SANOG36

18 - 21 January, 2021

Making story from system logs with

elastic stack

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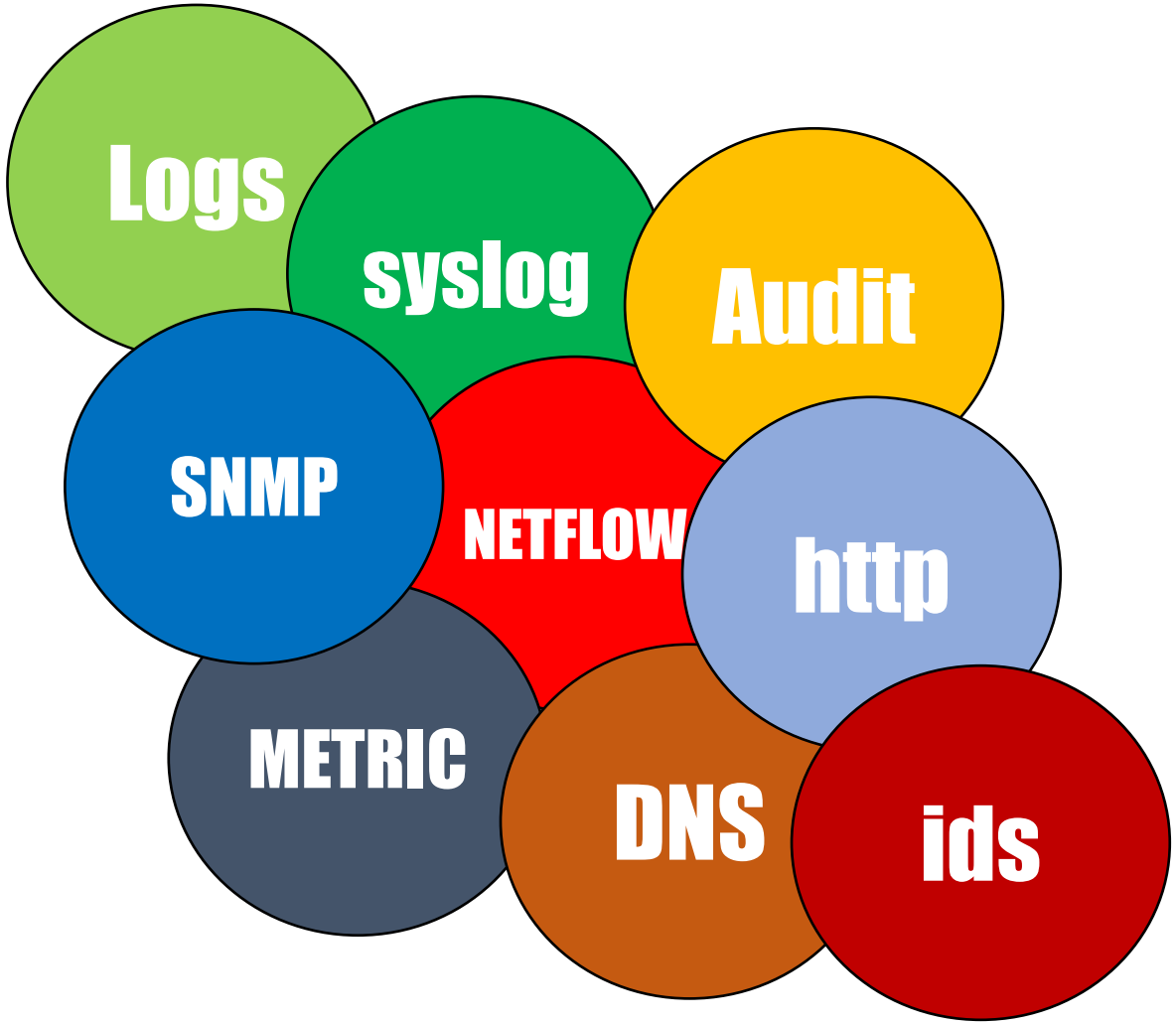

Logs
syslog
Audit
SNMP
NETFLOW
http
METRIC
DNS
ids

What is Elastic Stack ?

Store, Analyze

Ingest

User Interface


elasticsearch

a full-text based, distributed NoSQL database.

Written in Java, built on Apache Lucene

Commonly used for log analytics, full-text search, security intelligence, business analytics, and operational intelligence use cases.

Use REST API (GET, PUT, POST, and DELETE) for storing and searching data

Data is stored as documents

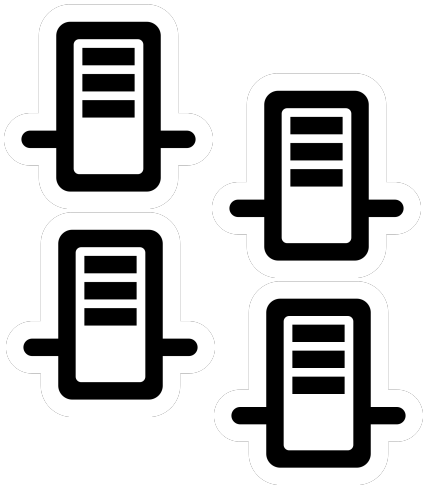
(rows in relational database)

Data is separated into fields

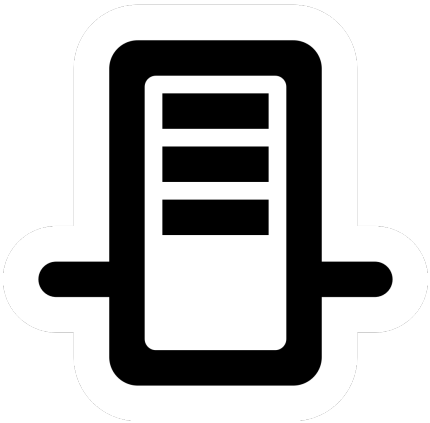
(columns in relational database)

Relational Database	**Elasticsearch**
Database	Index
Table	Type
Row/Record	Document
Column Name	Field

elasticsearch **Terminology**

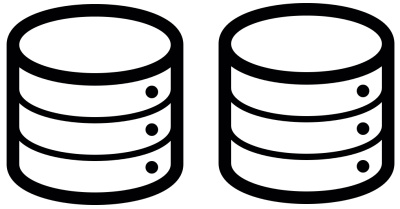


Cluster: A cluster consists of one or more nodes which share the same cluster name.

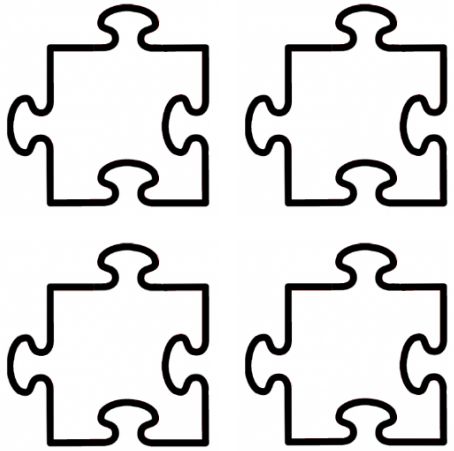


Node: A node is a running instance of elasticsearch which belongs to a cluster.

Terminology

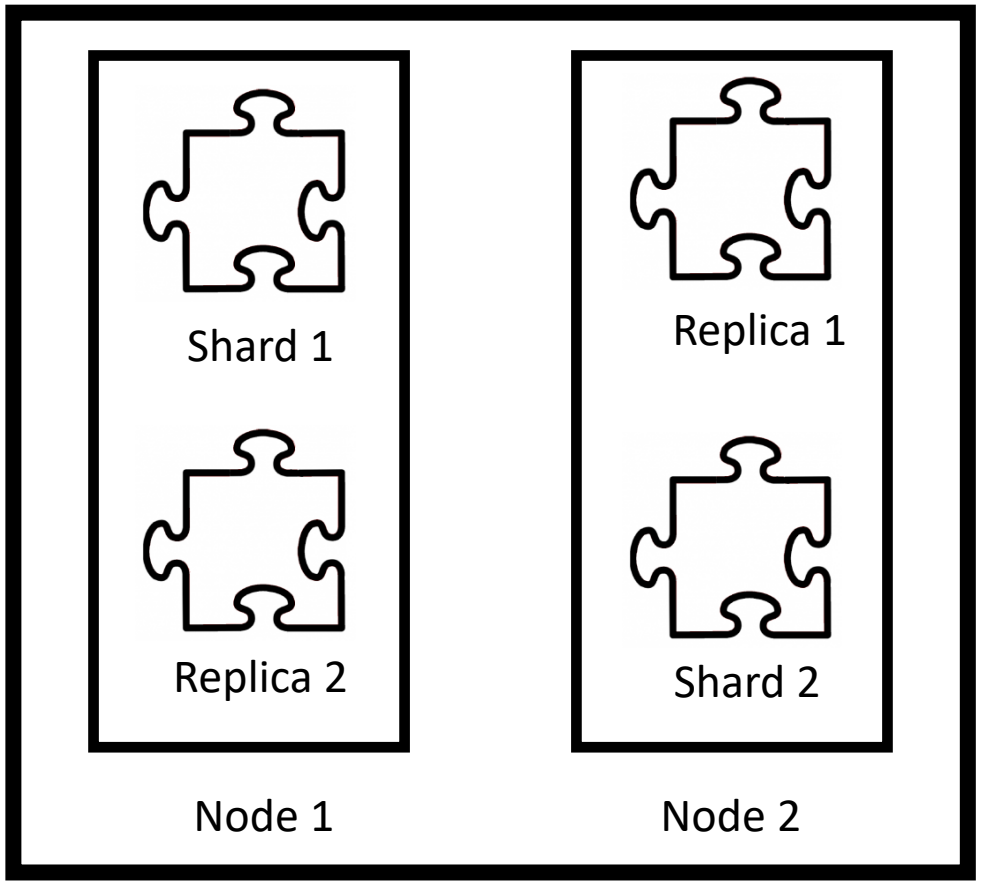


Index: Collection of documents



Shard: An index is split into elements known as shards that are distributed across multiple nodes. There are two types of shard, Primary and replica. By default elasticsearch creates 1 primary shard and 1 replica shard for each index.

elasticsearch Terminology



cluster

elasticsearch Terminology

Documents

- Indices hold **documents** in serialized **JSON objects**
- 1 document = 1 log entry
- Contains "field : value" pairs
- Metadata
  - **_index** – Index the document belongs to
  - **_id** – unique ID for that log
  - **_source** – parsed log fields


```
{
  "_index": "netflow-2020.10.08",
  "_type": "_doc",
  "_id": "ZwkiB3UBULotwSOX3Bdb",
  "_version": 1,
  "_score": null,
  "_source": {
    "@timestamp": "2020-10-08T07:35:32.000Z”,
    "host": "172.20.0.1",
    "netflow": {
      "ipv4_dst_addr": "103.12.179.136",
      "l4_dst_port": 80,
      "src_tos": 0,
      "l4_src_port": 53966,
      "ipv4_src_addr": ”192.168.110.18",
      "application_id": "13..0",
      "version": 9,
```

elasticsearch

Index creation

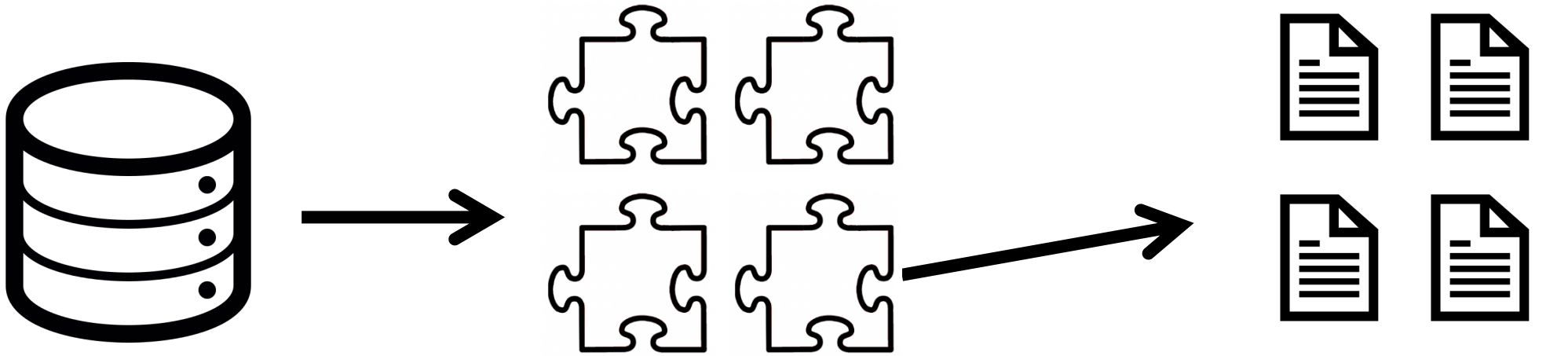
netflow-2020.10.08

netflow-2020.10.09

syslog-2020.10.08

syslog-2020.10.09

Shards and Documents



Installation

Hosted Elasticsearch:

Elastic cloud, AWS, GCP and Azure. Nothing to install, just login and run instances. Free 14 day trail.

Own hardware:

Linux and MacOS `tar.gz` archive
Windows `.zip` archive
`deb, rpm, msi, brew, docker`

elasticsearch Installation (Ubuntu example)

Install JAVA

```
curl  -fsSL  https://artifacts.elastic.co/GPG-KEY-elasticsearch
| sudo apt-key add -

echo "deb https://artifacts.elastic.co/packages/7.x/apt stable main"
| sudo tee -a /etc/apt/sources.list.d/elastic-7.x.list

sudo apt update

sudo apt install elasticsearch
```

elasticsearch Installation (docker example)

Pull the image

```
docker pull docker.elastic.co/elasticsearch/elasticsearch:7.x
```

Start a single node cluster

```
docker run -p 9200:9200 -p 9300:9300 -e
"discovery.type=single-node"
docker.elastic.co/elasticsearch/elasticsearch:7.x
```

elasticsearch Installation (docker example)

Multi node cluster with docker-compose

```
es01:
   image: ${ELASTICSEARCH_IMAGE}
   container_name: es01
   restart: always
   ports:
     - "9200:9200"
   environment:
     - "ES_JAVA_OPTS=-Xms1g -Xmx1g”
networks:
     - net
volumes:
  - type: bind
    source: some_path_your_host
    target: some_path_your_container
```

```
es02:
    image: ${ELASTICSEARCH_IMAGE}
    container_name: es02
    restart: always
    ports:
      - "9201:9201"
    environment:
      - "ES_JAVA_OPTS=-Xms1g -Xmx1g”
 networks:
      - net
 volumes:
   - type: bind
     source: some_path_your_host
     target: some_path_your_container
```

Configuration

Location and the config file

`/usr/share/elasticsearch/config/elasticsearch.yml`

Key configuration elements

Single node

```
network.host: 0.0.0.0
http.port: 9200
discovery.type=single-node
```

Cluster

```
node.name: es01
node.master: true
cluster.name: training
discovery.seed_hosts: es02
cluster.initial_master_nodes: es01,es02
network.host: 0.0.0.0
```

elasticsearch

```
[root@4f8cd6658b1b elasticsearch]# curl http://localhost:9200
{
  "name" : "es01",
  "cluster_name" : ”training",
  "cluster_uuid" : "vE9SZr8oRFK0A0HTq9U_oA",
  "version" : {
    "number" : "7.7.0",
    "build_flavor" : "default",
    "build_type" : "docker",
    "build_hash" : "81a1e9eda8e6183f5237786246f6dced26a10eaf",
    "build_date" : "2020-05-12T02:01:37.602180Z",
    "build_snapshot" : false,
    "lucene_version" : "8.5.1",
    "minimum_wire_compatibility_version" : "6.8.0",
    "minimum_index_compatibility_version" : "6.0.0-beta1"
  },
  "tagline" : "You Know, for Search"
}
[root@4f8cd6658b1b elasticsearch]#
```


logstash

Free, developed and maintained by Elastic

Integrates with Beats

Integrates with Elasticsearch

Tons of plugins

Logstatsh has three stages

INPUT

```
input {
  tcp {
    port => 5002
    type => "syslog"
  }
}
```

beats, file, syslog,
udp, snmp,
etc…

FILTER

```
filter {
 if [type] == "syslog" {
  grok {
  }
 }
}
```

http, kv,
xml, json,
etc…

OUTPUT

```
output {
if [type] == "syslog" {
  elasticsearch {
    hosts => "http://es01:9200"
    index => "syslog-%{+YYYY.MM.dd}"
   }
  }
}
```

csv, file,
http, stdout,
etc….

.conf

Grok is a great way to parse unstructured log data into something structured and queryable.

The syntax for a grok pattern is `%{SYNTAX:SEMANTIC}`

SYNTAX: is the name of the pattern that will match your text

SEMANTIC: is the identifier to the piece of text being matched

Grok Example

raw log

```
192.168.8.1 GET /index.html 15824 0.04
```

grok pattern

```
%{IP:client} %{WORD:method} %{URIPATHPARAM:request} %{NUMBER:bytes} %{NUMBER:duration}
```

output

```
{
  "duration": "0.04",
  "request": "/index.html",
  "method": "GET",
  "bytes": "15824",
  "client": "192.168.8.1"
}
```

Grok Debugger

Sample Data

```
1  192.168.8.1 GET /index.html 15824 0.04
```

Grok Pattern

```
1  %{IP:client} %{WORD:method} %{URIPATHPARAM:request} %{NUMBER:bytes} %{NUMBER:duration}
```

> Custom Patterns

Simulate

Structured Data

```
1 {
2   "duration": "0.04",
3   "request": "/index.html",
4   "method": "GET",
5   "bytes": "15824",
6   "client": "192.168.8.1"
7 }
```

logstash Installation

From binaries

Download the package from:
https://www.elastic.co/downloads/logstash

Options are: tar.gz, deb, zip, rpm

Package manager: yum, apt-get, homebrew

Container: docker

logstash Installation (Ubuntu example)

Install JAVA

```
wget  -qO  -  https://artifacts.elastic.co/GPG-KEY-elasticsearch
| sudo apt-key add -
```

```
sudo apt-get install apt-transport-https
```

```
echo "deb https://artifacts.elastic.co/packages/7.x/apt stable main"
| sudo tee -a /etc/apt/sources.list.d/elastic-7.x.list
```

```
sudo apt update
```

```
sudo apt install logstash
```

logstash Installation (docker example)

Pull the image

```
docker pull docker.elastic.co/logstash/logstash:7.x
```

Start the container

```
docker run --rm -it -v
~/settings/:/usr/share/logstash/config/
docker.elastic.co/logstash/logstash:7.x
```

Dockerfile

```
FROM docker.elastic.co/logstash/logstash:7.x
RUN rm -f /usr/share/logstash/pipeline/logstash.conf
ADD pipeline/ /usr/share/logstash/pipeline/
ADD config/ /usr/share/logstash/config/
```


kibana

kibana

Logs for single host

```
vagrant@logger:~/suricata-update$ tail -f /var/log/suricata/fast.log
01/13/2019-16:01:35.369922  [**] [1:2013504:5] ET POLICY GNU/Linux APT User-Agent Outbound likely re
lated to package management [**] [Classification: Not Suspicious Traffic] [Priority: 3] {TCP} 10.0.2
.15:33726 -> 91.189.88.149:80
01/13/2019-16:01:35.369922  [**] [1:2013504:5] ET POLICY GNU/Linux APT User-Agent Outbound likely re
lated to package management [**] [Classification: Not Suspicious Traffic] [Priority: 3] {TCP} 10.0.2
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.15:33726 -> 91.189.88.149:80
01/13/2019-16:01:35.470711  [**] [1:2013504:5] ET POLICY GNU/Linux APT User-Agent Outbound likely re
lated to package management [**] [Classification: Not Suspicious Traffic] [Priority: 3] {TCP} 10.0.2
.15:33726 -> 91.189.88.149:80
01/13/2019-16:01:35.684343  [**] [1:2013504:5] ET POLICY GNU/Linux APT User-Agent Outbound likely re
lated to package management [**] [Classification: Not Suspicious Traffic] [Priority: 3] {TCP} 10.0.2
.15:33726 -> 91.189.88.149:80
01/13/2019-16:01:41.548871  [**] [1:2013504:5] ET POLICY GNU/Linux APT User-Agent Outbound likely re
lated to package management [**] [Classification: Not Suspicious Traffic] [Priority: 3] {TCP} 10.0.2
.15:33726 -> 91.189.88.149:80
01/13/2019-16:01:43.074022  [**] [1:2013504:5] ET POLICY GNU/Linux APT User-Agent Outbound likely re
lated to package management [**] [Classification: Not Suspicious Traffic] [Priority: 3] {TCP} 10.0.2
.15:33726 -> 91.189.88.149:80
```
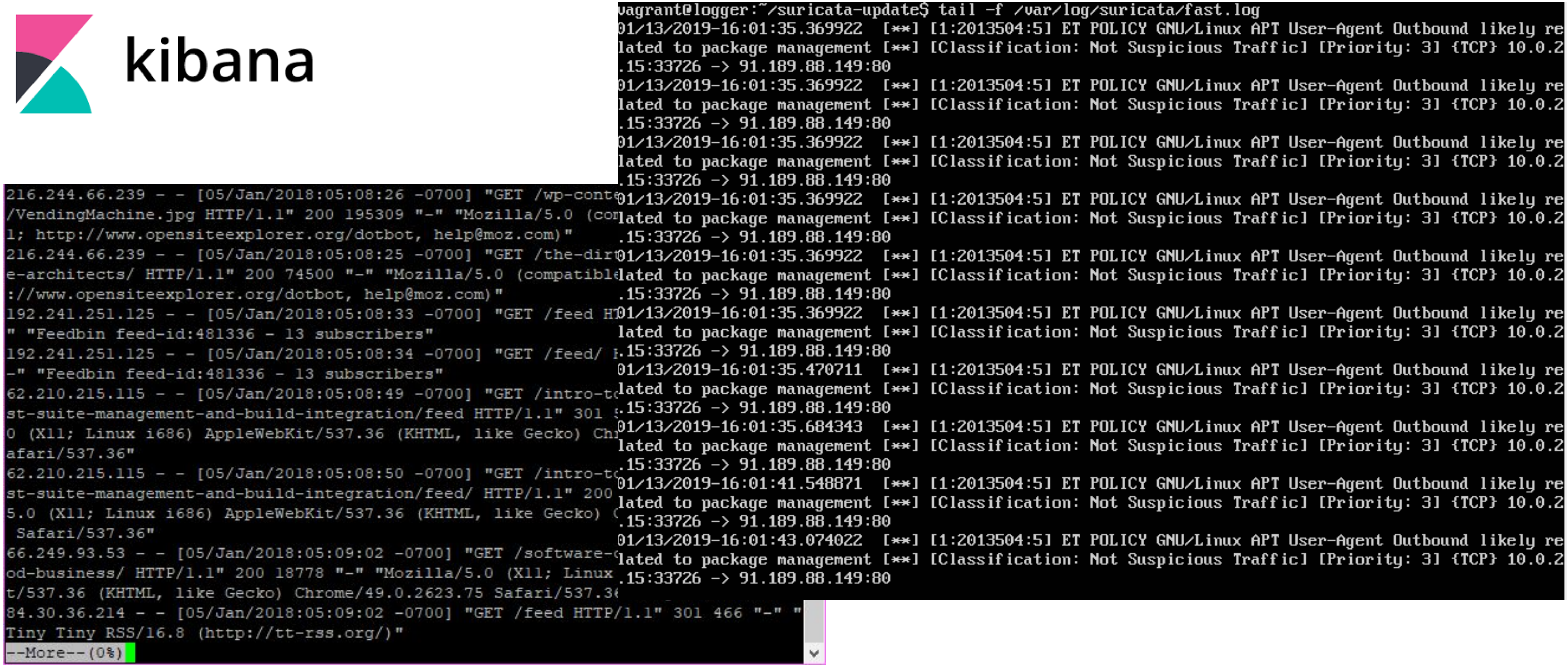

Command line logs

- cat
- tail
- grep
- vi/ vim/ nano /event viewer

kibana


vagrant@logger:~/suricata-update$ tail -f /var/log/suricata/fast.log
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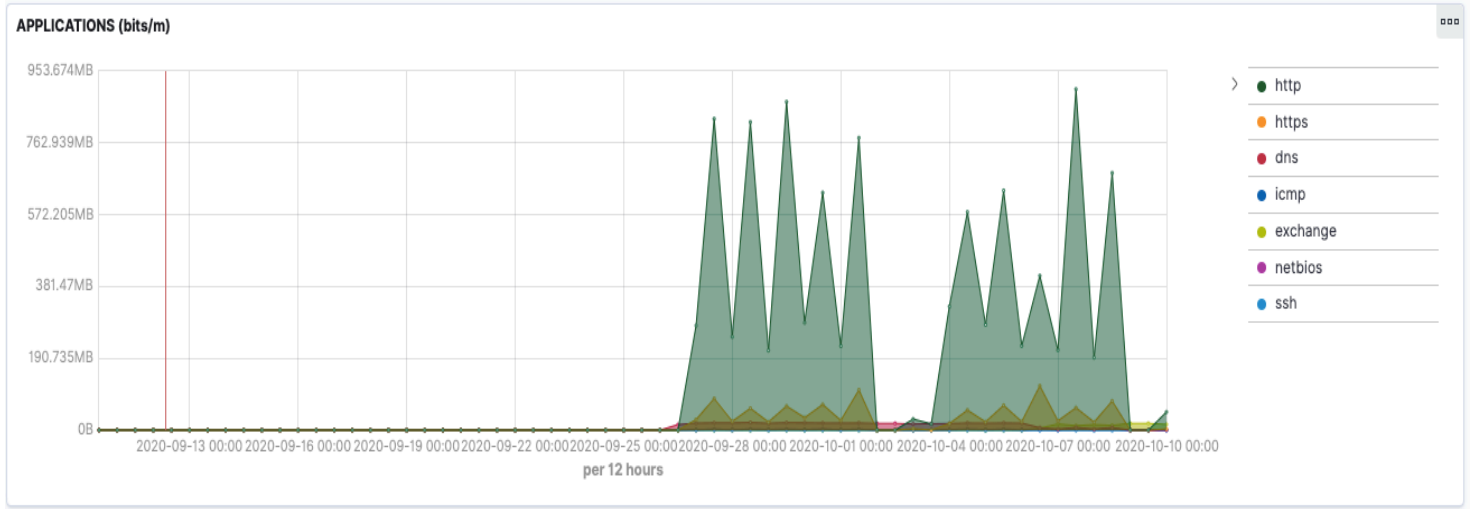
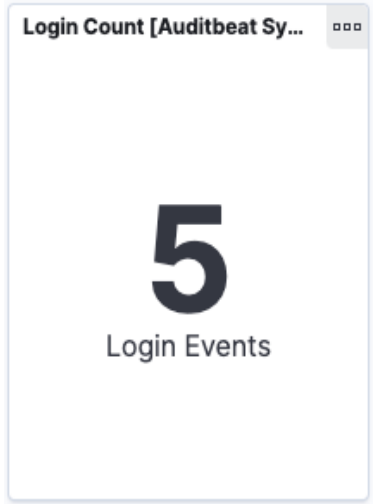
lated to package management [**] [Classification: Not Suspicious Traffic] [Priority: 3] {TCP} 10.0.2
.15:33726 -> 91.189.88.149:80
216.244.66.239 - - [05/Jan/2018:05:08:26 -0700] "GET /wp-conte
/VendingMachine.jpg HTTP/1.1" 200 195309 "-" "Mozilla/5.0 (co
1; http://www.opensiteexplorer.org/dotbot, help@moz.com)"
216.244.66.239 - - [05/Jan/2018:05:08:25 -0700] "GET /the-dir
e-architects/ HTTP/1.1" 200 74500 "-" "Mozilla/5.0 (compatible
://www.opensiteexplorer.org/dotbot, help@moz.com)"
192.241.251.125 - - [05/Jan/2018:05:08:33 -0700] "GET /feed H
" "Feedbin feed-id:481336 - 13 subscribers"
192.241.251.125 - - [05/Jan/2018:05:08:34 -0700] "GET /feed/
-" "Feedbin feed-id:481336 - 13 subscribers"
62.210.215.115 - - [05/Jan/2018:05:08:49 -0700] "GET /intro-t
st-suite-management-and-build-integration/feed HTTP/1.1" 301
0 (X11; Linux i686) AppleWebKit/537.36 (KHTML, like Gecko) Ch
afari/537.36"
62.210.215.115 - - [05/Jan/2018:05:08:50 -0700] "GET /intro-t
st-suite-management-and-build-integration/feed/ HTTP/1.1" 200
5.0 (X11; Linux i686) AppleWebKit/537.36 (KHTML, like Gecko)
Safari/537.36"
66.249.93.53 - - [05/Jan/2018:05:09:02 -0700] "GET /software-
od-business/ HTTP/1.1" 200 18778 "-" "Mozilla/5.0 (X11; Linux
t/537.36 (KHTML, like Gecko) Chrome/49.0.2623.75 Safari/537.3
84.30.36.214 - - [05/Jan/2018:05:09:02 -0700] "GET /feed HTTP/1.1" 301 466 "-" "
Tiny Tiny RSS/16.8 (http://tt-rss.org/)"
--More--(0%)

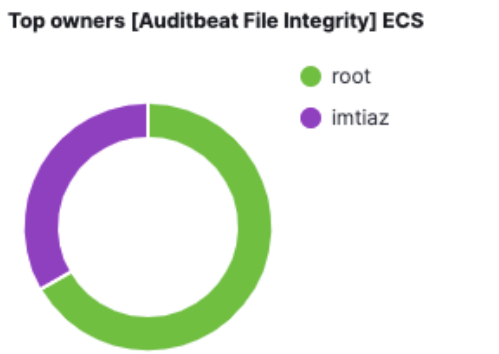
Not available on cli

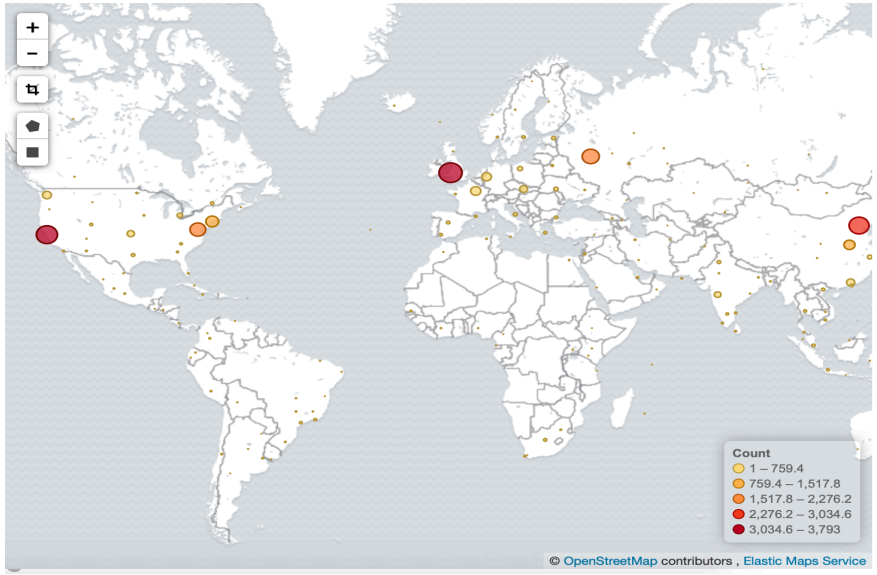
- Multiple source
- Corelating
- Seraching, filtering
- Visualize

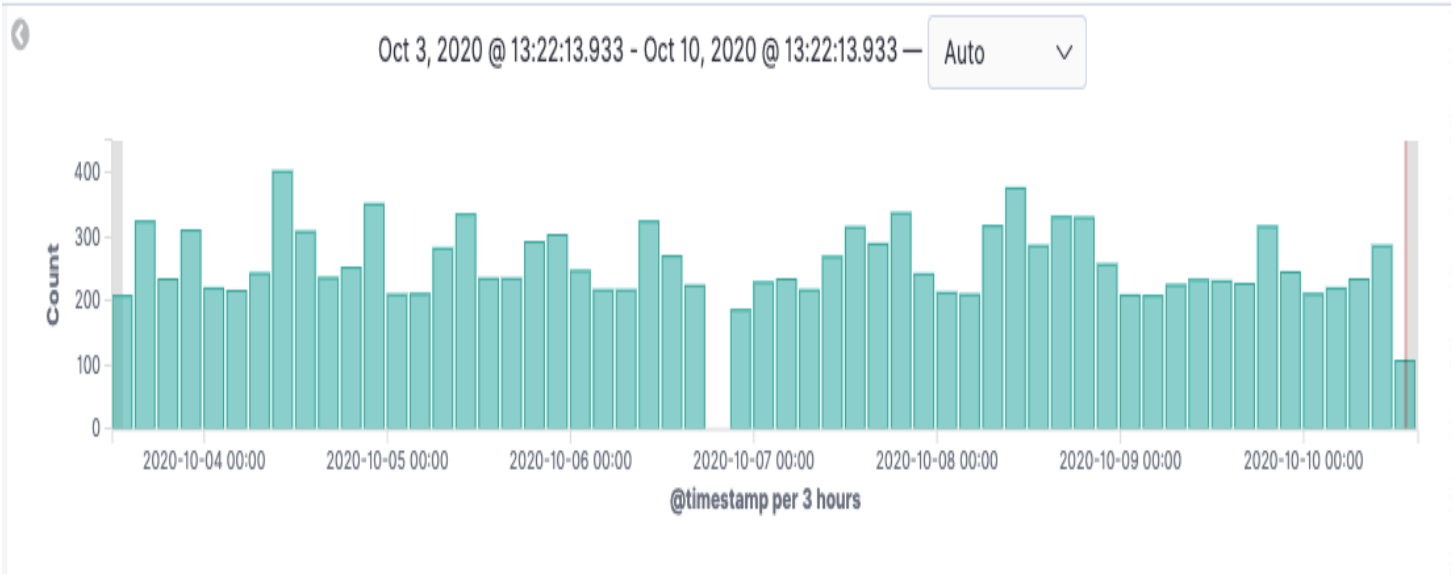
kibana is for visualization











kibana Installation

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`deb, rpm, msi, brew, docker`

kibana **Installation** (Ubuntu example)

```
wget -qO - https://artifacts.elastic.co/GPG-KEY-elasticsearch
| sudo apt-key add -
```

```
sudo apt-get install apt-transport-https
```

```
echo "deb https://artifacts.elastic.co/packages/7.x/apt stable main"
| sudo tee -a /etc/apt/sources.list.d/elastic-7.x.list
```

```
sudo apt update
```

```
sudo apt install kibana
```

kibana Installation (Docker example)

Pull the image

```
docker pull docker.elastic.co/kibana/kibana:7.x
```

Start the container

```
docker run --link
ELASTICSEARCH_CONTAINER:elasticsearch -p 5601:5601
docker.elastic.co/kibana/kibana:7.x
```

kibana Installation (Docker example)

Docker-compose

```
kibana:
   image: ${KIBANA_IMAGE}
   container_name: kibana
   restart: always
   ports:
     - "5601:5601"
   volumes:
     - type: bind
       source: ./kibana/conf/kibana.yml
       target: /usr/share/kibana/config/kibana.yml
   depends_on:
     - es01
   networks:
     - net
```

kibana configuration

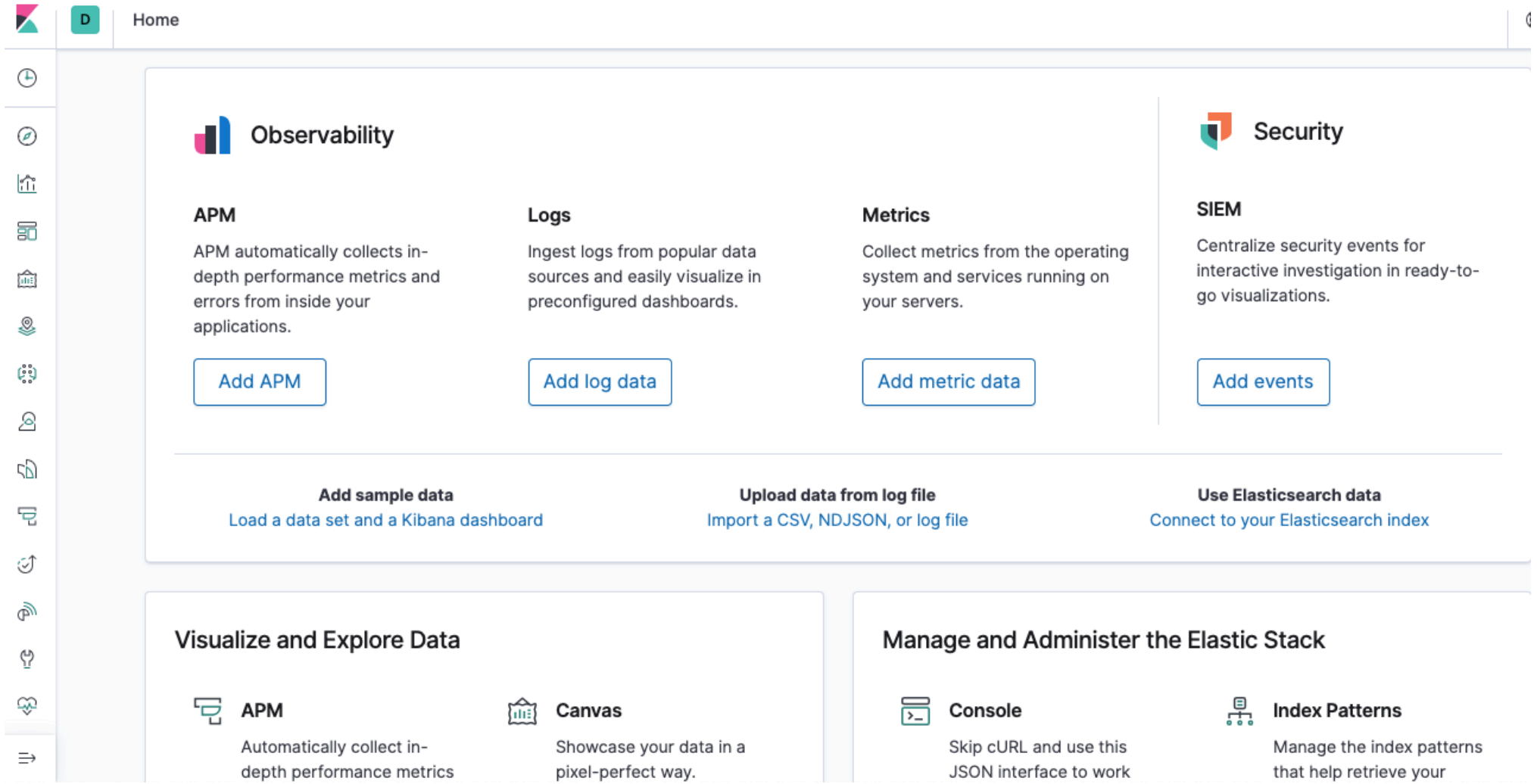
Location and the config file

`/usr/share/kibana/config/kibana.yml`

Key configuration elements

```
server.name: kibana
server.host: "0"
elasticsearch.hosts:
  - http://es01:9200
  - http://es02:9200
```

kibana http://<YOUR_KIBANA_HOST>:5601



Security (TLS, RBAC)

```
bin/elasticsearch-certutil ca
bin/elasticsearch-certutil cert --ca elastic-stack-ca.p12
```

PKCS12

```
vim /usr/share/elasticsearch/config/elasticsearch.yml

xpack.security.enabled: true
xpack.security.transport.ssl.enabled: true
xpack.security.transport.ssl.keystore.type: PKCS12
xpack.security.transport.ssl.verification_mode: certificate
xpack.security.transport.ssl.keystore.path: elastic-certificates.p12
xpack.security.transport.ssl.truststore.path: elastic-certificates.p12
xpack.security.transport.ssl.truststore.type: PKCS12
```

elasticsearch **Security (TLS, RBAC)**

Setup password for built-in users

```
bin/elasticsearch-setup-passwords auto/interactive


Changed password for user apm_system
PASSWORD apm_system = JreXXXXXXXXXXXXXDm2F
Changed password for user kibana
PASSWORD kibana = YKvXXXXXXXXXXXXXiCZ
Changed password for user logstash_system
PASSWORD logstash_system = jUcXXXXXXXXXXXXXNkP
Changed password for user beats_system
PASSWORD beats_system = uAkXXXXXXXXXXXXXv42
Changed password for user remote_monitoring_user
PASSWORD remote_monitoring_user = 9LdXXXXXXXXXXXXXlKC
Changed password for user elastic
PASSWORD elastic = GUdXXXXXXXXXXXXX8Ze
```

elasticsearch **Security (RBAC)**

built-in users

These users have a fixed set of privileges and cannot be authenticate/use without setup the credentials.

elastic: superuser

Kibana: to connect and communicate with elasticsearch

apm_system, logstash_system, beats_system, remote_monitoring_user: uses when storing monitoring information in Elasticsearch.

kibana Security

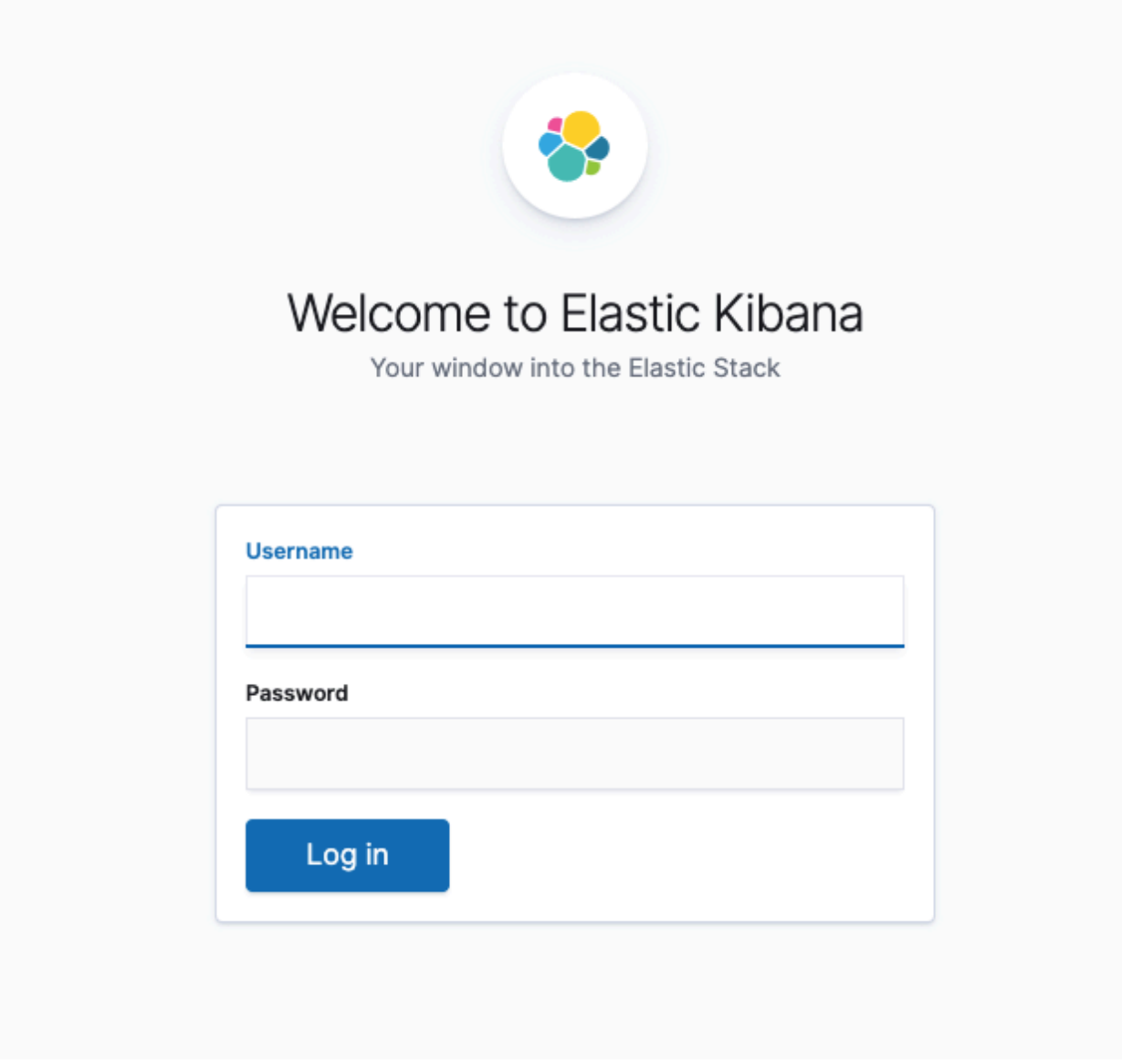
```
vim config/kibana.yml

server.name: kibana
server.host: "0"
elasticsearch.hosts:
  - http://es01:9200
  - http://es02:9200

elasticsearch.username: “user_namae”
elasticsearch.password: “password”
```

kibana

`http://<YOUR_KIBANA_HOST>:5601`




beats

Lightweight data shippers

install as agents on your servers

Available in Linux/Windows/Mac

Auditbeat

Filebeat

Heartbeat

Metricbeat

Packetbeat

Winlogbeat

beats **Installation** (Auditbeat)

Download and install

```
curl -L -O https://artifacts.elastic.co/downloads/beats/auditbeat/auditbeat-7.7.0-amd64.deb

sudo dpkg -i auditbeat-7.7.0-amd64.deb
```

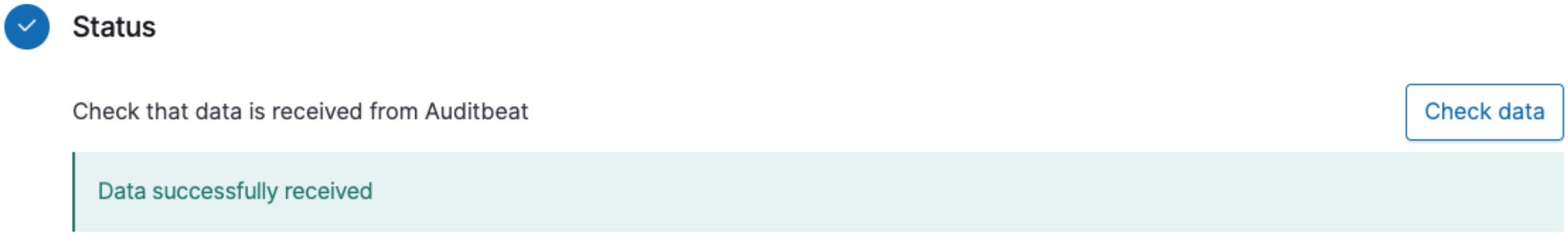
Edit configuration (/etc/auditbeat/auditbeat.yml)

```
output.elasticsearch:
  hosts: ["es_host:9200"]
  username: "elastic"
  password: "<password>"
setup.kibana:
  host: "http://kibana_host:5601"
```

beats Installation (Auditbeat)

Start auditbeat

```
sudo auditbeat setup
sudo service auditbeat start
```



Alerting

Elastalert

Elastalert

ElastAlert is a simple framework for alerting on anomalies, spikes, or other patterns of interest from data in Elasticsearch.

X events in Y time (`frequency` type)
rate of events increases or decreases" (`spike` type)
matches a blacklist/whitelist" (`blacklist` and `whitelist` type)
less than X events in Y time" (`flatline` type)

Email, JIRA, HipChat, MS Teams, Slack, Telegram etc..

Elastalert Installation

```
sudo apt-get install python-minimal

sudo apt-get install python-pip python-dev libffi-dev libssl-dev

sudo git clone https://github.com/Yelp/elastalert.git

sudo pip install "setuptools>=11.3"

sudo python setup.py install

sudo pip install "elasticsearch>=5.0.0"
```

Elastalert configuration

```
vim /opt/elastalert/config.yaml
```

```
es_host: elk-server
es_port: 9200
es_username: es_user
es_password: password
```

```
sudo elastalert-create-index
```

Demo

1. Run and explore Elastic Stack with `docker-compose`
2. Install, configure `"Auditbeat"` and send the logs to the Elastic
3. Configure `FIM` in `Auditbeat`
4. Alerting log event using elastalert to `slack channel`

? ? ?

Thank You

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