DEBUG
A KUBERNETES OPERATOR

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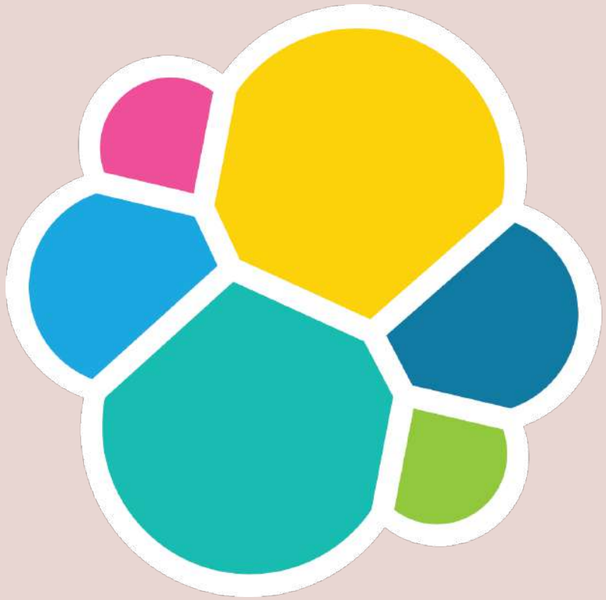
kubernetes

“KUBERNETES IS THE ANSWER. WHAT WAS THE QUESTION?”

https://twitter.com/charlesfitz/status/1068203930683752448

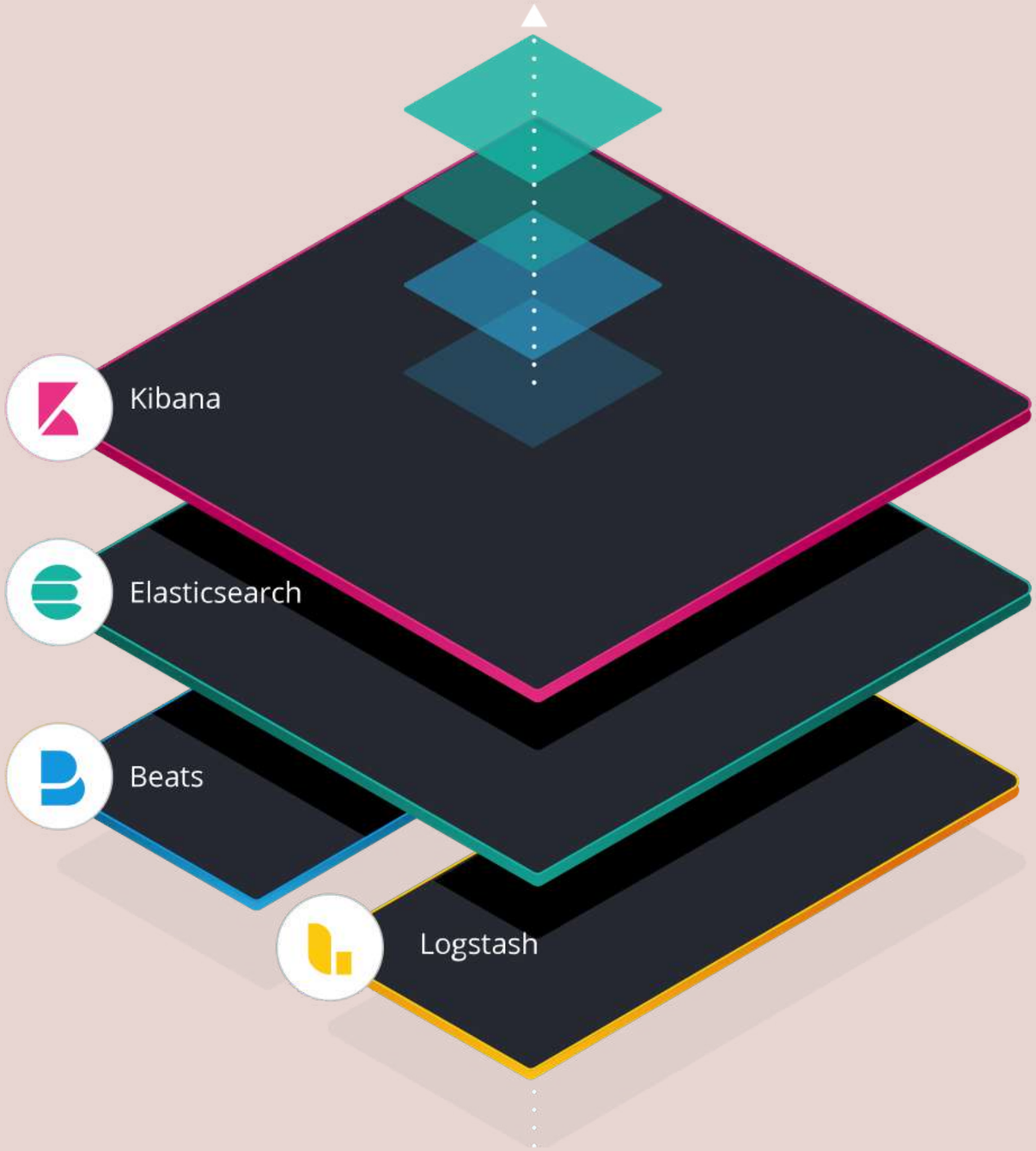
OPERATOR
LIFECYCLE MANAGER

EXPANDS K8S INTERFACES



elastic

DEVELOPER 


Kibana
Elasticsearch
Beats
Logstash

CUSTOM RESOURCE DEFINITION (CRD)

THINK: ELASTICSEARCH, KIBANA,...

CONTRAST: BUILT-IN RESOURCES (PODS, SERVICES, SECRETS, STATEFULSETS)

CUSTOM RESOURCE (CR)

CRD == TYPE DEFINITION (CLASS)

CR == INSTANCE (OBJECT)

OPERATORS

MONGODB, KAFKA, REDIS, COCKROACHDB,...

OPERATOR "MARKETPLACES": HTTPS://OPERATORHUB.IO

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 Postg

eG Innovations Universal Agent Operator
provided by eG Innovations

Elasticsearch (ECK) Operator
provided by Elastic

Run Elasticsearch, Kibana, APM Server, Beats, Enterp

Elasticsearch Index Operator
provided by IBM

An operator for managing indices on elasticsearch

Elasticsearch Phenix Operator
provided by Carrefour

Manage elasticsearch indices, templates lifecycle (creatio

Ember CSI Operator
provided by Red Hat

Multi-vendor CSI plugin supporting 80+ storage drivers

Encrypted Images Key Syncer Helm Operator
provided by IBM

This operator provides facility to sync decryption keys

EnMasse
provided by EnMasse

EnMasse provides messaging as a managed service on Kubernetes

etcd
provided by CNCF

Create and maintain highly-available etcd clusters on Kubernetes

Event Streams Topic
provided by IBM

An operator for the life cycle management of Topics on Event Streams for IBM Clo

ELASTIC OPERATOR

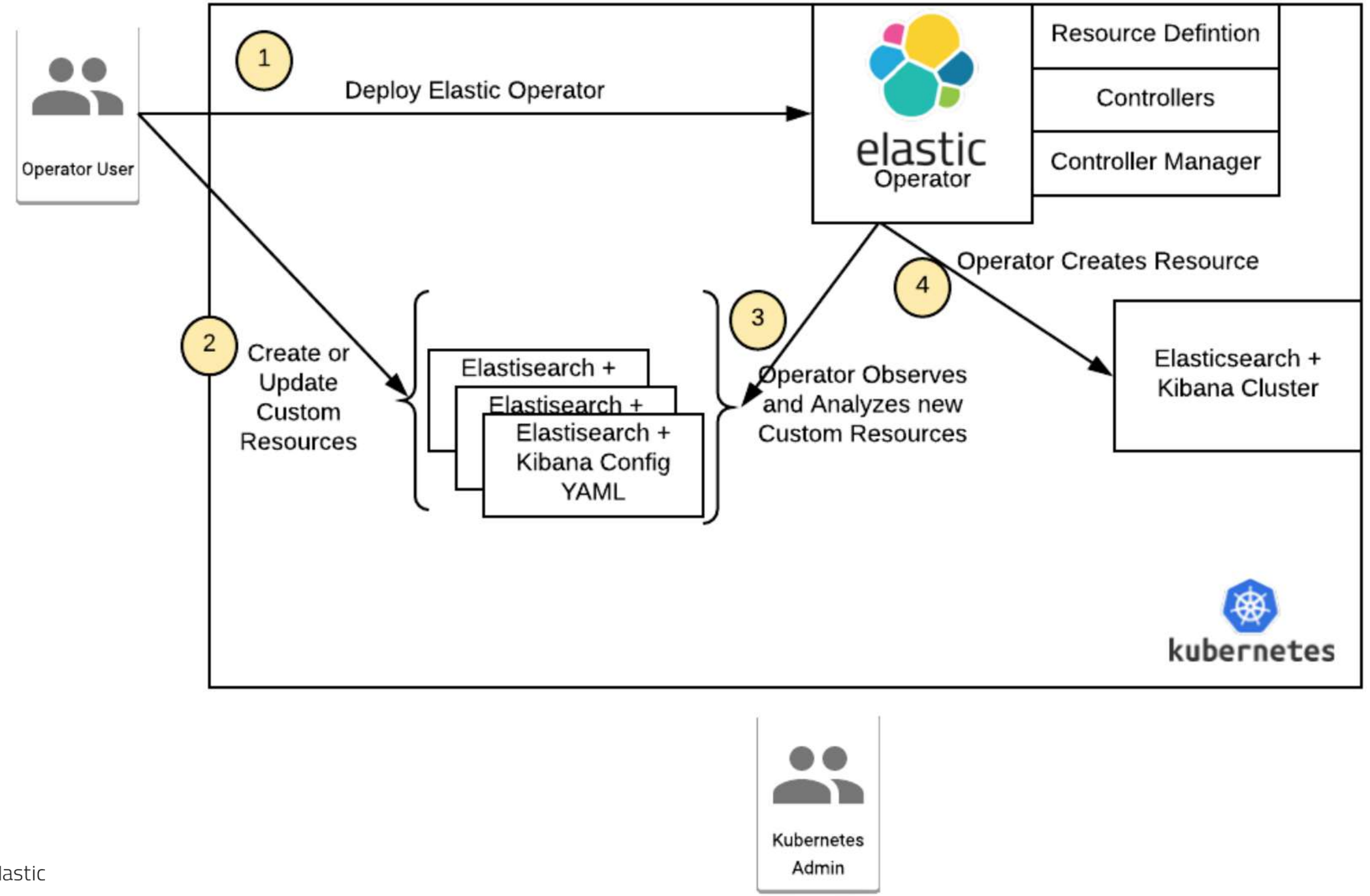
ELASTICSEARCH, KIBANA, BEATS, AGENT, APM SERVER, MAPS, ENTERPRISE SEARCH

HTTPS://GITHUB.COM/ELASTIC/CLOUD-ON-K8S

CUSTOM CONTROLLER

BRINGS CRDS TO "LIFE": RECONCILIATION LOOP

UPGRADES, SECRETS, CERTIFICATE MANAGEMENT,...


Operator User
1
Deploy Elastic Operator
elastic
Operator
Resource Defintion
Controllers
Controller Manager
Operator Creates Resource
4
2
Create or
Update
Custom
Resources
Elastisearch +
Elastisearch +
Elastisearch +
Kibana Config
YAML
3
Operator Observes
and Analyzes new
Custom Resources
Elasticsearch +
Kibana Cluster
kubernetes
Kubernetes
Admin

OPINIONATED

ENCODE BEST PRACTICES & OPERATIONAL KNOWLEDGE

RUNNING ON K3S: THE FAST WAY

```
# Get and install the Elastic Operator
kubectl create -f https://download.elastic.co/downloads/eck/2.5.0/crds.yaml
kubectl apply -f https://download.elastic.co/downloads/eck/2.5.0/operator.yaml

# Monitor its logs
kubectl -n elastic-system logs -f statefulset.apps/elastic-operator

# Get all pods including the operator
kubectl get pods --all-namespaces
```

RUNNING ON K3S: HELM CHART

```
# Add the Elastic repository
helm repo add elastic https://helm.elastic.co

# Update the available repos
helm repo update

# Install the current Elastic Operator
helm install elastic-operator elastic/eck-operator \
     -n elastic-system --create-namespace

# Monitor its logs
kubectl -n elastic-system logs -f statefulset.apps/elastic-operator

# Get all pods including the operator
kubectl get pods --all-namespaces
```

SAMPLE 1

RESOURCES & OPERATOR LOGS

```yaml
apiVersion: elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: quickstart
spec:
  version: 8.5.1
  nodeSets:
    - name: default
      count: 1
      config:
        node.store.allow_mmap: false
---
apiVersion: kibana.k8s.elastic.co/v1
kind: Kibana
metadata:
  name: quickstart
spec:
  version: 8.5.1
  count: 1
  config:
    server.publicBaseUrl: "https://xeraa.wtf"
  elasticsearchRef:
    name: elasticsearch-quickstart
  http:
    service:
      spec:
        type: LoadBalancer
```

DEBUG

```
# Apply the manifest
kubectl apply -f sample-1.yml

# Are the pods running?
kubectl get pods

# Is Kibana deployed?
kubectl get kibana

# What's in the logs?
kubectl -n elastic-system logs -f statefulset.apps/elastic-operator

# See the details of Kibana
kubectl describe kibana quickstart
```

FIX

CHANGE elasticsearchRef

```
# Reapply the manifest
kubectl apply -f sample-1.yml

# Are the pods running now?
kubectl get pods

# Is Kibana deployed now?
kubectl get kibana

# Open Kibana in the browser — what is the password?
kubectl get secret quickstart-es-elastic-user \
        -o go-template='{{.data.elastic | base64decode}}'
```

PS: HANDY ALIASES

```
# Elasticsearch by full name
kubectl get elasticsearch

# Elasticsearch by alias
kubectl get es

# Multiple resources by alias
kubectl get es,kb,sts,deploy,po

# Elastic resources
kubectl get elastic
```

CLEANUP

```
# Delete the first sample
kubectl delete -f sample-1.yml

# Check the successful termination
kubectl get pods
```

SAMPLE 2

INSPECTING CONTAINERS, MEMORY REQUIREMENTS & ROLLING UPGRADES

```
cat <<EOF | kubectl create -f -
apiVersion: elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: elasticsearch-sample
spec:
  version: 8.5.1
  nodeSets:
  - name: default
    count: 3
    config:
      node.store.allow_mmap: false
  podTemplate:
    spec:
      containers:
      - name: elasticsearch
        env:
        - name: ES_JAVA_OPTS
          value: -Xms750m -Xmx750m
        resources:
          requests:
            memory: 1.5Gi
          limits:
            memory: 1.5Gi
EOF
```

DEBUG

```
# Check the pods
kubectl get pods

# Check the memory constraint - is it set to 1.5GB?
kubectl get pod elasticsearch-sample-es-default-0 -o json | jq .spec.containers[0].resources

# Check the heap size - is it set to 750MB?
kubectl get pod elasticsearch-sample-es-default-0 -o json | jq .spec.containers[0].env

# Check the deployed resource
kubectl get elasticsearch elasticsearch-sample -o yaml
```

```
cat <<EOF | kubectl apply -f -
apiVersion: elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: elasticsearch-sample
spec:
  version: 8.5.1
  nodeSets:
  - name: default
    count: 3
    config:
      node.store.allow_mmap: false
    podTemplate:
      spec:
        containers:
        - name: elasticsearch
          env:
          - name: ES_JAVA_OPTS
            value: -Xms750m -Xmx750m
          resources:
            requests:
              memory: 1.5Gi
            limits:
              memory: 1.5Gi
EOF
```

FIX

```
# Watch the rolling upgrade
watch -n 1 kubectl get pods

# Check the memory constraint again
kubectl get pod elasticsearch-sample-es-default-0 -o json | jq .spec.containers[0].resources

# Check the heap size again
kubectl get pod elasticsearch-sample-es-default-0 -o json | jq .spec.containers[0].env

# Cleanup
kubectl delete es --all
```

PS: FIXED THROUGH A HACK

```
--validate=false
```

NEEDED SINCE HTTPS://GITHUB.COM/ELASTIC/CLOUD-ON-K8S/PULL/2433

SAMPLE 3

RELATIONSHIP BETWEEN POD, STS, PVC, AND PV VOLUMECLAIMTEMPLATE

```yaml
apiVersion: elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: elasticsearch-sample
spec:
  version: 8.5.1
  nodeSets:
  - name: default
    count: 3
    config:
      node.store.allow_mmap: false
    volumeClaimTemplates:
    - metadata:
       name: elasticsearch-data
      spec:
       accessModes:
         - ReadWriteOnce
       resources:
         requests:
           storage: 1Gi
       storageClassName: elasticsearch
```

DEBUG

```
# Apply the manifest
kubectl apply -f sample-3.yml

# Are the pods running?
kubectl get pods

# What is in the pod events?
kubectl describe pod elasticsearch-sample-es-default-0

# What is in the volume specs?
kubectl get pod elasticsearch-sample-es-default-0 -o json | jq .spec.volumes
```

ELASTICSEARCH STORAGE

EACH NODESET HAS A STATEFULSET == SEVERAL PODS AND PVS

PVC TO ACQUIRE A VOLUME

PV ASYNCHRONOUSLY CREATED TO MATCH CLAIMS

DEBUG

```
# Inspect PVCs
kubectl get pvc

# Describe one
kubectl describe pvc elasticsearch-data-elasticsearch-sample-es-default-0

# What are the available options?
kubectl get storageclass
```

FIX

CHANGE TO `storageClassName: local-path`

```
# Is it as easy as this?
kubectl apply -f sample-3.yml
```

CHANGE TO `name: default-fixed`

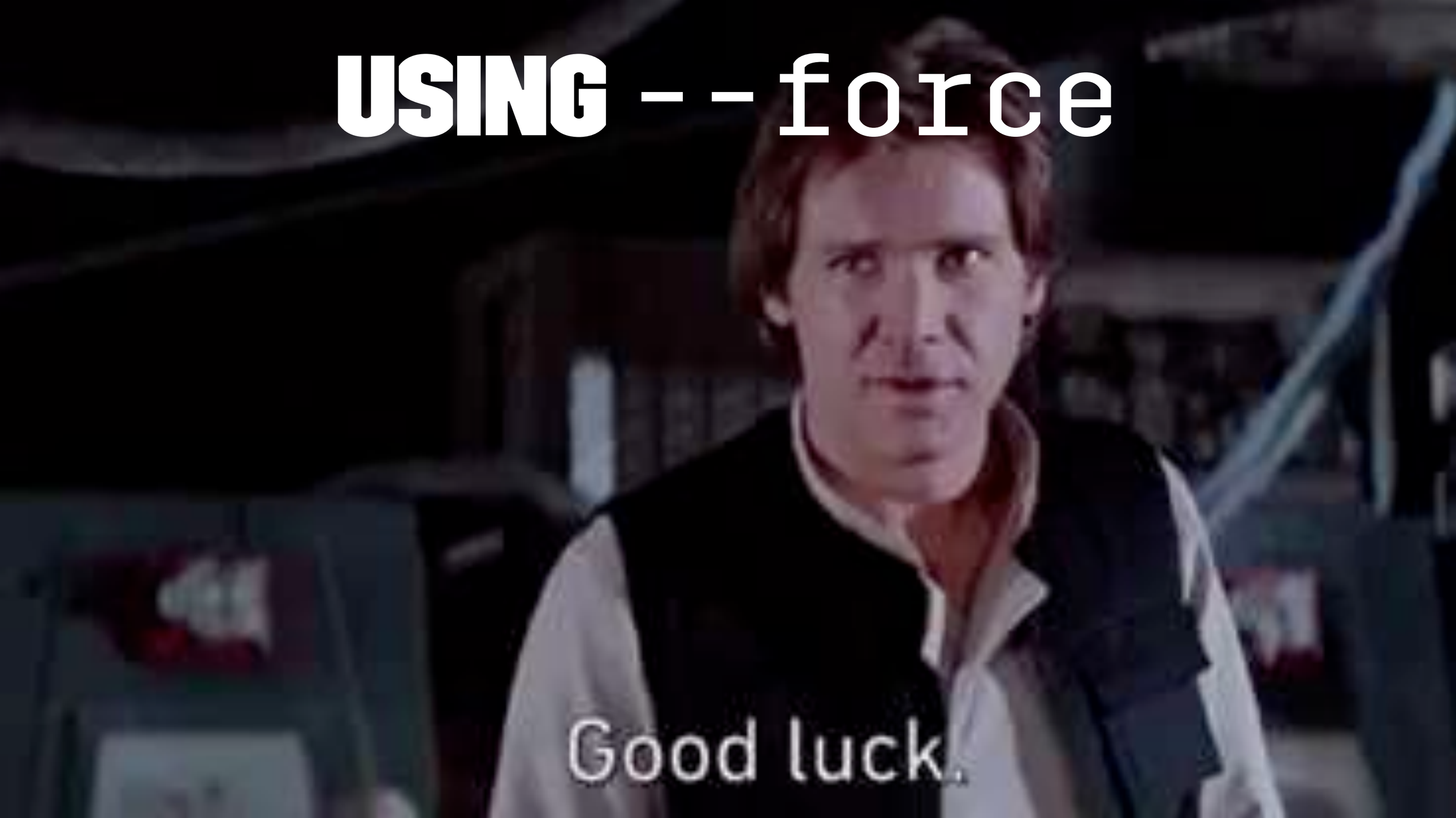
```
# Apply both changes
kubectl apply -f sample-3.yml

# What happens with the pods?
kubectl get pods

# What is the state of the storage now?
kubectl get pvc
```

CONCLUSION

NO 🚀 SCIENCE

MONITOR
THE ELASTIC OPERATOR
WITH
THE ELASTIC OPERATOR

USING `--force`



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