Advanced DevOps Experiment - 3

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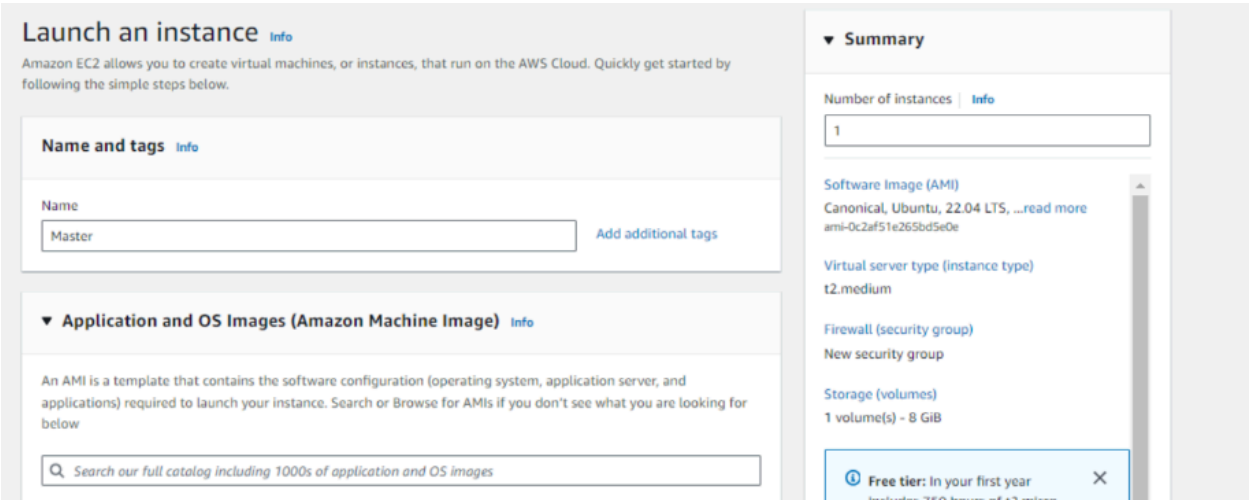
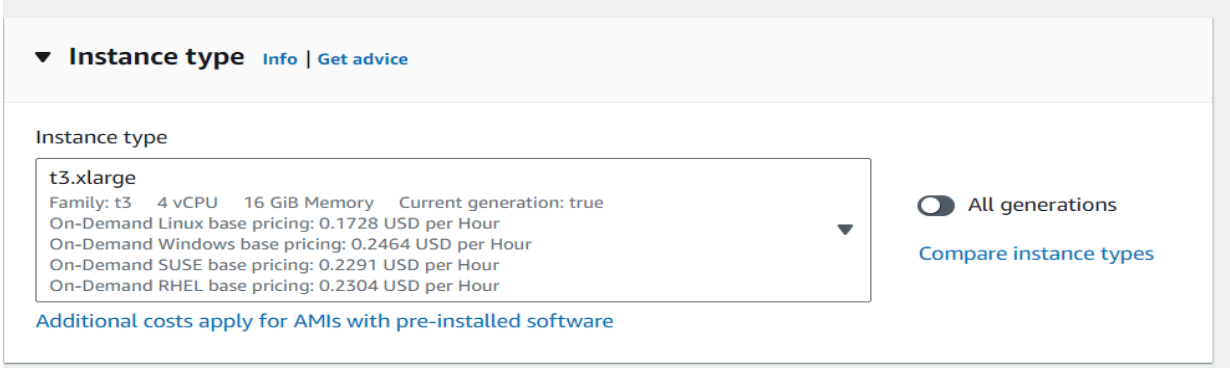
D15A 30

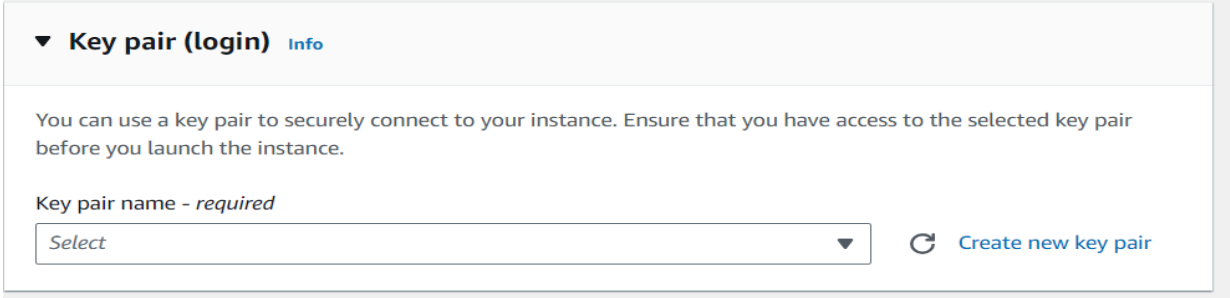
Aim : To understand the Kubernetes Cluster Architecture, install and Spin Up a Kubernetes Cluster on Linux Machines/Cloud Platforms.

Implementation:-

Creating Instance using Amazon Linux







Create key pair

Key pair name

Key pairs allow you to connect to your instance securely.

two-tier-app-k8s

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

Key pair type

- (•) RSA — RSA encrypted private and public key pair
- ( ) ED25519 — ED25519 encrypted private and public key pair

Private key file format

- (•) .pem — For use with OpenSSH
- ( ) .ppk — For use with PuTTY

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

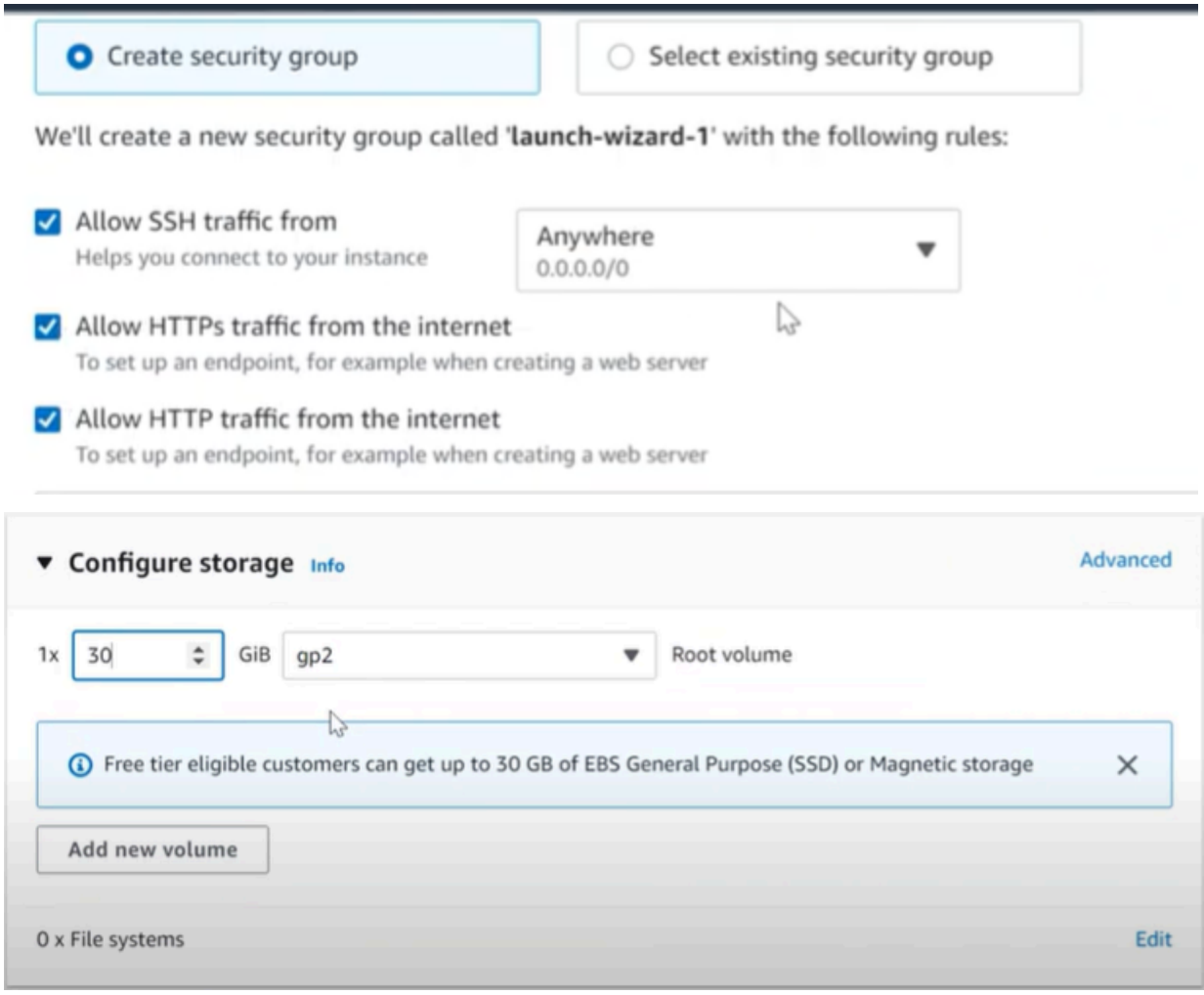
Cancel | Create key pair

Instances (4) Info

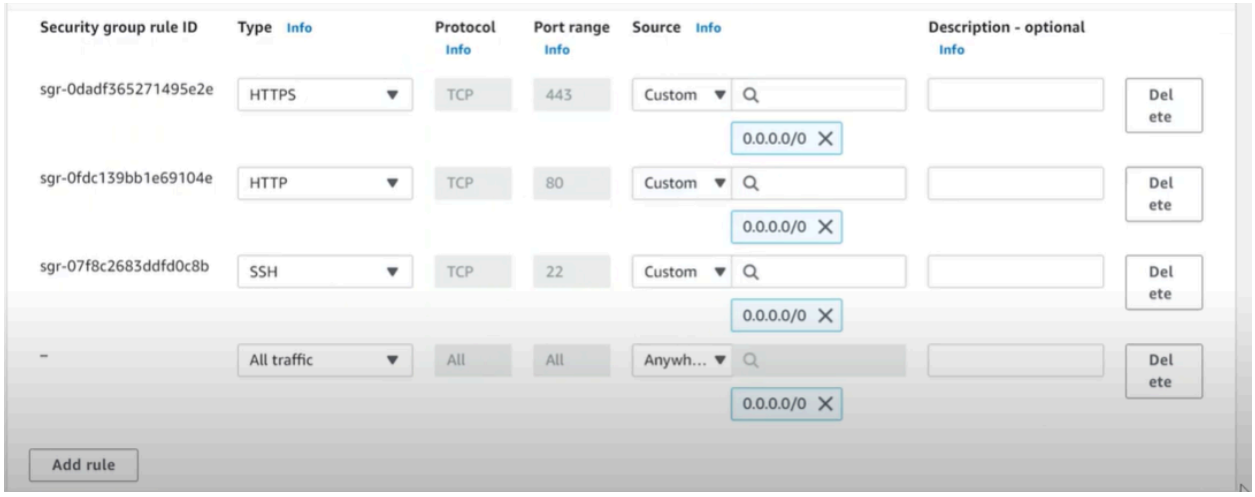
Last updated less than a minute ago | Connect | Instance state | Actions | Launch instances

Find Instance by attribute or tag (case-sensitive) | All states | 1

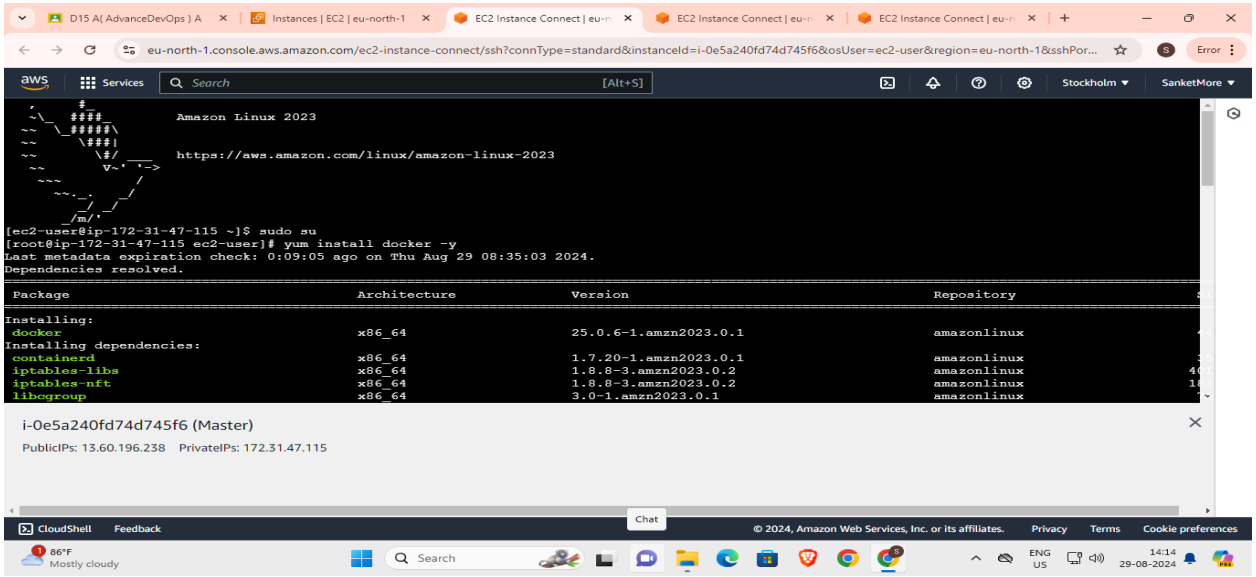
Name	Instance ID	Instance state	Instance type	Status check	Alarm status	Availability Zone	Public IPv4
30SAN-env	i-06dae01fd646e93ba	Running	t3.micro	3/3 checks passed	View alarms	eu-north-1a	ec2-13-49-
Master	i-05e71d31a2d0b9a11	Stopped	t3.xlarge	-	View alarms	eu-north-1a	-
node1	i-0065bd5c032d2fda0	Stopped	t3.xlarge	-	View alarms	eu-north-1b	-
node2	i-095cb5930eba6bee4	Stopped	t3.xlarge	-	View alarms	eu-north-1b	-

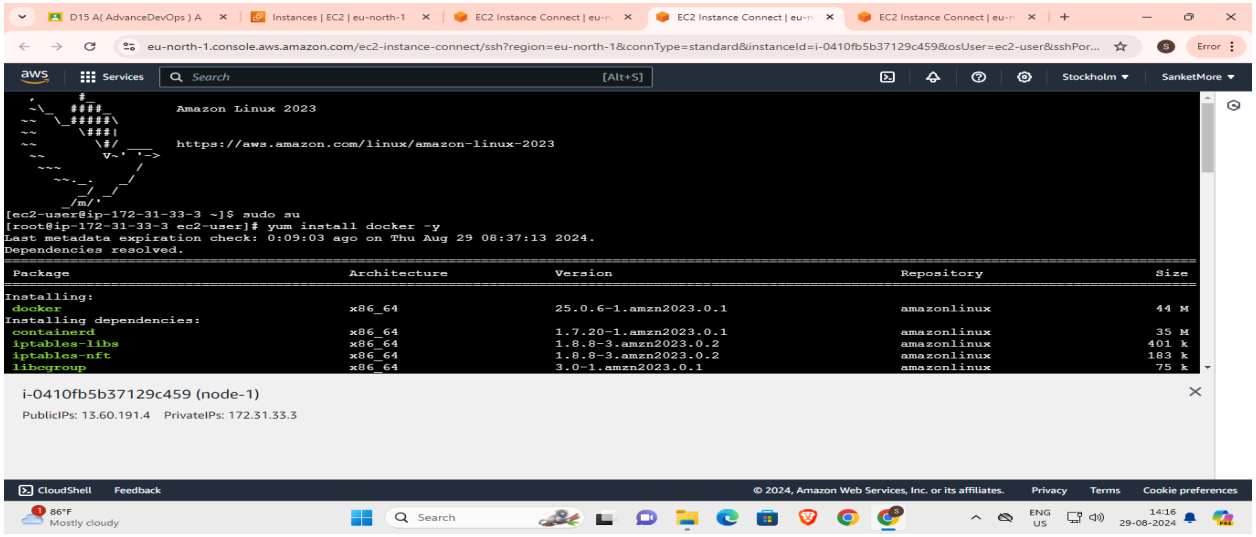


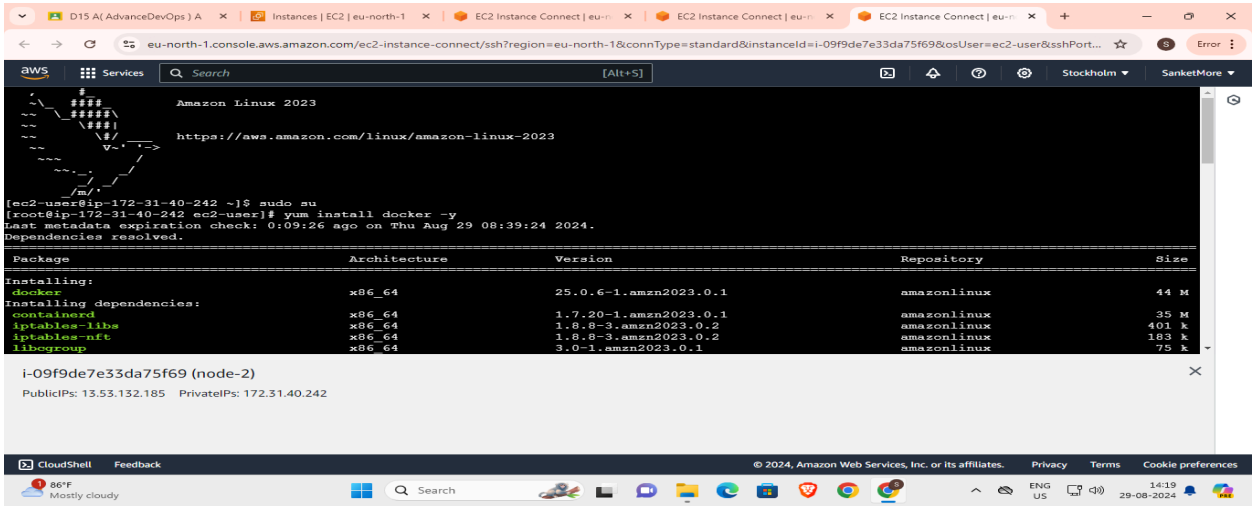
Add rules of 'All traffic' to your instances



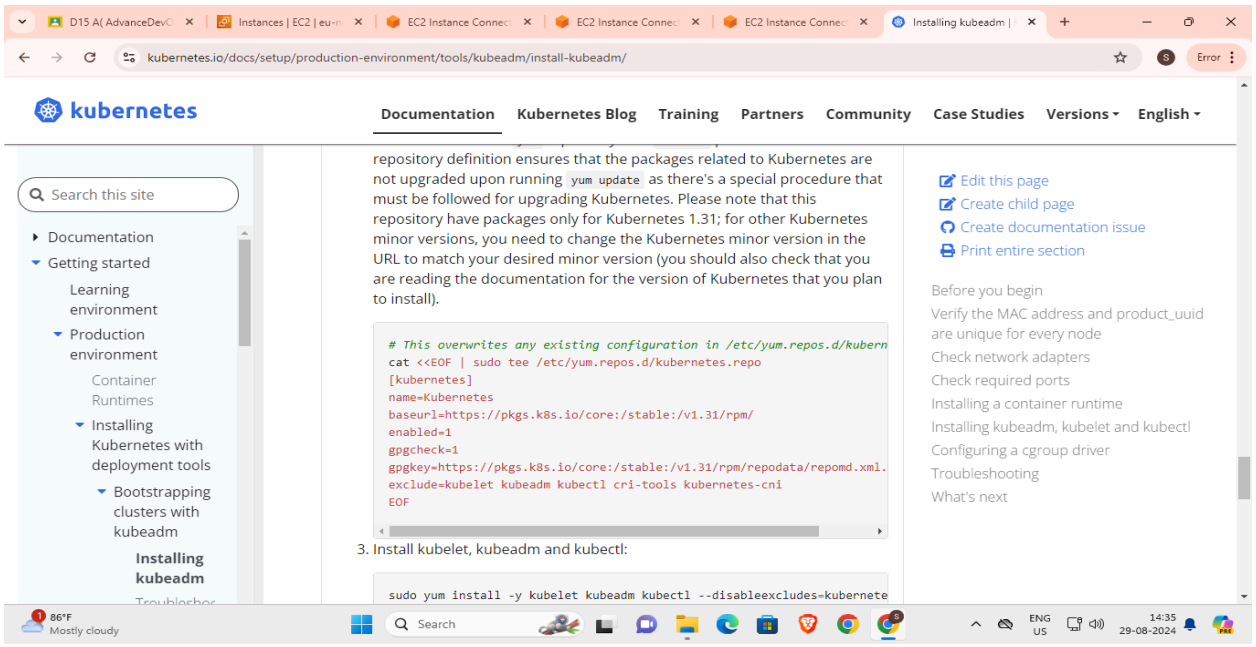
Installing Docker:-







Installing Kubernetes:-




```
[root@ip-172-31-47-115 ec2-user]# cat <<EOF | sudo tee /etc/yum.repos.d/kubernetes.repo
[kubernetes]
name=Kubernetes
baseurl=https://pkgs.k8s.io/core:/stable:/v1.31/rpm/
enabled=1
gpgcheck=1
gpgkey=https://pkgs.k8s.io/core:/stable:/v1.31/rpm/repodata/repomd.xml.key
exclude=kubelet kubeadm kubectl cri-tools kubernetes-cni
EOF
[kubernetes]
name=Kubernetes
baseurl=https://pkgs.k8s.io/core:/stable:/v1.31/rpm/
enabled=1
gpgcheck=1
gpgkey=https://pkgs.k8s.io/core:/stable:/v1.31/rpm/repodata/repomd.xml.key
exclude=kubelet kubeadm kubectl cri-tools kubernetes-cni
[root@ip-172-31-47-115 ec2-user]# sudo yum install -y kubelet kubeadm kubectl --disableexcludes=kubernetes
Kubernetes                                                                    16 kB/s | 6.5 kB     00:00
Dependencies resolved.
```

```
Complete!
[root@ip-172-31-47-115 ec2-user]# sudo systemctl enable --now kubelet
Created symlink /etc/systemd/system/multi-user.target.wants/kubelet.service → /usr/lib/systemd/system/kubelet.service.
[root@ip-172-31-47-115 ec2-user]#
```

i-0e5a240fd74d745f6 (Master)

PublicIPs: 13.60.196.238 PrivateIPs: 172.31.47.115

```
Installed:
  conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64                cri-tools-1.31.1-150500.1.1.x86_64
  kubeadm-1.31.0-150500.1.1.x86_64                           kubectl-1.31.0-150500.1.1.x86_64
  kubelet-1.31.0-150500.1.1.x86_64                           kubernetes-cni-1.5.0-150500.2.1.x86_64
  libnetfilter_cthelper-1.0.0-21.amzn2023.0.2.x86_64         libnetfilter_cttimeout-1.0.0-19.amzn2023.0.2.x86_64
  libnetfilter_queue-1.0.5-2.amzn2023.0.2.x86_64             socat-1.7.4.2-1.amzn2023.0.2.x86_64

Complete!
[root@ip-172-31-33-3 ec2-user]# sudo systemctl enable --now kubelet
Created symlink /etc/systemd/system/multi-user.target.wants/kubelet.service → /usr/lib/systemd/system/kubelet.service.
[root@ip-172-31-33-3 ec2-user]#
```

i-0410fb5b37129c459 (node-1)

PublicIPs: 13.60.191.4 PrivateIPs: 172.31.33.3

```
Installed:
  conntrack-tools-1.4.6-2.amzn2023.0.2.x86_64                cri-tools-1.31.1-150500.1.1.x86_64
  kubeadm-1.31.0-150500.1.1.x86_64                           kubectl-1.31.0-150500.1.1.x86_64
  kubelet-1.31.0-150500.1.1.x86_64                           kubernetes-cni-1.5.0-150500.2.1.x86_64
  libnetfilter_cthelper-1.0.0-21.amzn2023.0.2.x86_64         libnetfilter_cttimeout-1.0.0-19.amzn2023.0.2.x86_64
  libnetfilter_queue-1.0.5-2.amzn2023.0.2.x86_64             socat-1.7.4.2-1.amzn2023.0.2.x86_64

Complete!
[root@ip-172-31-40-242 ec2-user]# sudo systemctl enable --now kubelet
Created symlink /etc/systemd/system/multi-user.target.wants/kubelet.service → /usr/lib/systemd/system/kubelet.service.
[root@ip-172-31-40-242 ec2-user]#
```

i-09f9de7e33da75f69 (node-2)

PublicIPs: 13.53.132.185 PrivateIPs: 172.31.40.242

Initializing Kubeadm:-

```
[root@ip-172-31-37-74 ec2-user]# kubeadm init
[init] Using Kubernetes version: v1.31.0
[preflight] Running pre-flight checks
        [WARNING FileExisting-tc]: tc 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'
W0911 06:06:02.983804    2545 checks.go:846] detected that the sandbox image "registry.k8s.io/pause:3.8" of t
y kubeadm.It is recommended to use "registry.k8s.io/pause:3.10" as the CRI sandbox image.
[certs] Using certificateDir folder "/etc/kubernetes/pki"
[certs] Generating "ca" certificate and key
[certs] Generating "apiserver" certificate and key
```

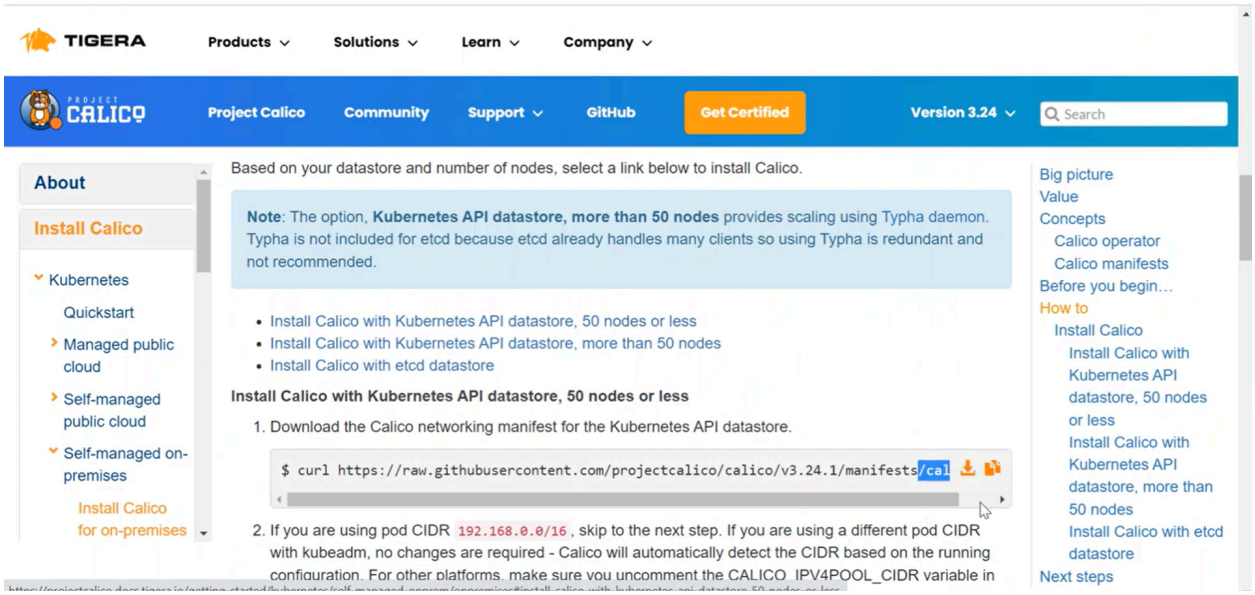
```
Your Kubernetes control-plane has initialized successfully!

To start using your cluster, you need to run the following as a regular user:

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

Alternatively, if you are the root user, you can run:

  export KUBECONFIG=/etc/kubernetes/admin.conf

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

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

kubeadm join 172.31.25.144:6443 --token kw6rp8.mi1vmqzveqzzeifs \
        --discovery-token-ca-cert-hash sha256:e2285a0bb9324e4ebd564331961c506c7c8172e4639c81d5d89c86a47f0ad842
[root@ip-172-31-25-144 ec2-user]#
```

```
[root@master ~]#  mkdir -p $HOME/.kube
[root@master ~]#  sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
[root@master ~]# sudo chown $(id -u):$(id -g) $HOME/.kube/config
[root@master ~]# export KUBECONFIG=/etc/kubernetes/admin.conf
```

Creating the kubernetes nodes by copying the link in the workers:-

```
[root@worker ~]# systemctl enable docker
[root@worker ~]# systemctl enable kubelet
Created symlink from /etc/systemd/system/multi-user.target.wants/kubelet.service to /usr/lib/systemd/system/kubelet.service.
[root@worker ~]# systemctl restart docker kubelet
[root@worker ~]# kubeadm join 172.31.46.167:6443 --token d47j51.2ejotl12hbxm5tys \
>         --discovery-token-ca-cert-hash sha256:a5511cfbd8b2b8bd69f15e7ad4247c34e1e2218b448a3a36509c0bb15b6f8d43
```

Installing the Calico file:-




```
[root@master ~]# curl https://raw.githubusercontent.com/projectcalico/calico/v3.24.1/manifests/calico.yaml -O
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  229k  100  229k    0     0   175k      0  0:00:01  0:00:01 --:--:--  176k
[root@master ~]#
[root@master ~]# kubectl apply -f calico.yaml
poddisruptionbudget.policy/calico-kube-controllers created
serviceaccount/calico-kube-controllers created
serviceaccount/calico-node created
configmap/calico-config created
customresourcedefinition.apiextensions.k8s.io/bgpconfigurations.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/bgppeers.crd.projectcalico.org created
customresourcedefinition.apiextensions.k8s.io/blockaffinities.crd.projectcalico.org created
```

```
Every 2.0s: kubectl get pods -A

NAMESPACE     NAME                                       READY   STATUS              RESTARTS   AGE
kube-system   calico-kube-controllers-58dbc876ff-nnprd   0/1     ContainerCreating   0          29s
kube-system   calico-node-bs95w                          0/1     Init:2/3            0          29s
kube-system   calico-node-hplqt                          0/1     Init:2/3            0          29s
kube-system   coredns-565d847f94-prsps                   0/1     ContainerCreating   0          6m7s
kube-system   coredns-565d847f94-qrg48                   0/1     ContainerCreating   0          6m6s
kube-system   etcd-master                                1/1     Running             0          6m14s
kube-system   kube-apiserver-master                      1/1     Running             0          6m12s
kube-system   kube-controller-manager-master             1/1     Running             0          6m11s
kube-system   kube-proxy-v2kxq                           1/1     Running             0          2m31s
kube-system   kube-proxy-w8nn7                           1/1     Running             0          6m7s
kube-system   kube-scheduler-master                      1/1     Running             0          6m13s
```

Nodes Created: