Kubernetes

- K8S is a container orchestration technology that creates, deploy and manages clusters(bunch of docker containers)
- It schedules, runs and manages isolated containers which are running on virtual/physical/cloud machines
- Convert isolated containers running on different H/W into cluster
- All 3 clouds support Kubernetes
- K8S originated at Google

Features of Kubernetes

- Orchestration (Clustering of any no of Containers running on different H/W)
- Auto-Scaling (more clients? More demand)
- Auto- Healing (new containers in place of crashed containers)
- Load-Balancing (Distribute client requests)
- Platform Independent (Cloud/Virtualization/Physical)
- Fault tolerance (Node/Pod failures)
- Rollback (Going back to previous versions)

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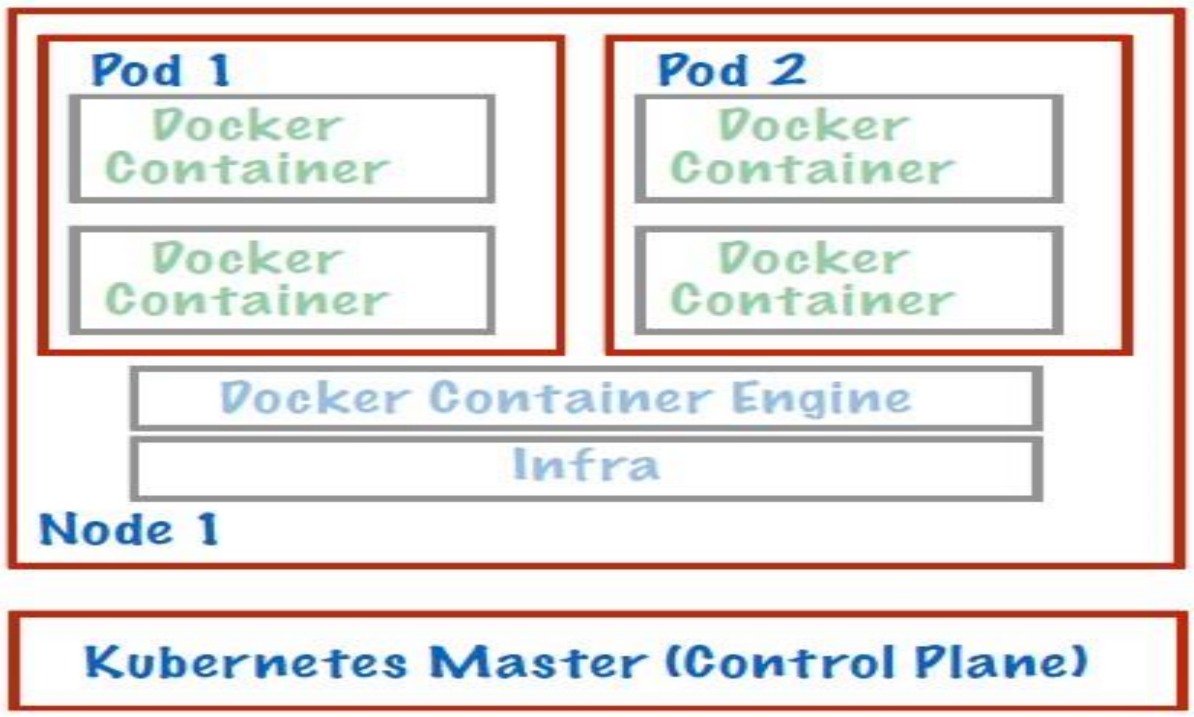
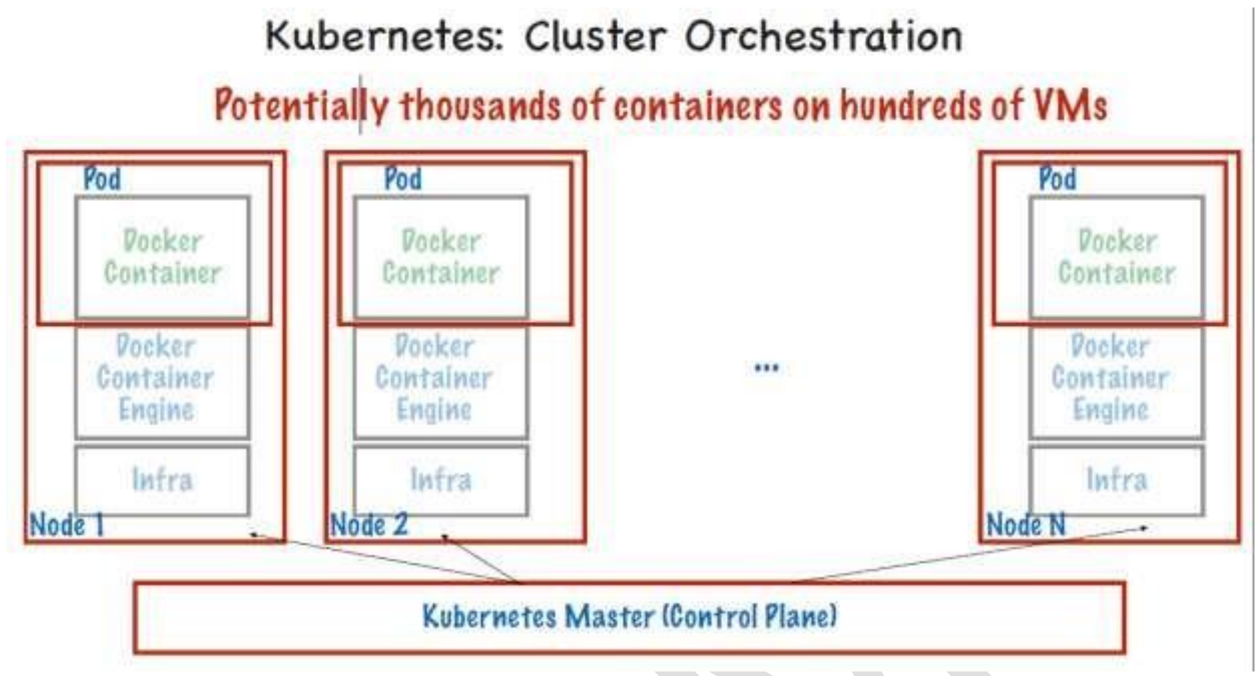
Kubernetes

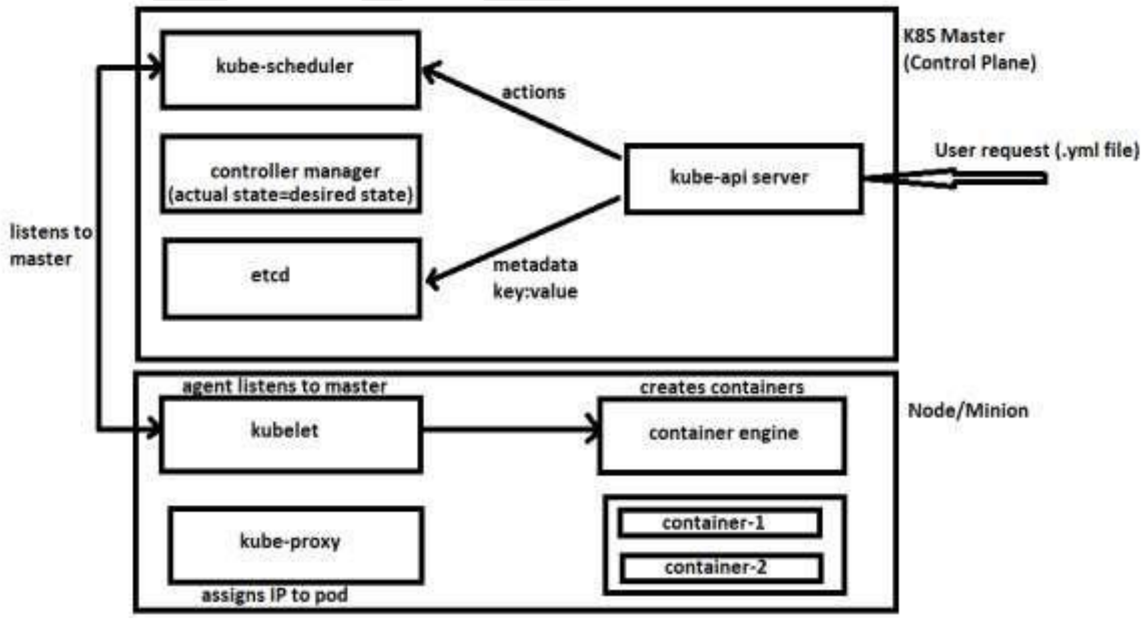
PODS

- Atomic unit of deployment in K8S
- Consists of 1 or more tightly coupled containers
- Pod runs on node, which is controlled by master





Kubernetes Architecture



Working with Kubernetes

- We create manifest (.yml)
- Apply this to cluster (to master) to bring into desired state Pod runs on node, which is controlled by master

Role of master node

- Kubernetes cluster contains containers running on Bare metal/VM Instances/Cloud instances/all mix.
- Kubernetes designates one or more of these as master and all others as workers
- The master is now going to run set of K8S processes. These processes will ensure smooth functioning of cluster. These processes are called "Control plane"
- Can be Multi-master for high availability
- Master runs control plane to run cluster smoothly

Constituents of Control plane

kube-apiserver:

- This apiserver interacts directly with user (i.e. we apply yaml or json manifest to kube-apiserver)
- This kube-apiserver is meant to scale automatically as per load.

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- Kube-api server is front end of control plane **etcd : (cluster store)**
- Stores metadata and status of cluster
- etcd is consistent and high available store (key-value store)
- source-of-touch for cluster state (info about state of cluster) **kube-scheduler:**
- when users make request for the creation & management of pods, kubescheduler is going to take action on these requests.
- Handles pod creation and management
- Kube-scheduler match/assign any node to create and run pods

Controller-manager:

- Make sure actual state of cluster matches to desired state
- 2 possible choices for controller manager
- if K8S on cloud, then it will be ○ Cloud-Controller-Manager
- if K8S on non cloud, then it will be ○ Kube-Controller-Manager

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Nodes (kubelet & Container engine)

what runs on each node of cluster?

node/minion is going to run 3 imp pieces of software

Kubelet:

- Agent running on the node
- Listens to kubernetes master (eg: pod creation request)
- Port 10255
- Sends success/fail reports to master

Container engine: (Docker)

- Works with kubelet
- Pulling images
- Start/Stop containers
- Exposing containers on ports specified in manifest

Nodes (kube-proxy)

- Kube-Proxy: (assigns IP to each pod)
- It is required to assign IP addresses to pods (dynamic)
- Kube-proxy runs on each node & this make sure that each pod will get its own unique IP address.

Above 3 components collectively consists "node“ --

- K8S for Hybrid & Multi-cloud
- Hybrid : On premise datacenter + Public cloud
- Multi cloud : More than one public cloud provider

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What is a POD?

- Atomic unit of deployment in kubernetes
- Consists of 1 or more tightly coupled containers
- Pod runs on node, which controlled by master
- Kubernetes only knows about pods (doesn't know about individual containers)
- Cannot start containers without a pod
- 1 pod usually contains 1 container
- Multi-container pods are possible too
- Such containers are tightly coupled
- Multi container pods;
- Share access to memory space
- Connect to each other using localhost:<container port>
- Share access to the same volumes
- Atomic unit of kubernetes
- Containers within pod are deployed in an all-or-nothing manner
- Entire pod is hosted on the same node (Scheduler will decide about which node)
- Pod runs on which node - Scheduler will decide

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POD Limitations

No auto-healing or scaling

Pod crashes? must be handled at higher level

- Replica set

- Deployment

Higher level kubernetes objects

Replication set: - -

Scaling & Healing

Deployment: -

Versioning and rollback

Service:

- Static (non-ephemeral) IP and networking

Volume:

- Non-ephemeral storage

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Important

- kubectl - single cloud
- kubeadm - on premise
- kubefed – federated

2 Object management methods

- Imperative method
- Declarative method
- Imperative : We say actions that we want kubernetes to take
- Declarative : We tell only require output, won't tell how to get

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