

# Demystifying Kubernetes Operators in Java with Quarkus

2024-12-17 - Nantes JUG



Horacio Gonzalez

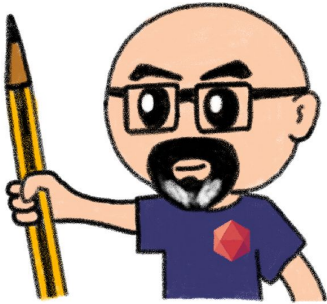


clever cloud



# Who are we?

Introducing myself and  
introducing Clever Cloud



# Horacio Gonzalez



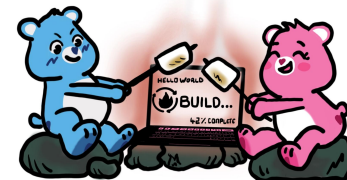
@LostInBrittany

Spaniard Lost in Brittany

Head of DevRel



clever cloud





# clever cloud

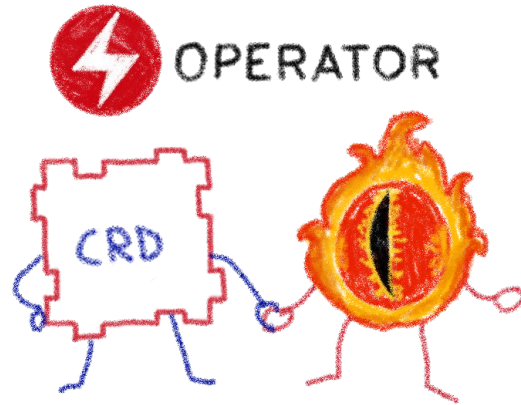
## From Code to Product

Our mission: give more **speed** to your **teams**  
and better **quality** to your **projects**

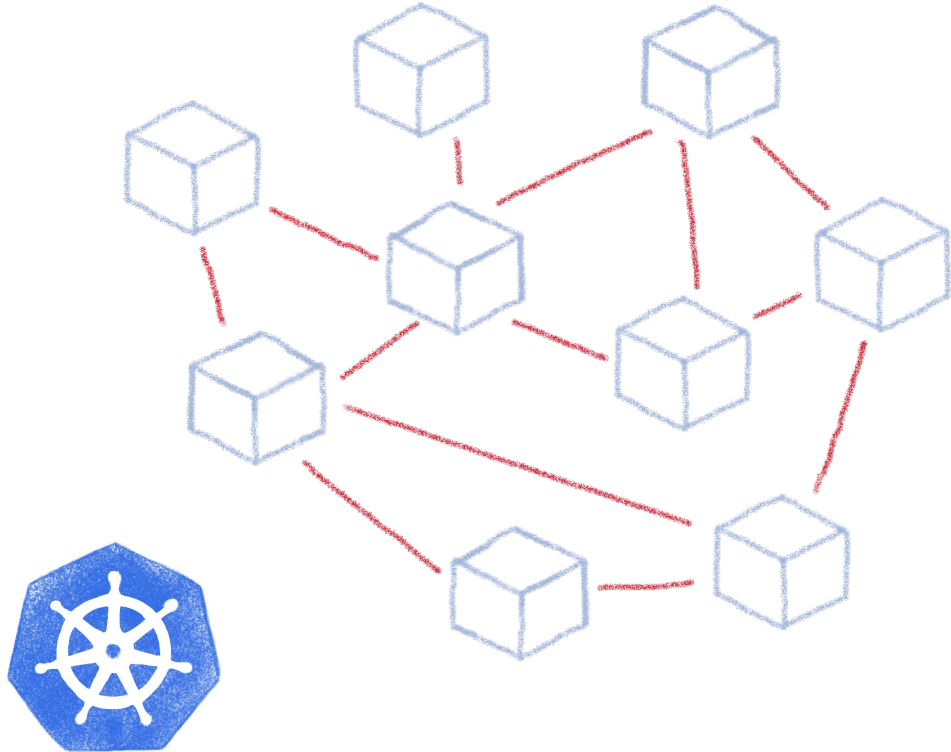


# Kubernetes operators

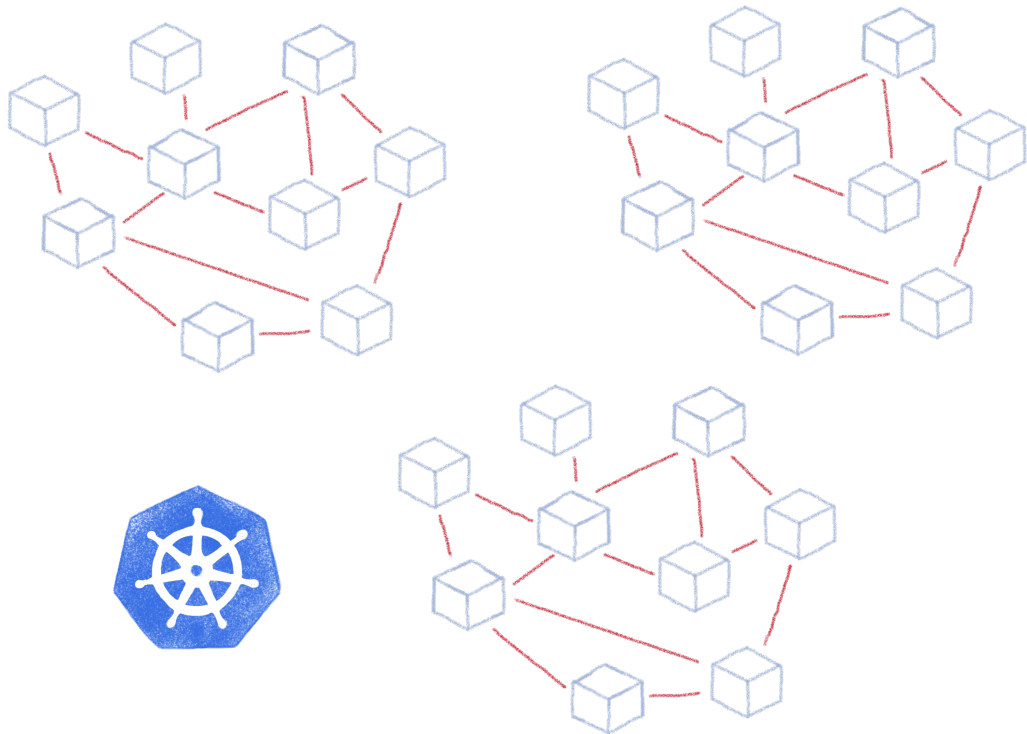
Helping to tame the complexity of K8s Ops



# Taming microservices with Kubernetes



# What about complex deployments



Ingress

Services

Deployments

Pods

Sidecars

Replica Sets

Stateful Sets

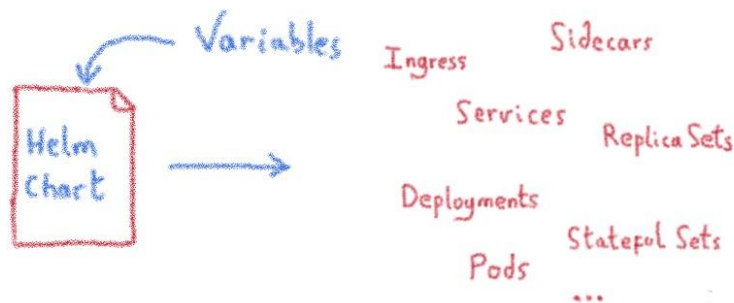
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# Tools like Helm helps with complexity



A package manager for Kubernetes



- Manage complexity 

- Easy upgrades 

- Simple sharing 

- Easy rollbacks 



# Helm Charts are configuration



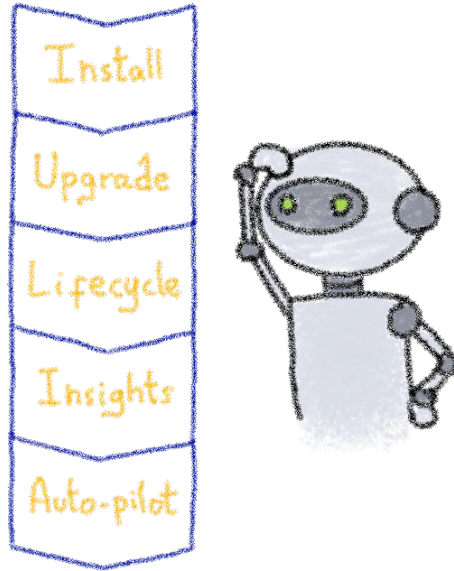
Ops/DevOps/SRE...  
Human operator



Operating is more than installs & upgrades

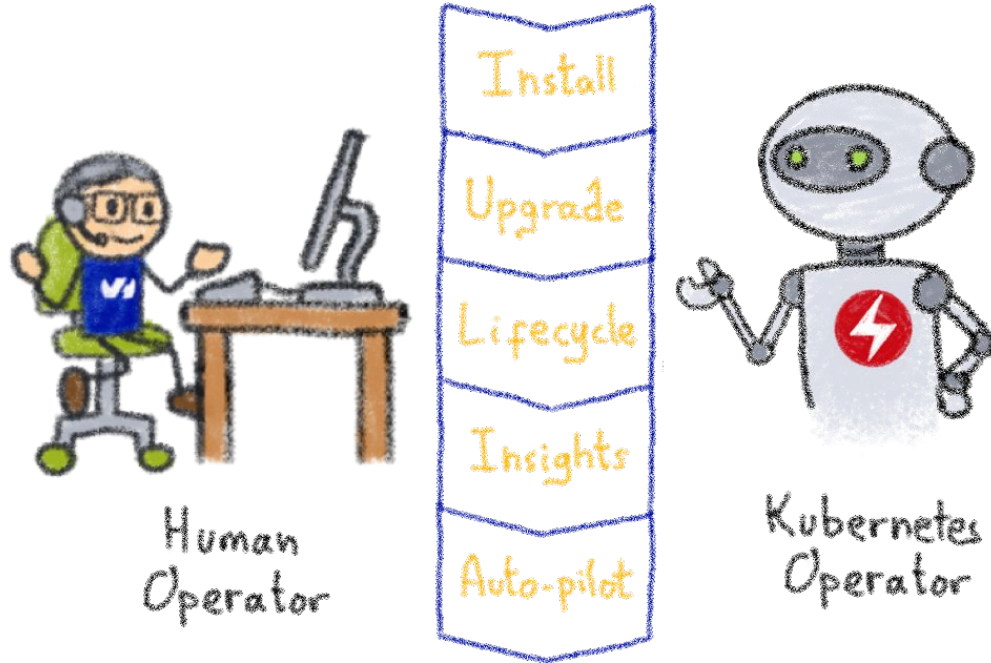


# Kubernetes is about automation

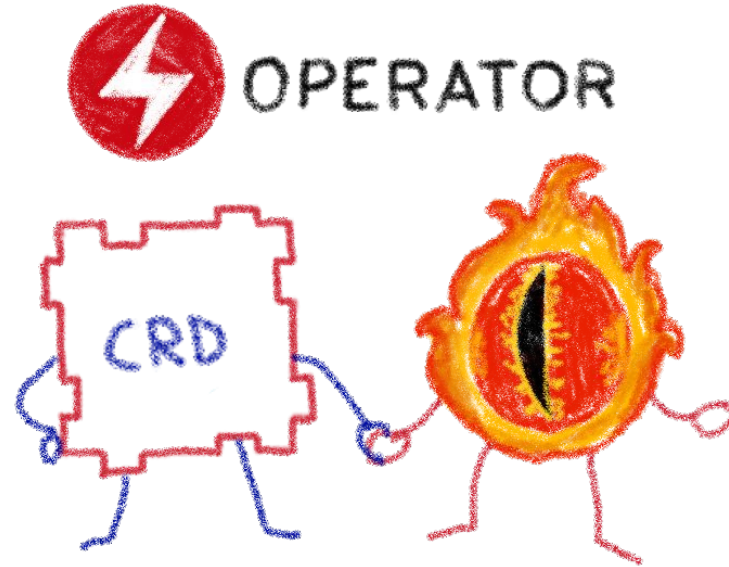


How about automating human operators?

# Kubernetes Operators



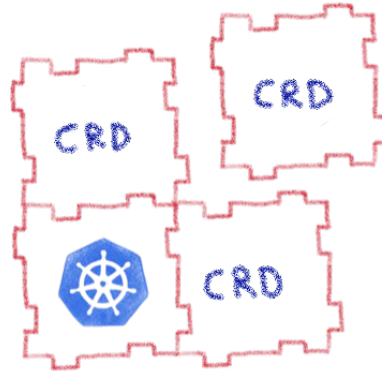
A Kubernetes version of the human operator



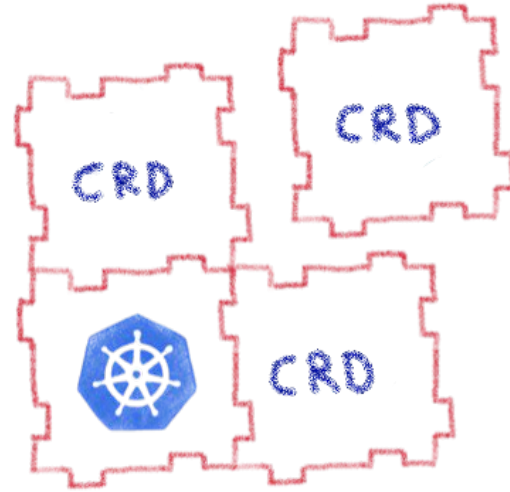
Basic K8s elements: Custom Resources & Controllers

# Custom Resource Definitions

Extending Kubernetes API



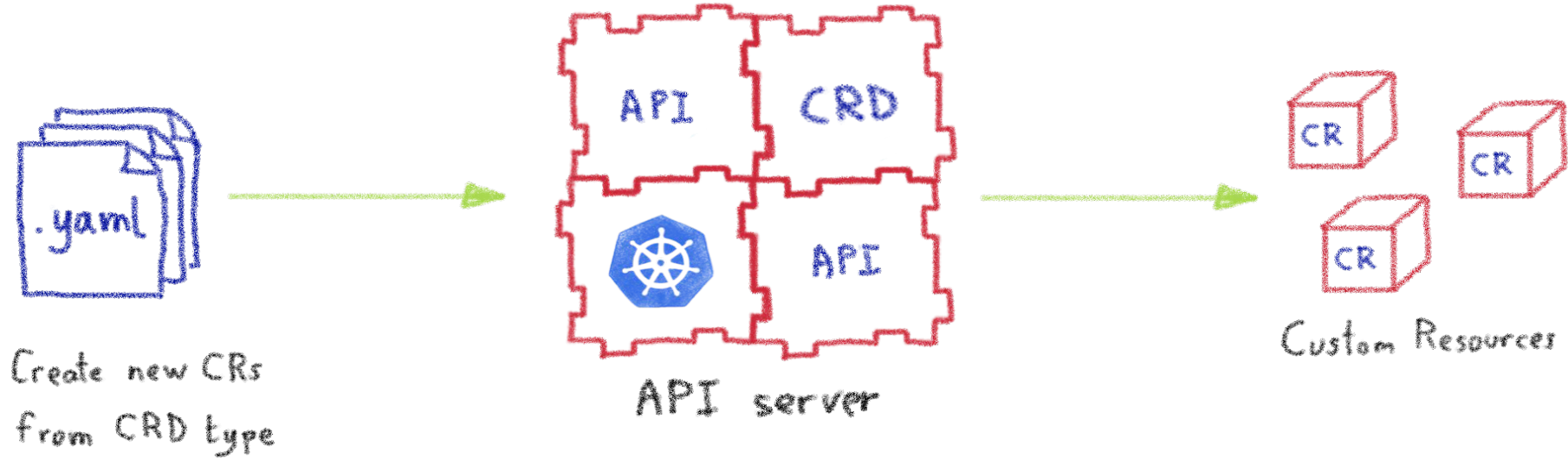
# Extending Kubernetes API



By defining new types of resources,  
internal or external to the cluster

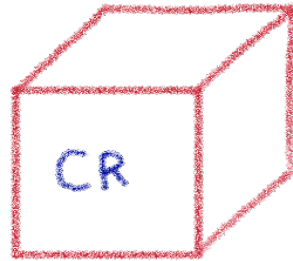


# With a CRD you can create CR in the cluster



They are the blueprints of the Custom Resources

# Custom Resources are simply data



a: xxx  
b: yyy  
c: zzz

Only data,  
properties,  
no logic

All the logic must be in the Controller

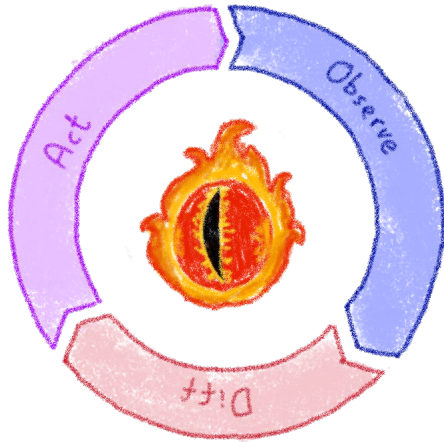


# Kubernetes Controllers

Keeping an eye on the resources



# A reconcile loop



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





# Kubernetes Operator

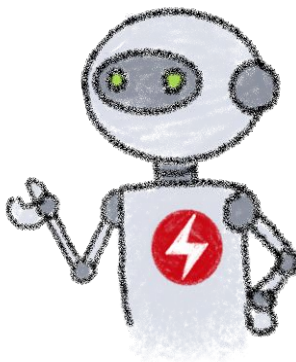
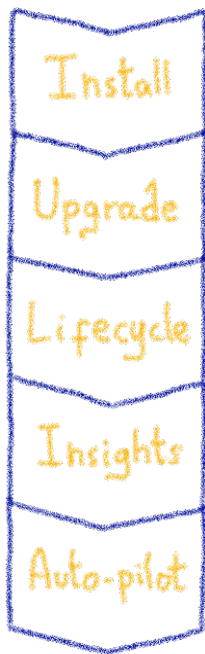
Automating operations



# What's a Kubernetes Operator?



Human Operator

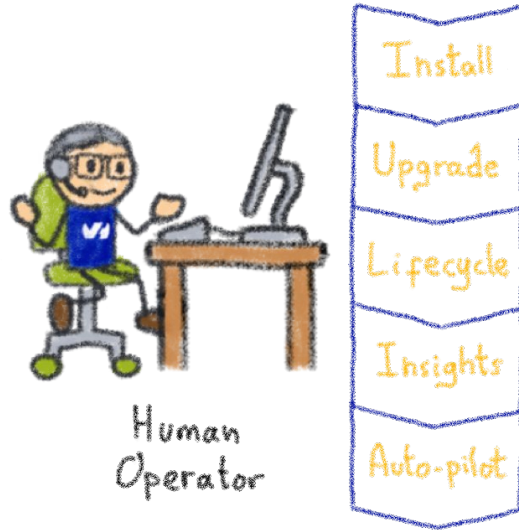


Kubernetes Operator

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



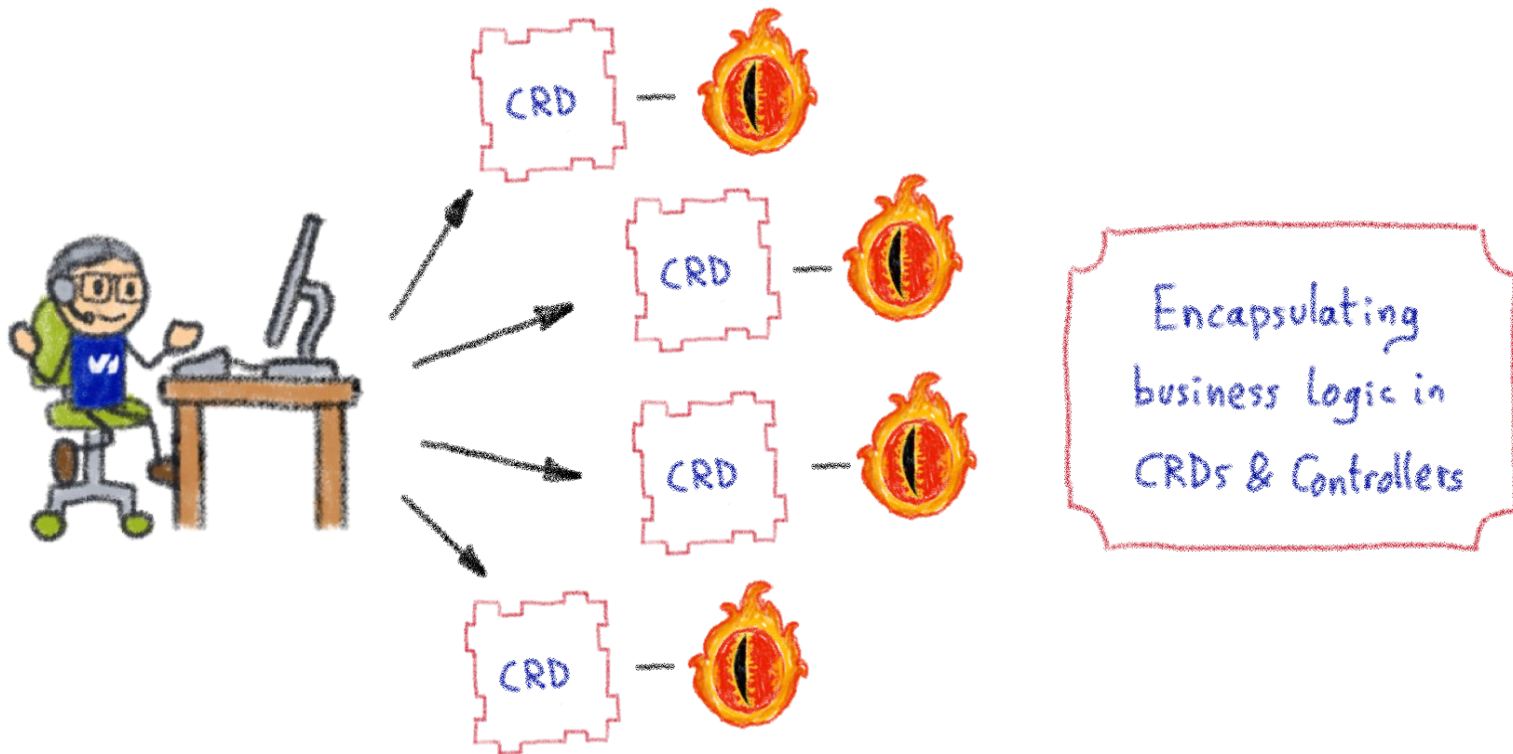
# Example: databases



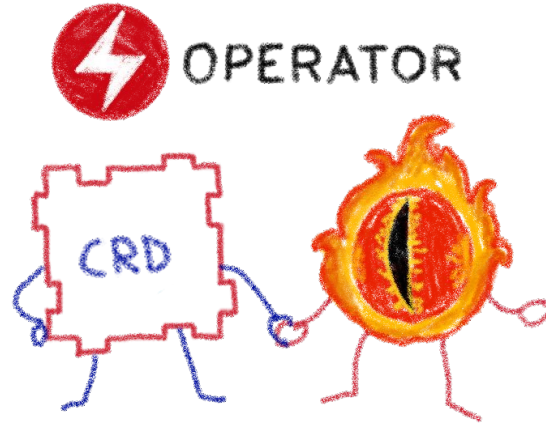
Things like adding an instance to a pool,  
doing a backup, sharding...



# Knowledge encoded in CRDs and Controllers



# Custom Controllers for Custom Resources



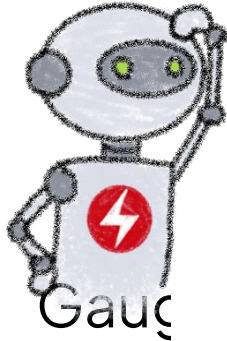
Operators implement and manage Custom Resources using custom reconciliation logic



# Operator Capability Model

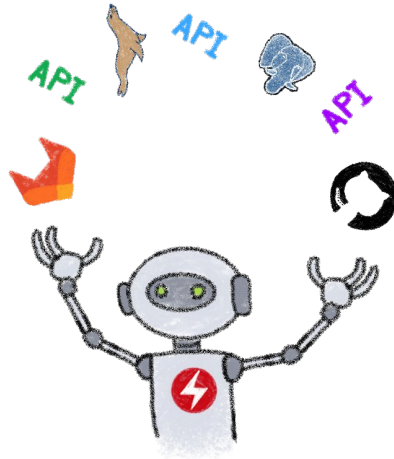


OPERATOR  
CAPABILITY MODEL

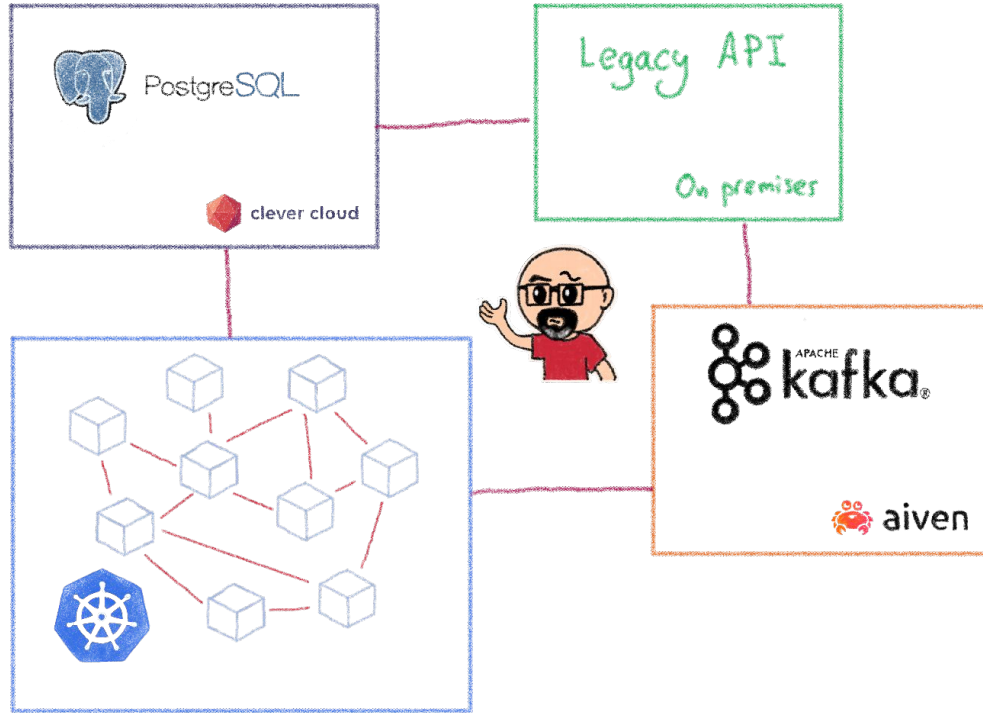


# Operators aren't limited to K8s

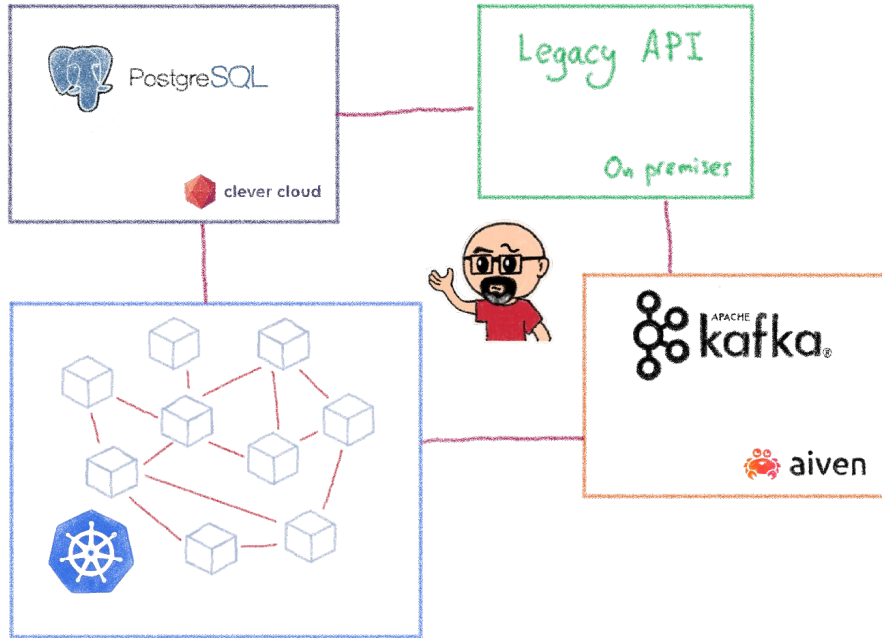
They can be used to pilot external APIs, i.e. non K8s software



# Don't put everything into Kubernetes



# Operators simplify Kubernetes integration

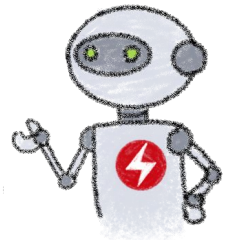


 OPERATOR



Human Operator

- Install
- Upgrade
- Lifecycle
- Insights
- Auto-pilot



Kubernetes Operator





# A real, open-source example

The Clever Operator




clever cloud



# Available on Operator Hub & GitHub



OperatorHub.io  [Contribute](#)

 **clever-operator**  
A kubernetes operator that expose clever cloud's resources through custom resource definition

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## clever-operator

A kubernetes operator that expose clever cloud's resources through custom resource definition

[Install](#)

### Custom Resource Definitions

#### PostgreSQL

Clever Cloud's managed postgresql database

[View YAML Example](#)

#### Redis

Clever Cloud's managed redis database

[View YAML Example](#)

#### MySQL

Clever Cloud's managed mysql database

[View YAML Example](#)

#### MongoDb

#### Pulsar

#### ConfigProvider

#### CHANNEL

alpha

#### VERSION

0.5.5 (Current)

#### MIN K8S VERSION

v1.24.0

#### CAPABILITY LEVEL

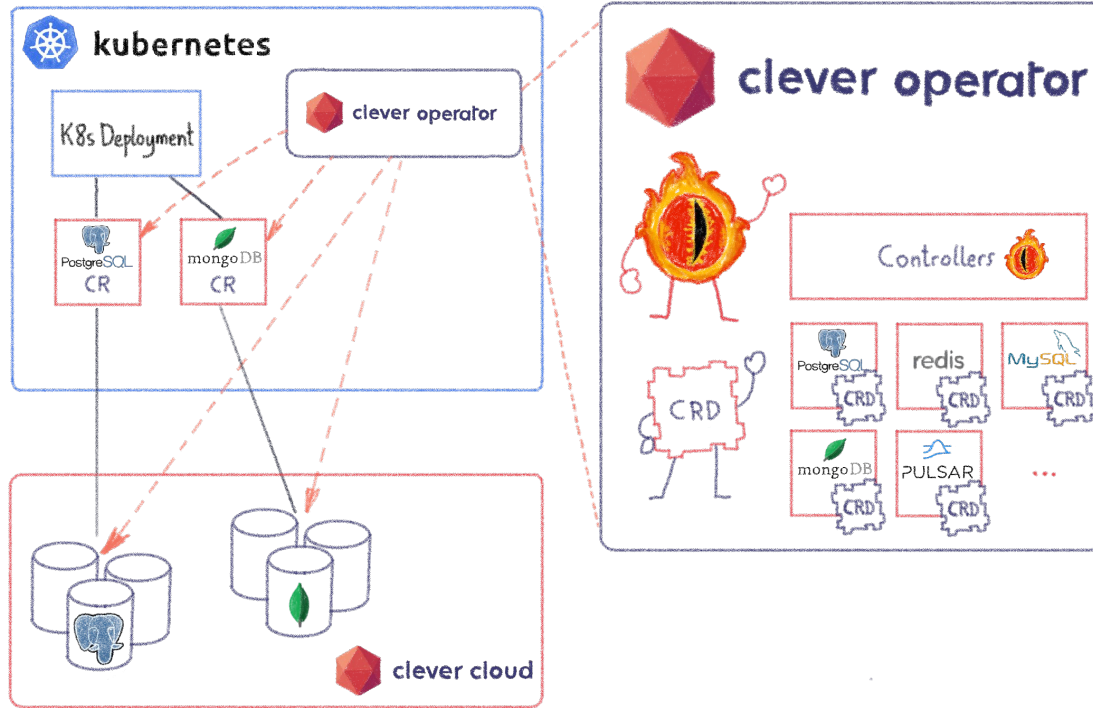
- Basic Install
- Seamless Upgrades
- Full Lifecycle
- Deep Insights

<https://operatorhub.io/operator/clever-operator>

<https://github.com/CleverCloud/clever-operator>



# Exposing Clever Cloud resources as CRD



Allowing your apps to use our DBs as if they were in K8s



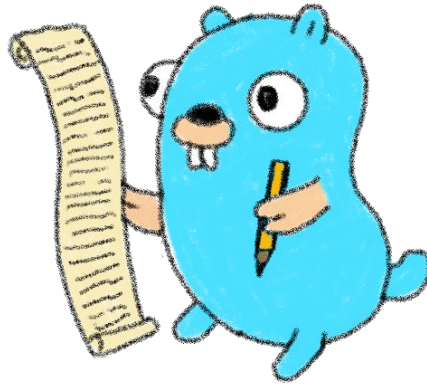
# Many possible use-cases



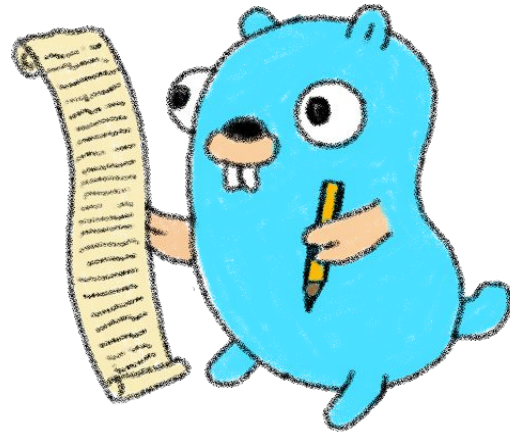
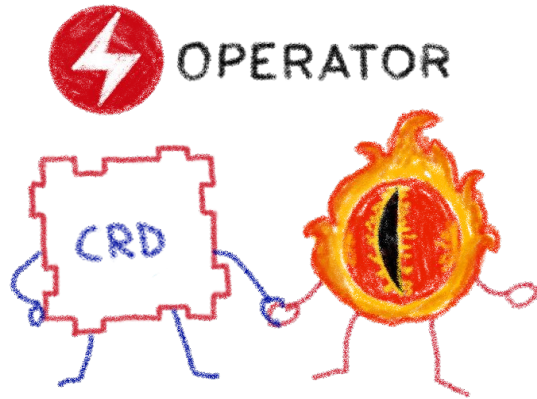
- External Service Health Monitor Operator
- External API Token Rotation Operator
- Database Synchronization Operator
- Legacy System Configuration Management Operator
- File Transfer Operator (FTP/SFTP Automation)
- Cloud Billing/Cost Monitoring Operator
- DNS Management Operator
- ...

# How can we write Operators?

Which language? Any framework?



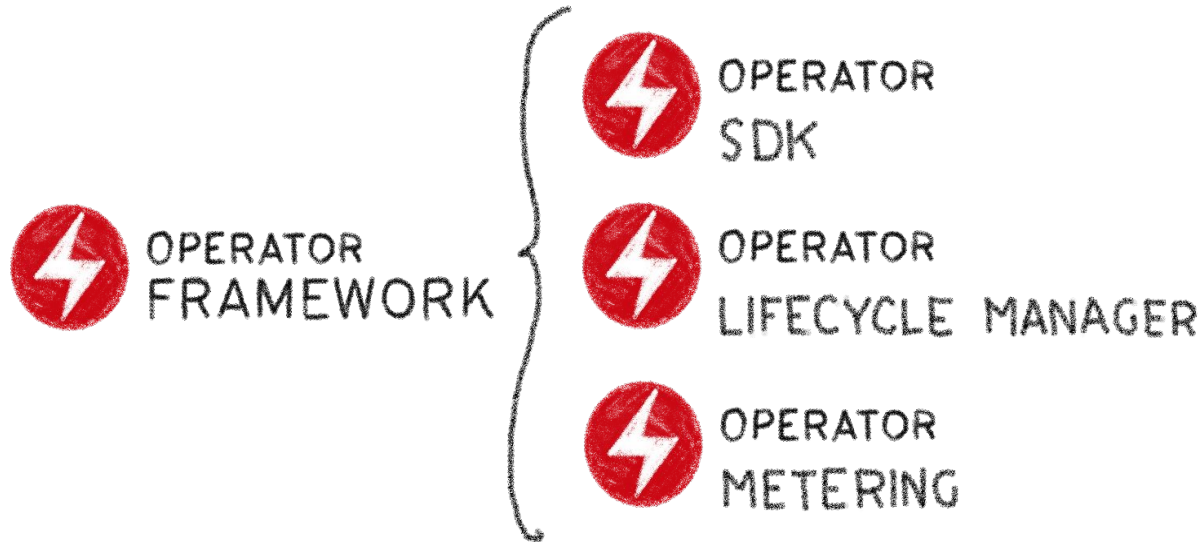
# They are simply pods and manifests



You can simply call Kubernetes APIs  
or use a compatible client



# The Operator Framework



Open source framework to accelerate the development of an Operator



# Hey Devovx Morocco, operators ❤️ Java

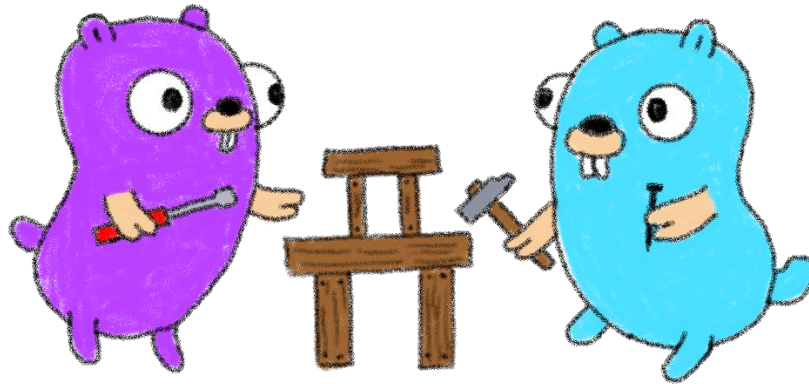


A screenshot of the Java Operator SDK website. The page has an orange header with the text "Java Operator SDK" and navigation links for "Docs", "Blog", "Community", and a search bar. The main content area features a background image of a cloudy sky. The title "Java Operator SDK" is centered in large white text. Below the title are two orange buttons: "Learn More" with a right-pointing arrow and "Download" with a download icon. Underneath these buttons is the text "Kubernetes operators in Java made easy!" followed by a light blue circular button with a white downward-pointing arrow.

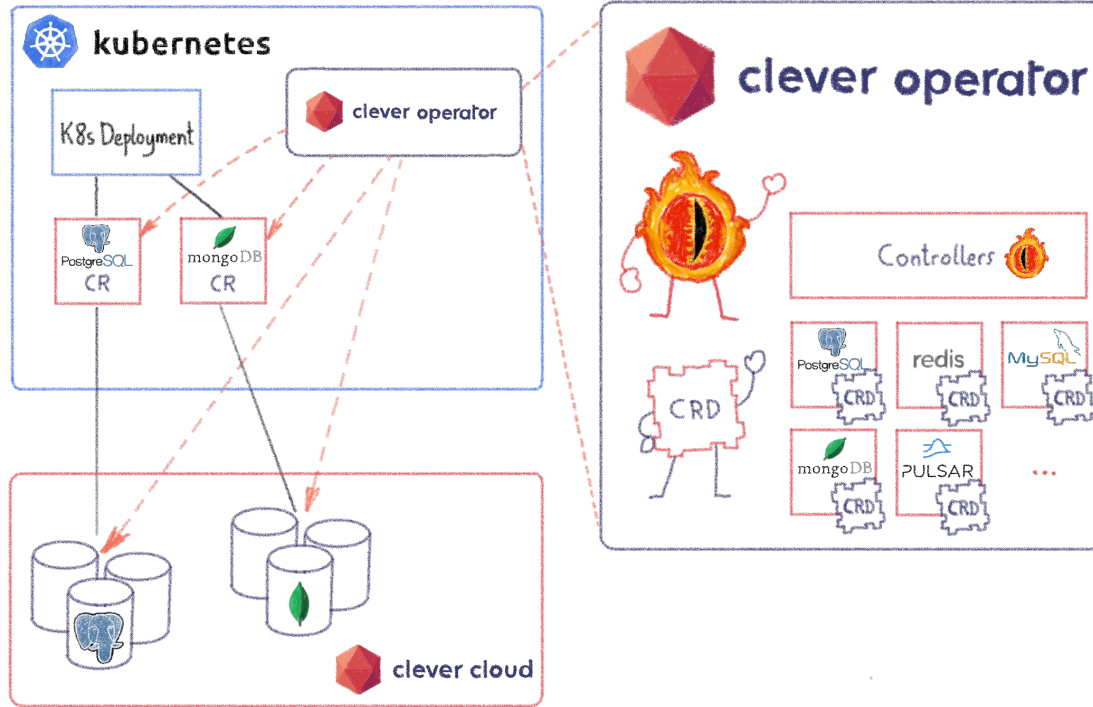


# Let's look at a real operator

Dealing with external databases



# Clever Cloud operator



Allowing your apps to use our DBs as if they were in K8s




# Available on Operator Hub & GitHub



OperatorHub.io

Search OperatorHub... Contribute



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Home > clever-operator

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Install

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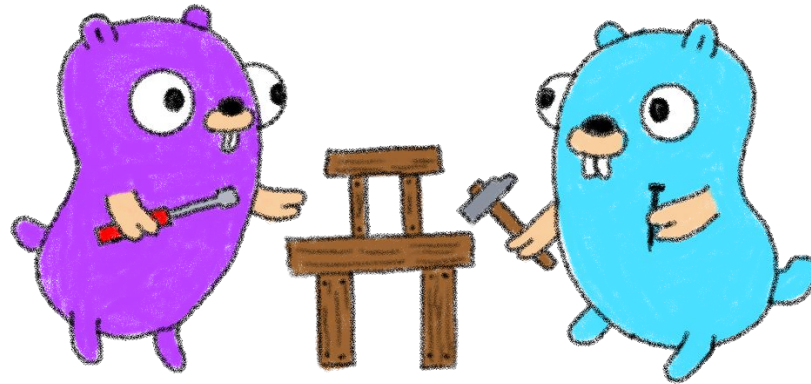
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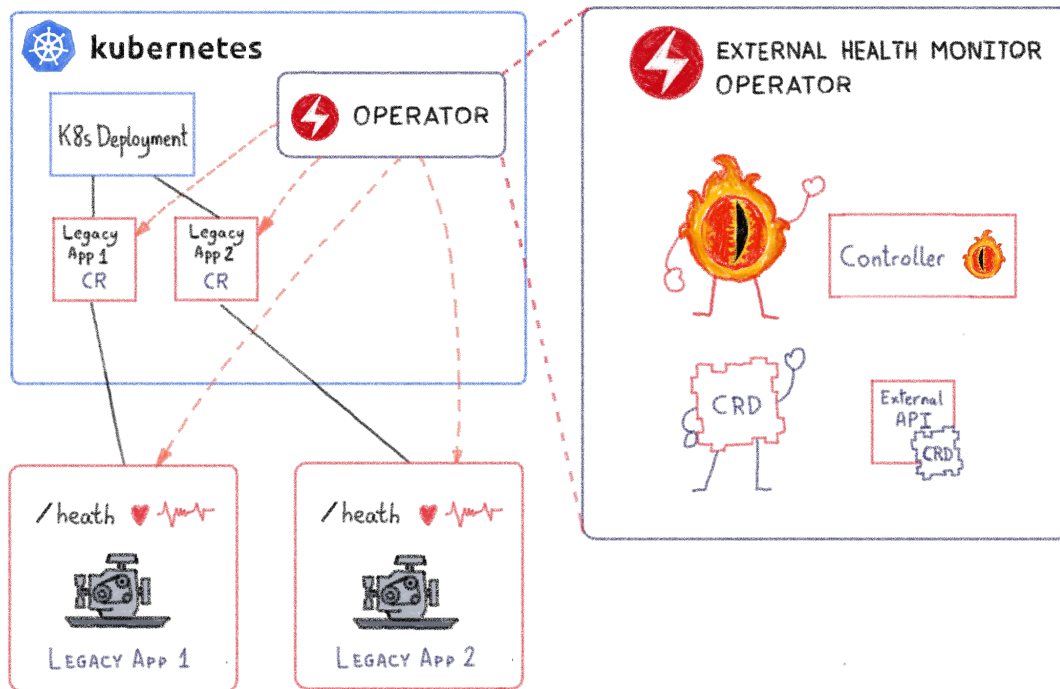


# Let's build an operator together

Why? Because we can!



# Let's choose a use-case



## External Service Health Monitor Operator



# Code available on GitHub



sebi-and-horacio / external-health-monitor-operator Public

Notifications Fork 1 Star 2

<> Code Issues Pull requests Actions Projects Security Insights

main 1 Branch 0 Tags

Go to file Code

File	Commit	Time
.vscode	Steps 2 and 3	3 months ago
step-01	Step 01	3 months ago
step-02	Updating for Nantes JUG	9 minutes ago
step-03	Updating for Nantes JUG	9 minutes ago
step-04	Updating for Nantes JUG	9 minutes ago
.gitignore	Fixing step 3 and doing step 4	2 months ago
README.md	Merging	4 minutes ago

LostInBrittany Merging b5e1bff · 4 minutes ago 8 Commits

**README**

## External Health Monitor Operator

A sample operator built in Java on Quarkus, used for the talk *Operators to the rescue: Manage your external data and legacy APIs from Kubernetes*, by [Sebastien Blanc](https://github.com/sebastienblanc) and [Horacio Gonzalez](https://github.com/horacio).

**About**

A sample operator built in Java on Quarkus, used for the talk *Operators to the rescue: Manage your external data and legacy APIs from Kubernetes*, by [Sebastien Blanc](https://github.com/sebastienblanc) and [Horacio Gonzalez](https://github.com/horacio).

- Readme
- Activity
- Custom properties
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**Releases**

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**Packages**

<https://github.com/sebi-and-horacio/external-health-monitor-operator>

