

How to Create a User in a Kubernetes Cluster and Grant Access



Hakan Bayraktar · Follow

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In this detailed guide, we'll illustrate the steps required to create a user, generate necessary certificates, and configure access using a kubeconfig file within a Kubernetes cluster.

Step 1: Generating a Key Pair and Certificate Signing Request (CSR)

First, let's generate a key pair and a Certificate Signing Request (CSR) using OpenSSL:

```
openssl genrsa -out developer.key 2048  
openssl req -new -key developer.key -out developer.csr -subj "/CN=developer"
```

```
root@hakan-yeni:~/rbac# openssl genrsa -out developer.key 2048
root@hakan-yeni:~/rbac# openssl req -new -key developer.key -out developer.csr -subj "/CN=developer"
```

Now, let's create a CSR YAML file named "csr_template.yaml" to submit to Kubernetes:

csr_template.yaml

```
cat <<EOF > csr_template.yaml
apiVersion: certificates.k8s.io/v1
kind: CertificateSigningRequest
metadata:
  name: developer-csr
spec:
  request: <Base64_encoded_CSR>
  signerName: kubernetes.io/kube-apiserver-client
  usages:
    - client auth
EOF
```

Replace <Base64_encoded_CSR> with the Base64-encoded content of the developer.csr file.

Generate the CSR content in Base64 and create the YAML file:

```
CSR_CONTENT=$(cat developer.csr | base64 | tr -d '\n')
sed "s|<Base64_encoded_CSR>|$CSR_CONTENT|" csr_template.yaml > developer_csr.yaml
```

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```
kubectl create -f developer_csr.yaml
```

```

root@hakan-yeni:~/rbac# cat <<EOF > csr_template.yaml
apiVersion: certificates.k8s.io/v1
kind: CertificateSigningRequest
metadata:
  name: developer-csr
spec:
  request: <Base64_encoded_CSR>
  signerName: kubernetes.io/kube-apiserver-client
  usages:
    - client auth
EOF
root@hakan-yeni:~/rbac# CSR_CONTENT=$(cat developer.csr | base64 | tr -d '\n')
sed "s|<Base64_encoded_CSR>|${CSR_CONTENT}|" csr_template.yaml > developer_csr.yaml
root@hakan-yeni:~/rbac# kubectl create -f developer_csr.yaml
certificatesigningrequest.certificates.k8s.io/developer-csr created
root@hakan-yeni:~/rbac# █

```

Approve the CSR and retrieve the approved certificate:

```

kubectl get csr
kubectl certificate approve developer-csr
kubectl get csr developer-csr -o jsonpath='{.status.certificate}' | base64 --de
kubectl get csr

```

```

root@hakan-yeni:~/rbac# kubectl get csr
NAME          AGE   SIGNERNAME              REQUESTOR    REQUESTEDDURATION   CONDITION
developer-csr 66s   kubernetes.io/kube-apiserver-client  kubernetes-admin  <none>              Pending
root@hakan-yeni:~/rbac# kubectl certificate approve developer-csr
certificatesigningrequest.certificates.k8s.io/developer-csr approved
root@hakan-yeni:~/rbac# kubectl get csr developer-csr -o jsonpath='{.status.certificate}' | base64 --decode > developer.crt
root@hakan-yeni:~/rbac# kubectl get csr
NAME          AGE   SIGNERNAME              REQUESTOR    REQUESTEDDURATION   CONDITION
developer-csr 106s  kubernetes.io/kube-apiserver-client  kubernetes-admin  <none>              Approved,Issued
root@hakan-yeni:~/rbac# █

```

Step 2: Generate and Configure a kubeconfig File

To access the Kubernetes cluster, it's essential to generate a configuration file tailored for the 'developer' user. This file needs to encompass critical information, including the Kubernetes API access specifics, the Cluster CA certificate, as well as the 'developer' user's certificate and context name. Initially, we'll generate the kubeconfig file specifically for the 'developer' user.

Configure the kubeconfig file:

We need to modify below the command according to our cluster-specific information to **Set Cluster Configuration**:

```
kubectl config set-cluster kubernetes --
server=https://<Kubernetes_API_server_endpoint>:<port> -- certificate-authority=
<Base64_encoded_CA_certificate> -- embed-certs=true --
kubeconfig=developer.kubeconfig
```

Replace <Kubernetes_API_server_endpoint> with the address of the Kubernetes API server and <port> with the corresponding port number. Also, replace <Base64_encoded_CA_certificate> with the file path of the CA certificate in Base64 encoding.

First, we need to locate the cluster's Kubernetes API access details and the Cluster CA certificate:

```
kubectl config view
ls /etc/kubernetes/pki/
```

```
root@hakan-yeni:~# kubectl get csr
No resources found
root@hakan-yeni:~# kubectl config view
apiVersion: v1
clusters:
- cluster:
  certificate-authority-data: DATA+OMITTED
  server: https://104.248.28.87:6443
  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
root@hakan-yeni:~# ls /etc/kubernetes/pki/
apiserver-etcd-client.crt  apiserver-kubelet-client.key  ca.crt  front-proxy-ca.crt  front-proxy-client.key
apiserver-etcd-client.key  apiserver.crt                ca.key  front-proxy-ca.key  sa.key
apiserver-kubelet-client.crt  apiserver.key                etcd    front-proxy-client.crt  sa.pub
```

I changed the command above according our cluster information.

```
# Set Cluster Configuration:
kubectl config set-cluster kubernetes --server=https://104.248.28.87:6443 --cer
```

```
# Set Credentials for Developer:
kubectl config set-credentials developer --client-certificate=developer.crt --c
# Set Developer Context:
kubectl config set-context developer-context --cluster=kubernetes --namespace=c
# Use Developer Context:
kubectl config use-context developer-context --kubeconfig=developer.kubeconfig
```

```
root@hakan-yeni:~/rbac# kubectl config set-cluster kubernetes --server=https://104.248.28.87:6443 --certificate-authority=/etc/kubernetes/pki/ca.crt --embed-certs=true --kubeconfig=developer.kubeconfig
Cluster "kubernetes" set.
root@hakan-yeni:~/rbac# kubectl config set-credentials developer --client-certificate=developer.crt --client-key=developer.key --embed-certs=true --kubeconfig=developer.kubeconfig
User "developer" set.
root@hakan-yeni:~/rbac# kubectl config set-context developer-context --cluster=kubernetes --namespace=default --user=developer --kubeconfig=developer.kubeconfig
Context "developer-context" created.
```

Verify the kubeconfig file's configuration:

```
kubectl --kubeconfig=developer.kubeconfig get pods
```

```
root@hakan-yeni:~/rbac# kubectl --kubeconfig=developer.kubeconfig get pods
Error from server (Forbidden): pods is forbidden: User "developer" cannot list resource "pods" in API group "" in the namespace "default"
root@hakan-yeni:~/rbac#
```

We logged into the cluster with the 'Developer' user and attempted to list the pods in the 'default' namespace. However, due to the lack of necessary permissions for the 'Developer' user, we couldn't retrieve the list of pods. Below, you can find how to grant the required permissions to this user.

Step 3: Assign Roles and Bindings for the Developer User

Create and apply roles and role bindings for the developer user:

developer-cluster-role.yaml

```
cat <<EOF > developer-cluster-role.yaml
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  name: developer-role
rules:
- apiGroups: [ "", "extensions", "apps"]
```

```
resources: ["*"]
verbs: ["*"]
EOF
```

developer-role-binding.yaml

```
cat <<EOF > developer-role-binding.yaml
apiVersion: rbac.authorization.k8s.io/v1
kind: RoleBinding
metadata:
  name: developer-binding
  namespace: default
subjects:
- kind: User
  name: developer
  apiGroup: rbac.authorization.k8s.io
roleRef:
  kind: ClusterRole
  name: developer-role
  apiGroup: rbac.authorization.k8s.io
EOF
```

Apply the roles and role bindings:

```
kubectl apply -f developer-cluster-role.yaml -f developer-role-binding.yaml
```



```
root@hakan-yeni:~/rbac# cat <<EOF > developer-cluster-role.yaml
apiVersion: rbac.authorization.k8s.io/v1
kind: ClusterRole
metadata:
  name: developer-role
rules:
- apiGroups: ["", "extensions", "apps"]
  resources: ["*"]
  verbs: ["*"]
EOF
root@hakan-yeni:~/rbac# cat <<EOF > developer-role-binding.yaml
apiVersion: rbac.authorization.k8s.io/v1
kind: RoleBinding
metadata:
  name: developer-binding
  namespace: default
subjects:
- kind: User
  name: developer
  apiGroup: rbac.authorization.k8s.io
roleRef:
  kind: ClusterRole
  name: developer-role
  apiGroup: rbac.authorization.k8s.io
EOF
root@hakan-yeni:~/rbac# kubectl apply -f developer-cluster-role.yaml -f developer-role-binding.yaml
clusterrole.rbac.authorization.k8s.io/developer-role created
rolebinding.rbac.authorization.k8s.io/developer-binding created
root@hakan-yeni:~/rbac#
```

Step 4: Verify developer User Rights

You can run the following commands to check the permissions assigned to the 'developer' user for accessing the Kubernetes cluster resources.

```
kubectl --kubeconfig=developer.kubeconfig get pods
kubectl --kubeconfig=developer.kubeconfig run nginx --image=nginx
kubectl --kubeconfig=developer.kubeconfig get pods
```

```
root@hakan-yeni:~/rbac# kubectl --kubeconfig=developer.kubeconfig get pods
No resources found in default namespace.
root@hakan-yeni:~/rbac# kubectl --kubeconfig=developer.kubeconfig run nginx --image=nginx
pod/nginx created
root@hakan-yeni:~/rbac# kubectl --kubeconfig=developer.kubeconfig get pods
NAME      READY   STATUS    RESTARTS   AGE
nginx     1/1     Running   0           4s
```

This confirms that the developer user has appropriate access to pods in the default namespace.

```
kubectl --kubeconfig=developer.kubeconfig get pods -A
```

```
root@hakan-yeni:~/rbac# kubectl --kubeconfig=developer.kubeconfig get pods -A
Error from server (Forbidden): pods is forbidden: User "developer" cannot list resource "pods" in API
group "" at the cluster scope
root@hakan-yeni:~/rbac#
```

We couldn't retrieve the information about pods across all namespaces. This limitation occurred because the permissions granted to the developer user are only applicable to the 'default' namespace.

Note: You can find more information about RBAC Authorization and different user role-related details at his link: <https://kubernetes.io/docs/reference/access-authn-authz/rbac/>

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```
join 146.190.135.86:6443 --token f1h95l.u4nkex9cw8d0g63w --discovery-token-ca-cert-hash sha256:8d1666af50c85f060b9fadc73f13c932e0e2a9eeef08f51f91a
# Run the following commands on the worker node to join the cluster...
# 1. Install the kubelet service
# 2. Configure the kubelet to use the token and certificate
# 3. Start the kubelet service
# 4. Verify the kubelet is running
# 5. Wait for the kubelet to perform the TLS Bootstrap...

# On the control-plane to see this node join the cluster.
```



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The screenshot displays the AWS Management Console interface. At the top, there's a search bar and navigation tabs for 'N. Virginia' and 'cloud_us'. The main content area is divided into several sections:

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- Account attributes:** A section on the right showing account details like 'Default VPC' and 'Settings'.
- Launch instance:** A section on the left with a 'Launch instance' button and a 'Migrate a server' link.
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- Explore AWS:** A section on the right with promotional text about saving up to 90% on EC2 with Spot Instances and getting up to 40% better price performance.



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```
 systemctl restart nfs-kernel-server
 systemctl status nfs-kernel-server
 NFS server and services
 ● nfs-kernel-server.service; enabled
    Loaded: loaded (/systemd/system/nfs-server.service; enabled)
    Active: active (running) since Fri 2023-11-03 16:53:28 UTC; 4min ago
    Process: 12345 (code=exited, status=0/SUCCESS)
    Main PID: 12345
    StartPre=/usr/sbin/exportfs -r (code=exited, status=0/SUCCESS)
    Start=/usr/sbin/rpc.nfsd (code=exited, status=0/SUCCESS)
    Restart=on-failure
    LimitNOFILE=infinity
    LimitNPROC=infinity
    LimitCORE=infinity
    TimeoutStartSec=0
    TimeoutStopSec=0
    KillMode=process
    RuntimeDirectory=/var/lib/nfs
    WorkingDirectory=/var/lib/nfs
```



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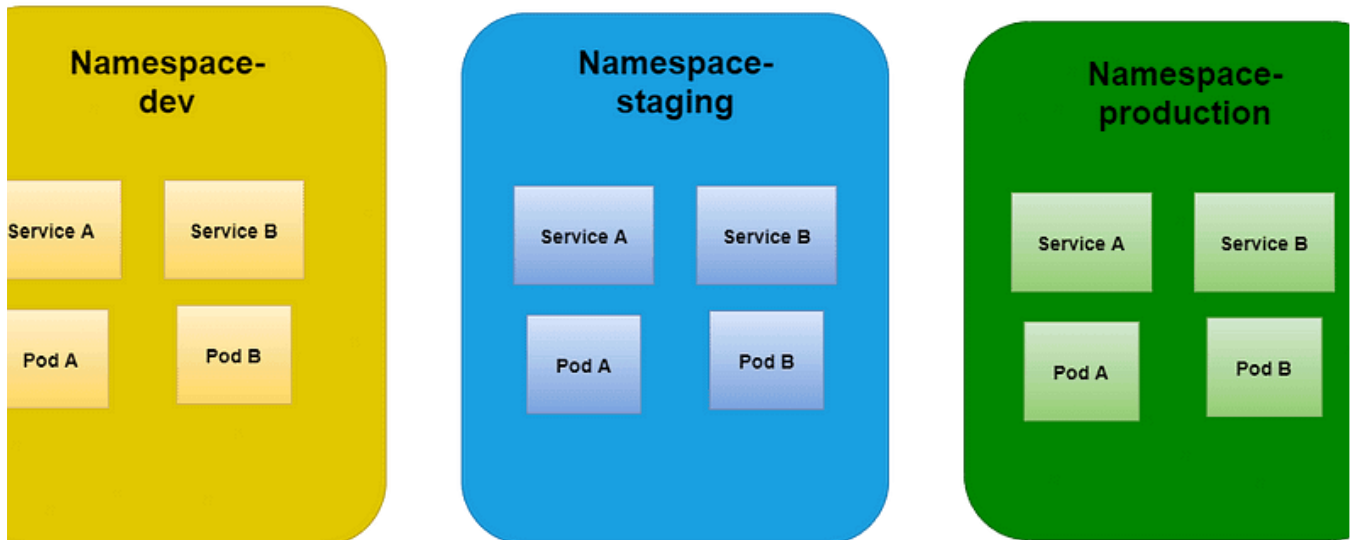
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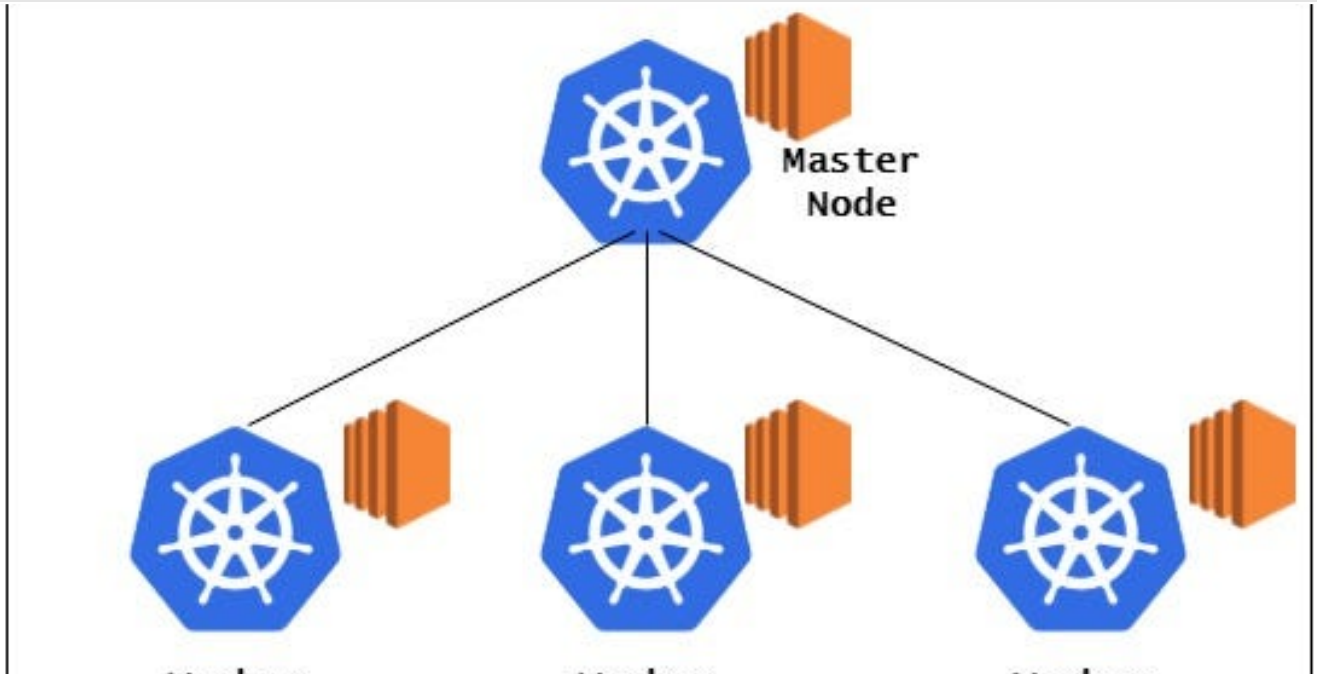
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