

DEVOXX
MOROCCO



Operators to the rescue: Manage your external data and legacy APIs from Kubernetes



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Who are we?



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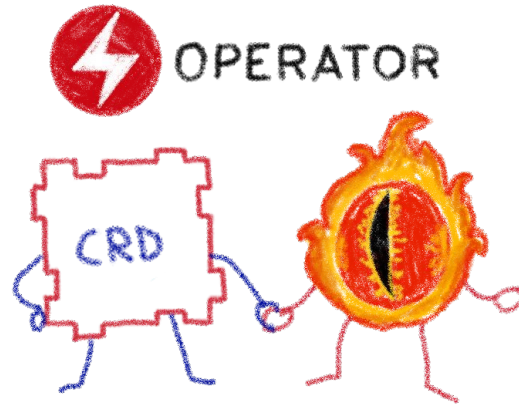
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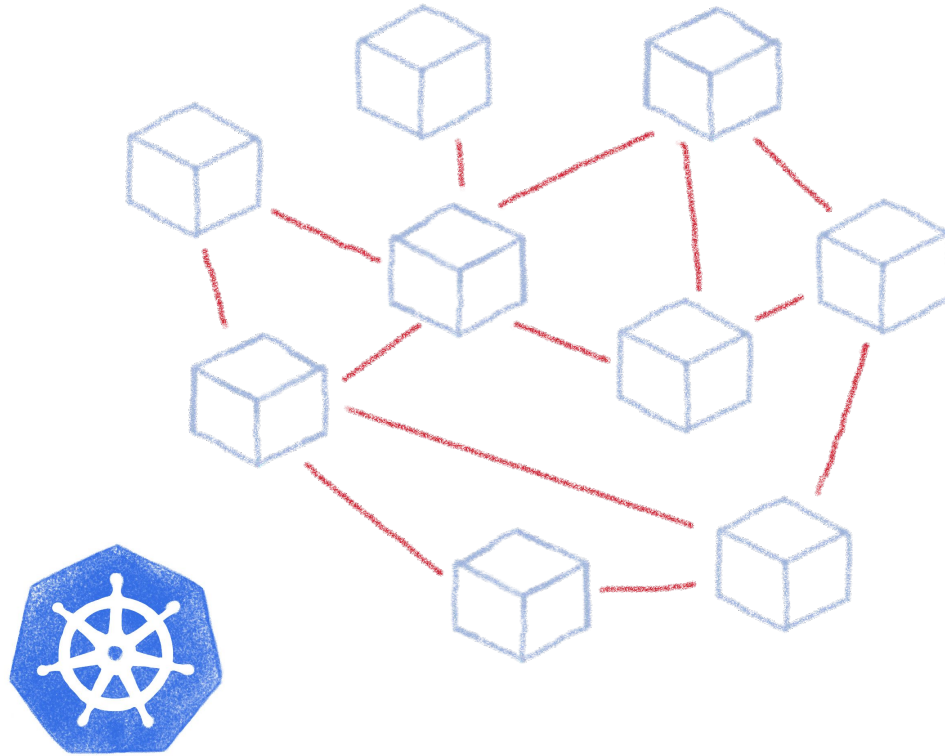
clever cloud

Kubernetes operators

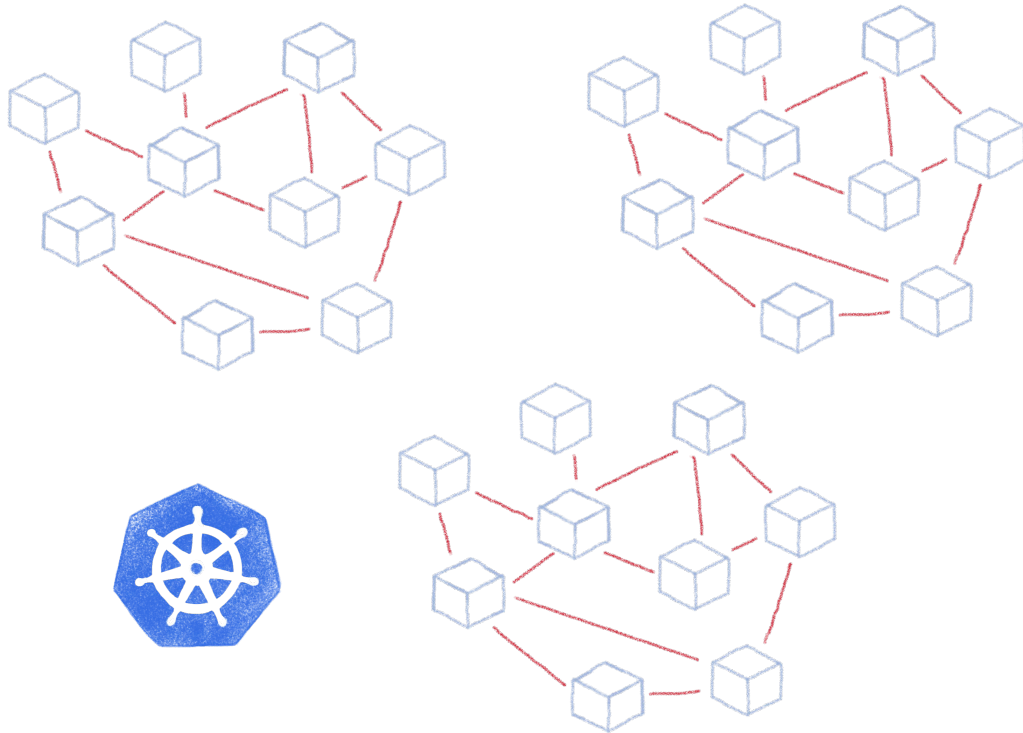
Helping to tame the complexity of K8s Ops



Taming microservices with Kubernetes



What about complex deployments



Ingress

Services

Deployments

Pods

Sidecars

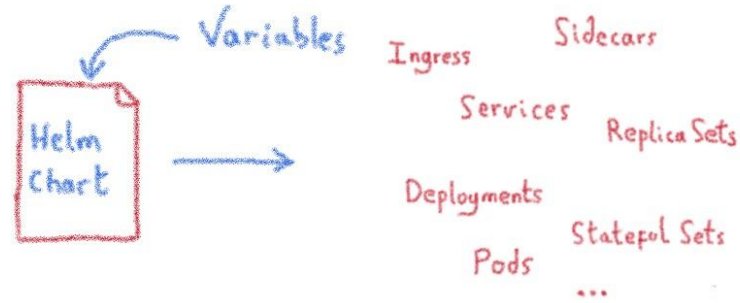
Replica Sets





Stateful Sets



Tools like Helm helps with complexity

A package manager for Kubernetes



- Manage complexity 
- Easy upgrades 
- Simple sharing 
- Easy rollbacks 

Helm Charts are configuration

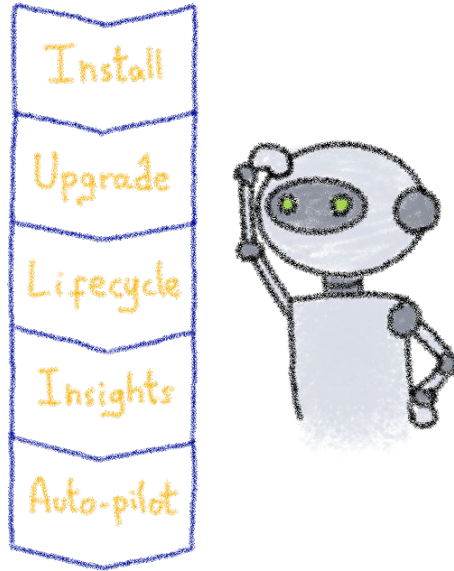


Ops/DevOps/SRE...
Human operator



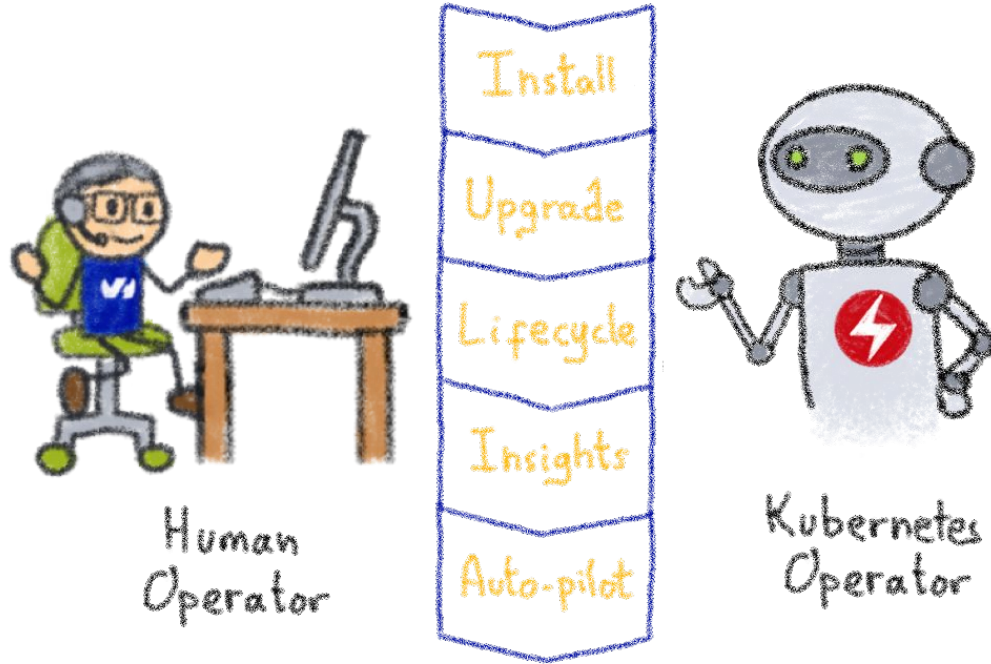
Operating is more than installs & upgrades

Kubernetes is about automation

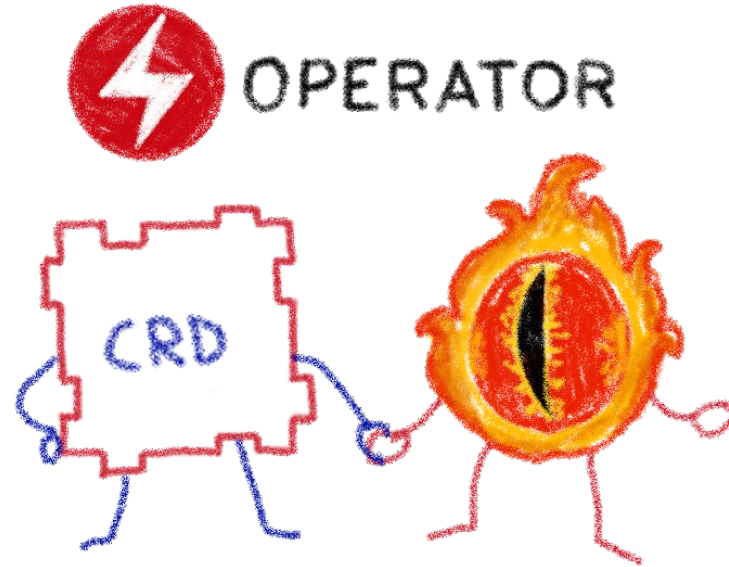


How about automating human operators?

Kubernetes Operators



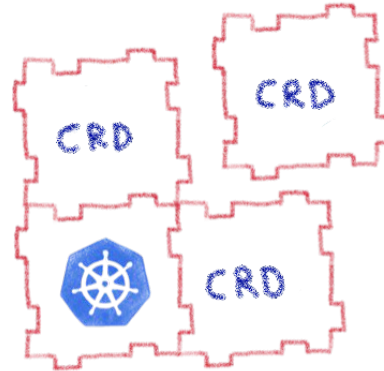
A Kubernetes version of the human operator



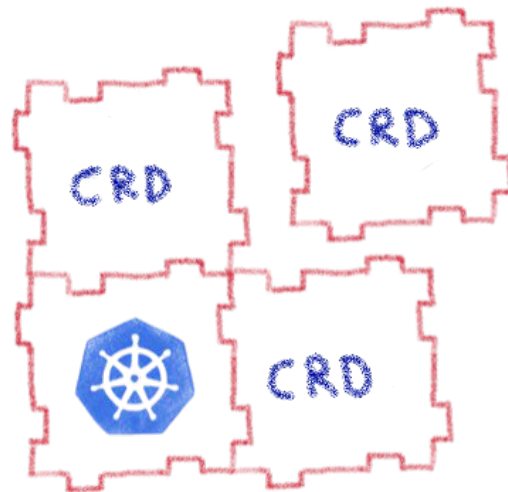
Basic K8s elements: Custom Resources & Controllers

Custom Resource Definitions

Extending Kubernetes API

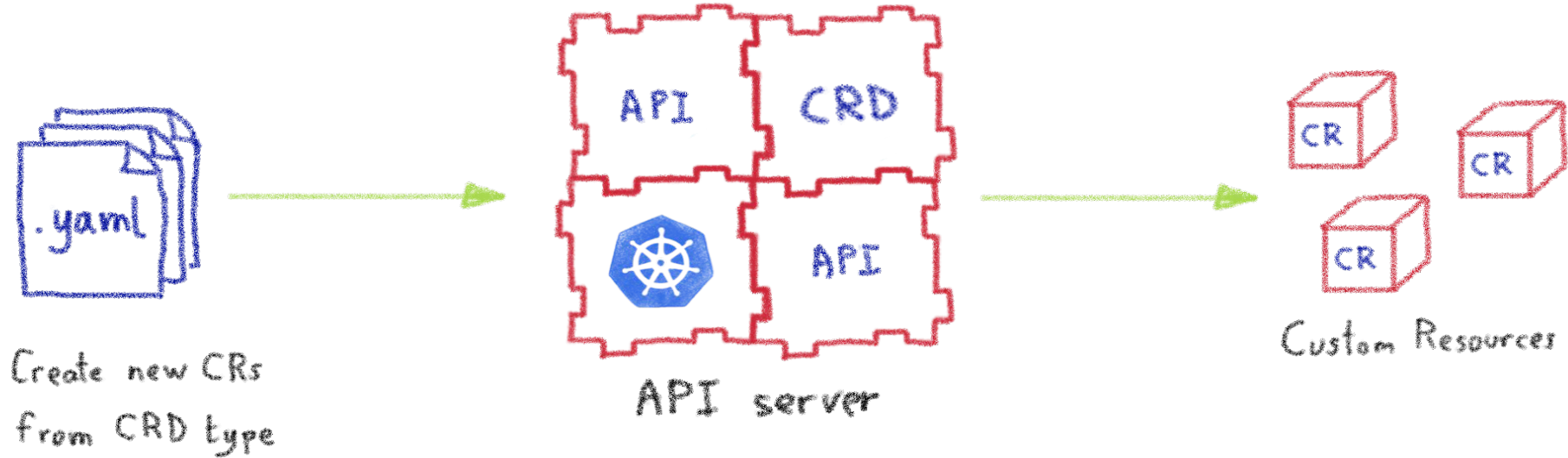


Extending Kubernetes API



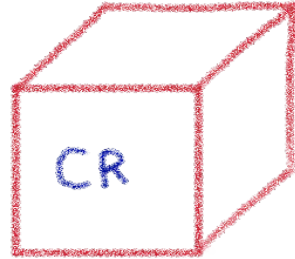
By defining new types of resources,
internal or external to the cluster

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

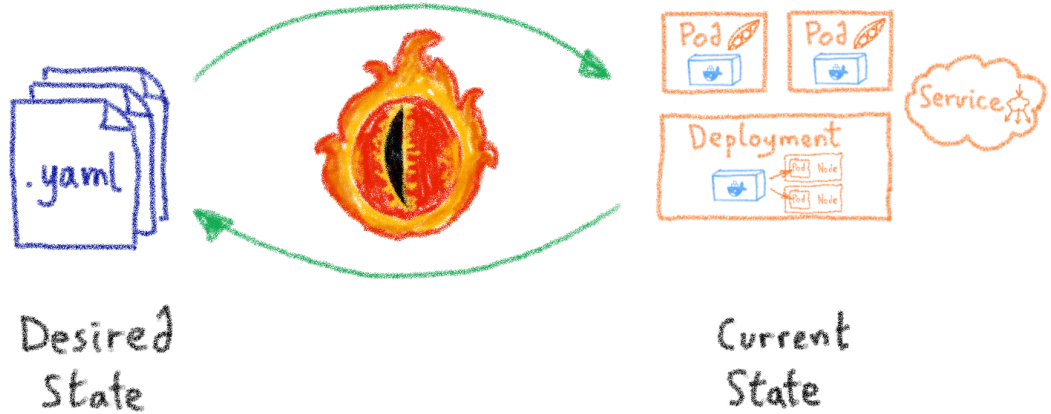
All the logic must be in the Controller

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

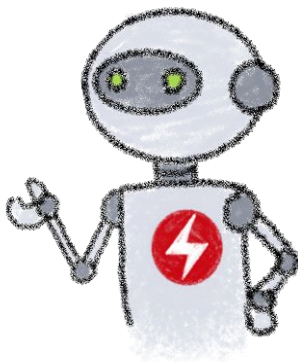
Automating operations



What's a Kubernetes Operator?



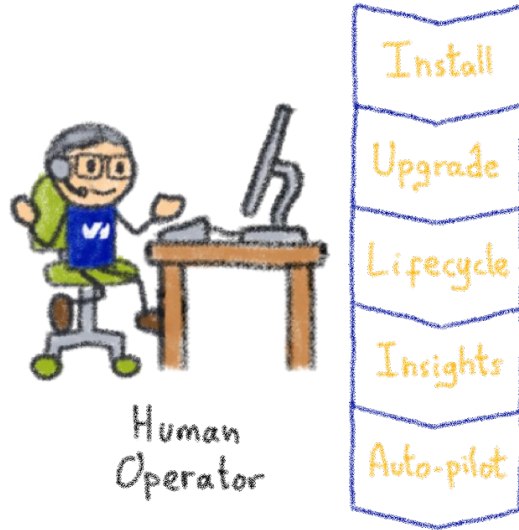
Human
Operator



Kubernetes
Operator

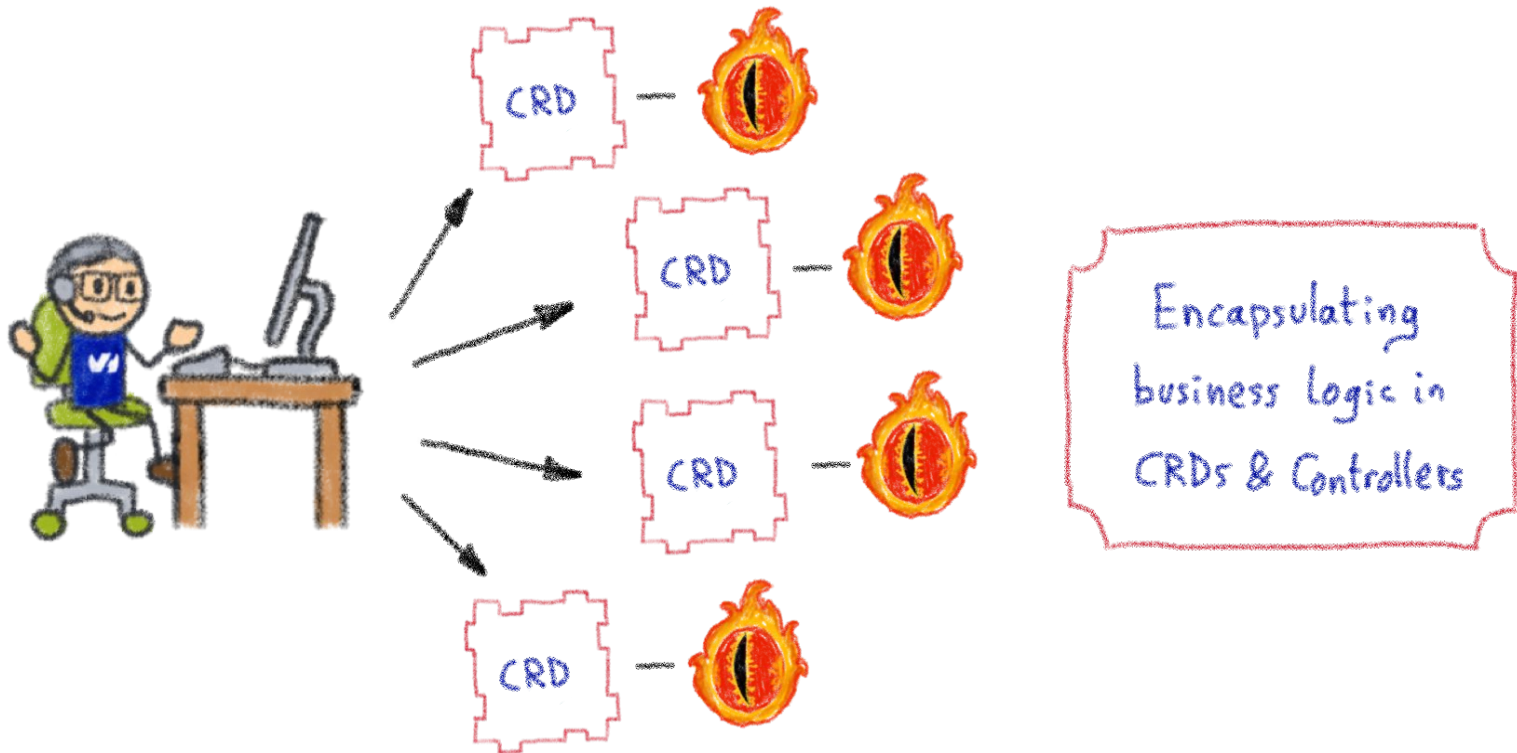
An Operator represents human operational knowledge in software to reliably manage an application

Example: databases

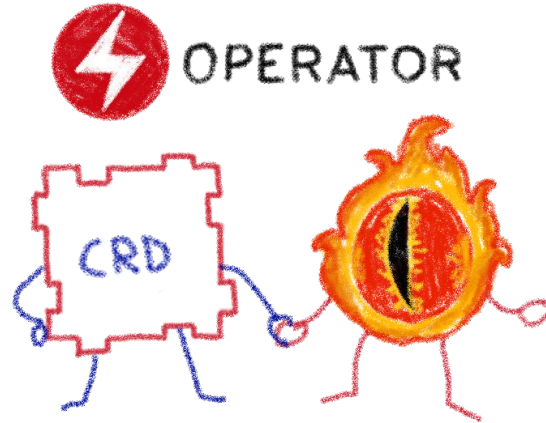


Things like adding an instance to a pool,
doing a backup, sharding...

Knowledge encoded in CRDs and Controllers



Custom Controllers for Custom Resources

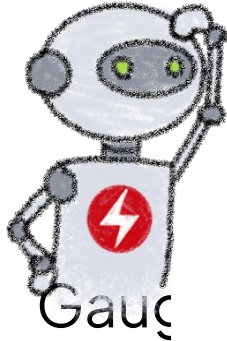


Operators implement and manage Custom Resources using custom reconciliation logic

Operator Capability Model

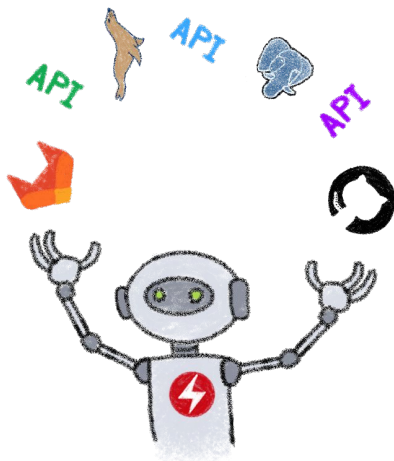


OPERATOR CAPABILITY MODEL

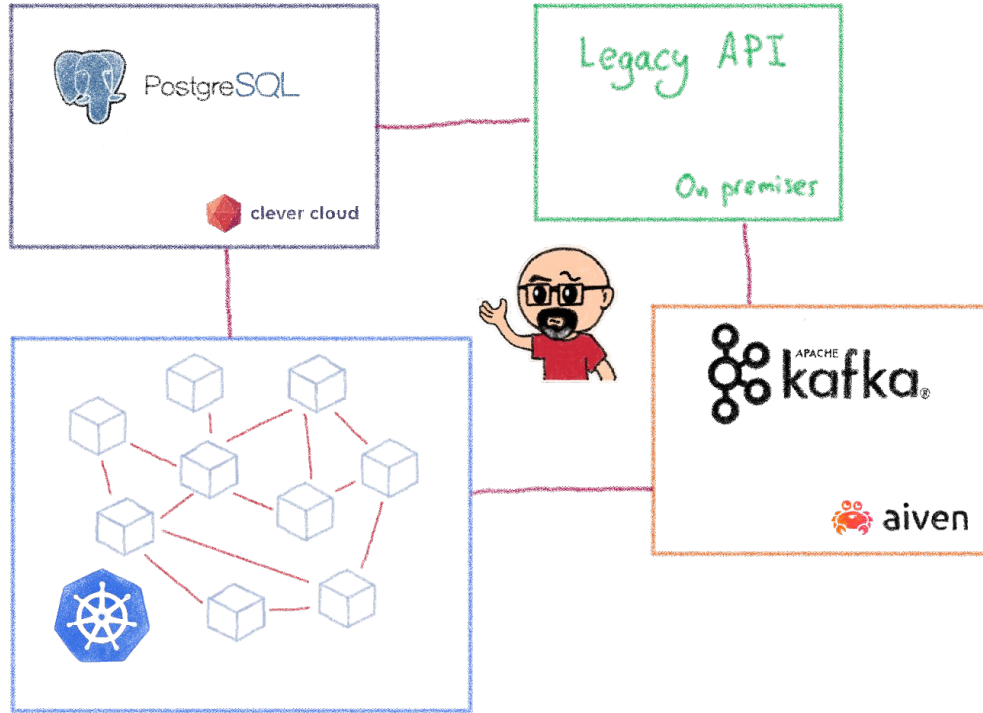


Operators aren't limited to K8s

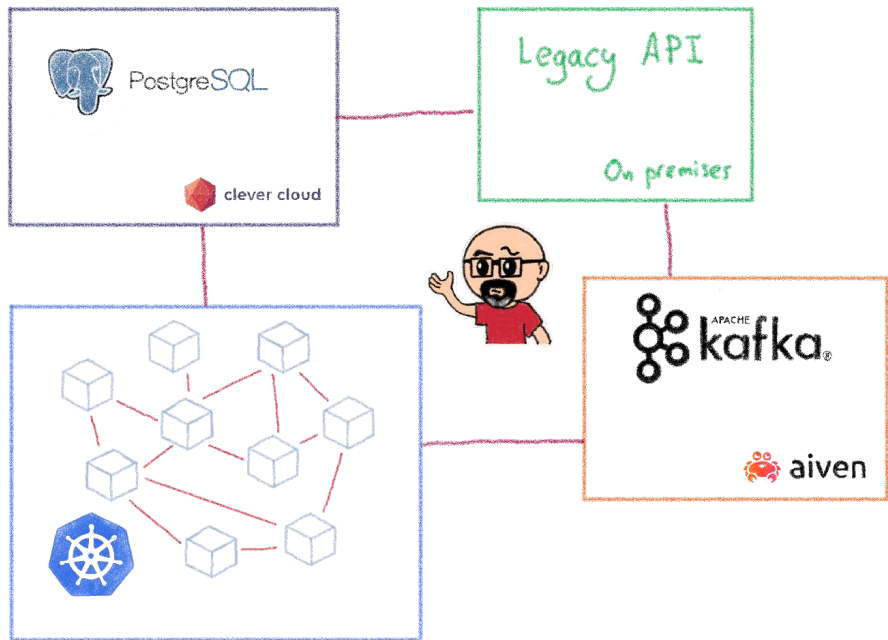
They can be used to pilot external APIs, i.e. non K8s software



Don't put everything into Kubernetes



Operators simplify Kubernetes integration

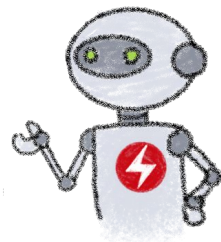


 OPERATOR



Human Operator

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



Kubernetes Operator

A real, open-source example

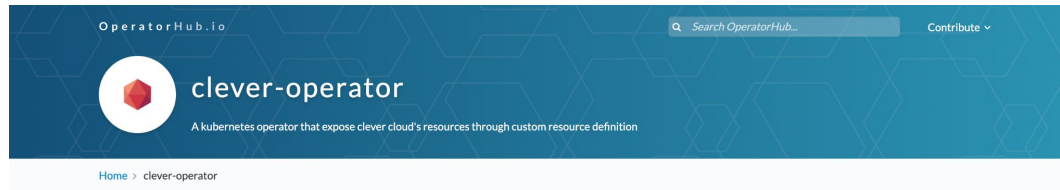
The Clever Operator



clever cloud



Available on Operator Hub & GitHub



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>

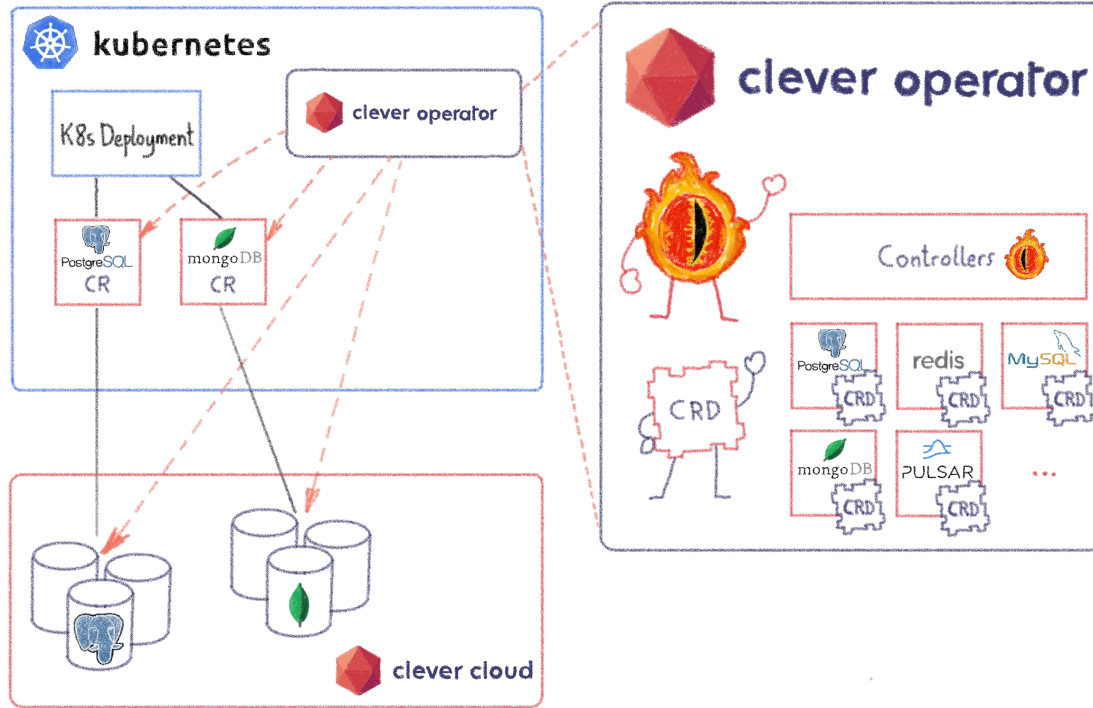


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clever cloud

Exposing Clever Cloud resources as CRD



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

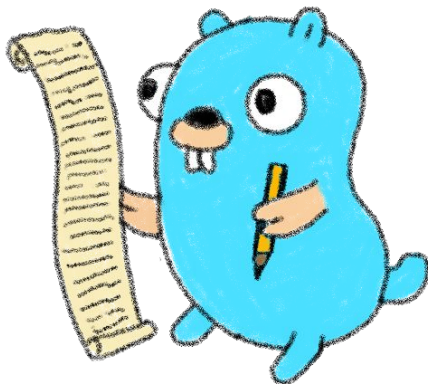
Many possible use-cases

- 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
- ...

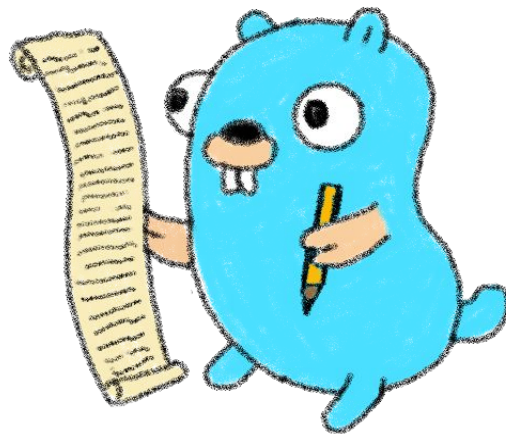
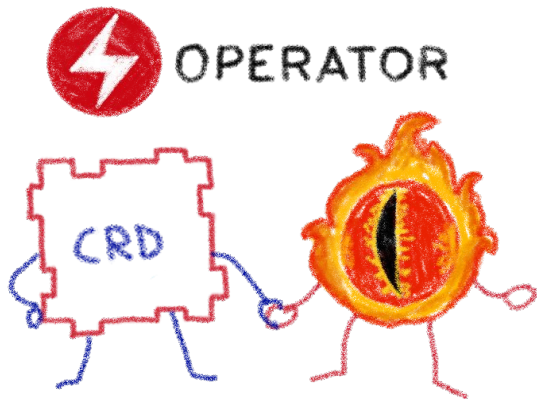


How can we write Operators?

Which language? Any framework?

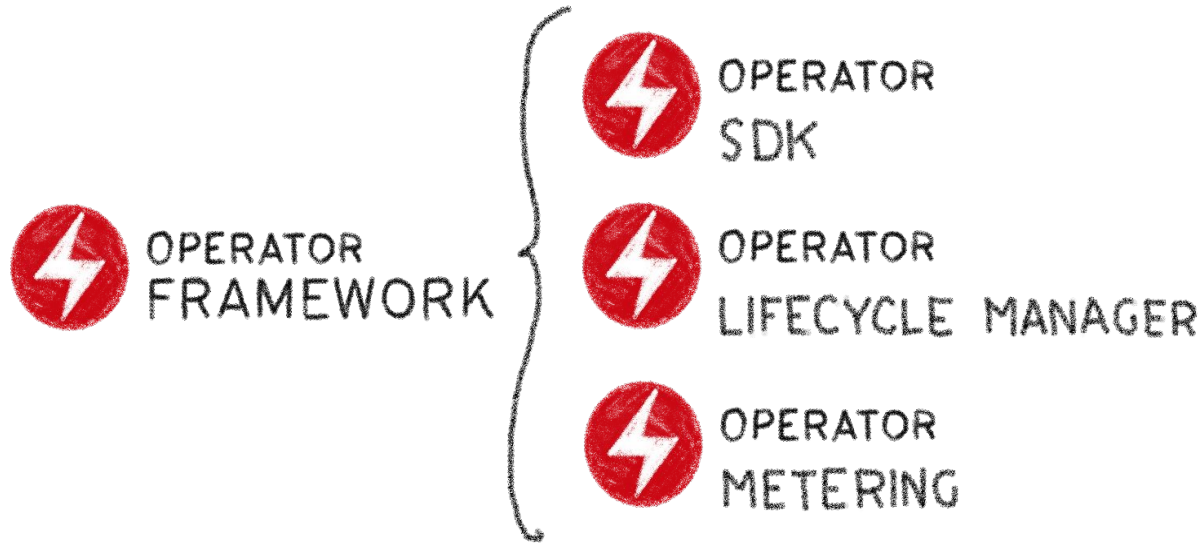


They are simply pods and manifests



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" on the left and navigation links "Docs", "Blog", "Community", and a search bar "Search this site..." on the right. The main content area has 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 chevron.



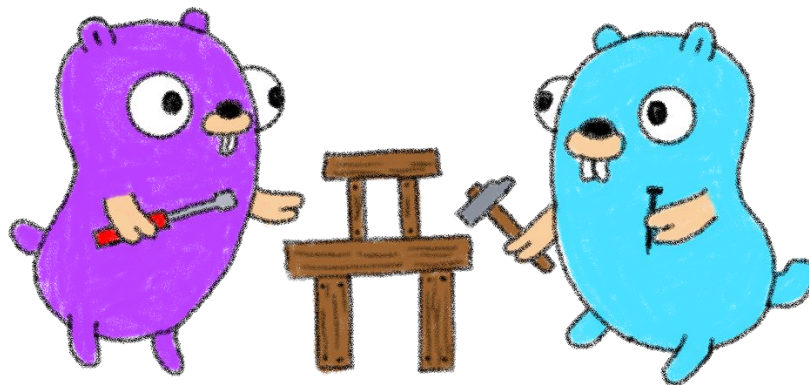
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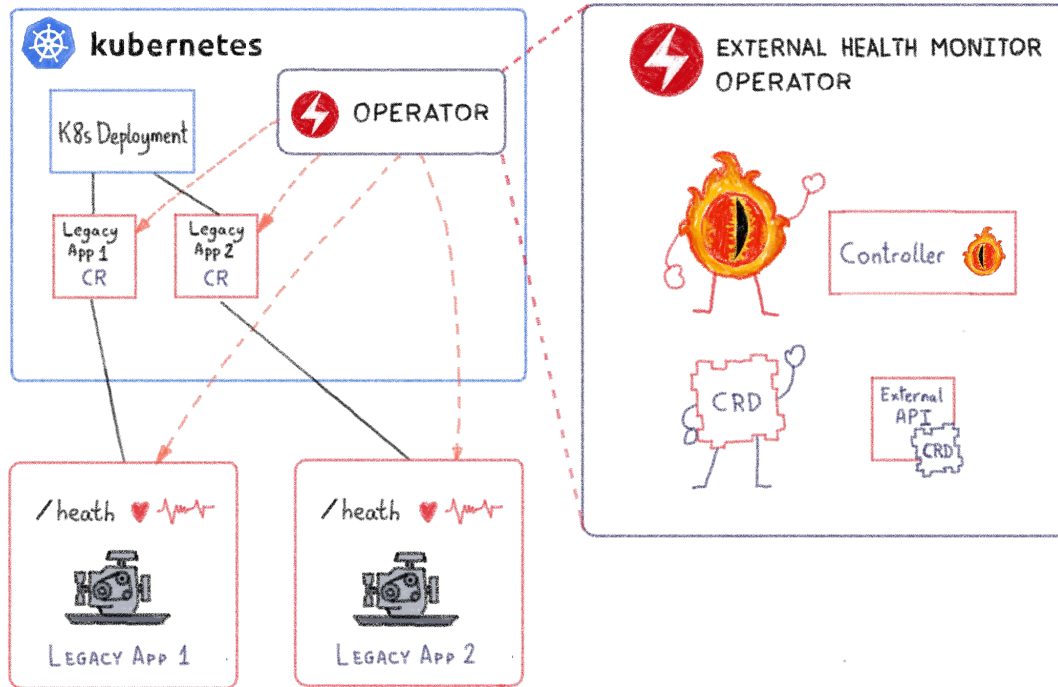
clever cloud

Let's build an operator together

Why? Because we can!

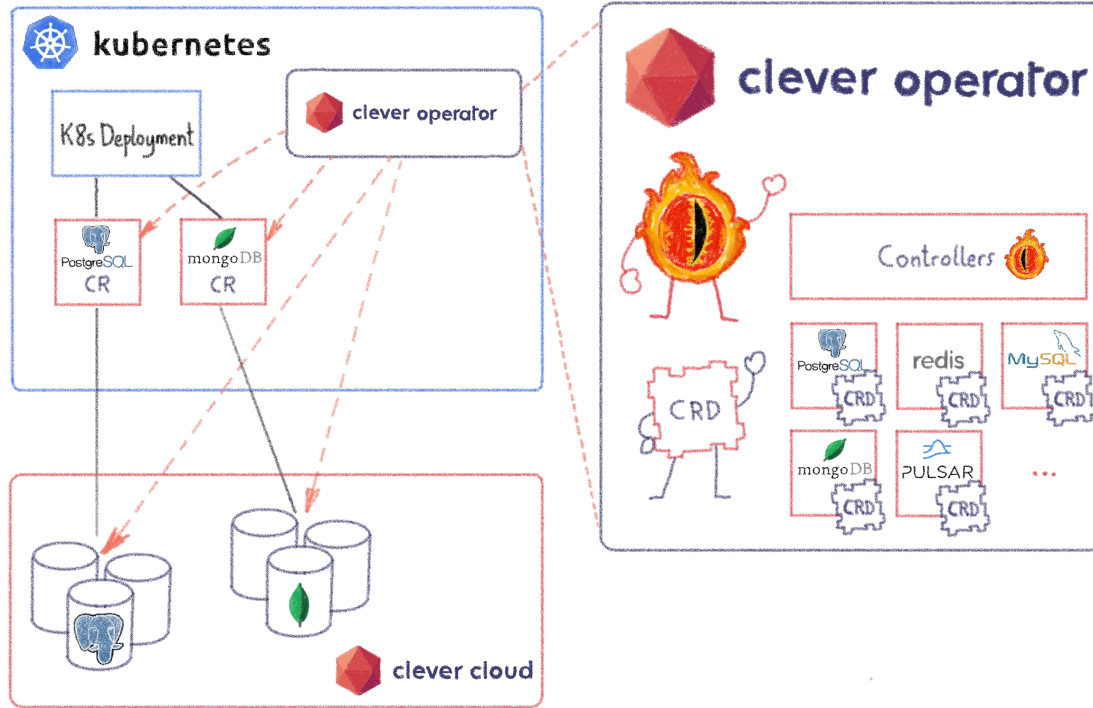


Let's choose a use-case



External Service Health Monitor Operator

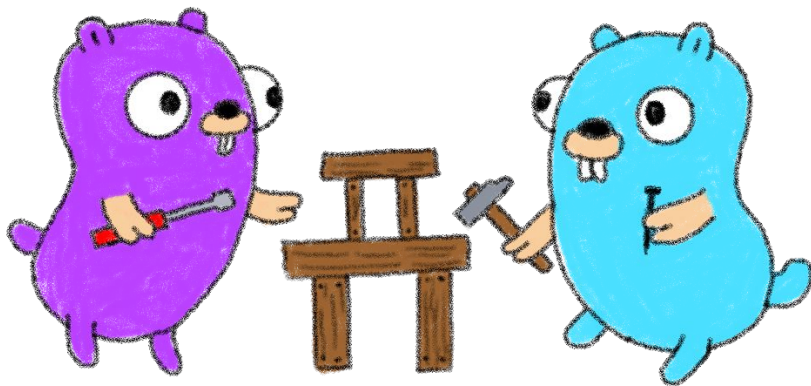
Exposing Clever Cloud resources as CRD



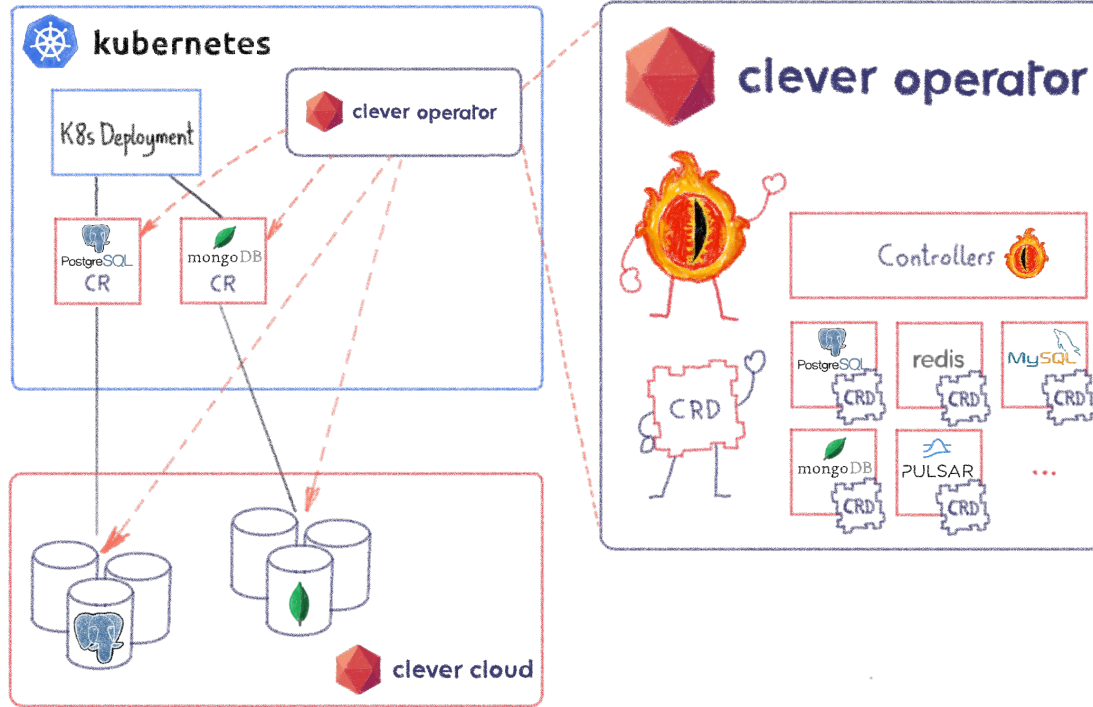
Allowing your apps to use our DBs as if they were in K8s

Let's look at a real operator

Dealing with external databases



Clever Cloud operator



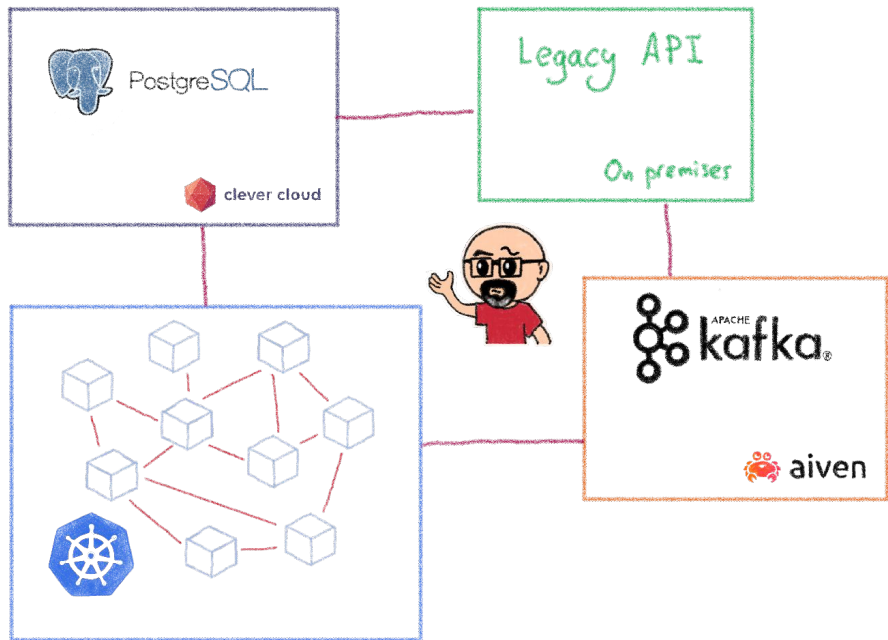
Allowing your apps to use our DBs as if they were in K8s

Operators can get lots of options

Should devs need to know all of them?



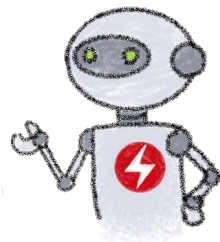
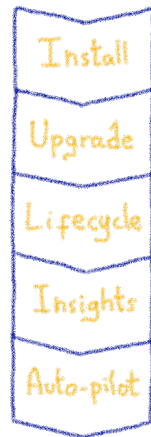
Operators simplify Kubernetes integration



 OPERATOR





















































Human Operator



Kubernetes Operator

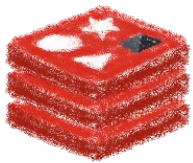
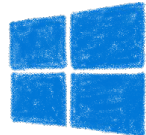
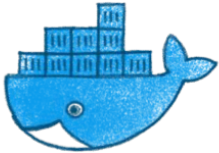
So you have a bunch of operators...

 Aerospike Kubernetes Operator provided by Aerospike The Aerospike Kubernetes Operator automates the...	 Airflow Helm Operator provided by ovelo An experimental operator that installs Apache Airflow.	 Aiven Operator provided by aiven Manage your https://aiven.io resources with Kubernetes.	 Alkita Cluster Operator provided by Lightbend, Inc. Run Alkita Cluster applications on Kubernetes.	 Atlassian Operator for ClickHouse provided by Atlassian ClickHouse Operator manages full lifecycle of ClickHouse...	 Dapr Control Plane Operator provided by dapr.io Dapr Control Plane Operator	 DataDog Operator provided by DataDog DataDog provides a modern monitoring and analytics platform. Gather metrics...	 DataStax Kubernetes Operator for Apache Cassandra provided by DataStax Simple provisioning, flexible...	 DataTrucker IO provided by DataTrucker IO	 Debezium Operator provided by Debezium Authors An Operator for installing and managing Debezium
 Alibaba Imaging Ingestion Operator provided by Alibaba The Alibaba Imaging Ingestion provides a collection of...	 Anchore Engine Operator provided by Anchore Inc. Anchore Engine - container image scanning service for policy-based security.	 Anolis Galaxy provided by Galaxy Community Anolis Galaxy is Anolis's official hub for sharing...	 Apache Spark Operator provided by ramanalytics An operator for managing the Apache Spark clusters and intelligent applications...	 API Operator for Kubernetes provided by WSO2 API Operator provides a fully automated experience for...	 Dell Container Storage Modules provided by Dell Technologies Easily install and manage Dell's CSI Drivers and CSM.	 Dell CSI Operator provided by Dell Technologies	 Deployment Validation Operator provided by Red Hat The deployment validation operator	 Devfile Registry Operator provided by Red Hat Deploy and manage Devfile Registries on Kubernetes and OpenShift with the Devfile...	 dnext-operator provided by North Agile dnext-operator
 API Testing provided by Ibsystem API Testing Operator provides a fully automated experience for API Testing applications.	 APiCaaS provided by Red Hat APiCaaS is an API gateway built on top of NGINX. It is part of the Red Hat SSO4 API.	 Apicurio Registry Operator provided by Apicurio Deploy and manage Apicurio Registry on Kubernetes.	 APIMatic Operator provided by APIMatic.io Generate client SDKs and Interactive Documentation for your APIs in minutes.	 App Director provided by Red Hat Enable Developer Self Service to Setup and Manage Applications on Multiple...	 DNS Operator provided by Red Hat A Kubernetes Operator to manage the lifecycle of DNS resources	 druid-operator provided by Apache Druid Community druid-operator allows creating Apache Druid cluster...	 DynaTrace OneAgent provided by Dynatrace LLC	 DynaTrace Operator provided by Dynatrace LLC	 Eclipse Ditto provided by Jens Remann Eclipse Ditto provides a Digital Twin platform. A digital twin is a virtual, cloud-based...
 AppDynamics Operator for Kubernetes provided by AppDynamics LLC AppDynamics Operator to install AppDynamics Clou...	 Application Services Metering Operator provided by Red Hat Collect the core usage of products from the Appli...	 Appraxis CPS Operator provided by Appraxis, Inc The Appraxis CPS operator enables you to back up and restore your...	 Aqua Security Operator provided by Aqua Security, Inc. The Aqua Security Operator runs within a OpenShift cluster and provides a means to...	 ArangoDB provided by ArangoDB GmbH ArangoDB Kubernetes Operator	 Eclipse Hawkbit provided by Jens Reimann Eclipse hawkbit is a firmware update platform.	 ECR Secret Operator provided by MOBB	 EDB Postgres for Kubernetes provided by EnterpriseDB Corporation Operator to manage Post...	 EDP Keycloak Operator provided by EPAM Delivery Platform An Operator for managing Keycloak.	 EDP Nexus Operator provided by EPAM Delivery Platform An Operator for managing Nexus entities.
 Argo CD provided by Argo CD Community Argo CD is a declarative, GitOps continuous delivery...	 Argo CD Operator (Helm) provided by OpenSource Zone Declarative Continuous Delivery following GitOps.	 Astra Trident provided by NetApp, Inc. Trident Operator, to manage Astra Trident installations	 AtlasMap Operator provided by AtlasMap AtlasMap is a data mapping solution with an interactive web-based user interface...	 AuthInfo Operator provided by Red Hat	 EDP Sensor Operator provided by EPAM Delivery Platform An Operator for managing Sensor entities.	 eG Innovations Universal Agent Operator provided by eG Innovations	 Elasticsearch (ECK) Operator provided by Elastic Run Elasticsearch, Kibana, APM Server, Beats, Emb...	 Elasticsearch Index Operator provided by IBM An operator for managing index installations...	 Elasticsearch Phoenix Operator provided by Carrefour Manage Elasticsearch indices, templates lifecycle...



Too many options again...

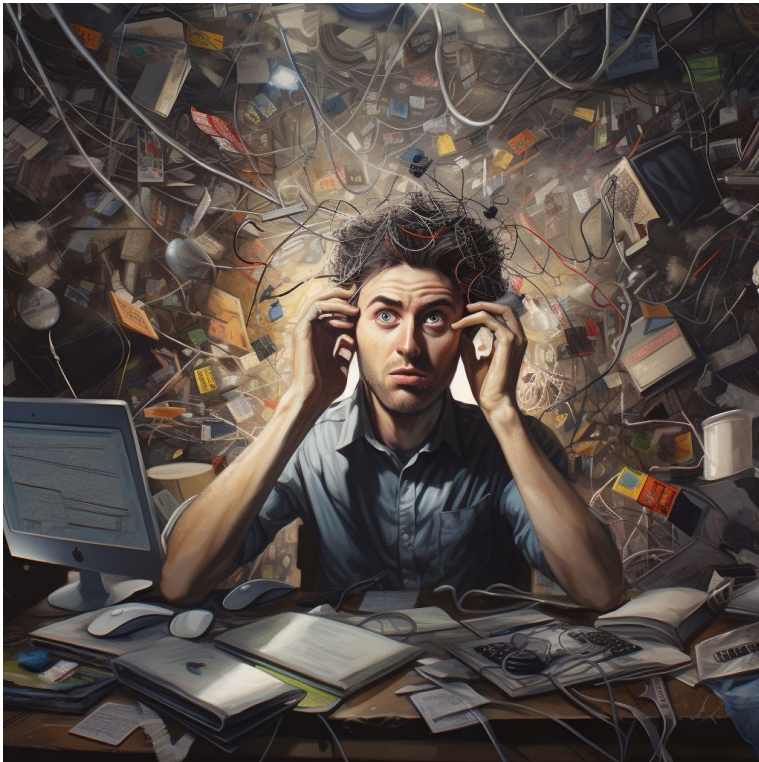
So many things to learn...



Managing the self-service commodity



Shift left and Cognitive Load

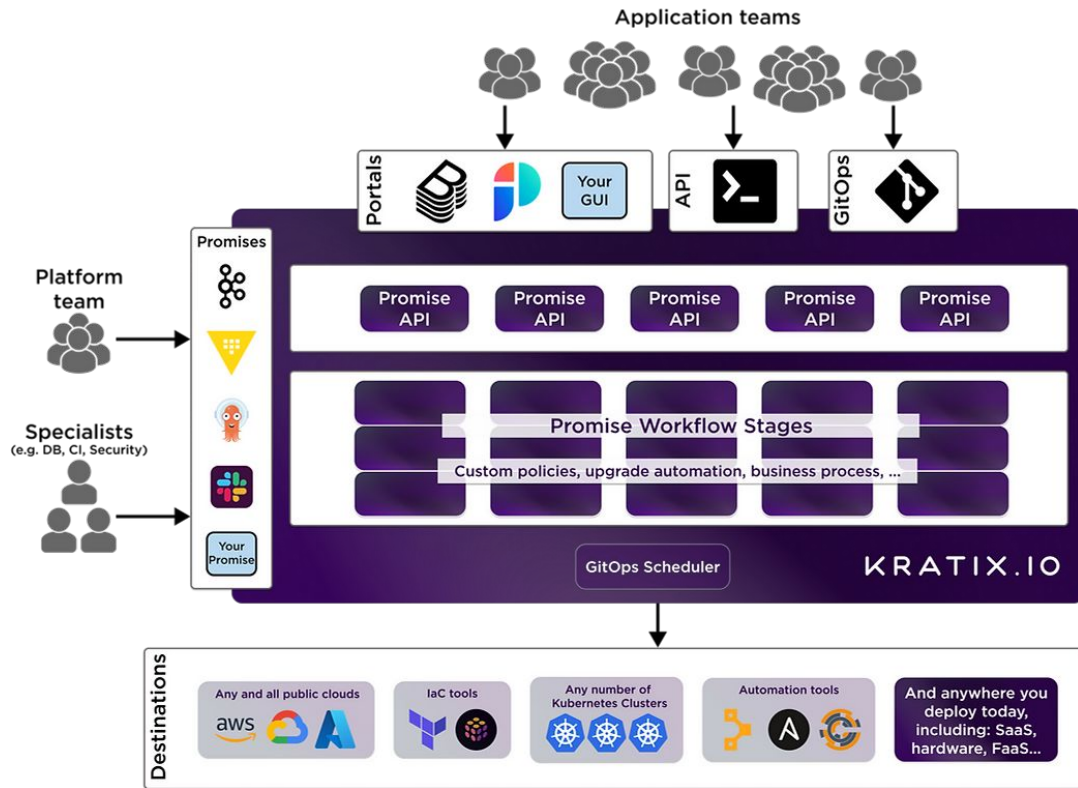


How about an operator to operate operators?



One operator to rule them all

How about a Platform Engineering framework?



Portal's main pillars

 Dashboards



Software
Catalog



Scorecards



Self-service



Workflow
automations



RBAC

