ThoughtWorks®

KUBERNETES

Rise of the Containers Workshop

“I predict this technology will be too good to resist, those who are not participating today will change their mind later.”

- *Jim Zemlin, Linux Foundation*

Brief History

- Greek for “helmsman” or pilot
- First announced in mid-2014, as an all-Google project
- In mid-2015, Google + Linux Foundation came together to form CNCF

What is it?

“Kubernetes is a portable, extensible open-source platform for managing containerized workloads and services”

Ansible

Configuration

Works with hosts directly

Provision a system with the required config

On-demand system

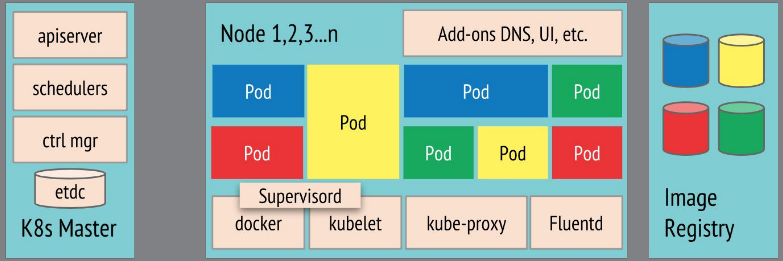
Kubernetes

Orchestration

Works with containers

Deploy ready-made images to infra

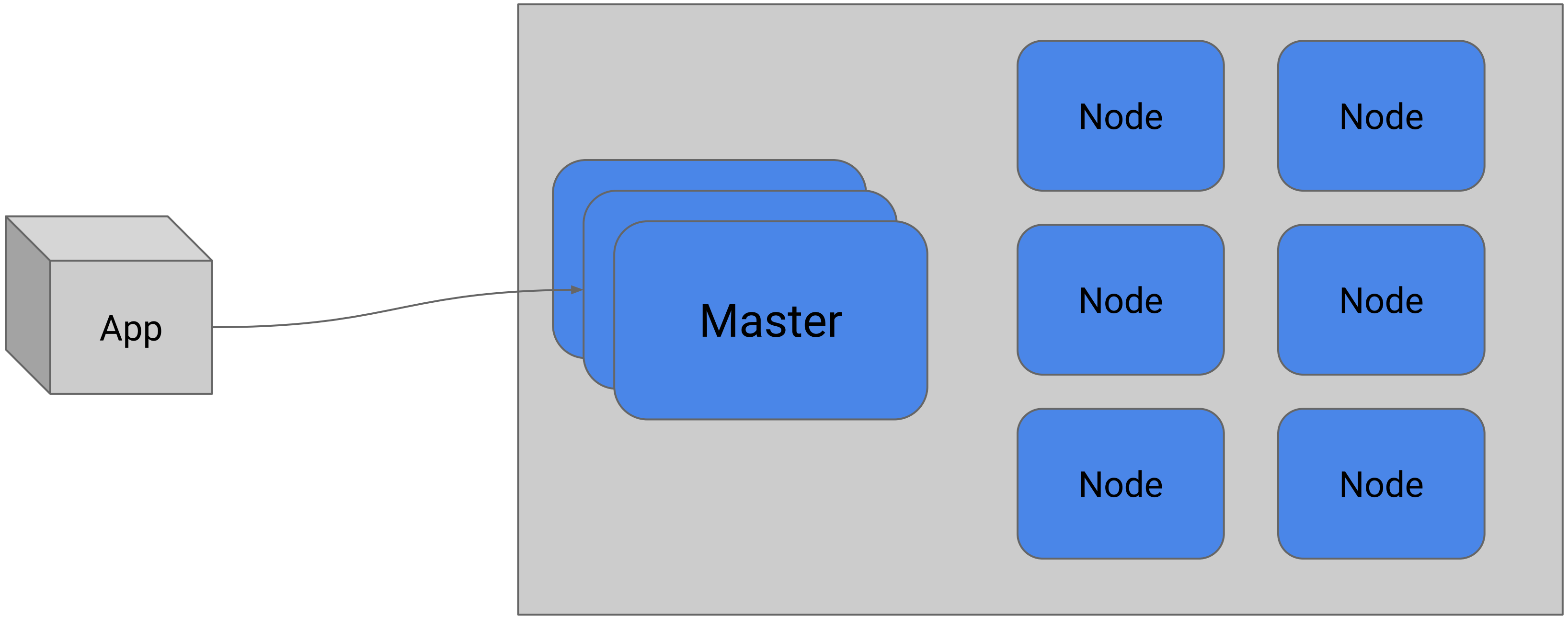
Live, realtime system



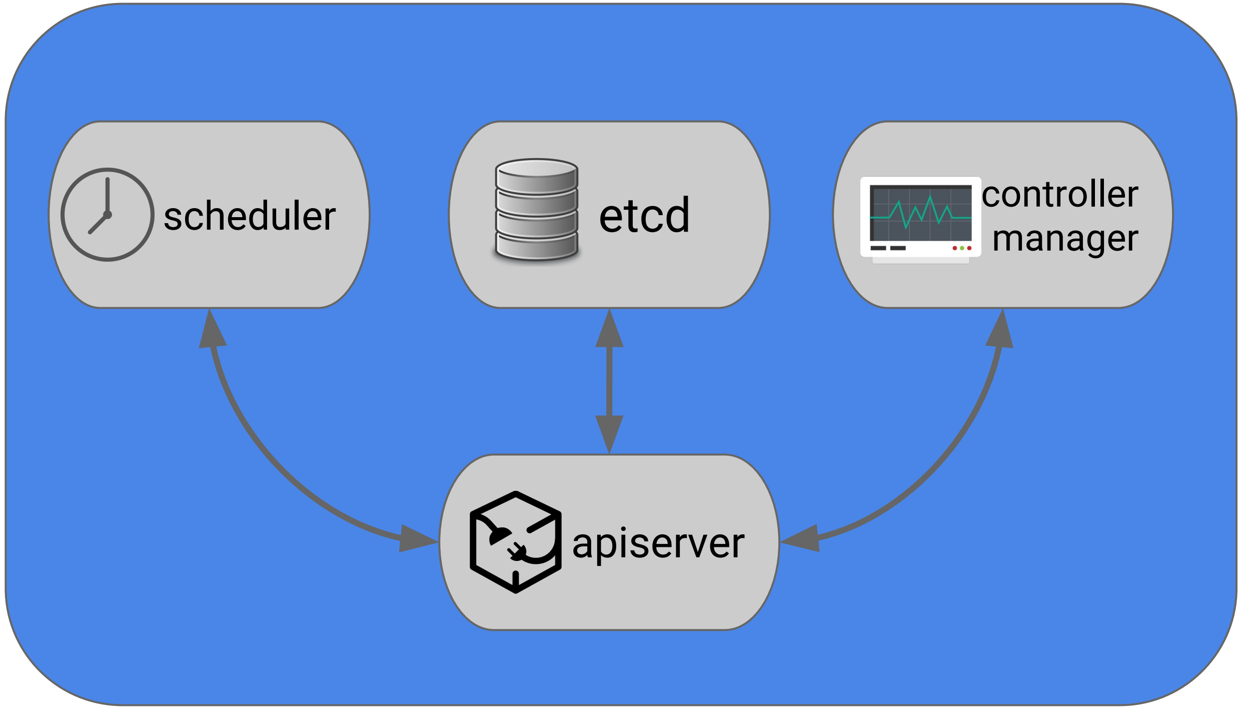
Kubernetes Architecture

Getting perspective at 30000 feet

High-level architecture

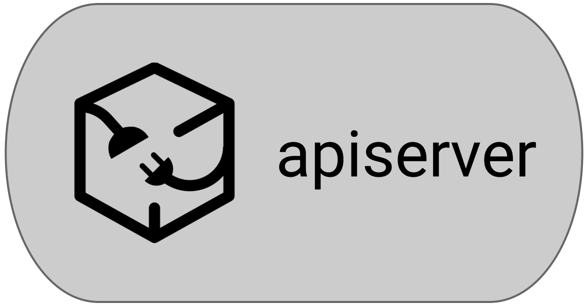


Master Components



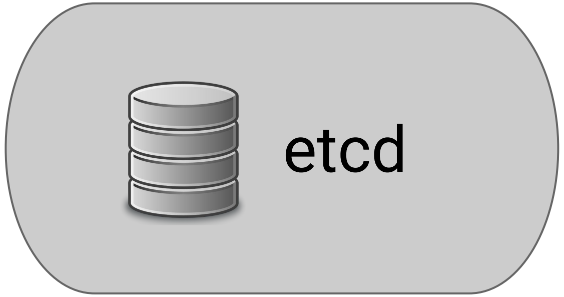
kube-apiserver

- Frontend to the “control plane”
- Exposes a REST API to interact with kubernetes
- Often mistaken for being the master



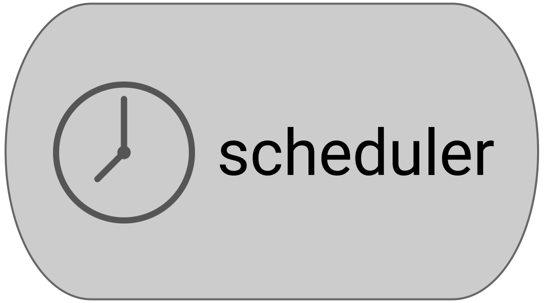
etcd

- Distributed, key-value store
- Used to store all cluster data
- The only stateful component in kubernetes
- “Source of Truth”



kube-scheduler

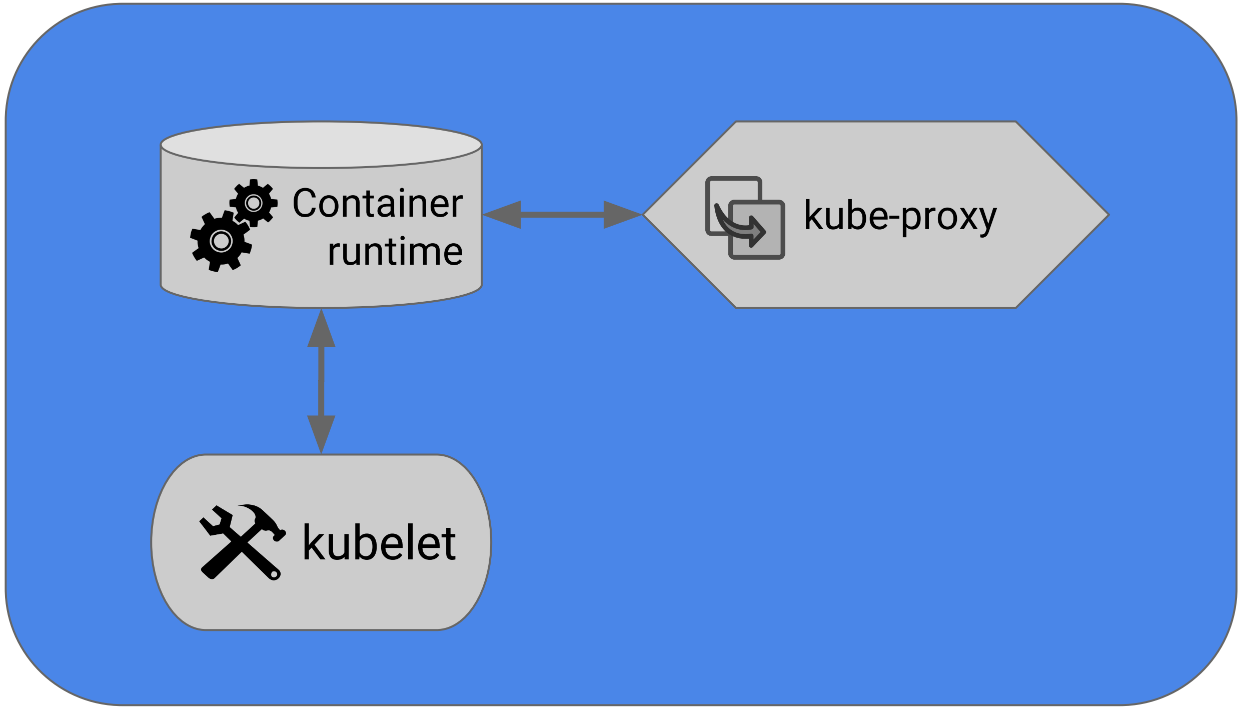
- Assigns a node for newly created pods
- Various options to choose from for affinity
- Continuously keeps watching store for new pods



kube-controller-manager

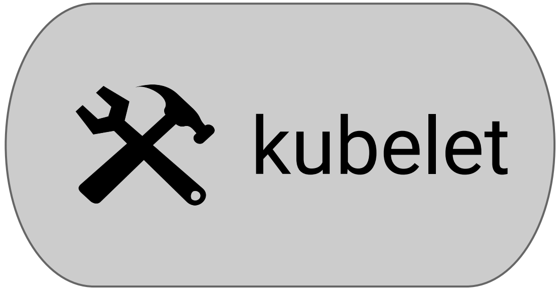
- Runs “controllers” in kubernetes
- Controllers are daemons that ensure the desired state is achieved in the cluster
- Examples of controller:
    - Node Controller
    - Replication Controller
    - Endpoints Controller

Node Components



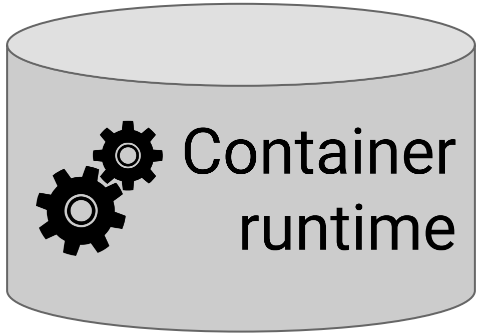
kubelet

- Main agent on the node, often mistaken for the node itself
- Keeps watching the apiserver for work
- Instantiates pods
- Reports to master



Container Runtime

- Deals with the container abstraction
- Pull images, start/stop containers, etc
- Works with any OCI compliant container engine
- Usually docker, but also supports rkt



kube-proxy

- Deals with networking within the node
- Assigns an IP to each “pod”
- Is primarily used to maintain the “service” abstraction

Reconciliation

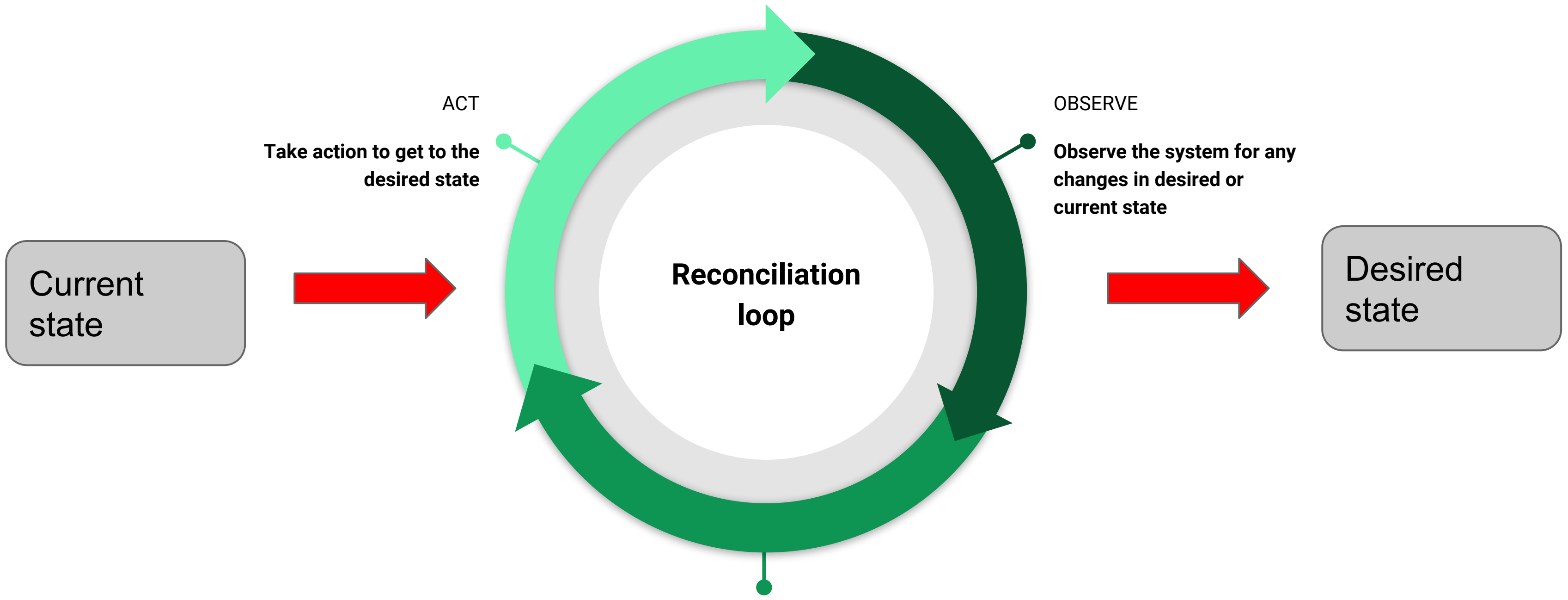

ACT
Take action to get to the desired state
OBSERVE
Observe the system for any changes in desired or current state
Current state
Reconciliation loop
Desired state
DIFF

Figure out the differences between desired and current state

Hands on Minikube

Let's kick things off with **`$ minikube start`**

kubectl the command line

```
kubectl [command] [TYPE] [NAME] [flags]
```

Basic commands to inspect k8s

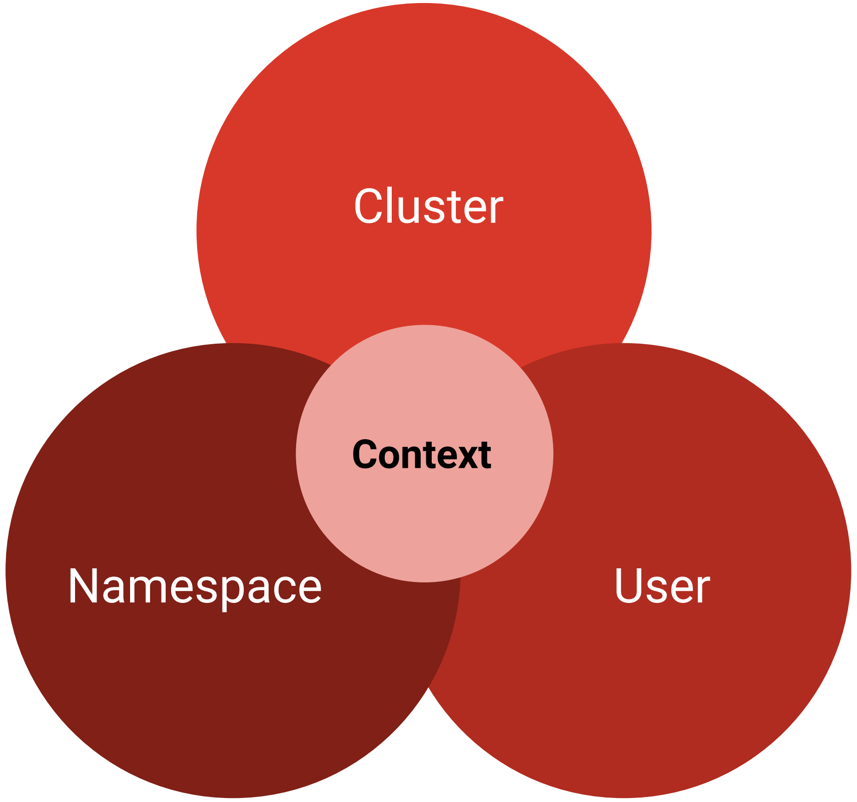
```
$ kubectl version

$ kubectl cluster-info

$ kubectl top

$ kubectl config view
```

kubectl config



kubectl *config context*

```
$ kubectl config get-contexts

$ kubectl config current-context

$ kubectl config use-context

$ kubectl --context [...]
```

kubectl *namespaces*

```
$ kubectl get namespaces

$ kubectl get pods

$ kubectl get pods \

    --namespace kube-system
```

kubectl

running applications

```
$ kubectl run hello-world \
    --image=gcr.io/google-samples/node-hello:1.0 \
    --port=8080


$ kubectl get pods

$ kubectl describe pod <podName>
```

kubectl

access applications

```
$ kubectl expose deployment
hello-world \

--type=NodePort \

--name=hello-world-service


$ kubectl describe services \

hello-world-service


$ curl http://<minikube-ip>:<nodePort>
```

Quick exercise!

Run the **metadata** service using **kubectl**

NOTE:

- Point local docker client to minikube's docker:

```
$ eval $(minikube docker-env)
```

- Build the metadata image again before attempting to run it