How to get started with Operators for Kubernetes

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The way of how Kubernetes works

Kubernetes is event driven



Running simple, stateless deployments

Simple & Stateless?

- no long-run persistence needed
- can be shutdown "any time"
- can run multiple time without issues
- can run in different versions without issues

"There are two ways of constructing a software design: One way is to make it so simple that there are obviously no deficiencies, and the other way is to make it so complicated that there are no obvious deficiencies. The first method is far more difficult." - C.A.R. Hoare

Running complex, stateful deployments

aka DON'T TOUCH!

- Need stable persistency
- Can't deal well with unpredictable issues
- Long(er) startup time
- Not flexible in scheduling

What we are talking about?

- Databases
- Legacy migrations
- Architecture designs which can't be event driven, stateless for some reasons
- Applications with many or heavy dependencies

Such applications in a dynamic environment like K8s causes additional operational effort for Day2 and later.

Operators!

A Kubernetes Operator abstracts the deployment of diverse and state sensitive applications by including domain-specific knowledge.

- Lifecycle Management
- Configuration
- Updates
- Handle Failures

Operator are the result of translating operative knowledge, and developer-specific knowledge of an application into own software.

Operator utilize Custom Resource Definitions (CRD) to extend natively the K8s resources and APIs.

Capability Levels of Operator



Auto Pilot

Horizontal scaling, auto config tuning, anomaly detection, scheduling optimization

Full Lifecycle

App lifecycle (automated canary deployments, rollbacks by failure, and so on), storage lifecycle (backup, failure recovery)

Basic Install

Automated application provisioning and configuration management

How does an Operator work? - Control(ler)/-loop

Controllers act on core resources like deployments, statefulsets or service, but they also work with custom resources.

Controllers are implemented by a control loop:

- 1. Check state of resources, ideally by events
- 2. Change state of the object or ext. resource
- 3. Update status of the resource

Independent of the complexity of your controller, in the end you will do always these steps.

Important to note, but no time to go into depths: Informers, Work Queues & Events



How does an Operator work? - Operator



An operator sum up the operational knowledge of an SRE and their domain specific knowledge, to automate the common tasks.

A Custom Resource Definition (CRD) captures the domain knowledge, while a custom resource represents this on an instance.

Therefore a custom controller manages the custom resource by e.g. trigger a backup or start a new pod with a new software version.

Some options to get started



Or for the lazy people:

OperatorHub.io				
Al/Machine Learning				
Application Runtime Big Data Cloud Provider Database Developer Tools Integration & Delivery Logging & Tracing	Akka Cluster Operator provided by Lightbend, Inc. Run Akka Cluster applications on Kubernetes.	Altinity ClickHouse Operator provided by Altinity ClickHouse Operator manages	Anchore Engine Operator provided by Anchore Inc. Anchore Engine - container image scanning service for	Apache Spark Operator provided by radanalytics.io An operator for managing the Apache Spark clusters and
Monitoring Networking OpenShift Optional Security Storage	WS © 2	full lifecycle of ClickHouse	policy-based security, best	intelligent applications that
Streaming & Messaging PROVIDER Alibaba Cloud (1) Altinity (1) Anchore (1)	API Operator for Kubernetes provided by WSO2 API Operator provides a fully automated experience for	APIcast provided by Red Hat APIcast is an API gateway built on top of NGINX. It is part of the 3scale API Managemen	Appdynamics Operator provided by AppDynamics LLC End to end monitoring of applications on Kubernetes and OpenShift clusters with	Appranix CPS Operator provided by Appranix, Inc The Appranix CPS operator enables you to back up and restore your
AppDynamics (1) Appranix (1) Show 88 more	•	0) Arango DB	*

Some options to get started





OperatorHub.io				
Al/Machine Learning Application Runtime Big Data Cloud Provider Database Developer Tools Integration & Delivery Logging & Tracing Monitoring	Akka Cluster Operator provided by Lightbend, Inc. Run Akka Cluster applications on Kubernetes.	Altinity ClickHouse Operator provided by Altinity ClickHouse Operator manages full lifecycle of ClickHouse	Anchore Engine Operator provided by Anchore Inc. Anchore Engine - container image scaming service for policy-based security, best	Apache Spark Operator provided by nationalytics.lo An operator for manging the Apache Spark clusters and intelligent applications thus
Networking OpenShit Optional Storage Streaming & Messaging FROVIDER Albab Cloud (1) Albah Cloud (1) Albah Cloud (1) AppDynamics (1) Appoprimits (1) Show 88 more	API Operator for Kubernetes provided by VSO2 API Operator provides a fully automated experience for	APIcast provided by Red Hat APicast is an API gateway built on top of NGNX. It is part of the Sacale API Management	Appdynamics Operator provided by AppDynamics LLC. End to end monitoring of applications on Kubernetes and OpenShift Clusters were ArangeDB	Apprants CPS Operator provided by Apprants, Inc Under Standing CPS operator enables you to back up and reatore your









Q&A