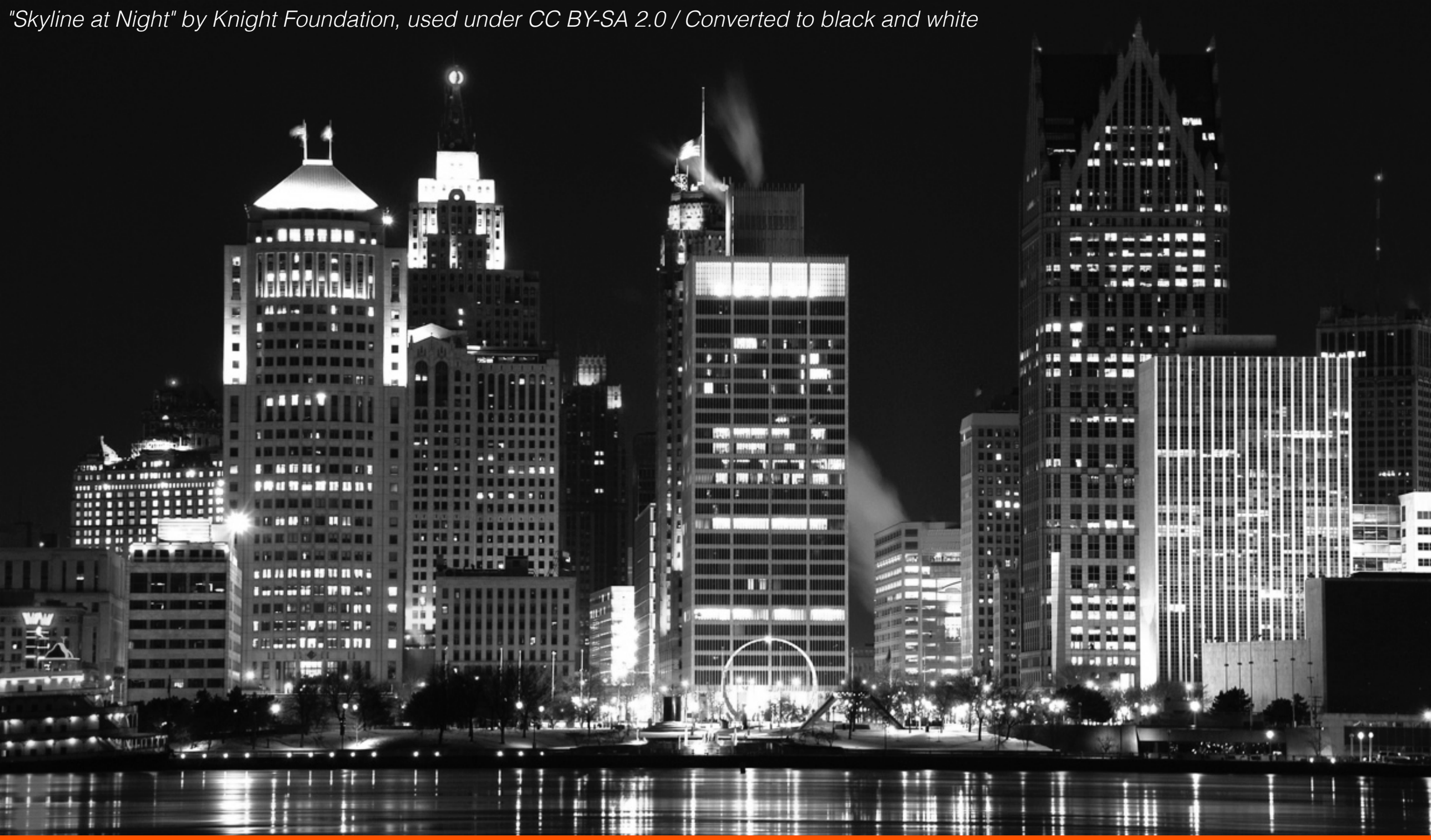
"Skyline at Night" by Knight Foundation, used under CC BY-SA 2.0 / Converted to black and white



Taming logs with Elasticsearch, Logstash, and Kibana

1DEVDAY Detroit 2014
Dan Grabowski

- Introductions
- Problem
- Solution
- Demo
- Quick Start
- Experiences
- Questions

My favorite programming language is Clojure.

My favorite technical talk is “Are We There Yet?” by Rich Hickey (http://www.infoq.com/presentations/Are-We-There-Yet-Rich-Hickey).

The most interesting thing I’ve read recently is Kyle Kingsbury’s Jepsen series of blog posts (http://aphyr.com/tags/Jepsen).

Non-technical topics I’ll talk forever about if you get me started include Formula 1 and The Wire.

Problem

Extracting information from large volumes of log data, making it accessible, and keeping it visible

Large

- On the order of
  - 10 million log events per day
  - A few dozen applications and services
  - Several dozen servers

Information

- Details of an occurrence of an issue
- Count and patterns of occurrences for an issue
- Future occurrences of an issue
- Performance trends and variations

Accessible

- Available to developers, business analysts, system administrators, customer support, etc.
- Can be used effectively by all these groups, perhaps with different levels of sophistication

Visible

- Keep monitoring in front of people
- … but don’t nag them

Solution

- Elasticsearch to store and index log events
- Logstash to monitor, parse, and load logs
- Kibana as a UI to search, visualize information, and build dashboards
- Elasticsearch HTTP API to extract data for further analysis

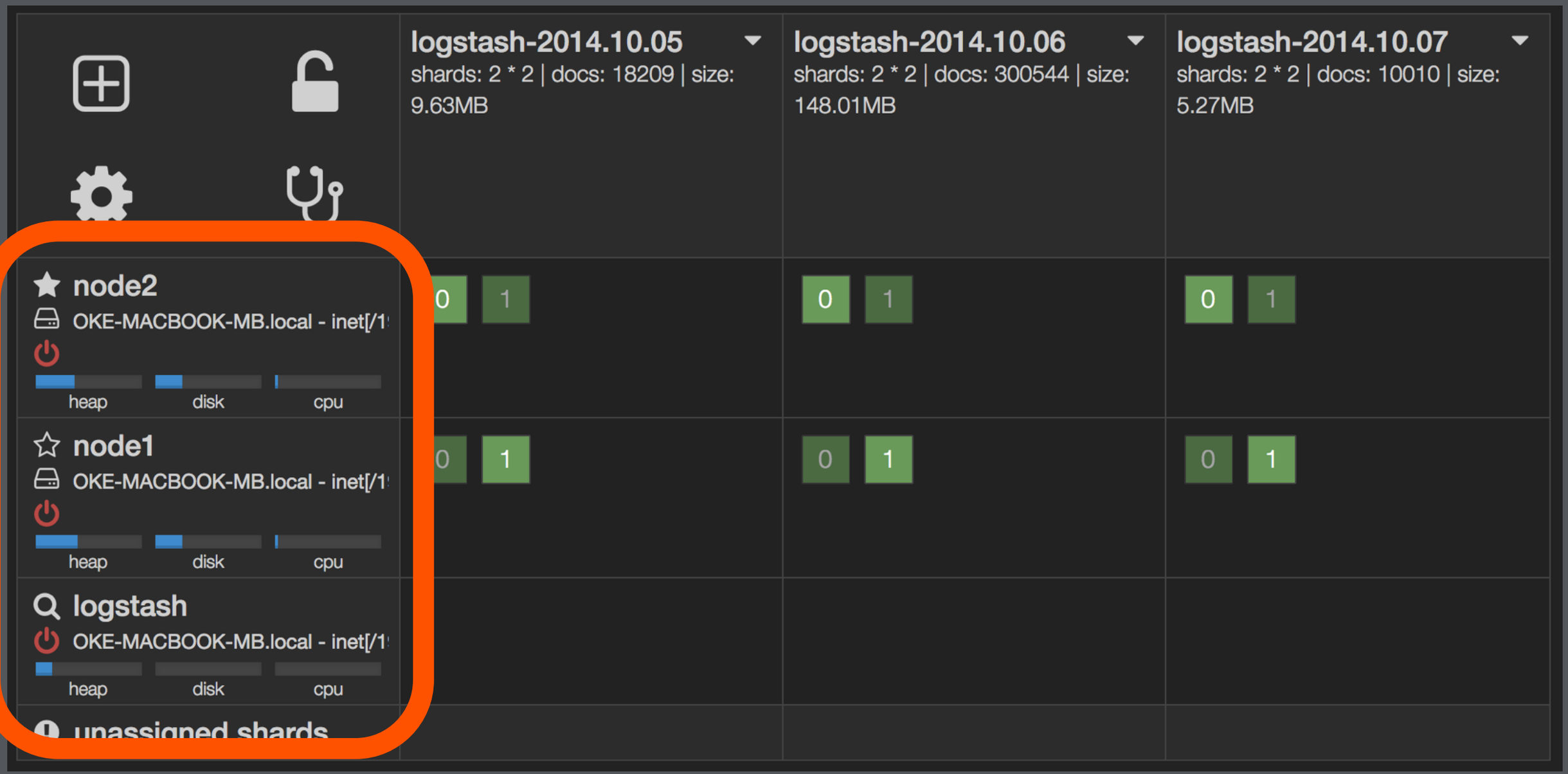
Elasticsearch (the product)

- Distributed Lucene indexes
- HTTP API
- Runs on JVM
- Apache 2.0 license
- Maintained and supported by Elasticsearch (the company)

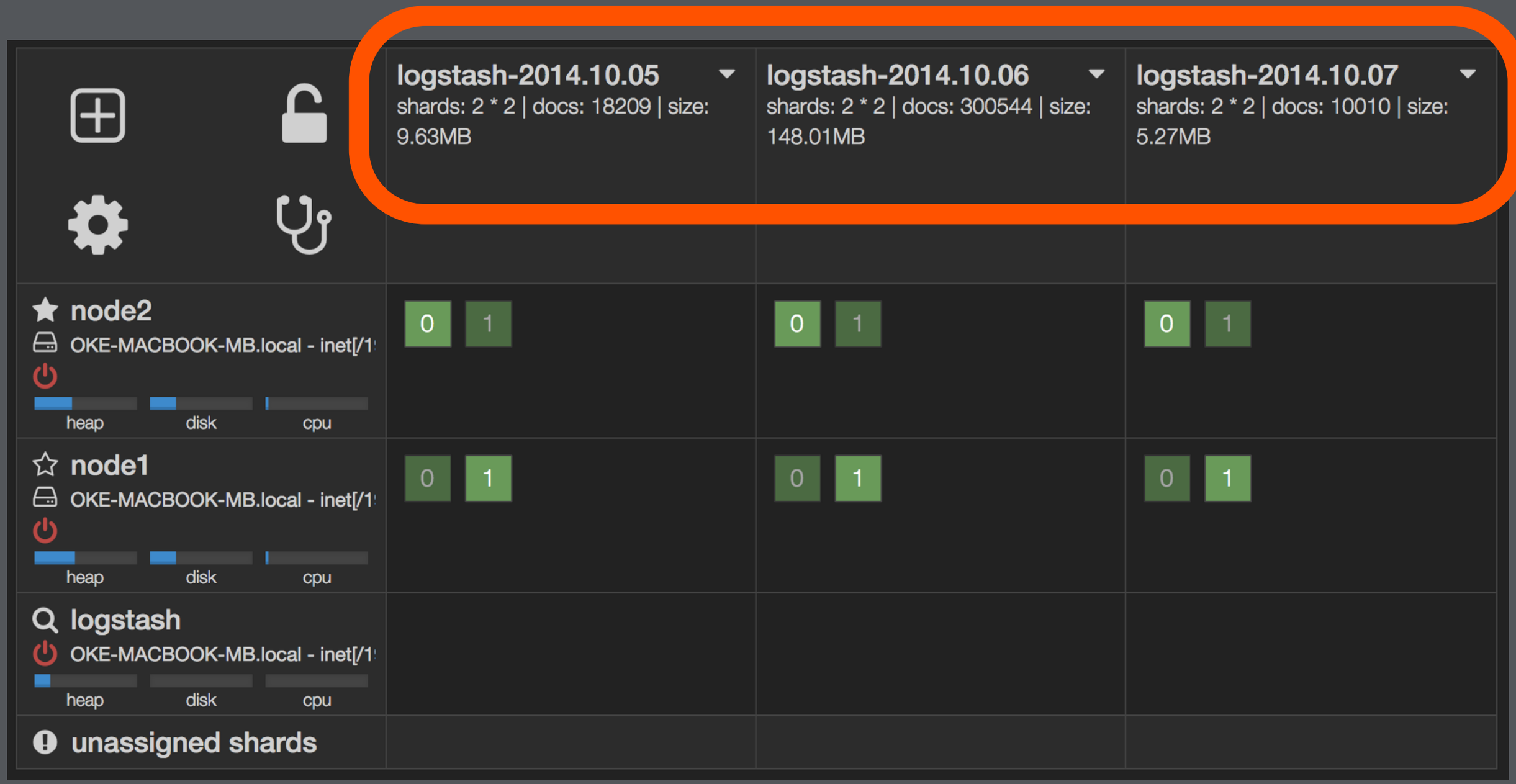
Cluster

	logstash-2014.10.05 shards: 2 * 2 | docs: 18209 | size: 9.63MB	logstash-2014.10.06 shards: 2 * 2 | docs: 300544 | size: 148.01MB	logstash-2014.10.07 shards: 2 * 2 | docs: 10010 | size: 5.27MB
★ node2 OKE-MACBOOK-MB.local - inet[/1 heap disk cpu	0 1	0 1	0 1
☆ node1 OKE-MACBOOK-MB.local - inet[/1 heap disk cpu	0 1	0 1	0 1
logstash OKE-MACBOOK-MB.local - inet[/1 heap disk cpu			
unassigned shards			

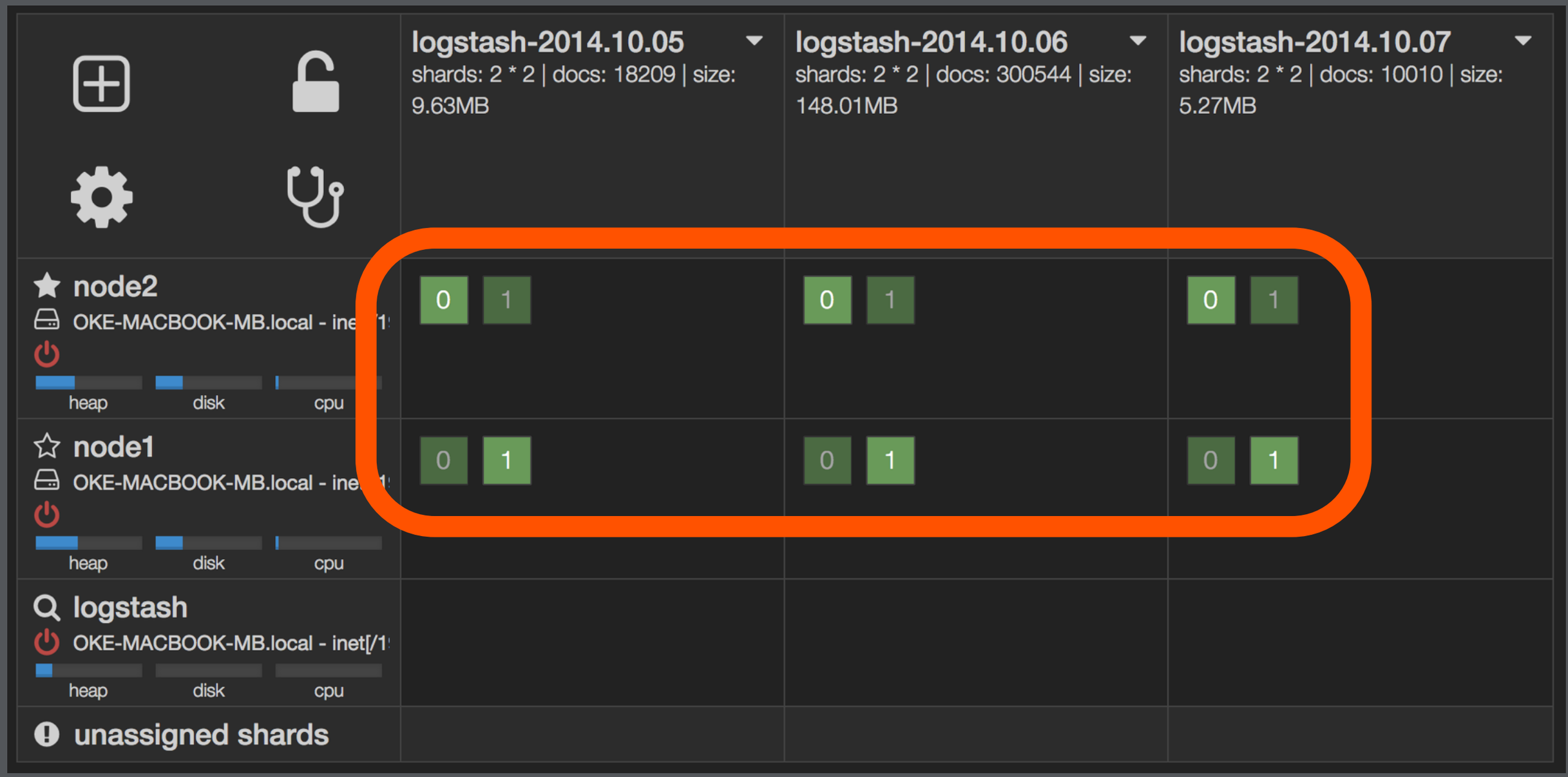
Nodes


logstash-2014.10.05
shards: 2 * 2 | docs: 18209 | size: 9.63MB
logstash-2014.10.06
shards: 2 * 2 | docs: 300544 | size: 148.01MB
logstash-2014.10.07
shards: 2 * 2 | docs: 10010 | size: 5.27MB
node2
OKE-MACBOOK-MB.local - inet[/1
heap
disk
cpu
node1
OKE-MACBOOK-MB.local - inet[/1
heap
disk
cpu
logstash
OKE-MACBOOK-MB.local - inet[/1
heap
disk
cpu
unassigned shards
0
1

Indexes


logstash-2014.10.05
shards: 2 * 2 | docs: 18209 | size: 9.63MB
logstash-2014.10.06
shards: 2 * 2 | docs: 300544 | size: 148.01MB
logstash-2014.10.07
shards: 2 * 2 | docs: 10010 | size: 5.27MB
node2
OKE-MACBOOK-MB.local - inet[/1
heap
disk
cpu
0
1
node1
logstash
unassigned shards

Shards

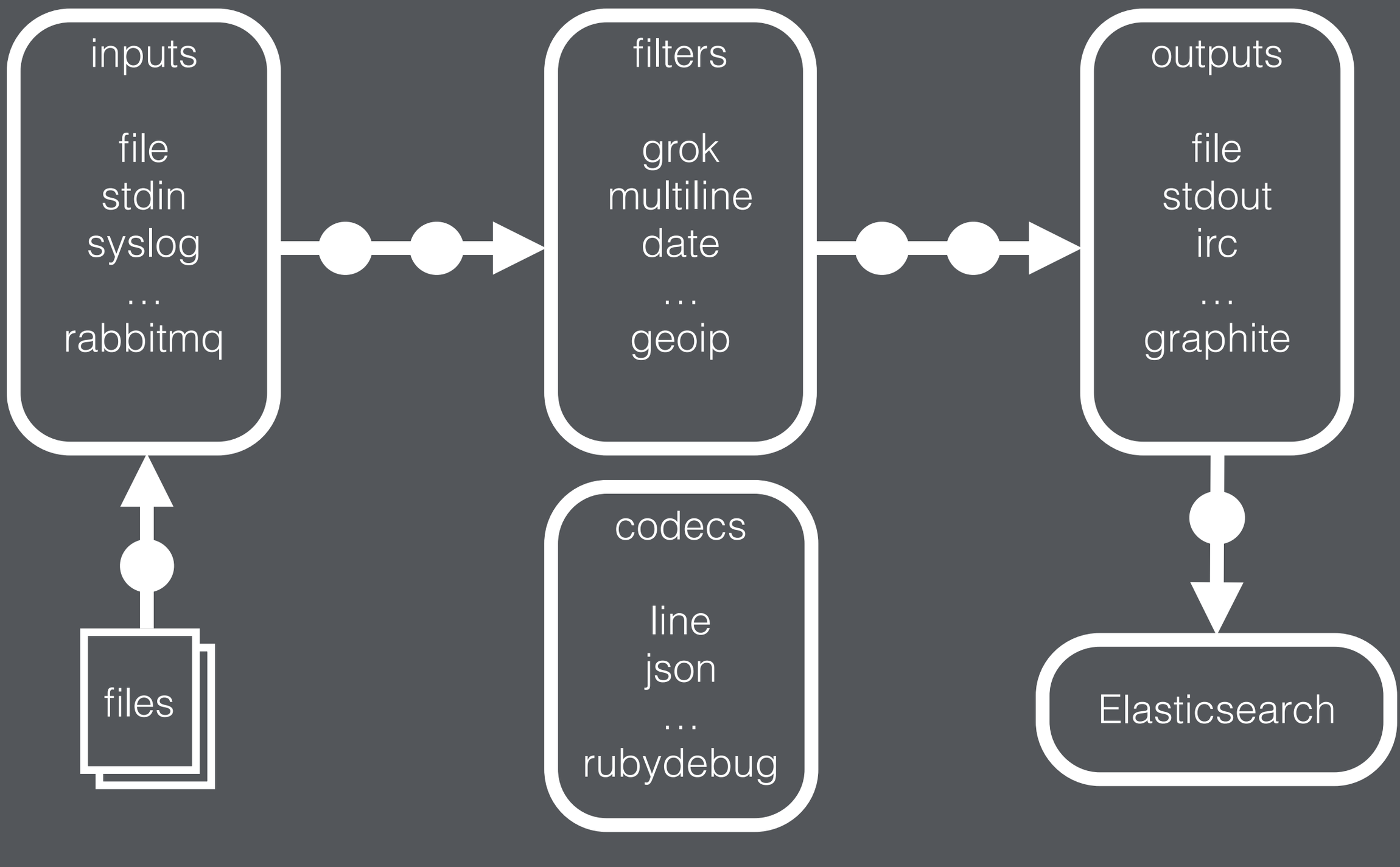

logstash-2014.10.05
shards: 2 * 2 | docs: 18209 | size: 9.63MB
logstash-2014.10.06
shards: 2 * 2 | docs: 300544 | size: 148.01MB
logstash-2014.10.07
shards: 2 * 2 | docs: 10010 | size: 5.27MB
node2
OKE-MACBOOK-MB.local - ine
heap
disk
cpu
0
1
node1
OKE-MACBOOK-MB.local - ine
heap
disk
cpu
0
1
logstash
OKE-MACBOOK-MB.local - inet[/1
heap
disk
cpu
unassigned shards

Logstash

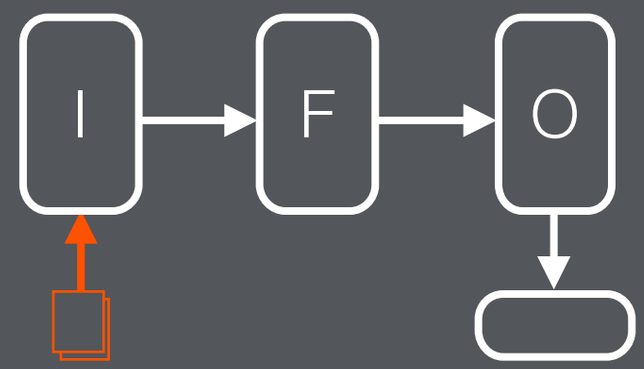
- Log stream processing
- Implemented with JRuby, runs on JVM
- Apache 2.0 license
- Created by Jordan Sissel
- Maintained and supported by Elasticsearch (the company)

Logstash logo from http://logstash.net/images/logstash.png

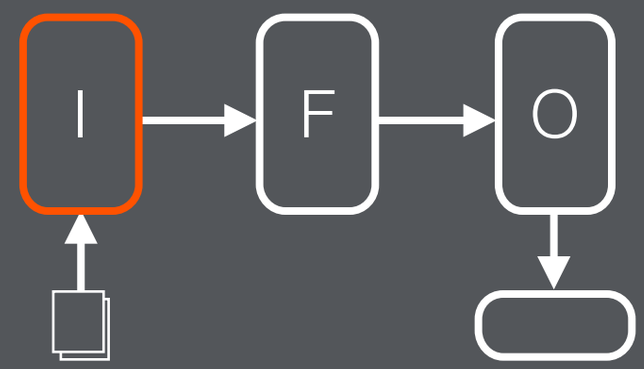
Logstash concepts



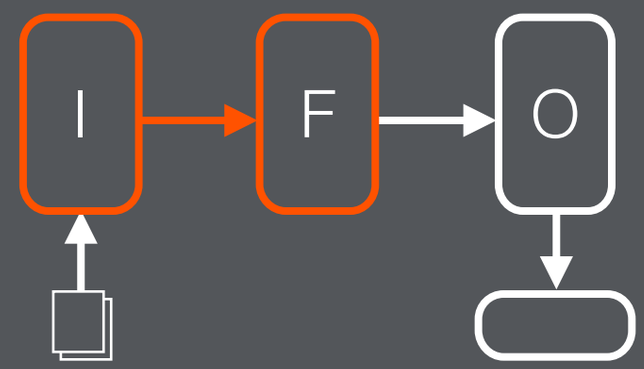
```
2014-10-11 12:52:22 GET /cgi-bin/ 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /default.asp 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /index.jsp 301 0 192.168.0.1 - - - 0.0010
2014-10-11 12:52:22 GET /scripts/formmail.html 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /demo/../%3f.jsp 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /q79w_38jg__.shtml 404 10049 192.168.0.1 - - - 0.0010
2014-10-11 12:52:22 GET /displaytable.php 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /default.jsp 404 10049 192.168.0.1 - - - 0.0010
2014-10-11 12:52:22 GET /scripts/mailform.html 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /forum/default.asp 404 10049 192.168.0.1 - - - 0.0010
```



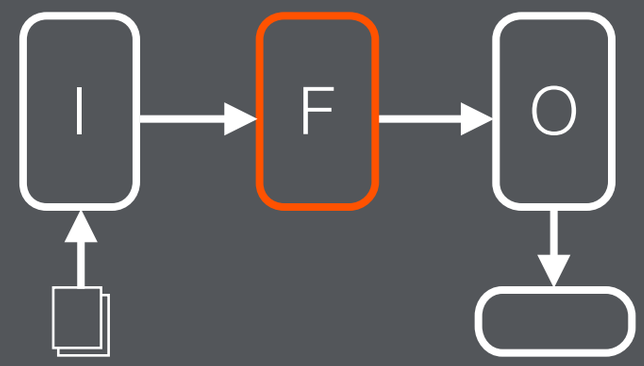
```
2014-10-11 12:52:22 GET /cgi-bin/ 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /index.jsp 301 0 192.168.0.1 - - - 0.0010
2014-10-11 12:52:22 GET /demo/../%3f.jsp 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /q79w_38jg__.shtml 404 10049 192.168.0.1 - - - 0.0010
2014-10-11 12:52:22 GET /displaytable.php 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /default.jsp 404 10049 192.168.0.1 - - - 0.0010
2014-10-11 12:52:22 GET /scripts/mailform.html 404 10049 192.168.0.1 - - - 0.0
2014-10-11 12:52:22 GET /forum/default.asp 404 10049 192.168.0.1 - - - 0.0010
```



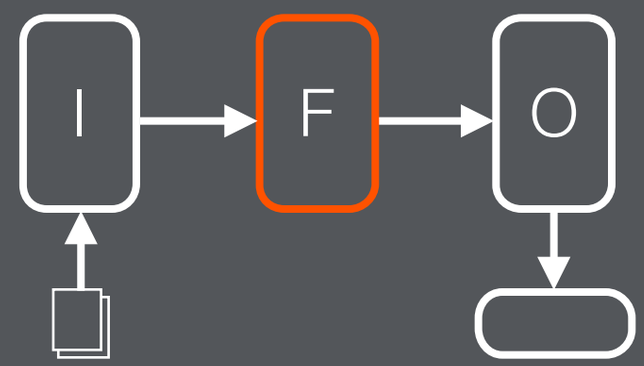
```
{
     "message" => "2014-10-11 12:52:22 GET /index.jsp 301 0
192.168.0.1 - - - 0.0010",
    "@version" => "1",
  "@timestamp" => "2014-11-13T20:39:41.753Z",
        "host" => "logstash.example.com",
        "path" => "/logs/access.log"
}
```



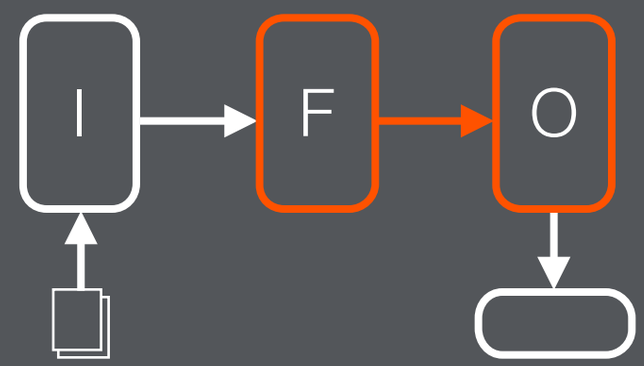
```
{
      "message" => "2014-10-11 12:52:22 GET /index.jsp 301 0
192.168.0.1 - - - 0.0010",
     "@version" => "1",
   "@timestamp" => "2014-11-13T20:39:41.753Z",
         "host" => "logstash.example.com",
         "path" => "/logs/access.log",
         "date" => "2014-10-11",
         "time" => "12:52:22",
       "method" => "GET",
     "uri-path" => "/index.jsp",
       "status" => 301,
        "bytes" => 0,
   "ip-address" => "192.168.0.1",
        "query" => "-",
     "referer" => "-",
   "user-agent" => "-",
    "elapsed_s" => 0.001
}
```



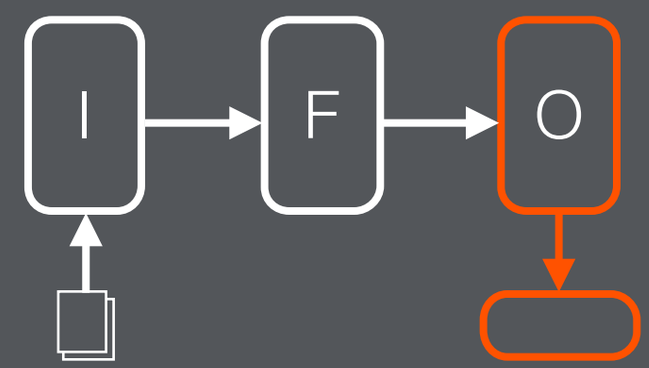
```
{
     "message" => "2014-10-11 12:52:22 GET /index.jsp 301 0
192.168.0.1 - - - 0.0010",
    "@version" => "1",
  "@timestamp" => "2014-10-11T17:52:22.000Z",
        "host" => "logstash.example.com",
        "path" => "/logs/access.log",
      "method" => "GET",
    "uri-path" => "/index.jsp",
      "status" => 301,
       "bytes" => 0,
  "ip-address" => "192.168.0.1",
       "query" => "-",
     "referer" => "-",
  "user-agent" => "-",
   "elapsed_s" => 0.001
}
```



```
{
     "message" => "2014-10-11 12:52:22 GET /index.jsp 301 0
192.168.0.1 - - - 0.0010",
    "@version" => "1",
  "@timestamp" => "2014-10-11T17:52:22.000Z",
        "host" => "server1.example.com",
        "path" => "/logs/access.log",
      "method" => "GET",
    "uri-path" => "/index.jsp",
      "status" => 301,
       "bytes" => 0,
  "ip-address" => "192.168.0.1",
       "query" => "-",
     "referer" => "-",
  "user-agent" => "-",
   "elapsed_s" => 0.001
}
```



```
{
     "message": "2014-10-11 12:52:22 GET /index.jsp 301 0
192.168.0.1 - - - 0.0010",
    "@version": "1",
  "@timestamp": "2014-10-11T17:52:22.000Z",
        "host": "server1.example.com",
        "path": "/logs/access.log",
      "method": "GET",
    "uri-path": "/index.jsp",
      "status": 301,
       "bytes": 0,
  "ip-address": "192.168.0.1",
       "query": "-",
    "referer": "-",
  "user-agent": "-",
   "elapsed_s": 0.001
}
```

Kibana

- Javascript application that interacts with Elasticsearch HTTP API
- Provides search, visualization, and dashboard capabilities
- Apache 2.0 license
- Maintained and supported by Elasticsearch (the company)

Kibana logo from https://github.com/elasticsearch/kibana/blob/3.0/src/img/kibana.png

Kibana Demo

7 days ago to a few seconds ago

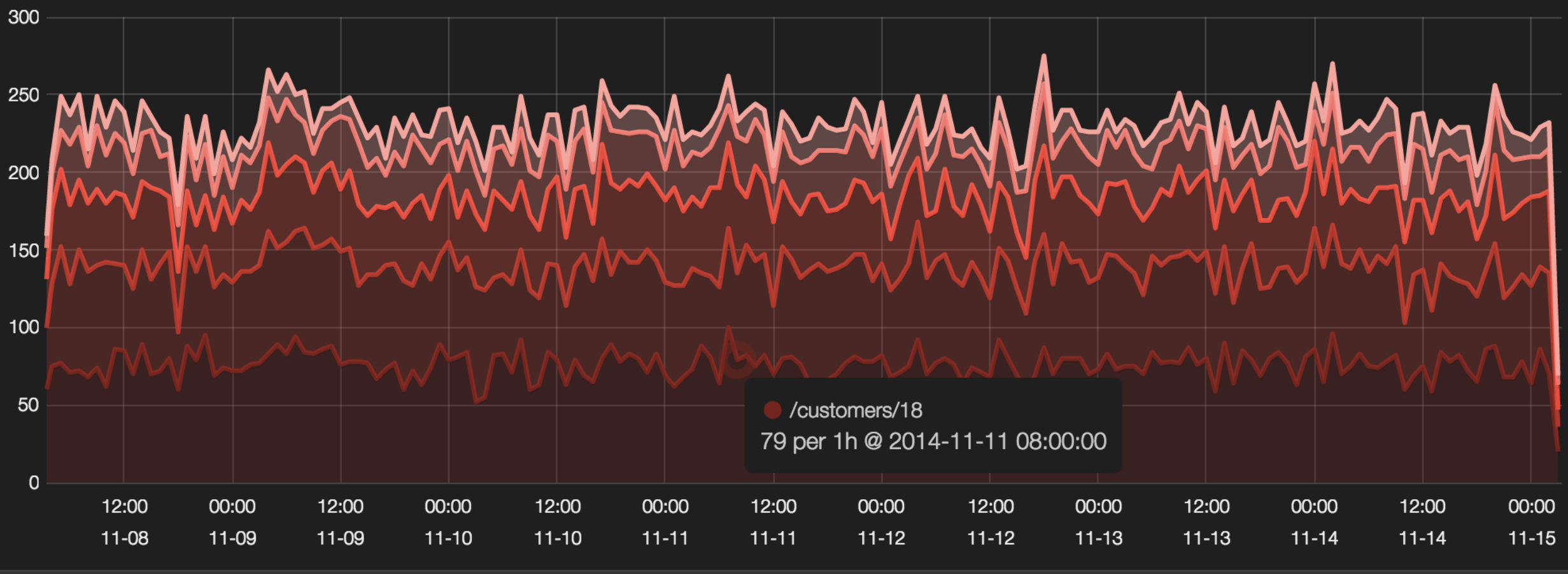
QUERY

host:"server1" AND method:"GET" AND uri-path.raw:/\/customers\/.*/

FILTERING

EVENTS OVER TIME

View | Zoom Out | /customers/18 (12747) /customers/18/orders (10484) /customers/5 (7724) /customers/5/orders (5173) /customers/32 (2602) count per **1h** | (**38730** hits)



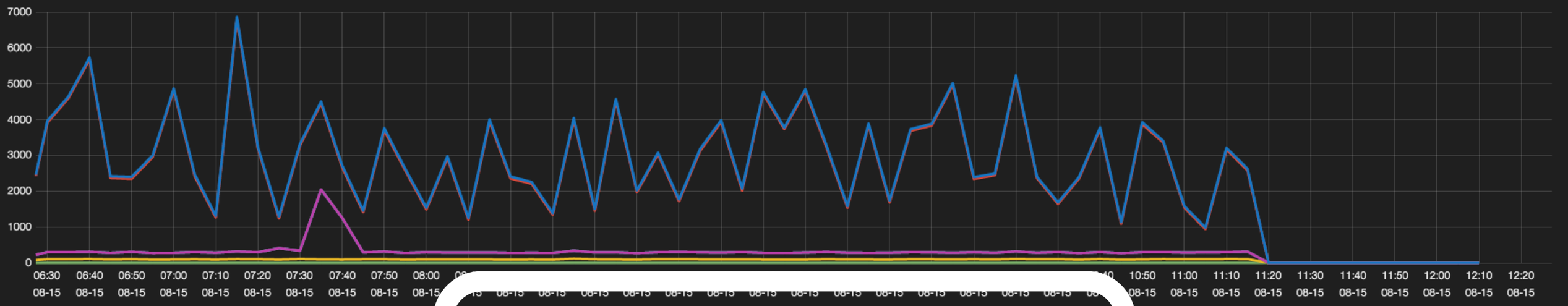
Access Dashboard

6 hours ago to 2 minutes ago

QUERY | FILTERING ★

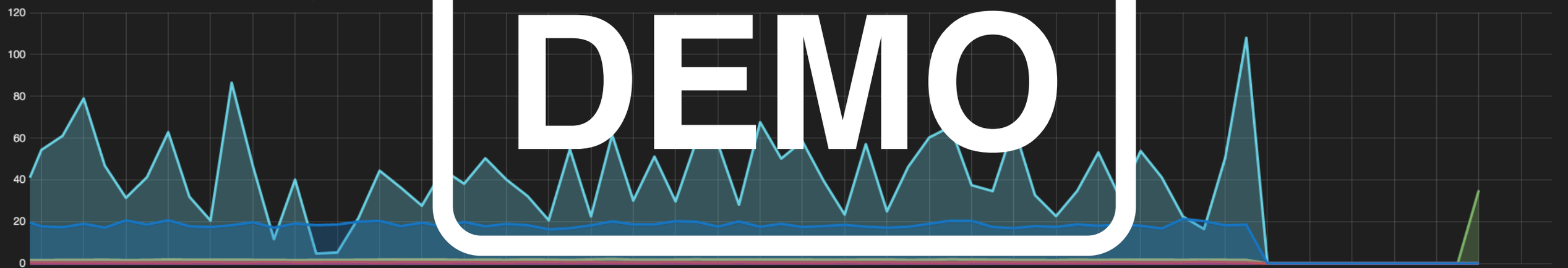
REQUEST RATE

View | Zoom Out | echo (1) | connection (5708) | edge (14201) | notification (0) | identity (154755) | license (2825) count per **5m** | (**177490** hits)



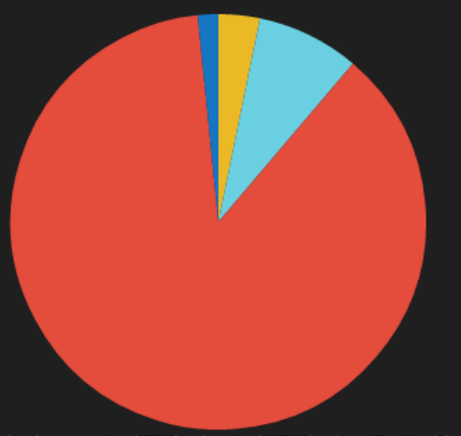
AVERAGE RESPONSE TIMES

View | Zoom Out | echo (1) | connection (5708) | edge (14201) | notification (| identity (154755) | license (2825) **elapsedTimeMillis** mean per **5m** | (**177490** hits)



DEMO

REQUESTS



echo (1) | connection (5708) | edge (14201) | notification (0) | identity (154755) | license (2825)

RESPONSE SIZE (BYTES)

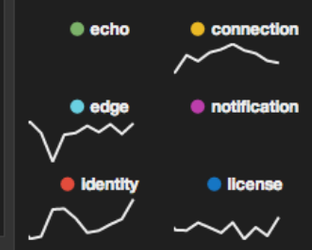
453 (mean)

Query	count	min	max	mean	total	variance	std_deviation
echo	1	6	6	6	6	0	0
connection	5,708	106	263,551	2,814	16,062,867	219,314,862	14,809
edge	14,201	0	642,733	3,003	42,648,398	536,104,447	23,154
notification	0	Infinity	-Infinity	0	0	0	0
identity	154,755	102	221	124	19,163,573	167	13
license	2,825	307	15,807	904	2,554,249	3,986,432	1,997

REQUEST RATE

- ▲0% (echo)
- ▼-1.77% (connection)
- ▼-1.42% (edge)
- ▲?% (notification)
- ▼-1.73% (identity)
- ▼-1.7% (license)

RESPONSE TIME



Demo/Quick Start Project

- Downloads, installs, and configures Elasticsearch, Logstash, Kibana, and kopf plugin
- Provides scripts for starting, stopping, and resetting data
- Generates log data to index
- Prerequisites
  - JDK (1.7 or 1.8 should work)
  - node.js
- Caveats
  - Shell scripts require OS X or Linux

Setup Steps

1. https://github.com/dgrabows/elk-demo
2. Clone or download zip
3. Run ./install.sh
4. Run ./start-all.sh
5. Kibana: http://localhost/9200
6. Admin UI (kopf): http://localhost:9200/_plugin/kopf

Experiences

- Don’t underestimate power of rsync, find, grep, awk, sed, wc, cron, etc.
- Elasticsearch and Kibana very effective for exploring log data
- Elasticsearch has additional capabilities not exposed through Kibana (e.g. percentile aggregates)

Experiences (cont.)

- One effective pattern
  - Analyze aggregate metrics with Elasticsearch, node.js, and spreadsheets
  - Drilled down into problem areas with Kibana and Elasticsearch
- You could get a lot done with a 4-8 core/32 GB RAM/1 TB disk server

Questions?

References

- https://github.com/dgrabows/presentations (this presentation)
- https://github.com/dgrabows/log-gen (access log generation code)
- http://www.elasticsearch.org
- http://logstash.net/
- https://github.com/elasticsearch (Elasticsearch, Logstash, Kibana repos)
- https://github.com/lmenezes/elasticsearch-kopf (kopf plugin)

Attributions

Full attributions provided inline, where practical

Title Slide

"Skyline at Night" (https://www.flickr.com/photos/knightfoundation/12119756375) by Knight Foundation (https://www.flickr.com/photos/knightfoundation/), used under CC BY-SA 2.0 (https://creativecommons.org/licenses/by-sa/2.0/) / Converted to black and white

Dan Grabowski

dan.grabowski@gmail.com

Except where otherwise noted, this work licensed under

http://creativecommons.org/licenses/by-sa/4.0/