

EXPERIMENT 3

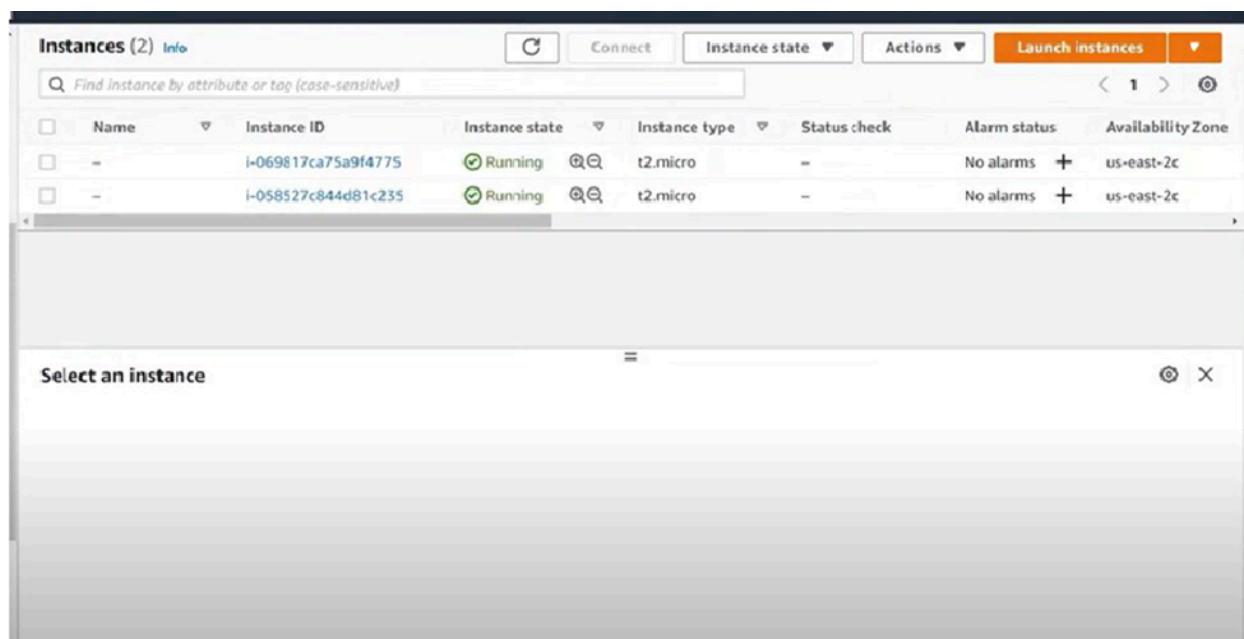
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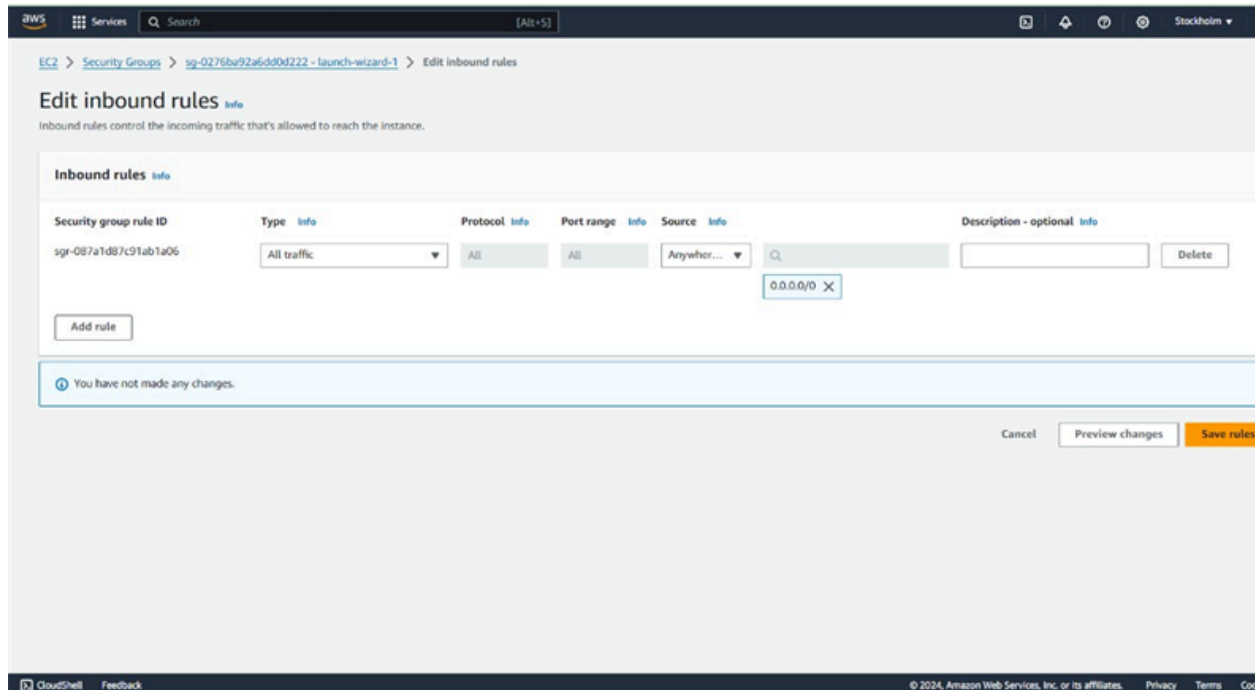
To understand the Kubernetes Cluster Architecture, install and Spin Up a Kubernetes Cluster on Linux Machines/Cloud Platforms.

Steps

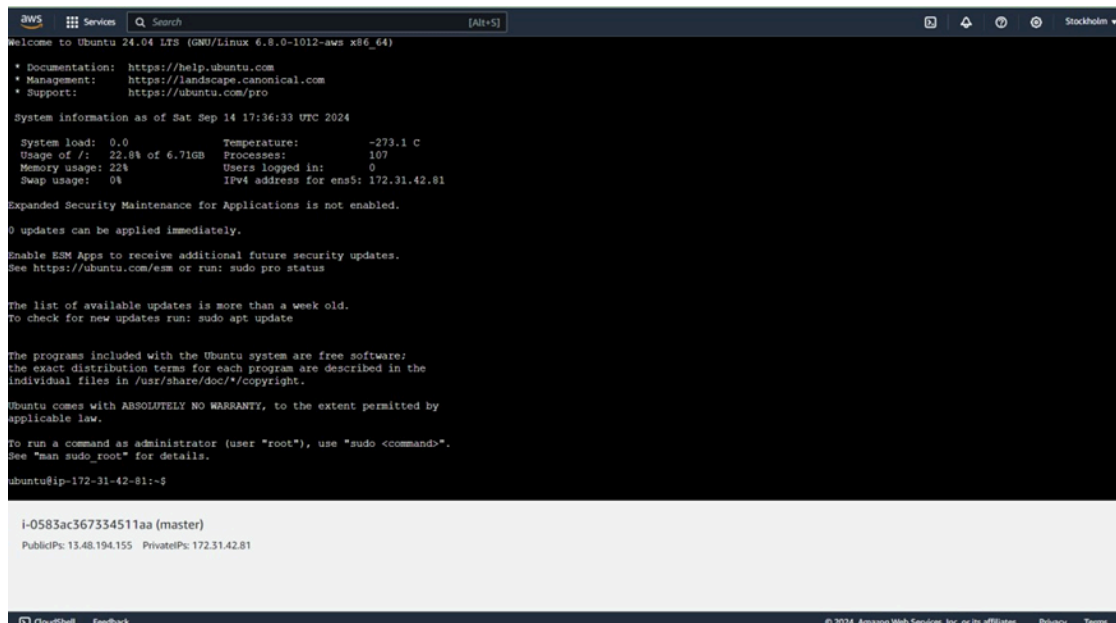
- 1) Create EC2 Ubuntu Instances on AWS. (Master and Worker)



2) Edit the Security Group Inbound Rules to allow SSH



3) AWS CLI for master and worker instances



```
AWS Services Search [Alt+S] Stockholm
Welcome to Ubuntu 24.04 LTS (GNU/Linux 6.8.0-1012-aws x86_64)

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

System information as of Sat Sep 14 17:38:49 UTC 2024

System load: 0.08      Temperature: -273.1 C
Usage of /: 22.8% of 6.71GB   Processes: 108
Memory usage: 22%      Users logged in: 0
Swap usage: 0%         IPv4 address for ens5: 172.31.40.191

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-172-31-40-191:~$

i-Ofce9f3cf5301b280 (worker)
PublicIPs: 13.60.77.58 PrivateIPs: 172.31.40.191

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```

4) Assign Unique Hostname for Each Server Node

```
$ sudo hostnamectl set-hostname master
```

```
$ sudo hostnamectl set-hostname worker-1
```

Set up Docker (both master and worker)

5) Install Docker

```
aws Services Search [Alt+S] Stockholm
ubuntu@master-node:~$ sudo apt-get update
Hit:1 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
ubuntu@master-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).
ca-certificates set to manually installed.
gpg is already the newest version (2.4.4-2ubuntu17).
gpg set to manually installed.
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 130 not upgraded.
Need to get 904 kB of archives.
After this operation, 38.9 kB of additional disk space will be used.
Get:1 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 apt-transport-https all 2.7.14build2 [3974 B]
Get:2 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 curl amd64 8.5.0-2ubuntu0.3 [227 kB]
Get:3 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl4t64 amd64 8.5.0-2ubuntu0.3 [341 kB]
Get:4 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl3t64-gnutls amd64 8.5.0-2ubuntu0.3 [333 kB]
Fetched 904 kB in 0s (26.3 MB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 69108 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_8.5.0-2ubuntu0.3_amd64.deb ...
Unpacking curl (8.5.0-2ubuntu0.3) over (8.5.0-2ubuntu0.1) ...
Preparing to unpack .../libcurl4t64_8.5.0-2ubuntu0.3_amd64.deb ...
Unpacking libcurl4t64:amd64 (8.5.0-2ubuntu0.3) over (8.5.0-2ubuntu0.1) ...
Preparing to unpack .../libcurl3t64-gnutls_8.5.0-2ubuntu0.3_amd64.deb ...
Unpacking libcurl3t64-gnutls:amd64 (8.5.0-2ubuntu0.3) over (8.5.0-2ubuntu0.1) ...
Setting up apt-transport-https (2.7.14build2) ...
```

\$ sudo apt-get update

```
aws Services Search [Alt+S]
ubuntu@worker1:~$ sudo apt-get install docker.io
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:
  (fdpdown aufs-tools cgroupfs-mount | cgroup-lite debocotstrap docker-buildx
  docker-compose v2 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 133 not upgraded.
Need to get 76.8 MB of archives.
After this operation, 289 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
Get:1 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 pigz amd64 2.8-1 [65.6 kB]
Get:2 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 bridge-utils amd64 1.7.1-1ubuntu2 [33.9 kB]
Get:3 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 runc amd64 1.1.12-0ubuntu3.1 [8599 kB]
Get:4 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 containerd amd64 1.7.12-0ubuntu1.1 [139.6 MB]
Get:5 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 dns-root-data all 2023112702~willisync1 [4490 B]
Get:6 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 dnsmasq-base amd64 2.90-2build2 [375 kB]
Get:7 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 docker.io amd64 24.0.7-0ubuntu4.1 [29.1 MB]
Get:8 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 ubuntu-fan all 0.12.16 [35.2 kB]
Fetched 76.8 MB in 1s (93.3 MB/s)
Preconfiguring packages ...
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 bridge-utils.
Preparing to unpack .../1-bridge-utils_1.7.1-1ubuntu2_amd64.deb ...
Unpacking bridge-utils (1.7.1-1ubuntu2) ...
Selecting previously unselected package runc.
Preparing to unpack .../2-runc_1.1.12-0ubuntu3.1_amd64.deb ...
Unpacking runc (1.1.12-0ubuntu3.1) ...
Selecting previously unselected package containerd.
Preparing to unpack .../3-containerd_1.7.12-0ubuntu1.1_amd64.deb ...
```

\$ sudo apt-get install docker.io

```
ubuntu@master-node:~$ sudo apt-get install docker
Command 'docker' not found, but can be installed with:
sudo snap install docker # version 24.0.5, or
sudo apt install podman-docker # version 4.9.3+dfsg1-1ubuntu0.1
sudo apt install docker.io # version 24.0.5-0ubuntu1
See 'snap info docker' for additional versions.
ubuntu@master-node:~$ sudo apt-get update
E: Invalid operation get-update
ubuntu@master-node:~$ sudo apt-get update
Get:1 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble InRelease [126 kB]
Get:2 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease [126 kB]
Get:3 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease [126 kB]
Get:4 http://security.ubuntu.com/ubuntu noble-security InRelease [126 kB]
Get:5 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Packages [15.0 MB]
Get:6 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/universe Translation-en [5982 kB]
Get:7 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 Components [3071 kB]
Get:8 http://security.ubuntu.com/ubuntu noble-security/main amd64 Packages [125 kB]
Get:9 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 c-n-f Metadata [301 kB]
Get:10 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Packages [249 kB]
Get:11 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse Translation-en [115 kB]
Get:12 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 Components [35.0 kB]
Get:13 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/multiverse amd64 c-n-f Metadata [8328 B]
Get:14 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 Packages [302 kB]
Get:15 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main Translation-en [123 kB]
Get:16 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 c-n-f Metadata [8264 B]
Get:17 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Packages [336 kB]
Get:18 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe Translation-en [150 kB]
Get:19 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 Components [45.0 kB]
Get:20 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/universe amd64 c-n-f Metadata [14.3 kB]
Get:21 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 Packages [117 kB]
Get:22 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted Translation-en [61.5 kB]
Get:23 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/restricted amd64 c-n-f Metadata [424 B]
Get:24 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Packages [14.4 kB]
Get:25 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse Translation-en [2608 B]
Get:26 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 Components [212 B]
Get:27 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/multiverse amd64 c-n-f Metadata [1932 B]
Get:28 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-backports/main amd64 Components [208 B]

i-0583ac367334511aa (master)
PublicIPs: 13.48.194.155 PrivateIPs: 172.31.42.81

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```

6.Start and Enable Docker

\$ sudo systemctl enable docker

\$ sudo systemctl status docker

\$ sudo systemctl start docker

```
ubuntu@master-node:~$ sudo systemctl enable docker
ubuntu@master-node:~$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
   Loaded: loaded (/usr/lib/systemd/system/docker.service; enabled; preset: enabled)
   Active: active (running) since Sat 2024-09-14 17:48:43 UTC; 5min ago
   TriggeredBy: ● docker.socket
     Docs: https://docs.docker.com
    Main PID: 3126 (dockerd)
      Tasks: 9
     Memory: 36.2M (peak: 37.6M)
        CPU: 359ms
    CGroup: /system.slice/docker.service
            └─3126 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.s

Sep 14 17:48:42 master-node systemd[1]: Starting docker.service - Docker Application Co
Sep 14 17:48:42 master-node dockerd[3126]: time="2024-09-14T17:48:42.845702248Z" level=
Sep 14 17:48:42 master-node dockerd[3126]: time="2024-09-14T17:48:42.846619650Z" level=
Sep 14 17:48:42 master-node dockerd[3126]: time="2024-09-14T17:48:42.941239211Z" level=
Sep 14 17:48:43 master-node dockerd[3126]: time="2024-09-14T17:48:43.182968694Z" level=
Sep 14 17:48:43 master-node dockerd[3126]: time="2024-09-14T17:48:43.287256246Z" level=
Sep 14 17:48:43 master-node dockerd[3126]: time="2024-09-14T17:48:43.289235690Z" level=
Sep 14 17:48:43 master-node dockerd[3126]: time="2024-09-14T17:48:43.343273615Z" level=
Sep 14 17:48:43 master-node systemd[1]: Started docker.service - Docker Application Con
ubuntu@master-node:~$
```

```

ubuntu@worker1:~$ sudo systemctl enable docker
ubuntu@worker1:~$ sudo systemctl status docker
● docker.service - Docker Application Container Engine
   Loaded: loaded (/usr/lib/systemd/system/docker.service; enabled; preset: enabled)
   Active: active (running) since Sat 2024-09-14 17:50:57 UTC; 5min ago
   TriggeredBy: ● docker.socket
     Docs: https://docs.docker.com
    Main PID: 2705 (dockerd)
      Tasks: 9
     Memory: 71.9M (peak: 73.2M)
        CPU: 332ms
     CGroup: /system.slice/docker.service
             └─2705 /usr/bin/dockerd -H fd:// --containerd=/run/containerd/containerd.s
Sep 14 17:50:56 worker1 systemd[1]: Starting docker.service - Docker Application Contain
Sep 14 17:50:56 worker1 dockerd[2705]: time="2024-09-14T17:50:56.897274813Z" level=info>
Sep 14 17:50:56 worker1 dockerd[2705]: time="2024-09-14T17:50:56.903217401Z" level=info>
Sep 14 17:50:56 worker1 dockerd[2705]: time="2024-09-14T17:50:56.990653034Z" level=info>
Sep 14 17:50:57 worker1 dockerd[2705]: time="2024-09-14T17:50:57.234623704Z" level=info>
Sep 14 17:50:57 worker1 dockerd[2705]: time="2024-09-14T17:50:57.312373541Z" level=info>
Sep 14 17:50:57 worker1 dockerd[2705]: time="2024-09-14T17:50:57.313406238Z" level=info>
Sep 14 17:50:57 worker1 systemd[1]: Started docker.service - Docker Application Contain
Sep 14 17:50:57 worker1 dockerd[2705]: time="2024-09-14T17:50:57.352453690Z" level=info>
lines 1-21/21 (END)

```

7) Install Kubernetes(both master and worker node)

\$ sudo apt-get update

\$ sudo apt-get install -y apt-transport-https ca-certificates curl

```

ubuntu@master-node:~$ sudo apt-get update
Hit:1 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble InRelease
Hit:2 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease
Hit:3 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease
Hit:4 http://security.ubuntu.com/ubuntu noble-security InRelease
Reading package lists... Done
ubuntu@master-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).
ca-certificates set to manually installed.
gpg is already the newest version (2.4.4-2ubuntu1).
gpg set to manually installed.
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 130 not upgraded.
Need to get 994 kB of archives.
After this operation, 38.9 kB of additional disk space will be used.
Get:1 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble/universe amd64 apt-transport-https all 2.7.14build2 [3074 B]
Get:2 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 curl amd64 8.5.0-2ubuntu0.3 [227 kB]
Get:3 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl4t64 amd64 8.5.0-2ubuntu0.3 [341 kB]
Get:4 http://eu-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates/main amd64 libcurl3t64-gnutls amd64 8.5.0-2ubuntu0.3 [333 kB]
Fetched 994 kB in 6s (26.3 MB/s)
Selecting previously unselected package apt-transport-https.
(Reading database ... 68108 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 8.5.0-2ubuntu0.3_amd64.deb ...
Unpacking curl (8.5.0-2ubuntu0.3) over (8.5.0-2ubuntu10.1) ...
Preparing to unpack .../libcurl4t64 8.5.0-2ubuntu0.2_amd64.deb ...
Unpacking libcurl4t64:amd64 (8.5.0-2ubuntu0.3) over (8.5.0-2ubuntu10.1) ...
Preparing to unpack .../libcurl3t64-gnutls 8.5.0-2ubuntu0.3_amd64.deb ...
Unpacking libcurl3t64-gnutls:amd64 (8.5.0-2ubuntu0.3) over (8.5.0-2ubuntu10.1) ...
Setting up apt-transport-https (2.7.14build2) ...

```

```
$ sudo curl -fsSL /usr/share/keyrings/kubernetes-archive-keyring.gpg
```

```
$ echo "deb [signed-by=/usr/share/keyrings/kubernetes-archive-keyring.gpg]  
https://apt.kubernetes.io/ kubernetes-xenial main" | sudo tee
```

```
/etc/apt/sources.list.d/kubernetes.list
```

```
ubuntu@master-node:~$ 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@master-node:~$ 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@master-node:~$
```

```
ubuntu@worker1:~$ 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@worker1:~$ 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@worker1:~$
```

```
$ sudo apt-get update
```

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

```
$ sudo apt-mark hold kubelet kubeadm kubectl
```

```
ubuntu@master-node:~$ sudo apt-get update  
Hit:1 http://us-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease  
Hit:2 http://us-north-1.ec2.archive.ubuntu.com/ubuntu noble-updates InRelease  
Hit:3 http://us-north-1.ec2.archive.ubuntu.com/ubuntu noble-backports InRelease  
Get:4 https://us-east-1.ec2.archive.ubuntu.com/ubuntu noble InRelease [111 kB]  
Get:5 https://us-east-1.ec2.archive.ubuntu.com/ubuntu noble-security InRelease [111 kB]  
Get:6 http://security.ubuntu.com/ubuntu noble-security InRelease  
Fetched 405 kB in 1s (40.7 kB/s)  
Reading package lists... Done  
Building dependency tree... Done  
Reading state information... Done  
The following additional packages will be installed:  
  containerd cri-tools kubelet kubeadm kubectl  
The following NEW packages will be installed:  
  containerd cri-tools kubelet kubeadm kubectl  
0 upgraded, 6 newly installed, 0 to remove and 130 not upgraded.  
Need to get 49.4 MB of archives.  
After this operation, 314 MB of additional disk space will be used.  
Get:1 http://us-north-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 containerd amd64 1:1.4.0-1ubuntu1 [37.9 MB]  
Get:2 http://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 cri-tools amd64 1.31.1-1 [13.7 MB]  
Get:3 https://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 kubelet amd64 1.31.1-1 [11.4 MB]  
Get:4 https://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 kubeadm amd64 1.31.1-1 [11.2 MB]  
Get:5 https://us-east-1.ec2.archive.ubuntu.com/ubuntu noble/main amd64 kubectl amd64 1.31.1-1 [13.9 MB]  
Fetched 74.4 MB in 1s (69.5 MB/s)  
Selecting previously unselected package containerd.  
(Reading database ... 68112 files and directories currently installed.)  
Preparing to unpack .../6-containerd_1:1.4.0-1ubuntu1_amd64.deb ...  
Unpacking containerd (1:1.4.0-1ubuntu1) ...  
Preparing to unpack .../1-cri-tools_1.31.1-1_amd64.deb ...  
Unpacking cri-tools (1.31.1-1) ...  
Preparing to unpack .../2-kubelet_1.31.1-1_amd64.deb ...  
Unpacking kubelet (1.31.1-1) ...  
Preparing to unpack .../3-kubeadm_1.31.1-1_amd64.deb ...  
Unpacking kubeadm (1.31.1-1) ...  
Preparing to unpack .../4-kubectl_1.31.1-1_amd64.deb ...  
Unpacking kubectl (1.31.1-1) ...  
Setting up containerd (1:1.4.0-1ubuntu1) ...  
Setting up cri-tools (1.31.1-1) ...  
Setting up kubelet (1.31.1-1) ...  
Setting up kubeadm (1.31.1-1) ...  
Setting up kubectl (1.31.1-1) ...  
Processing triggers for man-db (2.12.0-4ubuntu2) ...  
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@master-node:~$ sudo apt-mark hold kubelet kubeadm kubectl  
kubelet set on hold.  
kubeadm set on hold.  
kubectl set on hold.  
ubuntu@master-node:~$
```



```
ubuntu@master1:~$ 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
Get:5 https://ppa.launchpad.net/kevin-katz/ubuntu/ubuntu/ubuntu noble InRelease [1186 B]
Get:6 https://ppa.launchpad.net/kevin-katz/ubuntu/ubuntu/ubuntu noble InRelease [1186 B]
Fetched 1186 B in 1s (10.2 kB/s)
Reading package lists... Done
Reading state information... Done
Building dependency tree... Done
Building state information... Done
The following additional packages will be installed:
  cni-plugins kubelet kubeadm kubectl
The following new packages will be installed:
  cni-plugins kubelet kubeadm kubectl
0 upgraded, 4 newly installed, 0 to remove and 130 not upgraded.
Need to get 87.4 MB of archives.
After this operation, 314 MB of additional disk space will be used.
Get:1 https://ppa.launchpad.net/kevin-katz/ubuntu/ubuntu/ubuntu noble InRelease [1186 B]
Get:2 https://ppa.launchpad.net/kevin-katz/ubuntu/ubuntu/ubuntu noble InRelease [1186 B]
Get:3 https://ppa.launchpad.net/kevin-katz/ubuntu/ubuntu/ubuntu noble InRelease [1186 B]
Get:4 https://ppa.launchpad.net/kevin-katz/ubuntu/ubuntu/ubuntu noble InRelease [1186 B]
Get:5 https://ppa.launchpad.net/kevin-katz/ubuntu/ubuntu/ubuntu noble InRelease [1186 B]
Get:6 https://ppa.launchpad.net/kevin-katz/ubuntu/ubuntu/ubuntu noble InRelease [1186 B]
Fetched 1186 B in 1s (10.2 kB/s)
Detecting previously unselected package cni-plugins.
(Reading database ... 48112 files and directories currently installed.)
Preparing to unpack .../cni-plugins_1.3.1-1.1_amd64.deb ...
Unpacking cni-plugins (1.3.1-1.1) ...
Detecting previously unselected package kubelet.
Preparing to unpack .../kubelet_1.31.1-1.1_amd64.deb ...
Unpacking kubelet (1.31.1-1.1) ...
Detecting previously unselected package kubeadm.
Preparing to unpack .../kubeadm_1.31.1-1.1_amd64.deb ...
Unpacking kubeadm (1.31.1-1.1) ...
Detecting previously unselected package kubectl.
Preparing to unpack .../kubectl_1.31.1-1.1_amd64.deb ...
Unpacking kubectl (1.31.1-1.1) ...
Setting up cni-plugins (1.3.1-1.1) ...
Setting up kubelet (1.31.1-1.1) ...
Setting up kubeadm (1.31.1-1.1) ...
Setting up kubectl (1.31.1-1.1) ...
```

Kubernetes Deployment (master only)

8) Begin Kubernetes Deployment

```
$ sudo swapoff -a
```

9) Initialize Kubernetes on Master Node

```
$ sudo kubeadm init --pod-network-cidr=10.244.0.0/16--ignore-preflight-errors=all
```

```
ubuntu@master-node:~$ sudo kubeadm init --pod-network-cidr=10.244.0.0/16 --ignore-preflight-errors=all
[init] Using Kubernetes version: v1.31.0
[preflight] Running pre-flight checks
[WARNING Message]: the system RAM (914 MB) is less than the minimum 1700 MB
[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'
W0914 18:27:12.592860 4447 checks.go:846] detected that the sandbox image 'registry.k8s.io/pause:3.8' of the container runtime is inconsistent with that used by kubeadm. It is recommended to use 'registry.k8s.io/pause:3.10' as the CNI sandbox image.
[certs] Using certificateDir folder "/etc/kubernetes/pki"
[certs] Generating "ca" certificate and key
[certs] Generating "apiserver" certificate and key
[certs] apiserver serving cert is signed for DNS names [kubernetes kubernetes.default kubernetes.default.svc kubernetes.default.svc.cluster.local master-node] and IPs [10.96.0.1 172.31.42.81]
[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 master-node] and IPs [172.31.42.81 127.0.0.1 ::1]
[certs] etcd/peer serving cert is signed for DNS names [localhost master-node] and IPs [172.31.42.81 127.0.0.1 ::1]
[certs] Generating "etcd/healthcheck-client" certificate and key
[certs] Generating "apiserver-etcd-client" certificate and key
[certs] Generating "sa" key and public key
[kubeconfig] Using kubeconfig folder "/etc/kubernetes"
[kubeconfig] Writing "admin.conf" kubeconfig file
[kubeconfig] Writing "super-admin.conf" kubeconfig file
[kubeconfig] Writing "kubelet.conf" kubeconfig file
[kubeconfig] Writing "controller-manager.conf" kubeconfig file
[kubeconfig] Writing "scheduler.conf" kubeconfig file
[etcd] Creating static Pod manifest for local etcd in "/etc/kubernetes/manifests"
```


10) Deploy Pod Network to Cluster

```
$ mkdir -p $HOME/.kube
```

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

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

```
$ kubectl apply -f
```

<https://raw.githubusercontent.com/coreos/flannel/master/Documentation/kube>

-flannel.yml

```
ubuntu@master-node:~$ mkdir -p $HOME/.kube
ubuntu@master-node:~$ sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
ubuntu@master-node:~$ sudo chown $(id -u):$(id -g) $HOME/.kube/config
ubuntu@master-node:~$ kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/master/Documentation/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
```

```
$ kubectl get pods --all-namespaces
```

```
ubuntu@master-node:~$ kubectl get pods --all-namespaces
NAMESPACE   NAME                                     READY   STATUS    RESTARTS   AGE
kube-flannel kube-flannel-ds-cx5fj                 1/1     Running   5 (37s ago) 25m
kube-flannel kube-flannel-ds-nbyvz                 1/1     Running   6 (37s ago) 33m
kube-system  coredns-7c65d6cf9-5fbcg               1/1     Running   2 (87s ago) 44m
kube-system  coredns-7c65d6cf9-mag7b               1/1     Running   3 (87s ago) 44m
kube-system  etcd-master-node                      1/1     Running   3 (87s ago) 44m
kube-system  kube-apiserver-master-node            1/1     Running   3 (87s ago) 44m
kube-system  kube-controller-manager-master-node   1/1     Running   8 (87s ago) 44m
kube-system  kube-proxy-gh4ls                      1/1     Running   11 (69s ago) 25m
kube-system  kube-proxy-zg8tm                      1/1     Running   21 (68s ago) 44m
kube-system  kube-scheduler-master-node            1/1     Running   8 (87s ago) 44m
ubuntu@master-node:~$
```

Join Worker Node to Cluster (on worker node)

11) \$ kubectl join 172.31.42.81:6443 --token 1evaro.2xdo7fco07hizfja --discovery-token-ca-cert-hash sha256:be87f981c53e5ea6471eef94af12957cbdd291711150e58ceaf6a56b0f768d5e --ignore-preflight-errors=all

```
ubuntu@worker1:~$ kubectl join 172.31.42.81:6443 --token 1evaro.2xdo7fco07hizfja --discovery-token-ca-cert-hash sha256:be87f981c53e5ea6471eef94af12957cbdd291711150e58ceaf6a56b0f768d5e --ignore-preflight-errors=all
[preflight] Running pre-flight checks
[WARNING] FileExisting-socat: socat not found in system path
[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 at http://127.0.0.1:10248/healthz. This can take up to 4m0s
[kubelet-check] The kubelet is healthy after 503.209565ms
[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.
```

12) \$ kubectl get nodes (on master node)

```
ubuntu@master-node:~$ kubectl get pods --all-namespaces
NAMESPACE   NAME                                     READY   STATUS    RESTARTS   AGE
kube-flannel kube-flannel-ds-cs5fj                 1/1     Running   5 (37s ago) 25m
kube-flannel kube-flannel-ds-nbvpz                 1/1     Running   6 (37s ago) 33m
kube-system  coredns-7c65d6cfc9-5fhcg             1/1     Running   2 (87s ago) 44m
kube-system  coredns-7c65d6cfc9-msg7b             1/1     Running   3 (87s ago) 44m
kube-system  etcd-master-node                     1/1     Running   3 (87s ago) 44m
kube-system  kube-apiserver-master-node           1/1     Running   3 (87s ago) 44m
kube-system  kube-controller-manager-master-node  1/1     Running   8 (87s ago) 44m
kube-system  kube-proxy-g4t1s                     1/1     Running   11 (69s ago) 25m
kube-system  kube-proxy-zg8tm                     1/1     Running   21 (68s ago) 44m
kube-system  kube-scheduler-master-node           1/1     Running   8 (87s ago) 44m
ubuntu@master-node:~$ kubectl get nodes
NAME                STATUS    ROLES    AGE   VERSION
master-node         Ready     control-plane  54m   v1.31.1
worker1             Ready     <none>      36m   v1.31.1
ubuntu@master-node:~$
```

we now have a Kubernetes cluster running across AWS EC2 Instances. This cluster can be used to further deploy applications and their loads being distributed across these machines.