldVzuHFS1uy/Qihld0HjzqJjx
/Phvc1TIEIEHgNav3iliC0d+u/jmkzZDcTMlAgMBAAEwDQYJKoZIhvcNAQELBQAD
ggEBAI5R2k1XI/9lTluTcwHLxI9uOLCXLp3Jy3x/0jAT8W5ww4R7BKd9+/9GL7o7
vCZC/q2ocJ6+Vbqhs32GaNkf+is8E559MC1XSRqGmG+gZaH0FH7VIpt41A3C180T
WEPlC1bqPeutzRqpkGFJPoemRjeS67oPFybvYy3W5X75Y6hW57PWBQHvS0p8pj67
1S0PHb/g/KbBLTWcgLUuoRWbq5yrH+44AlpItxxdH3t+VaD5W+UHLL3rozK6mXzCB
hSXBxhRzKkiZ5QfzaTuh5m0eH6RrUyYKHirMo9ly7z3B+Yo+T5Sx78Hufgr5SM0A
ujMSiY3ayBNSysPZ1GycNLbrM18=
```

```
-----END CERTIFICATE-----
```

```
labsuser@worker-node-1:~/role$
```

- 5.13 Navigate to the master node, use the following command to access the key, and then copy the code as shown in the screenshot below:

sudo cat user3.key

```
labsuser@master:~/role$ ^C
labsuser@master:~/role$ cat user3.key
cat: user3.key: Permission denied
labsuser@master:~/role$ sudo cat user3.key
-----BEGIN PRIVATE KEY-----
MIIEvQIBADANBgkqhkiG9w0BAQEFAASCBCwggSjAgEAAoIBAQCtLLv9t06YYcLo
MzjH2w1QrNKpCg+1A1nb08cph33e8MF5NPED1pwp1cWn86Foh1RMDNfyTic80Wyt
hCR14K8mCn1cPTDTJx4WRS2or7J7m4+rFMZudtoeXDZqANySXwsPmx6DzUZw32dp
3CUzUNNoOcwOZE22KdYsK1RFEWIZUuycJJObJP4u11Fi/v9w9JvybYjWpmaamlWY
bcqHgINALnV7zvW4DE/fRDtRtKG1A6aVqYI8xx0mwGtLXxT6rEGTammQ6GmZdnJX
0mhcyNw8Ib4wUHce2Y4oCMc90TP4+gpRgRGjrnjxCP5XGKJXX3myf/58Z0gEaLYX
M+3bzcbraAgMBAECggEAMbShkHMBwi8DD2PZFu5x2xsqJIBf/W4aR42dqa4ZxdG+
yAz9s/Y9GC0I2+VhkqvTjqC37sNF0bHhmZttCuce9qgGcfumCygcaRGJrEvoyFr/
i3aG0s0y+RDvVv1VCMwvYPYRjoIG98Iq03bNapgiieVQ6+iwNzcZqn9Svns2Nwi
lpqAyEM1SzoGHymw90xYyM1GF3X0TGTJH3RB0bk6R+D4smGhhiXF2wdkKrIphPdK
p1HzDJ1WT3JkTEp1K6biRqHsudhGLZV10C8b4TVWzvXC9Z3R4V0aChJLneZsyeU/
LraJ936LjuwtG9M7Nu47ov22gSvAYxG31F8yYjypyQKBgQDEXWjnmrWxUbxKpqn
ukPTQp/tDAH4bKA811YbIQsCt58eeUIGE6/RIkZ+PPndJCJTCCw4JVaHGZcjDKNx
x/15+fgafC2Pxq93SD70u/hb2isXqN+iNwpaQLQxp2FauLJsoDz2X2aVrzmpb5tx
MsiFJ+2t2TFNnH4YjfmWw95H1wKBgQDAZpIjH8ej56HoGtI0fV7GPO/kR/R+Tauf
r47AsW8QWdsxmR0j26xMtdavHEZvADhTQqasELwBkpppTCRUyEUeWZahoNFGCz
h36tQhY1Y7hBI4qhBXQqtKZQRUK7NvrjgaAL7xake+Imwg10WDHUX14pcRw6GNXJ
OWY9uDTHDQKBgQCwh504oUw43RUwpNde1HYHJV0rFmBzGgyPi0LjhaC+ECHH9eQ
GYC0zVB8S0sCQGrPJILsYjzApcPwKZUaRAVfM9bU0JARMjgqTvuP1TJ4ONEGqx2o
8jxPWn31yaje6y4UM5W6k5dgt69p3ifw0wvC8R1ebeRB9o7xuiKIXbul7wKBgC0W
XFy6z9ALMhfwYR5H2vPdx+HZMuR+UyOCopNpfnXaZeBJxavbVPdVkfWpgCqkbM6G
YqkmB0k3Ef5+uRe9bCELCCehiivShy7LK9ZyTDpK2hz5tTzyyDxRxT++X0Dxieff
sp/ZUZc0KPSm0InPn03Fh49yoEjFNUmm/lysVEHpAoGAYFwKVvc33Iw79i41y/YC
yttvuIVE6T8VJKP0h8bQMzicytF42pMgv6CE/v/BzLh5+ugIVBjXzhuypAtdnoS
j3m5G5A2KbWPyCNP1RjNA0U7uQwfg+R0shvw+6fwZ/EQ+1SCFTietfwETzBSrBmB
wVAA149dKdfUBcQen6Qt1nk=
-----END PRIVATE KEY-----
labsuser@master:~/role$
```

5.14 Copy and paste the key into **worker-node-1** using the following commands:

```
vi user3.key
```

```
cat user3.key
```

```
labsuser@worker-node-1:~/role$ vi user3.key
labsuser@worker-node-1:~/role$ cat user3.key
-----BEGIN PRIVATE KEY-----
MIIEvgIBADANBgkqhkiG9w0BAQEFAASCBAKggggSkAgEAAoIBAQCQ+CysJMaa67v+
Qx/K/8pscd3uCG9uSYJKzc95gw24f7LIaVlse1i6ZDyLtrjpuGUWfVcz0pqqyR0n
c4UQjwx70nPjDwxQTb0DSuMb4WoYiC+YJDHw0sQWkgcV0AnW3YmmZITlJrUkkpEm
L6lNmNzCjQXq574MQGJOwawJowxPlV0SZii9AsTy7d6T/rrjZWLE/dsrVcEQr0mV
/la133i567DZatQI98+hL+x523P464MJfNA69V0x7rmdwYYNbW0DKKAwF6KPOnZv
VsCTCnJzb6jnIT/5GjybpqhNSiAoIn16oJWw/h2ntK3alfhIq2sMJWUZahownths
g6U1f3v1AgMBAAECggEAMnJ3I653V1PodeLX3KwaBgig35Vy2xinxTL8P5GTqCG
QA/FsqakhM1wcrBWGJBfda98lwjkbADmoFt3Arkbc0aTnlEsEeyQxGEzwWeDiaK
5bgm9vMEndQ5Cc3kQrX7ewa/sLaNUMp/IBpzIZGitkQsvIjkz0+yxrTGnsUy+hi7
R4yMq0Yx38luKy7lTcww//PfrUQhqn03wCHW3qVQ3uzAGNCiMXYAab6NO2WcnVhM
aBXeVxPr7dd+z9wc4uimzrMUKy7mjRYB4sIDyfyi++370s1ISlhwIuGzLryhqqlj
B+uxZtlVURew8HPKdDru36KaAK00n43VHb/9Yy0EGwKBgQC5KW+mjDH0S5meel0V
KBnjr4tyTYON78BisvI/xxHkf4v7CjqKw17ajYYpMd/Mwke7UK1K6wWlIEPI320E
59Cz5dbkcYoJeh7h38lFqV3nkcEHLmRmEz2UAe+JsLNbfyYXLYIOGFCVMisQkrv8
5vo1j0P7vfmaru76itmV7xGBlwKBgQDIbLU5GAoV9XEWG0PQs7UQYElwb44Riev2
5nEMFxoie6uahDrJWhXdA7xzoMILG00U0hcn0zPRxXU2k30e61oCElIveBTFQZKM
PZInkQIC2kNhRJ7Nbonj5p740CqgxcDf4pglTGZkHYz70P5SakqWwewEXPawLC4f
SmdEeKBIUwKBgQCnebgYDyQ7z4lyE0FQGoZYL3ZUe5Hq9pivbSW51Af2AfuNo/HR
guavjWR0rDy9ylIQUIWespKjlcyp8bLlqA/b8UH4vABcXfVKjgLNfA9MA2g+avDZp
MSv4TEvp4V5I+tdsDuChmRKB7++NvPq1xAE6IoweDfXPGDzldmNZvv05nwKBgGjK
BpSLFPrWEAHVkyYT7p5ZOQwnxsc0rMGxSXlgurE8p0NpZrJm/vdGdMifS+HKNEo+
bQzNR1JtQhL+mXQI6E4c9f1zgqh+1/eqWTeGgN6s7n100vJ80GrusD5mXyMfQ0/M
sG8PupitOoA+E/lSyRx41sSRNgh1kMebRtJtnp8xAoGBAJqo9kzgo7ATC1YBiPpy
KaiqIMzFEQ89Rw/+0E9k2H08em9dYZ+5DSUbnVcURc3z/ww5uZEqxLA43x+8fFyu
G3ZMXK7osiH6tCff9MApS+2AXoiRiQ0YEpmGSLzluZJPntMv180GlsY8LCAeyzha
w4fy0Gkc1Z2popPYm93ZK+61
-----END PRIVATE KEY-----
labsuser@worker-node-1:~/role$
```

Step 6: Verify the roles

6.1 Navigate to the home directory using the following command:

```
cd ..
```

```
labsuser@worker-node-1:~$ cd ..
```

6.2 Validate role permissions by listing pods, initiating a test deployment, and checking deployment and pod statuses with the following commands:

```
kubectl get pods --kubeconfig=myconf
```

```
kubectl create deployment test --image=docker.io/httpd -n role --kubeconfig=myconf
```

```
kubectl get pods --kubeconfig=myconf
```

```
kubectl get deployment --kubeconfig=myconf
```

```
labsuser@worker-node-1:~$ kubectl get pods --kubeconfig=myconf
```

NAME	READY	STATUS	RESTARTS	AGE
admin-56d684dff9-7tzk1	0/1	ImagePullBackOff	0	160m
frontend-4ff81	1/1	Running	1 (18m ago)	45m
frontend-jvd98	1/1	Running	1 (18m ago)	45m
mydep-548c7db5df-mxk4t	0/1	CreateContainerError	0	59m
mydep-6f74bcd49-jjw2g	0/1	CreateContainerError	0	60m
nginx	0/1	Pending	0	72m
security-context-1	1/1	Running	1 (18m ago)	41m

```
labsuser@worker-node-1:~$ kubectl create deployment test --image=docker.io/httpd -n role --kubeconfig=myconf
deployment.apps/test created
labsuser@worker-node-1:~$ kubectl get pods --kubeconfig=myconf
```

NAME	READY	STATUS	RESTARTS	AGE
admin-56d684dff9-7tzk1	0/1	ImagePullBackOff	0	161m
frontend-4ff81	1/1	Running	1 (19m ago)	46m
frontend-jvd98	1/1	Running	1 (19m ago)	46m
mydep-548c7db5df-mxk4t	0/1	CreateContainerError	0	60m
mydep-6f74bcd49-jjw2g	0/1	CreateContainerError	0	60m
nginx	0/1	Pending	0	73m
security-context-1	1/1	Running	1 (19m ago)	42m

```
labsuser@worker-node-1:~$ kubectl get deployment --kubeconfig=myconf
```

NAME	READY	UP-TO-DATE	AVAILABLE	AGE
admin	0/1	1	0	161m
mydep	0/1	1	0	61m

```
labsuser@worker-node-1:~$
```

6.3 Run the following commands to verify and create a ConfigMap named **my-config** in the **role** namespace using the **myconf kubeconfig** file:

```
kubectl create configmap my-config --from-literal=key1=config1 --kubeconfig=myconf
```

```
kubectl get configmaps --kubeconfig=myconf
```

```
kubectl get configmap my-config --kubeconfig=myconf -o yaml
```

```
labsuser@worker-node-1:~$ kubectl get deployment --kubeconfig=myconf
NAME          READY   UP-TO-DATE   AVAILABLE   AGE
myhttpd       0/1     1            0           3h21m
redis-cache   1/3     3            1           3d4h
web-server    1/3     3            1           3d3h
labsuser@worker-node-1:~$ kubectl create configmap my-config --from-literal=key1=config1 --kubeconfig=myconf
configmap/my-config created
labsuser@worker-node-1:~$
```

```
labsuser@worker-node-1:~$ kubectl get configmaps --kubeconfig=myconf
NAME              DATA   AGE
deployment-configmap  2       3h39m
kube-root-ca.crt    1       4d2h
my-config           1       17m
labsuser@worker-node-1:~$ kubectl get configmap my-config --kubeconfig=myconf -o yaml
apiVersion: v1
data:
  key1: config1
kind: ConfigMap
metadata:
  creationTimestamp: "2023-11-03T11:50:05Z"
  name: my-config
  namespace: default
  resourceVersion: "157363"
  uid: 62db8bbc-c41e-4445-9cb5-78ce259b2cbc
labsuser@worker-node-1:~$
```

By following these steps, you have successfully configured and verified RBAC in Kubernetes using namespaces.