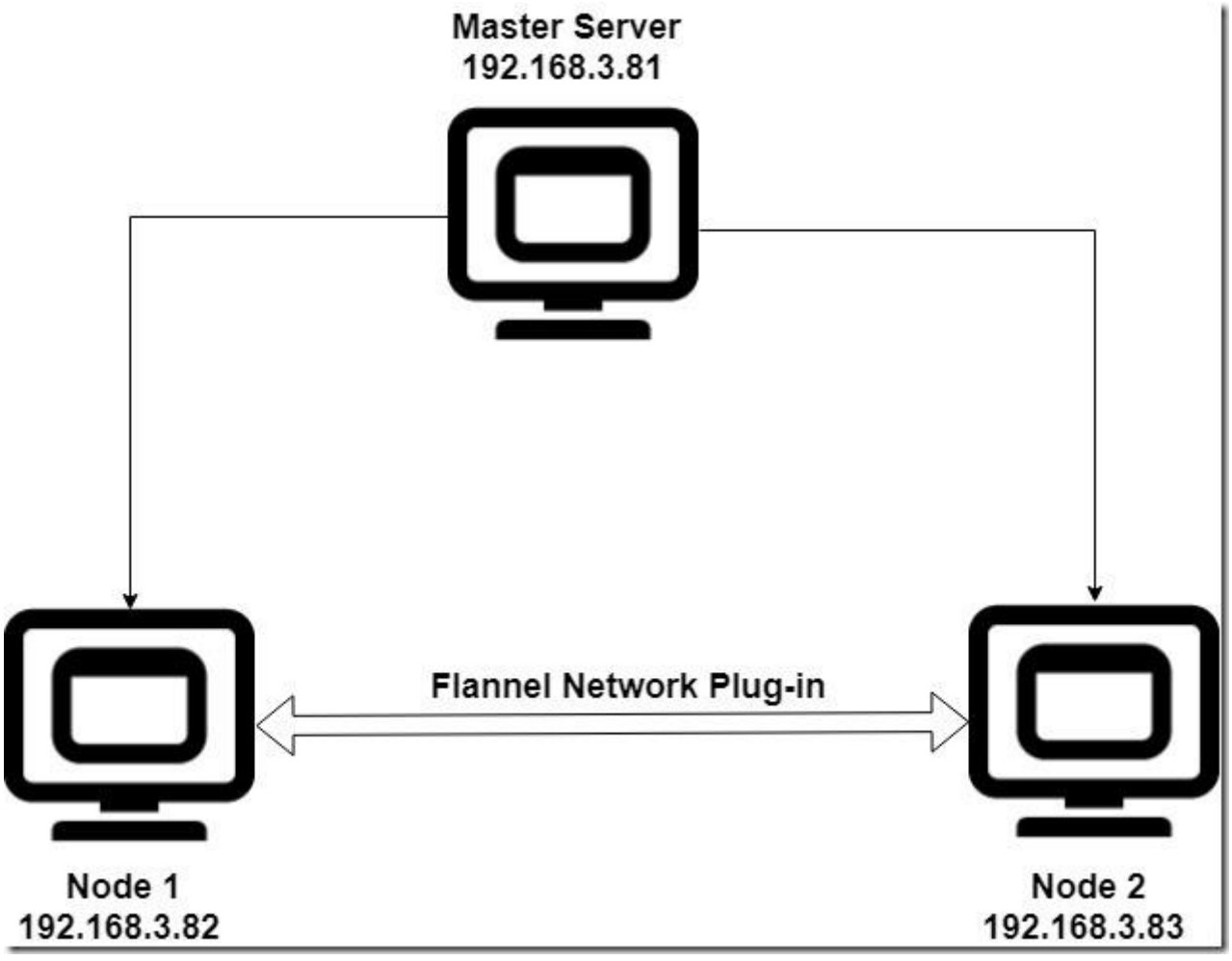
Steps to install kubernetes cluster manually using CENTOS 7

In this blog, we will show you the Steps to install kubernetes cluster manually using CENTOS 7.

REQUIREMENTS

- 3 t2.medium CentOs 7 with an internet connection.
- Kubenetes components

INFRASTRUCTURE OVERVIEW

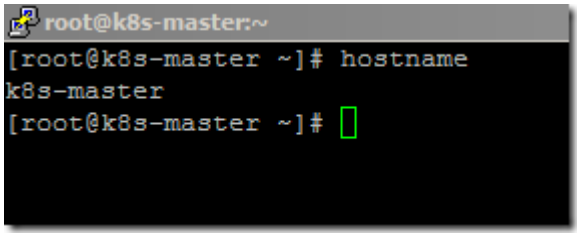


- We are creating two node cluster for this demo.
- The Master IP will be 192.168.3.81.
- Node 1 IP will be 192.68.3.82 and Node 2 IP will be 192.168.3.83.
- We are using the **Flannel Network** for the POD communication in this demo.

> ***Note: The VM IP's may change based on your environment***

MASTER SERVER CONFIGURATION

- Log in to the master server and we have already set the hostname as **k8s-master** during OS installation.

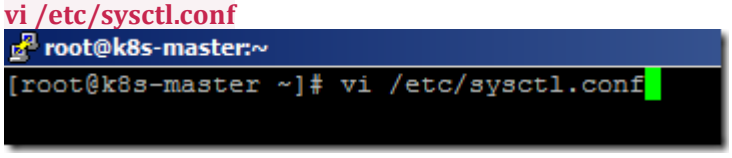


- Disable the SELinux using the below commands.

```
exec bash
setenforce 0
sed -i --follow-symlinks 's/SELINUX=enforcing/SELINUX=disabled/g' /etc/sysconfig/selinux
```

- Open the **sysctl.conf** file.

```
vi /etc/sysctl.conf
```



- Add the below entries in the conf file to change the Linux host bridge values and save the changes.

```
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
```

```
root@k8s-master:~
# System default settings live in /usr/lib/sysctl.d/00-system.conf.
# To override those settings, enter new settings here, or in an /etc/sysctl.d/<name>.co
#
# For more information, see sysctl.conf(5) and sysctl.d(5).

net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
```

- open the fstab file.

  vi /etc/fstab

```
root@k8s-master:~
[root@k8s-master ~]# vi /etc/fstab
```

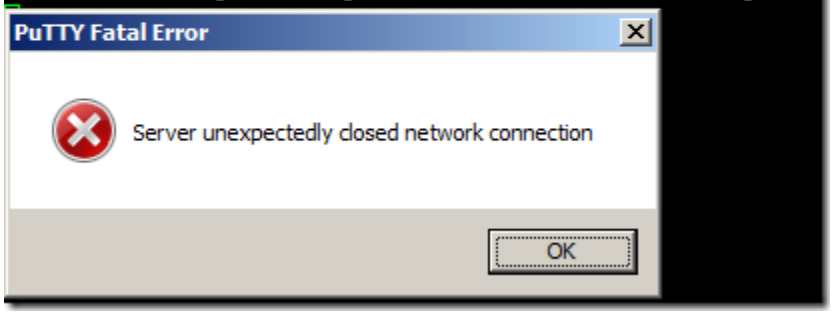
- Disable the SWAP by adding the # symbol at the beginning and save the changes.

```
root@k8s-master:~

#
# /etc/fstab
# Created by anaconda on Thu Mar  1 05:41:24 2018
#
# Accessible filesystems, by reference, are maintained under '/dev/disk'
# See man pages fstab(5), findfs(8), mount(8) and/or blkid(8) for more info
#
/dev/mapper/centos-root /                       xfs     defaults        0 0
UUID=0aad7414-bc94-4120-92c4-fd96022fe14d /boot                   xfs     defaults
# /dev/mapper/centos-swap swap                    swap    defaults        0 0
~
```

.

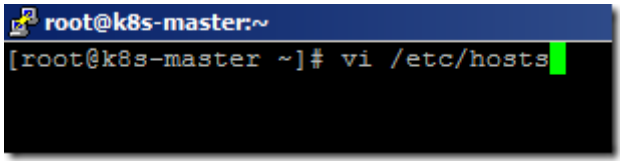
- Restart the VM using the command **init 6** to apply the **SELinux and SWAP changes.**

```
root@k8s-master:~
[root@k8s-master ~]# init 6
PolicyKit daemon disconnected from the bus.
We are no longer a registered authentication agent.
```



- Once the VM is back to online, open the host file.

  vi /etc/hosts

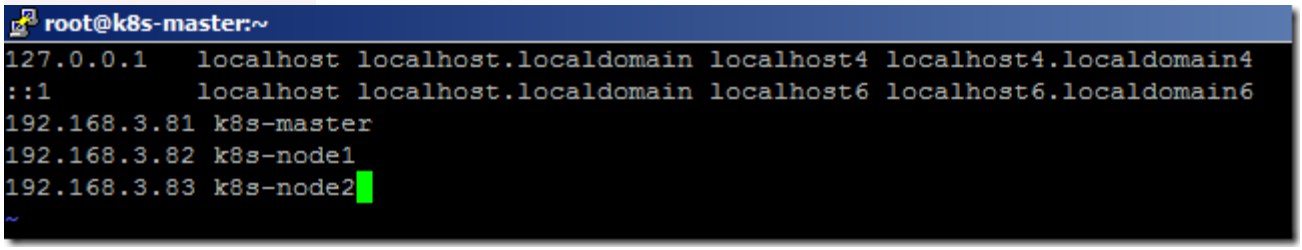


- Add the below entries in the host file and save the changes.

  192.168.3.81 k8s-master

  192.168.3.82 k8s-node1

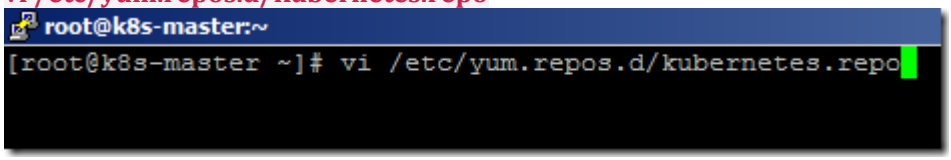
  192.168.3.83 k8s-node2



Note: The IP's may change based on your environment

- Create a new file named **kubernetes.repo** under **yum.repos.d** folder using the below command.

  vi /etc/yum.repos.d/kubernetes.repo



- Add the below entries and save the changes.

  [kubernetes]

  name=Kubernetes

  baseurl=https://packages.cloud.google.com/yum/repos/kubernetes-el7-x86_64

  enabled=1

  gpgcheck=1

  repo_gpgcheck=1

  gpgkey=https://packages.cloud.google.com/yum/doc/yum-key.gpg
  https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg

```
root@k8s-master:~
[kubernetes]
name=Kubernetes
baseurl=https://packages.cloud.google.com/yum/repos/kubernetes-el7-x86_64
enabled=1
gpgcheck=1
repo_gpgcheck=1
gpgkey=https://packages.cloud.google.com/yum/doc/yum-key.gpg
       https://packages.cloud.google.com/yum/doc/rpm-package-key.gpg
~
```

INSTALLING DOCKER AND KUBEADM

- Now, Install the **docker** and **kubeadm** using the below command.

  yum install -y kubeadm docker

```
root@k8s-master:~
[root@k8s-master ~]# yum install -y docker kubeadm
```

- It will take few minutes to complete the installation.

```
Updated:
  dracut.x86_64 0:033-502.el7_4.1              selinux-policy-targeted.noarch 0:3.13.1-

Dependency Updated:
  audit.x86_64 0:2.7.6-3.el7                       audit-libs.x86_64 0:2.7.6-3.el7
  dracut-network.x86_64 0:033-502.el7_4.1          libgudev1.x86_64 0:219-42.el7_4.7
  libselinux-utils.x86_64 0:2.5-11.el7             libsemanage.x86_64 0:2.5-8.el7
  policycoreutils.x86_64 0:2.5-17.1.el7            selinux-policy.noarch 0:3.13.1-166.e
  systemd-sysv.x86_64 0:219-42.el7_4.7

Complete!
[root@k8s-master ~]#
```

- Enable and start the docker and kubelet services using commands.

  systemctl enable docker && systemctl enable kubelet

  systemctl start docker && systemctl start kubelet

```
root@k8s-master:~
[root@k8s-master ~]# systemctl enable docker && systemctl enable kubelet
Created symlink from /etc/systemd/system/multi-user.target.wants/docker.service to /usr
Created symlink from /etc/systemd/system/multi-user.target.wants/kubelet.service to /et
[root@k8s-master ~]#
[root@k8s-master ~]#
[root@k8s-master ~]# systemctl start docker && systemctl start kubelet
[root@k8s-master ~]#
```

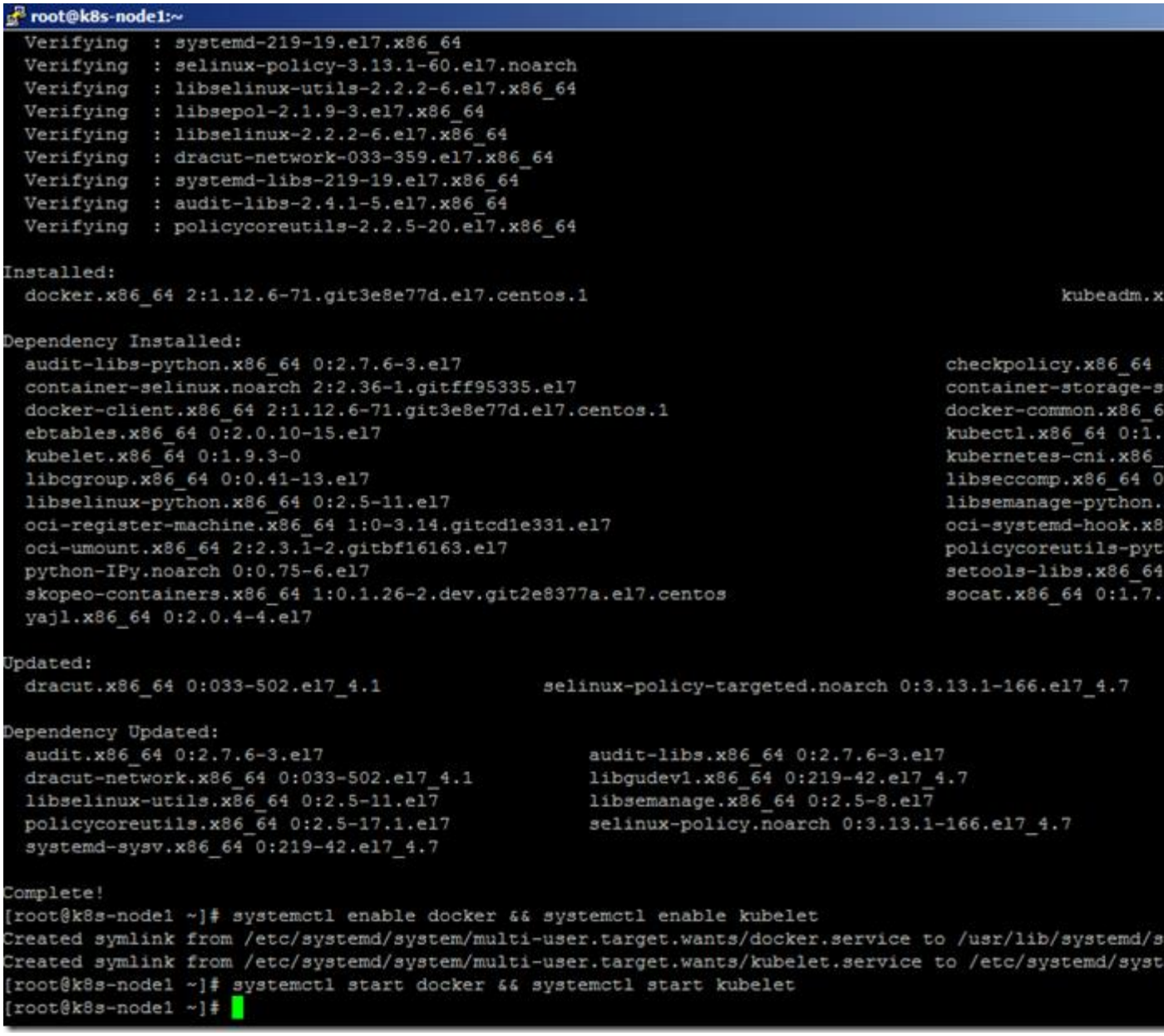
NODE(S) CONFIGURATION

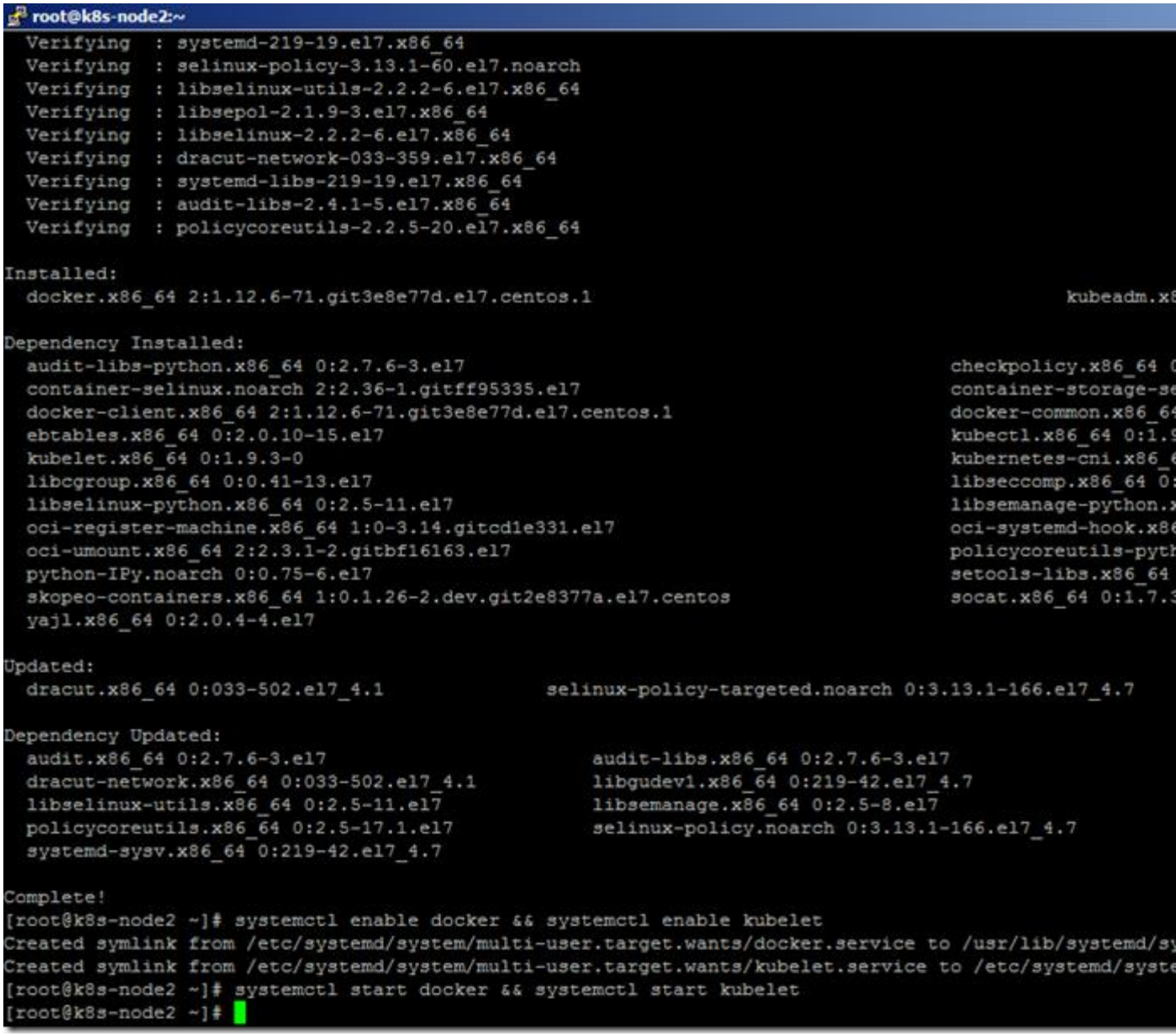
- We have already set the hostname for **node1** and **node2** during OS installation.

```
root@k8s-node1:~
[root@k8s-node1 ~]# hostname
k8s-node1
[root@k8s-node1 ~]#
```

```
root@k8s-node2:~
[root@k8s-node2 ~]# hostname
k8s-node2
[root@k8s-node2 ~]#
```

- Please follow the above **master server** configuration steps for the kubernetes node preparation. We have already installed the docker and kubeadm on both the nodes.

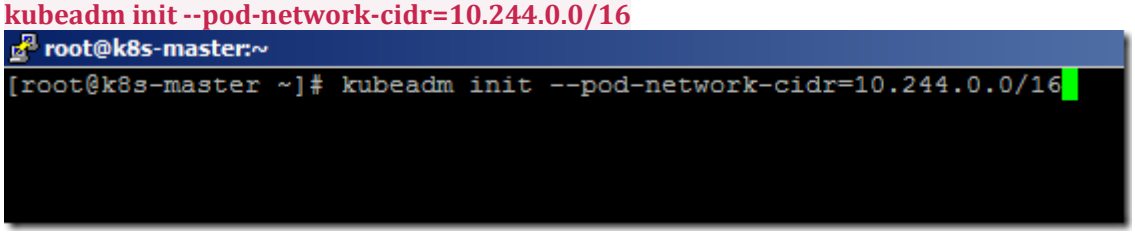

root@k8s-node1:~
Verifying : systemd-219-19.el7.x86_64
Verifying : selinux-policy-3.13.1-60.el7.noarch
Verifying : libselinux-utils-2.2.2-6.el7.x86_64
Verifying : libsepol-2.1.9-3.el7.x86_64
Verifying : libselinux-2.2.2-6.el7.x86_64
Verifying : dracut-network-033-359.el7.x86_64
Verifying : systemd-libs-219-19.el7.x86_64
Verifying : audit-libs-2.4.1-5.el7.x86_64
Verifying : policycoreutils-2.2.5-20.el7.x86_64
Installed:
docker.x86_64 2:1.12.6-71.git3e8e77d.el7.centos.1 kubeadm.x
Dependency Installed:
audit-libs-python.x86_64 0:2.7.6-3.el7 checkpolicy.x86_64
container-selinux.noarch 2:2.36-1.gitff95335.el7 container-storage-s
docker-client.x86_64 2:1.12.6-71.git3e8e77d.el7.centos.1 docker-common.x86_6
ebtables.x86_64 0:2.0.10-15.el7 kubectl.x86_64 0:1.
kubelet.x86_64 0:1.9.3-0 kubernetes-cni.x86_
libcgroup.x86_64 0:0.41-13.el7 libseccomp.x86_64 0
libselinux-python.x86_64 0:2.5-11.el7 libsemanage-python.
oci-register-machine.x86_64 1:0-3.14.gitcd1e331.el7 oci-systemd-hook.x8
oci-umount.x86_64 2:2.3.1-2.gitbf16163.el7 policycoreutils-pyt
python-IPy.noarch 0:0.75-6.el7 setools-libs.x86_64
skopeo-containers.x86_64 1:0.1.26-2.dev.git2e8377a.el7.centos socat.x86_64 0:1.7.
yajl.x86_64 0:2.0.4-4.el7
Updated:
dracut.x86_64 0:033-502.el7_4.1 selinux-policy-targeted.noarch 0:3.13.1-166.el7_4.7
Dependency Updated:
audit.x86_64 0:2.7.6-3.el7 audit-libs.x86_64 0:2.7.6-3.el7
dracut-network.x86_64 0:033-502.el7_4.1 libgudev1.x86_64 0:219-42.el7_4.7
libselinux-utils.x86_64 0:2.5-11.el7 libsemanage.x86_64 0:2.5-8.el7
policycoreutils.x86_64 0:2.5-17.1.el7 selinux-policy.noarch 0:3.13.1-166.el7_4.7
systemd-sysv.x86_64 0:219-42.el7_4.7
Complete!
[root@k8s-node1 ~]# systemctl enable docker && systemctl enable kubelet
Created symlink from /etc/systemd/system/multi-user.target.wants/docker.service to /usr/lib/systemd/s
Created symlink from /etc/systemd/system/multi-user.target.wants/kubelet.service to /etc/systemd/syst
[root@k8s-node1 ~]# systemctl start docker && systemctl start kubelet
[root@k8s-node1 ~]#



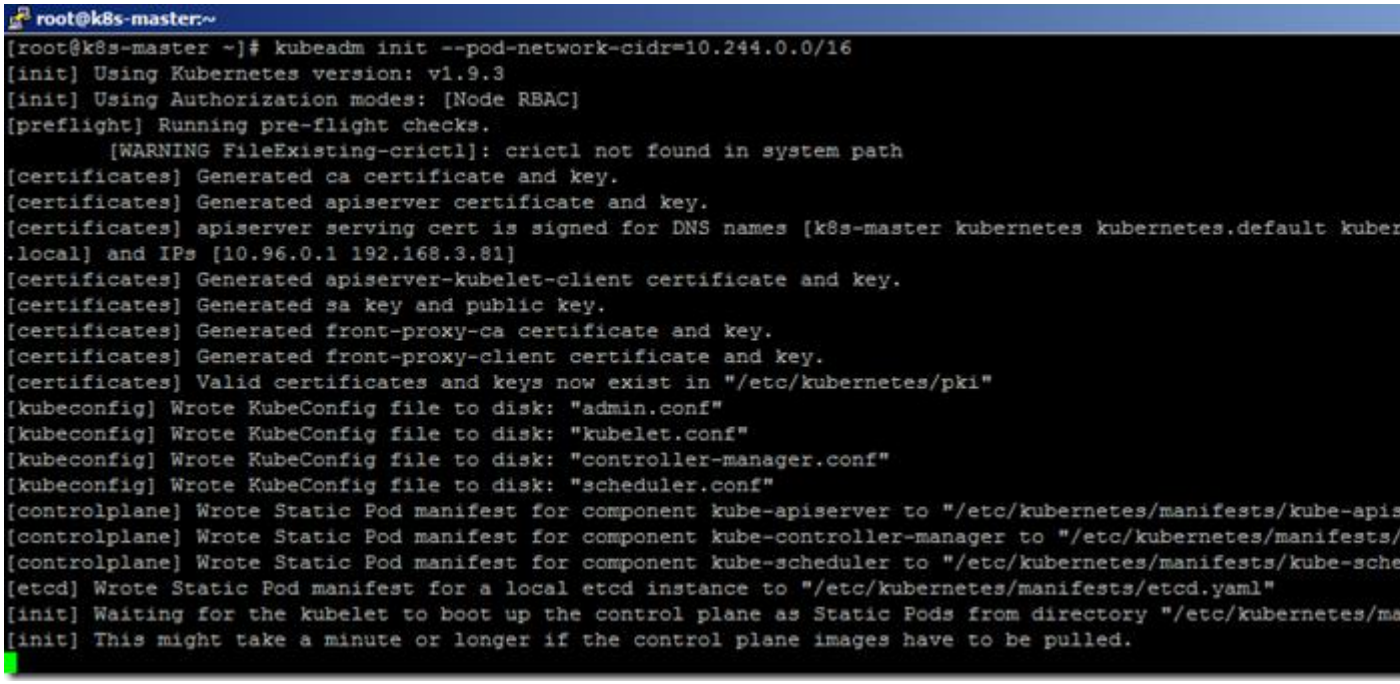
CREATING CLUSTER

- We are using the **Flannel network** for this demo.
- To make the flannel to working properly, we need to specify the network CIDR while configuring the cluster. Use the below command to create a cluster.

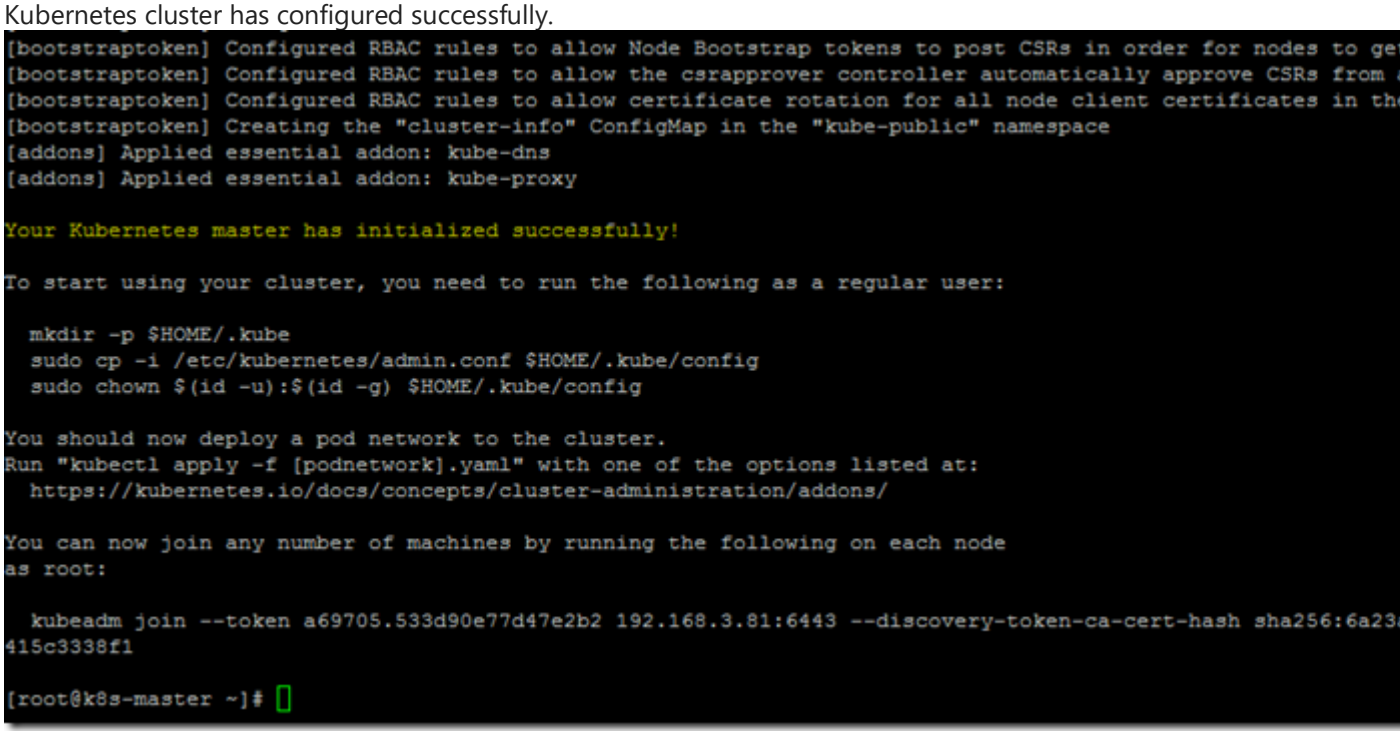
kubeadm init --pod-network-cidr=10.244.0.0/16



- It will take few minutes to complete the configuration process.



- Kubernetes cluster has configured successfully.



- Execute the below commands below start using the cluster.

  mkdir -p $HOME/.kube

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

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

```
[root@k8s-master ~]# mkdir -p $HOME/.kube
[root@k8s-master ~]# sudo cp -i /etc/kubernetes/admin.conf $HOME/.kube/config
[root@k8s-master ~]# sudo chown $(id -u):$(id -g) $HOME/.kube/config
[root@k8s-master ~]#
```

- Also, make a note of the kubeadm join command to add the nodes into the cluster.

```
  kubeadm join --token a69705.533d90e77d47e2b2 192.168.3.81:6443 --discovery-token-ca-cert-hash sha256:6a23
415c3338f1
```

- We can list the available system PODS using the below command.

kubectl get pods --all-namespaces

```
root@k8s-master:~
[root@k8s-master ~]# kubectl get pods --all-namespaces
NAMESPACE     NAME                                 READY     STATUS    RESTARTS   AGE
kube-system   etcd-k8s-master                      1/1       Running   2          6m
kube-system   kube-apiserver-k8s-master            1/1       Running   5          6m
kube-system   kube-controller-manager-k8s-master   1/1       Running   3          6m
kube-system   kube-dns-6f4fd4bdf-9j7zp             0/3       Pending   0          27m
kube-system   kube-proxy-p2247                     1/1       Running   2          27m
kube-system   kube-scheduler-k8s-master            1/1       Running   2          6m
[root@k8s-master ~]#
```

- Kube-DNS will be in pending state until we install the POD network for the cluster.

INSTALLING NETWORK

- Use the below command to install the **Flannel** network.

kubectl apply -

f https://raw.githubusercontent.com/coreos/flannel/v0.9.1/Documentation/kube-flannel.yml

```
root@k8s-master:~
[root@k8s-master ~]# kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/
```

- It will take few minutes to complete the installation.

```
root@k8s-master:~
[root@k8s-master ~]# kubectl apply -f https://raw.githubusercontent.com/coreos/flannel/
clusterrole "flannel" created
clusterrolebinding "flannel" created
serviceaccount "flannel" created
configmap "kube-flannel-cfg" created
daemonset "kube-flannel-ds" created
[root@k8s-master ~]#
```

- The flannel pod will start initiating and it will take few minutes to complete the configuration process.

```
root@k8s-master:~
[root@k8s-master ~]# kubectl get pods --all-namespaces
NAMESPACE     NAME                                 READY     STATUS     RESTARTS   AGE
kube-system   etcd-k8s-master                      0/1       Pending    0          4s
kube-system   kube-apiserver-k8s-master            0/1       Pending    0          3s
kube-system   kube-controller-manager-k8s-master   0/1       Pending    0          3s
kube-system   kube-dns-6f4fd4bdf-9j7zp             0/3       Pending    0          32m
kube-system   kube-flannel-ds-92bd7                0/1       Init:0/1   0          25s
kube-system   kube-proxy-p2247                     1/1       NodeLost   2          32m
kube-system   kube-scheduler-k8s-master            0/1       Pending    0          3s
[root@k8s-master ~]#
```

- We can get the detailed information about a POD using **describe** option.

kubectl describe pod <pod name> --namespace=kube-system

```
[root@k8s-master ~]# kubectl describe pod kube-flannel-ds-92bd7 --namespace=kube-system

Events:
  Type    Reason                 Age   From                  Message
  ----    ------                 ----  ----                  -------
  Normal  SuccessfulMountVolume  7m    kubelet, k8s-master   MountVolume.SetUp succeeded
  Normal  SuccessfulMountVolume  7m    kubelet, k8s-master   MountVolume.SetUp succeeded
  Normal  SuccessfulMountVolume  7m    kubelet, k8s-master   MountVolume.SetUp succeeded
  Normal  SuccessfulMountVolume  7m    kubelet, k8s-master   MountVolume.SetUp succeeded
  Normal  Pulling                7m    kubelet, k8s-master   pulling image "quay.io/core
  Normal  Pulled                 6m    kubelet, k8s-master   Successfully pulled image "
  Normal  Created                6m    kubelet, k8s-master   Created container
  Normal  Started                6m    kubelet, k8s-master   Started container
  Normal  Pulled                 6m    kubelet, k8s-master   Container image "quay.io/co
  Normal  Created                6m    kubelet, k8s-master   Created container
  Normal  Started                6m    kubelet, k8s-master   Started container
[root@k8s-master ~]#
```

- After some time, all the system pods are in running state.

```
root@k8s-master:~
[root@k8s-master ~]# kubectl get pods --all-namespaces
NAMESPACE     NAME                                   READY     STATUS    RESTARTS   AGE
kube-system   etcd-k8s-master                        1/1       Running   2          7m
kube-system   kube-apiserver-k8s-master              1/1       Running   5          7m
kube-system   kube-controller-manager-k8s-master     1/1       Running   3          7m
kube-system   kube-dns-6f4fd4bdf-9j7zp               3/3       Running   0          40m
kube-system   kube-flannel-ds-92bd7                  1/1       Running   0          8m
kube-system   kube-proxy-p2247                       1/1       Running   2          40m
kube-system   kube-scheduler-k8s-master              1/1       Running   2          7m
[root@k8s-master ~]#
[root@k8s-master ~]#
[root@k8s-master ~]#
```

ADDING NODES TO THE CLUSTER

- From the node1 use the **kubeadm join** command to add the nodes into the cluster.

  kubeadm join --token 878914.4587d610b5478141 192.168.3.81:6443 --discovery-token-ca-cert-hash sha256:6a23a6a7be997625f53e564a8b510627d035b000f9c288f7487fc9415c3338f1

Note: Token ID,IP and sha256 details will vary based on your environment

```
root@k8s-node1:~
[root@k8s-node1 ~]# kubeadm join --token 878914.4587d610b5478141 192.168.3.81:6443 --discovery-token-ca-cert-
b000f9c288f7487fc9415c3338f1
```

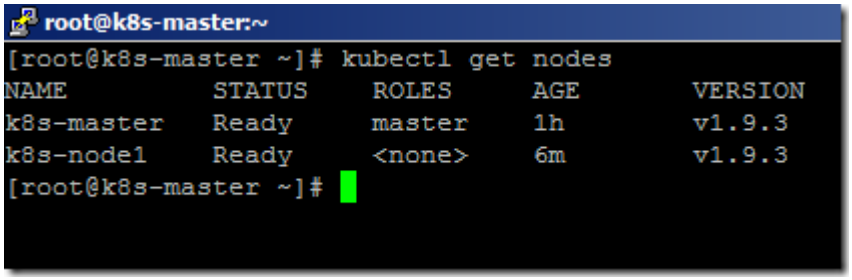
- Node has been joined into the cluster successfully.

```
root@k8s-node1:~
[root@k8s-node1 ~]# kubeadm join --token 878914.4587d610b5478141 192.168.3.81:6443 --discovery-token-ca-cert-
b000f9c288f7487fc9415c3338f1
[preflight] Running pre-flight checks.
        [WARNING FileExisting-crictl]: crictl not found in system path
[discovery] Trying to connect to API Server "192.168.3.81:6443"
[discovery] Created cluster-info discovery client, requesting info from "https://192.168.3.81:6443"
[discovery] Requesting info from "https://192.168.3.81:6443" again to validate TLS against the pinned public
[discovery] Cluster info signature and contents are valid and TLS certificate validates against pinned roots,
[discovery] Successfully established connection with API Server "192.168.3.81:6443"

This node has joined the cluster:
* Certificate signing request was sent to master and a response
  was received.
* The Kubelet was informed of the new secure connection details.

Run 'kubectl get nodes' on the master to see this node join the cluster.
[root@k8s-node1 ~]#
```

VERIFICATION

- From the master server, type the below command to list the available nodes in the cluster.

  kubectl get nodes



- We can use the same kubeadm join command to add more nodes in future.