

Kubernetes

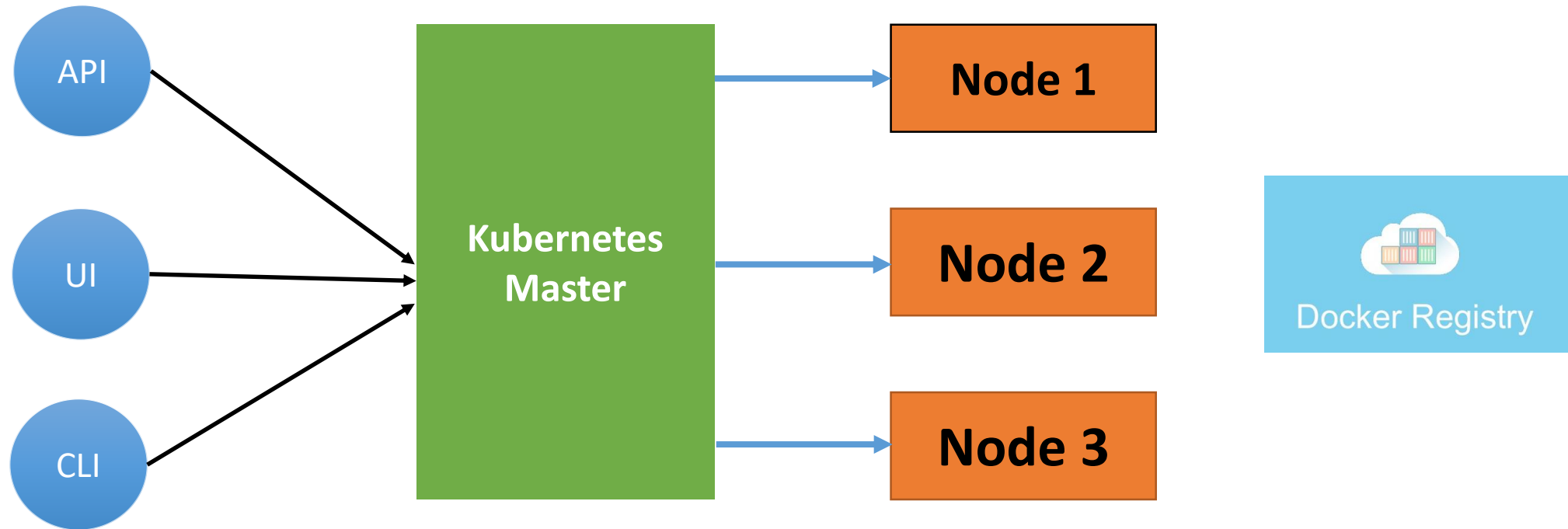


What is Kubernetes

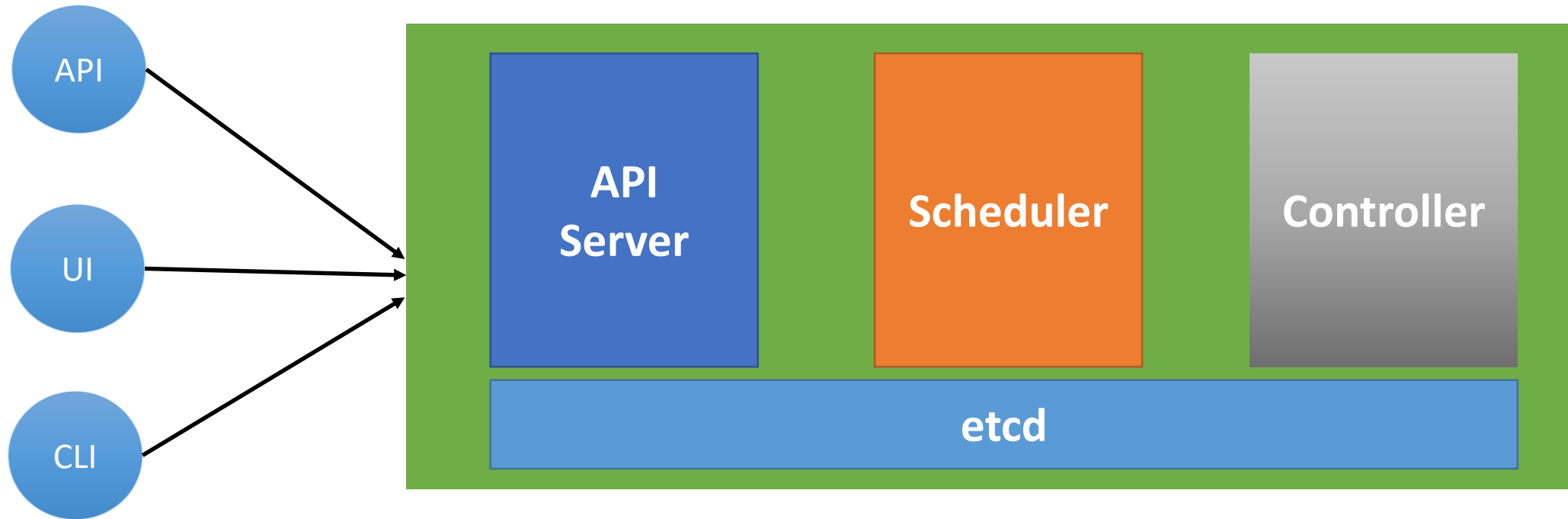
- Kubernetes is inspired from an internal Google project called Borg.
- Open source project managed by Linux Foundation.
- Unified API for deploying web applications, batch jobs, and databases.
- Decouples applications from machines through containers.
- Declarative approach to deploying applications.
- Maintains and tracks the global view of the cluster.
- APIs for deployment workflows.



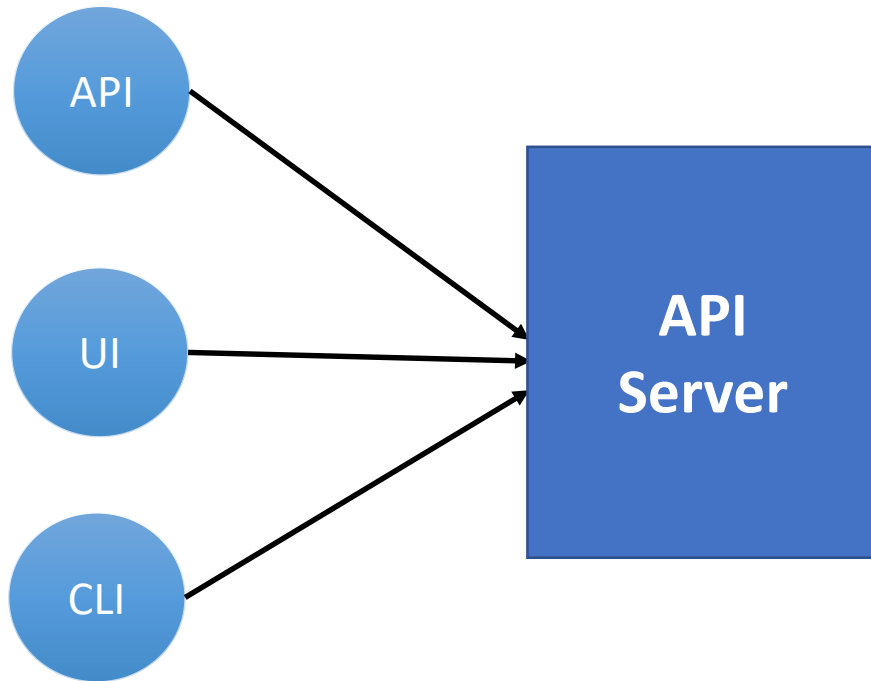
Kubernetes Architecture



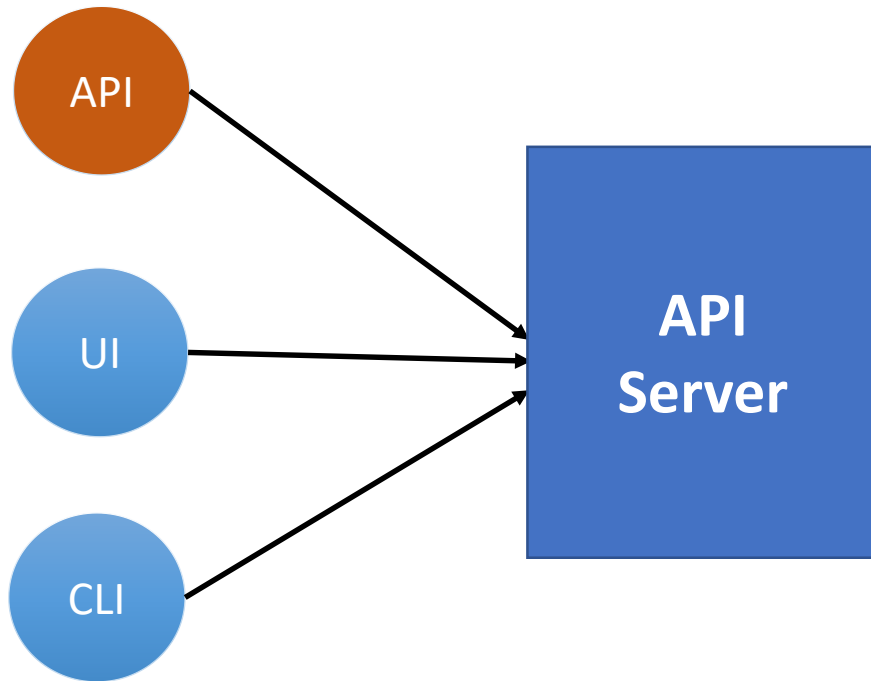
Kubernetes Master



Kubernetes Master –API Server



Kubernetes Master –API Server



You can reach to API Server over API's.

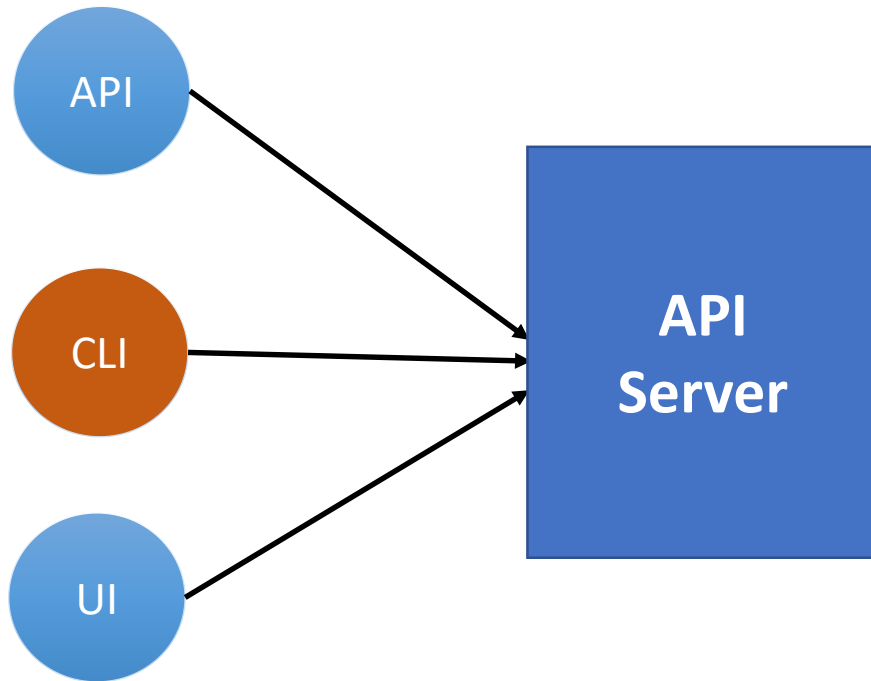
You can use different clients like curl, python, ruby..

Curl Example

```
[root@kube-master ~]# curl http://localhost:8080/api
{
  "kind": "APIVersions",
  "versions": [
    "v1"
  ],
  "serverAddressByClientCIDRs": [
    {
      "clientCIDR": "0.0.0.0/0",
      "serverAddress": "10.142.0.4:6443"
    }
  ]
}
```

Kubernetes Master –API Server

You can reach to API Server over CLI (kubectl)

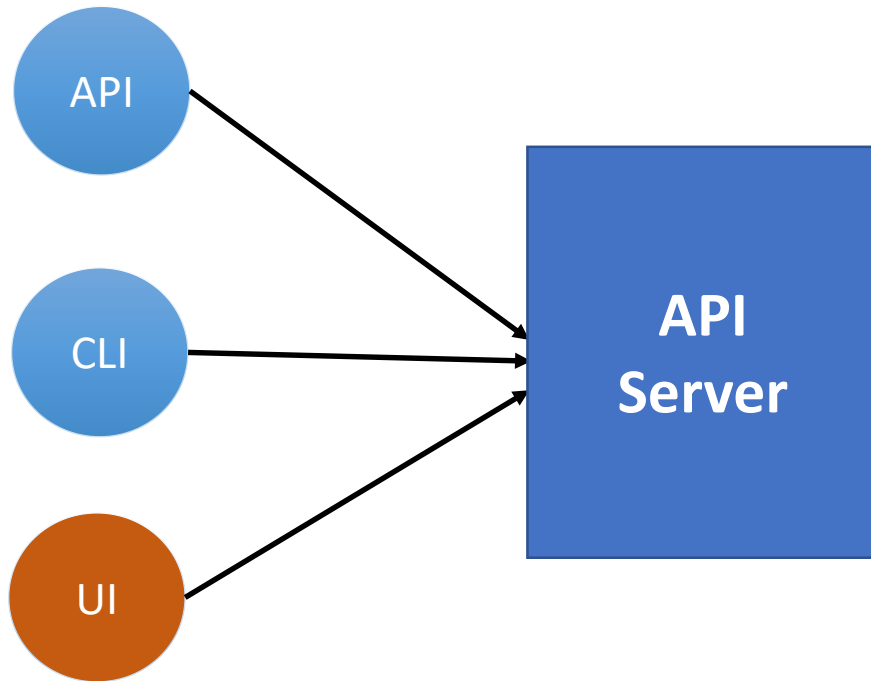


```
[root@kube-master ~]# mkdir -p $HOME/.kube
[root@kube-master ~]# sudo cp -f /etc/kubernetes/admin.conf $HOME/.kube/config
[root@kube-master ~]# sudo chown $(id -u):$(id -g) $HOME/.kube/config
[root@kube-master ~]# kubectl get nodes
```

NAME	STATUS	ROLES	AGE	VERSION
kube-master	Ready	master	1h	v1.10.1
kube-node01	Ready	node	1h	v1.10.1

```
[root@kube-master ~]#
```

Kubernetes Master –API Server



You can also access kubernetes cluster over web browser for ease of access.

You have different WEB-UI clients to manage kubernetes cluster.

1. Kubernetes Dashboard (Default)
2. Cockpit
3. Kubernetetic
4.

Kubernetes Master - Scheduler



Scheduler

The Kubernetes scheduler is in charge of scheduling pods onto nodes. Basically it works like this:

1. You create a pod
2. The scheduler notices that the new pod you created doesn't have a node assigned to it
3. The scheduler assigns a node to the pod

It's not responsible for actually running the pod – that's the kubelet's job. So it basically just needs to make sure every pod has a node assigned to it.



Kubernetes Master - Controller



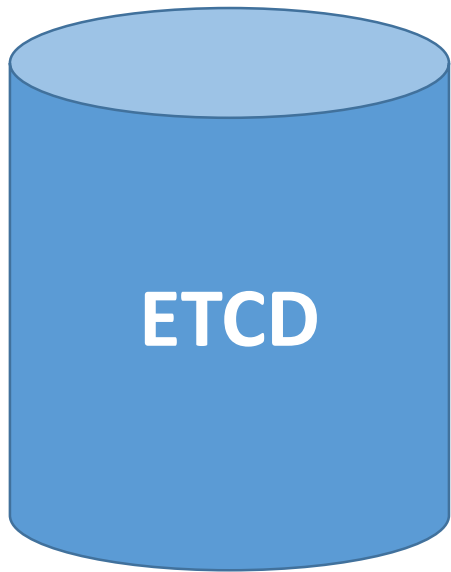
Controller

Known as the "kube-controller manager," this runs all the controllers that handle routine tasks in the cluster.

These include the Node Controller, Replication Controller, Endpoints Controller, and Service Account and Token Controllers.

Each of these controllers works separately to maintain the desired state.

Kubernetes Master - ETCD



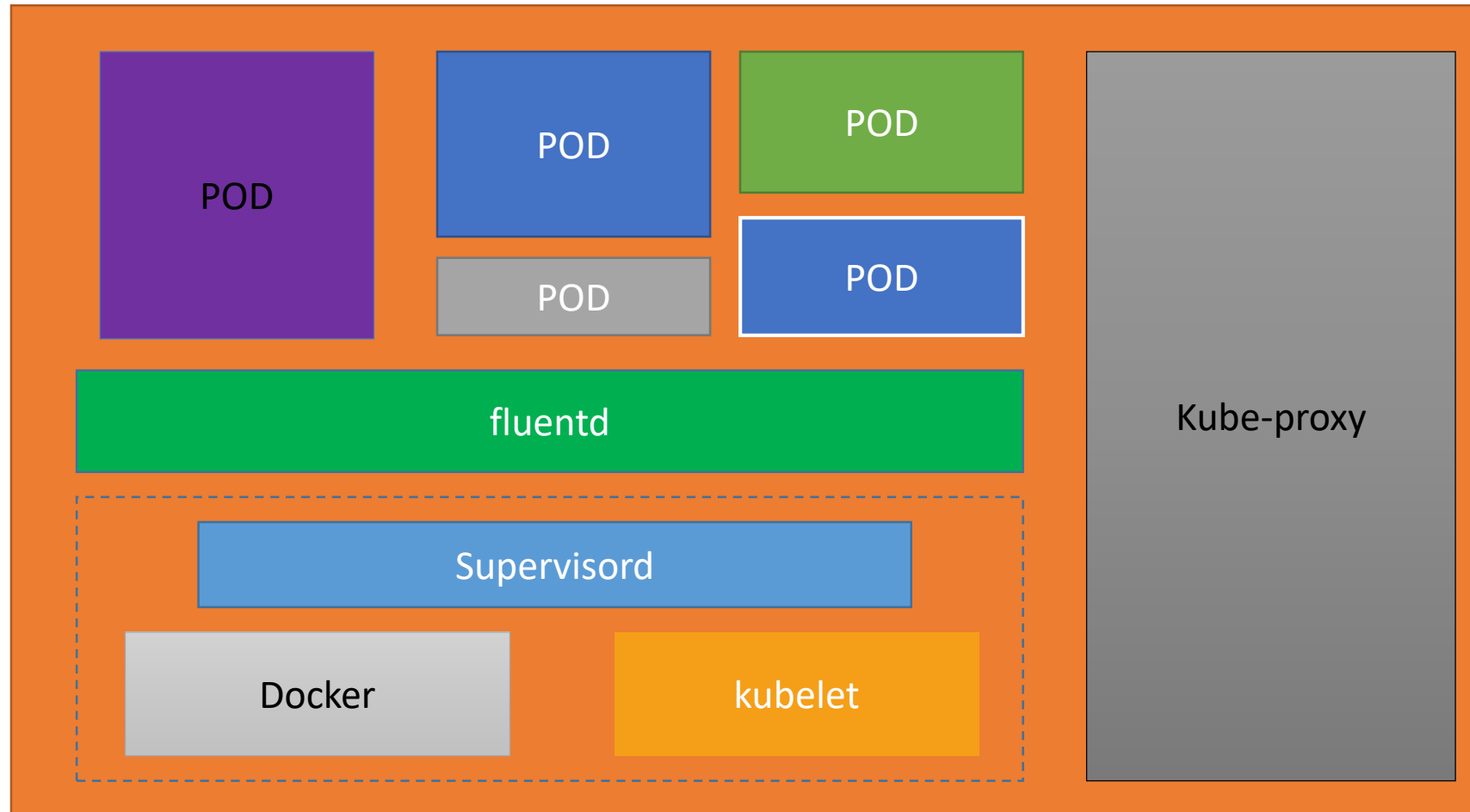
Etcd is a distributed, consistent key-value store used for configuration management, service discovery, and coordinating distributed work.

When it comes to Kubernetes, etcd reliably stores the configuration data of the Kubernetes cluster, representing the state of the cluster (what nodes exist in the cluster, what pods should be running, which nodes they are running on, and a whole lot more) at any given point of time.

As all cluster data is stored in etcd, you should always have a backup plan for it. You can easily back up your etcd data using the `etcdctl snapshot save` command. In case you are running Kubernetes on AWS, you can also back up etcd by taking a snapshot of the EBS volume.

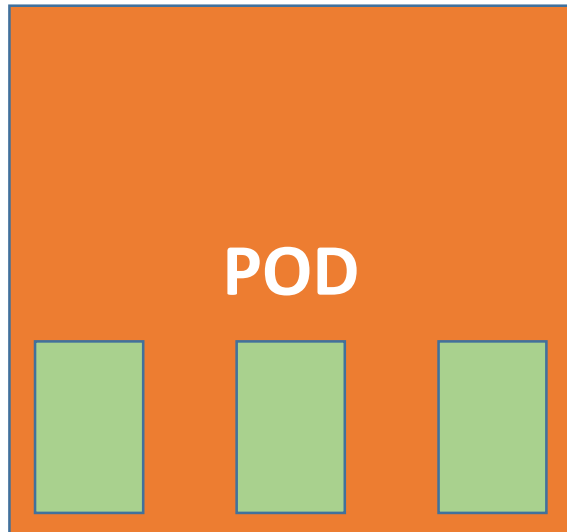


Kubernetes Node



Kubernetes Node - PODS

Pods are the smallest, most basic deployable objects in Kubernetes. A Pod represents a single instance of a running process in your cluster.



Pods contain one or more containers, such as Docker containers. When a Pod runs multiple containers, the containers are managed as a single entity and share the Pod's resources. Generally, running multiple containers in a single Pod is an advanced use case.

Pods also contain shared networking and storage resources for their containers:

Network: Pods are automatically assigned unique IP addresses. Pod containers share the same network namespace, including IP address and network ports.

Containers in a Pod communicate with each other inside the Pod on localhost.

Storage: Pods can specify a set of shared storage volumes that can be shared among the containers.

You can consider a Pod to be a self-contained, isolated "logical host" that contains the systemic needs of the application it serves.



Kubernetes Node - Kubelet



Kubelet

The Kubelet is one of the most important components in Kubernetes. Basically, it's an agent that runs on each node and is responsible for watching the API Server for pods that are bound to its node and making sure those pods are running (it talks to the Docker daemon using the API over the Docker socket to manipulate containers lifecycle). It then reports back to the API Server the status of changes regarding those pods.

The main Kubelet responsibilities include:

- Run the pods containers.
- Report the status of the node and each pod to the API Server.
- Run container probes.
- Retrieve container metrics from cAdvisor, aggregate and expose them through the Kubelet Summary API for components (such as Heapster) to consume.



Kubernetes Node – Kube-Proxy



Kube-Proxy

This is a proxy service which runs on each node and helps in making services available to the external host. It helps in forwarding the request to correct containers and is capable of performing primitive load balancing. It makes sure that the networking environment is predictable and accessible and at the same time it is isolated as well.

Kubernetes Cluster Setup

- **Minikube**
 - Simplest way to get kubernetes cluster up and running
 - Supports Windows and MacOS X
- **Kubernetes Multi-Node Cluster**
 - Emulates production environment
 - Good for testing advanced scenarios
- **Google Container Engine**
 - Hosted and managed by Google.
 - Powered by Google Compute Engine



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