Setting up Cilium on K3s using Vagrant and Virtualbox

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1 Introduction

In this article, we will outline the procedure for configuring a Cilium setup on K3s using Vagrant and Virtualbox. The setup comprises a host machine, a master virtual machine (VM), and one or more agent VMs. The following steps will guide you through the installation and configuration process on a host machine running Ubuntu 20.04.

2 Host Machine Setup

Ensure that you have Virtualbox and Vagrant installed on your host machine by running the following commands:

```
sudo apt-get install virtualbox
sudo apt install vagrant
vagrant plugin install vagrant-vbguest
```

Next, clone the Cilium-K3s-Demo repository:

```
https://github.com/Praneshss/Cilium_on_K3s.git
cd Cilium_on_K3s/Cilium_K3s_Updated/
```

3 Vagrant Configuration

The Vagrantfile provided defines the VM setup. By default, one K3s agent is configured, but you can specify the number of agents using the `K3S_AGENTS` environment variable.

3.1 Vagrantfile

The Vagrantfile defines the VM setup. By default, one K3s agent is configured, but you can specify the number of agents using the `K3S_AGENTS` environment variable.

```
# Vagrant configuration
number_of_agents = (ENV['K3S_AGENTS'] || "1").to_i
box_name = (ENV['VAGRANT_BOX'] || "ubuntu/focal64")

Vagrant.configure("2") do |config|
  # ... (Vagrant VM configuration)
end
```

3.2 Network Configuration

To avoid potential errors with VirtualBox host-only networks, modify the `/etc/networks.conf` file:

```
sudo mkdir /etc/vbox
sudo nano /etc/vbox/networks.conf
```

In `/etc/vbox/networks.conf`, add the following networks:

```
* 10.0.0.0/8 192.168.0.0/16
* 2001::/64
```

Refer to StackOverflow for more details.

4 Running the Setup

Run the Vagrant script to set up the VMs:

```
vagrant up
```

If the setup completes without errors, the initial configuration is successful.

5 VM Network Checks

If shell provisioning fails for the master and agent nodes, verify the network connections manually:

```
vagrant ssh master
vagrant ssh agent1
```

From the master VM, ping the following IPs:

```
ping 192.168.80.101
ping 10.161.5.192
```

From agent1 VM, ping the following IPs:

```
ping 192.168.80.10
ping 10.161.5.192
```

6 Master VM Configuration

6.1 Master VM Setup

Run the following commands within the master VM:

```
sudo mount bpffs -t bpf /sys/fs/bpf
export MASTER_IP=$(ip a |grep global | \
                   grep -v '10.0.2.15' | awk '{print␣$2}' | cut -f1 -d '/')
curl -sfL https://get.k3s.io | INSTALL_K3S_EXEC="--flannel-backend=none␣\
␣--node-ip=${MASTER_IP}␣--node-external-ip=${MASTER_IP}␣--cluster-cidr=192.168.0.0/16␣\
␣--bind-address=${MASTER_IP}␣no-deploy=servicelb␣no-deploy=traefik" sh -
systemctl status k3s
echo $MASTER_IP > /vagrant/master-ip
# ... (Install Helm and Cilium)
```

6.2 Install Helm and Cilium

Install Helm, the Kubernetes package manager, as follows:

```
helm upgrade cilium cilium/cilium --version 1.14.2 \
   --namespace kube-system \
   --reuse-values \
   --set hubble.relay.enabled=true \
   --set hubble.ui.enabled=true
```

Verify the Helm Installation

```
kubectl get pods -n kube-system -o wide
```

Add the line in /etc/environment file

```
export KUBECONFIG=/etc/rancher/k3s/k3s.yaml
```

Install Cilium using Helm:

```
sudo helm repo add cilium https://helm.cilium.io/
sudo helm install cilium cilium/cilium --version=1.14.2  \
   --set global.tag="v1.14.2" \
   --set global.containerRuntime.integration="containerd"    \
   --set global.containerRuntime.socketPath="/var/run/k3s/containerd/containerd.sock"  \
   --set global.kubeProxyReplacement="strict" --namespace kube-system
```

Verify the Cilium installation:

```
sudo kubectl get pods -n kube-system -o wide
```

6.3 Install Hubble

Upgrade Cilium to enable Hubble:

```
helm upgrade cilium cilium/cilium --version 1.14.2 \
   --namespace kube-system \
   --reuse-values \
   --set hubble.relay.enabled=true \
   --set hubble.ui.enabled=true
```

Verify the Hubble installation:

```
kubectl get pods -n kube-system -o wide
```

7 Agent VM Configuration

7.1 Agent Installation

Retrieve the server's IP address and node token:

```
export K3S_URL=https://192.68.80.10:6443
```

Run the following commands on the agent VM:

```
export AGENT_IP=$(ip a |grep global | \
                  grep -v '10.0.2.15' | awk '{print␣$2}' | cut -f1 -d '/')
export MASTER_IP=$(cat /vagrant/master-ip)
export NODE_TOKEN=$(cat /vagrant/node-token)

sudo mount bpffs -t bpf /sys/fs/bpf


curl -sfL https://get.k3s.io |    \
        K3S_URL="https://${MASTER_IP}:6443" \
        K3S_TOKEN="<node_token>"  \
        K3S_FLANNEL_BACKEND=none  \
        INSTALL_K3S_EXEC="--node-ip=${AGENT_IP}␣--node-external-ip=${AGENT_IP}" sh -
```

Enable the agent:

```
systemctl enable --now k3s-agent
```

Check the agent's status to confirm it's detected by Kubernetes and verify its status

```
sudo kubectl get nodes
```

8 Conclusion

In this article, we have outlined the steps to set up Cilium on K3s using Vagrant and Virtualbox. This provides a convenient environment for testing and experimentation with Cilium and Kubernetes networking. By following these instructions, you can create a multi-node Kubernetes cluster with Cilium networking for enhanced security and observability.