Name:Aditya Dubey Div:D15C Roll no:10

Advanced DevOps Lab
Experiment 4

Aim: To install Kubectl and execute Kubectl commands to manage the Kubernetes cluster and deploy Your First Kubernetes Application.

Theory:

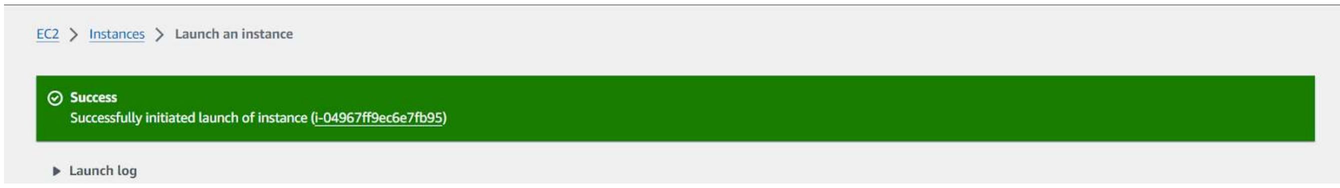
Originally developed by Google, Kubernetes is an open-source container orchestration platform designed to automate the deployment, scaling, and management of containerized applications. In fact, Kubernetes has established itself as the defacto standard for container orchestration and is the flagship project of the Cloud Native Computing Foundation (CNCF), backed by key players like Google, AWS, Microsoft, IBM, Intel, Cisco, and Red Hat.

Kubernetes Deployment

A Kubernetes Deployment is used to tell Kubernetes how to create or modify instances of the pods that hold a containerized application. Deployments can scale the number of replica pods, enable the rollout of updated code in a controlled manner, or roll back to an earlier deployment version if necessary.

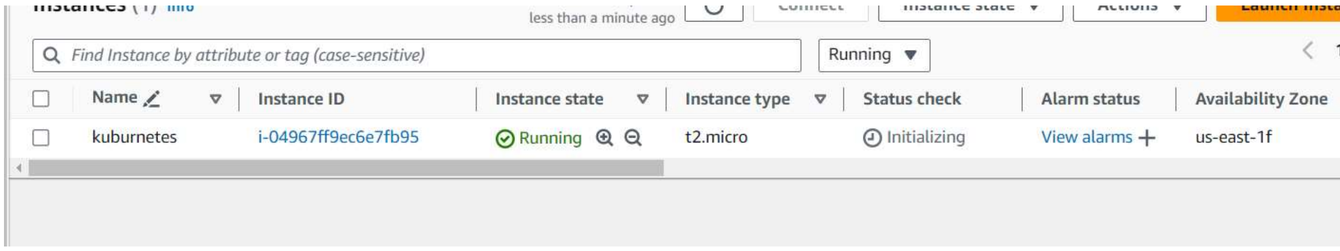
Steps:

1. Create an EC2 Ubuntu Instance on AWS.


EC2 > Instances > Launch an instance

Success
Successfully initiated launch of instance (i-04967ff9ec6e7fb95)

▶ Launch log


less than a minute ago

Find Instance by attribute or tag (case-sensitive) | Running

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
kuburnetes	i-04967ff9ec6e7fb95	Running	t2.micro	Initializing	View alarms +	us-east-1f

2. Edit the Security Group Inbound Rules to allow SSH

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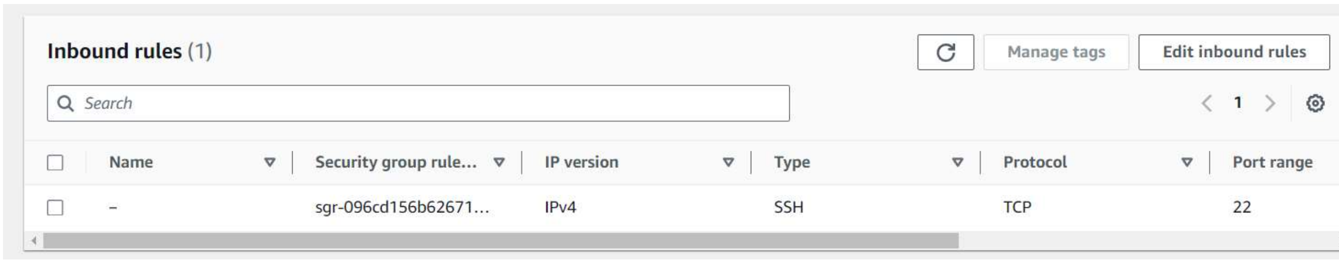
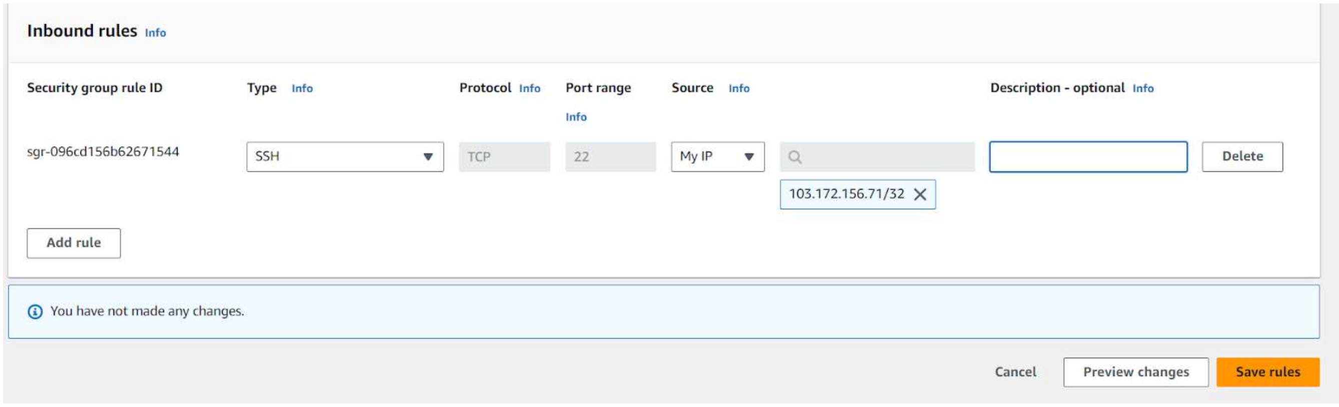


Inbound rules (1)

	Name	Security group rule...	IP version	Type	Protocol	Port range
☐	–	sgr-096cd156b62671...	IPv4	SSH	TCP	22

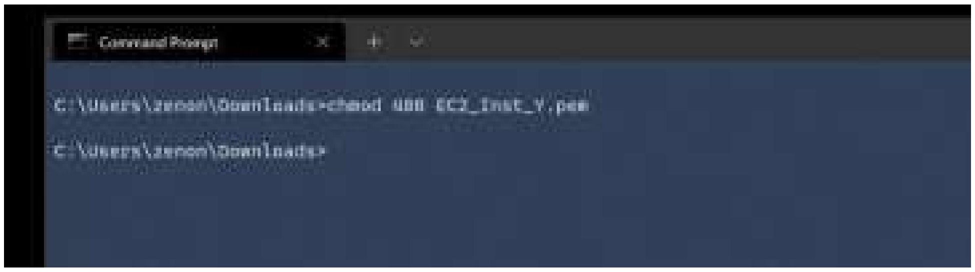


Inbound rules

Security group rule ID	Type	Protocol	Port range	Source		Description - optional
sgr-096cd156b62671544	SSH	TCP	22	My IP	103.172.156.71/32	

You have not made any changes.

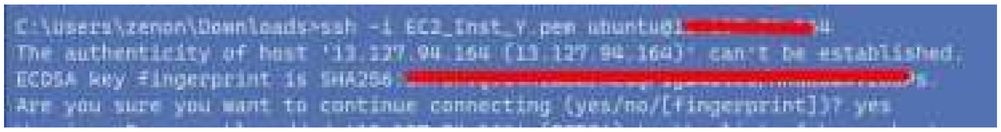
3. SSH into the machine



```
C:\Users\zenon\Downloads>chmod 400 EC2_Inst_Y.pem

C:\Users\zenon\Downloads>
```

ssh -i <keyname>.pem ubuntu@<public_ip_address>

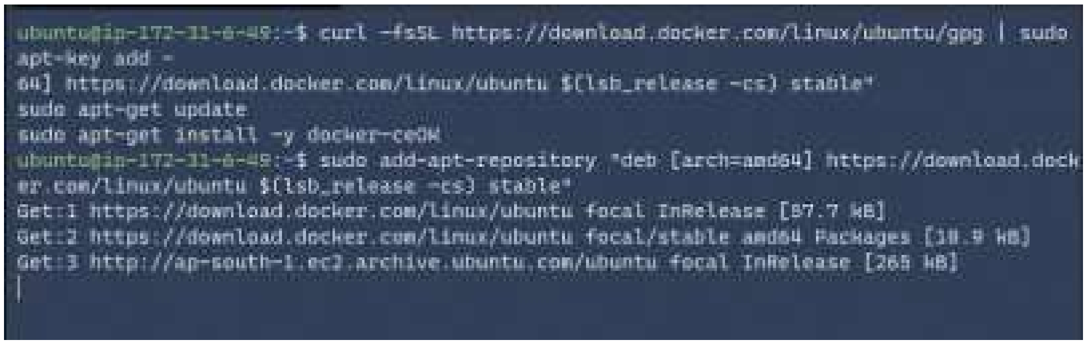


```
C:\Users\zenon\Downloads>ssh -i EC2_Inst_Y.pem ubuntu@[redacted]4
The authenticity of host '13.127.94.164 (13.127.94.164)' can't be established.
ECDSA key fingerprint is SHA256[redacted].
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
```

4. Install Docker

```
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key
add -
sudo add-apt-repository "deb [arch=amd64]
```

```
https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
sudo apt-get update
sudo apt-get install -y docker-ce
```



```
ubuntu@ip-172-31-6-49:~$ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo
apt-key add -
64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
sudo apt-get update
sudo apt-get install -y docker-ceOK
ubuntu@ip-172-31-6-49:~$ sudo add-apt-repository "deb [arch=amd64] https://download.dock
er.com/linux/ubuntu $(lsb_release -cs) stable"
Get:1 https://download.docker.com/linux/ubuntu focal InRelease [57.7 kB]
Get:2 https://download.docker.com/linux/ubuntu focal/stable amd64 Packages [18.9 kB]
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu focal InRelease [265 kB]
|
```

Then, configure cgroup in a daemon.json file.

```
cd /etc/docker
cat <<EOF | sudo tee /etc/docker/daemon.json
{
  "exec-opts": ["native.cgroupdriver=systemd"]
}
EOF
sudo systemctl enable docker
sudo systemctl daemon-reload
sudo systemctl restart docker
```

5. Install Kubernetes

```
curl -s https://packages.cloud.google.com/apt/doc/apt-key.gpg | sudo
apt-key add -
cat << EOF | sudo tee /etc/apt/sources.list.d/kubernetes.list
deb https://apt.kubernetes.io/ kubernetes-xenial main
EOF
sudo apt-get update
sudo apt-get install -y kubelet kubeadm kubectl
```

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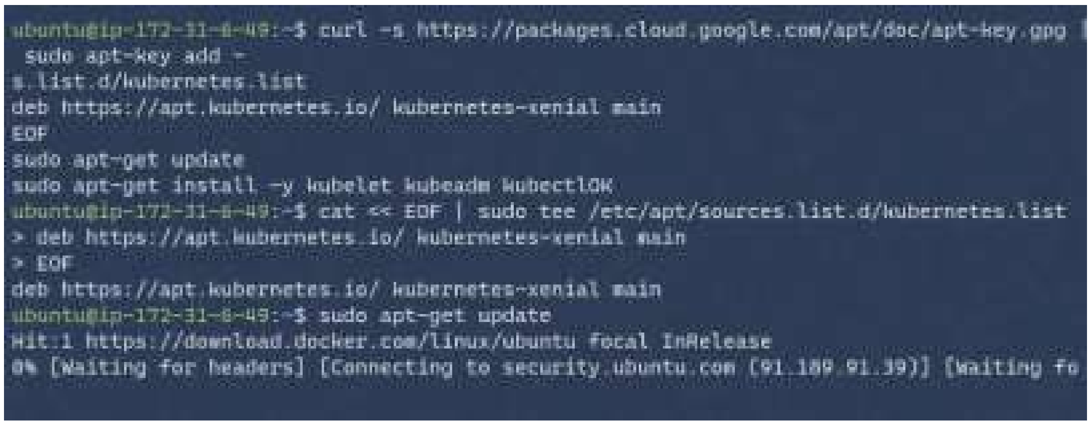


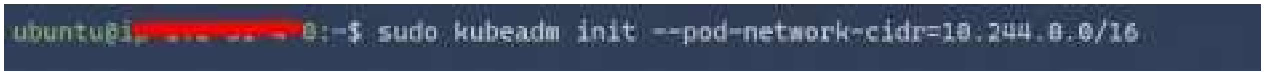
```
ubuntu@ip-172-31-6-49:~$ curl -s https://packages.cloud.google.com/apt/doc/apt-key.gpg |
 sudo apt-key add -
s.list.d/kubernetes.list
deb https://apt.kubernetes.io/ kubernetes-xenial main
EOF
sudo apt-get update
sudo apt-get install -y kubelet kubeadm kubectlOK
ubuntu@ip-172-31-6-49:~$ cat << EOF | sudo tee /etc/apt/sources.list.d/kubernetes.list
> deb https://apt.kubernetes.io/ kubernetes-xenial main
> EOF
deb https://apt.kubernetes.io/ kubernetes-xenial main
ubuntu@ip-172-31-6-49:~$ sudo apt-get update
Hit:1 https://download.docker.com/linux/ubuntu focal InRelease
0% [Waiting for headers] [Connecting to security.ubuntu.com (91.189.91.39)] [Waiting fo
```

After installing Kubernetes, we need to configure internet options to allow bridging.

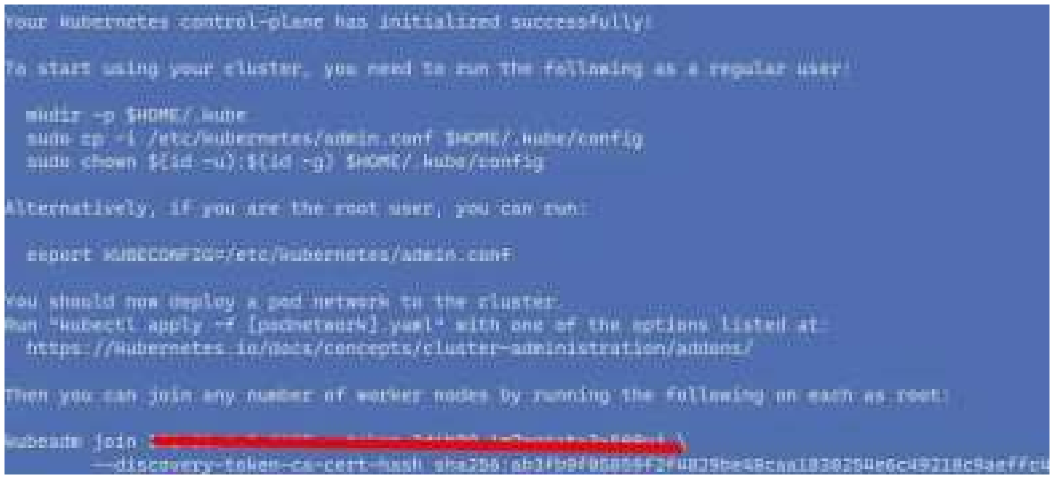
```
sudo swapoff -a
echo "net.bridge.bridge-nf-call-iptables=1" | sudo tee -a
/etc/sysctl.conf
sudo sysctl -p
```

6. Initialize the Kubecluster

```
sudo kubeadm init --pod-network-cidr=10.244.0.0/16
```

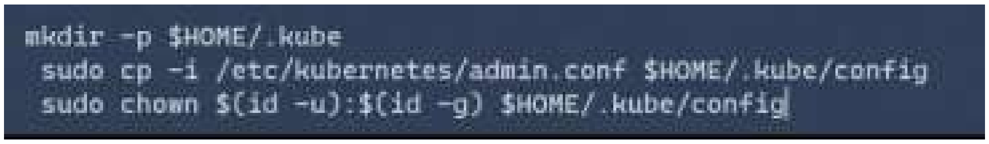


```
ubuntu@i[redacted]0:~$ sudo kubeadm init --pod-network-cidr=10.244.0.0/16
```



```
Your Kubernetes control-plane has initialized successfully!

To start using your cluster, you need to run the following as a regular user:

  mkdir -p $HOME/.kube
  sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
  sudo chown $(id -u):$(id -g) $HOME/.kube/config

Alternatively, if you are the root user, you can run:

  export KUBECONFIG=/etc/kubernetes/admin.conf

You should now deploy a pod network to the cluster.
Run "kubectl apply -f [podnetwork].yaml" with one of the options listed at:
  https://kubernetes.io/docs/concepts/cluster-administration/addons/

Then you can join any number of worker nodes by running the following on each as root:

kubeadm join [redacted]
        --discovery-token-ca-cert-hash sha256:ab1fb9f0585f2f4829be48caa1830254e6c49218c9aeffc4
```

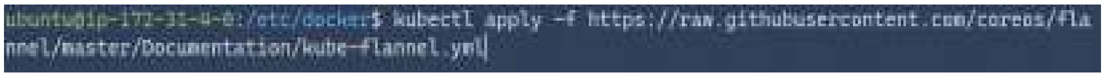
Copy the mkdir and chown commands from the top and execute them



```
mkdir -p $HOME/.kube
 sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
 sudo chown $(id -u):$(id -g) $HOME/.kube/config
```

Then, add a common networking plugin called flannel as mentioned in the code.

```
kubectl apply -f
https://raw.githubusercontent.com/coreos/flannel/master/Documentation/
k ube-flannel.yml
```

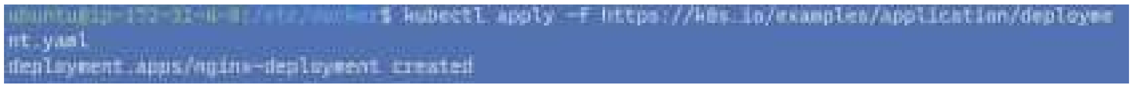


```
ubuntu@ip-172-31-4-0:/etc/docker$ kubectl apply -f https://raw.githubusercontent.com/coreos/fla
nnel/master/Documentation/kube-flannel.yml
```

7. Now that the cluster is up and running, we can deploy our nginx server on this cluster.

Apply this deployment file using this command to create a deployment

```
kubectl apply -f https://k8s.io/examples/application/deployment.yaml
```



```
ubuntu@ip-172-31-4-0:/etc/docker$ kubectl apply -f https://k8s.io/examples/application/deployme
nt.yaml
deployment.apps/nginx-deployment created
```

Use ‘kubectl get pods’ to verify if the deployment was properly created and the pod is working correctly.

Next up, create a name alias for this pod.

```
POD_NAME=$(kubectl get pods -l app=nginx -o
jsonpath="{.items[0].metadata.name}")
```

8. Lastly, port forward the deployment to your localhost so that you can view it.

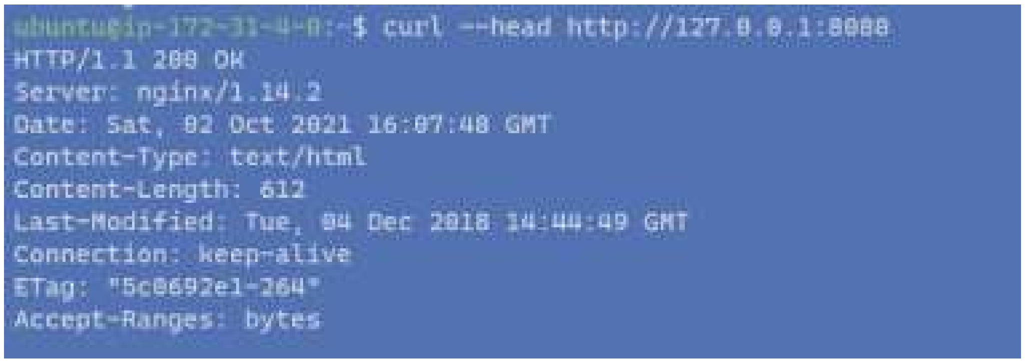
```
kubectl port-forward $POD_NAME 8080:80
```

9. Verify your deployment

Open up a new terminal and ssh to your EC2 instance.

Then, use this curl command to check if the Nginx server is running.

```
curl --head http://127.0.0.1:8080
```



```
ubuntu@ip-172-31-4-0:~$ curl --head http://127.0.0.1:8080
HTTP/1.1 200 OK
Server: nginx/1.14.2
Date: Sat, 02 Oct 2021 16:07:48 GMT
Content-Type: text/html
Content-Length: 612
Last-Modified: Tue, 04 Dec 2018 14:44:49 GMT
Connection: keep-alive
ETag: "5c0692e1-264"
Accept-Ranges: bytes
```

If the response is 200 OK and you can see the Nginx server name, your deployment was successful.

We have successfully deployed our Nginx server on our EC2 instance.