Kubernetes 101

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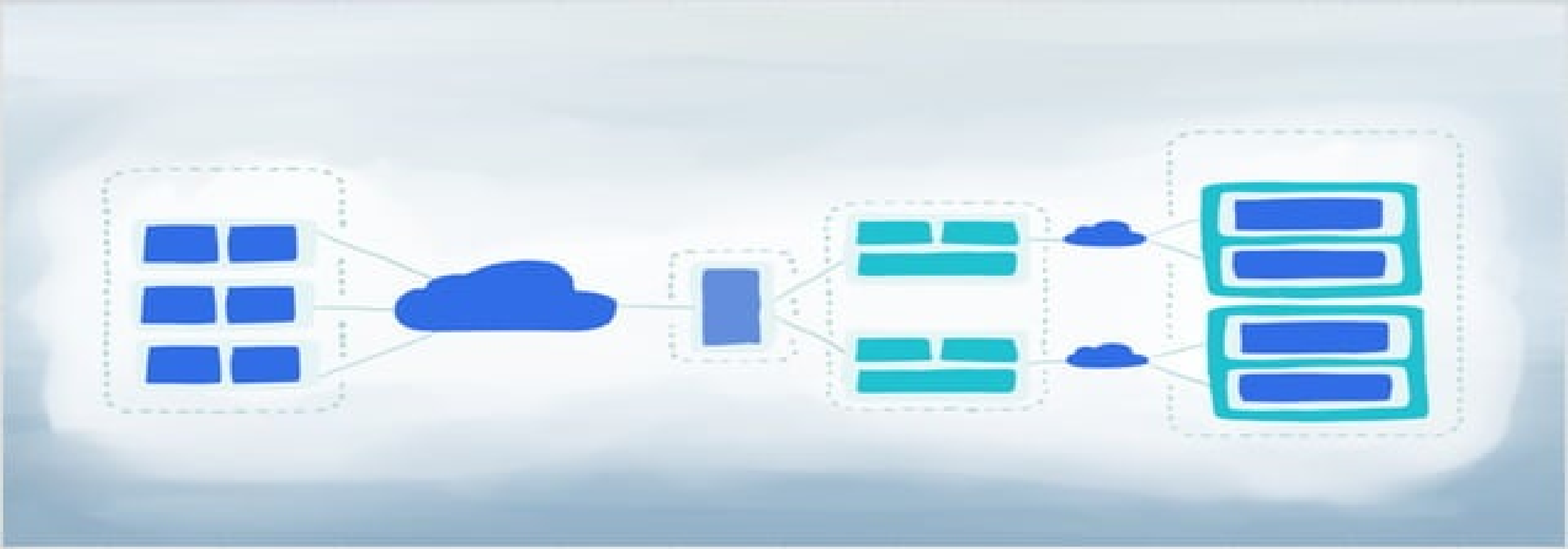
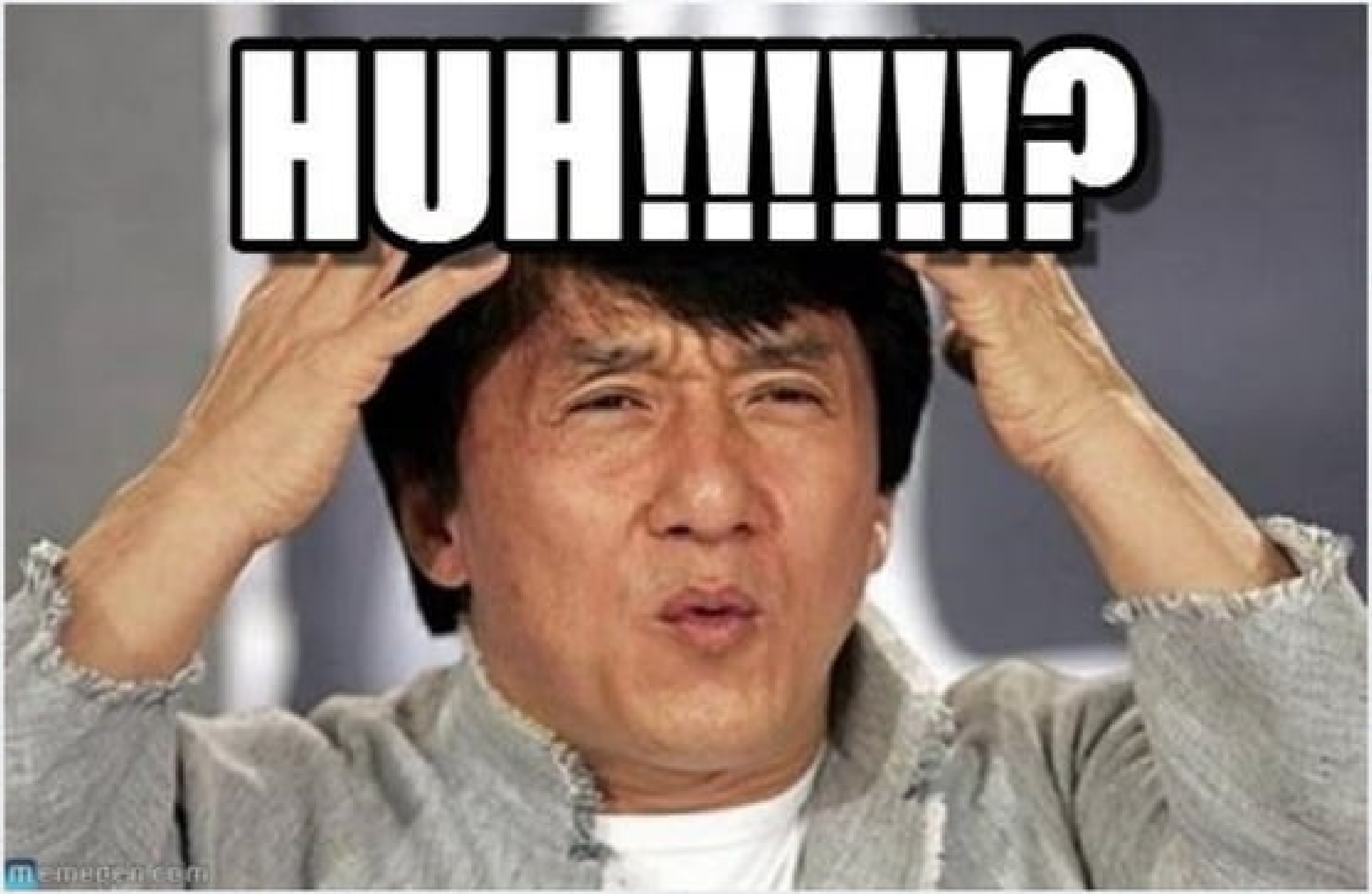


Kubernetes is an open source orchestration system for Docker containers. It handles scheduling onto nodes in a compute cluster and actively manages workloads to ensure that their state matches the users' declared intentions. Using the concepts of "labels" and "pods", it groups the container which make up an application into logical units for easy management and discovery.

Got It?


HUH!!!!!!?
memegen.com

Let's Start from the Start…

With some analogies!

04

S·LE 911

Zona Leste
Centro

Infrastructure Virtualization

- Physical Servers
- Virtual Machines
- Cloud
- Containers

What are containers?

- Virtual environment which is good enough to run your application
- Lightweight
- Run anywhere
- Jails, LXC Containers, CRI-O, Rkt, Docker

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Running thousands of containers in production

Container Orchestration

- Containers need to be managed
- Networking is hard
- Containers must be scheduled, distributed and load balanced
- Data persistence

Welcome Kubernetes!

- K8S
- Greek word for ship's captain
  - Helmsman
  - Cybernetics + Governor
- Started by Google
- Platform for running thousands of containers

Based on ideas proven at Google over 10 years
Everything at Google runs in a container.
Google launches 2 billion containers per week.

Open Source

- https://github.com/kubernetes/kubernetes
- Very active open source project
- 23k stars, 1400+ contributors
- Apache 2 licensed
- Written in Go
- Hosted by the Cloud Native Computing Foundation (CNCF)

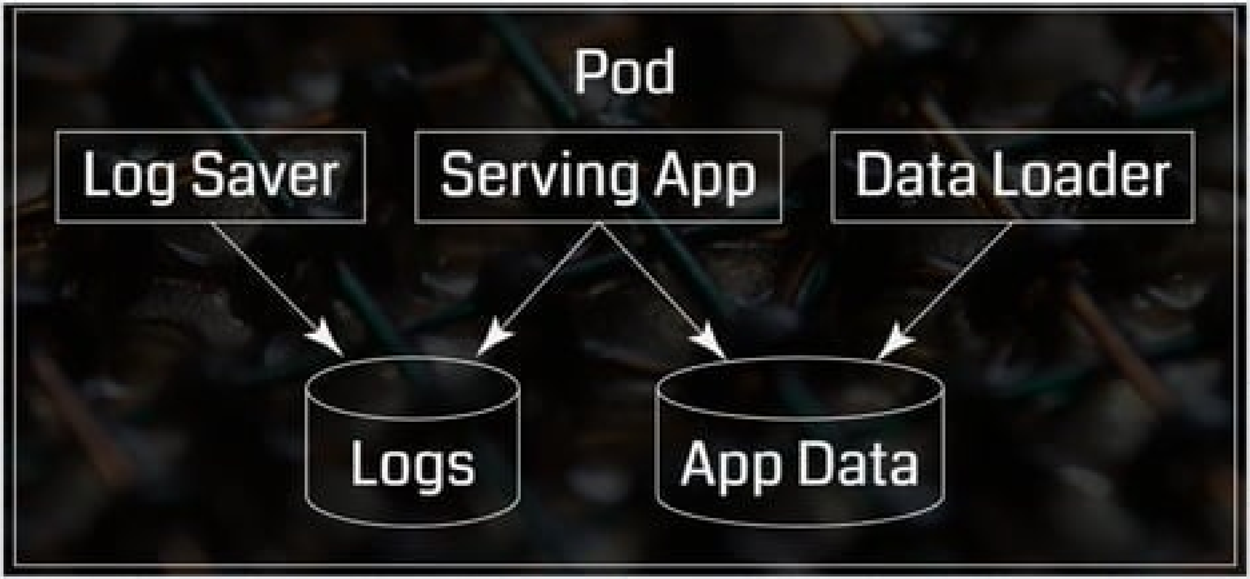
Benefits

- Container Orchestration made easy
- ClusterOps Vs AppOps
- Reduce cost to run many things in production
- Enables new ways of building applications

Key Concepts

Pod

- A group of containers that share a common resource



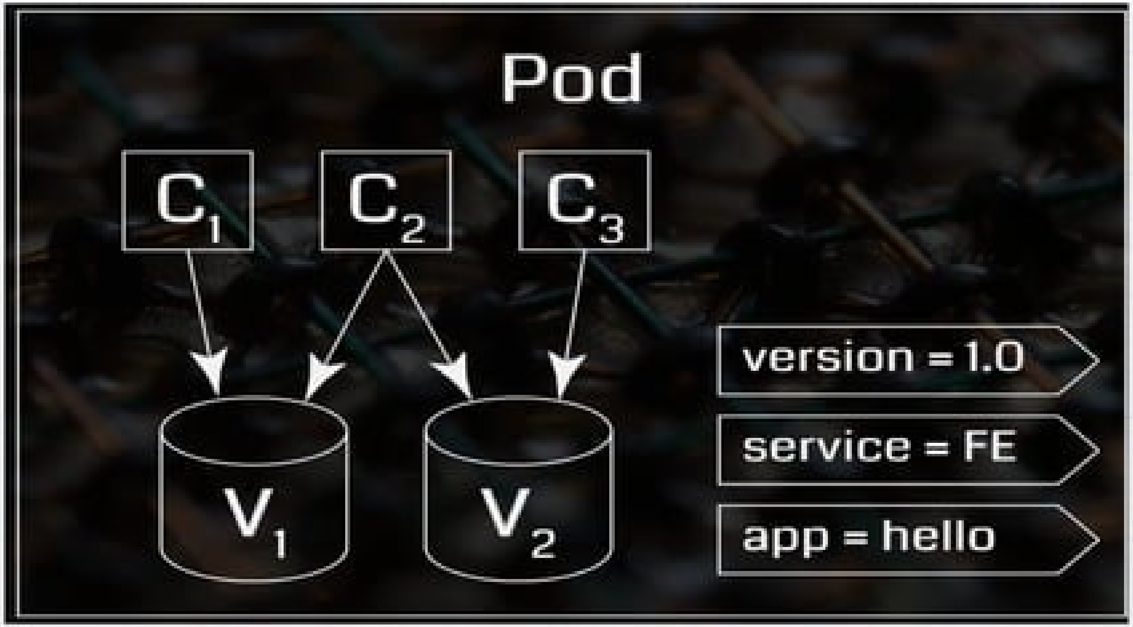
Pod Manifest

- Pods are defined used JSON or YAML file

```
apiVersion: v1
kind: Pod
metadata:
  name: nginx
spec:
  containers:
  - name: nginx
    image: nginx
    ports:
```

Labels

- Name. To identify Pods



Kubelet

- Container Agent
- lowest level component in Kubernetes
- It has one job: given a set of containers to run, make sure they are all running.
- "Kubelets run pods"

etcd

- Metadata service
- Distributed key-value store
- Store and Replicate data used by Kubernetes across the entire cluster
- Manages state of cluster
- Raft algorithm

```
$ mkdir etcd-data
$ docker run --volume=$PWD/etcd-data:/default.etcd \ --
detach --net=host quay.io/coreos/etcd > etcd-container-id
```

API Server

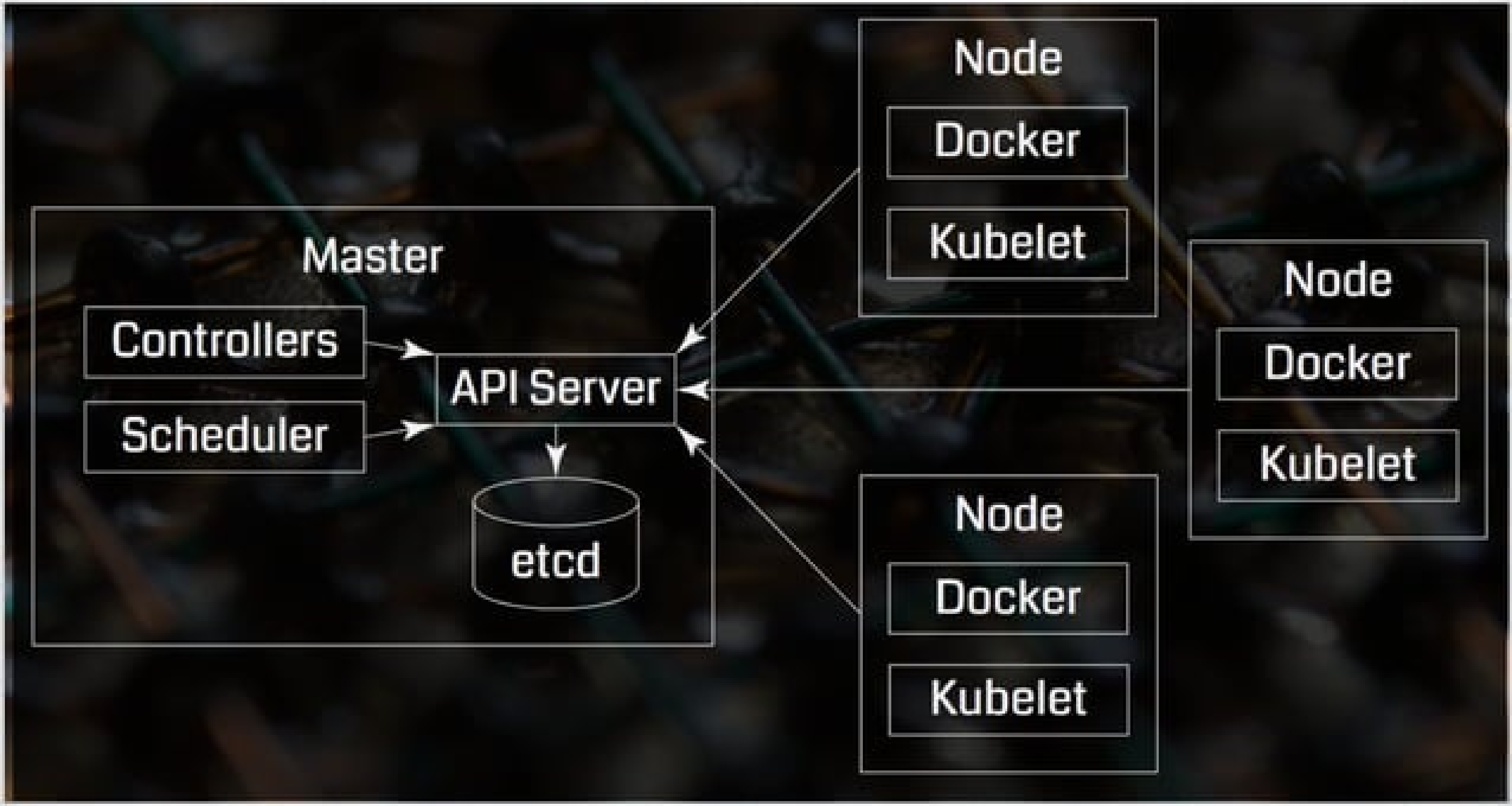
- Kubernetes API
- kubelet will get its pods to run from the Kubernetes API server

```
$ ./kube-apiserver \ --etcd-
  servers=http://127.0.0.1:2379 \ --
  service-cluster-ip-range=10.0.0.0/16
```

Proxy

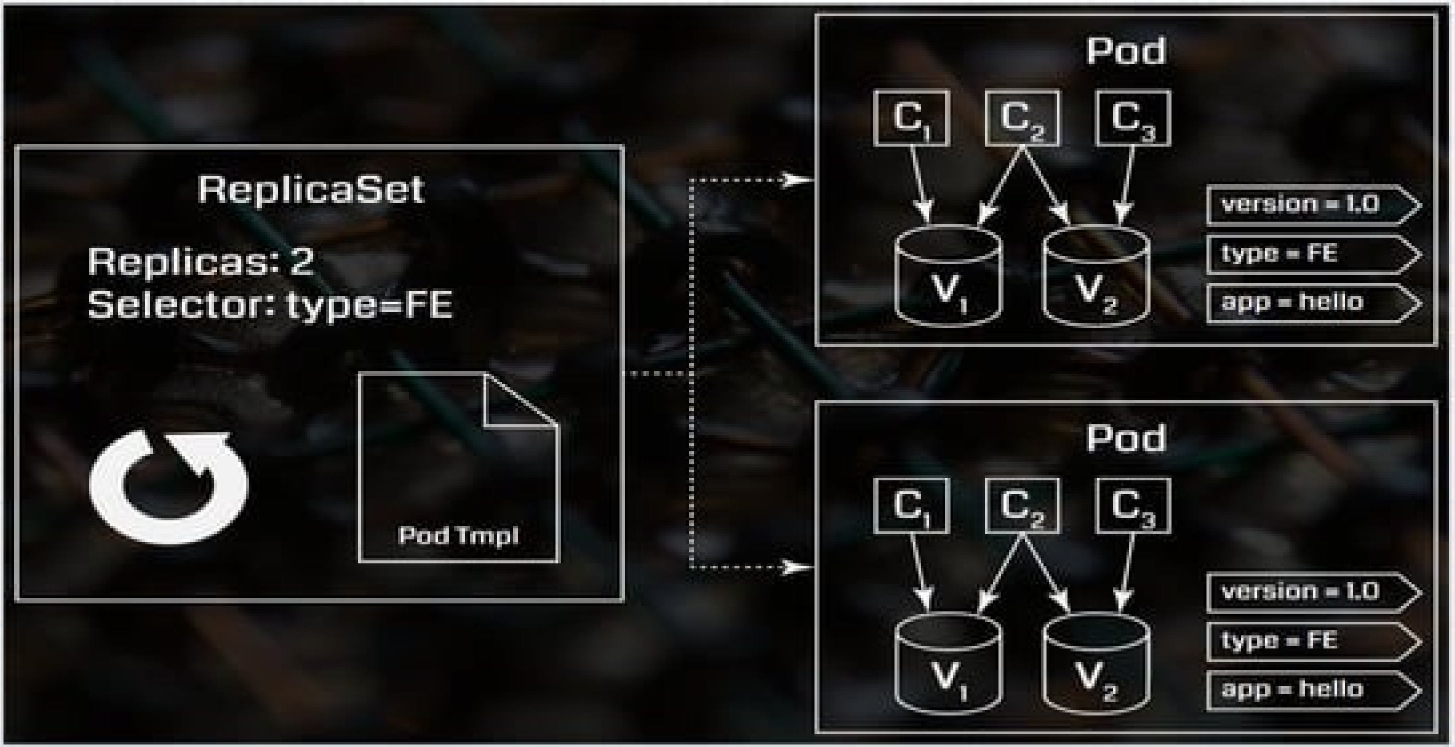
- LB for Pods
- kube-proxy
- TCP,UDP stream forwarding or round robin forwarding across a set of backends

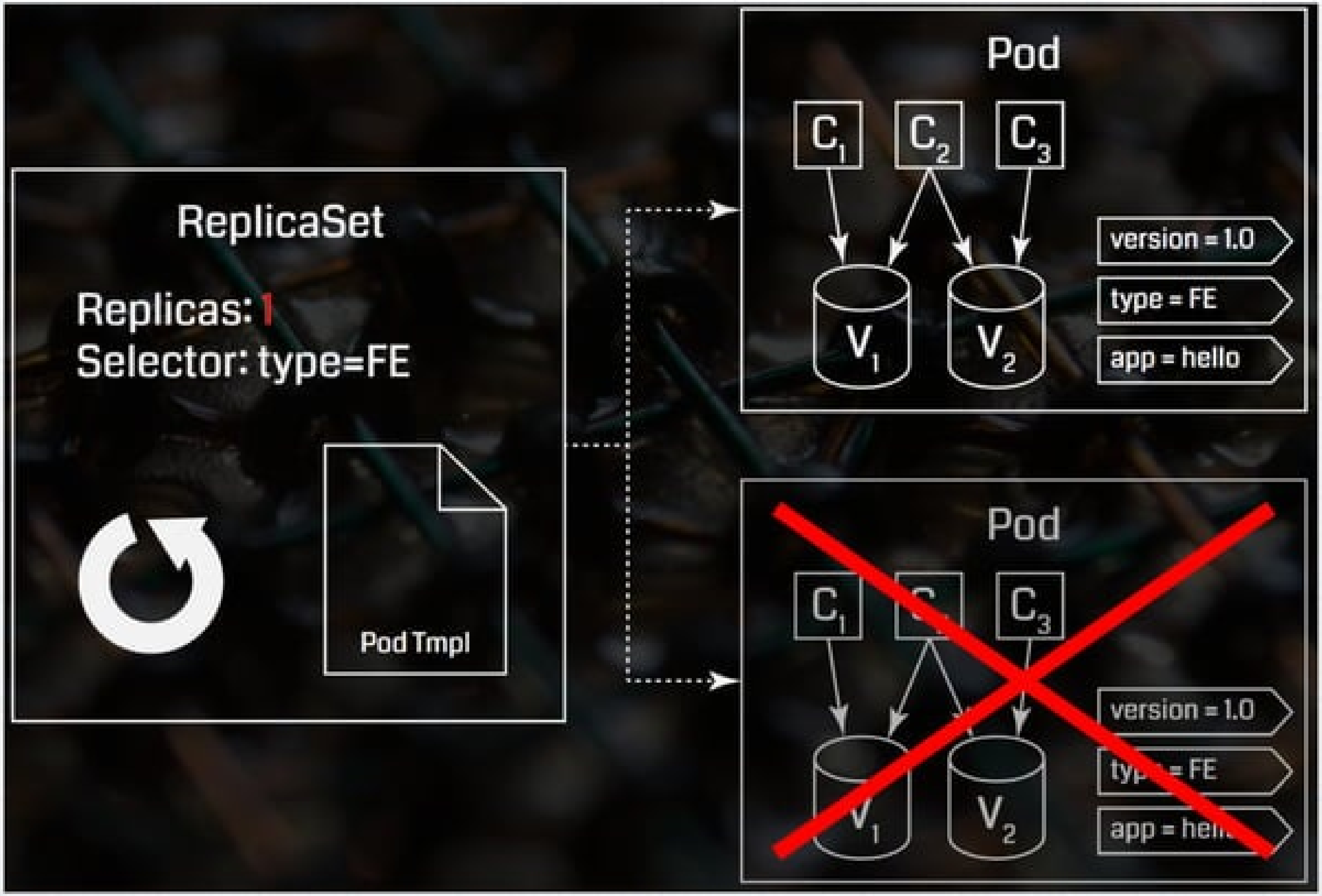
Putting this together



Replication Controller

- Manages replication of Pods





ReplicaSet

Replicas: 1

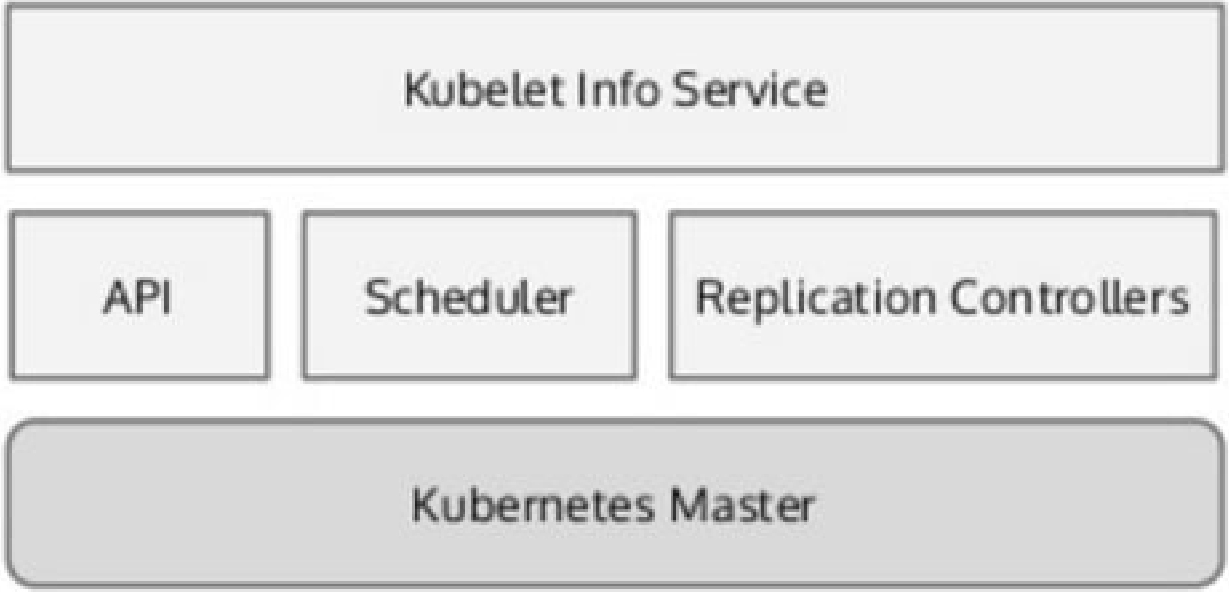
Selector: type=FE

Scheduler

- Schedules pods in worker nodes
- Ensures pods are placed on free nodes
- Balances resource utilization
- Node affinity, Pod affnity/anti-affinity
- Custom scheduler

k8s Architecture

Master



Kubelet Info Service

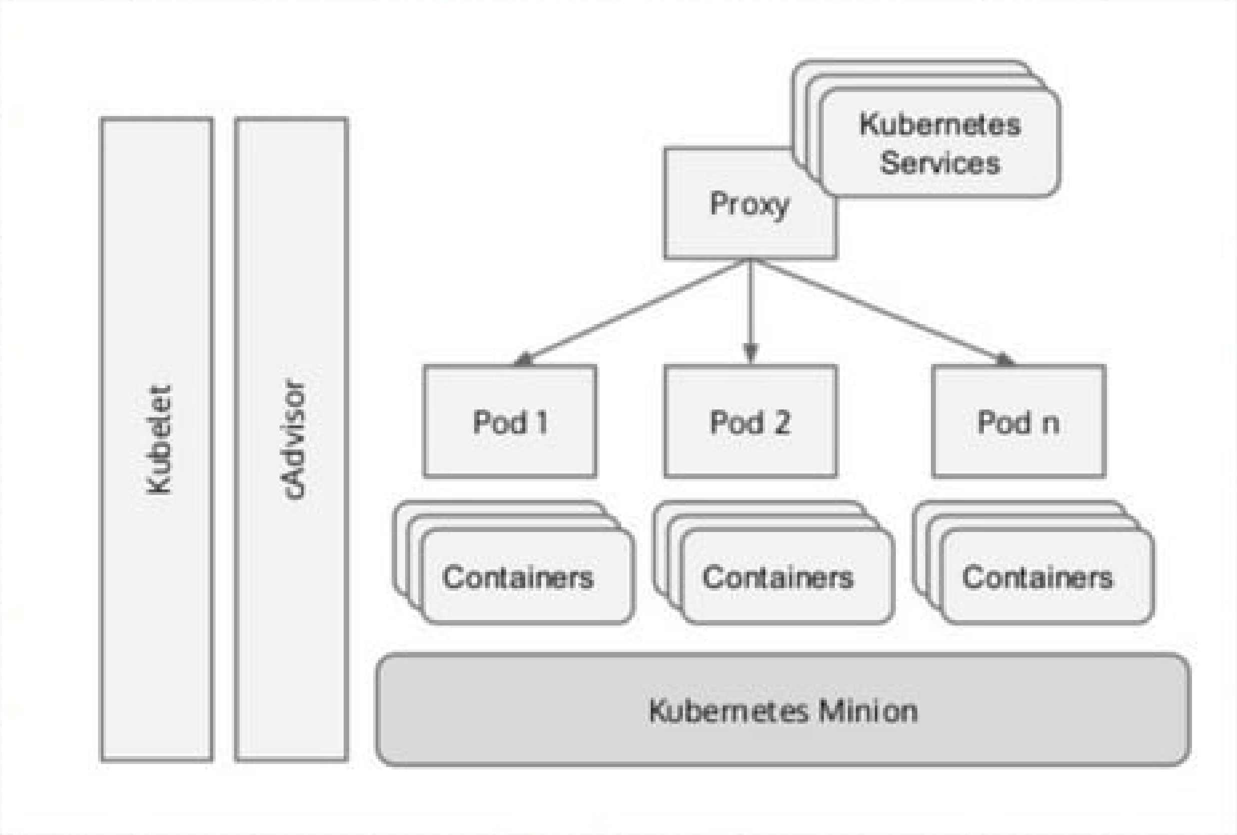
API

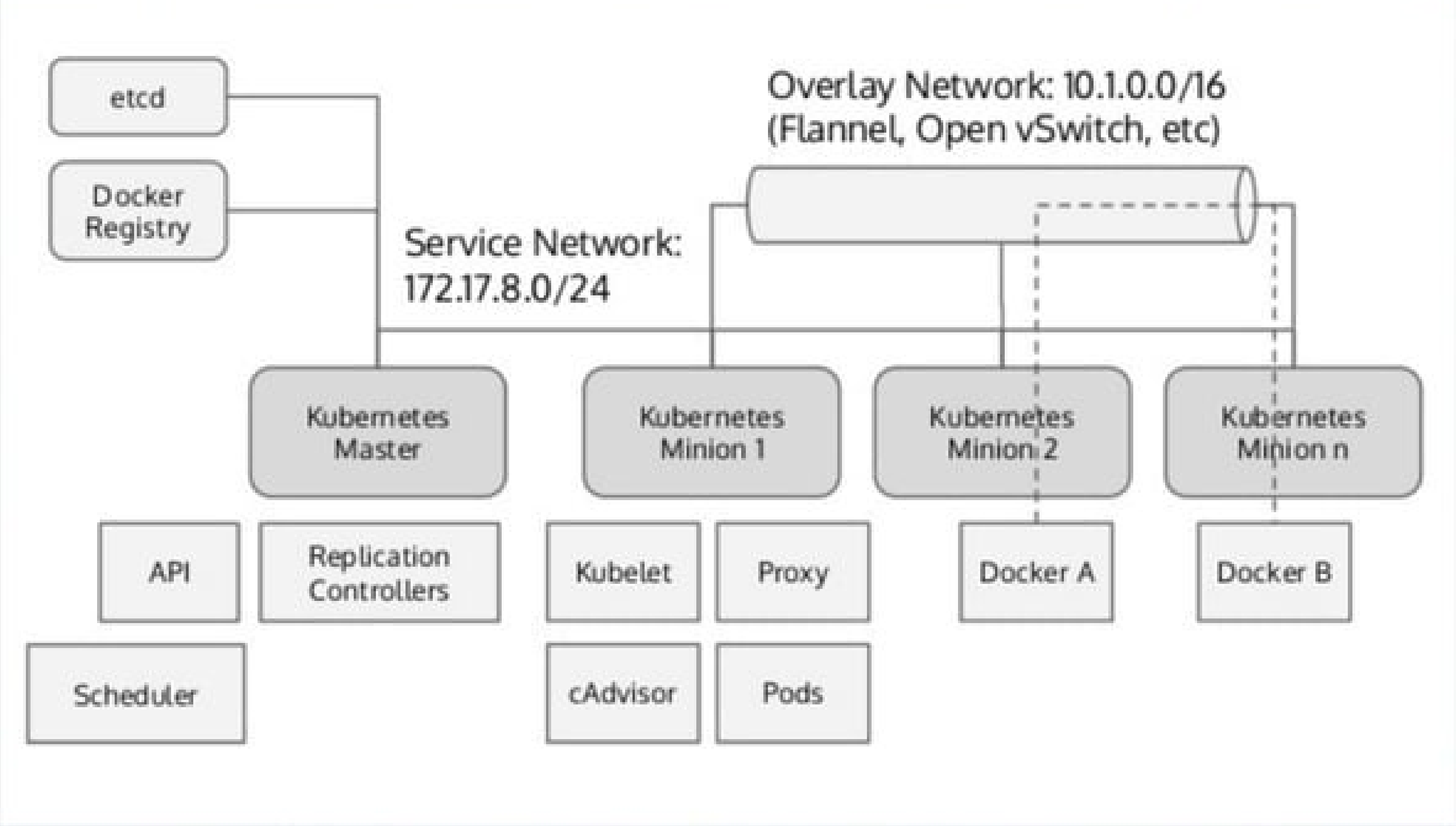
Scheduler

Replication Controllers

Kubernetes Master

k8s Minion (Worker Nodes)




etcd
Docker Registry
Overlay Network: 10.1.0.0/16
(Flannel, Open vSwitch, etc)
Service Network:
172.17.8.0/24
Kubernetes Master
Kubernetes Minion 1
Kubernetes Minion 2
Kubernetes Minion n
API
Replication Controllers
Kubelet
Proxy
Docker A
Docker B
Scheduler
cAdvisor
Pods

Hands-on Workshop

At 2pm
Convention Centre

Hands-on Prerequisites

- Laptop, Internet
- Virtualbox
- Getting Started: