Edge Cluster Multi-Layer Setup and Configuration

Date: 15 Dec. 2021

1. Virtual Machine Setup and Configuration (OnPremise)

- Ubuntu 18.04, one for cloud-core, two for edge-core.
- Open the port of 10000 and 10002 in the security group of the cloud-core machine and edge-core machine
- 16 GB RAM, 16 vCPUs, 128 GB storage.

2. Install Kubernetes Tools to Cloud core and Edge core

- Install Kubernetes tools to the virtual machine. (Make sure install version is: 1.21.100).
- Kubernetes Tools Doc
- Letting iptables see bridged traffic
- Install docker runtime
- Installing kubeadm, kubelet and kubectl

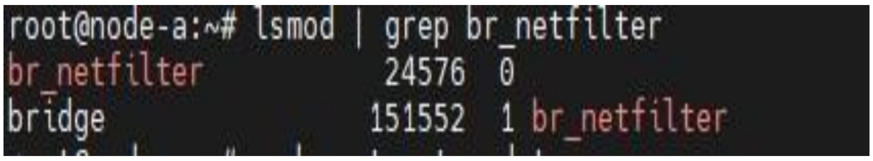
2.1. Letting iptables see bridged traffic

- Make sure that the br_netfilter module is loaded. This can be done by running **lsmod | grep br_netfilter**. To load it explicitly call **sudo modprobe br_netfilter**.
-

```
sudo modprobe br netfilter
lsmod | grep br netfilter

cat <<EOF | sudo tee /etc/modules-load.d/k8s.conf
br netfilter
EOF

cat <<EOF | sudo tee /etc/sysctl.d/k8s.conf
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
EOF
sudo sysctl --system
```

- Verify the bridged

```
lsmod | grep br_netfilter
```



```
root@node-a:~# lsmod | grep br_netfilter
br_netfilter           24576  0
bridge                151552  1 br_netfilter
```

2.2. Install docker runtime

- Install Docker runtime

```
sudo apt-get update
sudo apt-get install docker.io
```

2.3. Installing kubeadm, kubelet and kubectl

You will install these packages on all of your machines:

- **kubeadm:** the command to bootstrap the cluster.
- **kubelet:** the component that runs on all of the machines in your cluster and does things like starting pods and containers.
- **kubectl:** the command line util to talk to your cluster.

i. Update the apt package index and install packages needed to use the Kubernetes apt repository:

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

Download the Google Cloud public signing key:

```
sudo curl -fsSLo /usr/share/keyrings/kubernetes-archive-keyring.gpg
https://packages.cloud.google.com/apt/doc/apt-key.gpg
```

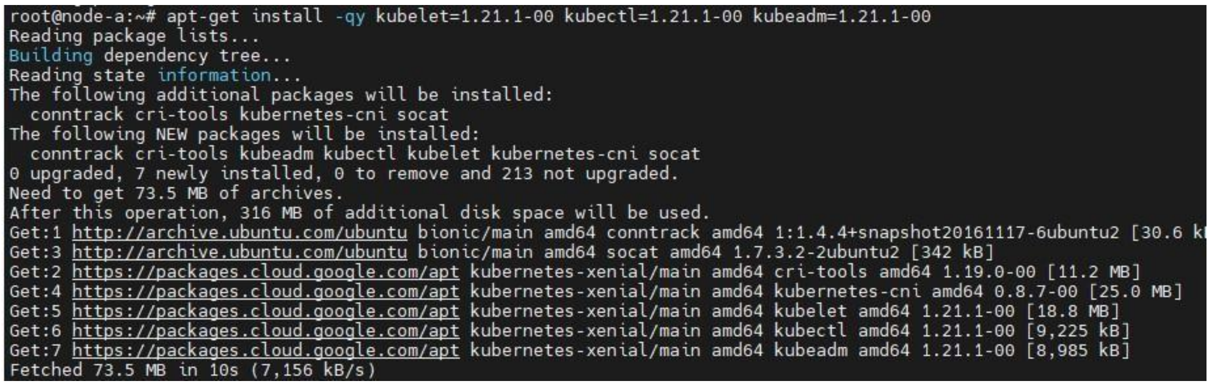
iii. Add the Kubernetes apt repository:

```
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
```

iv. Update apt package index, install kubelet, kubeadm and kubectl, and pin their version:

```
sudo apt-get update
apt-get install -qy kubelet=1.21.1-00 kubectl=1.21.1-00 kubeadm=1.21.1-00
sudo apt-mark hold kubelet kubeadm kubectl
```

systemctl enable docker.service



```
root@node-a:~# apt-get install -qy kubelet=1.21.1-00 kubectl=1.21.1-00 kubeadm=1.21.1-00
Reading package lists...
Building dependency tree...
Reading state information...
The following additional packages will be installed:
  conntrack cri-tools kubernetes-cni socat
The following NEW packages will be installed:
  conntrack cri-tools kubeadm kubectl kubelet kubernetes-cni socat
0 upgraded, 7 newly installed, 0 to remove and 213 not upgraded.
Need to get 73.5 MB of archives.
After this operation, 316 MB of additional disk space will be used.
Get:1 http://archive.ubuntu.com/ubuntu bionic/main amd64 conntrack amd64 1:1.4.4+snapshot20161117-6ubuntu2 [30.6 k
Get:3 http://archive.ubuntu.com/ubuntu bionic/main amd64 socat amd64 1.7.3.2-2ubuntu2 [342 kB]
Get:2 https://packages.cloud.google.com/apt kubernetes-xenial/main amd64 cri-tools amd64 1.19.0-00 [11.2 MB]
Get:4 https://packages.cloud.google.com/apt kubernetes-xenial/main amd64 kubernetes-cni amd64 0.8.7-00 [25.0 MB]
Get:5 https://packages.cloud.google.com/apt kubernetes-xenial/main amd64 kubelet amd64 1.21.1-00 [18.8 MB]
Get:6 https://packages.cloud.google.com/apt kubernetes-xenial/main amd64 kubectl amd64 1.21.1-00 [9,225 kB]
Get:7 https://packages.cloud.google.com/apt kubernetes-xenial/main amd64 kubeadm amd64 1.21.1-00 [8,985 kB]
Fetched 73.5 MB in 10s (7,156 kB/s)
```

2.4. Start a cluster using kubeadm

- (referring doc: https://kubernetes.io/docs/setup/productionenvironment/tools/kubeadm/create-cluster-kubeadm/)
-

i. Run command (it might cost a few minutes)

```
kubeadm init
```

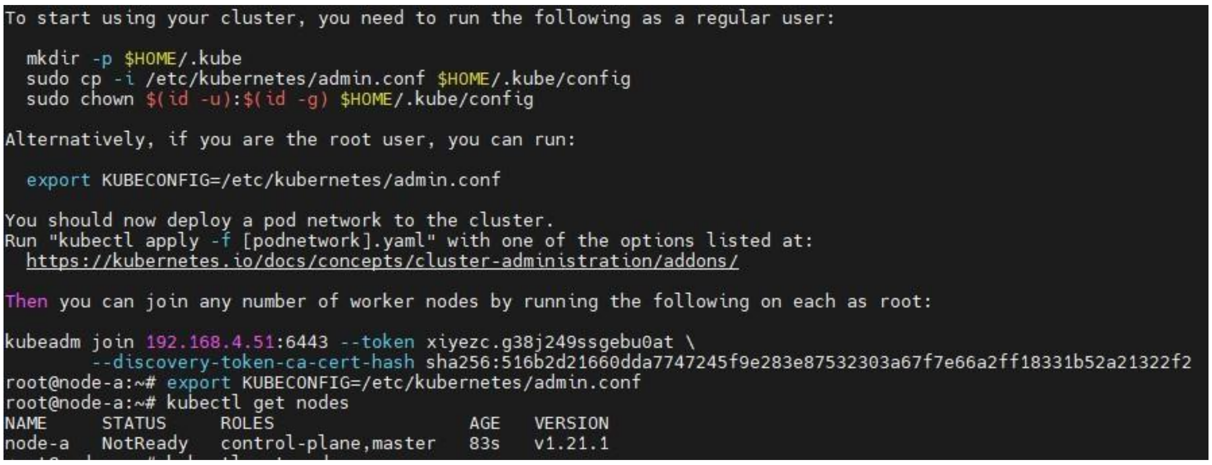
-

ii. At the end of the screen output, you will see info about setting the kubeconfig. Do the following if you are the root user:

```
export KUBECONFIG=/etc/kubernetes/admin.conf
```

iii. Check the cluster is up by running some commands, like

```
kubectl get nodes
```

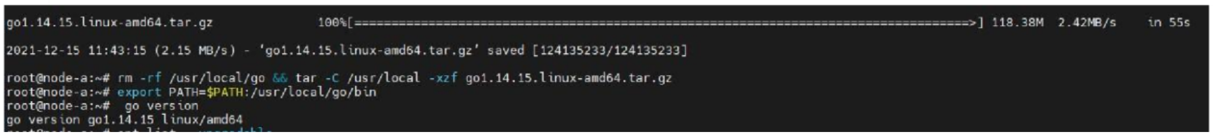


```
To start using your cluster, you need to run the following as a regular user:

  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 192.168.4.51:6443 --token xiyezc.g38j249ssgebu0at \
        --discovery-token-ca-cert-hash sha256:516b2d21660dda7747245f9e283e87532303a67f7e66a2ff18331b52a21322f2
root@node-a:~# export KUBECONFIG=/etc/kubernetes/admin.conf
root@node-a:~# kubectl get nodes
NAME     STATUS     ROLES                  AGE   VERSION
node-a   NotReady   control-plane,master   83s   v1.21.1
```

3.1. Install GoLang

- You should in root folder (**copy command line should by line by line to run**).

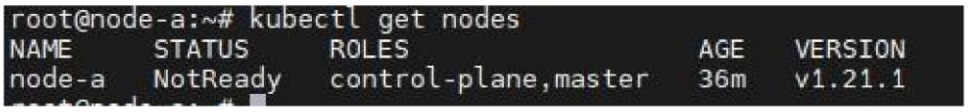
```
GOLANG_VERSION=${GOLANG_VERSION:-"1.14.15"}

sudo apt -y update

sudo apt -y install make

sudo apt -y install gcc

sudo apt -y install jq

wget https://dl.google.com/go/go${GOLANG_VERSION}.linux-amd64.tar.gz -P /tmp
 sudo tar -C /usr/local -xzf /tmp/go${GOLANG_VERSION}.linux-amd64.tar.gz
```



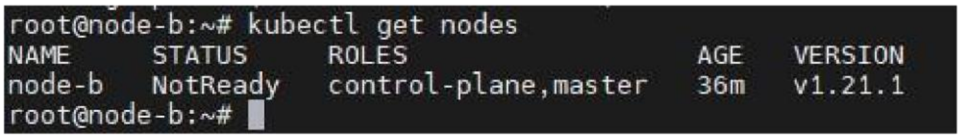
```
go1.14.15.linux-amd64.tar.gz            100%[==========================================================================>] 118.38M  2.42MB/s    in 55s

2021-12-15 11:43:15 (2.15 MB/s) - 'go1.14.15.linux-amd64.tar.gz' saved [124135233/124135233]

root@node-a:~# rm -rf /usr/local/go && tar -C /usr/local -xzf go1.14.15.linux-amd64.tar.gz
root@node-a:~# export PATH=$PATH:/usr/local/go/bin
root@node-a:~#  go version
go version go1.14.15 linux/amd64
```

ERROR

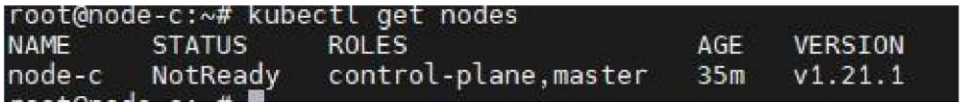
Nodes were not getting ready in any of the machines (A, B, C)



```
root@node-a:~# kubectl get nodes
NAME     STATUS     ROLES                  AGE   VERSION
node-a   NotReady   control-plane,master   36m   v1.21.1
```



```
root@node-b:~# kubectl get nodes
NAME     STATUS     ROLES                  AGE   VERSION
node-b   NotReady   control-plane,master   36m   v1.21.1
root@node-b:~#
```



```
root@node-c:~# kubectl get nodes
NAME     STATUS     ROLES                  AGE   VERSION
node-c   NotReady   control-plane,master   35m   v1.21.1
```