Introduction

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What is Kubernetes?

What is Kubernetes?

- Born in Google
- Donated to CNCF in 2014
- Open source (Apache 2.0)
- v1.0 July 2015
- Written in Go/Golang
- Often shortened to **k8s**

K~~ubernete~~s

K8 s

CNCF: Cloud Native Computing Foundation

What is Kubernetes?

➢ Kubernetes is **Open Source** Orchestration system for Containerised Applications.
➢ Kubernetes Implemented by **Google**.
➢ Kubernetes is a platform that eliminates the manual processes involved in **deploying containerised applications**.
➢ Kubernetes used to manage the **State of Containers**.

- Start Containers on Specifific Nodes.
- Restart Containers when gets Killed.
- Move containers from one Node to Another.

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Why you need Kubernetes?

Why you need Kubernetes?

Containers are a perfect way to get the applications packaged and run. In a production environment, you should manage the containers that run the applications and ensure no downtime.

Why you need Kubernetes?

Kubernetes supplies you with:

- Service discovery and load balancing
- Storage orchestration
- Automated rollouts and rollbacks
- Automatic bin packing
- Self-healing
- Secret and configuration management

Features of Kubernetes

- ➤ **Automated Scheduling :** Kubernetes provides advanced scheduler to launch container on cluster nodes based on their resource requirements and other constraints.
- ➤ **Healing Capabilities:** Kubernetes allows to replaces and reschedules containers when nodes die. Kubernetes doesn’t allow Containers to use, until they get ready.
- ➤ **Auto Upgrade and RollBack :** Kubernetes rolls out changes to the application or its configuration.

Monitoring Application ensure that Kubernetes doesn’t kill all Instance at that time.

If something goes wrong, with Kubernetes you can rollback the change.

Features of Kubernetes

- ➢ **Horizontal Scaling :** Kubernetes can scale up and scale down the application as per the requirements with a simple command, using a UI, or automatically based on CPU usage.
- ➢ **Storage Orchestration :** With Kubernetes, you can mount the storage system of your choice. You can either opt for local storage, or choose a public cloud provider.
- ➢ **Secret & Configuration Management :** Kubernetes can help you deploy and update secrets and application configuration without rebuilding your image and without exposing secrets in your stack configuration.

Features of Kubernetes

You can Run Kubernetes Anywhere:

- On-Premise(Own DataCenter)
- Public Cloud(Google, AWS, Azure, DigitalOcean…)
- Hybrid Cloud

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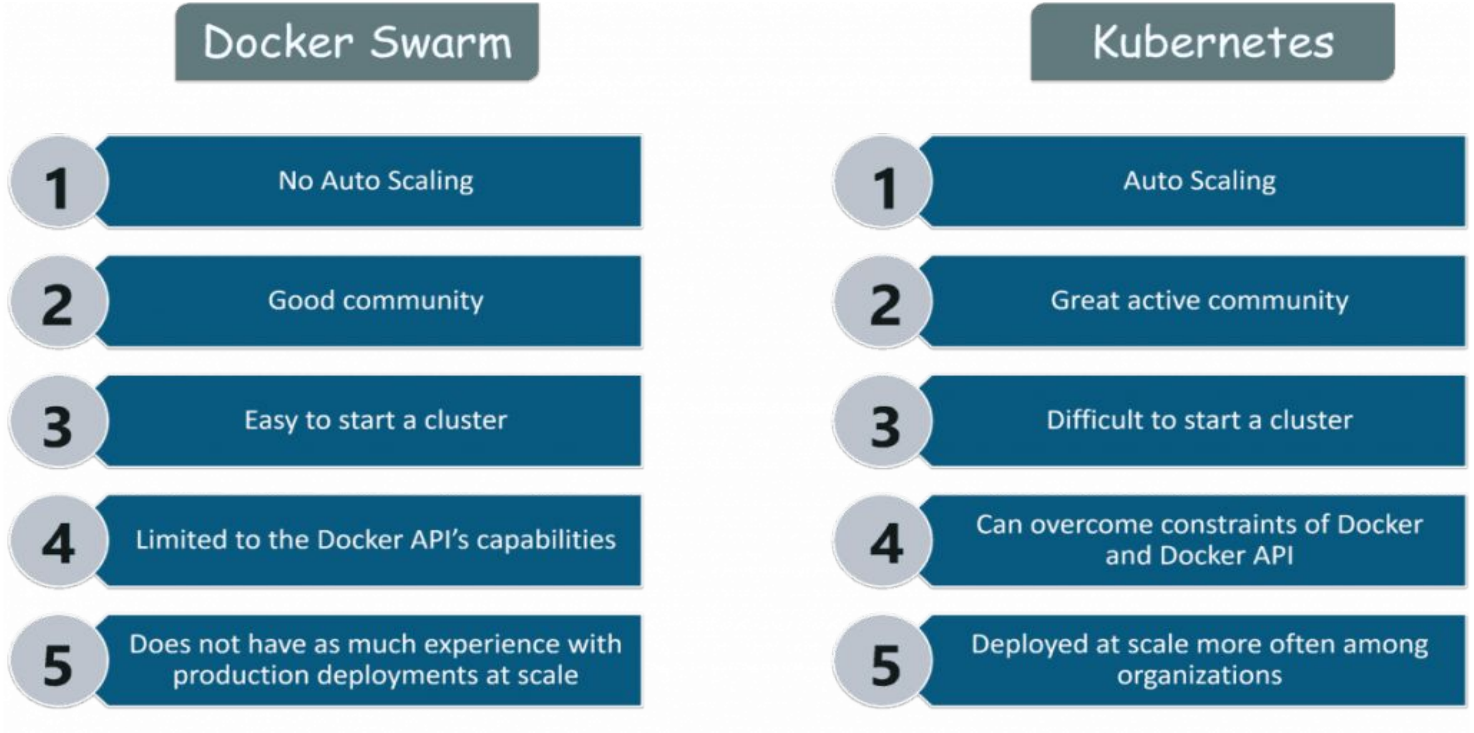
The differences of Kubernetes and Docker Swarm

The differences of Kubernetes and Docker Swarm



Docker Swarm		Kubernetes
No Auto Scaling	1	Auto Scaling
Good community	2	Great active community
Easy to start a cluster	3	Difficult to start a cluster
Limited to the Docker API's capabilities	4	Can overcome constraints of Docker and Docker API
Does not have as much experience with production deployments at scale	5	Deployed at scale more often among organizations

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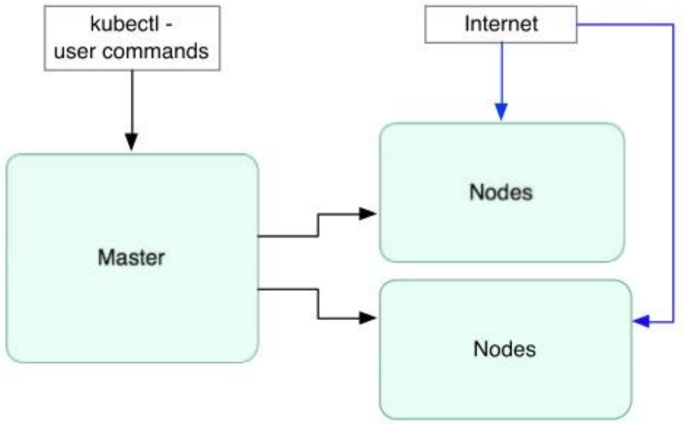
Kubernetes Components

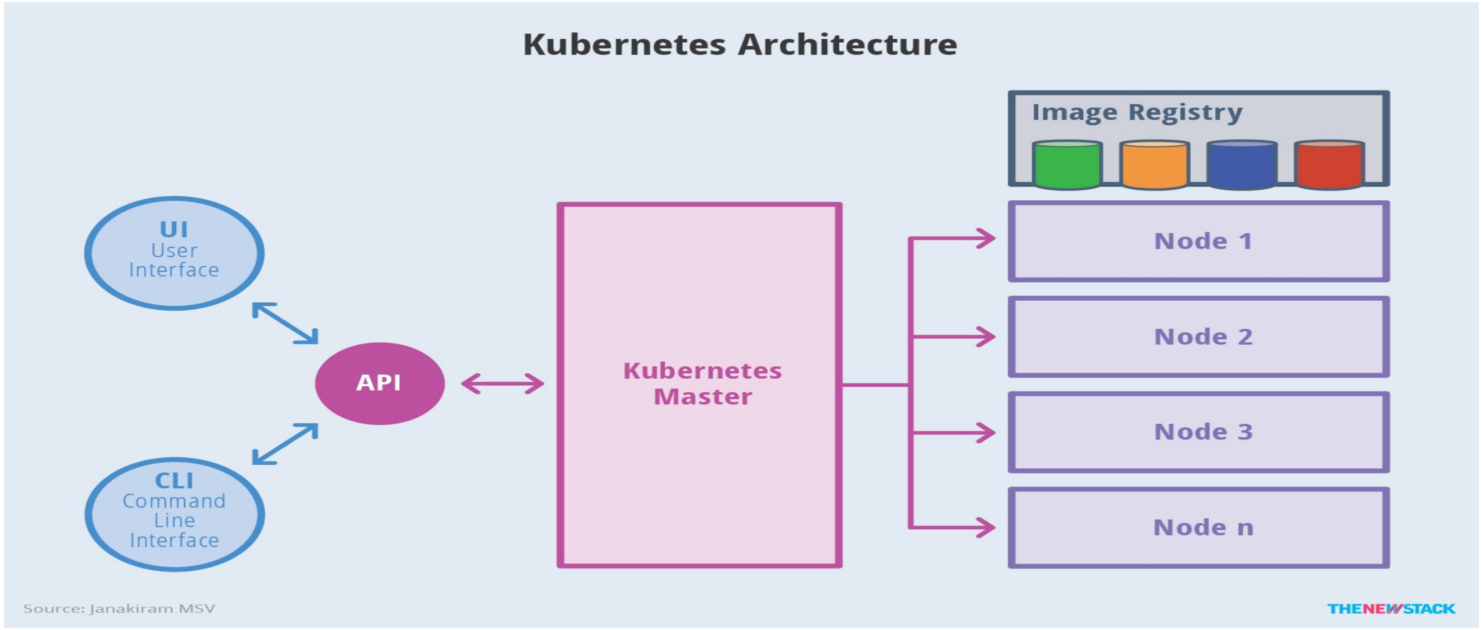
High Level Components



Kubernetes Components

Kubernetes has the following main components:

- One or more master nodes
- One or more worker nodes.



Kubernetes Nodes

- A **node** is a **worker** machine in Kubernetes.
- A node may be a VM or physical machine, depending on the cluster.
- Each node contains the **services** necessary to run pods.
- Nodes Primarily managed by **Kubernetes Master**.
- Single Master Can manage ~5000 Worker Nodes.

Kubernetes Master Component

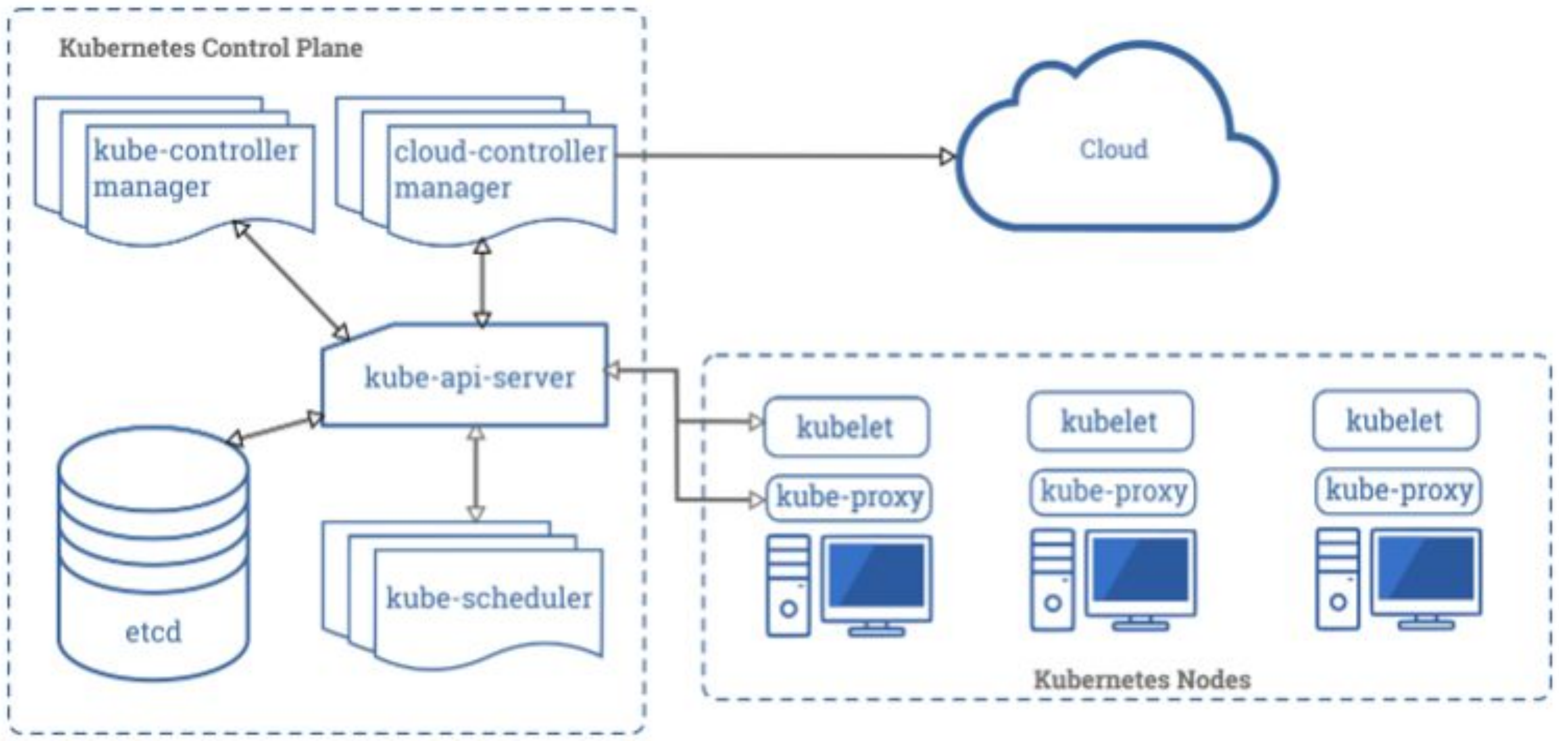
➢ To understand the Kubernetes Administration, First discuss the Architecture of Master Component.

➢ Workflow of Master Component.

➢ Kubernetes master runs the **Scheduler**, **Controller Manager**, **API Server** and **etcd** components and is responsible for managing the Kubernetes cluster.

➢ You can say **Master Component** is the **brain** of Kubernetes Cluster.

Control Plane Components



Control Plane Components

kube-apiserver:

- Provides a forward facing REST interface into the kubernetes control plane and datastore.
- All clients and other applications interact with kubernetes strictly through the API Server.
- Acts as the gatekeeper to the cluster by handling authentication and authorization, request validation, mutation, and admission control in addition to being the front-end to the backing datastore.

Control Plane Components

etcd:

- etcd acts as the cluster datastore.
- Purpose in relation to Kubernetes is to provide a strong, consistent and highly available key-value store for persisting cluster state.
- Stores objects and config information.

Control Plane Components

kube-controller-manager:

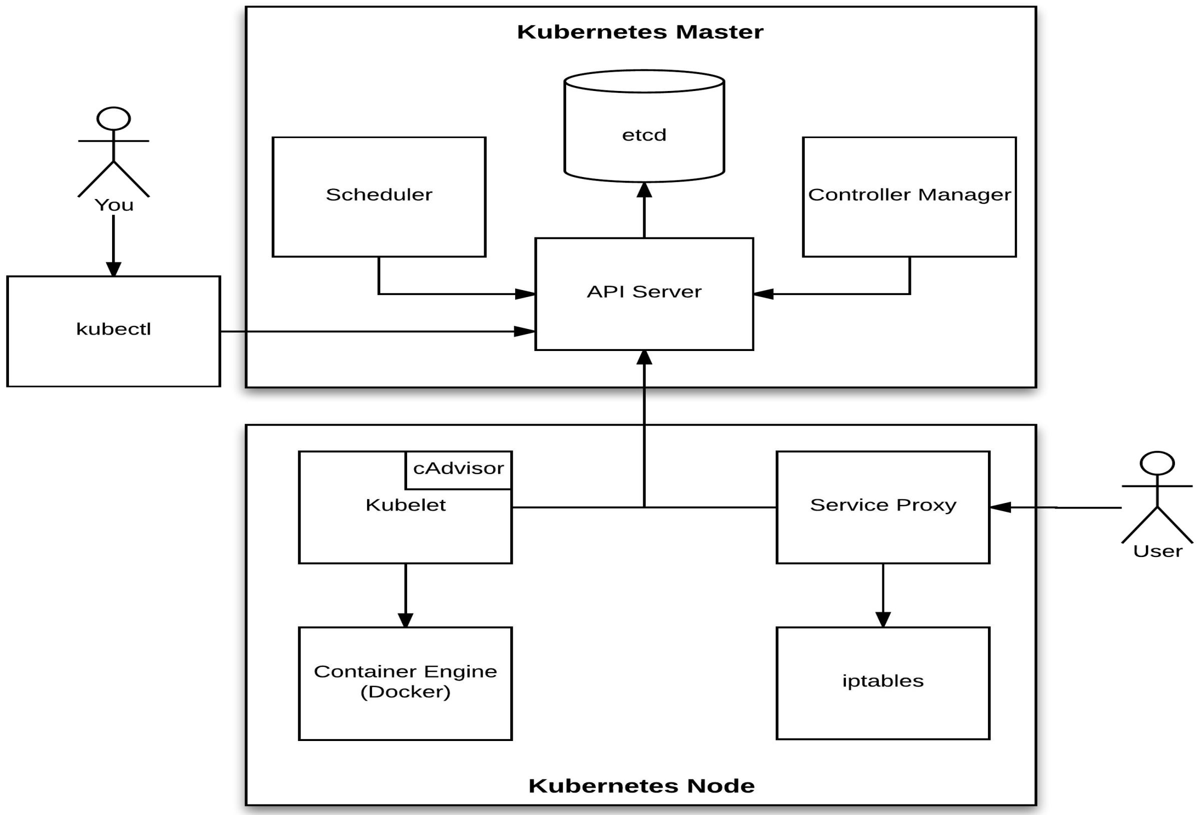
- Serves as the primary daemon that manages all core component control loops.
- Monitors the cluster state via the apiserver and steers the cluster towards the desired state

Control Plane Components

kube-scheduler:

- Verbose policy-rich engine that evaluates workload requirements and attempts to place it on a matching resource.
- Default scheduler uses bin packing.
- Workload Requirements can include: general hardware requirements, affinity/anti-affinity, labels, and other various custom resource requirements.

Node Components



Node Components

kubelet:

- Acts as the node agent responsible for managing the lifecycle of every pod on its host.
- Kubelet understands YAML container manifests that it can read from several sources:
    - file path
    - HTTP Endpoint
    - etcd watch acting on any changes
    - HTTP Server mode accepting container manifests over a simple API.

Node Components

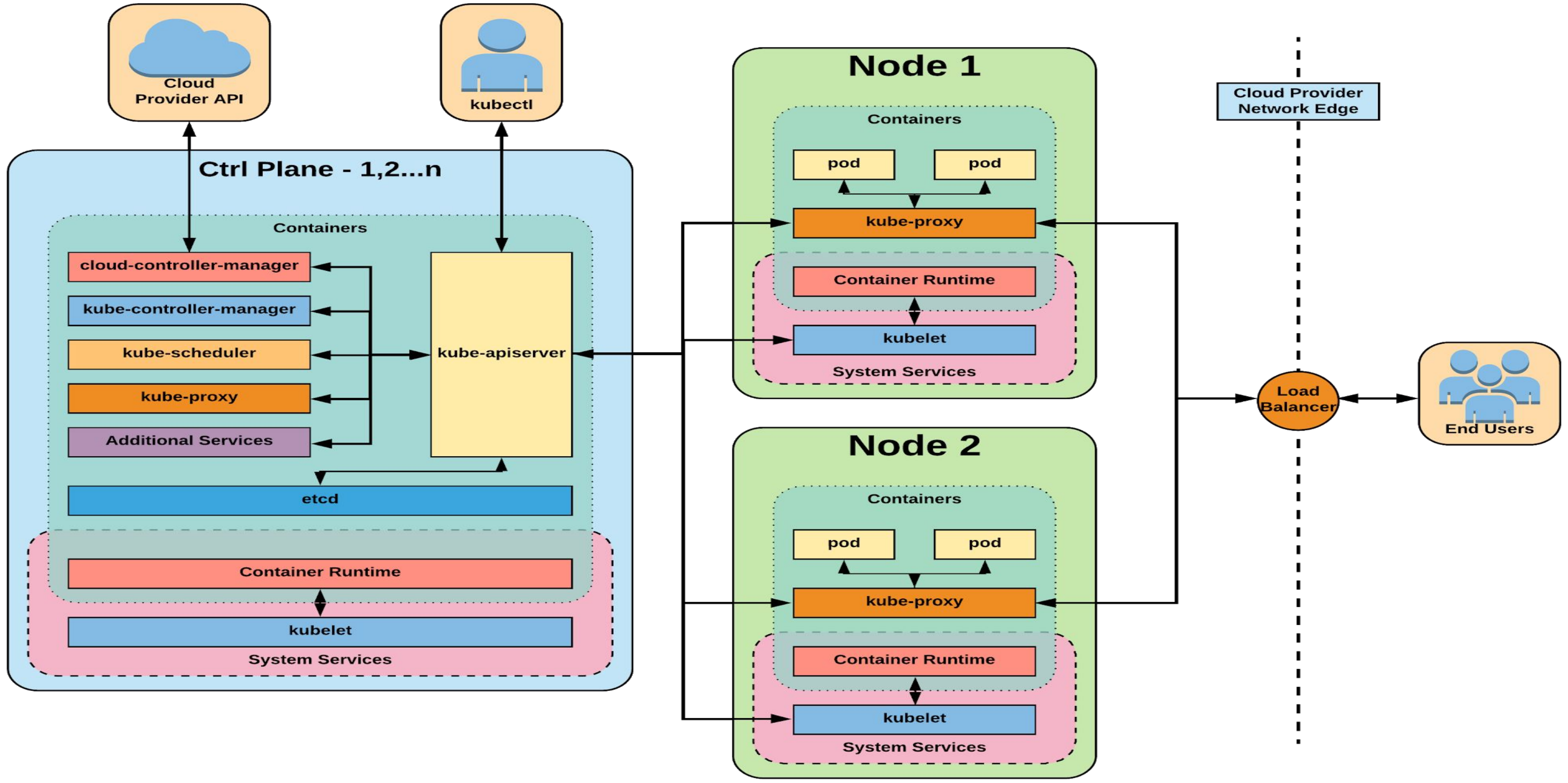
kube-proxy:

- Manages the network rules on each node.
- Performs connection forwarding or load balancing for Kubernetes cluster services.
- Available Proxy Modes:
  - Userspace
  - iptables
  - ipvs (default if supported)

Node Components

Container Runtime Engine:

- A container runtime is a CRI (Container Runtime Interface) compatible application that executes and manages containers.
    - Containerd (docker)
    - Cri-o
    - Rkt
    - Kata (formerly clear and hyper)
    - Virtlet (VM CRI compatible runtime)


Cloud Provider API
kubectl
Ctrl Plane - 1,2...n
Containers
cloud-controller-manager
kube-controller-manager
kube-scheduler
kube-proxy
Additional Services
kube-apiserver
etcd
Container Runtime
kubelet
System Services
Node 1
Containers
pod
pod
kube-proxy
Container Runtime
kubelet
System Services
Node 2
Containers
pod
pod
kube-proxy
Container Runtime
kubelet
System Services
Cloud Provider Network Edge
Load Balancer
End Users

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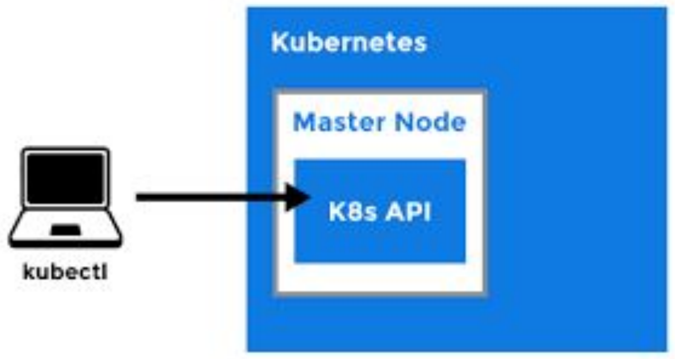
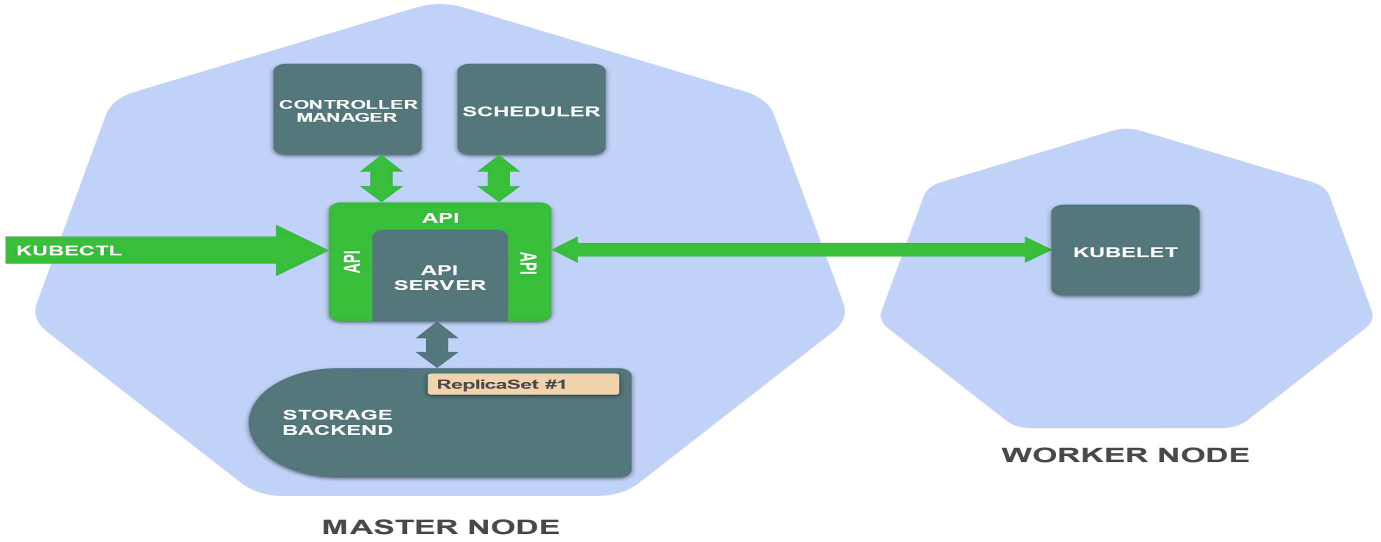
kubectl



kubectl



- **kubectl** is (almost) the only tool we'll need to talk to Kubernetes
- It is a rich CLI tool around the Kubernetes API
- Everything you can do with kubectl, you can do directly with the API
- kubectl can be pronounced "Cube C T L", "Cube cuttle", "Cube cuddle".

THANKS!

Any questions?

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