Kubernetes 101

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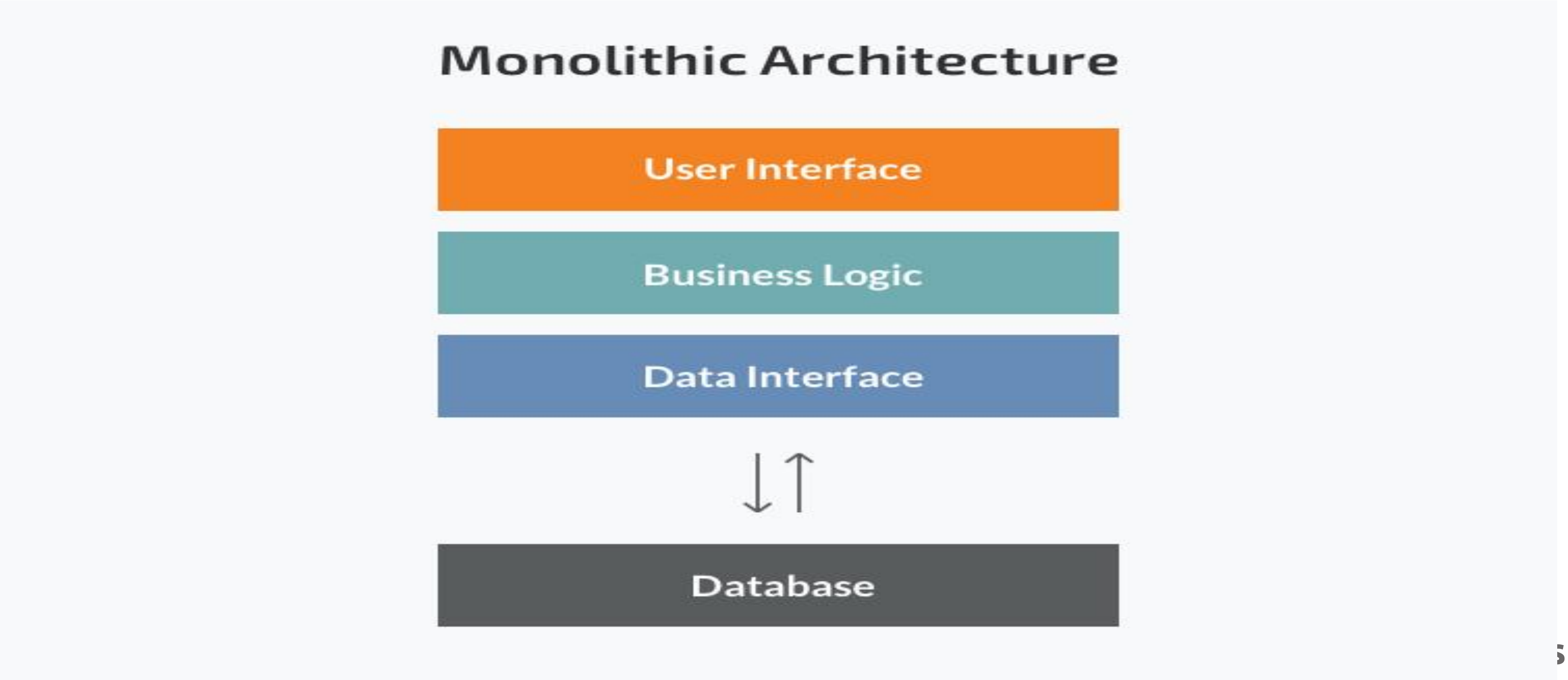
Monolithic application



Monolithic Architecture

User Interface

Business Logic

Data Interface

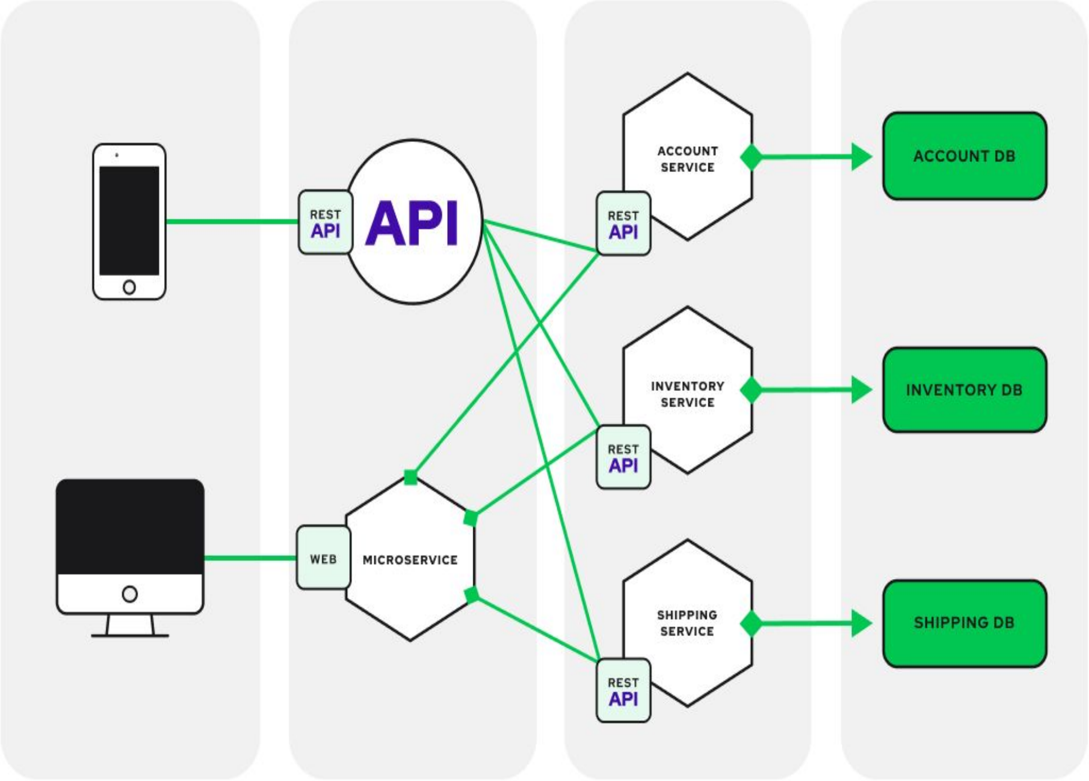
Database

Drawbacks of Monolithic application

- Redeploy the entire application on each update.
- Not flexible and impossible to adopt new tech, languages and frameworks.
- One bug or issue can affect the whole system.
- Due to tight dependency, monolithic applications can run into downtime difficulties.
- High Cost.
- Testing becomes harder.

Microservices & its Advantages

- Can scale easily depending on the needs.
- Changes can easily be deployed they don’t impact other stack
- Cost effective.
- Easier Testing
- Improved Fault tolerance.
- Easily adopt the latest emerging technology.



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Containers

- Containers are similar to but not the same thing as virtual machines (VMs).
- One of the primary differences is that containers are isolated or abstracted away from the underlying operating system and infrastructure that they run on.
- In the simplest terms, a container includes both an application's code and everything that code needs to run properly.

Container Orchestration

A container orchestration is an automation to manage the container workloads and services. There are many aspects that needs to be managed throughout a container's lifecycle, including:

- Updates with no downtime
- Deployment
- Scaling (up and down)
- Self healing of the containers
- Providing security
- Availability
- Reliability

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Kubernetes

- Kubernetes is a container orchestrator. It is an open source platform. It was released by Google in mid 2014. Now kubernetes is CNCF's graduating project.
- It automates the process of scheduling, scaling, load balancing, fault tolerance, deployment, rollouts, and rollbacks, etc. of the containerized application.
- It is highly extensible and portable. By using several plugins, it offers networking and security.

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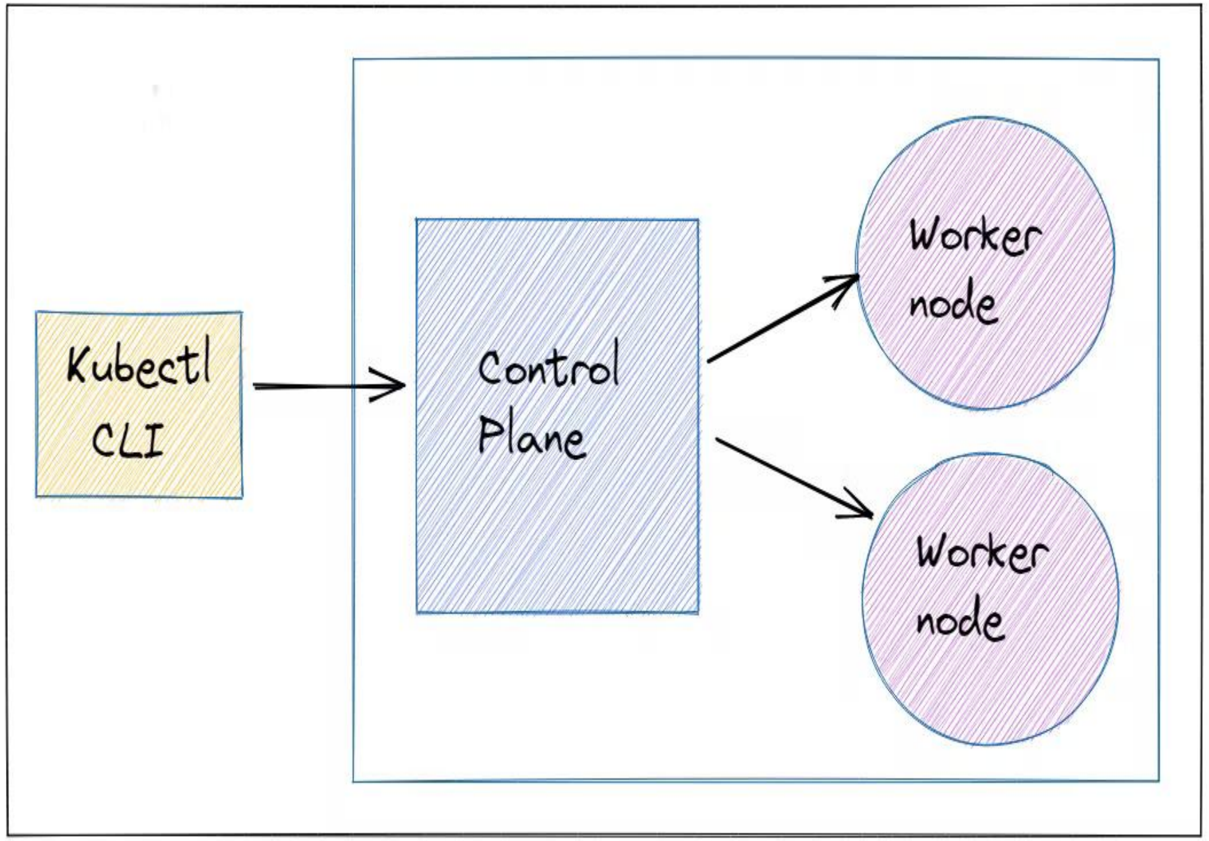
Components of Kubernetes

Cluster: A cluster is created when we deploy kubernetes. Control plane and worker node are present in cluster.

- **Worker Node**: It is similar to server or VM. It is where our application is running.

- **Control Plane**: It is incharge of controlling worker nodes.



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Kubectl

It is a command Line tool for Kubernetes. Kubectl communicates with the control plane. It may interact in one of two ways:

- **Declarative way**: By writing the manifest(yaml) files.
- **Imperative way**: Through specific commands in terminal.

NOTE: The best practise is to use declarative way rather than writing everything out repeatedly.

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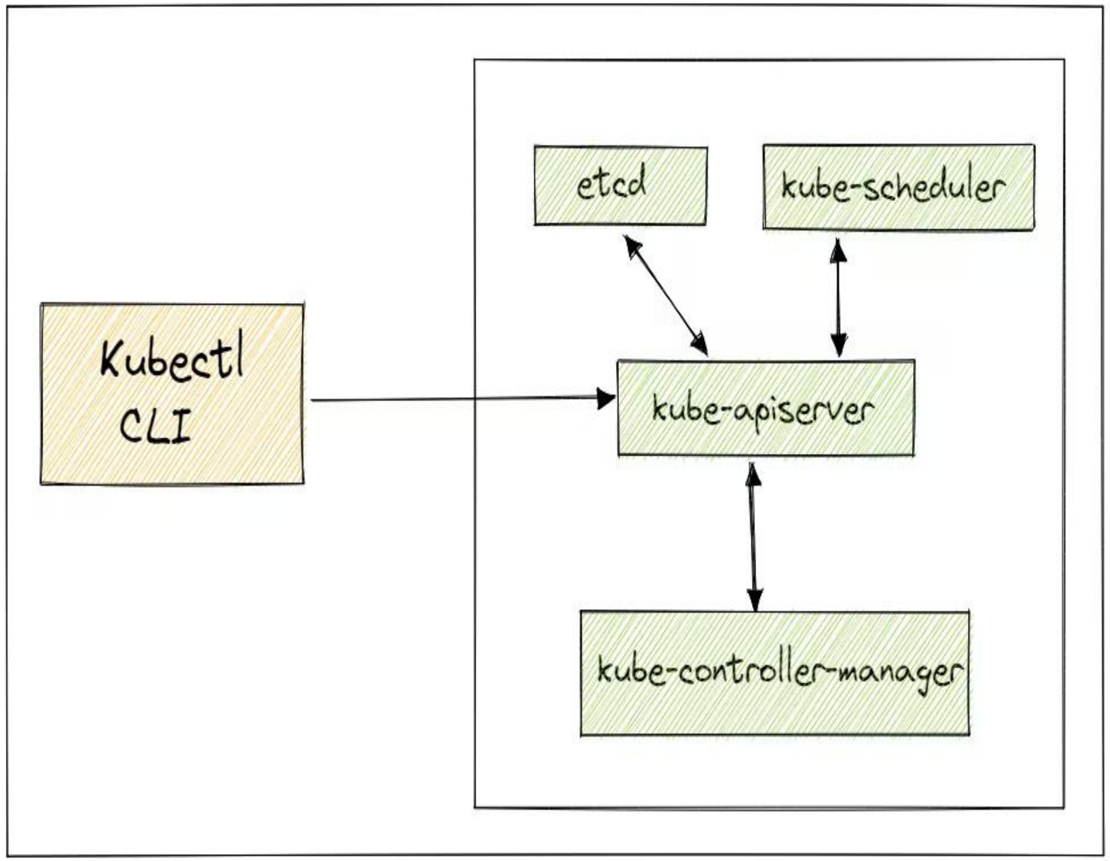
Control Plane Components

Kube-apiserver: All communications happen via API server using kubectl.

etcd: It is the central database used to store all the cluster data.

kube-scheduler: It is kubernetes scheduler which assignees pods to nodes.

kube-controller-manager: This manages various controllers. These are control-loops that tries to move the current state closer to the desired state of the cluster.



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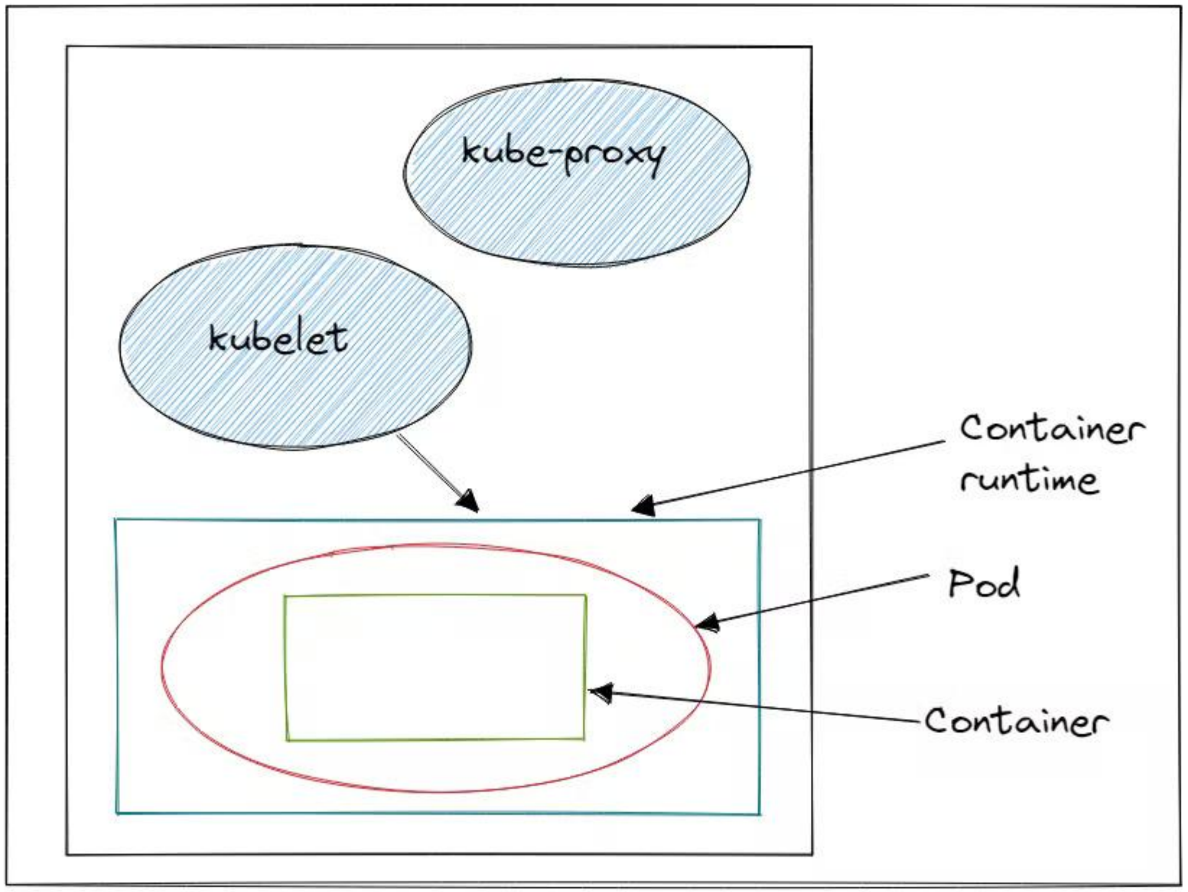
Worker Node Components

Kubelet: It runs on every node in the cluster and check whether pod's container are active and in good condition.

Container Runtime: It is responsible for running the containers. K8s supports container runtime such as containerd, CRI-O, etc.

kube-proxy: It is a network-proxy that runs on each node and allow communication of pod from inside and outside of the cluster.



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Pods

Pods are the fundamental component of kubernetes. Our containers run within the pod.

Pods have:

- a unique IP address (which allows them to communicate with each other)
- persistent storage volumes (as required)
- configuration information that determine how a container should run.

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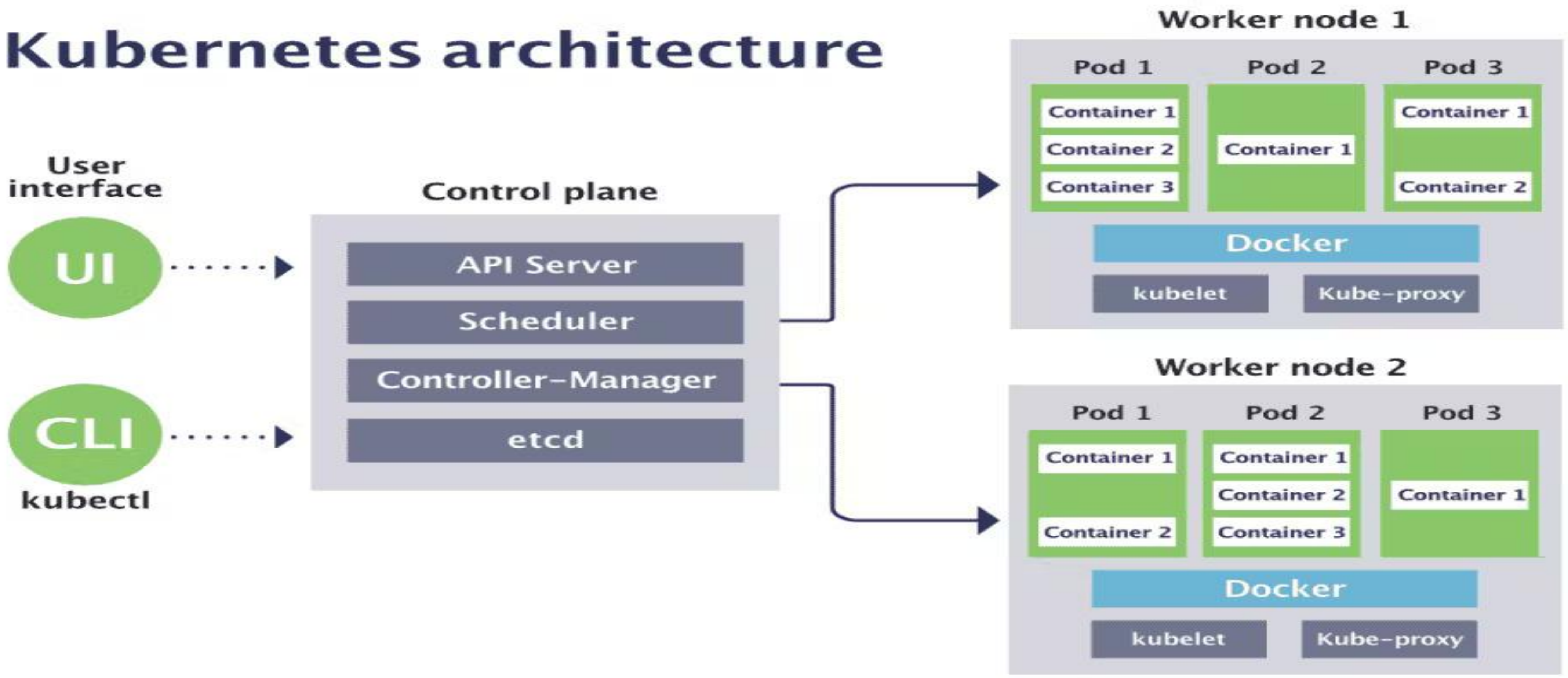
Complete Architecture

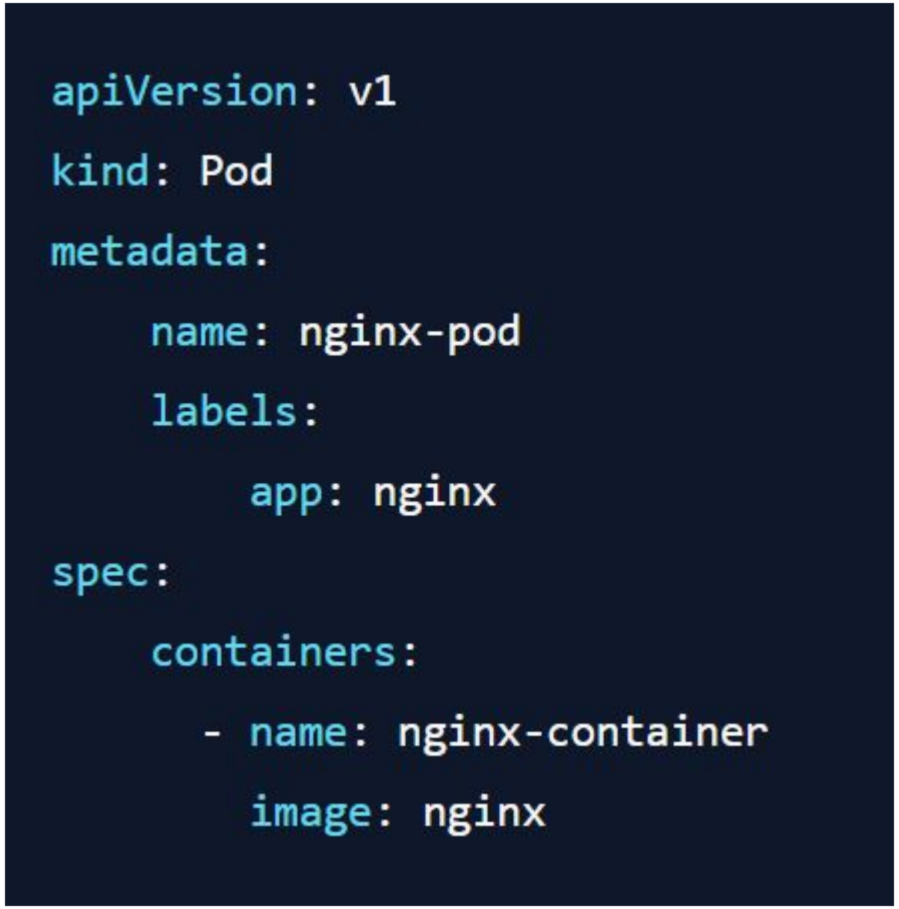


Installation

- Minikube
- Kubeadm
- Cloud Providers: GKE, AKS, EKS, etc.
- Playgrounds: Play with Kubernetes, Killerkoda

Kubernetes Manifest File

- This file include all the necessary information, about the sort of object we wish to build and the tasks we want it to perform.
- The manifest files can be written in declarative languages like **YAML** or **JSON.**
- Blog to learn the full format of the Kubernetes manifest file.



```
apiVersion: v1
kind: Pod
metadata:
    name: nginx-pod
    labels:
        app: nginx
spec:
    containers:
      - name: nginx-container
        image: nginx
```

Additional Resources

- Kubernetes tutorials, Hands on Practice:
  https://www.youtube.com/watch?v=PN3VqbZqmD8&t=358s
  https://kubernetes.io/docs/tutorials/
  https://www.youtube.com/watch?v=X48VuDVv0do&t=102s

- Contribution guide:
  https://www.youtube.com/watch?v=FgsXbHBRYIc
  https://www.youtube.com/watch?v=L1GwDvqR5H4

Thank You!

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