Understand, Visualize & Improve Continuous Integration

Alexander Reelsen
Community Advocate
alex@elastic.co | @spinscale

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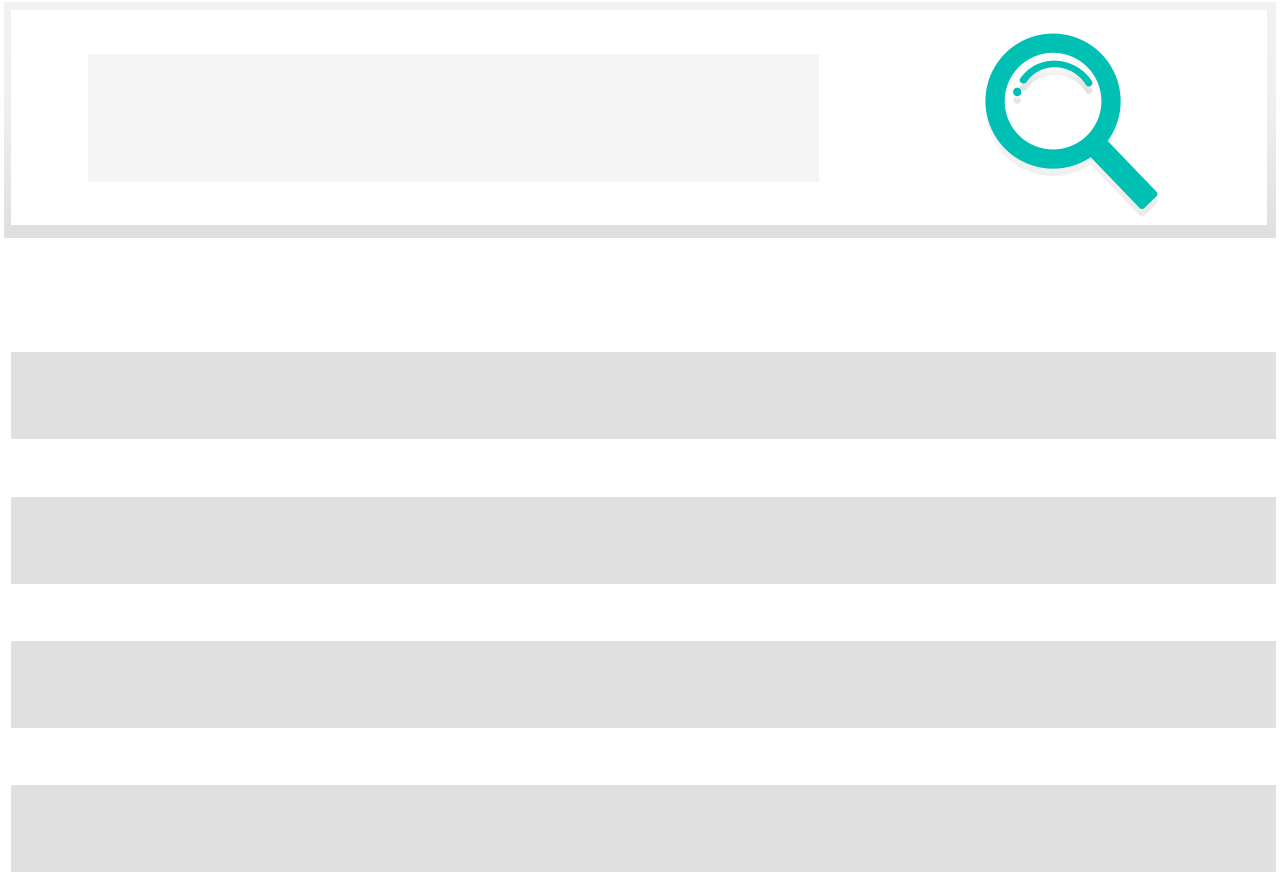
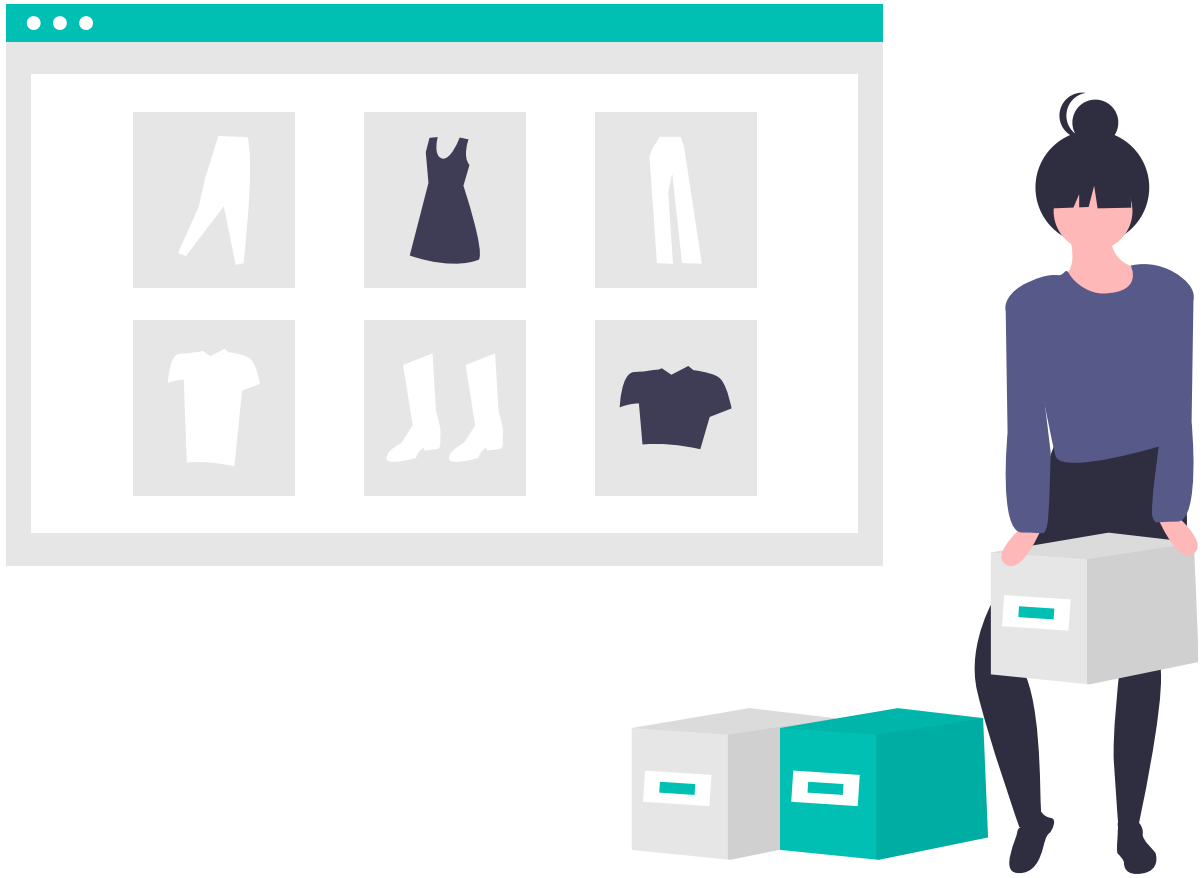
How do you act on your CI data?

Everything is a search problem!



Ecommerce

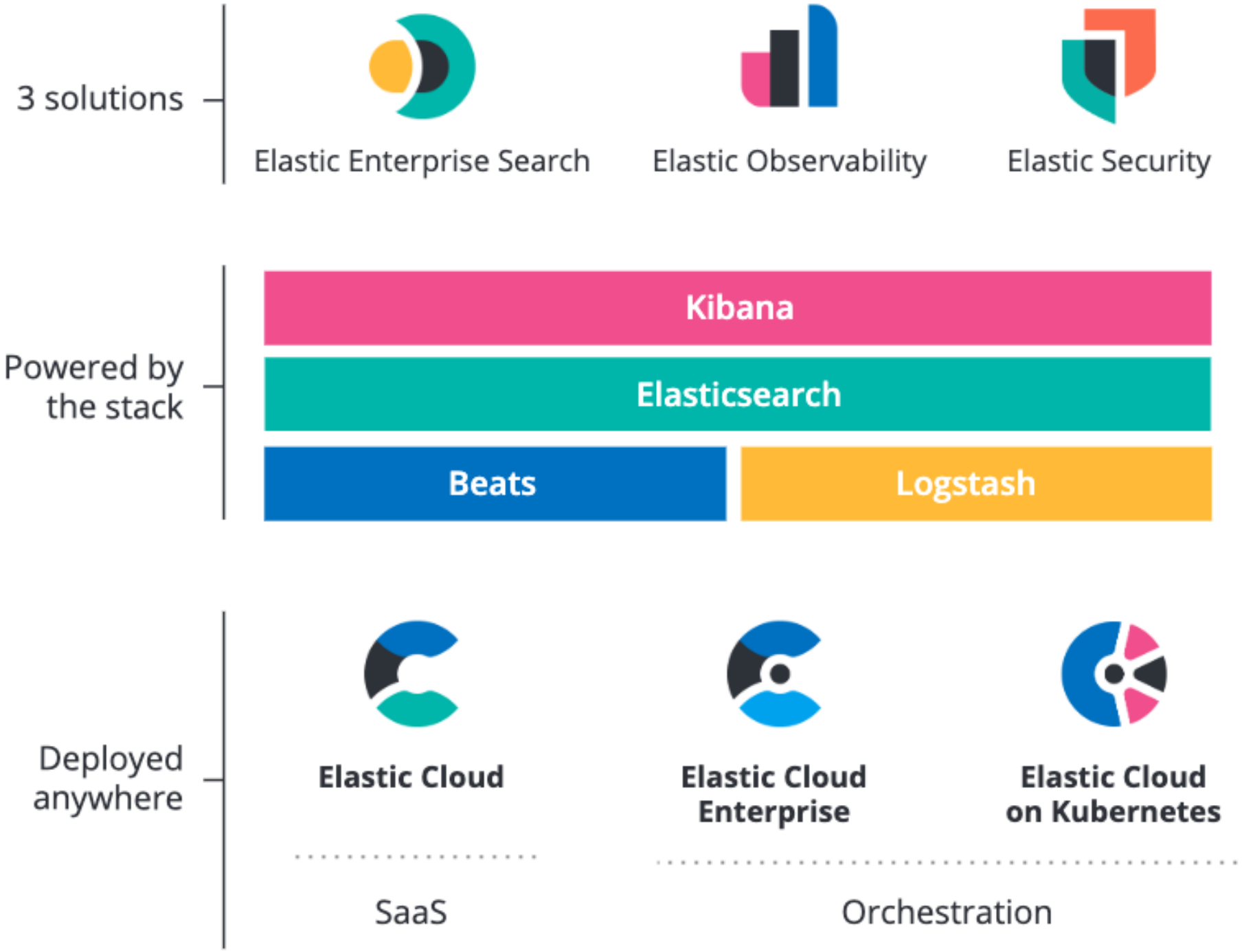


Social networks

File Search

Location Search

Observability


3 solutions
Elastic Enterprise Search
Elastic Observability
Elastic Security
Powered by the stack
Kibana
Elasticsearch
Beats
Logstash
Deployed anywhere
Elastic Cloud
Elastic Cloud Enterprise
Elastic Cloud on Kubernetes
SaaS
Orchestration

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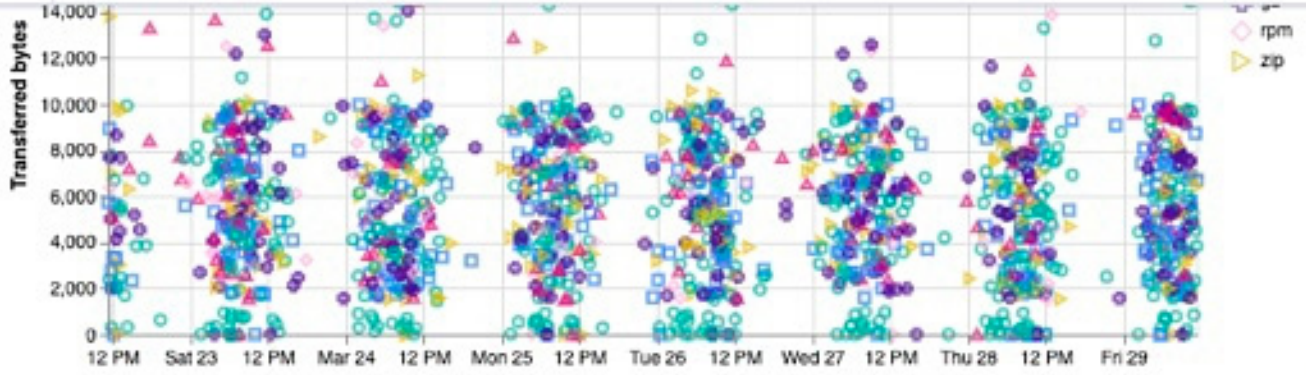
Elasticsearch in one minute

- Search Engine (FTS, Analytics, Geo), near real-time
- Distributed, scalable, highly available, resilient
- Interface: HTTP & JSON
- Heart of the Elastic Stack (Kibana, Logstash, Beats)

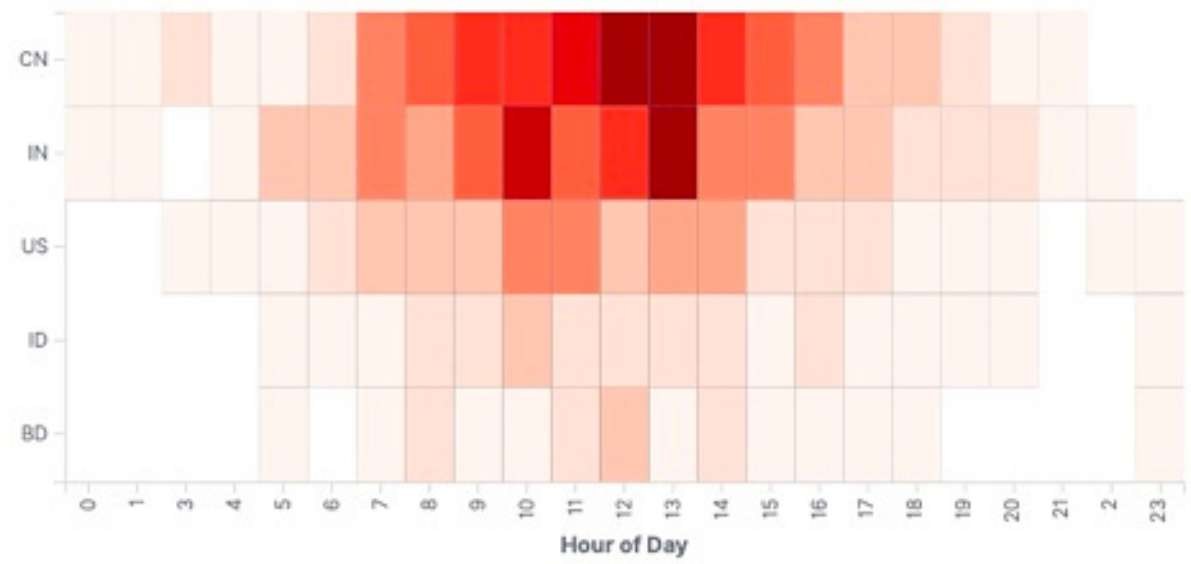
Kibana in one minute

- The window into the Elastic Stack
- Visualization & Dashboarding
- Management
- Monitoring

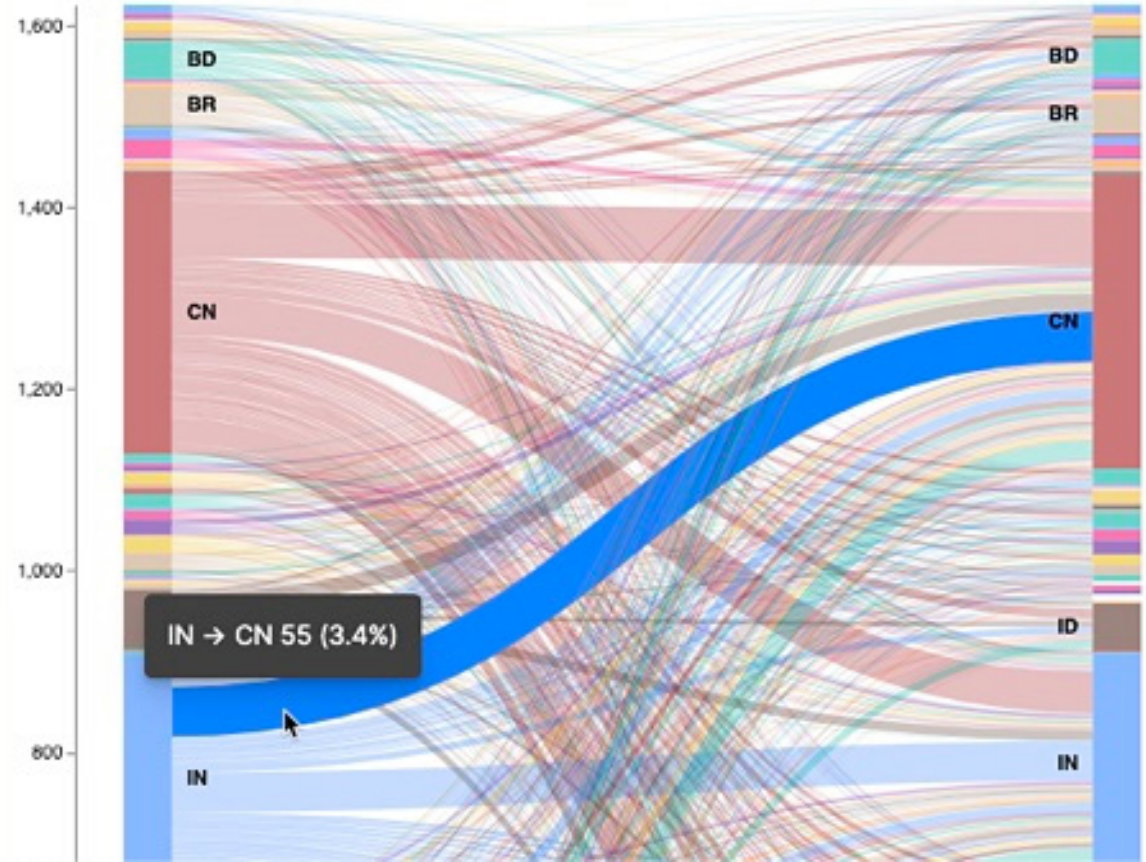


gz	1.594MB	34.493KB	283	7
css	1.385MB	12.378KB	270	2
zip	1.257MB	6.654KB	212	3
deb	1.085MB	6.844KB	173	1
rpm	458.989KB	0B	71	0

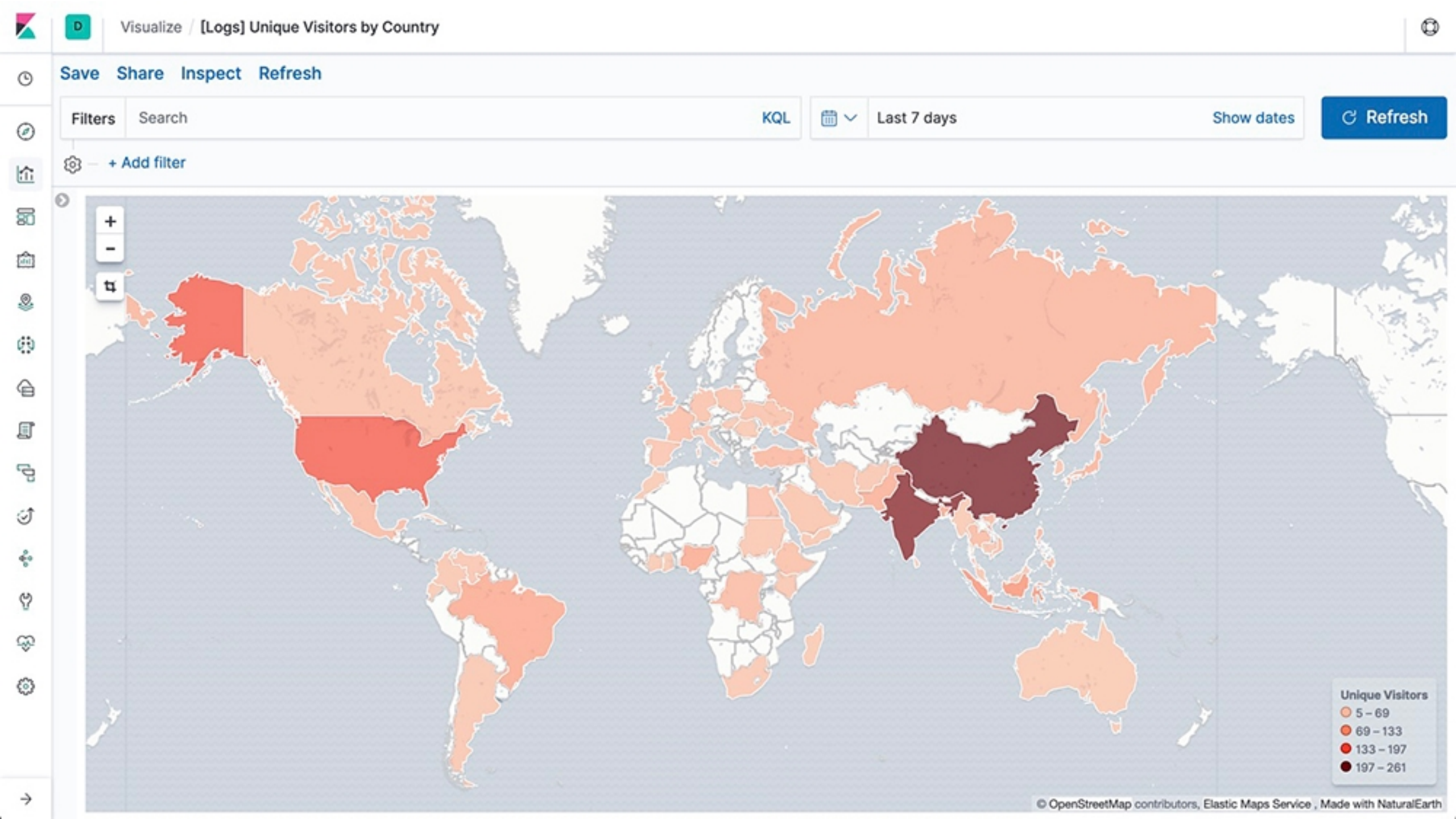
[Logs] Heatmap



[Vega] Source and Destination Sankey Chart



[Logs] Unique Visitors by Country


D
Visualize / [Logs] Unique Visitors by Country
Save Share Inspect Refresh
Filters
Search
KQL
Last 7 days
Show dates
Refresh
+ Add filter
Unique Visitors
5 – 69
69 – 133
133 – 197
197 – 261
© OpenStreetMap contributors, Elastic Maps Service , Made with NaturalEarth

Auto apply

The changes will be automatically applied.

Data | Panel options | Annotations

Data sources

Index pattern (required): kibana_sample_data_logs

Time field (required): timestamp

Query string: tags:error AND tags:security

Ignore global filters?: Yes / No

Ignore panel filters?: Yes / No

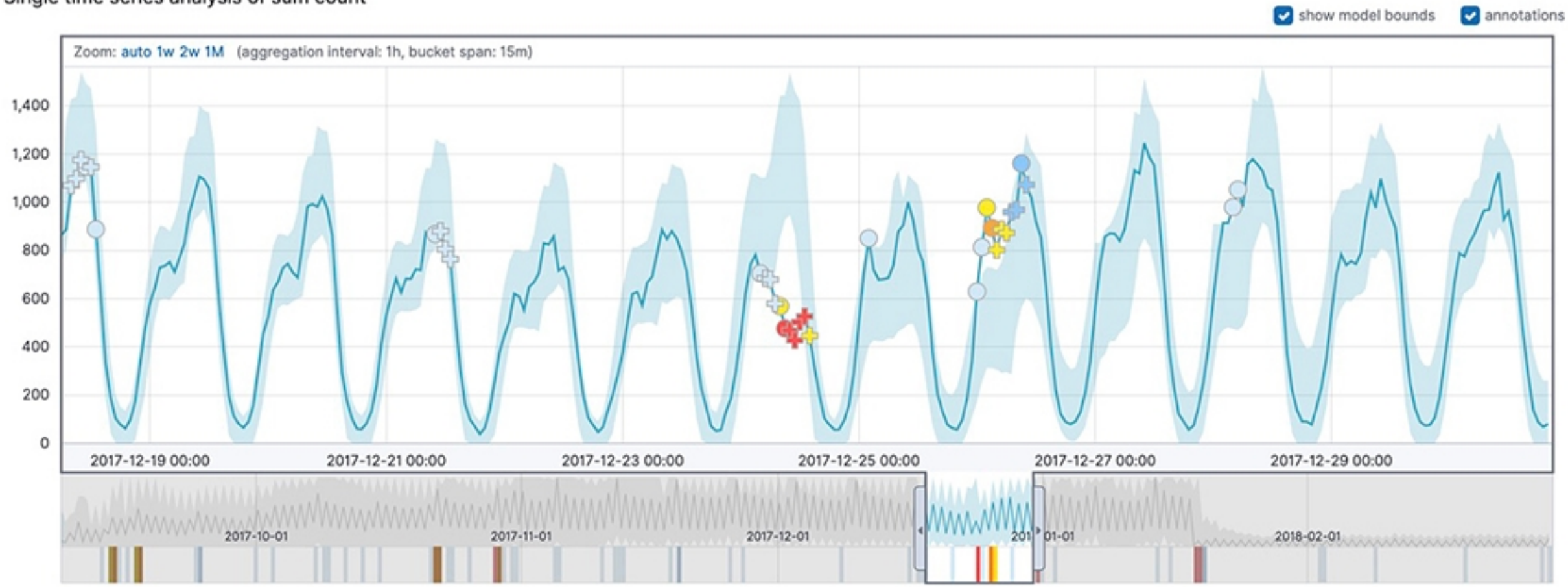
Icon (required): Asterisk

Fields (required - comma separated paths): geo.src, host

Row template (required): Security Error from {{geo.src}} on {{host}}

eg. `{{field}}`

Single time series analysis of sum count

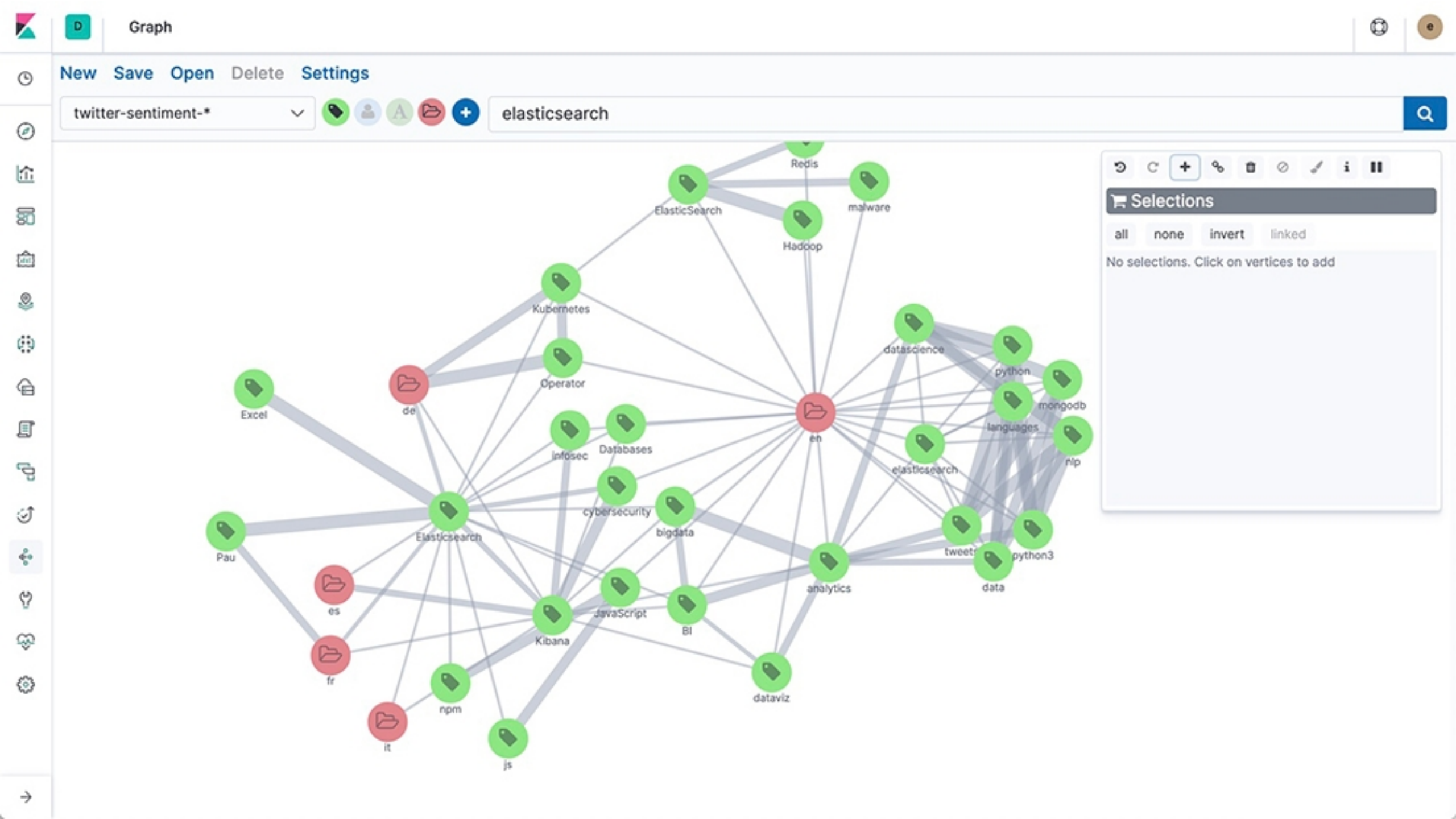


Anomalies

Severity threshold minor

Interval Auto

time	max severity	detector	actual	typical	description	actions
December 24th 2017, 11:00	96	non_zero_count	393	1186	3x lower	
December 24th 2017, 10:00	92	non_zero_count	437	1242.5	3x lower	


Graph
New
Save
Open
Delete
Settings
twitter-sentiment-*
elasticsearch
Selections
all
none
invert
linked
No selections. Click on vertices to add
Redis
ElasticSearch
malware
Hadoop
Kubernetes
Operator
datascience
python
mongodb
languages
nlp
Excel
de
en
infosec
Databases
elasticsearch
cybersecurity
bigdata
Elasticsearch
Pau
tweets
python3
data
analytics
es
JavaScript
BI
Kibana
fr
dataviz
npm
it
js

Save

Search KQL Last 7 days Show dates Update

+ Add filter

kibana_sample_data_logs

Search for fields

Fields filtered 0

- agent.keyword
- byte
- clientip
- event.dataset
- extension.keyword
- geo.dest
- geo.src
- geo.srcdest
- host.keyword
- index.keyword
- ip

New visualization

Drop some fields here to start

Lens is a new tool for creating visualizations BETA

Make requests and give feedback

Stacked Bar Chart

kibana_sample_data_logs

X-axis

Drop a field here

Y-axis

Drop a field here

Split series

Drop a field here

Survey time!

CI Tooling

- Jenkins, JenkinsX, TeamCity, Bamboo
- Travis, CircleCI, GitLab CI
- Azure Pipelines, AWS CI/CD, Google CI/CD
- Others?

CI infrastructure

- Self Hosted on own infrastructure
- Self Hosted in the cloud
- CI-as-a-service

CI as a role

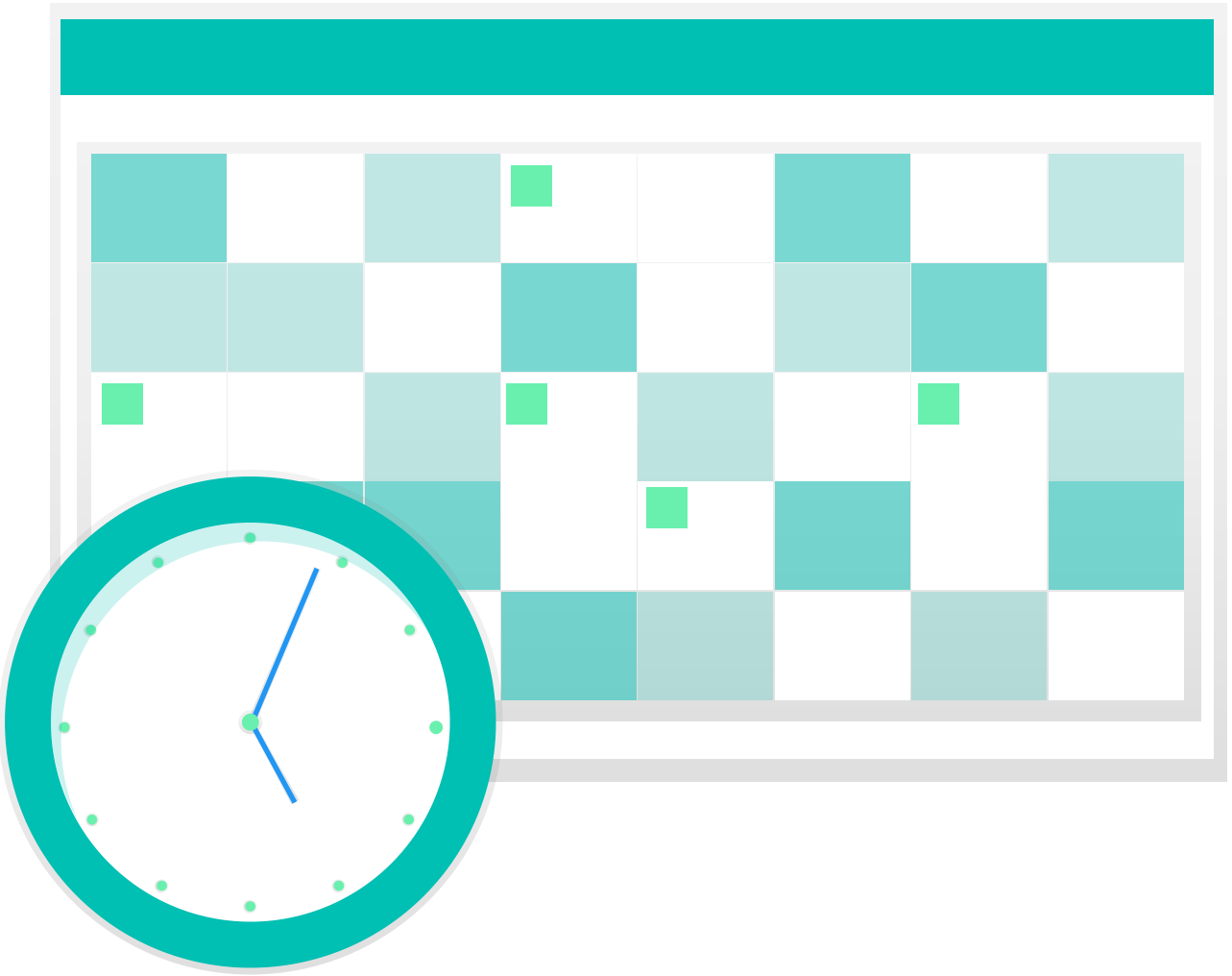
- CI is part of ops role
- CI is part of dev role
- Infrastructure Engineer
- Build Engineer

Test test test

- dev branches (master, 7.x)
- release branches (7.8, 6.8)
- feature branches
- PRs
- BWC
- Benchmarking
- Packaging tests
- JVM versions
- Garbage collectors
- Operating systems

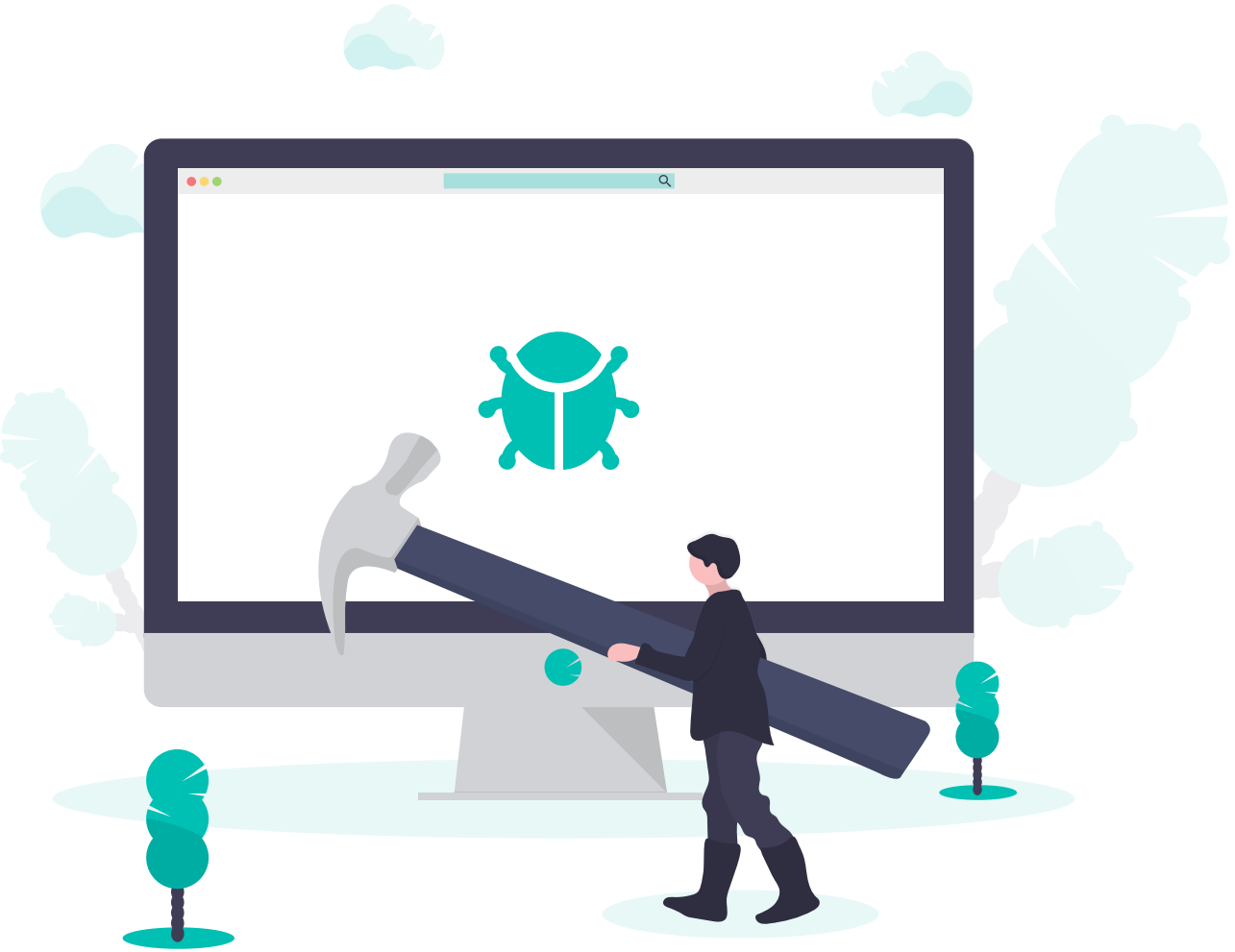
Do you act on CI results?

- If so, how?



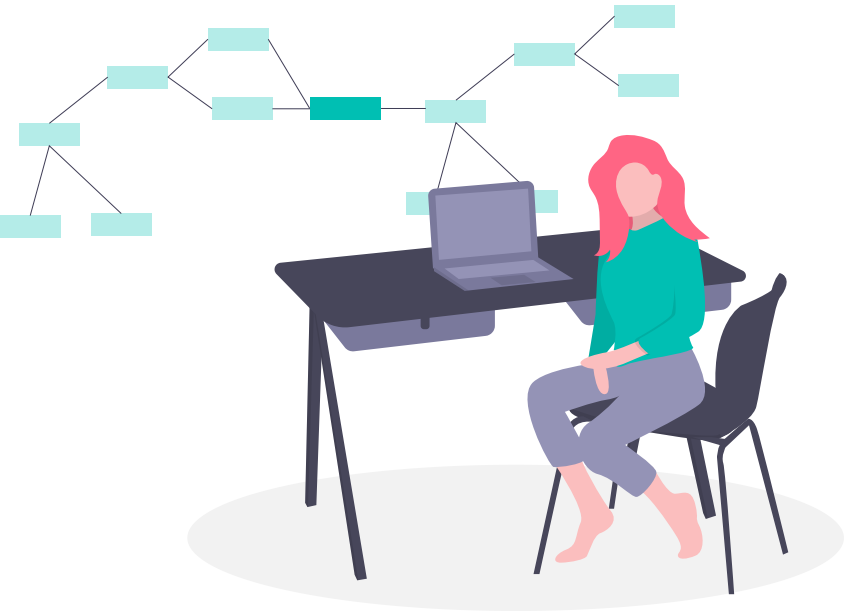
What is CI data?

- Time series
- Recency
- Locality
- Fragmentation



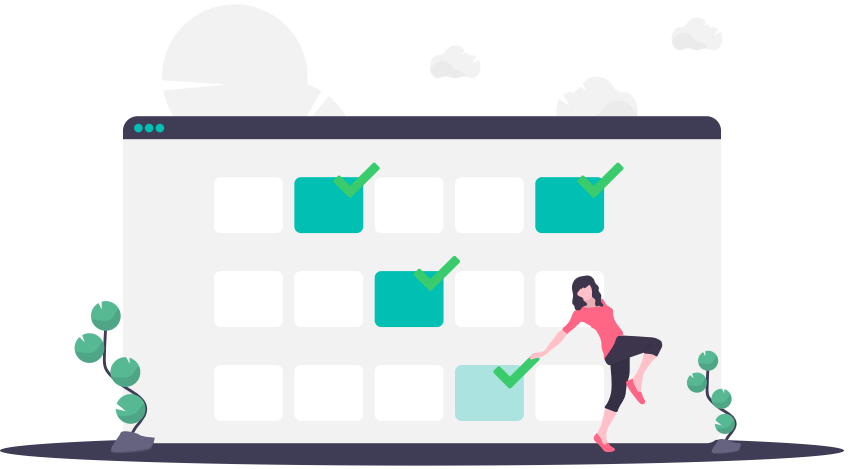
CI output

- unstructured
- huge
- needle in the haystack (`TRACE` loglevel)
- requires postprocessing
- security



Analyzing CI results

- Detect seemingly random bugs
- Centralised lookup ability for the team
- Emails are not a good CI status medium
- Long term trends (failures, test count, coverage)

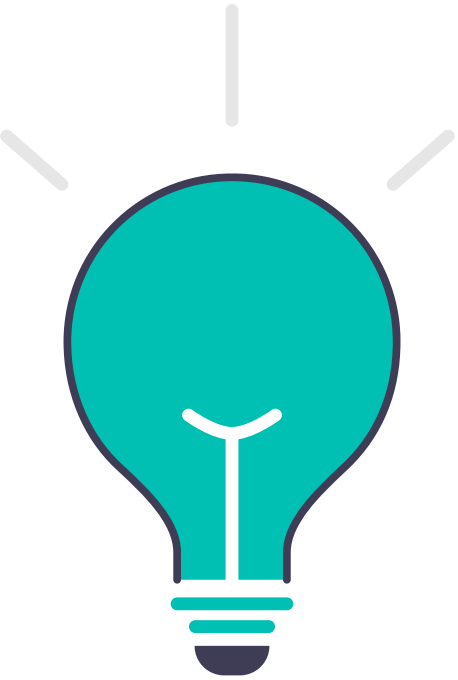


Requirements

- meta data enrichment - per branch, per test run, per test method run, failures only
- data model should be based on search requirements (query optimized)
- define search ability: by timestamp, by branch, by class, by test method, by success/failure

Ask your data

> `Did this test fail earlier this month?`

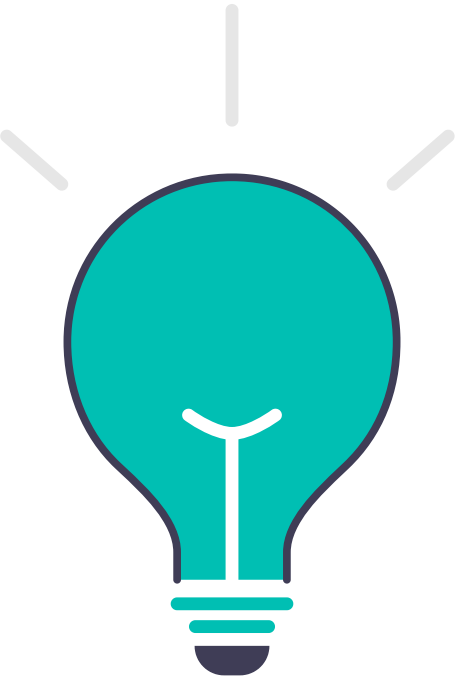


Ask your data

> Show me all failed test runs of this class in this branch in the last month

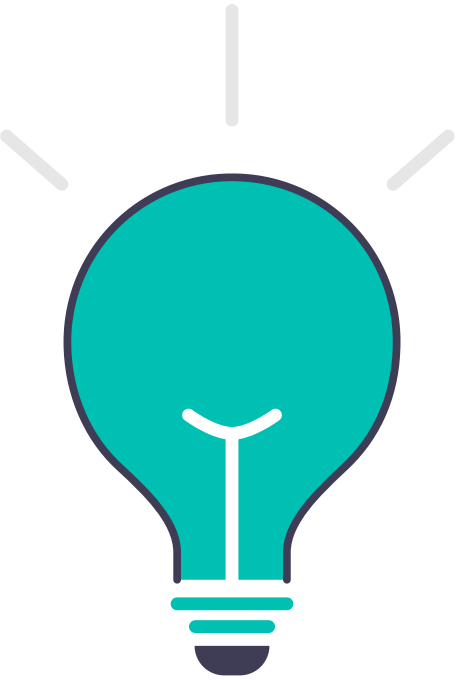
Ask your data

> `Is this test failing only under this OS?`



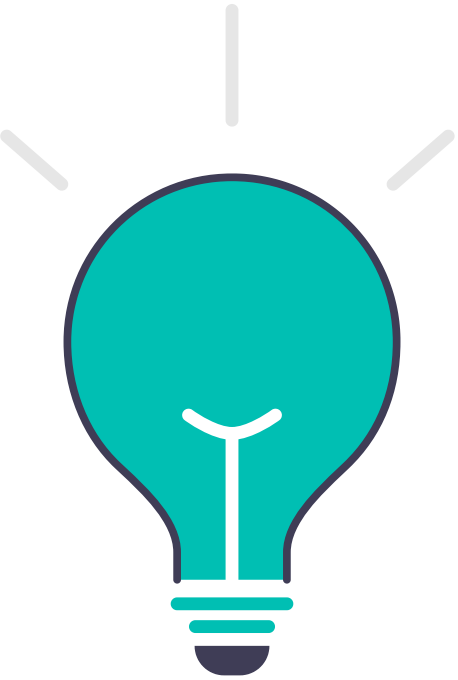
Ask your data

> Is our test count increasing compared to our SLOC count?



Ask your data

> Are our successful test runs decreasing since we doubled the team size?



Ask your data

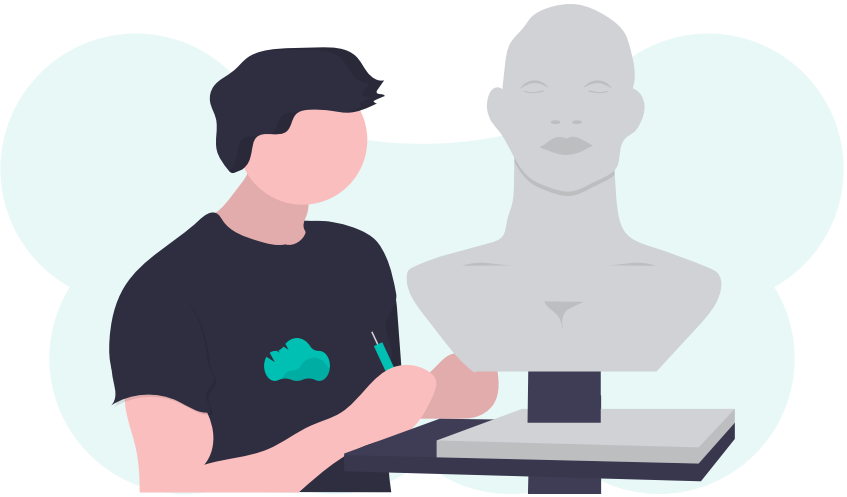
> Do the holidays/OOO hours have impact on our CI? Can we reduce costs?

crystal spec

```
elastic/community/slack-command-community  master ✔  crystal spec
.....................................................................

Finished in 267.99 milliseconds
62 examples, 0 failures, 0 errors, 0 pending
elastic/community/slack-command-community  master ✔
```

elastic



Structure test output

- xUnit
- Test Anything Protocol

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TAP

```
elastic/community/slack-command-community  master ✔  crystal spec --tap
ok 1 - CustomLogHandler should not log access to '/' endpoint
ok 2 - CustomLogHandler should log access to any other endpoint
ok 3 - Objects Event can retrieve html_url
ok 4 - Objects Event can retrieve region
ok 5 - Objects Event can retrieve topics
ok 6 - Objects Event can retrieve country
ok 7 - Objects Event can retrieve languages
ok 8 - Objects Event can retrieve focus
ok 9 - Objects Event can retrieve date
ok 10 - Objects Event can retrieve last updated timestamp
ok 11 - Objects Event can retrieve created at timestamp
ok 12 - Objects Event can retrieve state
ok 13 - Objects Event can retrieve title
ok 14 - Objects Event can retrieve body
ok 15 - Objects Event can retrieve id
ok 16 - Objects Event can retrieve number
ok 17 - Objects Event matches when all tags are in event
ok 18 - Objects Event does not match when not all tags are in event
ok 19 - Objects Event does not match when tags are empty
ok 20 - Objects NotificationUser should match subscriptions
ok 21 - Objects NotificationUser should ignore accepted events
ok 22 - Objects NotificationUser should not subscriptions issues that already were notified about
ok 23 - Objects NotificationUser should not emit duplicate events if event matches twice
ok 24 - Objects NotificationUser should not notify about events in the past
ok 25 - Objects NotificationUser should only include events that are within not earlier than three days of current date
ok 26 - Elastic::CFP should be able to calculate next duration
ok 27 - Elastic::CFP Elastic::CFP::GithubClient should be able to retrieve labels
ok 28 - Elastic::CFP Elastic::CFP::GithubClient should be able to retrieve labels via pagination
ok 29 - Elastic::CFP Elastic::CFP::GithubClient should be able to filter out irrelant labels
ok 30 - Elastic::CFP Elastic::CFP::GithubClient should be able to retrieve events
ok 31 - Elastic::CFP Elastic::CFP::GithubClient should be able to retrieve events and paginate
ok 32 - Elastic::CFP Elastic::CFP::SlackClient request verification should pass on matching signatures
ok 33 - Elastic::CFP Elastic::CFP::SlackClient request verification should detect replay attacks
ok 34 - Elastic::CFP Elastic::CFP::SlackClient request verification should raise on not matching signatures
ok 35 - Elastic::CFP Elastic::CFP::SlackClient can reply to a response URL with a message
ok 36 - Elastic::CFP Elastic::CFP::SlackClient can reply without attachments
ok 37 - Elastic::CFP Elastic::CFP::ElasticsearchClient can subscribe to a new list of tags
ok 38 - Elastic::CFP Elastic::CFP::ElasticsearchClient can unsubscribe from a single subscription
ok 39 - Elastic::CFP Elastic::CFP::ElasticsearchClient returns error if users tries to unsubscribe from unknown subscription
ok 40 - Elastic::CFP Elastic::CFP::ElasticsearchClient can retrieve notifications for user id
ok 41 - Elastic::CFP Elastic::CFP::ElasticsearchClient can retrieve all notifications
ok 42 - Elastic::CFP Elastic::CFP::ElasticsearchClient can add a notification to user data on version
ok 43 - Elastic::CFP Elastic::CFP::ElasticsearchClient can retrieve stats
ok 44 - MatchService should not send notifications when there are no users
ok 45 - MatchService should not send notifications when there are no events
ok 46 - MatchService should send notifications
ok 47 - SlackMessageProcessor should return unknown command error in response
ok 48 - SlackMessageProcessor should return help message to response
ok 49 - SlackMessageProcessor should return help message when text ends on help
ok 50 - SlackMessageProcessor should return error with empty tags
ok 51 - SlackMessageProcessor should return list tags to response
ok 52 - SlackMessageProcessor should list subscriptions via return URL
ok 53 - SlackMessageProcessor should tell when no subscriptions are found
ok 54 - SlackMessageProcessor should add a subscription via return URL
ok 55 - SlackMessageProcessor should show a help when calling /community events subscribe
ok 56 - SlackMessageProcessor should show a help when calling /community events unsubscribe
ok 57 - SlackMessageProcessor should not add a subscription based on unknown tags
ok 58 - SlackMessageProcessor should return an error when trying subscribe on two same tags
ok 59 - SlackMessageProcessor should delete a subscription via return URL
ok 60 - SlackMessageProcessor should show unreplied posts on discourse
ok 61 - DiscourseClient should retrieve noreplied posts and categories
ok 62 - DiscourseClient should paginate when more than one page is retrieved
1..62
```

elastic

xUnit output

```
<?xml version="1.0"?>
<testsuite tests="62" skipped="0" errors="0" failures="0" time="0.261869582"
  timestamp="2020-07-21T12:43:50Z" hostname="rhincodon">

  <testcase file="/Users/alr/devel/elastic/community/slack-command-community/spec/custom_log_handler_spec.cr"
    classname="spec.custom_log_handler_spec" name="CustomLogHandler should not log access to &#39;/&#39;
    endpoint" time="3.6394e-5"/>
  <testcase file="/Users/alr/devel/elastic/community/slack-command-community/spec/custom_log_handler_spec.cr"
    classname="spec.custom_log_handler_spec" name="CustomLogHandler should log access to any other endpoint"
    time="0.000250577"/>
  <testcase file="/Users/alr/devel/elastic/community/slack-command-community/spec/objects_spec.cr"
    classname="spec.objects_spec" name="Objects Event can retrieve html_url" time="7.589e-6"/>
  <testcase file="/Users/alr/devel/elastic/community/slack-command-community/spec/objects_spec.cr"
    classname="spec.objects_spec" name="Objects Event can retrieve region" time="7.438e-6"/>
```

That's it - right?

- Map standard output/error to tests
- Map logger output to tests
- Add run specific meta data (branch, OS, JVM)
- Indexing/Storing strategy
- Preaggregate data (test count, success/failure, failed tests)
- Code coverage metrics

Index data into Elasticsearch

- Massage output data into proper JSON
- logstash/ `xml2json` /self written tool?
- Integration with CI

Java Output (file per class)

```
<?xml version="1.0" encoding="UTF-8"?>
<testsuite name="co.elastic.community.AdminServiceTests" tests="2"
    skipped="0" failures="0" errors="0" timestamp="2020-07-14T11:32:02"
    hostname="rhincodon" time="0.016">
  <properties/>

  <testcase name="testDefaultAdminService()"
    classname="co.elastic.community.AdminServiceTests" time="0.015"/>
  <testcase name="testCustomAdminService()"
    classname="co.elastic.community.AdminServiceTests" time="0.001"/>

  <system-out><![CDATA[TEST TEST TEST
]]></system-out>
  <system-err><![CDATA[]]></system-err>
</testsuite>
```

elastic

Java Output (test failure)

```
<?xml version="1.0" encoding="UTF-8"?>
<testsuite name="co.elastic.community.AdminServiceTests" tests="2" skipped="0"
  failures="1" errors="0" timestamp="2020-07-14T11:36:54" hostname="rhincodon" time="0.022">
  <properties/>
  <testcase name="testDefaultAdminService()" classname="co.elastic.community.AdminServiceTests" time="0.021">
    <failure
      message="org.opentest4j.AssertionFailedError: &#10;Expecting:&#10; &lt;true&gt;&#10;to be equal to:&#10; &lt;false&gt;&#10;but was not."
      type="org.opentest4j.AssertionFailedError">org.opentest4j.AssertionFailedError:
Expecting:
 &lt;true&gt;
to be equal to:
 &lt;false&gt;
but was not.
  at java.base/jdk.internal.reflect.NativeConstructorAccessorImpl.newInstance0(Native Method)
  at java.base/jdk.internal.reflect.NativeConstructorAccessorImpl.newInstance(NativeConstructorAccessorImpl.java:62)
  at java.base/jdk.internal.reflect.DelegatingConstructorAccessorImpl.newInstance(DelegatingConstructorAccessorImpl.java:45)
  at java.base/java.lang.reflect.Constructor.newInstanceWithCaller(Constructor.java:500)
  at co.elastic.community.AdminServiceTests.testDefaultAdminService(AdminServiceTests.java:13)

  ...
```

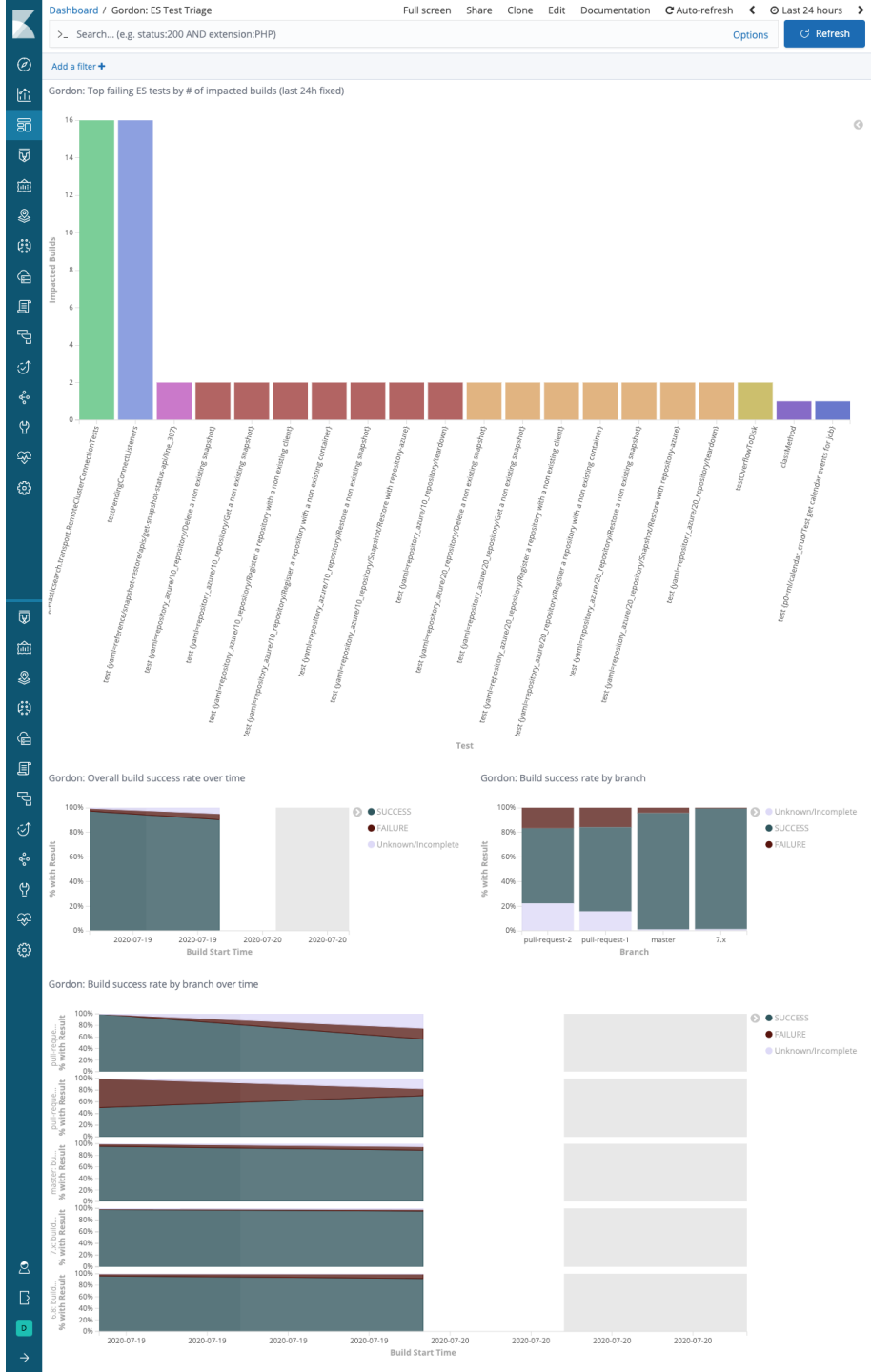
Crystal Output (single XML file)

```
<?xml version="1.0"?>
<testsuite tests="62" skipped="0" errors="0" failures="1" time="0.258457318"
  timestamp="2020-07-14T11:26:23Z" hostname="rhincodon">

  <testcase file="/Users/alr/devel/elastic/community/slack-command-community/spec/custom_log_handler_spec.cr"
    classname="spec.custom_log_handler_spec"
    name="CustomLogHandler should not log access to &#39;/&#39; endpoint" time="3.1523e-5"/>
  <testcase file="/Users/alr/devel/elastic/community/slack-command-community/spec/custom_log_handler_spec.cr"
    classname="spec.custom_log_handler_spec"
    name="CustomLogHandler should log access to any other endpoint" time="0.000282161">
    <failure message="Expected: 2
     got: 1">../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/spec/methods.cr:76:5 in &#39;fail&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/spec/expectations.cr:447:9 in &#39;should&#39;
spec/custom_log_handler_spec.cr:33:5 in &#39;-&gt;&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/primitives.cr:255:3 in &#39;internal_run&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/spec/example.cr:33:16 in &#39;run&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/spec/context.cr:18:23 in &#39;internal_run&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/spec/context.cr:330:7 in &#39;run&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/spec/context.cr:18:23 in &#39;internal_run&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/spec/context.cr:147:7 in &#39;run&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/spec/dsl.cr:270:7 in &#39;-&gt;&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/primitives.cr:255:3 in &#39;run&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/crystal/main.cr:45:14 in &#39;main&#39;
../../../../../../usr/local/Cellar/crystal/0.35.1_1/src/crystal/main.cr:114:3 in &#39;main&#39;</failure>
  </testcase>

  ...
</testsuite>
```

Demo

Elastic Build Stats

Elasticsearch CI


Dashboard / Gordon: ES Test Triage
Full screen
Share
Clone
Edit
Documentation
Auto-refresh
Last 24 hours
Search... (e.g. status:200 AND extension:PHP)
Options
Refresh
Add a filter +
Gordon: Top failing ES tests by # of impacted builds (last 24h fixed)
Impacted Builds
Test
Gordon: Overall build success rate over time
% with Result
Build Start Time
SUCCESS
FAILURE
Unknown/Incomplete
Gordon: Build success rate by branch
Branch
pull-request-2
pull-request-1
master
7.x
Gordon: Build success rate by branch over time

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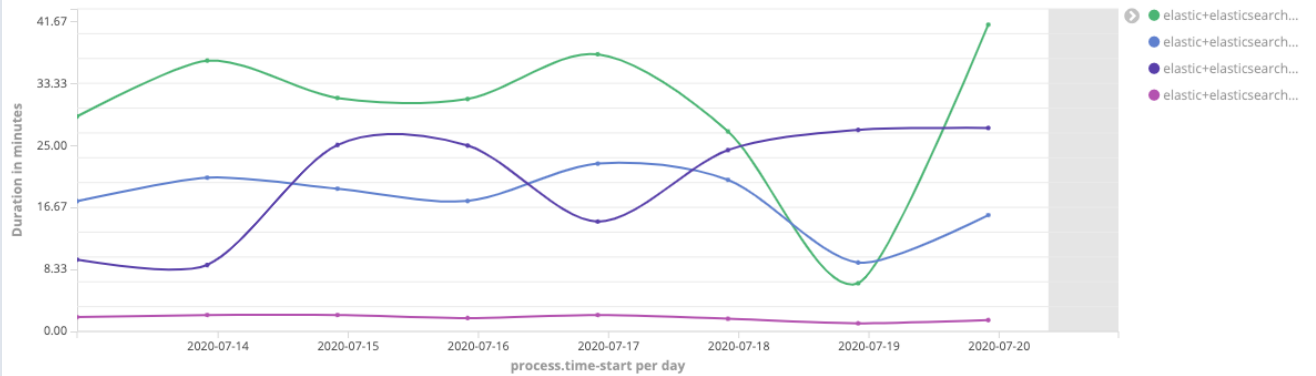
Dashboard / Alpar - Elasticsearc CI

Full screen | Share | Clone | Edit | Documentation | Auto-refresh | Last 7d rounded to the day

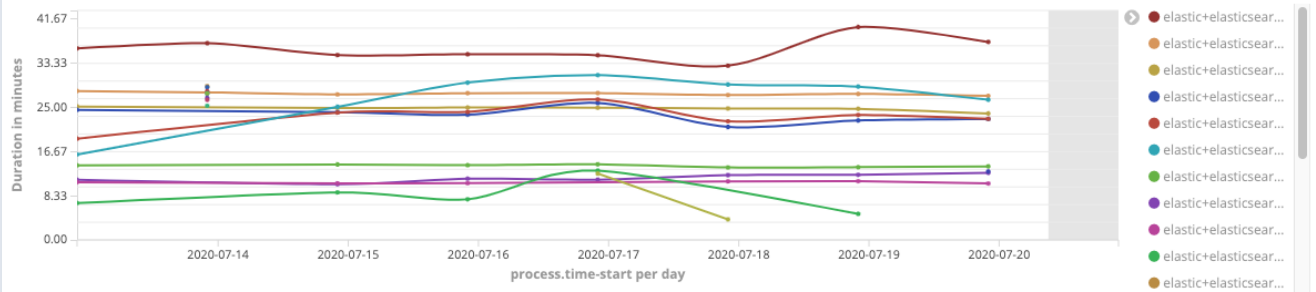
>_ Search... (e.g. status:200 AND extension:PHP) Options | Refresh

Add a filter +

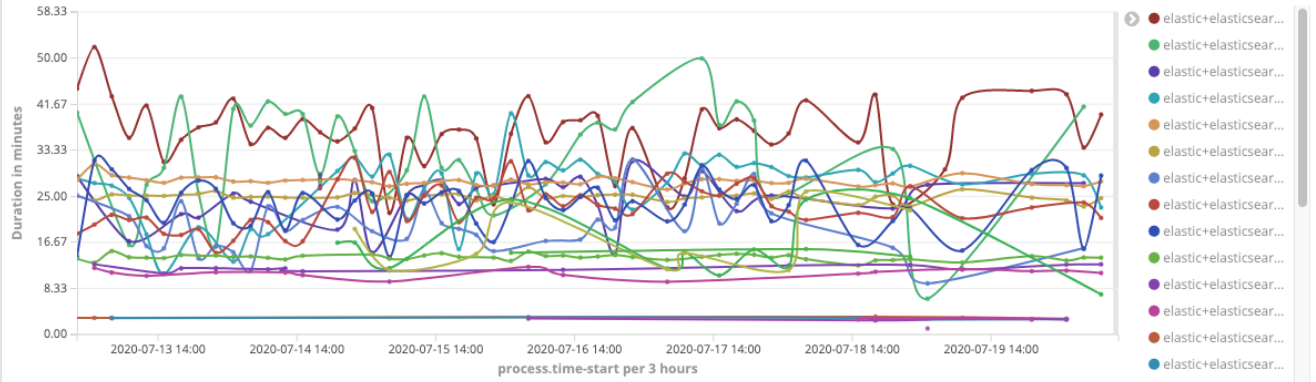
Alpar - Build duration intake



Alpar - Build duration PRs - daily AVG

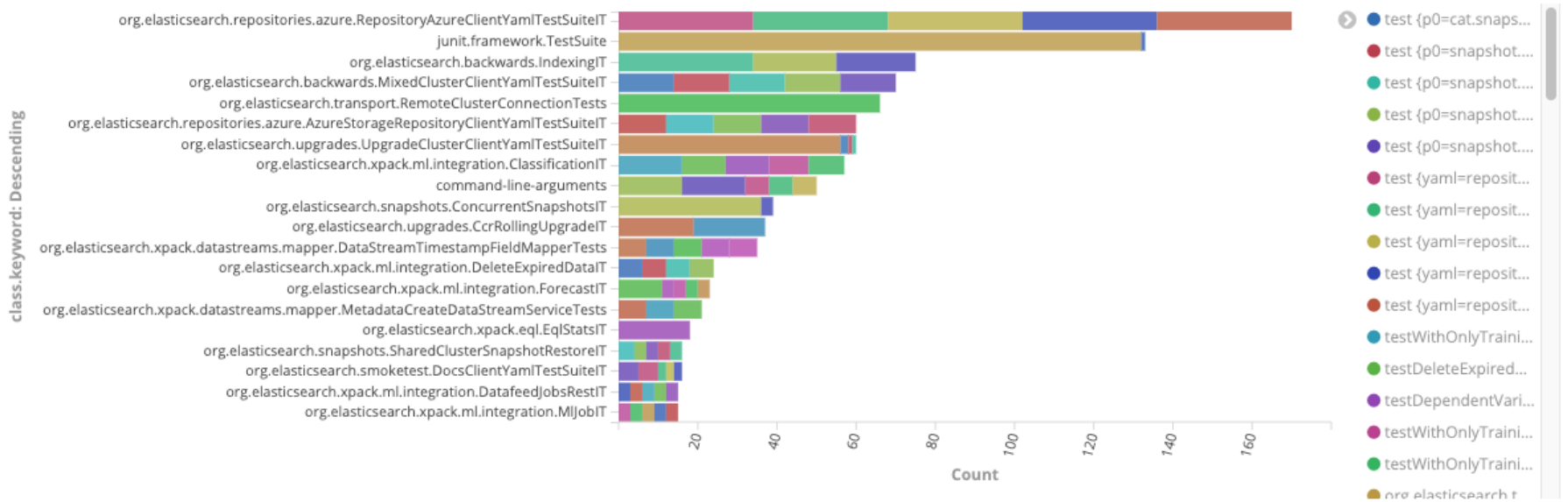


Alpar - Build duration master intake and PRs

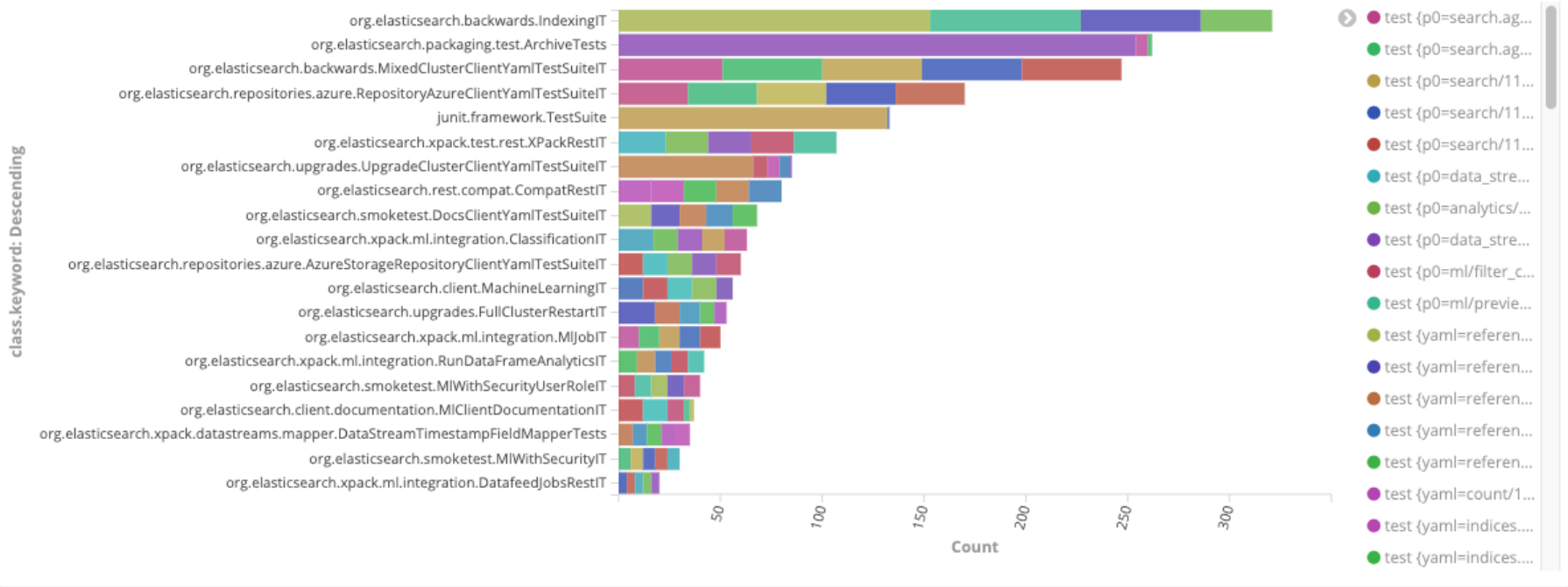


elastic

Alpar: Elaticsearch top test failures excluding PR builds



Alpar: Elaticsearch top test failures



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Summary

- Analytics use-case
- Not needed for operational tasks
- ML: Time series anomaly detection (network outage)
- Test triage!

Test triage

- Daily single person owner for test failures
- Check failure
- Assign team
- Disable tests to stabilize

The future[tm]

- Delivery pipeline as a service (K8s: Tekton)
- Much more automated canary deployments
- Smarter test execution (affected code changes test cases first)
- Increase of specialization roles around CI/CD
- Analytics build into pipelines

Thanks for listening

Q & A

Alexander Reelsen
Community Advocate
alex@elastic.co | @spinscale

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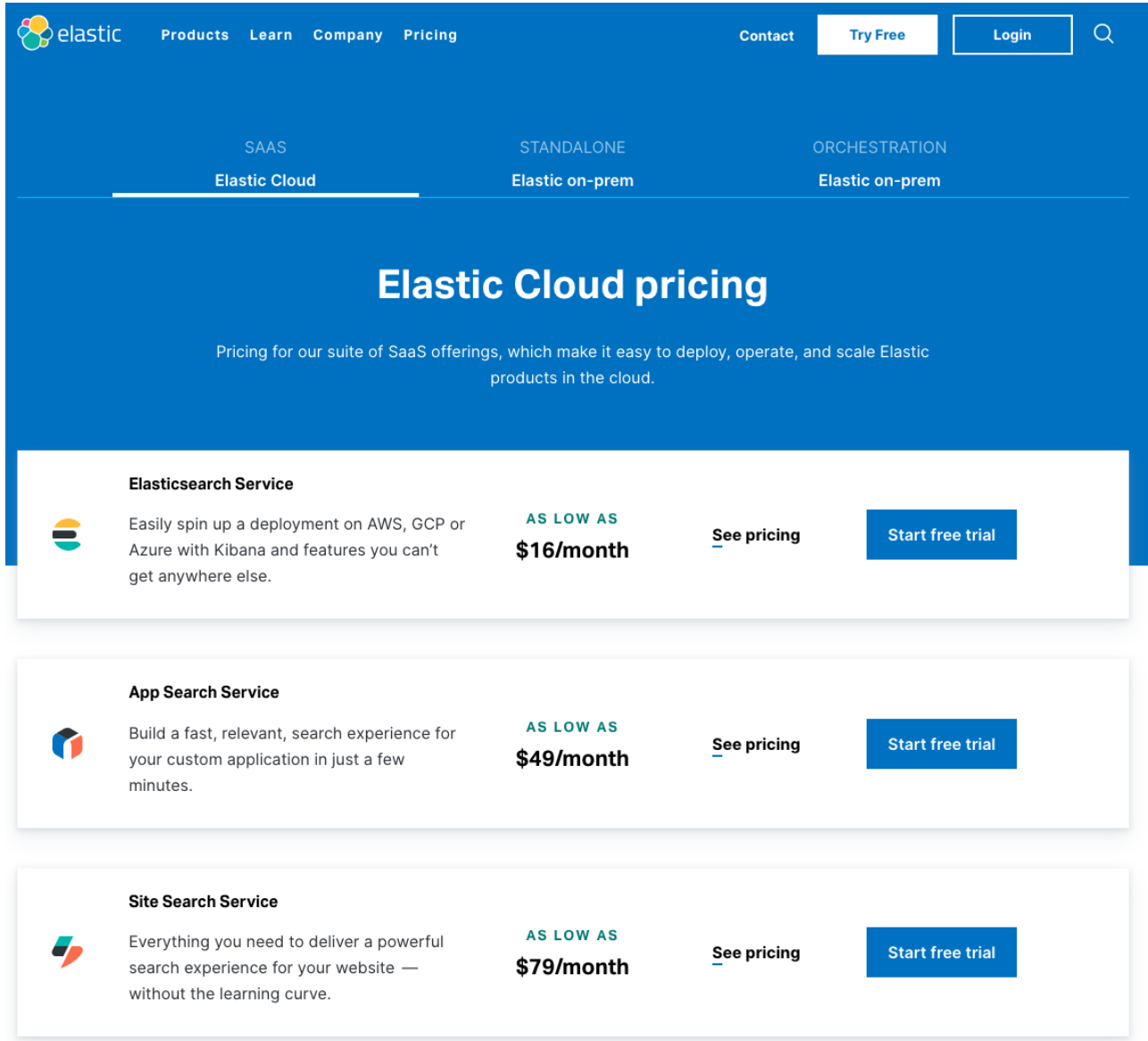
Elastic Cloud



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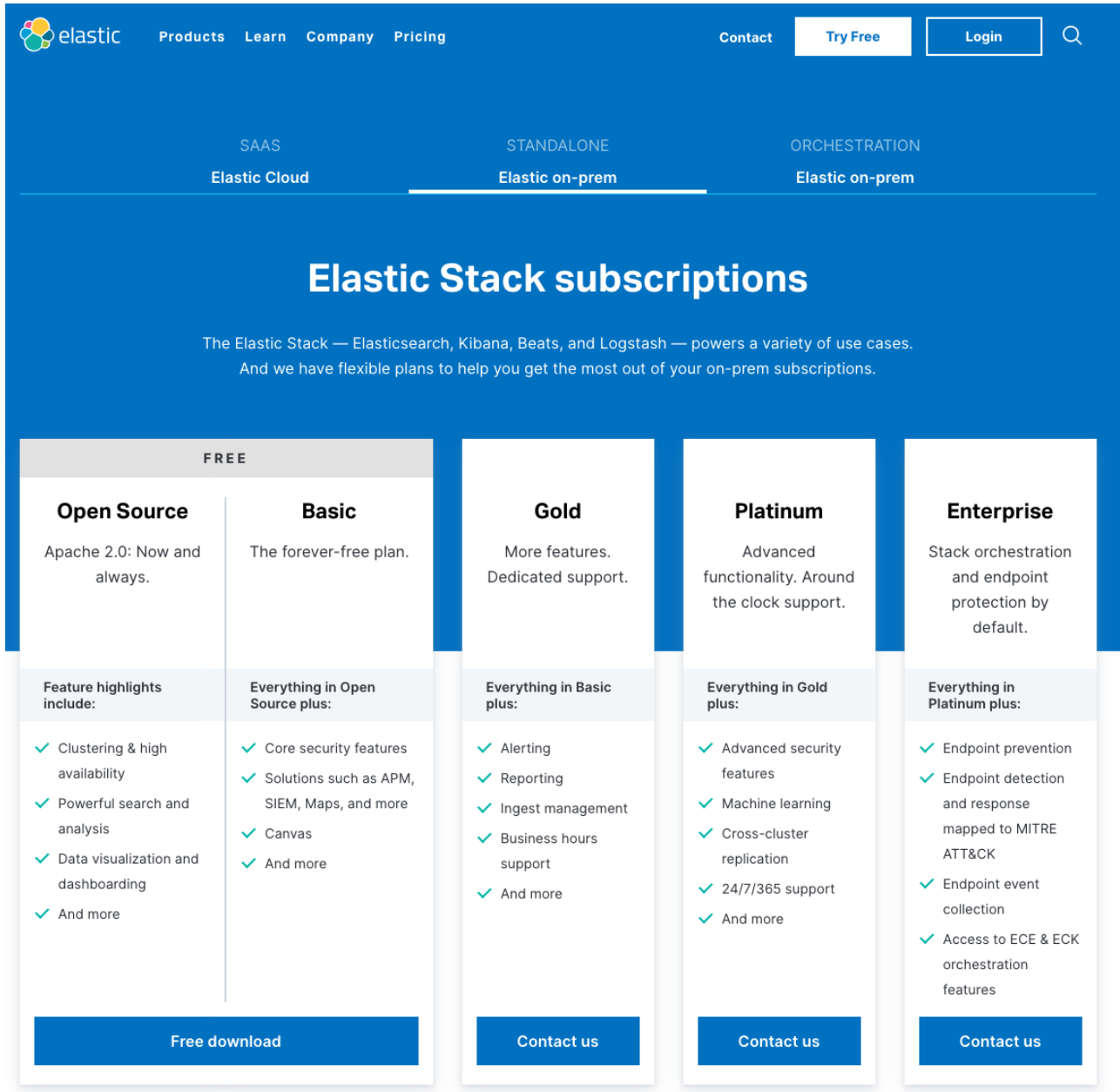
Elastic Support Subscriptions



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Getting more help

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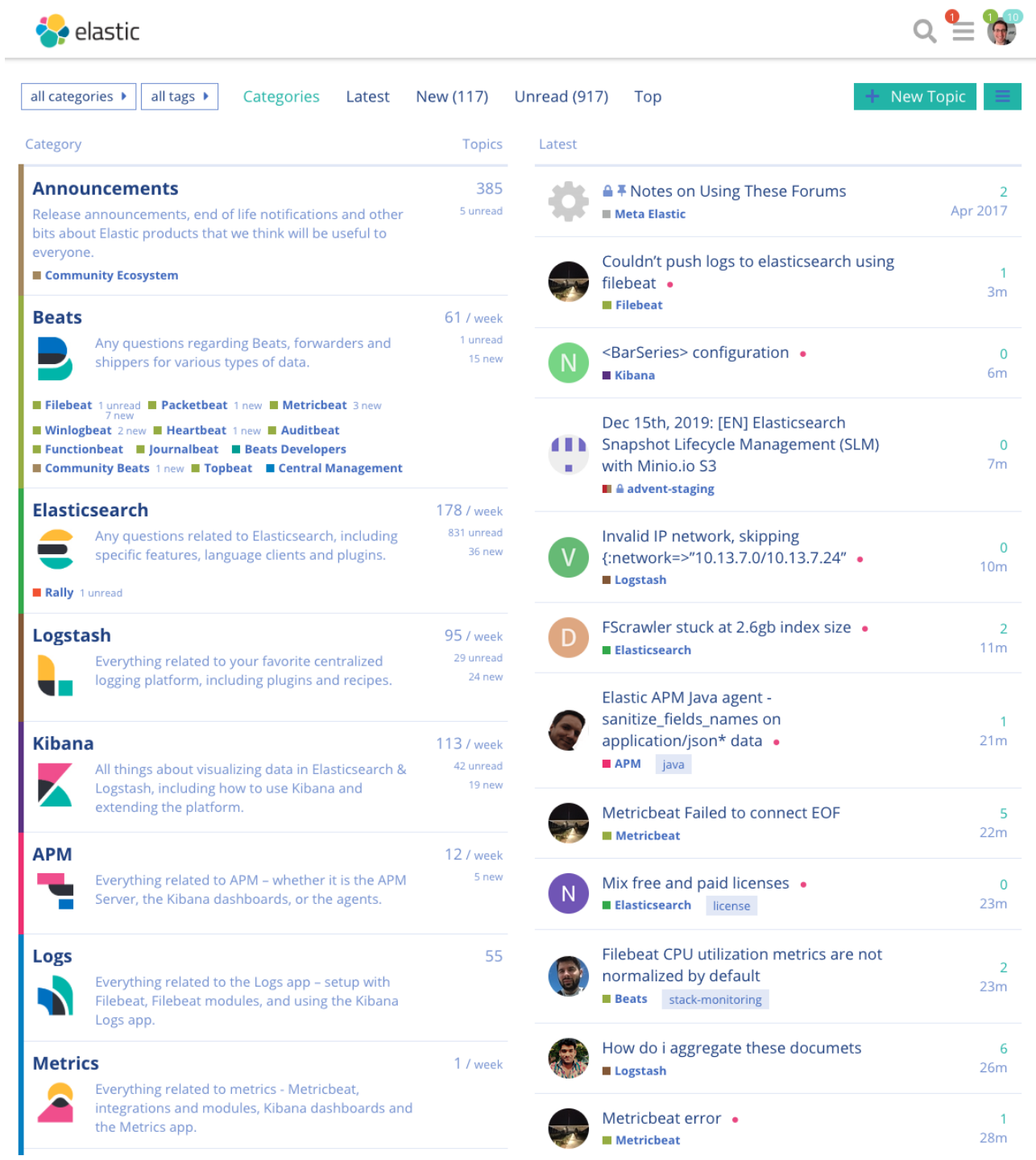
Discuss Forum

https://discuss.elastic.co



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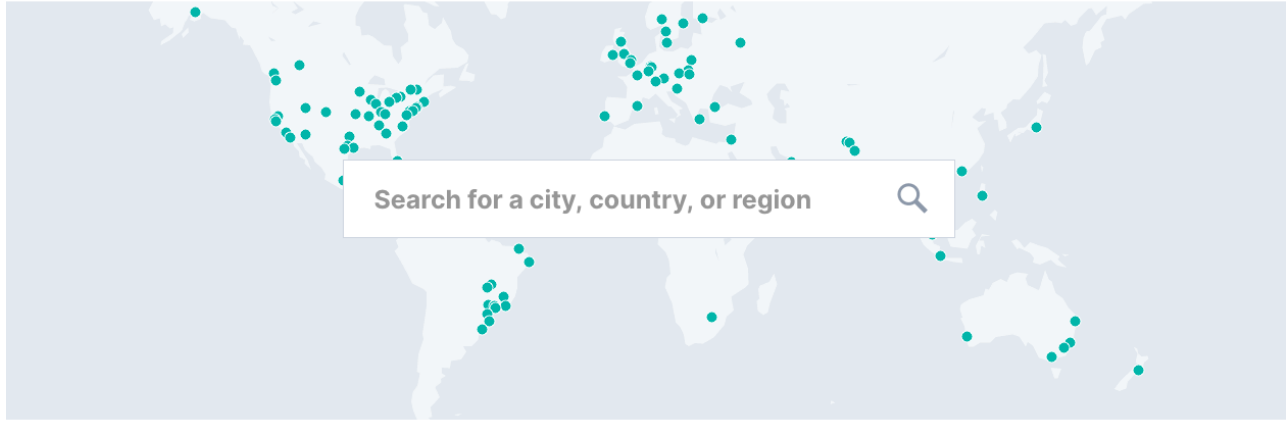
Community & Meetups

https://community.elastic.co



Explore by region

Asia Pacific and Japan | Europe, Middle East and Africa | North and South America | Virtual

ELASTIC - BARCELONA
Spain

ELASTIC - COPENHAGEN
Denmark

ELASTIC - GOTEBORG
Sweden

ELASTIC - SCOTLAND
United Kingdom

ELASTIC - STOCKHOLM
Sweden

ELASTIC - TEL AVIV
Israel

ELASTIC - TURKEY
Turkey

ELASTIC BONN USER GROUP
Germany

ELASTIC CAMBRIDGE & EAST ANGLIA USER GROUP
United Kingdom

ELASTIC DUBAI USER GROUP
United Arab Emirates

ELASTIC FR
France

ELASTIC GREECE
Greece

ELASTIC HELSINKI
Finland

ELASTIC KRAKOW USER GROUP
Poland

ELASTIC LONDON USER GROUP
United Kingdom

ELASTIC LUXEMBOURG USER GROUP
Luxembourg

ELASTIC MANCHESTER USER GROUP
United Kingdom

ELASTIC MOSCOW
Russian Federation

ELASTIC NIGERIA
Nigeria

ELASTIC OSLO USER GROUP
Norway

ELASTIC PORTUGAL
Portugal

ELASTIC RHEINRUHR
Germany

ELASTIC SLOVAK USER GROUP
Slovakia

ELASTIC USER GROUP - CZ
Czech Republic

ELASTIC USER GROUP - DUBLIN
Ireland

ELASTIC USER GROUP ABIDJAN
Côte d'Ivoire

ELASTIC WARSAW USER GROUP
Poland

ELASTIC ZAGREB
Croatia

ELASTICSEARCH - SOUTH AFRICA
South Africa

ELASTICSEARCH SWITZERLAND
Switzerland

ELASTICSEARCH USER GROUP PAKISTAN
Pakistan

SEARCH MEETUP MUNICH
Germany

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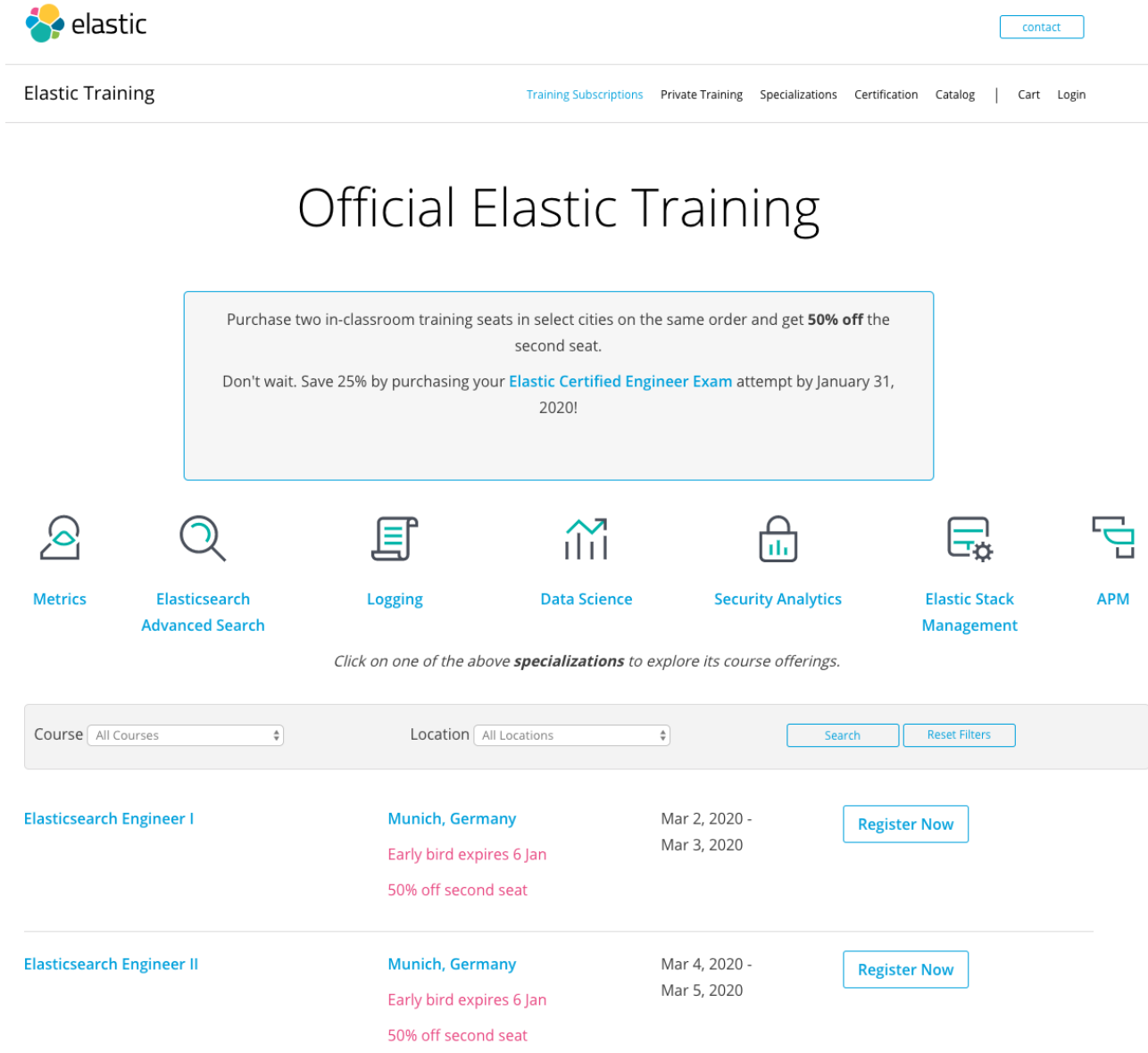
Official Elastic Training

https://training.elastic.co



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