


Why should you care about Operators?

Any application in any system must be
installed, configured, managed and
upgraded over time

Patching is critical to security

A close-up photograph showing a person's hands working on a mechanical component, likely a door hinge or latch, on a light-colored metal structure. The person is wearing a dark shirt and a watch on their left wrist. The background is dark and out of focus.

**“Anything that isn’t
automated is slowing you
down”**

What is Kubernetes?

An open source orchestration system for managing containerized workloads across a cluster of nodes.



Kubernetes Object Definitions

```
kind: Pod
apiVersion: v1
metadata:
  name: example-app
spec:
  containers:
  - name: example
    image: quay.io/my/app:v1.2.0
[...]
```

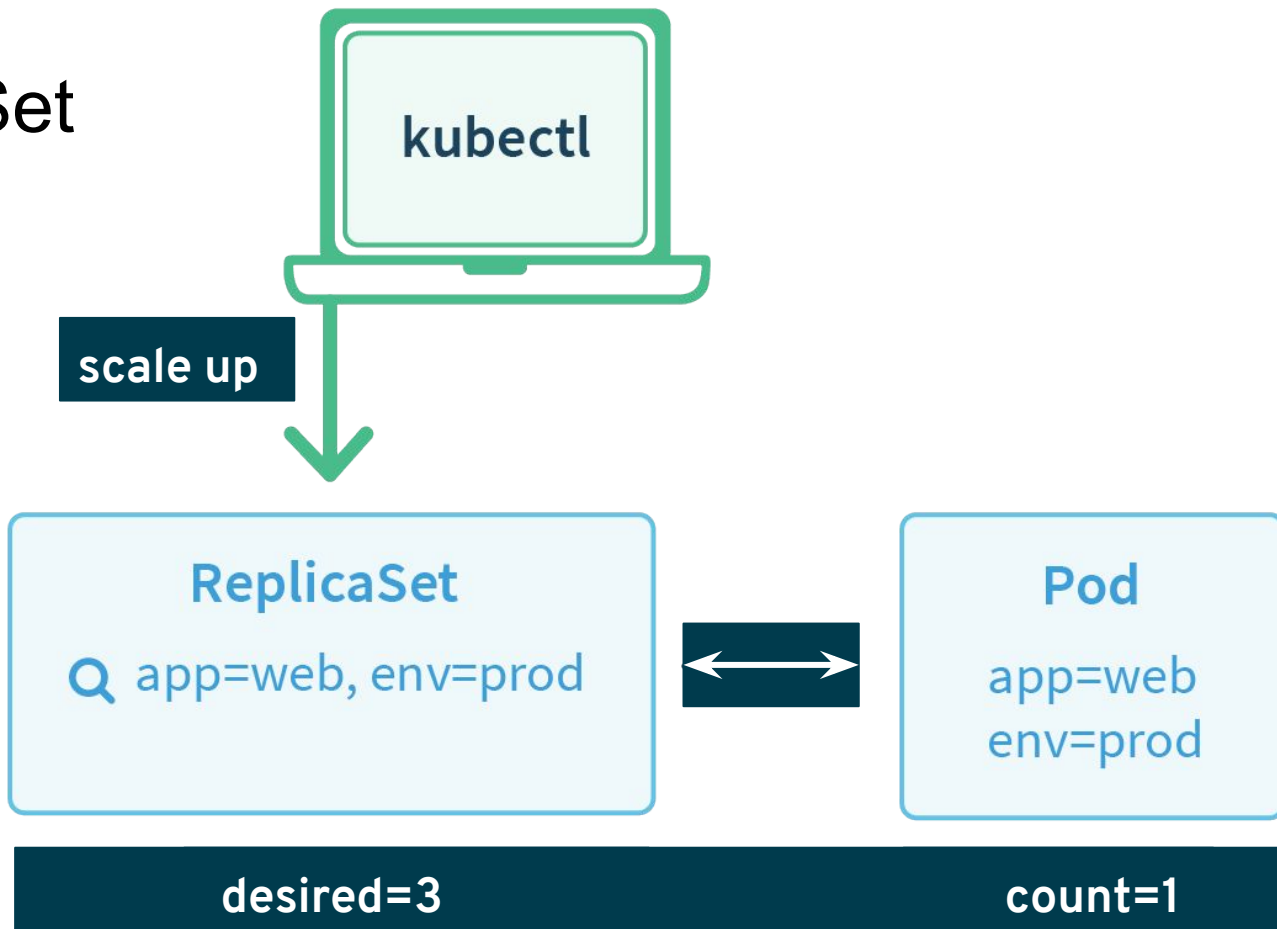
Kubernetes is a declarative platform



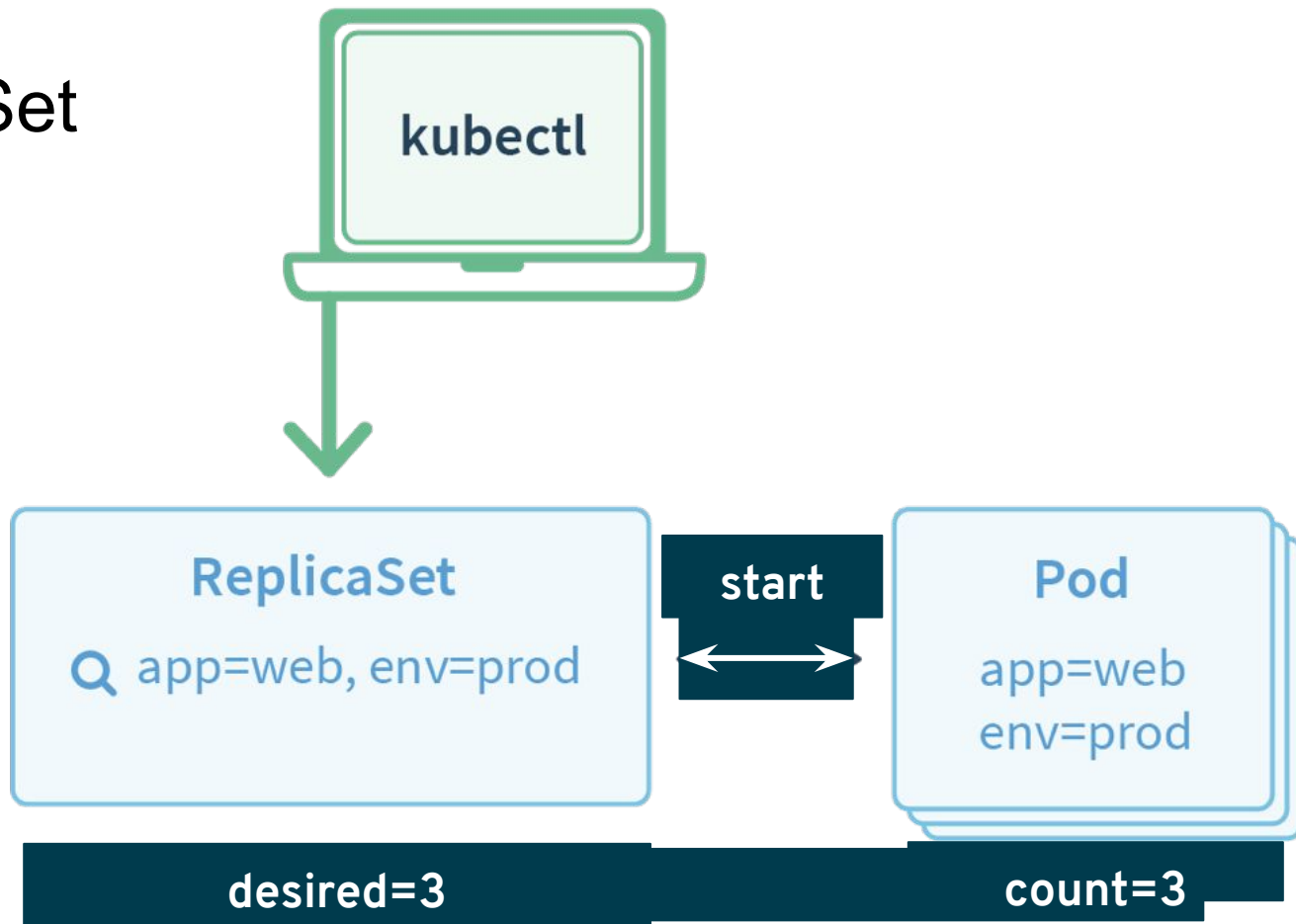
Scaling stateless apps: **easy**

```
$ kubectl scale deploy/staticweb --replicas=3
```


ReplicaSet



ReplicaSet



What about apps that **store data**?

Deploying a database is **easy**

```
$ kubectl create deployment db --image=quay.io/my/db
```

Running a database **over time** is harder

Resize/Upgrade

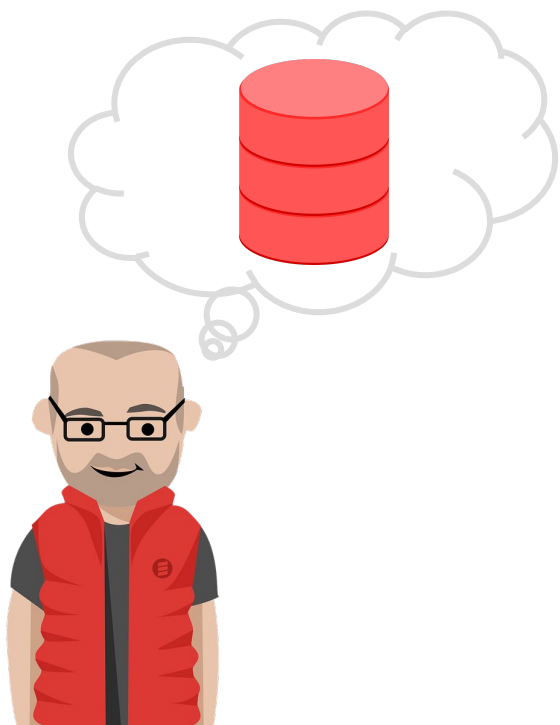
Reconfigure

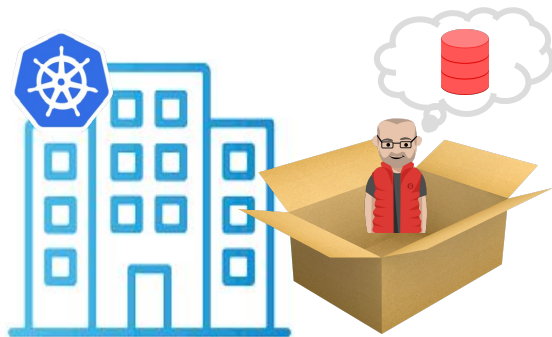
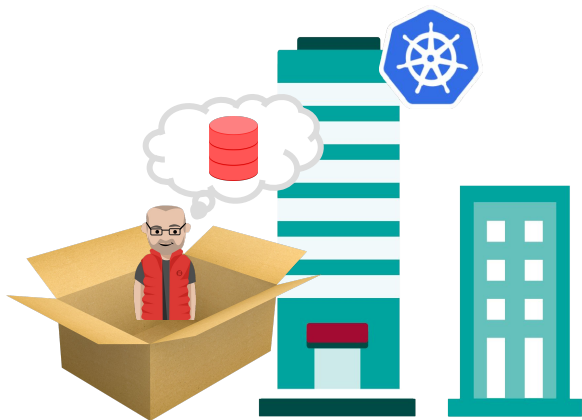
Backup

Healing



If only Kubernetes knew...

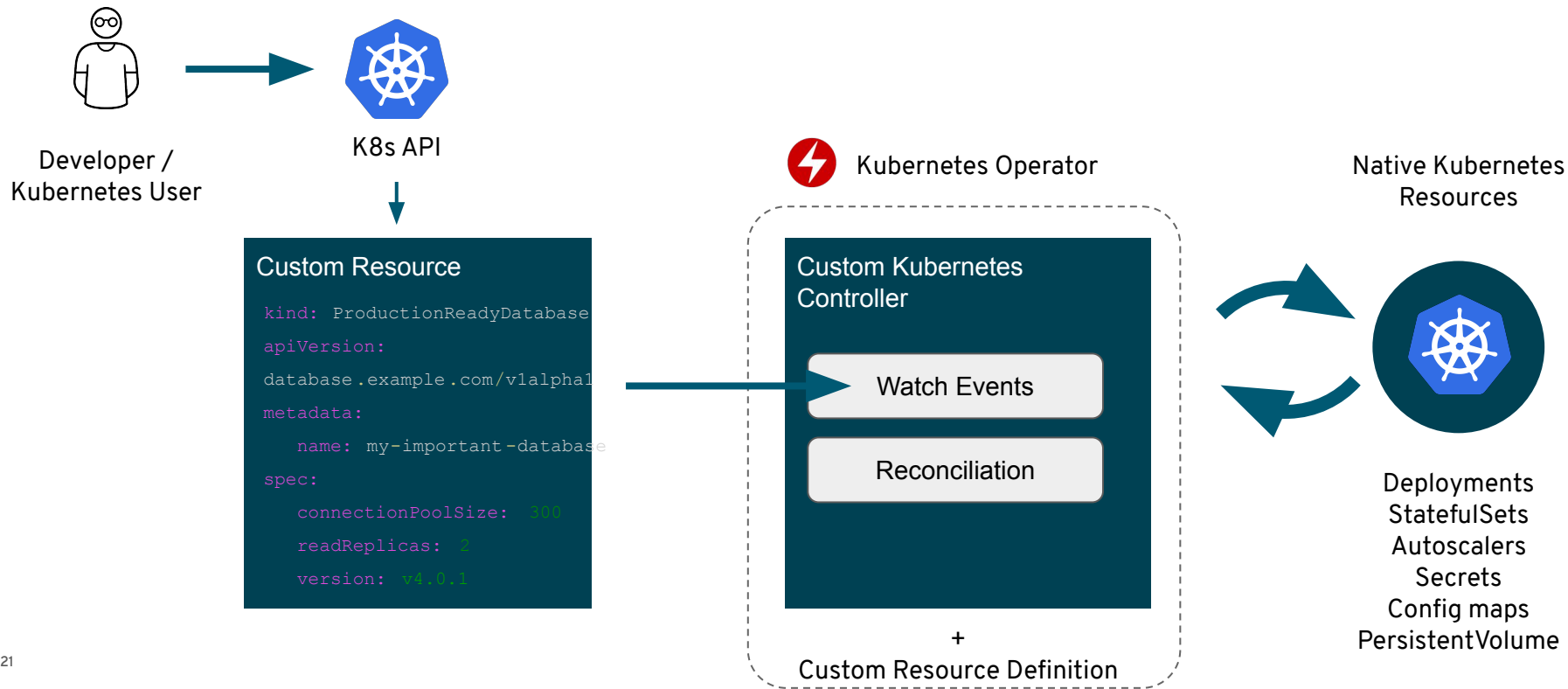




Operators are **automated software managers** that manage the entire lifecycle of Kubernetes applications

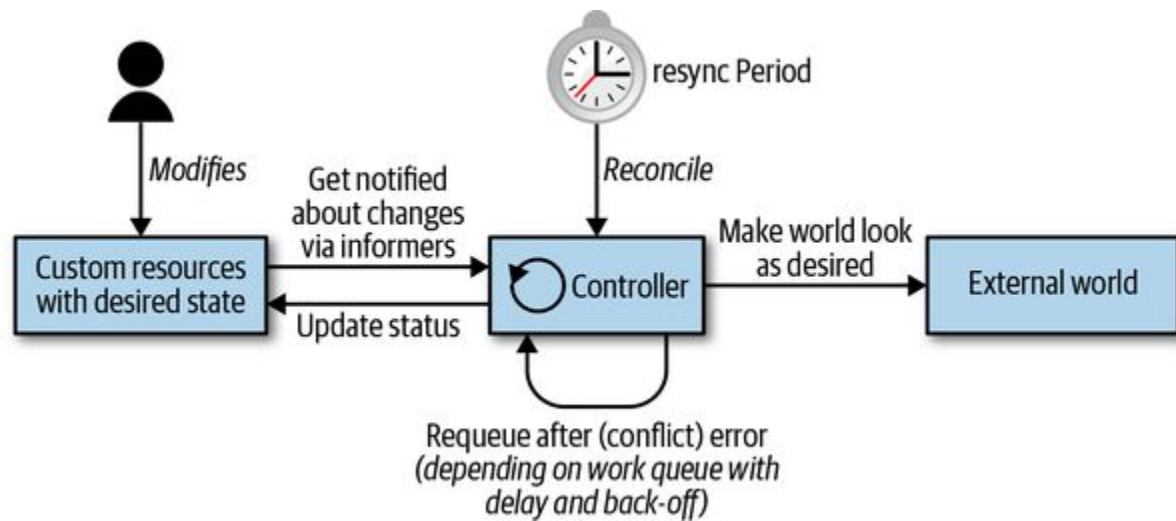
Extending the Kubernetes API

1. Application-specific custom controllers
2. Custom resource definitions (CRD)



Custom Resource (CR)

```
kind: ProductionReadyDatabase
apiVersion: database.example.com/v1alpha1
metadata:
  name: my-production-ready-database
spec:
  clusterSize: 3
  readReplicas: 2
  version: v4.0.1
[...]
```



Hausenblas, Schimanski. *Programming Kubernetes*. O'Reilly, 2019.

Example: etcd Operator

What is etcd?

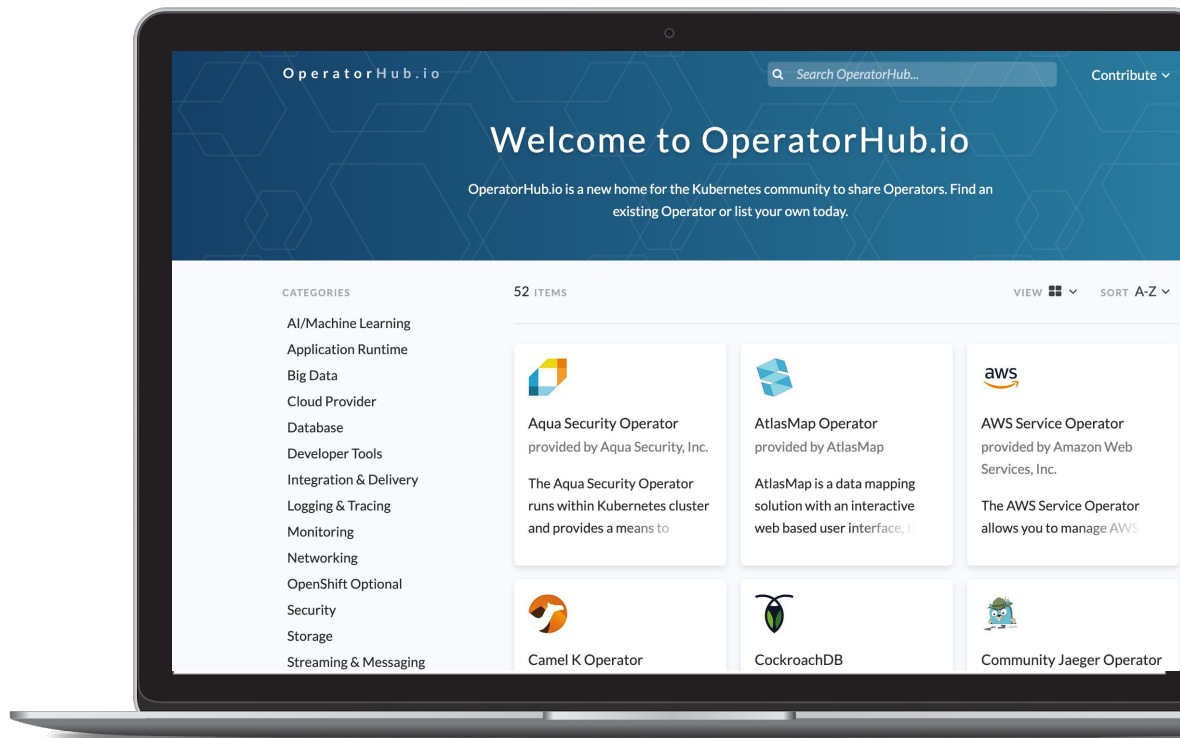

















- distributed key-value store
- At the heart of Kubernetes
- Vault, many other apps
- Your apps...

Example: etcd Operator

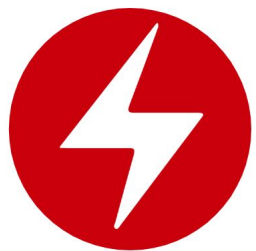
```
kind: EtcdCluster
apiVersion: etcd.database.coreos.com/v1beta2
metadata:
  name: example-etcd-cluster
spec:
  size: 3
  version: "3.2.13"
```

Use Operators Today



 <p>Apache Spark Operator provided by radanalytics.io</p> <p>An operator for managing the Apache Spark clusters and intelligent applications that</p>	 <p>Argo CD provided by Argo CD Community</p> <p>Argo CD is a declarative, GitOps continuous delivery</p>	 <p>Community Jaeger Operator provided by CNCF</p> <p>Provides tracing, monitoring and troubleshooting for microservices-based</p>	 <p>Dynatrace OneAgent provided by Dynatrace LLC</p> <p>Install full-stack monitoring of Kubernetes clusters with the Dynatrace OneAgent.</p>	 <p>Keycloak Operator provided by Red Hat</p> <p>An Operator for installing and managing Keycloak</p>
 <p>Kiali Operator provided by Kiali</p> <p>Kiali project provides answers to the questions: What microservices are part of</p>	 <p>MongoDB provided by MongoDB, Inc</p> <p>The MongoDB Enterprise Kubernetes Operator enables easy deploys of MongoDB</p>	 <p>Percona Server MongoDB Operator provided by Percona</p> <p>Percona Server for MongoDB Operator manages the</p>	 <p>Percona XtraDB Cluster Operator provided by Percona</p> <p>Percona XtraDB Cluster Operator manages the</p>	 <p>PlanetScale Operator for Vitess provided by PlanetScale</p> <p>PlanetScale's operator for Vitess deploys and manage</p>
 <p>Prometheus Operator provided by Red Hat</p> <p>Manage the full lifecycle of configuring and managing Prometheus and Alertman</p>	 <p>Spark Operator provided by GoogleCloudPlatform</p> <p>Apache Spark is a unified analytics engine for large</p>	 <p>StorageOS provided by StorageOS, Inc</p> <p>Cloud-native, persistent storage for containers.</p>	 <p>Strimzi Apache Kafka Operator provided by Red Hat</p> <p>Strimzi provides a way to run an Apache Kafka cluster on</p>	 <p>TiDB Operator provided by PingCAP</p> <p>TiDB is a popular NewSQL MySQL-compatible database. The TiDB Operator manag</p>

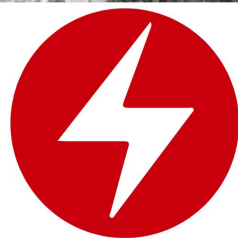




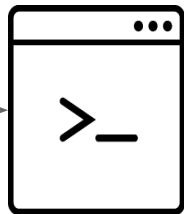
OPERATOR FRAMEWORK

<https://github.com/operator-framework>





**OPERATOR
SDK**



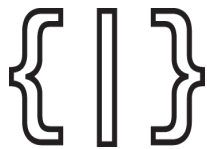
**OPERATOR
SDK**

“create new
operator”



scaffolding

+



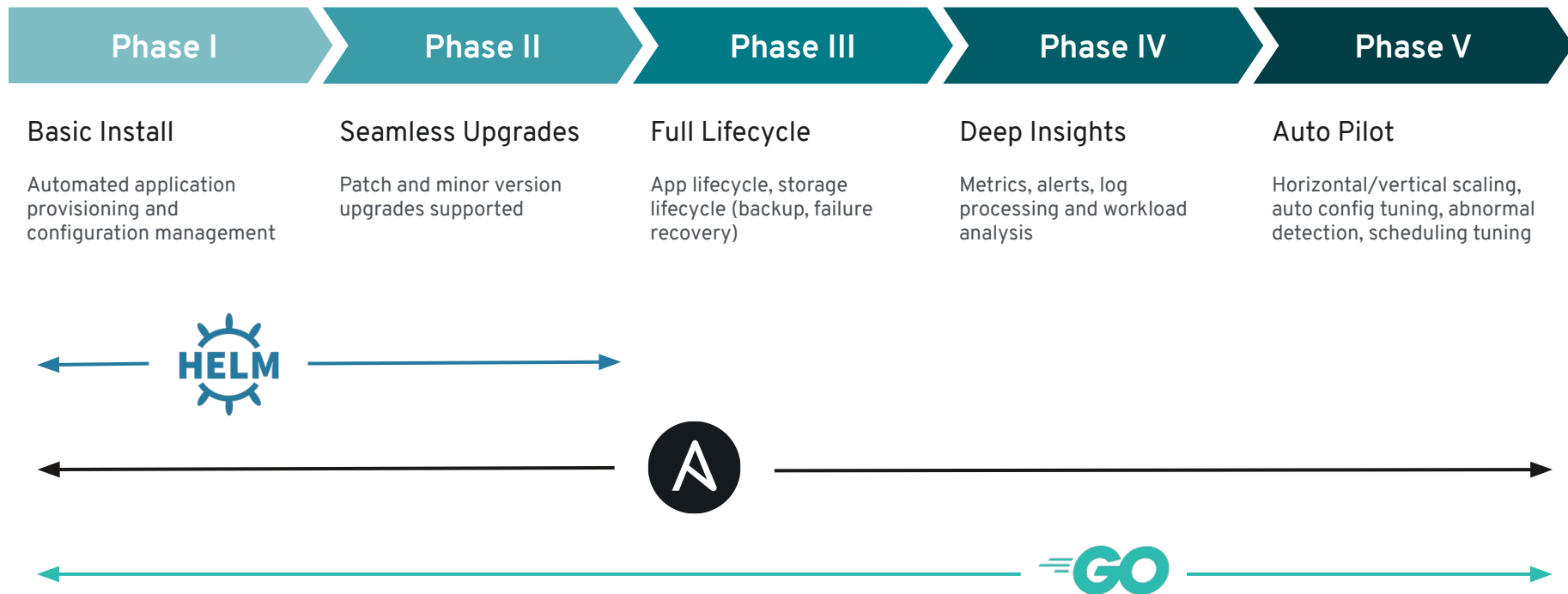
custom logic

=



**KUBERNETES
OPERATOR**

Operator Maturity Model



Try It! Hands-On Operator Tutorials

<https://learn.openshift.com/operatorframework/>

Resources

<https://github.com/operator-framework>

<https://operatorhub.io>

<https://learn.openshift.com/operatorframework/>

<http://bit.ly/kubernetes-operators>

