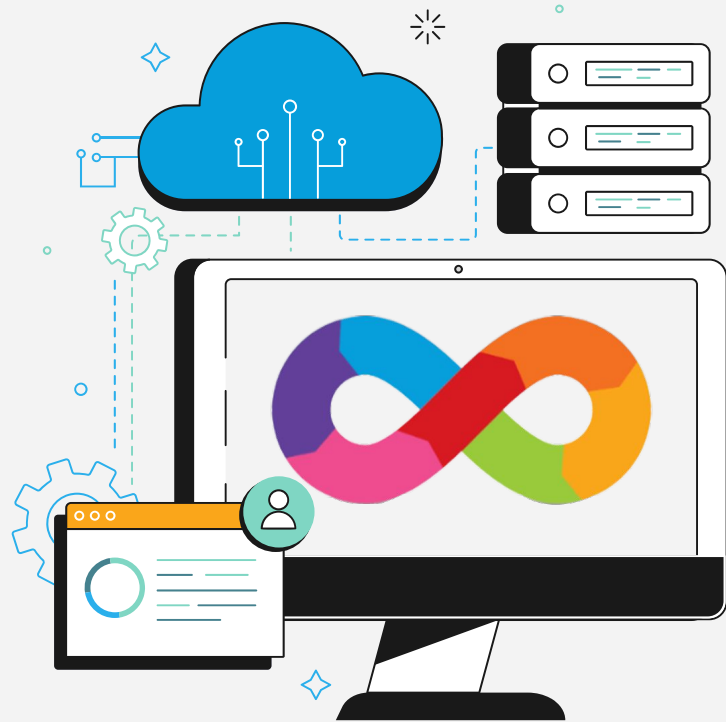


Introduction to DevOps

@ IBA - SMCS

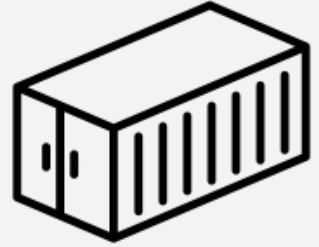
Week 03



Obaid ur Rehman
Software Architect / Engineering Manager @ Folio3

Agenda for this week

1. Container Orchestration
2. Kubernetes
3. MiniKube Hands on



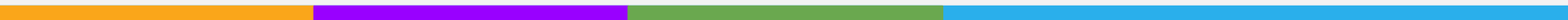
Recap

- Containers
- Docker Architecture
- Container and Image.
- Dockerfile, Docker compose, Volumes, Registry.
- Running containers on Cloud: General overview.
- Docker Alternatives

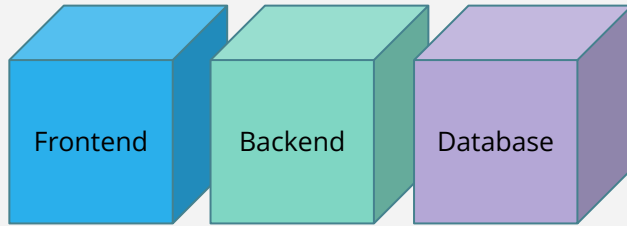


Container Orchestration

Container orchestration is a platform that automatically **provisions, deploys, scales**, and manages containerized applications without worrying about the underlying infrastructure.



Orchestration - A simple example



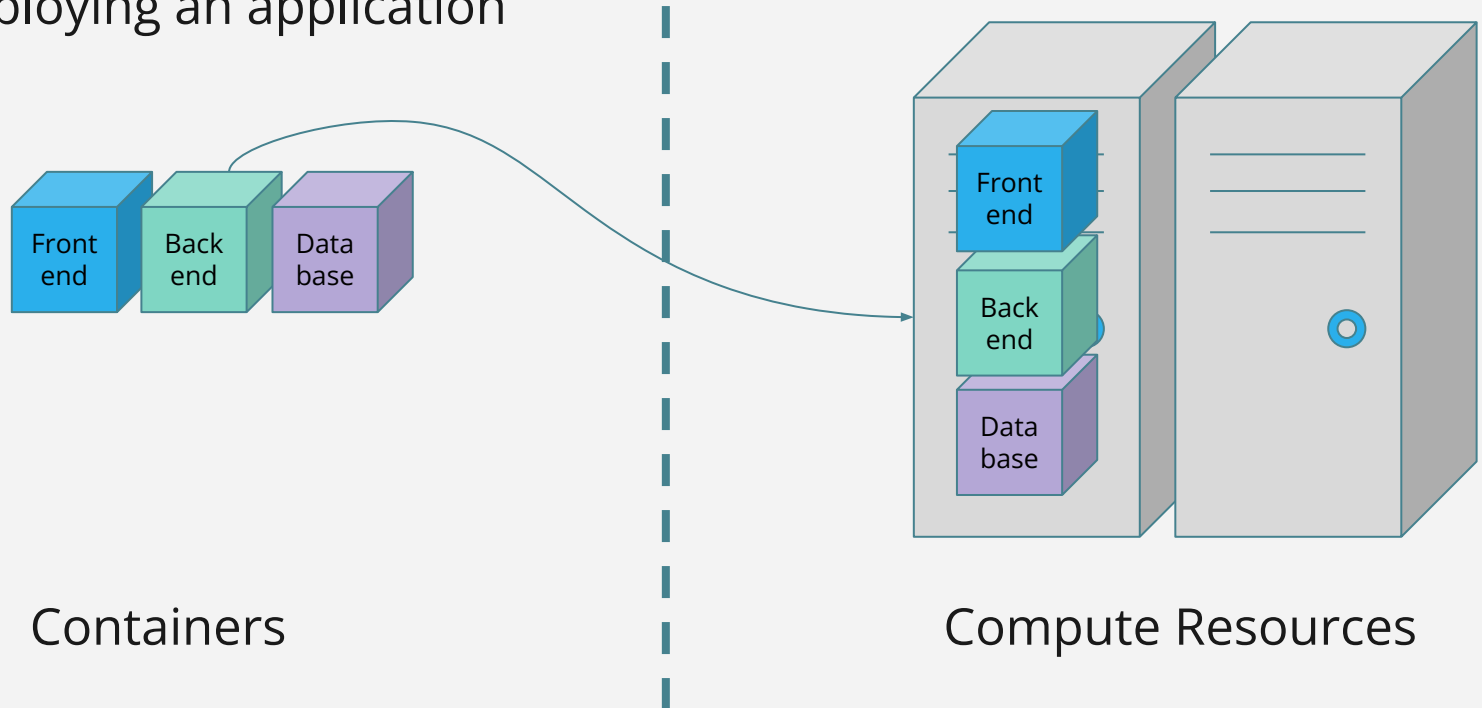
Containers



Compute Resources

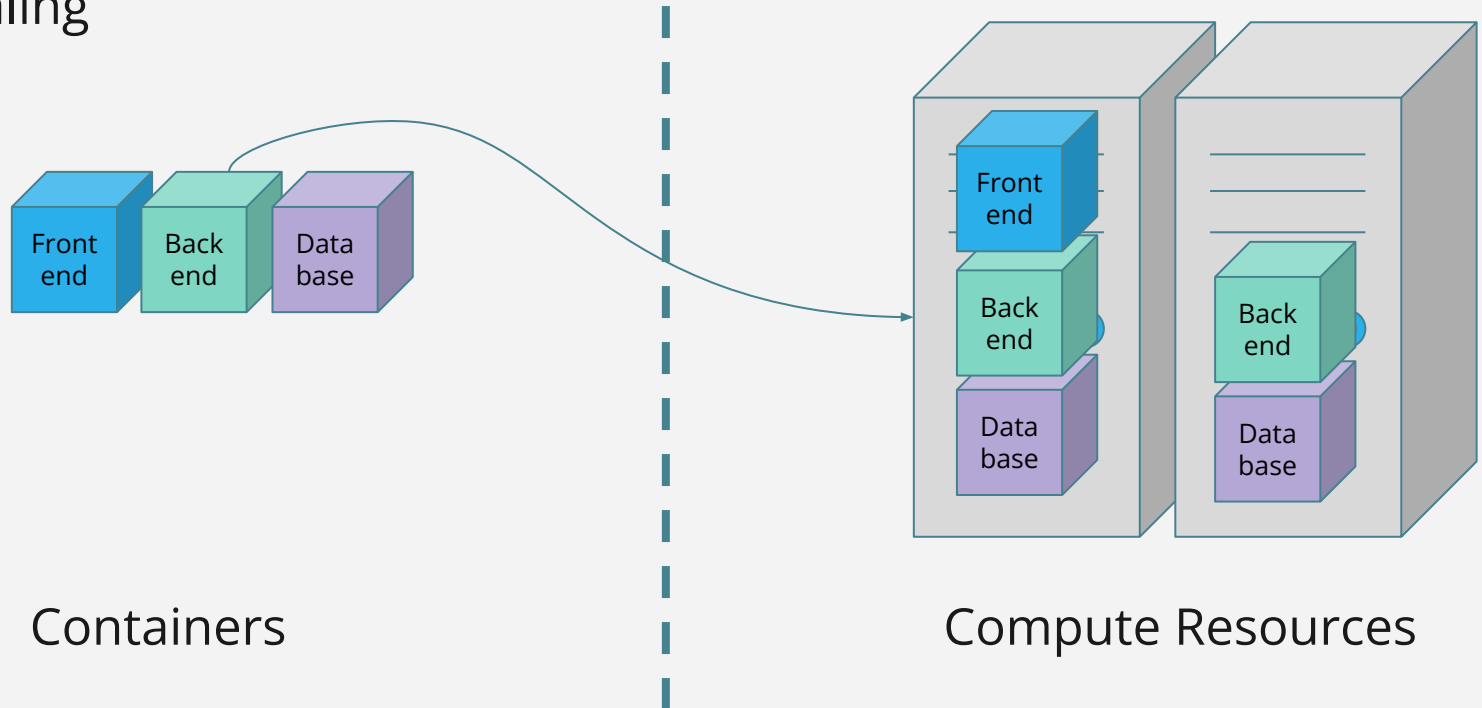
Orchestration – What does it do?

- Deploying an application



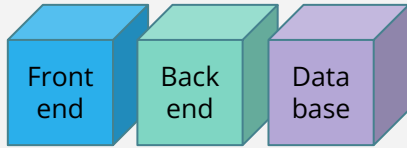
Orchestration - What does it do?

- Scaling

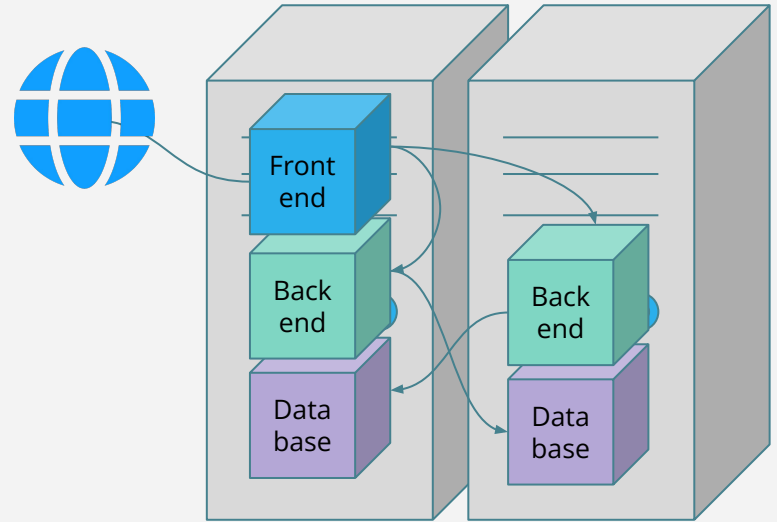


Orchestration – What does it do?

- Networking



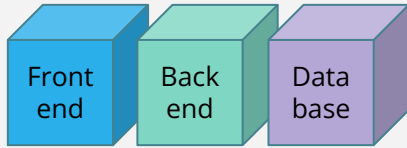
Containers



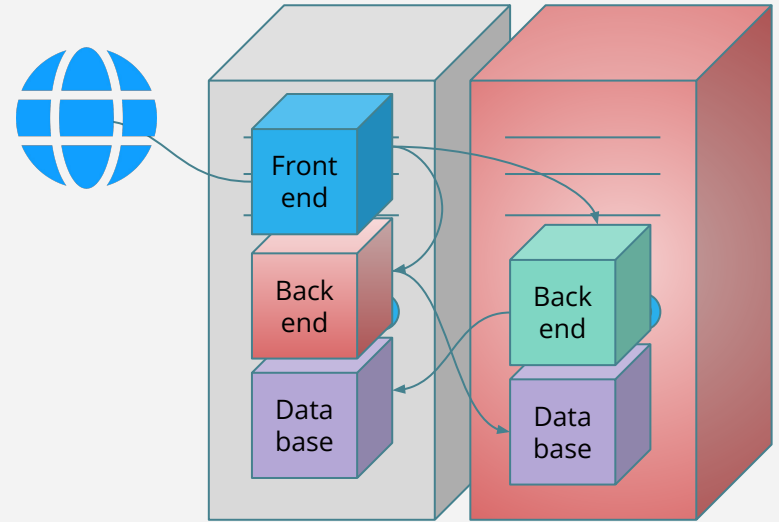
Compute Resources

Orchestration – What does it do?

- Recovery & Health Check



Containers



Compute Resources

Kubernetes

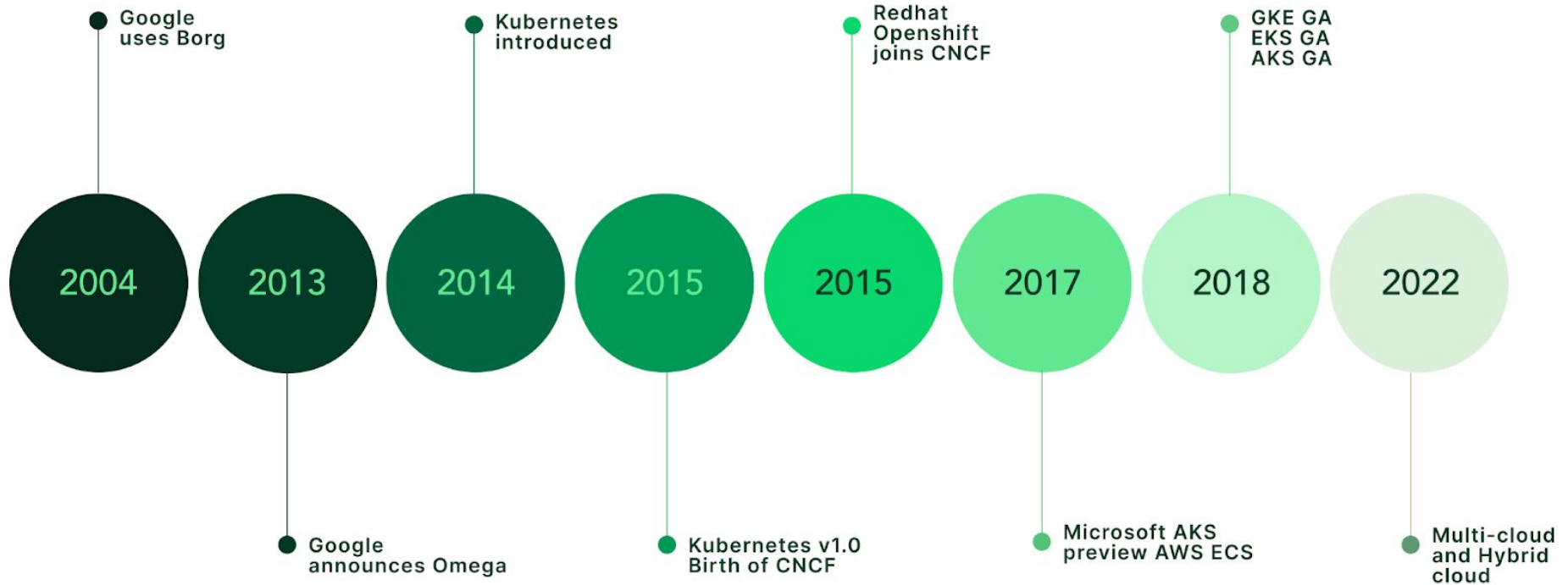
An open-source container orchestration system for automating software deployment, scaling, and management.

Originally designed by **Google**.

The name Kubernetes originates from Ancient Greek, meaning ***helmsman*** or pilot. Kubernetes is often abbreviated as **K8s**, counting the eight letters between the K and the s

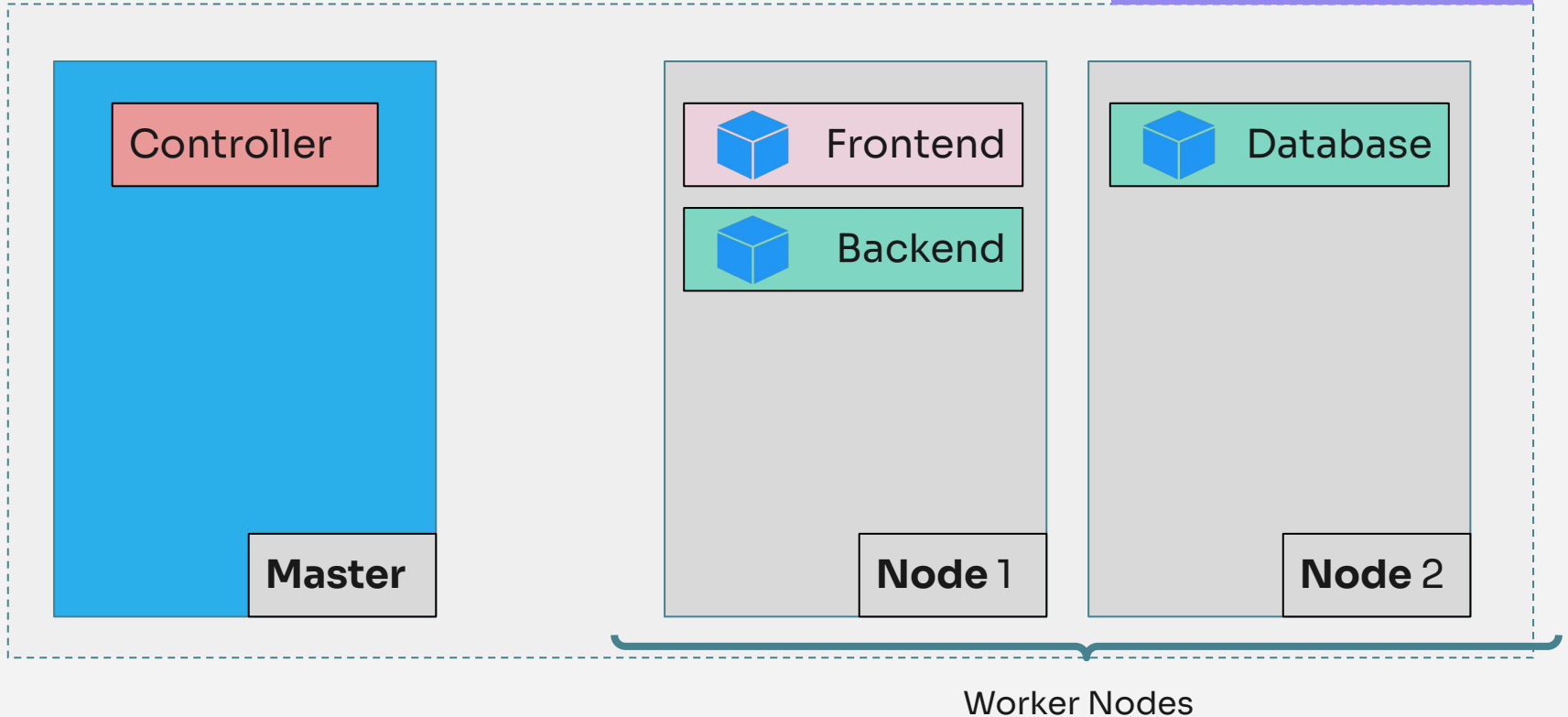


K8s - A brief History



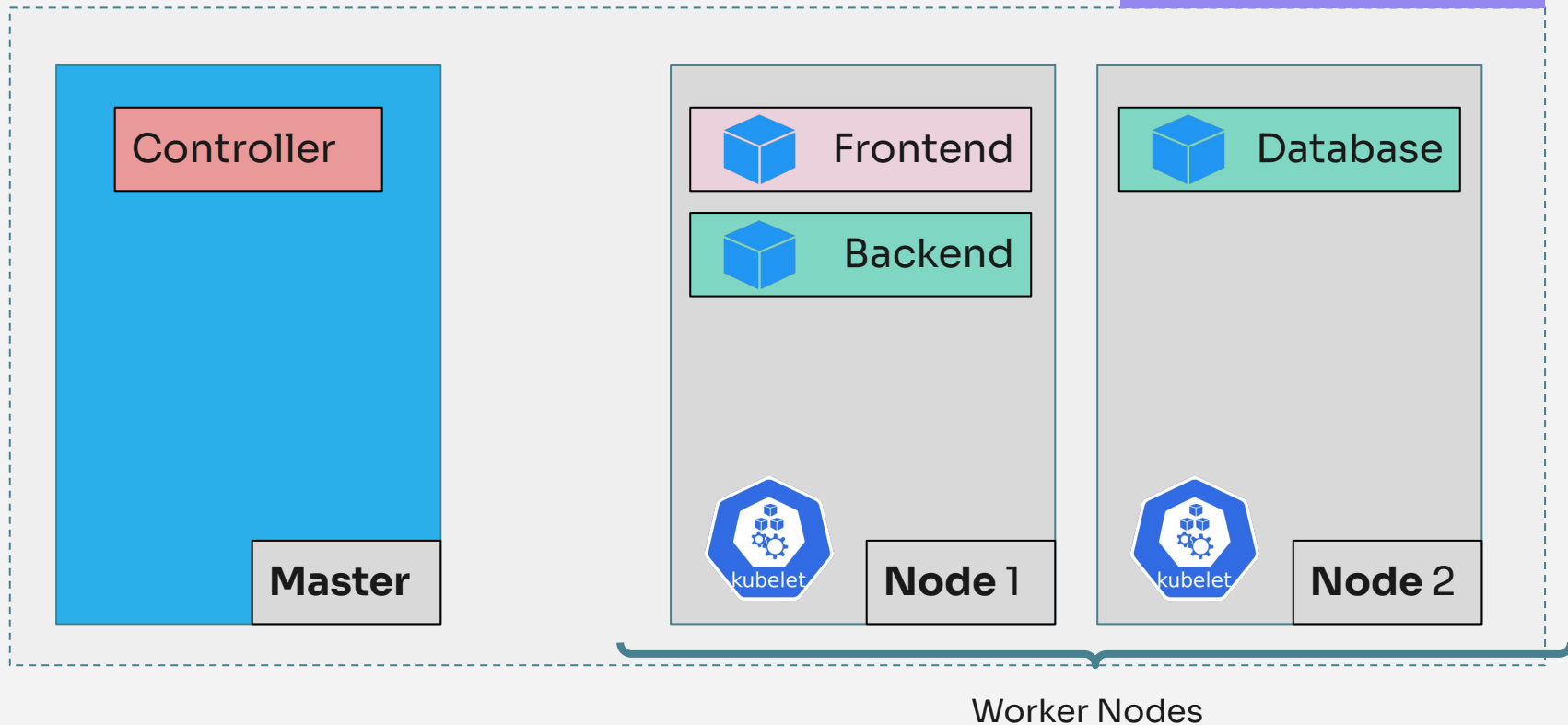
Kubernetes Architecture

Kubernetes Cluster



Worker Nodes - Kubelets

Kubernetes Cluster



Kubelet



Kubelet is a node-level agent that is in charge of executing pod requirements, managing resources, and guaranteeing cluster health. Kubelet is a cornerstone in managing both individual pods and the nodes that host them due to its involvement in pod execution, resource allocation, and health monitoring.

<https://kubernetes.io/docs/reference/command-line-tools-reference/kubelet/>

Whats on K8 Master Node(s)



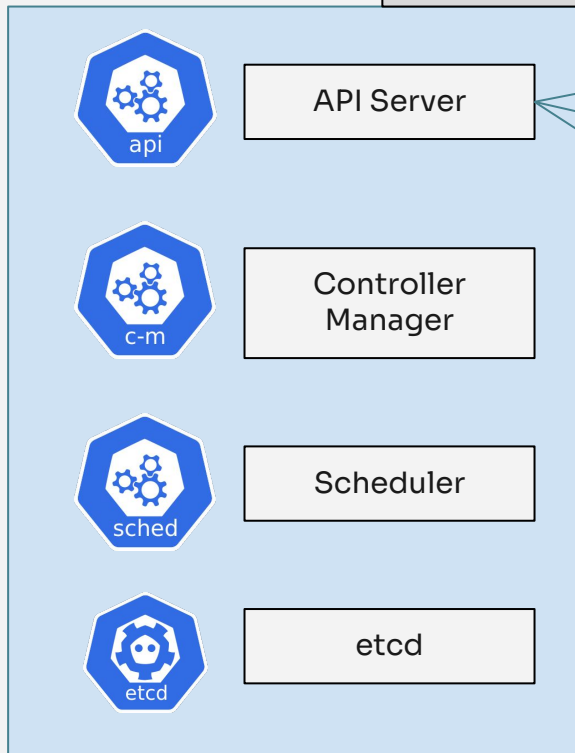
Master

API Server: Interface to the K8 Cluster.

CM: Keeps track of what going on the cluster.

Scheduler: Places containers on Nodes as per requirement.

etcd: Key value store where state of the cluster is stored.



API Server

Controller Manager

Scheduler

etcd

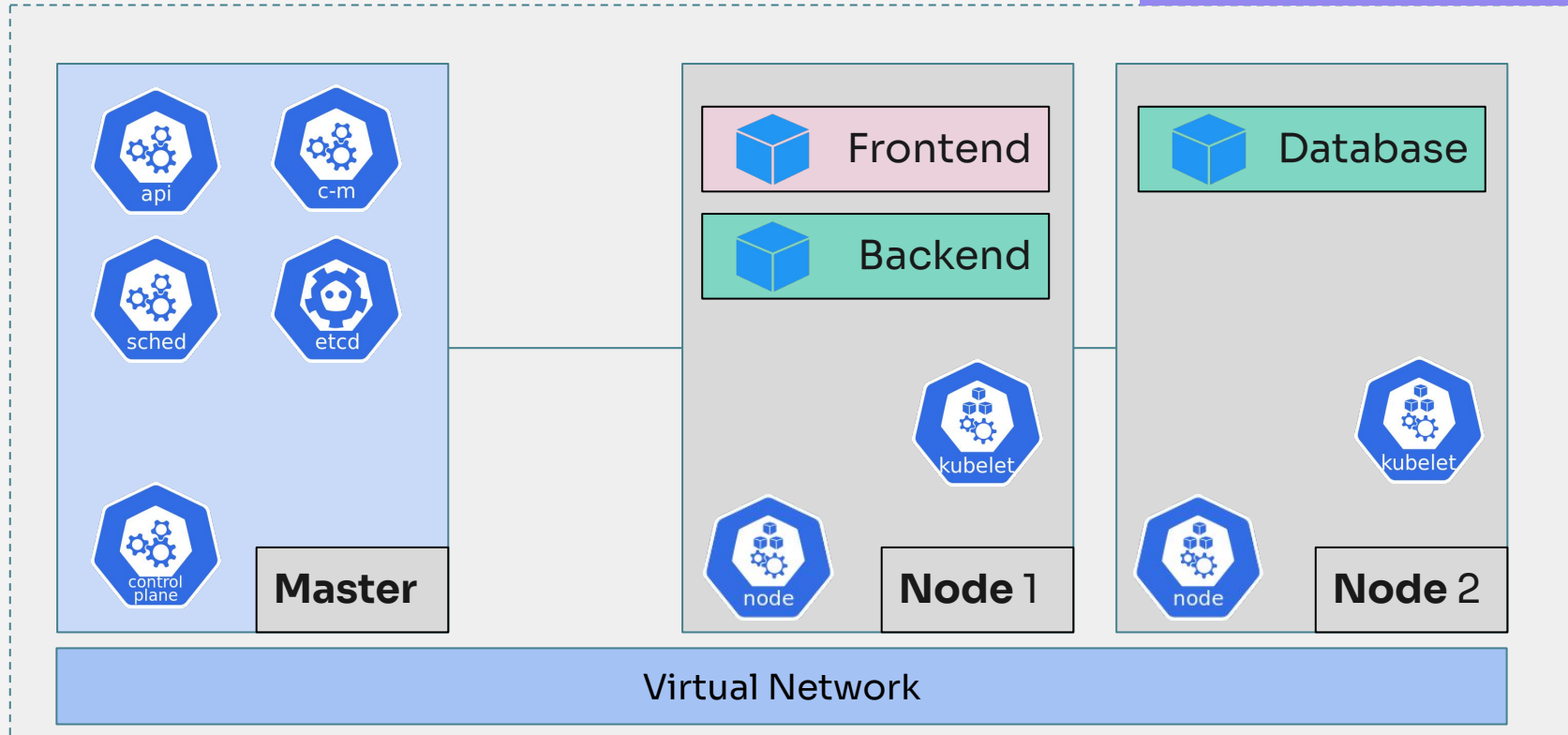
UI

CLI

API

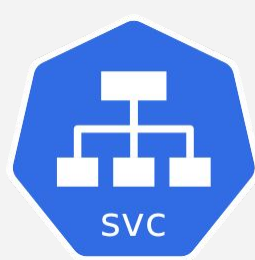
Master Node(s)

Kubernetes Cluster



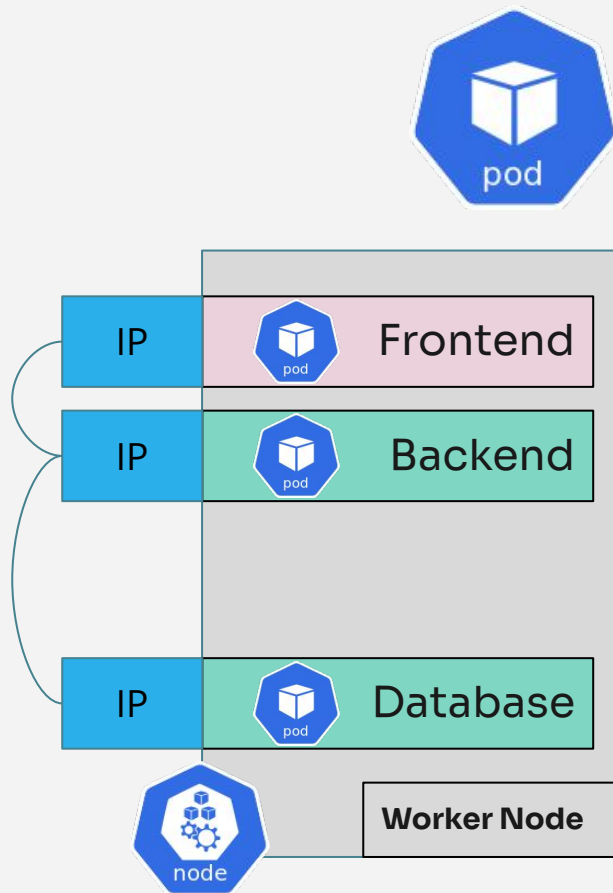
Some K8s components

1. Pod
2. Service
3. Ingress
4. Deployment
5. ConfigMap
6. Secret
7. StatefulSet
8. DaemonSet



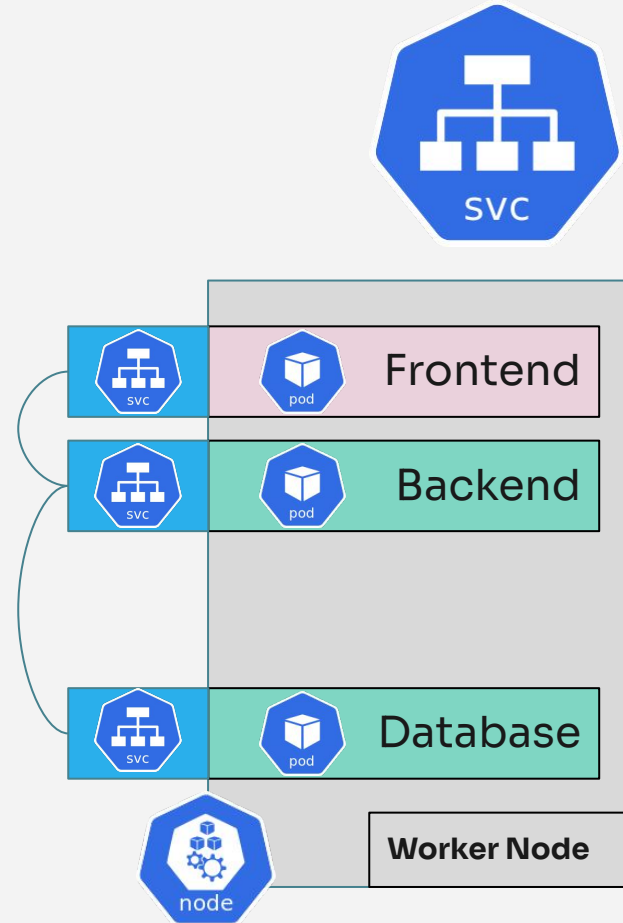
Pod

- Smallest unit in Kubernetes
- Abstraction over container
- Pods are ephemeral.
- 1 Pod per application.
- 1 Container per pod (but can be > 1 e.g: sidecar container)
- Each Pod has IP address.
- Pod can communicate with each other.



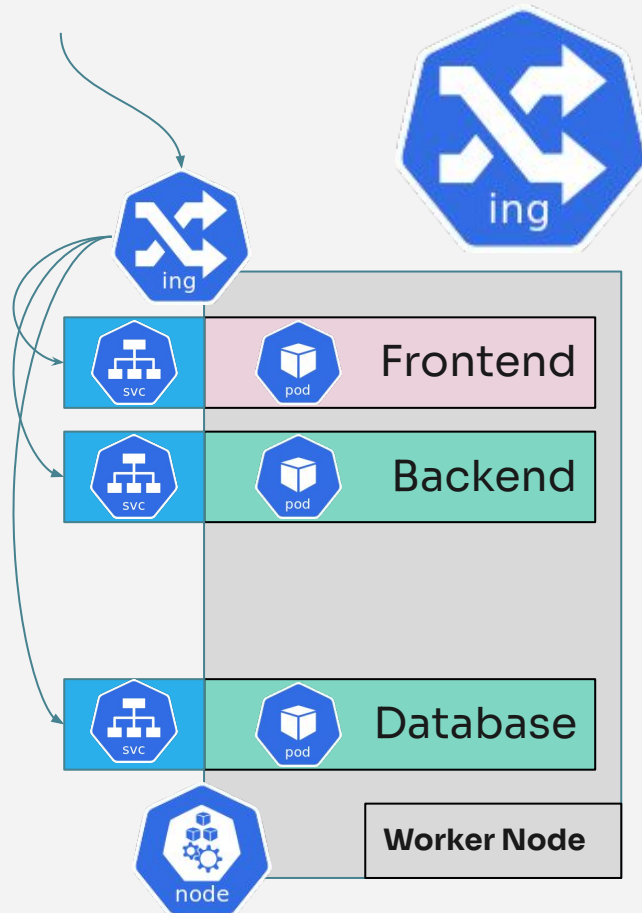
Service

- Permanent IP
- Independent of lifecycle of a Pod
- A method for exposing an application that is running as one or more Pods in your cluster to others.
- **External Service:** Accessible from outside world
- **Internal Service:** Only available within the cluster.
- Will also do load balancer
- 1 service can be connected to multiple pods.



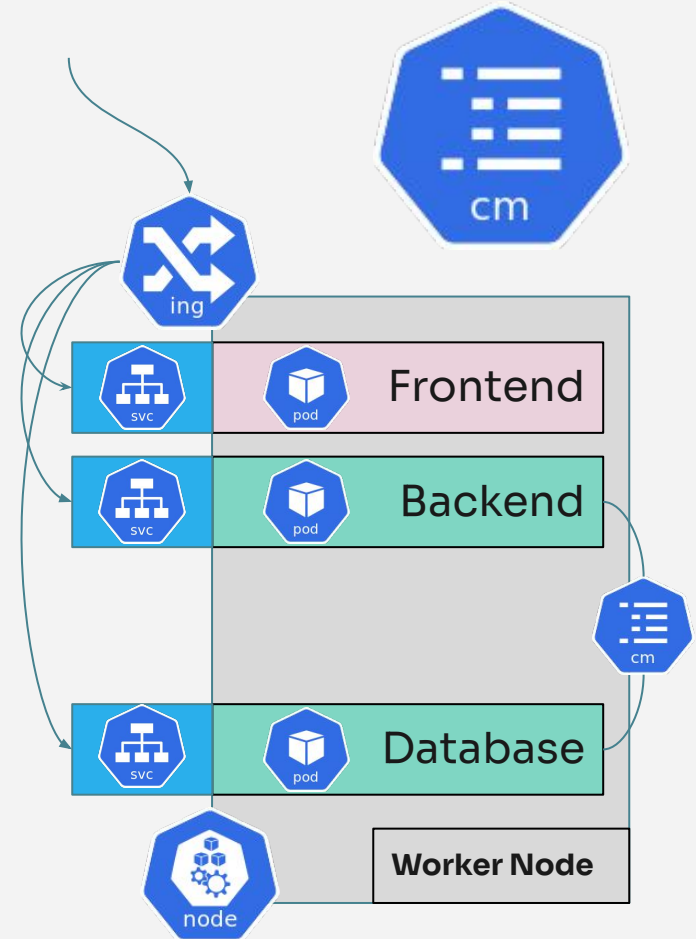
Ingress

- An external service might expose the URL to frontend like this:
<http://200.35.32.24:8080>
- An ingress will route external request to services based on config. May provide load balancing, SSL termination and name-based virtual hosting.
<http://my-super-app.com/>



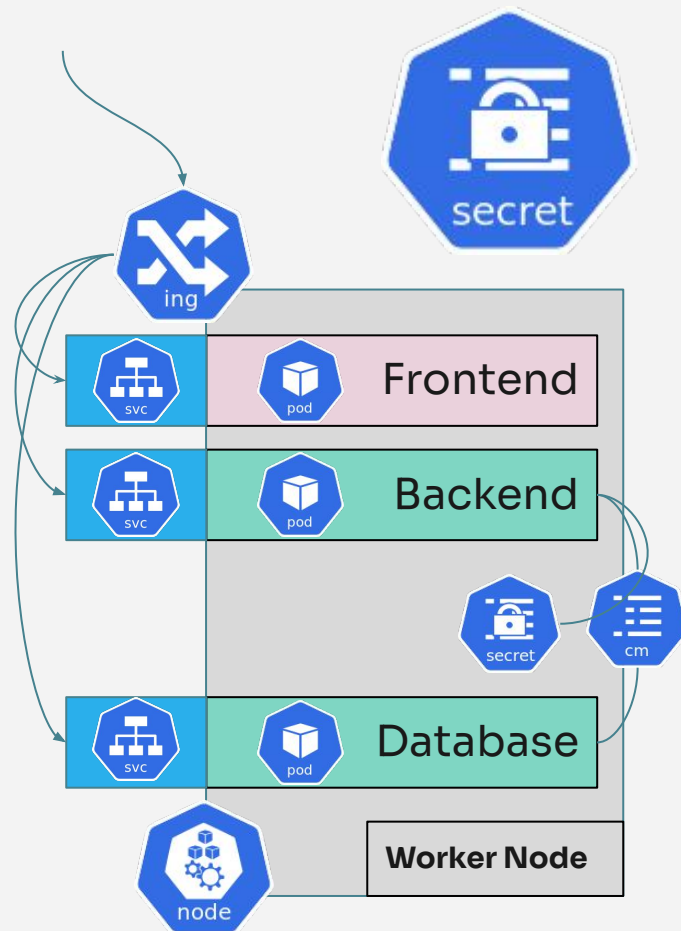
Config Maps

- Your application configuration.
- Like username/password for your database that is needed by the backend.



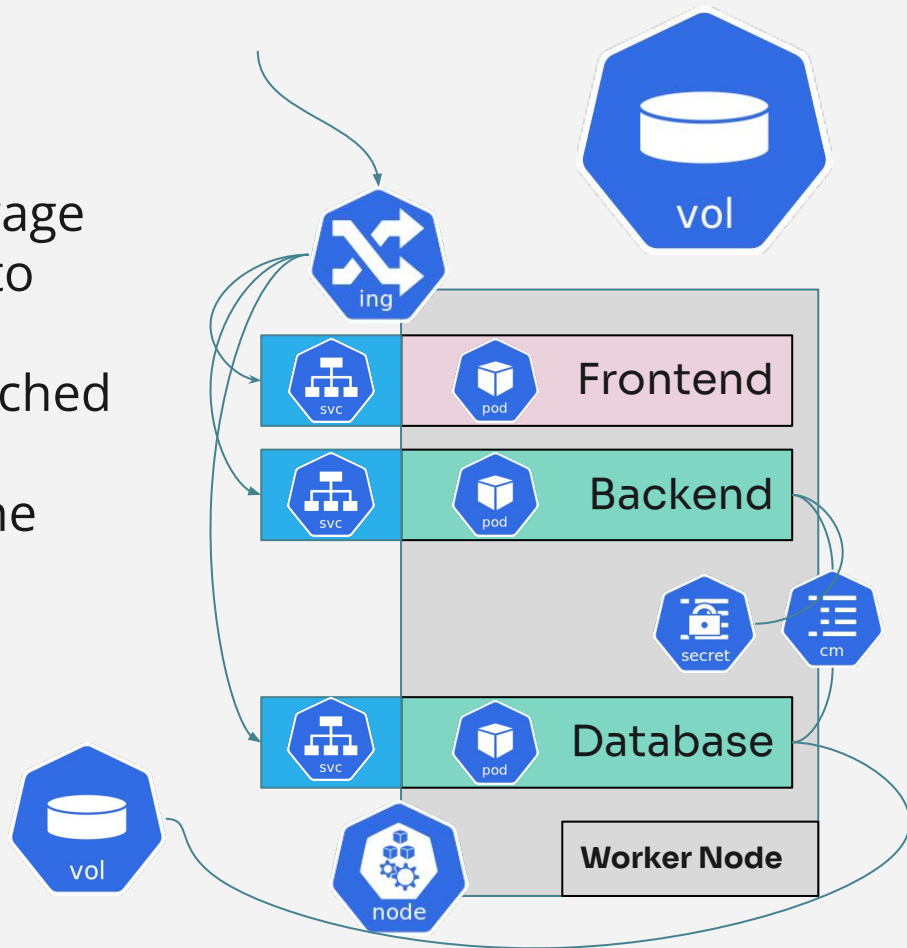
Secrets

- Used to store application secrets.
- Base64 encoded.
- Can use other 3rd-party tools to encrypt the secrets.

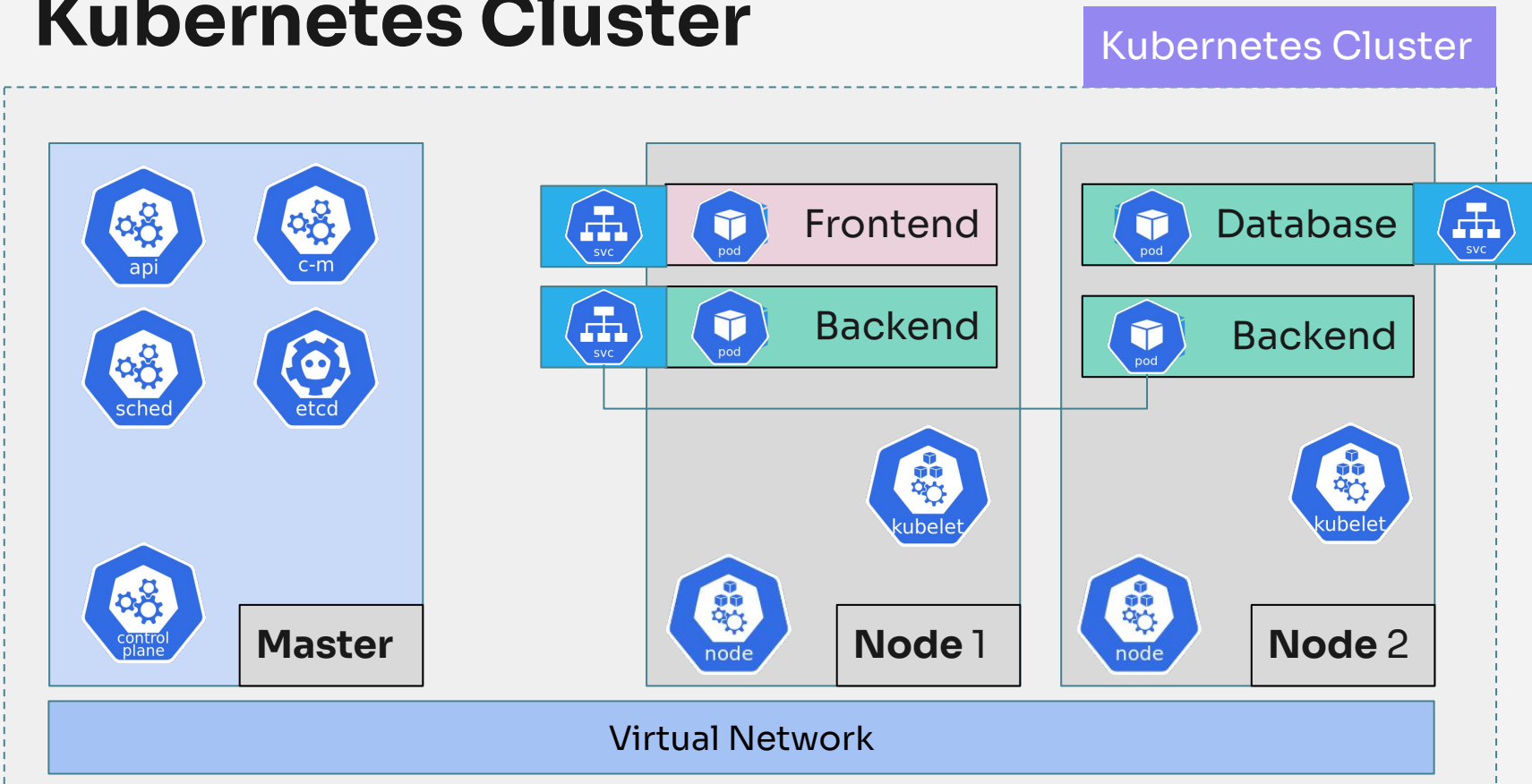


Volumes

- Can be a physical / cloud storage that is mounted or attached to Pod.
- Think of it a disk/storage attached to a cluster.
- K8s itself does not manage the volume, its backup etc.



Kubernetes Cluster



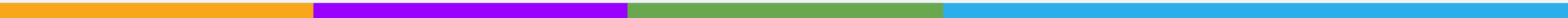
Deployment



- You will not create Pods
- You will create deployments.
- It's a blueprint for creating pods.
- You define the image, no of pods etc in deployment.
- For **Stateless** Apps

Zero down-time in Kubernetes

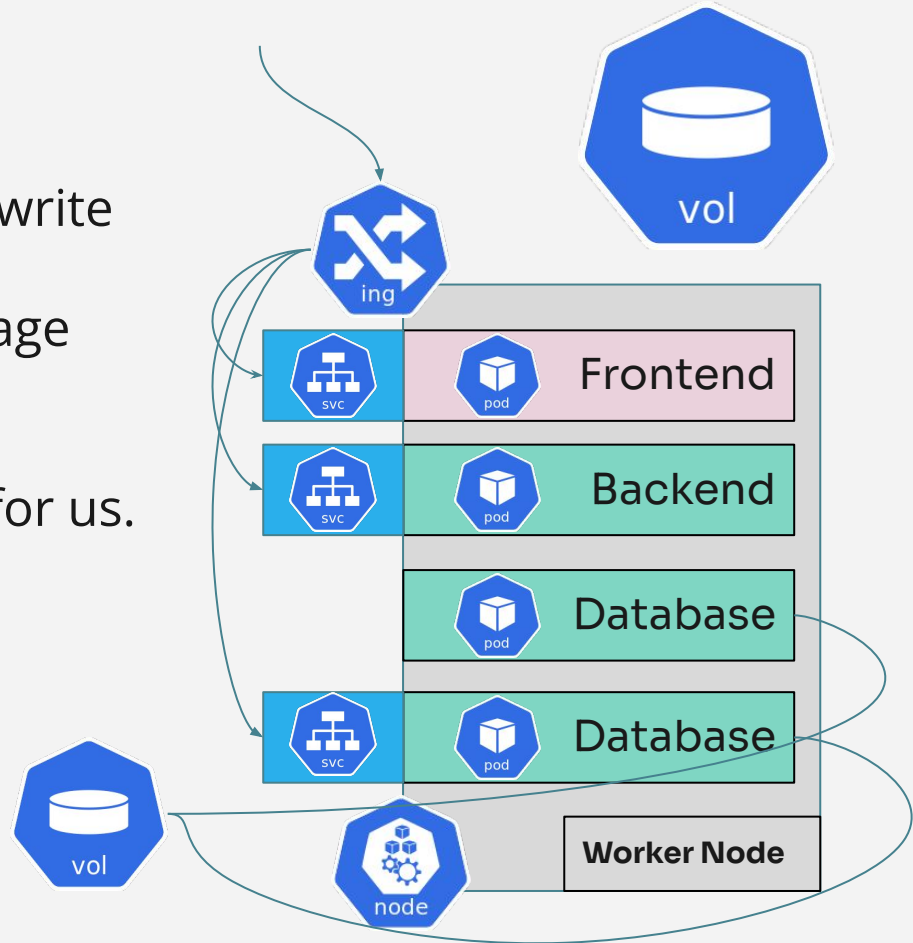
How?



Stateful sets

- Multiple Database pods that write to same storage.
- Its stateful. Will need to manage read and write to avoid data inconsistency.
- Stateful set will manage this for us.

<https://kubernetes.io/docs/tutorials/stateful-application/basic-stateful-set/>



A typical Production Level k8 Cluster

- 8 worker nodes
- 2 master nodes
- Each node: an EC2 machine.



minikube

Minikube is local Kubernetes, focusing on making it easy to learn and develop for Kubernetes.

[minikube start](#)

Minikube & KubeCtl

- Runs master and worker nodes on a single node.
- **KubeCtl**: The command line for kubernetes.

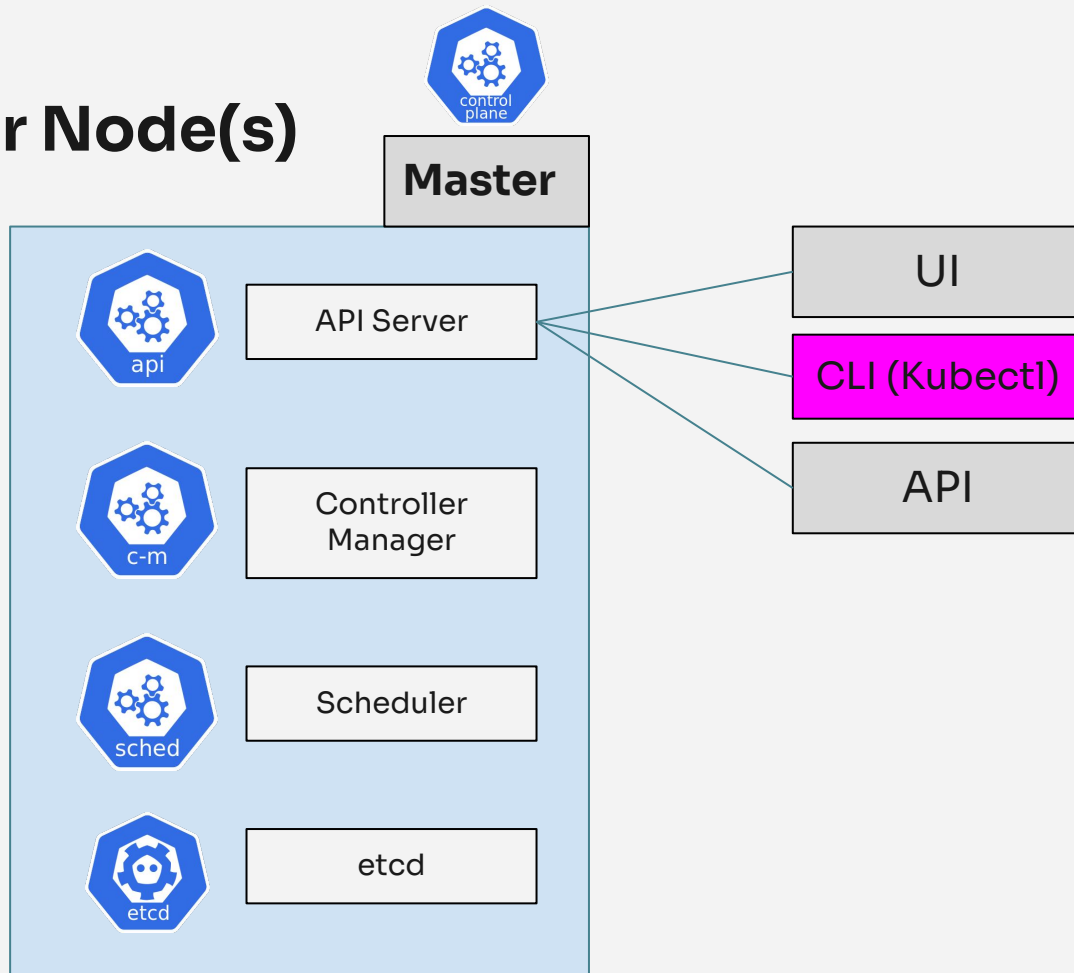
Whats on K8 Master Node(s)

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End of Week 3

Q&A

