Hi! :)

Who am I you might ask

- David Hondl
- **Cloud Engineer** @ XXXLdigital
- Things I **care** about
  - Coding / DevOps practises / CNCF
  - Music and mountains
  - All the standard stuff

Kubernetes as a universal **controlplane**

An Introduction into Crossplane

What and why is

Kubernetes

kubectl

containers!

YAML!

cloud hosted

CNCF

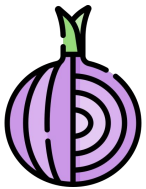
deploy apps

service mesh

so scalable

The main use case

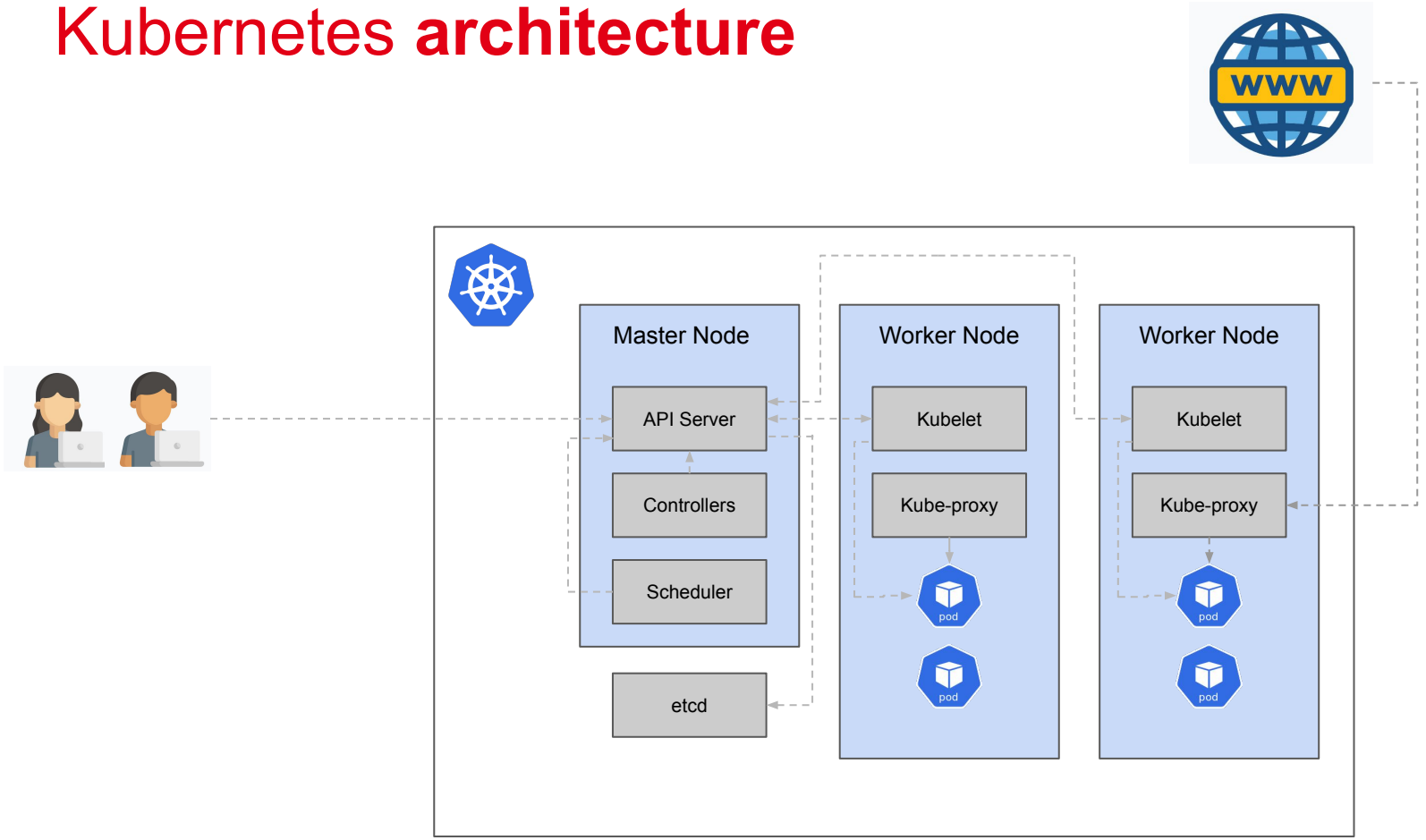
- Schedules and manages **containers** at scale
- Auto-**heal** and **scale**
- **Expose** deployment
- **Desired state** is applied
- `kubectl`



But it is **MORE** than that

Interesting K8s patterns I want to talk about

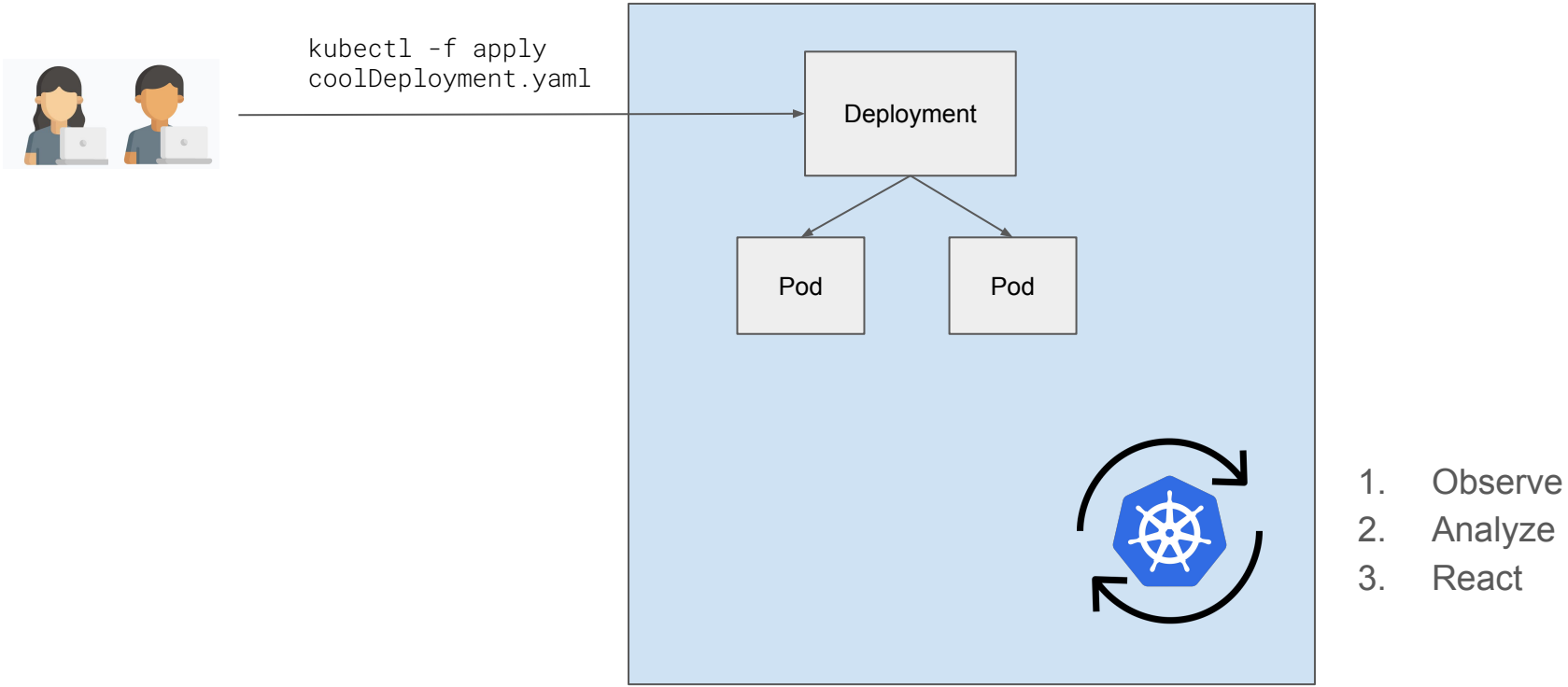
Kubernetes **architecture**



Resources and Reconciliation

- Can be **modified** by user (**CRUD**)
- Stored in **etcd**
- Desired state is **enforced** by Kubernetes

```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 3
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.14.2
  ...
```

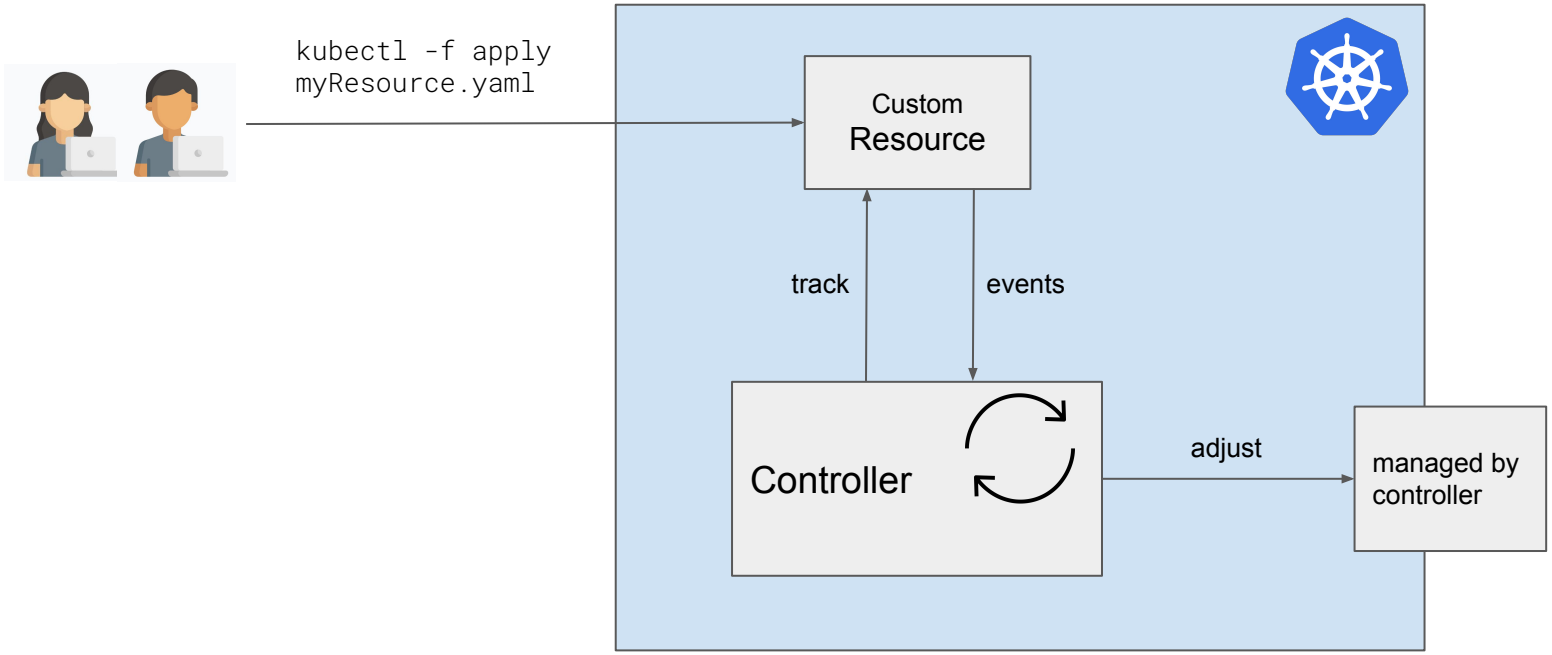


1. Observe
2. Analyze
3. React

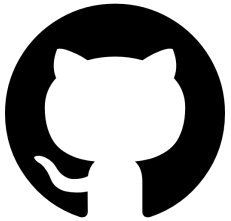
Custom Resources and Operator pattern

- **Custom Resources** extend Kubernetes
- Defined by **CustomResourceDefinition**
- Watched by controller
- CRDs + Controller = **Operator**
- Istio, MongoDB, Dynatrace

```yaml
apiVersion: networking.istio.io/v1beta1
kind: VirtualService
metadata:
  name: reviews-route
spec:
  hosts:
      -  example.prod.svc.cluster.local
  ...
```

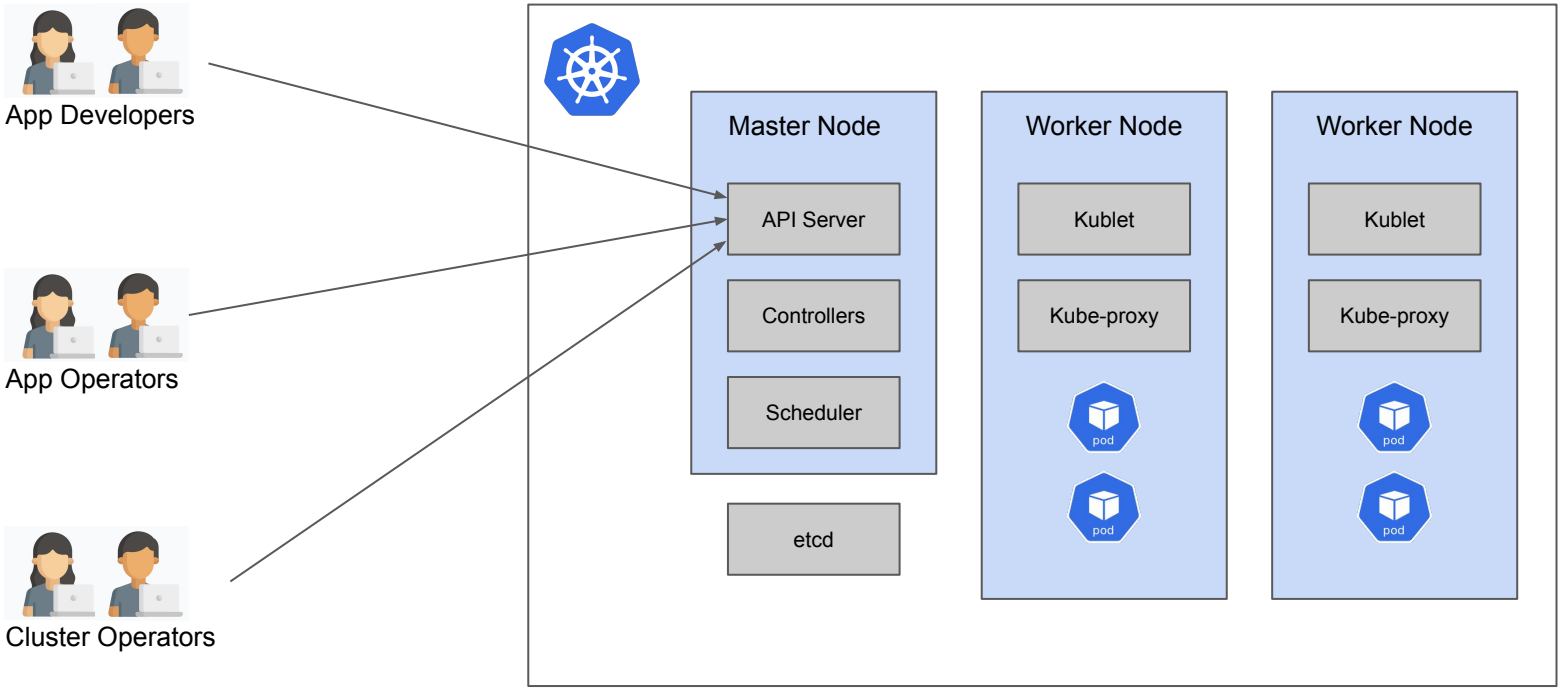

kubectl -f apply
myResource.yaml
Custom
Resource
track
events
Controller
adjust
managed by
controller

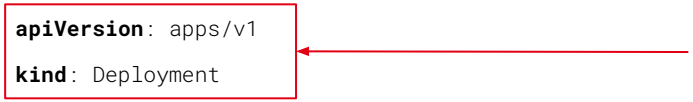
Focus on collaboration



- **Declarative**, optionally revisioned in Git
  - enables **GitOps**
- **RESTful** CRUD operations
- **Multi-persona collaboration** using API Groups in Kubernetes

Object / API access depends on user group





```yaml
apiVersion: apps/v1
kind: Deployment
metadata:
  name: nginx-deployment
  labels:
    app: nginx
spec:
  replicas: 3
  selector:
    matchLabels:
      app: nginx
  template:
    metadata:
      labels:
        app: nginx
    spec:
      containers:
      - name: nginx
        image: nginx:1.14.2
        ports:
        - containerPort: 80
```

Ingredient #2

infrastructure as code

What is it?

- Automate third party provisioning via applicable configurations

- It goes as follows:
  - Define your **needs** as config
  - Put them in a **repository**
  - **Apply** them via IaC tool
  - ???
  - **Profit**

- IaC tools talk to **all platforms** for you in a uniform way

```
terraform {
  required_providers {
    aws = {
      source  = "hashicorp/aws"
      version = "~> 4.16"
    }
  }
  required_version = ">= 1.2.0"
}
```

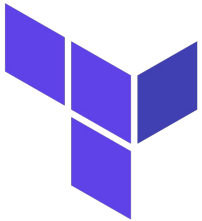
grouping

```
provider "aws" {
  region  = "us-west-2"
}
```

part of provider

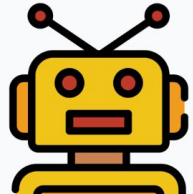
```
resource "aws_instance" "app_server" {
  instance_type = "t2.micro"

  tags = {
    Name = "ExampleAppServerInstance"
  }
}
```

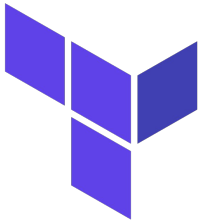


What makes it superior to us puny humans?

- Repeatability
- Consistency
- Transparency



Observations on current IaC tools



- **Template** approach
  - **Sequential / Synchronous** provisioning
  - **Access** depends on who executes it
  - Modeling **team boundaries** - who owns what
- **Monolithic** state
  - **Drift management** - keeping the state in sync with your config
  - State lock
- Yet **another** language / tool
- Thus →Infrastructure-silo **OpsPerson**

With this in mind…

Infrastructure as code
limitations and requirements

Write operators!

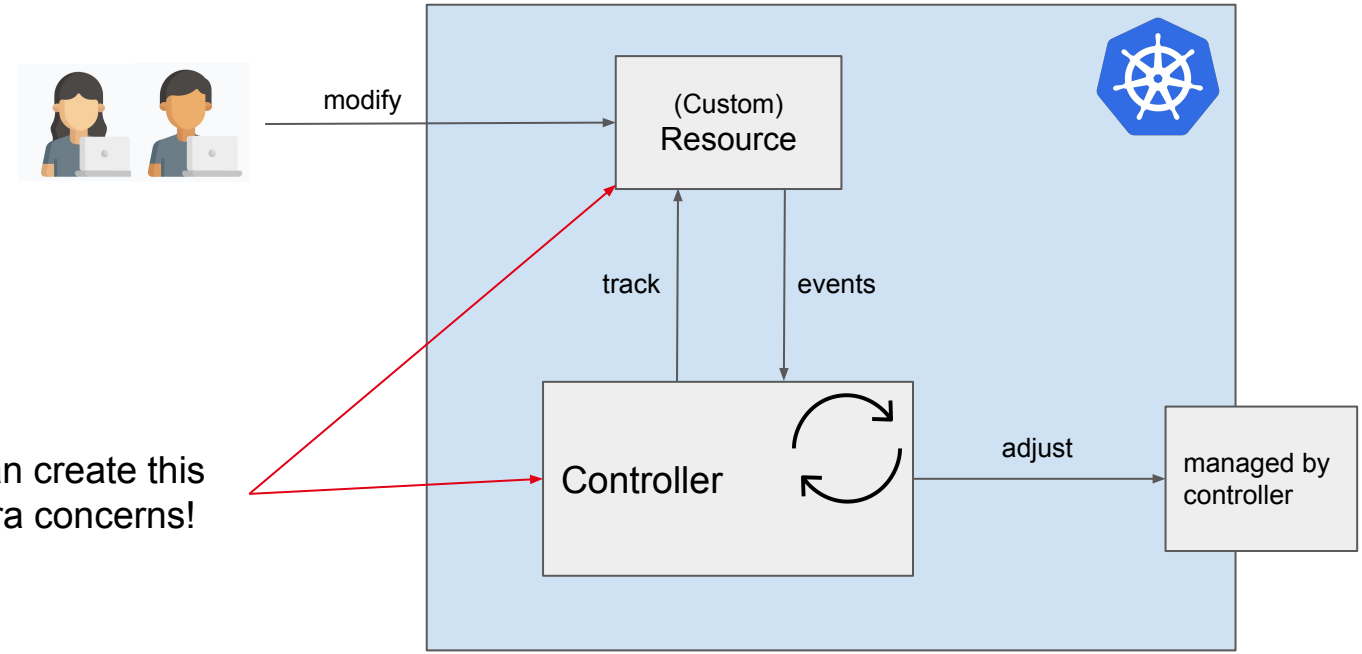
state managements

collaborative

declarative

unified workflows

extensible



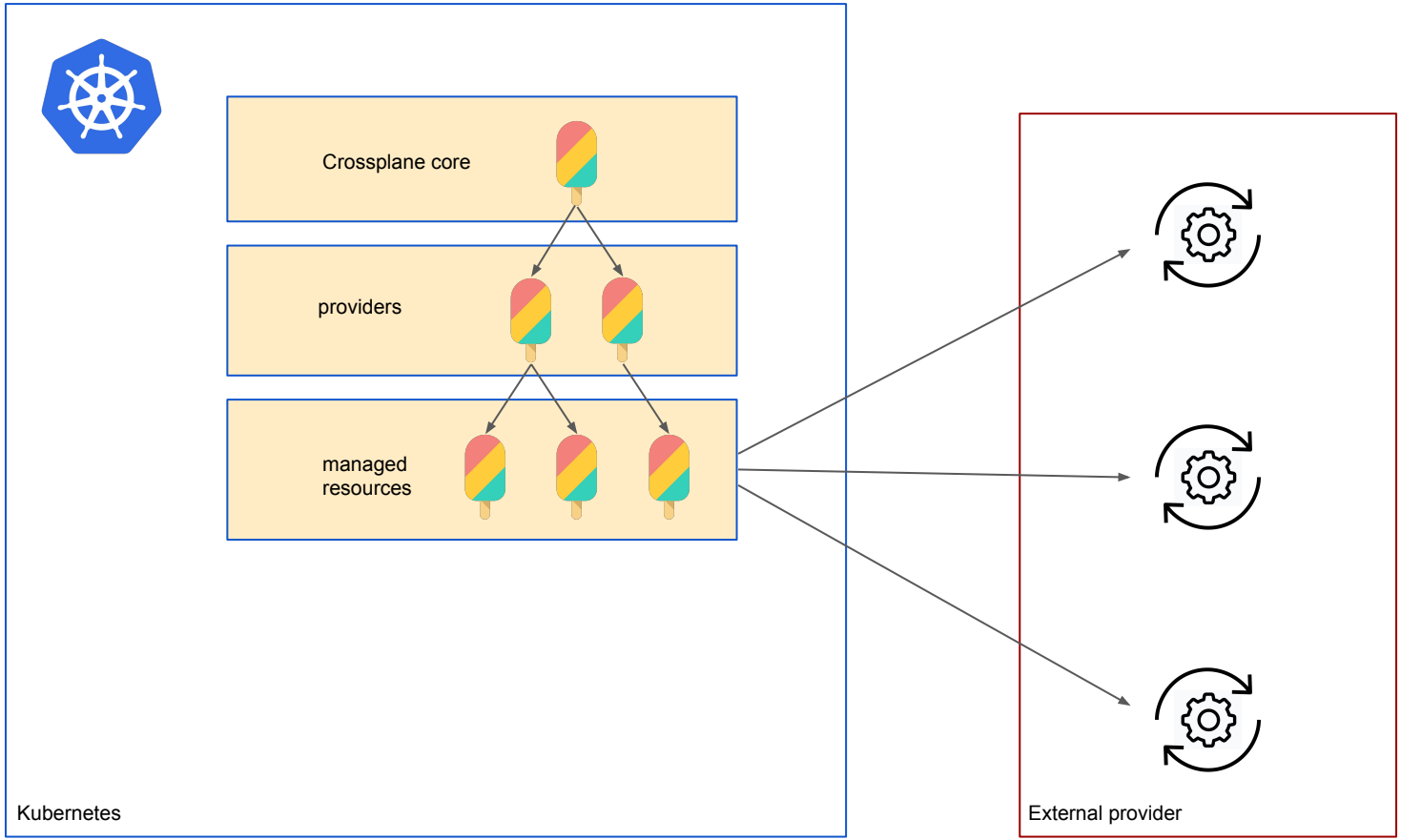
We can create this
for infra concerns!

Surprise announcement!

Crossplane

Crossplane

- Open source
- Control plane **framework**
- Built on top of **Kubernetes (principles)**
- It actually doesn’t start with a **K**


Crossplane core
providers
managed
resources
Kubernetes
External provider

Crossplane provider strategy

- Providers are **separately maintained**
- Open source
- Can be shared via **market place**
- Can be generated via **Upjet**
- Still a **lot** of work to do

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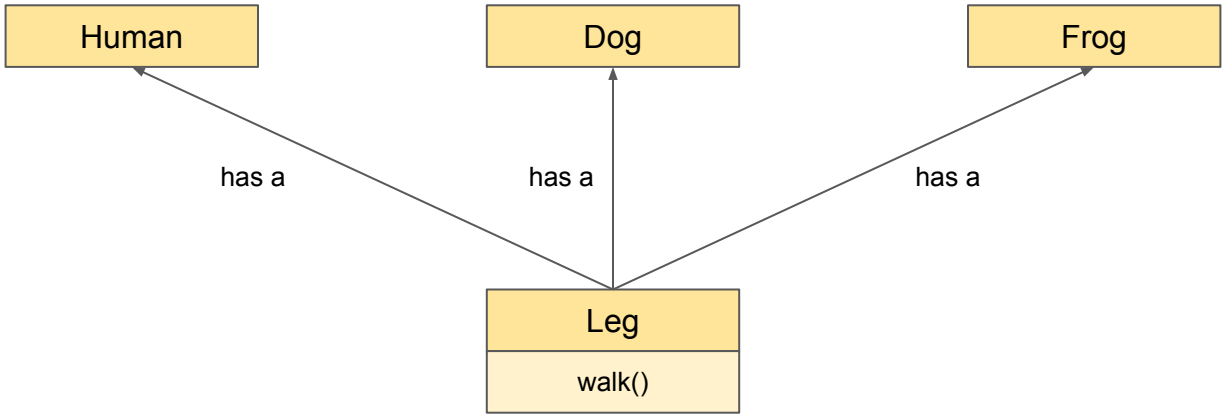
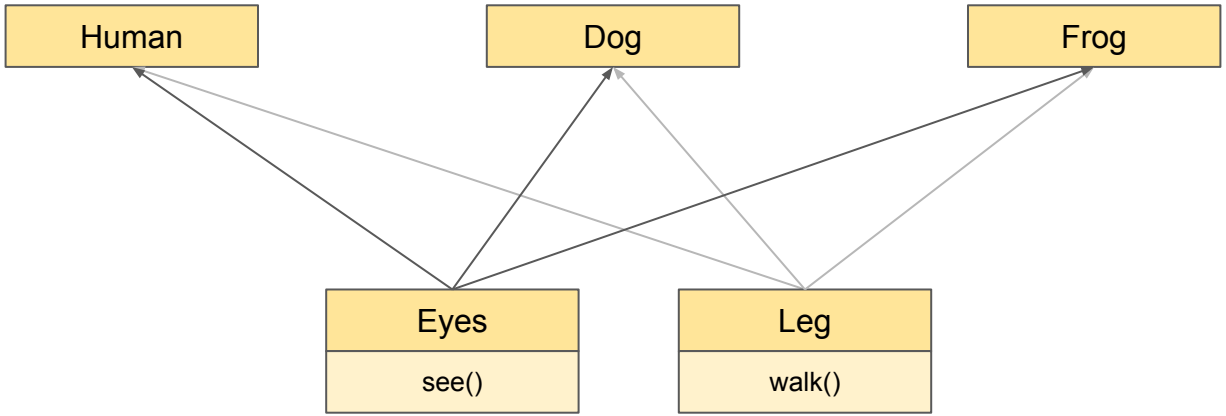
Core & providers

Crossplane resources

- Install new resources via **providers**
- Create **recipes** from managed resources
- **XRDs** build on the concept of **CRDs**
- **Composition** pattern


Human
Dog
Frog
has a
has a
has a
Leg
walk()




```
Not even trying
with an image
this time
```

App Developers

namespaced resource

AppSpace

Platform Engineer

global resource

AppSpace

KubernetesCluster

Project

GCPCluster

Nodepool

NetworkingRule

GCPProject

ProjectService

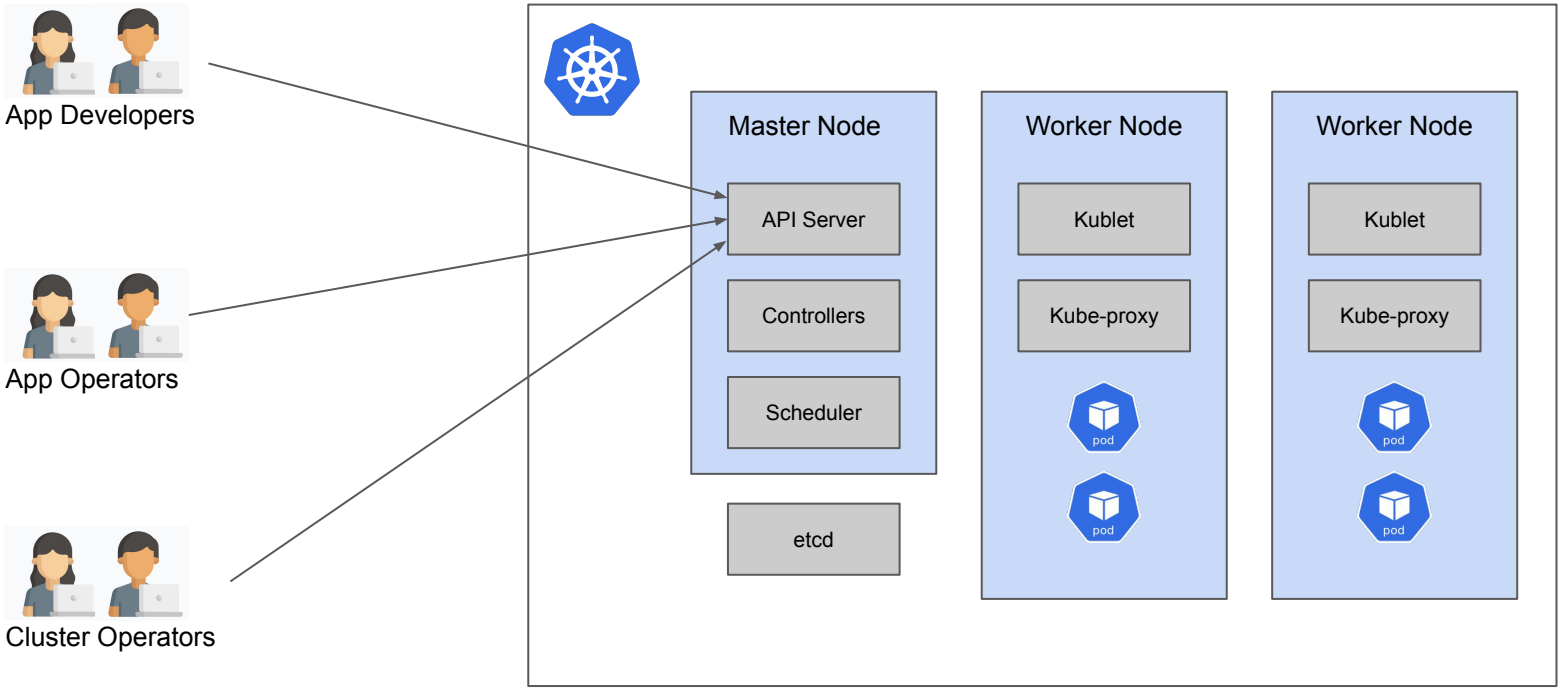
XRD

managed

Actually you are an

API designer

Object / API access depends on user group



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XRDs

How can this help us with

Overcoming **limitations**

A clear API

- Who loves YAML?? ***crowd cheers***
- Talk to a well defined (Kubernetes) **API**
- **Semantic versioning** and a rollout strategy

Continuous reconciliation

- Instead of **synchronous provisioning**
  - The same as other K8s resources
- It replaces **YOU** (as reconciliation loop)
- **Decouple** and break monolithic representation
  - Avoid configuration drift
- There always will be **dependencies**, model them correctly
  - E.g. K8s **labels**

Clear access control

- **Third party** access
  - Providers / controllers handle access secret
  - Multiple ProviderConfigs possible

- **User** access
  - Via **Kubernetes API**
  - **RBAC** all the way

Concept of self-service

- **Expose** specific claims to groups of people
- Underlying resources with separate state are **abstracted**
- Provisioning **without** supervision / manual interference

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Apply ALL the things

Thank you for listening!