Install Hard Way (S10)

Design a Kubernetes Cluster

- Purpose of Cluster?
  - Education: Minicube or Single Node cluster
  - Development & Testing: Multi Node Cluster with kubeadm
  - Production Application: Multi node cluster with multiple master nodes with kubeadm/GCP/AWS
- Cloud or on Prem?
  - Kubeadm for on prem
  - GKE for GCP, Kops for AWS, AKS for Azure
- Resources:
  - Storage:
    - high performance → SSD
    - multiple connections → network storage
    - also consider persistent storage
  - Nodes:
    - Virtual or physical machines
    - Master and worker nodes depending on workload
    - Not host workloads on master
- How many apps, what kind?
- Traffic amount

Choosing Kubernetes Infrastructure

- Not possible to install natively on windows → always running on Linux
- Minikube for single node cluster
- Kubeadm for single or multi-node cluster (requires VM's)
- Turnkey Solutions:
  - Provision, configure, maintain VM
  - Scripts for deployment
  - Kops on AWS
  - OpenShift: on prem solution with good ci-pipeline possibilities
  - CloudFoundry Container Runtime
  - VMware Cloud PKS
  - Vagrant
  - …
- Hosted Solutions :
  - Kubernetes as a Service
  - Provider provisions, installs and maintains VM's
  - GKE on GCP
  - OpenShift Online
  - Azure Kubernetes Service
  - Amazon Eleastic Container Service
  - …

Choosing a Network Solution

- https://kubernetes.io/docs/concepts/cluster-administration/networking/#how-to-implement-the-kubernetes-networking-model

Configure High Availability

- Consider use of multiple master nodes
- Also reduncancy of all other control plane components
    - Api-server: can be active on all master nodes, node balancer should be used
    - Scheduler and Controller manager: should run in active-standby mode
        - Needs leader elect option in kube-controller manager
    - ETCD: can be on master node or external(safer version)

ETCD in HA

- Distributed database which ensures consistency
    - One node is leader with RAFT protocol
    - Write operation is complete if it is written in quorum(>50%) of nodes
    - Odd number of nodes should be preferred
- Download etcd binary → install → configure service
- etcdctl for commands
    - export ETCDCTL_API=3
    - etcdctl put <key> <value>
    - etcdctl get <key>
    - etcdctl get / --prefix –keys-only (for all keys)
- etcd nodes for HA setup is 3,6 or 7

“Kubernetes the Hard Way” on Virtualbox

- https://github.com/mmumshad/kubernetes-the-hard-way

TLS Bootstrap Worker Nodes

- Certificate operations done automatically with kube-api
- Permissions on master node have to be made
- Needs a bootstrap token for permissions
- System:node-bootstrapper is default role
- Kubectl get csr to vies ertificate requests
- Can be automtically approved by role certificatesigningrequests:nodeclient
- Automatic approvement only for client certificates possible