kubeadm Bootstrap Kubernetes

CONCEPTS

kubeadm only bootstraps: it needs a container runtime and kubelet already installed, and you install a CNI plugin yourself afterwards.

Install runtime, kubelet, kubeadm
↓ `kubeadm init`
Control plane static pods, admin.conf
↓ apply a CNI
Network nodes become Ready
↓ `kubeadm join`
Workers kubelet joins

Run kubeadm as root. Swap must be off and the node needs a unique hostname and reachable port 6443.

BOOTSTRAP A CLUSTER

`kubeadm init`
Initialise a control-plane node

`kubeadm init --pod-network-cidr=<cidr>`
Reserve the pod IP range for a CNI

`kubeadm init --apiserver-advertise-address=<ip>`
Choose the API server IP

`kubeadm init --control-plane-endpoint=<dns>:6443`
Stable endpoint for HA control plane

`kubeadm init --config <file>`
Init from a config file

`mkdir -p $HOME/.kube && sudo cp /etc/kubernetes/admin.conf $HOME/.kube/config`
Let kubectl talk to the cluster

JOIN NODES

`kubeadm join <host>:6443 --token <token> --discovery-token-ca-cert-hash sha256:<hash>`
Join a worker node

`kubeadm join <host>:6443 ... --control-plane --certificate-key <key>`
Join as a control-plane node

TOKENS

`kubeadm token create --print-join-command`
New token plus full join command

`kubeadm token list`
List bootstrap tokens

`openssl x509 -pubkey -in /etc/kubernetes/pki/ca.crt | openssl rsa -pubin -outform der 2>/dev/null | openssl dgst -sha256 -hex | sed 's/^.* //'`
Compute the CA cert hash

CERTIFICATES

`kubeadm certs check-expiration`
Show expiry of all certs

`kubeadm certs renew all`
Renew every certificate

After renewing, restart the control-plane static pods and copy the new admin.conf to your kubeconfig.

UPGRADE

`kubeadm upgrade plan`
Show available versions and checks

`kubeadm upgrade apply v<version>`
Upgrade the first control plane

`kubeadm upgrade node`
Upgrade other nodes' local config

`kubectl drain <node> --ignore-daemonsets`
Evict pods before upgrading kubelet

`kubectl uncordon <node>`
Make the node schedulable again

`kubeadm version -o short`
Print the kubeadm version

CONFIG AND IMAGES

`kubeadm config print init-defaults`
Print the default init config

`kubeadm config validate --config <file>`
Check a config file

CONFIG AND IMAGES (cont.)

`kubeadm config images list`
List images kubeadm needs

`kubeadm config images pull`
Pre-pull the control-plane images

RESET

`kubeadm reset`
Revert init or join on this node

`kubeadm reset --force`
Reset without the prompt

`sudo rm -rf /etc/cni/net.d`
Remove leftover CNI config

`rm -rf $HOME/.kube`
Remove the stale kubeconfig

reset leaves CNI config, iptables rules and $HOME/.kube behind; clean them by hand before re-initialising.

RECIPES

Single-node cluster

```
sudo kubeadm init --pod-network-cidr=<cidr>
mkdir -p $HOME/.kube
sudo cp /etc/kubernetes/admin.conf $HOME/.kube/config
sudo chown $(id -u):$(id -g) $HOME/.kube/config
# install a CNI plugin, then let pods run on the control plane
kubectl taint nodes --all node-role.kubernetes.io/control-plane-
```

Add a worker later

```
# on the control plane
kubeadm token create --print-join-command
# on the new node, as root
kubeadm join <host>:6443 --token <token> \
  --discovery-token-ca-cert-hash sha256:<hash>
```

Upgrade a control plane node

```
# upgrade the kubeadm package first, then
sudo kubeadm upgrade plan
sudo kubeadm upgrade apply v<version>
kubectl drain <node> --ignore-daemonsets
# upgrade kubelet and kubectl packages
sudo systemctl daemon-reload && sudo systemctl restart kubelet
kubectl uncordon <node>
```