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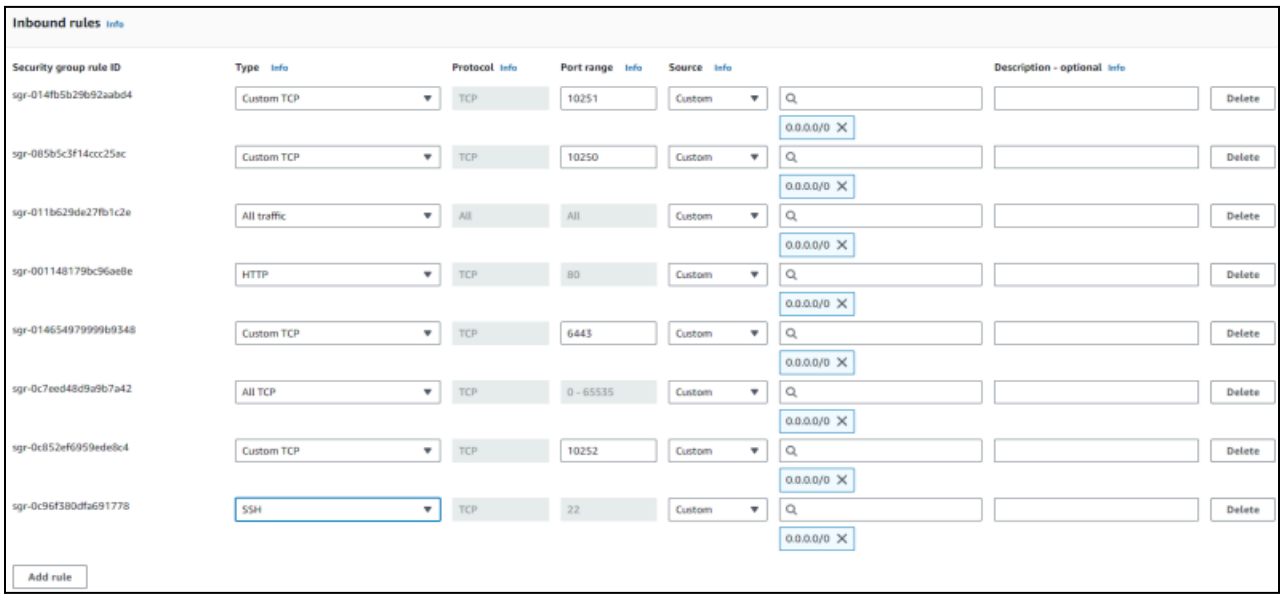
EXPERIMENT. 3

Aim: To understand the Kubernetes Cluster Architecture, install and Spin Up a Kubernetes Cluster on Linux Machines/Cloud Platforms.

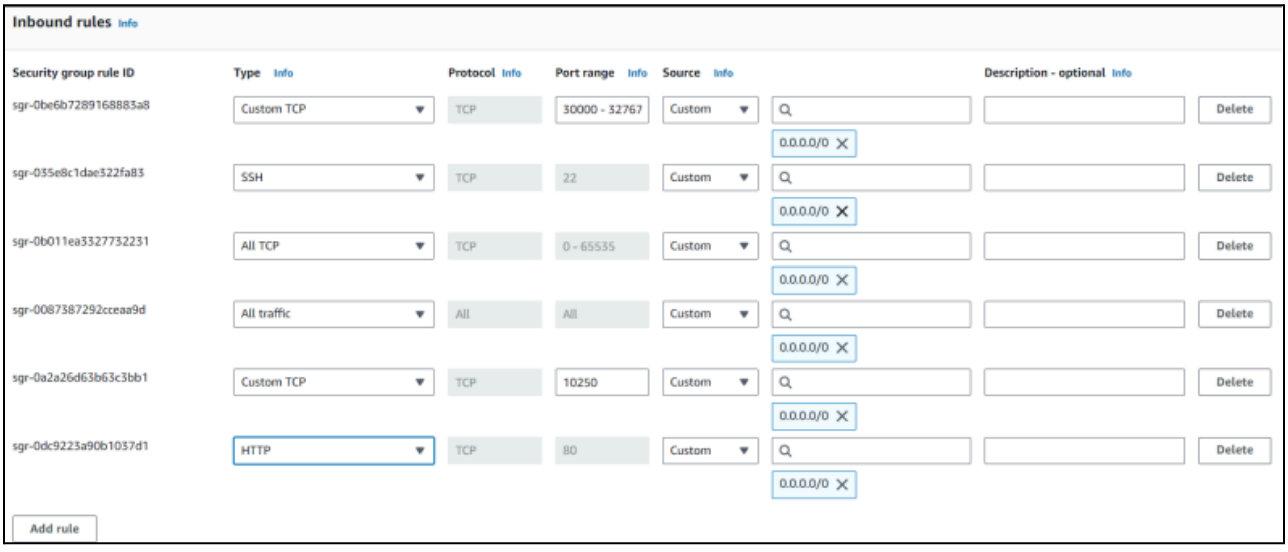
Steps:

Step 1: Create 2 Security Groups for Master and Nodes and add the following inbound rules in those groups

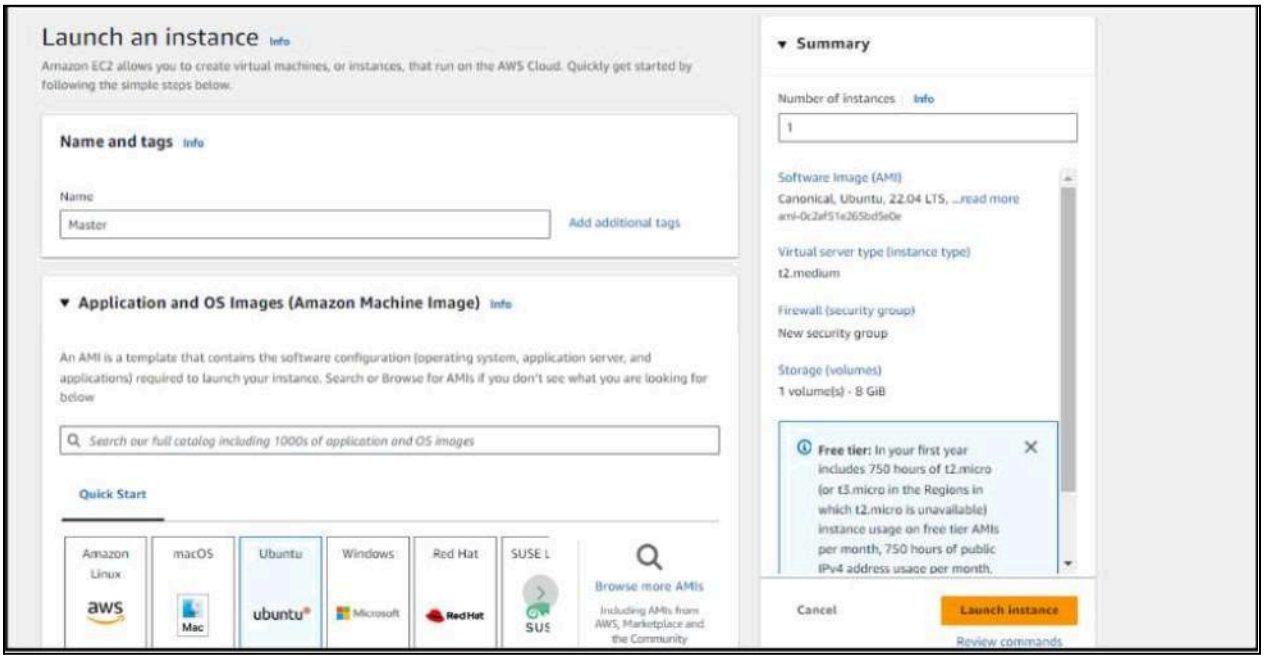
For Master-

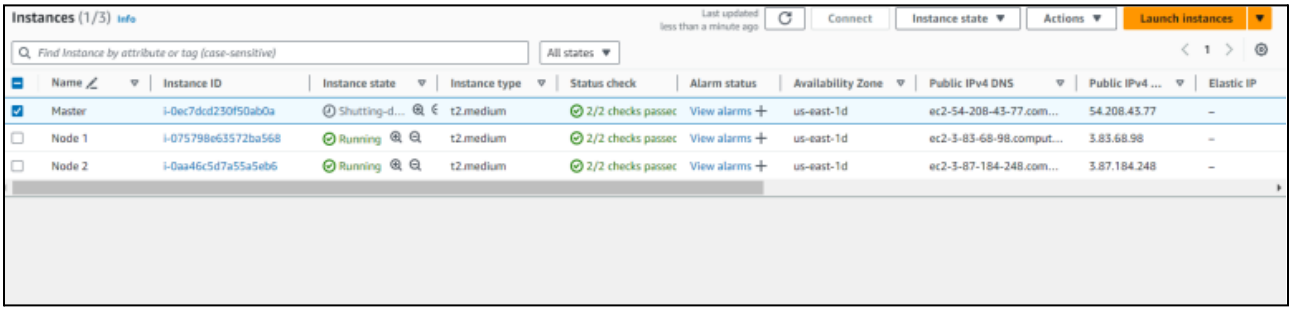


For Node-



Step 2: Log in to your AWS Academy/personal account and launch 3 new Ec2 Instances(1 for Master and 2 for Node).Select Ubuntu as AMI and t2.medium as Instance Type and create a key of type RSA with .pem extension and move the downloaded key to the new folder.We can use 2 Different keys, 1 for Master and 1 for Node. Also Select Security Groups from the existing.





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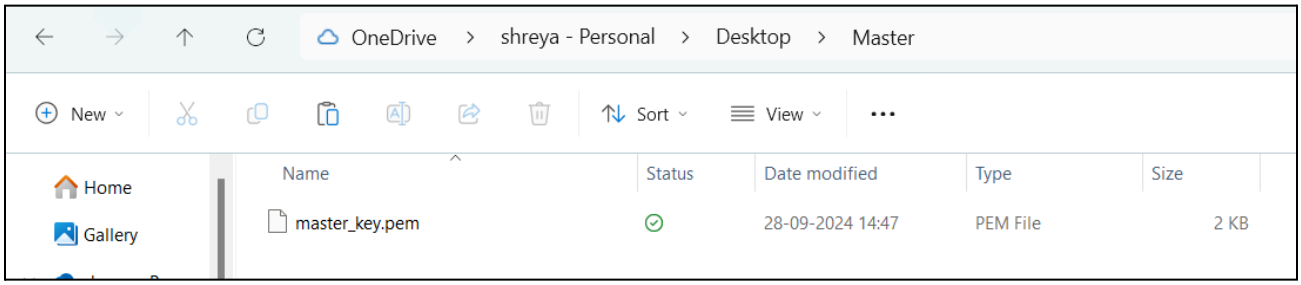
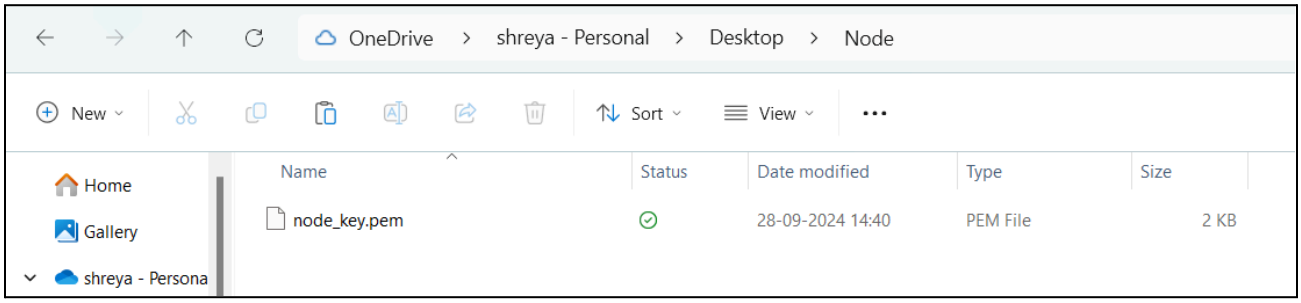
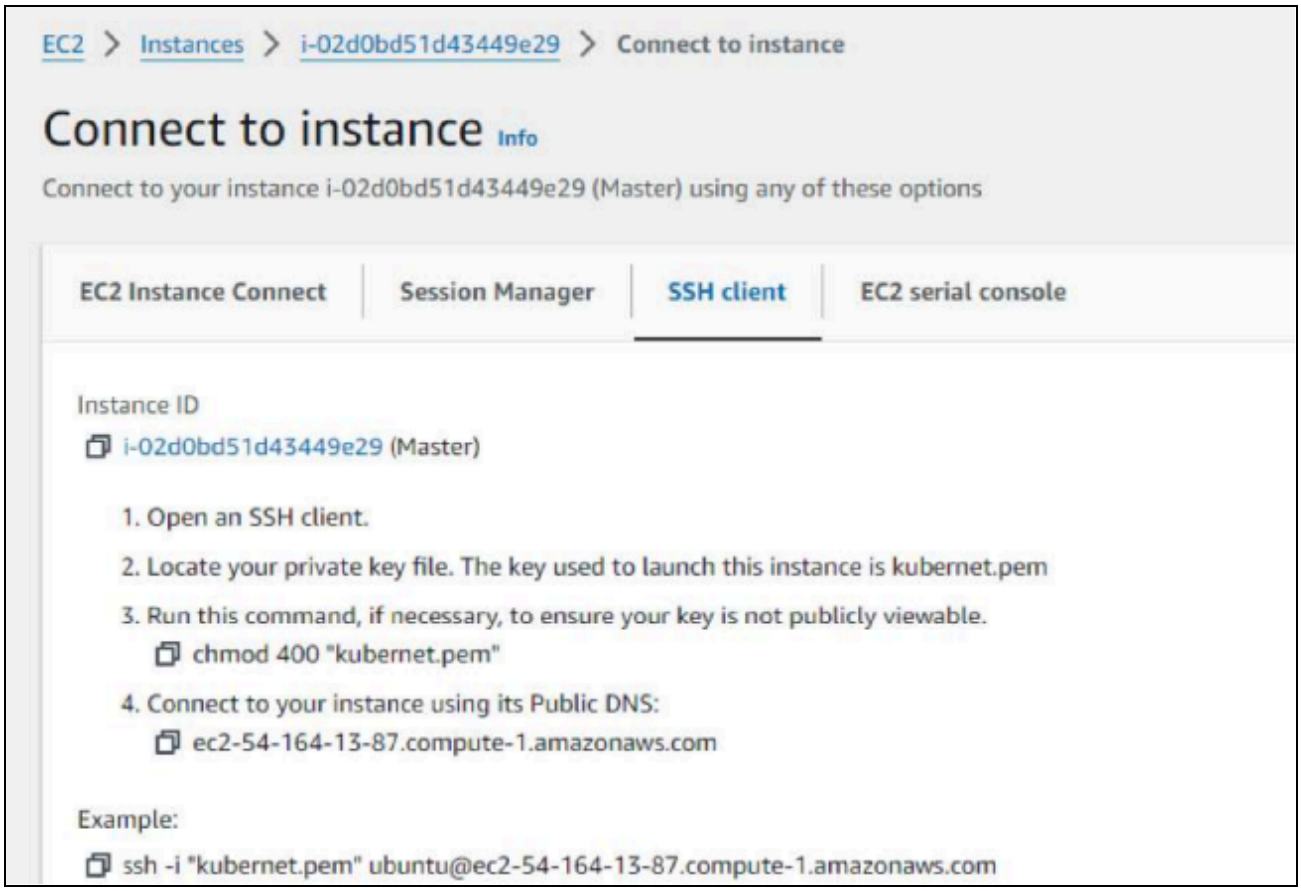
Step 3: Connect the instance and navigate to SSH client and copy the example command. Now open the folder in the terminal 3 times for Master, Node1 where our .pem key is stored and paste the Example command from ssh client (starting with ssh -i .....) in the terminal.







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```
C:\New volume\OneDrive\Desktop\Master>ssh -i "master_key.pem" ubuntu@ec2-3-88-174-4.compute-1.amazonaws.com
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-1012-aws x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/pro

 System information as of Sat Sep 28 09:49:45 UTC 2024

  System load:  0.0               Processes:             118
  Usage of /:   25.9% of 6.71GB   Users logged in:       1
  Memory usage: 6%                IPv4 address for enX0: 172.31.81.140
  Swap usage:   0%


Expanded Security Maintenance for Applications is not enabled.

145 updates can be applied immediately.
41 of these updates are standard security updates.
To see these additional updates run: apt list --upgradable

Enable ESM Apps to receive additional future security updates.
See https://ubuntu.com/esm or run: sudo pro status


Last login: Sat Sep 28 09:42:41 2024 from 110.224.118.66
```

```
ubuntu@ip-172-31-81-140:~$ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo tee /etc/apt/trusted.gpg.d/docker.gpg > /dev/null
sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
Warning: apt-key is deprecated. Manage keyring files in trusted.gpg.d instead (see apt-key(8)).
OK
Repository: 'deb [arch=amd64] https://download.docker.com/linux/ubuntu noble stable'
Description:
Archive for codename: noble components: stable
More info: https://download.docker.com/linux/ubuntu
Adding repository.
Press [ENTER] to continue or Ctrl-c to cancel.
Adding deb entry to /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-noble.list
Adding disabled deb-src entry to /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-noble.list
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:5 https://download.docker.com/linux/ubuntu noble InRelease [48.8 kB]
Get:6 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Packages [15.0 MB]
Get:7 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe Translation-en [5982 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Components [3871 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 c-n-f Metadata [301 kB]
```

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```
Get:38 https://download.docker.com/linux/ubuntu noble/stable amd64 Packages
[15.3 kB]
Get:39 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages
[380 kB]
Get:40 http://security.ubuntu.com/ubuntu noble-security/main Translation-en
[82.9 kB]
Get:41 http://security.ubuntu.com/ubuntu noble-security/main amd64 c-n-f Met
adata [4560 B]
Get:42 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Packa
ges [272 kB]
Get:43 http://security.ubuntu.com/ubuntu noble-security/universe Translation
-en [115 kB]
Get:44 http://security.ubuntu.com/ubuntu noble-security/universe amd64 Compo
nents [8632 B]
Get:45 http://security.ubuntu.com/ubuntu noble-security/universe amd64 c-n-f
 Metadata [10.3 kB]
Get:46 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 Pac
kages [353 kB]
Get:47 http://security.ubuntu.com/ubuntu noble-security/restricted Translati
on-en [68.1 kB]
Get:48 http://security.ubuntu.com/ubuntu noble-security/restricted amd64 c-n
-f Metadata [428 B]
Get:49 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Pac
kages [10.9 kB]
Get:50 http://security.ubuntu.com/ubuntu noble-security/multiverse Translati
on-en [2808 B]
Get:51 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 Com
ponents [208 B]
Get:52 http://security.ubuntu.com/ubuntu noble-security/multiverse amd64 c-n
-f Metadata [344 B]
Fetched 29.1 MB in 4s (7408 kB/s)
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: The key(s
) in the keyring /etc/apt/trusted.gpg.d/docker.gpg are ignored as the file h
as an unsupported filetype.
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: Key is st
ored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATI
ON section in apt-key(8) for details.
```

```
ubuntu@ip-172-31-81-140:~$ sudo apt-get update
sudo apt-get install -y docker-ce
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease

Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelea
se
Hit:4 https://download.docker.com/linux/ubuntu noble InRelease
Hit:5 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: The key(s
) in the keyring /etc/apt/trusted.gpg.d/docker.gpg are ignored as the file h
as an unsupported filetype.
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: Key is st
ored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATI
ON section in apt-key(8) for details.
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  containerd.io docker-buildx-plugin docker-ce-cli docker-ce-rootless-extras
 docker-compose-plugin libltdl7 libslirp0
  pigz slirp4netns
Suggested packages:
  aufs-tools cgroupfs-mount | cgroup-lite
The following NEW packages will be installed:
  containerd.io docker-buildx-plugin docker-ce docker-ce-cli docker-ce-rootl
ess-extras docker-compose-plugin libltdl7
  libslirp0 pigz slirp4netns
0 upgraded, 10 newly installed, 0 to remove and 143 not upgraded.
Need to get 123 MB of archives.
After this operation, 442 MB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 pi
gz amd64 2.8-1 [65.6 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libltd
l7 amd64 2.4.7-7build1 [40.3 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libsli
```

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```
Preparing to unpack .../7-libltdl7_2.4.7-7build1_amd64.deb ...
Unpacking libltdl7:amd64 (2.4.7-7build1) ...
Selecting previously unselected package libslirp0:amd64.
Preparing to unpack .../8-libslirp0_4.7.0-1ubuntu3_amd64.deb ...
Unpacking libslirp0:amd64 (4.7.0-1ubuntu3) ...
Selecting previously unselected package slirp4netns.
Preparing to unpack .../9-slirp4netns_1.2.1-1build2_amd64.deb ...
Unpacking slirp4netns (1.2.1-1build2) ...
Setting up docker-buildx-plugin (0.17.1-1~ubuntu.24.04~noble) ...
Setting up containerd.io (1.7.22-1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/containerd.servi
ce → /usr/lib/systemd/system/containerd.service.
Setting up docker-compose-plugin (2.29.7-1~ubuntu.24.04~noble) ...
Setting up libltdl7:amd64 (2.4.7-7build1) ...
Setting up docker-ce-cli (5:27.3.1-1~ubuntu.24.04~noble) ...
Setting up libslirp0:amd64 (4.7.0-1ubuntu3) ...
Setting up pigz (2.8-1) ...
Setting up docker-ce-rootless-extras (5:27.3.1-1~ubuntu.24.04~noble) ...
Setting up slirp4netns (1.2.1-1build2) ...
Setting up docker-ce (5:27.3.1-1~ubuntu.24.04~noble) ...
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service →
 /usr/lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /us
r/lib/systemd/system/docker.socket.
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
```

```
ubuntu@ip-172-31-81-140:~$ sudo mkdir -p /etc/docker
cat <<EOF | sudo tee /etc/docker/daemon.json
{
  "exec-opts": ["native.cgroupdriver=systemd"]
}
EOF
{
  "exec-opts": ["native.cgroupdriver=systemd"]
}
```

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```
ubuntu@ip-172-31-81-140:~$ sudo systemctl enable docker
sudo systemctl daemon-reload
sudo systemctl restart docker
Synchronizing state of docker.service with SysV service script with /usr/lib
/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable docker
```

```
ubuntu@ip-172-31-81-140:~$ curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.3
1/deb/Release.key | sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-k
eyring.gpg
echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg https://pk
gs.k8s.io/core:/stable:/v1.31/deb/ /' | sudo tee /etc/apt/sources.list.d/kub
ernetes.list
deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg https://pkgs.k8s
.io/core:/stable:/v1.31/deb/ /
```

ERROR-

```
ubuntu@ip-172-31-81-140:~$ sudo apt-get update
sudo apt-get install -y kubelet kubeadm kubectl
sudo apt-mark hold kubelet kubeadm kubectl
E: Malformed entry 1 in list file /etc/apt/sources.list.d/kubernetes.list ([
option] not assignment)
E: The list of sources could not be read.
E: Malformed entry 1 in list file /etc/apt/sources.list.d/kubernetes.list ([
option] not assignment)
E: The list of sources could not be read.
E: Malformed entry 1 in list file /etc/apt/sources.list.d/kubernetes.list ([
option] not assignment)
E: The list of sources could not be read.
```

To solve the error: Added sudo mkdir -p /etc/apt/keyrings in the previous command

```
ubuntu@ip-172-31-81-140:~$ sudo mkdir -p /etc/apt/keyrings
ubuntu@ip-172-31-81-140:~$ curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.3
1/deb/Release.key | sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-k
eyring.gpg
File '/etc/apt/keyrings/kubernetes-apt-keyring.gpg' exists. Overwrite? (y/N)
 y
ubuntu@ip-172-31-81-140:~$ echo 'deb [signed-by=/etc/apt/keyrings/kubernetes
-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.31/deb/ /' | sudo tee
 /etc/apt/sources.list.d/kubernetes.list
deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8
s.io/core:/stable:/v1.31/deb/ /
```

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```
ubuntu@ip-172-31-81-140:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
 [126 kB]
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelea
se
Hit:4 https://download.docker.com/linux/ubuntu noble InRelease
Hit:6 http://security.ubuntu.com/ubuntu noble-security InRelease
Get:5 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  InRelease [1186 B]
Get:7 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  Packages [4865 B]
Fetched 132 kB in 1s (240 kB/s)
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: The key(s
) in the keyring /etc/apt/trusted.gpg.d/docker.gpg are ignored as the file h
as an unsupported filetype.
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: Key is st
ored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATI
ON section in apt-key(8) for details.
```

```
ubuntu@ip-172-31-81-140:~$ sudo apt-get install -y kubelet kubeadm kubectl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  conntrack cri-tools kubernetes-cni
The following NEW packages will be installed:
  conntrack cri-tools kubeadm kubectl kubelet kubernetes-cni
0 upgraded, 6 newly installed, 0 to remove and 143 not upgraded.
Need to get 87.4 MB of archives.
After this operation, 314 MB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 conntr
ack amd64 1:1.4.8-1ubuntu1 [37.9 kB]
Get:2 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  cri-tools 1.31.1-1.1 [15.7 MB]
Get:3 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  kubeadm 1.31.1-1.1 [11.4 MB]
Get:4 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  kubectl 1.31.1-1.1 [11.2 MB]
Get:5 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  kubernetes-cni 1.5.1-1.1 [33.9 MB]
Get:6 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  kubelet 1.31.1-1.1 [15.2 MB]
Fetched 87.4 MB in 1s (90.5 MB/s)
Selecting previously unselected package conntrack.
(Reading database ... 68007 files and directories currently installed.)
Preparing to unpack .../0-conntrack_1%3a1.4.8-1ubuntu1_amd64.deb ...
Unpacking conntrack (1:1.4.8-1ubuntu1) ...
Selecting previously unselected package cri-tools.
Preparing to unpack .../1-cri-tools_1.31.1-1.1_amd64.deb ...
Unpacking cri-tools (1.31.1-1.1) ...
Selecting previously unselected package kubeadm.
Preparing to unpack .../2-kubeadm_1.31.1-1.1_amd64.deb ...
Unpacking kubeadm (1.31.1-1.1) ...
Selecting previously unselected package kubectl.
Preparing to unpack .../3-kubectl_1.31.1-1.1_amd64.deb ...
Unpacking kubectl (1.31.1-1.1) ...
Selecting previously unselected package kubernetes-cni.
```

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```
Unpacking kubernetes-cni (1.5.1-1.1) ...
Selecting previously unselected package kubelet.
Preparing to unpack .../5-kubelet_1.31.1-1.1_amd64.deb ...
Unpacking kubelet (1.31.1-1.1) ...
Setting up conntrack (1:1.4.8-1ubuntu1) ...
Setting up kubectl (1.31.1-1.1) ...
Setting up cri-tools (1.31.1-1.1) ...
Setting up kubernetes-cni (1.5.1-1.1) ...
Setting up kubeadm (1.31.1-1.1) ...
Setting up kubelet (1.31.1-1.1) ...
Processing triggers for man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-81-140:~$ sudo apt-mark hold kubelet kubeadm kubectl
kubelet set on hold.
kubeadm set on hold.
kubectl set on hold.
ubuntu@ip-172-31-81-140:~$ sudo apt-mark hold kubelet kubeadm kubectl
kubelet was already set on hold.
kubeadm was already set on hold.
kubectl was already set on hold.
ubuntu@ip-172-31-81-140:~$ sudo systemctl enable --now kubelet
sudo apt-get install -y containerd
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer requir
ed:
```

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```
ubuntu@ip-172-31-81-140:~$ sudo mkdir -p /etc/containerd
sudo containerd config default | sudo tee /etc/containerd/config.toml
disabled_plugins = []
imports = []
oom_score = 0
plugin_dir = ""
required_plugins = []
root = "/var/lib/containerd"
state = "/run/containerd"
temp = ""
version = 2

[cgroup]
  path = ""

[debug]
  address = ""
  format = ""
  gid = 0
  level = ""
  uid = 0

[grpc]
  address = "/run/containerd/containerd.sock"
  gid = 0
  max_recv_message_size = 16777216
  max_send_message_size = 16777216
  tcp_address = ""
  tcp_tls_ca = ""
  tcp_tls_cert = ""
  tcp_tls_key = ""
  uid = 0

[metrics]
  address = ""
  grpc_histogram = false
```

```
ubuntu@ip-172-31-81-140:~$ sudo systemctl restart containerd
sudo systemctl enable containerd
sudo systemctl status containerd
● containerd.service - containerd container runtime
     Loaded: loaded (/usr/lib/systemd/system/containerd.service; enabled; p>
     Active: active (running) since Sat 2024-09-28 10:07:50 UTC; 258ms ago
       Docs: https://containerd.io
   Main PID: 4844 (containerd)
      Tasks: 8
     Memory: 13.8M (peak: 14.5M)
        CPU: 54ms
     CGroup: /system.slice/containerd.service
             └─4844 /usr/bin/containerd

Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 containerd[4844]: time="2024-09-28T10:07:5>
Sep 28 10:07:50 ip-172-31-81-140 systemd[1]: Started containerd.service - c>
lines 1-21/21 (END)...skipping...
● containerd.service - containerd container runtime
     Loaded: loaded (/usr/lib/systemd/system/containerd.service; enabled; pr
eset: enabled)
     Active: active (running) since Sat 2024-09-28 10:07:50 UTC; 258ms ago
       Docs: https://containerd.io
   Main PID: 4844 (containerd)
      Tasks: 8
     Memory: 13.8M (peak: 14.5M)
        CPU: 54ms
     CGroup: /system.slice/containerd.service
             └─4844 /usr/bin/containerd
```

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```
ubuntu@ip-172-31-81-140:~$ sudo apt-get install -y socat
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer requir
ed:
  docker-buildx-plugin docker-ce-cli docker-ce-rootless-extras
  docker-compose-plugin libltdl7 libslirp0 pigz slirp4netns
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  socat
0 upgraded, 1 newly installed, 0 to remove and 143 not upgraded.
Need to get 374 kB of archives.
After this operation, 1649 kB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 socat
amd64 1.8.0.0-4build3 [374 kB]
Fetched 374 kB in 0s (16.7 MB/s)
Selecting previously unselected package socat.
(Reading database ... 68108 files and directories currently installed.)
Preparing to unpack .../socat_1.8.0.0-4build3_amd64.deb ...
Unpacking socat (1.8.0.0-4build3) ...
Setting up socat (1.8.0.0-4build3) ...
Processing triggers for man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
```

Shreya Sawant D15A -54

```
ubuntu@ip-172-31-81-140:~$ sudo kubeadm init --pod-network-cidr=10.244.0.0/16
[init] Using Kubernetes version: v1.31.0
[preflight] Running pre-flight checks
[preflight] Pulling images required for setting up a Kubernetes cluster
[preflight] This might take a minute or two, depending on the speed of your internet connection
[preflight] You can also perform this action beforehand using 'kubeadm config images pull'
W0928 10:09:26.018351    5076 checks.go:846] detected that the sandbox image "registry.k8s.io/pause:3.8" of the container runtime is inconsistent with that used by kubeadm.It is recommended to use "registry.k8s.io/pause:3.10" as the CRI sandbox image.
[certs] Using certificateDir folder "/etc/kubernetes/pki"
[certs] Generating "ca" certificate and key
[certs] Generating "apiserver" certificate and key
[certs] apiserver serving cert is signed for DNS names [ip-172-31-81-140 kubernetes kubernetes.default kubernetes.default.svc kubernetes.default.svc.cluster.local] and IPs [10.96.0.1 172.31.81.140]
[certs] Generating "apiserver-kubelet-client" certificate and key
[certs] Generating "front-proxy-ca" certificate and key
[certs] Generating "front-proxy-client" certificate and key
[certs] Generating "etcd/ca" certificate and key
[certs] Generating "etcd/server" certificate and key
[certs] etcd/server serving cert is signed for DNS names [ip-172-31-81-140 localhost] and IPs [172.31.81.140 127.0.0.1 ::1]
[certs] Generating "etcd/peer" certificate and key
[certs] etcd/peer serving cert is signed for DNS names [ip-172-31-81-140 localhost] and IPs [172.31.81.140 127.0.0.1 ::1]
[certs] Generating "etcd/healthcheck-client" certificate and key
[certs] Generating "apiserver-etcd-client" certificate and key
[certs] Generating "sa" key and public key
[kubeconfig] Using kubeconfig folder "/etc/kubernetes"
[kubeconfig] Writing "admin.conf" kubeconfig file
[kubeconfig] Writing "super-admin.conf" kubeconfig file
[kubeconfig] Writing "kubelet.conf" kubeconfig file
[kubeconfig] Writing "controller-manager.conf" kubeconfig file
```

```
ubuntu@ip-172-31-81-140:~$ mkdir -p $HOME/.kube
sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
sudo chown $(id -u):$(id -g) $HOME/.kube/config
cp: overwrite '/home/ubuntu/.kube/config'? y
ubuntu@ip-172-31-81-140:~$ kubectl get nodes
NAME               STATUS     ROLES           AGE   VERSION
ip-172-31-81-140   NotReady   control-plane   32m   v1.31.1
ubuntu@ip-172-31-81-140:~$ kubectl get nodes
NAME               STATUS     ROLES           AGE   VERSION
ip-172-31-81-140   NotReady   control-plane   33m   v1.31.1
ip-172-31-85-214   NotReady   <none>          18s   v1.31.1
```

Shreya Sawant D15A -54

```
ubuntu@ip-172-31-81-140:~$ sudo apt-get install -y kubelet kubeadm kubectl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  conntrack cri-tools kubernetes-cni
The following NEW packages will be installed:
  conntrack cri-tools kubeadm kubectl kubelet kubernetes-cni
0 upgraded, 6 newly installed, 0 to remove and 143 not upgraded.
Need to get 87.4 MB of archives.
After this operation, 314 MB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 conntr
ack amd64 1:1.4.8-1ubuntu1 [37.9 kB]
Get:2 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  cri-tools 1.31.1-1.1 [15.7 MB]
Get:3 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  kubeadm 1.31.1-1.1 [11.4 MB]
Get:4 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  kubectl 1.31.1-1.1 [11.2 MB]
Get:5 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  kubernetes-cni 1.5.1-1.1 [33.9 MB]
Get:6 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/s
table:/v1.31/deb  kubelet 1.31.1-1.1 [15.2 MB]
Fetched 87.4 MB in 1s (90.5 MB/s)
Selecting previously unselected package conntrack.
(Reading database ... 68007 files and directories currently installed.)
Preparing to unpack .../0-conntrack_1%3a1.4.8-1ubuntu1_amd64.deb ...
Unpacking conntrack (1:1.4.8-1ubuntu1) ...
Selecting previously unselected package cri-tools.
Preparing to unpack .../1-cri-tools_1.31.1-1.1_amd64.deb ...
Unpacking cri-tools (1.31.1-1.1) ...
Selecting previously unselected package kubeadm.
Preparing to unpack .../2-kubeadm_1.31.1-1.1_amd64.deb ...
Unpacking kubeadm (1.31.1-1.1) ...
Selecting previously unselected package kubectl.
Preparing to unpack .../3-kubectl_1.31.1-1.1_amd64.deb ...
```

```
ubuntu@ip-172-31-81-140:~$ sudo apt-mark hold kubelet kubeadm kubectl
kubelet set on hold.
kubeadm set on hold.
kubectl set on hold.
```

Shreya Sawant D15A -54

```
ubuntu@ip-172-31-81-140:~$ sudo systemctl enable --now kubelet
sudo apt-get install -y containerd
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer requir
ed:
  docker-buildx-plugin docker-ce-cli docker-ce-rootless-extras
  docker-compose-plugin libltdl7 libslirp0 pigz slirp4netns
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  runc
The following packages will be REMOVED:
  containerd.io docker-ce
The following NEW packages will be installed:
  containerd runc
0 upgraded, 2 newly installed, 2 to remove and 143 not upgraded.
Need to get 47.2 MB of archives.
After this operation, 53.1 MB disk space will be freed.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd6
4 runc amd64 1.1.12-0ubuntu3.1 [8599 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd6
4 containerd amd64 1.7.12-0ubuntu4.1 [38.6 MB]
Fetched 47.2 MB in 1s (81.9 MB/s)
(Reading database ... 68064 files and directories currently installed.)
Removing docker-ce (5:27.3.1-1~ubuntu.24.04~noble) ...
Removing containerd.io (1.7.22-1) ...
Selecting previously unselected package runc.
(Reading database ... 68044 files and directories currently installed.)
Preparing to unpack .../runc_1.1.12-0ubuntu3.1_amd64.deb ...
Unpacking runc (1.1.12-0ubuntu3.1) ...
Selecting previously unselected package containerd.
Preparing to unpack .../containerd_1.7.12-0ubuntu4.1_amd64.deb ...
Unpacking containerd (1.7.12-0ubuntu4.1) ...
Setting up runc (1.1.12-0ubuntu3.1) ...
Setting up containerd (1.7.12-0ubuntu4.1) ...
```

```
Selecting previously unselected package runc.
(Reading database ... 68044 files and directories currently installed.)
Preparing to unpack .../runc_1.1.12-0ubuntu3.1_amd64.deb ...
Unpacking runc (1.1.12-0ubuntu3.1) ...
Selecting previously unselected package containerd.
Preparing to unpack .../containerd_1.7.12-0ubuntu4.1_amd64.deb ...
Unpacking containerd (1.7.12-0ubuntu4.1) ...
Setting up runc (1.1.12-0ubuntu3.1) ...
Setting up containerd (1.7.12-0ubuntu4.1) ...
Processing triggers for man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
```

Shreya Sawant D15A -54

```
ubuntu@ip-172-31-81-140:~$ sudo mkdir -p /etc/containerd
sudo containerd config default | sudo tee /etc/containerd/config.toml
disabled_plugins = []
imports = []
oom_score = 0
plugin_dir = ""
required_plugins = []
root = "/var/lib/containerd"
state = "/run/containerd"
temp = ""
version = 2

[cgroup]
  path = ""

[debug]
  address = ""
  format = ""
  gid = 0
  level = ""
  uid = 0

[grpc]
  address = "/run/containerd/containerd.sock"
  gid = 0
  max_recv_message_size = 16777216
  max_send_message_size = 16777216
  tcp_address = ""
  tcp_tls_ca = ""
  tcp_tls_cert = ""
  tcp_tls_key = ""
  uid = 0

[metrics]
  address = ""
  grpc_histogram = false
```

Shreya Sawant D15A -54

```
ubuntu@ip-172-31-81-140:~$ kubectl apply -f https://docs.projectcalico.org/manifests/calico.yaml
poddisruptionbudget.policy/calico-kube-controllers created
serviceaccount/calico-kube-controllers created
serviceaccount/calico-node created
configmap/calico-config created
customresourcedefinition.apiextensions.k8s.io/bgpconfigurations.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/bgppeers.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/blockaffinities.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/caliconodestatuses.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/clusterinformations.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/felixconfigurations.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/globalnetworkpolicies.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/globalnetworksets.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/hostendpoints.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ipamblocks.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ipamconfigs.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ipamhandles.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ippools.crd.projectcalico.org
```

```
ubuntu@ip-172-31-81-140:~$ kubectl get nodes -o wide
NAME                STATUS   ROLES           AGE     VERSION   INTERNAL-IP
  EXTERNAL-IP   OS-IMAGE           KERNEL-VERSION   CONTAINER-RUNTIME
ip-172-31-81-140    Ready    control-plane   35m     v1.31.1   172.31.81.140
  <none>        Ubuntu 24.04 LTS   6.8.0-1012-aws   containerd://1.7.12
ubuntu@ip-172-31-81-140:~$ kubectl get nodes -o wide
NAME                STATUS   ROLES           AGE     VERSION   INTERNAL-IP
  EXTERNAL-IP   OS-IMAGE           KERNEL-VERSION   CONTAINER-RUNTIME
ip-172-31-81-140    Ready    control-plane   36m     v1.31.1   172.31.81.140
  <none>        Ubuntu 24.04 LTS   6.8.0-1012-aws   containerd://1.7.12
ip-172-31-85-214    Ready    <none>          3m15s   v1.31.1   172.31.85.214
  <none>        Ubuntu 24.04 LTS   6.8.0-1012-aws   containerd://1.7.12
ubuntu@ip-172-31-81-140:~$ 1:kubectl label node ip-172-31-28-117 kubernetes.io/role=Node1
1:kubectl: command not found
ubuntu@ip-172-31-81-140:~$ kubectl label node ip-172-31-85-214 kubernetes.io/role=Node1
node/ip-172-31-85-214 labeled
ubuntu@ip-172-31-81-140:~$ kubectl get nodes
NAME                STATUS   ROLES           AGE    VERSION
ip-172-31-81-140    Ready    control-plane   38m    v1.31.1
ip-172-31-85-214    Ready    Node1           5m9s   v1.31.1
```

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