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)

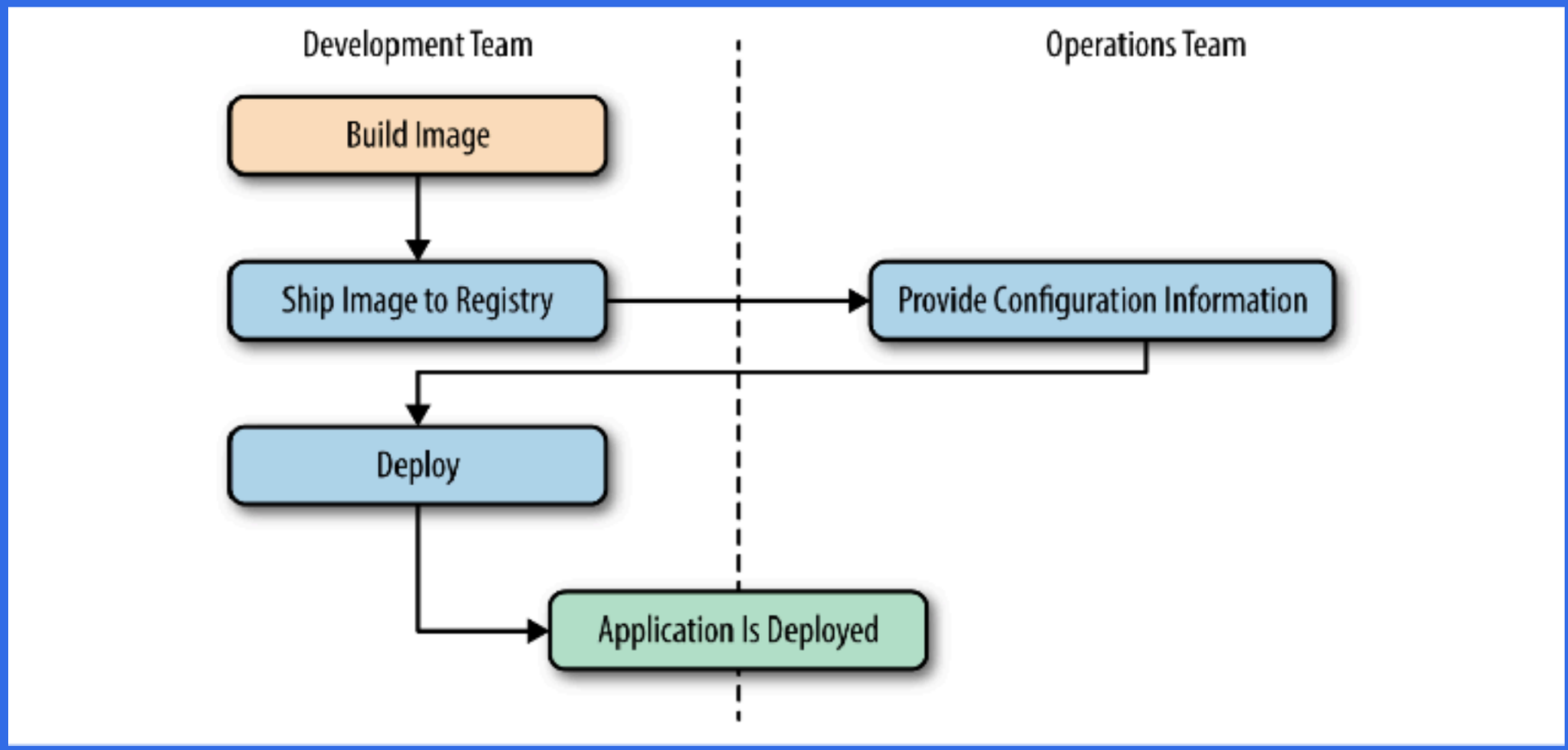
Two main benefits:

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

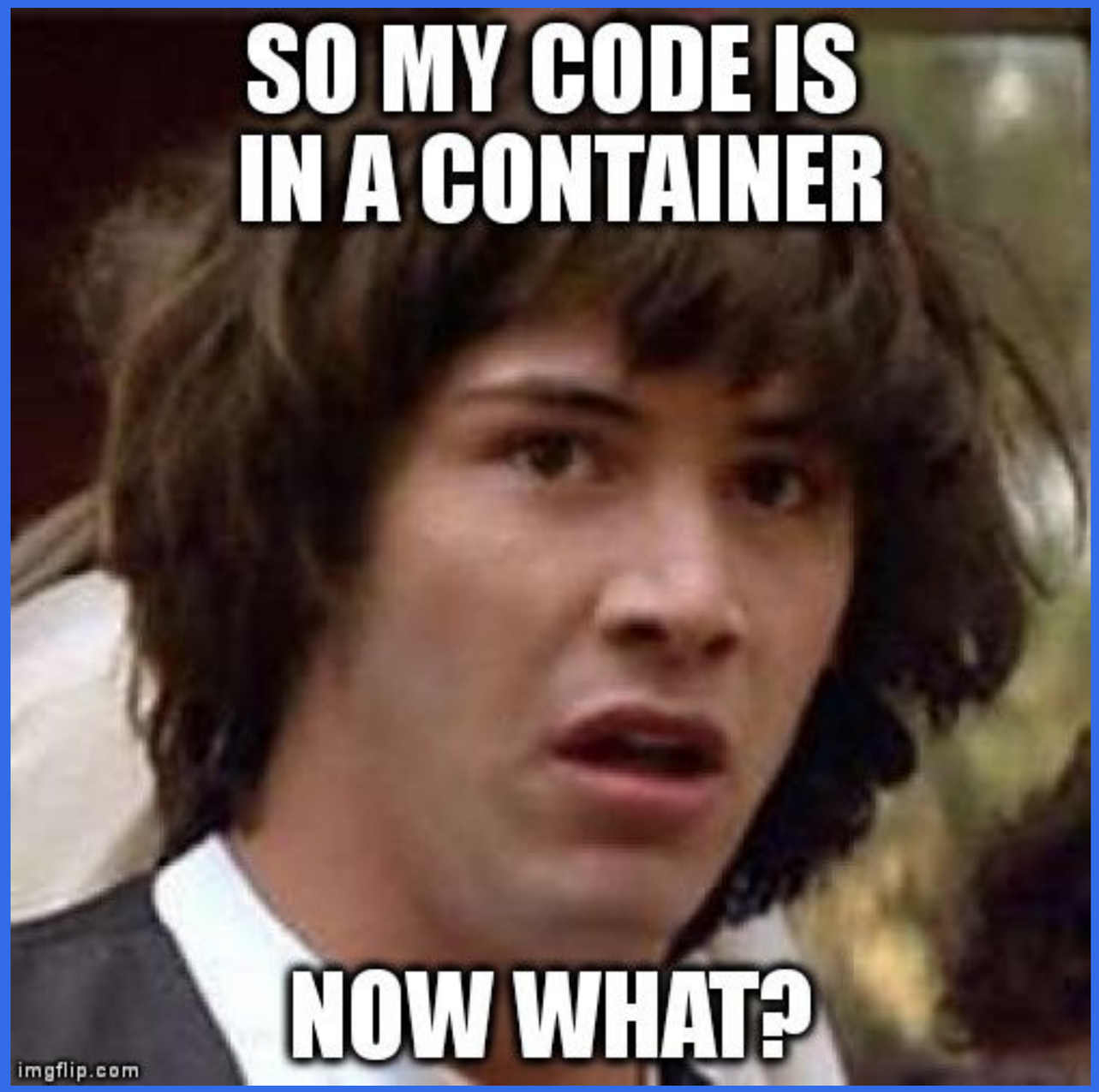
Packaging applications

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

Docker deployment



Now what?



Why do we need k8?

- **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

Application

Kubernetes

Storage

Machine

Network

EBS

NFS

GFS

VM

PHYSICAL

L2

L3

Infrastructure

k8 architecture

Kubernetes Master

KUBE - API SERVER

Scheduler

ETCD

Controller Manager

Cloud Controller

Node

Kubelet

Kube-proxy

POD

Container

Node

Kubelet

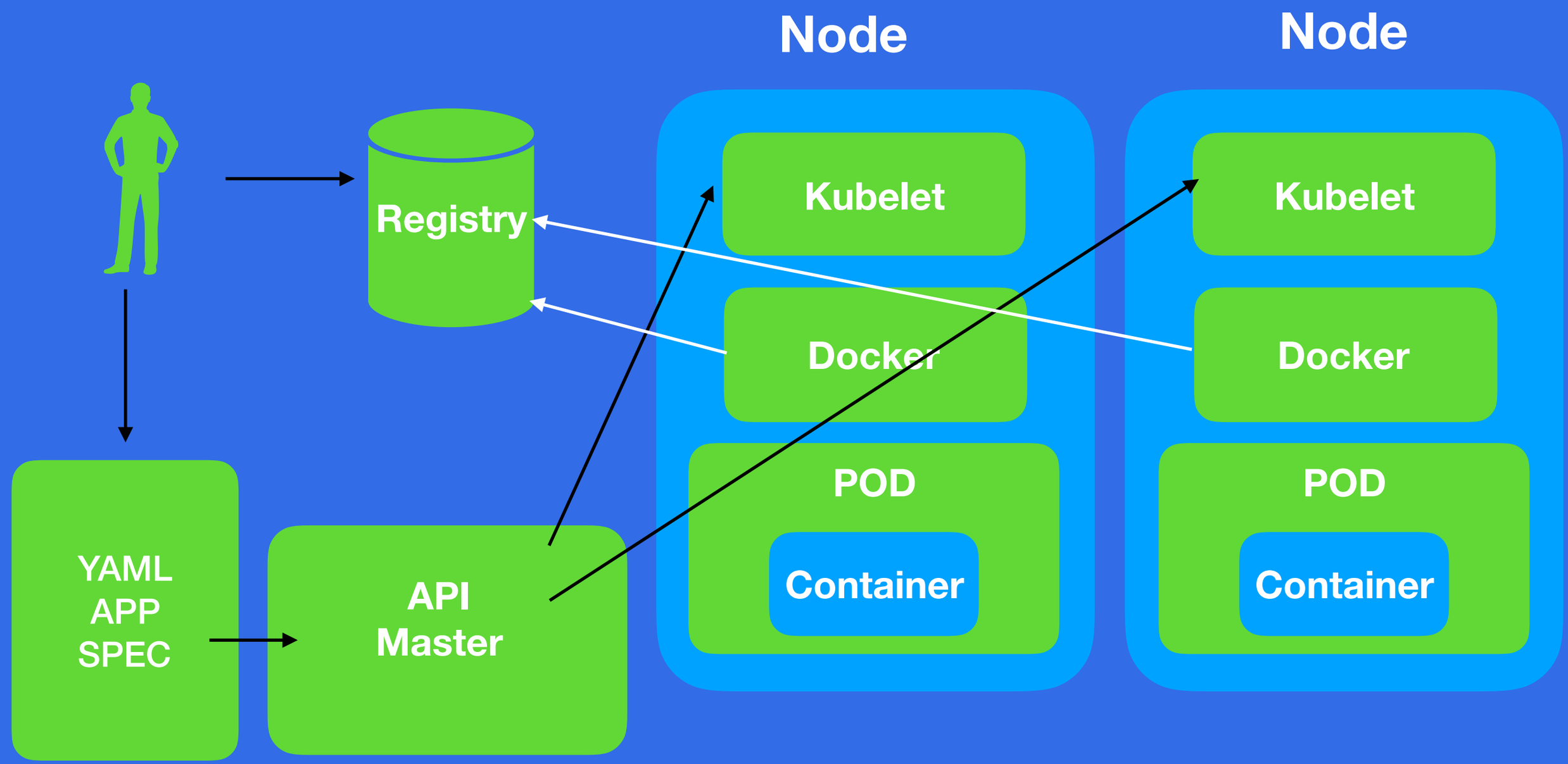
Kube-proxy

POD

Container

Cloud

pods/apps running on k8



k8 basic objects

- **Everything in k8 is a declarative configuration object (RESTfull 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**

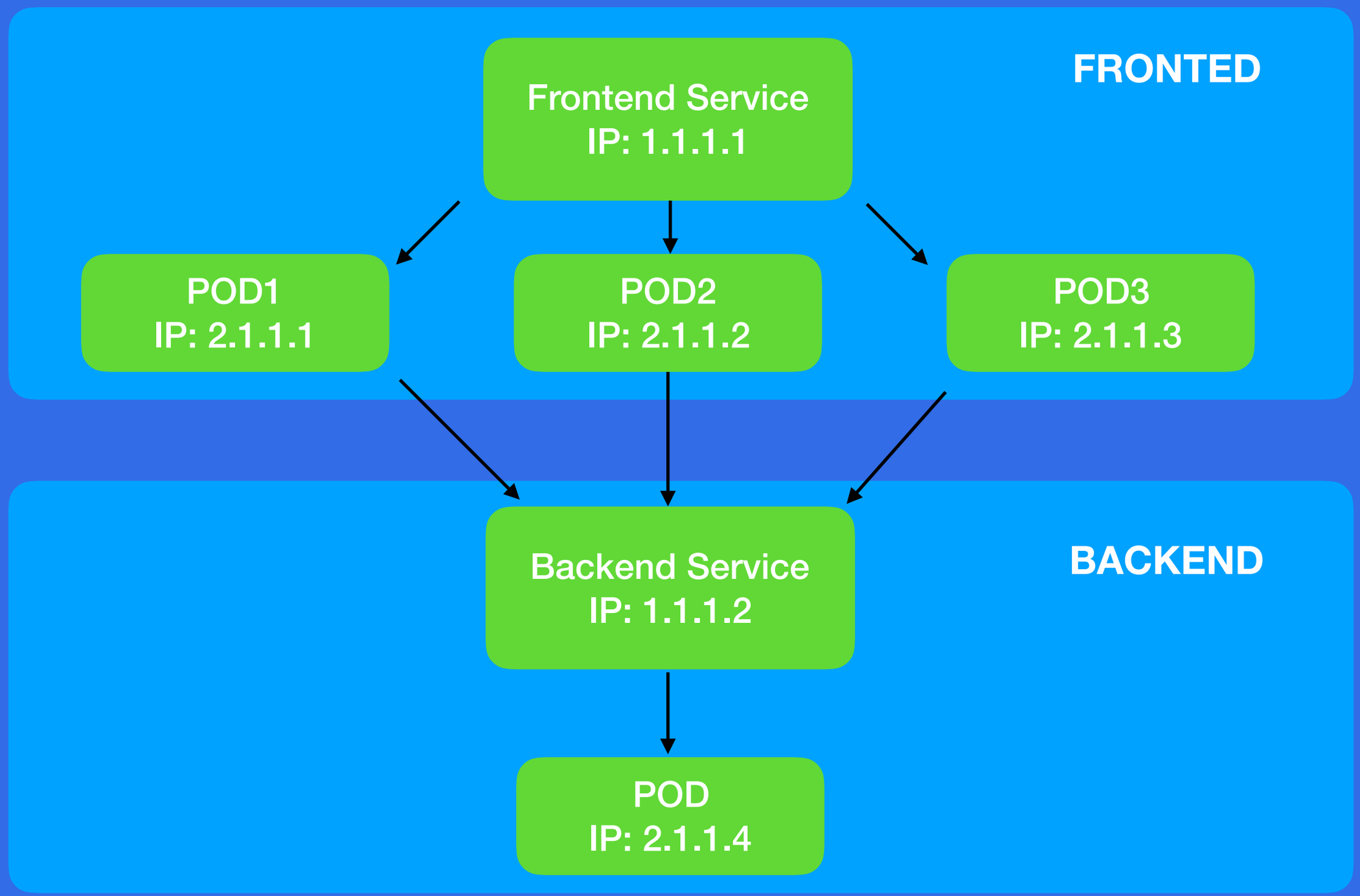
  generate the pods with a label, and keeps them alive

- **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

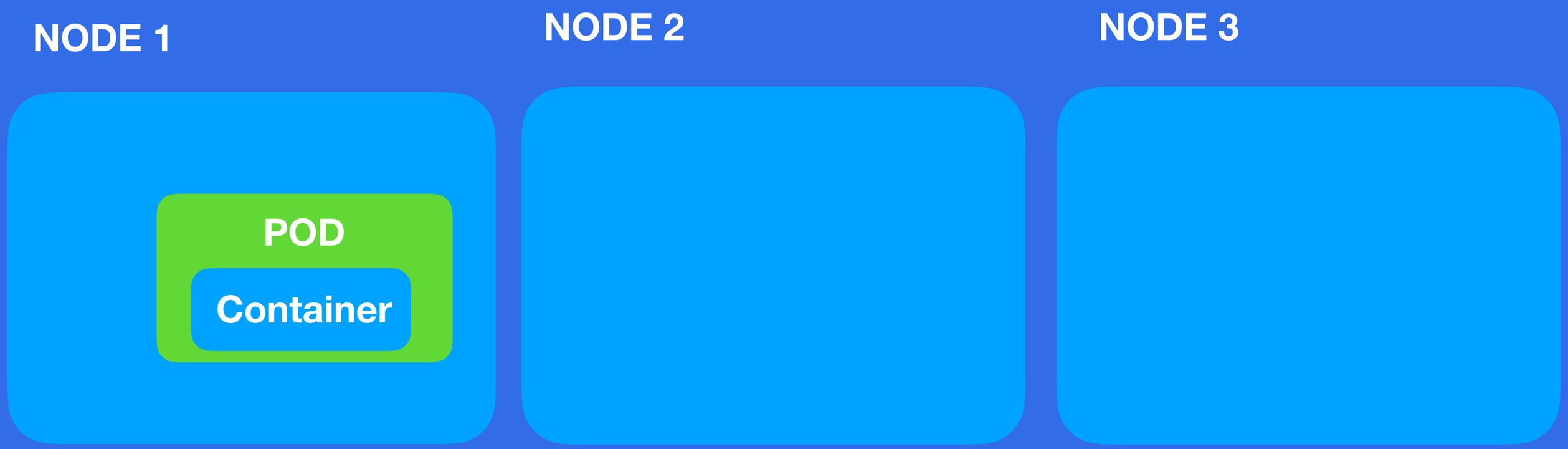
NODE 2

NODE 3

Deployment controller

Drives current state towards the desired state

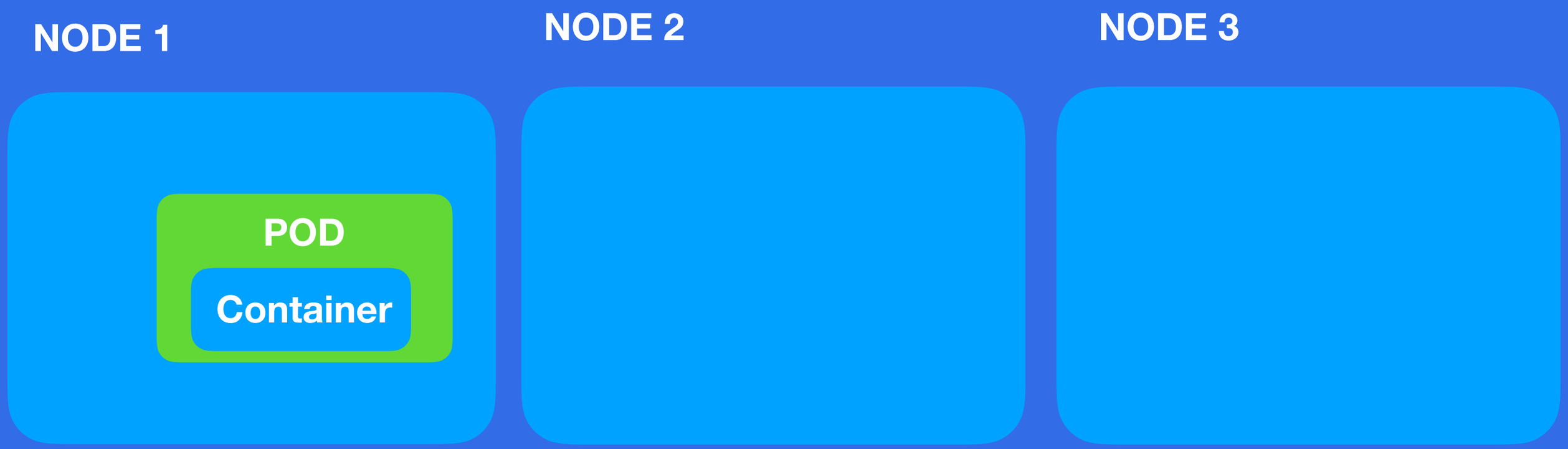
app: televendcloud
replicas: 1



Deployment controller

Drives current state towards the desired state

app: televendcloud
replicas: 3



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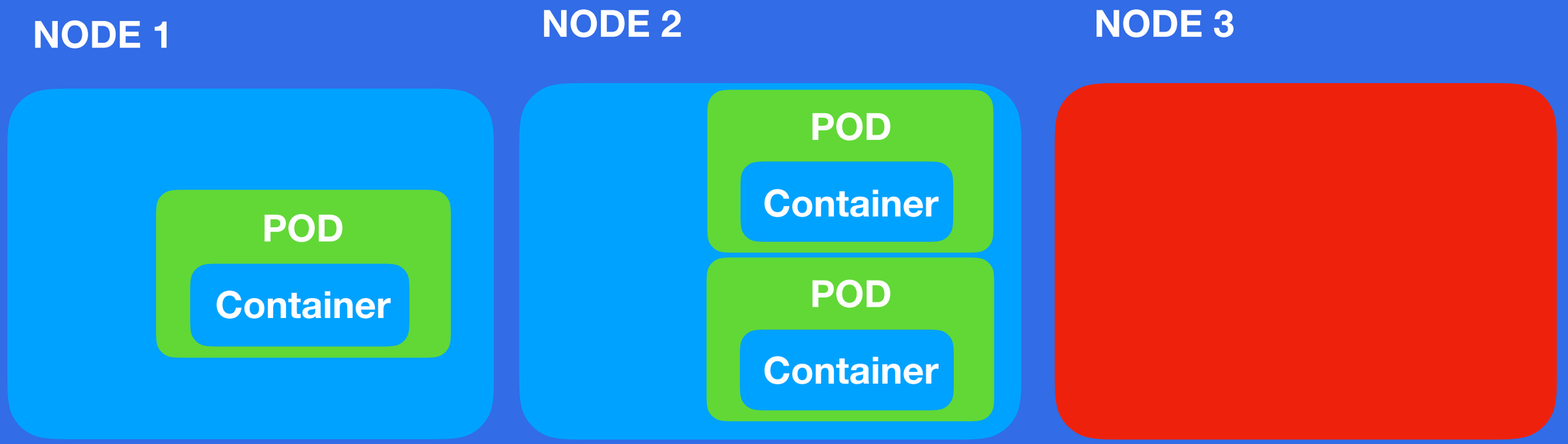
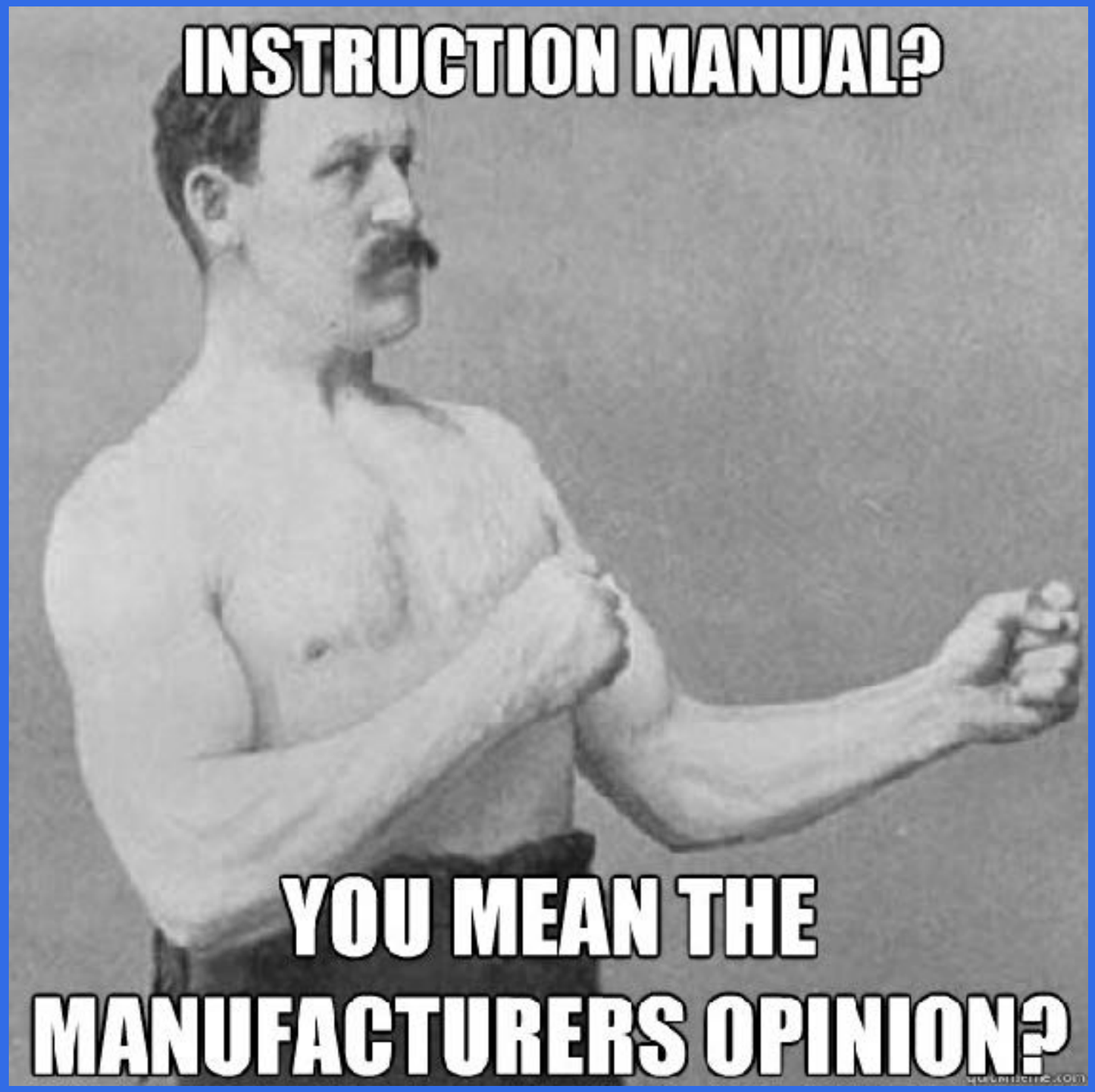


k8 documentation



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