TUTORIAL ON SETUP KUBEEDGE ENVIRONMENT ON CLOUD, EDGE1, EDGE2

LEGEND:

Command run on cloud node

Command run on edge nodes

Command run on cloud and edge nodes

###CHANGE HOSTNAME###

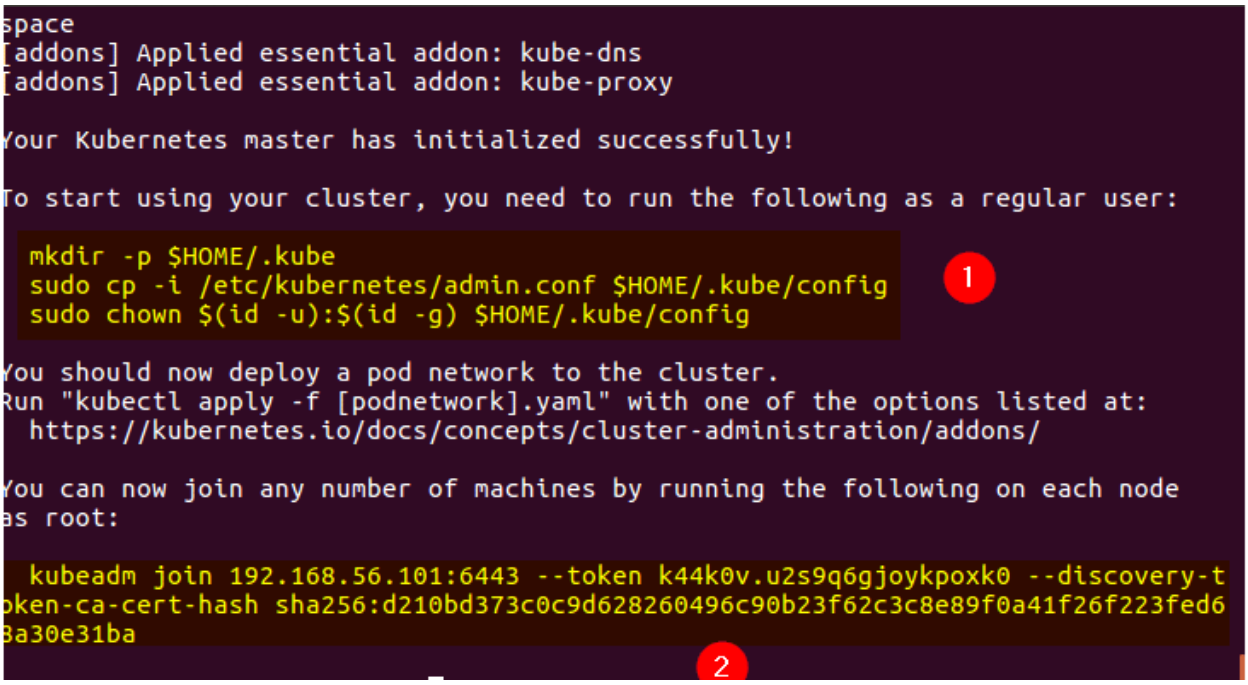
```
sudo hostnamectl set-hostname cloud

sudo hostnamectl set-hostname edge1

sudo hostnamectl set-hostname edge2
```

####INSTALL KUBENERTES#####

```
sudo  su

apt update

apt -y upgrade && sudo systemctl reboot

apt update

apt -y install curl apt-transport-https

curl -s https://packages.cloud.google.com/apt/doc/apt-key.gpg | sudo apt-key add - && \

echo "deb http://apt.kubernetes.io/ kubernetes-xenial main" | sudo tee
/etc/apt/sources.list.d/kubernetes.list && \

apt-get update -q && \

apt-get install -qy kubelet=1.21.0-00 kubectl=1.21.0-00 kubeadm=1.21.0-00

apt-mark hold kubelet kubeadm kubectl

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

swapoff -v /swap*

rm /swap*


echo "br_netfilter" >> /etc/modules-load.d/br_netfilter.conf

modprobe overlay

modprobe br_netfilter
```

```
tee /etc/sysctl.d/kubernetes.conf <<EOF
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF

sysctl --system
########INSTALL DOCKER#################
# Add repo and Install packages
apt update
apt install -y curl gnupg2 software-properties-common apt-transport-https ca-certificates

curl -fsSL https://download.docker.com/linux/ubuntu/gpg | sudo apt-key add -
add-apt-repository "deb [arch=amd64] https://download.docker.com/linux/ubuntu $(lsb_release -cs) stable"
apt update
apt install -y containerd.io docker-ce docker-ce-cli
# Create required directories
mkdir -p /etc/systemd/system/docker.service.d

# Create daemon json config file
tee /etc/docker/daemon.json <<EOF
{
  "exec-opts": ["native.cgroupdriver=systemd"],
  "log-driver": "json-file",
  "log-opts": {
    "max-size": "100m"
  },
  "storage-driver": "overlay2"
```

```
}
EOF

# Start and enable Services
systemctl daemon-reload
systemctl restart docker
systemctl enable docker
exit

#RUN BELOW COMMAND ONLY ON CLOUD
systemctl enable --now kubelet
#RUN KUBENERTES:
#For Callico:
sudo kubeadm init --apiserver-advertise-address=192.168.27.128  --pod-network-cidr=192.168.0.0/16
```




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

watch kubectl get all -A

###########INSTALL KUBE-EDGE###############

#nodeAffinity

The most important thing to watch out for in KubeEdge is that pods such as kube-proxy and cni plugin are scheduled to edge. As a solution to this problem, KubeEdge suggests using the following nodeAffinity to prevent pods from being scheduled on nodes with edge labels as follows.

“

```
affinity:
  nodeAffinity:
    requiredDuringSchedulingIgnoredDuringExecution:
      nodeSelectorTerms:
        - matchExpressions:
          - key: node-role.kubernetes.io/edge
            operator: DoesNotExist
```

“

kubectl -n kube-system edit daemonsets.apps kube-proxy

#Add the above content to daemonset.apps file (to spec.template.spec)

#Below is yaml file of Calico CNI (already add nodeAffinity), download this file to your cloud node.

curl https://docs.projectcalico.org/manifests/calico.yaml -O

```yaml
---
# Source: calico/templates/calico-node.yaml
# This manifest installs the calico-node container, as well
# as the CNI plugins and network config on
# each master and worker node in a Kubernetes cluster.
kind: DaemonSet
apiVersion: apps/v1
metadata:
  name: calico-node
  namespace: kube-system
  labels:
    k8s-app: calico-node
spec:
  selector:
    matchLabels:
      k8s-app: calico-node
  updateStrategy:
    type: RollingUpdate
    rollingUpdate:
      maxUnavailable: 1
  template:
    metadata:
      labels:
        k8s-app: calico-node
    spec:
      affinity:
        nodeAffinity:
          requiredDuringSchedulingIgnoredDuringExecution:
            nodeSelectorTerms:
              - matchExpressions:
                - key: node-role.kubernetes.io/edge
                  operator: DoesNotExist
      nodeSelector:
```

kubectl apply -f calico.yaml

#Check your pods (it should be all running state):

kubectl get pod -o wide -A

```
cloud@cloud:~$ kubectl get pod -o wide -A
NAMESPACE     NAME                                       READY   STATUS    RESTARTS   AGE    IP              NODE
S GATES
kube-system   calico-kube-controllers-6b9fbfff44-7k788   1/1     Running   1          6d2h   192.168.41.3    cloud
kube-system   calico-node-4gj8l                          1/1     Running   0          6d2h   192.168.27.128  cloud
kube-system   coredns-558bd4d5db-d2xz8                   1/1     Running   0          6d4h   192.168.41.1    cloud
kube-system   coredns-558bd4d5db-p9gsc                   1/1     Running   0          6d4h   192.168.41.2    cloud
kube-system   etcd-cloud                                 1/1     Running   0          6d4h   192.168.27.128  cloud
kube-system   kube-apiserver-cloud                       1/1     Running   0          6d4h   192.168.27.128  cloud
kube-system   kube-controller-manager-cloud              1/1     Running   1          6d4h   192.168.27.128  cloud
kube-system   kube-proxy-bmx9c                           1/1     Running   0          6d2h   192.168.27.128  cloud
kube-system   kube-scheduler-cloud                       1/1     Running   1          6d4h   192.168.27.128  cloud
```

watch kubectl get all -n kube-system

```
Every 2.0s: kubectl get all -n kube-system                                    cloud: Sun Jan  2 23:41:27 2022

NAME                                          READY   STATUS    RESTARTS   AGE
pod/calico-kube-controllers-6b9fbfff44-7k788  1/1     Running   1          6d2h
pod/calico-node-4gj8l                         1/1     Running   0          6d2h
pod/coredns-558bd4d5db-d2xz8                  1/1     Running   0          6d5h
pod/coredns-558bd4d5db-p9gsc                  1/1     Running   0          6d5h
pod/etcd-cloud                                1/1     Running   0          6d5h
pod/kube-apiserver-cloud                      1/1     Running   0          6d5h
pod/kube-controller-manager-cloud             1/1     Running   1          6d5h
pod/kube-proxy-bmx9c                          1/1     Running   0          6d2h
pod/kube-scheduler-cloud                      1/1     Running   1          6d5h

NAME               TYPE        CLUSTER-IP   EXTERNAL-IP   PORT(S)                  AGE
service/kube-dns   ClusterIP   10.96.0.10   <none>        53/UDP,53/TCP,9153/TCP   6d5h

NAME                           DESIRED   CURRENT   READY   UP-TO-DATE   AVAILABLE   NODE SELECTOR            AGE
daemonset.apps/calico-node     1         1         1       1            1           kubernetes.io/os=linux   6d2h
daemonset.apps/kube-proxy      1         1         1       1            1           kubernetes.io/os=linux   6d5h

NAME                                      READY   UP-TO-DATE   AVAILABLE   AGE
deployment.apps/calico-kube-controllers   1/1     1            1           6d2h
deployment.apps/coredns                   2/2     2            2           6d5h

NAME                                                DESIRED   CURRENT   READY   AGE
replicaset.apps/calico-kube-controllers-6b9fbfff44  1         1         1       6d2h
replicaset.apps/coredns-558bd4d5db                  2         2         2       6d5h
```

#INSTALL KEADM

cd /tmp

wget -c https://github.com/kubeedge/kubeedge/releases/download/v1.9.1/keadm-v1.9.1-linux-amd64.tar.gz -O - | tar xz

mv keadm-v1.9.1-linux-amd64/keadm/keadm /usr/local/bin

#Change below address to your cloud ip address

sudo keadm init --advertise-address=192.168.27.128 --kube-config=$HOME/.kube/config

```
cloud@cloud:~$ sudo keadm init --advertise-address=192.168.27.128 --kube-config=$HOME/.kube/config
[sudo] password for cloud:
Kubernetes version verification passed, KubeEdge installation will start...
kubeedge-v1.9.1-linux-amd64.tar.gz checksum:
checksum_kubeedge-v1.9.1-linux-amd64.tar.gz.txt content:
[Run as service] start to download service file for cloudcore
[Run as service] success to download service file for cloudcore
kubeedge-v1.9.1-linux-amd64/
kubeedge-v1.9.1-linux-amd64/edge/
kubeedge-v1.9.1-linux-amd64/edge/edgecore
kubeedge-v1.9.1-linux-amd64/cloud/
kubeedge-v1.9.1-linux-amd64/cloud/csidriver/
kubeedge-v1.9.1-linux-amd64/cloud/csidriver/csidriver
kubeedge-v1.9.1-linux-amd64/cloud/admission/
kubeedge-v1.9.1-linux-amd64/cloud/admission/admission
kubeedge-v1.9.1-linux-amd64/cloud/cloudcore/
kubeedge-v1.9.1-linux-amd64/cloud/cloudcore/cloudcore
kubeedge-v1.9.1-linux-amd64/version

KubeEdge cloudcore is running, For logs visit:  /var/log/kubeedge/cloudcore.log
CloudCore started
```

sudo pkill cloudcore

sudo mv /etc/kubeedge/cloudcore.service /etc/systemd/system/

sudo systemctl enable --now cloudcore

sudo systemctl status cloudcore

sudo keadm gettoken --kube-config=$HOME/.kube/config

```
cloud@cloud:~$ sudo systemctl status cloudcore
● cloudcore.service
     Loaded: loaded (/etc/systemd/system/cloudcore.service; enabled; vendor preset: enabled)
     Active: active (running) since Thu 2021-12-30 22:30:49 PST; 1min 13s ago
   Main PID: 1495436 (cloudcore)
      Tasks: 13 (limit: 9202)
     Memory: 13.9M
     CGroup: /system.slice/cloudcore.service
             └─1495436 /usr/local/bin/cloudcore

Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.576752 1495436 downstream.go:878] Start downstream devicecontrol>
Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.576801 1495436 core.go:46] starting module cloudhub
Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.576841 1495436 downstream.go:339] start downstream controller
Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.678357 1495436 server.go:257] Ca and CaKey don't exist in local >
Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.691880 1495436 server.go:302] CloudCoreCert and key don't exist >
Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.734316 1495436 signcerts.go:100] Succeed to creating token
Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.734421 1495436 server.go:44] start unix domain socket server
Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.734768 1495436 uds.go:71] listening on: //var/lib/kubeedge/kubee>
Dec 30 22:30:50 cloud cloudcore[1495436]: I1230 22:30:50.746715 1495436 server.go:64] Starting cloudhub websocket server
Dec 30 22:30:52 cloud cloudcore[1495436]: I1230 22:30:52.577015 1495436 upstream.go:64] Start upstream devicecontroller

cloud@cloud:~$ sudo keadm gettoken --kube-config=$HOME/.kube/config
654037501858e92e2dc83b92a3c749ae0cebd32ad95fec90d279e0e15b17c73a.eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJleHAiOjE2NDEwMTg2
NTB9.hbNOrkzmYXOWeB8UdPMeAI5wHNIkqMjUukT_MQk7bIEcloud@cloud:~$ cd
```

#Copy the token and copy it into below command:

sudo keadm join --cloudcore-ipport=192.168.27.132:10000 --token=9d870d748ebf98bae692e258ab4adfd79e32e812054ec66161c3dffb4262e5e7.eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9.eyJleHAiOjE2Mzg4MzkxOTZ9.4J3gpmZZrm4p4PqL0-TL3qDEBXZYSwmtacyIiazSEsw

```
edge1@edge1:~$ sudo keadm join --cloudcore-ipport=192.168.27.128:10000 --token=sudo keadm join --cloudcore-ipport=192.168.
27.128:10000 --token=654037501858e92e2dc83b92a3c749ae0cebd32ad95fec90d279e0e15b17c73a.eyJhbGciOiJIUzI1NiIsInR5cCI6IkpXVCJ9
.eyJleHAiOjE2NDEyMzQ2NTB9.bOvhuNjoVCUVB9byz1IC0WgdmqWeddmkJ98LWnpVD5M
[sudo] password for edge1:
Host has mosquit+ already installed and running. Hence skipping the installation steps !!!
kubeedge-v1.9.1-linux-amd64.tar.gz checksum:
checksum_kubeedge-v1.9.1-linux-amd64.tar.gz.txt content:
[Run as service] start to download service file for edgecore
[Run as service] success to download service file for edgecore
kubeedge-v1.9.1-linux-amd64/
kubeedge-v1.9.1-linux-amd64/edge/
kubeedge-v1.9.1-linux-amd64/edge/edgecore
kubeedge-v1.9.1-linux-amd64/cloud/
kubeedge-v1.9.1-linux-amd64/cloud/csidriver/
kubeedge-v1.9.1-linux-amd64/cloud/csidriver/csidriver
kubeedge-v1.9.1-linux-amd64/cloud/admission/
kubeedge-v1.9.1-linux-amd64/cloud/admission/admission
kubeedge-v1.9.1-linux-amd64/cloud/cloudcore/
kubeedge-v1.9.1-linux-amd64/cloud/cloudcore/cloudcore
kubeedge-v1.9.1-linux-amd64/version

KubeEdge edgecore is running, For logs visit: journalctl -u edgecore.service -b
```

sudo sed -i 's/cgroupfs/systemd/g' /etc/kubeedge/config/edgecore.yaml

sudo systemctl restart edgecore

#Edgecore status should be active

systemctl status edgecore

```
edge1@edge1:~$ systemctl status edgecore
● edgecore.service
     Loaded: loaded (/etc/systemd/system/edgecore.service; enabled; vendor preset: enabled)
     Active: active (running) since Sun 2022-01-02 22:37:26 PST; 17min ago
   Main PID: 117033 (edgecore)
      Tasks: 12 (limit: 9430)
     Memory: 28.1M
     CGroup: /system.slice/edgecore.service
             └─117033 /usr/local/bin/edgecore

Jan 02 22:50:26 edge1 edgecore[117033]: I0102 22:50:26.509605  117033 process.go:329] start to sync pod status in edge-st>
Jan 02 22:50:26 edge1 edgecore[117033]: I0102 22:50:26.510838  117033 process.go:336] list pod status, no record, skip sy>
Jan 02 22:51:26 edge1 edgecore[117033]: I0102 22:51:26.510972  117033 process.go:329] start to sync pod status in edge-st>
Jan 02 22:51:26 edge1 edgecore[117033]: I0102 22:51:26.513352  117033 process.go:336] list pod status, no record, skip sy>
Jan 02 22:52:26 edge1 edgecore[117033]: I0102 22:52:26.511027  117033 process.go:329] start to sync pod status in edge-st>
Jan 02 22:52:26 edge1 edgecore[117033]: I0102 22:52:26.511182  117033 process.go:336] list pod status, no record, skip sy>
Jan 02 22:53:26 edge1 edgecore[117033]: I0102 22:53:26.512250  117033 process.go:329] start to sync pod status in edge-st>
Jan 02 22:53:26 edge1 edgecore[117033]: I0102 22:53:26.514471  117033 process.go:336] list pod status, no record, skip sy>
Jan 02 22:54:26 edge1 edgecore[117033]: I0102 22:54:26.513481  117033 process.go:329] start to sync pod status in edge-st>
Jan 02 22:54:26 edge1 edgecore[117033]: I0102 22:54:26.517499  117033 process.go:336] list pod status, no record, skip sy>
lines 1-19/19 (END)
```

journalctl -u edgecore -f

```
edge1@edge1:~$ journalctl -u edgecore -f
-- Logs begin at Thu 2021-12-23 21:28:00 PST. --
Jan 02 23:48:26 edge1 edgecore[117033]: I0102 23:48:26.552235  117033 process.go:329] start to sync pod status in edge-sto
re to cloud
Jan 02 23:48:26 edge1 edgecore[117033]: I0102 23:48:26.554553  117033 process.go:336] list pod status, no record, skip syn
c
Jan 02 23:49:26 edge1 edgecore[117033]: I0102 23:49:26.553425  117033 process.go:329] start to sync pod status in edge-sto
re to cloud
Jan 02 23:49:26 edge1 edgecore[117033]: I0102 23:49:26.558274  117033 process.go:336] list pod status, no record, skip syn
c
Jan 02 23:50:26 edge1 edgecore[117033]: I0102 23:50:26.554306  117033 process.go:329] start to sync pod status in edge-sto
re to cloud
Jan 02 23:50:26 edge1 edgecore[117033]: I0102 23:50:26.555312  117033 process.go:336] list pod status, no record, skip syn
c
Jan 02 23:51:26 edge1 edgecore[117033]: I0102 23:51:26.555136  117033 process.go:329] start to sync pod status in edge-sto
re to cloud
Jan 02 23:51:26 edge1 edgecore[117033]: I0102 23:51:26.555423  117033 process.go:336] list pod status, no record, skip syn
c
Jan 02 23:52:26 edge1 edgecore[117033]: I0102 23:52:26.555460  117033 process.go:329] start to sync pod status in edge-sto
re to cloud
Jan 02 23:52:26 edge1 edgecore[117033]: I0102 23:52:26.557164  117033 process.go:336] list pod status, no record, skip syn
```

kubectl get node

```
cloud@cloud:~$ kubectl get node
NAME    STATUS   ROLES                  AGE    VERSION
cloud   Ready    control-plane,master   6d5h   v1.21.0
edge1   Ready    agent,edge             90m    v1.19.3-kubeedge-v1.9.1
edge2   Ready    agent,edge             89m    v1.19.3-kubeedge-v1.9.1
```

#########################INSTALL KUBEEDGE COMPLETED#######################

####INSTALL CLOUD STREAM, EDGE STREAM, EDGE-MESH#########################

ls /etc/kubernetes/pki/

sudo su

cd /etc/kubeedge/

wget https://raw.githubusercontent.com/kubeedge/kubeedge/master/build/tools/certgen.sh

export CLOUDCOREIPS=192.168.27.128

bash certgen.sh stream

```
root@cloud:/etc/kubeedge# bash certgen.sh stream
Generating RSA private key, 2048 bit long modulus (2 primes)
.....................................................+++++
.............+++++
e is 65537 (0x010001)
Certificate Request:
    Data:
        Version: 1 (0x0)
        Subject: C = CN, ST = Zhejiang, L = Hangzhou, O = KubeEdge
        Subject Public Key Info:
            Public Key Algorithm: rsaEncryption
                RSA Public-Key: (2048 bit)
                Modulus:
                    00:c2:29:32:a9:83:56:b5:f2:21:83:ae:55:7a:4c:
                    97:c8:8d:5c:b7:d9:58:5d:7b:08:fd:f1:14:39:28:
                    2c:a8:3b:09:bd:75:56:f4:0c:db:9a:14:86:24:3c:
                    9e:e0:d4:33:a5:f0:b7:e3:06:42:8e:a0:15:c7:b8:
                    20:aa:10:45:db:98:7f:60:25:9f:25:37:db:04:5d:
                    14:f6:8b:3a:1f:1a:9b:97:c7:2f:8b:71:42:91:fe:
                    d7:8c:b0:d3:ba:36:56:c0:4c:c1:20:40:67:b2:f4:
                    ab:a4:19:ee:b9:6c:a3:a6:45:69:aa:ad:7b:5e:69:
                    cd:c6:e9:55:00:dc:9f:8e:f5:03:2a:ca:14:3b:5f:
                    de:ea:56:2a:3f:63:95:8e:f3:9a:8a:94:06:b7:b2:
                    8a:ad:90:87:37:cf:91:db:fa:bb:2f:6b:b8:8d:92:
                    28:8c:d4:67:be:d9:55:0b:6f:94:87:02:ef:ce:87:
                    84:54:a9:28:16:e9:20:7a:a3:5d:b2:29:9c:d6:03:
                    f5:a8:a5:74:5b:6f:51:23:cb:1e:33:84:33:a4:62:
                    c9:ed:59:95:e9:87:f3:f1:56:c9:72:25:86:6c:99:
                    42:f4:75:b9:fa:1b:05:1c:e3:e8:75:44:8b:2a:56:
                    15:fe:86:fd:86:87:2a:5f:ee:aa:ce:24:ab:42:55:
                    f0:33
                Exponent: 65537 (0x10001)
        Attributes:
            a0:00
    Signature Algorithm: sha256WithRSAEncryption
         79:74:bf:2c:c4:d5:a6:2d:dc:0b:fa:64:1c:01:01:85:88:14:
```

nano /etc/kubeedge/config/cloudcore.yaml

- ➔ cloudStream:
  - enable: true
- ➔ dynamicController:
  - enable: true

systemctl restart cloudcore.service

sudo nano /etc/kubeedge/config/edgecore.yaml

- ➔ edgeStream:
  - enable: true
- ➔ metaServer:
  - enable: true

sudo systemctl restart edgecore.service

sudo su

ss -tnlp | grep 1000

```
root@cloud:/etc/kubeedge# ss -tnlp | grep 1000
LISTEN    0         4096                    *:10000                 *:*       users:(("cloudcore",pid=2694589,fd=11))
LISTEN    0         4096                    *:10002                 *:*       users:(("cloudcore",pid=2694589,fd=10))
LISTEN    0         4096                    *:10003                 *:*       users:(("cloudcore",pid=2694589,fd=7))
LISTEN    0         4096                    *:10004                 *:*       users:(("cloudcore",pid=2694589,fd=8))
```

iptables -t nat -A OUTPUT -p tcp --dport 10350 -j DNAT --to $CLOUDCOREIPS:10003

exit

#Install Edge mesh, follow manual installation, skip the enable local APIServer:

https://edgemesh.netlify.app/guide/getting-started.html#manual-installation

#Before apply this command: kubectl apply -f build/server/edgemesh/

- ➔ Let's change the node name in 05-configmap.yaml with you cloud node name
- ➔ kubectl taint node cloud node-role.kubernetes.io/master:NoSchedule-

#Deploy edgemesh-server and edgemesh-agentku

#Check: kubectl get pod -o wide -A

- ➔ It should be 1 edgemesh-server and 3 edgemesh-agent run on cloud/edge1/edge2 and all in running state.

###Done###