Name:Atharv Nikam Div:D15C Roll:36

Experiment 4

Aim: To set up Kubectl for managing a Kubernetes cluster and deploy a basic application.

Theory: Kubernetes, which originated from Google, is a popular open-source platform for managing containerized applications. It streamlines the scaling, deployment, and maintenance of containers, ensuring resilience and flexibility. It's become a standard in the industry for orchestrating containers, with contributions from top technology companies through the Cloud Native Computing Foundation (CNCF).

Kubernetes Deployment:
This refers to a resource in Kubernetes that allows for rolling updates and rollbacks of applications. It ensures that the correct number of pods are running, maintaining desired configurations at all times.

Requirements:

- **EC2 Instance:** A t2.medium instance with at least 2 CPUs is necessary to accommodate Kubernetes' resource needs.
    - **Minimum configuration:**
        - Instance Type: t2.medium
        - CPUs: 2
        - Memory: Suitable for container operations

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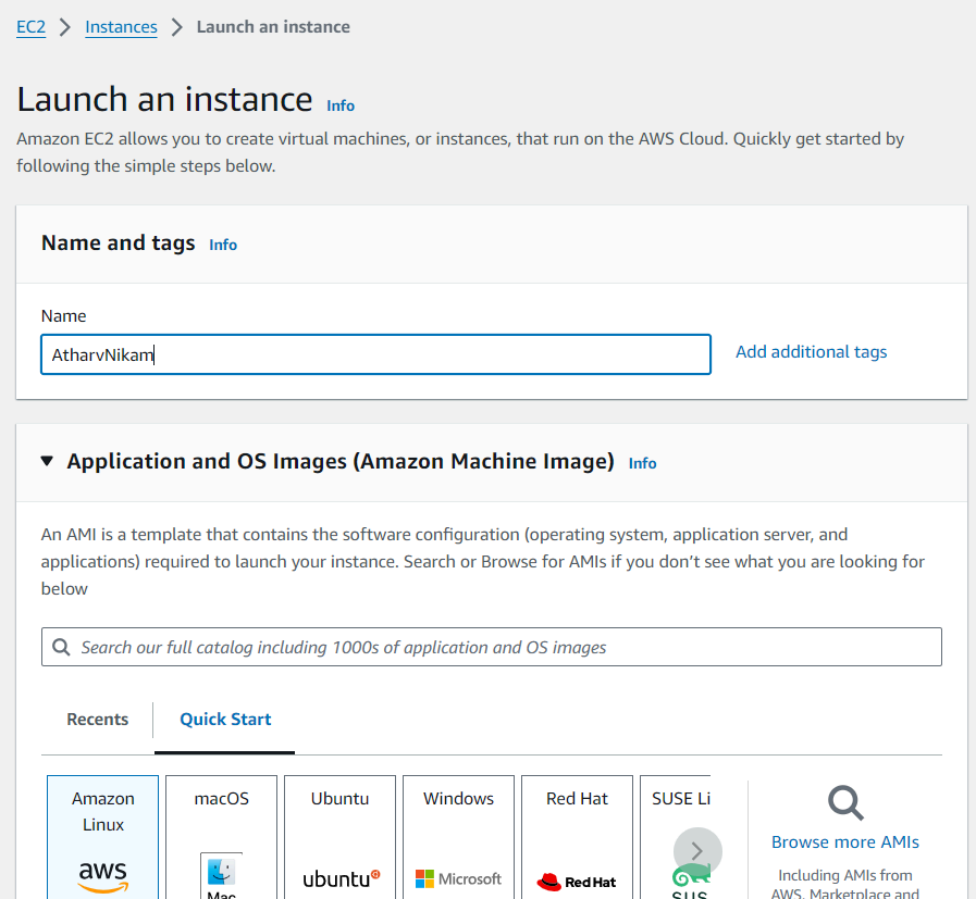
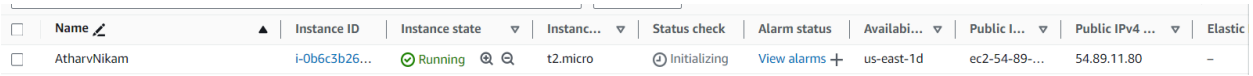
Step 1:

Log in to your AWS account and launch an EC2 instance. Choose Ubuntu as the AMI and set the instance type to t2.medium. Generate an RSA key in `.pem` format, and move it to a secure folder on your system.
Note: Kubernetes requires at least 2 CPUs, so ensure you select the t2.medium instance. Be mindful to terminate the instance after the task is complete, as it isn't covered under the free tier.





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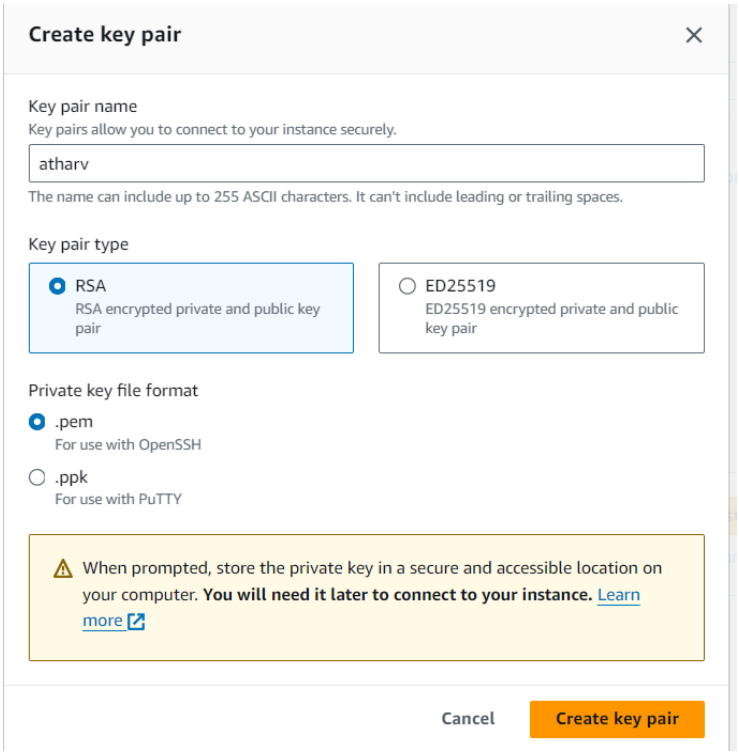
Step 2:

Connect to your EC2 instance via SSH. Open the terminal in the directory where the `.pem` key is stored, and run the SSH command to access the instance.




```
PS D:\Key> ssh -i "atharv.pem" ubuntu@ec2-54-83-70-136.compute-1.amazonaws.com
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-1012-aws x86_64)

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

 System information as of Mon Sep 16 05:30:31 UTC 2024

  System load:  0.24              Processes:             159
  Usage of /:   55.6% of 6.71GB   Users logged in:       1
  Memory usage: 20%               IPv4 address for enX0: 172.31.30.208
  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.

135 updates can be applied immediately.
41 of these updates are standard security updates.
```

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Step 3:
Install Docker on your EC2 instance using the following commands:
curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
sudo add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
sudo apt-get update
sudo apt-get install -y docker-ce

```
ubuntu@ip-172-31-30-208:~$ curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo tee /etc/apt/trusted.gpg.d/docker.gpg > /dev/nul
ubuntu@ip-172-31-30-208:~$ 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 noble stable'
Description:
Archive for codename: noble components: stable
More info: https://download.docker.com/linux/ubuntu
Adding repository.
Press [ENTER] to continue or Ctrl-c to cancel.
Adding deb entry to /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-noble.list
Adding disabled deb-src entry to /etc/apt/sources.list.d/archive_uri-https_download_docker_com_linux_ubuntu-noble.list
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 https://download.docker.com/linux/ubuntu noble InRelease [48.8 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:5 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Packages [15.0 MB]
Get:6 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:7 https://download.docker.com/linux/ubuntu noble/stable amd64 Packages [13.8 kB]
Get:8 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe Translation-en [5982 kB]
Get:9 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Components [3871 kB]
Get:10 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 c-n-f Metadata [301 kB]
Get:11 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Packages [269 kB]
Get:12 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse Translation-en [118 kB]
Get:13 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Components [35.0 kB]
Get:14 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 c-n-f Metadata [8328 B]
Get:15 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [502 kB]
Get:16 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [123 kB]
Get:17 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 c-n-f Metadata [8264 B]
Get:18 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [365 kB]
Get:19 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [150 kB]
Get:20 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [45.0 kB]
Get:21 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f Metadata [14.3 kB]
Get:22 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [317 kB]
Get:23 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [61.5 kB]
Get:24 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 c-n-f Metadata [424 B]
```

```
ubuntu@ip-172-31-30-208:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:5 https://download.docker.com/linux/ubuntu noble InRelease
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: The key(s) in the keyring /etc/apt/trusted.gpg.d/docker.gpg are ignored as the file has an unsupported filetype.
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
```

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```
ubuntu@ip-172-31-30-208:~$ sudo apt-get install -y docker-ce
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  containerd.io docker-buildx-plugin docker-ce-cli docker-ce-rootless-extras docker-compose-plugin libltdl7 libslirp0 pigz slirp4netns
Suggested packages:
  aufs-tools cgroupfs-mount | cgroup-lite
The following NEW packages will be installed:
  containerd.io docker-buildx-plugin docker-ce docker-ce-cli docker-ce-rootless-extras docker-compose-plugin libltdl7 libslirp0 pigz slirp4netns
0 upgraded, 10 newly installed, 0 to remove and 133 not upgraded.
Need to get 122 MB of archives.
After this operation, 440 MB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 pigz amd64 2.8-1 [65.6 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libltdl7 amd64 2.4.7-7build1 [40.3 kB]
Get:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 libslirp0 amd64 4.7.0-1ubuntu3 [63.8 kB]
Get:4 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 slirp4netns amd64 1.2.1-1build2 [34.9 kB]
Get:5 https://download.docker.com/linux/ubuntu noble/stable amd64 containerd.io amd64 1.7.22-1 [29.5 MB]
Get:6 https://download.docker.com/linux/ubuntu noble/stable amd64 docker-buildx-plugin amd64 0.16.2-1~ubuntu.24.04~noble [29.9 MB]
Get:7 https://download.docker.com/linux/ubuntu noble/stable amd64 docker-ce-cli amd64 5:27.2.1-1~ubuntu.24.04~noble [15.0 MB]
Get:8 https://download.docker.com/linux/ubuntu noble/stable amd64 docker-ce amd64 5:27.2.1-1~ubuntu.24.04~noble [25.6 MB]
Get:9 https://download.docker.com/linux/ubuntu noble/stable amd64 docker-ce-rootless-extras amd64 5:27.2.1-1~ubuntu.24.04~noble [9571 kB]
Get:10 https://download.docker.com/linux/ubuntu noble/stable amd64 docker-compose-plugin amd64 2.29.2-1~ubuntu.24.04~noble [12.5 MB]
Fetched 122 MB in 2s (66.5 MB/s)
Selecting previously unselected package pigz.
(Reading database ... 67741 files and directories currently installed.)
Preparing to unpack .../0-pigz_2.8-1_amd64.deb ...
Unpacking pigz (2.8-1) ...
Selecting previously unselected package containerd.io.
Preparing to unpack .../1-containerd.io_1.7.22-1_amd64.deb ...
Unpacking containerd.io (1.7.22-1) ...
Selecting previously unselected package docker-buildx-plugin.
Preparing to unpack .../2-docker-buildx-plugin_0.16.2-1~ubuntu.24.04~noble_amd64.deb ...
Unpacking docker-buildx-plugin (0.16.2-1~ubuntu.24.04~noble) ...
Selecting previously unselected package docker-ce-cli.
Preparing to unpack .../3-docker-ce-cli_5%3a27.2.1-1~ubuntu.24.04~noble_amd64.deb ...
Unpacking docker-ce-cli (5:27.2.1-1~ubuntu.24.04~noble) ...
Selecting previously unselected package docker-ce.
Preparing to unpack .../4-docker-ce_5%3a27.2.1-1~ubuntu.24.04~noble_amd64.deb ...
Unpacking docker-ce (5:27.2.1-1~ubuntu.24.04~noble) ...
Selecting previously unselected package docker-ce-rootless-extras.
Preparing to unpack .../5-docker-ce-rootless-extras_5%3a27.2.1-1~ubuntu.24.04~noble_amd64.deb ...
Unpacking docker-ce-rootless-extras (5:27.2.1-1~ubuntu.24.04~noble) ...
Selecting previously unselected package docker-compose-plugin.
Preparing to unpack .../6-docker-compose-plugin_2.29.2-1~ubuntu.24.04~noble_amd64.deb ...
Unpacking docker-compose-plugin (2.29.2-1~ubuntu.24.04~noble) ...
Selecting previously unselected package libltdl7:amd64.
Preparing to unpack .../7-libltdl7_2.4.7-7build1_amd64.deb ...
Unpacking libltdl7:amd64 (2.4.7-7build1) ...
```

```
Selecting previously unselected package docker-compose-plugin.
Preparing to unpack .../6-docker-compose-plugin_2.29.2-1~ubuntu.24.04~noble_amd64.deb ...
Unpacking docker-compose-plugin (2.29.2-1~ubuntu.24.04~noble) ...
Selecting previously unselected package libltdl7:amd64.
Preparing to unpack .../7-libltdl7_2.4.7-7build1_amd64.deb ...
Unpacking libltdl7:amd64 (2.4.7-7build1) ...
Selecting previously unselected package libslirp0:amd64.
Preparing to unpack .../8-libslirp0_4.7.0-1ubuntu3_amd64.deb ...
Unpacking libslirp0:amd64 (4.7.0-1ubuntu3) ...
Selecting previously unselected package slirp4netns.
Preparing to unpack .../9-slirp4netns_1.2.1-1build2_amd64.deb ...
Unpacking slirp4netns (1.2.1-1build2) ...
Setting up docker-buildx-plugin (0.16.2-1~ubuntu.24.04~noble) ...
Setting up containerd.io (1.7.22-1) ...
Created symlink /etc/systemd/system/multi-user.target.wants/containerd.service → /usr/lib/systemd/system/containerd.service.
Setting up docker-compose-plugin (2.29.2-1~ubuntu.24.04~noble) ...
Setting up libltdl7:amd64 (2.4.7-7build1) ...
Setting up docker-ce-cli (5:27.2.1-1~ubuntu.24.04~noble) ...
Setting up libslirp0:amd64 (4.7.0-1ubuntu3) ...
Setting up pigz (2.8-1) ...
Setting up docker-ce-rootless-extras (5:27.2.1-1~ubuntu.24.04~noble) ...
Setting up slirp4netns (1.2.1-1build2) ...
Setting up docker-ce (5:27.2.1-1~ubuntu.24.04~noble) ...
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /usr/lib/systemd/system/docker.service.
Created symlink /etc/systemd/system/sockets.target.wants/docker.socket → /usr/lib/systemd/system/docker.socket.
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8.2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-30-208:~$
```

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Configure Docker to use the systemd cgroup driver:
sudo mkdir -p /etc/docker
cat <<EOF | sudo tee /etc/docker/daemon.json {
"exec-opts": ["native.cgroupdriver=systemd"]
} EOF
{
"exec-opts": ["native.cgroupdriver=systemd"]
}

```
ubuntu@ip-172-31-30-208:~$ sudo mkdir -p /etc/docker
cat <<EOF | sudo tee /etc/docker/daemon.json {
"exec-opts": ["native.cgroupdriver=systemd"] } EOF
{
"exec-opts": ["native.cgroupdriver=systemd"] }ubuntu@ip-172-31-30-208:~$
```

Enable and restart Docker:

sudo systemctl enable docker

sudo systemctl daemon-reload

sudo systemctl restart docker

```
ubuntu@ip-172-31-30-208:~$ sudo systemctl enable docker
Synchronizing state of docker.service with SysV service script with /usr/lib/systemd/systemd-sysv-install.
Executing: /usr/lib/systemd/systemd-sysv-install enable docker
ubuntu@ip-172-31-30-208:~$
```

Install Kubernetes using the following commands:

```
curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.31/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:/v1.31/deb/ /' | sudo tee
/etc/apt/sources.list.d/kubernetes.list
sudo apt-get update
sudo apt-get install -y kubelet kubeadm kubectl
sudo apt-mark hold kubelet kubeadm kubectl
```

```
ubuntu@ip-172-31-30-208:~$ curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.31/deb/Release.key | sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg
ubuntu@ip-172-31-30-208:~$ echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.31/deb/ /' | sudo tee /etc/apt/sources.list.d/kubernetes.list
deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.31/deb/ /
ubuntu@ip-172-31-30-208:~$
```

```
ubuntu@ip-172-31-30-208:~$ sudo apt-get update
Hit:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Hit:3 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Hit:5 https://download.docker.com/linux/ubuntu noble InRelease
Get:6 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.31/deb  InRelease [1186 B]
Get:7 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.31/deb  Packages [4865 B]
Fetched 132 kB in 1s (218 kB/s)
Reading package lists... Done
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: The key(s) in the keyring /etc/apt/trusted.gpg.d/docker.gpg are ignored as the file has an unsupported filetype.
W: https://download.docker.com/linux/ubuntu/dists/noble/InRelease: Key is stored in legacy trusted.gpg keyring (/etc/apt/trusted.gpg), see the DEPRECATION section in apt-key(8) for details.
```

```
ubuntu@ip-172-31-30-208:~$ sudo apt-get install -y kubelet kubeadm kubectl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  conntrack cri-tools kubernetes-cni
The following NEW packages will be installed:
  conntrack cri-tools kubeadm kubectl kubelet kubernetes-cni
0 upgraded, 6 newly installed, 0 to remove and 133 not upgraded.
Need to get 87.4 MB of archives.
After this operation, 314 MB of additional disk space will be used.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 conntrack amd64 1:1.4.8-1ubuntu1 [37.9 kB]
Get:2 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.31/deb  cri-tools 1.31.1-1.1 [15.7 MB]
Get:3 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.31/deb  kubeadm 1.31.1-1.1 [11.4 MB]
Get:4 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.31/deb  kubectl 1.31.1-1.1 [11.2 MB]
Get:5 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.31/deb  kubernetes-cni 1.5.1-1.1 [33.9 MB]
Get:6 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.31/deb  kubelet 1.31.1-1.1 [15.2 MB]
Fetched 87.4 MB in 1s (81.3 MB/s)
Selecting previously unselected package conntrack.
(Reading database ... 68007 files and directories currently installed.)
ubuntu@ip-172-31-30-208:~$
```

```
ubuntu@ip-172-31-30-208:~$ sudo apt-mark hold kubelet kubeadm kubectl
kubelet set on hold.
kubeadm set on hold.
kubectl set on hold.
ubuntu@ip-172-31-30-208:~$
```

Step 5:

To initialize the Kubernetes cluster, run:

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

```
ubuntu@ip-172-31-30-208:~$ sudo systemctl enable --now kubelet
ubuntu@ip-172-31-30-208:~$ sudo kubeadm init --pod-network-cidr=10.244.0.0/16
[init] Using Kubernetes version: v1.31.0
[preflight] Running pre-flight checks
W0916 04:01:46.391802    6909 checks.go:1080] [preflight] WARNING: Couldn't create the interfac
validate CRI v1 runtime API for endpoint "unix:///var/run/containerd/containerd.sock": rpc erro
        [WARNING FileExisting-socat]: socat not found in system path
[preflight] Pulling images required for setting up a Kubernetes cluster
[preflight] This might take a minute or two, depending on the speed of your internet connection
[preflight] You can also perform this action beforehand using 'kubeadm config images pull'
error execution phase preflight: [preflight] Some fatal errors occurred:
failed to create new CRI runtime service: validate service connection: validate CRI v1 runtime
e runtime.v1.RuntimeService[preflight] If you know what you are doing, you can make a check non
To see the stack trace of this error execute with --v=5 or higher
ubuntu@ip-172-31-30-208:~$
```

If you encounter any errors, such as missing container runtimes, install containerd:

```
sudo apt-get install -y containerd
sudo mkdir -p /etc/containerd
sudo containerd config default | sudo tee /etc/containerd/config.toml
sudo systemctl restart containerd
sudo systemctl enable containerd
```

```
ubuntu@ip-172-31-30-208:~$ sudo apt-get install -y containerd
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following packages were automatically installed and are no longer required:
  docker-buildx-plugin docker-ce-cli docker-ce-rootless-extras docker-compose-plugin libltdl7 libslirp0 pigz slirp4netns
Use 'sudo apt autoremove' to remove them.
The following additional packages will be installed:
  runc
The following packages will be REMOVED:
  containerd.io docker-ce
The following NEW packages will be installed:
  containerd runc
0 upgraded, 2 newly installed, 2 to remove and 133 not upgraded.
Need to get 47.2 MB of archives.
After this operation, 53.1 MB disk space will be freed.
Get:1 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 runc amd64 1.1.12-0ubuntu3.1 [8599 kB]
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 containerd amd64 1.7.12-0ubuntu4.1 [38.6 MB]
Fetched 47.2 MB in 1s (82.5 MB/s)
(Reading database ... 68064 files and directories currently installed.)
Removing docker-ce (5:27.2.1-1~ubuntu.24.04~noble) ...
Removing containerd.io (1.7.22-1) ...
Selecting previously unselected package runc.
(Reading database ... 68044 files and directories currently installed.)
Preparing to unpack .../runc_1.1.12-0ubuntu3.1_amd64.deb ...
Unpacking runc (1.1.12-0ubuntu3.1) ...
Selecting previously unselected package containerd.
Preparing to unpack .../containerd_1.7.12-0ubuntu4.1_amd64.deb ...
Unpacking containerd (1.7.12-0ubuntu4.1) ...
Setting up runc (1.1.12-0ubuntu3.1) ...
Setting up containerd (1.7.12-0ubuntu4.1) ...
Processing triggers for man-db (2.12.0-4build2) ...
Scanning processes...
Scanning linux images...

Running kernel seems to be up-to-date.

No services need to be restarted.

No containers need to be restarted.

No user sessions are running outdated binaries.

No VM guests are running outdated hypervisor (qemu) binaries on this host.
ubuntu@ip-172-31-30-208:~$
```

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```
ubuntu@ip-172-31-30-208:~$ sudo containerd config default | sudo tee /etc/containerd/config.toml
disabled_plugins = []
imports = []
oom_score = 0
plugin_dir = ""
required_plugins = []
root = "/var/lib/containerd"
state = "/run/containerd"
temp = ""
version = 2

[cgroup]
  path = ""

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

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

[metrics]
  address = ""
  grpc_histogram = false

[plugins]

  [plugins."io.containerd.gc.v1.scheduler"]
    deletion_threshold = 0
    mutation_threshold = 100
    pause_threshold = 0.02
    schedule_delay = "0s"
    startup_delay = "100ms"

  [plugins."io.containerd.grpc.v1.cri"]
    cdi_spec_dirs = ["/etc/cdi", "/var/run/cdi"]
```

```
ubuntu@ip-172-31-30-208:~$ sudo systemctl restart containerd
ubuntu@ip-172-31-30-208:~$ sudo systemctl enable containerd
ubuntu@ip-172-31-30-208:~$ sudo systemctl status containerd
● containerd.service - containerd container runtime
     Loaded: loaded (/usr/lib/systemd/system/containerd.service; enabled; preset: enabled)
     Active: active (running) since Mon 2024-09-16 04:11:07 UTC; 22s ago
       Docs: https://containerd.io
   Main PID: 7659 (containerd)
      Tasks: 7
     Memory: 14.0M (peak: 14.7M)
        CPU: 107ms
     CGroup: /system.slice/containerd.service
             └─7659 /usr/bin/containerd

Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807160348Z" level=info msg="Start subscribing containerd event"
Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807213129Z" level=info msg="Start recovering state"
Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807163270Z" level=info msg=serving... address=/run/containerd/containerd.sock.ttrpc
Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807351018Z" level=info msg=serving... address=/run/containerd/containerd.sock
Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807469775Z" level=info msg="Start event monitor"
Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807526625Z" level=info msg="Start snapshots syncer"
Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807580042Z" level=info msg="Start cni network conf syncer for default"
Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807593159Z" level=info msg="Start streaming server"
Sep 16 04:11:07 ip-172-31-30-208 containerd[7659]: time="2024-09-16T04:11:07.807763589Z" level=info msg="containerd successfully booted in 0.028456s"
Sep 16 04:11:07 ip-172-31-30-208 systemd[1]: Started containerd.service - containerd container runtime.
ubuntu@ip-172-31-30-208:~$
```

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

```
[ec2-user@ip-172-31-25-17 docker]$ cat <<EOF | sudo tee /etc/yum.repos.d/kubernetes.repo
[kubernetes]
name=Kubernetes
baseurl=https://pkgs.k8s.io/core:/stable:/v1.30/rpm/
enabled=1
gpgcheck=1
gpgkey=https://pkgs.k8s.io/core:/stable:/v1.30/rpm/repodata/repomd.x
ml.key exclude=kubelet kubeadm kubectl cri-tools kubernetes-cni
EOF
[kubernetes]
name=Kubernetes
baseurl=https://pkgs.k8s.io/core:/stable:/v1.30/rpm/
enabled=1
gpgcheck=1
gpgkey=https://pkgs.k8s.io/core:/stable:/v1.30/rpm/repodata/repomd.x
ml.key exclude=kubelet kubeadm kubectl cri-tools kubernetes-cni
[ec2-user@ip-172-31-25-17 docker]$
```

Install a networking plugin:

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

```
ubuntu@ip-172-31-30-208:~$ kubectl apply -f https://github.com/flannel-io/flannel/releases/latest/download/kube-flannel.yml
namespace/kube-flannel created
serviceaccount/flannel created
clusterrole.rbac.authorization.k8s.io/flannel created
clusterrolebinding.rbac.authorization.k8s.io/flannel created
configmap/kube-flannel-cfg created
daemonset.apps/kube-flannel-ds created
ubuntu@ip-172-31-30-208:~$
```

Step 7:

To deploy an Nginx server, use the following commands:

```
ubuntu@ip-172-31-30-208:~$ kubectl apply -f https://k8s.io/examples/application/deployment.yaml
deployment.apps/nginx-deployment created
ubuntu@ip-172-31-30-208:~$
```

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```
ubuntu@ip-172-31-30-208:~$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
nginx-deployment-d556bf558-fzkg4    0/1     Pending   0          30s
nginx-deployment-d556bf558-qvghq    0/1     Pending   0          30s
ubuntu@ip-172-31-30-208:~$
```

Forward the port to access the server:

POD_NAME=$(kubectl get pods -l app=nginx -o jsonpath="{.items[0].metadata.name}")
kubectl port-forward $POD_NAME 8080:80

```
ubuntu@ip-172-31-30-208:~$ POD_NAME=$(kubectl get pods -l app=nginx -o jsonpath="{.items[0].metadata.name}")
ubuntu@ip-172-31-30-208:~$ kubectl port-forward $POD_NAME 8080:80
error: unable to forward port because pod is not running. Current status=Pending
ubuntu@ip-172-31-30-208:~$
```

If the pod is in a pending state, remove the control-plane taint:

kubectl taint nodes --all node-role.kubernetes.io/control-plane-

```
ubuntu@ip-172-31-30-208:~$ kubectl taint nodes --all node-role.kubernetes.io/control-plane-node/ip-172-31-20-171 untainted
error: at least one taint update is required
```

```
ubuntu@ip-172-31-30-208:~$ kubectl get nodes
NAME               STATUS   ROLES           AGE   VERSION
ip-172-31-30-208   Ready    control-plane   39m   v1.31.1
ubuntu@ip-172-31-30-208:~$ kubectl get pods
NAME                                READY   STATUS    RESTARTS   AGE
nginx-deployment-d556bf558-fzkg4    1/1     Running   0          23m
nginx-deployment-d556bf558-qvghq    1/1     Running   0          23m
ubuntu@ip-172-31-30-208:~$
```

Step 8:

Finally, verify the Nginx server is running:

```
ubuntu@ip-172-31-30-208:~$ curl --head http://127.0.0.1:8080
HTTP/1.1 200 OK
Server: nginx/1.14.2
Date: Mon, 16 Sep 2024 05:04:04 GMT
Content-Type: text/html
Content-Length: 612
Last-Modified: Tue, 04 Dec 2018 14:44:49 GMT
Connection: keep-alive
ETag: "5c0692e1-264"
Accept-Ranges: bytes
```

If the response is `200 OK`, your Nginx deployment is successful.

Conclusion:

Through this experiment, Kubernetes was successfully installed on an EC2 instance, and an Nginx server was deployed. The process included troubleshooting common issues like pod states and container runtimes, ensuring a stable deployment environment