

R7 Installation Document

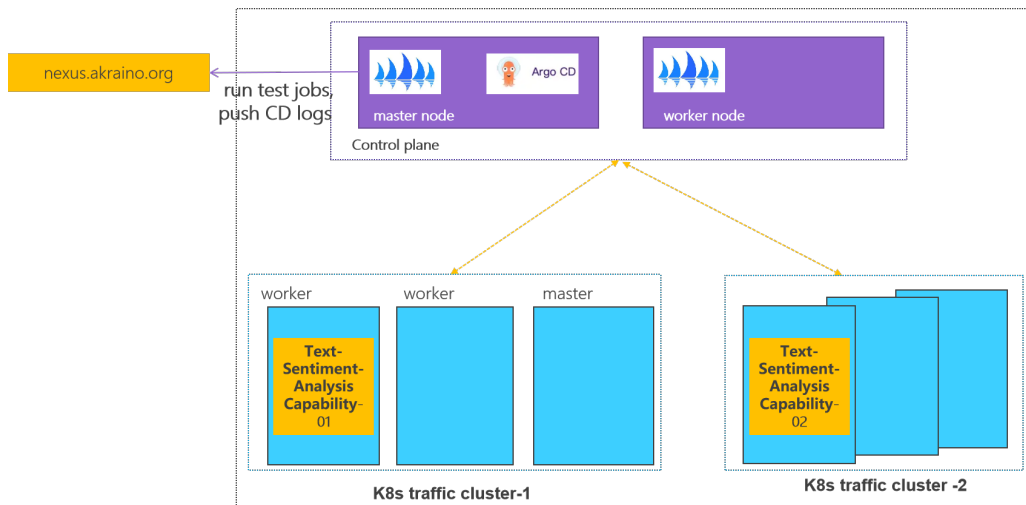
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Introduction

This document describes steps required to deploy a sample environment and test for [CFN \(Computing Force Network\) Ubiquitous Computing Force Scheduling](#) Blueprint.

Deployment Architecture



Control plane: one k8s cluster is deployed in private lab.

Traffic plane: two K8s clusters are deployed in private lab.

Pre-Installation Requirements

• Hardware Requirements

64-bit CentOS 7

• Software Perequisites

`docker-ce-20.10.11`

`kubelet-1.23.7`

`kubeadm-1.23.7`

`kubectl-1.23.7`

• Database Perequisites

schema scripts: N/A

• Other Installation Requirements

- Jump Host Requirements N/A
- Network Requirements: N/A
- Bare Metal Node Requirements N/A
- Execution Requirements (Bare Metal Only) N/A

Installation control plane cluster

0 Environmental description

At least two CentOS machines are required, one as the master node and the other as the worker node. The installed k8s version is 1.23.7.

There will be a comment like #master in front of each bash command, which is used to indicate which type of machine the command is used on. If there is no comment, the bash command needs to be executed on both types of machines

This document contains the operation and execution process, you can compare the screenshots of the document during the installation process.

1 Basic environment preparation

Both master node and worker node need to execute.

Preparing the basic environment to ensure the normal execution of subsequent operations.

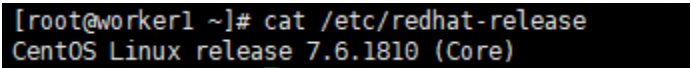
1.1 Confirm your OS

Confirm that the operating system of the current machine is CentOS 7 .

Execute command

```
cat /etc/redhat-release
```

Execute screenshot



```
[root@worker1 ~]# cat /etc/redhat-release
CentOS Linux release 7.6.1810 (Core)
```

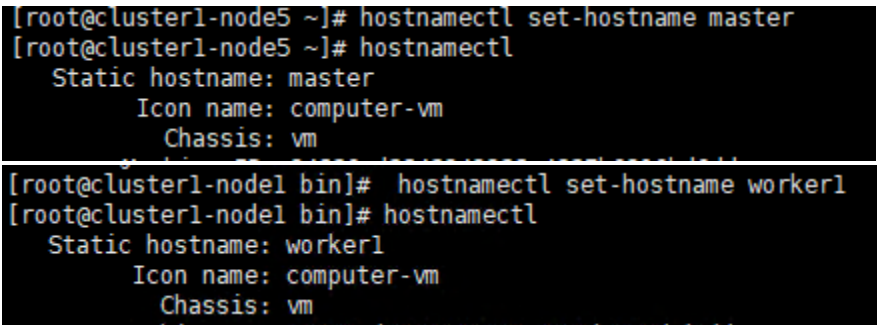
1.2 Set hostname

If the name is long, it is recommended to use a combination of letters and dashes, such as "aa-bb-cc", here directly set to master and worker1.

Execute command

```
# master
hostnamectl set-hostname master
hostnamectl
# worker
hostnamectl set-hostname worker1
hostnamectl
```

Execute screenshot



```
[root@cluster1-node5 ~]# hostnamectl set-hostname master
[root@cluster1-node5 ~]# hostnamectl
  Static hostname: master
          Icon name: computer-vm
          Chassis: vm

[root@cluster1-nodel bin]# hostnamectl set-hostname worker1
[root@cluster1-nodel bin]# hostnamectl
  Static hostname: worker1
          Icon name: computer-vm
          Chassis: vm
```

The changed host name needs to take effect after reboot.

Execute command

```
reboot
```

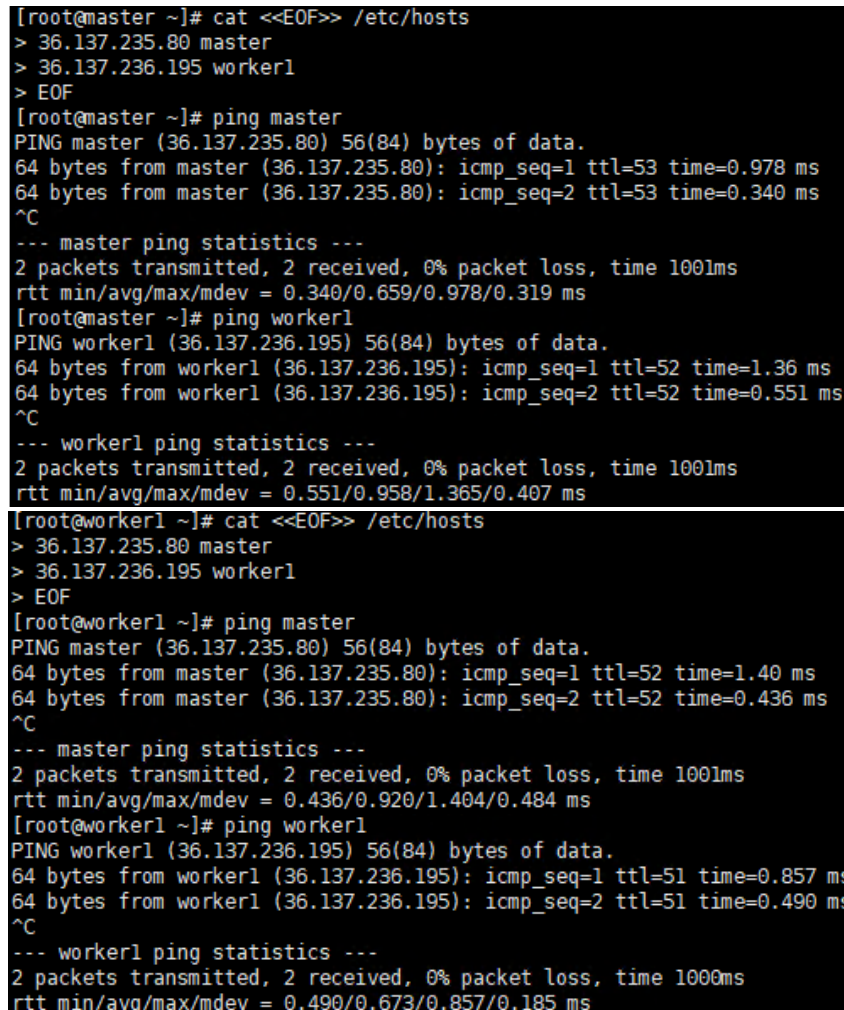
1.3 Set address mapping

Set address mapping, and test the network.

Execute command

```
cat <<EOF>> /etc/hosts
${YOUR_IP} master
${YOUR_IP} worker1
EOF
ping master
ping worker1
```

Execute screenshot



The first screenshot shows the configuration of /etc/hosts on the master node and subsequent ping tests to master and worker1. The second screenshot shows the same configuration and ping tests performed from the worker1 node.

```
[root@master ~]# cat <<EOF>> /etc/hosts
> 36.137.235.80 master
> 36.137.236.195 worker1
> EOF
[root@master ~]# ping master
PING master (36.137.235.80) 56(84) bytes of data.
64 bytes from master (36.137.235.80): icmp_seq=1 ttl=53 time=0.978 ms
64 bytes from master (36.137.235.80): icmp_seq=2 ttl=53 time=0.340 ms
^C
--- master ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.340/0.659/0.978/0.319 ms
[root@master ~]# ping worker1
PING worker1 (36.137.236.195) 56(84) bytes of data.
64 bytes from worker1 (36.137.236.195): icmp_seq=1 ttl=52 time=1.36 ms
64 bytes from worker1 (36.137.236.195): icmp_seq=2 ttl=52 time=0.551 ms
^C
--- worker1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.551/0.958/1.365/0.407 ms

[root@worker1 ~]# cat <<EOF>> /etc/hosts
> 36.137.235.80 master
> 36.137.236.195 worker1
> EOF
[root@worker1 ~]# ping master
PING master (36.137.235.80) 56(84) bytes of data.
64 bytes from master (36.137.235.80): icmp_seq=1 ttl=52 time=1.40 ms
64 bytes from master (36.137.235.80): icmp_seq=2 ttl=52 time=0.436 ms
^C
--- master ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1001ms
rtt min/avg/max/mdev = 0.436/0.920/1.404/0.484 ms
[root@worker1 ~]# ping worker1
PING worker1 (36.137.236.195) 56(84) bytes of data.
64 bytes from worker1 (36.137.236.195): icmp_seq=1 ttl=51 time=0.857 ms
64 bytes from worker1 (36.137.236.195): icmp_seq=2 ttl=51 time=0.490 ms
^C
--- worker1 ping statistics ---
2 packets transmitted, 2 received, 0% packet loss, time 1000ms
rtt min/avg/max/mdev = 0.490/0.673/0.857/0.185 ms
```

1.4 Turn off firewall, selinux and swap

Execute command

```
systemctl stop firewalld
systemctl disable firewalld
setenforce 0 sed -i "s/^SELINUX=enforcing/SELINUX=disabled/g" /etc/selinux/config
swapoff -a
sed -i 's/.*swap.*#&/' /etc/fstab
```

Execute screenshot

```
[root@master ~]# systemctl stop firewalld
[root@master ~]# systemctl disable firewalld
[root@master ~]# setenforce 0
[root@master ~]# sed -i "s/^SELINUX=enforcing/SELINUX=disabled/g" /etc/selinux/config
[root@master ~]# swapoff -a
[root@master ~]# sed -i 's/.*swap.*/#&/' /etc/fstab

[root@worker1 ~]# systemctl stop firewalld
[root@worker1 ~]# systemctl disable firewalld
[root@worker1 ~]# setenforce 0
[root@worker1 ~]# sed -i "s/^SELINUX=enforcing/SELINUX=disabled/g" /etc/selinux/config
[root@worker1 ~]# swapoff -a
[root@worker1 ~]# sed -i 's/.*swap.*/#&/' /etc/fstab
```

1.5 Download the new yum source

Execute command

```
rm -rf /etc/yum.repos.d/* ; wget ftp://ftp.rhce.cc/k8s/* -P /etc/yum.repos.d/
ls /etc/yum.repos.d/
```

Execute screenshot

```
--2022-11-26 16:00:07-- ftp://ftp.rhce.cc/k8s/k8s.repo.bak
=> '/etc/yum.repos.d/k8s.repo.bak'
==> CWD not required.
==> PASV ... done. ==> RETR k8s.repo.bak ... done.
Length: 276

100%[=====] 276 --K/s in 0s

2022-11-26 16:00:07 (1.81 MB/s) - '/etc/yum.repos.d/k8s.repo.bak' saved [276]

[root@master ~]#
[root@master ~]#
[root@master ~]#
[root@master ~]# ls /etc/yum.repos.d/
CentOS-Base.repo  docker-ce.repo  docker-ce.repo.bak  epel.repo  k8s.repo  k8s.repo.bak
```

1.6 Set iptables

Execute command

```
cat <<EOF> /etc/sysctl.d/k8s.conf
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
EOF
sysctl -p /etc/sysctl.d/k8s.conf
```

Execute screenshot

```
[root@master ~]# cat <<EOF> /etc/sysctl.d/k8s.conf
> net.bridge.bridge-nf-call-ip6tables = 1
> net.bridge.bridge-nf-call-iptables = 1
> net.ipv4.ip_forward = 1
> EOF
[root@master ~]# sysctl -p /etc/sysctl.d/k8s.conf
net.bridge.bridge-nf-call-ip6tables = 1
net.bridge.bridge-nf-call-iptables = 1
net.ipv4.ip_forward = 1
```

1.7 Make sure the time zone and time are correct

Execute command

```
timedatectl set-timezone Asia/Shanghai
systemctl restart rsyslog
```

Execute screenshot

```
[root@master ~]# timedatectl set-timezone Asia/Shanghai
[root@master ~]# systemctl restart rsyslog
```

2 Install docker

Both master node and worker node need to execute

The main content is to install docker-ce, and configure the cgroup driver of docker as systemd, confirm the driver.

2.1 Uninstall old docker

Execute command

```
yum -y remove docker docker-client docker-client-latest docker-common docker-latest docker-latest-logrotate
docker-logrotate docker-engine docker-ce docker-ce-cli
```

Execute screenshot

```
[root@master ~]# yum -y remove docker docker-client docker-client-latest docker-common docker-latest docker-latest-logrotate docker-logrotate dock
er-engine docker-ce docker-ce-cli
Loaded plugins: versionlock
No Match for argument: docker
No Match for argument: docker-client
No Match for argument: docker-client-latest
No Match for argument: docker-common
No Match for argument: docker-latest
No Match for argument: docker-latest-logrotate
No Match for argument: docker-logrotate
No Match for argument: docker-engine
Resolving Dependencies
--> Running transaction check
--> Package docker-ce.x86_64 3:20.10.21-3.el7 will be erased
--> Processing Dependency: docker-ce for package: docker-ce-rootless-extras-20.10.21-3.el7.x86_64
```

```
Removed:
  docker-ce.x86_64 3:20.10.21-3.el7                                docker-ce-cli.x86_64 1:20.10.21-3.el7

Dependency Removed:
  docker-ce-rootless-extras.x86_64 0:20.10.21-3.el7

Complete!
```

2.2 Install docker

Execute command

```
yum -y install docker-ce
```

Execute screenshot

```
Installed:
  docker-ce.x86_64 3:20.10.21-3.el7

Dependency Installed:
  docker-ce-cli.x86_64 1:20.10.21-3.el7                                docker-ce-rootless-extras.x86_64 0:20.10.21-3.el7

Complete!
```

2.3 Set docker to boot and confirm docker status

Execute command

```
systemctl enable docker
systemctl start docker
systemctl status docker
```

Execute screenshot

```
[root@worker1 ~]# systemctl status docker
● docker.service - Docker Application Container Engine
   Loaded: loaded (/etc/systemd/system/docker.service; disabled; vendor preset: disabled)
   Drop-In: /etc/systemd/system/docker.service.d
            └─docker-options.conf
   Active: active (running) since Sat 2022-11-26 12:12:58 CST; 2h 15min ago
     Docs: http://docs.docker.com
    Main PID: 5504 (dockerd)
```

2.4 Configure the driver of docker's cgroup

The driver of docker's cgroup needs to be consistent with that of kubelet. It is recommended to set it to systemd.

Execute command

```
docker info | grep -i cgroup
```

Check the current configuration, if it is the system in the figure below, skip the follow-up and go directly to the third section

Execute screenshot

```
[root@master ~]# docker info | grep -i cgroup
Cgroup Driver: systemd
Cgroup Version: 1
```

If it is cgroupfs, add the following statement

Execute command

```
vim /etc/docker/daemon.json
# add this
{
  "exec-opts": ["native.cgroupdriver=systemd"]
}
```

Restart to check for changes

Execute command

```
systemctl daemon-reload && systemctl restart docker
docker info | grep -i cgroup
```

```
[root@node1 ~]# docker info | grep -i cgroup
Cgroup Driver: cgroupfs
Cgroup Version: 1
[root@node1 ~]# vim /etc/docker/daemon.json
[root@node1 ~]# systemctl daemon-reload && systemctl restart docker
[root@node1 ~]# docker info | grep -i cgroup
Cgroup Driver: systemd
Cgroup Version: 1
[root@node1 ~]#
```

3 Install k8s basic components

Both master node and worker node need to execute

The main content is to install the 1.23.7 version of the component kubeadm kubectl kubelet

3.1 Check kubeadm kubectl kubelet

If it is the version inconsistent, you need to uninstall it through yum remove \${name}.

Execute command

```
yum list installed | grep kube
```

Execute screenshot

```
[root@master ~]# yum list installed | grep kube
[root@master ~]#
```

3.2 Install kubelet kubeadm kubectl version 1.23.7

Execute command

```
yum -y install kubelet-1.23.7 kubeadm-1.23.7 kubectl-1.23.7
```

Execute screenshot

```
[root@worker1 yum.repos.d]# yum -y install kubelet-1.23.7-0 kubeadm-1.23.7-0 kubectl-1.23.7-0
Loaded plugins: versionlock
Resolving Dependencies
--> Running transaction check
---> Package kubeadm.x86_64 0:1.23.7-0 will be installed
--> Processing Dependency: cri-tools >= 1.19.0 for package: kubeadm-1.23.7-0.x86_64
--> Processing Dependency: kubernetes-cni >= 0.8.6 for package: kubeadm-1.23.7-0.x86_64
---> Package kubectl.x86_64 0:1.23.7-0 will be installed
```

```
Installed:
  kubeadm.x86_64 0:1.23.7-0                kubectl.x86_64 0:1.23.7-0                kubelet.x86_64 0:1.23.7-0

Dependency Installed:
  cri-tools.x86_64 0:1.25.0-0                kubernetes-cni.x86_64 0:1.1.1-0

Complete!
```

3.3 Verify installation

Execute command

```
kubelet --version
kubeadm version
kubectl version
```

Execute screenshot

```
[root@master ~]# kubelet --version
Kubernetes v1.23.7
[root@master ~]# kubeadm version
kubeadm version: &version.Info{Major:"1", Minor:"23", GitVersion:"v1.23.7", GitCommit:"42c05a547468804b2053ecf60a3bd15560362fc2", GitTreeState:"clean", BuildDate:"2022-05-24T12:29:44Z", GoVersion:"go1.17.10", Compiler:"gc", Platform:"linux/amd64"}
[root@master ~]# kubectl version
Client Version: version.Info{Major:"1", Minor:"23", GitVersion:"v1.23.7", GitCommit:"42c05a547468804b2053ecf60a3bd15560362fc2", GitTreeState:"clean", BuildDate:"2022-05-24T12:30:55Z", GoVersion:"go1.17.10", Compiler:"gc", Platform:"linux/amd64"}
The connection to the server localhost:8080 was refused - did you specify the right host or port?
```

4 Initialize the master

Execute only on the master node

The main content is to pull the image of version 1.23.7, initialize the master node, and configure the cilium network plugin for the master node

4.1 Pull the k8s image Pull the k8s image

Execute command

```
# master
kubeadm config images list --kubernetes-version=v1.23.7 |sed -e 's/^/docker pull /g' -e 's/#k8s.gcr.io#registry.
aliyuncs.com/google_containers#g' |sh -x
docker pull registry.aliyuncs.com/google_containers/coredns:v1.8.6
docker images
```

Execute screenshot

```
[root@master ~]# docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
[root@master ~]# kubeadm config images list --kubernetes-version=v1.23.7
[root@master ~]# kubeadm config images list --kubernetes-version=v1.23.7 |sed -e 's/^/docker pull /g' -e 's/#k8s.gcr.io#registry.aliyuncs.com/google
_containers#g' |sh -x
+ docker pull registry.aliyuncs.com/google_containers/kube-apiserver:v1.23.7
v1.23.7: Pulling from google_containers/kube-apiserver
36698cfa5275: Pull complete
8ccb9e3bd522: Pull complete
301cac25da41: Pull complete
Digest: sha256:a7206717f4a04b2dbd33505c0c4eb93907b892f5a610488ef7bfe94c6692be99
Status: Downloaded newer image for registry.aliyuncs.com/google_containers/kube-apiserver:v1.23.7
registry.aliyuncs.com/google_containers/kube-apiserver:v1.23.7
+ docker pull registry.aliyuncs.com/google_containers/kube-controller-manager:v1.23.7
v1.23.7: Pulling from google_containers/kube-controller-manager
36698cfa5275: Already exists
8ccb9e3bd522: Already exists
5dac8c9289ed: Pull complete
Digest: sha256:4b4979df9c7a657d31299a6b9c96b86d9d36c1d91e914b3428a43302fa4299068
[root@master ~]# docker pull registry.aliyuncs.com/google_containers/coredns:v1.8.6
v1.8.6: Pulling from google_containers/coredns
d92bdee79785: Pull complete
6elb7c06e42d: Pull complete
Digest: sha256:5b6ec0d6de9baaf3e92d0f66cd96a25b9edbc8e8716f5f15dcd1a616b3abd590e
Status: Downloaded newer image for registry.aliyuncs.com/google_containers/coredns:v1.8.6
registry.aliyuncs.com/google_containers/coredns:v1.8.6
[root@master ~]#
[root@master ~]#
[root@master ~]# docker images
REPOSITORY TAG IMAGE ID CREATED SIZE
registry.aliyuncs.com/google_containers/kube-apiserver v1.23.7 03c169f383d9 6 months ago 135MB
registry.aliyuncs.com/google_containers/kube-controller-manager v1.23.7 e34d4a6252ed 6 months ago 125MB
registry.aliyuncs.com/google_containers/kube-proxy v1.23.7 b1aa05aa5100 6 months ago 112MB
registry.aliyuncs.com/google_containers/kube-scheduler v1.23.7 ed0ccfa052ab 6 months ago 53.5MB
registry.aliyuncs.com/google_containers/etcd 3.5.1-0 25f8c7f3da61 13 months ago 293MB
registry.aliyuncs.com/google_containers/coredns v1.8.6 a4ca41631cc7 13 months ago 46.8MB
registry.aliyuncs.com/google_containers/pause 3.6 6270bb605e12 15 months ago 683kB
```

Please make sure that the above 7 images have been pulled down

4.2 Init master

Execute command

```
# master
kubeadm init --image-repository registry.aliyuncs.com/google_containers --kubernetes-version=v1.23.7 --pod-
network-cidr=10.10.0.0/16
```

Execute screenshot

```
[root@master ~]# kubeadm init --image-repository registry.aliyuncs.com/google_containers --kubernetes-version=v1.23.7 --pod-network-cidr=10.10.0.0/16
[init] Using Kubernetes version: v1.23.7
[preflight] Running pre-flight checks
[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 in beforehand using 'kubeadm config images pull'
[certs] Using certificateDir folder "/etc/kubernetes/pki"
[certs] Generating "ca" certificate and key
[certs] Generating "apiserver" certificate and key
[certs] apiserver serving cert is signed for DNS names [kubernetes kubernetes.default kubernetes.default.svc kubernetes.default.svc.cluster.local master] and IPs [10.96.0.1 192.168.30.12]
[certs] Generating "apiserver-kubelet-client" certificate and key
[certs] Generating "front-proxy-ca" certificate and key
[certs] Generating "front-proxy-client" certificate and key
[certs] Generating "etcd/ca" certificate and key
[certs] Generating "etcd/server" certificate and key
[certs] etcd/server serving cert is signed for DNS names [localhost master] and IPs [192.168.30.12 127.0.0.1 ::1]
[certs] Generating "etcd/peer" certificate and key
[certs] etcd/peer serving cert is signed for DNS names [localhost master] and IPs [192.168.30.12 127.0.0.1 ::1]
[certs] Generating "etcd/healthcheck-client" certificate and key
[certs] Generating "apiserver-etcd-client" certificate and key
[certs] Generating "sa" key and public key
[kubeconfig] Using kubeconfig folder "/etc/kubernetes"
[kubeconfig] Writing "admin.conf" kubeconfig file
[kubeconfig] Writing "kubelet.conf" kubeconfig file
[kubeconfig] Writing "controller-manager.conf" kubeconfig file
[kubeconfig] Writing "scheduler.conf" kubeconfig file
[kubelet-start] Writing kubelet environment file with flags to file "/var/lib/kubelet/kubeadm-flags.env"
[kubelet-start] Writing kubelet configuration to file "/var/lib/kubelet/config.yaml"
[kubelet-start] Starting the kubelet
[control-plane] Using manifest folder "/etc/kubernetes/manifests"
[control-plane] Creating static Pod manifest for "kube-apiserver"
[control-plane] Creating static Pod manifest for "kube-controller-manager"
[control-plane] Creating static Pod manifest for "kube-scheduler"
[etcd] Creating static Pod manifest for local etcd in "/etc/kubernetes/manifests"
[wait-control-plane] Waiting for the kubelet to boot up the control plane as static Pods from directory "/etc/kubernetes/manifests". This can take up to 4m0s
[apiclient] All control plane components are healthy after 5.002161 seconds
[upload-config] Storing the configuration used in ConfigMap "kubeadm-config" in the "kube-system" Namespace
[kubelet] Creating a ConfigMap "kubelet-config-1.23" in namespace kube-system with the configuration for the kubelets in the cluster
```

Let kubectl take effect

Execute command

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

Execute screenshot

```
[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 ~]#
[root@master ~]# kubectl get po
No resources found in default namespace.
[root@master ~]# kubectl get po -A
```

NAMESPACE	NAME	READY	STATUS	RESTARTS	AGE
kube-system	coredns-6d8c4cb4d-jnfvq	0/1	ContainerCreating	0	6m7s
kube-system	coredns-6d8c4cb4d-sv7wg	0/1	ContainerCreating	0	6m7s
kube-system	etcd-master	1/1	Running	2	6m21s
kube-system	kube-apiserver-master	1/1	Running	6	6m21s
kube-system	kube-controller-manager-master	1/1	Running	2	6m21s
kube-system	kube-proxy-2pc4c	1/1	Running	0	6m7s
kube-system	kube-scheduler-master	1/1	Running	6	6m21s

We can see that the coredns is not ready, so we need configure the network plugin

Note that if an error occurs and you need to reinit, you need to execute the following statement first to ensure that kubeadm is re-executed normally

```
# master, if an error occurs
kubeadm reset -f
rm -rf ~/.kube/
rm -rf /etc/kubernetes/
rm -rf /var/lib/etcd
rm -rf /var/etcd
```

4.3 Configure the cilium network plugin

Here select cilium as the network plugin

Confirm that your current default version of the kernel is above 4.9

Check the current kernel version

Execute command

```
# master
uname -sr
```

If current version ist not satisfied, you need [update kernel](#)

Cilium install

Execute command

```
# master
curl -L --remote-name-all https://github.com/cilium/cilium-cli/releases/latest/download/cilium-linux-amd64.tar.gz
tar -zxvf cilium-linux-amd64.tar.gz
mv cilium /usr/local/bin/
cilium version
cilium install
kubectl get po -A
```

Execute screenshot

```
[root@master ~]# curl -L --remote-name-all https://github.com/cilium/cilium-cli/releases/latest/download/cilium-linux-amd64.tar.gz
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           % Done    0     0     0     0         0      0      0      0
0   0     0    0     0     0     0      0     0      0
100 24.6M 100 24.6M    0     0  829k    0  0:00:30  0:00:30 --:--:-- 903k
```

```
[root@master ~]# tar -zxvf cilium-linux-amd64.tar.gz
cilium
[root@master ~]# mv cilium /usr/local/bin/
[root@master ~]# cilium version
cilium-cli: v0.12.11 compiled with go1.19.3 on linux/amd64
cilium image (default): v1.12.2
cilium image (stable): unknown
cilium image (running): v1.12.2
```

```
[root@master ~]# cilium install
[+] Using Cilium version 1.12.2
[+] Auto-detected cluster name: kubernetes
[+] Auto-detected datapath mode: tunnel
[+] Auto-detected kube-proxy has been installed
[+] helm template --namespace kube-system cilium/cilium --version 1.12.2 --set cluster.id=0,cluster.name=kubernetes,encryption.nodeEncryption=false,kubeProxyReplacement=disabled,operator.replicas=1,serviceAccounts.cilium.name=cilium,serviceAccounts.operator.name=cilium-operator,tunnel=vxlan
[+] Storing helm values file in kube-system/cilium-cli-helm-values Secret
[+] Created CA in secret cilium-ca
[+] Generating certificates for Hubble...
[+] Creating Service accounts...
[+] Creating cluster roles...
[+] Creating ConfigMap for Cilium version 1.12.2...
[+] Creating Agent DaemonSet...
[+] Creating Operator Deployment...
[+] Waiting for Cilium to be installed and ready...
[+] Cilium was successfully installed! Run 'cilium status' to view installation health
```

```
[root@master ~]# k get po -A
NAMESPACE     NAME                                     READY   STATUS    RESTARTS   AGE
kube-system   cilium-ntkfm                           1/1     Running   0           70s
kube-system   cilium-operator-9dc4b59f7-mf2sj        1/1     Running   0           70s
kube-system   coredns-6d8c4cb4d-7pg6m               1/1     Running   0          2m22s
kube-system   coredns-6d8c4cb4d-84tsq               1/1     Running   0          2m22s
kube-system   etcd-master                           1/1     Running   2          2m40s
kube-system   kube-apiserver-master                  1/1     Running   2          2m39s
kube-system   kube-controller-manager-master         1/1     Running   2          2m37s
kube-system   kube-proxy-2mt6c                       1/1     Running   0          2m22s
kube-system   kube-scheduler-master                  1/1     Running   2          2m38s
```

We can see that the all the pod is ready

If an error occur, you can use cilium uninstall to reset.

5 Initialize workers

The main content is to add worker nodes to the cluster

5.1 Get the join command on the master node

The joining of the worker node needs to initialize the join statement given by the master. If you forget this statement, execute the following statement on the master node machine to get it again.

Execute command

```
# master
kubeadm token create --print-join-command
```

Execute screenshot

```
[root@master ~]# kubeadm token create --print-join-command
kubeadm join 192.168.30.12:6443 --token ixvr7j.ymry4jzmzcoilluk --discovery-token-ca-cert-hash sha256:c8cd5ee56ee1aa2f92ad7856991188d740eb2e443b4c55add98cb33cb57887
[root@master ~]# kubectl get nodes
```

5.2 Join the master node

Execute command

```
# worker, change the ip,token and cert-hash to your's
kubeadm join ${YOUR IP} --token ${YOUR TOKEN} --discovery-token-ca-cert-hash ${YOUR CERT HASH}
```

When you have the join statement, copy it and execute it on the worker node

```
[root@worker1 ~]# kubeadm join 192.168.30.12:6443 --token oey5s5.k9xo0t0be9kzid --discovery-token-ca-cert-hash sha256:61ba2df5940423ac7c25bf2c24d83f66f8707db4edc98a20c30733408e894a9a
[preflight] Running pre-flight checks
[preflight] Reading configuration from the cluster...
[preflight] FYI: You can look at this config file with 'kubectl -n kube-system get cm kubeadm-config -o yaml'
[kubelet-start] Writing kubelet configuration to file "/var/lib/kubelet/config.yaml"
[kubelet-start] Writing kubelet environment file with flags to file "/var/lib/kubelet/kubeadm-flags.env"
[kubelet-start] Starting the kubelet
[kubelet-start] Waiting for the kubelet to perform the TLS Bootstrap...

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

Run 'kubectl get nodes' on the control-plane to see this node join the cluster.
```

Note that if an error occurs and you need to re-init, you need to execute the following statement first to ensure that kubeadm is re-executed normally

```
# worker
kubeadm reset -f
rm -rf ~/.kube/
rm -rf /etc/kubernetes/
rm -rf /var/lib/etcd
rm -rf /var/etcd
```

5.3 Verify the joining of worker nodes

After the worker is added, you can execute the following command on the master machine to confirm the newly added node.

Execute command

```
# master
kubectl get nodes
```

Execute screenshot

```
[root@master ~]# kubectl get nodes
NAME      STATUS    ROLES          AGE      VERSION
master    Ready     control-plane,master  26m      v1.23.7
worker1    Ready     <none>         2m53s    v1.23.7
```

6 Install karmada

The main content is to install karmada on control plane cluster

6.1 Install the Karmada kubectl plugin

Execute command

```
# master
wget https://github.com/karmada-io/karmada/releases/download/v1.4.0/kubectl-karmada-linux-amd64.tgz
tar -zxvf kubectl-karmada-linux-amd64.tgz
mv kubectl-karmada /usr/bin
```

Execute screenshot

```
[root@node1 ~]# wget https://github.com/karmada-io/karmada/releases/download/v1.2.1/kubectl-karmada-linux-amd64.tgz
--2022-12-02 10:39:20-- https://github.com/karmada-io/karmada/releases/download/v1.2.1/kubectl-karmada-linux-amd64.tgz
Resolving github.com (github.com)... 20.205.243.166
Connecting to github.com (github.com)[20.205.243.166]:443... failed: Connection timed out.
Retrying.

--2022-12-02 10:41:28-- (try: 2) https://github.com/karmada-io/karmada/releases/download/v1.2.1/kubectl-karmada-linux-amd64.tgz
Connecting to github.com (github.com)[20.205.243.166]:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://objects.githubusercontent.com/github-production-release-asset-2e65be/311639195/79527bf1-2f58-4b72-99f4-852511156d2f?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20221202%2Fus-east-1%2F%3A%2Faws4_request&X-Amz-Date=20221202T024129Z&X-Amz-Expires=300&X-Amz-Signature=6388364aef715617b9cc43d3ad898316fd6b88911185f747e0c4d441d0ab4dd96&X-Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=311639195&response-content-disposition=attachment%3B%20filename%3Dkubectl-karmada-linux-amd64.tgz&response-content-type=application%2Foctet-stream [following]
--2022-12-02 10:41:29-- https://objects.githubusercontent.com/github-production-release-asset-2e65be/311639195/79527bf1-2f58-4b72-99f4-852511156d2f?X-Amz-Algorithm=AWS4-HMAC-SHA256&X-Amz-Credential=AKIAIWNJYAX4CSVEH53A%2F20221202%2Fus-east-1%2F%3A%2Faws4_request&X-Amz-Date=20221202T024129Z&X-Amz-Expires=300&X-Amz-Signature=6388364aef715617b9cc43d3ad898316fd6b88911185f747e0c4d441d0ab4dd96&X-Amz-SignedHeaders=host&actor_id=0&key_id=0&repo_id=311639195&response-content-disposition=attachment%3B%20filename%3Dkubectl-karmada-linux-amd64.tgz&response-content-type=application%2Foctet-stream
Resolving objects.githubusercontent.com (objects.githubusercontent.com)... 185.199.111.133, 185.199.109.133, 185.199.108.133, ...
Connecting to objects.githubusercontent.com (objects.githubusercontent.com)[185.199.111.133]:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 26021780 (25M) [application/octet-stream]
Saving to: 'kubectl-karmada-linux-amd64.tgz.1'

100%[=====] 26,021,780 957KB/s in 28s

2022-12-02 10:41:57 (916 KB/s) - 'kubectl-karmada-linux-amd64.tgz.1' saved [26021780/26021780]

[root@node1 ~]# tar -zxvf kubectl-karmada-linux-amd64.tgz
[root@node1 ~]# ls
anaconda-ks.cfg  calico.yaml  deployment.yaml  kubectl-karmada  kubectl-karmada-linux-amd64.tgz.1  kubelet.csr  kubersprayls  recommended.yaml
auth.yaml        deployment-update.yaml  k8s-images-pull.sh  kubectl-karmada-linux-amd64.tgz  kubelet.crt  kubelet.key  LICENSE  v2.1.2.tar.gz
[root@node1 ~]# mv kubectl-karmada /usr/bin
```

6.2 Install karmada via karmadactl

Install karmada via kubectl. China mainland registry mirror can be specified by using kube-image-mirror-country

Execute command

```
kubectl karmada init --kube-image-registry=registry.cn-hangzhou.aliyuncs.com/google_containers
```

Due to network problems, you may need to retry a few times

Execute screenshot

```
[root@master ~]# kubectl karmada init --kube-image-registry=registry.cn-hangzhou.aliyuncs.com/google_containers
11205 09:54:43.435955 17848 deploy.go:1271 kubeconfig file: /root/.kube/config, Kubernetes: https://192.168.30.12:6443
11205 09:54:43.445416 17848 deploy.go:1477 karmada apiserver ip: [192.168.30.12]
11205 09:54:44.034964 17848 cert.go:230 Generate ca certificate success.
11205 09:54:44.271461 17848 cert.go:230 Generate etcd-server certificate success.
11205 09:54:44.420922 17848 cert.go:230 Generate etcd-client certificate success.
11205 09:54:44.557192 17848 cert.go:230 Generate karmada certificate success.
11205 09:54:44.639322 17848 cert.go:230 Generate front-proxy-ca certificate success.
11205 09:54:44.922561 17848 cert.go:230 Generate front-proxy-client certificate success.
11205 09:54:44.922711 17848 deploy.go:2311 download crds file name: /etc/karmada/crds.tar.gz
Error: prepare karmada failed.Get "https://github.com/karmada-io/karmada/releases/download/v1.2.0/crds.tar.gz": context deadline exceeded (Client.Timeout exceeded while awaiting headers)
[root@master ~]# kubectl karmada init --kube-image-registry=registry.cn-hangzhou.aliyuncs.com/google_containers
11205 09:55:48.259082 18263 deploy.go:1271 kubeconfig file: /root/.kube/config, Kubernetes: https://192.168.30.12:6443
11205 09:55:48.268557 18263 deploy.go:1477 karmada apiserver ip: [192.168.30.12]
11205 09:55:49.058009 18263 cert.go:230 Generate ca certificate success.
11205 09:55:49.379470 18263 cert.go:230 Generate etcd-server certificate success.
11205 09:55:49.540680 18263 cert.go:230 Generate etcd-client certificate success.
11205 09:55:49.614995 18263 cert.go:230 Generate karmada certificate success.
11205 09:55:50.161731 18263 cert.go:230 Generate front-proxy-ca certificate success.
11205 09:55:50.342230 18263 cert.go:230 Generate front-proxy-client certificate success.
11205 09:55:50.342450 18263 deploy.go:2311 download crds file name: /etc/karmada/crds.tar.gz
Error: prepare karmada failed.Get "https://github.com/karmada-io/karmada/releases/download/v1.2.0/crds.tar.gz": dial tcp 20.205.243.166:443: i/o timeout
[root@master ~]# kubectl karmada init --kube-image-registry=registry.cn-hangzhou.aliyuncs.com/google_containers
11205 09:56:25.482296 18673 deploy.go:1271 kubeconfig file: /root/.kube/config, Kubernetes: https://192.168.30.12:6443
11205 09:56:25.491568 18673 deploy.go:1477 karmada apiserver ip: [192.168.30.12]
11205 09:56:26.355821 18673 cert.go:230 Generate ca certificate success.
11205 09:56:26.444696 18673 cert.go:230 Generate etcd-server certificate success.
11205 09:56:26.728544 18673 cert.go:230 Generate etcd-client certificate success.
11205 09:56:27.178896 18673 cert.go:230 Generate karmada certificate success.
11205 09:56:27.396484 18673 cert.go:230 Generate front-proxy-ca certificate success.
11205 09:56:27.534610 18673 cert.go:230 Generate front-proxy-client certificate success.
11205 09:56:27.534760 18673 deploy.go:2311 download crds file name: /etc/karmada/crds.tar.gz
Error: prepare karmada failed.Get "https://github.com/karmada-io/karmada/releases/download/v1.2.0/crds.tar.gz": dial tcp 20.205.243.166:443: i/o timeout
[root@master ~]# kubectl karmada init --kube-image-registry=registry.cn-hangzhou.aliyuncs.com/google_containers
11205 09:57:03.024529 18957 deploy.go:1271 kubeconfig file: /root/.kube/config, Kubernetes: https://192.168.30.12:6443
11205 09:57:03.033345 18957 deploy.go:1477 karmada apiserver ip: [192.168.30.12]
11205 09:57:03.507074 18957 cert.go:230 Generate ca certificate success.
11205 09:57:03.826830 18957 cert.go:230 Generate etcd-server certificate success.
11205 09:57:04.003514 18957 cert.go:230 Generate etcd-client certificate success.
11205 09:57:04.125780 18957 cert.go:230 Generate karmada certificate success.
11205 09:57:04.270539 18957 cert.go:230 Generate front-proxy-ca certificate success.
11205 09:57:04.513613 18957 cert.go:230 Generate front-proxy-client certificate success.

11205 10:01:58.277528 20880 check.go:491 pod: karmada-webhook-677cbc9c78-bsq9v is ready, status: Running
```

```

KARMADA
-----
Karmada is installed successfully.

Register Kubernetes cluster to Karmada control plane.

Register cluster with 'Push' mode

Step 1: Use kubectl karmada join to register the cluster to Karmada control panel. --cluster-kubeconfig is members kubeconfig.
(In karmada)➥ MEMBER_CLUSTER_NAME="get -f /etc/kubeconfig | grep current-context | sed 's/: /:/g' | sed '1d'"
(In karmada)➥ kubectl karmada --kubeconfig /etc/karmada/karmada-apiserver.config join ${MEMBER_CLUSTER_NAME} --cluster-kubeconfig=$HOME/.kube/config

Step 2: Show members of karmada
(In karmada)➥ kubectl --kubeconfig /etc/karmada/karmada-apiserver.config get clusters

Register cluster with 'Pull' mode

Step 1: Send karmada kubeconfig and karmada-agent.yaml to member Kubernetes
(In karmada)➥ scp /etc/karmada/karmada-apiserver.config /etc/karmada/karmada-agent.yaml (member Kubernetes):~

Step 2: Create karmada kubeconfig secret
Notice:
Cross-network, need to change the config server address.
(In member Kubernetes)➥ kubectl create ns karmada-system
(In member Kubernetes)➥ kubectl create secret generic karmada-kubeconfig --from-file=karmada-kubeconfig=/root/karmada-apiserver.config -n karmada-system

Step 3: Create karmada agent
(In member Kubernetes)➥ kubectl create ns ${MEMBER_CLUSTER_NAME}-demo
(In member Kubernetes)➥ sed -i "s/$(member_cluster_name)/$(MEMBER_CLUSTER_NAME)/g" karmada-agent.yaml
(In member Kubernetes)➥ kubectl apply -f karmada-agent.yaml

Step 4: Show members of karmada
(In karmada)➥ kubectl --kubeconfig /etc/karmada/karmada-apiserver.config get clusters
```

Check all your pod is READY

Execute command

```
kubectl get po -A
```

Execute screenshot

```
[root@master ~]# kubectl get po -A
NAMESPACE      NAME                                                    READY   STATUS    RESTARTS   AGE
karmada-system  etcd-0                                                  1/1     Running   0           15m
karmada-system  karmada-aggregated-apiserver-7578459784-k2rgf         1/1     Running   0           15m
karmada-system  karmada-apiserver-6b6957497-lnrvf                     1/1     Running   0           15m
karmada-system  karmada-controller-manager-5c88c9478-mkzdz            1/1     Running   0           14m
karmada-system  karmada-scheduler-78f8dc8845-489pd                   1/1     Running   0           14m
karmada-system  karmada-webhook-677cbc9c78-bsq9v                     1/1     Running   0           14m
karmada-system  kube-controller-manager-84969b756d-7ml6v              1/1     Running   0           14m
kube-system     cilium-b7g9m                                            1/1     Running   0           21m
kube-system     cilium-ntkfm                                           1/1     Running   0           24m
kube-system     cilium-operator-9dc4b59f7-mf2sj                       1/1     Running   0           24m
kube-system     coredns-6d8c4cb4d-7pg6m                               1/1     Running   0           25m
kube-system     coredns-6d8c4cb4d-84tsq                               1/1     Running   0           25m
kube-system     etcd-master                                             1/1     Running   2           25m
kube-system     kube-apiserver-master                                  1/1     Running   2           25m
kube-system     kube-controller-manager-master                        1/1     Running   2           25m
kube-system     kube-proxy-2mt6c                                       1/1     Running   0           25m
kube-system     kube-proxy-fl7rp                                       1/1     Running   0           21m
kube-system     kube-scheduler-master                                 1/1     Running   2           25m
[root@master ~]#
```


7 Propagate a deployment by Karmada

Before propagating a deployment, make sure the worker cluster is already working properly And get the latest config currently running

In the following steps, we are going to propagate a deployment by Karmada. We use the installation of nginx as an example

7.1 Join a worker/member cluster to karmada control plane

Here we add the working node cluster through push mode

It is worth noting that /root/.kube/config is Kubernetes host config and the /etc/karmada/karmada-apiserver.config is karmada-apiserver config

Execute command

```
kubectl karmada --kubeconfig /etc/karmada/karmada-apiserver.config join ${YOUR MEMBER NAME} --cluster-kubeconfig=${YOUR MEMBER CONFIG PATH} --cluster-context=${YOUR CLUSTER CONTEXT}
```

```
[root@master nginx]# kubectl karmada --kubeconfig /etc/karmada/karmada-apiserver.config join member1 --cluster-kubeconfig=/root/.kube/member1-config --cluster-context=kubernetes-admin@kubernetes
cluster(member1) is joined successfully
```

Here is example command for your information: `kubectl karmada --kubeconfig /etc/karmada/karmada-apiserver.config join member1 --cluster-kubeconfig=/root/.kube/member1-config --cluster-context=kubernetes-admin@kubernetes`

- `--kubeconfig` specifies the Karmada's kubeconfig file and the CLI
- `--cluster-kubeconfig` specifies the member's config. Generally, it can be obtained from the worker cluster in "`/root/.kube/config`"
- `--cluster-context` the value of current-context from `--cluster-kubeconfig`

If you want unjoin the member cluster, just change the join to unjoin: `kubectl karmada --kubeconfig /etc/karmada/karmada-apiserver.config unjoin member2 --cluster-kubeconfig=/root/.kube/192.168.30.2_config --cluster-context=kubernetes-admin@kubernetes`

check the members of karmada

Execute command

```
kubectl --kubeconfig /etc/karmada/karmada-apiserver.config get clusters
```

```
[root@master .kube]# kubectl --kubeconfig /etc/karmada/karmada-apiserver.config get clusters
NAME      VERSION  MODE   READY   AGE
member1   v1.23.5  Push   True    3m24s
member2   v1.23.7  Push   True    109s
```

7.2 Create nginx deployment in Karmada

deployment.yaml are obtained through here <https://github.com/karmada-io/karmada/tree/master/samples/nginx>

Execute command

```
kubectl create -f /root/sample/nginx/deployment.yaml --kubeconfig /etc/karmada/karmada-apiserver.config
kubectl get deployment --kubeconfig /etc/karmada/karmada-apiserver.config
```

```
[root@master nginx]# kubectl create -f /root/sample/nginx/deployment.yaml
deployment.apps/nginx created
```

```
[root@master nginx]# kubectl get deployment --kubeconfig /etc/karmada/karmada-apiserver.config
NAME    READY   UP-TO-DATE   AVAILABLE   AGE
nginx   2/2     2             2           21m
```

7.3 Create PropagationPolicy that will propagate nginx to member cluster

propagationpolicy.yaml are obtained through here <https://github.com/karmada-io/karmada/tree/master/samples/nginx>

Execute command

```
kubectl create -f /root/sample/nginx/propagationpolicy.yaml --kubeconfig /etc/karmada/karmada-apiserver.config
```

```
[root@master nginx]# kubectl create -f /root/sample/nginx/propagationpolicy.yaml --kubeconfig /etc/karmada/karmada-apiserver.config
propagationpolicy.policy.karmada.io/nginx-propagation created
```

7.4 Check the deployment status from Karmada

```
kubectl get po --kubeconfig /root/.kube/member1-config
kubectl get po --kubeconfig /root/.kube/member2-config
```

```
[root@master nginx]# k get po --kubeconfig /root/.kube/member1-config
NAME                READY   STATUS    RESTARTS   AGE
nginx-85b98978db-84lms 1/1     Running   0           3m45s
[root@master nginx]# k get po --kubeconfig /root/.kube/member2-config
NAME                READY   STATUS    RESTARTS   AGE
nginx-85b98978db-l2n2w 1/1     Running   0           3m51s
```

Reference

<https://lazytoki.cn/index.php/archives/4/>

<https://www.cnblogs.com/renshengdezhe/p/16686769.html#%E5%9B%9B%E5%AE%89%E8%A3%85%E9%83%A8%E7%BD%B2kubernetes%E9%9B%86%E7%BE%A4>

<https://www.cnblogs.com/renshengdezhe/p/16686769.html#%E5%9B%9B%E5%AE%89%E8%A3%85%E9%83%A8%E7%BD%B2kubernetes%E9%9B%86%E7%BE%A4>

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<https://docs.docker.com/engine/install/centos/>

<https://kubernetes.io/zh-cn/docs/setup/production-environment/container-runtimes/>

<https://karmada.io/docs/installation/install-kubectl-karmada>

<https://karmada.io/docs/installation/>

<https://docs.cilium.io/en/stable/gettingstarted/k8s-install-kubeadm/>

<https://karmada.io/docs/get-started/nginx-example>

Installation worker cluster

0 Environmental

Three centos machines are required, one as the master node and others as the worker node. The installed k8s version is 1.23.5

1 Preparation

The main content is to prepare the basic environment to ensure the normal execution of subsequent operations.

2 Install docker

The main content is to install docker, and configure the cgroup driver of docker as systemd, confirm the driver

2.1 uninstall old docker

Execute command

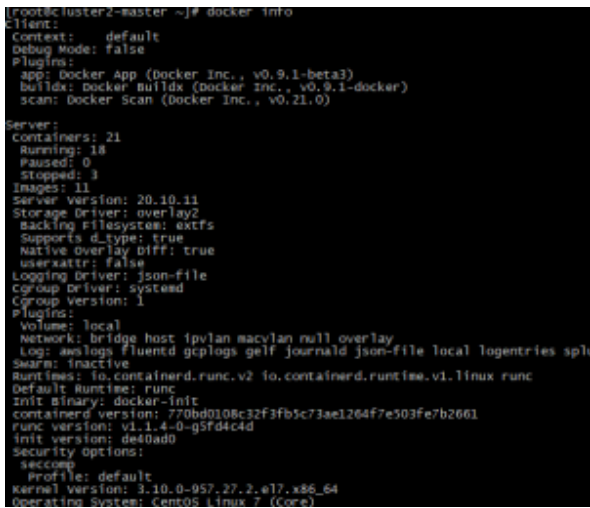
```
yum -y remove docker docker-client docker-client-latest docker-common docker-latest docker-latest-logrotate  
docker-logrotate docker-engine docker-ce docker-ce-cli
```

2.2 install docker

Execute command

```
yum -y install docker-ce-20.10.11
```

Execute screenshot



```
[root@cluster2-master ~]# docker info  
Client:  
Context: default  
Debug Mode: false  
Plugins:  
app: Docker App (Docker Inc., v0.9.1-beta3)  
buildx: docker buildx (Docker Inc., v0.9.1-docker)  
scan: Docker Scan (Docker Inc., v0.21.0)  
Server:  
Containers: 21  
Running: 18  
Paused: 0  
Stopped: 3  
Images: 11  
Server Version: 20.10.11  
Storage Driver: overlay2  
Backing Filesystem: extfs  
Supports d_type: true  
Native Overlay Diff: true  
userxattr: false  
Logging Driver: json-file  
Cgroup Driver: systemd  
Cgroup version: 1  
Plugins:  
Volume: local  
Network: bridge host ipvlan macvlan null overlay  
Log: awslogs fluentd gcplogs gelf journald json-file local logentries splunk  
Swarm: inactive  
Runtimes: io.containerd.runc.v2 io.containerd.runtime.v1.linux runc  
Default Runtime: runc  
Init Binary: docker-init  
containerd version: 770bd0108c32f3fb5c73ae1264f7e503fe7b2661  
runc version: v1.1.4-0-g5f94c4d  
init version: de40ad0  
Security options:  
seccomp  
Profile: default  
Kernel version: 3.10.0-957.27.2.el7.x86_64  
Operating System: CentOS Linux 7 (Core)
```

2.3 Set docker to boot and confirm docker status

Execute command

```
systemctl enable docker  
systemctl start docker  
systemctl status docker
```

2.4 Configure the driver of docker's cgroup

The driver of docker's cgroup needs to be consistent with that of kubelet. It is recommended to set it to systemd. At this time, the execution of subsequent commands may be stuck. Wait for a few minutes or restart, and then try again

Execute command

```
docker info | grep -i cgroup
```

Check the current configuration, if it is the system in the figure below, skip the follow-up and go directly to the third section

If it is cgroups, add the following statement

```
vim /etc/docker/daemon.json
# add this
{
  "exec-opts": ["native.cgroupdriver=systemd"],
  "insecure-registries": ["0.0.0.0/0"]
}
```

Restart to check for changes

```
systemctl daemon-reload && systemctl restart docker
docker info | grep -i cgroup
```

3 Install k8s

The main content is to install the 1.23.5 version of the component kubeadm kubectl kubelet

3.1 Uninstall old k8s

If it is the version inconsistent, you need to uninstall.

```
kubeadm reset -f
modprobe -r ipip
lsmod
rm -rf ~/.kube/
rm -rf /etc/kubernetes/
rm -rf /etc/systemd/system/kubelet.service.d
rm -rf /etc/systemd/system/kubelet.service
rm -fr /usr/lib/systemd/system/kubelet.service
rm -fr /etc/systemd/system/multi-user.target.wants/kubelet.service
rm -rf /usr/bin/kube*
rm -rf /etc/cni
rm -rf /opt/cni
rm -rf /var/lib/etcd
rm -rf /var/etcd
yum remove kubeadm
yum remove kubelet
yum remove kube*
```

3.2 Download the new yum source

```
rm -rf /etc/yum.repos.d/* ;
wget ftp://ftp.rhce.cc/k8s/* -P /etc/yum.repos.d/ ls /etc/yum.repos.d/
```

3.2 Remove kubeadm kubectl kubelet

If it is the version inconsistent, you need to uninstall it through yum remove.

```
yum -y remove kubelet kubeadm kubectl
```

3.3 Install kubelet kubeadm kubectl version 1.23.5

```
yum -y install kubelet-1.23.5 kubeadm-1.23.5 kubectl-1.23.5
```

3.3 verify installation

```
kubelet --version
kubeadm version
kubectl version
```

3.5 Set kubelet to boot

```
systemctl daemon-reload
systemctl start kubelet
systemctl enable kubelet
```

4 Initialize master

The main content is to pull the image of version 1.23.5, initialize the master node.

4.1 Edit init-config.yaml

```
# init-config.yaml
apiVersion: kubeadm.k8s.io/v1beta3
bootstrapTokens:
- groups:
  - system:bootstrappers:kubeadm:default-node-token
  token: abcdef.0123456789abcdef
  ttl: 24h0m0s
  usages:
  - signing
  - authentication
kind: InitConfiguration
localAPIEndpoint:
  advertiseAddress: 192.168.30.22
  bindPort: 6443
nodeRegistration:
  criSocket: /var/run/dockershim.sock
  imagePullPolicy: IfNotPresent
  name: cluster1-master
  taints: null
---
apiServer:
  timeoutForControlPlane: 4m0s
apiVersion: kubeadm.k8s.io/v1beta3
certificatesDir: /etc/kubernetes/pki
clusterName: kubernetes
controllerManager: {}
dns: {}
etcd:
  local:
    dataDir: /var/lib/etcd
imageRepository: registry.aliyuncs.com/google_containers
kind: ClusterConfiguration
kubernetesVersion: 1.23.5
networking:
  dnsDomain: cluster.local
  serviceSubnet: 10.1.0.0/12
scheduler: {}
```

4.2 Pull the k8s image

```
kubeadm config images list --config=init-config.yaml
# images list
registry.aliyuncs.com/google_containers/kube-apiserver:v1.23.0
registry.aliyuncs.com/google_containers/kube-controller-manager:v1.23.0
registry.aliyuncs.com/google_containers/kube-scheduler:v1.23.0
registry.aliyuncs.com/google_containers/kube-proxy:v1.23.0
registry.aliyuncs.com/google_containers/pause:3.6
registry.aliyuncs.com/google_containers/etcd:3.5.1-0
registry.aliyuncs.com/google_containers/coredns:v1.8.6

# pull images
kubeadm config images pull --config=init-config.yaml
```

Please make sure that the above images have been pulled down

4.2 init master

```
kubeadm init --apiserver-advertise-address=192.168.30.22 --apiserver-bind-port=6443 --pod-network-cidr=10.100.0.0/16 --service-cidr=10.1.0.0/12 --kubernetes-version=1.23.5 --image-repository registry.aliyuncs.com/google_containers
```

You can see that the prompt initialization is successful. The prompt executes the following command to use kubectl normally

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

5 Initialize workers

The main content is to add worker nodes to the cluster

5.1 Join the master node

```
# worker
kubeadm join 192.168.30.22:6443 --token zb4ydd.afsdnt1k58ow3z8x \
--discovery-token-ca-cert-hash sha256:a73132eb5e9a911f24697e8550333ddc20d3ae641d35ba17c09580730b607080
```

Note that if an error occurs and you need to re-init, you need to execute the following statement first to ensure that kubeadm is re-executed normally

```
# worker
kubeadm reset -f
rm -rf ~/.kube/
rm -rf /etc/kubernetes/
rm -rf /var/lib/etcd
rm -rf /var/etcd
```

5.3 Verify worker nodes

After the worker is added, you can execute the following command on the master machine to confirm .

```
# master
kubectl get nodes
```

Execute screenshot

```
[root@cluster1-master ~]# kubectl get nodes
```

NAME	STATUS	ROLES	AGE	VERSION
cluster1-master	Ready	control-plane,master	3d6h	v1.23.5
cluster1-node1	Ready	<none>	3d6h	v1.23.5
cluster1-node2	Ready	<none>	3d6h	v1.23.5

```
[root@cluster1-master ~]#
```

5.4 Configure the calico network plugin

Configure the calico network plug-in to make it work. Create the calico.yaml file.

```
# master
curl https://docs.projectcalico.org/v3.11/manifests/calico.yaml -O
vi calico.yaml
#
kubectl apply -f calico.yaml
# loopuntil all the pod's status is running
kubectl get po -A
```

Execute screenshot

```
[root@cluster1-master ~]# kubectl get po -A
```

NAMESPACE	NAME	READY	STATUS	RESTARTS
kube-system	calico-kube-controllers-7f76d48f74-4wr2g	1/1	Running	0
kube-system	calico-node-gmscb	1/1	Running	0
kube-system	calico-node-tfczc	1/1	Running	0
kube-system	calico-node-tsvpn	1/1	Running	0
kube-system	coredns-6d8c4cb4d-nsrz2	1/1	Running	0
kube-system	coredns-6d8c4cb4d-t5d6s	1/1	Running	0
kube-system	etcd-cluster1-master	1/1	Running	0
kube-system	kube-apiserver-cluster1-master	1/1	Running	0
kube-system	kube-controller-manager-cluster1-master	1/1	Running	5
kube-system	kube-proxy-4dfw5	1/1	Running	0
kube-system	kube-proxy-ctnvs	1/1	Running	0
kube-system	kube-proxy-t7cjl	1/1	Running	0
kube-system	kube-scheduler-cluster1-master	1/1	Running	6

Deploy Application

0 Environmental

The k8s version is 1.23.5.

1 Preparation

The main content is to prepare the Application image.

```
192.168.30.20:5000/migu/sentiment:latest
```

2 Deployment

The main content is to install sentiment application.

2.1 namespace

```
# namespace.yaml
apiVersion: v1
kind: Namespace
metadata:
  name: migu
```

Execute command

```
kubectl create -f namespace.yaml
```

2.2 image pull secret

Add Harbor Image Registry Pull Secret to Kubernetes.

```
#harborsecret
kubectl create secret generic harborsecret \
  --from-file=.dockerconfigjson=/root/.docker/config.json \
  --type=kubernetes.io/dockerconfigjson \
  -n migu
```

2.3 deployment

```
#deploy.yaml
kind: Deployment
apiVersion: apps/v1
metadata:
  labels:
    app: sentiment
  name: migu-sentiment
  namespace: migu
spec:
  replicas: 2
  selector:
    matchLabels:
      app: sentiment
  template:
    metadata:
      labels:
        app: sentiment
    spec:
      imagePullSecrets:
        - name: harborsecret
      containers:
        - name: sentiment-container
          image: 192.168.30.20:5000/migu/sentiment:latest
          imagePullPolicy: IfNotPresent
          imagePullPolicy: Always
          ports:
            - containerPort: 9600
              protocol: TCP
              name: http
          resources:
            limits:
              cpu: 2
              memory: 4G
            requests:
              cpu: 2
              memory: 4G
```

Execute command

```
kubectl create -f deploy.yaml
```

Execute screenshot

```
[root@cluster1-master migu]#  
[root@cluster1-master migu]# kubectl get deploy -n migu  
NAME          READY   UP-TO-DATE   AVAILABLE   AGE  
migu-sentiment 2/2     2            2           3d  
[root@cluster1-master migu]# kubectl get pod -n migu  
NAME                                READY   STATUS  
migu-sentiment-6f94c899fc-47g8d    1/1     Running  
migu-sentiment-6f94c899fc-zjl7v    1/1     Running
```

2.3 service

```
#service.yaml  
apiVersion: v1  
kind: Service  
metadata:  
  labels:  
    app: sentiment  
  name: sentiment  
  namespace: migu  
spec:  
  ports:  
    - port: 9600  
      protocol: TCP  
      targetPort: 9600  
      nodePort: 30960  
  selector:  
    app: sentiment  
  type: NodePort
```

Execute command

```
kubectl create -f service.yaml
```

Execute screenshot

```
[root@cluster1-master migu]#  
[root@cluster1-master migu]# kubectl get svc -n migu  
NAME          TYPE          CLUSTER-IP      EXTERNAL-IP      PORT(S)  
sentiment     NodePort      10.15.113.78    <none>           9600:30960/TCP  
[root@cluster1-master migu]#
```

2.4 test service

```
## request  
curl http://192.168.30.20:30960/health  
  
##response  
{ "status": "UP" }
```

Execute screenshot

Installation High-Level Overview

- Bare Metal Deployment Guide
 - Install Bare Metal Jump Host : N/A
 - Creating a Node Inventory File: N/A
 - Creating the Settings Files: N/A
 - Running: N/A

- Virtual Deployment Guide
 - Standard Deployment Overview N/A
 - Snapshot Deployment OverviewN/A
 - Special Requirements for Virtual Deployments
 - Install Jump Host: N/A
 - Verifying the Setup - VMsN/A
- Upstream Deployment Guide
 - Upstream Deployment Key Features N/A
 - Special Requirements for Upstream Deployments N/A
 - Scenarios and Deploy Settings for Upstream Deployments N/A
 - Including Upstream Patches with DeploymentN/A
 - Running N/A
 - Interacting with Containerized Overcloud N/A

Developer Guide and Troubleshooting

- Utilization of Images

N/A

- Post-deployment Configuration

N/A

- Debugging Failures

N/A

- Reporting a Bug

N/A

Uninstall Guide

Troubleshooting

1. Network problem: the working cluster uses the default communication mode of calico, and the access between nodes is blocked; After many attempts, calico vxlan is feasible and flannel is feasible at present;

2. Disaster recovery scenario scheduling, test scenario 2, requires the karmada control plane to install the deschedule component;

Maintenance

- Blue Print Package Maintenance
 - Software maintenance N/A
 - Hardware maintenanceN/A
- Blue Print Deployment Maintenance (N/A)

Frequently Asked Questions

N/A

License

N/A

References

N/A

Definitions, acronyms and abbreviations

N/A