



Introduction to Kubernetes (k8)

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DevOps



Word of caution





What is kubernetes?

Formal definition:

“Kubernetes is an open source system for automating deployment, scaling and management of containerized applications”

Kubernetes documentation



What is kubernetes?

Unformal definition:

“Kubernetes is like having a little devops in a cluster that takes care of you’re applications and makes sure that everything is up and running.”

Kelsey Hightower (Google)



Packaging applications

Containers (Docker)

Two main benefits:



- **They make shipping and deploying apps a lot easier!**
- **They bundle all the apps dependencies in a single image**



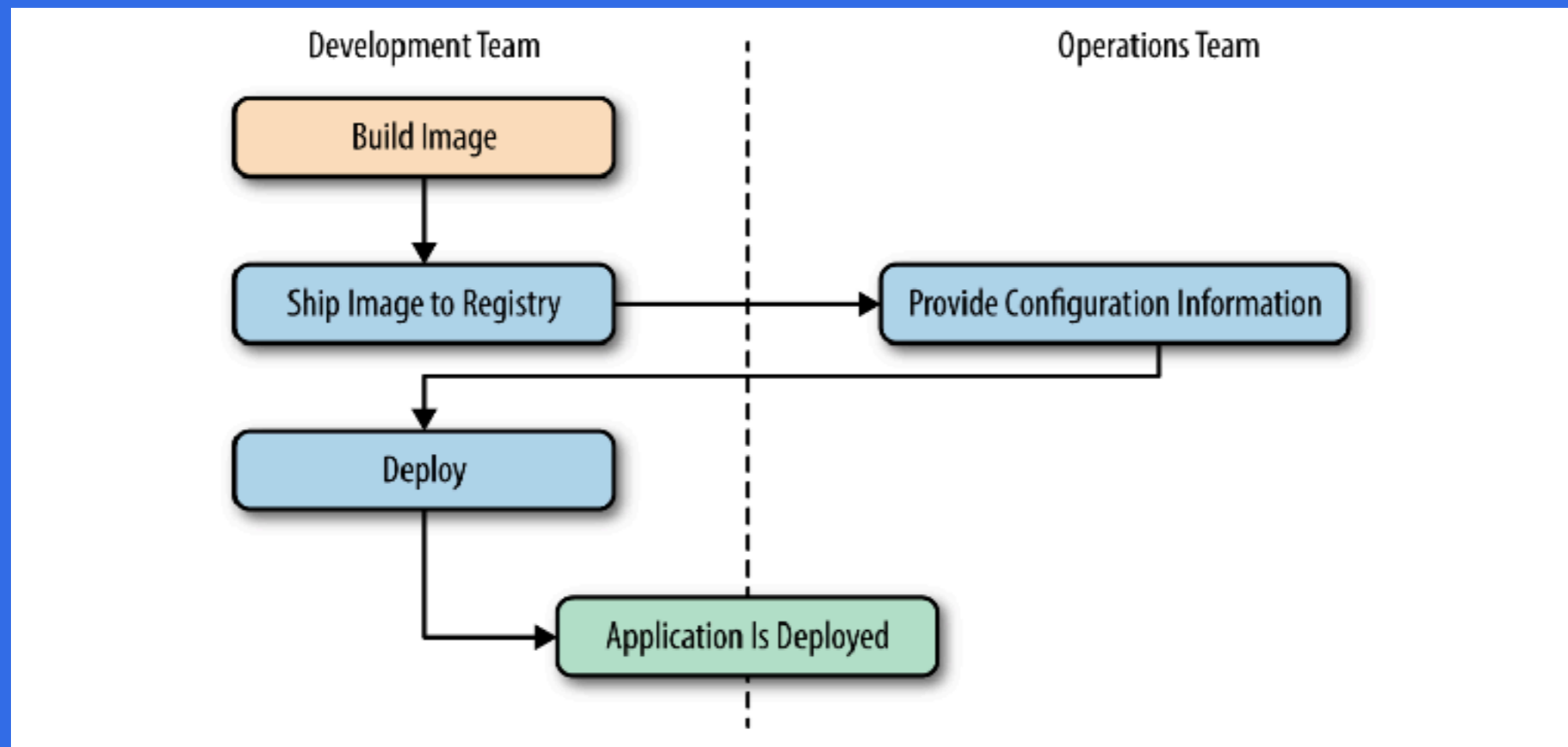
Packaging applications

Docker - like mobile apps on a smartphone, but for servers



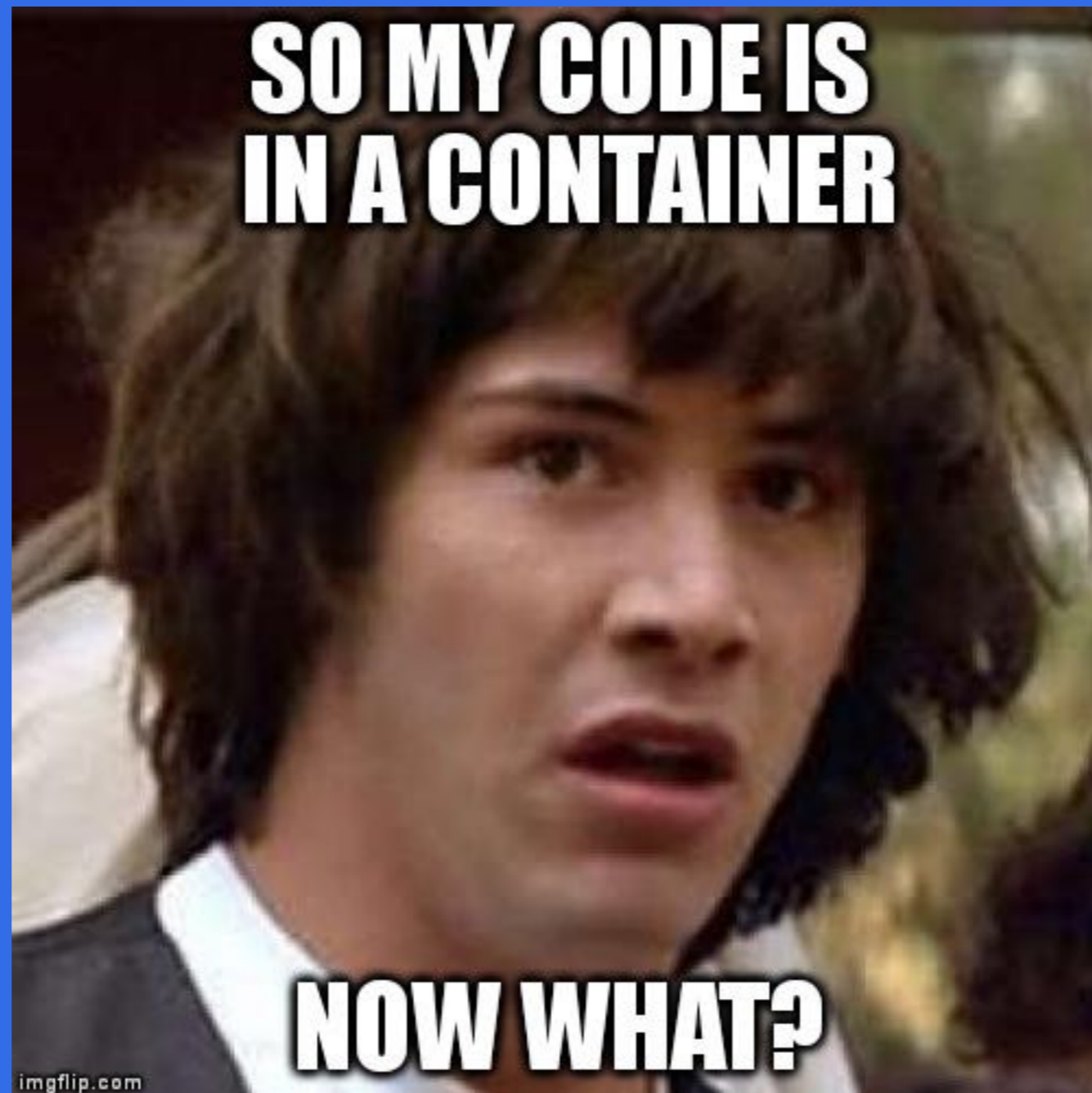


Docker deployment





Now what?





Why do we need k8s?

- **Real issues are:**
- **Application configuration**
- **Service discovery**
- **Managing updates**
- **Monitoring**
- **Deployment...**



Why is k8 special?

- **Github (37,578 ★)**
- **1693 contributors**

Backed up by :

- **Google, RedHat, CoreOS, Cloud Native Computing Foundation**
- **Cloud providers AWS, GCLOUD, AZURE**
- **10/15 years of R&D in Google (Borg, Omega)**



k8 features

- **Horizontal scaling**
- **Automated rollouts and rollbacks**
- **Self healing**
- **Service discovery and load balancing**
- **Secret and configuration management**
- **Better server utilization (less money goes to aws)**



Abstracts the hardware layer

LoadBalancers | Routes | DNS

Kubernetes

Application

Storage

Machine

Network

EBS

NFS

GFS

VM

PHYSICAL

L2

L3

Infrastructure

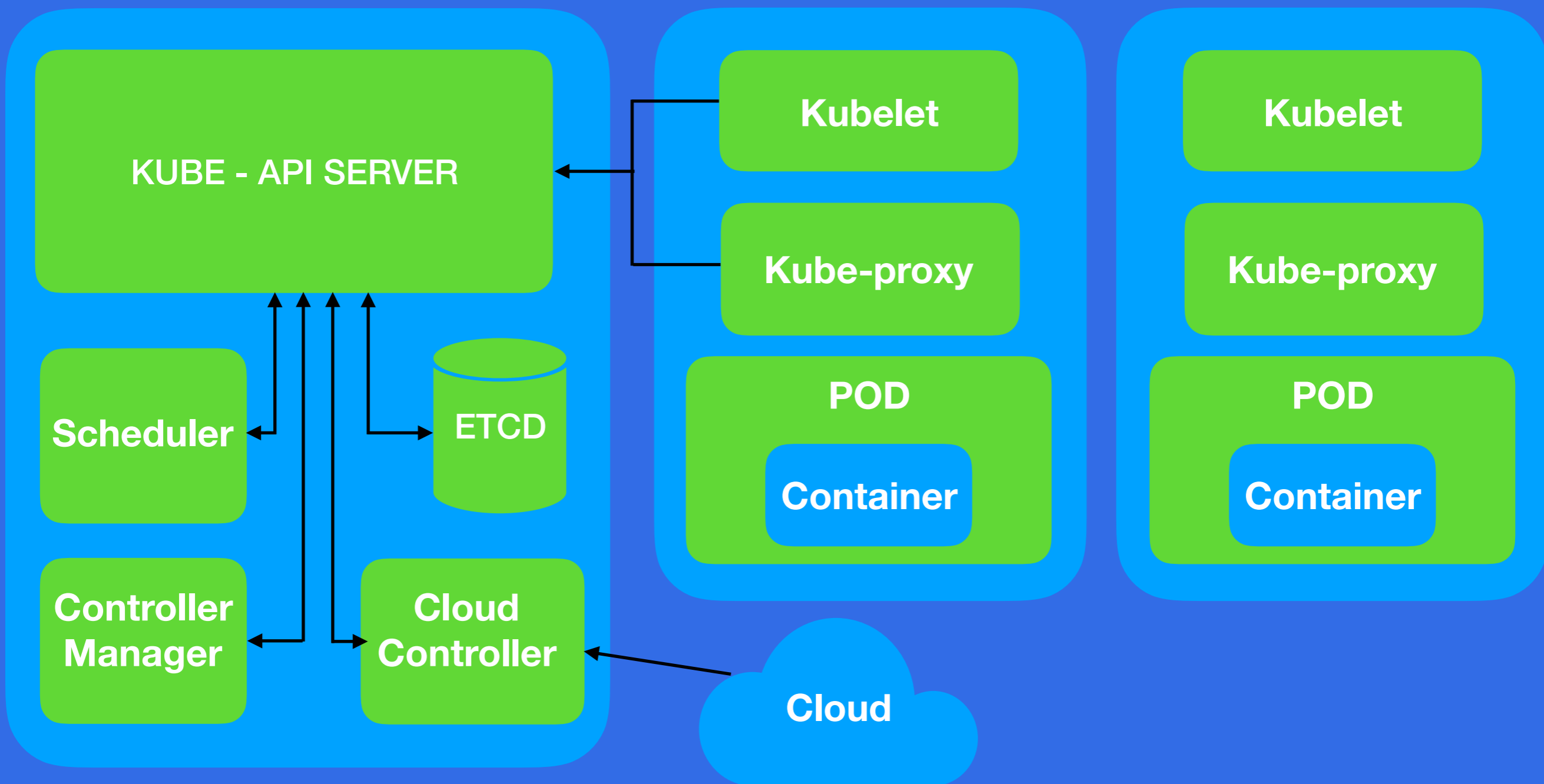


k8 architecture

Kubernetes Master

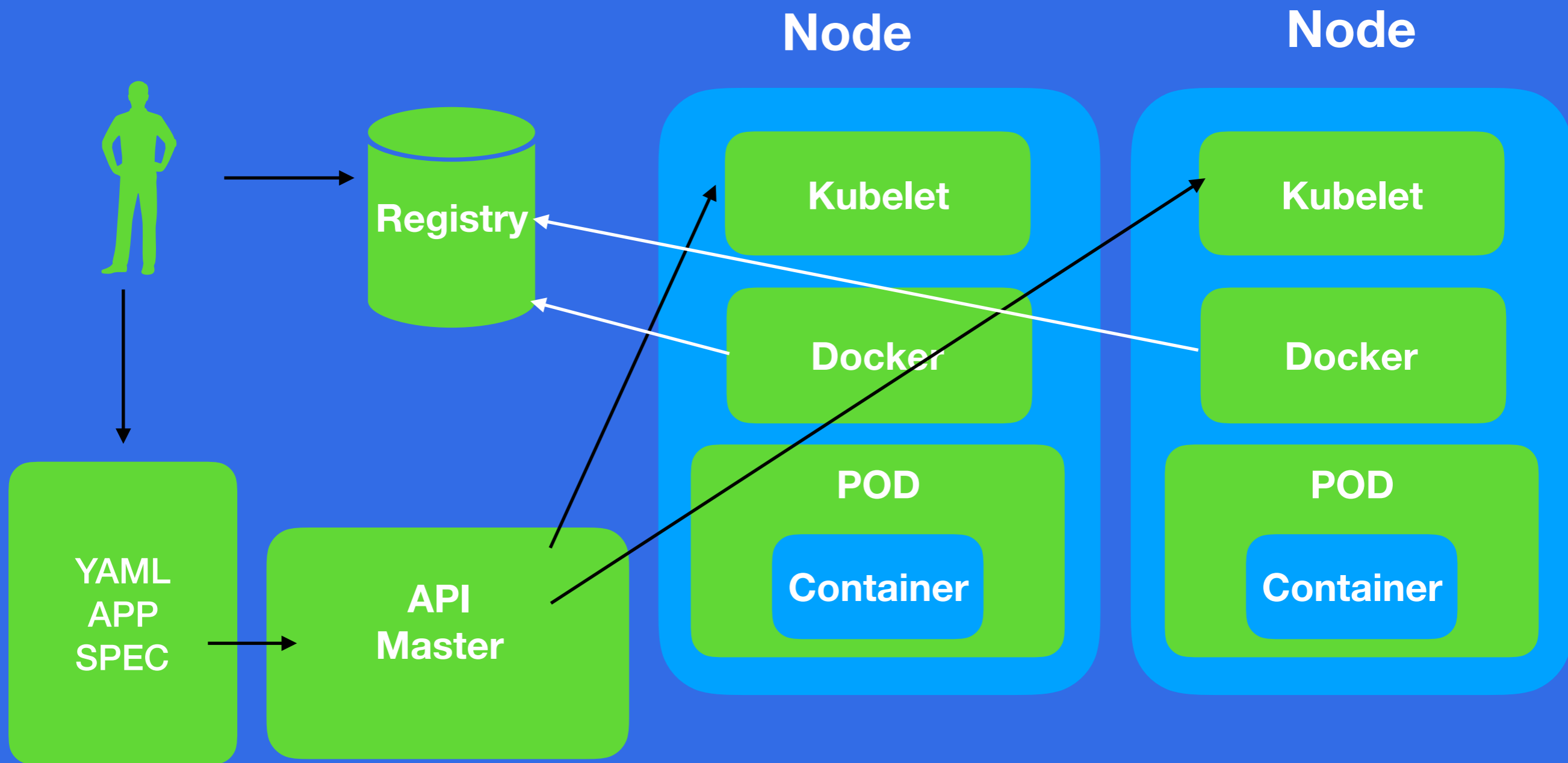
Node

Node





Pods/apps running on k8





k8 basic objects

- Everything in k8 is a declarative configuration object (RESTful API object)

k8 uses them to represent the state of a cluster:

- **Pod** - a group of one or more containers
- **Service** - gives your pods a stable IP
- **Volume** - storage and configuration for the pods
- **Nodes** - VM or physical machine



k8 high-level objects controllers

- **ReplicaSet**
- **Deployment (important)**
- **StatefulState (PetSets)**
- **DaemonSet**
- **Job**



Whats a pod anyway?

Pod is group of containers

Containers run under the same Network and UTS namespace (same hostname and net. interface)

Run under the same IPC namespace

Containers in a pod share the same IP address (localhost) and port space

Pods can be seen as very very light VM-s



Basic objects for an app

- **Deployment object**

generate the pods with a label, and keeps them alive

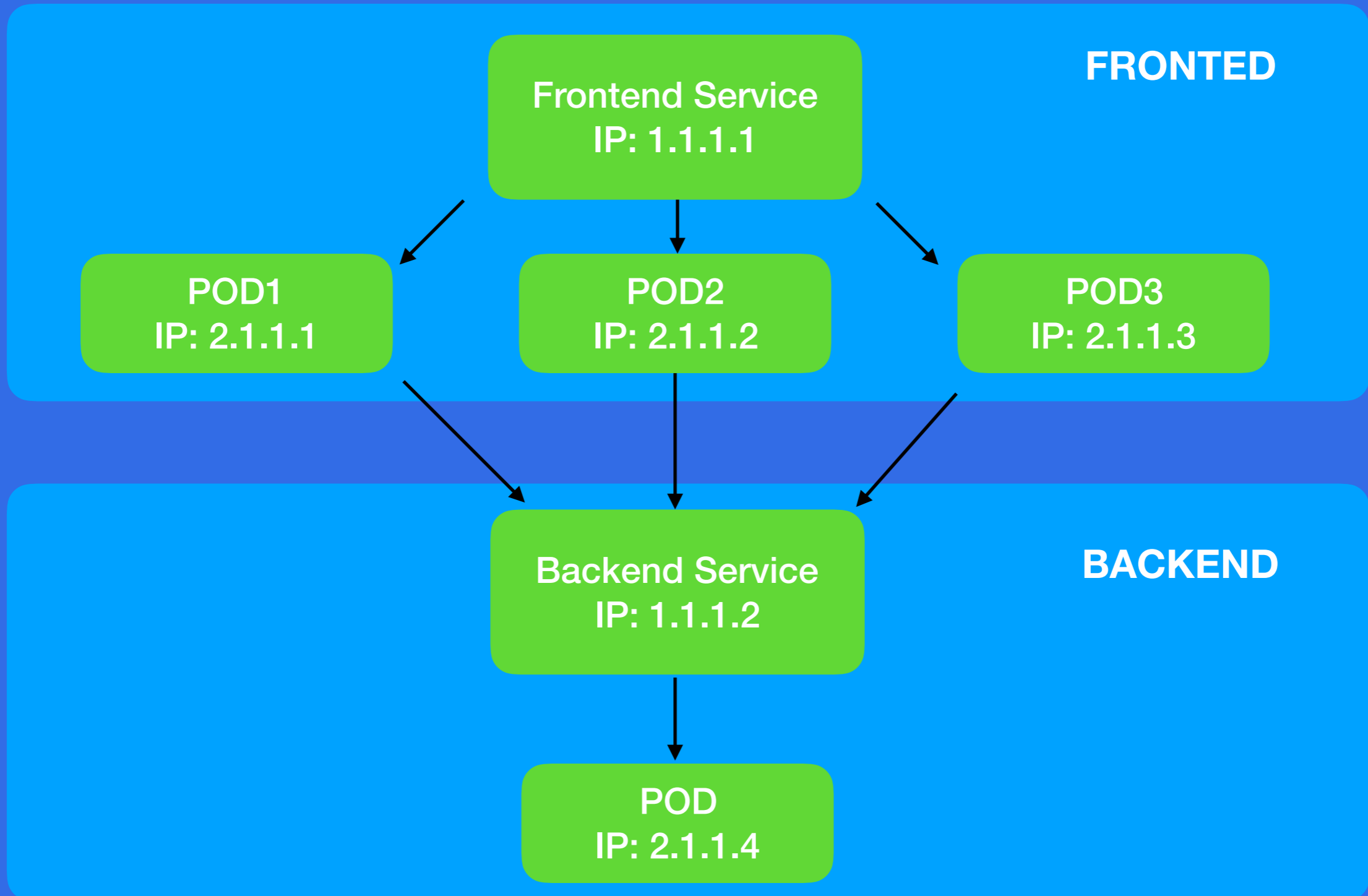
- **Service object**

Grouping object that gives you a stable IP (virtual IP) for the pods that have a certain LABEL

- (Config map - app configuration file)



Services in k8



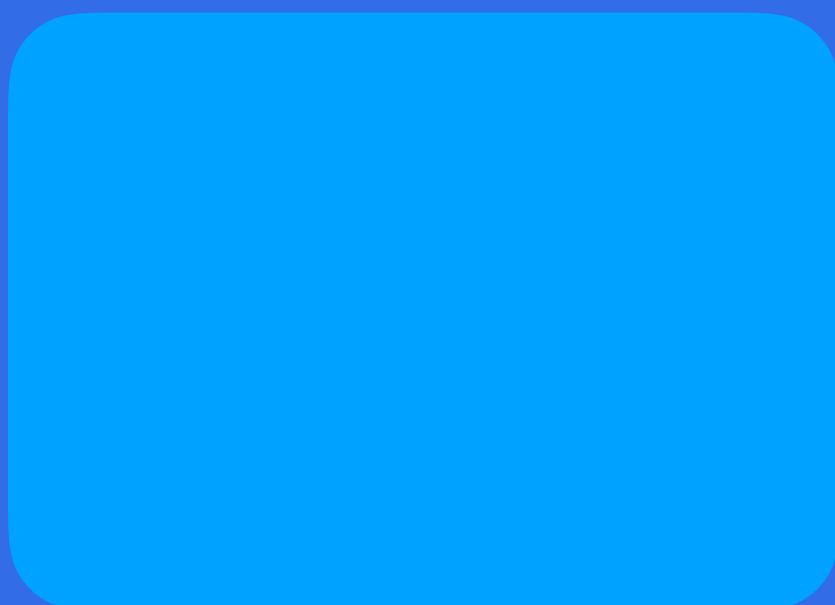


Deployment controller

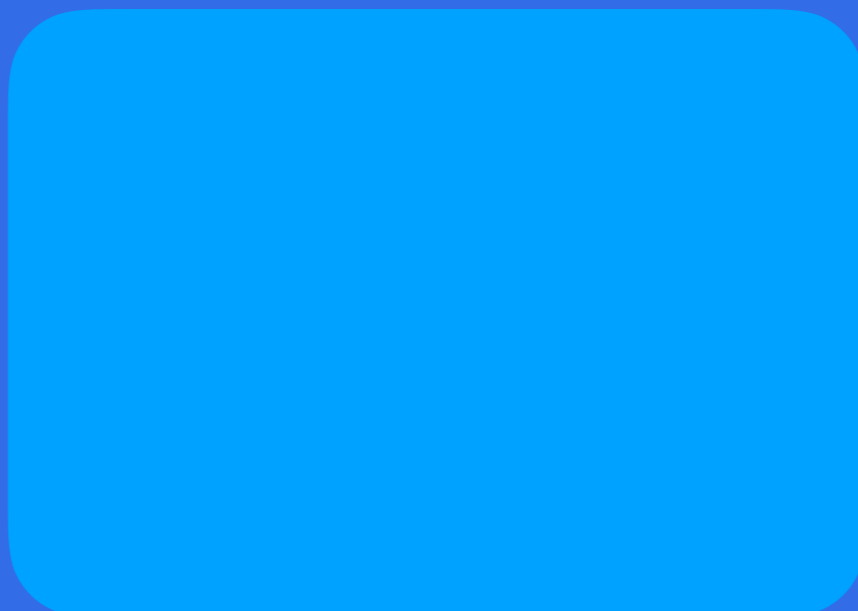
Drives current state towards the desired state

**app: televendcloud
replicas: 1**

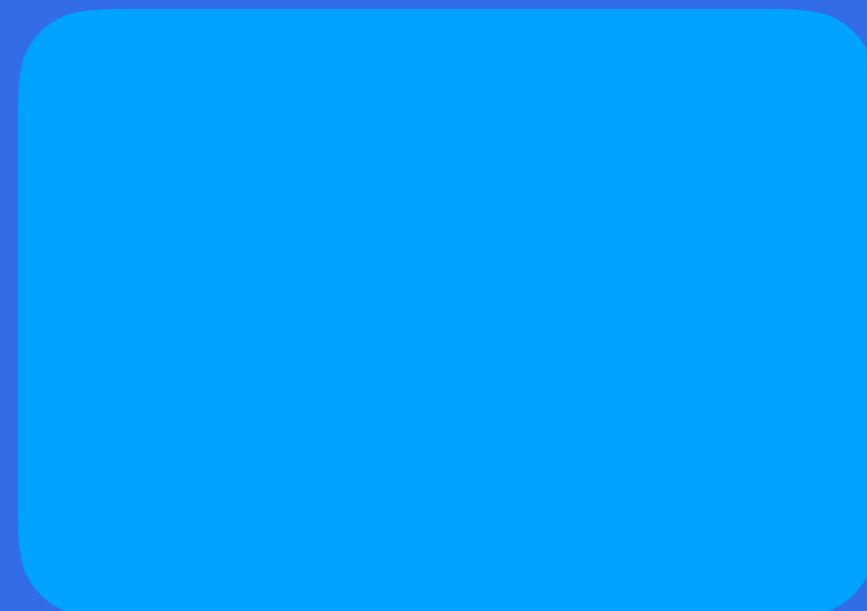
NODE 1



NODE 2



NODE 3



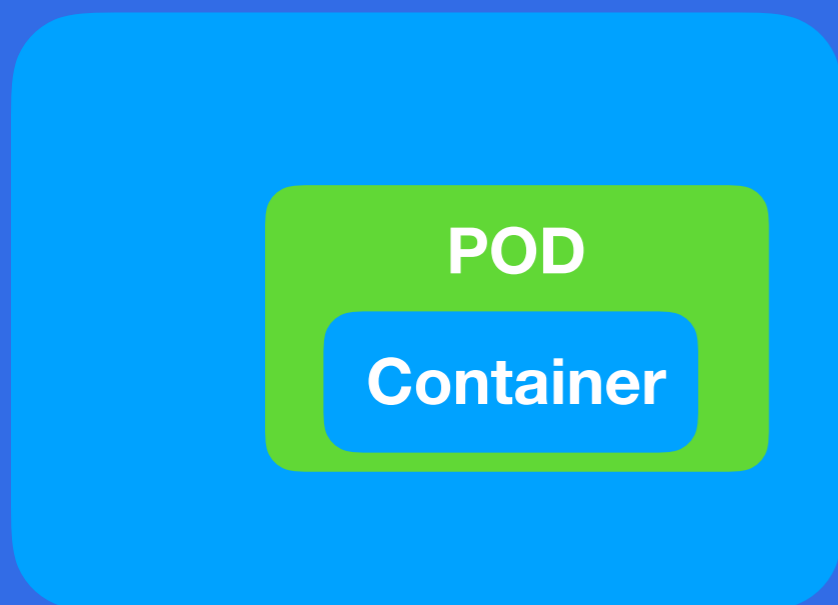


Deployment controller

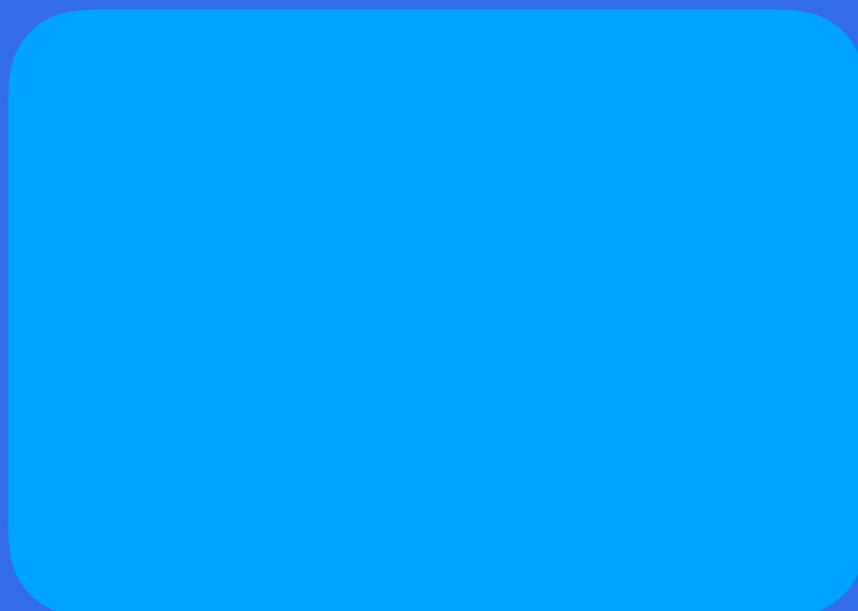
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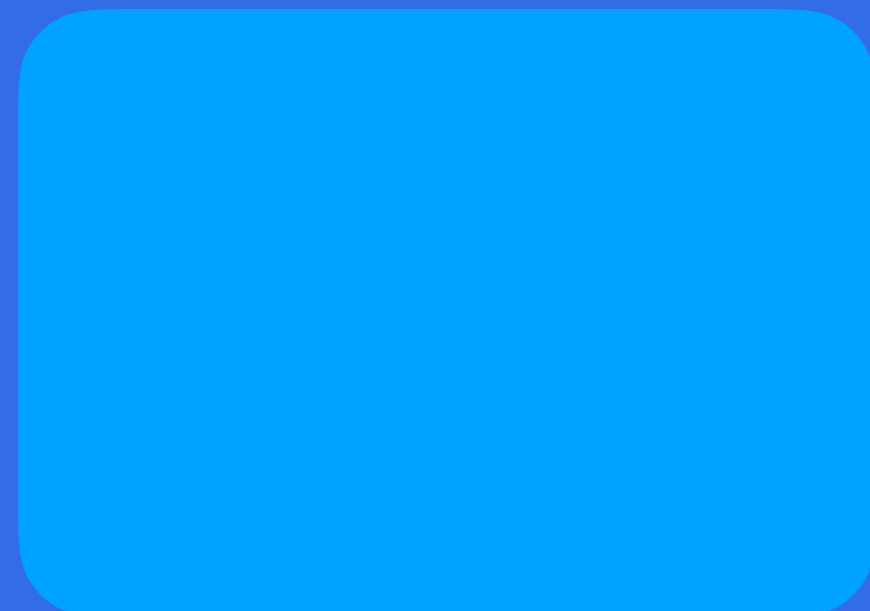
NODE 1



NODE 2



NODE 3



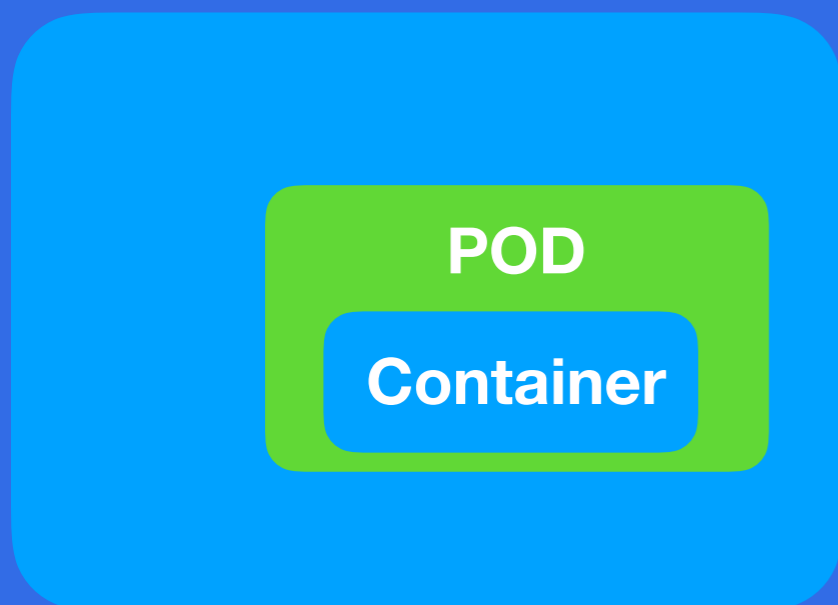


Deployment controller

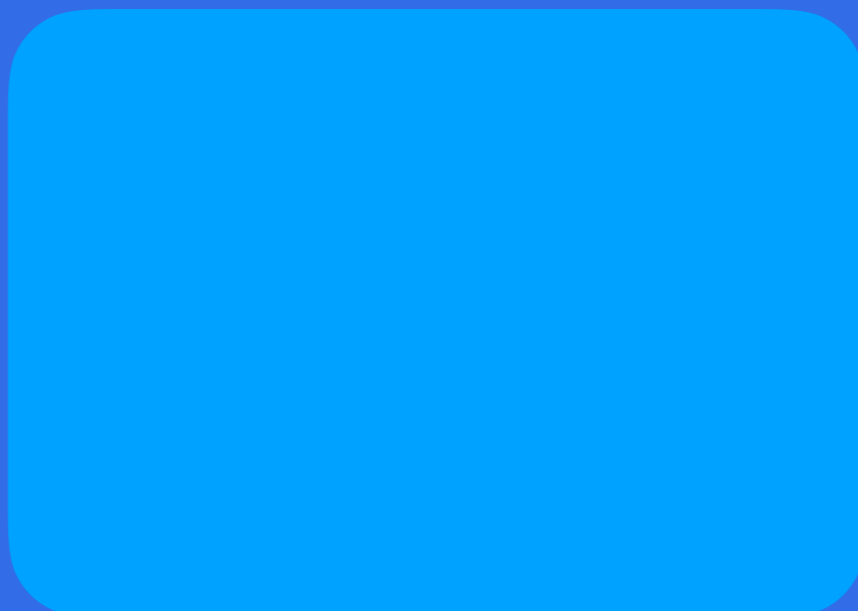
Drives current state towards the desired state

app: televendcloud
replicas: 3

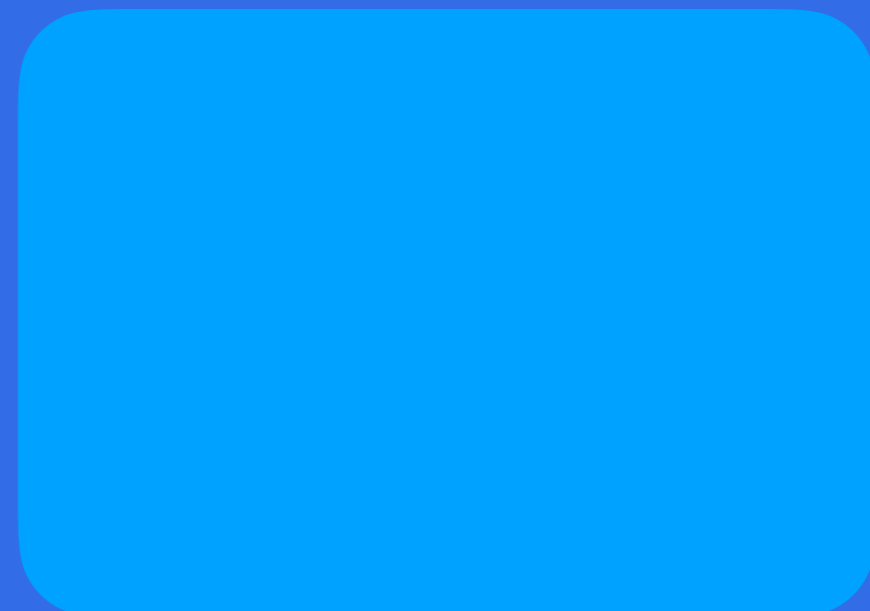
NODE 1



NODE 2



NODE 3





Deployment controller

Drives current state towards the desired state

app: televendcloud
replicas: 3

NODE 1



NODE 2



NODE 3



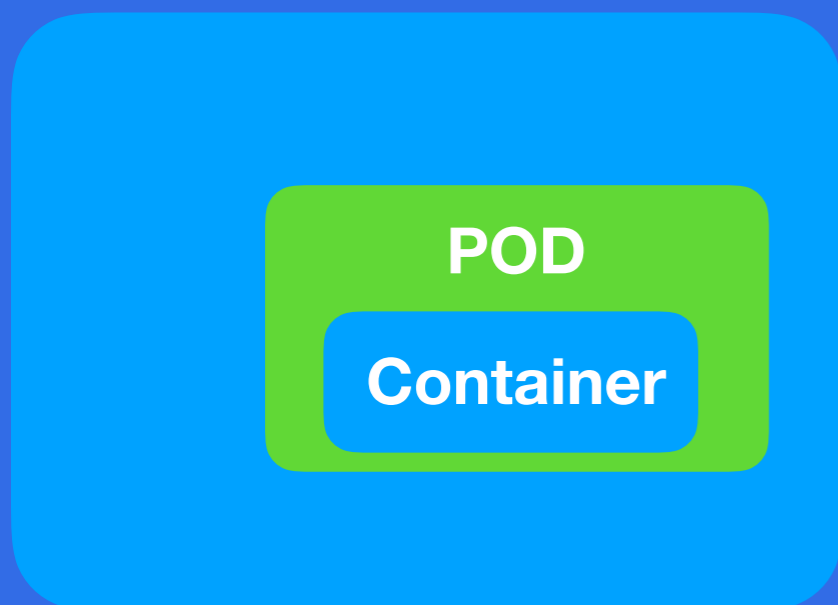


Deployment controller

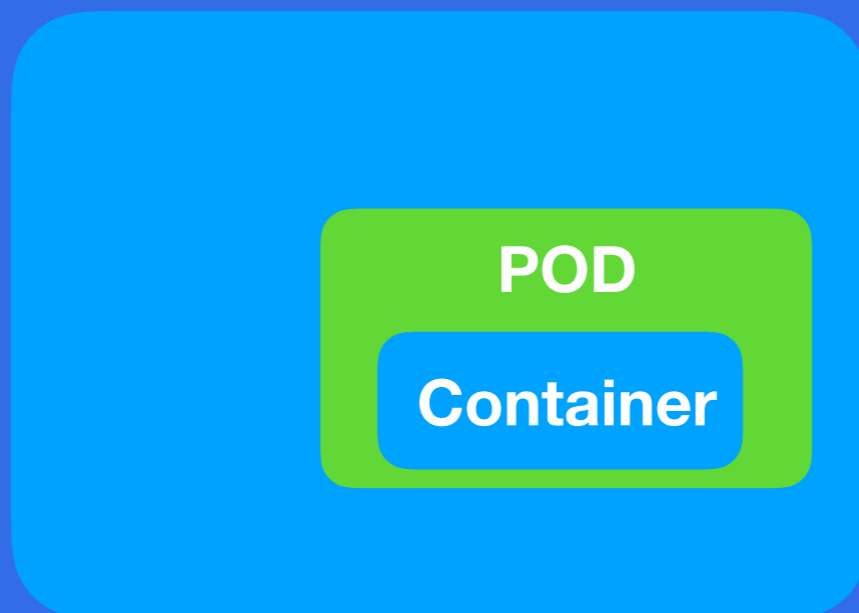
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replicas: 3

NODE 1



NODE 2



NODE 3



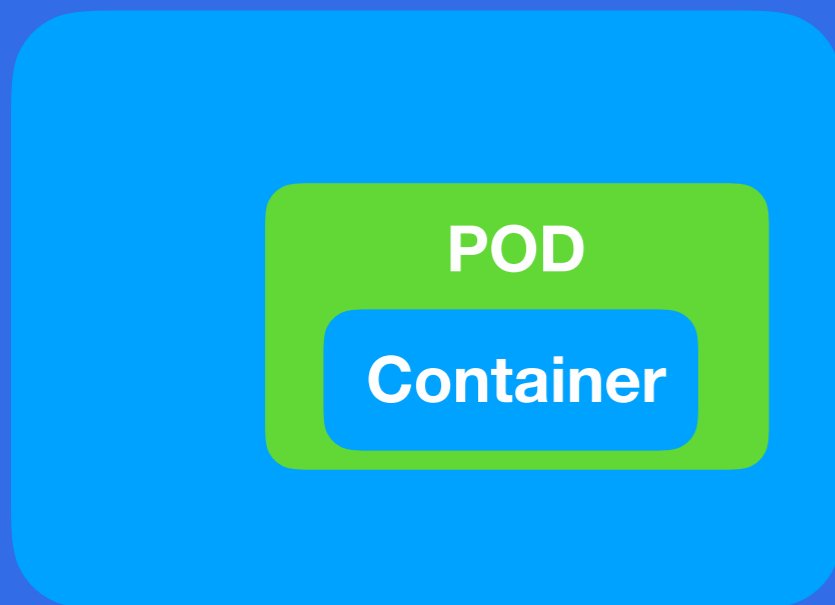


Deployment controller

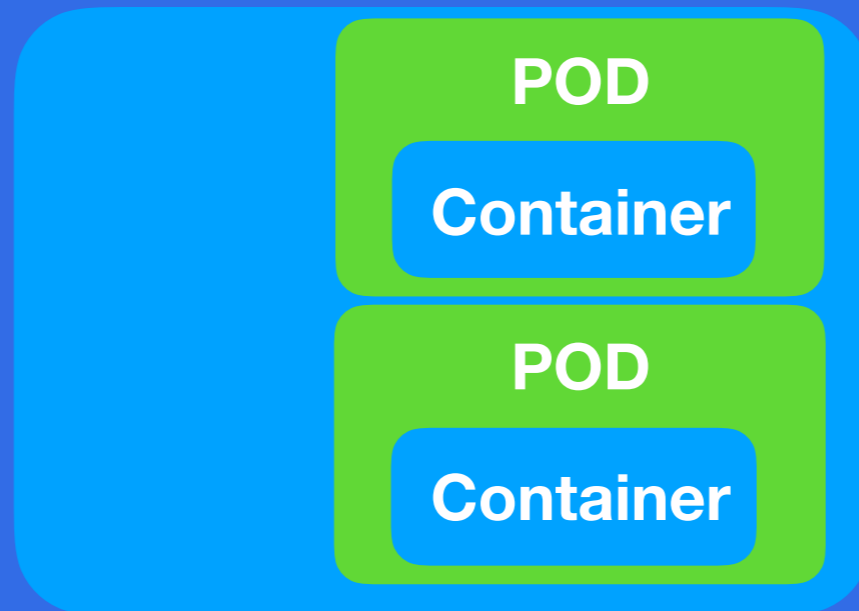
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NODE 1



NODE 2

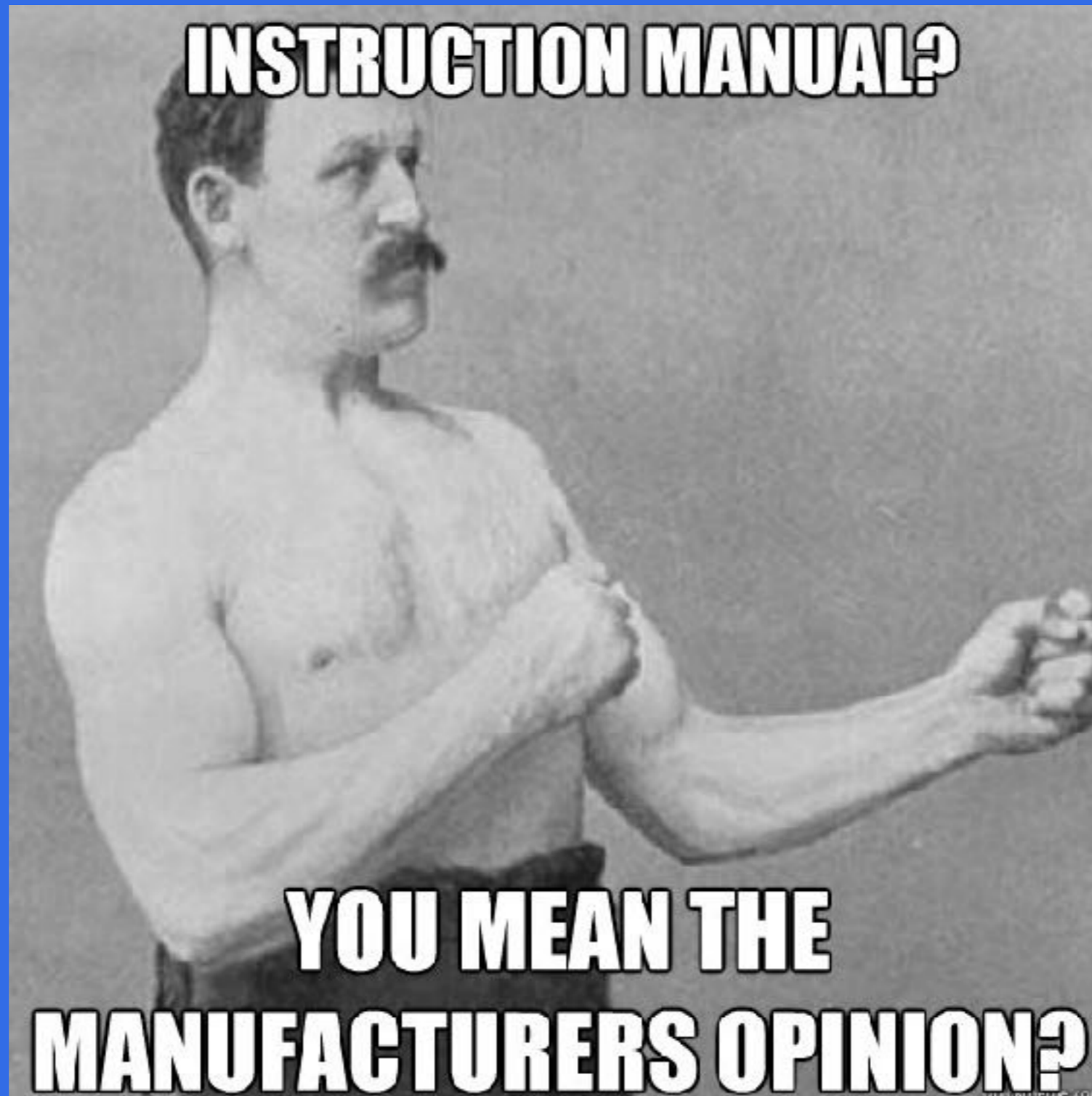


NODE 3





k8 documentation





k8 learning material:

Minikube - program (for practicing and development)

“Up and running with Kubernetes” - book

Scalable microservices with Kubernetes - Udacity course

<https://www.katacoda.com/> - website

kubernetes.io - documentation