ISO 200

AUTO

ELK STACK 중 KIBANA

swuforce

E L K S T A C K

SEB1

REC

SWUFORCE WEB1

-4 3 2 1 0 1 2 3 +4

AF

C O N T E N T S

ELK STACK(스택)

KIBANA

[Elasti ... na]

로그 저장 ... 기술

ELK | Elasticsearch의 E, Logstash의 L, Kibana의 K를 따서 ELK 스택

BEATS

LOGSTASH

데이터 수집의 역할을 맡고 있는
Logstash의 오버헤드가 커서 도입된
데이터 수집 만을 담당하는 경량화된 모듈

[Beats]

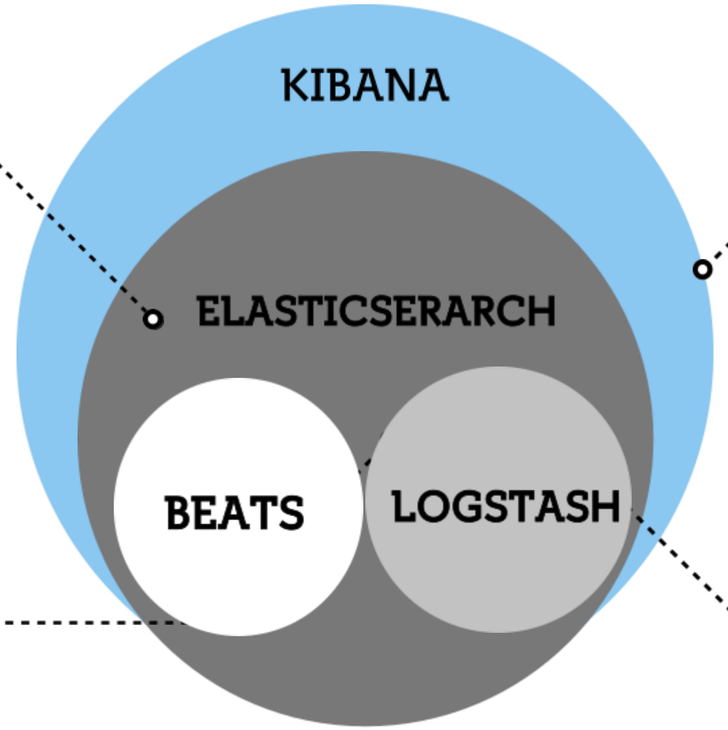
로그 수집 엔진의 역할을 하는 기술

[Logstash]

ELK STACK(스택)

[Elasticsearch]

로그 저장 및 검색의 역할을 하는 기술



[Kibana]

로그 시각화 및 관리의 역할을 하는 기술

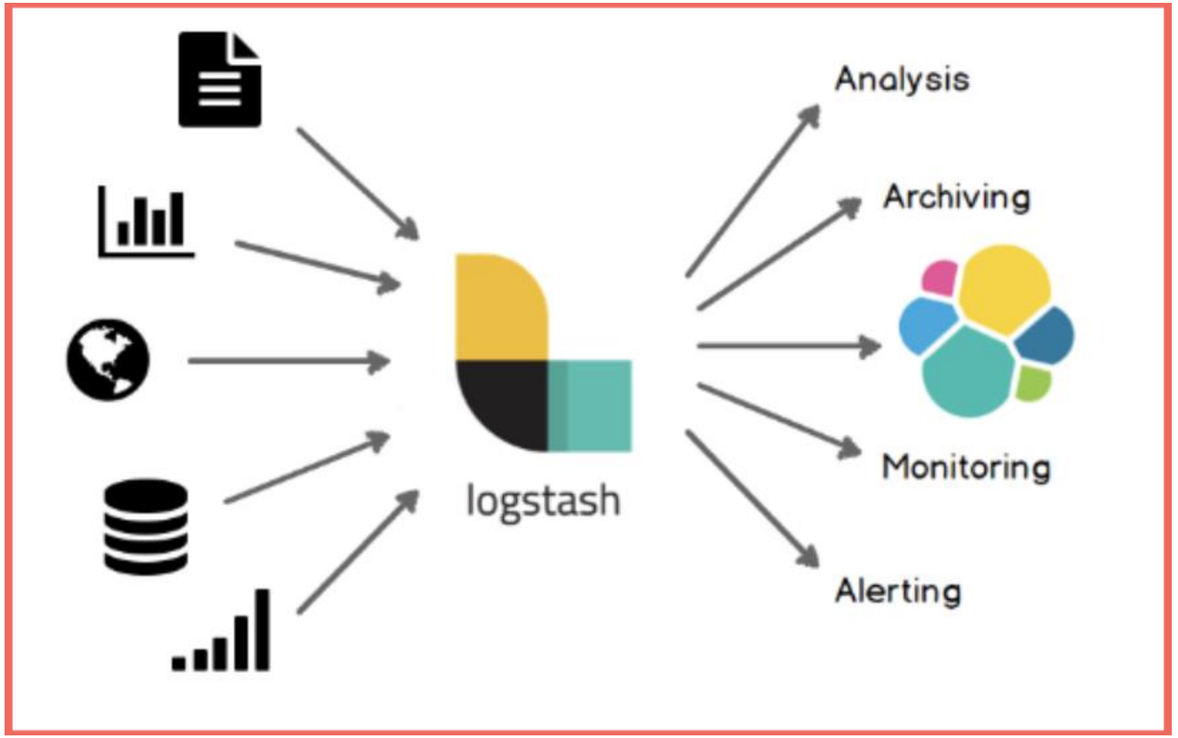
데이터 수집의 역할을 맡고 있는
Logstash의 오버헤드가 커서 도입된
데이터 수집 만을 담당하는 경량화된 모듈

[Beats]

로그 수집 엔진의 역할을 하는 기술

[Logstash]

ELK STACK(스택)



로그스태시에서 데이터 수집 및 변환

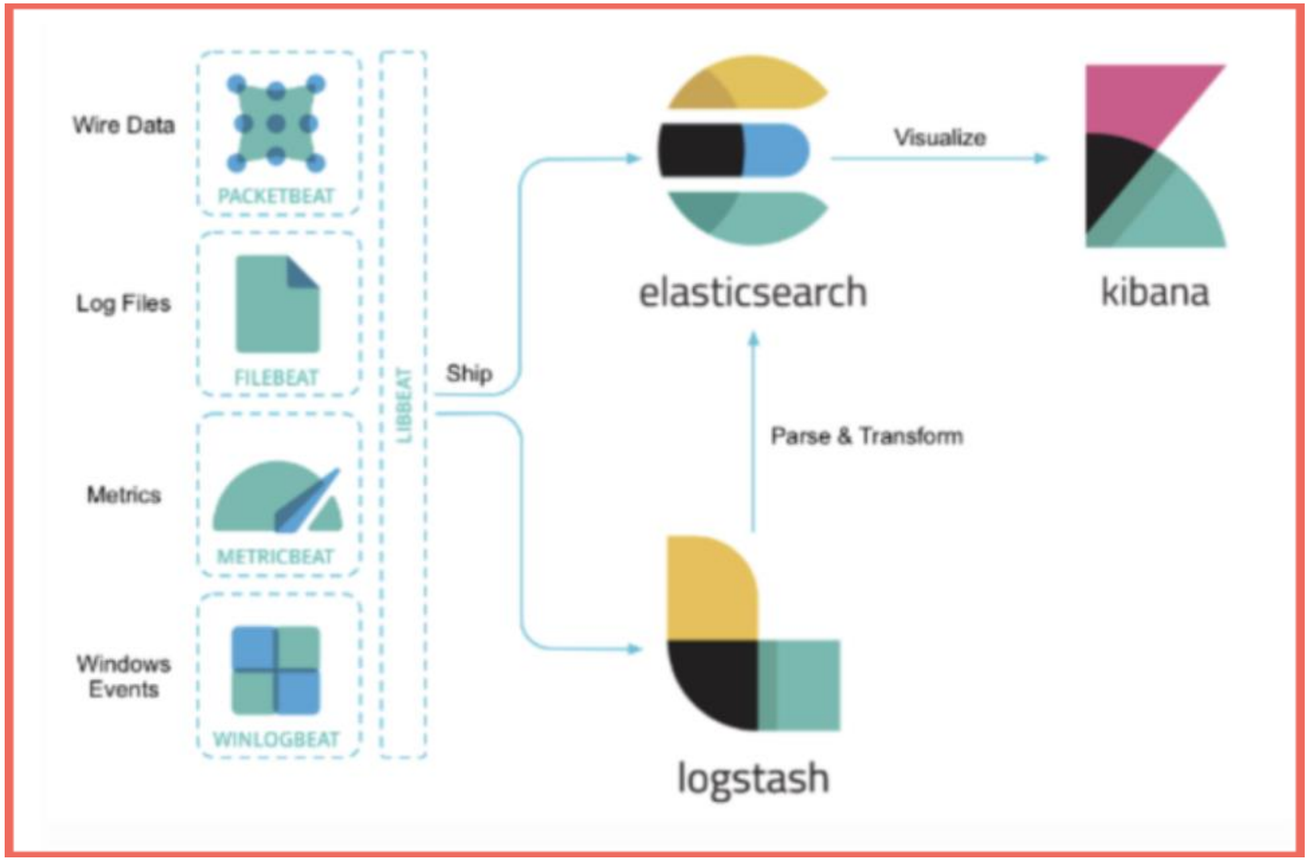
ELK STACK(스택)

데이터를 중심부에 저장하여 예상되는 항목을 검색

ELK STACK(스택)

데이터를 시각적으로 탐색하고 실시간으로 분석

ELK STACK(스택)


Wire Data
PACKETBEAT
Log Files
FILEBEAT
Metrics
METRICBEAT
Windows Events
WINLOGBEAT
LIBBEAT
Ship
elasticsearch
Visualize
kibana
Parse & Transform
logstash

ELK 스택 논문 리뷰

2021년도 한국통신학회 하계종합학술발표회

Elastic Stack과 Kafka를 이용한 로그 분석 및 시각화 시스템 설계

윤용국, 최의인
한남대학교
ykyoon328@naver.com, eichoi@hnu.kr

Log analysis and visualization system design using Elastic Stack and Kafka

Yoon Yong Kuk, Choi Eui In
Hannam Univ.

요 약

IT기술의 발전에 따라 함께 발전하고 있는 사이버 공격으로 인해 기존보다 더 높은 보안성을 요구하고 있는 현 상황에 대응하기 위해 본 논문에서는 Elastic Search 검색 엔진을 활용한 사용자 애플리케이션, Elastic Stack 시스템을 구축한다. Apache Kafka를 통해 Elastic Stack 시스템의 Logstash와 Beat 사이의 일시 버퍼 스트림을 구현함으로써 안정성을 확보하여 웹 서버의 접근 로그를 분석하기 위한 분석환경을 구현하였다. 또한, 이러한 분석환경에 의해 도출된 분석결과를 실시간으로 모니터링하기 위해 Kibana를 활용하여 분석된 데이터를 통계 및 시각화하고 모니터링하기 위한 시각화 관제 시스템을 제안한다.

2019년 대한전자공학회 하계학술대회 논문집

ElasticSearch와 Kibana를 이용한 웹 아티팩트 시각화

박정민, 현주연
경일대학교 사이버보안학과
e-mail : jmp0322@naver.com, sandy37158466@gmail.com

Web Artifacts visualization Using ElasticSearch and Kibana

Jeong-Min Park, Ju-Yeon Hyun
Department of Cyber Security
Kyungil University

대표적으로 두 논문을 읽어보며 ELK를 이용하여 시각화를 진행해보는 걸 목표로 삼음.

ELK 스택 논문 리뷰

CSV& JSON

CSV파일로 파싱한 웹 아티팩트를 JSON파일로 변환하여 ElasticSearch에 업로드

시각화

인덱스와 필드를 토글하여 하나의 테이블로 볼 수 있도록 시각화

웹 아티팩트 분석

아티팩트를 분석 할 때 쉽게 타임라인을 구상하고 데이터를 비교

ELK 스택 설치 과정 (Elastic Search)

엘라스틱서치를 설치하기 전, 자바를 먼저 설치해야한다.

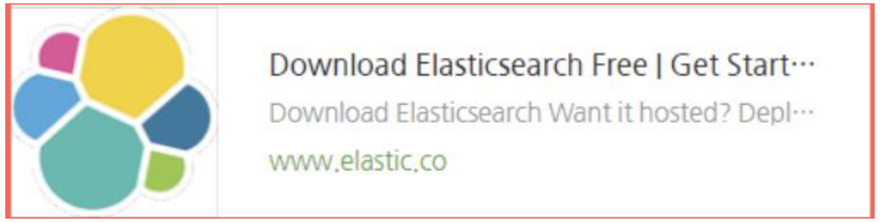
```
hyomin@DESKTOP-J96E6L0:~$ sudo apt install openjdk-8-jdk
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following additional packages will be installed:
  adwaita-icon-theme alsa-topology-conf alsa-ucm-conf at-spi2-core ca-certificates-java dconf-gsettings-backend
```

자바 설치 중인 모습

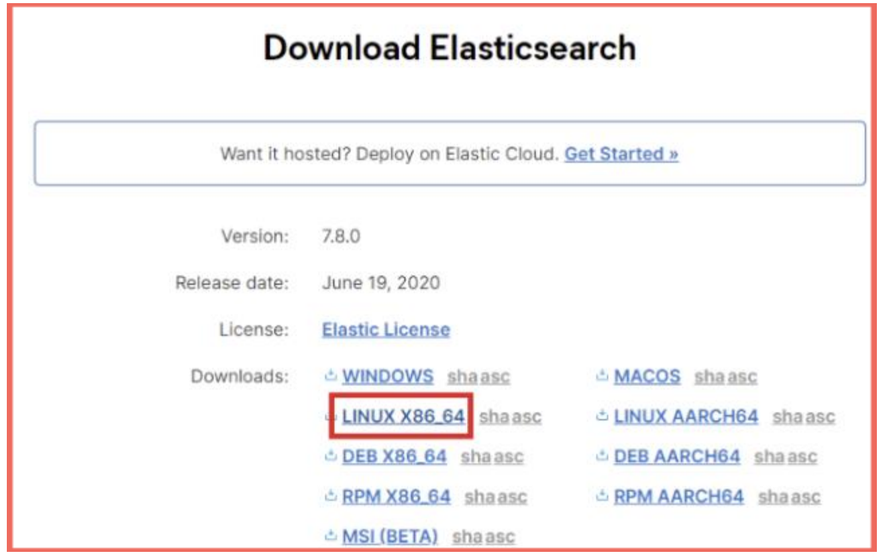
```
hyomin@DESKTOP-J96E6L0:~$ java -version
openjdk version "1.8.0_352"
OpenJDK Runtime Environment (build 1.8.0_352-8u352-ga-1~22.04-b08)
OpenJDK 64-Bit Server VM (build 25.352-b08, mixed mode)
```

설치 후, 자바 버전 확인

ELK 스택 설치 과정 (Elastic Search)



홈페이지 접속 > 다운로드 목록



빨간색 상자로 표시된 부분을 마우스 우클릭을 통해 복사

ELK 스택 설치 과정 (Elastic Search)

```
hyomin@DESKTOP-J96E6L0:~$ wget https://artifacts.elastic.co/downloads/elasticsearch/elasticsearch-7.4.1-l
.gz
--2023-02-25 23:18:58--  https://artifacts.elastic.co/downloads/elasticsearch/elasticsearch-7.4.1-linux-x
Resolving artifacts.elastic.co (artifacts.elastic.co)... 34.120.127.130, 2600:1901:0:1d7::
Connecting to artifacts.elastic.co (artifacts.elastic.co)|34.120.127.130|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 288774222 (275M) [application/x-gzip]
Saving to: 'elasticsearch-7.4.1-linux-x86_64.tar.gz'

         elasticsearch-7.4.1-  52%[=========================>                        ] 143.21M  9.34MB/s
```

wget 명령어를 통해 엘라스틱서치 설치

```
hyomin@DESKTOP-J96E6L0:~$ tar zxvf elasticsearch-7.4.1-linux-x86_64.tar.gz
elasticsearch-7.4.1/
elasticsearch-7.4.1/lib/
elasticsearch-7.4.1/lib/elasticsearch-7.4.1.jar
elasticsearch-7.4.1/lib/elasticsearch-x-content-7.4.1.jar
elasticsearch-7.4.1/lib/elasticsearch-cli-7.4.1.jar
elasticsearch-7.4.1/lib/elasticsearch-core-7.4.1.jar
elasticsearch-7.4.1/lib/elasticsearch-secure-sm-7.4.1.jar
elasticsearch-7.4.1/lib/elasticsearch-geo-7.4.1.jar
elasticsearch-7.4.1/lib/lucene-core-8.2.0.jar
elasticsearch-7.4.1/lib/lucene-analyzers-common-8.2.0.jar
elasticsearch-7.4.1/lib/lucene-backward-codecs-8.2.0.jar
```

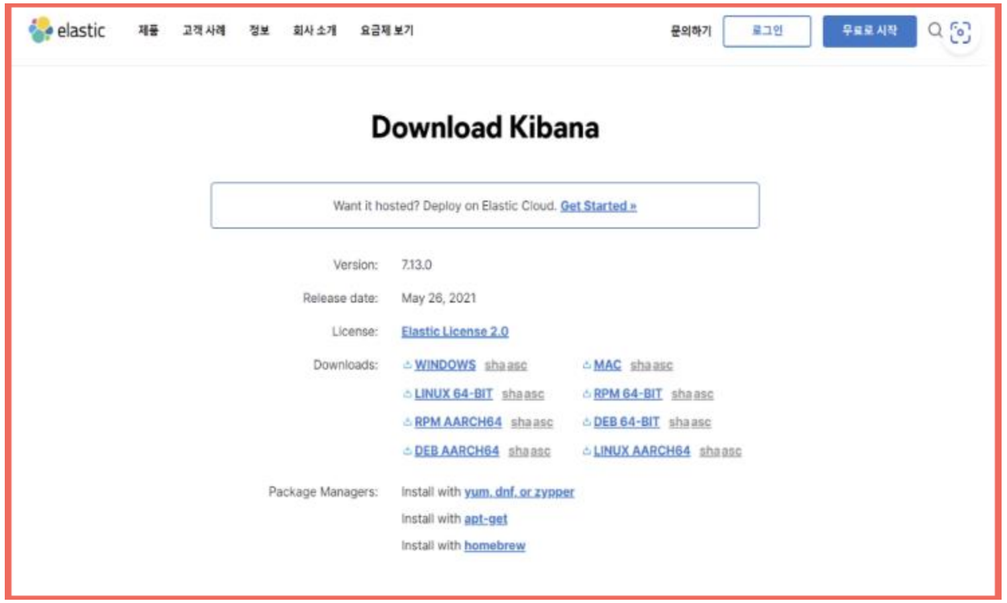
tar 명령어를 통해 압축 해제

ELK 스택 설치 과정 (Elastic Search)

```
hyomin@DESKTOP-J96E6L0:~$ cd elasticsearch-7.4.1/bin/
hyomin@DESKTOP-J96E6L0:~/elasticsearch-7.4.1/bin$ ./elasticsearch
OpenJDK 64-Bit Server VM warning: Option UseConcMarkSweepGC was deprecated in version 9.0 and wi
a future release.
[2023-02-26T00:31:18,242][INFO ][o.e.e.NodeEnvironment    ] [DESKTOP-J96E6L0] using [1] data pat
)]], net usable_space [235.7gb], net total_space [250.9gb], types [ext4]
[2023-02-26T00:31:18,245][INFO ][o.e.e.NodeEnvironment    ] [DESKTOP-J96E6L0] heap size [989.8mb
bject pointers [true]
[2023-02-26T00:31:18,247][INFO ][o.e.n.Node               ] [DESKTOP-J96E6L0] node name [DESKTOP
27SSSS6a8PnewaymLg], cluster name [elasticsearch]
[2023-02-26T00:31:18,247][INFO ][o.e.n.Node               ] [DESKTOP-J96E6L0] version[7.4.1], pi
ar/fc0eeb6e2c25915d63d871d344e3d0b45ea0ea1e/2019-10-22T17:16:35.176724Z], OS[Linux/5.10.16.3-mic
```

bin 폴더로 이동 후 elasticsearch 바이너리 실행

ELK 스택 설치 과정 (Kibana)



위 사이트에서 다운로드할 이미지의 주소를 복사
반드시 엘라스틱서치와 같은 버전으로 설치

```
yomin@DESKTOP-J96E6L0:~$ wget https://artifacts.elastic.co/downloads/kibana/kibana-7.4.1-linux-x86_64.tar.gz
--2023-02-26 00:38:44--  https://artifacts.elastic.co/downloads/kibana/kibana-7.4.1-linux-x86_64.tar.gz
Resolving artifacts.elastic.co (artifacts.elastic.co)... 34.120.127.130, 2600:1901:0:1d7::
Connecting to artifacts.elastic.co (artifacts.elastic.co)|34.120.127.130|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 252517864 (241M) [application/x-gzip]
Saving to: 'kibana-7.4.1-linux-x86_64.tar.gz'

kibana-7.4.1-linux-x86_64.tar   4%[=>                                        ]  10.49M  2.80MB/s    eta 1m 55s
```

wget 명령어를 통해 설치, tar 명령어로 압축 해제

ELK 스택 설치 과정 (Kibana)

키바나와 엘라스틱서치의 연동 -> 연동을 위해서는 같은 버전으로 설치해야 함.

```
hyomin@DESKTOP-J96E6L0:~$ rpm -i kibana-7.4.1-x86_64.rpm
Command 'rpm' not found, but can be installed with:
sudo apt install rpm
hyomin@DESKTOP-J96E6L0:~$ sudo apt install rpm
[sudo] password for hyomin:
Selecting previously unselected package librpmsign9.
Preparing to unpack .../08-librpmsign9_4.17.0+dfsg1-4build1_amd64.deb ...
Unpacking librpmsign9 (4.17.0+dfsg1-4build1) ...
Selecting previously unselected package rpm-common.
Preparing to unpack .../09-rpm-common_4.17.0+dfsg1-4build1_amd64.deb ...
Unpacking rpm-common (4.17.0+dfsg1-4build1) ...
Selecting previously unselected package rpm2cpio.
Preparing to unpack .../10-rpm2cpio_4.17.0+dfsg1-4build1_amd64.deb ...
Unpacking rpm2cpio (4.17.0+dfsg1-4build1) ...
Selecting previously unselected package rpm.
Preparing to unpack .../11-rpm_4.17.0+dfsg1-4build1_amd64.deb ...
Unpacking rpm (4.17.0+dfsg1-4build1) ...
Setting up libarchive13:amd64 (3.6.0-1ubuntu1) ...
Setting up libgomp1:amd64 (12.1.0-2ubuntu1~22.04) ...
Setting up libfsverity0:amd64 (1.4-1~exp1build1) ...
Setting up liblua5.3-0:amd64 (5.3.6-1build1) ...
Setting up debugedit (1:5.0-4build1) ...
Setting up librpmio9 (4.17.0+dfsg1-4build1) ...
```

다운로드 받은 rpm 파일 설치

```
hyomin@DESKTOP-J96E6L0:~/kibana-7.4.1-linux-x86_64$ cd config
hyomin@DESKTOP-J96E6L0:~/kibana-7.4.1-linux-x86_64/config$ vi kibana.yml
```

설치가 완료된 후, yml 파일을 통해 포트를 수정

ELK 스택 설치 과정 (Kibana)

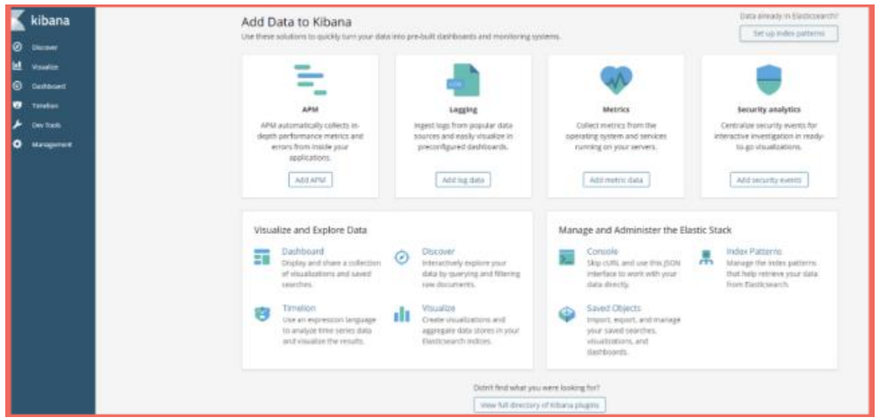
```
# Kibana is served by a back end server. This setting specifies the port to use.
server.port: 5601

# Specifies the address to which the Kibana server will bind. IP addresses and host names are both valid values.
# The default is 'localhost', which usually means remote machines will not be able to connect.
# To allow connections from remote users, set this parameter to a non-loopback address.
server.host: "0.0.0.0"

# Enables you to specify a path to mount Kibana at if you are running behind a proxy.
# Use the `server.rewriteBasePath` setting to tell Kibana if it should remove the basePath
# from requests it receives, and to prevent a deprecation warning at startup.
# This setting cannot end in a slash.
#server.basePath: ""

# Specifies whether Kibana should rewrite requests that are prefixed with
# `server.basePath` or require that they are rewritten by your reverse proxy.
# This setting was effectively always `false` before Kibana 6.3 and will
# default to `true` starting in Kibana 7.0.
#server.rewriteBasePath: false

# The maximum payload size in bytes for incoming server requests.
#server.maxPayloadBytes: 1048576

# The Kibana server's name.  This is used for display purposes.
#server.name: "your-hostname"

# The URLs of the Elasticsearch instances to use for all your queries.
elasticsearch.hosts: ["http://localhost:9200"]
```

주석을 제거하여 server.port, server.host, elasticsearch.url 세 개의 항목을 다음과 같이 설정

ELK 스택 설치 과정 (Kibana)

```
yomin@DESKTOP-J96E6L0:~$ # firewall-cmd --permanent --zone=public --add-port=5601/tcp
yomin@DESKTOP-J96E6L0:~$ # firewall-cmd --permanent --zone=public --add-service=kibana
yomin@DESKTOP-J96E6L0:~$ # firewall-cmd --reload
yomin@DESKTOP-J96E6L0:~$ # firewall-cmd --list-ports
yomin@DESKTOP-J96E6L0:~$ #systemctl start kibana
yomin@DESKTOP-J96E6L0:~$
```

방화벽 오픈 후 키바나 실행



http://server-ip:port로 접속

ELK 스택 설치 과정 (Logstash)

```
hyomin@DESKTOP-J96E6L0:~$ wget https://artifacts.elastic.co/downloads/logstash/logstash-7.12.0-linux-x86_64.tar.gz
--2023-02-26 03:14:17--  https://artifacts.elastic.co/downloads/logstash/logstash-7.12.0-linux-x86_64.tar.gz
Resolving artifacts.elastic.co (artifacts.elastic.co)... 34.120.127.130, 2600:1901:0:1d7::
Connecting to artifacts.elastic.co (artifacts.elastic.co)|34.120.127.130|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 368429061 (351M) [application/x-gzip]
Saving to: 'logstash-7.12.0-linux-x86_64.tar.gz'

-7.12.0-linux-x86_64.tar.gz    5%[=>                                          ]  17.75M  4.56MB/s    eta 93s
```

wget 명령어를 통해 logstash 설치, 압축 해제

```
hyomin@DESKTOP-J96E6L0:~$ cd logstash-7.12.0/bin
hyomin@DESKTOP-J96E6L0:~/logstash-7.12.0/bin$ ls
benchmark.bat        ingest-convert.bat  logstash-keystore.bat  logstash.lib.sh  pqrepair.bat
benchmark.sh         ingest-convert.sh   logstash-plugin        pqcheck          ruby
cpdump               logstash            logstash-plugin.bat    pqcheck.bat      setup.bat
dependencies-report  logstash-keystore   logstash.bat           pqrepair         system-install
hyomin@DESKTOP-J96E6L0:~/logstash-7.12.0/bin$  ./logstash -e 'input { stdin { } } output { stdout {} }'
Using bundled JDK: /home/hyomin/logstash-7.12.0/jdk
OpenJDK 64-Bit Server VM warning: Option UseConcMarkSweepGC was deprecated in version 9.0 and will likely be removed in
a future release.
Sending Logstash logs to /home/hyomin/logstash-7.12.0/logs which is now configured via log4j2.properties
[2023-02-26T03:20:52,567][INFO ][logstash.runner          ] Log4j configuration path used is: /home/hyomin/logstash-7.12
.0/config/log4j2.properties
[2023-02-26T03:20:52,584][INFO ][logstash.runner          ] Starting Logstash {"logstash.version"=>"7.12.0", "jruby.vers
ion"=>"jruby 9.2.13.0 (2.5.7) 2020-08-03 9a89c94bcc OpenJDK 64-Bit Server VM 11.0.10+9 on 11.0.10+9 +indy +jit [linux-x8
6_64]"}
[2023-02-26T03:20:52,605][INFO ][logstash.setting.writabledirectory] Creating directory {:setting=>"path.queue", :path=>
```

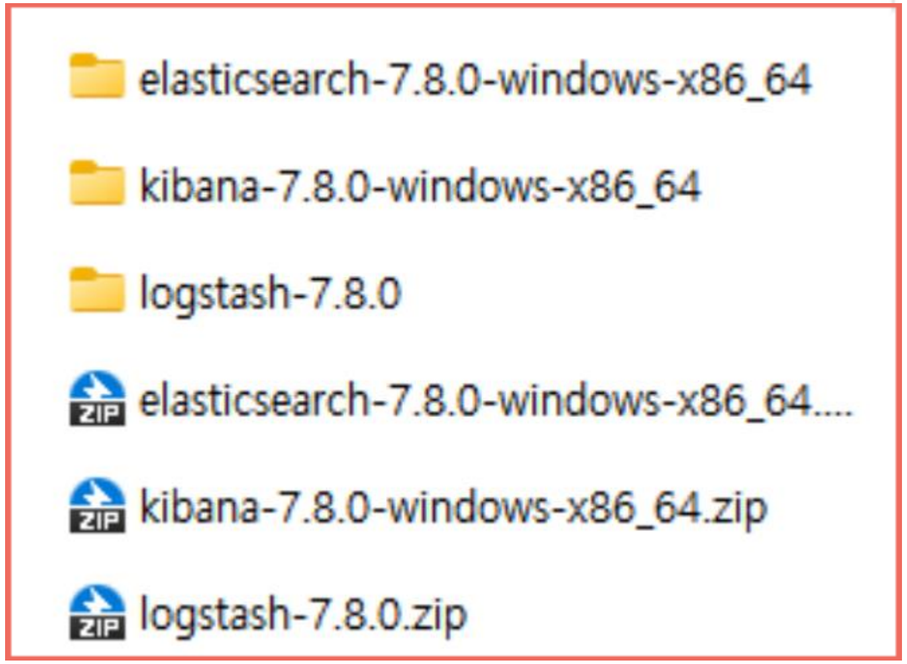
압축해제한 파일 내의 logstash/bin 디렉토리로 이동하여 아래와 같이 명령을 실행

ELK 스택 설치 과정 (Logstash)

```
=>0.7}
WARNING: An illegal reflective access operation has occurred
WARNING: Illegal reflective access by com.jrubystdinchannel.StdinChannelLibrary$Reader (file:/home/hyomin/logstash-7.12.
)/vendor/bundle/jruby/2.5.0/gems/jruby-stdin-channel-0.2.0-java/lib/jruby_stdin_channel/jruby_stdin_channel.jar) to fiel
l java.io.FilterInputStream.in
WARNING: Please consider reporting this to the maintainers of com.jrubystdinchannel.StdinChannelLibrary$Reader
WARNING: Use --illegal-access=warn to enable warnings of further illegal reflective access operations
WARNING: All illegal access operations will be denied in a future release
[2023-02-26T03:20:55,568][INFO ][logstash.javapipeline    ][main] Pipeline started {"pipeline.id"=>"main"}
The stdin plugin is now waiting for input:
[2023-02-26T03:20:55,620][INFO ][logstash.agent           ] Pipelines running {:count=>1, :running_pipelines=>[:main], :
non_running_pipelines=>[]}
```

Pipelines running 이라고 뜨면 성공

ELK 스택 설치 과정 (window)



elasticsearch, kibana, logstash 의 zip 파일을 각각 다운받아 모두 압축 해제

*이때, 각 파일은 모두 같은 버전으로 다운받아야 서로 연동 가능

ELK 스택 설치 과정 (window)

```
network.host: localhost
#
# Set a custom port for HTTP:
#
http.port: 9200
#
# For more information, consult the network module documentation.
#
```

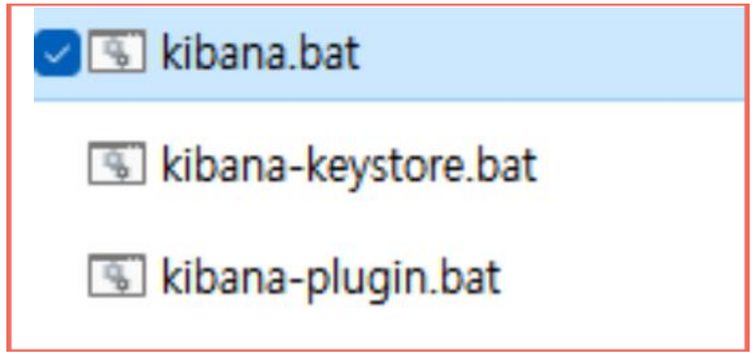
elasticsearch.yml 파일에서 network host와 http.port의 주석을 제거

```
# Kibana is served by a back end server. Th
server.port: 5601

# Specifies the address to which the Kibana
# The default is 'localhost', which usually
# To allow connections from remote users, s
server.host: "localhost"
```

kibana.yml 파일에서 server.port와 server.host의 주석을 제거

*host를 localhost로 지정

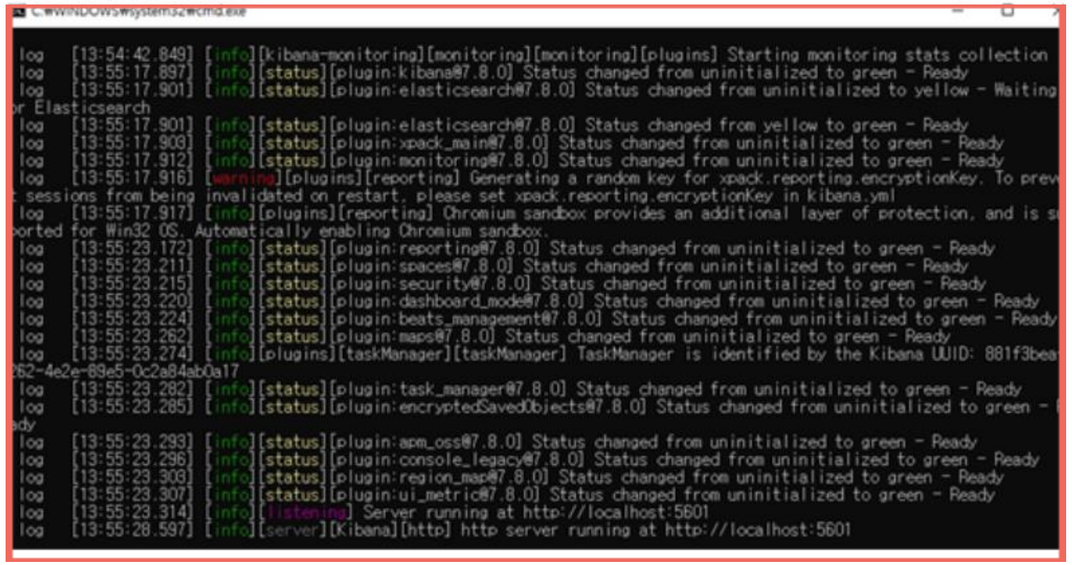
ELK 스택 설치 과정 (window)



elasticsearch와 kibana의 bin 파일에서
각각 bat 파일을 눌러 실행

*kibana의 경우 keystore, plugin의 bat파일을
먼저 눌러 실행시키고 kibana.bat파일을 실행

ELK 스택 설치 과정 (window)



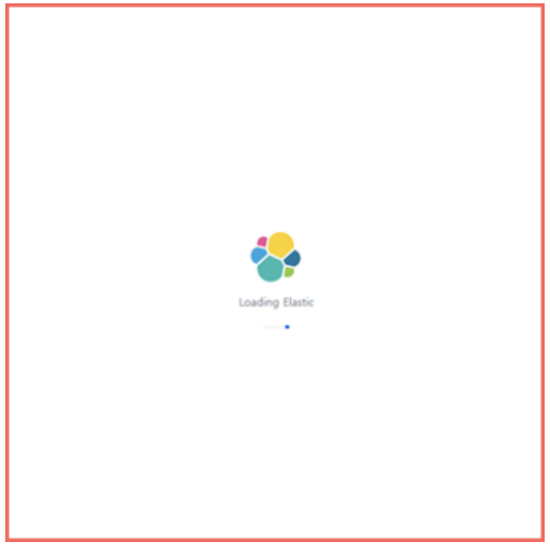
각각의 bat파일을 실행하면
cmd가 열리고 다음과 같이 로딩

ELK 스택 설치 과정 (window)


```
{
  "name" : "DESKTOP-TP5AAFV",
  "cluster_name" : "elasticsearch",
  "cluster_uuid" : "yMwNJFALQ7WLU9a7wmC_2Q",
  "version" : {
    "number" : "7.8.0",
    "build_flavor" : "default",
    "build_type" : "zip",
    "build_hash" : "757314695644ea9a1dc2fecd26d1a43856725e65",
    "build_date" : "2020-06-14T19:35:50.234439Z",
    "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"
}
```

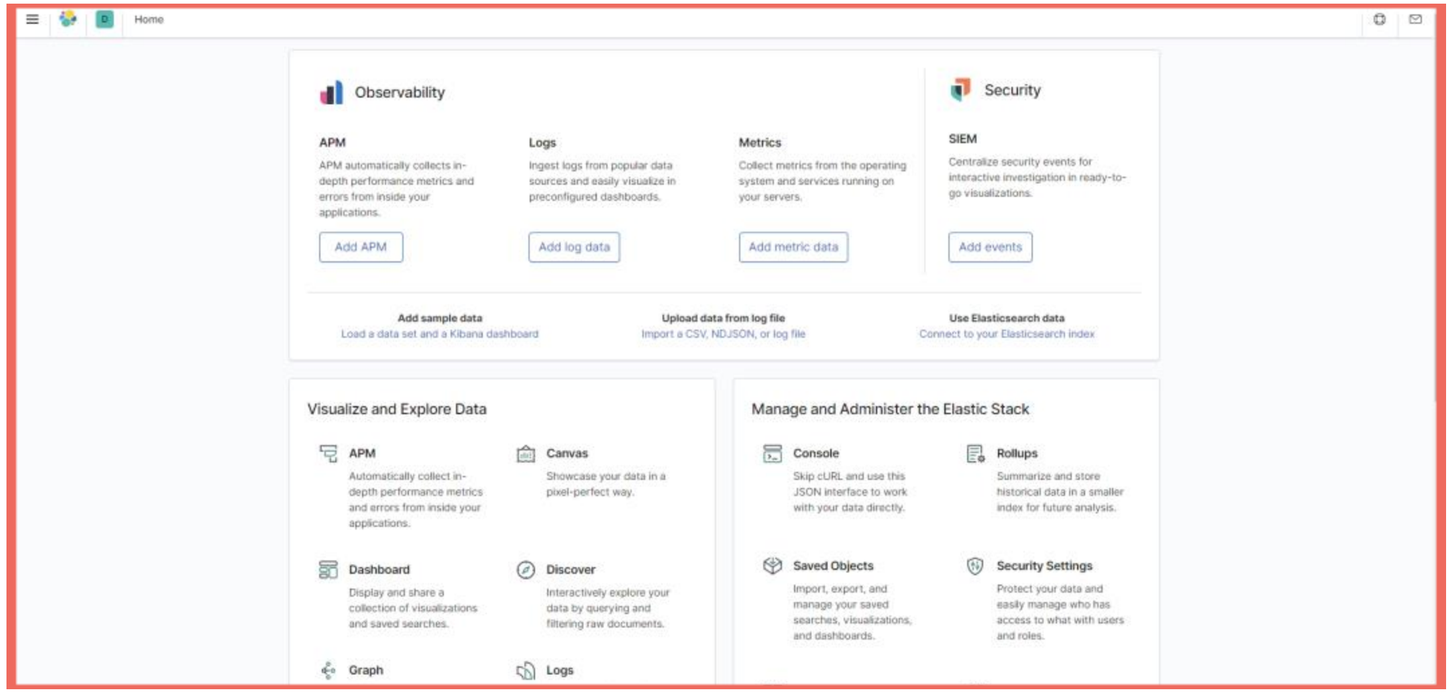

elasticsearch가 잘 설치됐는지 웹에서
http://localhost:9200으로 접속하여 확인

ELK 스택 설치 과정 (window)



elasticsearch로 접속 가능

ELK 스택 설치 과정 (window)



kibana 작동 가능

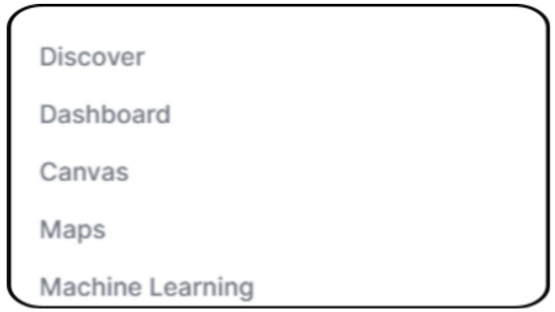
Visualize_Kibana

예상 실습 진행

step 1

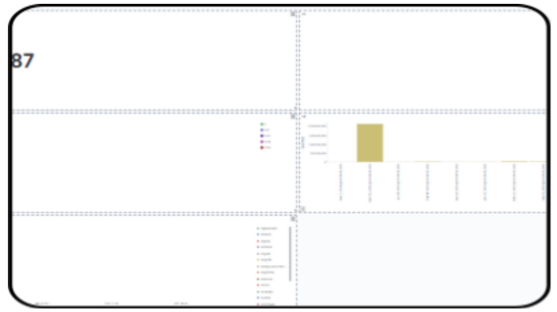
Logstash를 통해 데이터 수집

step 2



수집한 데이터를 전처리 후,
Kibana를 통해 시각화

step 3

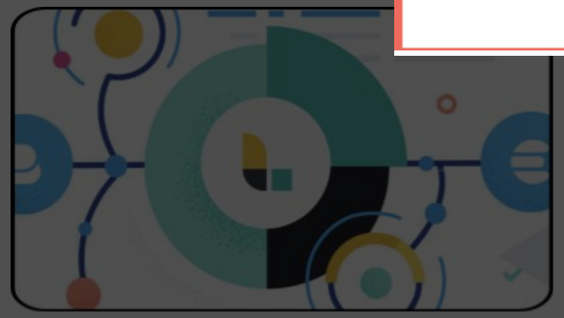


시각화한 데이터를 대시보드에 정리

Visualize_Kibana

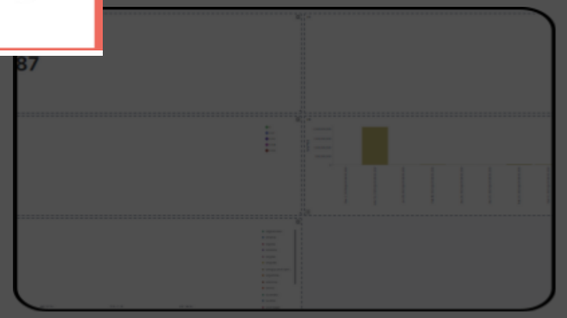
```
{
  "error" : {
    "root_cause" : [
      {
        "type" : "index_not_found_exception",
        "reason" : "no such index [test]",
```

step 1



Logstash를 통해 데이터 수집

step 3



시각화한 데이터를 대시보드에 정리

logstash 설치 후, 오류로 인해 데이터 수집이 불가

Visualize_Kibana

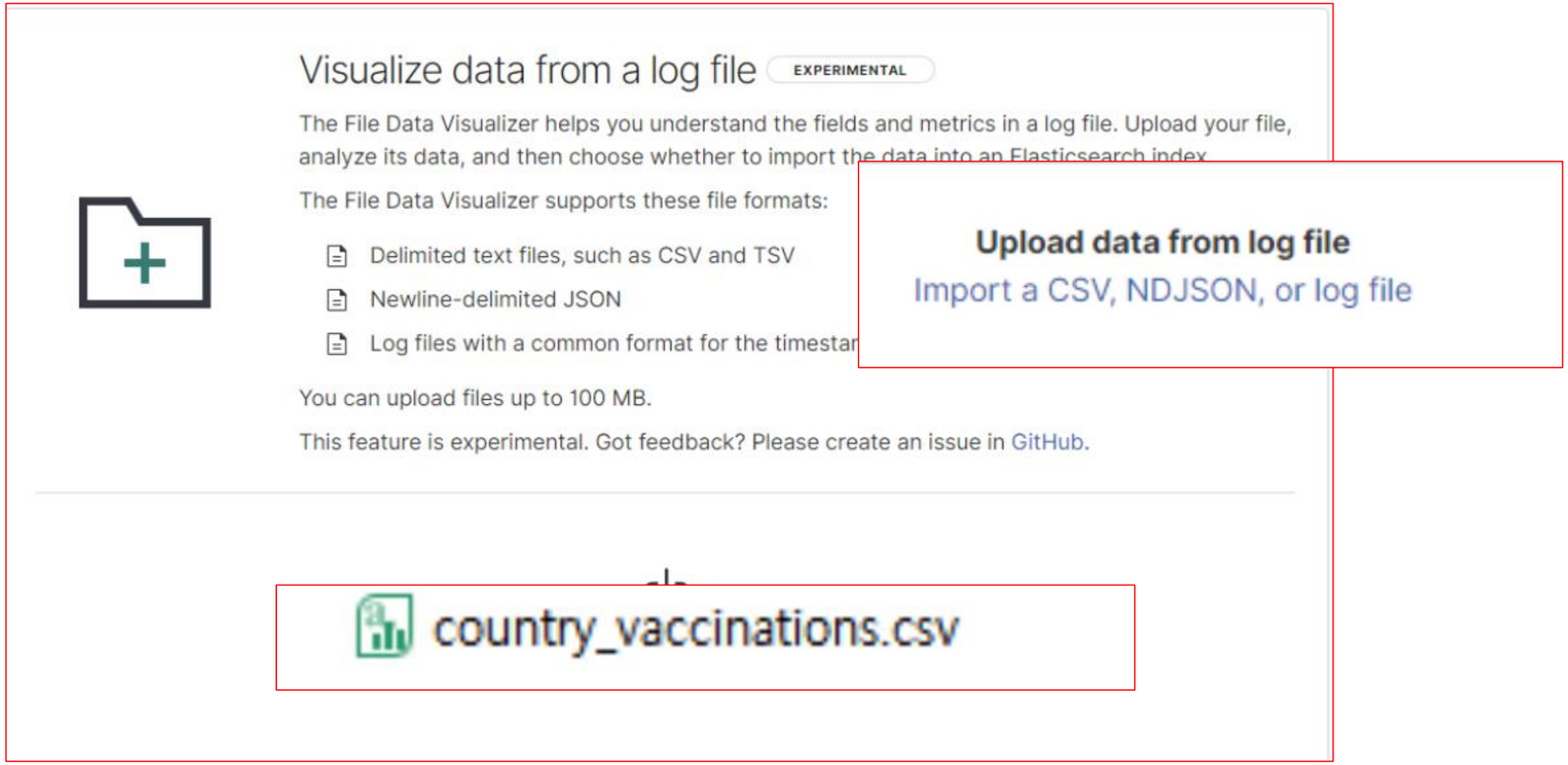
country_vaccinations.csv

daily_vacci	total_vacci	people_va	people_ful	daily_vacci	vaccines	source_na	source_website
	0	0			Johnson&	World Hea	https://covid19.who.int/
1367				34	Johnson&	World Hea	https://covid19.who.int/
1367				34	Johnson&	World Hea	https://covid19.who.int/
1367				34	Johnson&	World Hea	https://covid19.who.int/
1367				34	Johnson&	World Hea	https://covid19.who.int/
1367				34	Johnson&	World Hea	https://covid19.who.int/
1367	0.02	0.02		34	Johnson&	World Hea	https://covid19.who.int/
1580				40	Johnson&	World Hea	https://covid19.who.int/
1794				45	Johnson&	World Hea	https://covid19.who.int/
2008				50	Johnson&	World Hea	https://covid19.who.int/
2221				56	Johnson&	World Hea	https://covid19.who.int/
2435				61	Johnson&	World Hea	https://covid19.who.int/
2649				66	Johnson&	World Hea	https://covid19.who.int/
2862				72	Johnson&	World Hea	https://covid19.who.int/
2862				72	Johnson&	World Hea	https://covid19.who.int/
2862				72	Johnson&	World Hea	https://covid19.who.int/

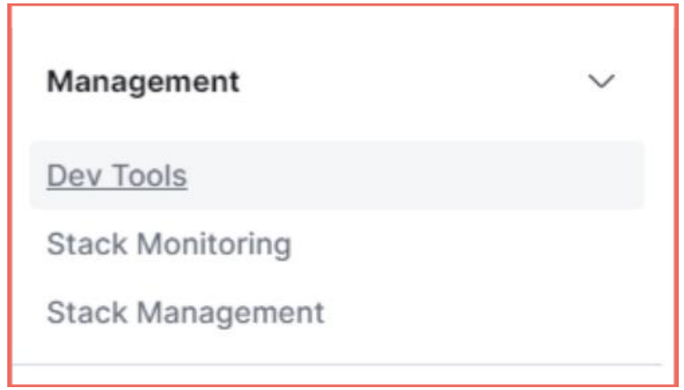
데이터 수집 과정을 진행했다는 전제 하에
이미 데이터 수집이 완료된 CSV파일을 통해
실습 진행

* country_vaccinations.csv 파일을
통해 실습 진행

Visualize_Kibana



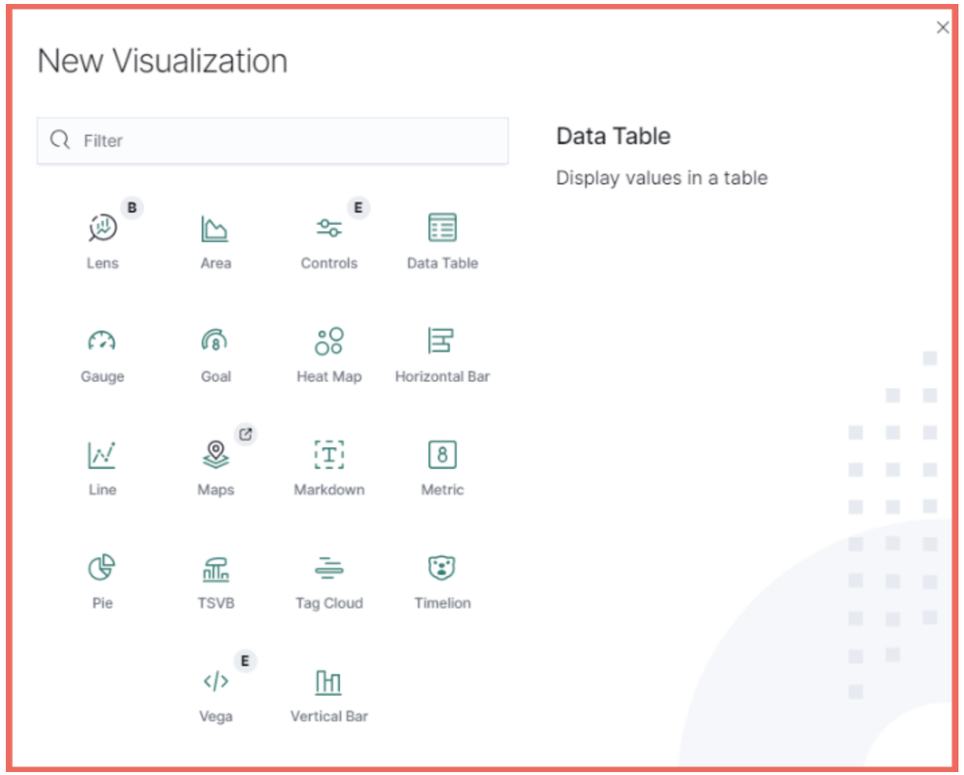
Visualize_Kibana




```
GET country-vaccinations/_search
{
  "query": {
    "match_all": {}
  }
}
```

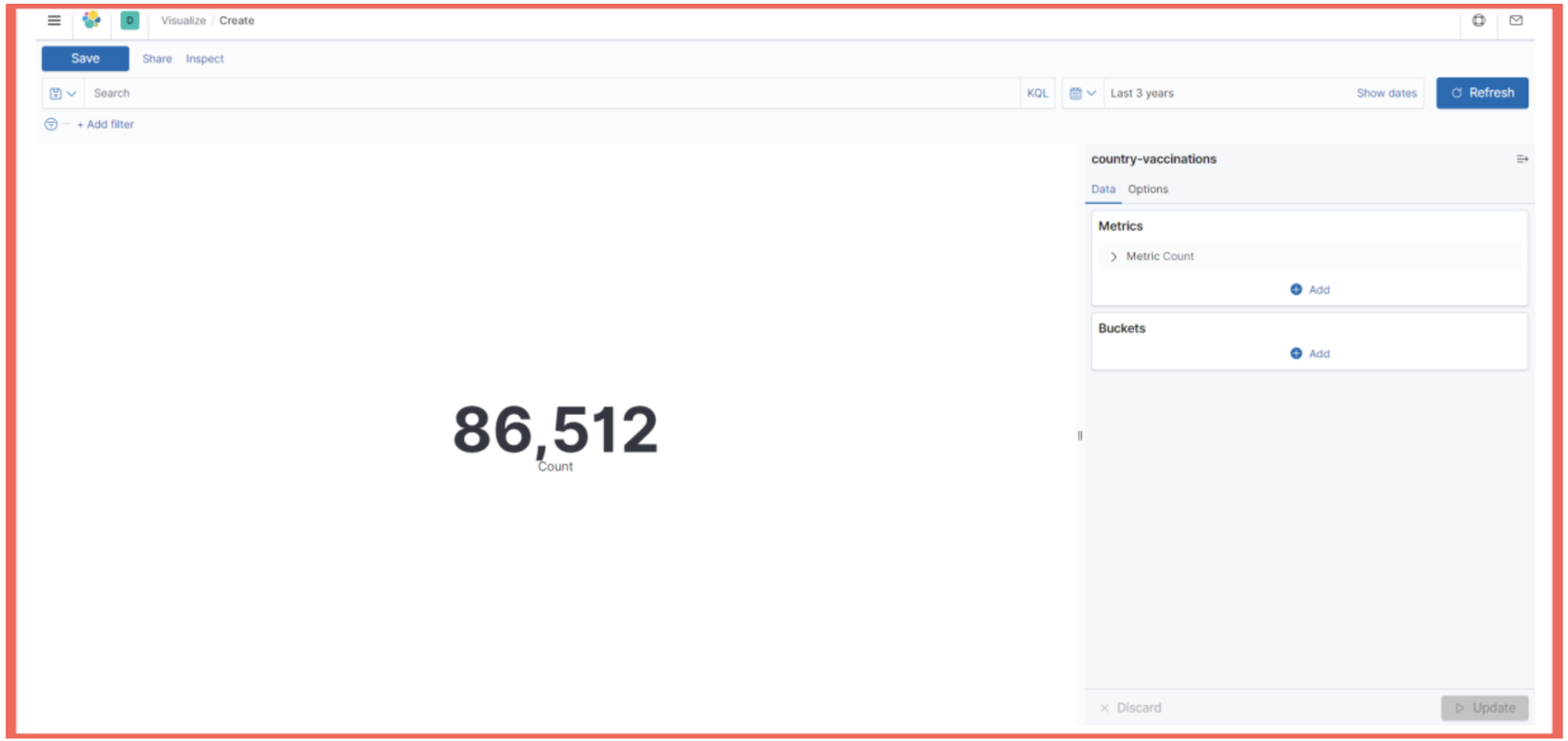

```
{
  "took" : 1,
  "timed_out" : false,
  "_shards" : {
    "total" : 1,
    "successful" : 1,
    "skipped" : 0,
    "failed" : 0
  },
  "hits" : {
    "total" : {
      "value" : 10000,
      "relation" : "gte"
    },
    "max_score" : 1.0,
    "hits" : [
      {
        "_index" : "country-vaccinations",
        "_type" : "_doc",
        "_id" : "Q1DCkoYBZJNuD1sVzXlp",
        "_score" : 1.0,
        "_source" : {
          "date" : "2021-02-22",
          "people_vaccinated" : 0.0,
          "country" : "Afghanistan",
          "people_vaccinated_per_hundred" : 0.0,
          "vaccines" : "Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing",
          "total_vaccinations" : 0.0,
          "@timestamp" : "2021-02-22T00:00:00.000+09:00",
          "total_vaccinations_per_hundred" : 0.0,
          "iso_code" : "AFG",
          "source_name" : "World Health Organization",
          "source_website" : "https://covid19.who.int/"
        }
      },
      {
        "_index" : "country-vaccinations",
        "_type" : "_doc",
        "_id" : "RFDCkoYBZJNuD1sVzXlp",
        "_score" : 1.0,
        "_source" : {
          "date" : "2021-02-23",
          "country" : "Afghanistan",
          "vaccines" : "Johnson&Johnson, Oxford/AstraZeneca, Pfizer/BioNTech, Sinopharm/Beijing",
          "daily_vaccinations_per_million" : 34.0,
          "daily_vaccinations" : 1367.0,
```

Visualize_Kibana



Visualize_Kibana

Metric 4

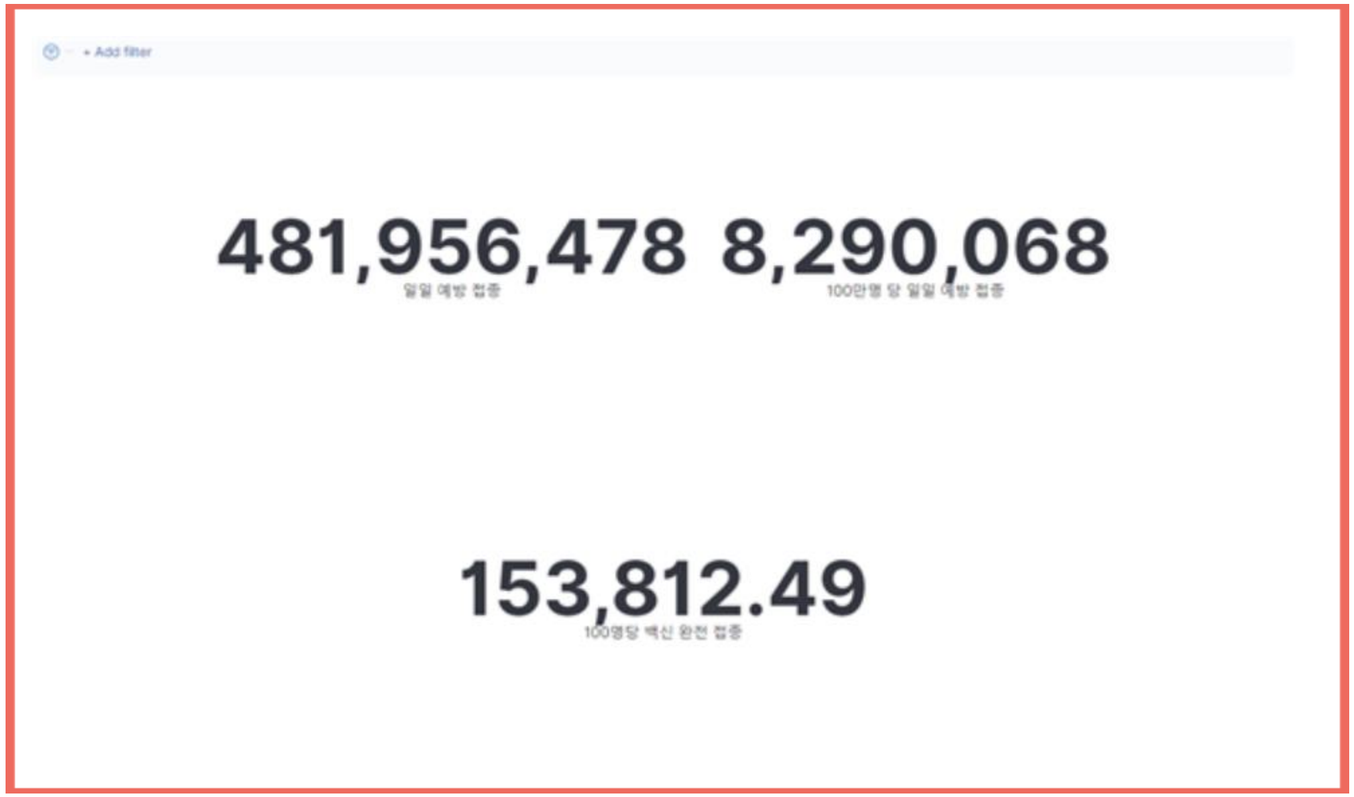


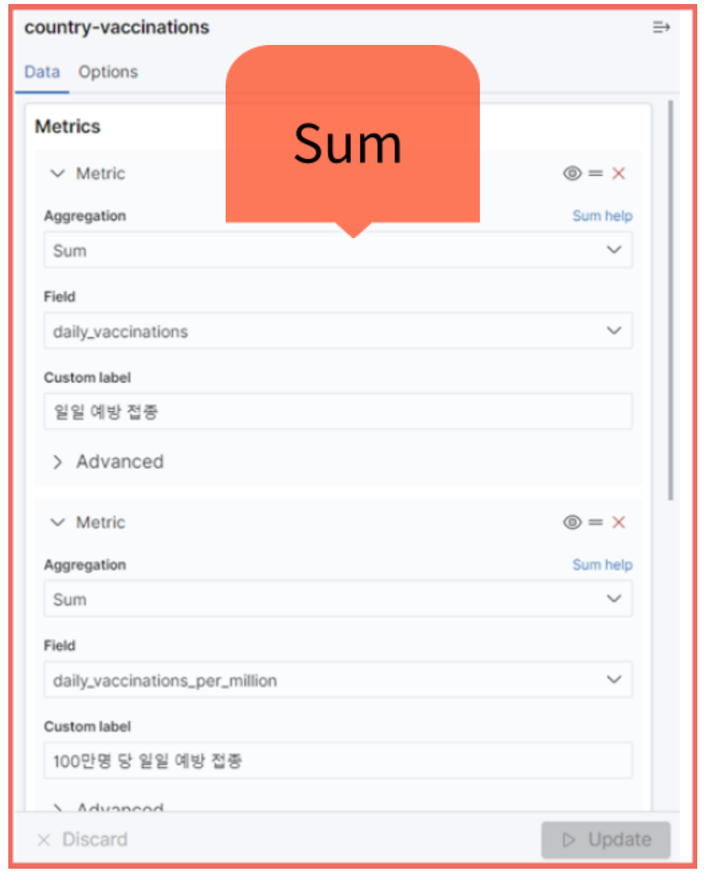
-4 3 2 1 0 1 2 3 +4

AF

Visualize_Kibana

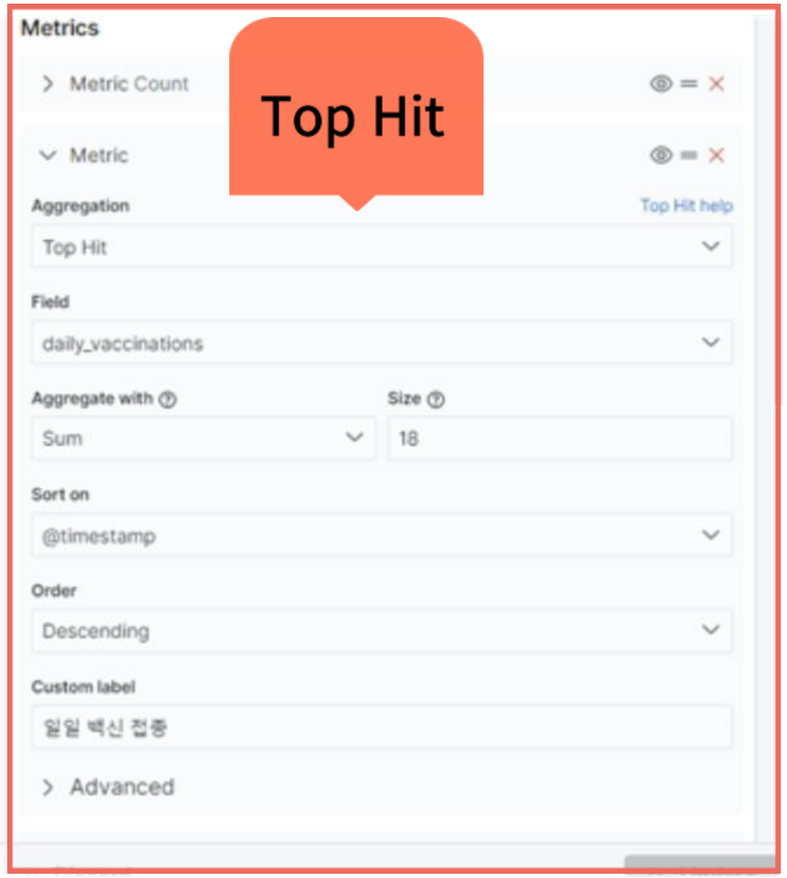
Metric 4





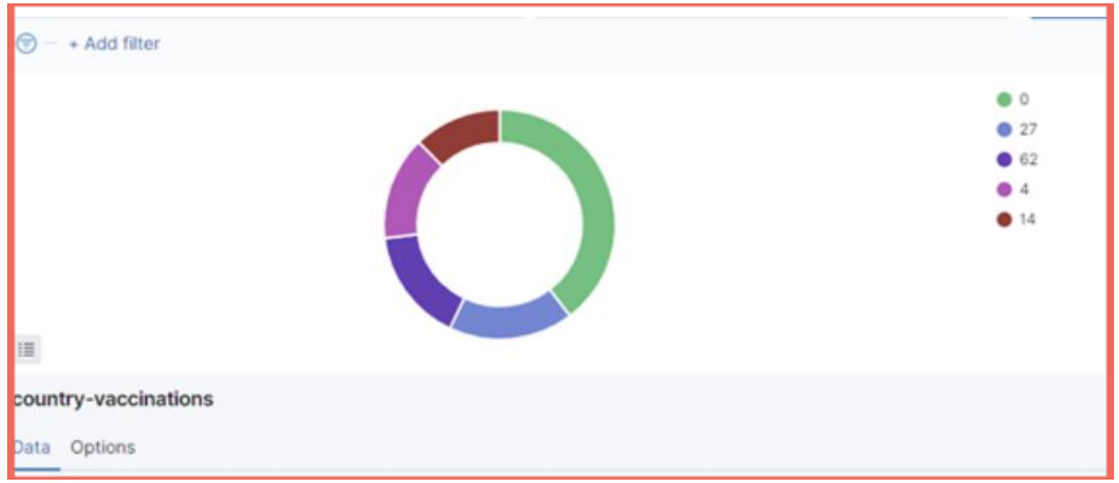
Visualize_Kibana

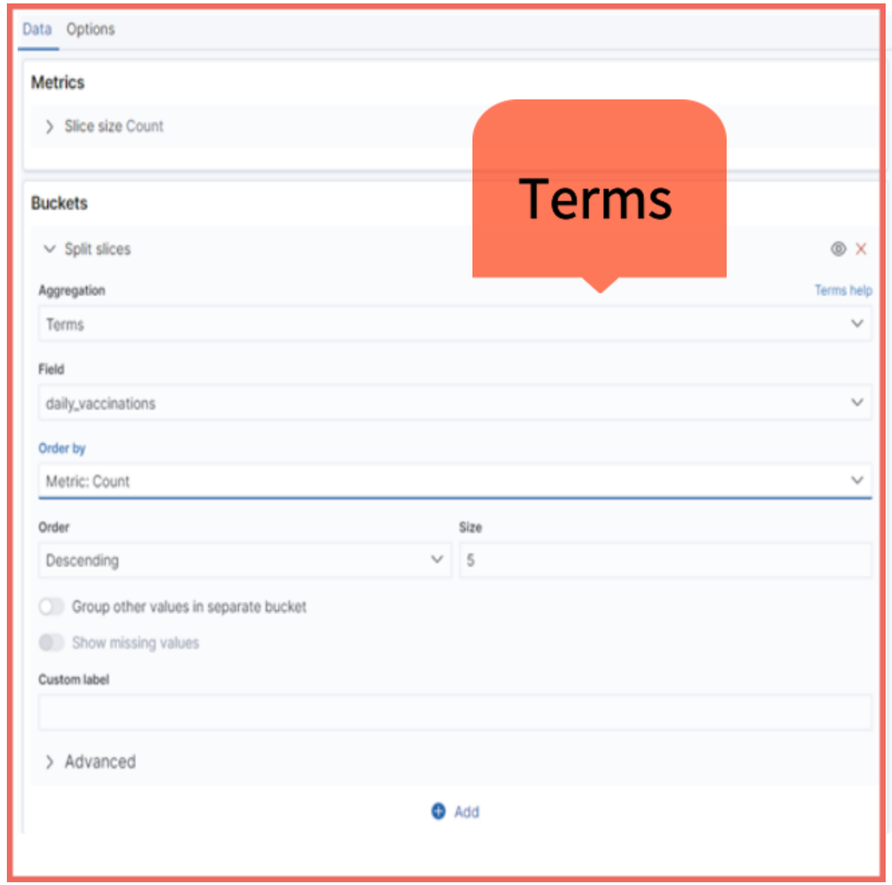
Metric 4



Visualize_Kibana

Pie 5



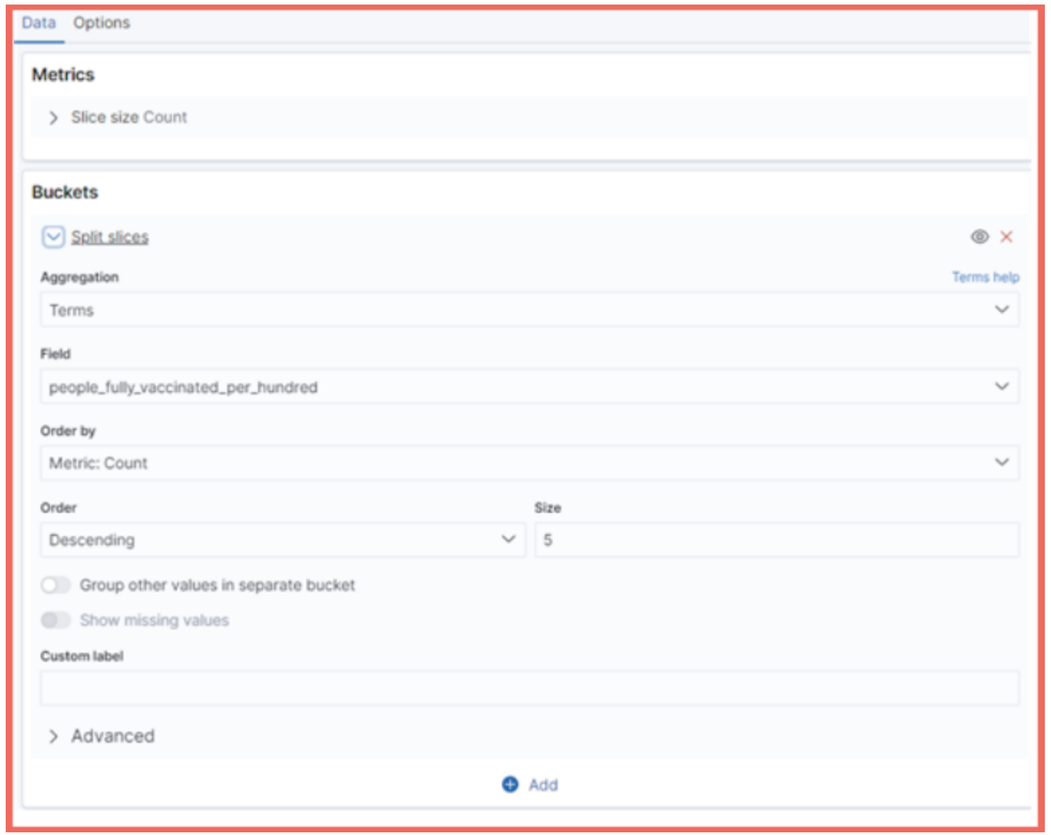


-4 3 2 1 0 1 2 3 +4

AF

Visualize_Kibana

Pie 5



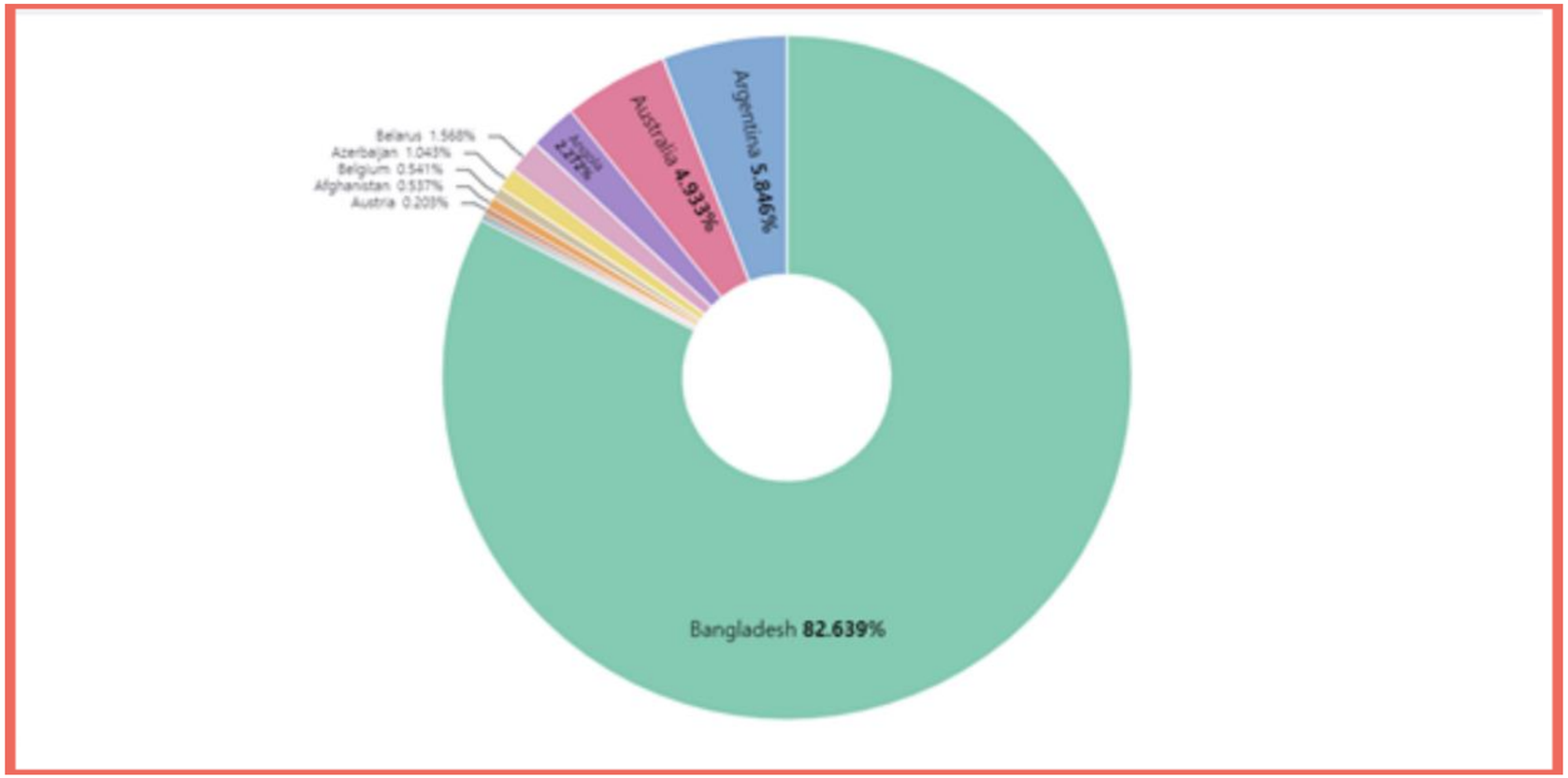
-4 3 2 1 0 1 2 3 +4

AF

ISO 007

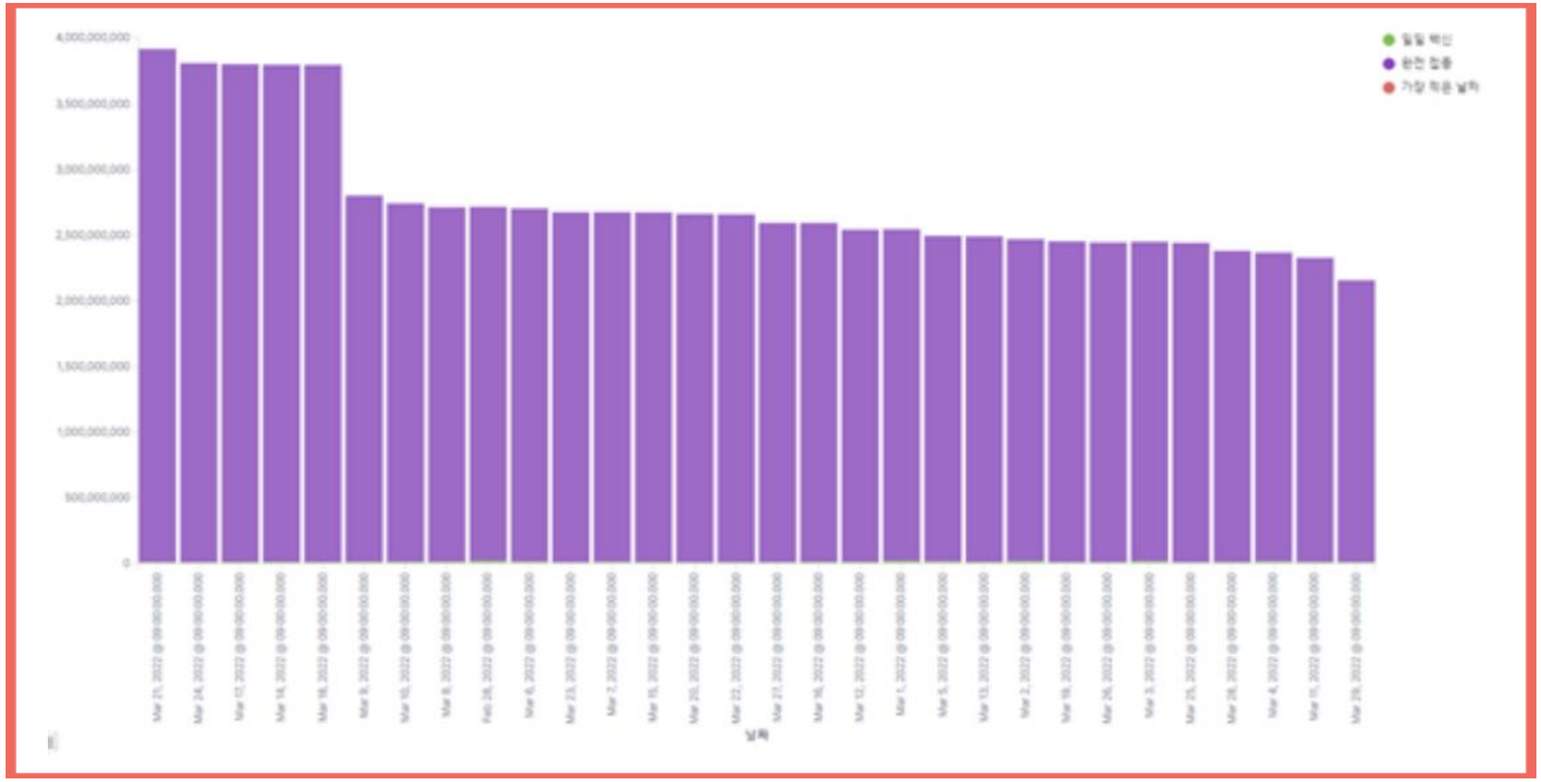
Pie 5

Visualize_Kibana



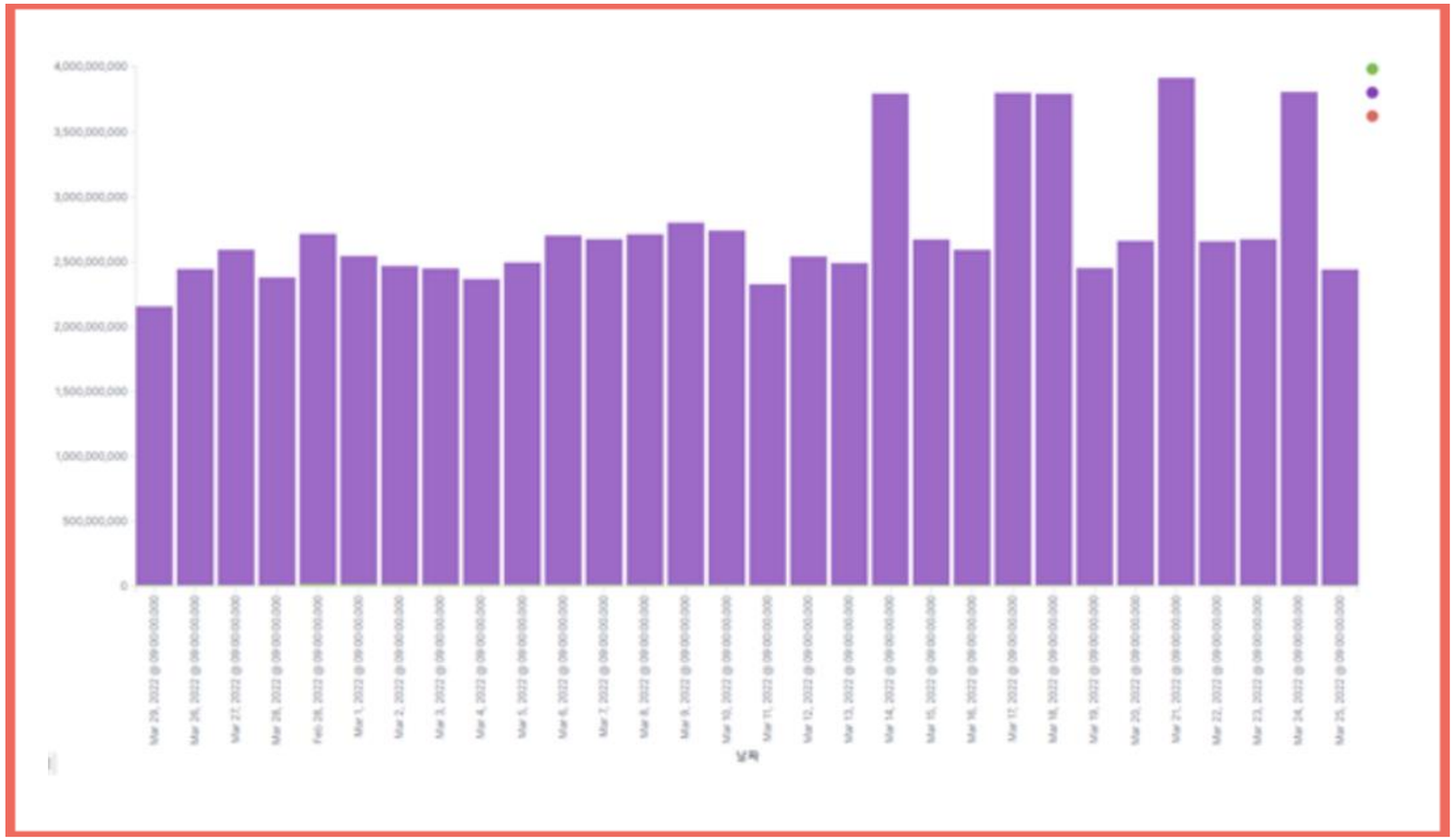
Visualize_Kibana

Vertical Bar 6

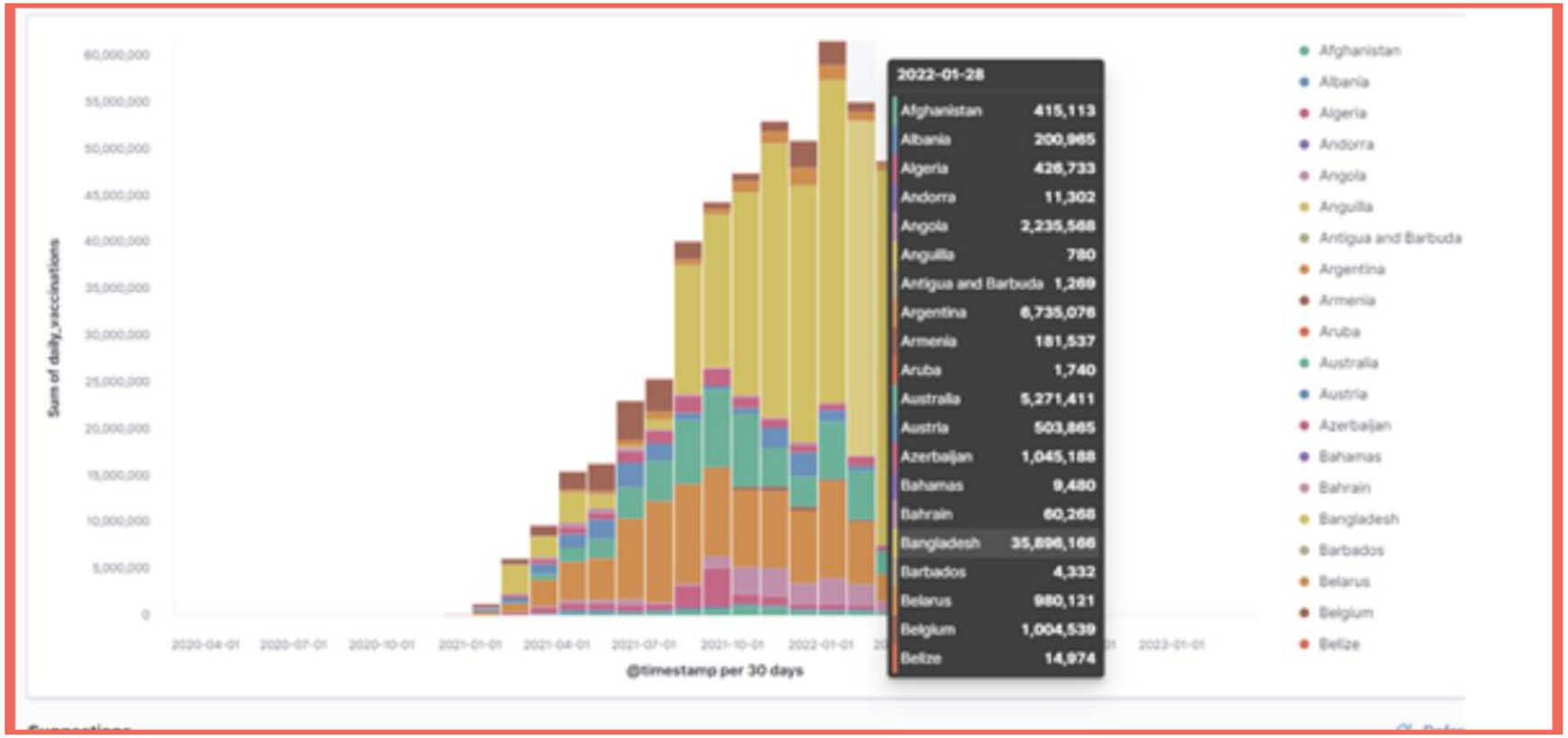


Visualize_Kibana

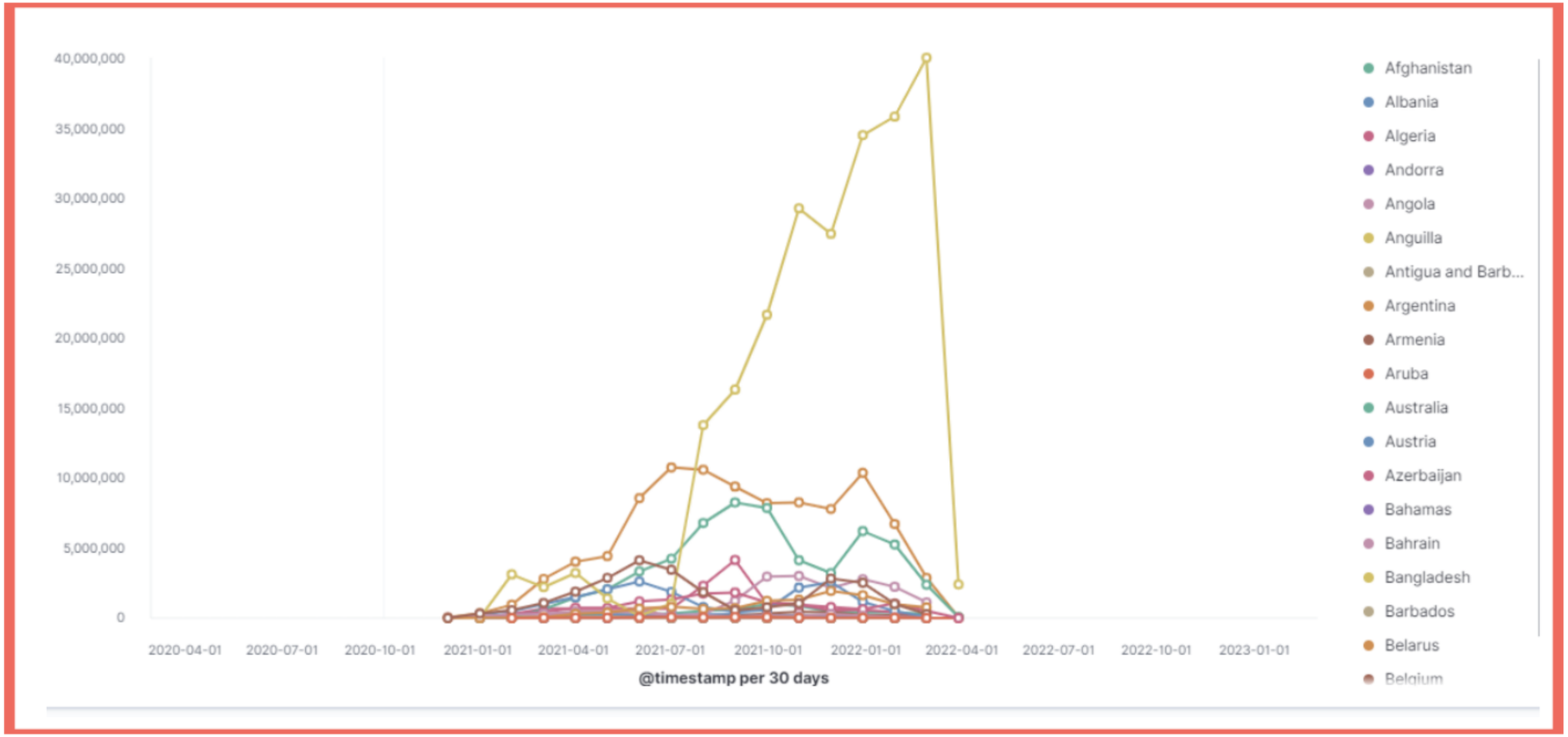
Vertical Bar 6



Visualize_Kibana



Visualize_Kibana



Visualize_Kibana

Dashboard 8

-4 3 2 1 0 1 2 3 +4

AF

느낀점 및 추후 계획

느낀점

생각보다 ELK를 설치하고 환경 설정을 하는 과정이 어려웠고,
여러가지 예상대로 되지 않는 부분이 많아서 직접 데이터 수집을
하지 못한 것이 아쉬웠다

추후 계획

Logstash 설치와 키바나와의 연동을 다시 시도해보고
Logstash를 통해 고유한 데이터 수집을 도전해보고 싶다

참고 자료

Elastic Stack과 Kafka를 이용한 로그 분석 및 시각화 시스템 설계
ElasticSearch와 Kibana를 이용한 웹 아티팩트 시각화
https://m.blog.naver.com/PostList.naver?blogId=ho96200&categoryNo=22&logCode=0
https://www.elastic.co/kr/logstash/
https://berrrrr.github.io/programming/2019/08/17/elk-csv/
https://www.youtube.com/@elastic7014/videos
https://ko.101-help.com/09f4d14f01-banghwabyeogeseo-chrome-networke-aegseseuhadorog-heoyonghaneun-bangbeob/
https://taetaetae.github.io/posts/make-dashboards-from-elasticstack-2/

SWUFORCE WEB1

감사합니다

ELK 중 KIBANA를 통한 시각화

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Q&A

ELK 중 KIBANA를 통한 시각화

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