

Операторы в OpenShift и Kubernetes

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Что такое операторы?

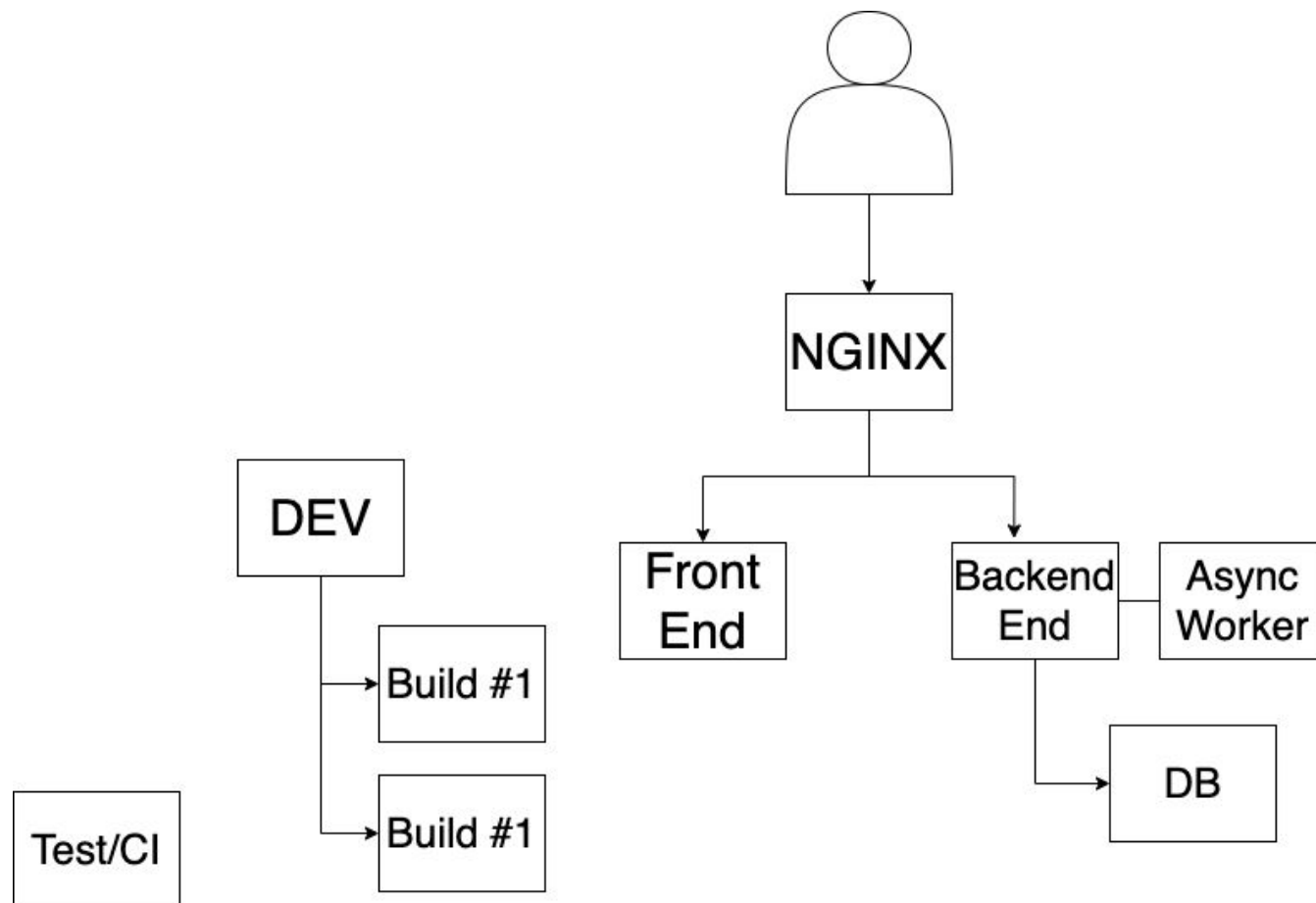
Какие проблемы они решают?

Как мы используем операторы внутри Red Hat?

Принципы работы операторов - “deep dive”

Лайв демо с установкой и использованием

Пример типичного приложения



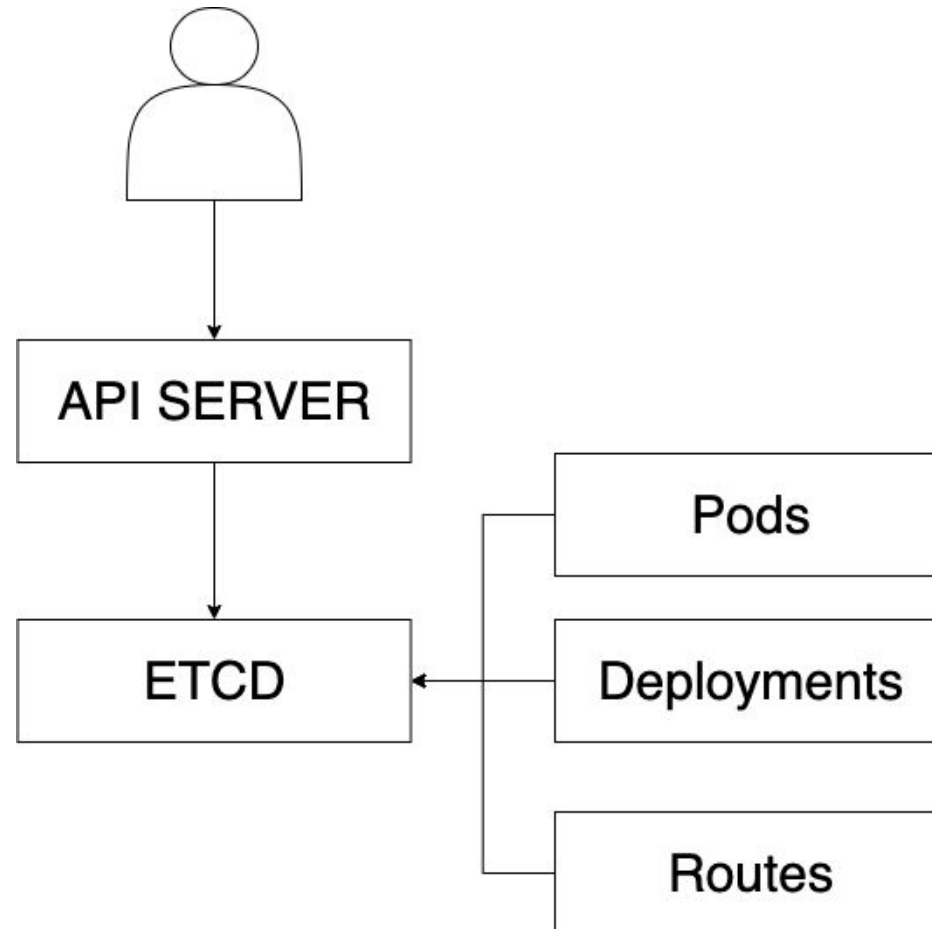
Проблемы масштабирования и обновления Stateful приложений:

- Грамотное копирование данных
 - Снижение времени простоя
- Понимание нужной конфигурации
- Необходимость в живом человеке

Операторы - это эксплуатационные знания, упакованные в код, для автоматического менеджмента приложениями.

Работа операторов базируется на взаимосвязи ресурсов в Kubernetes управляемых контроллером

ETCD ?



Custom Resource Definition

«Модель данных»

apiVersion: apiextensions.k8s.io/v1

kind: CustomResourceDefinition

metadata:

name: postgresql.example.com

spec:

group: stable.example.com

versions:

- name: v1

schema:

openAPIV3Schema: ...

scope: Namespaced

names:

plural: pgclusters

singular: pgclusters

kind: PGcluster

shortNames:

- pg

oc create -f crd.yaml

Custom Resource

«Данные по модели»

```
apiVersion: stable.example.com/v1
```

```
kind: MyDatabase
```

```
metadata:
```

```
  name: myDatabase1
```

```
spec:
```

```
  replicas: 1
```

```
oc create -f cr1.yaml
```

```
apiVersion: stable.example.com/v1
```

```
kind: MyDatabase
```

```
metadata:
```

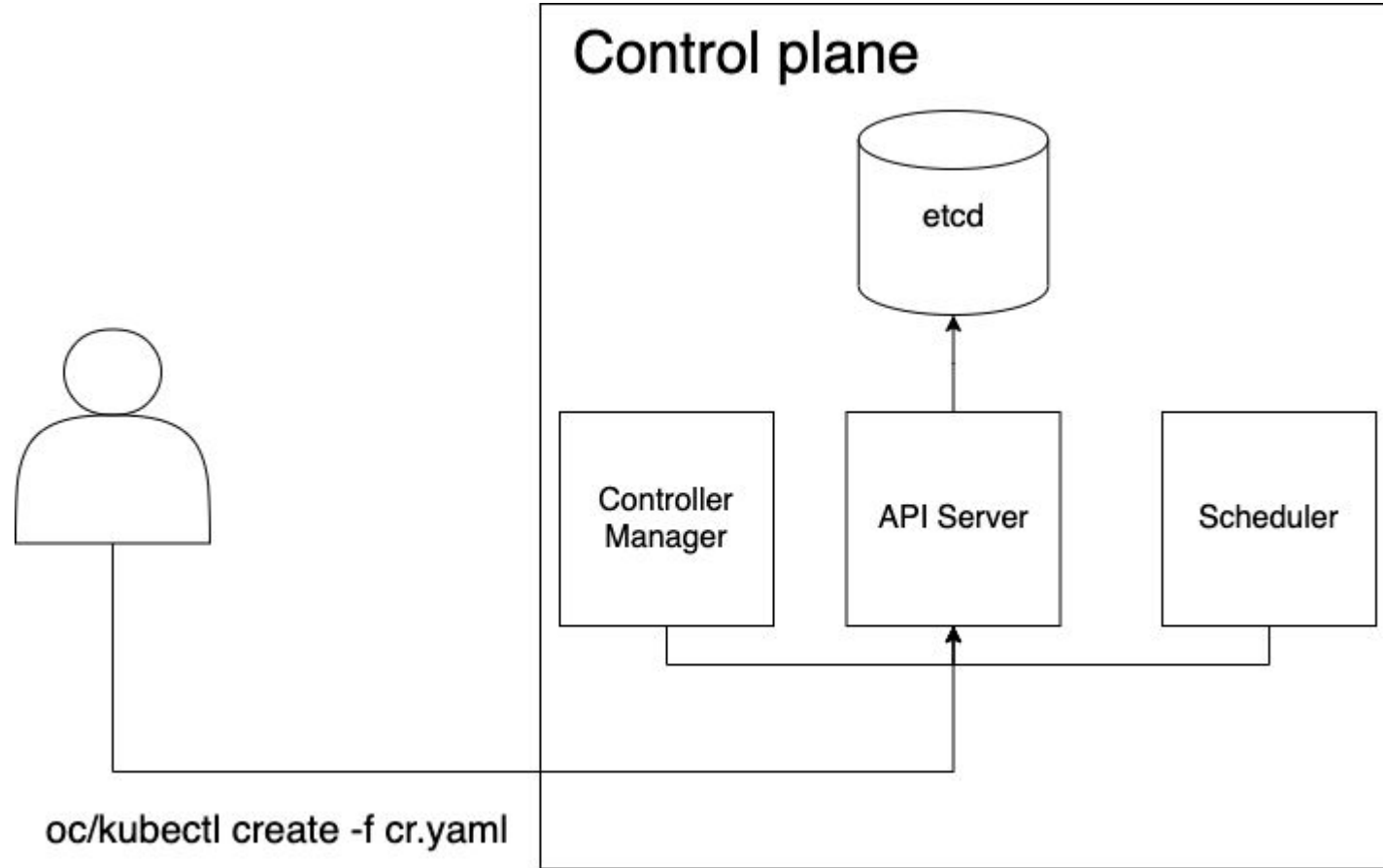
```
  name: myDatabase2
```

```
spec:
```

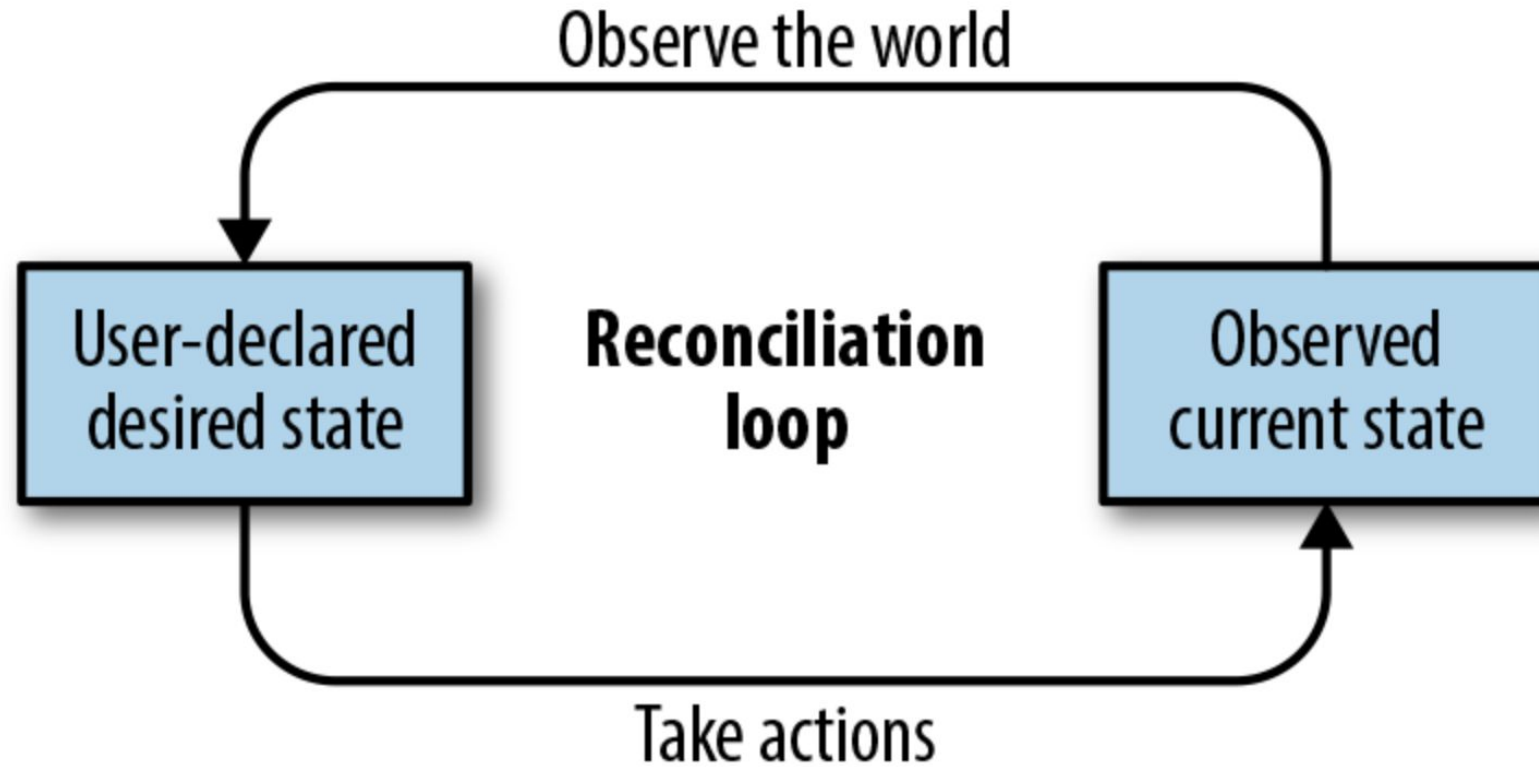
```
  replicas: 1
```

```
oc create -f cr2.yaml
```

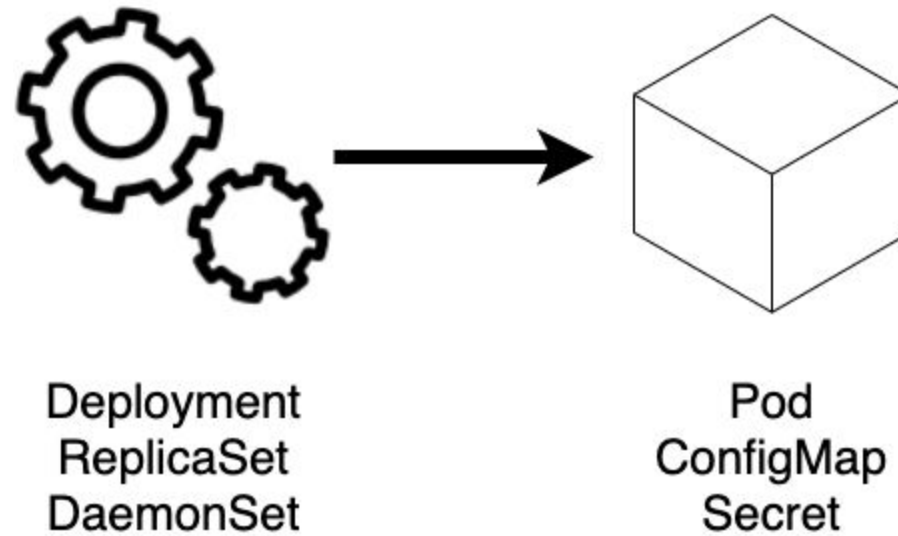
Сохранение ресурса в ETCD



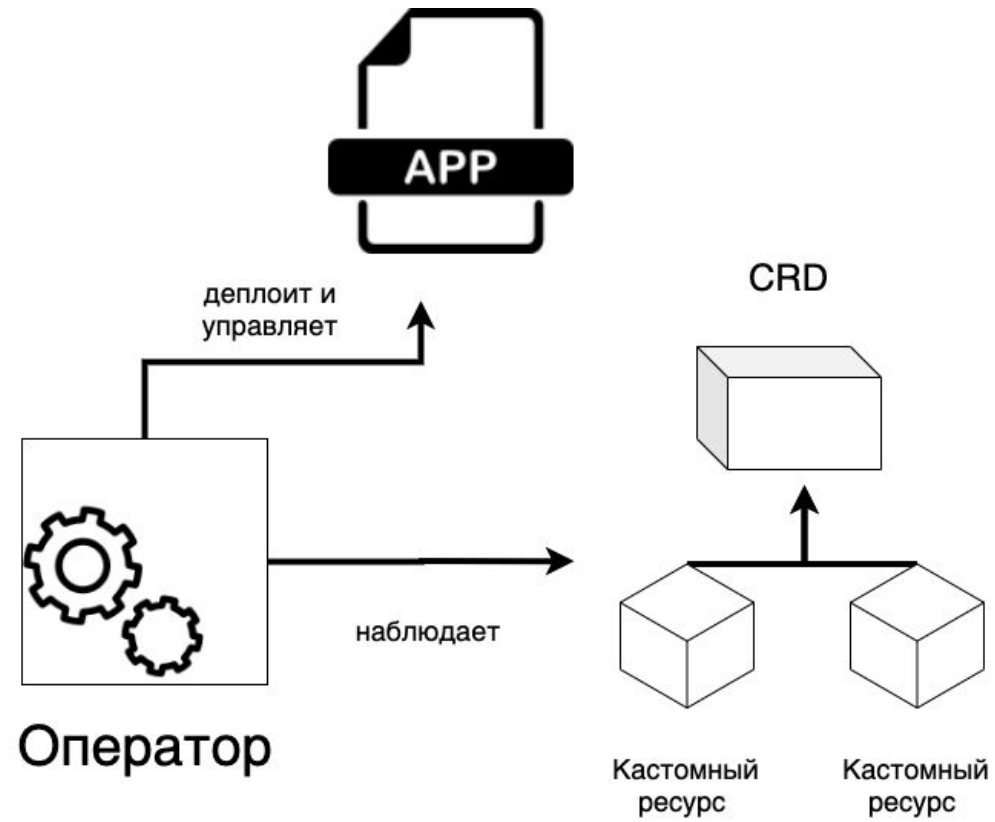
Принцип работы контроллера



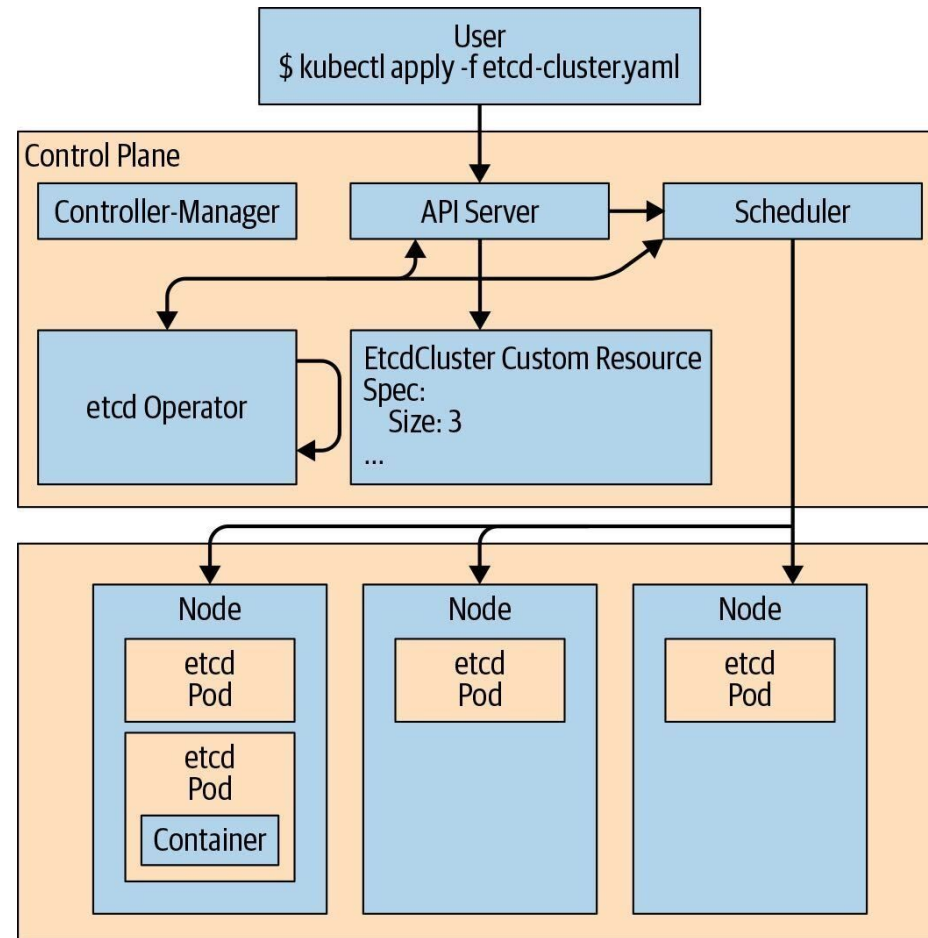
Взаимосвязь контроллеров и ресурсов



Оператор



Что происходит с ресурсом?



Operator SDK

Набор инструментов для написание операторов

Helm SDK

Ansible
SDK

Go SDK

Как работает Operator SDK?

```
operator-sdk new nginx-operator \  
  --api-version=example.com/v1alpha1 \  
  --kind=Nginx \  
  --type=helm  
cd nginx-operator
```

Как работает Operator SDK?

```
operator-sdk new nginx-operator \  
  --api-version=example.com/v1alpha1 \  
  --kind=Nginx \  
  --type=helm \  
cd nginx-operator
```

```
cat deploy/crds/example_v1alpha1_nginx_cr.yaml
```

```
apiVersion: example.com/v1alpha1  
kind: Nginx  
metadata:  
  name: example-nginx  
spec:
```

Как работает Operator SDK?

```
operator-sdk new nginx-operator \  
  --api-version=example.com/v1alpha1 \  
  --kind=Nginx \  
  --type=helm \  
cd nginx-operator
```

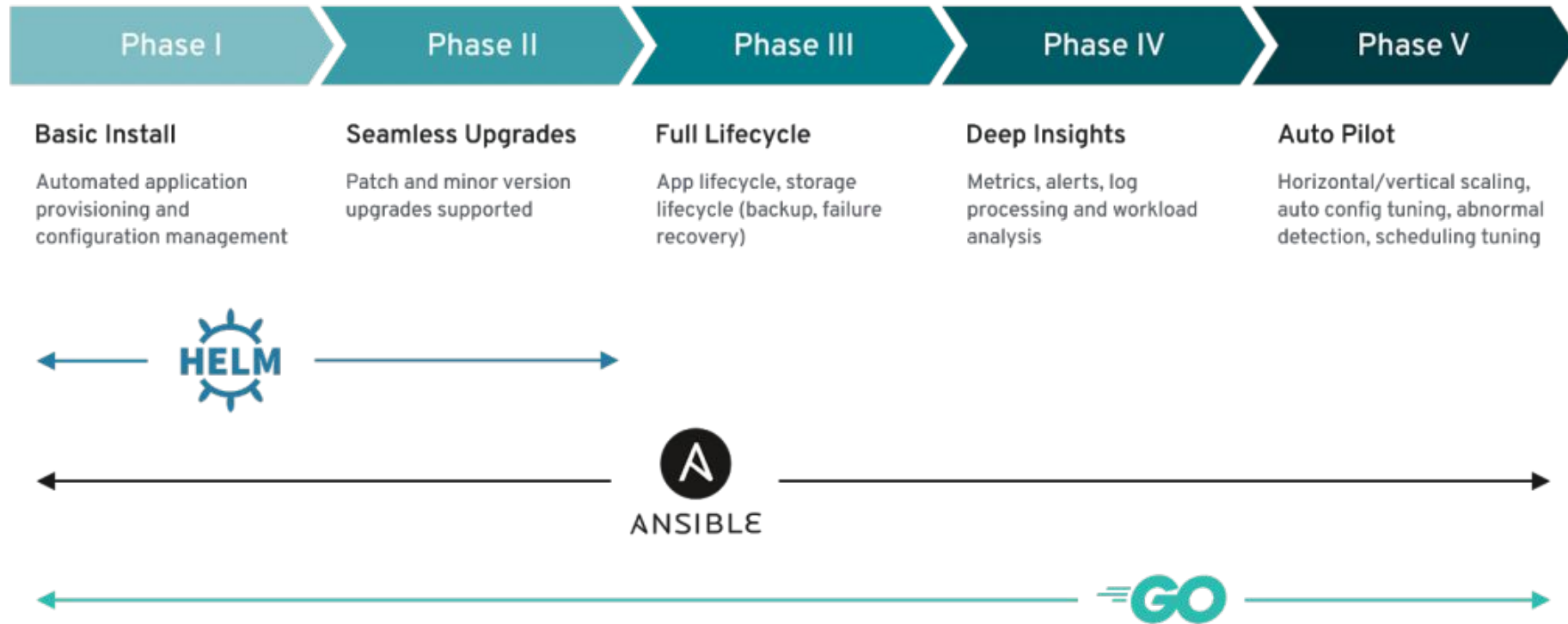
```
cat deploy/crds/example_v1alpha1_nginx_cr.yaml
```

```
apiVersion: example.com/v1alpha1  
kind: Nginx  
metadata:  
  name: example-nginx  
spec:
```

```
ls nginx-operator/helm-charts/nginx/
```

```
templates/  
.helmignore  
Chart.yaml  
values.yaml
```

Operator maturity model



OperatorHub.io

The screenshot shows the OperatorHub.io website. At the top, there's a navigation bar with the OperatorHub.io logo, a search bar containing 'sql', and a 'Contribute' button. Below the navigation bar is a large blue banner with the text 'Welcome to OperatorHub.io' and a subtext: 'OperatorHub.io is a new home for the Kubernetes community to share Operators. Find an existing Operator or list your own today.'

Below the banner, there's a section with 'CATEGORIES' and '15 ITEMS'. The categories listed on the left are: AI/Machine Learning, Application Runtime, Big Data, Cloud Provider, Database, Developer Tools, Integration & Delivery, Logging & Tracing, Monitoring, Networking, OpenShift Optional, Security, Storage, and Streaming & Messaging. The providers listed are: Alibaba Cloud (1), Altinity (1), and Anchore (1).

The main content area displays a grid of operators. Each operator card includes an icon, the operator name, the provider, and a brief description. The operators shown are:

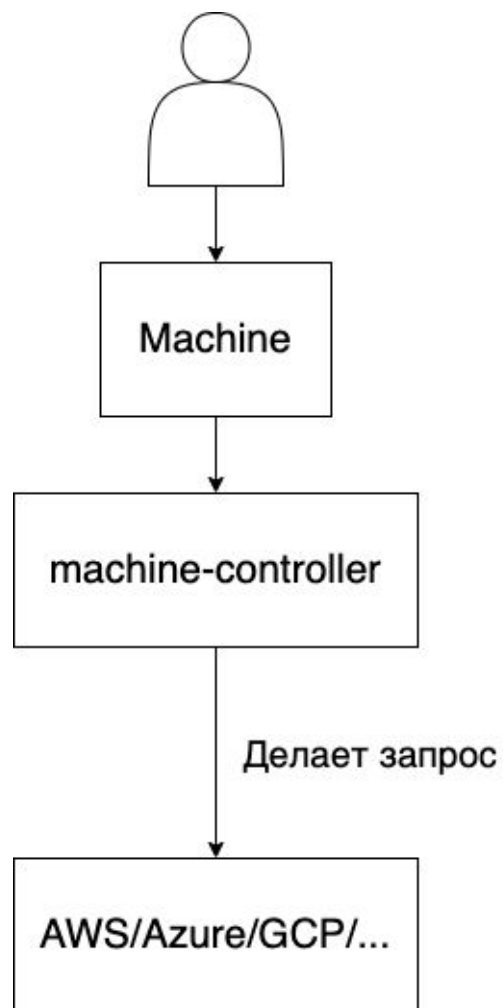
- Couchbase Operator** provided by Couchbase: The Couchbase Autonomous Operator allows users to easily deploy, manage, and maintain...
- Crossplane** provided by Upbound: Manage any infrastructure your applications need directly from Kubernetes.
- Crunchy PostgreSQL for Kubernetes** provided by Crunchy Data: Enterprise open source PostgreSQL-as-a-Service
- MongoDB** provided by MongoDB, Inc: The MongoDB Enterprise Kubernetes Operator enables easy deploys of MongoDB...
- NuoDB Operator** provided by NuoDB, Inc: This Operator will deploy the Community Edition of NuoDB
- Operator for Apache CouchDB** provided by IBM: Apache CouchDB is a highly available NOSQL database
- Percona XtraDB Cluster Operator** provided by Percona: Percona XtraDB Cluster Operator manages the
- PlanetScale Operator for Vitess** provided by PlanetScale: PlanetScale's operator for Vitess deploys and manages...

Типы операторов в Openshift 4

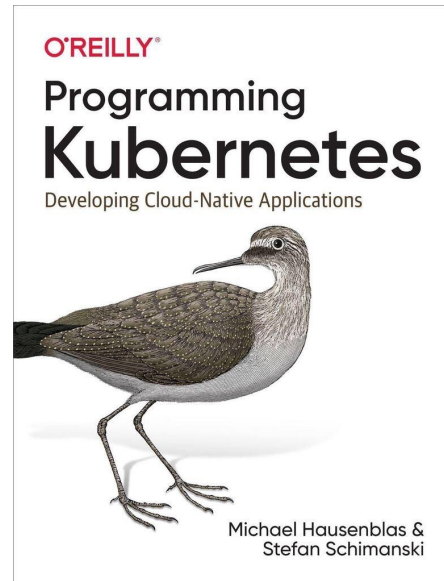
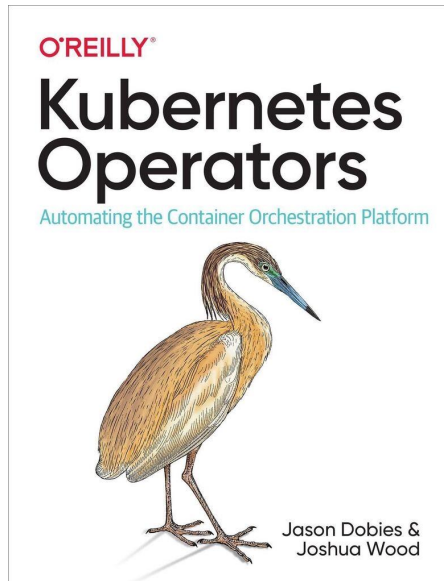
Операторы платформы - отвечают за функционирование Openshift кластера.
Пример - cluster autoscaler operator

Операторы которые основываются на
Operator Lifecycle Manager

Machine API



Что почитать?



- Kubernetes operators: <https://learning.oreilly.com/library/view/kubernetes-operators/9781492048039/>
- Programming kubernetes: <https://learning.oreilly.com/library/view/programming-kubernetes/9781492047094/>
- Operator-sdk: <https://github.com/operator-framework/operator-sdk>
- Пример простого оператора: <https://github.com/kubernetes-operators-book/chapters.git>

Q & A



DEMO TIME



Спасибо!

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