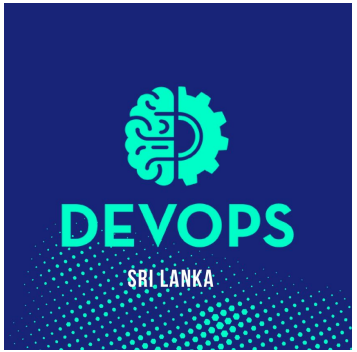
Extending

kubernetes



Collaboration of Dev and Ops

@ ZALANDO

160+ k8s Clusters

700+ postgres databases

240+ teams

> 250 million visits per month.

In 17 countries

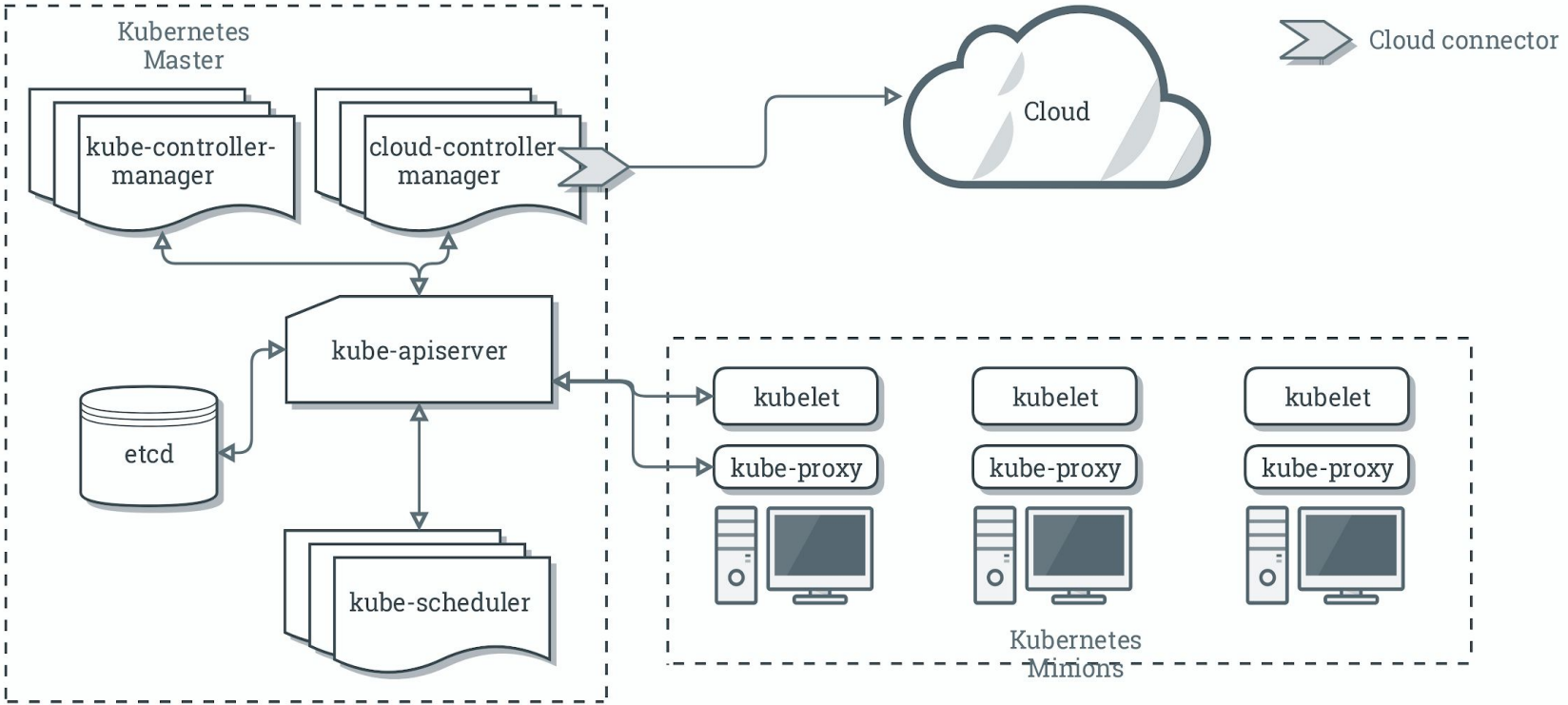
Plan

Kubernetes internals
Why you would extend Kubernetes?
Available Options
Operator SDK

A little bit of background

- Kubernetes is a portable, extensible open-source platform for managing containerized workloads and services, that facilitates both declarative configuration and automation.
- All Interactions with Kubernetes are through an API

Let’s look into Internals


Kubernetes
Master
kube-controller-
manager
cloud-controller
manager
Cloud
Cloud connector
kube-apiserver
etcd
kube-scheduler
kubelet
kubelet
kubelet
kube-proxy
kube-proxy
kube-proxy
Kubernetes
Minions

Kubernetes is API Centric

Declarative

What vs How?
Easy to track changes.
Everything can be build from a definition.

State Separation

Desired State

Observed State

Transparent

Single Control Plan

Facilitate Composability

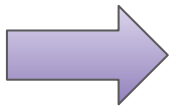
kubernetes

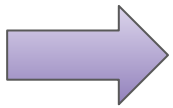
Declarative?

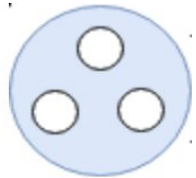
kubernetes

I want a pod!!

```
apiVersion: v1
kind: Pod
metadata:
  name: test-pod
spec:
  containers:
    - name: test-container
      image: nginx
```





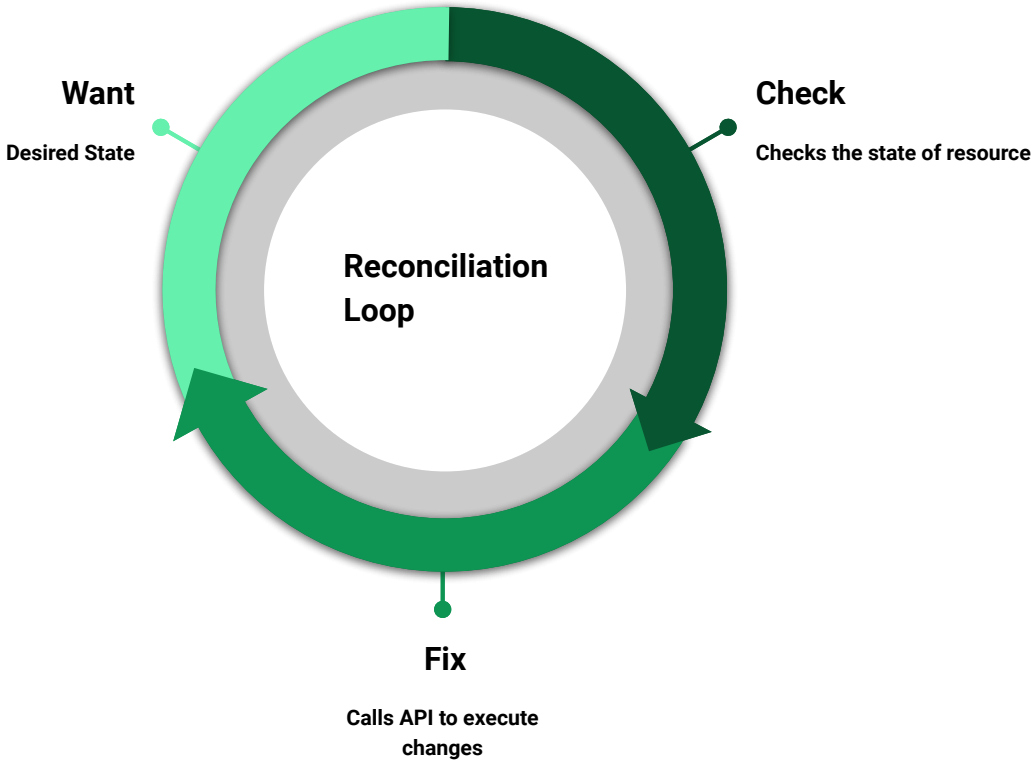


What just happened?

Controller

Control Theory

Control Loop



Resources with controllers

- Pods
- Deployments
- Replication Sets/Replication Controllers
- Service
- Ingress
- Secrets


I Don't Need To Fit In
mmiles
I'm Custom Made

Custom Resources

- We can create new resources type with our own attributes
- This can be driven through the Kubernetes API
- Custom Resource with Custom Controller creates a true declarative API

Operators

What are those?

- Operators are also a class of Controllers
- Implements and manages custom resources with custom operational and reconciliation logic.
- Hold information on how an application is managed

Why?

The Operator pattern captures how you can write code to automate a task beyond what Kubernetes itself provides.

How?

- Controller-runtime(Go)
  - client-go(sample-controller)
  - Operator-sdk
  - Kubebuilder
- meta-controller
- rook-operatorkit
- kopf
- Shell-operator
- Other langages
  - Python & Java clients

Operator SDK Types

- Go
- Helm
- Ansible

Create Operator

Operator to get an image and run multiple instances as described in a CRD

Operators for Reference

- https://github.com/zalando/postgres-operator
- https://github.com/aws/aws-service-operator-k8s
- https://github.com/coreos/prometheus-operator

Resources

- https://sdk.operatorframework.io/
- https://kubernetes.io/docs/concepts/extend-kubernetes/api-extension/custom-resources/#custom-resources
- https://operatorhub.io/
- https://www.openshift.com/learn/topics/operators
- https://www.katacoda.com/openshift/courses/operatorframework/go-operator-podset

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