



# Es-operator

## Building an Operator From the Bottom Up



KubeCon



CloudNativeCon

Europe 2019

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\$ whoami



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# “EUROPE’S LEADING ONLINE FASHION PLATFORM”


DAMEN | **HERREN** | KINDER

zalando

DE | EN Anmelden Wunschzettel Warenkorb

Get the Look Neu Bekleidung Schuhe Sport Accessoires Pflege Premium Marken Sale %

Suche



**Get the Look**

Perfekt kombiniert von Mode-Kennern: Hol dir frische Outfit-Ideen für die neue Saison und jeden Anlass.

Alle Styles Classic Casual Streetwear **Persönliches Styling**

## Für dich ausgewählt



# WE BRING FASHION TO PEOPLE IN 17 COUNTRIES

**17** markets

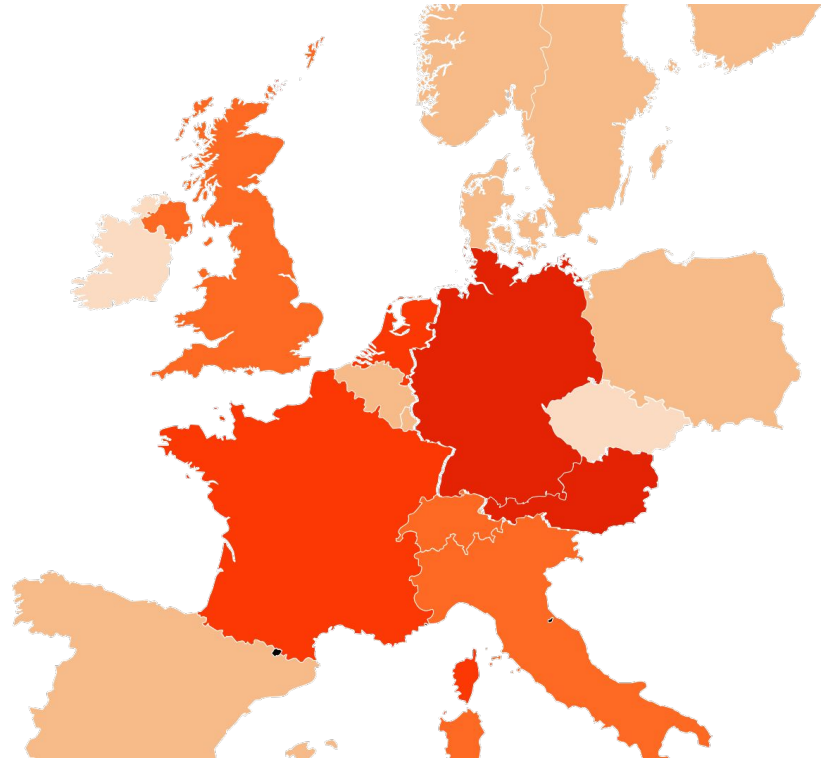
**7** fulfillment centers

**26 million** active customers

**5.4 billion €** revenue 2018

**250 million** visits per month

**15,000** employees in Europe

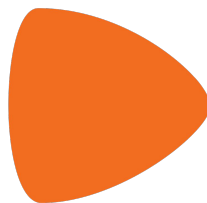


# KUBERNETES @ ZALANDO

Default  
Deployment  
Target

1400~  
nodes

Since  
Oct 2016



zalando

~125  
clusters

Node  
Autoscaling

From v1.4  
to v1.13

# SEARCH @ ZALANDO

**300k+**  
Products  
per country

**~2000**  
Brands

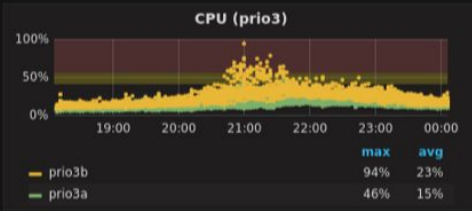
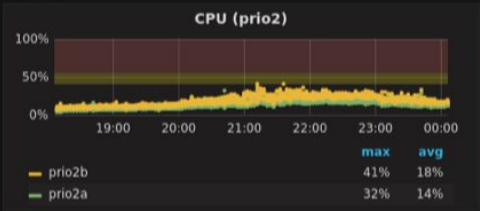
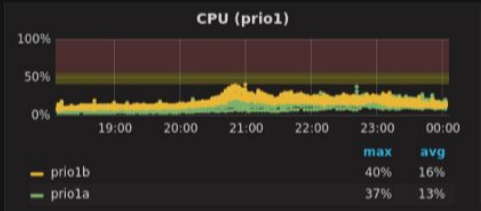
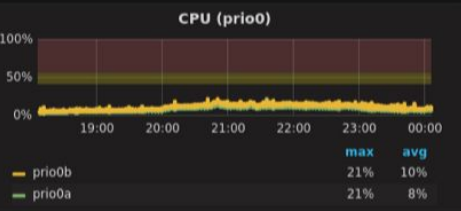
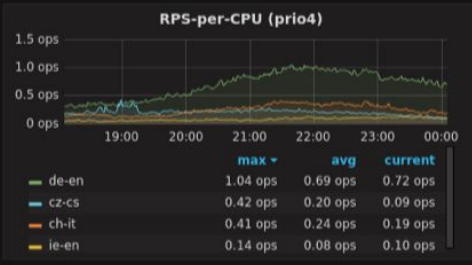
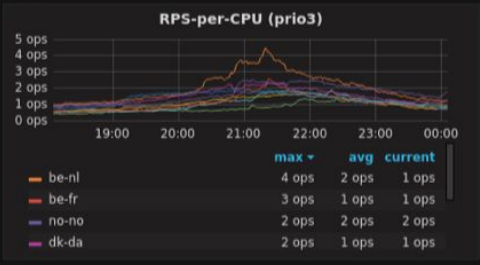
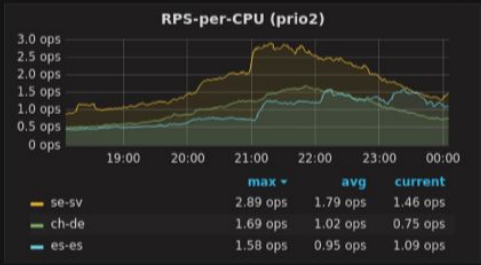
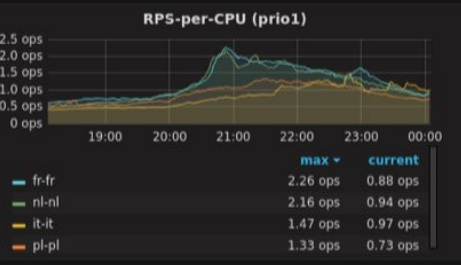
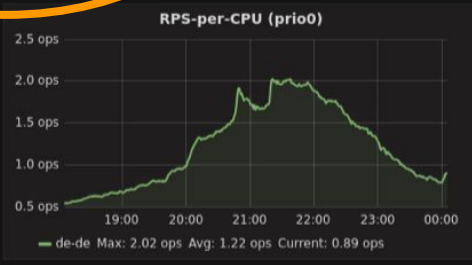
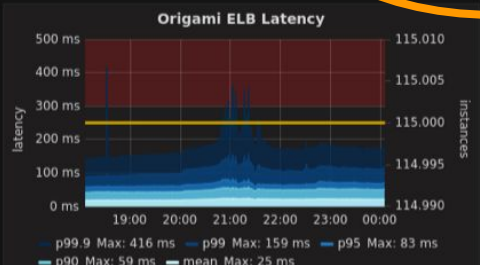
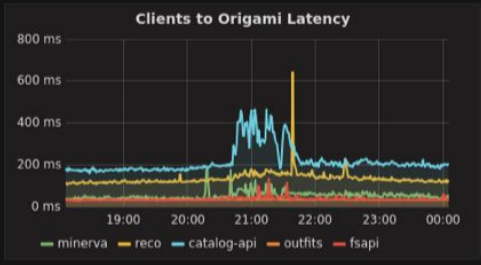
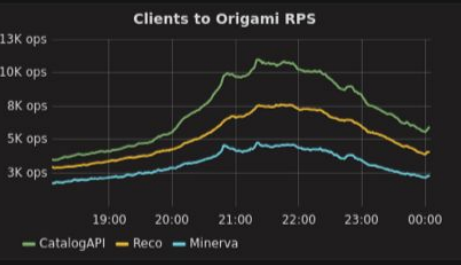
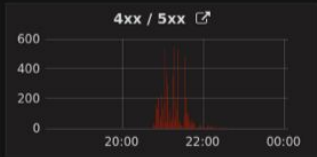
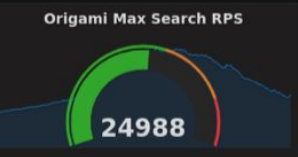
**~700**  
Categories



**45%**  
Mobile Traffic

**12K**  
QPS

**8K**  
Updates/s

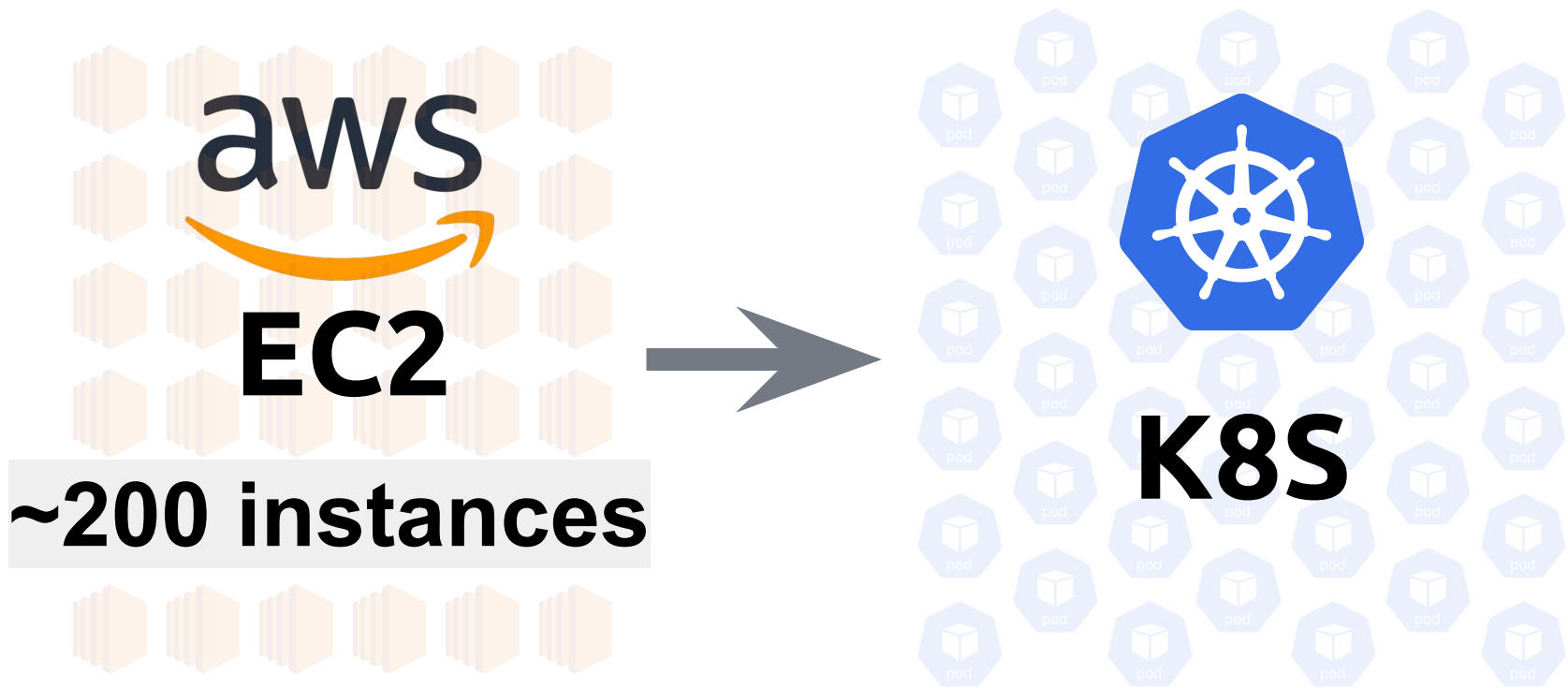


#### ORIGAMI

#### CATALOG API

#### ELASTICSEARCH

# WORKLOAD





# RUNNING ELASTICSEARCH IN KUBERNETES

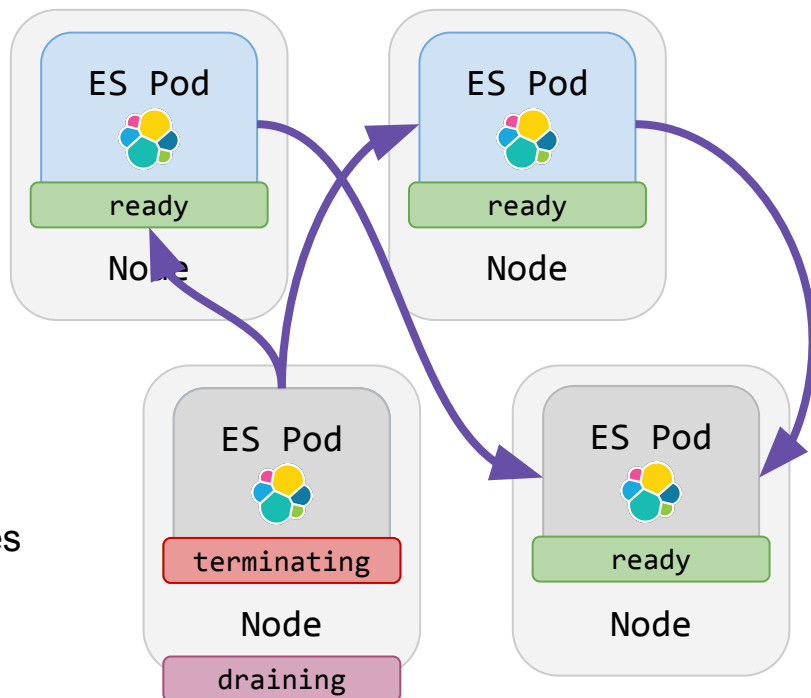
1. **Safe automatic updates**  
(Including Kubernetes cluster updates)
2. **Advanced auto-scaling for cost efficiency**



# UPDATING ELASTICSEARCH (STATEFULSET)

## 1) PreStop Hook ([bash script](#))

- Exclude node in ES
- Wait for node to drain (up to 1h)
- Data is moved to existing nodes



## 2) PostStart Hook ([bash script](#))

- Remove all excludes
- Let ES rebalance from existing nodes

# OPERATOR PATTERN



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



# v0: MANAGE STATEFULSET

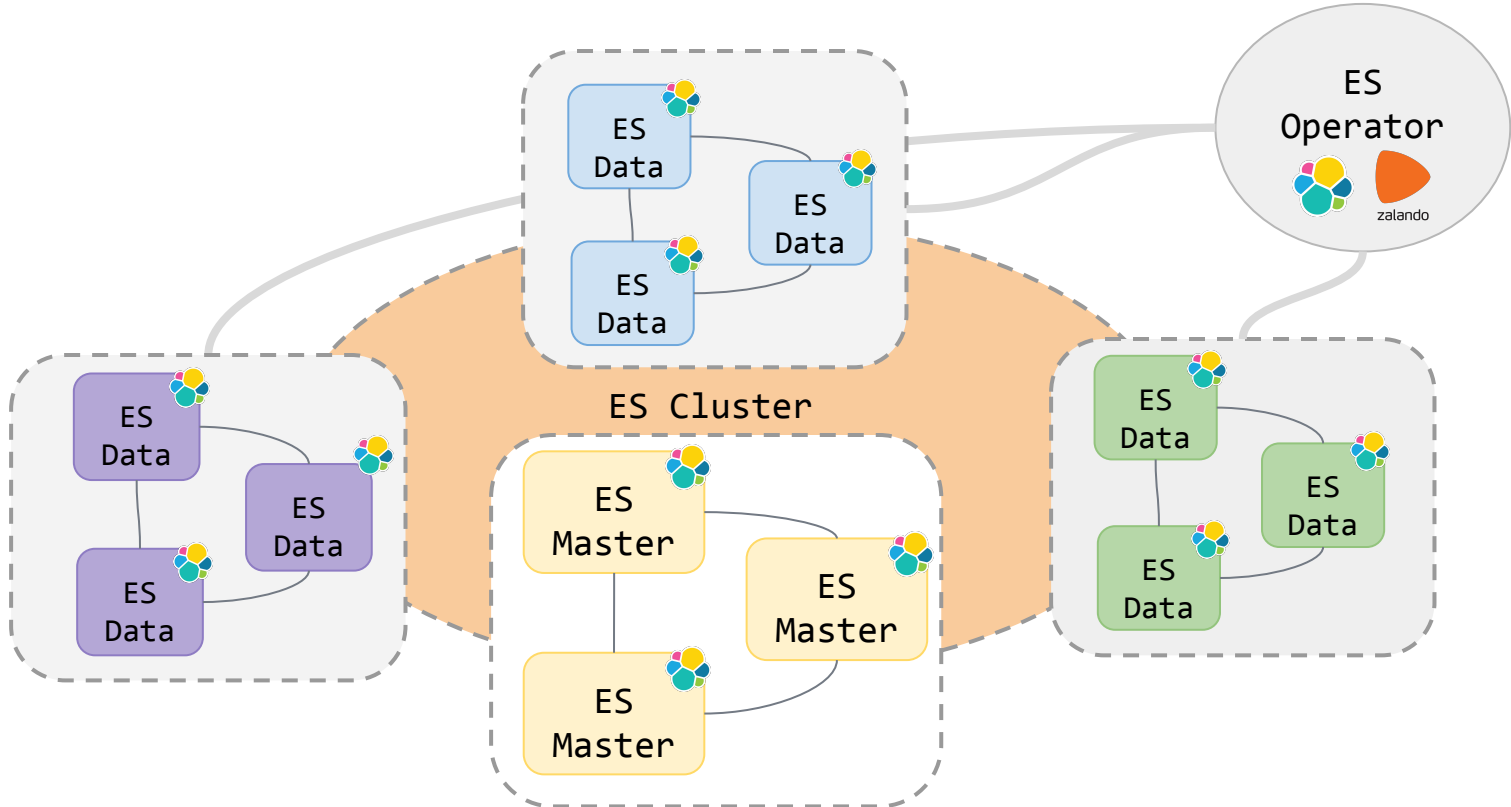
```
apiVersion: apps/v1
kind: StatefulSet
metadata:
  name:
  annotations:
    es-operat
  replicas: "3"
spec:
  updateStrategy:
    type:
  replicas
  template: # PodTemplate
    {...}
```

- Complicated to update without changing replicas.
- State must be stored in annotations

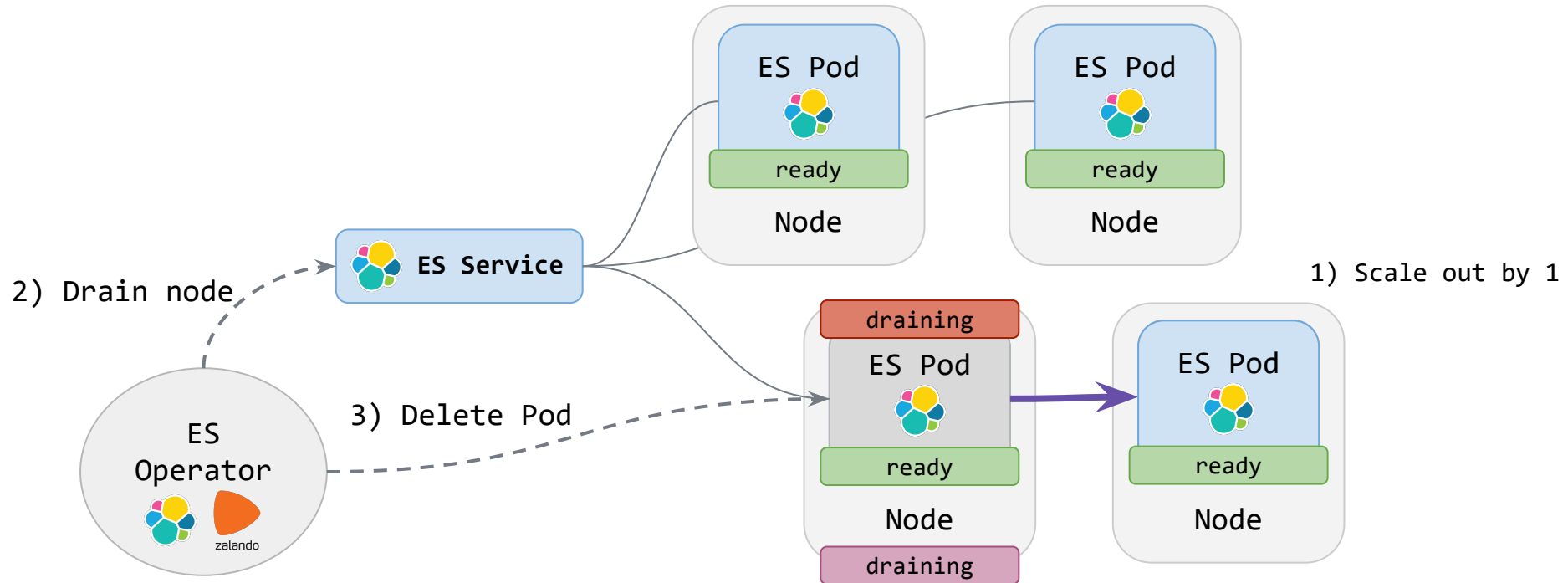
# v1: ELASTICSEARCH DATA SETS

```
apiVersion: zalando.org/v1
kind: ElasticsearchDataSet
metadata:
  name: test-cluster
spec:
  scaling:
    {...}
  replicas: 3
  template: # PodTemplate
    {...}
  volumeClaimTemplates:
    {...}
```

# ELASTICSEARCH DATA SETS



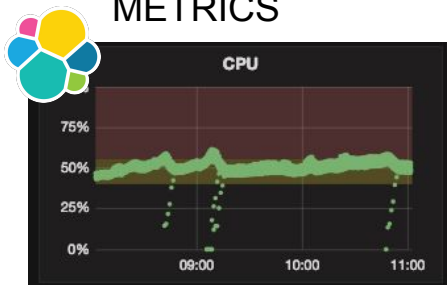
# UPDATING ELASTICSEARCH (OPERATOR)



[github.com/zalando-incubator/es-operator](https://github.com/zalando-incubator/es-operator)

# SCALING UP ELASTICSEARCH (1)

## METRICS

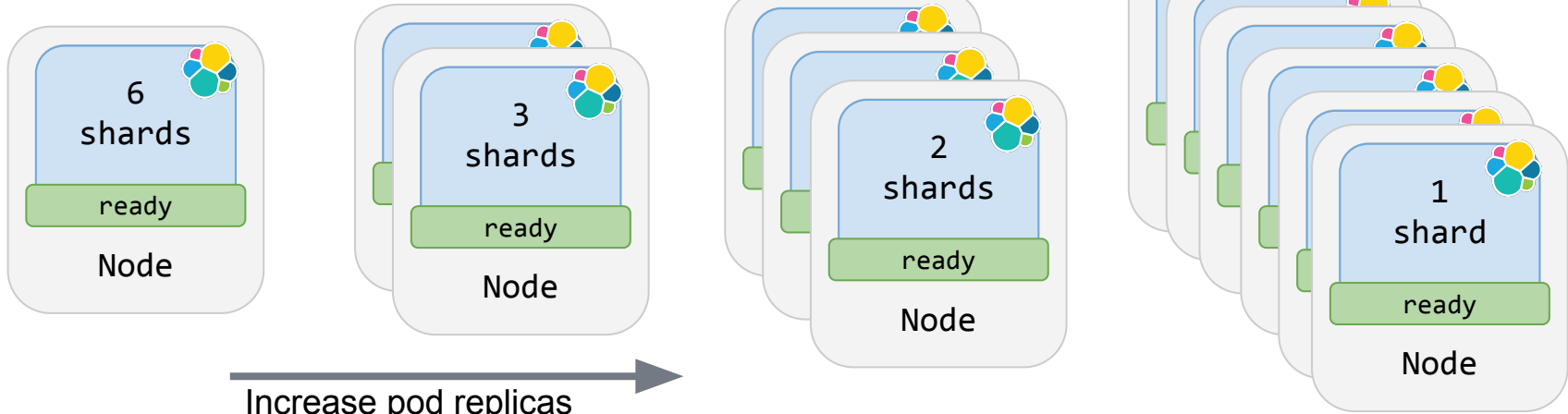


### Thresholds

- CPU
- Duration
- Cooldown

### Boundaries

- Max # Pod replicas
- Min # Shards per node

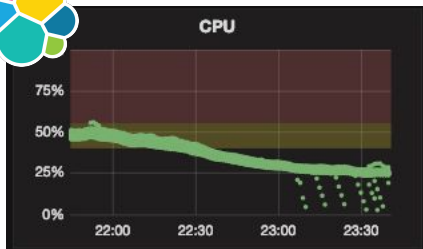




# SCALING DOWN ELASTICSEARCH

**DON'T OPERATE  
WHEN CLUSTER  
IS NOT GREEN!**

## METRICS

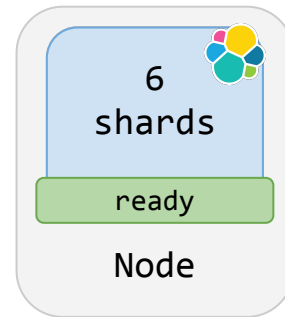
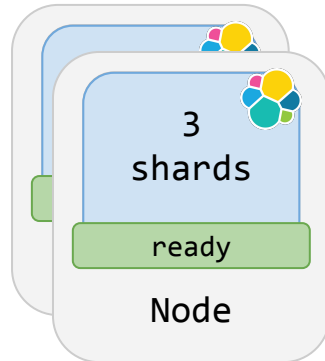
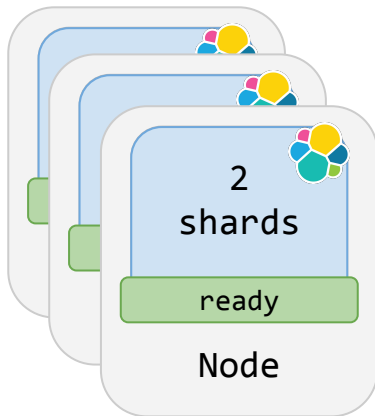
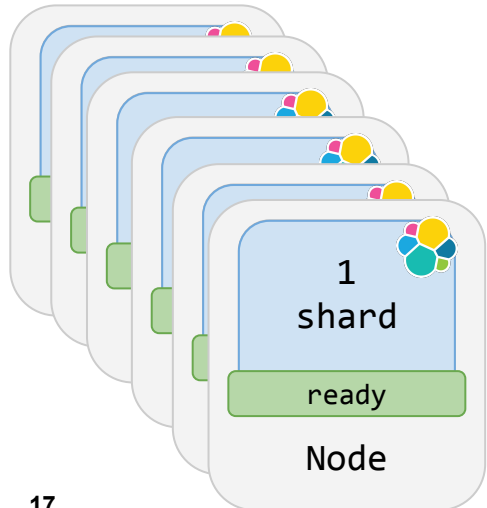


### Thresholds

- CPU
- Duration
- Cooldown

### Boundaries

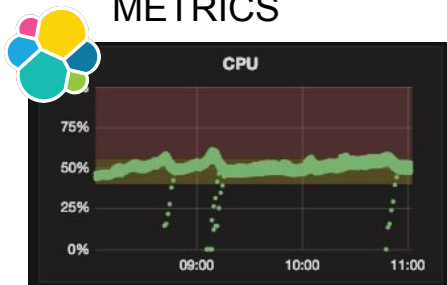
- Min # Replica
- Max # Shards per node
- Max disk usage (%)



Decrease Pod replicas →

# SCALING UP ELASTICSEARCH (2)

## METRICS

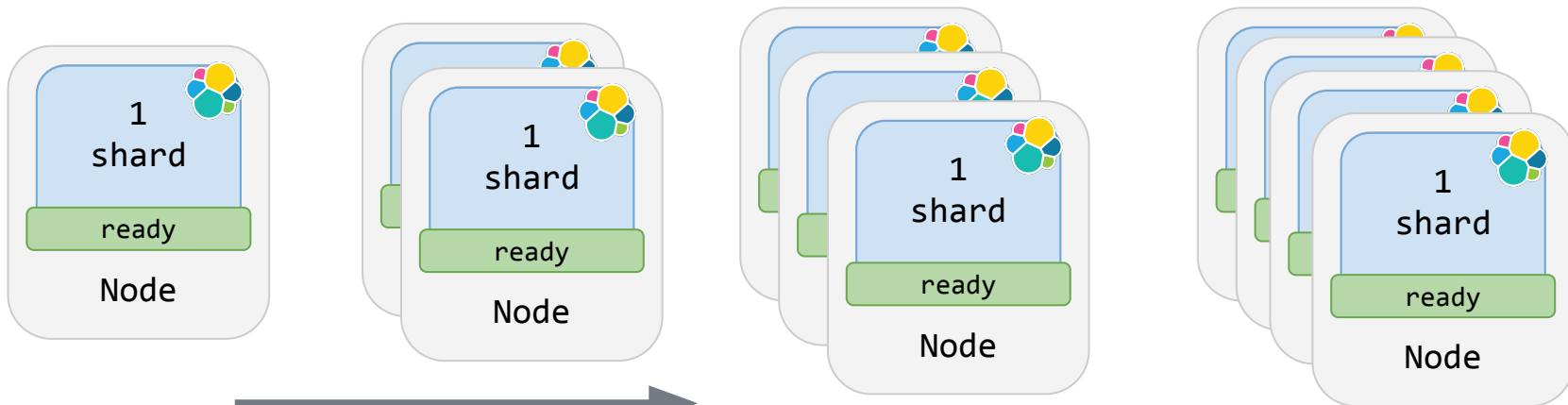


### Thresholds

- CPU
- Duration
- Cooldown

### Boundaries

- Min # Shards per node
- Max # Pod replicas



Increase index replicas

# SCALING IN PRODUCTION (7d)



# SCALING IN PRODUCTION (24h)



# LESSONS LEARNED / TAKEAWAYS

- Turn those bash scripts into an operator!
- Assume Operator can die at any point.
- Start simple, add abstractions only when needed.



# OPEN SOURCE

## Elasticsearch Operator

[github.com/zalando-incubator/es-operator](https://github.com/zalando-incubator/es-operator)

## Kubernetes on AWS

[github.com/zalando-incubator/kubernetes-on-aws](https://github.com/zalando-incubator/kubernetes-on-aws)

## Postgres Operator

[github.com/zalando/postgres-operator](https://github.com/zalando/postgres-operator)

## Kubernetes Operator Pythonic Framework (Kopf)

[github.com/zalando-incubator/kopf](https://github.com/zalando-incubator/kopf)



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# ¡GRACIAS!



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