OpenSearchCon

NORTH AMERICA | San Francisco 2024

LET YOUR OPENSEARCH CLUSTER MONITOR ITSELF

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CERN

Uncover what the universe is made of & how it works

- 17,000 people from all over the world
- Particle accelerator facilities
- Push the frontiers of science and technology

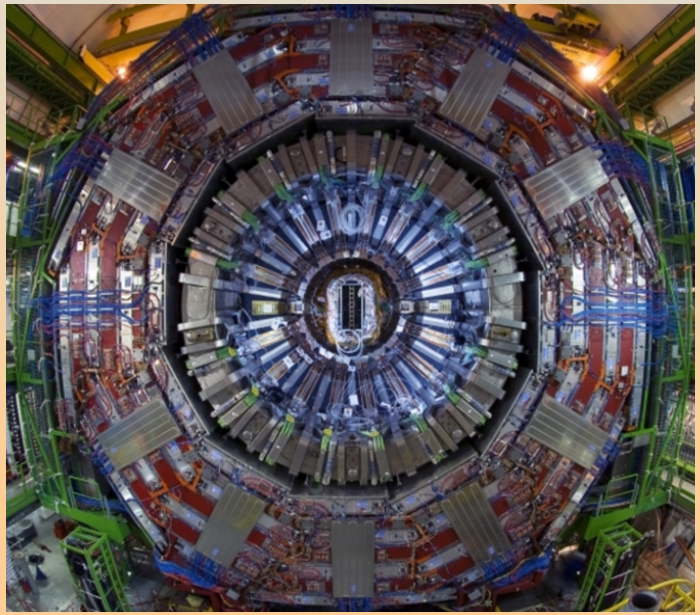
CERN | 1954-2024 70 YEARS / ANS CERN

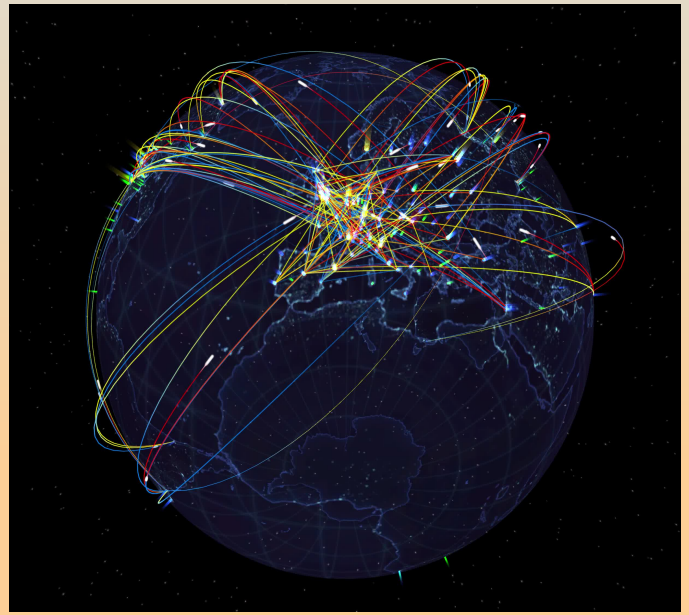
Worldwide LHC Computing Grid

Generating
1 PB per second
only 1% is kept
(interesting events)

CERN data center
data reconstruction
tape archival
data distribution

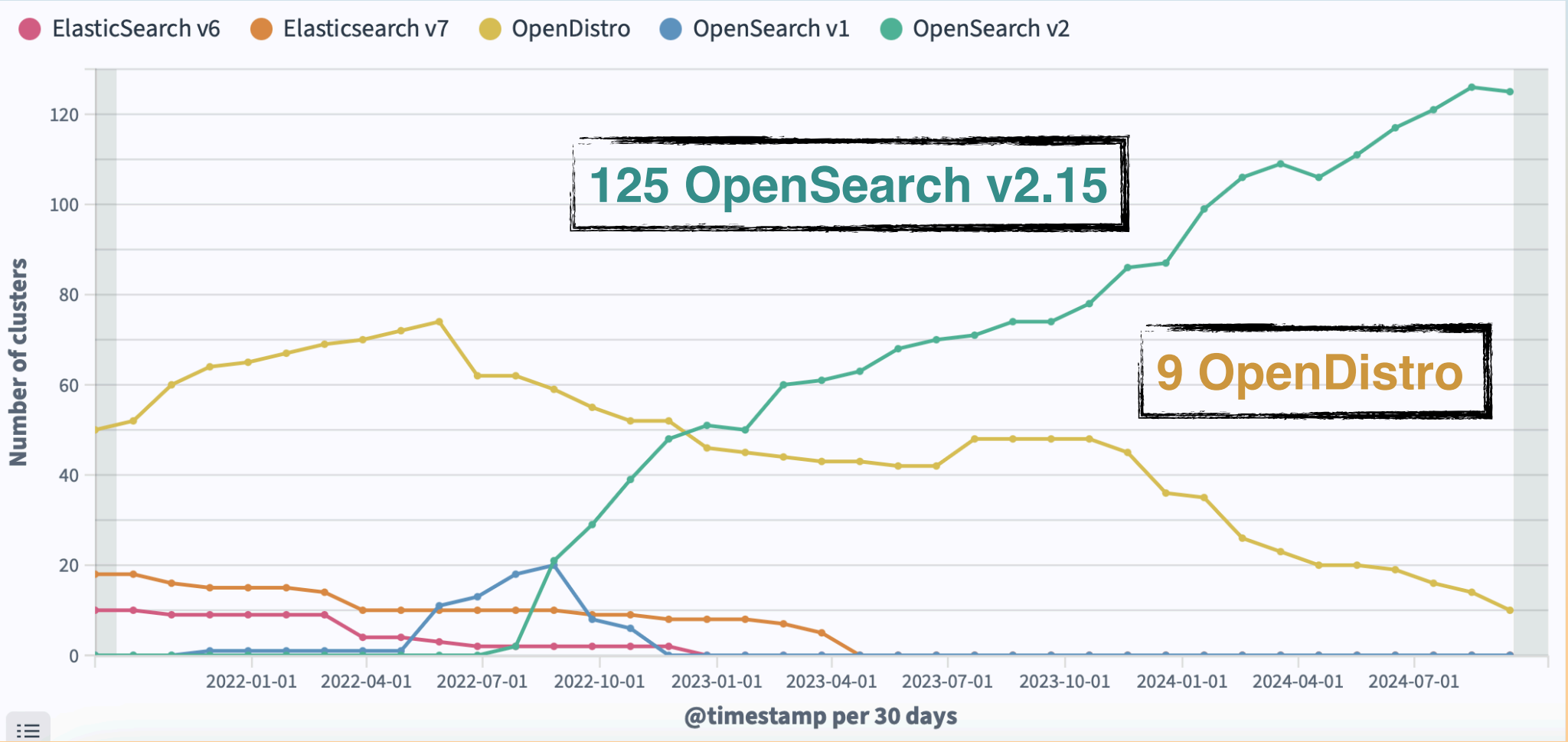
170 centers
36 countries
~200 PB of data/year
data analysis





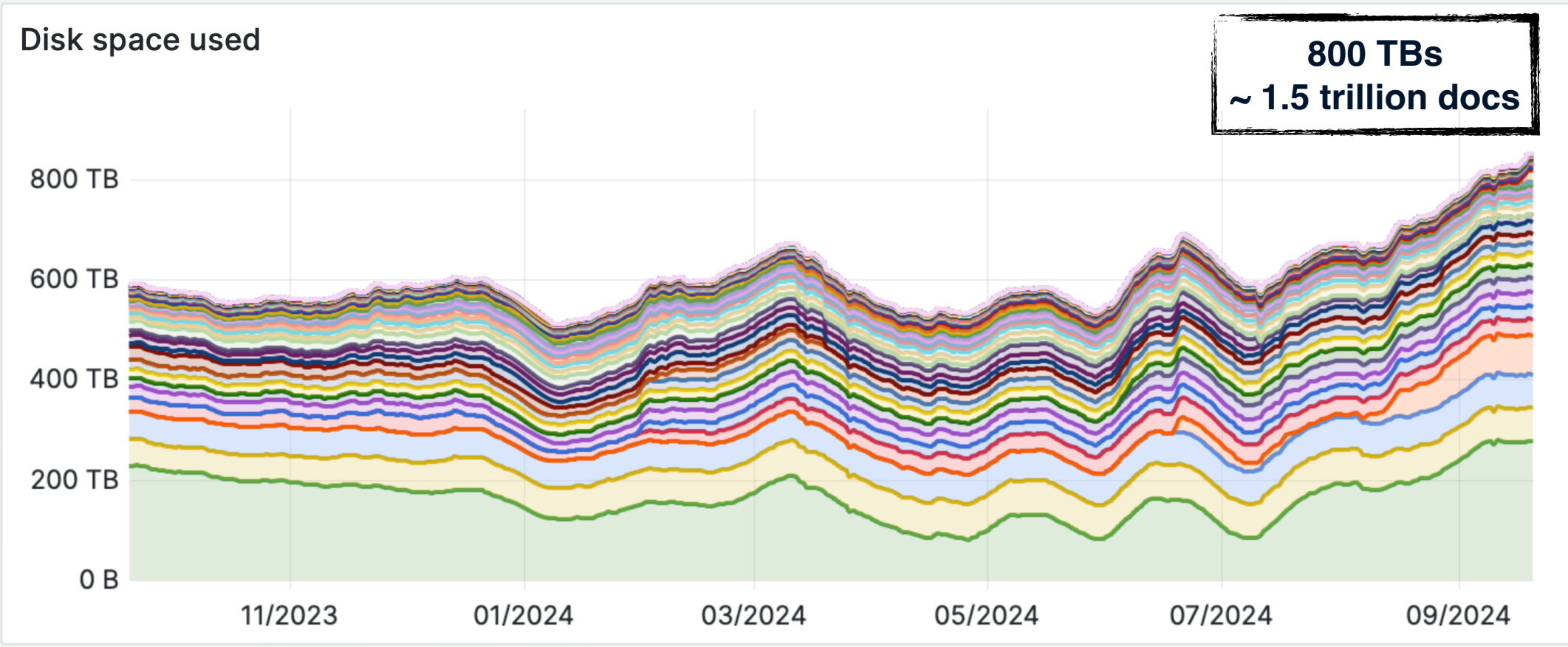
OpenSearch Service at CERN

From Elasticsearch to OpenDistro to OpenSearch



OpenSearch Service at CERN

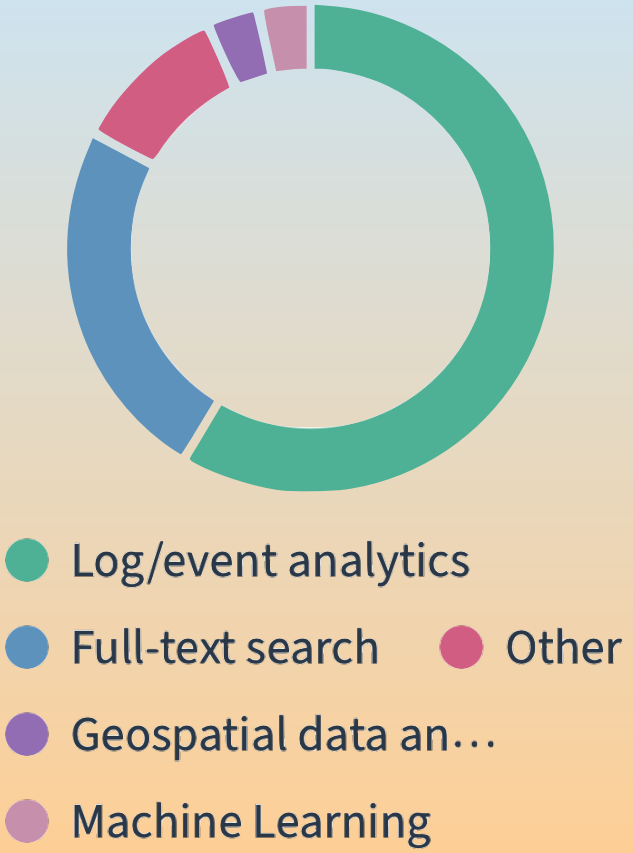
Used disk space evolution over the past 3 years



OpenSearch Service at CERN

Who is using it?

- Experiments
  - ATLAS, CMS, ALICE, LHCb, etc.
- HEP community search engines
  - Zenodo & Inspire
- IT
  - Security, Monitoring, Storage, etc.
- WLCG monitoring

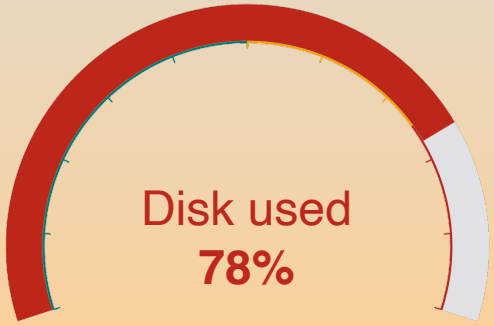


What is the challenge?

Addressing common poor practices in OpenSearch usage

- Growing number of OpenSearch clusters
- Observed common bad practices on OpenSearch usage
  - Leading to high resource utilization & poor performance

Too big shards



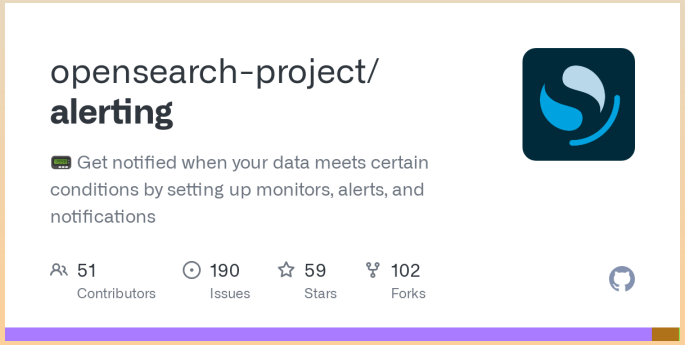
Node getting full

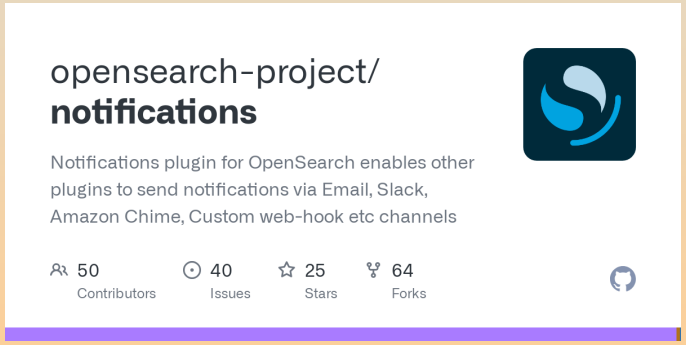
Too many shards

WHAT IS THE CHALLENGE?

Addressing common poor practices in OpenSearch usage

- Part of the responsibility falls on our customers' shoulders
  - Each one has a different communication channel
- **Alerting** & **Notifications** plugins come to the rescue!





MONITORING USAGE ATTEMPTS

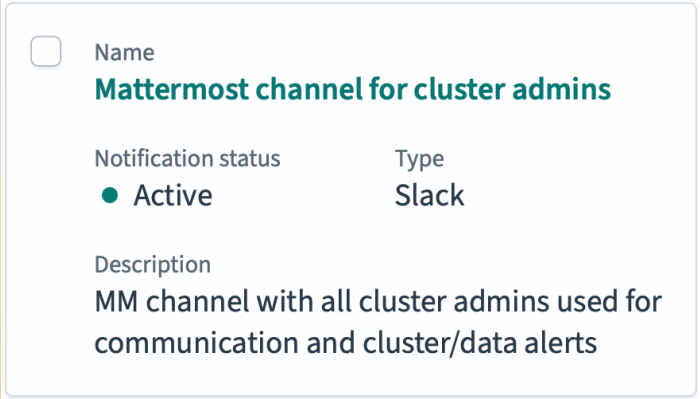
Attempt 1: Centralized monitoring cluster

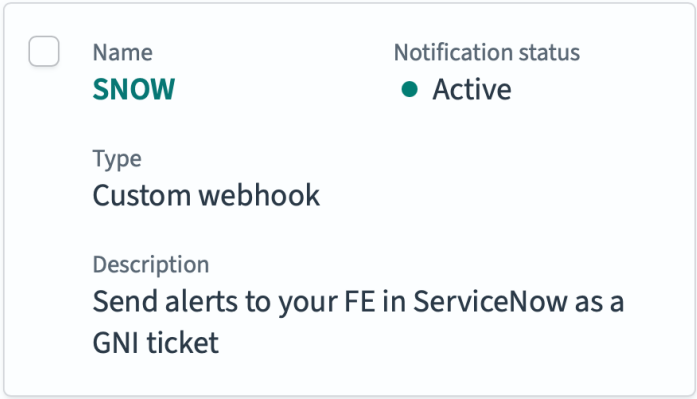
- Query customers' cluster APIs
  - Using e.g., Logstash
- Store responses in central cluster
- Create Monitors on top of those
- 100s of Notification channels
- One *trigger* for each cluster
  - limited to 10 triggers

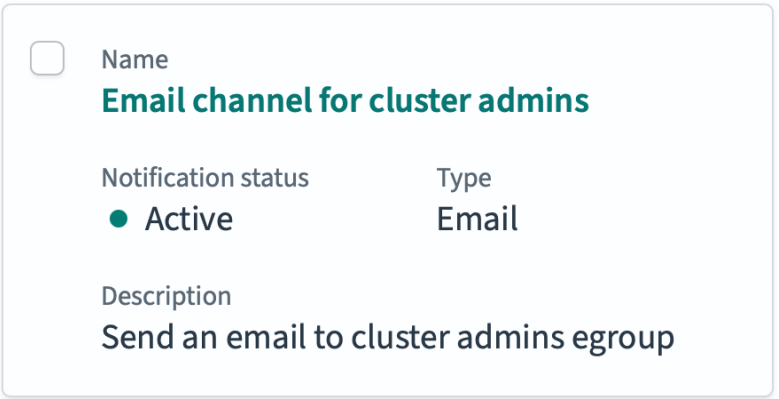
MONITORING USAGE ATTEMPTS

Attempt 2: Decentralized monitoring

- Create **default notification channels** upon cluster bootstrap
  - Slack, Email, Webhook, etc.







MONITORING USAGE ATTEMPTS

Attempt 2: Decentralized monitoring

- Create **default monitors** upon cluster bootstrap
  - Analyzing all common OpenSearch usage problems
  - Targeting respective notification channels

Node stats

Cluster health

Shards number

Snapshots

Disk watermarks

Tasks

Zero replicas

Cluster managers

Transient settings

Shards size

Indexes size

DECENTRALISED MONITORING

Pros and cons

- No single point of failure
- Better scalability
- No need to store metrics
- No external tools/dependencies

- Maintain monitoring objects across clusters
- Does not work if cluster is down

DECENTRALISED MONITORING

Implementation: Scripting

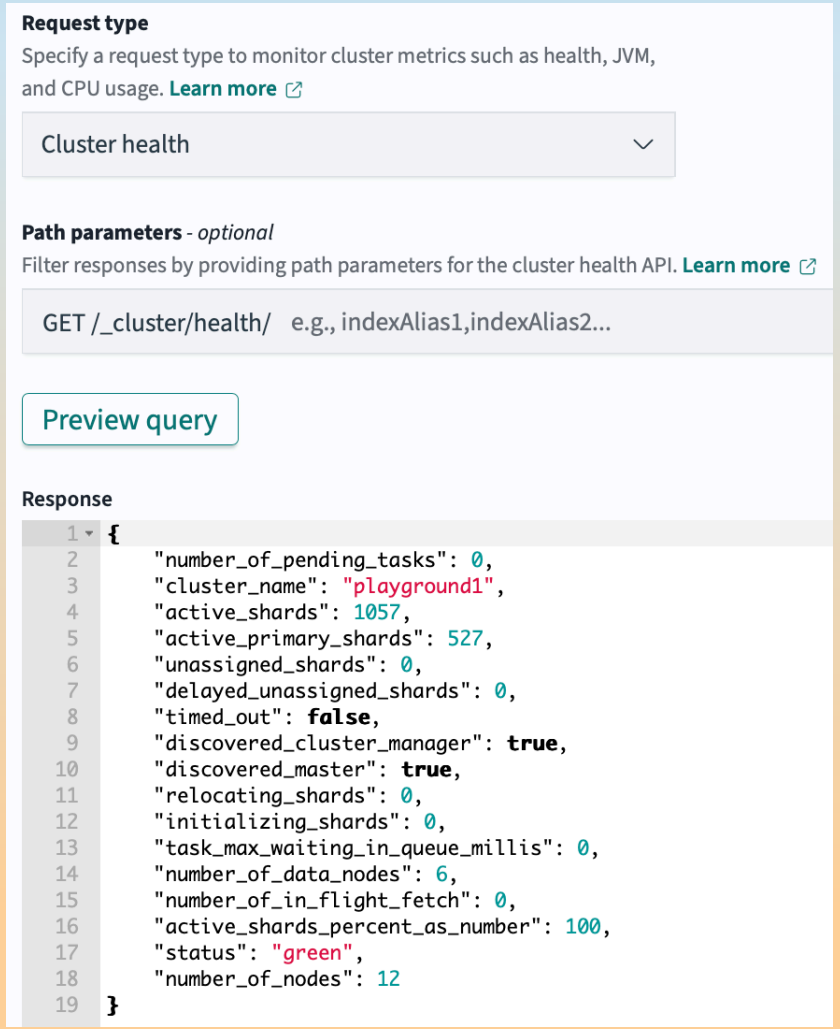
- Clusters config is stored in yaml files on GitLab
  - Customer channels
  - Allocated resources
- Created 12 monitor templates
  - Placeholders for cluster-specific values
  - Placeholders for notification channel
- Using *opensearch-py* library to create objects

- {..} cluster_health.json
- {..} cluster_health_yellow.json
- {..} cluster_managers.json
- {..} disk_watermarks.json
- {..} indexes_size.json
- {..} node_stats.json
- {..} shards_number.json
- {..} shards_size.json
- {..} snapshots.json
- {..} tasks.json
- {..} transient_settings.json
- {..} zero_replicas.json

DECENTRALISED MONITORING

Implementation: Monitor configuration

- Using **Per cluster metrics** monitors
- Periodic API calls, e.g.,
  - GET _cluster/health
  - GET _cluster/stats
  - GET _node/stats
- Set trigger conditions based on responses
- Notify the appropriate channel



DECENTRALISED MONITORING

Implementation: Monitor configuration

```
{
  "name": "Shards number",
  "type": "monitor",
  "monitor_type": "cluster_metrics_monitor",
  …
  "inputs": [
    {
      "uri": {
        "api_type": "CLUSTER_HEALTH",
        "path": "_cluster/health",
        …
  …
```

```
…
"subject_template": {
  "source": "High number of shards in cluster
**__cluster_name__**"
…
}
```

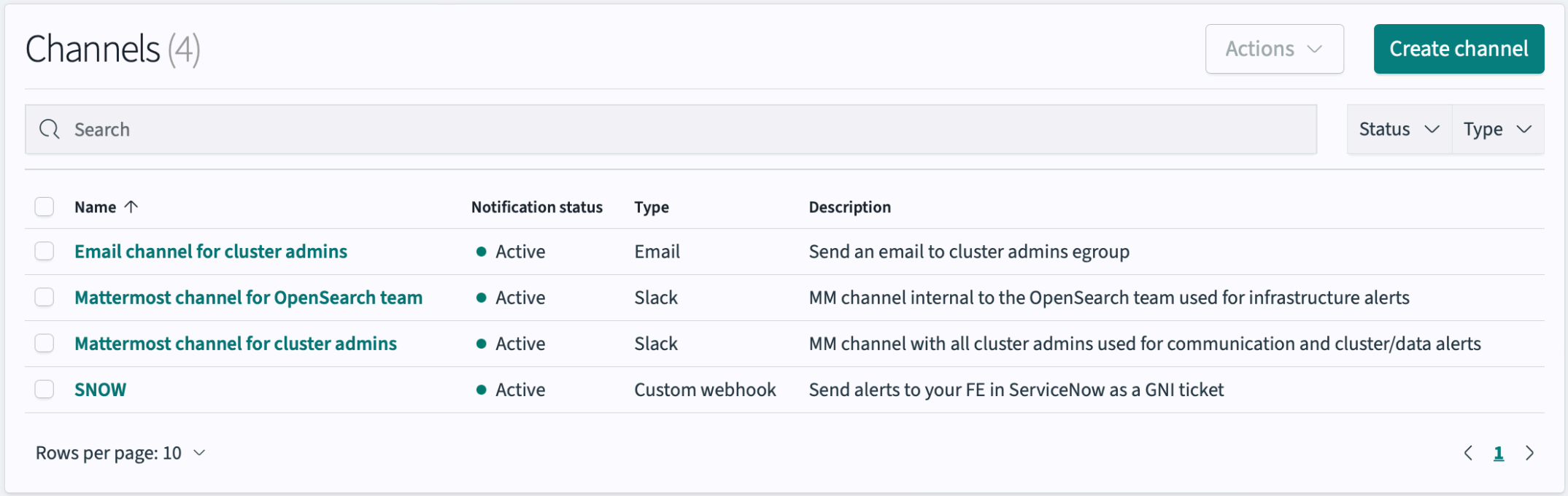
```
"actions": [
   {
      "name": "Notify Mattermost channel",
       "destination_id": "__customers_channel_id__",
       "message_template": { …

 - shards per data node:
       **{{ctx.results.0.shards_per_node}}**
         (threshold: __shards_number_threshold__)

Check your [index policies]
(https://__cluster_alias__.cern.ch/.../index-policies)
…
]
```

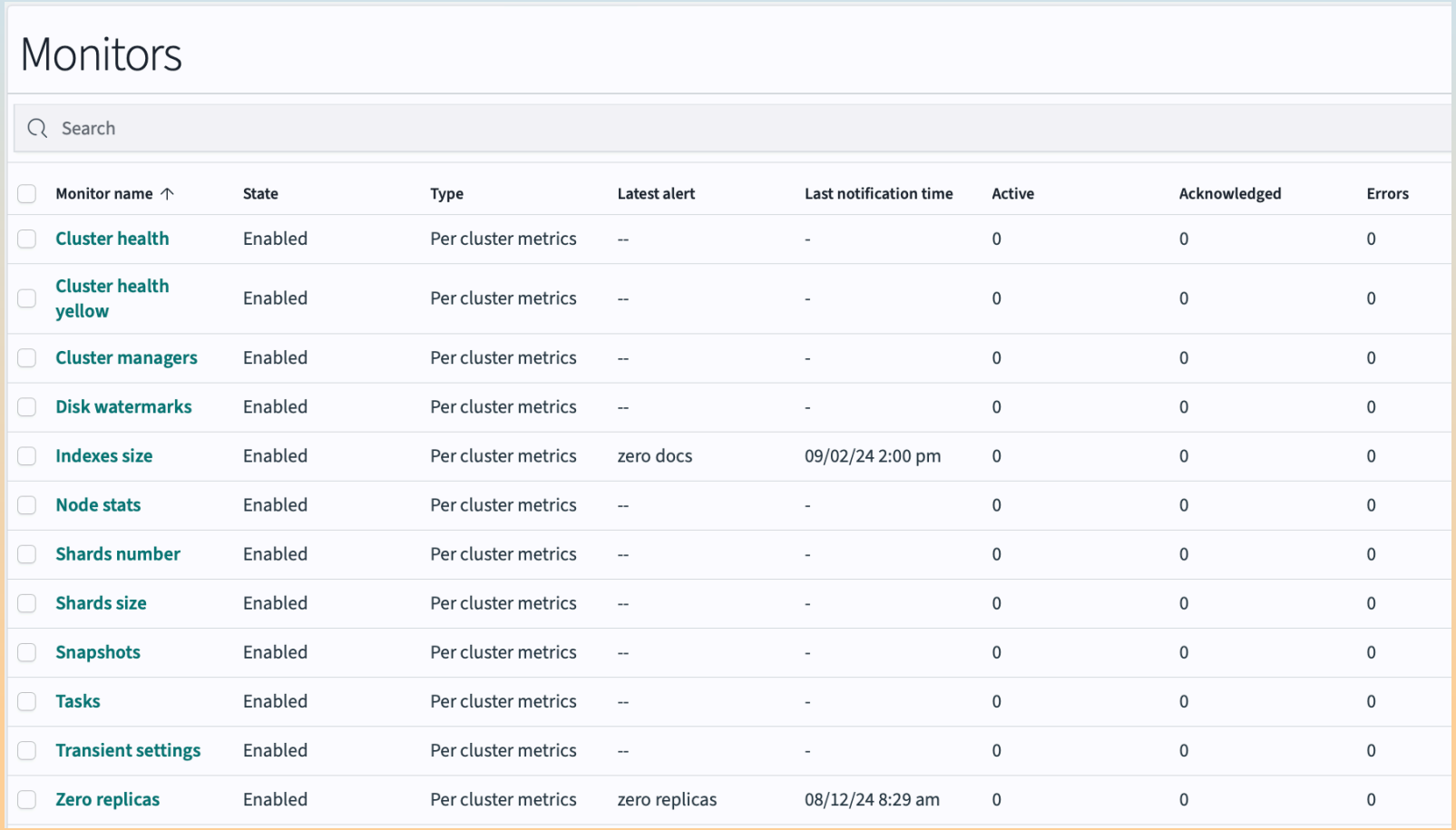
DECENTRALISED MONITORING

OpenSearch Dashboards UI: Notification channels



DECENTRALISED MONITORING

OpenSearch Dashboards UI: Monitors



Monitors

Search

Monitor name	State	Type	Latest alert	Last notification time	Active	Acknowledged	Errors
Cluster health	Enabled	Per cluster metrics	--	-	0	0	0
Cluster health yellow	Enabled	Per cluster metrics	--	-	0	0	0
Cluster managers	Enabled	Per cluster metrics	--	-	0	0	0
Disk watermarks	Enabled	Per cluster metrics	--	-	0	0	0
Indexes size	Enabled	Per cluster metrics	zero docs	09/02/24 2:00 pm	0	0	0
Node stats	Enabled	Per cluster metrics	--	-	0	0	0
Shards number	Enabled	Per cluster metrics	--	-	0	0	0
Shards size	Enabled	Per cluster metrics	--	-	0	0	0
Snapshots	Enabled	Per cluster metrics	--	-	0	0	0
Tasks	Enabled	Per cluster metrics	--	-	0	0	0
Transient settings	Enabled	Per cluster metrics	--	-	0	0	0
Zero replicas	Enabled	Per cluster metrics	zero replicas	08/12/24 8:29 am	0	0	0

ALERTING EXAMPLES

High number of shards in a node

opensearch BOT 14:00

High number of shards in cluster **zenodo-prod1**

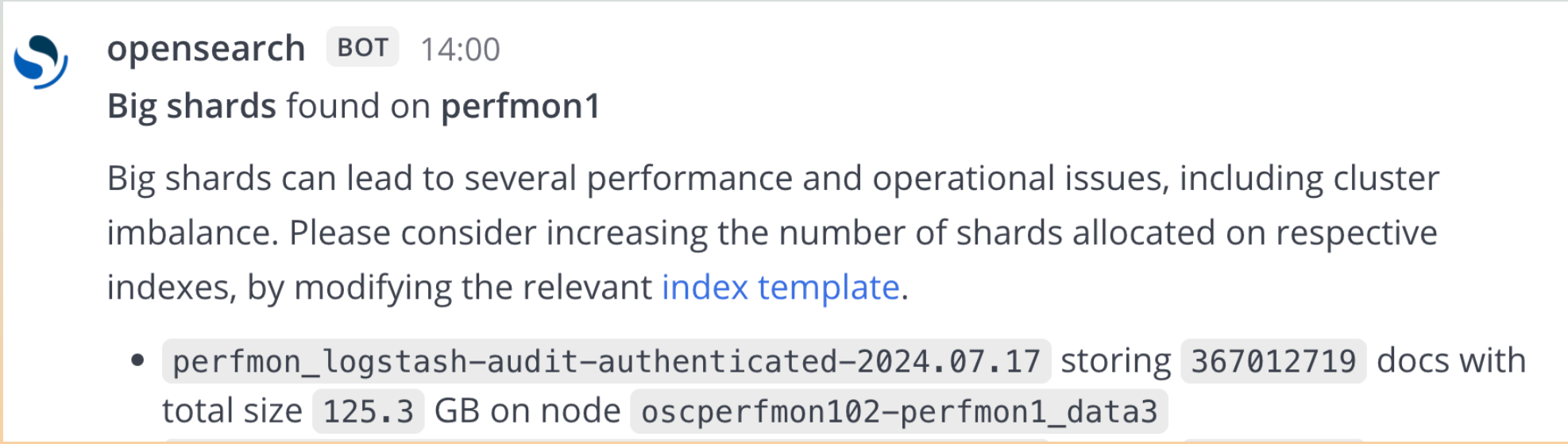
Each index consists of shards, typically 1 + 1 replica and they capture space in memory. The cluster is currently configured to handle less shards than it actually does and this may lead to performance issues.

- shards: **1192**
- data nodes: **3**
- shards per data node: **397** (threshold: 240)

Please ensure your index policies are set up properly. Also, often times you have a high number of small shards, which you can reduce by moving from daily indices (YYYY-MM-DD) to monthly ones (YYYY-MM), as explained here.
If in doubt, please contact the OpenSearch service managers for assistance.

Alerting examples

Too big shards



ALERTING EXAMPLES

Zero replicas

opensearch BOT 17:59

⚠️ Zero replicas found on some **tiny1** indexes ⚠️

Setting zero replicas for an index is highly discouraged as it makes your data vulnerable to permanent loss in the event of a node failure. In production environments, it's essential to have replicas for data redundancy and high availability.

In order to fix it, run the following command from your devtools console:

```
PUT index_name/_settings
{
  "settings": {
    "number_of_replicas": 1
  }
}
```

Then, ensure that you do not have any index template that sets replicas to "0" for new indexes.

ALERTING EXAMPLES

Index with zero docs

opensearch BOT 14:00

Indexes with **zero docs** found in **cds-ils1**

This is a bad practice. Please **take one of the following actions**:

- if they are no longer useful, simply delete them by running the following command from your devtools console:

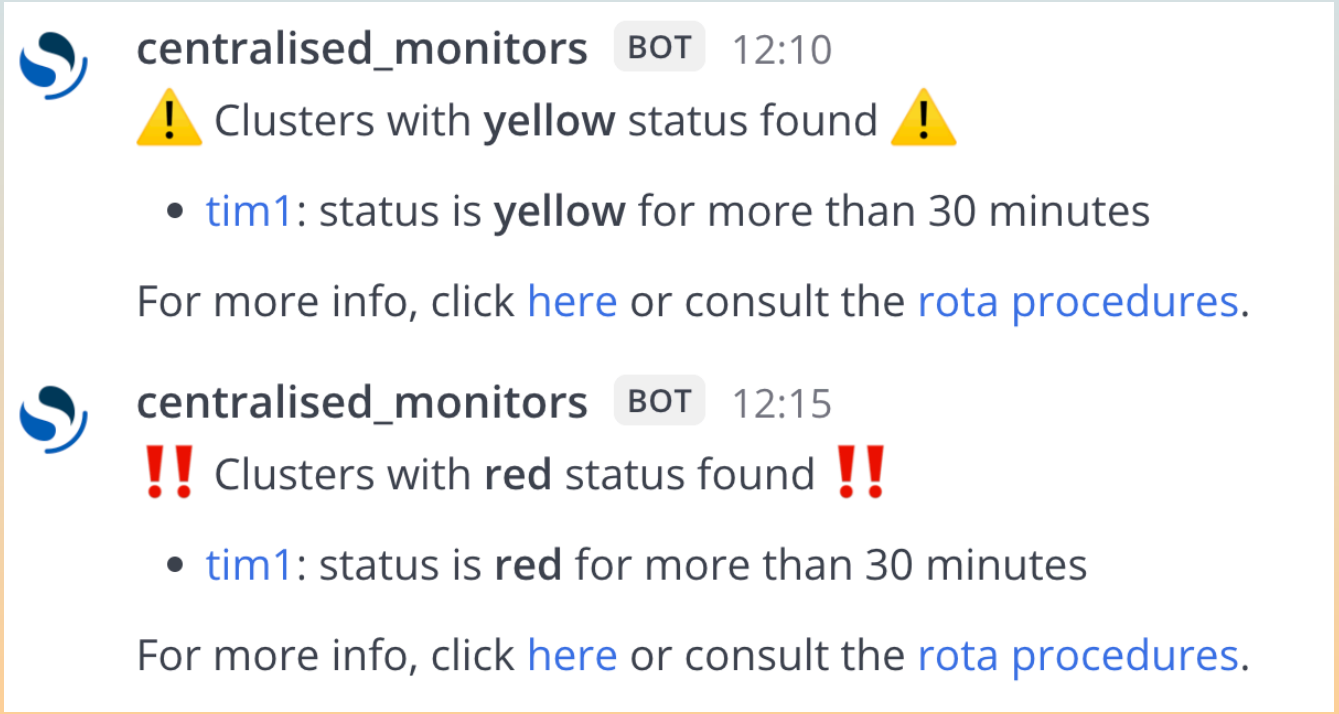
```
DELETE eitems-eitem-v1.0.0
DELETE eitems-eitem-v2.0.0-1718273496
DELETE items-item-v1.0.0-1678463505
DELETE series-series-v1.0.0-1678463505
```

- if they are still used, but have a low document rate, convert your index to rotate on monthly or yearly basis.

If in doubt, please contact the OpenSearch service managers for assistance.

Alerting examples

Cluster health



SUMMARY

Stay on the optimal path, or get alerted!

- The decentralised monitor solution scales freely
- External monitoring is needed for cluster health
- Customers act upon informative alerts on the right channel
- Customers can trust that any missteps will trigger timely alerts