



Introduction to the Elastic Cloud on Kubernetes Operator

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2020-11-23

Running the Elastic Stack on Kubernetes?

Elastic Technology

3 solutions



Elastic Enterprise Search



Elastic Observability



Elastic Security

Powered by the
Elastic Stack

Kibana

Elasticsearch

Beats

Logstash

Deployed
anywhere



Elastic Cloud

SaaS



Elastic Cloud
Enterprise



Elastic Cloud
on Kubernetes

Orchestration

Elastic Cloud on Kubernetes Operator

The screenshot shows the OperatorHub.io interface for the Elasticsearch (ECK) operator. The page is titled "Elasticsearch (ECK) operator" and provides a detailed overview of the operator's capabilities and installation options.

OperatorHub.io Search OperatorHub... Contribute

Home > Elasticsearch (ECK) operator

Elastic Cloud on Kubernetes (ECK) is the official operator by Elastic for automating the deployment, provisioning, management, and orchestration of Elasticsearch, Kibana, APM Server, Beats, and Enterprise Search on Kubernetes.

Current features:

- Elasticsearch, Kibana, APM Server, Enterprise Search, and Beats deployments
- TLS Certificates management
- Safe Elasticsearch cluster configuration and topology changes
- Persistent volumes usage
- Custom node configuration and attributes
- Secure settings keystore updates

Supported versions:

- Kubernetes: 1.12+ or OpenShift 3.11+
- Elasticsearch: 6.8+, 7.1+

See the [Quickstart](#) to get started with ECK.

Custom Resource Definitions

APM Server	Beats	Elasticsearch Cluster
APM Server instance	Beats instance	Instance of an Elasticsearch cluster
View YAML Example	View YAML Example	View YAML Example

Enterprise Search	Kibana

CHANNEL
stable

VERSION
1.3.0 (Current)

CAPABILITY LEVEL

- ☒ Basic Install
- ☒ Seamless Upgrades
- ☒ Full Lifecycle
- ☐ Deep Insights
- ☐ Auto Pilot

PROVIDER
Elastic

LINKS
[Documentation](#)

REPOSITORY
<https://github.com/elastic/cloud-on-k8s>

CONTAINER IMAGE
docker.elastic.co/eck/eck-operator:1.3.0

CREATED AT
2020-11-11 23:48:30

MAINTAINERS
Elastic
eck@elastic.co

Challenges of running on Kubernetes



Managing **resources**: StatefulSets, Services, Secrets ...



Storage: volume management



Ensuring **consistency** and **availability**



Scaling **up or down** and **configuration changes or upgrades**

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Challenges of running on Kubernetes



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Storage: volume management



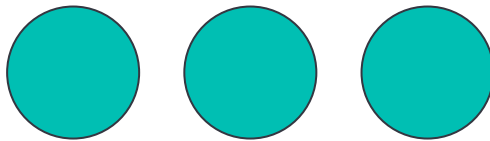
Ensuring **consistency** and **availability**



Scaling **up or down** and **configuration changes or upgrades**

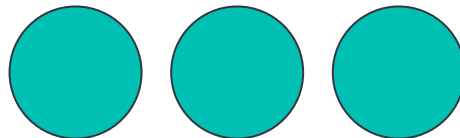
A simple, uniform Elasticsearch cluster

Master, Data, Ingest, ML

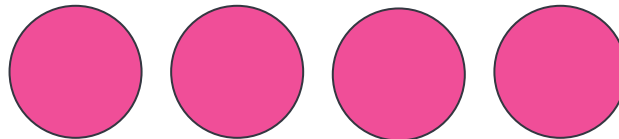


Elasticsearch Nodes are not always uniform

Dedicated Masters



Data, Ingest, ML



Elasticsearch Nodes are not always uniform



Challenges of running on Kubernetes



Managing **resources**: StatefulSets, Services, Secrets ...



Storage: volume management



Ensuring **consistency** and **availability**



Scaling **up or down** and **configuration changes or upgrades**

Operators?

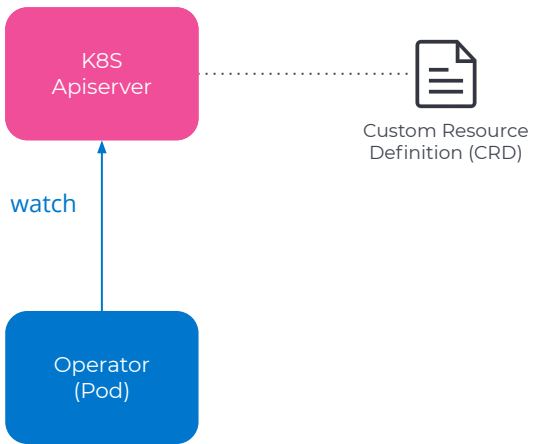
CRDs



```
apiVersion:
elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: quickstart
spec:
  version: 7.10.0
  nodeSets:
    - name: master-nodes
      count: 3
      config:
        node.master: true
    - name: data-nodes
      count: 2
      config:
        node.data: true
```

Operators?

Reconciliation loop

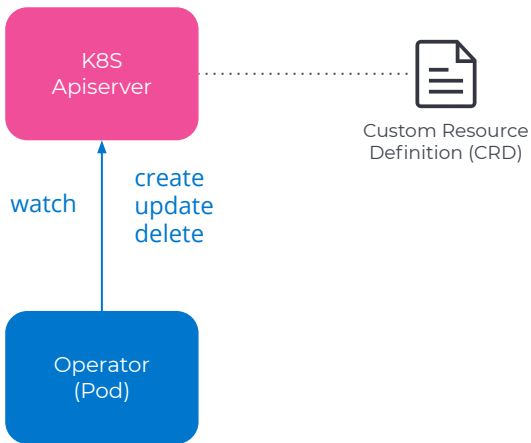


New event

A **watched resource** was created/updated/deleted

Operators?

Reconciliation loop



New event

A **watched resource** was created/updated/deleted



Reconcile!

Get resource spec

Create/update **expected** resources

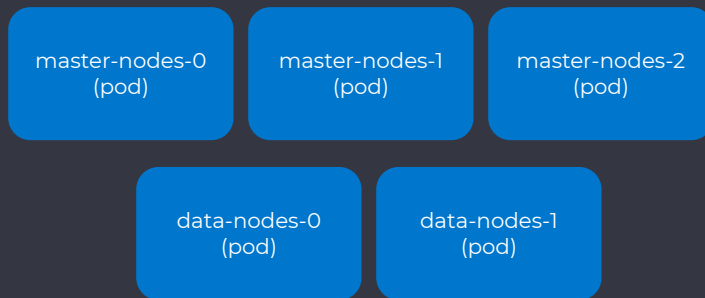
Reconciliation loop

In Elastic Cloud on Kubernetes

```
apiVersion:
elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: quickstart
spec:
  version: 7.10.0
  nodeSets:
  - name: master-nodes
    count: 3
    config:
      node.master: true
  - name: data-nodes
    count: 2
    config:
      node.data: true
```



Create/update Elasticsearch Pods...



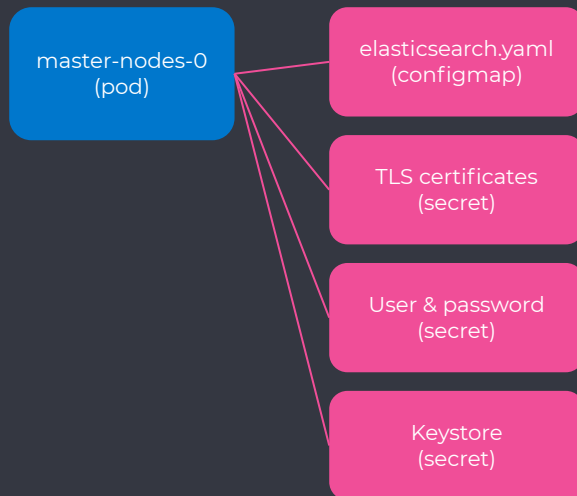
Reconciliation loop

In Elastic Cloud on Kubernetes

```
apiVersion:
elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: quickstart
spec:
  version: 7.10.0
  nodeSets:
  - name: master-nodes
    count: 3
    config:
      node.master: true
  - name: data-nodes
    count: 2
    config:
      node.data: true
```



...and much more



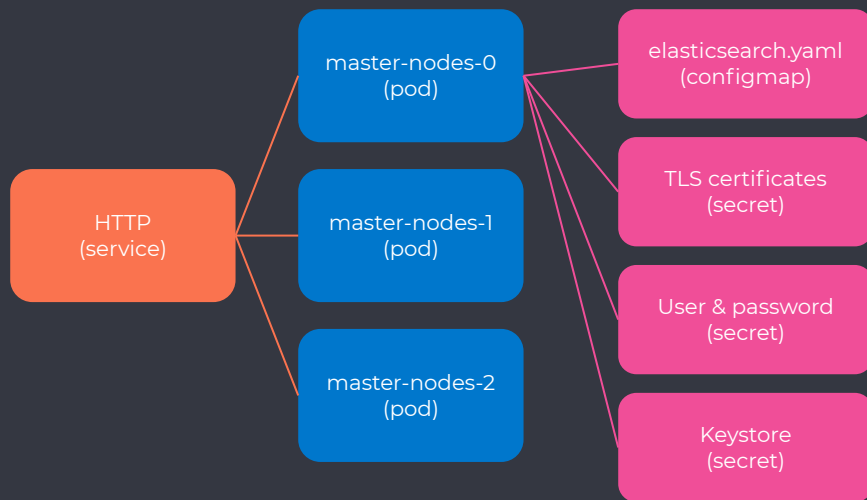
Reconciliation loop

In Elastic Cloud on Kubernetes

```
apiVersion:
elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: quickstart
spec:
  version: 7.7.0
  nodeSets:
  - name: master-nodes
    count: 3
    config:
      node.master: true
  - name: data-nodes
    count: 2
    config:
      node.data: true
```

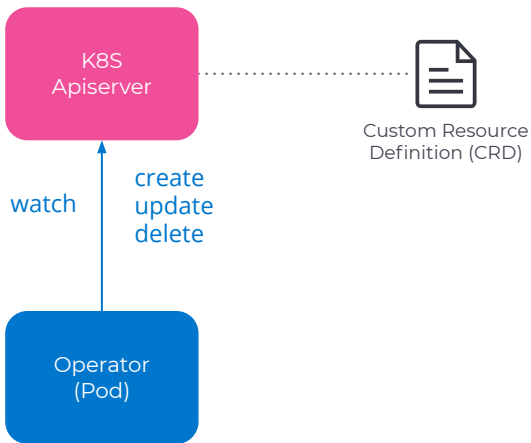


...and much much more



Operators?

Reconciliation loop



New event

A **watched resource** was created/updated/deleted



Reconcile!

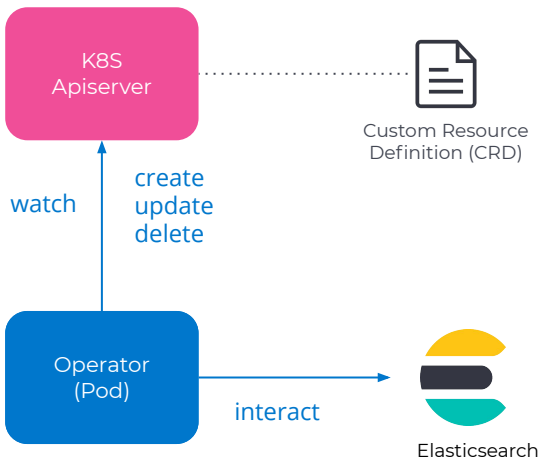
Get resource spec

Create/update **expected** resources

- HTTP service
- TLS certificates (secret)
- Users (secret)
- Keystore (secret)
- ES configuration (configmap)
- ES Nodes StatefulSets (Pod + PersistentVolume)

Operators?

Reconciliation loop



New event

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Reconcile!

Get resource spec

Create/update **expected** resources

- HTTP service
- TLS certificates (secret)
- Users (secret)
- Keystore (secret)
- ES configuration (configmap)
- ES Nodes StatefulSets (Pod + PersistentVolume)

Interact with the **Elasticsearch API**

- Change cluster settings
- Migrate data
- Prepare for rolling upgrade

```
apiVersion: elasticsearch.k8s.elastic.co/v1beta1
kind: Elasticsearch
metadata:
  name: elasticsearch-sample
spec:
  version: 7.10.0
  nodeSets:
  - name: default
    count: 1
```

```
  podTemplate:
    metadata:
      labels: {"foo": "bar"}
    spec:
      affinity:
        nodeAffinity:
          requiredDuringSchedulingIgnoredDuringExecution:
            nodeSelectorTerms:
            - matchExpressions:
              - key: environment
                operator: In
                values: ["e2e", "production"]
      containers:
      - name: elasticsearch
        env:
        - name: ES_JAVA_OPTS
          value: "-Xms2g -Xmx4g"
```

Empower users
But provide good defaults

optional podTemplate

```
apiVersion: elasticsearch.k8s.elastic.co/v1
kind: Elasticsearch
metadata:
  name: elasticsearch-sample
spec:
  version: 7.10.0
  nodeSets:
  - name: master-nodes
    count: 3
    config:
      node.master: true
      node.data: false
  - name: data-nodes
    count: 3
    config:
      node.master: false
      node.data: true
```

volumeClaimTemplates:

```
- metadata:
  name: elasticsearch-data
```

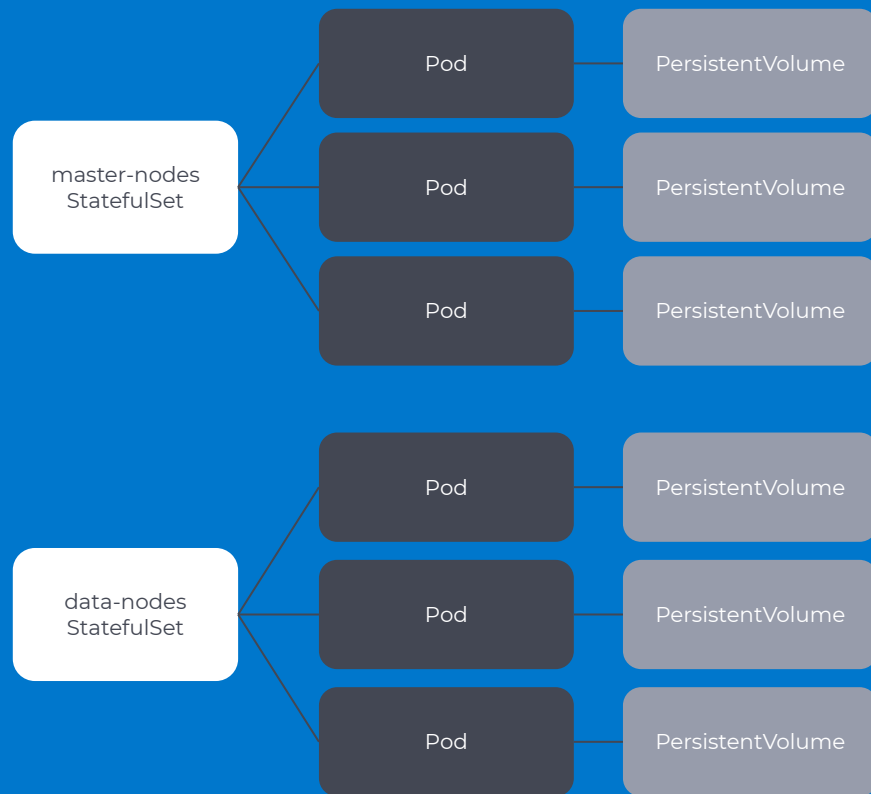
spec:

resource:

requests:

```
storage: 100Gi
```

```
storageClassName: <name>
                  (gce-pd)
                  (aws-ebs)
                  (local-storage)
                  (your-own)
```



Elastic Operator

Elastic Cloud on Kubernetes

Deploy

Elasticsearch, Kibana, APM Server, Beats and Enterprise Search

On Kubernetes

Vanilla, OpenShift, GKE, EKS, AKS, etc.

Simple integration

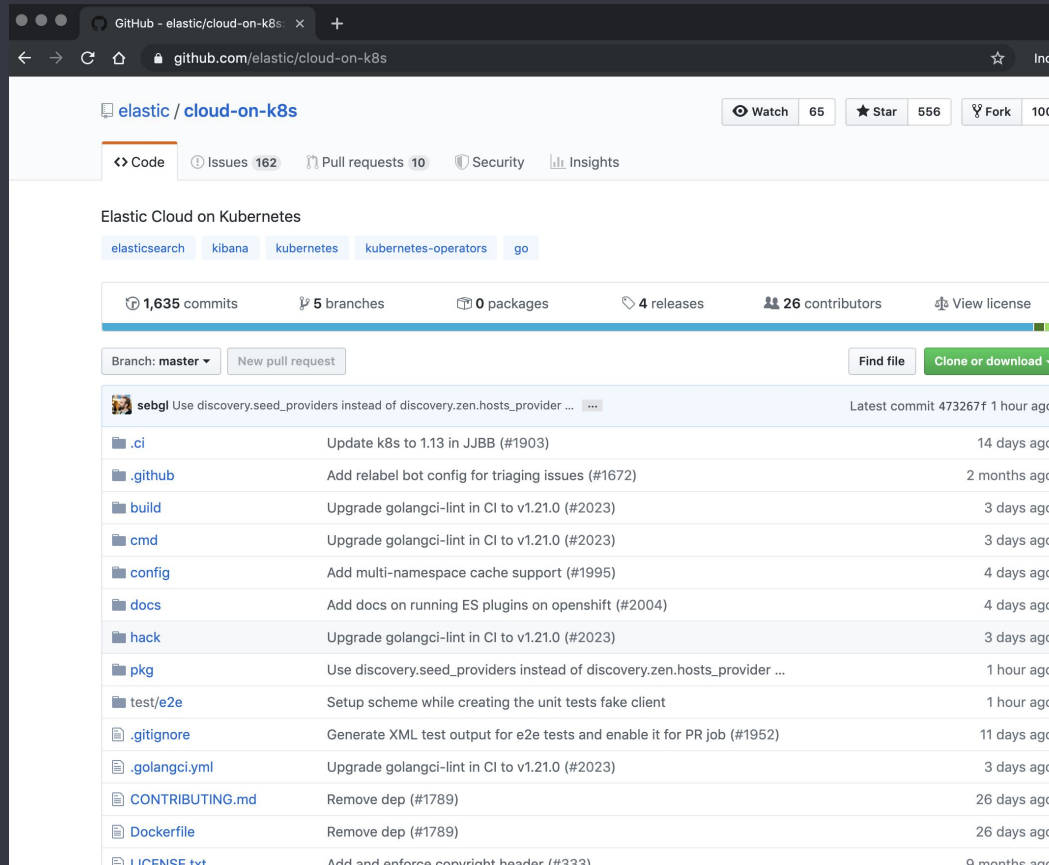
kubectrl & usual k8s tooling

Advanced topologies

Hot/warm/cold, dedicated masters

Smooth operations

Scale up/down, rolling upgrade, version upgrade



The screenshot shows the GitHub repository page for `elastic/cloud-on-k8s`. The repository is under the `elastic` organization. It has 65 watchers, 556 stars, and 10 forks. The repository is categorized under `Code`, `Issues` (162), `Pull requests` (10), `Security`, and `Insights`. The repository is titled `Elastic Cloud on Kubernetes` and includes a search bar with filters for `elasticsearch`, `kibana`, `kubernetes`, `kubernetes-operators`, and `go`. The repository statistics show 1,635 commits, 5 branches, 0 packages, 4 releases, 26 contributors, and a `View license` button. The `Branch: master` dropdown and `New pull request` button are visible. The `Find file` and `Clone or download` buttons are also present. The commit history table lists the following commits:

Commit	Message	Time ago
sebgl	Use discovery.seed_providers instead of discovery.zen.hosts_provider ...	Latest commit 473267f 1 hour ago
	Update k8s to 1.13 in JJBB (#1903)	14 days ago
	Add relabel bot config for triaging issues (#1672)	2 months ago
	Upgrade golanci-lint in CI to v1.21.0 (#2023)	3 days ago
	Upgrade golanci-lint in CI to v1.21.0 (#2023)	3 days ago
	Add multi-namespace cache support (#1995)	4 days ago
	Add docs on running ES plugins on openshift (#2004)	4 days ago
	Upgrade golanci-lint in CI to v1.21.0 (#2023)	3 days ago
	Use discovery.seed_providers instead of discovery.zen.hosts_provider ...	1 hour ago
	Setup scheme while creating the unit tests fake client	1 hour ago
	Generate XML test output for e2e tests and enable it for PR job (#1952)	11 days ago
	Upgrade golanci-lint in CI to v1.21.0 (#2023)	3 days ago
	Remove dep (#1789)	26 days ago
	Remove dep (#1789)	26 days ago
	Add and enforce copyright header (#333)	9 months ago

Elastic Cloud on Kubernetes Operator

1.3.0 just released!

1.3.0

- Red Hat OpenShift Certified Operator
- Volume expansion support
- Helm chart for the operator
- IPv6 support



Demo



Docs and Quickstart <https://www.elastic.co/guide/en/cloud-on-k8s>

Code <https://github.com/elastic/cloud-on-k8s>

Sebastien Guilloux on our experience writing an operator
<https://www.youtube.com/watch?v=wMqzAOp15wo>