ADVANCE DEVOPS EXP 3

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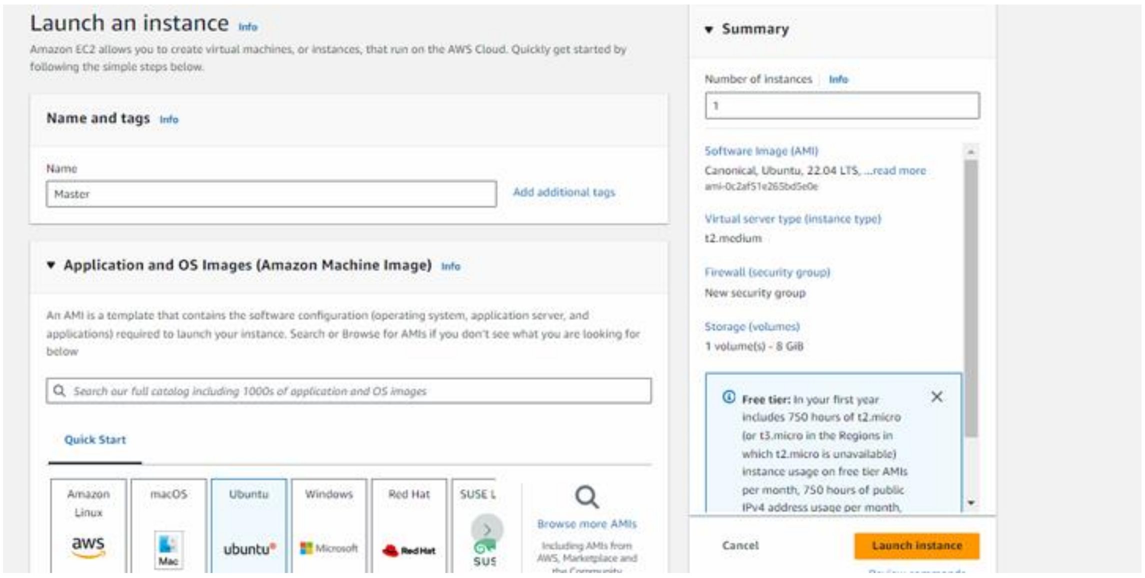
Roll no :- 36

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

Step 1: Pre-requisites

1.1 Create 3 EC2 instances,one for the master node and two for the worker nodes.



Launch an instance Info

Amazon EC2 allows you to create virtual machines, or instances, that run on the AWS Cloud. Quickly get started by following the simple steps below.

Name and tags Info

Name: Master

▼ Application and OS Images (Amazon Machine Image) Info

An AMI is a template that contains the software configuration (operating system, application server, and applications) required to launch your instance. Search or Browse for AMIs if you don't see what you are looking for below

▼ Summary

Number of instances: 1

Software Image (AMI): Canonical, Ubuntu, 22.04 LTS, ...read more ami-0c2af51e265bd5e0e

Virtual server type (instance type): t2.medium

Firewall (security group): New security group

Storage (volumes): 1 volume(s) - 8 GiB

Free tier: In your first year includes 750 hours of t2.micro (or t3.micro in the Regions in which t2.micro is unavailable) instance usage on free tier AMIs per month, 750 hours of public IPv4 address usage per month,

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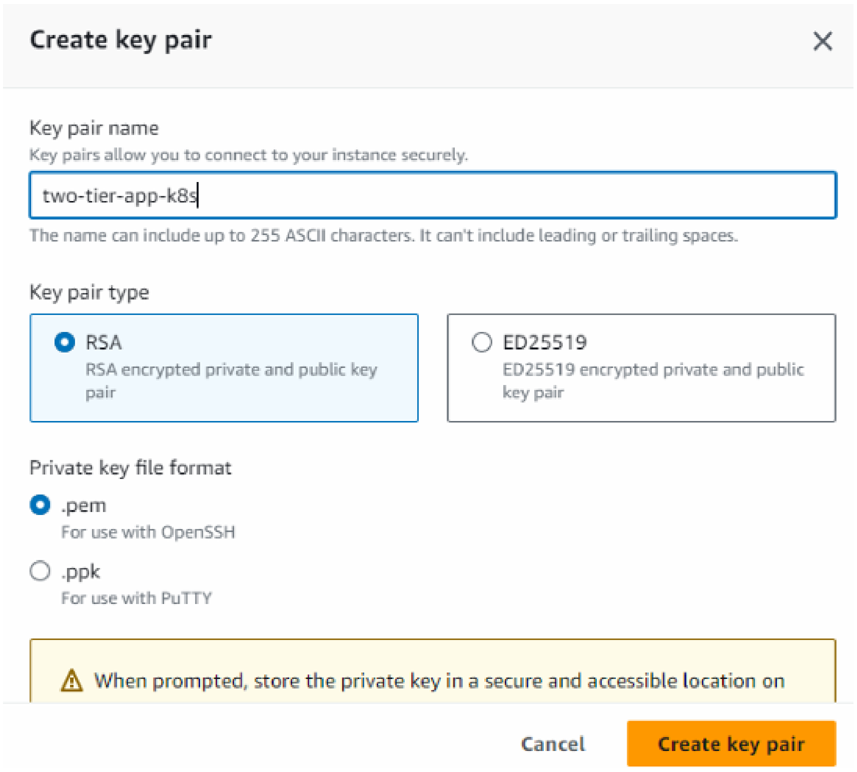
Ubuntu
Windows
Red Hat
SUSE L
Browse more AMIs
Including AMIs from AWS, Marketplace and the Community
Cancel
Launch instance



Create key pair

Key pair name
Key pairs allow you to connect to your instance securely.

two-tier-app-k8s

The name can include up to 255 ASCII characters. It can't include leading or trailing spaces.

Key pair type

[✓ RSA] RSA encrypted private and public key pair

ED25519 — ED25519 encrypted private and public key pair

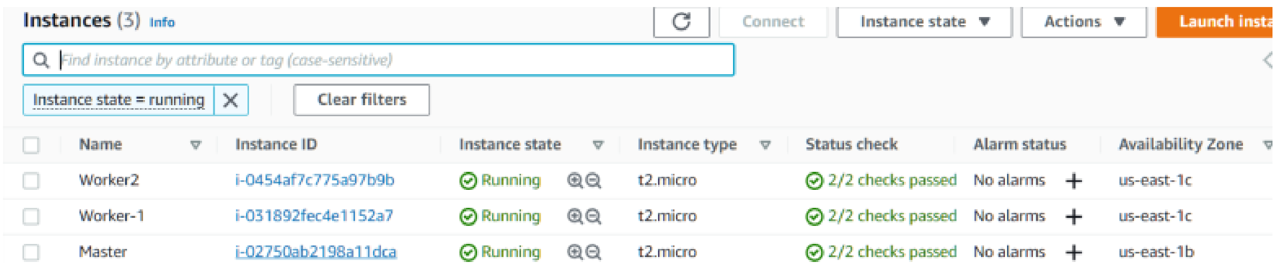
Private key file format

[✓ .pem] For use with OpenSSH

.ppk — For use with PuTTY

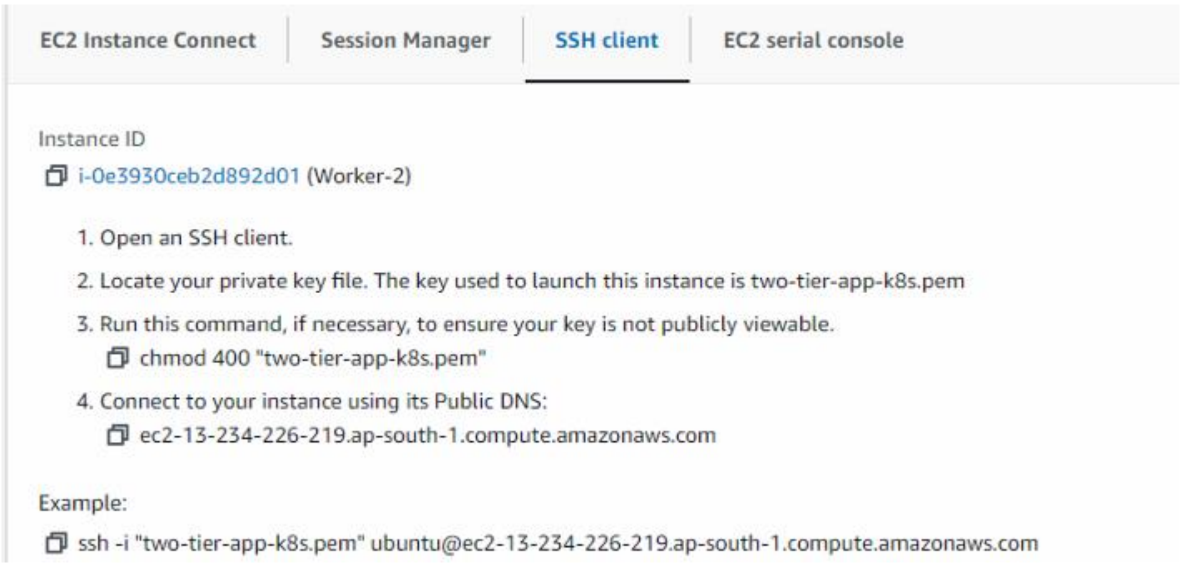
⚠ When prompted, store the private key in a secure and accessible location on

Create 3 EC2 Ubuntu Instances of Ubuntu version 20.04 and keep all the instances in the same security group on AWS. (Name 1 as Master, the other 2 as worker-1 and worker-2)



Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
Worker2	i-0454af7c775a97b9b	Running	t2.micro	2/2 checks passed	No alarms	us-east-1c
Worker-1	i-031892fec4e1152a7	Running	t2.micro	2/2 checks passed	No alarms	us-east-1c
Master	i-02750ab2198a11dca	Running	t2.micro	2/2 checks passed	No alarms	us-east-1b

Now the ssh created, copy the text given in the example



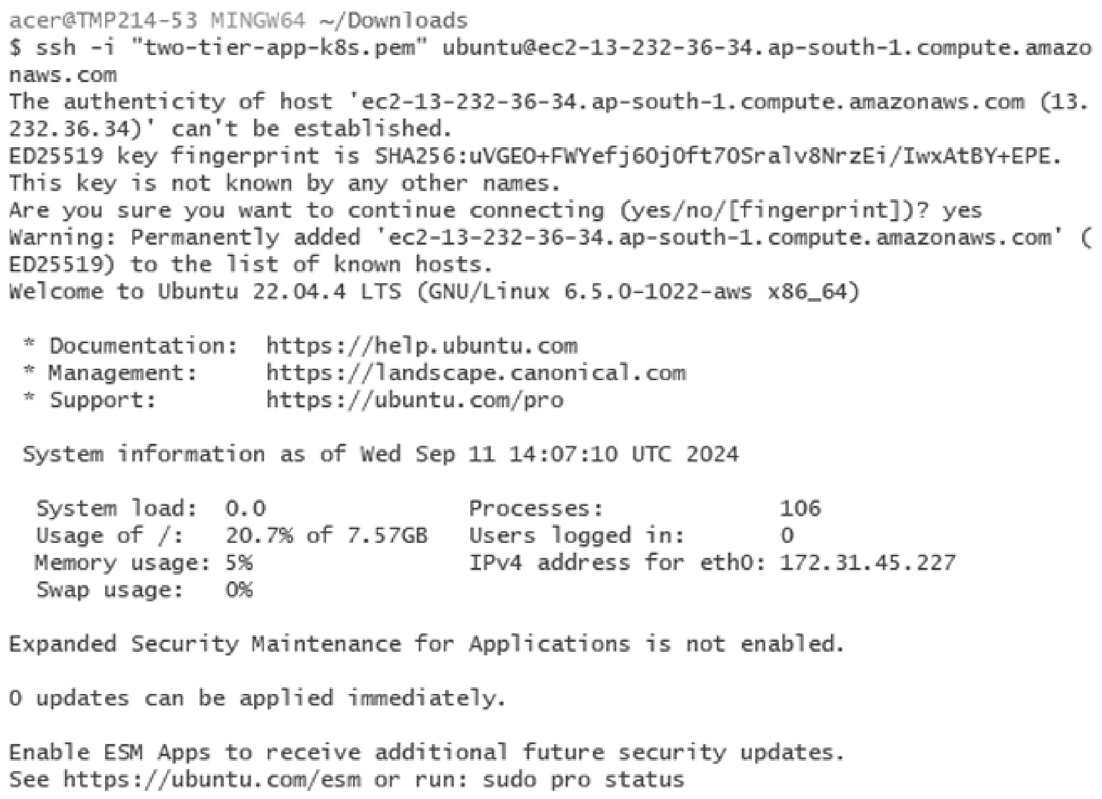
Instance ID

i-0e3930ceb2d892d01 (Worker-2)

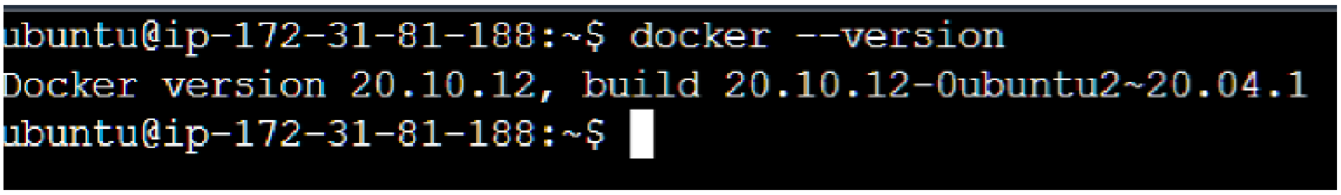
1. Open an SSH client.
2. Locate your private key file. The key used to launch this instance is two-tier-app-k8s.pem
3. Run this command, if necessary, to ensure your key is not publicly viewable.
   chmod 400 "two-tier-app-k8s.pem"
4. Connect to your instance using its Public DNS:
   ec2-13-234-226-219.ap-south-1.compute.amazonaws.com

Example:

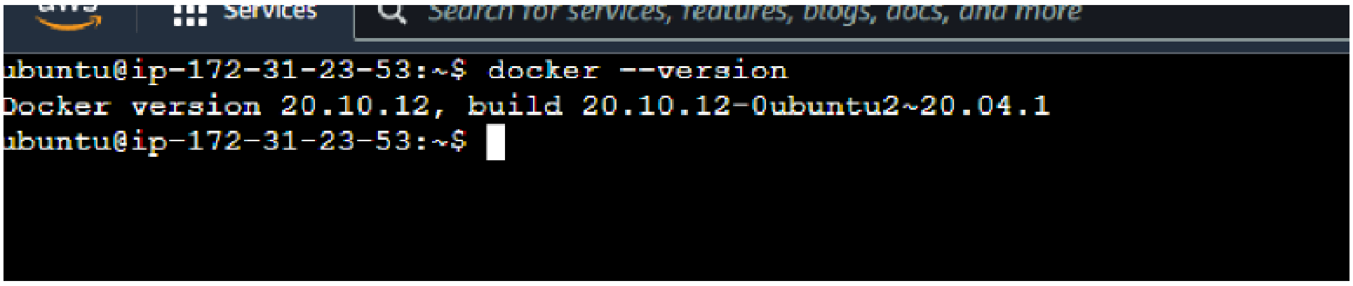
ssh -i "two-tier-app-k8s.pem" ubuntu@ec2-13-234-226-219.ap-south-1.compute.amazonaws.com



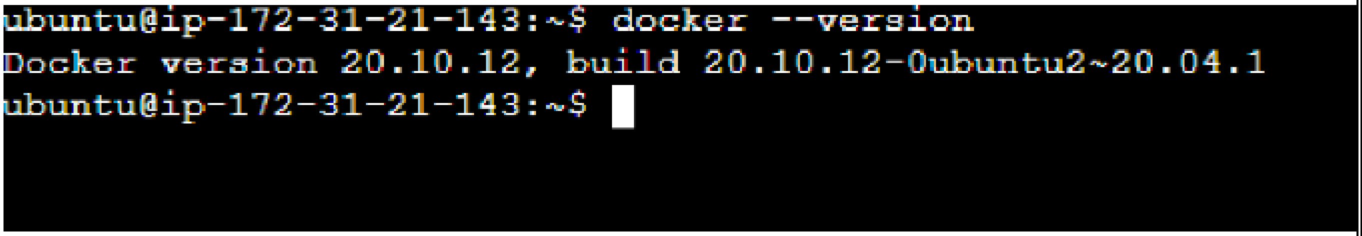
```
acer@TMP214-53 MINGW64 ~/Downloads
$ ssh -i "two-tier-app-k8s.pem" ubuntu@ec2-13-232-36-34.ap-south-1.compute.amazo
naws.com
The authenticity of host 'ec2-13-232-36-34.ap-south-1.compute.amazonaws.com (13.
232.36.34)' can't be established.
ED25519 key fingerprint is SHA256:uVGEO+FWYefj60j0ft70Sralv8NrzEi/IwxAtBY+EPE.
This key is not known by any other names.
Are you sure you want to continue connecting (yes/no/[fingerprint])? yes
Warning: Permanently added 'ec2-13-232-36-34.ap-south-1.compute.amazonaws.com' (
ED25519) to the list of known hosts.
Welcome to Ubuntu 22.04.4 LTS (GNU/Linux 6.5.0-1022-aws x86_64)

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

 System information as of Wed Sep 11 14:07:10 UTC 2024

  System load:  0.0              Processes:             106
  Usage of /:   20.7% of 7.57GB  Users logged in:       0
  Memory usage: 5%               IPv4 address for eth0: 172.31.45.227
  Swap usage:   0%

Expanded Security Maintenance for Applications is not enabled.

0 updates can be applied immediately.

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



```
ubuntu@ip-172-31-81-188:~$ docker --version
Docker version 20.10.12, build 20.10.12-0ubuntu2~20.04.1
ubuntu@ip-172-31-81-188:~$
```



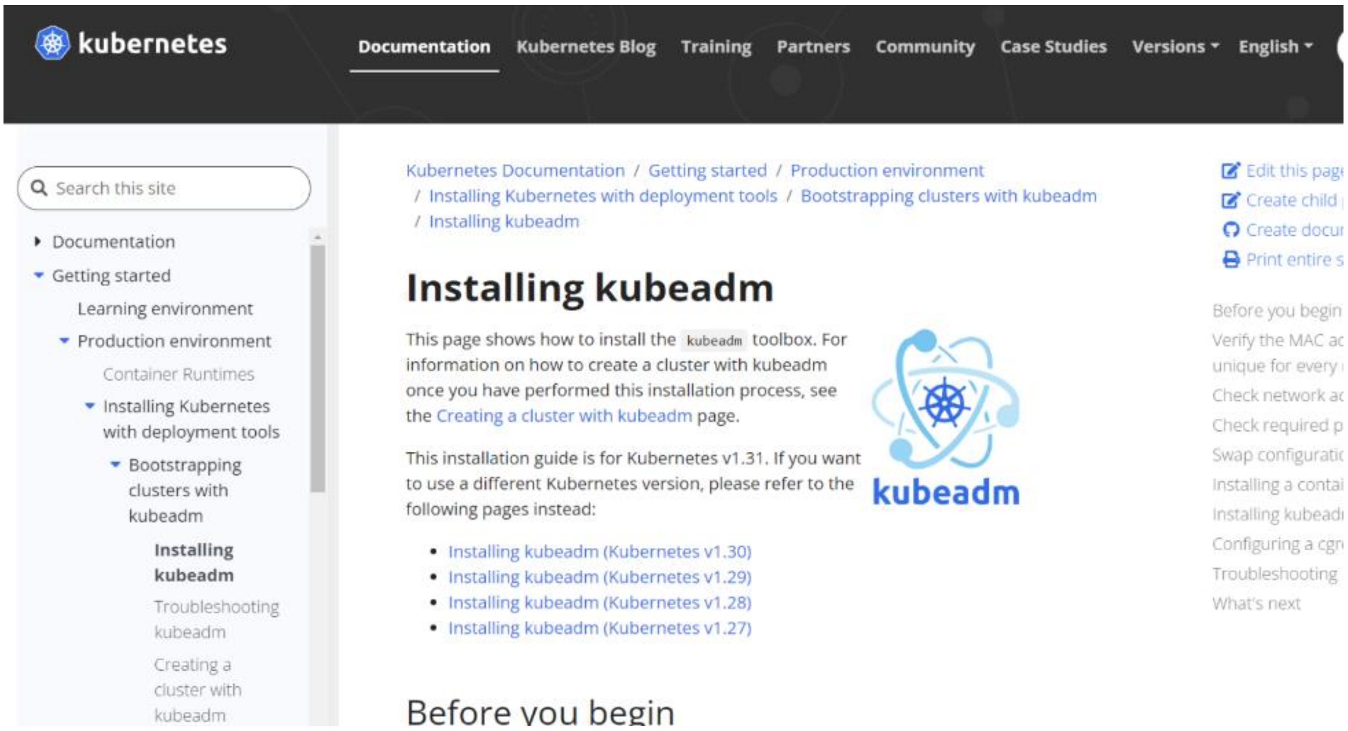
```
ubuntu@ip-172-31-23-53:~$ docker --version
Docker version 20.10.12, build 20.10.12-0ubuntu2~20.04.1
ubuntu@ip-172-31-23-53:~$
```



```
ubuntu@ip-172-31-21-143:~$ docker --version
Docker version 20.10.12, build 20.10.12-0ubuntu2~20.04.1
ubuntu@ip-172-31-21-143:~$
```

Kubernetes Installation

Go to official documentation off kubedam



Kubernetes Documentation / Getting started / Production environment / Installing Kubernetes with deployment tools / Bootstrapping clusters with kubeadm / Installing kubeadm

Installing kubeadm

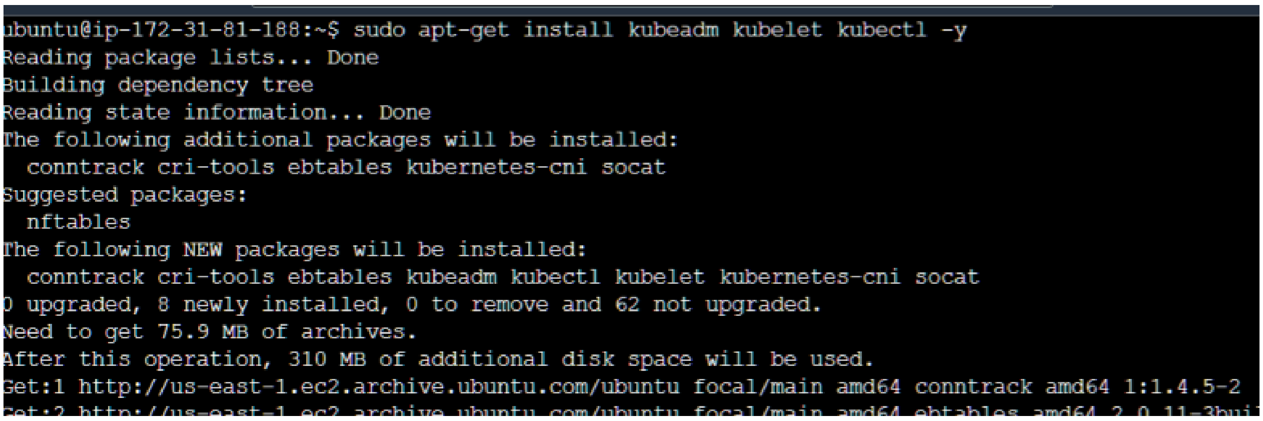
This page shows how to install the `kubeadm` toolbox. For information on how to create a cluster with kubeadm once you have performed this installation process, see the Creating a cluster with kubeadm page.

This installation guide is for Kubernetes v1.31. If you want to use a different Kubernetes version, please refer to the following pages instead:

- Installing kubeadm (Kubernetes v1.30)
- Installing kubeadm (Kubernetes v1.29)
- Installing kubeadm (Kubernetes v1.28)
- Installing kubeadm (Kubernetes v1.27)

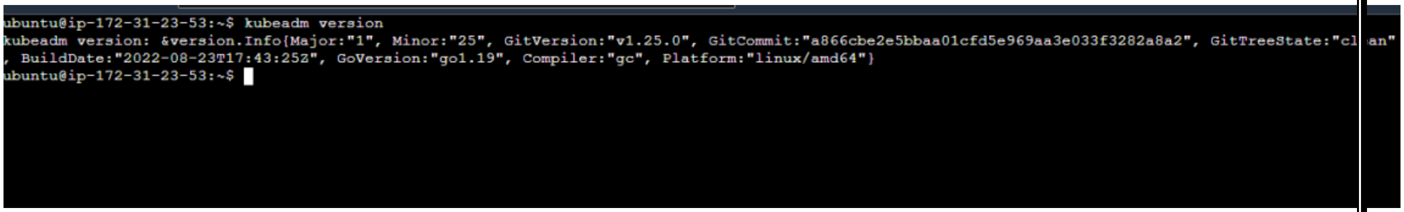
Before you begin

1. $sudo apt-get install kubeadm kubelet kubectl -y



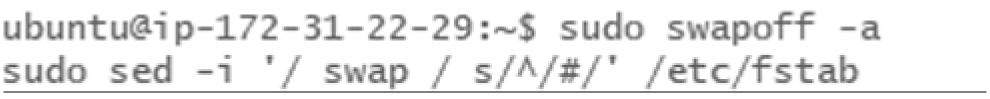
```
ubuntu@ip-172-31-81-188:~$ sudo apt-get install kubeadm kubelet kubectl -y
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  conntrack cri-tools ebtables kubernetes-cni socat
Suggested packages:
  nftables
The following NEW packages will be installed:
  conntrack cri-tools ebtables kubeadm kubectl kubelet kubernetes-cni socat
0 upgraded, 8 newly installed, 0 to remove and 62 not upgraded.
Need to get 75.9 MB of archives.
After this operation, 310 MB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu focal/main amd64 conntrack amd64 1:1.4.5-2
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu focal/main amd64 ebtables amd64 2.0.11-3bui
```

2. Verify the installation with



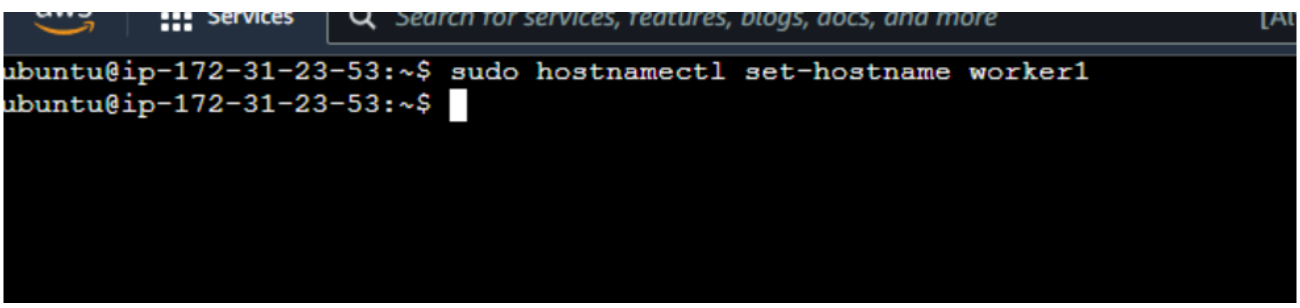
```
ubuntu@ip-172-31-23-53:~$ kubeadm version
kubeadm version: &version.Info{Major:"1", Minor:"25", GitVersion:"v1.25.0", GitCommit:"a866cbe2e5bbaa01cfd5e969aa3e033f3282a8a2", GitTreeState:"clean"
, BuildDate:"2022-08-23T17:43:25Z", GoVersion:"go1.19", Compiler:"gc", Platform:"linux/amd64"}
ubuntu@ip-172-31-23-53:~$
```

3. $sudo swapoff –a



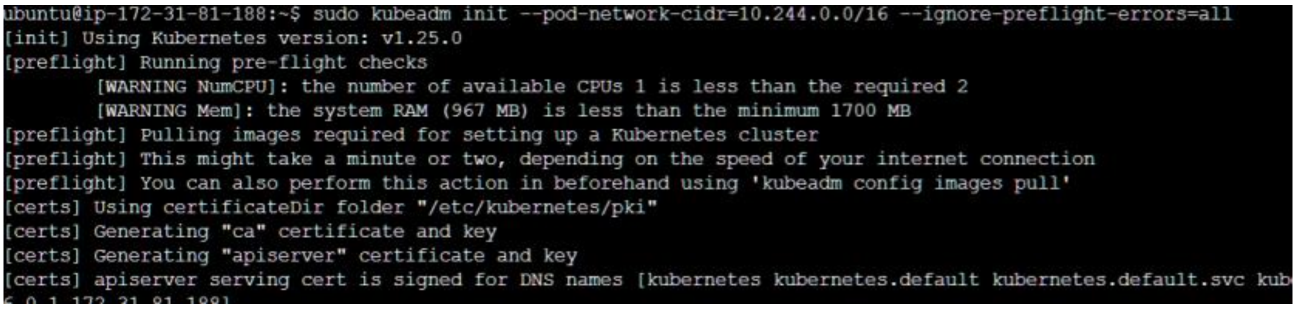
```
ubuntu@ip-172-31-22-29:~$ sudo swapoff -a
sudo sed -i '/ swap / s/^/#/' /etc/fstab
```

4. $sudo hostnamectl set-hostname

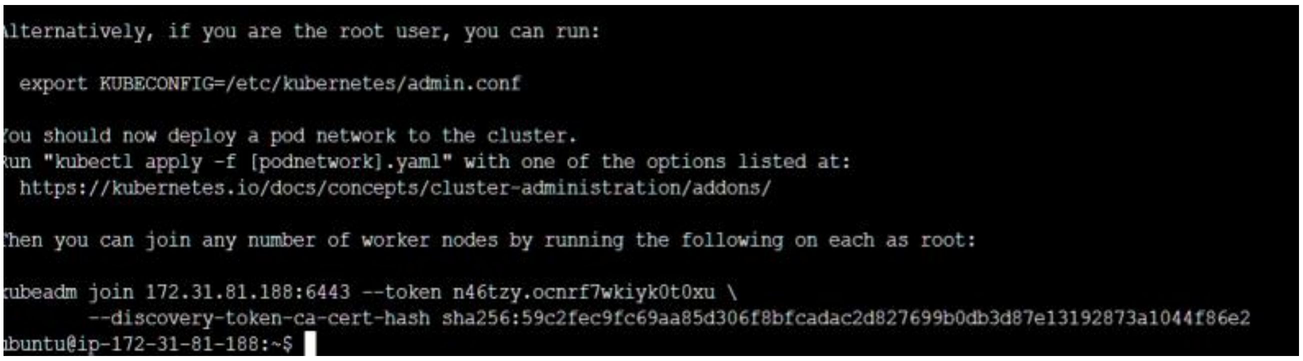


```
ubuntu@ip-172-31-23-53:~$ sudo hostnamectl set-hostname worker1
ubuntu@ip-172-31-23-53:~$
```

cat <<EOF | sudo tee /etc/sysctl.d/k8s.conf
 net.bridge.bridge-nf-call-ip6tables = 1
 net.bridge.bridge-nf-call-iptables = 1
 EOF
 sudo sysctl—system

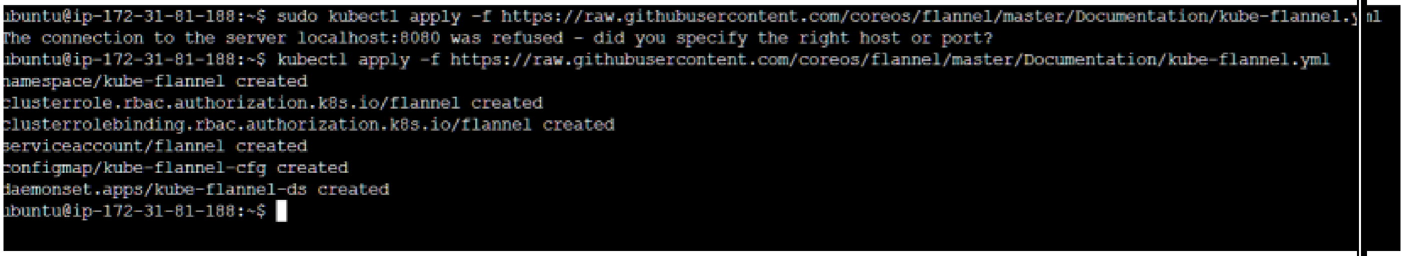


```
ubuntu@ip-172-31-81-188:~$ sudo kubeadm init --pod-network-cidr=10.244.0.0/16 --ignore-preflight-errors=all
[init] Using Kubernetes version: v1.25.0
[preflight] Running pre-flight checks
        [WARNING NumCPU]: the number of available CPUs 1 is less than the required 2
        [WARNING Mem]: the system RAM (967 MB) is less than the minimum 1700 MB
[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 in beforehand using 'kubeadm config images pull'
[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 [kubernetes kubernetes.default kubernetes.default.svc kub
```



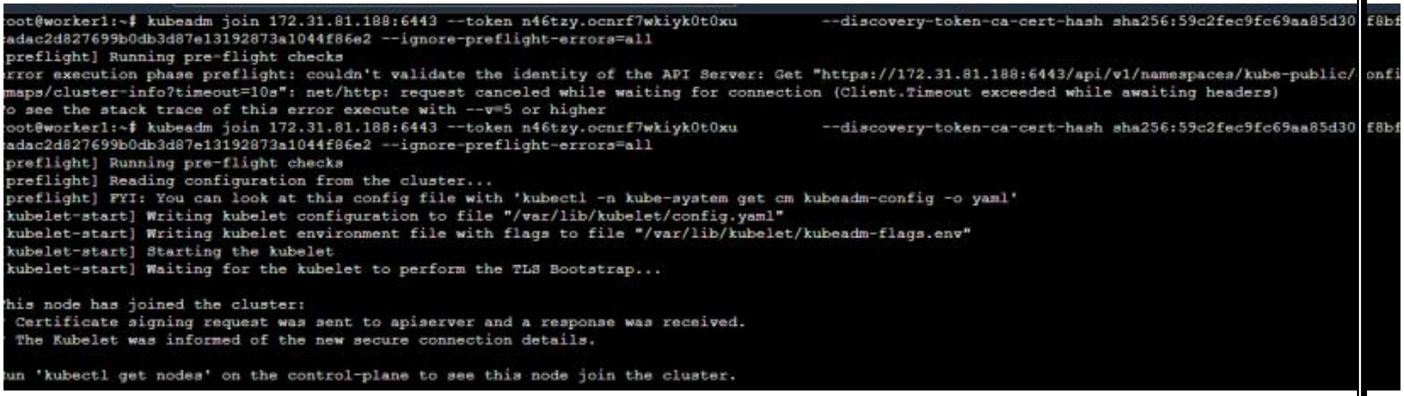
```
lternatively, if you are the root user, you can run:

 export KUBECONFIG=/etc/kubernetes/admin.conf

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

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

ubeadm join 172.31.81.188:6443 --token n46tzy.ocnrf7wkiyk0t0xu \
       --discovery-token-ca-cert-hash sha256:59c2fec9fc69aa85d306f8bfcadac2d827699b0db3d87e13192873a1044f86e2
ubuntu@ip-172-31-81-188:~$
```

Deploy Pod Network to Cluster A Pod Network is a way to allow communication between different nodes in the cluster. This tutorial uses the flannel virtual network.



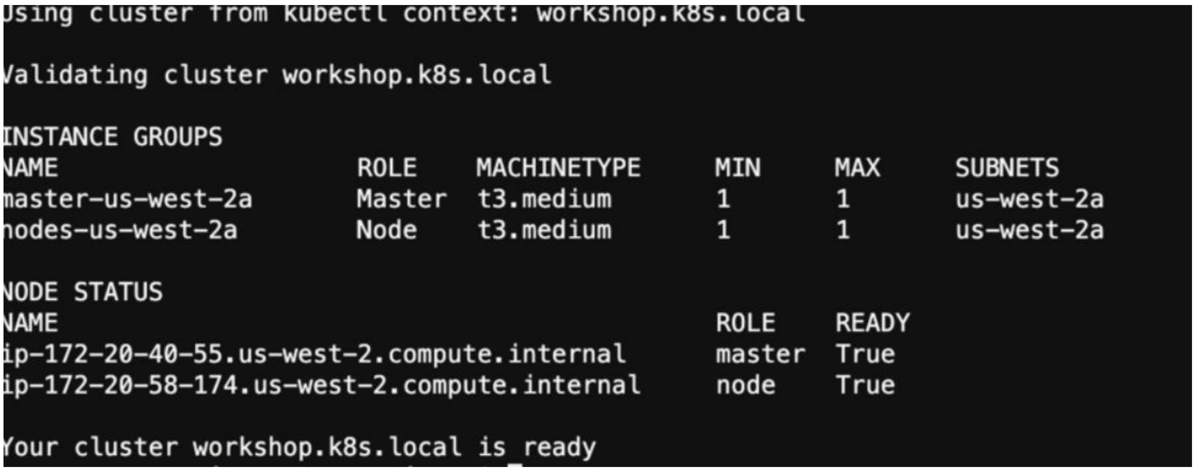
```
ubuntu@ip-172-31-81-188:~$ sudo kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/master/Documentation/kube-flannel.yml
The connection to the server localhost:8080 was refused - did you specify the right host or port?
ubuntu@ip-172-31-81-188:~$ kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/master/Documentation/kube-flannel.yml
namespace/kube-flannel created
clusterrole.rbac.authorization.k8s.io/flannel created
clusterrolebinding.rbac.authorization.k8s.io/flannel created
serviceaccount/flannel created
configmap/kube-flannel-cfg created
daemonset.apps/kube-flannel-ds created
ubuntu@ip-172-31-81-188:~$
```

Join Worker Nodes to the Cluster On the worker nodes, run the command provided by the master node during initialization . It looks something like this: sudo kubeadm join :6443--token --discovery-token-ca-cert-hash sha256:



```
oot@worker1:~# kubeadm join 172.31.81.188:6443 --token n46tzy.ocnrf7wkiyk0t0xu        --discovery-token-ca-cert-hash sha256:59c2fec9fc69aa85d30 f8bf
adac2d827699b0db3d87e13192873a1044f86e2 --ignore-preflight-errors=all
preflight] Running pre-flight checks
rror execution phase preflight: couldn't validate the identity of the API Server: Get "https://172.31.81.188:6443/api/v1/namespaces/kube-public/ onfi
maps/cluster-info?timeout=10s": net/http: request canceled while waiting for connection (Client.Timeout exceeded while awaiting headers)
o see the stack trace of this error execute with --v=5 or higher
oot@worker1:~# kubeadm join 172.31.81.188:6443 --token n46tzy.ocnrf7wkiyk0t0xu        --discovery-token-ca-cert-hash sha256:59c2fec9fc69aa85d30 f8bf
adac2d827699b0db3d87e13192873a1044f86e2 --ignore-preflight-errors=all
preflight] Running pre-flight checks
preflight] Reading configuration from the cluster...
preflight] FYI: You can look at this config file with 'kubectl -n kube-system get cm kubeadm-config -o yaml'
kubelet-start] Writing kubelet configuration to file "/var/lib/kubelet/config.yaml"
kubelet-start] Writing kubelet environment file with flags to file "/var/lib/kubelet/kubeadm-flags.env"
kubelet-start] Starting the kubelet
kubelet-start] Waiting for the kubelet to perform the TLS Bootstrap...

his node has joined the cluster:
 Certificate signing request was sent to apiserver and a response was received.
 The Kubelet was informed of the new secure connection details.

un 'kubectl get nodes' on the control-plane to see this node join the cluster.
```

Verify the Cluster



```
Using cluster from kubectl context: workshop.k8s.local

Validating cluster workshop.k8s.local

INSTANCE GROUPS
NAME                    ROLE    MACHINETYPE     MIN     MAX     SUBNETS
master-us-west-2a       Master  t3.medium       1       1       us-west-2a
nodes-us-west-2a        Node    t3.medium       1       1       us-west-2a

NODE STATUS
NAME                                            ROLE    READY
ip-172-20-40-55.us-west-2.compute.internal      master  True
ip-172-20-58-174.us-west-2.compute.internal     node    True

Your cluster workshop.k8s.local is ready
```