The Elastic Stack

Log management and analysis

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About this presentation

- What is log analysis ?
- Why do I need it ?
- The Elastic stack
- Practical example
- Alternatives

About me

- SUSE veteran
- Open source veteran

  (Google knows it all)
- Father, Maker, Hacker
- Agilist
- Currently: Product Owner for SUSE Container platform offering

Log Analysis

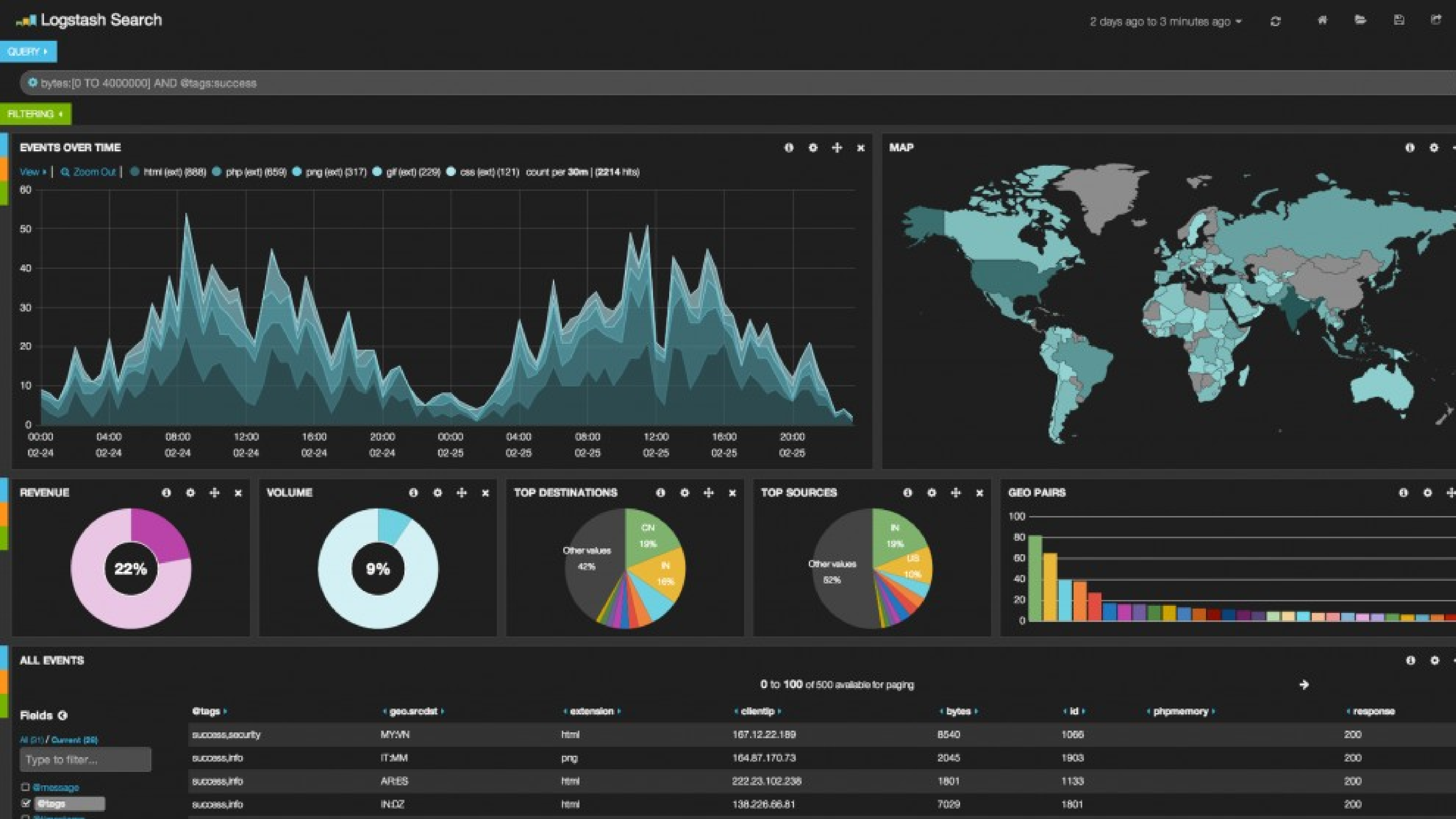
```
127.0.0.1 - - [05/Oct/2016:15:30:18 +0200] "GET /cgi-bin/translate_key.cgi?scout_shared_key=7a6a63848194
10.160.4.230 - - [05/Oct/2016:15:30:18 +0200] "POST /satconfig/cgi-mod-perl/accept_status_log.cgi HTTP/1.
127.0.0.1 - - [05/Oct/2016:15:30:39 +0200] "GET /cgi-bin/translate_key.cgi?scout_shared_key=7a6a63848194
10.160.4.230 - - [05/Oct/2016:15:30:39 +0200] "POST /tsdb HTTP/1.1" 200 82 "-" "libwww-perl/5.816"
10.160.4.230 - - [05/Oct/2016:15:30:39 +0200] "POST /cgi-bin/eventHandler.cgi HTTP/1.1" 200 82
127.0.0.1 - - [05/Oct/2016:15:30:40 +0200] "GET /cgi-bin/translate_key.cgi?scout_shared_key=7a6a63848194
10.160.4.230 - - [05/Oct/2016:15:30:40 +0200] "GET /satconfig/cgi-mod-perl/fetch_commands.cgi?cluster_id=
10.160.4.230 - - [05/Oct/2016:15:30:41 +0200] "GET /satconfig/cgi-mod-perl/fetch_commands.cgi?cluster_id=
10.160.4.230 - - [05/Oct/2016:15:30:50 +0200] "POST /tsdb HTTP/1.1" 200 164 "-" "libwww-perl/5.816"
10.160.4.230 - - [05/Oct/2016:15:30:50 +0200] "POST /cgi-bin/eventHandler.cgi HTTP/1.1" 200 164
10.162.166.1 - - [05/Oct/2016:15:30:58 +0200] "POST /XMLRPC HTTP/1.1" 200 163
10.162.166.1 - - [05/Oct/2016:15:30:58 +0200] "POST /XMLRPC HTTP/1.1" 200 731
10.160.4.230 - - [05/Oct/2016:15:31:00 +0200] "POST /cobbler_api HTTP/1.1" 200 144 "-" "Java/1.7.0"
10.160.4.230 - - [05/Oct/2016:15:31:00 +0200] "POST /cobbler_api HTTP/1.1" 200 129 "-" "Java/1.7.0"
10.160.4.230 - - [05/Oct/2016:15:31:00 +0200] "POST /tsdb HTTP/1.1" 200 111 "-" "libwww-perl/5.816"
10.160.4.230 - - [05/Oct/2016:15:31:00 +0200] "POST /cgi-bin/eventHandler.cgi HTTP/1.1" 200 111
10.160.4.230 - - [05/Oct/2016:15:31:05 +0200] "POST /tsdb HTTP/1.1" 200 87 "-" "libwww-perl/5.816"
10.160.4.230 - - [05/Oct/2016:15:31:05 +0200] "POST /cgi-bin/eventHandler.cgi HTTP/1.1" 200 87
127.0.0.1 - - [05/Oct/2016:15:31:18 +0200] "GET /cgi-bin/translate_key.cgi?scout_shared_key=7a6a63848194
10.160.4.230 - - [05/Oct/2016:15:31:18 +0200] "POST /satconfig/cgi-mod-perl/accept_status_log.cgi HTTP/1.
10.160.4.230 - - [05/Oct/2016:15:31:41 +0200] "GET /satconfig/cgi-mod-perl/fetch_commands.cgi?cluster_id=
10.160.4.230 - - [05/Oct/2016:15:32:00 +0200] "POST /cobbler_api HTTP/1.1" 200 144 "-" "Java/1.7.0"
10.160.4.230 - - [05/Oct/2016:15:32:00 +0200] "POST /cobbler_api HTTP/1.1" 200 129 "-" "Java/1.7.0"
127.0.0.1 - - [05/Oct/2016:15:32:18 +0200] "GET /cgi-bin/translate_key.cgi?scout_shared_key=7a6a63848194
10.160.4.230 - - [05/Oct/2016:15:32:18 +0200] "POST /satconfig/cgi-mod-perl/accept_status_log.cgi HTTP/1.
10.162.166.1 - - [05/Oct/2016:15:32:26 +0200] "POST /XMLRPC HTTP/1.1" 200 163
10.162.166.1 - - [05/Oct/2016:15:32:27 +0200] "POST /XMLRPC HTTP/1.1" 200 731
```

Problem statement

- Many deamons
- Large stacks
- Distributed
- Huge amounts of data
- Hard to read

Problem statement (2)

- Central logging
- Safe, Tamper-resistant
- Dependency, Causality
- One-offs vs. Trends
- Text vs. Graphic



bytes:[0 TO 4000000] AND @tags:success

0 to 100 of 500 available for paging

@tags	geo.srcdst	extension	clientip	bytes	id	phpmemory	response
success,security	MY:VN	html	167.12.22.189	8540	1066		200
success,info	IT:MM	png	164.87.170.73	2045	1903		200
success,info	AR:ES	html	222.23.102.238	1801	1133		200
success,info	IN:DZ	html	138.226.66.81	7029	1801		200

The Elastic stack

(formerly: ELK stack)

Elasticsearch

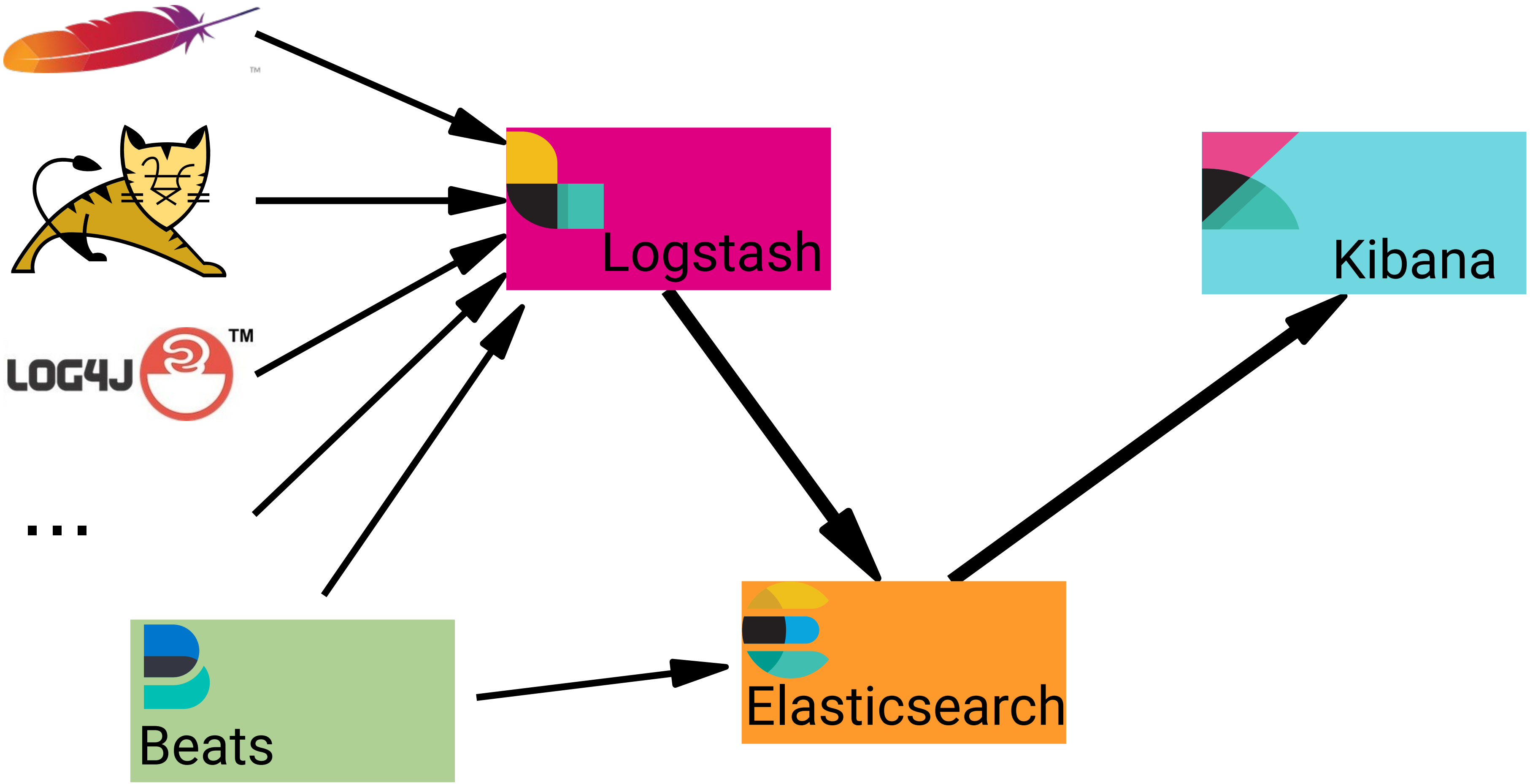
Logstash

Kibana

Database

Log server / parser

UI



Logstash

Kibana

...

Beats

Elasticsearch

Apache Logos: The Apache Software Foundation - http://svn.apache.org/viewvc/jakarta/site/xdocs/images/logos/tomcat.eps, Apache License 2.0, https://commons.wikimedia.org/w/index.php?curid=11302180

Beats

Beats

- Formerly ‘logstash-forwarder’
- Unobtrusive (log) file forwarder
  - ‘tail -f | tee’
- Written in Go, fast
- Simple configuration

Beats

- Filebeat
- Metricbeat
- Packetbeat
- Heartbeat
- Auditbeat
- Winlogbeat
- Functionbeat

Example: Apache + Filebeat

```
# /usr/filebeat/filebeat.yml
filebeat:
  prospectors:
    -
      paths:
        - /var/log/apache2/access_log
      encoding: utf-8
      input_type: log
      document_type: access_log
    ...
output:
  logstash:
    hosts: ["logstash.mgr.suse.de:5045"]
```

Elasticsearch

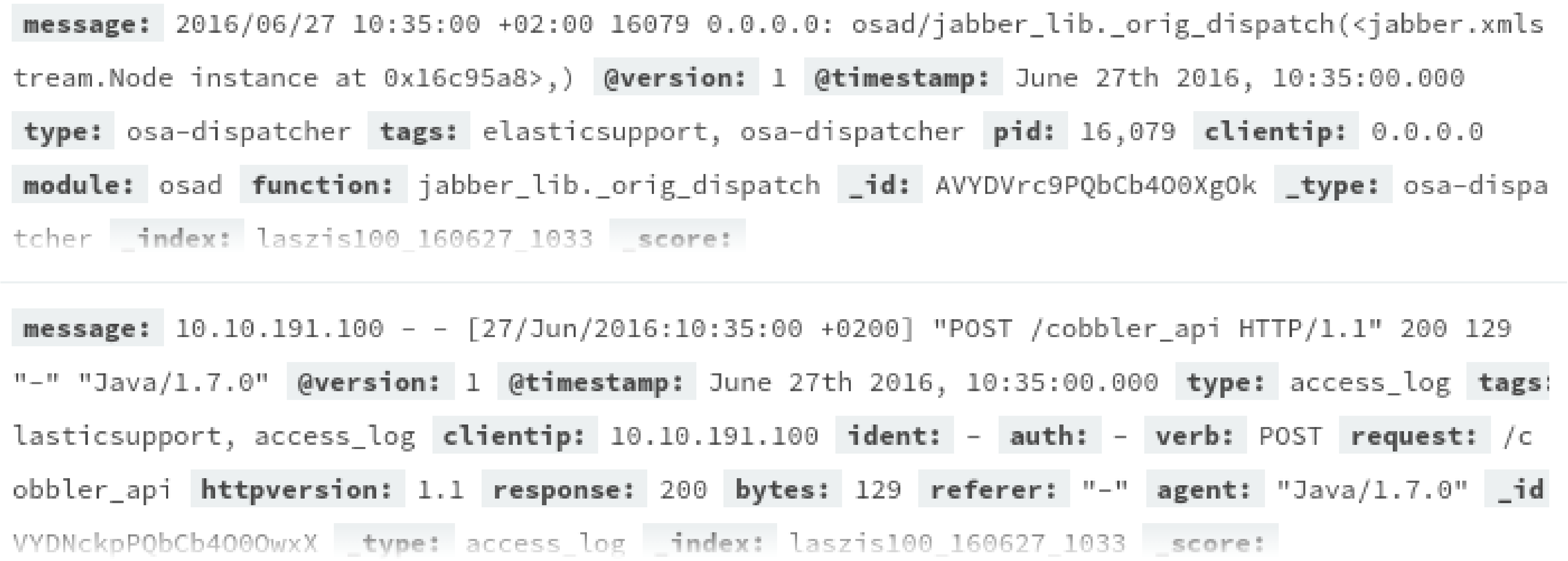
Elasticsearch

- Fulltext database (Apache Lucene)
- Key-Value pairs
- Scalable

Terminology

- Index: Database
- Mapping: Schema
- Document: Record
- Field: key-value pair

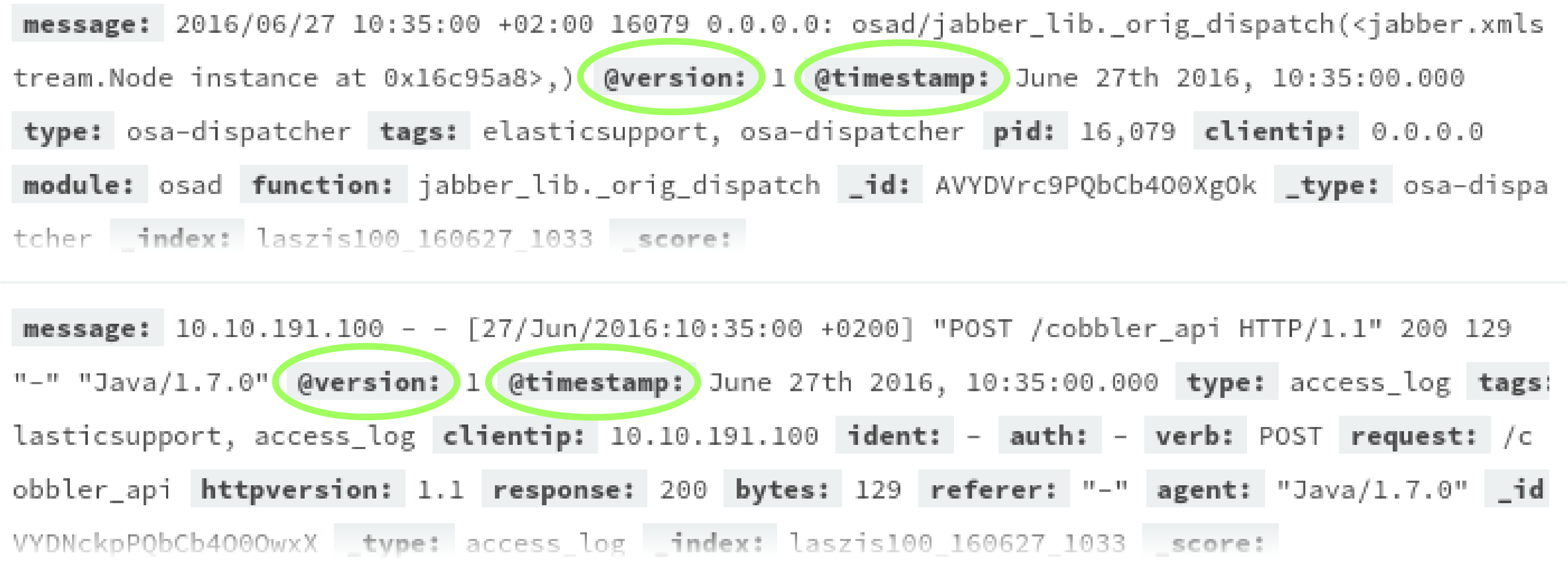
Elasticsearch – raw data



```
message: 2016/06/27 10:35:00 +02:00 16079 0.0.0.0: osad/jabber_lib._orig_dispatch(<jabber.xmls
tream.Node instance at 0x16c95a8>,) @version: 1 @timestamp: June 27th 2016, 10:35:00.000
type: osa-dispatcher tags: elasticsupport, osa-dispatcher pid: 16,079 clientip: 0.0.0.0
module: osad function: jabber_lib._orig_dispatch _id: AVYDVrc9PQbCb4O0XgOk _type: osa-dispa
tcher _index: laszis100_160627_1033 _score:
```

```
message: 10.10.191.100 - - [27/Jun/2016:10:35:00 +0200] "POST /cobbler_api HTTP/1.1" 200 129
"-" "Java/1.7.0" @version: 1 @timestamp: June 27th 2016, 10:35:00.000 type: access_log tags:
lasticsupport, access_log clientip: 10.10.191.100 ident: - auth: - verb: POST request: /c
obbler_api httpversion: 1.1 response: 200 bytes: 129 referer: "-" agent: "Java/1.7.0" _id
VYDNckpPQbCb4O0OwxX _type: access_log _index: laszis100_160627_1033 _score:
```

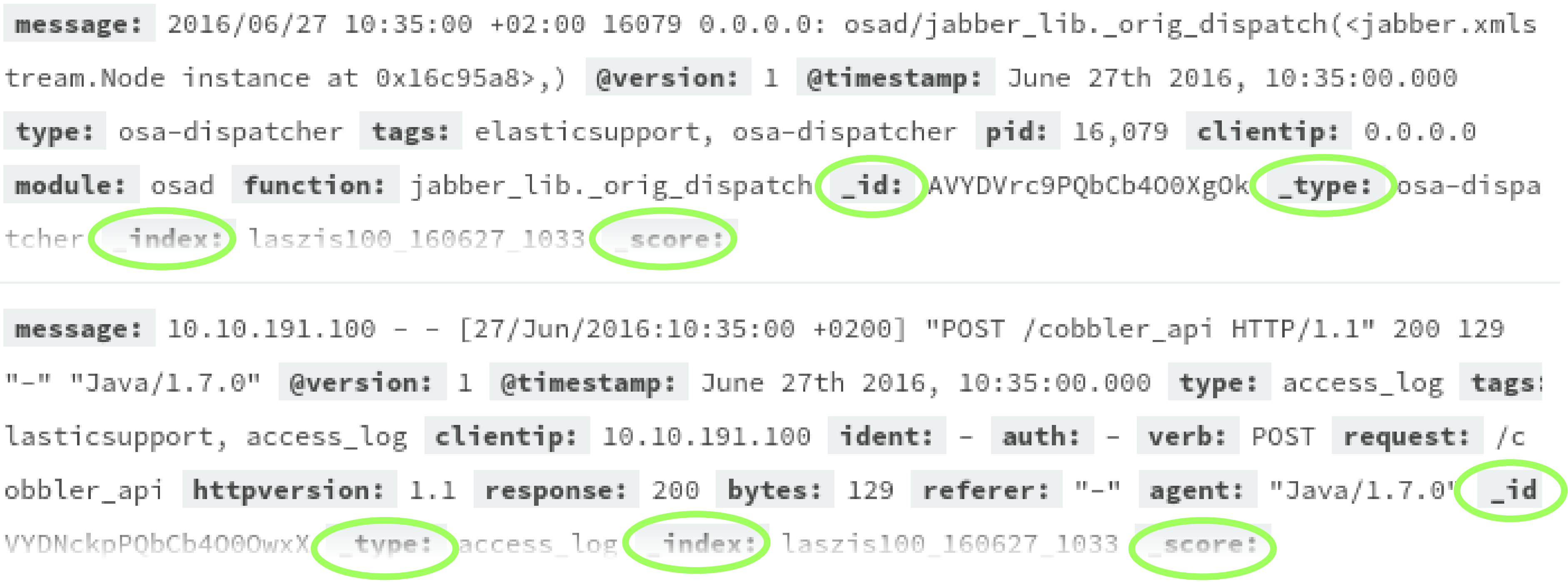
Elasticsearch – Kibana fields



```
message: 2016/06/27 10:35:00 +02:00 16079 0.0.0.0: osad/jabber_lib._orig_dispatch(<jabber.xmls
tream.Node instance at 0x16c95a8>,) @version: 1 @timestamp: June 27th 2016, 10:35:00.000
type: osa-dispatcher tags: elasticsupport, osa-dispatcher pid: 16,079 clientip: 0.0.0.0
module: osad function: jabber_lib._orig_dispatch _id: AVYDVrc9PQbCb4O0XgOk _type: osa-dispa
tcher _index: laszis100_160627_1033 _score:
```

```
message: 10.10.191.100 - - [27/Jun/2016:10:35:00 +0200] "POST /cobbler_api HTTP/1.1" 200 129
"-" "Java/1.7.0" @version: 1 @timestamp: June 27th 2016, 10:35:00.000 type: access_log tags:
lasticsupport, access_log clientip: 10.10.191.100 ident: - auth: - verb: POST request: /c
obbler_api httpversion: 1.1 response: 200 bytes: 129 referer: "-" agent: "Java/1.7.0" _id
VYDNckpPQbCb4O0OwxX _type: access_log _index: laszis100_160627_1033 _score:
```

Elasticsearch – internal fields



```
message: 2016/06/27 10:35:00 +02:00 16079 0.0.0.0: osad/jabber_lib._orig_dispatch(<jabber.xmls
tream.Node instance at 0x16c95a8>,) @version: 1 @timestamp: June 27th 2016, 10:35:00.000
type: osa-dispatcher tags: elasticsupport, osa-dispatcher pid: 16,079 clientip: 0.0.0.0
module: osad function: jabber_lib._orig_dispatch _id: AVYDVrc9PQbCb4O0XgOk _type: osa-dispa
tcher _index: laszis100_160627_1033 _score:
```

```
message: 10.10.191.100 - - [27/Jun/2016:10:35:00 +0200] "POST /cobbler_api HTTP/1.1" 200 129
"-" "Java/1.7.0" @version: 1 @timestamp: June 27th 2016, 10:35:00.000 type: access_log tags:
lasticsupport, access_log clientip: 10.10.191.100 ident: - auth: - verb: POST request: /c
obbler_api httpversion: 1.1 response: 200 bytes: 129 referer: "-" agent: "Java/1.7.0" _id
VYDNckpPQbCb4O0OwxX _type: access_log _index: laszis100_160627_1033 _score:
```

Logstash

Logstash - Overview

- Logserver
- Scalable
- Time-based events
- JRuby

- Input: Text or JSON
- Filter: Parse and manipulate
- Output: Elasticsearch or other

Logstash - input.conf

```
input {
  stdin {}
}
```

Logstash - input.conf

```
input {
  tcp {
    port => 9000
    type => "access_log"
  }
  tcp {
    port => 9001
    type => "error_log"
    tags => ["tag1", "tag2"]
...
```

Logstash Grok Patterns

Logstash - filter.conf

```
# osa-dispatcher
# 2015/06/12 11:39:04 +02:00 14117 0.0.0.0: osad/jabber_lib.main('ERROR',...)
filter {
  if ([type] == "osa-dispatcher") {
    grok {
      match => {
       "message" => "\d\d\d\d\/\d\d\/\d\d\s\d\d:\d\d:\d\d\s[+-]\d\d:\d\d:timestamp ...”
      }
    }
  }
}
```

Logstash - filter.pattern

```
# osa-dispatcher
# 2015/06/12 11:39:04 +02:00 14117 0.0.0.0: osad/jabber_lib.main('ERROR',...)

TIMESTAMP \d\d\d\d\/\d\d\/\d\d\s\d\d:\d\d:\d\d\s[+-]\d\d:\d\d
PID [\d]+
FUNCTION [\w_\.]+
ARGS \([^\)]+\)
```

Logstash - filter.conf

```
filter {
  if ([type] == "osa-dispatcher") {
    grok {
      match => {
       "message" => "%{TIMESTAMP:timestamp} %{PID:pid:int} %{IPV4:clientip}: ...”
      }
    }
  }
}
```

Logstash - output.conf

```
output {
  stdout { codec => rubydebug }
}
```

Logstash - output.conf

```
output {
  elasticsearch {
    hosts => [“localhost:9200”]
  }
}
```

Logstash - Start

```
# ls
filter.conf  input.conf  osa-
dispatcher.pattern  output.conf
rhn_web_api.pattern


# logstash -f ./\*.conf --auto-reload
```

Kibana

Kibana - Overview

- Web based visualization frontend for Elasticsearch
- Time-based events
- Comfortable query interface
- Dashboard management

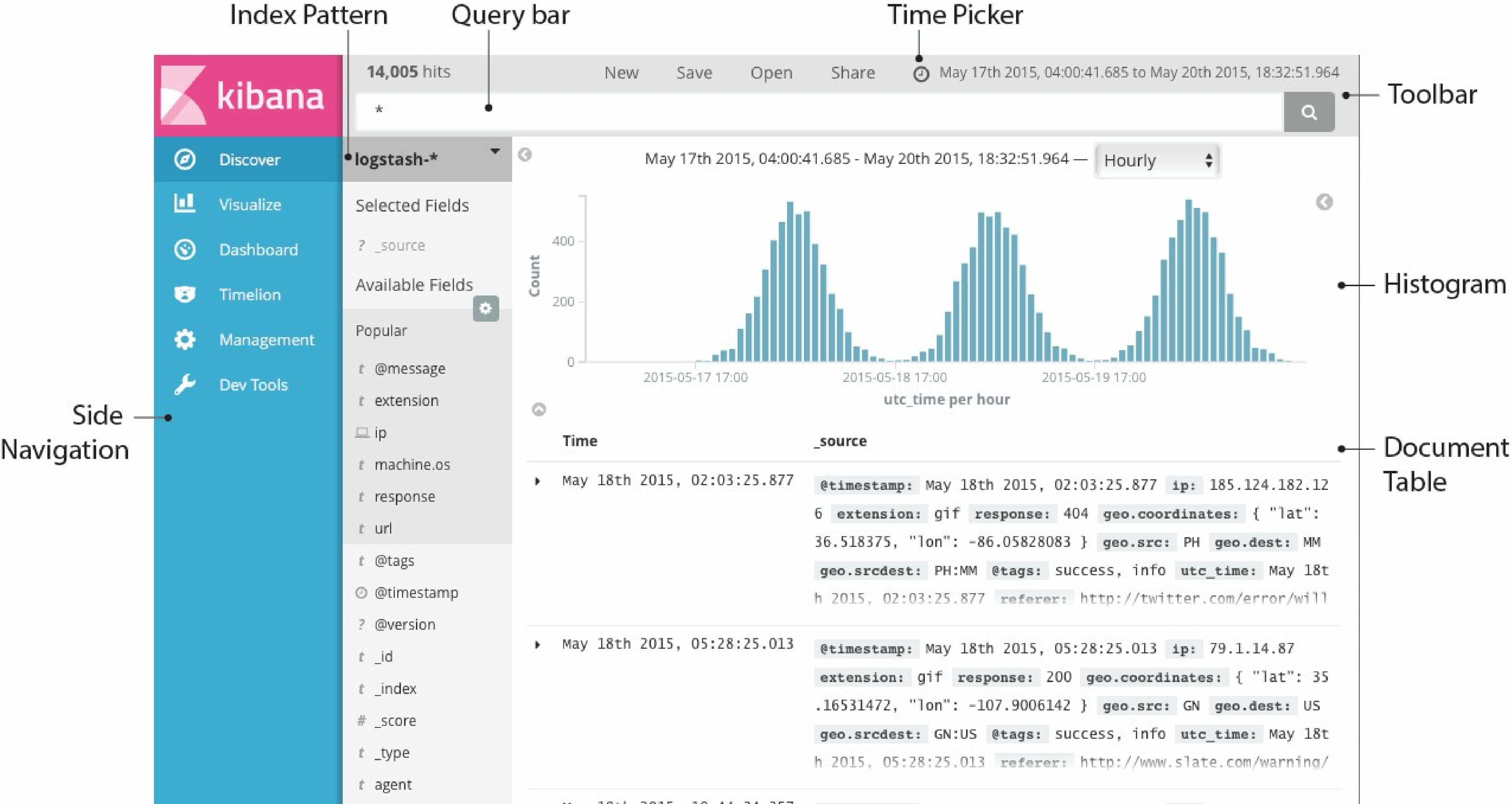
- Settings
- Discover
- Visualize
- Dashboard

Kibana - Settings

- Select index pattern
  - wildcards possbile
- Time based ?
  - Time-field name

Loads mapping

- field names
- field types
- analyzed ?



Index Pattern

Query bar

Time Picker

Toolbar

Histogram

Document Table

Side Navigation

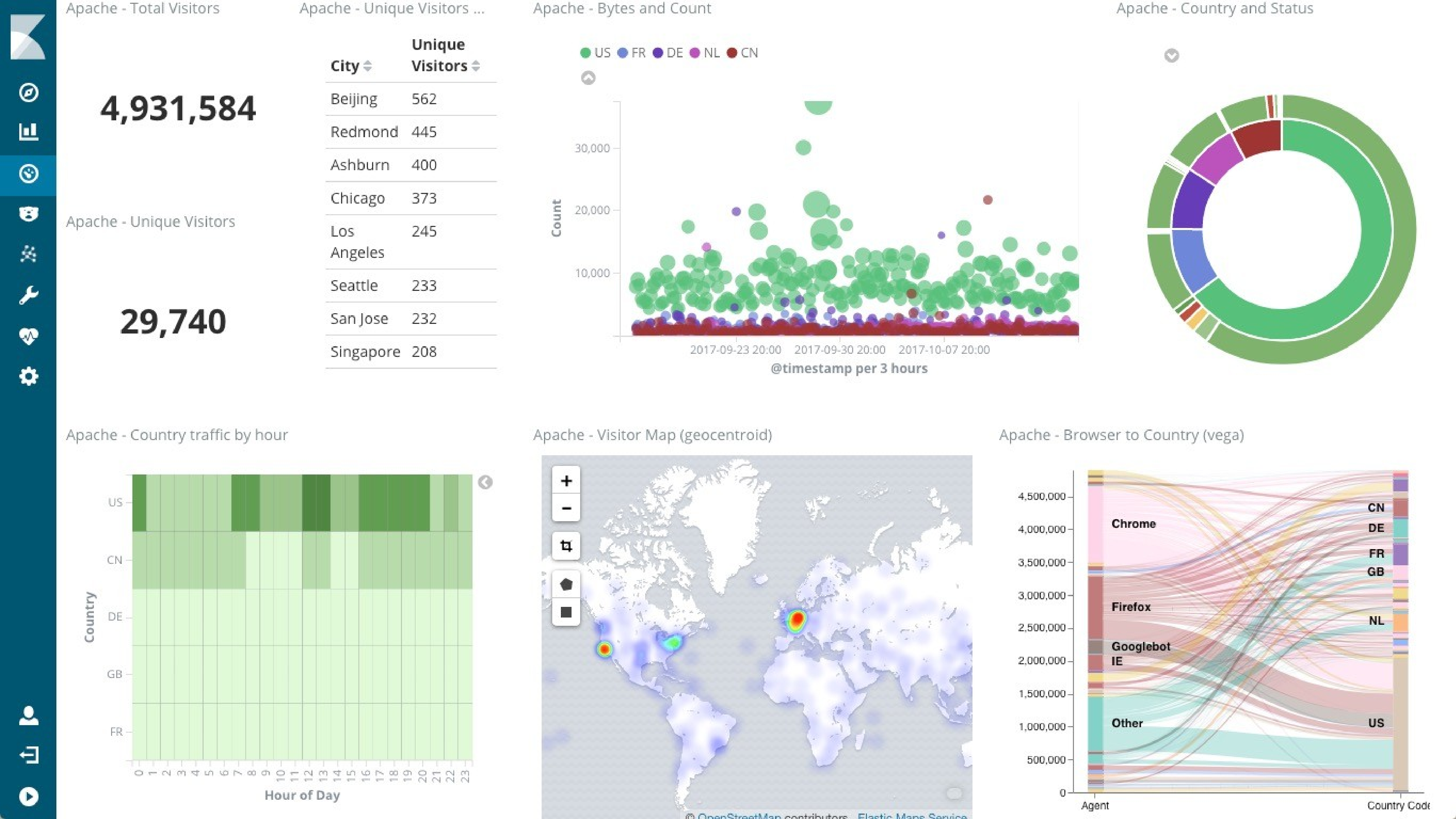
```
May 18th 2015, 02:03:25.877   @timestamp: May 18th 2015, 02:03:25.877 ip: 185.124.182.12
                              6 extension: gif response: 404 geo.coordinates: { "lat":
                              36.518375, "lon": -86.05828083 } geo.src: PH geo.dest: MM
                              geo.srcdest: PH:MM @tags: success, info utc_time: May 18t
                              h 2015, 02:03:25.877 referer: http://twitter.com/error/will

May 18th 2015, 05:28:25.013   @timestamp: May 18th 2015, 05:28:25.013 ip: 79.1.14.87
                              extension: gif response: 200 geo.coordinates: { "lat": 35
                              .16531472, "lon": -107.9006142 } geo.src: GN geo.dest: US
                              geo.srcdest: GN:US @tags: success, info utc_time: May 18t
                              h 2015, 05:28:25.013 referer: http://www.slate.com/warning/
```

Kibana - Discover

- No results found ?
  - Expand your time range
- Explore fields
  - Include/Exclude
- Create query
- Save search
- Visualize !

Kibana - Visualize

- Create new
  - Select visualization type
- New/Saved search
- Graph-specific parameters



Apache - Total Visitors

4,931,584

Apache - Unique Visitors

29,740

Apache - Unique Visitors ...

City	Unique Visitors
Beijing	562
Redmond	445
Ashburn	400
Chicago	373
Los Angeles	245
Seattle	233
San Jose	232
Singapore	208

Apache - Bytes and Count

Apache - Country and Status

Apache - Country traffic by hour

Apache - Visitor Map (geocentroid)

Apache - Browser to Country (vega)

Kibana - Dashboard

- Visualize Elasticsearch fields
- Collection of visualization tiles
- Table, Graph, Map, …
- Can be saved/shared

Help !

Help !

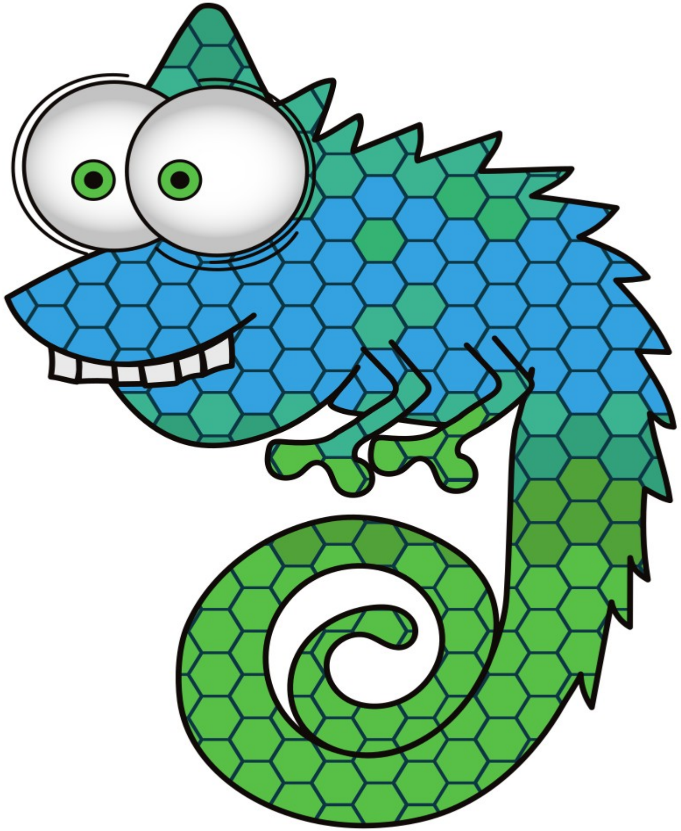
- https://github.com/elastic is **very** active
- Packaging is complex
- Java, JRuby, Go, JavaScript … oh my !

`security:logging` on build.opensuse.org

Other resources

- https://github.com/SUSE/log-analysis
- Dockerfiles
- Salt states
- Grok patterns

Contributions welcome !



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