



# Module 6: Container Orchestration - Kubernetes



~ ABHIJIT ZENDE

1. Install and Configure Kubernetes cluster using Kubeadm on AWS



2. Create Deployment Controller Object to Deploy the Application Image Created in Docker Module and Expose it to the Internet



3. Scale-up and Scale-Down the Pods Deployed



4. Implement Rolling-Update Strategy to Upgrade the Application Image from V1.0 to V1.1



# Detailed notes & Guide on my GitHub #

[https://github.com/Abhiz2411/kubernetes-  
container-orchestration-mastery](https://github.com/Abhiz2411/kubernetes-container-orchestration-mastery)



**#On all pages with screenshot the last screenshot is first one while first is last#**

**# All screen shots are attached at end of every question's answer #**

## **1. L1 – Install and Configure Kubernetes cluster using Kubeadm on AWS.**

Ans.

### Step 1: Launch Three t2.medium Ubuntu 22.04 Instances:

1. Use AWS cloud provider to launch **three EC2 t2.medium Ubuntu 22.04 instances:**
  - a. One instance will act as the **Kubernetes Master** node.
  - b. The other two will serve as **Worker** nodes.

### Step 2: Configure all necessary Kubernetes tools:

1. Install and Configure all necessary Kubernetes tools like **kubeadm**, **kubelet**, **kubectl**, etc on all three nodes(Kubernetes Maste node\*1 + Kubernetes Worker node\*2)
2. You can do above by following the official Kubernetes documentation  
<https://kubernetes.io/docs/tasks/tools/>
3. For guided tour of installation you can follow below link:  
[https://github.com/SA-AWS-DevOps-July24/Training\\_Documents/blob/main/Kubernetes/Kubernetes\\_Installation\\_Config.txt](https://github.com/SA-AWS-DevOps-July24/Training_Documents/blob/main/Kubernetes/Kubernetes_Installation_Config.txt)

#### **a. Preliminary Steps on All Nodes (Master and Workers)**

##### **i. Update System and Set Hostnames**

```

```
sudo apt update -y
sudo hostnamectl set-hostname <node-name>
reboot
````
```

##### **ii. Disable Swap**

```

```
sudo swapoff -a
sudo sed -i '/ swap / s/^(\.*$)#/1/g' /etc/fstab
````
```

##### **iii. Install Docker and Containerd**

```

```
sudo apt install docker.io -y
sudo modprobe overlay br_netfilter
sudo tee /etc/modules-load.d/containerd.conf <<EOF
overlay
br_netfilter
EOF
sudo tee /etc/sysctl.d/kubernetes.conf <<EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF
sudo sysctl --system
sudo apt install -y apt-transport-https curl
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 update -y
sudo apt install -y containerd.io
sudo mkdir -p /etc/containerd
sudo containerd config default | sudo tee /etc/containerd/config.toml
sudo systemctl restart containerd
```
```

#### iv. Install Kubernetes Components

```
sudo mkdir -p -m 755 /etc/apt/keyrings
curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.29/deb/Release.key
| sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg
echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.29/deb/ /' | sudo tee /etc/apt/sources.list.d/kubernetes.list
sudo apt-get update
```

```
sudo apt-get install -y kubelet kubeadm kubectl  
sudo systemctl enable kubelet  
```
```

## b. On Master node:

### i. Initialize Kubernetes Cluster

```
```
```

```
sudo kubeadm config images pull  
sudo kubeadm init --pod-network-cidr=10.244.0.0/16  
mkdir -p $HOME/.kube  
sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config  
sudo chown $(id -u):$(id -g) $HOME/.kube/config  
```
```

### ii. Deploy Network Plugin

```
```
```

```
kubectl apply -f  
https://github.com/coreos/flannel/raw/master/Documentation/ku  
be-flannel.yml  
kubectl get nodes  
kubectl get pods --all-namespaces  
```
```

### iii. Generate Join Command

```
```
```

```
kubeadm token create --print-join-command  
```
```

## c. On Worker Nodes

### i. Join Cluster

```
```
```

```
kubeadm join <master-ip>:6443 --token <token> --discovery-  
token-ca-cert-hash <hash>  
```
```

### ii. Verify Node Status (From Master)

```
```
```

```
kubectl get nodes  
```
```

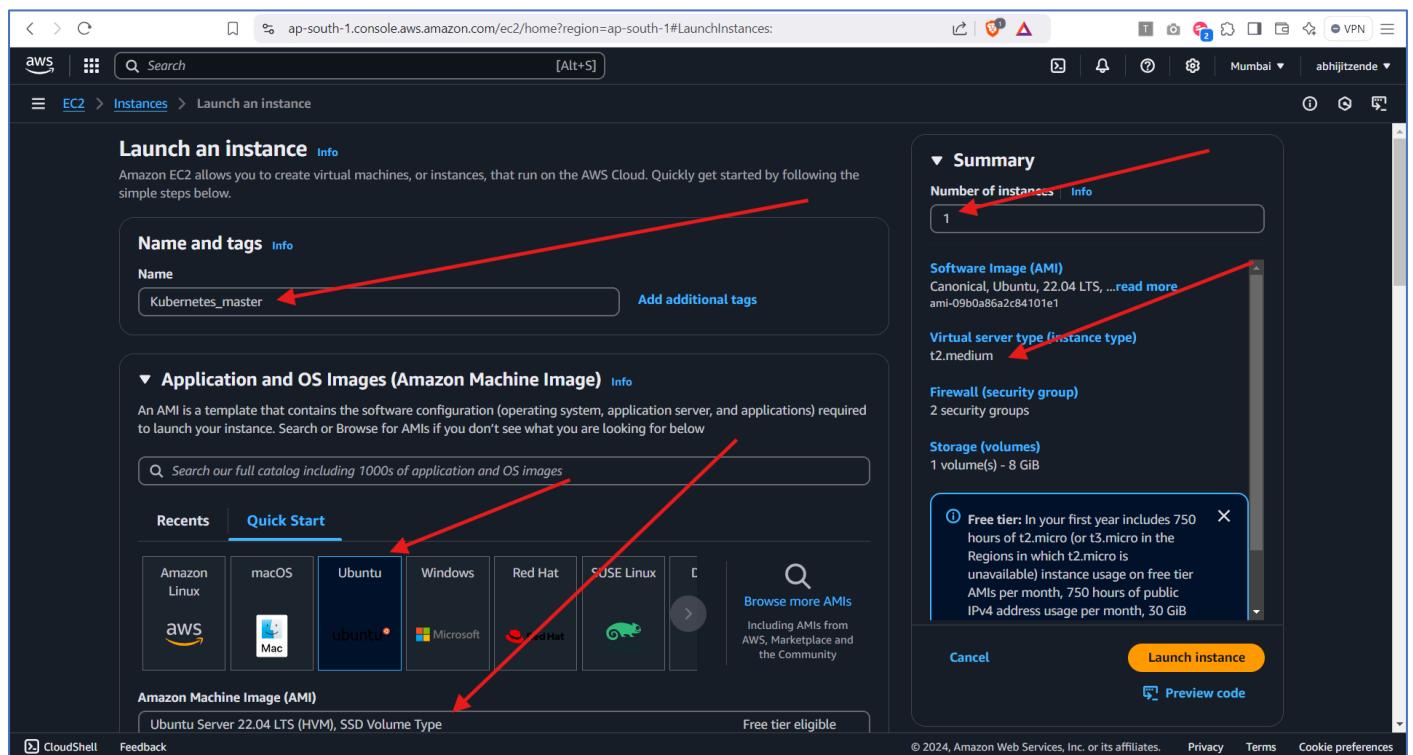
## d. Final Steps (Optional)

### i. Label worker nodes from the master:

```

```
kubectl label node <worker-node-name> node-role.kubernetes.io/worker=worker
```

```



Screenshot of the AWS EC2 Launch Instances page. The instance configuration includes:

- Architecture:** 64-bit (x86)
- AMI ID:** ami-09b0a86a2c84101e1
- Username:** ubuntu (Verified provider)

**Instance type:** t2.medium (Family: t2, 2 vCPU, 4 GiB Memory, Current generation: true)  
On-Demand Linux base pricing: 0.0496 USD per Hour  
On-Demand Ubuntu Pro base pricing: 0.0531 USD per Hour  
On-Demand Windows base pricing: 0.0676 USD per Hour  
On-Demand RHEL base pricing: 0.0784 USD per Hour  
On-Demand SUSE base pricing: 0.1496 USD per Hour

**Key pair (login):** aws\_instance\_safe\_key\_pair (Key pair name - required)

**Summary:** Number of instances: 1

**Software Image (AMI):** Canonical, Ubuntu, 22.04 LTS, ...read more

**Virtual server type (instance type):** t2.medium

**Firewall (security group):** 2 security groups

**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, 30 GiB

**Buttons:** Cancel, Launch instance, Preview code

Screenshot of the AWS EC2 Launch Instances page. The instance configuration includes:

**Key pair name - required:** aws\_instance\_safe\_key\_pair

**Network settings:**

- Network:** vpc-067c947592b5dacbe
- Subnet:** No preference (Default subnet in any availability zone)
- Auto-assign public IP:** Info
- Additional charges apply:** when outside of free tier allowance
- Firewall (security groups):** Info
- A security group is a set of firewall rules that control the traffic for your instance. Create rules to allow specific traffic to reach your instance.

**Common security groups:** Info

- Select security groups: MyKubernetesMasterSecurityGroup sg-000a45bcd2fb4fd25 (selected), MySSHSecurityGroup sg-096ee8a1bc2bd54d6 (selected)
- Create security group
- Select existing security group

**Summary:** Number of instances: 1

**Software Image (AMI):** Canonical, Ubuntu, 22.04 LTS, ...read more

**Virtual server type (instance type):** t2.medium

**Firewall (security group):** 2 security groups

**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, 30 GiB

**Buttons:** Cancel, Launch instance, Preview code

Screenshot of the AWS EC2 Instances Launch wizard, Step 3: Configure storage.

**Configure storage**

- Root volume (Encrypted): 1x 8 GiB gp2
- Free tier eligible customers can get up to 30 GB of EBS General Purpose (SSD) or Magnetic storage.
- Click refresh to view backup information.
- File systems: 0 x File systems.

**Advanced**

**Summary**

Number of instances: 1

Software Image (AMI): Canonical, Ubuntu, 22.04 LTS, ami-09b0a86a2c84101e1

Virtual server type (instance type): t2.medium

Firewall (security group): 2 security groups

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, 30 GiB

Launch instance

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Screenshot of the AWS EC2 Instances Launch wizard, Step 4: Launch an instance.

**Launch an instance**

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**

Name: e.g. My Web Server

**Application and OS Images (Amazon Machine Image)**

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.

Search our full catalog including 1000s of application and OS images

Recent AMIs: Amazon Linux, macOS, Ubuntu, Windows, Red Hat, SUSE Linux, AWS

Quick Start AMIs: Ubuntu (selected), Windows, Red Hat, SUSE Linux, More >

Browse more AMIs

Amazon Machine Image (AMI): Ubuntu Server 22.04 LTS (HVM), SSD Volume Type

Free tier eligible

**Summary**

Number of instances: 2

When launching more than 1 instance, consider EC2 Auto Scaling

Software Image (AMI): Canonical, Ubuntu, 22.04 LTS, ami-09b0a86a2c84101e1

Virtual server type (instance type): t2.medium

Firewall (security group): 2 security groups

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, 30 GiB

Launch instance

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The screenshot shows the 'Launch an instance' wizard on the AWS EC2 console. In the 'Key pair (login)' section, a key pair named 'aws\_instance\_safe\_key\_pair' is selected. A red arrow points from this selection to the 'Network settings' section below. In the 'Network settings' section, there are tabs for 'Network' (selected) and 'Subnet'. Under 'Network', a VPC and subnet are chosen. Under 'Auto-assign public IP', 'Enable' is selected. A note about additional charges applies when outside of free tier allowance. Below this, there are buttons for 'Create security group' and 'Select existing security group', with 'Select existing security group' being highlighted by a red arrow. The right side of the screen displays a summary of the instance configuration, including the number of instances (2), software image (Canonical, Ubuntu, 22.04 LTS), virtual server type (t2.medium), and storage (1 volume(s) - 8 GiB). A tooltip for the free tier is shown, and at the bottom are 'Cancel', 'Launch instance', and 'Preview code' buttons.

The screenshot shows the 'Launch an instance' wizard on the AWS EC2 console. In the 'Amazon Machine Image (AMI)' section, an AMI for 'Ubuntu Server 22.04 LTS (HVM), SSD Volume Type' is selected. A red arrow points from this selection to the 'Instance type' section below. In the 'Instance type' section, the 't2.medium' instance type is selected. A red arrow points from this selection to the 'Summary' section on the right. The 'Summary' section displays the same configuration as the previous screenshot, including the number of instances (2), software image (Canonical, Ubuntu, 22.04 LTS), virtual server type (t2.medium), and storage (1 volume(s) - 8 GiB). A tooltip for the free tier is shown, and at the bottom are 'Cancel', 'Launch instance', and 'Preview code' buttons.

Screenshot of the AWS EC2 Instances page showing three running instances:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
i-06e3c377b18b2f0d5	i-06e3c377b18b2f0d5	Running	t2.medium	Initializing	<a href="#">View alarms</a>	ap-south-1a
i-0281f57ea493a9e64	i-0281f57ea493a9e64	Running	t2.medium	Initializing	<a href="#">View alarms</a>	ap-south-1a
Kubernetes_master	i-09c0eda9439eab117	Running	t2.medium	2/2 checks passed	<a href="#">View alarms</a>	ap-south-1a

The sidebar shows navigation links for Dashboard, EC2 Global View, Events, Instances (selected), Instance Types, Launch Templates, Spot Requests, Savings Plans, Reserved Instances, Dedicated Hosts, Capacity Reservations, Images (AMIs, AMI Catalog), Elastic Block Store (Volumes, Snapshots, Lifecycle Manager), and Network & Security (Security Groups, Elastic IPs). The bottom of the page includes CloudShell, Feedback, and copyright information.

Screenshot of the AWS EC2 Instances page showing two instances selected for monitoring:

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
Kubernetes_worker_node_1	i-06e3c377b18b2f0d5	Running	t2.medium	Initializing	<a href="#">View alarms</a>	ap-south-1a
Kubernetes_worker_node_2	i-0281f57ea493a9e64	Running	t2.medium	Initializing	<a href="#">View alarms</a>	ap-south-1a
Kubernetes_master	i-09c0eda9439eab117	Running	t2.medium	2/2 checks passed	<a href="#">View alarms</a>	ap-south-1a

Two red arrows point from the instance names "Kubernetes\_worker\_node\_1" and "Kubernetes\_worker\_node\_2" to the selection checkboxes in the table header. The message "2 instances selected" is displayed below the table. The Monitoring section is active, showing CPU utilization (%), Network in (bytes), Network out (bytes), and Network packets in (cou...). The bottom of the page includes CloudShell, Feedback, and copyright information.

Screenshot of the AWS EC2 Security Groups page showing the Inbound rules for the security group "sg-09d63d323ab0e74d8 - MyKubernetesWorkerNodeGroup".

The Inbound rules table has the following data:

Name	Security group rule ID	IP version	Type	Protocol	Port range	Source
-	sgr-0c9a1cc4bdccc3e	IPv4	Custom UDP	UDP	8472	0.0.0.0/0
-	sgr-02396c8ba5233393f	IPv4	Custom TCP	TCP	10250	0.0.0.0/0
-	sgr-0f51d7e5545ae8480	IPv4	Custom TCP	TCP	6783 - 6784	0.0.0.0/0
-	sgr-08067cf8e286e4558	IPv4	DNS (TCP)	TCP	53	0.0.0.0/0
-	sgr-02a4f0737f46e9f68	IPv4	Custom TCP	TCP	30000 - 32767	0.0.0.0/0

Screenshot of the AWS EC2 Security Groups page showing the Inbound rules for the security group "sg-000a45bcd2fb4fd25 - MyKubernetesMasterSecurityGroup".

The Inbound rules table has the following data:

Name	Security group rule ID	IP version	Type	Protocol	Port range	Source
-	sgr-0fe16f4bf8f3aa79	IPv4	Custom TCP	TCP	6783 - 6784	0.0.0.0/0
-	sgr-0160e47e20c995909	IPv4	Custom UDP	UDP	8472	0.0.0.0/0
-	sgr-0a706d275db80934	IPv4	Custom TCP	TCP	10250 - 10259	0.0.0.0/0
-	sgr-006391cb8669d2baf	IPv4	Custom TCP	TCP	2379 - 2380	0.0.0.0/0
-	sgr-0271fe639894f7b77	IPv4	DNS (TCP)	TCP	53	0.0.0.0/0
-	sgr-005bb1716ea013f3e	IPv4	Custom TCP	TCP	6443	0.0.0.0/0

Screenshot of the AWS EC2 Instances page showing three running instances: Kubernetes\_worker\_node\_1, Kubernetes\_worker\_node\_2, and Kubernetes\_master. A red arrow points from the instance name 'Kubernetes\_worker\_node\_1' to its Public IPv4 address '13.233.236.216'. Another red arrow points from the instance name 'Kubernetes\_master' to its Public IPv4 address '13.233.236.216'.

**Instances (1/3) Info**

Last updated 1 minute ago | Connect | Instance state | Actions | Launch instances

Instance state = running | Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Z.
Kubernetes_worker_node_1	i-06e3c377b18b2f0d5	Running	t2.medium	2/2 checks passed	View alarms +	ap-south-1a
Kubernetes_worker_node_2	i-0281f57ea493a9e64	Running	t2.medium	2/2 checks passed	View alarms +	ap-south-1a
Kubernetes_master	i-09c0eda9439eab117	Running	t2.medium	2/2 checks passed	View alarms +	ap-south-1a

**i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)**

Details Status and alarms Monitoring Security Networking Storage Tags

Instance summary

Instance ID: i-06e3c377b18b2f0d5  
Public IPv4 address: 13.233.236.216 | open address  
IPv6 address: -  
Instance state: Running  
Private IPv4 addresses: 172.31.35.80  
Public IPv4 DNS: ec2-13-233-236-216.ap-south-1.compute.amazonaws.com | open address

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Screenshot of the AWS EC2 Instances page showing three running instances: Kubernetes\_worker\_node\_1, Kubernetes\_worker\_node\_2, and Kubernetes\_master. A red arrow points from the instance name 'Kubernetes\_master' to its Public IPv4 address '15.206.169.47'. Another red arrow points from the instance name 'Kubernetes\_master' to its Public IPv4 address '15.206.169.47'.

**Instances (1/3) Info**

Last updated less than a minute ago | Connect | Instance state | Actions | Launch instances

Instance state = running | Clear filters

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Z.
Kubernetes_worker_node_1	i-06e3c377b18b2f0d5	Running	t2.medium	2/2 checks passed	View alarms +	ap-south-1a
Kubernetes_worker_node_2	i-0281f57ea493a9e64	Running	t2.medium	2/2 checks passed	View alarms +	ap-south-1a
Kubernetes_master	i-09c0eda9439eab117	Running	t2.medium	2/2 checks passed	View alarms +	ap-south-1a

**i-09c0eda9439eab117 (Kubernetes\_master)**

Details Status and alarms Monitoring Security Networking Storage Tags

Instance summary

Instance ID: i-09c0eda9439eab117  
Public IPv4 address: 15.206.169.47 | open address  
IPv6 address: -  
Instance state: Running  
Private IPv4 addresses: 172.31.33.46  
Public IPv4 DNS: ec2-15-206-169-47.ap-south-1.compute.amazonaws.com | open address

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System information as of Thu Nov 28 18:54:17 UTC 2024

```

System load: 0.0          Processes:           108
Usage of /: 21.1% of 7.57GB  Users logged in: 0
Memory usage: 5%          IPv4 address for eth0: 172.31.33.46
Swap usage: 0%            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

The list of available updates is more than a week old.  
To check for new updates run: sudo apt update

The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/\*copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo\_root" for details.

ubuntu@ip-172-31-33-46:~\$

**i-09c0eda9439eab117 (Kubernetes\_master)**

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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Instances (1/3) [Info](#) Last updated 2 minutes ago [Connect](#) [Instance state](#) [Actions](#) [Launch instances](#)

[Find Instance by attribute or tag \(case-sensitive\)](#) [All states](#)

Instance state = running	<a href="#">Clear filters</a>							
Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Z.		
Kubernetes_worker_node_1	i-06e3c377b18b2f0d5	<span>Running</span>	t2.medium	<span>2/2 checks passed</span>	<a href="#">View alarms +</a>	ap-south-1a		
<b>Kubernetes_worker_node_2</b>	<b>i-0281f57ea493a9e64</b>	<span>Running</span>	t2.medium	<span>2/2 checks passed</span>	<a href="#">View alarms +</a>	ap-south-1a		
Kubernetes_master	i-09c0eda9439eab117	<span>Running</span>	t2.medium	<span>2/2 checks passed</span>	<a href="#">View alarms +</a>	ap-south-1a		

**i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)**

[Details](#) [Status and alarms](#) [Monitoring](#) [Security](#) [Networking](#) [Storage](#) [Tags](#)

**Instance summary** [Info](#)

Instance ID	<a href="#">i-0281f57ea493a9e64</a>	Public IPv4 address	<a href="#">13.233.237.177   open address</a>	Private IPv4 addresses	<a href="#">172.31.33.33</a>
IPv6 address	-	Instance state	<span>Running</span>	Public IPv4 DNS	<a href="#">ec2-13-233-237-177.ap-south-1.compute.amazonaws.com   open address</a>

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System information as of Thu Nov 28 18:54:56 UTC 2024

```
System load: 0.0      Processes:          108
Usage of /: 21.1% of 7.57GB  Users logged in:    0
Memory usage: 5%      IPv4 address for eth0: 172.31.33.33
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  
  
The list of available updates is more than a week old.  
To check for new updates run: sudo apt update  
  
The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*copyright.  
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
ubuntu@ip-172-31-33-33:~$
```

**i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)**

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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```
Memory usage: 5%      IPV4 address for eth0: 172.31.35.80
Swap usage:  0%  
* Ubuntu Pro delivers the most comprehensive open source security and  
compliance features.  
https://ubuntu.com/aws/pro  
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  
  
The list of available updates is more than a week old.  
To check for new updates run: sudo apt update  
  
The programs included with the Ubuntu system are free software;  
the exact distribution terms for each program are described in the  
individual files in /usr/share/doc/*copyright.  
Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by  
applicable law.  
To run a command as administrator (user "root"), use "sudo <command>".  
See "man sudo_root" for details.  
ubuntu@ip-172-31-35-80:~$
```

**i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)**

Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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ubuntu@ip-172-31-33-46:~\$ sudo -i  
apt update -y

Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease  
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]  
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]  
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [14.1 MB]  
Get:5 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]  
Get:6 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe Translation-en [5652 kB]  
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f Metadata [286 kB]  
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]  
Get:9 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [112 kB]  
Get:10 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 c-n-f Metadata [8372 B]  
Get:11 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [2179 kB]  
Get:12 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [372 kB]  
Get:13 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 c-n-f Metadata [17.9 kB]  
Get:14 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [2680 kB]  
Get:15 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [466 kB]  
Get:16 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 c-n-f Metadata [612 B]  
Get:17 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1178 kB]  
Get:18 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [287 kB]  
Get:19 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [26.4 kB]  
Get:20 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [43.6 kB]  
Get:21 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [11.4 kB]  
Get:22 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 c-n-f Metadata [440 B]  
Get:23 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [67.7 kB]  
Get:24 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main Translation-en [11.1 kB]  
Get:25 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 c-n-f Metadata [388 B]  
Get:26 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 c-n-f Metadata [116 B]  
Get:27 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [28.9 kB]  
Get:28 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [16.5 kB]

i-09c0eda9439eab117 (Kubernetes\_master)

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

ubuntu@ip-172-31-35-80:~\$ sudo -i  
root@ip-172-31-35-80:~# apt update -y

Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease  
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]  
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]  
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [14.1 MB]  
Get:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe Translation-en [5652 kB]  
Get:6 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]  
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f Metadata [286 kB]  
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]  
Get:9 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [112 kB]  
Get:10 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 c-n-f Metadata [8372 B]  
Get:11 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [2179 kB]  
Get:12 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [372 kB]  
Get:13 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 c-n-f Metadata [17.9 kB]  
Get:14 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [2680 kB]  
Get:15 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [466 kB]  
Get:16 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 c-n-f Metadata [612 B]  
Get:17 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1178 kB]  
Get:18 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [287 kB]  
Get:19 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [26.4 kB]  
Get:20 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [43.6 kB]  
Get:21 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [11.4 kB]  
Get:22 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 c-n-f Metadata [440 B]  
Get:23 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [67.7 kB]  
Get:24 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main Translation-en [11.1 kB]  
Get:25 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 c-n-f Metadata [388 B]  
Get:26 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 c-n-f Metadata [116 B]  
Get:27 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [28.9 kB]  
Get:28 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [16.5 kB]  
Get:29 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 c-n-f Metadata [672 B]

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)

Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

ubuntu@ip-172-31-33-46:~\$ sudo hostnamectl set-hostname "kmaster-node"  
ubuntu@ip-172-31-33-46:~\$ exec bash  
ubuntu@kmaster-node:~\$ reboot  
Failed to set wall message, ignoring: Interactive authentication required.  
Failed to reboot system via logind: Interactive authentication required.  
Failed to open initctl fifo: Permission denied  
Failed to talk to init daemon.  
ubuntu@kmaster-node:~\$

A red arrow points from the command "exec bash" to the error message "Interactive authentication required". Another red arrow points from the error message to the command "reboot".

i-09c0eda9439eb117 (Kubernetes\_master)

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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ubuntu@ip-172-31-33-33:~\$ sudo -i  
root@ip-172-31-33-33:~# apt update -y  
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease  
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]  
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease [127 kB]  
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 Packages [14.1 MB]  
Get:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe Translation-en [5652 kB]  
Get:6 http://security.ubuntu.com/ubuntu jammy-security InRelease [129 kB]  
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 c-n-f Metadata [286 kB]  
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 Packages [217 kB]  
Get:9 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse Translation-en [112 kB]  
Get:10 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/multiverse amd64 c-n-f Metadata [8372 B]  
Get:11 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [2179 kB]  
Get:12 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main Translation-en [372 kB]  
Get:13 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 c-n-f Metadata [17.9 kB]  
Get:14 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 Packages [2680 kB]  
Get:15 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted Translation-en [466 kB]  
Get:16 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/restricted amd64 c-n-f Metadata [612 B]  
Get:17 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [1178 kB]  
Get:18 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe Translation-en [287 kB]  
Get:19 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 c-n-f Metadata [26.4 kB]  
Get:20 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 Packages [43.6 kB]  
Get:21 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse Translation-en [11.4 kB]  
Get:22 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/multiverse amd64 c-n-f Metadata [440 B]  
Get:23 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 Packages [67.7 kB]  
Get:24 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main Translation-en [11.1 kB]  
Get:25 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/main amd64 c-n-f Metadata [388 B]  
Get:26 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/restricted amd64 c-n-f Metadata [116 B]  
Get:27 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 Packages [28.9 kB]  
Get:28 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe Translation-en [16.5 kB]  
Get:29 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports/universe amd64 c-n-f Metadata [672 B]

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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root@ip-172-31-33-33:~# sudo hostnamectl set-hostname "worker-node2"  
root@ip-172-31-33-33:~# exec bash  
root@worker-node2:~# reboot

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)  
Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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root@ip-172-31-35-80:~# sudo hostnamectl set-hostname "worker-node1"  
root@ip-172-31-35-80:~# exec bash  
root@worker-node1:~# reboot

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)  
Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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aws | Search [Alt+S] Mumbai abhijitzende

```
root@worker-node1:~# sudo swapoff -a
root@worker-node1:~# sudo sed -i '/ swap / s/^(\.*\)$/#\1/g' /etc/fstab
root@worker-node1:~#
```

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)  
Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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aws | Search [Alt+S] Mumbai abhijitzende

```
root@kmaster-node:~# sudo swapoff -a ←
root@kmaster-node:~# sudo sed -i '/ swap / s/^(\.*\)$/#\1/g' /etc/fstab ←
root@kmaster-node:~#
```

i-09c0eda9439eb117 (Kubernetes\_master)  
Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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root@kmaster-node:~# sudo swapoff -a  
root@kmaster-node:~# sudo sed -i '/ swap / s/^(\.\*\)\$/#\1/g' /etc/fstab  
root@kmaster-node:~# apt install docker.io -y ←  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
bridge-utils containerd dns-root-data dnsmasq-base pigz runc ubuntu-fan  
Suggested packages:  
ifupdown aufs-tools cgroupfs-mount | cgroup-lite debootstrap docker-doc rinse zfs-fuse | zfsutils  
The following NEW packages will be installed:  
bridge-utils containerd dns-root-data dnsmasq-base docker.io pigz runc ubuntu-fan  
0 upgraded, 8 newly installed, 0 to remove and 30 not upgraded.  
Need to get 75.5 MB of archives.  
After this operation, 284 MB of additional disk space will be used.  
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 pigz amd64 2.6-1 [63.6 kB]  
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 bridge-utils amd64 1.7-lubuntu3 [34.4 kB]  
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 runc amd64 1.1.12-0ubuntu2-22.04.1 [8405 kB]  
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 containerd amd64 1.7.12-0ubuntu2~22.04.1 [37.8 MB]  
Get:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dns-root-data all 2023112702-ubuntu0.22.04.1 [5136 B]  
Get:6 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dnsmasq-base amd64 2.90-0ubuntu0.22.04.1 [374 kB]  
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 docker.io amd64 24.0.7-0ubuntu2-22.04.1 [28.6 MB]  
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 ubuntu-fan all 0.12.16 [35.2 kB]  
Fetched 75.5 MB in 1s (88.6 MB/s)  
Preconfiguring packages ...  
Selecting previously unselected package pigz.  
(Reading database ... 65783 files and directories currently installed.)  
Preparing to unpack .../0-pigz\_2.6-1\_amd64.deb ...  
Unpacking pigz (2.6-1) ...  
Selecting previously unselected package bridge-utils.  
Preparing to unpack .../1-bridge-utils\_1.7-1ubuntu3\_amd64.deb ...

**i-09c0eda9439eab117 (Kubernetes\_master)**

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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root@worker-node2:~# sudo swapoff -a  
root@worker-node2:~# sudo sed -i '/ swap / s/^(\.\*\)\$/#\1/g' /etc/fstab  
root@worker-node2:~#

**i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)**

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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```
root@worker-node2:~# apt install docker.io -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
bridge-utils containerd dns-root-data dnsmasq-base pigz runc ubuntu-fan
Suggested packages:
ifupdown aufs-tools cgroupfs-mount | cgroup-lite debootstrap docker-doc rinse zfs-fuse | zfsutils
The following NEW packages will be installed:
bridge-utils containerd dns-root-data dnsmasq-base docker.io pigz runc ubuntu-fan
0 upgraded, 8 newly installed, 0 to remove and 30 not upgraded.
Need to get 75.5 MB of archives.
After this operation, 284 MB of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 pigz amd64 2.6-1 [63.6 kB]
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 bridge-utils amd64 1.7-lubuntu3 [34.4 kB]
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 runc amd64 1.1.12-0ubuntu2-22.04.1 [8405 kB]
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 containerd amd64 1.7.12-0ubuntu2-22.04.1 [37.8 MB]
Get:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dns-root-data all 2023112702-ubuntu0.22.04.1 [5136 B]
Get:6 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dnsmasq-base amd64 2.90-0ubuntu0.22.04.1 [374 kB]
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 docker.io amd64 24.0.7-0ubuntu2-22.04.1 [28.8 MB]
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 ubuntu-fan all 0.12.16 [35.2 kB]
Fetched 75.5 MB in 1s (90.0 MB/s)
Preconfiguring packages ...
Selecting previously unselected package pigz.
(Reading database ... 65783 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1) ...
Selecting previously unselected package bridge-utils.
Preparing to unpack .../1-bridge-utils_1.7-lubuntu3_amd64.deb ...
Unpacking bridge-utils (1.7-1ubuntu3) ...
Selecting previously unselected package runc.

```

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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```
root@worker-node1:~# apt install docker.io -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
bridge-utils containerd dns-root-data dnsmasq-base pigz runc ubuntu-fan
Suggested packages:
ifupdown aufs-tools cgroupfs-mount | cgroup-lite debootstrap docker-doc rinse zfs-fuse | zfsutils
The following NEW packages will be installed:
bridge-utils containerd dns-root-data dnsmasq-base docker.io pigz runc ubuntu-fan
0 upgraded, 8 newly installed, 0 to remove and 30 not upgraded.
Need to get 75.5 MB of archives.
After this operation, 284 MB of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 pigz amd64 2.6-1 [63.6 kB]
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 bridge-utils amd64 1.7-lubuntu3 [34.4 kB]
Get:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 runc amd64 1.1.12-0ubuntu2-22.04.1 [8405 kB]
Get:4 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 containerd amd64 1.7.12-0ubuntu2-22.04.1 [37.8 MB]
Get:5 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dns-root-data all 2023112702-ubuntu0.22.04.1 [5136 B]
Get:6 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 dnsmasq-base amd64 2.90-0ubuntu0.22.04.1 [374 kB]
Get:7 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 docker.io amd64 24.0.7-0ubuntu2-22.04.1 [28.8 MB]
Get:8 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/universe amd64 ubuntu-fan all 0.12.16 [35.2 kB]
Fetched 75.5 MB in 1s (88.7 MB/s)
Preconfiguring packages ...
Selecting previously unselected package pigz.
(Reading database ... 65783 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.6-1_amd64.deb ...
Unpacking pigz (2.6-1) ...
Selecting previously unselected package bridge-utils.
Preparing to unpack .../1-bridge-utils_1.7-lubuntu3_amd64.deb ...
Unpacking bridge-utils (1.7-1ubuntu3) ...
Selecting previously unselected package runc.

```

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)

Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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Created symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /lib/systemd/system/containerd.service.  
Setting up ubuntu-fan (0.12.16) ...  
Created symlink /etc/systemd/system/multi-user.target.wants/ubuntu-fan.service → /lib/systemd/system/ubuntu-fan.service.  
Setting up docker.io (24.0.7-0ubuntu2-22.04.1) ...  
Adding group 'docker' (GID 122) ...  
Done.  
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /lib/systemd/system/docker.service.  
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /lib/systemd/system/docker.socket.  
Processing triggers for dbus (1.12.20-2ubuntu4.1) ...  
Processing triggers for man-db (2.10.2-1) ...  
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.  
root@worker-node1:~# sudo modprobe overlay  
root@worker-node1:~# sudo modprobe br\_netfilter  
root@worker-node1:~# cat <<EOF | sudo tee /etc/modules-load.d/containerd.conf  
overlay  
br\_netfilter  
EOF  
overlay  
br\_netfilter  
root@worker-node1:~#

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)  
PublicIPs: 13.233.236.216 PrivateIPs: 172.31.35.80

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root@kmaster-node:~# sudo modprobe overlay  
root@kmaster-node:~# sudo modprobe br\_netfilter  
root@kmaster-node:~# cat <<EOF | sudo tee /etc/modules-load.d/containerd.conf  
overlay  
br\_netfilter  
EOF  
overlay  
br\_netfilter  
root@kmaster-node:~#

i-09c0eda9439eb117 (Kubernetes\_master)  
PublicIPs: 15.206.169.47 PrivateIPs: 172.31.33.46

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```
root@worker-node1:~# sudo tee /etc/sysctl.d/kubernetes.conf<<EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
root@worker-node1:~#
```

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)  
Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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```
root@kmaster-node:~# sudo modprobe overlay
root@kmaster-node:~# sudo modprobe br_netfilter
root@kmaster-node:~# cat <<EOF | sudo tee /etc/modules-load.d/containerd.conf
overlay
br_netfilter
EOF
overlay
br_netfilter
root@kmaster-node:~# sudo tee /etc/sysctl.d/kubernetes.conf<<EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
root@kmaster-node:~#
```

i-09c0eda9439eb117 (Kubernetes\_master)  
Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```
root@kmaster-node:~# sudo modprobe overlay
root@kmaster-node:~# sudo modprobe br_netfilter
root@kmaster-node:~# cat <<EOF | sudo tee /etc/modules-load.d/containerd.conf
overlay
br_netfilter
EOF
overlay
br_netfilter
root@kmaster-node:~# sudo tee /etc/sysctl.d/kubernetes.conf<<EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
root@kmaster-node:~# sudo sysctl --system
* Applying /etc/sysctl.d/10-console-messages.conf ...
kernel.printk = 4 4 1 7
* Applying /etc/sysctl.d/10-ipv6-privacy.conf ...
net.ipv6.conf.all.use_tempaddr = 2
net.ipv6.conf.default.use_tempaddr = 2
* Applying /etc/sysctl.d/10-kernel-hardening.conf ...
kernel.kptr_restrict = 1
* Applying /etc/sysctl.d/10-magic-sysrq.conf ...
kernel.sysrq = 176
* Applying /etc/sysctl.d/10-network-security.conf ...
net.ipv4.conf.default.rp_filter = 2
net.ipv4.conf.all.rp_filter = 2
* Applying /etc/sysctl.d/10-ptrace.conf ...
kernel.yama.ptrace_scope = 1

i-09c0eda9439eb117 (Kubernetes_master)
Public IPs: 15.206.169.47 Private IPs: 172.31.33.46
```

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```
root@worker-node2:~# sudo tee /etc/sysctl.d/kubernetes.conf<<EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
root@worker-node2:~#
```

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```
root@worker-node2:~# sudo tee /etc/sysctl.d/kubernetes.conf<<EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
root@worker-node2:~# sudo sysctl --system
* Applying /etc/sysctl.d/10-console-messages.conf ...
kernel.printk = 4 4 1 7
* Applying /etc/sysctl.d/10-ipv6-privacy.conf ...
net.ipv6.conf.all.use_tempaddr = 2
net.ipv6.conf.default.use_tempaddr = 2
* Applying /etc/sysctl.d/10-kernel-hardening.conf ...
kernel.kptr_restrict = 1
* Applying /etc/sysctl.d/10-magic-sysrq.conf ...
kernel.sysrq = 176
* Applying /etc/sysctl.d/10-network-security.conf ...
net.ipv4.conf.default.rp_filter = 2
net.ipv4.conf.all.rp_filter = 2
* Applying /etc/sysctl.d/10-ptrace.conf ...
kernel.yama.ptrace_scope = 1
* Applying /etc/sysctl.d/10-zero-page.conf ...
vm.mmap_min_addr = 65536
* Applying /etc/sysctl.d/50-cloudimg-settings.conf ...
net.ipv4.neigh.default.gc_thresh2 = 15360
net.ipv4.neigh.default.gc_thresh3 = 16384
net.netfilter.nf_conntrack_max = 1048576
* Applying /usr/lib/sysctl.d/50-default.conf ...
kernel.core_uses_pid = 1

i-0281f57ea493a9e64 (Kubernetes_worker_node_2)
Public IPs: 13.233.237.177 Private IPs: 172.31.33.33
```

[CloudShell](#) [Feedback](#)

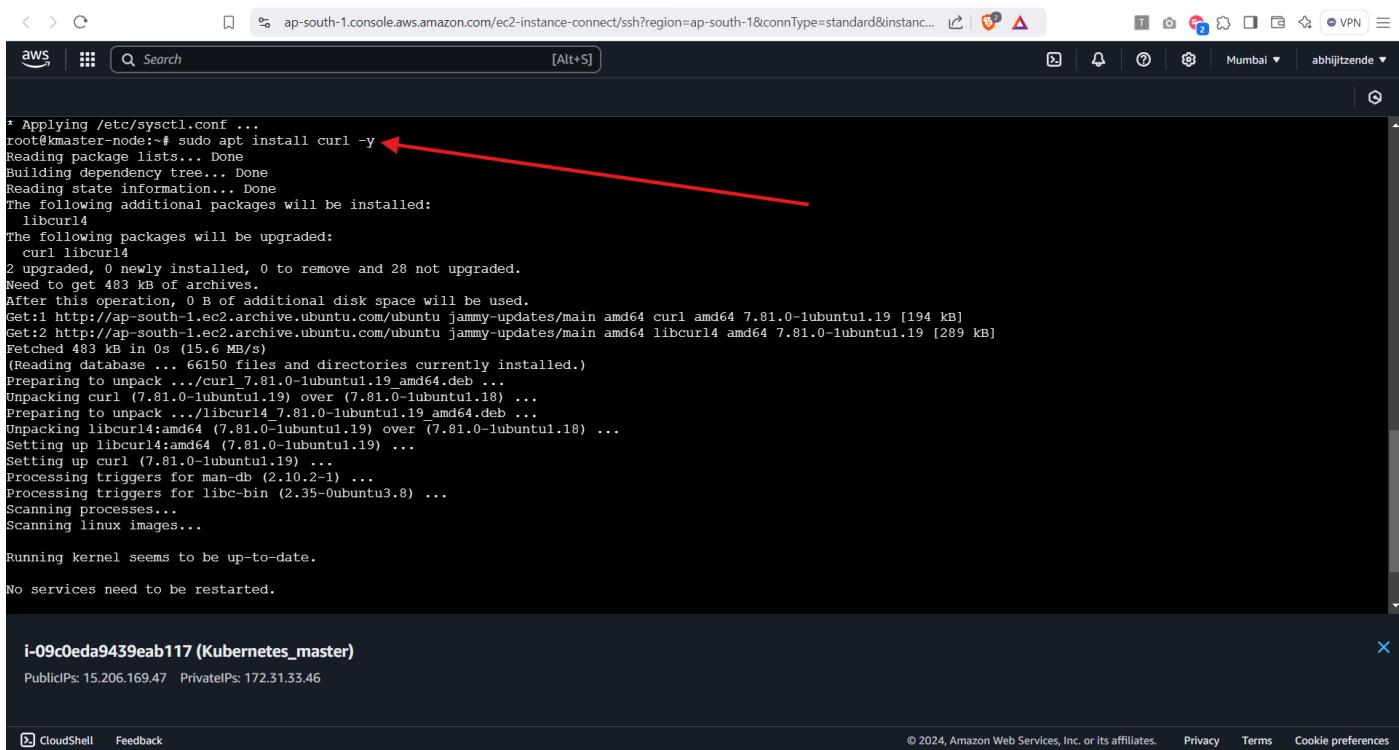
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```
root@worker-node1:~# sudo tee /etc/sysctl.d/kubernetes.conf<<EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
root@worker-node1:~# sudo sysctl --system
* Applying /etc/sysctl.d/10-console-messages.conf ...
kernel.printk = 4 4 1 7
* Applying /etc/sysctl.d/10-ipv6-privacy.conf ...
net.ipv6.conf.all.use_tempaddr = 2
net.ipv6.conf.default.use_tempaddr = 2
* Applying /etc/sysctl.d/10-kernel-hardening.conf ...
kernel.kptr_restrict = 1
* Applying /etc/sysctl.d/10-magic-sysrq.conf ...
kernel.sysrq = 176
* Applying /etc/sysctl.d/10-network-security.conf ...
net.ipv4.conf.default.rp_filter = 2
net.ipv4.conf.all.rp_filter = 2
* Applying /etc/sysctl.d/10-ptrace.conf ...
kernel.yama.ptrace_scope = 1
* Applying /etc/sysctl.d/10-zero-page.conf ...
vm.mmap_min_addr = 65536
* Applying /etc/sysctl.d/50-cloudimg-settings.conf ...
net.ipv4.neigh.default.gc_thresh2 = 15360
net.ipv4.neigh.default.gc_thresh3 = 16384
net.netfilter.nf_conntrack_max = 1048576
* Applying /usr/lib/sysctl.d/50-default.conf ...
kernel.core_uses_pid = 1

i-06e3c377b18b2f0d5 (Kubernetes_worker_node_1)
Public IPs: 13.233.236.216 Private IPs: 172.31.35.80
```

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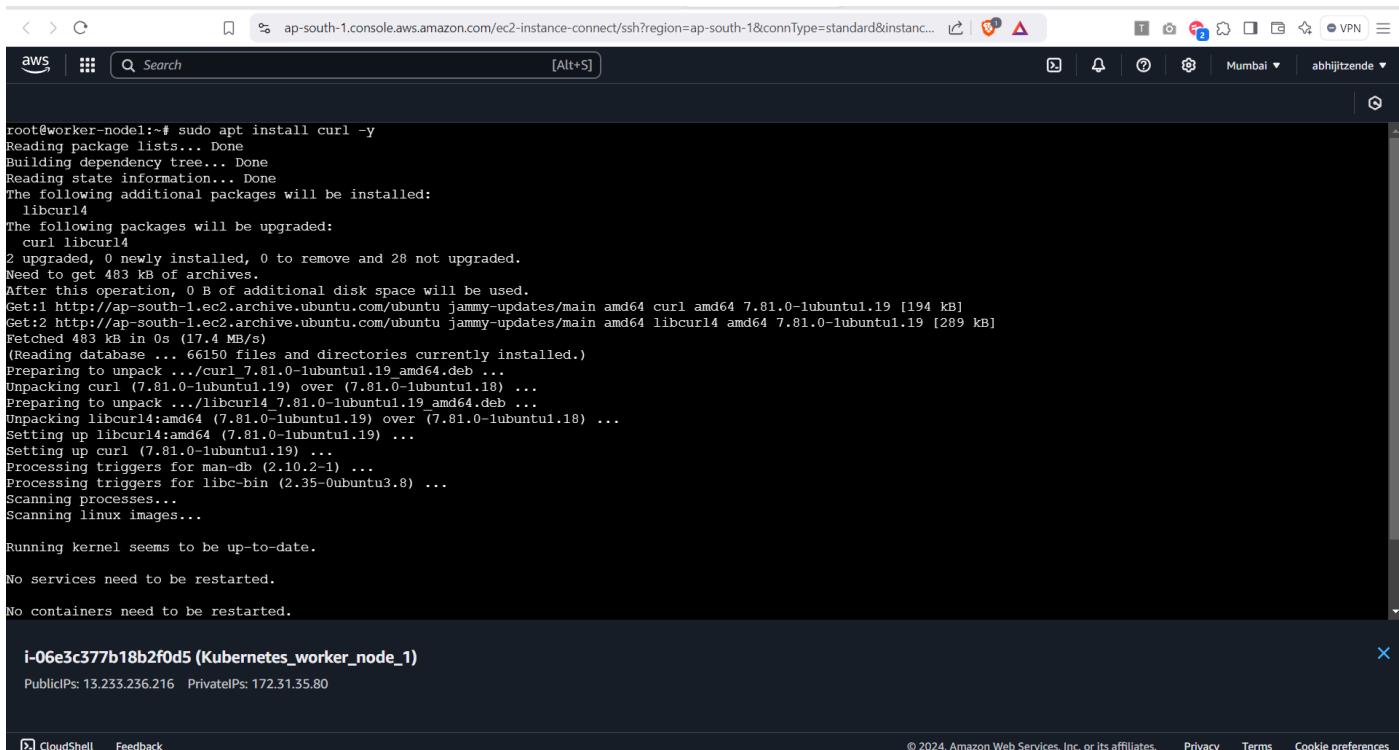


\* Applying /etc/sysctl.conf ...  
root@kmaster-node:~# sudo apt install curl -y ←  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
libcurl4  
The following packages will be upgraded:  
curl libcurl4  
2 upgraded, 0 newly installed, 0 to remove and 28 not upgraded.  
Need to get 483 kB of archives.  
After this operation, 0 B of additional disk space will be used.  
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 curl amd64 7.81.0-1ubuntu1.19 [194 kB]  
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libcurl4 amd64 7.81.0-1ubuntu1.19 [289 kB]  
Fetched 483 kB in 0s (15.6 MB/s)  
(Reading database ... 66150 files and directories currently installed.)  
Preparing to unpack .../curl\_7.81.0-1ubuntu1.19\_amd64.deb ...  
Unpacking curl (7.81.0-1ubuntu1.19) over (7.81.0-1ubuntu1.18) ...  
Preparing to unpack .../libcurl4\_7.81.0-1ubuntu1.19\_amd64.deb ...  
Unpacking libcurl4:amd64 (7.81.0-1ubuntu1.19) over (7.81.0-1ubuntu1.18) ...  
Setting up libcurl4:amd64 (7.81.0-1ubuntu1.19) ...  
Setting up curl (7.81.0-1ubuntu1.19) ...  
Processing triggers for man-db (2.10.2-1) ...  
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...  
Scanning processes...  
Scanning linux images...  
  
Running kernel seems to be up-to-date.  
  
No services need to be restarted.

i-09c0eda9439eab117 (Kubernetes\_master)

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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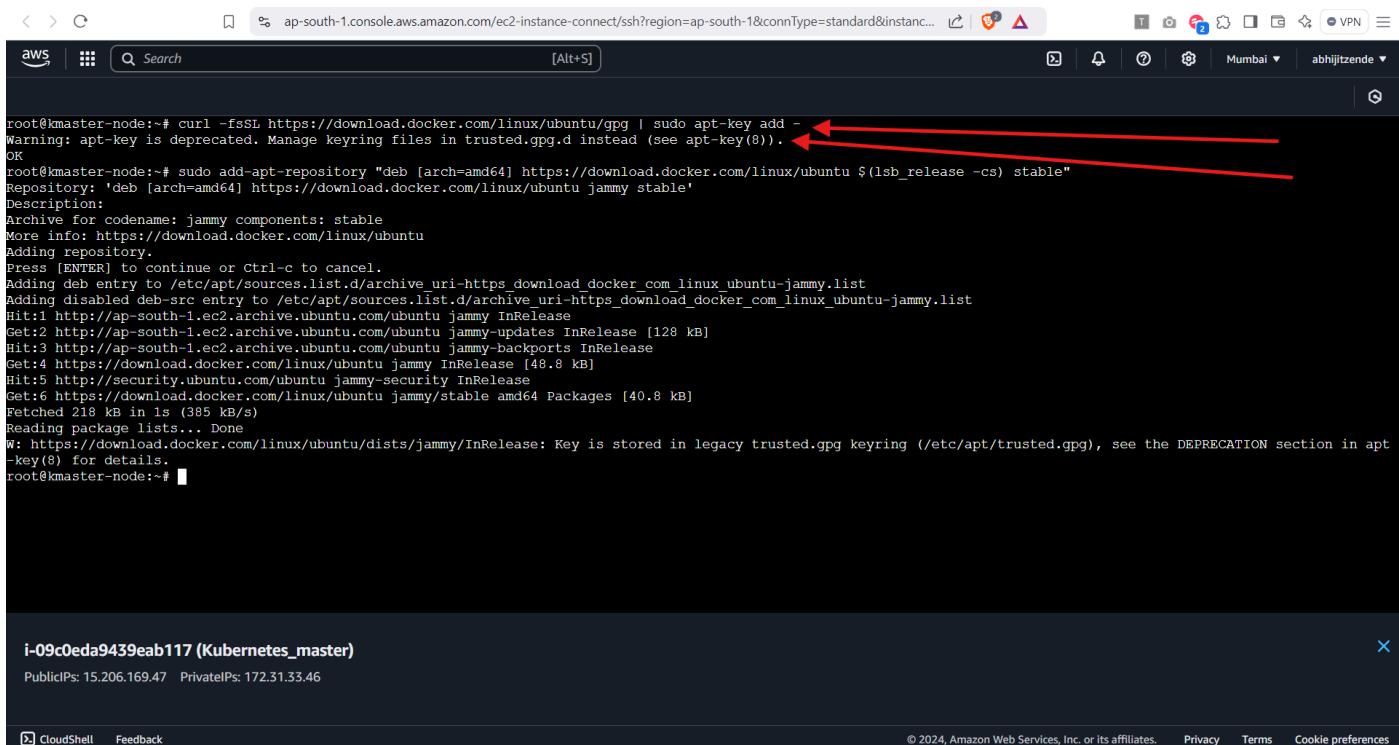


root@worker-node1:~# sudo apt install curl -y  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
libcurl4  
The following packages will be upgraded:  
curl libcurl4  
2 upgraded, 0 newly installed, 0 to remove and 28 not upgraded.  
Need to get 483 kB of archives.  
After this operation, 0 B of additional disk space will be used.  
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 curl amd64 7.81.0-1ubuntu1.19 [194 kB]  
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libcurl4 amd64 7.81.0-1ubuntu1.19 [289 kB]  
Fetched 483 kB in 0s (17.4 MB/s)  
(Reading database ... 66150 files and directories currently installed.)  
Preparing to unpack .../curl\_7.81.0-1ubuntu1.19\_amd64.deb ...  
Unpacking curl (7.81.0-1ubuntu1.19) over (7.81.0-1ubuntu1.18) ...  
Preparing to unpack .../libcurl4\_7.81.0-1ubuntu1.19\_amd64.deb ...  
Unpacking libcurl4:amd64 (7.81.0-1ubuntu1.19) over (7.81.0-1ubuntu1.18) ...  
Setting up libcurl4:amd64 (7.81.0-1ubuntu1.19) ...  
Setting up curl (7.81.0-1ubuntu1.19) ...  
Processing triggers for man-db (2.10.2-1) ...  
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...  
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.

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)

Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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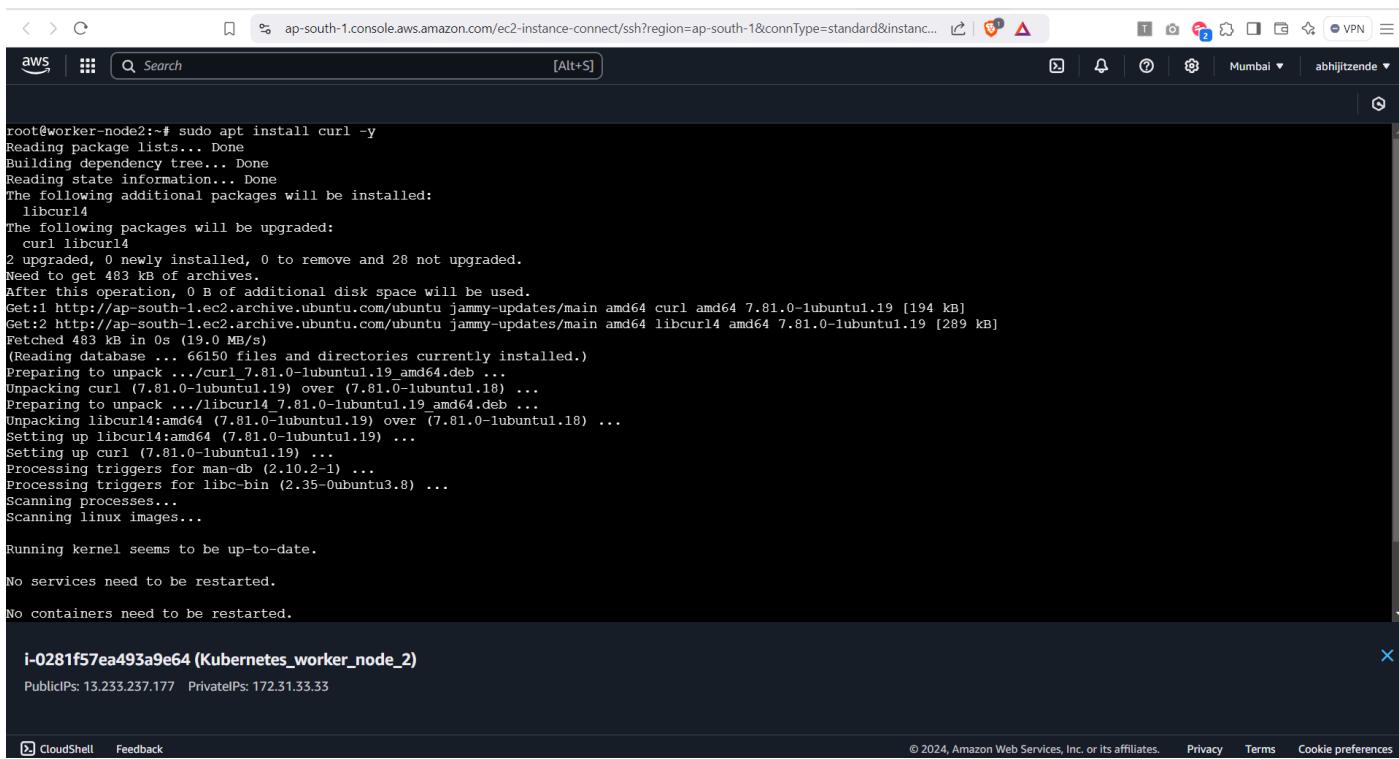


```
root@kmaster-node:~# curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
Warning: apt-key is deprecated. Manage keyring files in trusted.gpg.d instead (see apt-key(8)). ←
OK
root@kmaster-node:~# sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
Repository: 'deb [arch=amd64] https://download.docker.com/linux/ubuntu jammy stable'
Description:
Archive for codename: jammy 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-jammy.list
Adding disabled deb-src entry to /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-jammy.list
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:4 https://download.docker.com/linux/ubuntu jammy InRelease [48.8 kB]
Hit:5 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:6 https://download.docker.com/linux/ubuntu jammy/stable amd64 Packages [40.8 kB]
Fetched 218 kB in 1s (385 kB/s)
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@kmaster-node:~#
```

i-09c0eda9439eab117 (Kubernetes\_master)

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```
root@worker-node2:~# sudo apt install curl -y
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  libcurl4
The following packages will be upgraded:
  curl libcurl4
2 upgraded, 0 newly installed, 0 to remove and 28 not upgraded.
Need to get 483 kB of archives.
After this operation, 0 B of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 curl amd64 7.81.0-1ubuntu1.19 [194 kB]
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/main amd64 libcurl4 amd64 7.81.0-1ubuntu1.19 [289 kB]
Fetched 483 kB in 0s (19.0 MB/s)
(Reading database ... 66150 files and directories currently installed.)
Preparing to unpack .../curl_7.81.0-1ubuntu1.19_amd64.deb ...
Unpacking curl (7.81.0-1ubuntu1.19) over (7.81.0-1ubuntu1.18) ...
Preparing to unpack .../libcurl4_7.81.0-1ubuntu1.19_amd64.deb ...
Unpacking libcurl4_amd64 (7.81.0-1ubuntu1.19) over (7.81.0-1ubuntu1.18) ...
Setting up libcurl4_amd64 (7.81.0-1ubuntu1.19) ...
Setting up curl (7.81.0-1ubuntu1.19) ...
Processing triggers for man-db (2.10.2-1) ...
Processing triggers for libc-bin (2.35-0ubuntu3.8) ...
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.
```

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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```
root@worker-node2:~# curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
Warning: apt-key is deprecated. Manage keyring files in trusted.gpg.d instead (see apt-key(8)).
OK
root@worker-node2:~# sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
Repository: 'deb [arch=amd64] https://download.docker.com/linux/ubuntu jammy stable'
Description:
Archive for codename: jammy components: stable
More info: https://download.docker.com/linux/ubuntu
Adding repository.
Press [ENTER] to continue or Ctrl-c to cancel.
Found existing deb entry in /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-jammy.list
Adding deb entry to /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-jammy.list
Found existing deb-src entry in /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-jammy.list
Adding disabled deb-src entry to /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-jammy.list
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu jammy InRelease
Hit:5 https://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists...
Done
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@worker-node2:~#
```

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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```
root@worker-node2:~# curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
Warning: apt-key is deprecated. Manage keyring files in trusted.gpg.d instead (see apt-key(8)).
OK
root@worker-node2:~# sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
Repository: 'deb [arch=amd64] https://download.docker.com/linux/ubuntu jammy stable'
Description:
Archive for codename: jammy 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-jammy.list
Adding disabled deb-src entry to /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-jammy.list
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:4 https://download.docker.com/linux/ubuntu jammy InRelease [48.8 kB]
Hit:5 https://security.ubuntu.com/ubuntu jammy-security InRelease
Get:6 https://download.docker.com/linux/ubuntu jammy/stable amd64 Packages [40.8 kB]
Fetched 218 kB in 1s (409 kB/s)
Reading package lists...
Done
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@worker-node2:~#
```

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

CloudShell Feedback

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```
root@worker-node2:~# sudo apt update -y
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu jammy InRelease
Hit:5 https://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
28 packages can be upgraded. Run 'apt list --upgradable' to see them.
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@worker-node2:~# sudo apt install -y containerd.io
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
bridge-utils dns-root-data dnsmasq-base pigz ubuntu-fan
Use 'sudo apt autoremove' to remove them.
The following packages will be REMOVED:
containerd docker.io runc
The following NEW packages will be installed:
containerd.io
0 upgraded, 1 newly installed, 3 to remove and 28 not upgraded.
Need to get 29.5 MB of archives.
After this operation, 162 MB disk space will be freed.
Get:1 https://download.docker.com/linux/ubuntu jammy/stable amd64 containerd.io amd64 1.7.23-1 [29.5 MB]
Fetched 29.5 MB in 0s (60.6 MB/s)
(Reading database ... 66149 files and directories currently installed.)
Removing docker.io (24.0.7-0ubuntu2~22.04.1) ...
/usr/share/docker.io/contrib/nuke-graph-directory.sh' -> '/var/lib/docker/nuke-graph-directory.sh'

i-0281f57ea493a9e64 (Kubernetes_worker_node_2)
Public IPs: 13.233.237.177 Private IPs: 172.31.33.33
```

```
root@kmaster-node:~# sudo apt update -y
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu jammy InRelease
Hit:5 https://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
28 packages can be upgraded. Run 'apt list --upgradable' to see them.
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@kmaster-node:~# sudo apt install -y containerd.io
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
bridge-utils dns-root-data dnsmasq-base pigz ubuntu-fan
Use 'sudo apt autoremove' to remove them.
The following packages will be REMOVED:
containerd docker.io runc
The following NEW packages will be installed:
containerd.io
0 upgraded, 1 newly installed, 3 to remove and 28 not upgraded.
Need to get 29.5 MB of archives.
After this operation, 162 MB disk space will be freed.
Get:1 https://download.docker.com/linux/ubuntu jammy/stable amd64 containerd.io amd64 1.7.23-1 [29.5 MB]
Fetched 29.5 MB in 3s (11.3 MB/s)
(Reading database ... 66149 files and directories currently installed.)
Removing docker.io (24.0.7-0ubuntu2~22.04.1) ...
/usr/share/docker.io/contrib/nuke-graph-directory.sh' -> '/var/lib/docker/nuke-graph-directory.sh'

i-09c0eda9439eb117 (Kubernetes_master)
Public IPs: 15.206.169.47 Private IPs: 172.31.33.46
```

root@kmaster-node:~# sudo mkdir -p /etc/containerd

root@kmaster-node:~# sudo containerd config default | sudo tee /etc/containerd/config.toml

```
root@kmaster-node:~# sudo mkdir -p /etc/containerd
root@kmaster-node:~# sudo containerd config default | sudo tee /etc/containerd/config.toml
```

**i-09c0eda9439eab117 (Kubernetes\_master)**

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```
root@worker-node2:~# sudo apt update -y
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu jammy InRelease
Hit:5 http://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
28 packages can be upgraded. Run 'apt list --upgradable' to see them.
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@worker-node2:~# sudo apt install -y containerd.io
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
containerd.io is already the newest version (1.7.23-1).
The following packages were automatically installed and are no longer required:
  bridge-utils dns-root-data dnsmasq-base pigz ubuntu-fan
Use 'sudo apt autoremove' to remove them.
0 upgraded, 0 newly installed, 0 to remove and 28 not upgraded.
root@worker-node2:~#
```

**i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)**

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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```
root@worker-node2:~# sudo mkdir -p /etc/containerd
root@worker-node2:~# 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 = ""

i-0281f57ea493a9e64 (Kubernetes_worker_node_2)
PublicIPs: 13.233.237.177 PrivateIPs: 172.31.33.33
```

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```
root@worker-node1:~# sudo mkdir -p /etc/containerd
root@worker-node1:~# 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 = ""

i-06e3c377b18b2f0d5 (Kubernetes_worker_node_1)
PublicIPs: 13.233.236.216 PrivateIPs: 172.31.35.80
```

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```
cni_conf_dir = ""
cni_max_conf_num = 0
container_annotations = []
pod_annotations = []
privileged_without_host_devices = false
privileged_without_host_devices_all_devices_allowed = false
runtime_engine = ""
runtime_path = ""
runtime_root = ""
runtime_type = "io.containerd.runc.v2"
sandbox_mode = "pod sandbox"
snapshotter = ""

[plugins."io.containerd.grpc.v1.cri".containerd.runtimes.runc.options]
  BinaryName = ""
  CriuImagePath = ""
  CriuPath = ""
  CriuWorkPath = ""
  IoGid = 0
  IoUid = 0
  NoNewKeyring = false
  NoPivotRoot = false
  Root = ""
  ShimCgroup = ""
  SystemdCgroup = true

[plugins."io.containerd.grpc.v1.cri".containerd.untrusted_workload_runtime]
  base_runtime_spec = ""
  cni_conf_dir = ""
  cni_max_conf_num = 0
```

i-09c0eda9439eab117 (Kubernetes\_master)  
PublicIPs: 15.206.169.47 PrivateIPs: 172.31.33.46

```
root@kmaster-node:~# sudo vi /etc/containerd/config.toml
```

i-09c0eda9439eab117 (Kubernetes\_master)  
PublicIPs: 15.206.169.47 PrivateIPs: 172.31.33.46

```
root@worker-node1:~# sudo vi /etc/containerd/config.toml
```

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)  
Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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```
root@kmaster-node:~# sudo vi /etc/containerd/config.toml
root@kmaster-node:~# sudo systemctl restart containerd
root@kmaster-node:~# sudo systemctl status containerd
● containerd.service - containerd container runtime
   Loaded: loaded (/lib/systemd/system/containerd.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2024-11-28 19:41:54 UTC; 8s ago
     Docs: https://containerd.io
   Process: 5761 ExecStartPre=/sbin/modprobe overlay (code=exited, status=0/SUCCESS)
 Main PID: 5764 (containerd)
    Tasks: 7
   Memory: 13.3M
      CPU: 67ms
     CGroup: /system.slice/containerd.service
             └─5764 /usr/bin/containerd

Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.645255230Z" level=info msg="Start subscribing containerd event"
Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.645404089Z" level=info msg="Start recovering state"
Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.645451834Z" level=info msg="Start event monitor"
Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.645461522Z" level=info msg="Start snapshots syncer"
Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.645470127Z" level=info msg="Start cni network conf syncer for default"
Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.645480233Z" level=info msg="Start streaming server"
Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.645494026Z" level=info msg=serving... address=/run/containerd/containerd.sock.ttrpc
Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.645527777Z" level=info msg=serving... address=/run/containerd/containerd.sock
Nov 28 19:41:54 kmaster-node systemd[1]: Started containerd container runtime.
Nov 28 19:41:54 kmaster-node containerd[5764]: time="2024-11-28T19:41:54.647273278Z" level=info msg="containerd successfully booted in 0.028129s"
```

i-09c0eda9439eb117 (Kubernetes\_master)  
Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```
root@worker-node1:~# sudo vi /etc/containerd/config.toml
root@worker-node1:~# sudo systemctl restart containerd
root@worker-node1:~# sudo systemctl status containerd
● containerd.service - containerd container runtime
   Loaded: loaded (/lib/systemd/system/containerd.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2024-11-28 19:44:05 UTC; 6s ago
     Docs: https://containerd.io
   Process: 3900 ExecStartPre=/sbin/modprobe overlay (code=exited, status=0/SUCCESS)
 Main PID: 3902 (containerd)
    Tasks: 7
   Memory: 13.3M
      CPU: 82ms
      CGroup: /system.slice/containerd.service
              └─3902 /usr/bin/containerd

Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.978556533Z" level=info msg="Start subscribing containerd event"
Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.978609566Z" level=info msg="Start recovering state"
Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.978650386Z" level=info msg="Start event monitor"
Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.978668053Z" level=info msg="Start snapshots syncer"
Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.978676044Z" level=info msg="Start cni network config syncer for default"
Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.978681889Z" level=info msg="Start streaming server"
Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.978832374Z" level=info msg="serving..." address=/run/containerd/containerd.sock.ttrpc
Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.978973412Z" level=info msg="serving..." address=/run/containerd/containerd.sock
Nov 28 19:44:05 worker-node1 containerd[3902]: time="2024-11-28T19:44:05.979059271Z" level=info msg="containerd successfully booted in 0.027311s"
Nov 28 19:44:05 worker-node1 systemd[1]: Started containerd container runtime.
root@worker-node1:~#
```

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)

PublicIPs: 13.233.236.216 PrivateIPs: 172.31.35.80

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```
cni conf dir = ""
cni max conf num = 0
container annotations = []
pod annotations = []
privileged without host devices = false
privileged without host devices all devices allowed = false
runtime engine = ""
runtime path = ""
runtime root = ""
runtime type = "io.containerd.runc.v2"
sandbox mode = "pod sandbox"
snapshotter = ""

[plugins."io.containerd.grpc.v1.cri".containerd.runtimes.runc.options]
  BinaryName = ""
  CriuImagePath = ""
  CriuPath = ""
  CriuWorkPath = ""
  IoGid = 0
  IoUid = 0
  NoNewKeyring = false
  NoPivotRoot = false
  Root = ""
  ShimCgroup = ""
  SystemdCgroup = true

[plugins."io.containerd.grpc.v1.cri".containerd.untrusted workload runtime]
  base runtime spec = ""
  cni conf dir = ""
  cni max conf num = 0
:wg
```

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)

PublicIPs: 13.233.236.216 PrivateIPs: 172.31.35.80

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```
root@worker-node2:~# sudo vi /etc/containerd/config.toml
root@worker-node2:~# sudo systemctl restart containerd
root@worker-node2:~# sudo systemctl status containerd
● containerd.service - containerd container runtime
   Loaded: loaded (/lib/systemd/system/containerd.service; enabled; vendor preset: enabled)
   Active: active (running) since Thu 2024-11-28 19:45:40 UTC; 3s ago
     Docs: https://containerd.io
   Process: 6845 ExecStartPre=/sbin/modprobe overlay (code=exited, status=0/SUCCESS)
  Main PID: 6848 (containerd)
    Tasks: 7
   Memory: 13.4M
      CPU: 64ms
     CGroup: /system.slice/containerd.service
             └─6848 /usr/bin/containerd

Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.679494014Z" level=info msg="Start subscribing containerd event"
Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.679576985Z" level=info msg="serving... address=/run/containerd/containerd.sock.ttrpc"
Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.679591698Z" level=info msg="Start recovering state"
Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.679610109Z" level=info msg="serving... address=/run/containerd/containerd.sock"
Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.679900937Z" level=info msg="Start event monitor"
Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.680022517Z" level=info msg="Start snapshots syncer"
Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.680030405Z" level=info msg="Start cnr network conf syncer for default"
Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.680038026Z" level=info msg="Start streaming server"
Nov 28 19:45:40 worker-node2 containerd[6848]: time="2024-11-28T19:45:40.680076955Z" level=info msg="containerd successfully booted in 0.027289s"
Nov 28 19:45:40 worker-node2 systemd[1]: Started containerd container runtime.
root@worker-node2:~#
```

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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```
cni_conf_dir = ""
cni_max_conf_num = 0
container_annotations = []
pod_annotations = []
privileged_without_host_devices = false
privileged_without_host_devices_all_devices_allowed = false
runtime_engine = ""
runtime_path = ""
runtime_root = ""
runtime_type = "io.containerd.runc.v2"
sandbox_mode = "pod sandbox"
snapshotter = ""

[plugins."io.containerd.grpc.v1.cri".containerd.runtimes.runc.options]
BinaryName = ""
CriuImagePath = ""
CriuPath = ""
CriuWorkPath = ""
Igid = 0
Iouid = 0
NoNewKeyring = false
NoPivotRoot = false
Root = ""
ShimCgroup = ""
SystemdCgroup = true

[plugins."io.containerd.grpc.v1.cri".containerd.untrusted_workload_runtime]
base_runtime_spec = ""
cni_conf_dir = ""
cni_max_conf_num = 0
```

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

CloudShell Feedback

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```
root@worker-node1:~# sudo apt-get update
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Get:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease [128 kB]
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu jammy-security InRelease
Fetched 128 kB in 0s (256 kB/s)
Reading package lists... Done
root@worker-node1:~# sudo apt-get install -y apt-transport-https ca-certificates curl gpg
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20240203-22.04.1).
ca-certificates set to manually installed.
curl is already the newest version (7.81.0-1ubuntu1.19).
curl set to manually installed.
gpg is already the newest version (2.2.27-3ubuntu2.1).
gpg set to manually installed.
The following NEW packages will be installed:
  apt-transport-https
0 upgraded, 1 newly installed, 0 to remove and 28 not upgraded.
Need to get 1510 B of archives.
After this operation, 170 kB of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 apt-transport-https all 2.4.13 [1510 B]
Fetched 1510 B in 0s (120 kB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 66150 files and directories currently installed.)
Preparing to unpack .../apt-transport-https_2.4.13_all.deb ...
Unpacking apt-transport-https (2.4.13) ...
Setting up apt-transport-https (2.4.13) ...
Scanning processes...
Scanning linux images...

i-06e3c377b18b2f0d5 (Kubernetes_worker_node_1)
```

Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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```
root@kmaster-node:~# sudo apt-get update
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu jammy InRelease
Hit:5 http://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@kmaster-node:~# sudo apt-get install -y apt-transport-https ca-certificates curl gpg
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20240203-22.04.1).
ca-certificates set to manually installed.
curl is already the newest version (7.81.0-1ubuntu1.19).
curl set to manually installed.
gpg is already the newest version (2.2.27-3ubuntu2.1).
gpg set to manually installed.
The following packages were automatically installed and are no longer required:
  bridge-utils dns-root-data dnsmasq-base pigz ubuntu-fan
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
  apt-transport-https
0 upgraded, 1 newly installed, 0 to remove and 28 not upgraded.
Need to get 1510 B of archives.
After this operation, 170 kB of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 apt-transport-https all 2.4.13 [1510 B]
Fetched 1510 B in 0s (113 kB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 65891 files and directories currently installed.)
```

**i-09c0eda9439eb117 (Kubernetes\_master)**

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```
root@kmaster-node:~# sudo mkdir -p /etc/apt/keyrings
root@kmaster-node:~# curl -fsSL https://pkgs.k8s.io/core/stable:/v1.29/deb/Release.key | sudo gpg --dearmor -c /etc/apt/keyrings/kubernetes-apt-keyring.gpg
root@kmaster-node:~# echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core/stable:/v1.29/deb/ /' | sudo tee /etc/apt/sources.list.d/kubernetes.list
deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core/stable:/v1.29/deb/
root@kmaster-node:~# sudo apt-get update
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu jammy InRelease
Get:5 https://prod-cdn.packages.k8s.io/repositories/isv/:/kubernetes/:/core:/stable:/v1.29/deb InRelease [1189 B]
Hit:6 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:7 https://prod-cdn.packages.k8s.io/repositories/isv/:/kubernetes/:/core:/stable:/v1.29/deb Packages [16.4 kB]
Fetched 17.6 kB in 1s (27.0 kB/s)
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@kmaster-node:~# sudo apt-get install -y kubelet kubeadm kubectl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
bridge-utils dns-root-data dnsmasq-base pigz ubuntu-fan
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
conctrack cri-tools kubernetes-cni
The following NEW packages will be installed:
conctrack cri-tools kubeadm kubectl kubelet kubernetes-cni
0 upgraded, 6 newly installed, 0 to remove and 28 not upgraded.
Need to get 92.2 MB of archives.
After this operation, 346 MB of additional disk space will be used.
```

i-09c0eda9439eb117 (Kubernetes\_master)

PublicIPs: 15.206.169.47 PrivateIPs: 172.31.33.46

```
root@worker-node2:~# sudo apt-get update
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu jammy InRelease
Hit:5 https://security.ubuntu.com/ubuntu jammy-security InRelease
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@worker-node2:~# sudo apt-get install -y apt-transport-https ca-certificates curl gpg
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20240203~22.04.1).
ca-certificates set to manually installed.
curl is already the newest version (7.81.0-1ubuntu1.19).
curl set to manually installed.
gpg is already the newest version (2.2.27-3ubuntu2.1).
gpg set to manually installed.
The following packages were automatically installed and are no longer required:
bridge-utils dns-root-data dnsmasq-base pigz ubuntu-fan
Use 'sudo apt autoremove' to remove them.
The following NEW packages will be installed:
apt-transport-https
0 upgraded, 1 newly installed, 0 to remove and 28 not upgraded.
Need to get 1510 B of archives.
After this operation, 170 kB of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates/universe amd64 apt-transport-https all 2.4.13 [1510 B]
Fetched 1510 B in 0s (98.4 kB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 65891 files and directories currently installed.)
```

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

PublicIPs: 13.233.237.177 PrivateIPs: 172.31.33.33

```
root@worker-node2:~# sudo mkdir -p -m 755 /etc/apt/keyrings
root@worker-node2:~# curl -fsSL https://pkgs.k8s.io/core/stable:v1.29/deb/Release.key | sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg
root@worker-node2:~# echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core/stable:v1.29/deb/ /' | sudo tee /etc/apt/sources.list.d/kubernetes.list
deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core/stable:v1.29/deb/
root@worker-node2:~# sudo apt-get update
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Hit:4 https://download.docker.com/linux/ubuntu jammy InRelease
Get:5 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb InRelease [1189 B]
Hit:6 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:7 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb Packages [16.4 kB]
Fetched 17.6 kB in 1s (28.3 kB/s)
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/jammy/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
root@worker-node2:~# sudo apt-get install -y kubelet kubeadm kubectl
Reading package lists... Done
Building dependency tree... Done
Building state information... Done
The following packages were automatically installed and are no longer required:
bridge-utils dns-root-data dnsmasq-base pigz ubuntu-fan
Use 'sudo apt autoremove' to remove them.
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 28 not upgraded.
Need to get 92.2 MB of archives.

i-0281f57ea493a9e64 (Kubernetes_worker_node_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33
```

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```
root@worker-node1:~# sudo mkdir -p -m 755 /etc/apt/keyrings
root@worker-node1:~# curl -fsSL https://pkgs.k8s.io/core/stable:v1.29/deb/Release.key | sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg
root@worker-node1:~# echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core/stable:v1.29/deb/ /' | sudo tee /etc/apt/sources.list.d/kubernetes.list
deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core/stable:v1.29/deb/
root@worker-node1:~# sudo apt-get update
Hit:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy InRelease
Hit:2 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-updates InRelease
Hit:3 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy-backports InRelease
Get:4 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb InRelease [1189 B]
Hit:5 http://security.ubuntu.com/ubuntu jammy-security InRelease
Get:6 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb Packages [16.4 kB]
Fetched 17.6 kB in 0s (35.6 kB/s)
Reading package lists... Done
root@worker-node1:~# sudo apt-get install -y kubelet kubeadm kubectl
Reading package lists... Done
Building dependency tree... Done
Building 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 28 not upgraded.
Need to get 92.2 MB of archives.
After this operation, 346 MB of additional disk space will be used.
Get:1 http://ap-south-1.ec2.archive.ubuntu.com/ubuntu jammy/main amd64 conntrack amd64 1:1.4.6-2build2 [33.5 kB]
Get:2 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb cri-tools 1.29.0-1.1 [20.1 MB]
Get:3 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb kubernetes-cni 1.3.0-1.1 [31.4 MB]
Get:4 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb kubelet 1.29.11-1.1 [19.9 MB]
Get:5 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb kubectl 1.29.11-1.1 [10.6 MB]
Get:6 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes/:core/stable:v1.29/deb kubeadm 1.29.11-1.1 [10.2 MB]

i-06e3c377b18b2f0d5 (Kubernetes_worker_node_1)

Public IPs: 13.233.236.216 Private IPs: 172.31.35.80
```

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```
root@worker-node1:~# sudo systemctl enable kubelet
root@worker-node1:~#
```

i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)  
Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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```
root@kmaster-node:~# sudo systemctl enable kubelet
root@kmaster-node:~#
```

i-09c0eda9439eab117 (Kubernetes\_master)  
Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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root@kmaster-node:~# sudo systemctl enable kubelet

root@kmaster-node:~# sudo kubeadm config images pull

11128 19:56:00.640911 6974 version.go:256] remote version is much newer: v1.31.3; falling back to: stable-1.29

[config/images] Pulled registry.k8s.io/kube-apiserver:v1.29.11

[config/images] Pulled registry.k8s.io/kube-controller-manager:v1.29.11

[config/images] Pulled registry.k8s.io/kube-scheduler:v1.29.11

[config/images] Pulled registry.k8s.io/kube-proxy:v1.29.11

[config/images] Pulled registry.k8s.io/coredns/coredns:v1.11.1

[config/images] Pulled registry.k8s.io/etcd:3.5.16-0

root@kmaster-node:~# sudo kubeadm init --pod-network-cidr=10.244.0.0/16 --ignore-preflight-errors=NumCPU --ignore-preflight-errors=Mem

11128 19:58:18.201684 7188 version.go:256] remote version is much newer: v1.31.3; falling back to: stable-1.29

[init] Using Kubernetes version: v1.29.11

[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 in beforehand using 'kubeadm config images pull'

W1128 19:58:18.974118 7188 checks.go:83] detected that the sandbox image "registry.k8s.io/pause:3.9" of the container runtime is inconsistent with that used by kubeadm. It is recommended that using "registry.k8s.io/pause:3.9" as the CRI sandbox image.

[certs] Using certificate-dir 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 [kmaster-node kubernetes kubernetes.default kubernetes.default.svc kubernetes.default.svc.cluster.local] and IPs [10.96.0.1 172.31.33.46]

[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 [localhost] and IPs [172.31.33.46 127.0.0.1 ::1]

[certs] Generating "etcd/peer" certificate and key

**i-09c0eda9439eab117 (Kubernetes\_master)**

PublicIPs: 15.206.169.47 PrivateIPs: 172.31.33.46

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root@worker-node2:~# sudo systemctl enable kubelet

root@worker-node2:~#

**i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)**

PublicIPs: 13.233.237.177 PrivateIPs: 172.31.33.33

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```
root@worker-node1:~# kubeadm join 172.31.33.46:6443 --token oyzi3l.0rf2gbq5hd7p4ckd --discovery-token-ca-cert-hash sha256:53b640d1130c525cf9e46099de8de34d6a310cf3a3a3bb4c0e60f88bala8862
[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...

This 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.

Run 'kubectl get nodes' on the control-plane to see this node join the cluster.
root@worker-node1:~#
```

### i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)

Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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```
root@kmaster-node:~# mkdir -p $HOME/.kube
root@kmaster-node:~# sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
root@kmaster-node:~# sudo chown $(id -u):$(id -g) $HOME/.kube/config
root@kmaster-node:~# kubectl apply -f https://github.com/coreos/flannel/raw/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
root@kmaster-node:~# kubectl get nodes
NAME           STATUS    ROLES   AGE     VERSION
kmaster-node   Ready     control-plane   108s   v1.29.11
root@kmaster-node:~# kubectl get pods --all-namespaces
NAMESPACE      NAME                READY   STATUS    RESTARTS   AGE
kube-flannel   kube-flannel-ds-vg4ng   1/1    Running   0          33s
kube-system    coredns-76f75df574-57fcw   1/1    Running   0          101s
kube-system    coredns-76f75df574-xbwgf   1/1    Running   0          101s
kube-system    etcd-kmaster-node      1/1    Running   0          115s
kube-system    kube-apiserver-kmaster-node  1/1    Running   0          115s
kube-system    kube-controller-manager-kmaster-node  1/1    Running   0          115s
kube-system    kube-proxy-6g2qz       1/1    Running   0          101s
kube-system    kube-scheduler-kmaster-node  1/1    Running   0          115s
root@kmaster-node:~# sudo kubeadm token create --print-join-command
kubeadm join 172.31.33.46:6443 --token oyzi3l.0rf2gbq5hd7p4ckd --discovery-token-ca-cert-hash sha256:53b640d1130c525cf9e46099de8de34d6a310cf3a3a3bb4c0e60f88bala8862
root@kmaster-node:~#
```

### i-09c0eda9439eb117 (Kubernetes\_master)

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```

root@kmaster-node:~# kubectl get nodes -o wide
NAME        STATUS   ROLES      AGE     VERSION    INTERNAL-IP    EXTERNAL-IP   OS-IMAGE       KERNEL-VERSION   CONTAINER-RUNTIME
kmaster-node Ready    control-plane   5m8s   v1.29.11  172.31.33.46  <none>        Ubuntu 22.04.5 LTS  6.8.0-1015-aws  containerd://1.7.23
worker-node1 Ready    <none>      84s    v1.29.11  172.31.35.80  <none>        Ubuntu 22.04.5 LTS  6.8.0-1015-aws  containerd://1.7.12
worker-node2 Ready    <none>      32s    v1.29.11  172.31.33.33  <none>        Ubuntu 22.04.5 LTS  6.8.0-1015-aws  containerd://1.7.23
root@kmaster-node:~# kubectl get pods --all-namespaces
NAMESPACE     NAME           READY   STATUS    RESTARTS   AGE
kube-flannel kube-flannel-ds-lqjgs   1/1    Running   0          108s
kube-flannel kube-flannel-ds-tnt6q   1/1    Running   0          56s
kube-flannel kube-flannel-ds-vq4ng   1/1    Running   0          4m6s
kube-system   coredns-76f75df574-57fcw  1/1    Running   0          5m14s
kube-system   coredns-76f75df574-xbwgf  1/1    Running   0          5m14s
kube-system   etcd-kmaster-node     1/1    Running   0          5m28s
kube-system   kube-apiserver-kmaster-node  1/1    Running   0          5m28s
kube-system   kube-controller-manager-kmaster-node  1/1    Running   0          5m28s
kube-system   kube-proxy-6g2qz      1/1    Running   0          5m14s
kube-system   kube-proxy-759kt      1/1    Running   0          56s
kube-system   kube-proxy-z8xf9      1/1    Running   0          108s
kube-system   kube-scheduler-kmaster-node  1/1    Running   0          5m28s
root@kmaster-node:~#

```

**i-09c0eda9439eab117 (Kubernetes\_master)**

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```

root@worker-node2:~# kubeadm join 172.31.33.46:6443 --token 0wrt1l.mllr9ev4ipigg0v9 --discovery-token-ca-cert-hash sha256:53b640d1130c525cf9e46099de8de34d6a310cf3a3a3bb4c0e60f88b1a8862
[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...

This 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.

Run 'kubectl get nodes' on the control-plane to see this node join the cluster.
root@worker-node2:~#

```

**i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)**

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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```
aws | [Alt+S] | Search | Mumbai | abhijitzenze | VPN | X
devopsadmin@kmaster-node:~/.ssh$ exit
logout
root@kmaster-node:~# usermod -aG docker devopsadmin
root@kmaster-node:~# visudo
root@kmaster-node:~# 
```

**i-09c0eda9439eb117 (Kubernetes\_master)**

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```
aws | [Alt+S] | Search | Mumbai | abhijitzenze | VPN | X
root@kmaster-node:~# useradd devopsadmin -s /bin/bash -m -d /home/devopsadmin
root@kmaster-node:~# su - devopsadmin
devopsadmin@kmaster-node:~$ ssh-keygen -t ecdsa -b 521
Generating public/private ecdsa key pair.
Enter file in which to save the key (/home/devopsadmin/.ssh/id_ecdsa):
Created directory '/home/devopsadmin/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/devopsadmin/.ssh/id_ecdsa
Your public key has been saved in /home/devopsadmin/.ssh/id_ecdsa.pub
The key's fingerprint is:
SHA256:2pyLjT9mcDil5edCQnqi647ceTWSJ9A95HMeBoInQMM devopsadmin@kmaster-node
The key's randomart image is:
+---[ECDSA 521]---+
|oo
| E. . .
| . o . .
| . =. . .
| +o. =S
| o.o.*=o
| . o.*==X
|+ . o++*=.
|= = o. ++*.
+---[SHA256]---+
devopsadmin@kmaster-node:~$ cd .ssh/
devopsadmin@kmaster-node:~/ssh$ pwd
/home/devopsadmin/.ssh
devopsadmin@kmaster-node:~/ssh$ cat id_ecdsa.pub > authorized_keys
devopsadmin@kmaster-node:~/ssh$ chmod 600 /home/devopsadmin/.ssh/*
devopsadmin@kmaster-node:~/ssh$ usermod -aG docker devopsadmin
usermod: Permission denied.
```

**i-09c0eda9439eb117 (Kubernetes\_master)**

Public IPs: 15.206.169.47 Private IPs: 172.31.33.46

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```
devopsadmin@kmaster-node:~/.ssh$ exit
logout
root@kmaster-node:~# usermod -aG docker devopsadmin
root@kmaster-node:~# visudo
root@kmaster-node:~# mkdir -p $HOME/.kube
root@kmaster-node:~# ls ~
snap
root@kmaster-node:~# su - devopsadmin
devopsadmin@kmaster-node:~$ mkdir -p $HOME/.kube
devopsadmin@kmaster-node:~$ sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
devopsadmin@kmaster-node:~$ sudo chown $(id -u):$(id -g) $HOME/.kube/config
devopsadmin@kmaster-node:~$ kubectl get nodes
NAME           STATUS    ROLES      AGE     VERSION
kmaster-node   Ready     control-plane   13m    v1.29.11
worker-node1   Ready     <none>    9m32s   v1.29.11
worker-node2   Ready     <none>    8m40s   v1.29.11
devopsadmin@kmaster-node:~$
```

i-09c0eda9439eab117 (Kubernetes\_master)

PublicIPs: 15.206.169.47 PrivateIPs: 172.31.33.46

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```
GNU nano 6.2                               /etc/sudoers.tmp *
# "sudo scp" or "sudo rsync" should be able to use your SSH agent.
Defaults: sudo env_keep += "SSH_AGENT_PID SSH_AUTH_SOCK"

# Ditto for GPG agent
Defaults: sudo env_keep += "GPG_AGENT_INFO"

# Host alias specification

# User alias specification

# Cmnd alias specification

# User privilege specification
root    ALL=(ALL:ALL) ALL

# Members of the admin group may gain root privileges
%admin  ALL=(ALL) ALL

# Allow members of group sudo to execute any command
%sudo   ALL=(ALL:ALL) ALL

devopsadmin ALL=(ALL) NOPASSWD: ALL

# See sudoers(5) for more information on "@include" directives:
@includedir /etc/sudoers.d
```

^G Help ^Q Write Out ^W Where Is ^R Cut ^T Execute ^C Location M-U Undo M-A Set Mark M-J To Bracket M-Q Previous
^X Exit ^R Read File ^Y Replace ^U Paste ^J Justify ^V Go To Line M-B Redo M-C Copy ^S Where Was M-W Next

i-09c0eda9439eab117 (Kubernetes\_master)

PublicIPs: 15.206.169.47 PrivateIPs: 172.31.33.46

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```
root@worker-node1:~# apt install docker.io
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
docker.io is already the newest version (24.0.7-0ubuntu2~22.04.1).
0 upgraded, 0 newly installed, 0 to remove and 28 not upgraded.
root@worker-node1:~# usermod -aG docker devopsadmin
root@worker-node1:~# visudo
```

```
root@worker-node1:~# useradd devopsadmin -s /bin/bash -m -d /home/devopsadmin
root@worker-node1:~# su - devopsadmin
devopsadmin@worker-node1:~$ ssh-keygen -t ecdsa -b 521
Generating public/private ecdsa key pair.
Enter file in which to save the key (/home/devopsadmin/.ssh/id_ecdsa):
Created directory '/home/devopsadmin/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/devopsadmin/.ssh/id_ecdsa
Your public key has been saved in /home/devopsadmin/.ssh/id_ecdsa.pub
The key fingerprint is:
SHA256:4XN+UtrlyREGFerzeT/F8Px81xoVdDU6fq33GBYrzM devopsadmin@worker-node1
The key's randomart image is:
+---[ECDSA 521]---+
|          .o=+|
|         =ooo|
|        oo* . |
|       . .=.B.|
|      S . +o+.B|
|     + . + ++=|
|    oo.=.oB|
|   o+E=o+|
|      ++. |
+---[SHA256]---+
devopsadmin@worker-node1:~$ cd .ssh/
devopsadmin@worker-node1:~/ssh$ cat id_ecdsa.pub > authorized_keys
devopsadmin@worker-node1:~/ssh$ chmod 600 /home/devopsadmin/.ssh/*
devopsadmin@worker-node1:~/ssh$ apt install docker.io
E: Could not open lock file /var/lib/dpkg/lock-frontend - open (13: Permission denied)
E: Unable to acquire the dpkg frontend lock (/var/lib/dpkg/lock-frontend), are you root?
devopsadmin@worker-node1:~/ssh$ sudo !!
i-06e3c377b18b2f0d5 (Kubernetes_worker_node_1)
Public IPs: 13.233.236.216 Private IPs: 172.31.35.80
```

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GNU nano 6.2 /etc/sudoers.tmp

```
# "sudo scp" or "sudo rsync" should be able to use your SSH agent.
Defaults:env_keep += "SSH_AGENT_PID SSH_AUTH_SOCK"

# Ditto for GPG agent
Defaults:env_keep += "GPG_AGENT_INFO"

# Host alias specification

# User alias specification

# Cmnd alias specification

# User privilege specification
root    ALL=(ALL:ALL) ALL

# Members of the admin group may gain root privileges
%admin  ALL=(ALL) ALL

# Allow members of group sudo to execute any command
%sudo   ALL=(ALL:ALL) ALL

devopsadmin ALL=(ALL) NOPASSWD: ALL

# See sudoers(5) for more information on "@include" directives:
@includedir /etc/sudoers.d
```

^G Help ^Q Write Out ^W Where Is ^F Cut ^T Execute ^C Location M-U Undo M-A Set Mark M-[ To Bracket M-Q Previous  
^X Exit ^R Read File ^V Replace ^U Paste ^J Justify ^Y Go To Line M-E Redo M-G Copy ^Q Where Was M-W Next

i-06e3c377b1b2f0d5 (Kubernetes\_worker\_node\_1)

Public IPs: 13.233.236.216 Private IPs: 172.31.35.80

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root@worker-node2:~# useradd devopsadmin -s /bin/bash -m -d /home/devopsadmin

```
root@worker-node2:~# su - devopsadmin
devopsadmin@worker-node2:~$ ssh-keygen -t ecdsa -b 521
Generating public/private ecdsa key pair.
Enter file in which to save the key (/home/devopsadmin/.ssh/id_ecdsa):
Created directory '/home/devopsadmin/.ssh'.
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /home/devopsadmin/.ssh/id_ecdsa
Your public key has been saved in /home/devopsadmin/.ssh/id_ecdsa.pub
The key's randomart image is:
+---[ECDSA 521]---+
| .o .o .
| .oo o B .
| o +*o* * o
| + ..+oS= =
| .+ + *oE...
| o o @ .
| . . .
| .o .
+---[SHA256]----+
devopsadmin@worker-node2:~$ cd .ssh/
devopsadmin@worker-node2:~/ssh$ cat id_ecdsa.pub > authorized_keys
devopsadmin@worker-node2:~/ssh$ chmod 600 /home/devopsadmin/.ssh/*
devopsadmin@worker-node2:~/ssh$ exit
logout
root@worker-node2:~# apt install docker.io
Reading package lists... done
```

i-0281f57ea493a9e64 (Kubernetes\_worker\_node\_2)

Public IPs: 13.233.237.177 Private IPs: 172.31.33.33

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## 2. L2 – Create Deployment Controller Object to Deploy the Application Image Created in Docker Module and Expose it to the Internet

Ans.

Step 1: SSH into master node:

Step 2: Verify Kubernetes Nodes:

1. Check the status of your Kubernetes cluster nodes

```

kubectl get nodes

```

Step 3: Create a Deployment YAML File

1. Save the following as **deployment.yaml**

```

```
apiVersion: apps/v1
kind: Deployment
metadata:
  name: tomcat-deployment
  labels:
    app: tomcat
spec:
  replicas: 2
  selector:
    matchLabels:
      app: tomcat
  template:
    metadata:
      labels:
        app: tomcat
    spec:
      containers:
        - name: tomcat
          image: abhiz2411/tomcat_web_img:7
          ports:
            - containerPort: 8080
```
```

## Step 4: Apply the Deployment:

1. Deploy the application to your cluster

```

**kubectl apply -f deployment.yaml**

```

## Step 5: Verify the Deployment

1. Confirm that the pods are running:

```

**kubectl get pods**

```

## Step 6: Create a Service YAML File

1. Save the following as **service.yaml**

```

```
apiVersion: v1
kind: Service
metadata:
  name: tomcat-service
spec:
  type: NodePort
  selector:
    app: tomcat
  ports:
    - protocol: TCP
      port: 8080
      targetPort: 8080
      nodePort: 30007 # NodePort to expose on the cluster
```

```

## Step 7: Verify the Service

1. Check the service details

``` **kubectl get service tomcat-service** ```

## Step 8: Access the Application

1. Open a browser and visit **http://<node-ip>:30007**. Replace <node-ip> with the IP address of any Kubernetes node.

The screenshot shows the AWS EC2 Instances page with the search bar set to "Find Instance by attribute or tag (case-sensitive)" and the filter set to "All states". A red arrow points from the "Public IPv4 address" field (13.232.210.243) to the terminal window below. The table lists several instances, including the "Kubernetes\_master" instance which is running.

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone
Kubernetes_master	i-09c0eda9439eab117	Running	t2.medium	Initializing	View alarms +	ap-south-1a
build_server	i-09a1c99ed46e7f4bb	Stopped	t2.medium	-	View alarms +	ap-south-1a
master_server	i-091912f1fc5419060	Stopped	t2.medium	-	View alarms +	ap-south-1a
Kubernetes_worker_node_1	i-06e3c377b18b2f0d5	Running	t2.medium	Initializing	View alarms +	ap-south-1a
Kubernetes_worker_node_2	i-0281f57ea493a9e64	Running	t2.medium	Initializing	View alarms +	ap-south-1a
monitoring_server	i-0eb6c8a29dfaee88	Stopped	t2.micro	-	View alarms +	ap-south-1b
prod_server	i-0b19d37b829491a34	Stopped	t2.micro	-	View alarms +	ap-south-1b

The screenshot shows the AWS CloudShell terminal with a red arrow pointing from the terminal window back up to the "Public IPv4 address" field in the previous screenshot. The terminal output shows the user logging in as devopsadmin and running kubectl commands to list nodes and edit deployment files.

```
ubuntu@kmaster-node:~$ sudo -i
root@kmaster-node:~# su - devopsadmin
devopsadmin@kmaster-node:~$ kubectl get nodes
NAME      STATUS   ROLES    AGE     VERSION
kmaster-node  Ready    control-plane   6d19h   v1.29.11
worker-node1  Ready    <none>    6d19h   v1.29.11
worker-node2  Ready    <none>    6d19h   v1.29.11
devopsadmin@kmaster-node:~$ ls
devopsadmin@kmaster-node:~$ pwd
/home/devopsadmin
devopsadmin@kmaster-node:~$ mkdir assign_examples
devopsadmin@kmaster-node:~$ cd assign_examples/
devopsadmin@kmaster-node:~/assign_examples$ vi deployment.yaml
```

i-09c0eda9439eab117 (Kubernetes\_master)  
PublicIPs: 13.232.210.243 PrivateIPs: 172.31.33.46

The screenshot shows a terminal window within the AWS CloudShell interface. The user is connected to a Kubernetes master node with the IP i-09c0eda9439eab117. The terminal session is running on the command line, displaying the following commands:

```
devopsadmin@kmaster-node:~/assign_examples$ ls
deployment.yaml
devopsadmin@kmaster-node:~/assign_examples$ vi service.yaml
```

The AWS CloudShell interface includes standard browser navigation controls (back, forward, search), a top bar with the AWS logo, a search bar, and various status indicators and icons.

Screenshot of the AWS EC2 Instances page showing a list of 7 instances. A red arrow points from the instance table to the 'Networking' tab of the selected instance's details page.

**Instances (1/7) Info**

Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Z.
Kubernetes_master	i-09c0eda9439eab117	Running	t2.medium	2/2 checks passed	<a href="#">View alarms +</a>	ap-south-1a
build_server	i-09a1c99ed46e7f4bb	Stopped	t2.medium	-	<a href="#">View alarms +</a>	ap-south-1a
master_server	i-091912f1fc5419060	Stopped	t2.medium	-	<a href="#">View alarms +</a>	ap-south-1a
<b>Kubernetes_worker_node_1</b>	<b>i-06e3c377b18b2f0d5</b>	<b>Running</b>	<b>t2.medium</b>	<b>2/2 checks passed</b>	<a href="#">View alarms +</a>	<b>ap-south-1a</b>
Kubernetes_worker_node_2	i-0281f57ea493a9e64	Running	t2.medium	2/2 checks passed	<a href="#">View alarms +</a>	ap-south-1a
monitoring_server	i-0eb6c8a29dfaee88	Stopped	t2.micro	-	<a href="#">View alarms +</a>	ap-south-1b
prod_server	i-0b19d37b829491a34	Stopped	t2.micro	-	<a href="#">View alarms +</a>	ap-south-1b

**i-06e3c377b18b2f0d5 (Kubernetes\_worker\_node\_1)**

**Details** [Status and alarms](#) [Monitoring](#) [Security](#) [Networking](#) [Storage](#) [Tags](#)

**Instance summary**

Instance ID <a href="#">i-06e3c377b18b2f0d5</a>	Public IPv4 address <a href="#">15.207.87.78   open address</a>	Private IP4 addresses <a href="#">172.31.35.80</a>
IPv6 address -	Instance state <b>Running</b>	Public IPv4 DNS <a href="#">ec2-15-207-87-78.ap-south-1.compute.amazonaws.com   open address</a>
Hostname type	Private IP DNS name (IPv4 only)	

Screenshot of the AWS CloudShell terminal showing a series of Kubernetes commands being run on a master node.

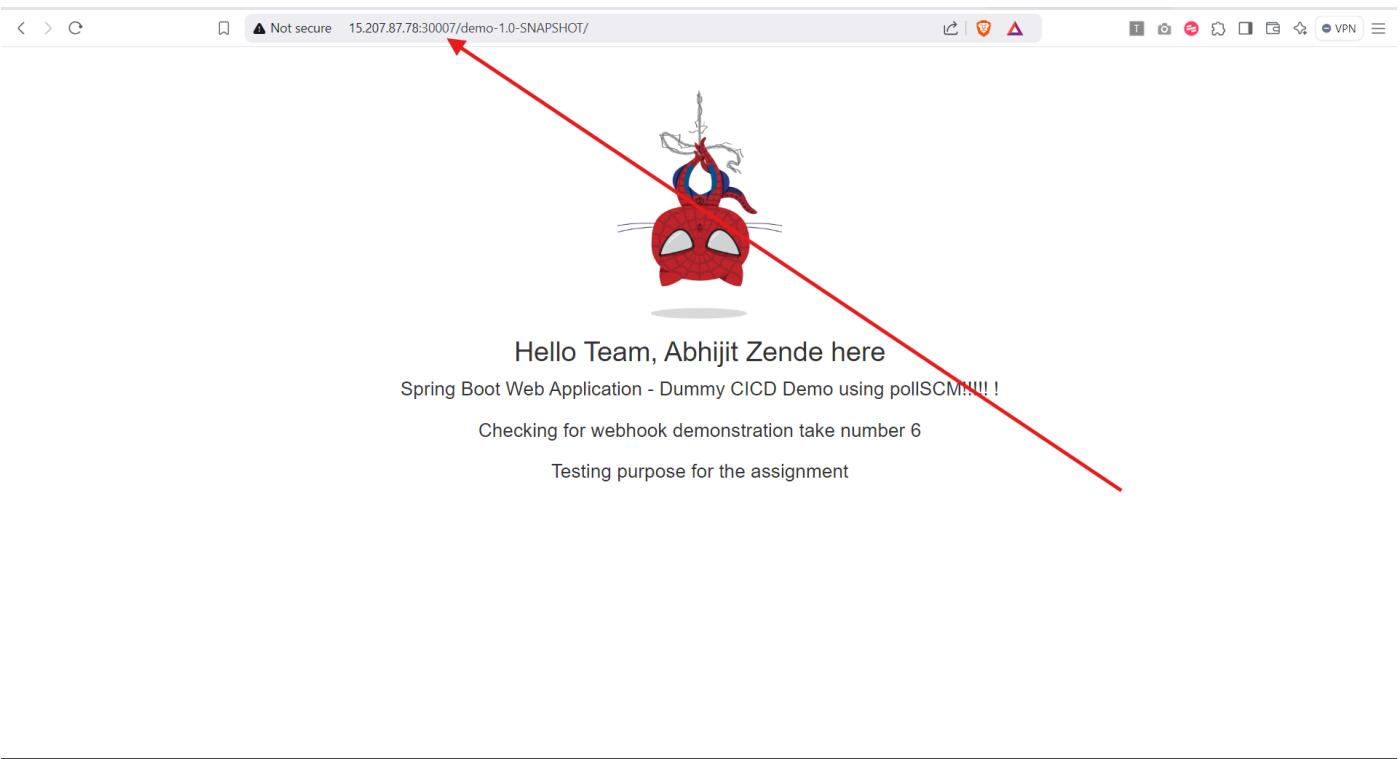
```

devopsadmin@kmaster-node:~/assign_examples$ ls
deployment.yaml
devopsadmin@kmaster-node:~/assign_examples$ vi service.yaml
devopsadmin@kmaster-node:~/assign_examples$ kubectl apply -f deployment.yaml
deployment.apps/tomcat-deployment created
devopsadmin@kmaster-node:~/assign_examples$ kubectl get deployment -o wide
NAME          READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES           SELECTOR
tomcat-deployment   0/2      2          0          13s   tomcat       abhiz2411/tomcat_web_img:7   app=tomcat
devopsadmin@kmaster-node:~/assign_examples$ kubectl get pods -o wide
NAME          READY   STATUS    RESTARTS   AGE   IP           NODE   NOMINATED NODE   READINESS GATES
tomcat-deployment-c7f8bf68f-pql87  0/1   ContainerCreating   0      22s   <none>       worker-node2   <none>        <none>
tomcat-deployment-c7f8bf68f-qlbnn  1/1   Running       0      22s   10.244.1.2   worker-node1   <none>        <none>
devopsadmin@kmaster-node:~/assign_examples$ kubectl get pods -o wide
NAME          READY   STATUS    RESTARTS   AGE   IP           NODE   NOMINATED NODE   READINESS GATES
tomcat-deployment-c7f8bf68f-pql87  0/1   ContainerCreating   0      30s   <none>       worker-node2   <none>        <none>
tomcat-deployment-c7f8bf68f-qlbnn  1/1   Running       0      30s   10.244.1.2   worker-node1   <none>        <none>
devopsadmin@kmaster-node:~/assign_examples$ kubectl apply -f service.yaml
service/tomcat-service created
devopsadmin@kmaster-node:~/assign_examples$ kubectl get service tomcat-service
NAME          TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
tomcat-service  NodePort   10.108.82.28  <none>        8080:30007/TCP   12s
devopsadmin@kmaster-node:~/assign_examples$ 

```

**i-09c0eda9439eab117 (Kubernetes\_master)**

Public IPs: 13.232.210.243 Private IPs: 172.31.33.46



```
aws | Search [Alt+S] Mumbai abhijitzende

devopsadmin@kmaster-node:~/assign_examples$ ls
deployment.yaml
devopsadmin@kmaster-node:~/assign_examples$ vi service.yaml
devopsadmin@kmaster-node:~/assign_examples$ kubectl apply -f deployment.yaml
deployment.apps/tomcat-deployment created
devopsadmin@kmaster-node:~/assign_examples$ kubectl get deployment -o wide
NAME          READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES           SELECTOR
tomcat-deployment   0/2     2           0           13s   tomcat       abhiz2411/tomcat_web_img:7   app=tomcat
devopsadmin@kmaster-node:~/assign_examples$ kubectl get pods -o wide
NAME          READY   STATUS    RESTARTS   AGE   IP           NODE   NOMINATED NODE   READINESS GATES
tomcat-deployment-c7f8bf68f-pql87   0/1   ContainerCreating   0      22s   <none>        worker-node2   <none>
tomcat-deployment-c7f8bf68f-qlbmh   1/1   Running      0      22s   10.244.1.2   worker-node1   <none>
devopsadmin@kmaster-node:~/assign_examples$ kubectl get pods -o wide
NAME          READY   STATUS    RESTARTS   AGE   IP           NODE   NOMINATED NODE   READINESS GATES
tomcat-deployment-c7f8bf68f-pql87   0/1   ContainerCreating   0      30s   <none>        worker-node2   <none>
tomcat-deployment-c7f8bf68f-qlbmh   1/1   Running      0      30s   10.244.1.2   worker-node1   <none>
devopsadmin@kmaster-node:~/assign_examples$ kubectl apply -f service.yaml
service/tomcat-service created
devopsadmin@kmaster-node:~/assign_examples$ kubectl get service tomcat-service
NAME          TYPE      CLUSTER-IP   EXTERNAL-IP   PORT(S)   AGE
tomcat-service NodePort  10.108.82.28 <none>        8080:30007/TCP  12s
devopsadmin@kmaster-node:~/assign_examples$ kubectl delete -f deployment.yaml service.yaml
error: when paths, URLs, or stdin is provided as input, you may not specify resource arguments as well
devopsadmin@kmaster-node:~/assign_examples$ kubectl delete -f deployment.yaml
deployment.apps "tomcat-deployment" deleted
devopsadmin@kmaster-node:~/assign_examples$ kubectl delete -f service.yaml
service "tomcat-service" deleted
devopsadmin@kmaster-node:~/assign_examples$
```

i-09c0eda9439eb117 (Kubernetes\_master)  
Public IPs: 13.232.210.243 Private IPs: 172.31.33.46

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### 3. L3 - Scale-up and Scale-Down the Pods Deployed

Ans

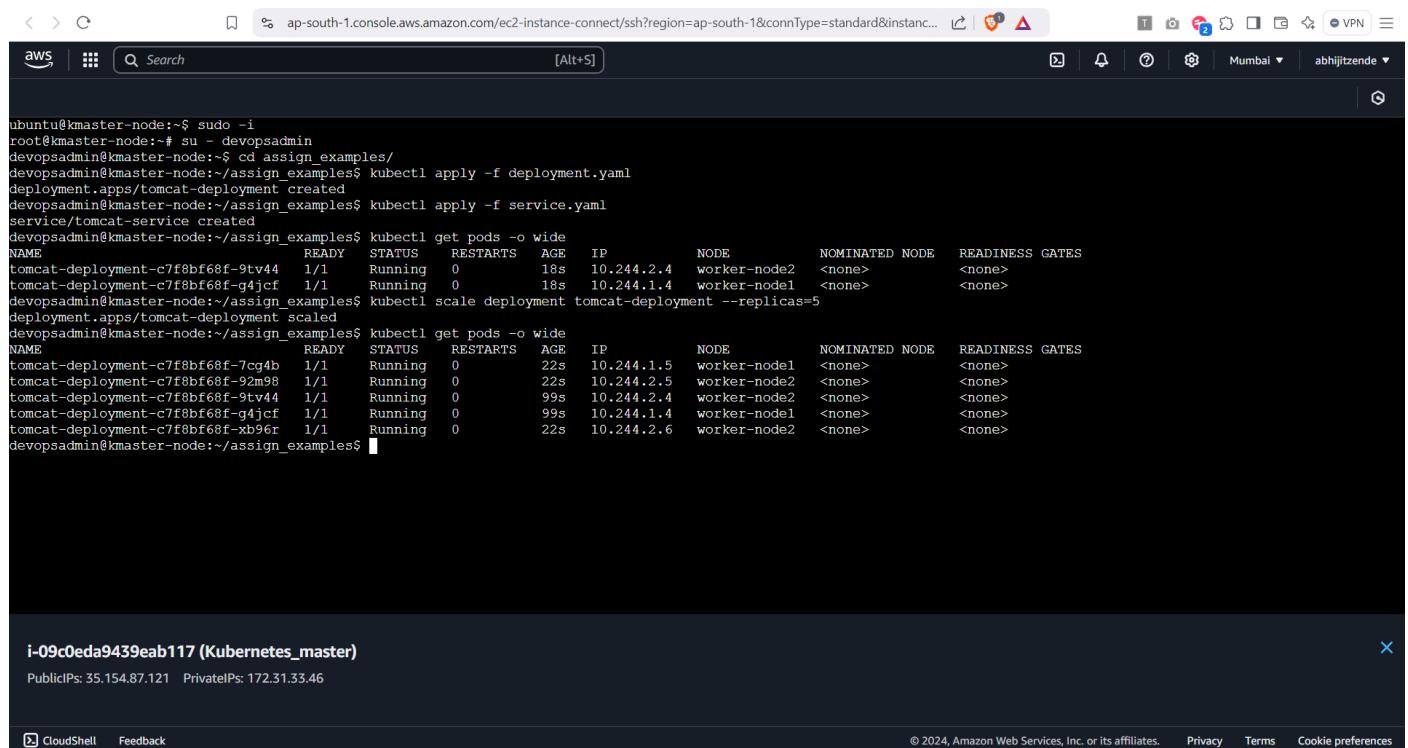
Step 1 – Initial Deployed Pods and scaling up the pods and check scaling using

```

kubectl scale deployment tomcat-deployment --replicas=5

kubectl get pods -o wide

```



The screenshot shows a terminal window in the AWS CloudShell interface. The user has run several commands to manage a Tomcat deployment:

```
ubuntu@kmaster-node:~$ sudo -i
root@kmaster-node:~# su - devopsadmin
devopsadmin@kmaster-node:~$ cd assign_examples/
devopsadmin@kmaster-node:~/assign_examples$ kubectl apply -f deployment.yaml
deployment.apps/tomcat-deployment created
devopsadmin@kmaster-node:~/assign_examples$ kubectl apply -f service.yaml
service/tomcat-service created
devopsadmin@kmaster-node:~/assign_examples$ kubectl get pods -o wide
NAME           READY   STATUS    RESTARTS   AGE   IP          NODE      NOMINATED NODE   READINESS GATES
tomcat-deployment-c7f8bf68f-9tv44  1/1    Running   0          18s   10.244.2.4  worker-node2  <none>        <none>
tomcat-deployment-c7f8bf68f-q4jcf  1/1    Running   0          18s   10.244.1.4  worker-node1  <none>        <none>
devopsadmin@kmaster-node:~/assign_examples$ kubectl scale deployment tomcat-deployment --replicas=5
deployment.apps/tomcat-deployment scaled
devopsadmin@kmaster-node:~/assign_examples$ kubectl get pods -o wide
NAME           READY   STATUS    RESTARTS   AGE   IP          NODE      NOMINATED NODE   READINESS GATES
tomcat-deployment-c7f8bf68f-7cg4b  1/1    Running   0          22s   10.244.1.5  worker-node1  <none>        <none>
tomcat-deployment-c7f8bf68f-92m98  1/1    Running   0          22s   10.244.2.5  worker-node2  <none>        <none>
tomcat-deployment-c7f8bf68f-9tv44  1/1    Running   0          99s  10.244.2.4  worker-node2  <none>        <none>
tomcat-deployment-c7f8bf68f-q4jcf  1/1    Running   0          99s  10.244.1.4  worker-node1  <none>        <none>
tomcat-deployment-c7f8bf68f-xb96r  1/1    Running   0          22s   10.244.2.6  worker-node2  <none>        <none>
devopsadmin@kmaster-node:~/assign_examples$
```

The terminal also displays the instance ID and public/private IP addresses at the bottom.

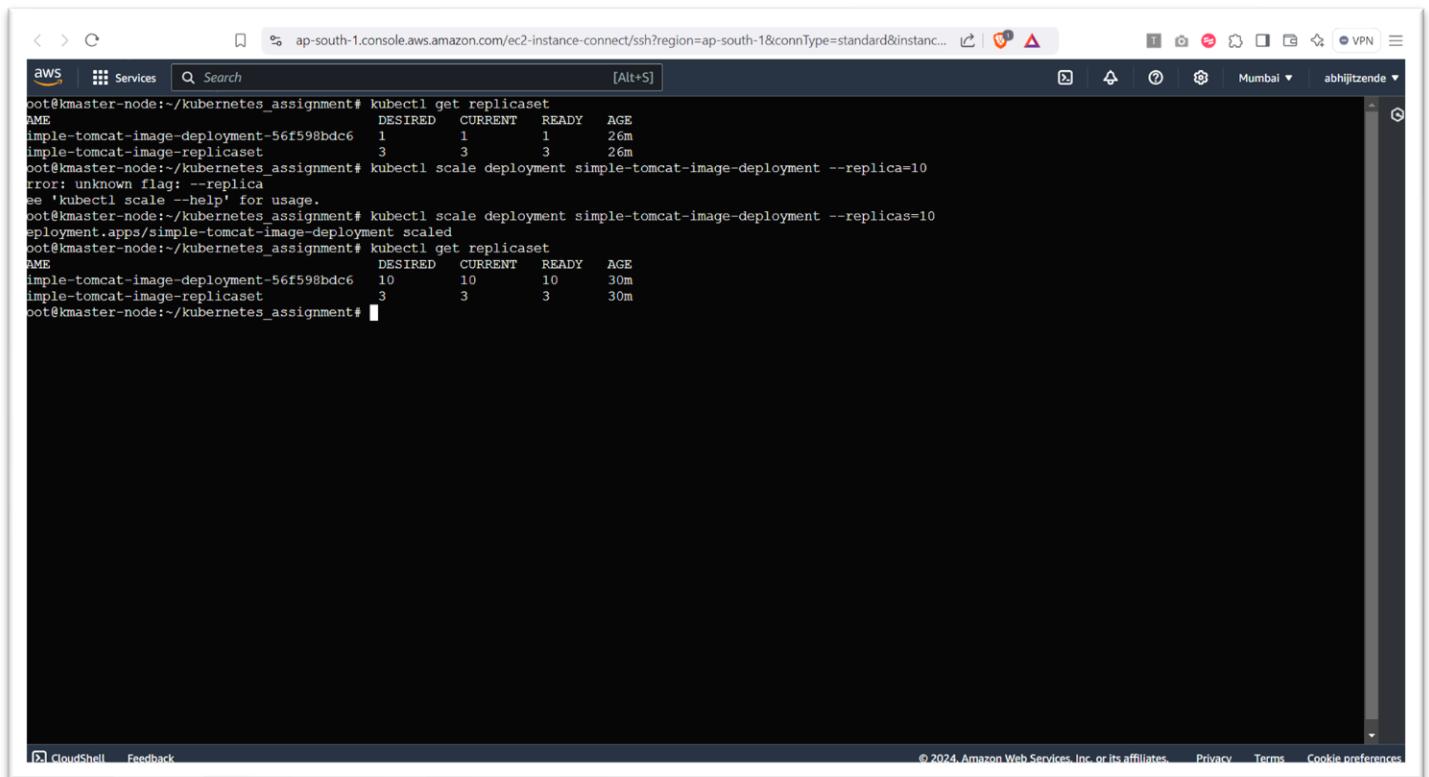
## Step 2 – Scaling down the pods using command

...

kubectl scale deployment tomcat-deployment --replicas=2

kubectl get pods -o wide

...



The screenshot shows a terminal window within the AWS CloudShell interface. The URL in the address bar is `ap-south-1.console.aws.amazon.com/ec2-instance-connect/ssh?region=ap-south-1&connType=standard&instanceId=...&port=22`. The terminal session is titled "aws" and contains the following command history:

```
aws | Services | Q Search [Alt+S]
bot@kmaster-node:~/kubernetes_assignment# kubectl get replicaset
NAME           DESIRED   CURRENT   READY   AGE
simple-tomcat-image-deployment-56f598bdc6  1         1         1      26m
simple-tomcat-image-replicaset            3         3         3      26m
bot@kmaster-node:~/kubernetes_assignment# kubectl scale deployment simple-tomcat-image-deployment --replicas=10
error: unknown flag: --replica
see 'kubectl scale --help' for usage.
bot@kmaster-node:~/kubernetes_assignment# kubectl scale deployment simple-tomcat-image-deployment --replicas=10
deployment.apps/simple-tomcat-image-deployment scaled
bot@kmaster-node:~/kubernetes_assignment# kubectl get replicaset
NAME           DESIRED   CURRENT   READY   AGE
simple-tomcat-image-deployment-56f598bdc6  10        10        10     30m
simple-tomcat-image-replicaset            3         3         3      30m
bot@kmaster-node:~/kubernetes_assignment#
```

## 4. L4 - Implement Rolling-Update Strategy to Upgrade the Application Image from V1.0 to V1.1

Ans

Step 1: Verify the Existing Deployment and update the deployment with new image:

```

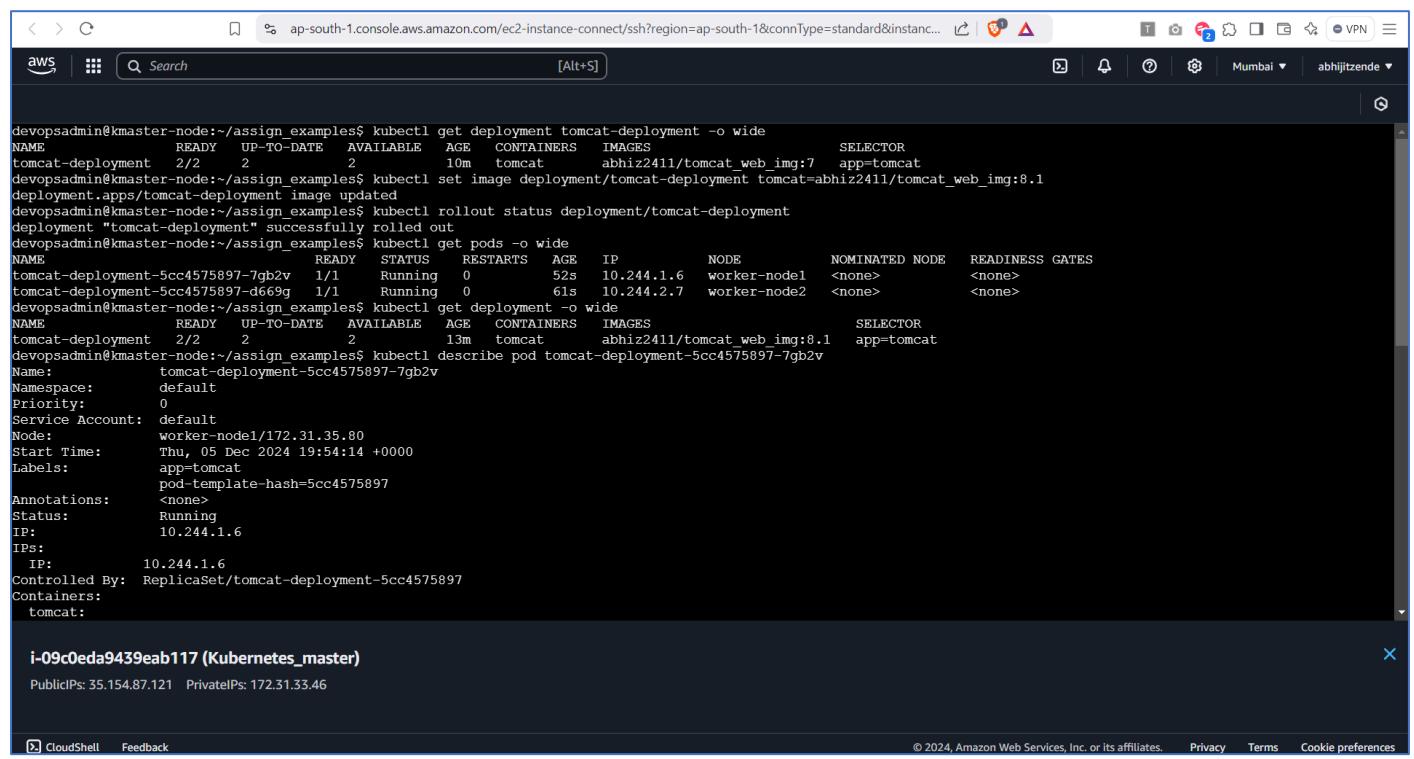
kubectl get deployment tomcat-deployment -o wide

kubectl set image deployment/tomcat-deployment tomcat=abhiz2411/tomcat\_web\_img:8

kubectl get pods

kubectl describe pod <pod-name>

```



The screenshot shows a terminal window in the AWS CloudShell interface. The user has run several commands to verify an existing deployment and then update it with a new image. The output of these commands is displayed below:

```
devopsadmin@kmaster-node:~/assign_exampless$ kubectl get deployment tomcat-deployment -o wide
NAME          READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES           SELECTOR
tomcat-deployment   2/2     2           2          10m   tomcat       abhiz2411/tomcat_web_img:7   app=tomcat
devopsadmin@kmaster-node:~/assign_exampless$ kubectl set image deployment/tomcat-deployment tomcat=abhiz2411/tomcat_web_img:8.1
deployment.apps/tomcat-deployment image updated
devopsadmin@kmaster-node:~/assign_exampless$ kubectl rollout status deployment/tomcat-deployment
deployment "tomcat-deployment" successfully rolled out
devopsadmin@kmaster-node:~/assign_exampless$ kubectl get pods -o wide
NAME          READY   UP-TO-DATE   AVAILABLE   AGE   NODE        NOMINATED NODE   READINESS GATES
tomcat-deployment-5cc4575897-7gb2v  1/1     Running      0      52s   worker-node1   <none>          <none>
tomcat-deployment-5cc4575897-d669g  1/1     Running      0      61s   worker-node2   <none>          <none>
devopsadmin@kmaster-node:~/assign_exampless$ kubectl get deployment -o wide
NAME          READY   UP-TO-DATE   AVAILABLE   AGE   CONTAINERS   IMAGES           SELECTOR
tomcat-deployment   2/2     2           2          13m   tomcat       abhiz2411/tomcat_web_img:8.1   app=tomcat
devopsadmin@kmaster-node:~/assign_exampless$ kubectl describe pod tomcat-deployment-5cc4575897-7gb2v
Name:         tomcat-deployment-5cc4575897-7gb2v
Namespace:    default
Priority:    0
Service Account: default
Node:        worker-node1/172.31.35.80
Start Time:  Thu, 05 Dec 2024 19:54:14 +0000
Labels:      app=tomcat
Annotations: <none>
Status:     Running
IP:          10.244.1.6
IPs:          IP: 10.244.1.6
Controlled By: ReplicaSet/tomcat-deployment-5cc4575897
Containers:
  tomcat:
```

**i-09c0eda9439eab117 (Kubernetes\_master)**

PublicIPs: 35.154.87.121 PrivateIPs: 172.31.33.46

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```
Annotations:          pod-template-hash=5cc4575897
Status:             Running
IP:                10.244.1.6
IPs:
  IP:           10.244.1.6
Controlled By:    ReplicaSet/tomcat-deployment-5cc4575897
Containers:
  tomcat:
    Container ID:  containerd://d20ecbc7c480f100e7935ce1be129e3c10a5665e50b987f86fac24980bdc8b01
    Image:         abhiz2411/tomcat_web_img:8.1
    Image ID:     docker.io/abhiz2411/tomcat_web_img@sha256:fcc39190e68be07f651c913a26479115ab4ded15b755916662fa5f1aec5ba913
    Port:          8080/TCP
    Host Port:    0/TCP
    State:         Running
      Started:   Thu, 05 Dec 2024 19:54:22 +0000
    Ready:         True
    Restart Count: 0
    Environment:  <none>
    Mounts:
      /var/run/secrets/kubernetes.io/serviceaccount from kube-api-access-nlkn4 (ro)
Conditions:
  Type        Status
  PodReadyToStartContainers  True
  Initialized  True
  Ready        True
  ContainersReady  True
  PodsScheduled  True
Volumes:
  kube-api-access-nlkn4:
    Type:       Projected (a volume that contains injected data from multiple sources)

```

devopsadmin@kmaster-node:~/assign\_examples\$ kubectl delete -f deployment.yaml  
deployment.apps "tomcat-deployment" deleted  
devopsadmin@kmaster-node:~/assign\_examples\$ kubectl delete -f service.yaml  
service "tomcat-service" deleted  
devopsadmin@kmaster-node:~/assign\_examples\$

i-09c0eda9439eab117 (Kubernetes\_master)  
Public IPs: 35.154.87.121 Private IPs: 172.31.33.46

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## Step 2: Rollback if Necessary

devopsadmin@kmaster-node:~/assign\_examples\$ kubectl delete -f deployment.yaml  
deployment.apps "tomcat-deployment" deleted  
devopsadmin@kmaster-node:~/assign\_examples\$ kubectl delete -f service.yaml  
service "tomcat-service" deleted  
devopsadmin@kmaster-node:~/assign\_examples\$

i-09c0eda9439eab117 (Kubernetes\_master)  
Public IPs: 35.154.87.121 Private IPs: 172.31.33.46

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