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Kubernetes Task 1

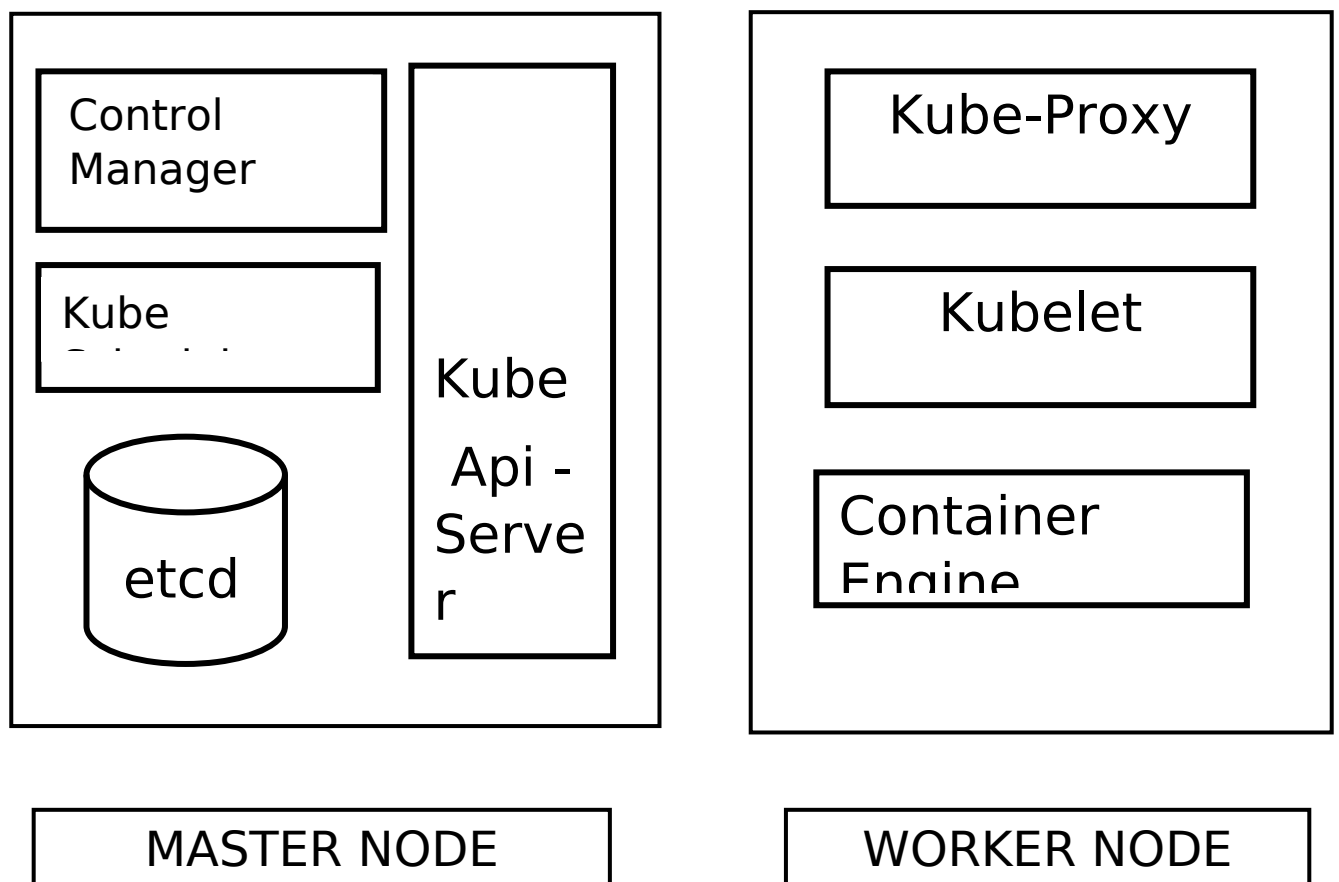
Q1. Write a note on Kubernetes Architecture. Explain about each component of Kubernetes cluster.

Ans:

Kubernetes follows a client-server architecture. It's designed as a set of loosely coupled and highly modular components, which makes the system flexible, extensible, and easy to manage.

A master and worker nodes constitute a Kubernetes cluster.

Overview of the Kubernetes Architecture:



Master Node: The master node is responsible for the management of the Kubernetes cluster. It is the entry point for all administrative tasks.

The master node manages worker nodes and pods in the cluster. The components of the master node include:

API Server (kube-apiserver): Acts as the frontend for the Kubernetes control plane.

It exposes the Kubernetes API and is the main management point of the entire cluster.

Controller Manager (kube-controller-manager): Runs controllers, which are background threads that handle routine tasks in the cluster.

Scheduler (kube-scheduler): Distributes work or containers across multiple nodes. It looks for newly created pods and assigns them to nodes.

etcd: A consistent and highly-available key value store used as Kubernetes' backing store for all cluster data.

Worker Nodes: Worker nodes are the machines (VMs, physical servers, etc.) that run your applications and cloud workflows.

The components of a worker node include:

Kubelet: An agent that runs on each node in the cluster. It makes sure that containers are running in a pod1.

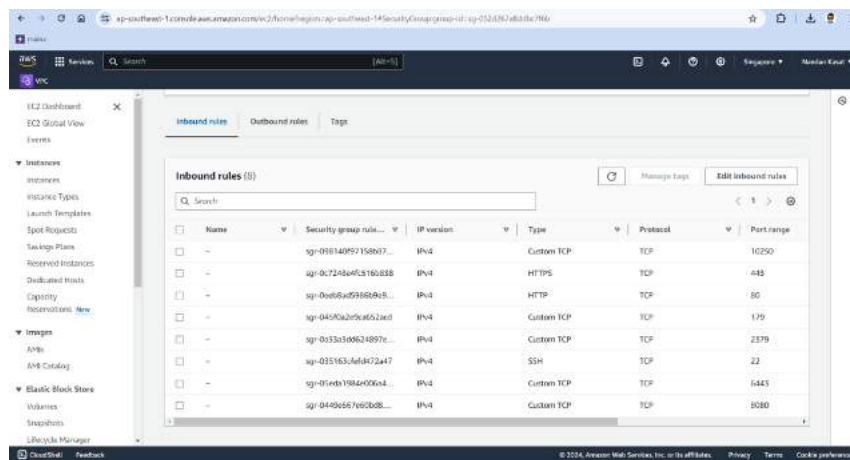
Kube Proxy (kube-proxy): A network proxy that runs on each node in your cluster, implementing part of the Kubernetes Service concept.

Pods (Container Engine): The smallest and simplest unit in the Kubernetes object model that you create or deploy.

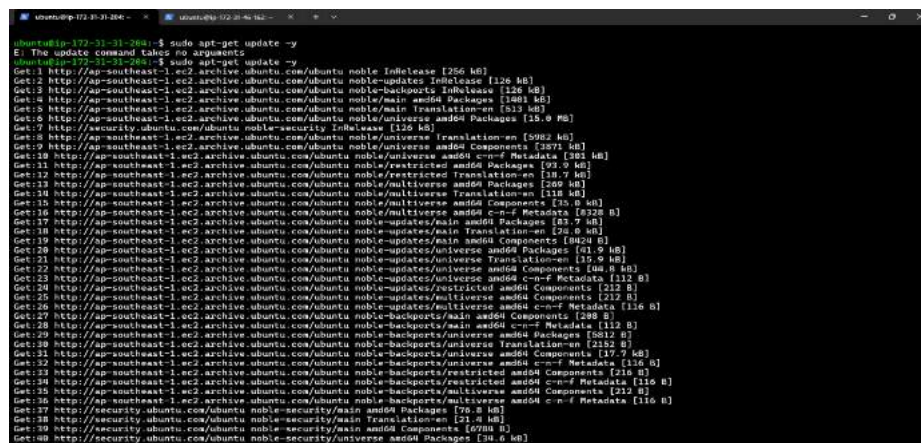
Q2. Prepare a documentation on Kubernetes setup on Ubuntu. With screenshot of each command.

On Master:

Add Rules 8080, 179, 6443, 10250, 2379 to Security Group of Master Node instance (kube_master).



1 sudo apt-get update -y



2 sudo apt-get install docker.io -y

```

ubuntu@ip-172-31-31-204:~$ sudo apt-get 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 cri-tools docker-compose-v2 docker-doc runc xfs-fuse | xfstools
Suggested packages:
  apparmor aufs-tools cgroupfs-mount | cgroup-lite dnsmasq-trap docker-buildx docker-compose-v2 docker-doc runc xfs-fuse | xfstools
The following NEW packages will be installed:
  bridge-utils containerd cri-tools docker-compose-v2 docker-doc runc xfs-fuse | xfstools
0 upgraded, 8 newly installed, 0 to remove and 37 not upgraded.
Need to get 70.5 MB of archives.
After this operation, 280 MB of additional disk space will be used.
Get:1 http://apt-mirror-1-ec2.archive.ubuntu.com/ubuntu noble/universe amd64 pipx amd64 2.8-1 [65.4 kB]
Get:2 http://apt-mirror-1-ec2.archive.ubuntu.com/ubuntu noble/main amd64 bridge-utils amd64 1.7.1-ubuntu2 [22.9 kB]
Get:3 http://apt-mirror-1-ec2.archive.ubuntu.com/ubuntu noble/main amd64 runc amd64 1.1.12-ubuntu1 [1690 kB]
Get:4 http://apt-mirror-1-ec2.archive.ubuntu.com/ubuntu noble/main amd64 containerd amd64 1.7.12-ubuntu1 [20.6 MB]
Get:5 http://apt-mirror-1-ec2.archive.ubuntu.com/ubuntu noble/main amd64 cri-tools amd64 0.30.0-ubuntu1 [1450 kB]
Get:6 http://apt-mirror-1-ec2.archive.ubuntu.com/ubuntu noble/main amd64 docker-compose-v2 amd64 2.30.0-2ubuntu1 [27.6 kB]
Get:7 http://apt-mirror-1-ec2.archive.ubuntu.com/ubuntu noble/universe amd64 docker.io amd64 24.0.7-ubuntu1 [29.1 MB]
Get:8 http://apt-mirror-1-ec2.archive.ubuntu.com/ubuntu noble/universe amd64 xfs-fuse all 0.12.16 [30.2 kB]
Fetched 70.5 MB in 24 s (2.9 MB/s)
Preconfiguring packages...
Selecting previously unselected package pipx.
(Reading database ... 71839 files and directories currently installed.)
Preparing to unpack .../pipx_2.8-1_amd64.deb ...
Unpacking pipx (2.8-1) ...
Selecting previously unselected package bridge-utils.
Preparing to unpack .../bridge-utils_1.7.1-ubuntu2_amd64.deb ...
Unpacking bridge-utils (1.7.1-ubuntu2) ...
Selecting previously unselected package runc.
Preparing to unpack .../runc_1.1.12-ubuntu1_amd64.deb ...
Unpacking runc (1.1.12-ubuntu1) ...
Selecting previously unselected package containerd.
Preparing to unpack .../containerd_1.7.12-ubuntu1_amd64.deb ...
Unpacking containerd (1.7.12-ubuntu1) ...
Selecting previously unselected package cri-tools.
Preparing to unpack .../cri-tools_0.30.0-ubuntu1_amd64.deb ...
Unpacking cri-tools (0.30.0-ubuntu1) ...
Selecting previously unselected package docker-compose-v2.
Preparing to unpack .../docker-compose-v2_2.30.0-2ubuntu1_amd64.deb ...
Unpacking docker-compose-v2 (2.30.0-2ubuntu1) ...
Selecting previously unselected package docker.io.
Preparing to unpack .../docker.io_24.0.7-ubuntu1_amd64.deb ...
Unpacking docker.io (24.0.7-ubuntu1) ...
Setting up pipx (2.8-1) ...
Setting up bridge-utils (1.7.1-ubuntu2) ...
Setting up runc (1.1.12-ubuntu1) ...
Setting up containerd (1.7.12-ubuntu1) ...
Setting up cri-tools (0.30.0-ubuntu1) ...
Setting up docker-compose-v2 (2.30.0-2ubuntu1) ...
Setting up docker.io (24.0.7-ubuntu1) ...

```

3 `curl -LO "https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl.sha256"`

```

ubuntu@ip-172-31-31-204:~$ curl -LO "https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl.sha256"
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
100 138 100 138  0 529 0 --:--:-- --:--:-- --:--:-- 530
100 64 100 64  0 207 0 --:--:-- --:--:-- --:--:-- 207

```

4 `sudo install -o root -g root -m 0755 kubectl /usr/local/bin/kubectl`

```

ubuntu@ip-172-31-31-204:~$ sudo install -o root -g root -m 0755 kubectl /usr/local/bin/kubectl
ubuntu@ip-172-31-31-204:~$ s

```

5 `kubectl version --client`

```

ubuntu@ip-172-31-31-204:~$ kubectl version --client
Client Version: v1.30.1
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
ubuntu@ip-172-31-31-204:~$

```

6 `sudo apt-get update`

7 `sudo apt-get install -y apt-transport-https ca-certificates curl`

```

ubuntu@ip-172-31-31-204:~$ sudo apt-get install -y apt-transport-https ca-certificates curl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20240203).
ca-certificates set to manually installed.
The following additional packages will be installed:
  libcurl3t64-gnutls libcurl4t64
The following NEW packages will be installed:
  apt-transport-https
The following packages will be upgraded:
  curl libcurl3t64-gnutls libcurl4t64
3 upgraded, 1 newly installed, 0 to remove and 34 not upgraded.
Need to get 984 kB of archives.
After this operation, 35.0 kB of additional disk space will be used.
Get:1 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 apt-transport-https all 2.7.14build2 [3974 B]
Get:2 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 curl amd64 8.5.0-2ubuntu10.1 [227 kB]
Get:3 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl4t64 amd64 8.5.0-2ubuntu10.1 [341 kB]
Get:4 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl3t64-gnutls amd64 8.5.0-2ubuntu10.1 [333 kB]
Fetched 984 kB in 11s (83.2 kB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 72266 files and directories currently installed.)
Preparing to unpack .../apt-transport-https-2.7.14build2_all.deb ...
Unpacking apt-transport-https (2.7.14build2) ...
Preparing to unpack .../curl-8.5.0-2ubuntu10.1.amd64.deb ...
Unpacking curl (8.5.0-2ubuntu10.1) over (8.5.0-2ubuntu10) ...
Preparing to unpack .../libcurl4t64-8.5.0-2ubuntu10.1.amd64.deb ...
Unpacking libcurl4t64:amd64 (8.5.0-2ubuntu10.1) over (8.5.0-2ubuntu10) ...
Preparing to unpack .../libcurl3t64-gnutls-8.5.0-2ubuntu10.1.amd64.deb ...
Unpacking libcurl3t64-gnutls:amd64 (8.5.0-2ubuntu10.1) over (8.5.0-2ubuntu10) ...
Setting up apt-transport-https (2.7.14build2) ...
Setting up libcurl4t64:amd64 (8.5.0-2ubuntu10.1) ...
Setting up libcurl3t64-gnutls:amd64 (8.5.0-2ubuntu10.1) ...
Setting up curl (8.5.0-2ubuntu10.1) ...
Processing triggers for man-db (2.12.0-4build2) ...
Processing triggers for libc-bin (2.39-0ubuntu8) ...
Scanning processes...
Scanning candidates...
Scanning linux images...

Running kernel seems to be up-to-date.

```

8 curl -fsSL

<https://pkgs.k8s.io/core:/stable:/v1.30/deb/Release.key> |
 sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-
 keyring.gpg

```

ubuntu@ip-172-31-31-204:~$ curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.30/deb/Release.key | sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyri
ng.gpg
ubuntu@ip-172-31-31-204:~$ |

```

9 sudo chmod 644 /etc/apt/keyrings/kubernetes-apt-
 keyring.gpg

```

ubuntu@ip-172-31-31-204:~$ sudo chmod 644 /etc/apt/keyrings/kubernetes-apt-keyring.gpg
ubuntu@ip-172-31-31-204:~$ |

```

10 echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-
 keyring.gpg] <https://pkgs.k8s.io/core:/stable:/v1.30/deb/> /' |
 sudo tee /etc/apt/sources.list.d/kubernetes.list

```

ubuntu@ip-172-31-31-204:~$ echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.30/deb/ /' | sudo tee /et
c/apt/sources.list.d/kubernetes.list
deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.30/deb/ /
ubuntu@ip-172-31-31-204:~$ |

```

11 sudo chmod 644 /etc/apt/sources.list.d/kubernetes.list

```

ubuntu@ip-172-31-31-204:~$ sudo chmod 644 /etc/apt/sources.list.d/kubernetes.list
ubuntu@ip-172-31-31-204:~$ |

```

12 sudo apt-get update

```
ubuntu@ip-172-31-31-204:~$ sudo apt-get update
Hit:1 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Get:4 https://prod-cdn.packages.k8s.io/repositories/iscv:/kubernetes:/core:/stable:/v1.30/deb InRelease [1186 B]
Hit:5 http://security.ubuntu.com/ubuntu noble-security InRelease
Get:6 https://prod-cdn.packages.k8s.io/repositories/iscv:/kubernetes:/core:/stable:/v1.30/deb Packages [3957 B]
Fetched 5143 B in 1s (6668 B/s)
Reading package lists... Done
ubuntu@ip-172-31-31-204:~$
```

13 sudo apt-get install -y kubectyl kubeadm kubelet

```
ubuntu@ip-172-31-31-204:~$ sudo apt-get install -y kubectyl kubeadm kubelet
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  conntrack cri-tools ebtables kubernetes-cni socat
The following NEW packages will be installed:
  conntrack cri-tools ebtables kubeadm kubectyl kubelet kubernetes-cni socat
0 upgraded, 8 newly installed, 0 to remove and 34 not upgraded.
Need to get 93.9 MB of archives.
After this operation, 343 MB of additional disk space will be used.
Get:1 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 conntrack amd64 1:1.4.8-1ubuntu1 [37.9 kB]
Get:2 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 ebtables amd64 2.0.11-6build1 [88.4 kB]
Get:3 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 socat amd64 1.8.0-4build3 [374 kB]
Get:4 https://prod-cdn.packages.k8s.io/repositories/iscv:/kubernetes:/core:/stable:/v1.30/deb cri-tools 1.30.0-1.1 [21.3 MB]
Get:5 https://prod-cdn.packages.k8s.io/repositories/iscv:/kubernetes:/core:/stable:/v1.30/deb kubeadm 1.30.1-1.1 [10.4 MB]
Get:6 https://prod-cdn.packages.k8s.io/repositories/iscv:/kubernetes:/core:/stable:/v1.30/deb kubectyl 1.30.1-1.1 [10.8 MB]
Get:7 https://prod-cdn.packages.k8s.io/repositories/iscv:/kubernetes:/core:/stable:/v1.30/deb kubernetes-cni 1.4.0-1.1 [32.9 MB]
Get:8 https://prod-cdn.packages.k8s.io/repositories/iscv:/kubernetes:/core:/stable:/v1.30/deb kubelet 1.30.1-1.1 [18.1 MB]
Fetched 93.9 MB in 2s (59.0 MB/s)
```

14 sudo systemctl enable kubelet && sudo systemctl start kubelet

```
ubuntu@ip-172-31-31-204:~$ sudo systemctl enable kubelet && sudo systemctl start kubelet
ubuntu@ip-172-31-31-204:~$
```

16 sudo kubeadm init --pod-network-cidr=192.168.0.0/16

17 sudo kubeadm init --pod-network-cidr=192.168.0.0/16 --ignore-preflight-errors=all

```
ubuntu@ip-172-31-31-204:~$ sudo kubeadm init --pod-network-cidr=192.168.0.0/16 --ignore-preflight-errors=all
[init] Using Kubernetes version: v1.30.1
[preflight] Running pre-flight checks
[WARNING] Running kubelet: the number of available CPUs 1 is less than the required 2
[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'
W0529 14:34:02.930289 3398 checks.go:840] 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 to use "registry.k8s.io/pause:3.9" as the CRI sandbox image.
[certs] Using certificateDir folder "/etc/kubernetes/phi"
[certs] Generating "ca" certificate and key
[certs] Generating "apiserver" certificate and key
[certs] apiserver serving cert is signed for DNS names [ip-172-31-31-204 kubernetes kubernetes.default kubernetes.default.svc kubernetes.default.svc.cluster
.local] and IPs [10.96.0.1 172.31.31.204]
[certs] Generating "apiserver-kubelet-client" certificate and key
[certs] Generating "front-proxy-ca" certificate and key
[certs] Generating "front-proxy-client" certificate and key
[certs] Generating "etcd/ca" certificate and key
[certs] Generating "etcd/server" certificate and key
[certs] etcd/server serving cert is signed for DNS names [ip-172-31-31-204 localhost] and IPs [172.31.31.204 127.0.0.1 ::1]
[certs] Generating "etcd/peer" certificate and key
[certs] etcd/peer serving cert is signed for DNS names [ip-172-31-31-204 localhost] and IPs [172.31.31.204 127.0.0.1 ::1]
[certs] Generating "etcd/healthcheck-client" certificate and key
[certs] Generating "apiserver-etcd-client" certificate and key
[certs] Generating "sa" key and public key
```

18 mkdir -p \$HOME/.kube


```
ubuntu@ip-172-31-31-204:~$ mkdir -p $HOME/.kube
ubuntu@ip-172-31-31-204:~$ |
```

19 sudo cp -i /etc/kubernetes/admin.conf
\$HOME/.kube/config

```
ubuntu@ip-172-31-31-204:~$ sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
ubuntu@ip-172-31-31-204:~$ |
```

20 sudo chown \$(id -u):\$(id -g) \$HOME/.kube/config

```
ubuntu@ip-172-31-31-204:~$ sudo chown $(id -u):$(id -g) $HOME/.kube/config
ubuntu@ip-172-31-31-204:~$
```

21 sudo su

export KUBECONFIG=/etc/kubernetes/admin.conf

```
root@ip-172-31-31-204:/home/ubuntu# export KUBECONFIG=/etc/kubernetes/admin.conf
root@ip-172-31-31-204:/home/ubuntu# exit
exit
ubuntu@ip-172-31-31-204:~$ |
```

Exit

22 kubectl create -f

<https://raw.githubusercontent.com/projectcalico/calico/v3.27.3/manifests/tigera-operator.yaml>

```
ubuntu@ip-172-31-31-204:~$ kubectl create -f https://raw.githubusercontent.com/projectcalico/calico/v3.27.3/manifests/tigera-operator.yaml
namespace/tigera-operator created
customresourcedefinition.apiextensions.k8s.io/bgppolicies.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/bgpprofiles.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/blockaffinities.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/caliconodestatuses.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/clusterinformations.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/felixconfigurations.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/globalnetworkpolicies.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/globalnetworksets.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/hostendpoints.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ipamblocks.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ipamconfigs.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ipamhandles.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ippeers.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/ipreservations.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/kubecontrollersconfigurations.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/networkpolicies.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/networksets.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/apiservers.operator.tigera.io created
customresourcedefinition.apiextensions.k8s.io/imagesets.operator.tigera.io created
customresourcedefinition.apiextensions.k8s.io/installations.operator.tigera.io created
customresourcedefinition.apiextensions.k8s.io/tigerastatuses.operator.tigera.io created
serviceaccount/tigera-operator created
clusterrole.rbac.authorization.k8s.io/tigera-operator created
clusterrolebinding.rbac.authorization.k8s.io/tigera-operator created
deployment.apps/tigera-operator created
ubuntu@ip-172-31-31-204:~$ |
```

23 kubectl create -f <https://raw.githubusercontent.com/projectcalico/calico/v3.27.3/manifests/custom-resources.yaml>

```
ubuntu@ip-172-31-31-204:~$ kubectl create -f https://raw.githubusercontent.com/projectcalico/calico/v3.27.3/manifests/custom-resources.yaml
installation.operator.tigera.io/default created
apiserver.operator.tigera.io/default created
ubuntu@ip-172-31-31-204:~$
```

24 kubectl get nodes

```
ubuntu@ip-172-31-31-204:~$ kubectl get nodes
NAME                                STATUS    ROLES    AGE      VERSION
ip-172-31-24-174                   Ready     <none>   62s      v1.30.1
ip-172-31-31-204                   Ready     control-plane 153m     v1.30.1
ubuntu@ip-172-31-31-204:~$
```

```
25 kubectl get componentstatus
```

```
ubuntu@ip-172-31-31-204:~$ kubectl get componentstatus
Warning: v1 ComponentStatus is deprecated in v1.19+
NAME                STATUS    MESSAGE             ERROR
controller-manager  Healthy   ok
scheduler            Healthy   ok
etcd-0              Healthy   ok
ubuntu@ip-172-31-31-204:~$
```

On Worker (kube worker):

```
1 sudo apt-get update -y
```

[illegible]

2 `curl -LO "https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl.sha256"`

```
ubuntu@ip-172-31-46-162:~$ curl -LO "https://dl.k8s.io/release/$(curl -L -s https://dl.k8s.io/release/stable.txt)/bin/linux/amd64/kubectl.sha256"
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload   Total   Spent    Left   Speed
100 138 100 138 0 0 538 0 --:--:-- --:--:-- --:--:-- 539
100 64 100 64 0 0 210 0 --:--:-- --:--:-- --:--:-- 210
ubuntu@ip-172-31-46-162:~$
```

3 `sudo install -o root -g root -m 0755 kubectl /usr/local/bin/kubectl`

```
kubectl: OK
ubuntu@ip-172-31-46-162:~$ sudo install -o root -g root -m 0755 kubectl /usr/local/bin/kubectl
ubuntu@ip-172-31-46-162:~$
```

4 `kubectl version --client`

```
ubuntu@ip-172-31-46-162:~$ kubectl version --client
Client Version: v1.30.1
Kustomize Version: v5.0.4-0.20230601165947-6ce0bf390ce3
ubuntu@ip-172-31-46-162:~$
```

5 `sudo apt-get update`

6 `sudo apt-get install -y apt-transport-https ca-certificates curl`

```
ubuntu@ip-172-31-46-162:~$ sudo apt-get install -y apt-transport-https ca-certificates curl
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
ca-certificates is already the newest version (20240203).
ca-certificates set to manually installed.
The following additional packages will be installed:
  libcurl3t64-gnutls libcurl4t64
The following NEW packages will be installed:
  apt-transport-https
The following packages will be upgraded:
  curl libcurl3t64-gnutls libcurl4t64
3 upgraded, 1 newly installed, 0 to remove and 34 not upgraded.
Need to get 904 kB of archives.
After this operation, 35.8 kB of additional disk space will be used.
Get:1 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 apt-transport-https all 2.7.14build2 [3974 B]
Get:2 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 curl amd64 8.5.0-2ubuntu10.1 [227 kB]
Get:3 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl4t64 amd64 8.5.0-2ubuntu10.1 [341 kB]
Get:4 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl3t64-gnutls amd64 8.5.0-2ubuntu10.1 [333 kB]
Fetched 904 kB in 4s (24.2 MB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 71839 files and directories currently installed.)
Preparing to unpack .../apt-transport-https_2.7.14build2_all.deb ...
Unpacking apt-transport-https (2.7.14build2) ...
Preparing to unpack .../curl_8.5.0-2ubuntu10.1_amd64.deb ...
Unpacking curl (8.5.0-2ubuntu10.1) over (8.5.0-2ubuntu10) ...
Preparing to unpack .../libcurl4t64_8.5.0-2ubuntu10.1_amd64.deb ...
Unpacking libcurl4t64:amd64 (8.5.0-2ubuntu10.1) over (8.5.0-2ubuntu10) ...
Preparing to unpack .../libcurl3t64-gnutls_8.5.0-2ubuntu10.1_amd64.deb ...
Unpacking libcurl3t64-gnutls:amd64 (8.5.0-2ubuntu10.1) over (8.5.0-2ubuntu10) ...
Setting up apt-transport-https (2.7.14build2) ...
Setting up libcurl4t64:amd64 (8.5.0-2ubuntu10.1) ...
Setting up libcurl3t64-gnutls:amd64 (8.5.0-2ubuntu10.1) ...
```

7 `curl -fsSL`

`https://pkgs.k8s.io/core:/stable:/v1.30/deb/Release.key |`
`sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-`
`keyring.gpg`

```
ubuntu@ip-172-31-46-162:~$ curl -fsSL https://pkgs.k8s.io/core:/stable:/v1.30/deb/Release.key | sudo gpg --dearmor -o /etc/apt/keyrings/kubernetes-apt-keyring.gpg
ubuntu@ip-172-31-46-162:~$
```

- 8 `sudo chmod 644 /etc/apt/keyrings/kubernetes-apt-keyring.gpg`

```
ubuntu@ip-172-31-46-162:~$ sudo chmod 644 /etc/apt/keyrings/kubernetes-apt-keyring.gpg
```

- 9 `echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.30/deb/ /' | sudo tee /etc/apt/sources.list.d/kubernetes.list`

```
ubuntu@ip-172-31-46-162:~$ echo 'deb [signed-by=/etc/apt/keyrings/kubernetes-apt-keyring.gpg] https://pkgs.k8s.io/core:/stable:/v1.30/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:/v1.30/deb/ /
ubuntu@ip-172-31-46-162:~$
```

- 10 `sudo chmod 644 /etc/apt/sources.list.d/kubernetes.list`

```
ubuntu@ip-172-31-46-162:~$ sudo chmod 644 /etc/apt/sources.list.d/kubernetes.list
ubuntu@ip-172-31-46-162:~$
```

- 11 `sudo apt-get update`

```
ubuntu@ip-172-31-46-162:~$ sudo apt-get update
Hit:1 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
```

- 12 `sudo apt-get install -y kubectl kubeadm kubelet`

```
ubuntu@ip-172-31-46-162:~$ sudo apt-get install -y kubectl kubeadm kubelet
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  conntrack cri-tools ebtables kubernetes-cni socat
The following NEW packages will be installed:
  conntrack cri-tools ebtables kubeadm kubectl kubelet kubernetes-cni socat
0 upgraded, 8 newly installed, 0 to remove and 34 not upgraded.
Need to get 93.9 MB of archives.
After this operation, 343 MB of additional disk space will be used.
Get:1 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 conntrack amd64 1:1.4.8-1ubuntu1 [37.9 kB]
Get:2 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 ebtables amd64 2.0.11-6build1 [88.4 kB]
Get:3 http://ap-southeast-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 socat amd64 1.8.0-4build3 [374 kB]
Get:4 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.30/deb cri-tools 1.30.0-1.1 [21.3 MB]
Get:5 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.30/deb kubeadm 1.30.1-1.1 [10.4 MB]
Get:6 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.30/deb kubectl 1.30.1-1.1 [10.8 MB]
Get:7 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.30/deb kubernetes-cni 1.4.0-1.1 [32.9 MB]
Get:8 https://prod-cdn.packages.k8s.io/repositories/isv:/kubernetes:/core:/stable:/v1.30/deb kubelet 1.30.1-1.1 [18.1 MB]
Fetched 93.9 MB in 2s (60.3 MB/s)
```

- 13 `sudo systemctl enable kubelet && sudo systemctl start kubelet`

```
ubuntu@ip-172-31-46-162:~$ sudo systemctl enable kubelet && sudo systemctl start kubelet
ubuntu@ip-172-31-46-162:~$
```

- 14 `sudo kubeadm join 172.31.31.204:6443 --token 94rvk5.ktc40cqW6uglynex --discovery-token-ca-cert-hash`

sha256:7180064feebe0053a1a687ced31d3aea9ed80d226
942795631a3503559e7cd2e

```
ubuntu@ip-172-31-29-170:~$ sudo kubeadm join 172.31.31.204:6443 --token 94rvk5.ktc40cq6uglynex --discovery-token-ca-cert-hash sha256:7180064feebe0053a1a687ced31d3aea9ed80d226942795631a3503559e7cd2e
[kubeadm] 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-check] Waiting for a healthy kubelet. This can take up to 4m0s
[kubelet-check] The kubelet is healthy after 1.00266988s
[kubelet-start] Waiting for the kubelet to perform the TLS Bootstrap

This node has joined the cluster:
* Certificate signing request was sent to apiservert 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.
ubuntu@ip-172-31-29-170:~$
```

Q3. Write a manifest file to create an httpd container in Pod, create pod using that manifest file. Also go inside that httpd container and create own pages and try to access those pages from inside the container.

Ans:

Step 1: Create a httpd images.

Step 2: Run httpd image:

```
root@ip-172-31-36-148:/home/ubuntu# docker run -d --name my-httpd httpd
71df14b0e615ee26e4a1164c4a699c3ef3b6ee4e103786b2274d20c99840a84c
root@ip-172-31-36-148:/home/ubuntu# docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
httpd latest 356125da0595 8 weeks ago 147MB
root@ip-172-31-36-148:/home/ubuntu# docker ps
CONTAINER ID IMAGE COMMAND CREATED STATUS PORTS NAMES
71df14b0e615 httpd "httpd-foreground" About a minute ago Up About a minute 80/tcp my-httpd
```

Step 3: Go inside the httpd container and create your own pages:

docker exec -it 71df14b0e615 /bin/bash

```
root@ip-172-31-36-148:/home/ubuntu# docker exec -it 71df14b0e615 /bin/bash
root@71df14b0e615:/usr/local/apache2# cd htdocs/
```

Step 4: Navigate to the htdocs directory

```
root@ip-172-31-36-148:/home/ubuntu# docker exec -it 71df14b0e615 /bin/bash
root@71df14b0e615:/usr/local/apache2# cd htdocs/
```

Step 6: Create HTML pages

```
root@71df14b0e615:/usr/local/apache2/htdocs# echo  
"<h1>Hello, World</h1>" > hello.html
```

```
root@71df14b0e615:/usr/local/apache2/htdocs# echo  
"<h1>Welcome to Kubernetes Task</h1>" > task.html
```

```
root@71df14b0e615:/usr/local/apache2/htdocs# echo "<h1>Hello, World</h1>" > hello.html  
root@71df14b0e615:/usr/local/apache2/htdocs# echo "<h1>Welcome to Kubernetes Task</h1>" > task.html  
root@71df14b0e615:/usr/local/apache2/htdocs# ls  
hello.html index.html task.html
```

Step 7: Access the pages from inside the container:

```
root@71df14b0e615:~# curl localhost/task.html
```

```
<h1>Welcome to Kubernetes Task</h1>
```

```
root@71df14b0e615:~# curl localhost/task.html  
<h1>Welcome to Kubernetes Task</h1>  
root@71df14b0e615:~# |
```

```
root@71df14b0e615:~# curl localhost/hello.html  
<h1>Hello, World</h1>  
root@71df14b0e615:~# |
```