

kubernetes



OVHcloud Kubernetes Tech Lab Spain

Horacio Gonzalez

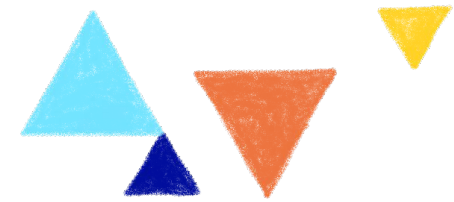
2022-09-20 - Madrid

2022-09-21 - Bilbao

2022-09-22 - Barcelona



@LostInBrittany



Who are we?

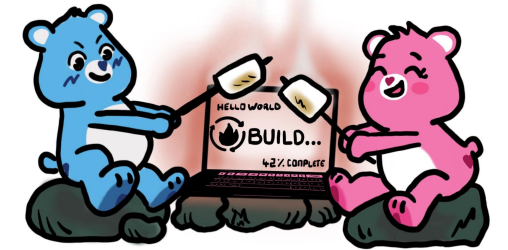
Introducing myself and
introducing OVHcloud



Horacio Gonzalez

@LostInBrittany

Spaniard Lost in Brittany



OVHcloud



Web Cloud & Telecom



Private Cloud



Public Cloud



Storage



Network & Security



30 Data Centers
in 12 locations



34 Points of Presence
on a 20 TBPS Bandwidth Network



2200 Employees
worldwide



115K Private Cloud
VMS running



300K Public Cloud
instances running



380K Physical Servers
running in our data centers



1 Million+ Servers
produced since 1999



1.5 Million Customers
across 132 countries



3.8 Million Websites
hosting



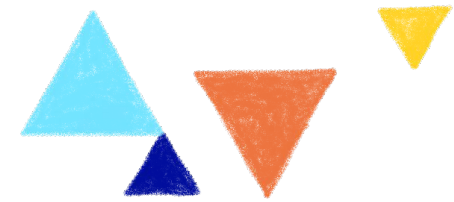
1.5 Billion Euros Invested
since 2016



P.U.E. 1.09
Energy efficiency indicator

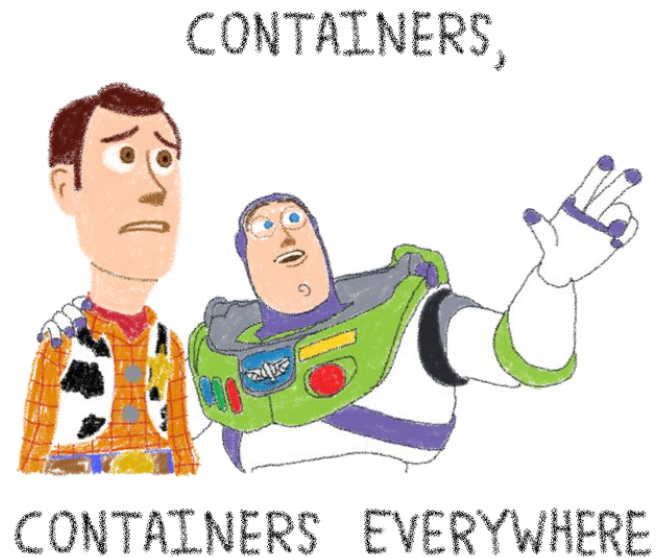


20+ Years in Business
Disrupting since 1999



Why do we need Kubernetes?

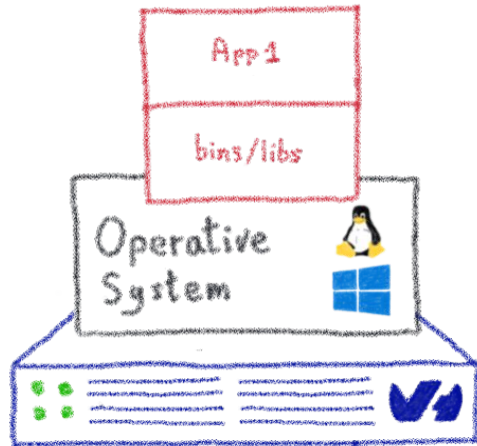
Taming the complexity of operating containers



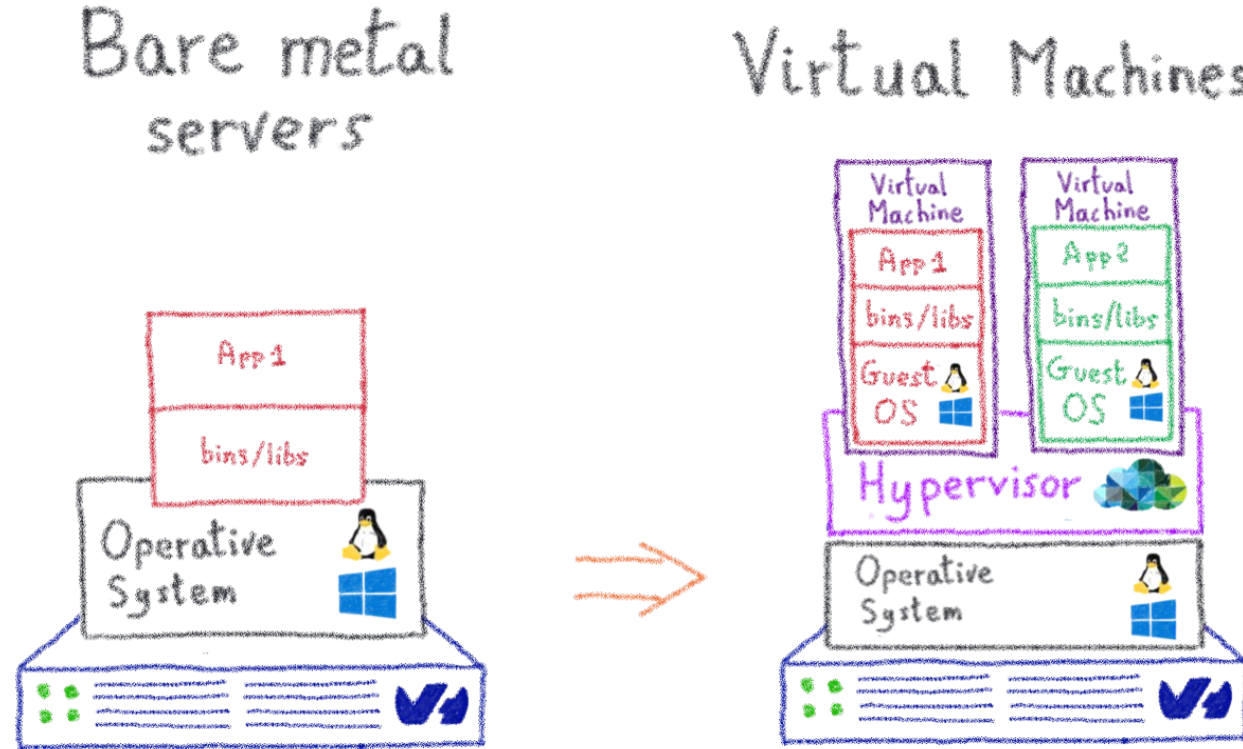
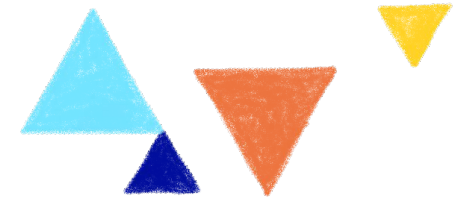
From bare metal to containers



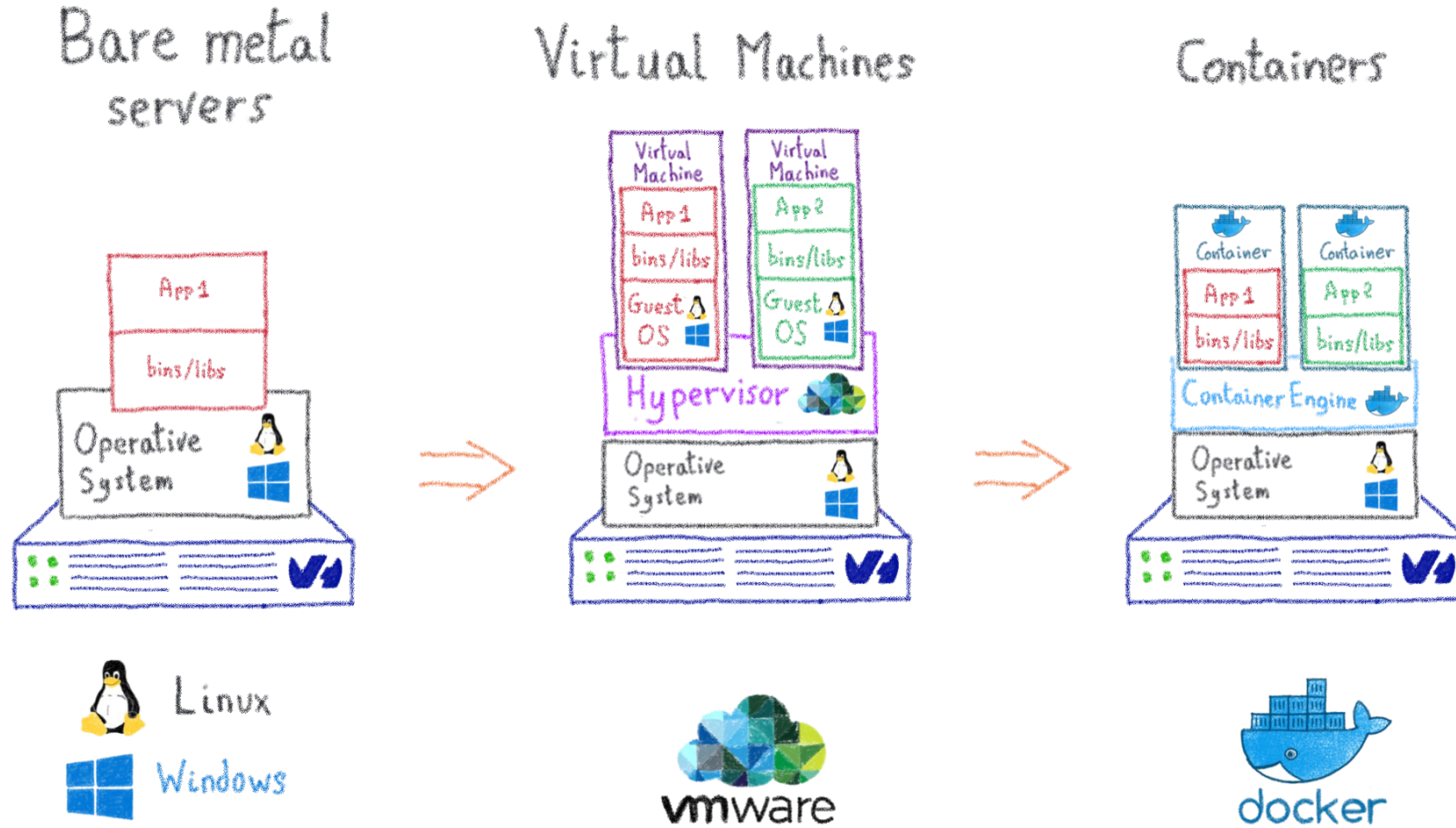
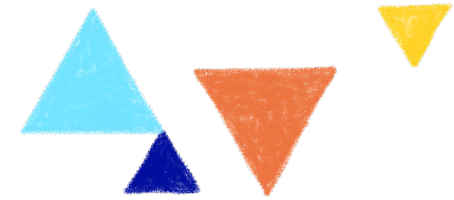
Bare metal
servers



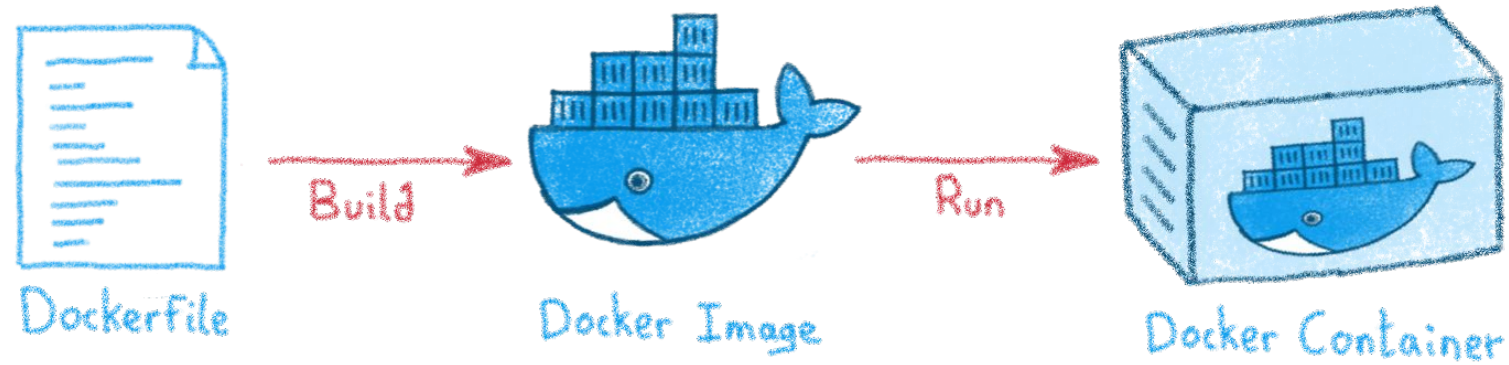
From bare metal to containers



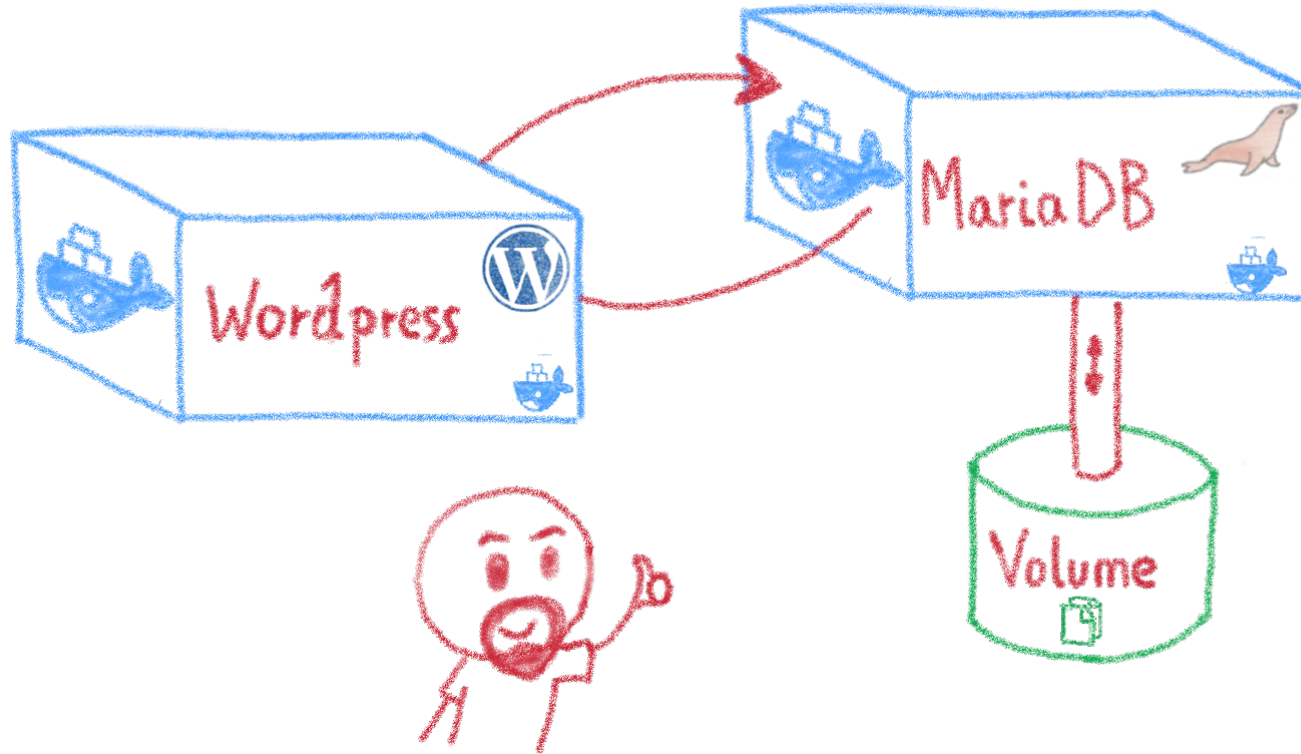
From bare metal to containers



Dockerfiles, images and containers

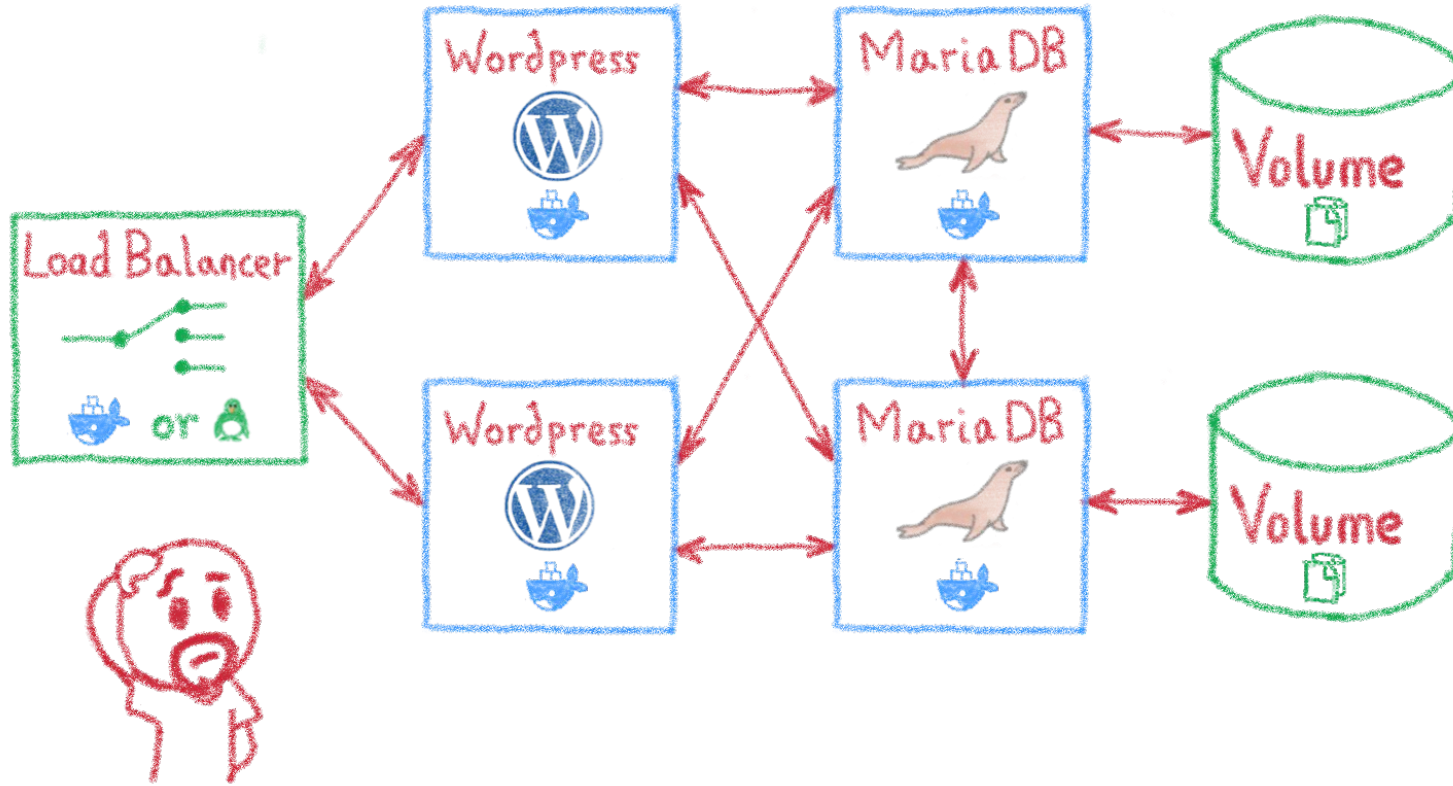
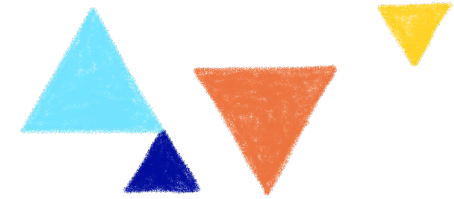


Containers are easy...



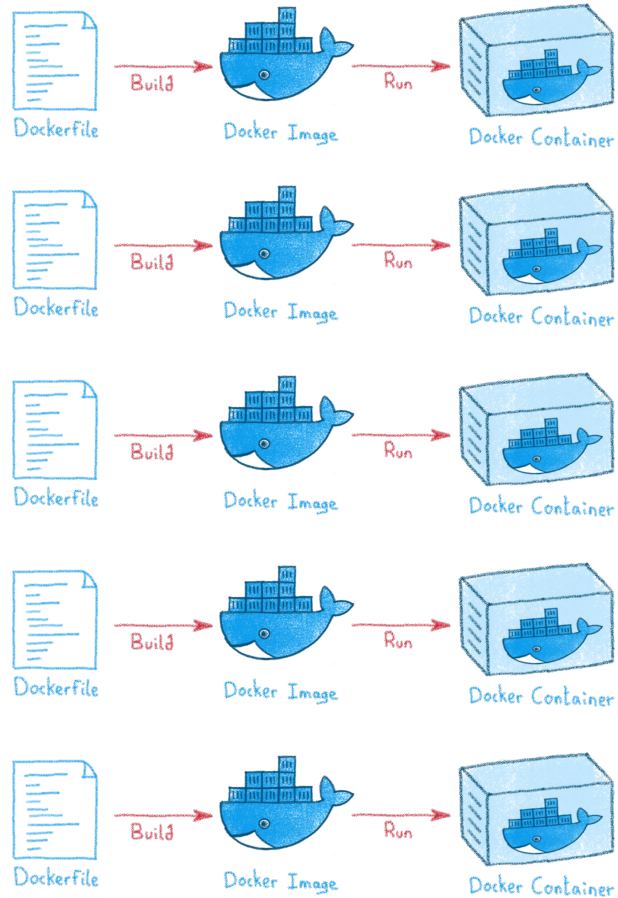
For developers

Less simple if you must operate them



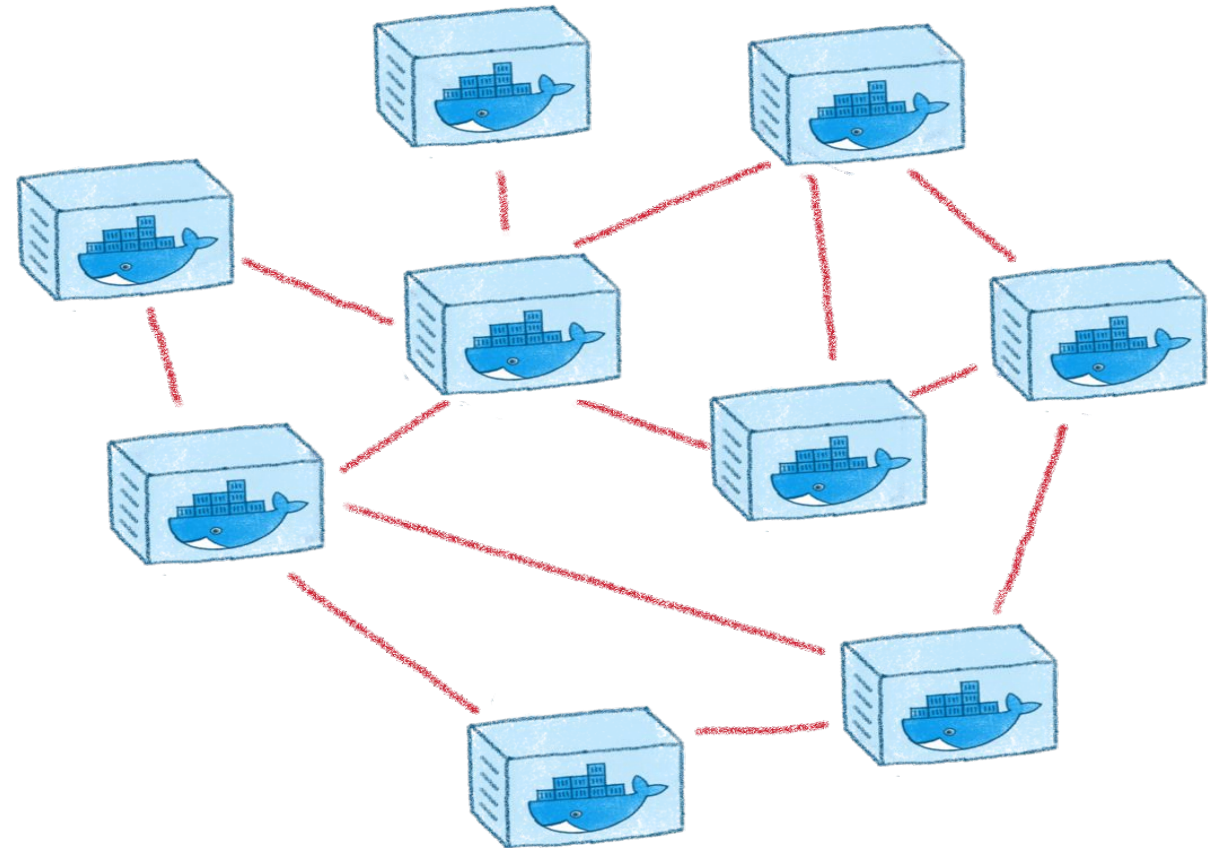
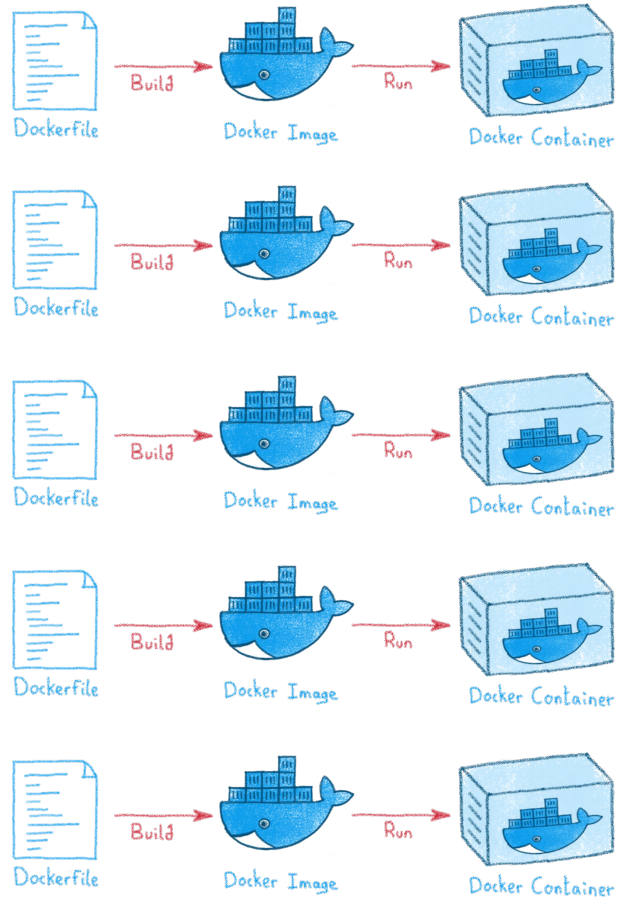
Like in a production context

And what about microservices?



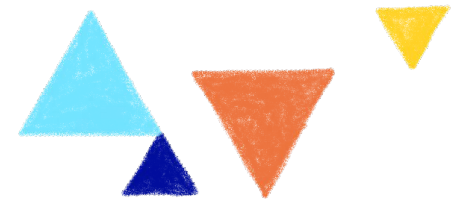
Are you sure you want to operate them by hand?

And what about microservices?

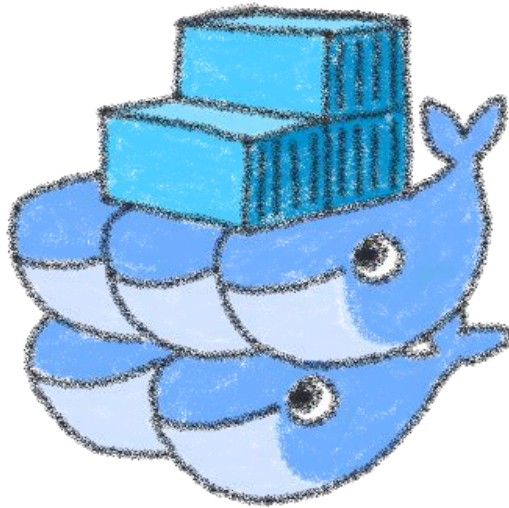


Are you sure you want to operate them by hand?

Helping to tame de complexity



Docker
Compose

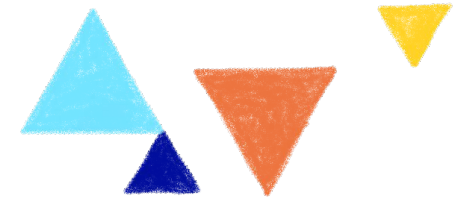


Docker
Swarm



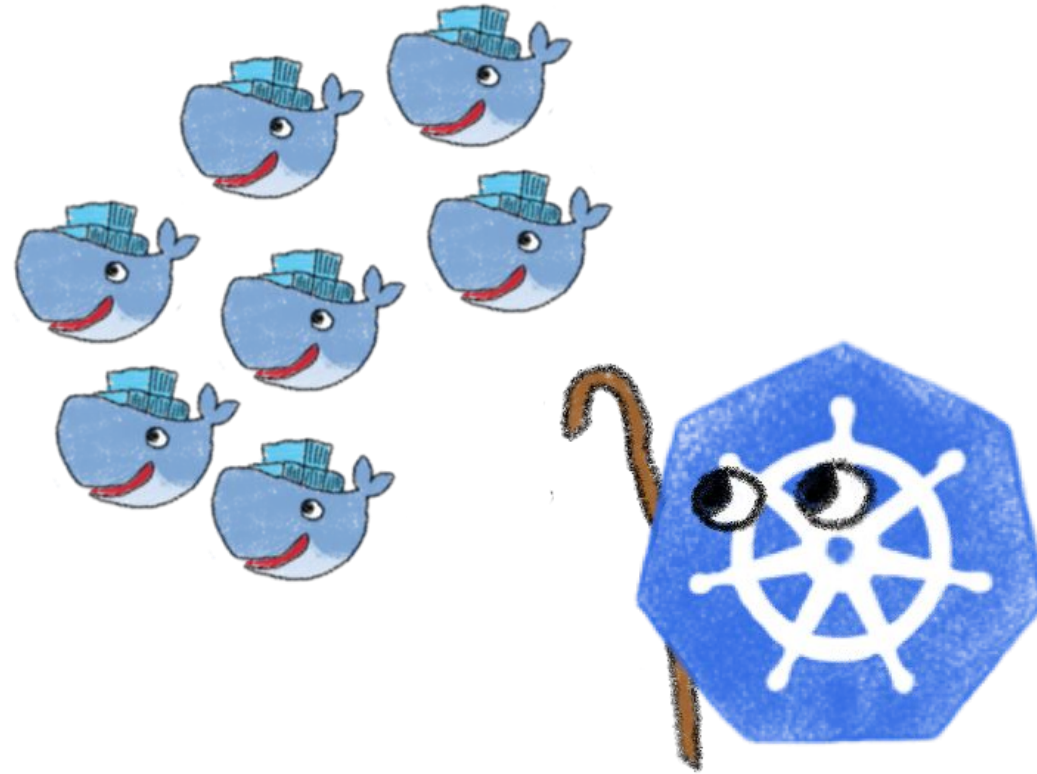
kubernetes

Kubernetes: a full orchestrator

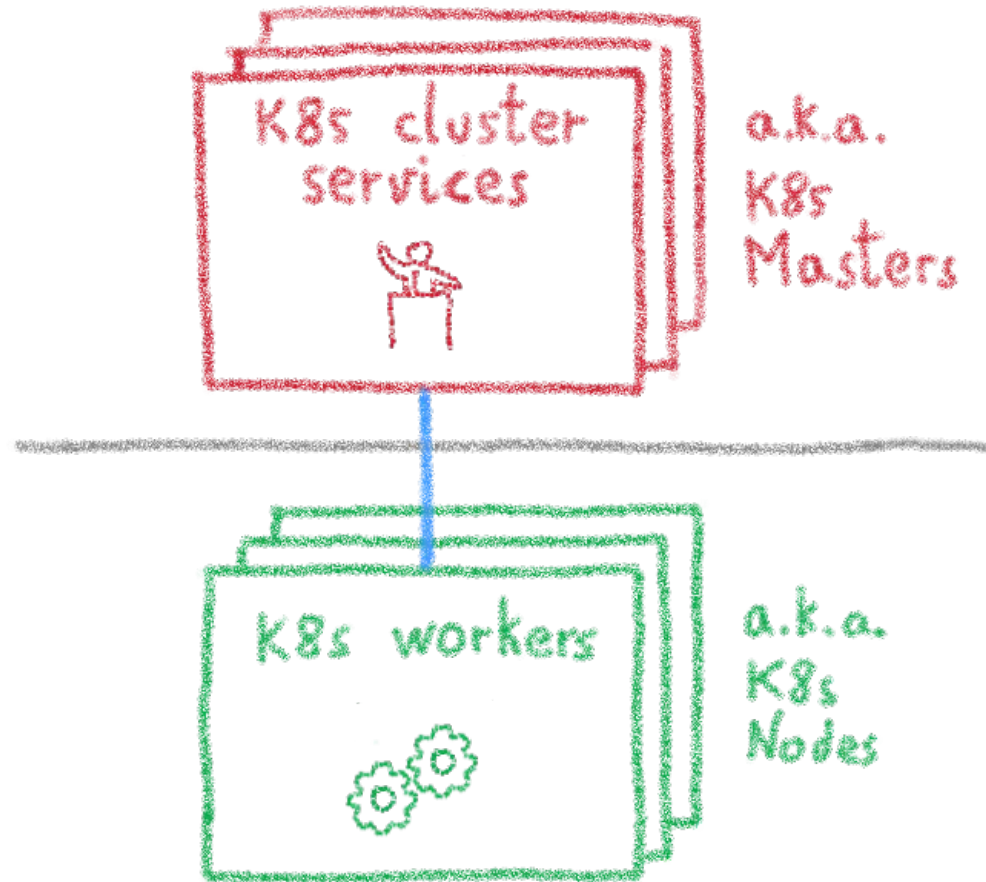


Takes care of:

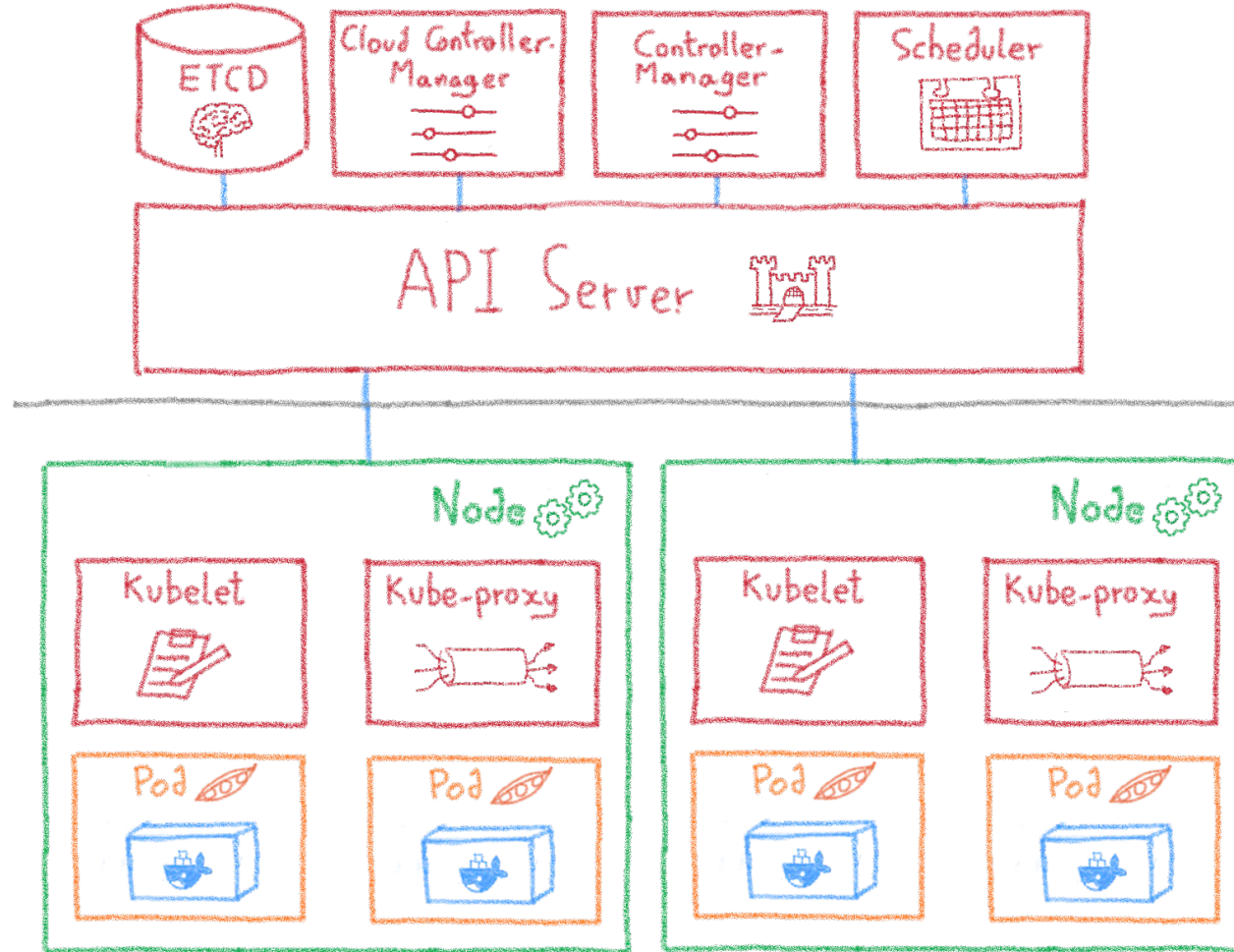
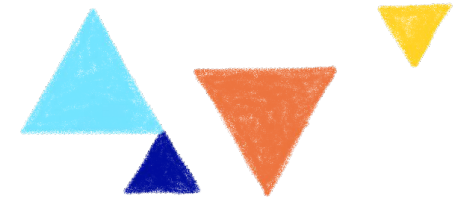
- Deployment
- Scaling
- Monitoring
- Repairing
- Securing
- ...



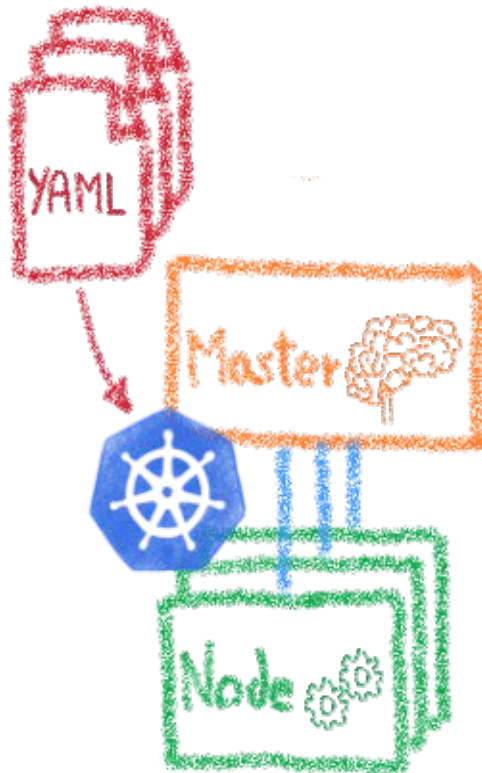
Kubernetes cluster: masters and nodes



Kubernetes cluster: more details



Desired State Management



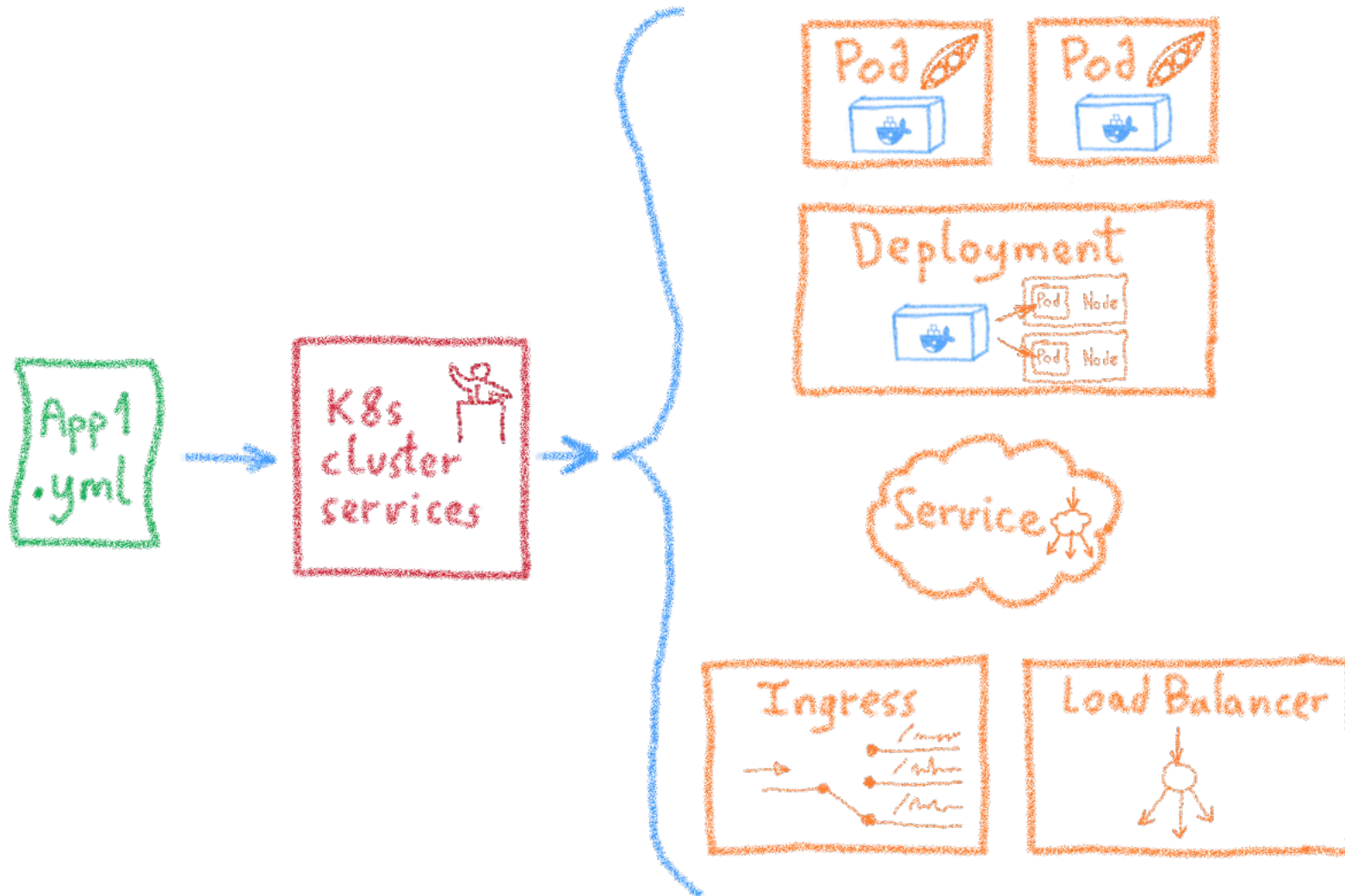
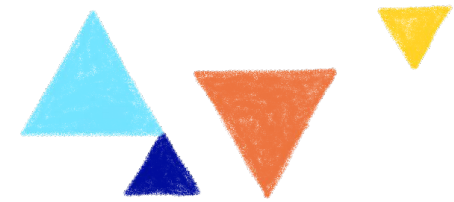
Manifest files:

Text files in YAML format

High-level description of
the target architecture

Declarative infrastructure

Desired State Management



Ingress

Services

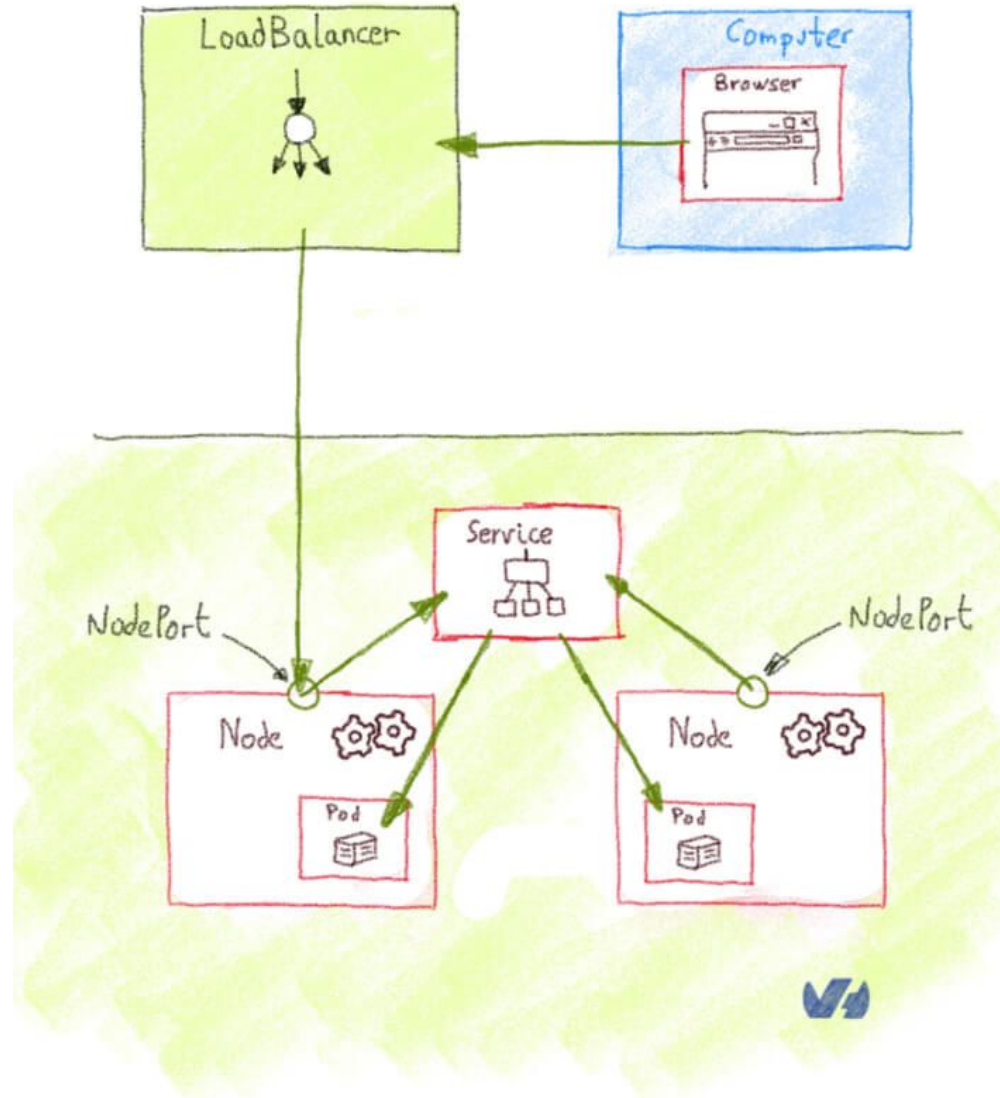
Deployments

Pods

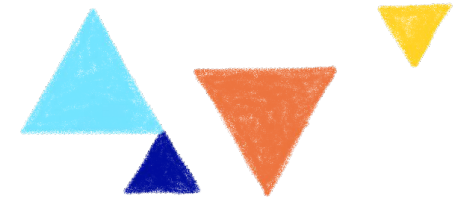
Sidecars

Replica Sets

Let's deploy an application

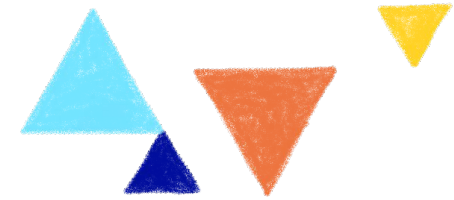


Demo: Hello Kubernetes World



<https://docs.ovh.com/gb/en/kubernetes/deploying-hello-world/>

Needed tools: kubectl



The screenshot shows the Kubernetes Documentation website. The top navigation bar includes links for Documentation, Kubernetes Blog, Training, Partners, Community, Case Studies, Versions, and English. The left sidebar contains a search bar and a navigation menu with links to Home, Getting started, Concepts, Tasks, and Install Tools. The main content area is titled 'Install Tools' and features a section for 'kubectl'. The text describes kubectl as the Kubernetes command-line tool and provides a link to the 'kubectl reference documentation'. A list of installation instructions is partially visible, with 'Install kubectl on Linux' being the first item.

Kubernetes Documentation / Tasks / Install Tools

Install Tools

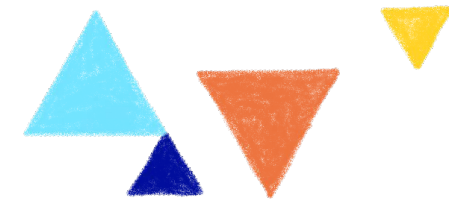
kubectl

The Kubernetes command-line tool, [kubectl](#), allows you to run commands against Kubernetes clusters. You can use kubectl to deploy applications, inspect and manage cluster resources, and view logs. For more information including a complete list of kubectl operations, see the [kubectl reference documentation](#).

kubectl is installable on a variety of Linux platforms, macOS and Windows. Find your preferred operating system below.

- [Install kubectl on Linux](#)

<https://kubernetes.io/docs/tasks/tools/>



Putting Kubernetes in production

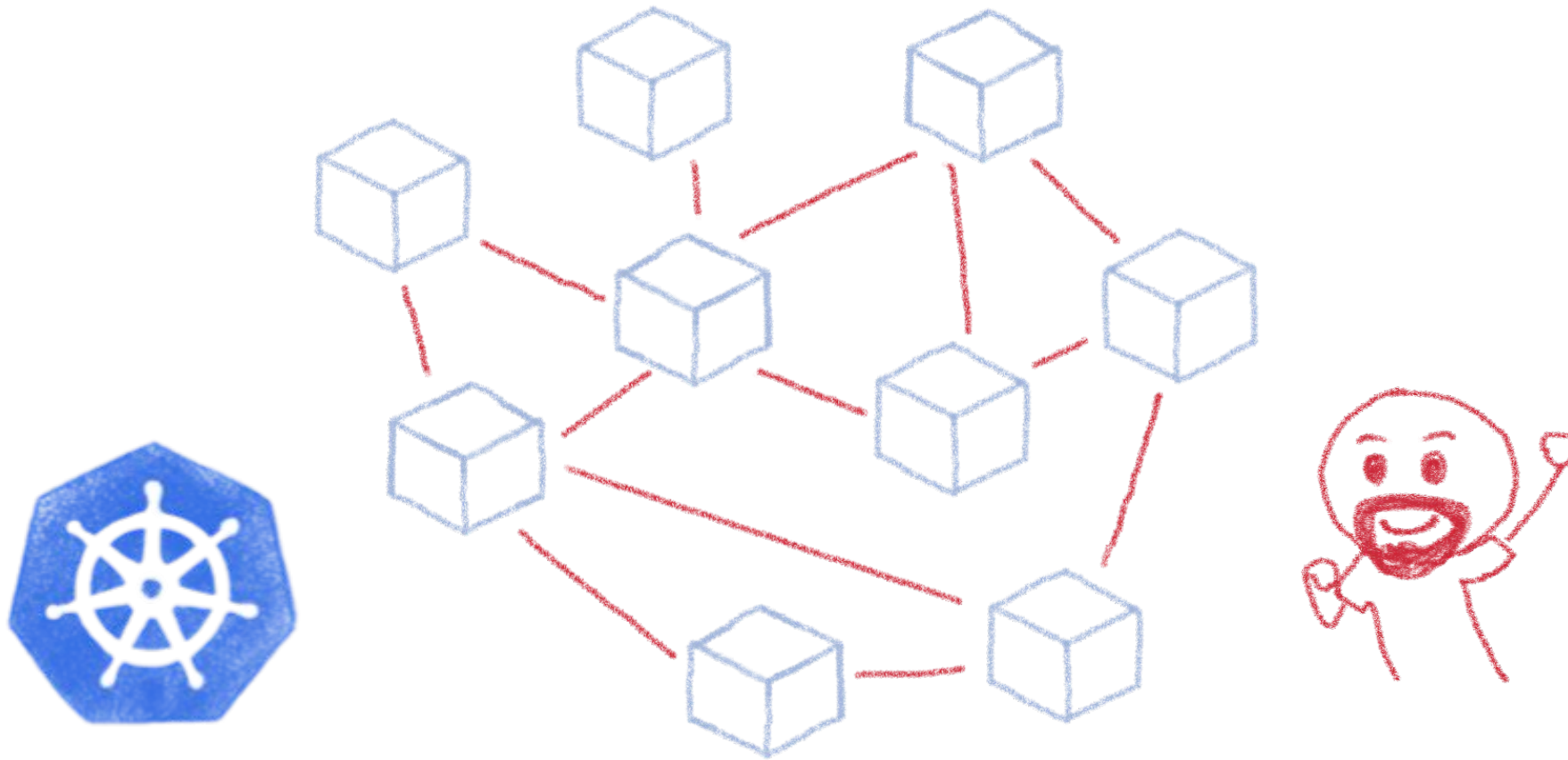
A journey not for the faint of heart

ONE DOES NOT SIMPLY



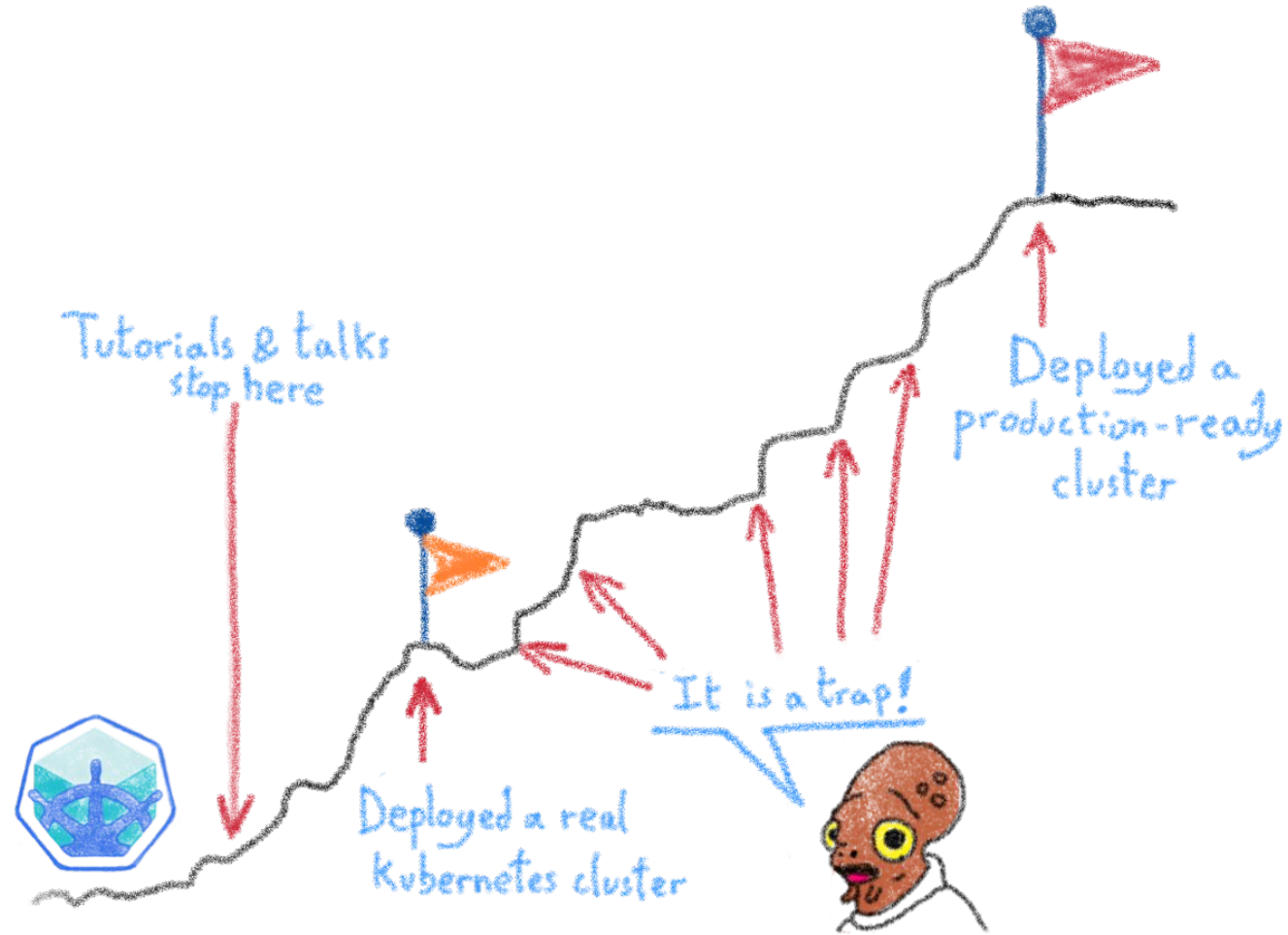
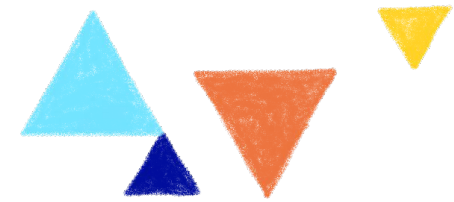
DEPLOYS K8S IN PRODUCTION

Kubernetes can be wonderful

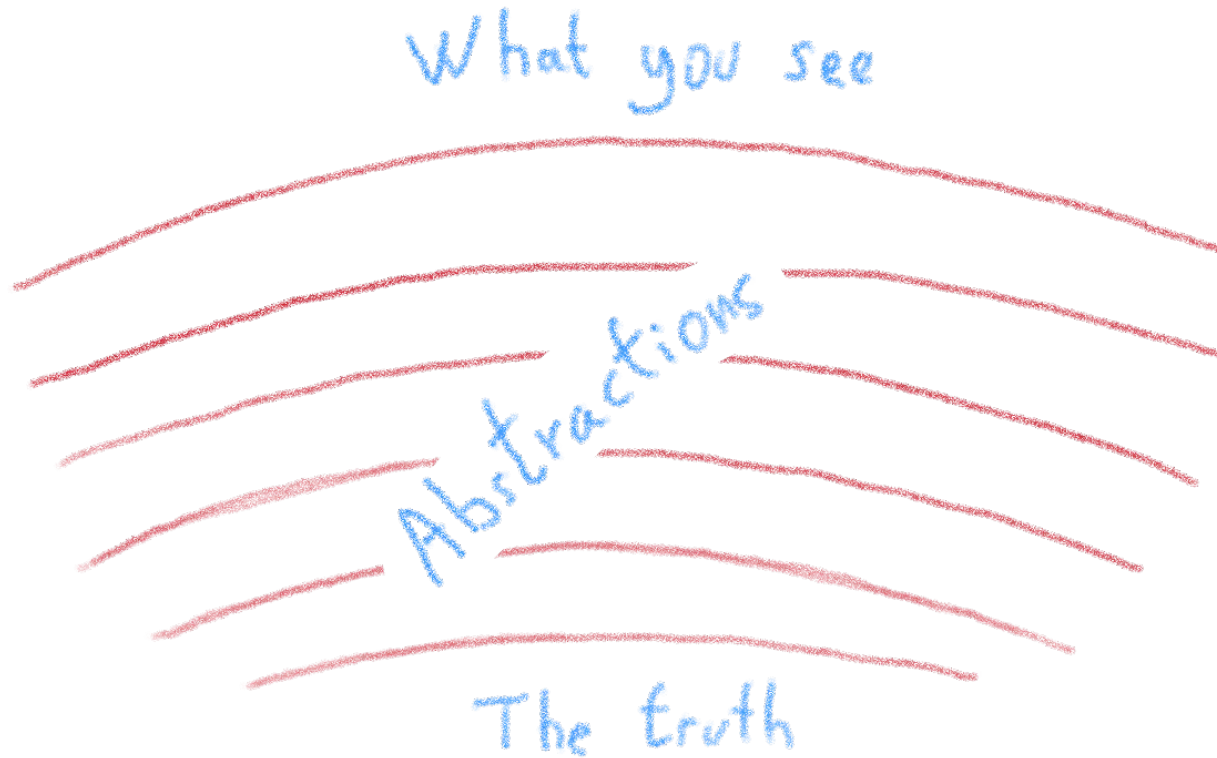


For both developers and devops

The journey from dev to production

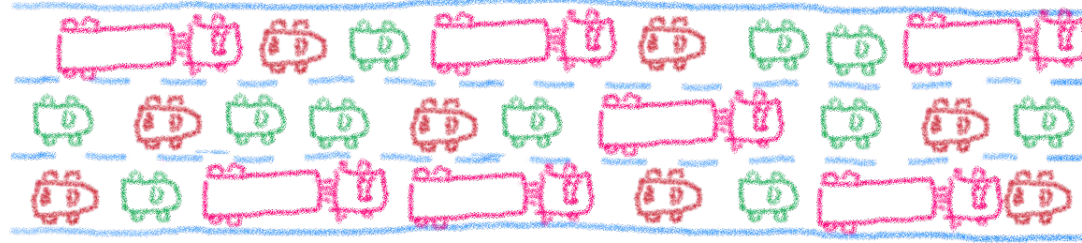
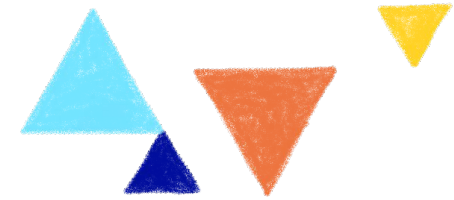


It's a complex technology



Lots of abstraction layers

Kubernetes networking is complex...



All this traffic...
is it normal?



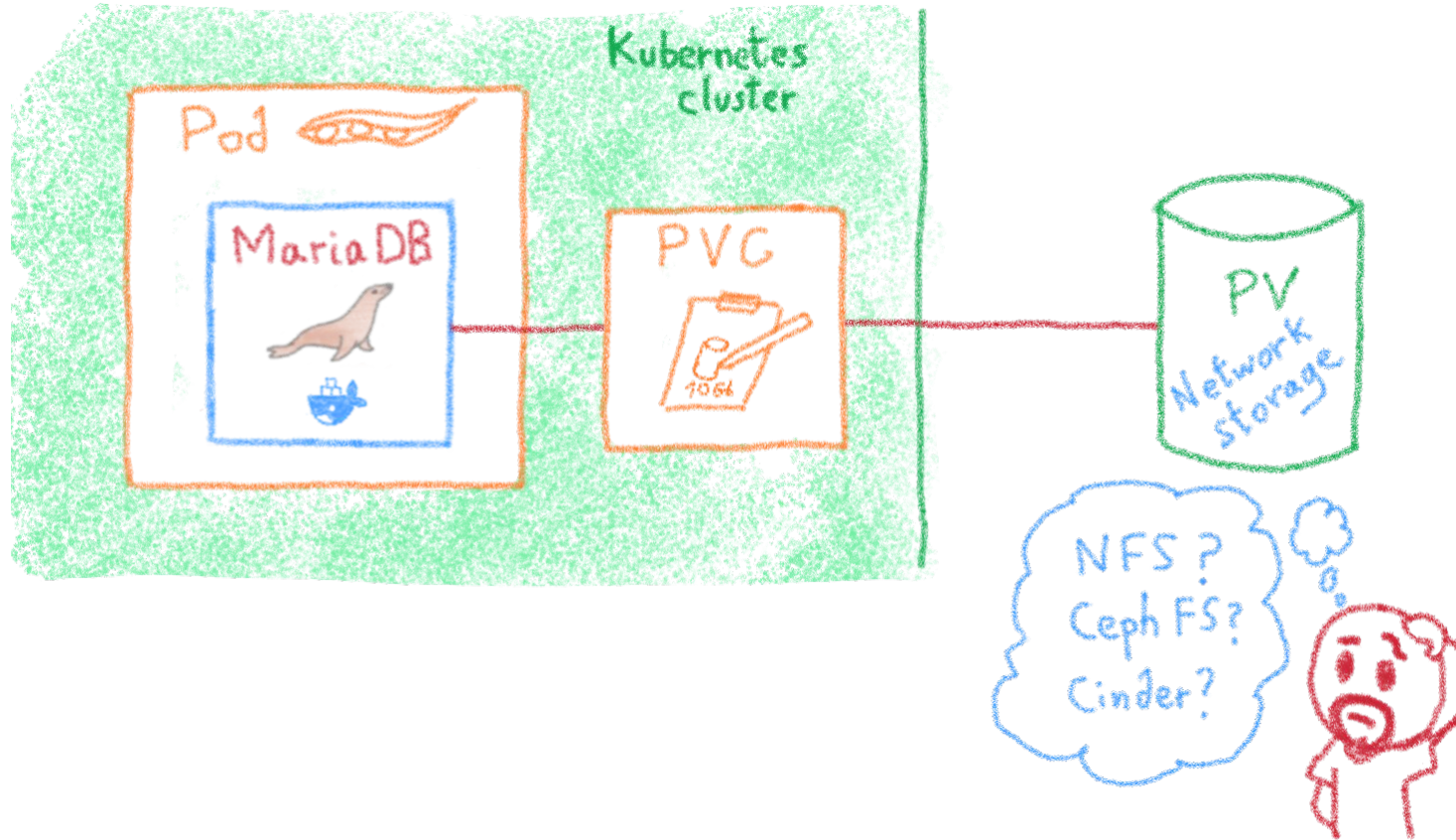
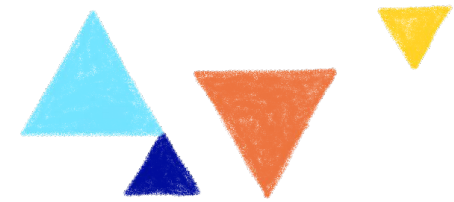
Network plugins (Flannel, Calico, Weave...)

- IPAM
- iptables
- routing
- crossnode networking

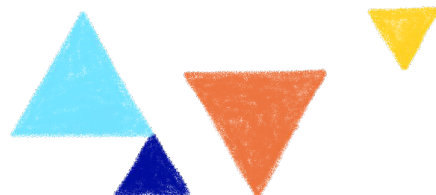
Cluster IP, NodePort, Ingress

Service Meshes, Istio

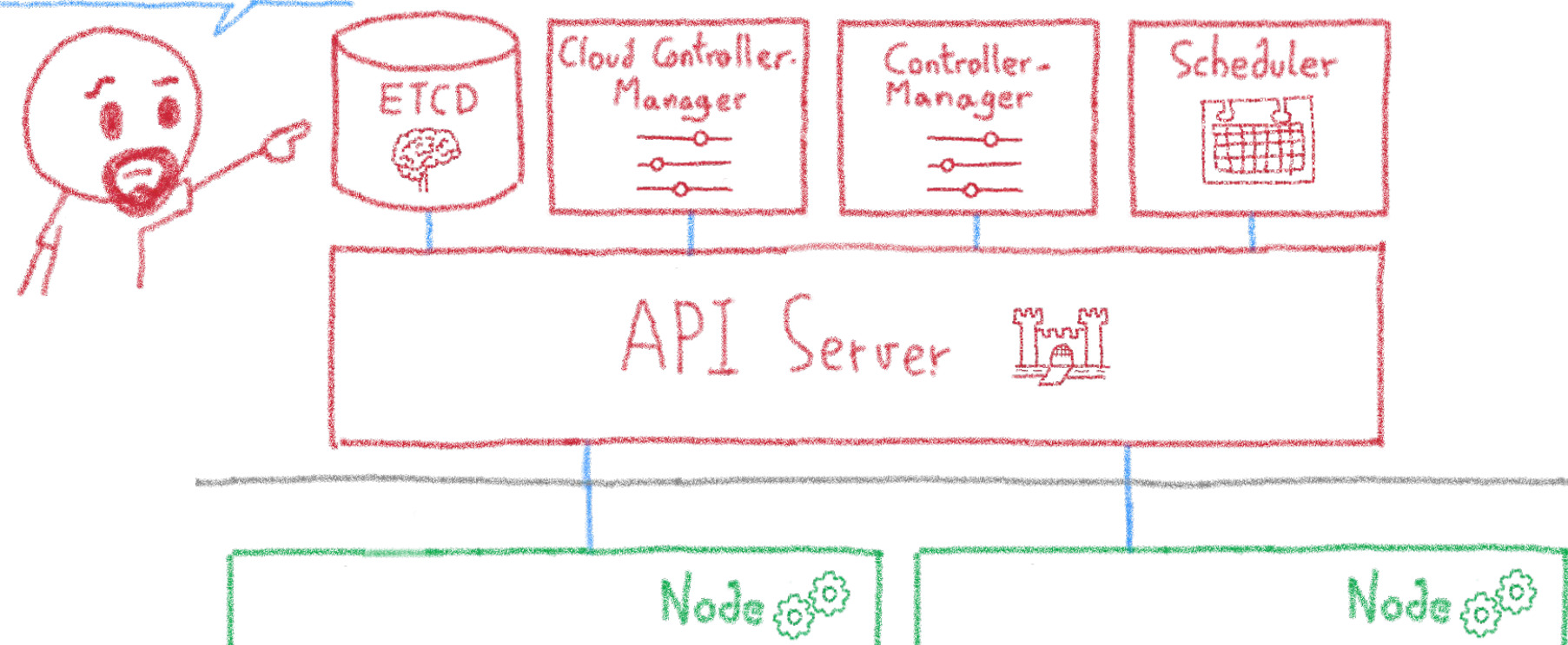
The storage dilemma



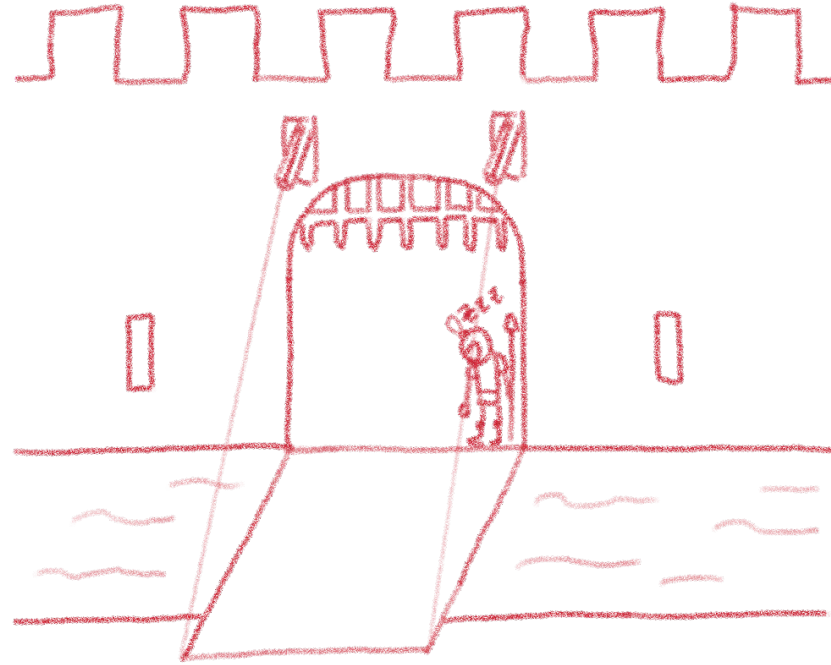
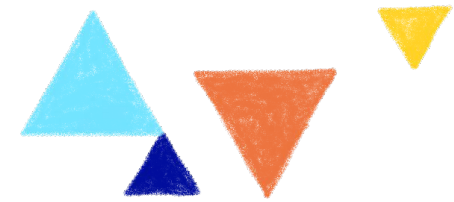
The ETCD vulnerability



A single instance ETCD?
Are you sure?



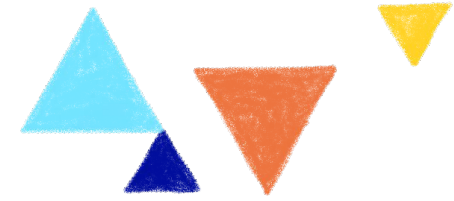
Kubernetes is insecure by design*



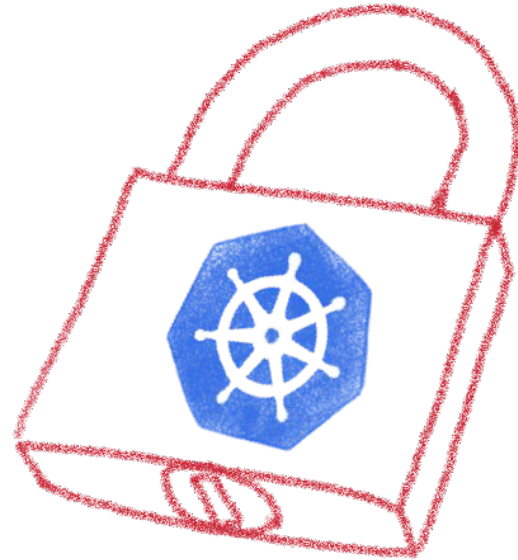
It's a feature, not a bug.

Up to K8s admin to secure it according to needs

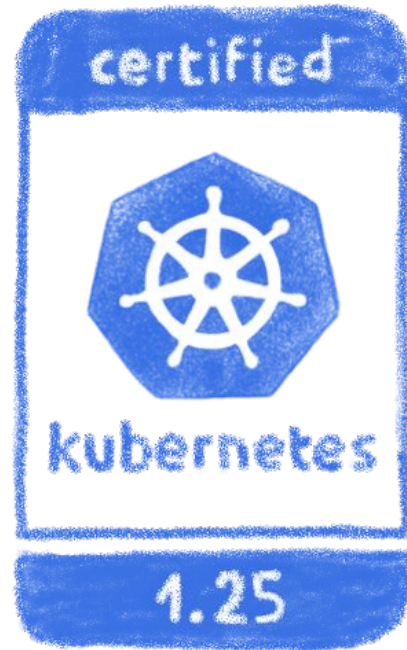
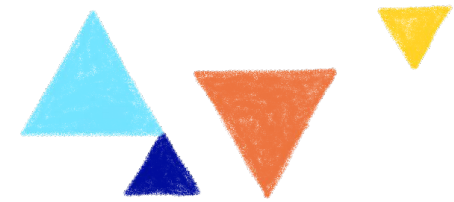
Not everybody has the same security needs



Kubernetes allows to enforce security practices as needed



Always keep up to date



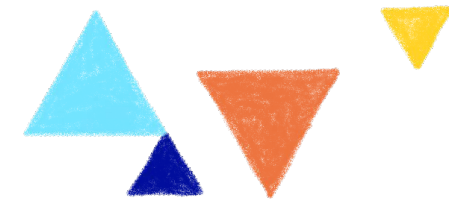
Both Kubernetes and plugins

And remember, even the best can get hacked



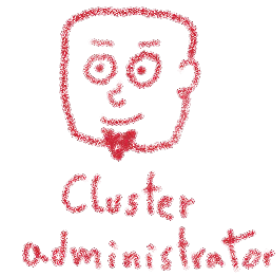
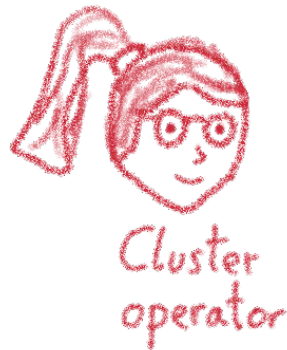
One of Tesla's cluster got hacked
via an unprotected K8s API endpoint,
and was used to mine cryptocurrency...

Remain attentive, don't get too confident

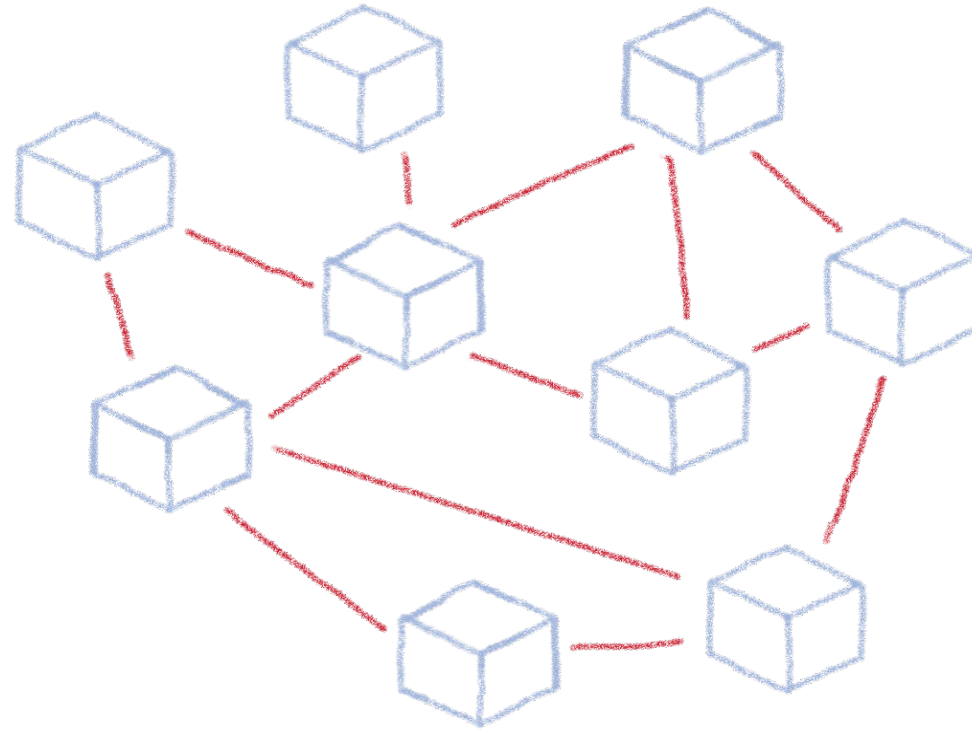


A managed Kubernetes

**Because your company job is to use Kubernetes,
not to operate it!**



Kubernetes is powerful



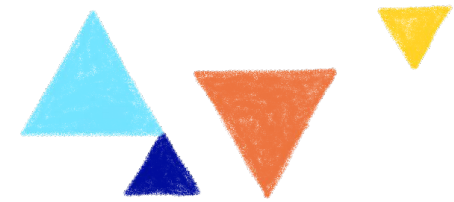
It can make Developers' and
DevOps' lives easier

But there is a price: operating it



Lot of things to think about

We have seen some of them



Security



Deployment



Monitoring



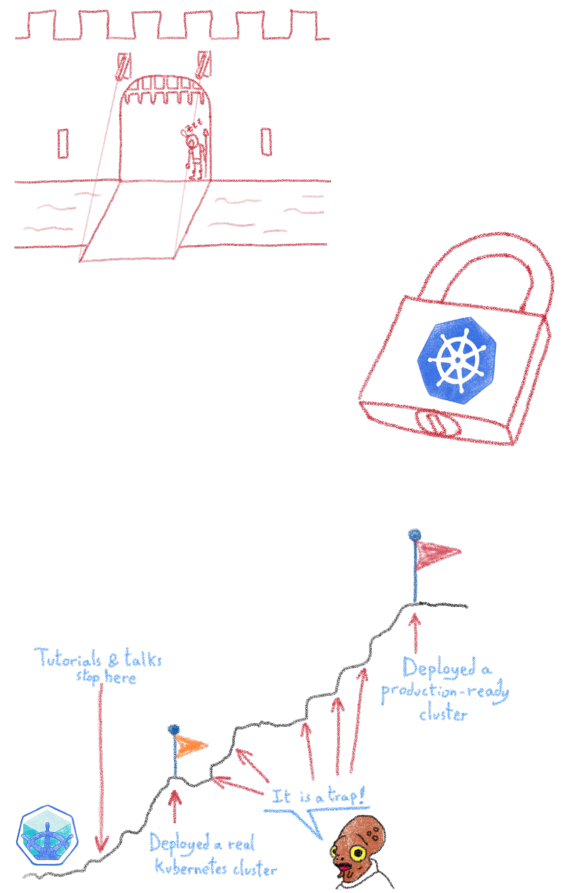
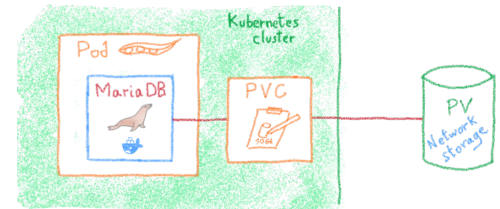
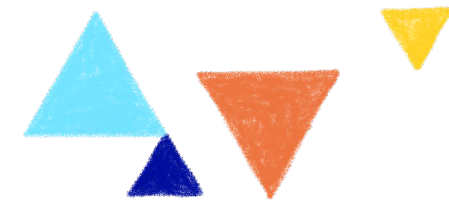
Backups

Different roles



Each role asks for very different
knowledge and skill sets

Operating a Kubernetes cluster is hard



But we have a good news...

Most companies don't need to do it!



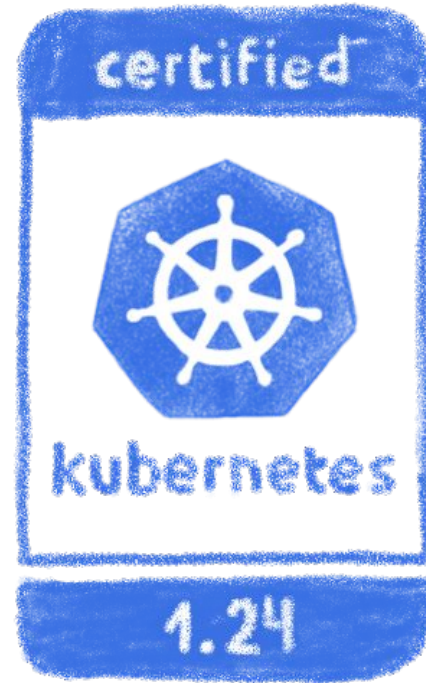
Developer



Cluster
administrator

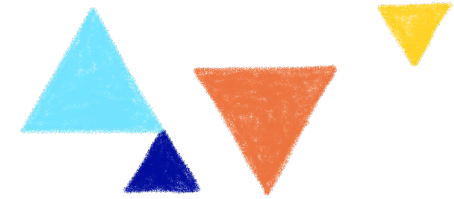
As they don't build and rack
their own servers!

If you don't need to build it, choose a certified managed solution



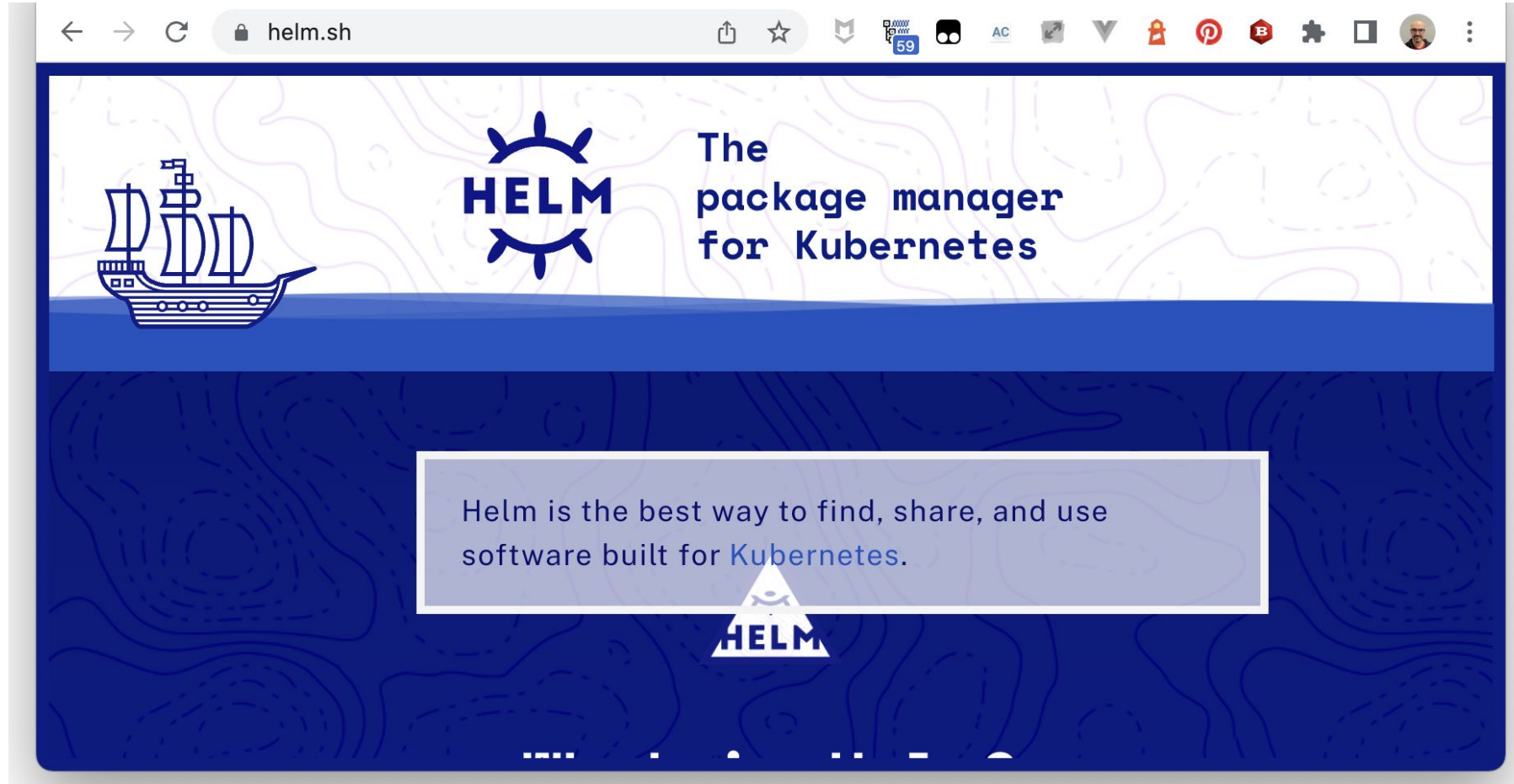
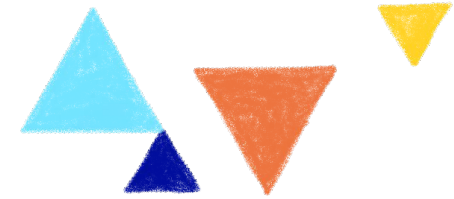
You get the cluster, the operator
get the problems

Demo: A complete app - Wordpress



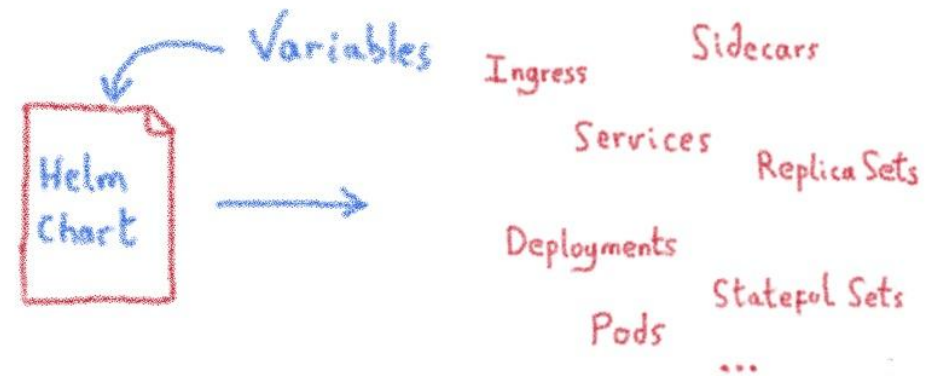
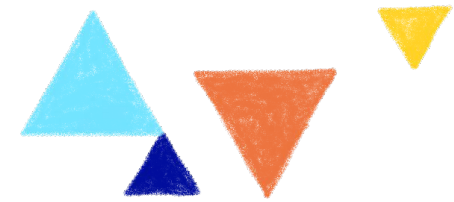
<https://docs.ovh.com/gb/en/kubernetes/installing-wordpress/>

Needed tools: helm



<https://helm.sh/>

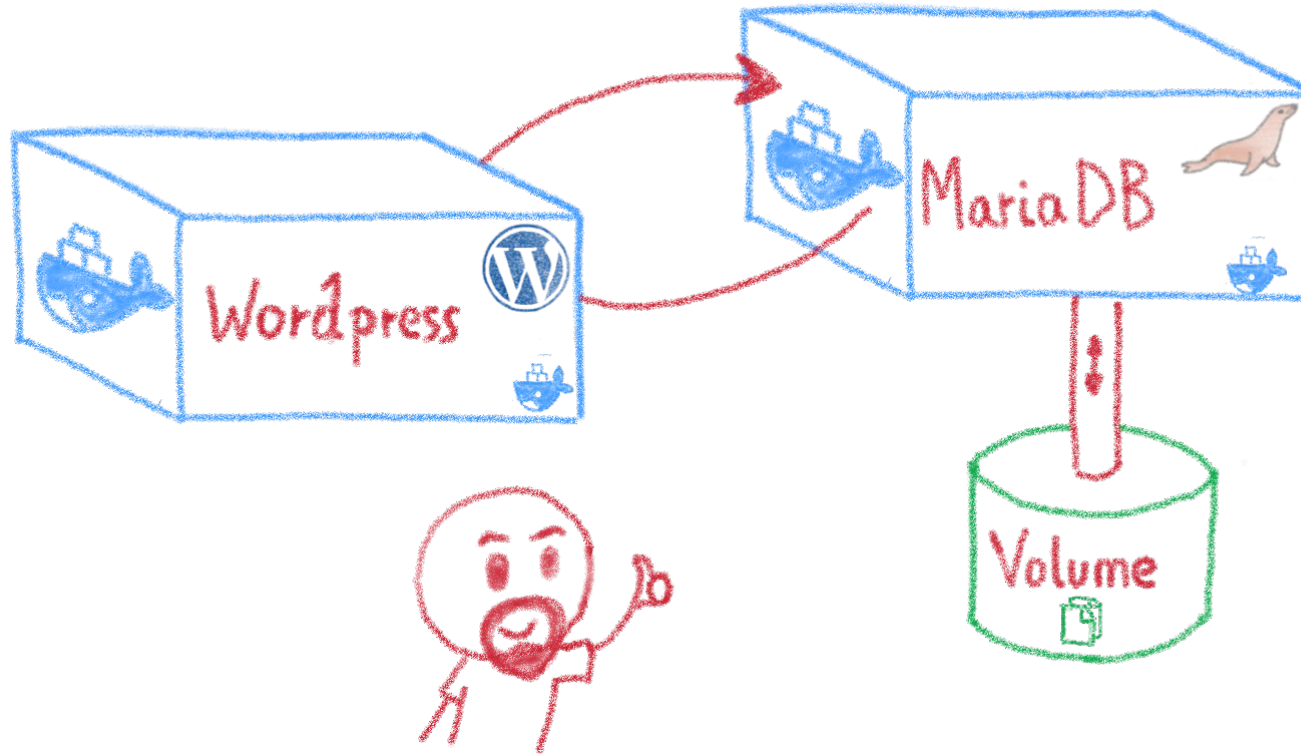
Helm: a package manager for K8s



- Manage complexity
- Simple sharing

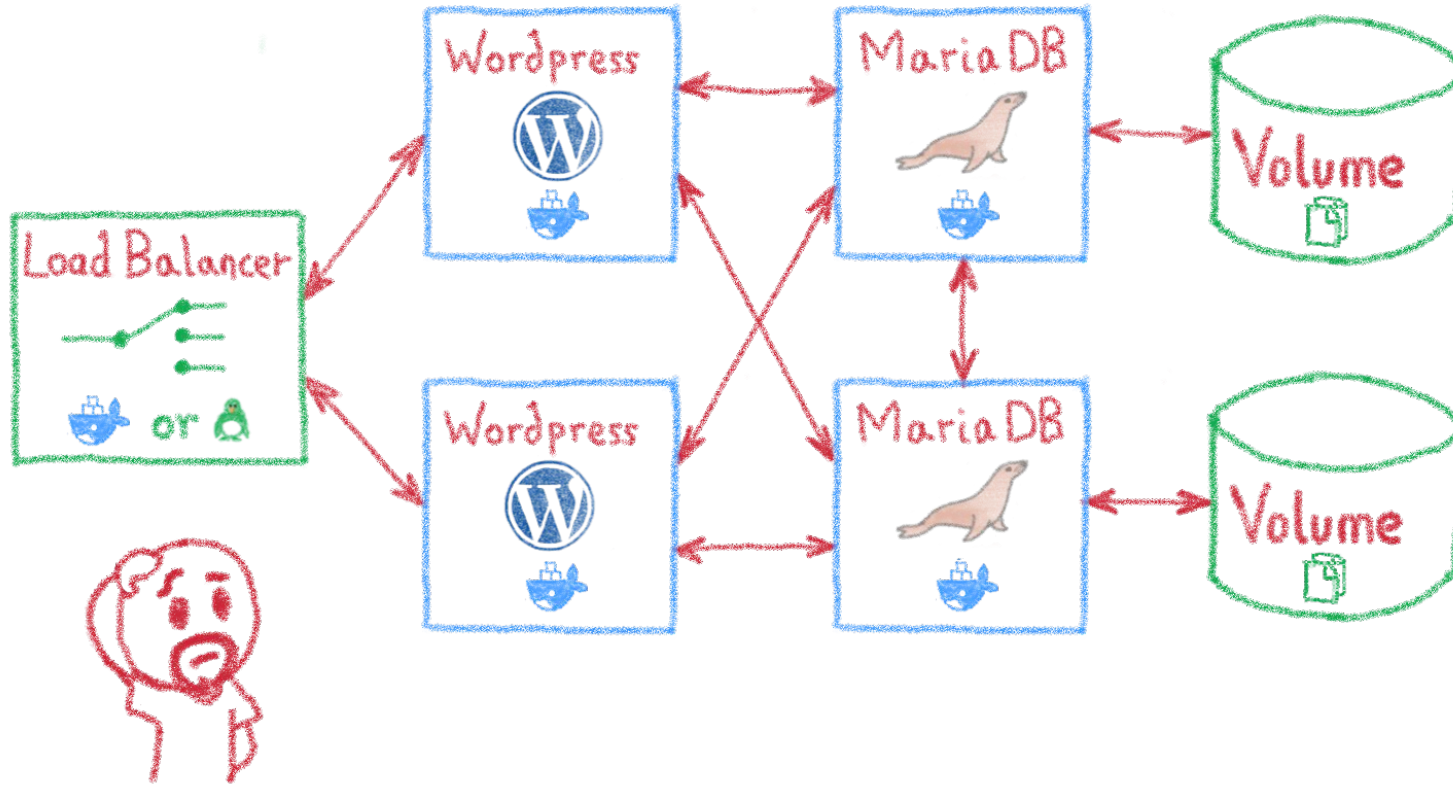
- Easy upgrades
- Easy rollbacks

Wordpress is easy...



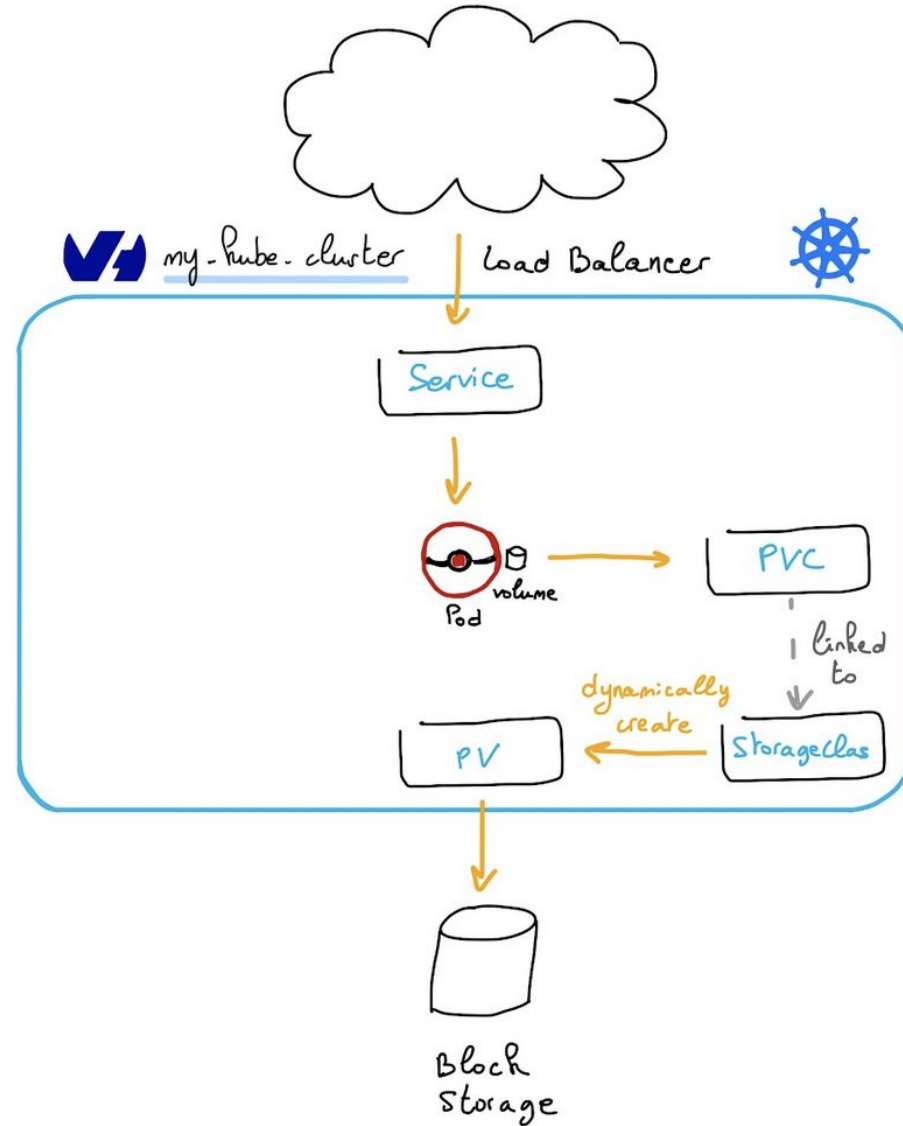
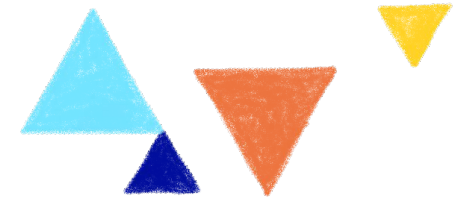
Two pods and a persistent volume

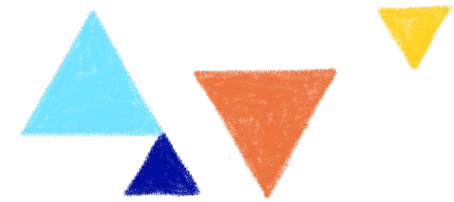
Yet is a complete app



Specially when deployed in production context

Persistent storage in Kubernetes



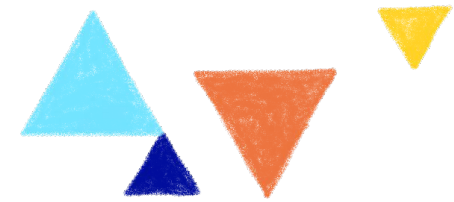


OVHcloud Managed Kubernetes

Why would you choose ours?



Certified Kubernetes platform



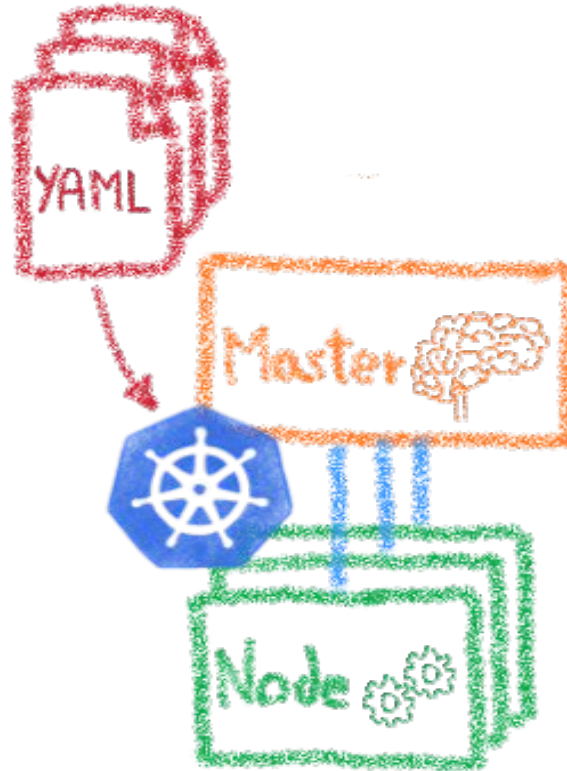
Managed Kubernetes
certified Kubernetes 1.24



OVHcloud Managed Private Registry

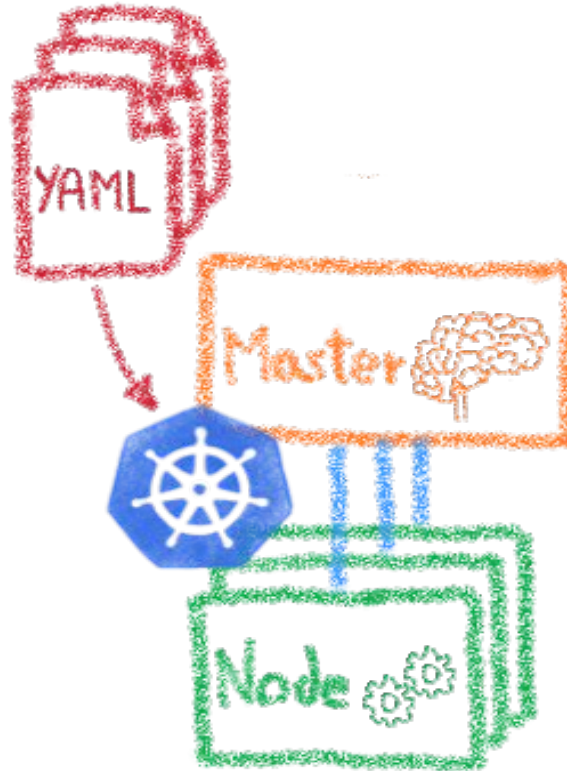
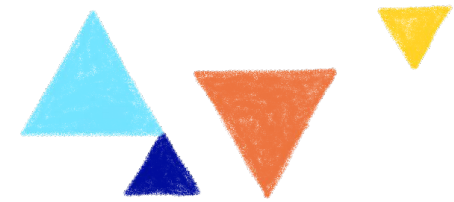


Node Pools



Users can define node pools
controlled from inside Kubernetes

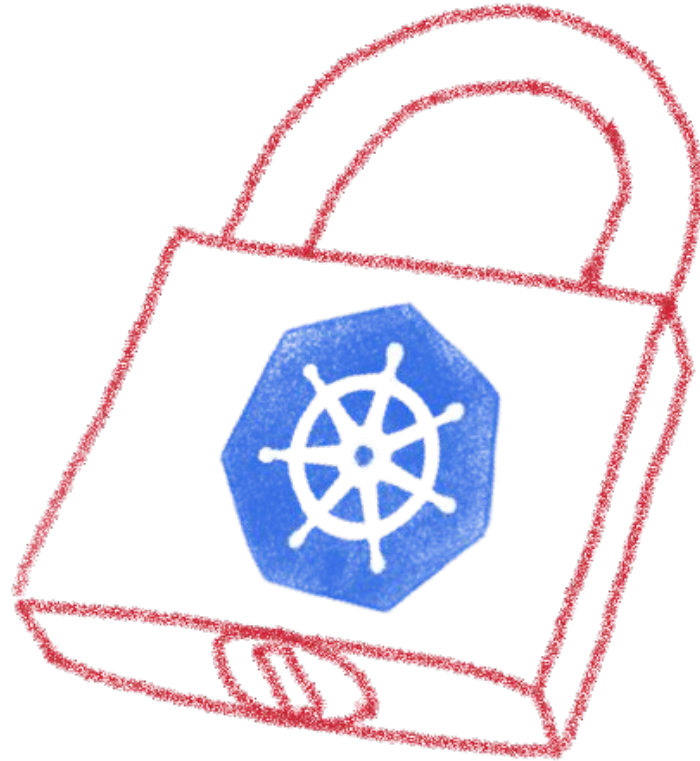
Autoscaling



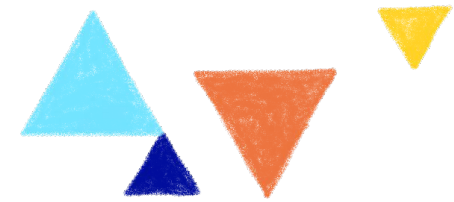
Based on node pools

New instances are spawned or released based on load

Kubernetes in a private network



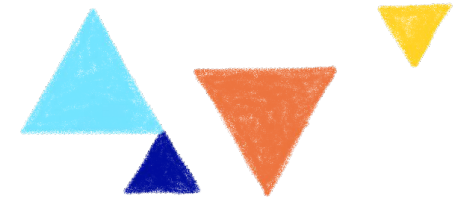
Other features



- Healthcare HDS 1 conformity
- ISO 27001/27701/27017/27018 conformity
- Terraform provider
- Control plane audit logs
- API server IP restrictions
- ...

<https://github.com/ovh/public-cloud-roadmap/projects/1>

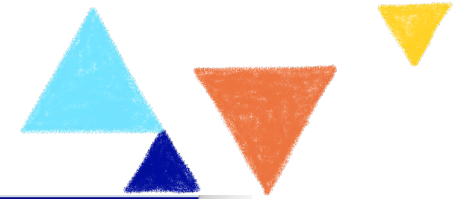
Demo: cluster auto-scaling



The screenshot shows the OVHcloud website header with navigation links: My customer account, Contact Sales, Webmail, Support, Communities, OVHcloud Blog, and a UK flag. Below the header is a secondary navigation bar with links: Bare Metal Cloud, Hosted Private Cloud, Public Cloud, Web Hosting & Domains, Enterprise, Ecosystem, and About. The breadcrumb trail reads: Public Cloud > Managed Kubernetes (k8s) > Cluster autoscaler example. A language selector shows 'English (GB)'. The main heading is 'Cluster autoscaler example' with a play button icon to its left. Below the heading is a search bar labeled 'Search OVHcloud documentation'. The text 'Last updated May 17th, 2022.' is displayed. The main content area begins with 'OVHcloud Managed Kubernetes service provides you Kubernetes clusters without the hassle of installing or operating them.' and starts a paragraph about dynamically adjusting cluster size. A 'Contribute' button is visible on the left.

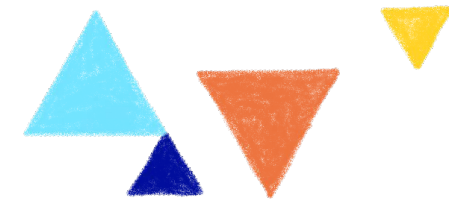
<https://docs.ovh.com/gb/en/kubernetes/cluster-autoscaler-example/>

Demo: Working with OVHcloud API



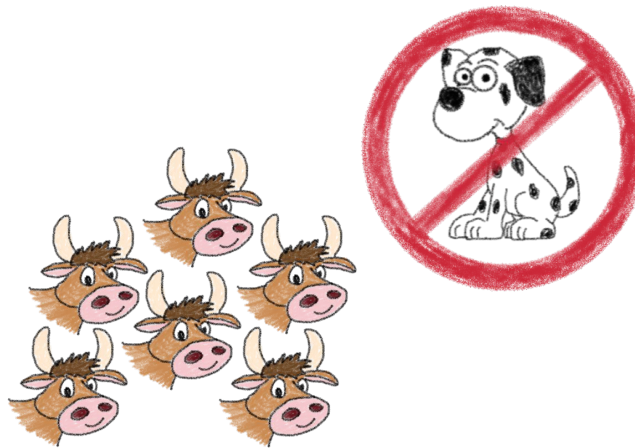
The screenshot shows the OVHcloud website with a dark blue header. The header includes the OVHcloud logo, a user account icon, and links for 'My customer account', 'Contact Sales', 'Webmail', 'Support', 'Communities', 'OVHcloud Blog', and a UK flag. Below the header is a navigation bar with links for 'Bare Metal Cloud', 'Hosted Private Cloud', 'Public Cloud', 'Web Hosting & Domains', 'Enterprise', 'Ecosystem', and 'About'. The main content area has a breadcrumb trail: 'Public Cloud > Managed Kubernetes (k8s) > Deploying a Hello World with the OVHcloud API'. A language selector shows 'English (GB)'. The title 'Deploying a Hello World with the OVHcloud API' is prominently displayed in white text on a blue background, accompanied by a large white play button icon. Below the title, a subtitle reads 'Find out how to deploy a Hello World application with the OVHcloud API'. At the bottom, there is a search bar labeled 'Search OVHcloud documentation' with a magnifying glass icon.

<https://docs.ovh.com/gb/en/kubernetes/deploying-hello-world-ovh-api/>

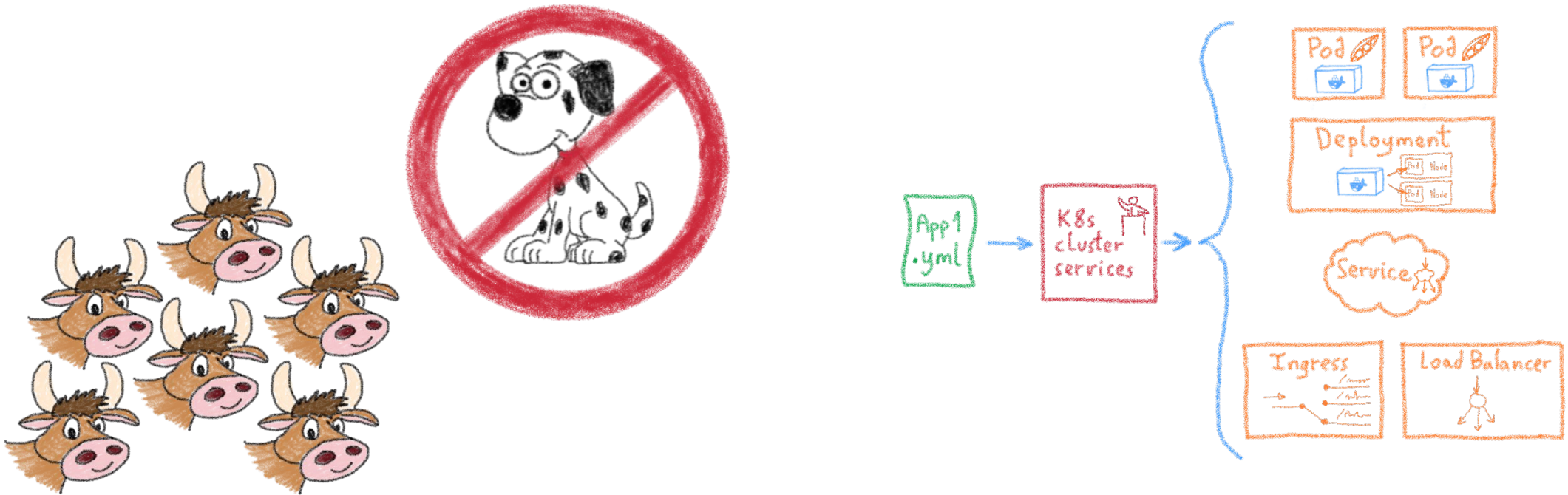


Infrastructure as Code

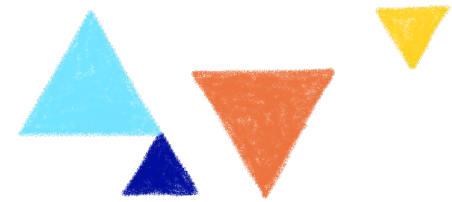
The perfect companion to a cloud



Infrastructure as Code (IaC)



Types of IaC

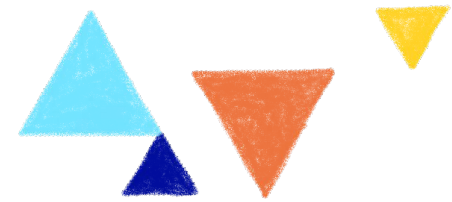


Imperative – Instructions to follow step by step

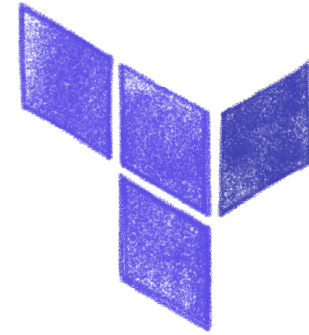
Declarative – Desired state description

Environment Aware – Intelligent desired state management

IaC tools



ANSIBLE



HashiCorp

Terraform



puppet

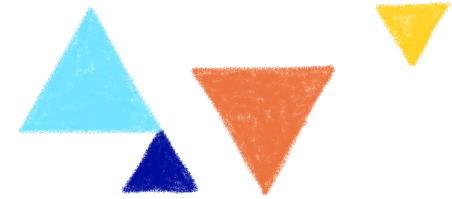
Demo: Using Terraform




The screenshot shows the OVHcloud website header with navigation links: Bare Metal Cloud, Hosted Private Cloud, Public Cloud, Web Hosting & Domains, Enterprise, Ecosystem, and About. The breadcrumb trail is: Public Cloud > Managed Kubernetes (k8s) > Creating a cluster through Terraform. The main heading is 'Creating a cluster through Terraform' with a subtitle 'Creates a Kubernetes cluster through Terraform'. A search bar at the bottom contains the text 'Search OVHcloud documentation'.

<https://docs.ovh.com/gb/en/kubernetes/creating-a-cluster-through-terraform/>

Needed tools: terraform



Just announced | HashiConf Global full schedule: keynotes, sessions, labs & more. X



Menu ▾

Automate Infrastructure on Any Cloud

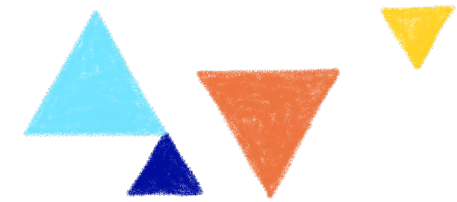
Provision, change, and version resources on any

Open Source

Self-managed | always free

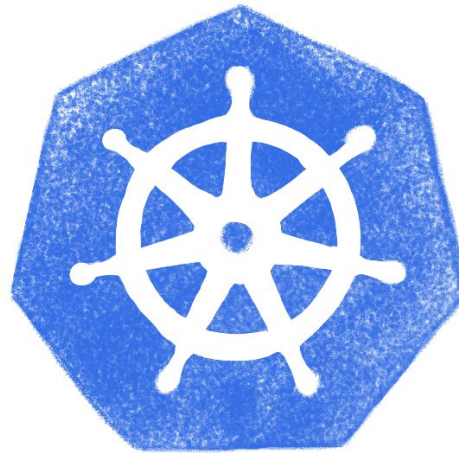
Download

<https://www.terraform.io/>

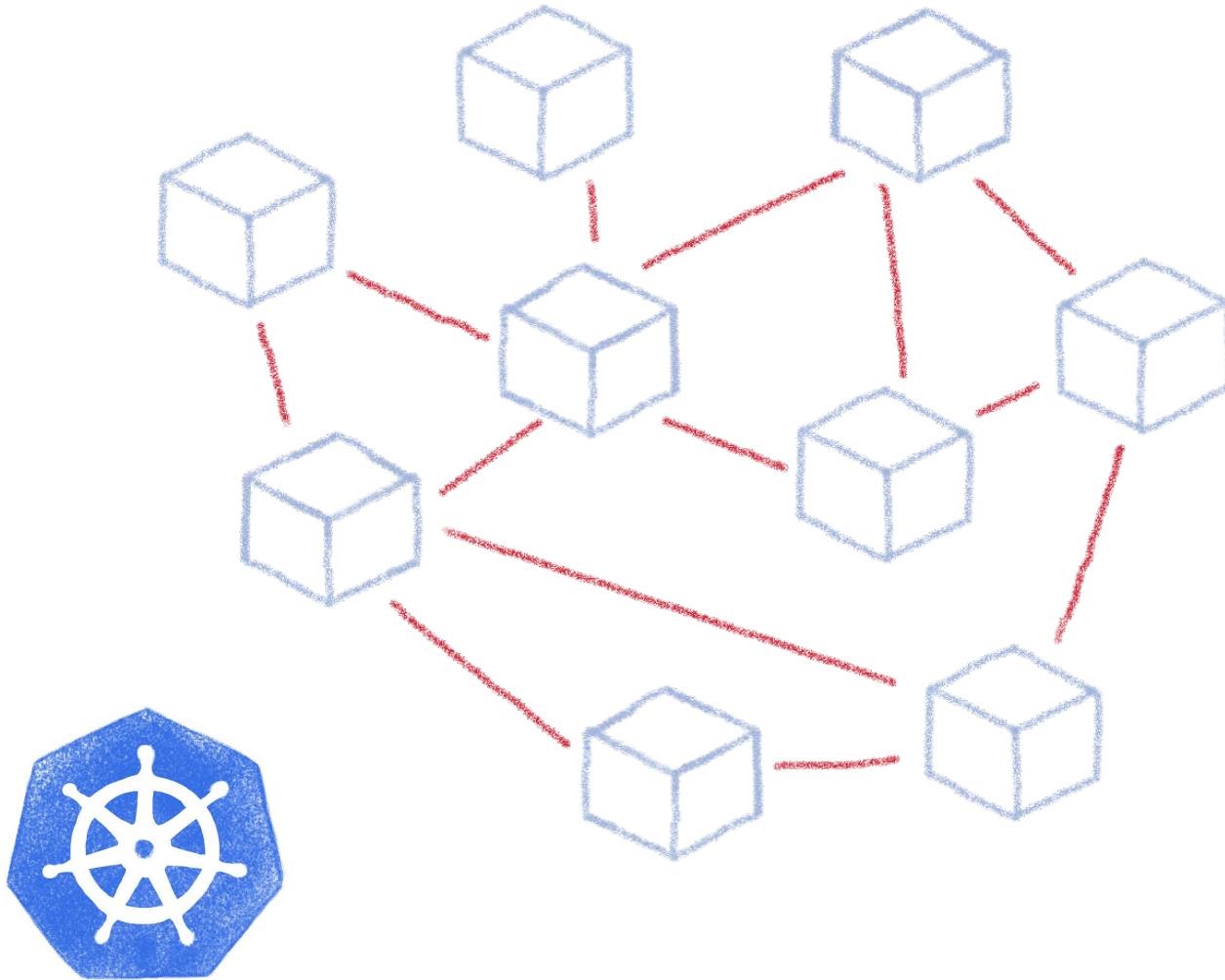
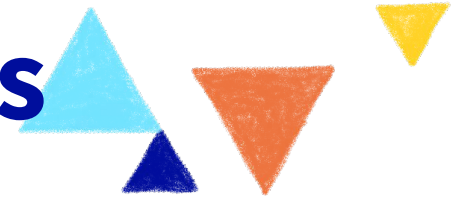


Kubernetes Operators

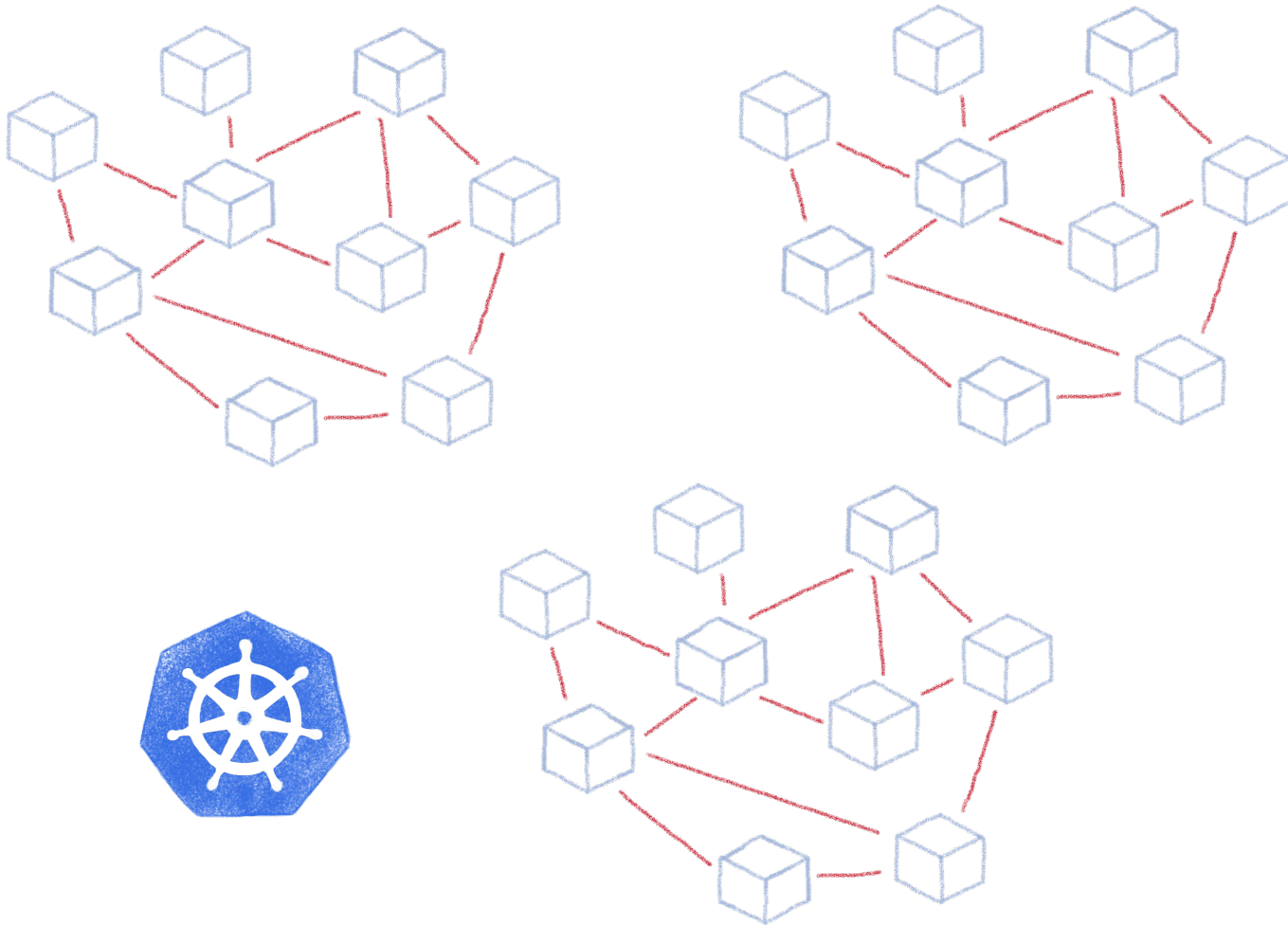
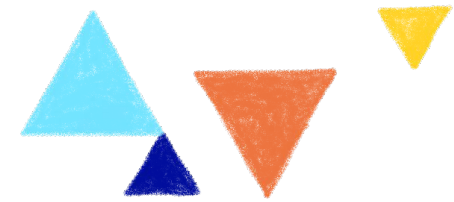
Helping to tame the complexity of K8s Ops



Taming microservices with Kubernetes



What about complex deployments



Ingress

Services

Deployments

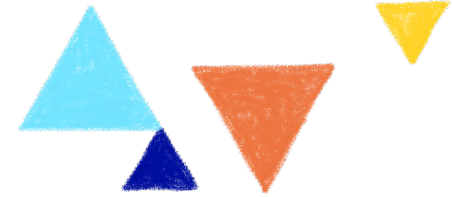
Pods

Sidecars

Replica Sets

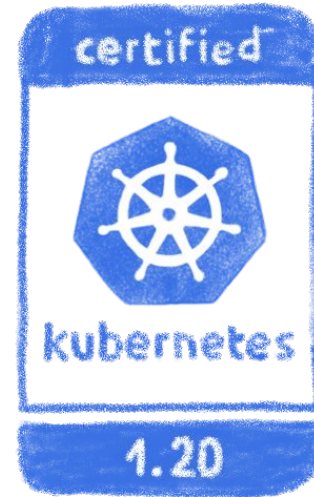
Stateful Sets

Specially at scale



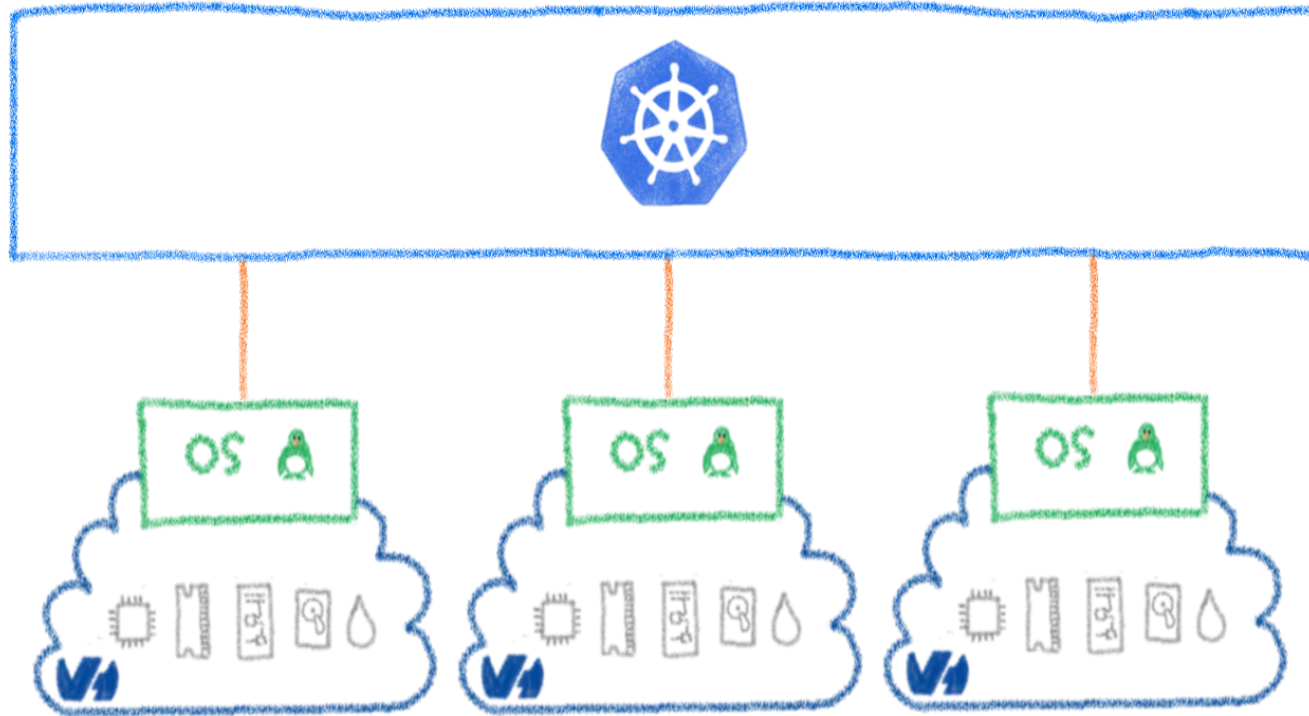
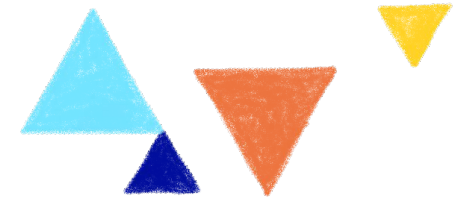
Lots of clusters with lots and lots of deployments

That's just our case

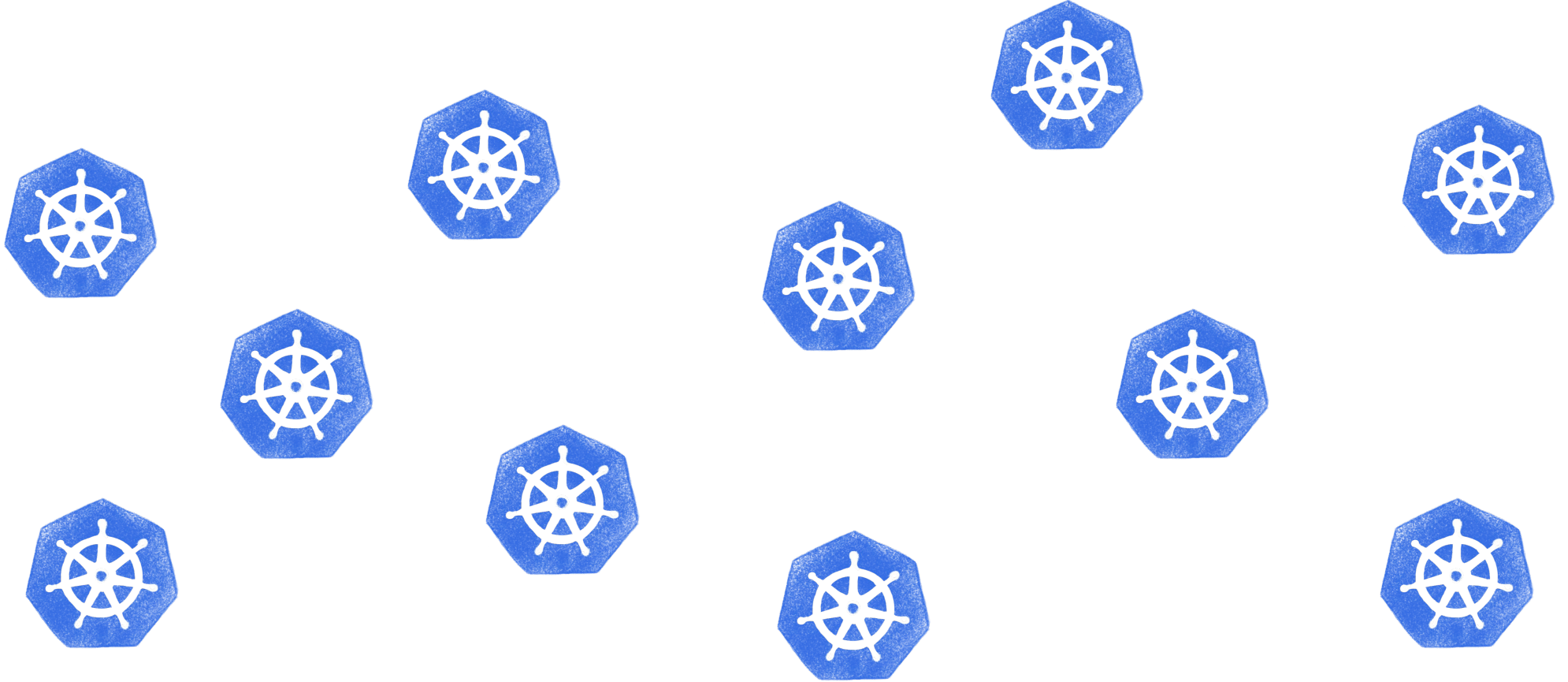


We both use Kubernetes and
operate a Managed Kubernetes platform

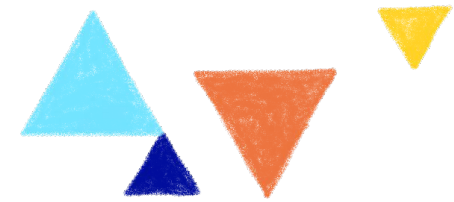
Built over our Openstack based Public Cloud



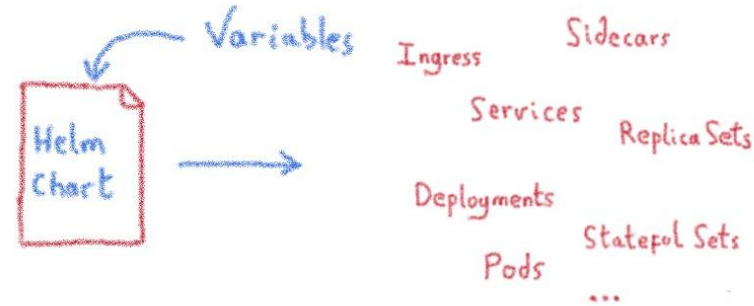
We need to tame the complexity



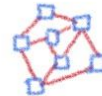
Taming the complexity



A package manager for Kubernetes



- Manage complexity



- Easy upgrades



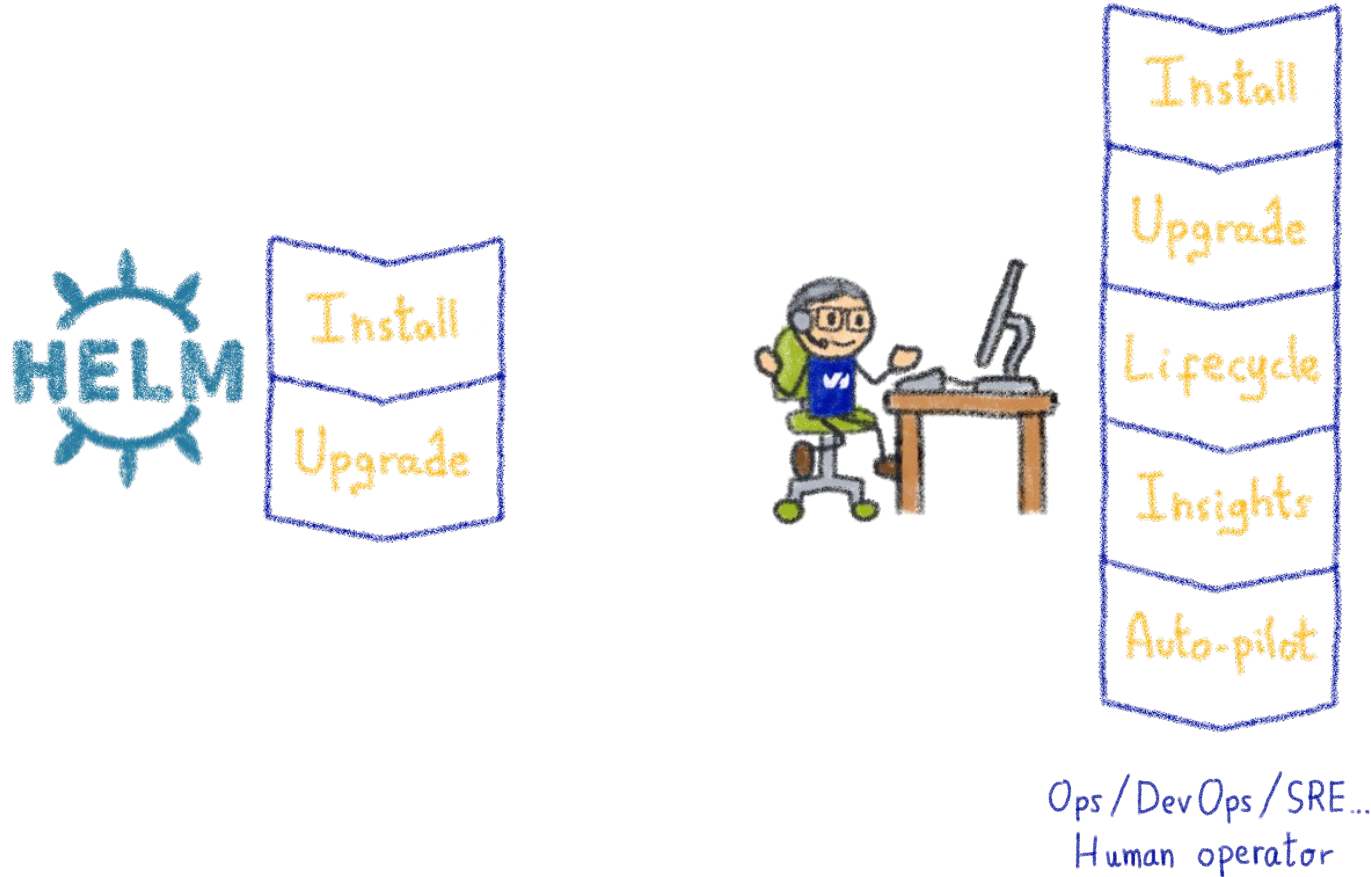
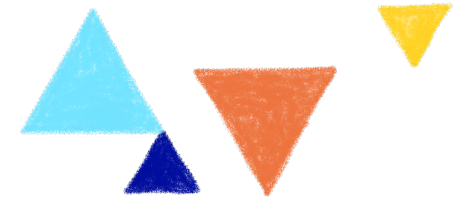
- Simple sharing



- Easy rollbacks

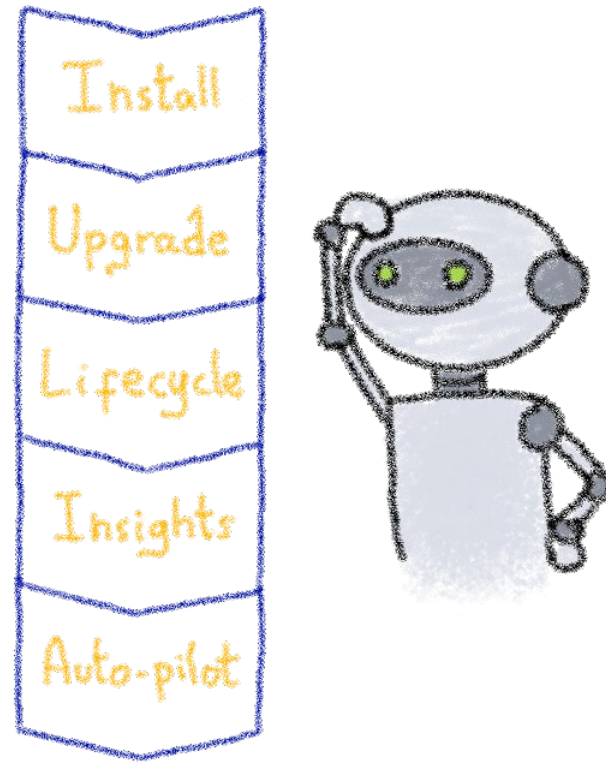


Helm Charts are configuration



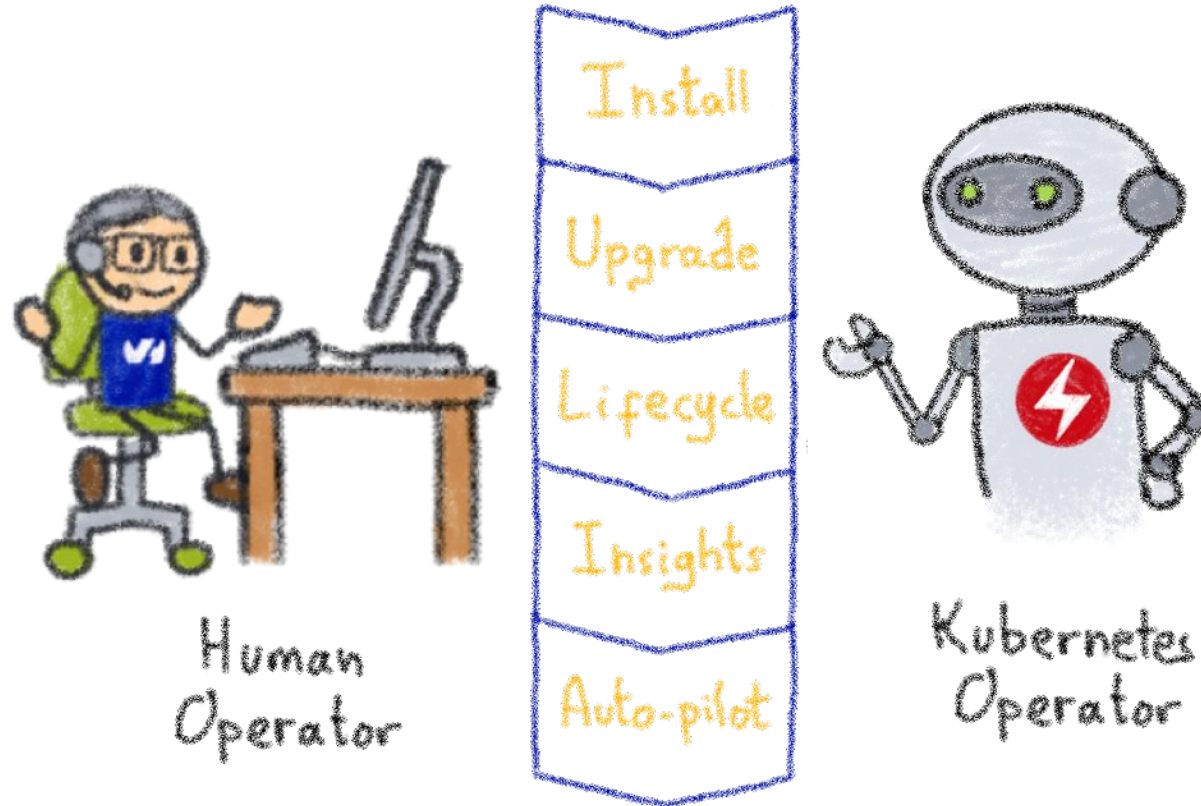
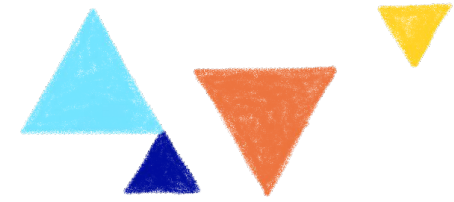
Operating is more than installs & upgrades

Kubernetes is about automation



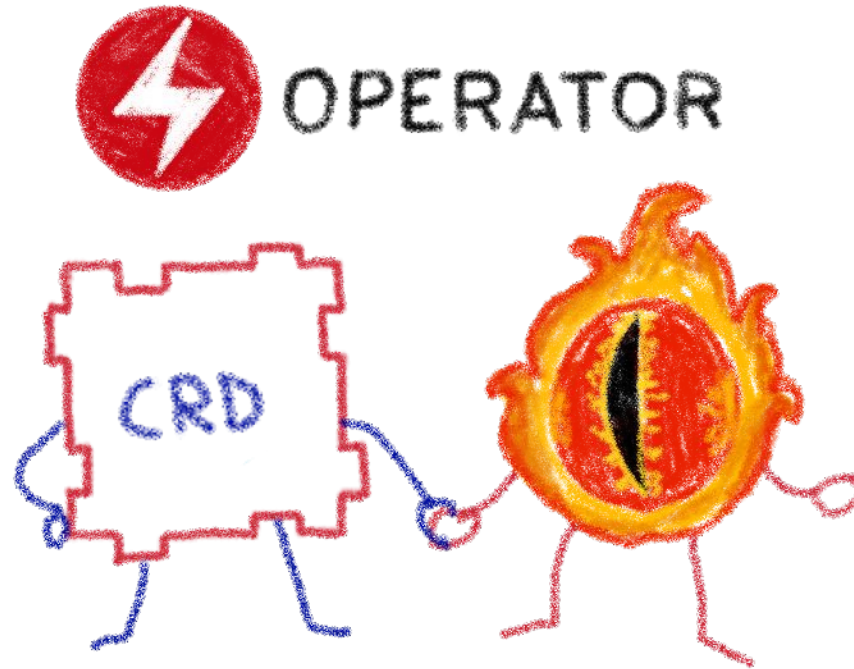
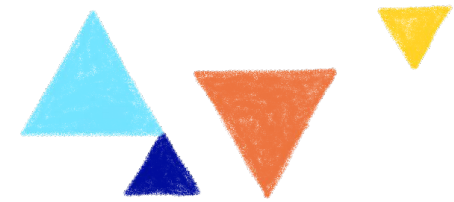
How about automating human operators?

Kubernetes Operators

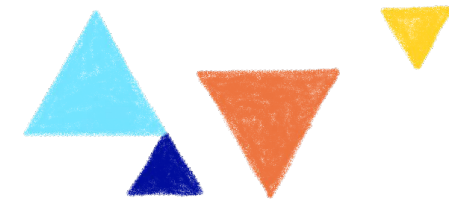


A Kubernetes version of the human operator

Building operators



Basic K8s elements: Controllers and Custom Resources

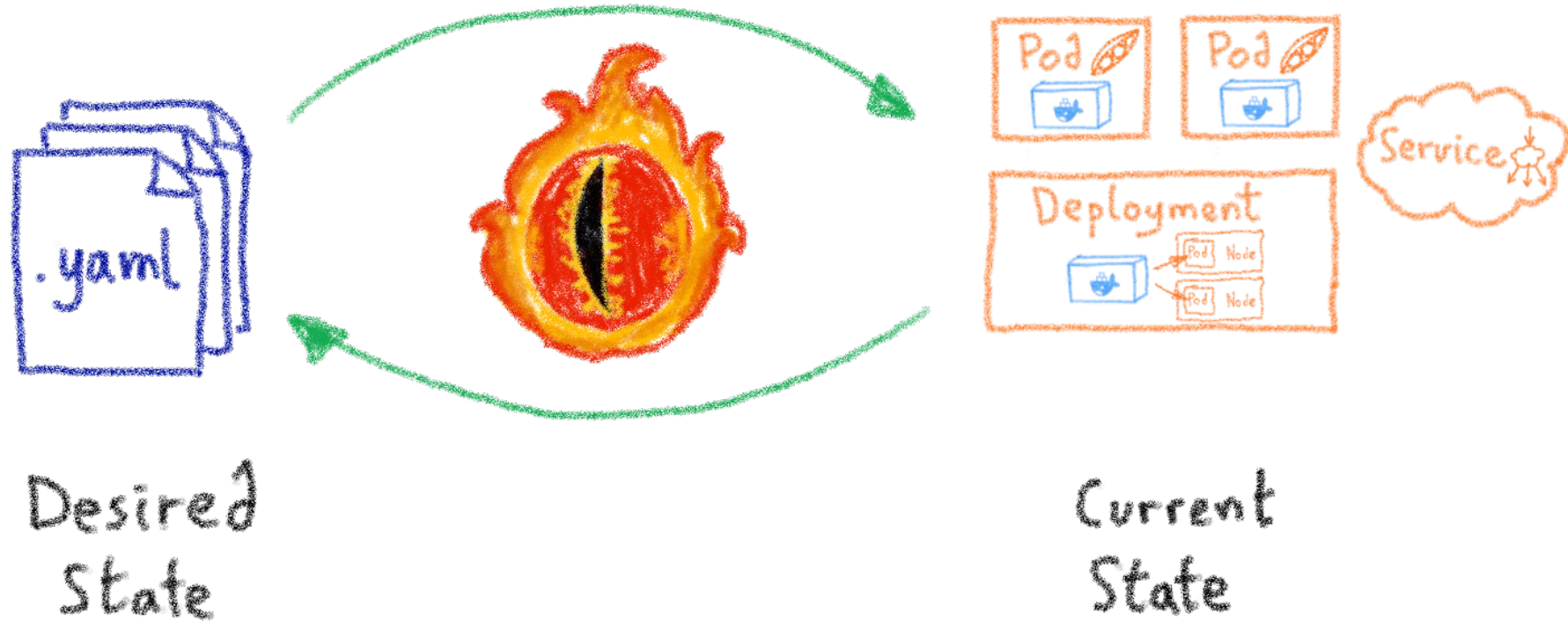
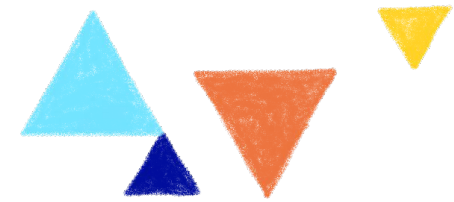


Kubernetes Controllers

Keeping an eye on the resources

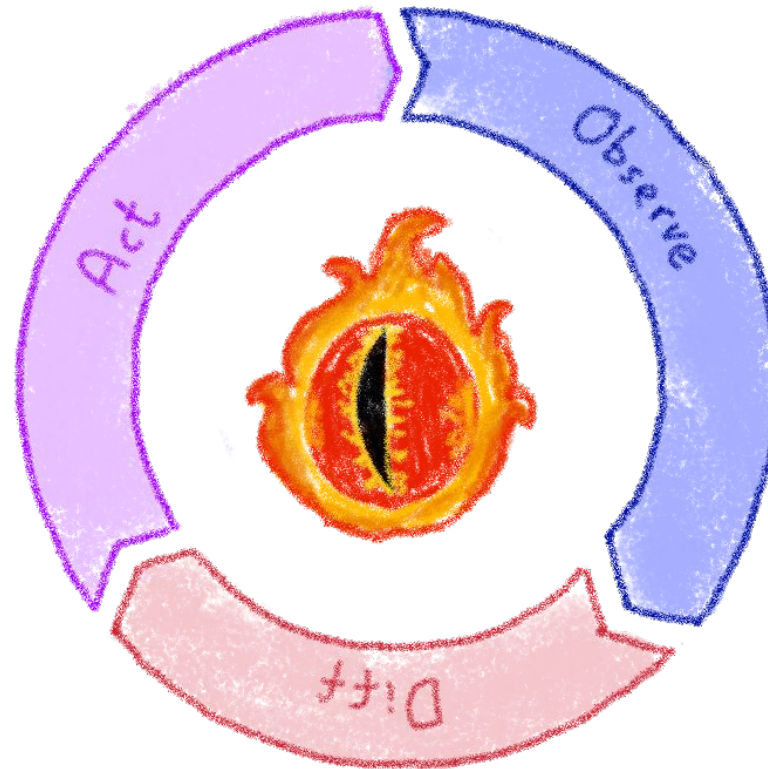
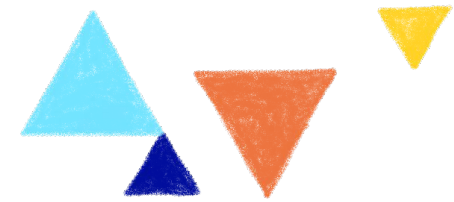


A control loop

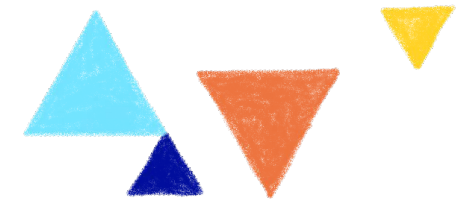


They watch the state of the cluster,
and make or request changes where needed

A reconcile loop

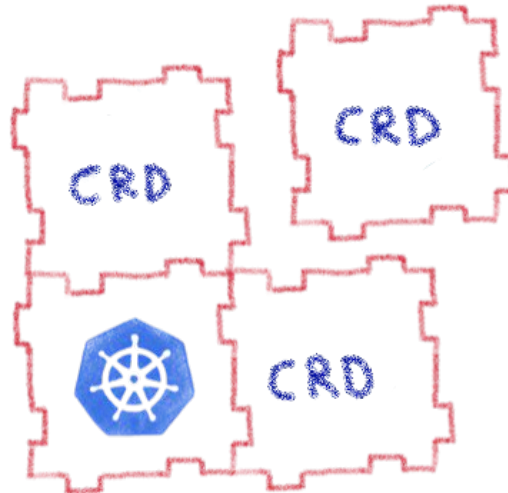


Strives to reconcile current state and desired state

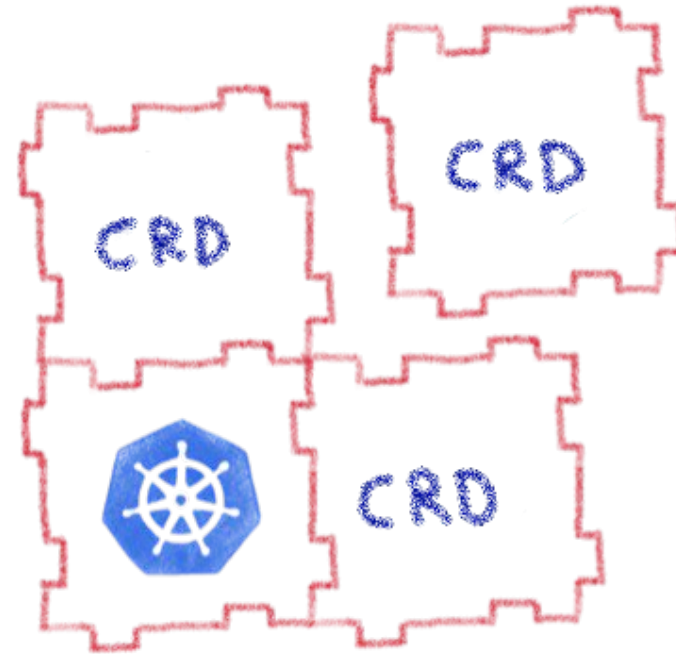


Custom Resource Definitions

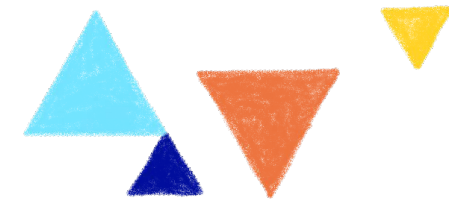
Extending Kubernetes API



Extending Kubernetes API



By defining new types of resources

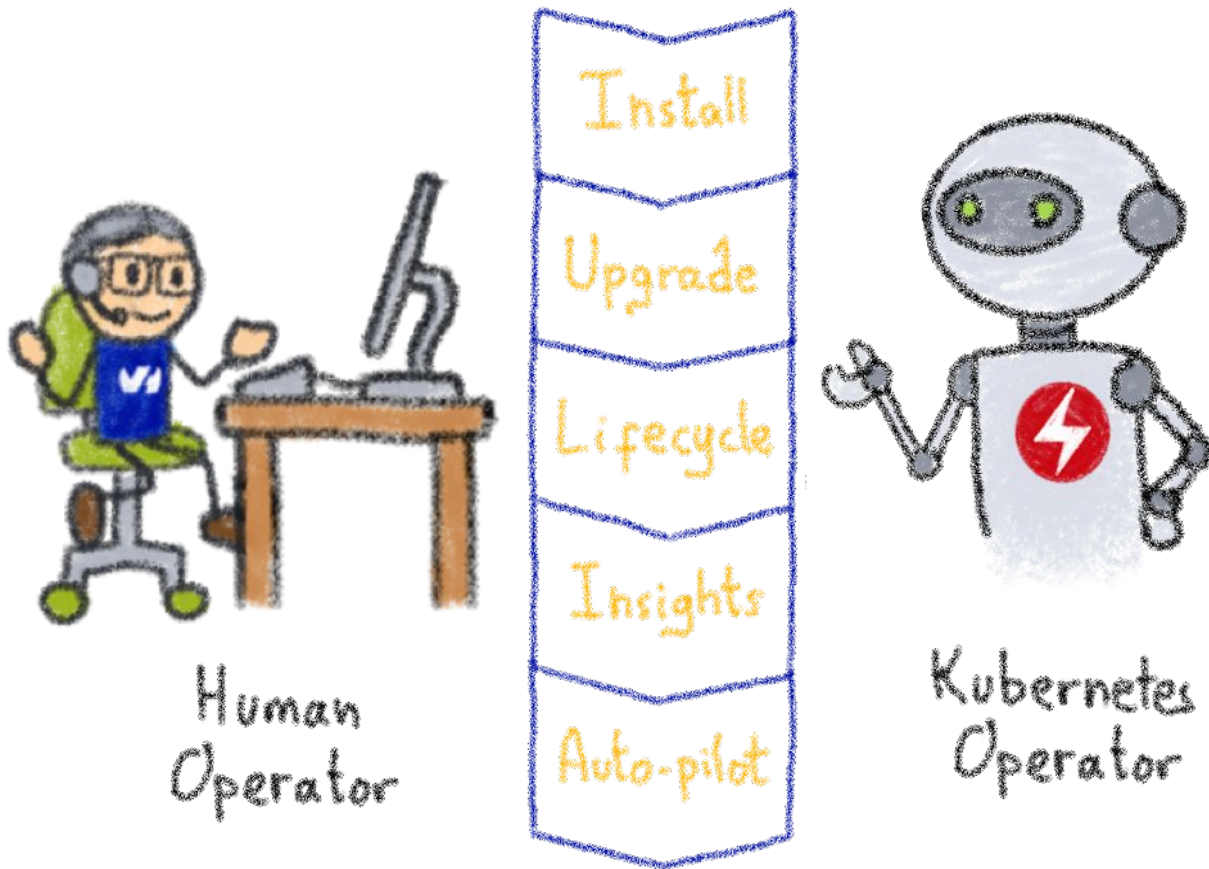


Kubernetes Operator

Automating operations

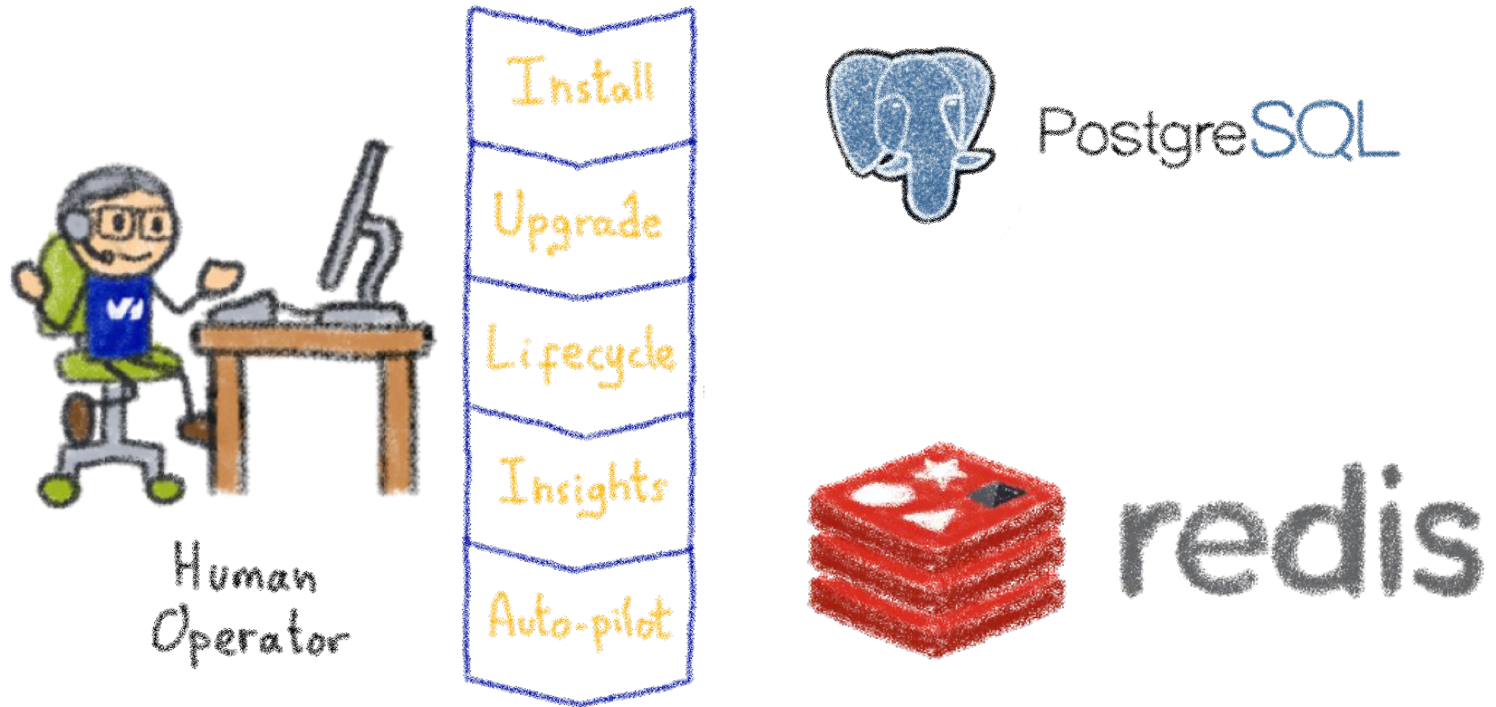
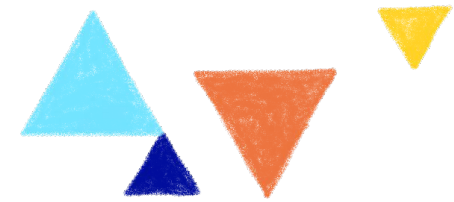


What's a Kubernetes Operator?



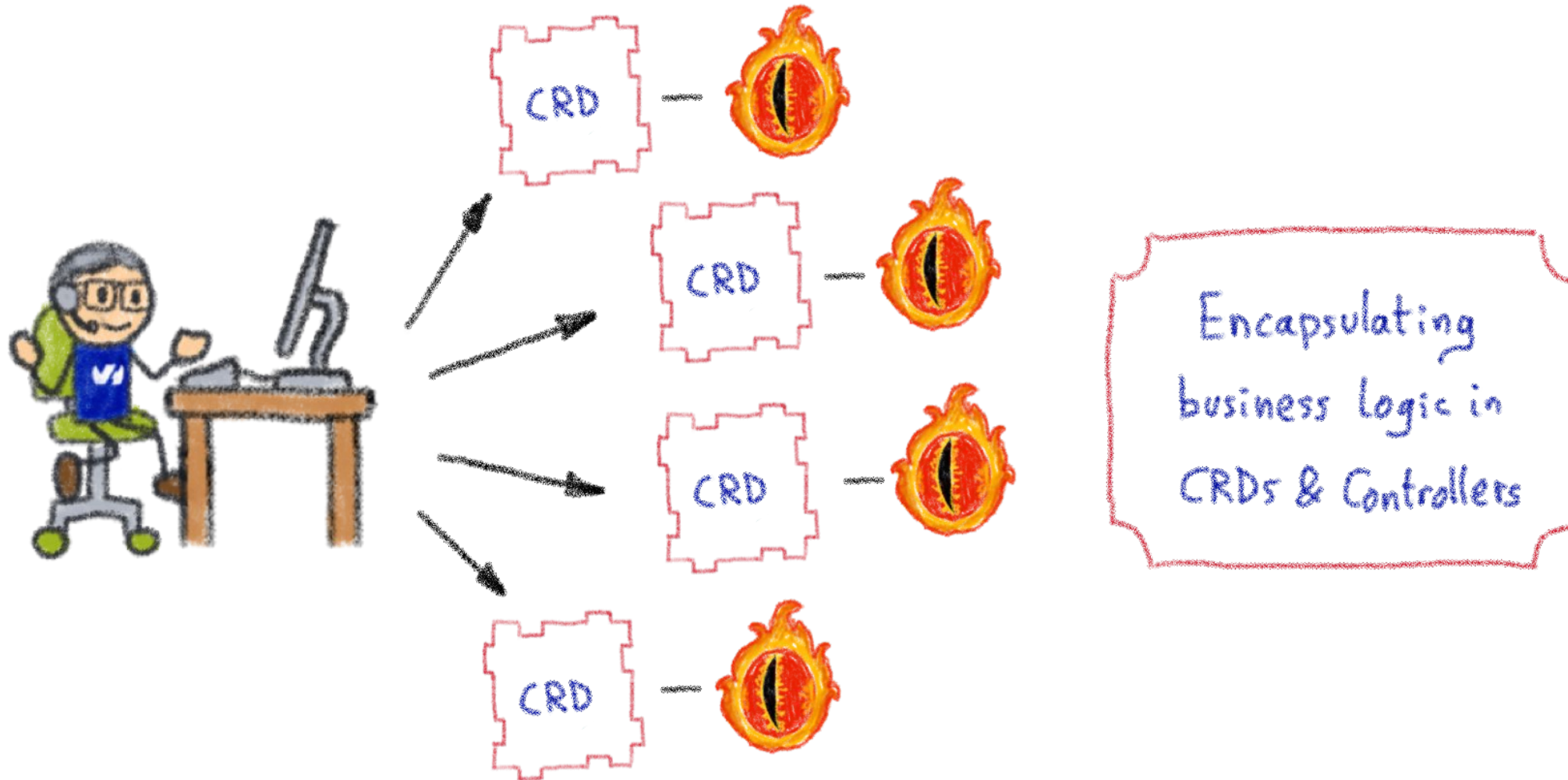
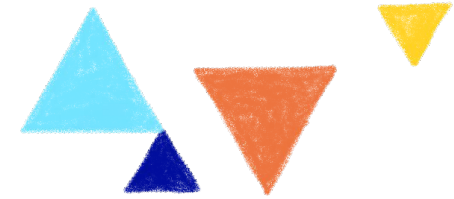
An Operator represents human operational knowledge in software to reliably manage an application

Example: databases

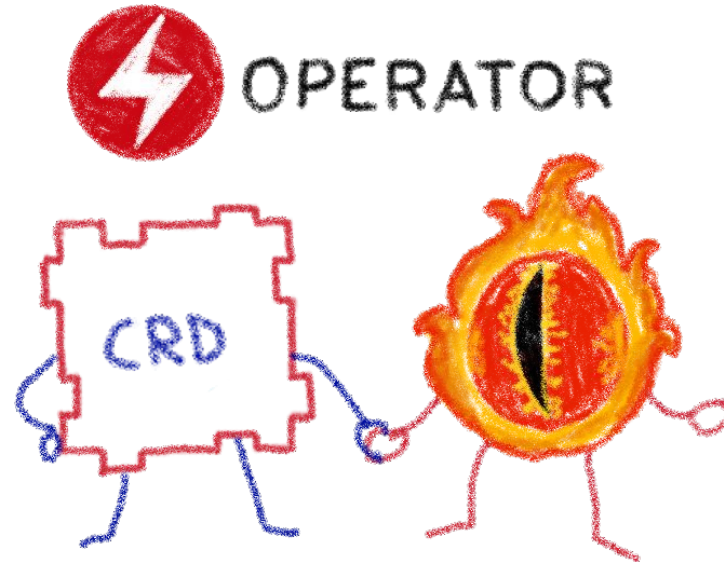


Things like adding an instance to a pool,
doing a backup, sharding...

Knowledge encoded in CRDs and Controllers



Custom Controllers for Custom Resources

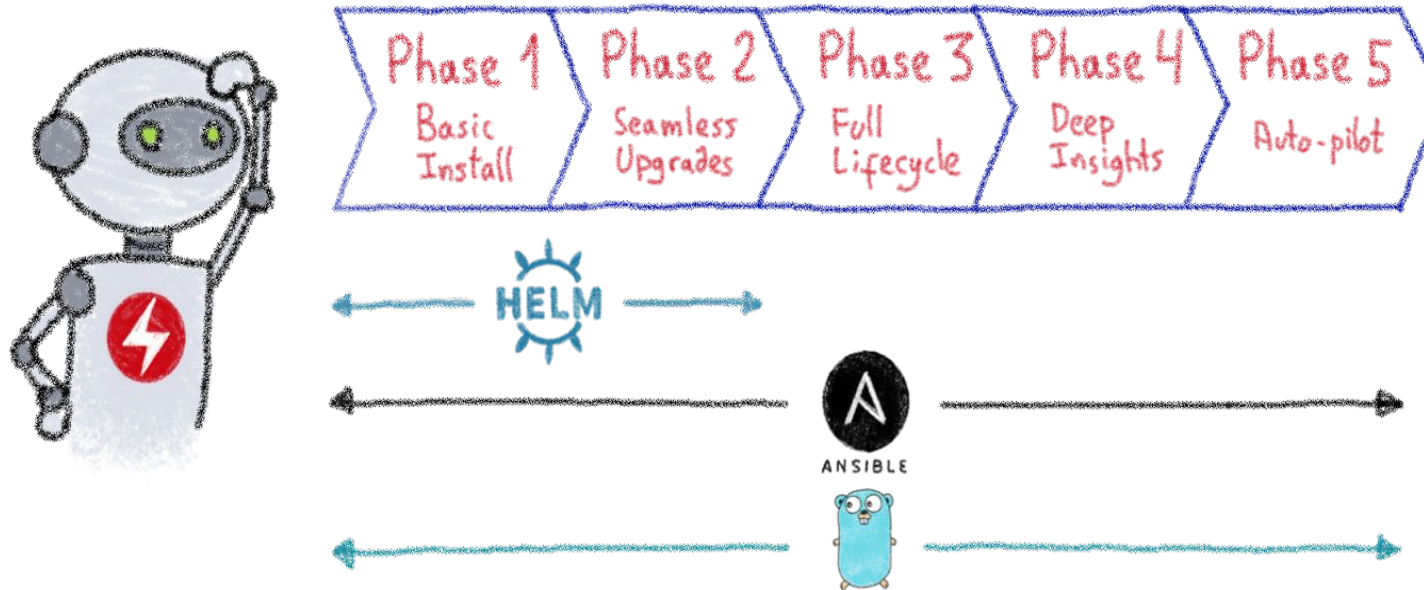


Operators implement and manage Custom Resources
using custom reconciliation logic

Operator Capability Model



OPERATOR
CAPABILITY MODEL



Gauging the operator maturity

