Elastic Stack을 활용한 Data Dashboard 만들기

Week 5 - Logstash로 데이터를 전처리하고 전송하자

Fast Campus

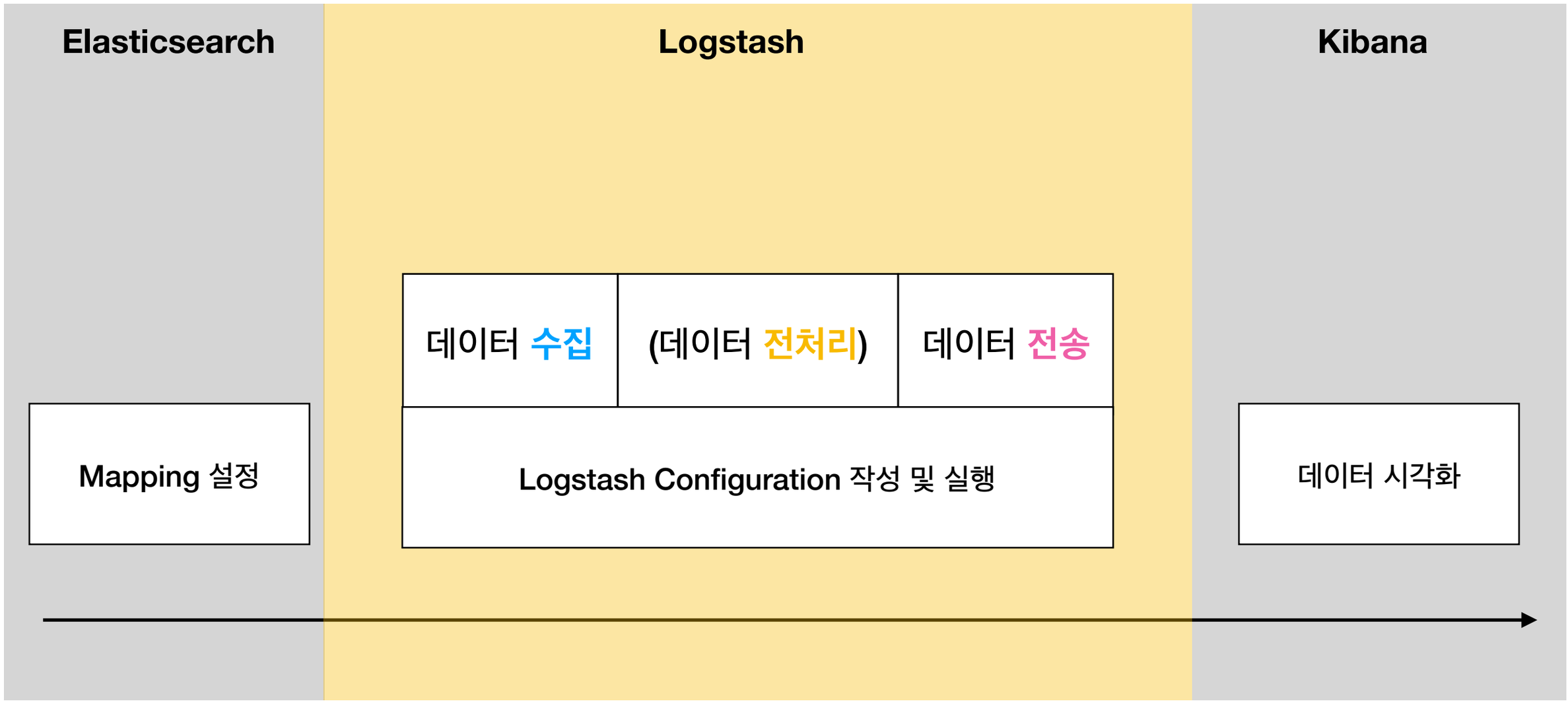
지금까지 시각화도 했고, 검색도 해봤는데 뭔가 2% 부족하다

이번에는 내가 가지고 있는 데이터를 시각화하고 싶다

내가 가진 모든 데이터를 Elastic Stack으로 분석할 수 있나?

원본 데이터를 변형할 수도 있나?

이 때 데이터를 필요한 게 Logstash!



(분석가 workflow)

logstash 6.2이 공식적으로 지원하는 plugins 중에서…

<-> community plugins 예) mongodb input plugin ♕

	용어	종류	예시
수집 ♕	input plugin	48	stdin, file(log, csv …), jdbc(mysql, …), elasticsearch, s3, …
전처리 ♕	filter plugin	41	mutate, csv, date, ruby, if, grok, drop, kv, range, …
전송 ♕	output plugin	50	stdout, elasticsearch, csv, kafka, mongodb, redis, s3, …

… 목적에 맞게 선택해서 사용하면 된다 (example)

	예시	해석
input plugin 👑	**jdbc**	mysql database에서 데이터를 수집해서…
filter plugin 👑	**mutate**	데이터에 mutate filter를 적용하고…
output plugin 👑	**elasticsearch**	elasticsearch에 데이터를 전송해라

input

filter

output

product	quantity	sales
Onepiece	2	39000
Cardigan	1	37000
Knit	3	69000
Jeans	1	78000
T-Shirt	1	89000

다음 상품 ’10% off’ tag 추가
- Onepiece
- Cardigan


```
"hits": {
  "total": 2,
  "max_score": 1,
  "hits": [
    {
      "_index": "week5_higee",
      "_type": "week5_higee",
      "_id": "AWFaqPo-PloSIAlpN8yg",
      "_score": 1,
      "_source": {
        "product": "Onepiece",
        "quantity": 2,
        "sales": 39000,
        "tags": [
          "10% off"
        ]
      }
    },
    {
      "_index": "week5_higee",
      "_type": "week5_higee",
      "_id": "AWFaqQIiPloSIAlpN8yh",
      "_score": 1,
      "_source": {
        "product": "Knit",
        "quantity": 3,
        "sales": 69000
      }
    }
  ]
}
```

그렇다면 logstash를 실제로 활용할 경우 어떤 flow로 생각해야할까?

1. HOME Logstash Home Directory 이동 `$ docker exec –it logstash bash`

2. conf 생성 Logstash conf 파일 생성 🐳 `$ vi exercise.conf` (파일 이름 예시 : exercise.conf)

3. conf 편집 Logstash conf 파일 편집모드 🐳 `i`

4. conf 작성 Logstash conf 파일 편집

문제 정의
1. 데이터가 어디에 있는지 (=**input**) 명확히 한다.
2. 데이터를 어디로 전송할지 (=**output**) 명확히 한다.
3. 데이터를 어떻게 변형할지 (=**filter**) 명확히 한다.

코드 작성
4. 적절한 **input** plugin 선택
5. 적절한 **output** plugin 선택
6. 적절한 **filter** plugin 선택

☝ **conf 작성이 logstash 핵심**

5. conf 저장 Logstash conf 파일 저장 🐳 `ESC 입력 후 :wq`

6. 실행 Logstash (conf 파일) 실행 🐳 `$ bin/logstash –f exercise.conf`

1. HOME Logstash Home Directory 이동 `$ docker exec –it logstash bash`

2. conf 생성 Logstash conf 파일 생성 🐋 `$ vi exercise.conf` (파일 이름 예시 : exercise.conf)

전반적인 흐름을 기억하자.

3. conf 편집 Logstash conf 파일 편집모드 🐋 `i`

큰 흐름은 같고 conf 작성하는 부분만 바꾼다.

4. conf 작성 Logstash conf 파일 편집

문제 정의
2. 데이터를 어디로 전송할지 (=**output**) 명확히 한다.
3. 데이터를 어떻게 변형할지 (=**filter**) 명확히 한다.

코드 작성
4. 적절한 **input** plugin 선택
5. 적절한 **output** plugin 선택
6. 적절한 **filter** plugin 선택

(오늘 실습은 이 과정의 반복이다.)

5. conf 저장 Logstash conf 파일 저장 🐋 `ESC 입력 후 :wq` **conf 작성이 logstash 핵심**

6. 실행 Logstash (conf 파일) 실행 🐋 `$ bin/logstash –f exercise.conf`

sample logstash configuration은 아래와 같다

```
input {
  stdin {}
}

filter {
  mutate {
    split => { "message" => ":"}
    add_field => {
      "ip" => "%{message[0]}"
      "port" => "%{message[1]}"
    }
  }
}

output {
  stdout {
  }
}
```

sample logstash configuration은 아래와 같다

```
1  input {
2    stdin {}
3  }
4
5  filter {
6    mutate {
7      split => { "message" => ":"}
8      add_field => {
9        "ip" => "%{message[0]}"
10       "port" => "%{message[1]}"
11     }
12   }
13 }
14
15 output {
16   stdout {
17   }
18 }
```

1. 데이터가 어디에 있는지 (=**input**) 명확히 한다.
2. 데이터를 어디로 전송할지 (=**output**) 명확히 한다.
3. 데이터를 어떻게 변형할지 (=**filter**) 명확히 한다.
4. 적절한 **input** plugin 선택 stdin
5. 적절한 **output** plugin 선택 stdout
6. 적절한 **filter** plugin 선택 mutate

실습에 앞서

- 수업 시간에 logstash configuration을 직접 작성하지 않음
- 대신, 미리 만들어 놓은 logstash configuration을 실행
- docker container 내부와 host를 구분하기 위해 docker container 내부 작업은 🐳 표시

Input - stdin

- console에 직접 입력한 데이터 수집
- 간단한 logstash 테스트 할 때 혹은 디버깅 할 때 주로 사용

logstash configuration을 확인하자 👑

```
input {
  stdin {}
}

output {
  stdout {}
}
```

- **input** plugin과 **output** plugin은 최소 1개씩 있어야 한다 (filter는 옵션)
- 그러므로 input 학습 실습이지만 기본 output인 stdout을 설정했다

logstash를 실행하자

```
$ bin/logstash -f code/input/stdin/stdin.conf
```

(약 1분 후) 아래와 같이 나오면…

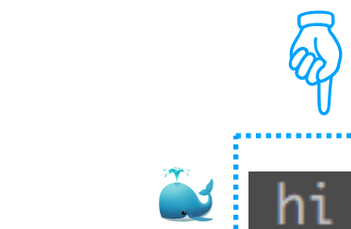
```
bash-4.2$ bin/logstash -f code/input/stdin/stdin.conf
warning: ignoring JAVA_OPTS=-Xms128m -Xmx128m -XX:-AssumeMP; pass JVM parameters via LS_JAVA_OPTS
OpenJDK 64-Bit Server VM warning: If the number of processors is expected to increase from one, then you should configure the number of parallel GC threads appropriately using -XX:ParallelGCThreads=N
Sending Logstash's logs to /usr/share/logstash/logs which is now configured via log4j2.properties
[2018-07-15T09:12:13,379][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"fb_apache", :directory=>"/usr/share/logstash/modules/fb_apache/configuration"}
[2018-07-15T09:12:13,429][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"netflow", :directory=>"/usr/share/logstash/modules/netflow/configuration"}
[2018-07-15T09:12:14,542][WARN ][logstash.config.source.multilocal] Ignoring the 'pipelines.yml' file because modules or command line options are specified
[2018-07-15T09:12:15,692][INFO ][logstash.runner          ] Starting Logstash {"logstash.version"=>"6.2.4"}
[2018-07-15T09:12:16,456][INFO ][logstash.agent           ] Successfully started Logstash API endpoint {:port=>9600}
[2018-07-15T09:12:20,668][INFO ][logstash.pipeline        ] Starting pipeline {:pipeline_id=>"main", "pipeline.workers"=>1, "pipeline.batch.size"=>125, "pipeline.batch.delay"=>50}
[2018-07-15T09:12:20,862][INFO ][logstash.pipeline        ] Pipeline started successfully {:pipeline_id=>"main", :thread=>"#<Thread:0x6c2895 run>"}
The stdin plugin is now waiting for input:
[2018-07-15T09:12:21,029][INFO ][logstash.agent           ] Pipelines running {:count=>1, :pipelines=>["main"]}
```

```
The stdin plugin is now waiting for input:
[2018-07-15T09:18:16,175][INFO ][logstash.agent           ] Pipelines running {:count=>1, :pipelines=>["main"]}
hi
```

stdin으로 **hi** 입력하고 **Enter** 를 누르자

logstash 실행 결과

- **stdin** 입력값 (= 사용자가 직접 입력)
- input을 stdin으로 설정했기에 "hi" 입력하자 결과 출력
- event 1개



```
hi
{
       "message" => "hi",
          "host" => "72f070e6b6a4",
    "@timestamp" => 2018-07-15T09:18:20.484Z,
      "@version" => "1"
}
```

- **stdout** 출력값 (= 화면에 직접 출력)
- stdin 입력값인 "hi" 이외의 메타데이터는 시스템에서 제공

Input - file

- file 형태 데이터를 수집할 때 사용
- test.log, test.csv 등 일반적인 파일형태는 모두 file plugin을 사용

logstash configuration을 확인하자 👑

```
1  input {
2    file {
3      path => "/usr/share/logstash/data/titanic.csv"
4    }
5  }
6
7  output {
8    stdout {
9    }
10 }
```

file에서 데이터를 읽을 것이기에 file 입력

파일 경로 입력

logstash를 실행하자

```
$ bin/logstash -f code/input/file/file.conf
```

아무 것도 안 나온다 (~~정상이다~~)

```
bash-4.2$ bin/logstash -f code/input/file/file.conf
warning: ignoring JAVA_OPTS=-Xms128m -Xmx128m -XX:-AssumeMP; pass JVM
OpenJDK 64-Bit Server VM warning: If the number of processors is ex
Sending Logstash's logs to /usr/share/logstash/logs which is now co
[2018-07-15T09:39:16,011][INFO ][logstash.modules.scaffold] Initial
[2018-07-15T09:39:16,053][INFO ][logstash.modules.scaffold] Initial
[2018-07-15T09:39:17,208][WARN ][logstash.config.source.multilocal]
[2018-07-15T09:39:18,456][INFO ][logstash.runner          ] Starting L
[2018-07-15T09:39:19,294][INFO ][logstash.agent           ] Successfully s
[2018-07-15T09:39:24,321][INFO ][logstash.pipeline        ] Starting pipel
[2018-07-15T09:39:25,005][INFO ][logstash.pipeline        ] Pipeline start
[2018-07-15T09:39:25,249][INFO ][logstash.agent           ] Pipel
```

- **start_position**이라는 옵션이 default로 **end**로 설정되어 있기 때문이다.
- 즉, 새로 추가되는 데이터만 보겠다는 것인데 이걸 **beginning**으로 해줘야 된다.
- **다른 파일**로 다시 실행해보자

logstash configuration을 확인하자 👑

```
input {
  file {
    path => "/usr/share/logstash/data/titanic2.csv"
    start_position => "beginning"
  }
}

output {
  stdout {
  }
}
```

logstash를 실행하자

```
$ bin/logstash -f code/input/file/file-start-position.conf
```

파일을 처음부터 읽으므로 결과가 제대로 출력

```
bash-4.2$ bin/logstash -f code/input/file/file-start-position.conf
warning: ignoring JAVA_OPTS=-Xms128m -Xmx128m -XX:-AssumeMP; pass JVM parameters via LS_JAVA_OPTS
OpenJDK 64-Bit Server VM warning: If the number of processors is expected to increase from one, then you sh
Sending Logstash's logs to /usr/share/logstash/logs which is now configured via log4j2.properties
[2018-07-15T10:07:18,372][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"fb_apache"
[2018-07-15T10:07:18,413][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"netflow",
[2018-07-15T10:07:19,490][WARN ][logstash.config.source.multilocal] Ignoring the 'pipelines.yml' file becau
[2018-07-15T10:07:20,688][INFO ][logstash.runner          ] Starting Logstash {"logstash.version"=>"6.2.4"}
[2018-07-15T10:07:21,477][INFO ][logstash.agent           ] Successfully started Logstash API endpoint {:po
[2018-07-15T10:07:26,973][INFO ][logstash.pipeline        ] Starting pipeline {:pipeline_id=>"main", "pipel
[2018-07-15T10:07:27,724][INFO ][logstash.pipeline        ] Pipeline started successfully {:pipeline_id=>"m
[2018-07-15T10:07:27,952][INFO ][logstash.agent           ] Pipelines running {:count=>1, :pipelines=>["mai
{
      "@version" => "1",
          "host" => "d0d2cd6bcf0a",
          "path" => "/usr/share/logstash/data/titanic2.csv",
       "message" => "51,Panula,0,3,male,7,4,1,3101295,39.6875,S",
    "@timestamp" => 2018-07-15T10:07:28.562Z
}
{
      "@version" => "1",
          "host" => "d0d2cd6bcf0a",
          "path" => "/usr/share/logstash/data/titanic2.csv",
       "message" => "52,Nosworthy,0,3,male,21,0,0,A/4. 39886,7.8,S",
    "@timestamp" => 2018-07-15T10:07:28.641Z
}
{
      "@version" => "1",
          "host" => "d0d2cd6bcf0a",
          "path" => "/usr/share/logstash/data/titanic2.csv",
       "message" => "53,Harper,1,1,female,49,1,0,PC 17572,76.7292,C",
    "@timestamp" => 2018-07-15T10:07:28.647Z
}
```

심화

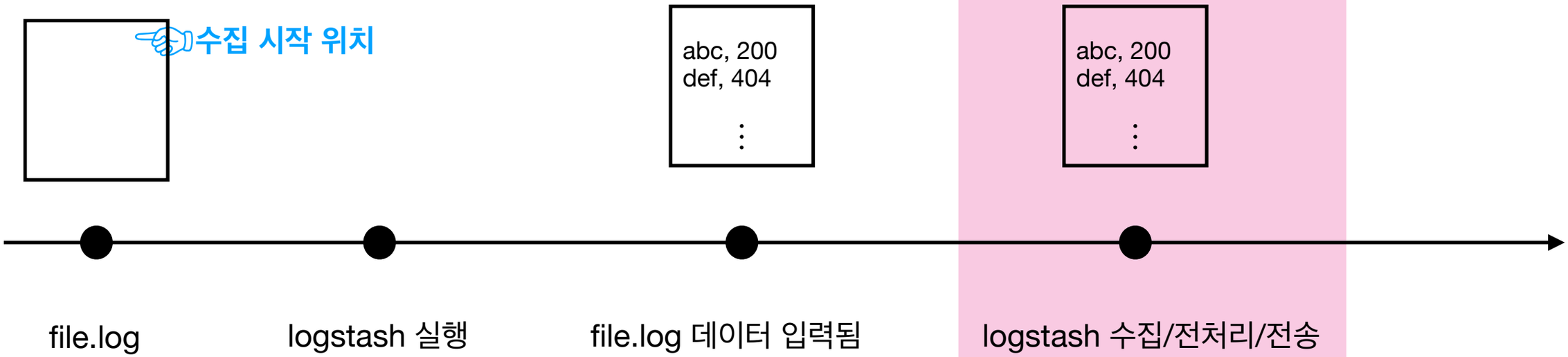
Q. 그래서 start_position option를 어떻게 하라는건지?

A. logstash 실행 전에 file에 이미 데이터가 있는지 아닌지가 중요하다

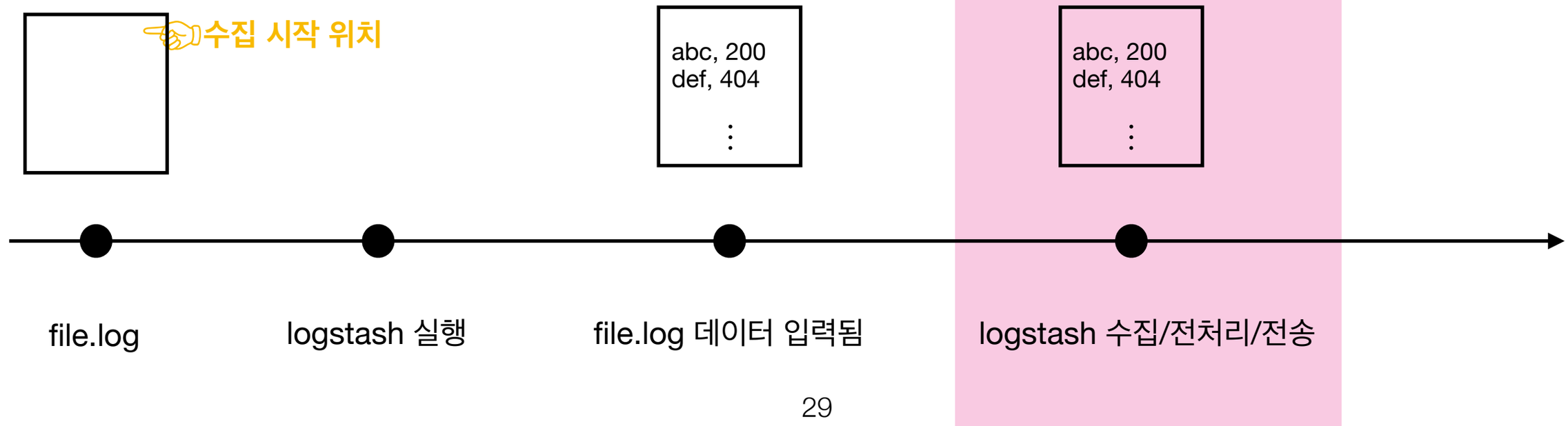
심화

logstash 실행 전 path file에 데이터가 없는 경우 : **차이가 없다**

start_position : beginning



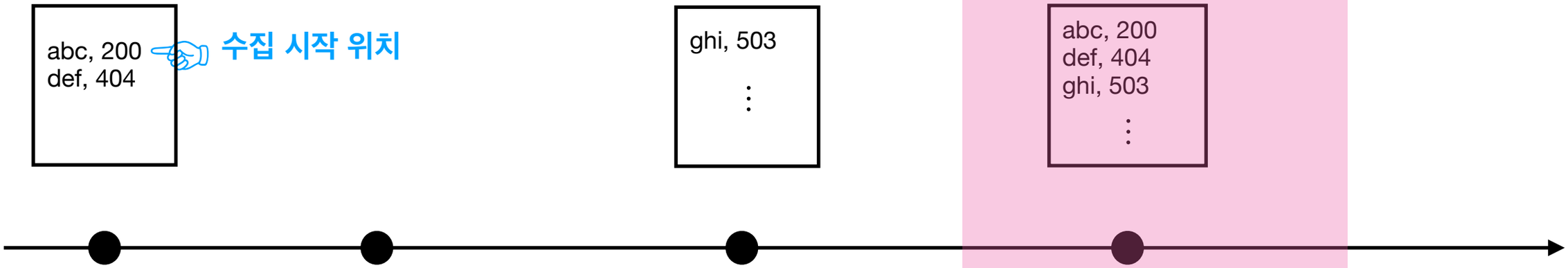
start_position : end



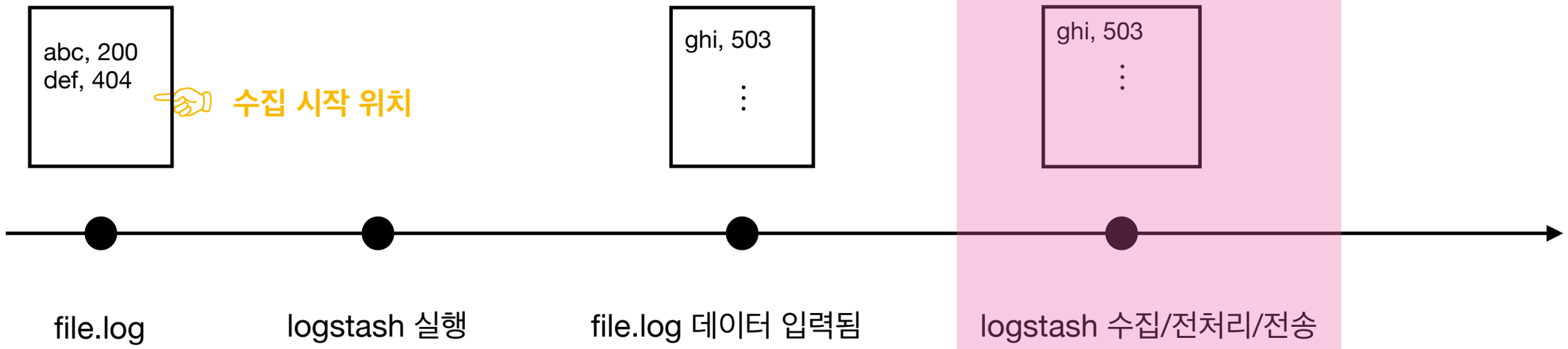
심화

logstash 실행 전 path file에 데이터가 있는 경우 : **차이가 있다**

start_position : beginning



start_position : end



심화

단, start_position은 특정 파일을 처음 읽을 때에만 효과가 있다.

그 이후에는 sincedb에 기록이 되어 효과가 없다.

심화

Q. 왜 한 번 **titanic.csv**를 logstash로 읽은 후에는 **titanic2.csv**로 수정했을까?

A. logstash는 기본적으로, 같은 데이터는 한 번만 조회하는 정책을 가지고 있기 때문이다

sincedb

sincedb 👑 심화

- path : <$path.data>/plugins/inputs/file

```
bash-4.2$ pwd
/usr/share/logstash/data/plugins/inputs/file
bash-4.2$ ls -lah
total 16K
drwxr-xr-x 2 logstash logstash 4.0K Jul 15 12:33 .
drwxr-xr-x 3 logstash logstash 4.0K Jul 15 06:25 ..
-rw-r--r-- 1 logstash logstash   20 Jul 15 12:28 sincedb_b503666ae29e95ab8024b1fd6cbc694c
-rw-r--r-- 1 logstash logstash   20 Jul 15 12:33 .sincedb_dae92a8984be95dcb3377c3b9394a87f
```

file input plugin에서 설정한 path 별로 1개씩 생긴다

- data

```
bash-4.2$ cat .sincedb_dae92a8984be95dcb3377c3b9394a87f
137722 0 51713 2232
```

파일정보

current byte offset

sincedb 👑 심화

- path : <$path.data>/plugins/inputs/file

```
bash-4.2$ pwd
/usr/share/logstash/data/plugins/inputs/file
bash-4.2$ ls -lah
total 16K
drwxr-xr-x 2 logstash logstash 4.0K Jul 15 12:33
drwxrwxr-x 2 logstash logstash 4.0K Jul 15 12:33
-rw-r--r-- 1 logstash logstash   20 Jul 15 12:33 .sincedb_dae92a8984be95dcb3377c3b9394a87f
```

한 마디로, logstash는 sincedb를 이용해서

1) file (혹은 file patterns) 별로

file input plugin에서 설정한 path 별로 1개씩 생긴다

2) 어디까지 조회했는지

data

```
bash-4.2$ cat .sincedb_dae92a8984be95dcb3377c3b9394a87f
```

기록하고 있다고 알고 넘어가자

파일정보

current byte offset

심화

그러므로, 한 번 끝까지 읽은 파일을 logstash로 재실행해도 반응이 없는 이유는

이미 해당 파일에 대해 끝까지 봤다는 기록이 남아있기 때문이다.

다시 조회하고 싶으면 sincedb_path option을 변경하면 된다.

logstash configuration을 확인하자 👑

```
1 input {
2   file {
3     path => "/usr/share/logstash/data/titanic.csv"
4     start_position => "beginning"
5     sincedb_path => "/dev/null"
6   }
7 }
8
9 output {
10   stdout {
11   }
13 }
```

- 이미 읽은 데이터도 처음 보는 데이터인 것처럼 설정
- 단, 이번에 실행한 결과에 대한 기록은 sincedb에 저장하지 않는다.
- 주로 디버깅/테스트 용도로 사용

logstash를 실행하자

```
$ bin/logstash -f code/input/file/file-sincedb-path.conf
```

이미 읽은 데이터도 다시 읽어 들인다 **심화**

```
bash-4.2$ bin/logstash -f code/input/file/file-sincedb-path.conf
warning: ignoring JAVA_OPTS=-Xms128m -Xmx128m -XX:-AssumeMP; pass JVM parameters via LS_JAVA_OPTS
OpenJDK 64-Bit Server VM warning: If the number of processors is expected to increase from one, th
Sending Logstash's logs to /usr/share/logstash/logs which is now configured via log4j2.properties
[2018-07-15T13:11:10,496][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"fb
[2018-07-15T13:11:10,542][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"ne
[2018-07-15T13:11:11,625][WARN ][logstash.config.source.multilocal] Ignoring the 'pipelines.yml' f
[2018-07-15T13:11:12,829][INFO ][logstash.runner          ] Starting Logstash {"logstash.version"=
[2018-07-15T13:11:13,560][INFO ][logstash.agent           ] Successfully started Logstash API endp
[2018-07-15T13:11:19,264][INFO ][logstash.pipeline        ] Starting pipeline {:pipeline_id=>"main
[2018-07-15T13:11:19,982][INFO ][logstash.pipeline        ] Pipeline started successfully {:pipeli
[2018-07-15T13:11:20,218][INFO ][logstash.agent           ] Pipelines running {:count=>1, :pipelin
{
    "@timestamp" => 2018-07-15T13:11:20.744Z,
      "@version" => "1",
       "message" => "1,Braund,0,3,male,22,1,0,A/5 21171,7.25,S",
          "path" => "/usr/share/logstash/data/titanic.csv",
          "host" => "fef3405d41af"
}
{
    "@timestamp" => 2018-07-15T13:11:20.815Z,
      "@version" => "1",
       "message" => "2,Cumings,1,1,female,38,1,0,PC 17599,71.2833,C",
          "path" => "/usr/share/logstash/data/titanic.csv",
          "host" => "fef3405d41af"
}
{
    "@timestamp" => 2018-07-15T13:11:20.823Z,
      "@version" => "1",
       "message" => "3,Heikkinen,1,3,female,26,0,0,STON/O2. 3101282,7.925,S",
          "path" => "/usr/share/logstash/data/titanic.csv",
          "host" => "fef3405d41af"
}
```

Input - jdbc

- jdbc를 지원하는 database 데이터를 수집할 때 사용하는 plugin
- 실습 database 정보
  - uri : mysql://52.78.134.20:3306/fc
  - database : fc
  - table : fc
  - user : fc
  - password : fc

원본 데이터 (총 33 row)

```
mysql> use fc;
Reading table information for completion of table and column names
You can turn off this feature to get a quicker startup with -A

Database changed
mysql> select * from fc;
+----+------+--------+-----------+----------+-------------------+
| id | age  | salary | name      | location | employment_status |
+----+------+--------+-----------+----------+-------------------+
|  1 |   33 |   4000 | Josh      | US       | employed          |
|  2 |   33 |  45000 | Tom       | US       | employed          |
|  3 |   23 |   3000 | Kirk      | US       | employed          |
|  4 |   27 |   3500 | Ken       | US       | employed          |
|  5 |   38 |   4500 | Jessie    | US       | employed          |
|  6 |   31 |   5200 | Jennifer  | US       | unemployed        |
|  7 |   33 |  22200 | Bob       | US       | unemployed        |
```

logstash configuration을 확인하자 👑

```
input {
  jdbc {
    jdbc_validate_connection => true
    jdbc_connection_string => "jdbc:mysql://52.78.134.20:3306/fc"
    jdbc_user => "fc"
    jdbc_password => "fc"
    jdbc_driver_library => "/usr/share/logstash/driver/mysql-connector-java-5.1.36-bin.jar"
    jdbc_driver_class => "com.mysql.jdbc.Driver"
    statement => "SELECT * FROM fc"
  }
}

output {
  stdout {
  }
}
```

logstash를 실행하자

```
$ bin/logstash -f code/input/jdbc/jdbc.conf
```

logstash를 실행하면...

```
bash-4.2$ bin/logstash -f code/input/jdbc/jdbc.conf
warning: ignoring JAVA_OPTS=-Xms128m -Xmx128m -XX:-AssumeMP; pass JVM parameters via LS_JAVA_OPTS
OpenJDK 64-Bit Server VM warning: If the number of processors is expected to increase from one, then y
Sending Logstash's logs to /usr/share/logstash/logs which is now configured via log4j2.properties
[2018-07-15T14:05:53,013][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"fb_apa
[2018-07-15T14:05:53,059][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"netflo
[2018-07-15T14:05:54,205][WARN ][logstash.config.source.multilocal] Ignoring the 'pipelines.yml' file
[2018-07-15T14:05:55,466][INFO ][logstash.runner          ] Starting Logstash {"logstash.version"=>"6.
[2018-07-15T14:05:56,240][INFO ][logstash.agent           ] Successfully started Logstash API endpoint
[2018-07-15T14:06:02,578][INFO ][logstash.pipeline        ] Starting pipeline {:pipeline_id=>"main", "
[2018-07-15T14:06:03,008][INFO ][logstash.pipeline        ] Pipeline started successfully {:pipeline_i
[2018-07-15T14:06:03,254][INFO ][logstash.agent           ] Pipelines running {:count=>1, :pipelines=>
[2018-07-15T14:06:06,344][INFO ][logstash.inputs.jdbc     ] (0.036580s) SELECT * FROM fc
{
                 "age" => 33,
              "salary" => 4000,
                "name" => "Josh",
    "employment_status" => "employed",
          "@timestamp" => 2018-07-15T14:06:06.393Z,
                "id" => 1,
            "location" => "US",
            "@version" => "1"
}
{
                 "age" => 33,
              "salary" => 45000,
                "name" => "Tom",
    "employment_status" => "employed",
          "@timestamp" => 2018-07-15T14:06:06.439Z,
                "id" => 2,
            "location" => "US",
            "@version" => "1"
}
{
                 "age" => 23,
              "salary" => 3000,
                "name" => "Kirk",
    "employment_status" => "employed",
          "@timestamp" => 2018-07-15T14:06:06.440Z,
                "id" => 3,
            "location" => "US",
            "@version" => "1"
}
```

심화

Q. jdbc input도 logstash가 어디까지 조회했는지 기록을 하나?

A. sql로 조회한 마지막 row의 특정 column 데이터를 기록하는 방식으로 한다.

sql_last_value

다음 중 기준 column으로 적합한 column은? **심화**

```
{
          "@timestamp" => 2018-02-03T19:03:01.883Z,
                "name" => "Kwon",
            "@version" => "1",
            "location" => "KR",
                  "id" => 29,
    "employment_status" => "unemployed",
              "salary" => 3500,
                 "age" => 48
}
{
          "@timestamp" => 2018-02-03T19:03:01.884Z,
                "name" => "Kang",
            "@version" => "1",
            "location" => "KR",
                  "id" => 30,
    "employment_status" => "employed",
              "salary" => 3300,
                 "age" => 28
}
{
          "@timestamp" => 2018-02-03T19:03:01.884Z,
                "name" => "Yoon",
            "@version" => "1",
            "location" => "KR",
                  "id" => 31,
    "employment_status" => "unemployed",
              "salary" => 3500,
                 "age" => 23
}
```

마지막 row 였다면

기준 column	sql_last_value
id	29
salary	3500
age	48

마지막 row 였다면

기준 column	sql_last_value
id	30
salary	3300
age	28

실제 마지막 row

기준 column	sql_last_value
id	31
salary	3500
age	23

정해진 답은 없지만, 다음 2가지는 잘 살펴보자 **심화**

1. 기준 column 선정은 다음과 같은 성격을 가진 column을 권장
   - **(일정하게) incremental** 하는 numeric type
   - created date 또는 updated date 같은 date type

2. sql 작성할 때 기준으로 정한 column으로 **order by** 할 것
   - sql last value는 가장 마지막 row만을 기억한다
   - 그러므로 꼭 order by를 해서 **마지막 row에 최대값**이 (혹은 최소값) 오도록 설정

logstash configuration을 확인하자 👑 **심화**

```
input {
  jdbc {
    jdbc_validate_connection => true
    jdbc_connection_string => "jdbc:mysql://52.78.134.20:3306/fc"
    jdbc_user => "fc"
    jdbc_password => "fc"
    jdbc_driver_library => "/usr/share/logstash/driver/mysql-connector-java-5.1.36-bin.jar"
    jdbc_driver_class => "com.mysql.jdbc.Driver"
    use_column_value => true
    tracking_column => id
    last_run_metadata_path => "/usr/share/logstash/id-under-5.db"
    statement => "
      SELECT *
      FROM fc
      WHERE id < 5
    "
  }
}

output {
  stdout {
  }
}
```

☜ 어디까지 조회했는지를 id라는 column으로 추적

☝ 어디까지 조회했는지에 대한 기록을 id-under-5.db라는 파일에 저장

(Step 1)_id < 5 인 데이터를 조회하고 id column을 sql_last_value로 저장하자

logstash를 실행하자

```
$ bin/logstash -f code/input/jdbc/jdbc-sql-last-value-1.conf
```

logstash를 실행하면…

```
{
                  "id" => 1,
              "salary" => 4000,
                 "age" => 33,
            "location" => "US",
    "employment_status" => "employed",
            "@version" => "1",
                "name" => "Josh",
          "@timestamp" => 2018-07-15T14:55:53.248Z
}
{
                  "id" => 2,
              "salary" => 45000,
                 "age" => 33,
            "location" => "US",
    "employment_status" => "employed",
            "@version" => "1",
                "name" => "Tom",
          "@timestamp" => 2018-07-15T14:55:53.300Z
}
{
                  "id" => 3,
              "salary" => 3000,
                 "age" => 23,
            "location" => "US",
    "employment_status" => "employed",
            "@version" => "1",
                "name" => "Kirk",
          "@timestamp" => 2018-07-15T14:55:53.302Z
}
{
                  "id" => 4,
              "salary" => 3500,
                 "age" => 27,
            "location" => "US",
    "employment_status" => "employed",
            "@version" => "1",
                "name" => "Ken",
          "@timestamp" => 2018-07-15T14:55:53.306Z
}
[2018-07-15T14:55:54,686][INFO ][logstash.pipeline        ] Pipeline has terminated {:pipeline_id=>"main", :thread=>"#<Thread:0x23464788 run>"}
bash-4.2$ cat id-under-5.db
--- 4
```

- id < 5 인 데이터를 조회했으므로 sql_last_value는 4가 된다
- (last_run_metadata_path를 변경하지 않는다면) 이 값을 이용해서 연이은 작업을 할 수 있다

logstash configuration을 확인하자 👑 **심화**

```
input {
  jdbc {
    jdbc_validate_connection => true
    jdbc_connection_string => "jdbc:mysql://52.78.134.20:3306/fc"
    jdbc_user => "fc"
    jdbc_password => "fc"
    jdbc_driver_library => "/usr/share/logstash/driver/mysql-connector-java-5.1.36-bin.jar"
    jdbc_driver_class => "com.mysql.jdbc.Driver"
    use_column_value => true
    tracking_column => id
    last_run_metadata_path => "/usr/share/logstash/id-under-5.db"
    statement => "
      SELECT *
      FROM fc
      WHERE id > :sql_last_value
    "
  }
}

output {
  stdout {
  }
}
```

이 부분을 수정했다

(Step2) sql_last_value를 이용해서 데이터를 조회하자

logstash를 실행하자

```
$ bin/logstash -f code/input/jdbc/jdbc-sql-last-value-2.conf
```

step1의 기록이 반영되어 id > 4 인 데이터만 출력되었다 **심화**

```
bash-4.2$ bin/logstash -f code/input/jdbc/jdbc-sql-last-value-2.conf
warning: ignoring JAVA_OPTS=-Xms128m -Xmx128m -XX:-AssumeMP; pass JVM parameters via LS_JAVA_OPTS
OpenJDK 64-Bit Server VM warning: If the number of processors is expected to increase from one, then you
Sending Logstash's logs to /usr/share/logstash/logs which is now configured via log4j2.properties
[2018-07-15T15:55:20,248][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"fb_apache
[2018-07-15T15:55:20,292][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"netflow",
[2018-07-15T15:55:21,465][WARN ][logstash.config.source.multilocal] Ignoring the 'pipelines.yml' file bec
[2018-07-15T15:55:22,768][INFO ][logstash.runner          ] Starting Logstash {"logstash.version"=>"6.2.4
[2018-07-15T15:55:23,567][INFO ][logstash.agent           ] Successfully started Logstash API endpoint {:
[2018-07-15T15:55:30,507][INFO ][logstash.pipeline        ] Starting pipeline {:pipeline_id=>"main", "pip
[2018-07-15T15:55:31,064][INFO ][logstash.pipeline        ] Pipeline started successfully {:pipeline_id=>
[2018-07-15T15:55:31,307][INFO ][logstash.agent           ] Pipelines running {:count=>1, :pipelines=>["m
[2018-07-15T15:55:34,559][INFO ][logstash.inputs.jdbc     ] (0.037203s)
      SELECT *
      FROM fc
    WHERE id > 4          ☜ 내부적으로 코드가 수정됐다

{
                  "age" => 38,
             "@version" => "1",
           "@timestamp" => 2018-07-15T15:55:34.621Z,
             "location" => "US",
               "salary" => 4500,
                 "name" => "Jessie",
                   "id" => 5,          ☜ id = 5 부터 조회
    "employment_status" => "employed"
}
{
                  "age" => 31,
             "@version" => "1",
           "@timestamp" => 2018-07-15T15:55:34.676Z,
             "location" => "US",
               "salary" => 5200,
                 "name" => "Jennifer",
                   "id" => 6,
    "employment_status" => "unemployed"
}
{
```

심화

Q. 데이터베이스에서 정기적으로 데이터를 조회할 수 없나?

A. scheduling을 이용해서 가능하다

logstash configuration을 확인하자 👑 **심화**

```
input {
  jdbc {
    jdbc_validate_connection => true
    jdbc_connection_string => "jdbc:mysql://52.78.134.20:3306/fc"
    jdbc_user => "fc"
    jdbc_password => "fc"
    jdbc_driver_library => "/usr/share/logstash/driver/mysql-connector-java-5.1.36-bin.jar"
    jdbc_driver_class => "com.mysql.jdbc.Driver"
    statement => "SELECT * FROM fc"
    schedule => "0 6 * * *"
  }
}

output {
  stdout {
  }
}
```

☜ 스케줄 시간 설정

```
* * * * *
| | | | |
| | | | |
| | | | +---- Day of the Week   (range: 1-7, 1 standing for Monday)
| | | +------ Month of the Year (range: 1-12)
| | +-------- Day of the Month  (range: 1-31)
| +---------- Hour              (range: 0-23)
+------------ Minute            (range: 0-59)
```

logstash process는 항상 떠있으며 매일 오전 6시에 위의 task를 수행한다

단, logstash는 가볍지 않아 서버 성능에 부담을 줄 수 있다.

그러므로 linux cron tab을 사용해서 특정한 시점에 한 번

logstash를 실행하고 종료하는 방법도 고려할만하다.

(주기가 긴 경우)

Input - elasticsearch

- elasticsearch에 저장된 데이터를 수집할 때 사용
- 어떤 use case가 있을까?
  - 데이터를 csv로 export 할 경우
  - 서로 다른 cluster 상의 elasticsearch 간 데이터 전송
- 실습 elasticsearch 정보
  - host: http://52.78.134.20:9200
  - index : exercise1

원본 데이터

Dev Tools

History Settings Help

Console

```
GET exercise1/_search
{
  "query": {
    "match_all": {}
  }
}
```


```
{
  "took": 0,
  "timed_out": false,
  "_shards": {
    "total": 5,
    "successful": 5,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": 33,
    "max_score": 1,
    "hits": [
      {
        "_index": "exercise1",
        "_type": "exercise1",
        "_id": "D5X0nmQByNsCKuKnLCTX",
        "_score": 1,
        "_source": {
          "@version": "1",
          "salary": 4000,
          "age": 33,
          "location": "US",
          "@timestamp": "2018-07-15T17:19:20.289Z",
          "id": 1,
          "employment_status": "employed",
          "name": "Josh"
        }
      },
      {
        "_index": "exercise1",
        "_type": "exercise1",
        "_id": "FJX0nmQByNsCKuKnLCTX",
        "_score": 1,
        "_source": {
          "@version": "1",
          "salary": 5200,
          "age": 31,
          "location": "US",
          "@timestamp": "2018-07-15T17:19:20.342Z",
          "id": 6,
          "employment_status": "unemployed",
```

logstash configuration을 확인하자 👑 **심화**

```
1  input {
2    elasticsearch {
3      hosts => ["52.78.134.20:9200"]
4      index => "exercise1"
5      query => '{
6        "query" : {
7          "match_all" : {}
8        }
9      }'
10   }
11 }
12
13 output {
14   stdout {
15   }
16 }
```

☝ **Query DSL을 알면 좋은 이유가 하나 더 늘었다**

logstash를 실행하자

```
$ bin/logstash -f code/input/elasticsearch/elasticsearch.conf
```

logstash를 실행하면…

```
bash-4.2$ bin/logstash -f code/input/jdbc/jdbc-sql-last-value-2.conf
warning: ignoring JAVA_OPTS=-Xms128m -Xmx128m -XX:-AssumeMP; pass JVM parameters via LS_JAVA_OPTS
OpenJDK 64-Bit Server VM warning: If the number of processors is expected to increase from one, then you
Sending Logstash's logs to /usr/share/logstash/logs which is now configured via log4j2.properties
[2018-07-15T15:55:20,248][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"fb_apache
[2018-07-15T15:55:20,292][INFO ][logstash.modules.scaffold] Initializing module {:module_name=>"netflow",
[2018-07-15T15:55:21,465][WARN ][logstash.config.source.multilocal] Ignoring the 'pipelines.yml' file bec
[2018-07-15T15:55:22,768][INFO ][logstash.runner          ] Starting Logstash {"logstash.version"=>"6.2.4
[2018-07-15T15:55:23,567][INFO ][logstash.agent           ] Successfully started Logstash API endpoint {:
[2018-07-15T15:55:30,507][INFO ][logstash.pipeline        ] Starting pipeline {:pipeline_id=>"main", "pip
[2018-07-15T15:55:31,064][INFO ][logstash.pipeline        ] Pipeline started successfully {:pipeline_id=>
[2018-07-15T15:55:31,307][INFO ][logstash.agent           ] Pipelines running {:count=>1, :pipelines=>["m
[2018-07-15T15:55:34,559][INFO ][logstash.inputs.jdbc     ] (0.037203s)
      SELECT *
      FROM fc
      WHERE id > 4

{
                "age" => 38,
           "@version" => "1",
         "@timestamp" => 2018-07-15T15:55:34.621Z,
           "location" => "US",
             "salary" => 4500,
               "name" => "Jessie",
                 "id" => 5,
    "employment_status" => "employed"
}
{
                "age" => 31,
           "@version" => "1",
         "@timestamp" => 2018-07-15T15:55:34.676Z,
           "location" => "US",
             "salary" => 5200,
               "name" => "Jennifer",
                 "id" => 6,
    "employment_status" => "unemployed"
}
{
                "age" => 33,
           "@version" => "1",
         "@timestamp" => 2018-07-15T15:55:34.677Z,
           "location" => "US",
             "salary" => 22200,
               "name" => "Bob",
                 "id" => 7,
    "employment_status" => "unemployed"
}
```

Output - csv

- Input (Input + Filter)를 거친 데이터를 csv 형태로 저장
- 실습 elasticsearch 정보
  - host: http://52.78.134.20:9200
  - index : exercise1

logstash configuration을 확인하자 👑 **심화**

```
1  input {
2    elasticsearch {
3      hosts => ["52.78.134.20:9200"]
4      index => "exercise1"
5      query => '{
6        "query" : {
7          "match_all" : {}
8        }
9      }'
10   }
11 }
12
13 output {
14   csv {
15     fields => ["name", "location", "employment_status", "salary",  "age"]
16     path => "/usr/share/logstash/data/exercise1.csv"
17   }
18 }
```

csv 출력을 위해 csv output plugin 사용

- event에서 csv에 저장할 Field 설정
- csv 각 row의 column 또한 저 순서로 저장

csv file을 저장할 경로 설정

logstash를 실행하자

```
$ bin/logstash -f code/output/csv/csv.conf
```

logstash를 실행하면…

```
bash-4.2$ head -10 data/exercise1.csv
Josh,US,employed,4000,33
Jennifer,US,unemployed,5200,31
John,US,unemployed,2200,25
Hanks,UK,unemployed,6200,45
Waterhouse,UK,employed,9900,37
Lee,KR,unemployed,3200,48
Tom,US,employed,45000,33
Bob,US,unemployed,22200,33
Lisa,UK,employed,3900,25
Yamauchi,JP,unemployed,5600,46
```

Output - elasticsearch

- 수집하고 전처리한 결과를 **elasticsearch**에 전송
- **dashboard**를 만드는 데 있어 가장 중요한 **output plugin**

logstash configuration을 확인하자 👑 **심화**

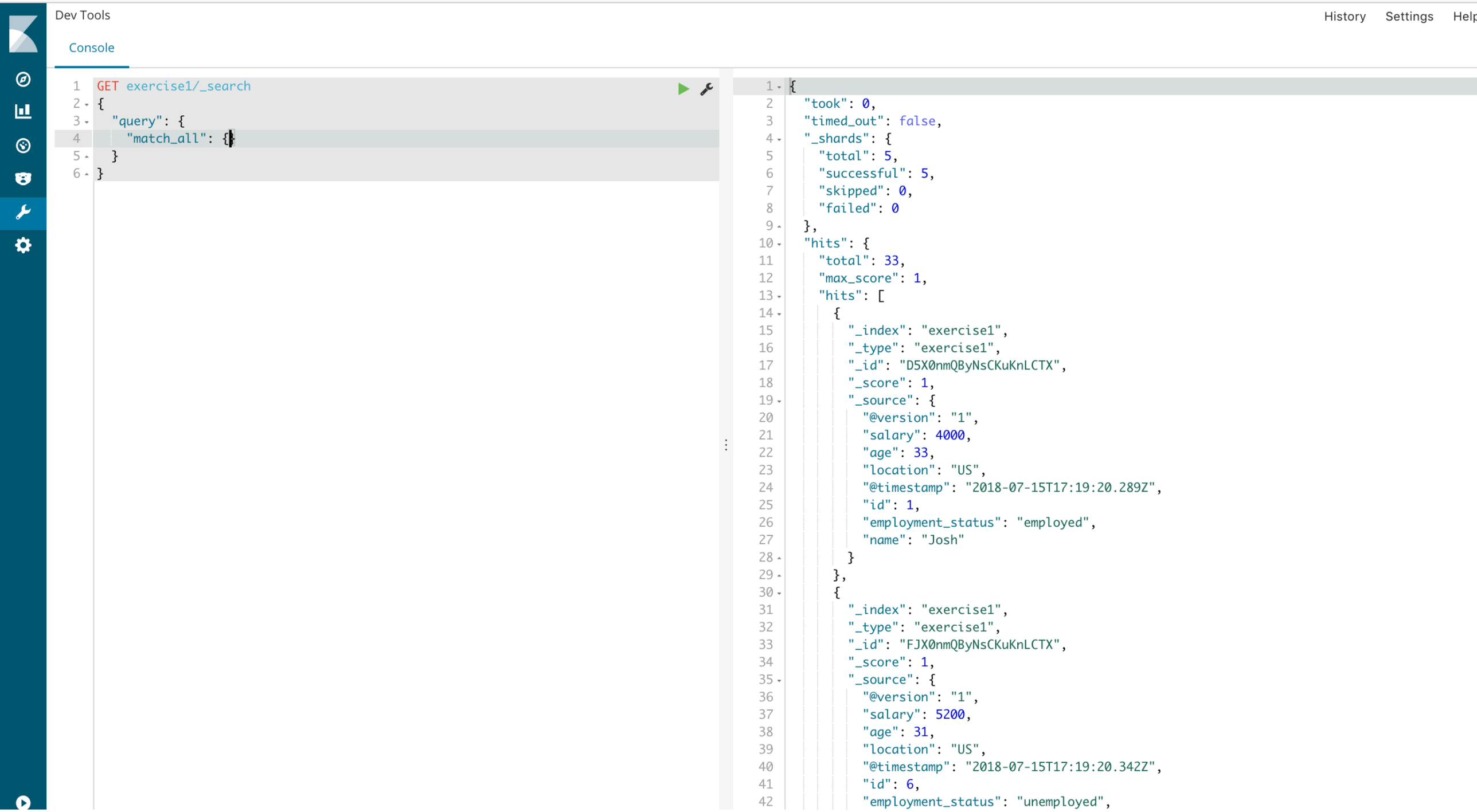
```
input {
  jdbc {
    jdbc_validate_connection => true
    jdbc_connection_string => "jdbc:mysql://52.78.134.20:3306/fc"
    jdbc_user => "fc"
    jdbc_password => "fc"
    jdbc_driver_library => "/usr/share/logstash/driver/mysql-connector-java-5.1.36-bin.jar"
    jdbc_driver_class => "com.mysql.jdbc.Driver"
    statement => "SELECT * FROM fc"
  }
}

output {
  elasticsearch {
    hosts => ["elasticsearch:9200"]
    index => "exercise1"
    document_type => "exercise1"
  }
}
```

☞ **es에 데이터를 전송하기 위해 es output plugin 사용**

logstash를 실행하자

```
$ bin/logstash -f code/output/elasticsearch/elasticsearch.conf
```

Kibana에서 확인하자



index를 생성할 때 index 이름에 날짜 정보를 넣을 수 있나?

logstash configuration을 확인하자 👑 **심화**

```
input {
  jdbc {
    jdbc_validate_connection => true
    jdbc_connection_string => "jdbc:mysql://52.78.134.20:3306/fc"
    jdbc_user => "fc"
    jdbc_password => "fc"
    jdbc_driver_library => "/usr/share/logstash/driver/mysql-connector-java-5.1.36-bin.jar"
    jdbc_driver_class => "com.mysql.jdbc.Driver"
    statement => "SELECT * FROM fc"
  }
}

output {
  elasticsearch {
    hosts => ["elasticsearch:9200"]
    index => "exercise1-%{+YYYY.MM.dd}"
    document_type => "exercise1"
  }
}
```

@timestamp에서 연도, 월, 일을 추출해서 index이름을 생성할 때 추가해준다.

logstash를 실행하자

```
$ bin/logstash -f code/output/elasticsearch/elasticsearch-dynamic-field-name-1.conf
```

logstash를 실행하면…

Dev Tools

History Settings Help

Console

```
GET exercise1-2018.07.15/_search
{
  "query": {
    "match_all": {}
  }
}
```

다음과 같은 조합으로 index 이름 생성

- static : exercise
- dynamic : 2018.07.15


```
{
  "took": 0,
  "timed_out": false,
  "_shards": {
    "total": 5,
    "successful": 5,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": 33,
    "max_score": 1,
    "hits": [
      {
        "_index": "exercise1-2018.07.15",
        "_type": "exercise1",
        "_id": "kZUZn2QByNsCKuKnhCRB",
        "_score": 1,
        "_source": {
          "age": 25,
          "location": "UK",
          "salary": 3900,
          "employment_status": "employed",
          "@version": "1",
          "name": "Lisa",
          "id": 14,
          "@timestamp": "2018-07-15T18:00:07.473Z"
        }
      },
      {
        "_index": "exercise1-2018.07.15",
        "_type": "exercise1",
        "_id": "lJUZn2QByNsCKuKnhCRB",
        "_score": 1,
        "_source": {
          "age": 38,
          "location": "JP",
          "salary": 3500,
          "employment_status": "employed",
          "@version": "1",
          "name": "Tanaka",
          "id": 17,
```

es document id를 event의 특정 field data를 이용해서 설정할 수 있나?

logstash configuration을 확인하자 👑 **심화**

```
input {
  jdbc {
    jdbc_validate_connection => true
    jdbc_connection_string => "jdbc:mysql://52.78.134.20:3306/fc"
    jdbc_user => "fc"
    jdbc_password => "fc"
    jdbc_driver_library => "/usr/share/logstash/driver/mysql-connector-java-5.1.36-bin.jar"
    jdbc_driver_class => "com.mysql.jdbc.Driver"
    statement => "SELECT * FROM fc"
  }
}

output {
  elasticsearch {
    hosts => ["elasticsearch:9200"]
    index => "exercise2-%{+YYYY.MM.dd}"
    document_type => "exercise2"
    document_id => "%{@timestamp}-%{name}"
  }
}
```

☝ **%{@timestamp}와 %{name} 부분에 각 event에서 수집한 실제 value가 입력된다**

logstash를 실행하자

```
$ bin/logstash -f code/output/elasticsearch/elasticsearch-dynamic-field-name-2.conf
```

Kibana에서 확인하자

Dev Tools

History Settings Help

Console

```
GET exercise2-2018.07.15/_search
{
  "query": {
    "match_all": {}
  }
}
```


```
{
  "took": 0,
  "timed_out": false,
  "_shards": {
    "total": 5,
    "successful": 5,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": 33,
    "max_score": 1,
    "hits": [
      {
        "_index": "exercise2-2018.07.15",
        "_type": "exercise2",
        "_id": "2018-07-15T18:08:19.785Z-Ken",
        "_score": 1,
        "_source": {
          "@version": "1",
          "id": 4,
          "name": "Ken",
          "salary": 3500,
          "@timestamp": "2018-07-15T18:08:19.785Z",
          "location": "US",
          "age": 27,
          "employment_status": "employed"
        }
      },
      {
        "_index": "exercise2-2018.07.15",
        "_type": "exercise2",
        "_id": "2018-07-15T18:08:19.786Z-Jessie",
        "_score": 1,
        "_source": {
          "@version": "1",
          "id": 5,
          "name": "Jessie",
          "salary": 4500,
          "@timestamp": "2018-07-15T18:08:19.786Z",
          "location": "US",
          "age": 38,
```

Output - multiple output plugins

- (수집하고 전처리한 결과를) 여러 output에 전송하는 방법
- 개발 단계에서 stdout+main output을 함께 쓰면 빠르게 확인할 수 있다

logstash configuration을 확인하자 👑 심화

```
input {
  jdbc {
    jdbc_validate_connection => true
    jdbc_connection_string => "jdbc:mysql://52.78.134.20:3306/fc"
    jdbc_user => "fc"
    jdbc_password => "fc"
    jdbc_driver_library => "/usr/share/logstash/driver/mysql-connector-java-5.1.36-bin.jar"
    jdbc_driver_class => "com.mysql.jdbc.Driver"
    statement => "SELECT * FROM fc"
  }
}

output {
  elasticsearch {
    hosts => ["elasticsearch:9200"]
    index => "exercise3"
    document_type => "exercise3"
  }
  stdout {
  }
}
```

- output plugin에 2개(elasticsearch, stdout) 사용
- elasticsearch와 stdout에 모두 전송
- input/output/filter 모두 복수개 사용 가능

logstash를 실행하자

```
$ bin/logstash -f code/output/elasticsearch/elasticsearch-stdout.conf
```

logstash를 실행하면…

stdout

```
{
                "name" => "Josh",
          "@timestamp" => 2018-07-15T18:53:15.758Z,
            "@version" => "1",
              "salary" => 4000,
                  "id" => 1,
                 "age" => 33,
            "location" => "US",
    "employment_status" => "employed"
}
{
                "name" => "Tom",
          "@timestamp" => 2018-07-15T18:53:15.796Z,
            "@version" => "1",
              "salary" => 45000,
                  "id" => 2,
                 "age" => 33,
            "location" => "US",
    "employment_status" => "employed"
}
{
                "name" => "Kirk",
          "@timestamp" => 2018-07-15T18:53:15.802Z,
            "@version" => "1",
              "salary" => 3000,
                  "id" => 3,
                 "age" => 23,
            "location" => "US",
    "employment_status" => "employed"
}
```

elasticsearch


```
{
  "took": 0,
  "timed_out": false,
  "_shards": {
    "total": 5,
    "successful": 5,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": 33,
    "max_score": 1,
    "hits": [
      {
        "_index": "exercise3",
        "_type": "exercise3",
        "_id": "FJVKn2QByNsCKuKnKiU-",
        "_score": 1,
        "_source": {
          "name": "Jennifer",
          "@timestamp": "2018-07-15T18:53:15.812Z",
          "@version": "1",
          "salary": 5200,
          "id": 6,
          "age": 31,
          "location": "US",
          "employment_status": "unemployed"
        }
      },
      {
        "_index": "exercise3",
        "_type": "exercise3",
        "_id": "FZVKn2QByNsCKuKnKiU-",
        "_score": 1,
        "_source": {
          "name": "Bob",
          "@timestamp": "2018-07-15T18:53:15.812Z",
          "@version": "1",
          "salary": 22200,
          "id": 7,
          "age": 33,
          "location": "US",
```

Conditionals 👑

- 조건에 따라 **filter** 또는 **output**을 선별적으로 적용하고 싶을 때
- 옵션
  - **if**
  - **else if**
  - **else**

logstash configuration을 확인하자 👑 **심화**

```
input {
  stdin {}
}

output {
  if [message] in ["Seoul", "Busan"] {
    elasticsearch {
      hosts => ["elasticsearch:9200"]
      index => "korea"
    }
  }
  else if [message] == "Osaka" {
    elasticsearch {
      hosts => ["elasticsearch:9200"]
      index => "japan"
    }
  }
  else {
    elasticsearch {
      hosts => ["elasticsearch:9200"]
      index => "else"
    }
  }
}
```

logstash를 실행하자

```
$ bin/logstash -f code/output/conditional.conf
```

+

```
The stdin plugin is now waiting for input:
[2018-07-15T19:05:05,972][INFO ][logstash.agent
Osaka
Seoul
New Yor
New York
```

입력

logstash를 실행하면…

Dev Tools

Console

```
GET korea/_search
{
  "query": {
    "match_all": {}
  }
}

GET japan/_search
{
  "query": {
    "match_all": {}
  }
}

GET else/_search
{
  "query": {
    "match_all": {}
  }
}
```

```
{
  "took": 0,
  "timed_out": false,
  "_shards": {
    "total": 5,
    "successful": 5,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": 1,
    "max_score": 1,
    "hits": [
      {
        "_index": "korea",
        "_type": "doc",
        "_id": "TZVVn2QByNsCKuKnoyVW",
        "_score": 1,
        "_source": {
          "message": "Seoul",
          "@timestamp": "2018-07-15T19:05:48.031Z",
          "@version": "1",
          "host": "fef3405d41af"
        }
      }
    ]
  }
}
```

Filter - csv

- 특정한 separator로 연결된 데이터 (예: csv) parsing할 때 유용

이런 데이터가 있다고 하자

```
1 Index, Name, Survival, Pclass, Sex, Age, SibSp, Parch, Ticket, Fare, Embarked
2 1,Braund,0,3,male,22,1,0,A/5 21171,7.25,S
3 2,Cumings,1,1,female,38,1,0,PC 17599,71.2833,C
4 3,Heikkinen,1,3,female,26,0,0,STON/O2. 3101282,7.925,S
```

아래와 같은 형태로 변형하려면 어떻게 해야 할까?

```
{
  "Index" : 1,
  "Name" : "Braud",
  "Survival" : 0,
  "Pclass" : 3,
  "Sex" : "male",
  "Age" : 22,
  "Sibsp" : 1,
  "Parch" : 0,
  "Ticket" : "A/5 21171",
  "Fare" : 7.25,
  "Embarked" : "S"
}
```

logstash configuration을 확인하자 👑 **심화**

```
1  input {
2    file {
3      path => "/usr/share/logstash/data/titanic-header.csv"
4      start_position => "beginning"
5      sincedb_path => "/dev/null"
6    }
7  }
8
9  filter {
10   csv {
11     separator => ","
12   }
13 }
14
15 output {
16   stdout {
17   }
18 }
```

☞ **test용 설정**

☞ **filter plugin의 전반적인 구조는 input/output과 유사**

,(comma)로 구분된 csv 데이터이기에 ‘,’ 입력

logstash를 실행하자

```
$ bin/logstash -f code/filter/csv/separator.conf
```

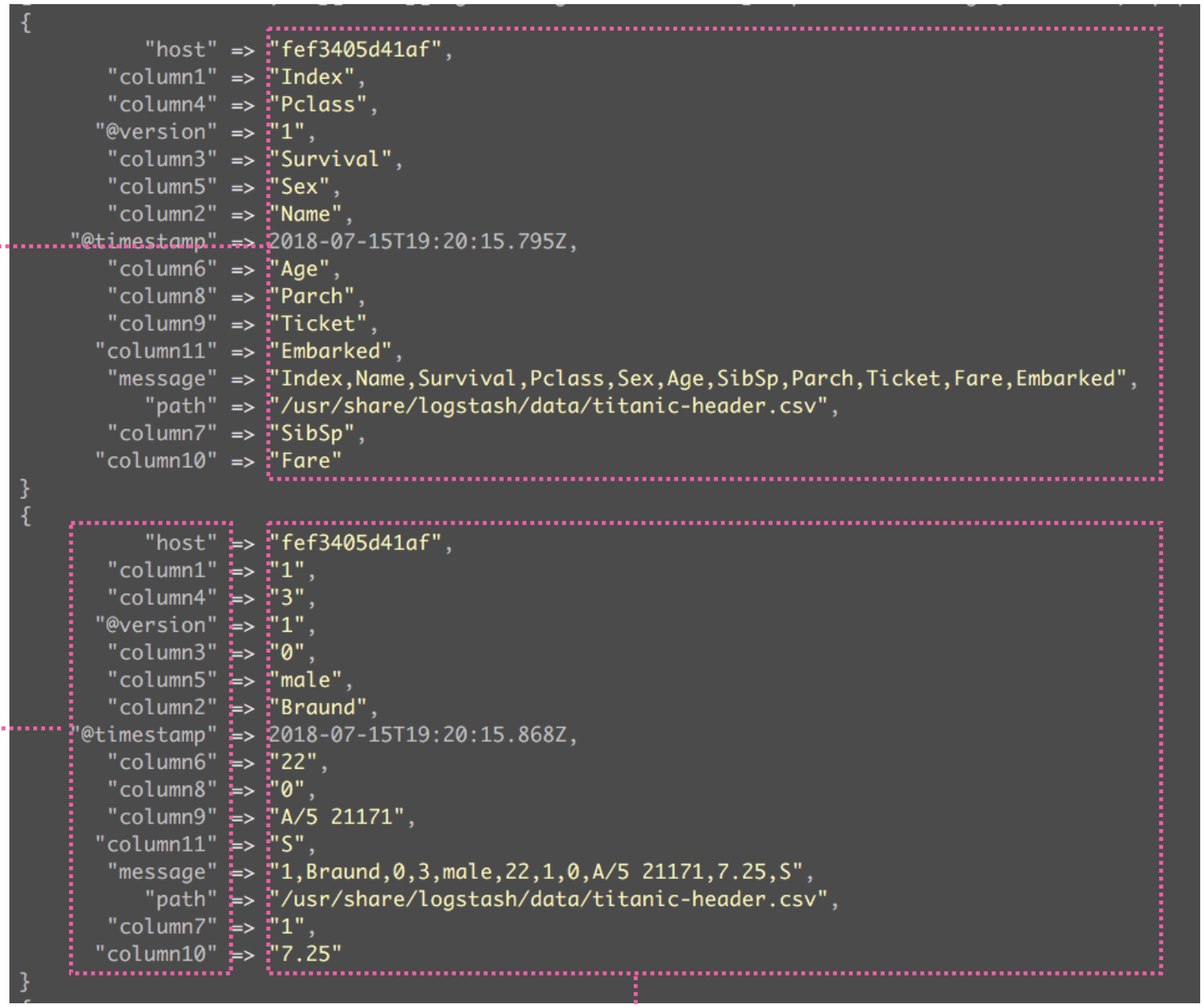
logstash를 실행하면…

Header에 해당하는 데이터

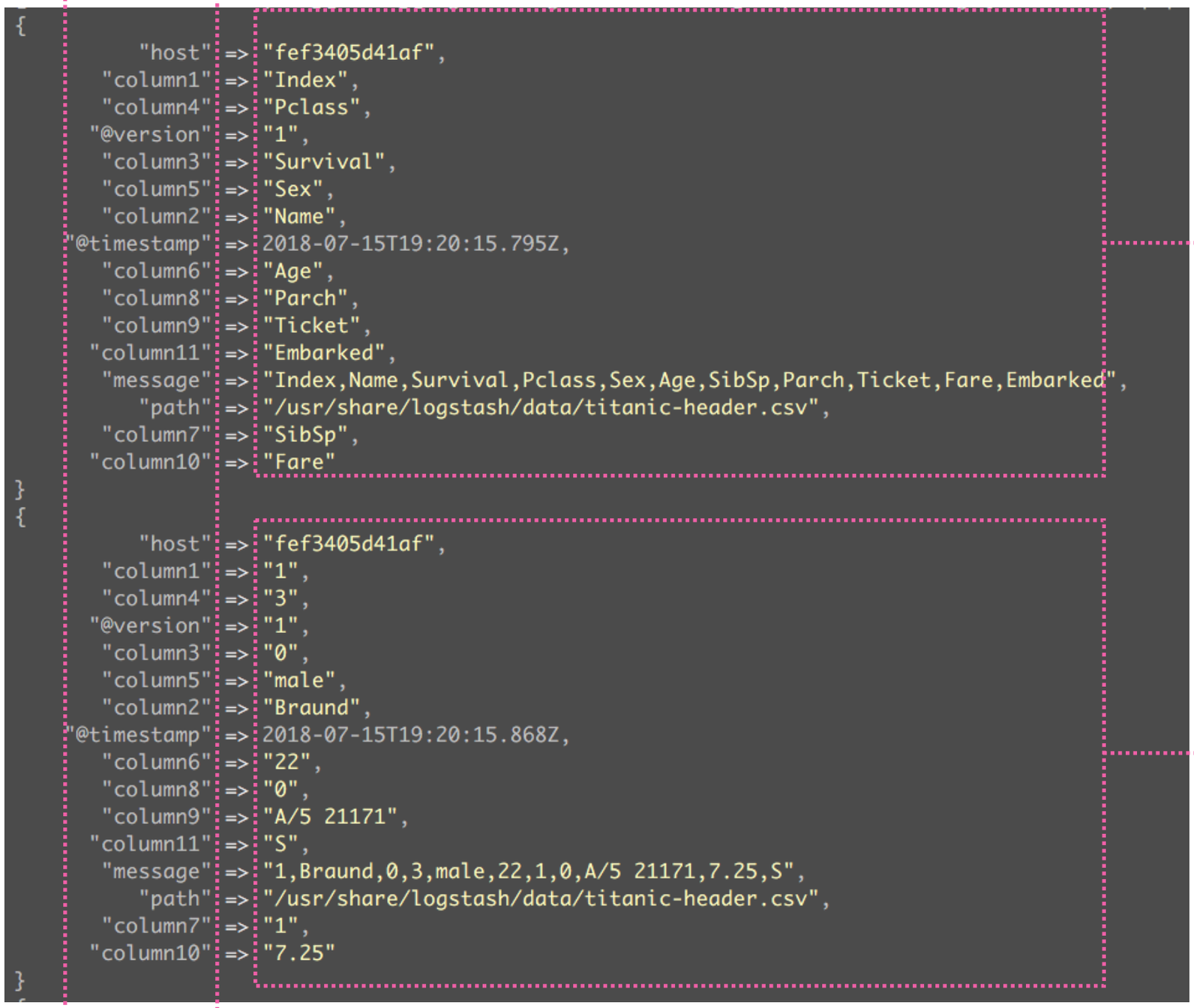
잘 구분되었으나 column 이름으로는

어떤 데이터를 나타내는지 파악이 어렵다

실제 데이터



logstash를 실행하면…



Header

실제 데이터

column1, column2 등으로는 의미 파악이 어렵다

csv의 Header 값이 Field 이름으로 오도록 설정하자

logstash configuration을 확인하자 👑 **심화**

```
input {
  file {
    path => "/usr/share/logstash/data/titanic-header.csv"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  csv {
    separator => ","
    autodetect_column_names => true
  }
}

output {
  stdout {
  }
}
```

☝ 이 옵션을 이용해서 첫번째 row의 데이터를 column으로 사용하도록 설정

logstash를 실행하자

```
$ bin/logstash -f code/filter/csv/autodetect-column-names.conf
```

logstash를 실행하면…

```
{
          "Index" => "1",
         "Ticket" => "A/5 21171",
           "Fare" => "7.25",
     "@timestamp" => 2018-07-16T02:11:47.106Z,
           "host" => "fef3405d41af",
          "SibSp" => "1",
          "Parch" => "0",
       "Embarked" => "S",
        "message" => "1,Braund,0,3,male,22,1,0,A/5 21171,7.25,S",
       "@version" => "1",
            "Sex" => "male",
           "path" => "/usr/share/logstash/data/titanic-header.csv",
       "Survival" => "0",
            "Age" => "22",
         "Pclass" => "3",
           "Name" => "Braund"
}
{
          "Index" => "2",
         "Ticket" => "PC 17599",
           "Fare" => "71.2833",
     "@timestamp" => 2018-07-16T02:11:47.112Z,
           "host" => "fef3405d41af",
          "SibSp" => "1",
          "Parch" => "0",
       "Embarked" => "C",
        "message" => "2,Cumings,1,1,female,38,1,0,PC 17599,71.2833,C",
       "@version" => "1",
            "Sex" => "female",
           "path" => "/usr/share/logstash/data/titanic-header.csv",
       "Survival" => "1",
            "Age" => "38",
         "Pclass" => "1",
           "Name" => "Cumings"
}
```

column name이 올바르게 매칭된 걸 볼 수 있다

그런데 모든 field가 string 처리 되었다.

적절히 integer, float, date type 등으로 변경해보자 👑

logstash configuration을 확인하자 👑 **심화**

```
input {
  file {
    path => "/usr/share/logstash/data/titanic-header.csv"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  csv {
    separator => ","
    autodetect_column_names => true
    convert => {
      "Pclass" => "integer"
      "Index" => "integer"
      "Survival" => "integer"
      "Fare" => "float"
      “@timestamp” => "date"
    }
  }
}

output {
  stdout {
  }
}
```

"Pclass" Field의 Type을 integer로
"Index" Field의 Type을 integer로
"Survival" Field의 Type을 integer로
"Fare" Field의 Type을 float로
“@timestamp” Field의 Type을 date로

logstash를 실행하자

```
$ bin/logstash -f code/filter/csv/convert.conf
```

logstash를 실행하면…

Before

```
{
          "Index" => "1",
         "Ticket" => "A/5 21171",
           "Fare" => "7.25",
     "@timestamp" => 2018-07-16T02:11:47.106Z,
           "host" => "fef3405d41af",
          "SibSp" => "1",
          "Parch" => "0",
       "Embarked" => "S",
        "message" => "1,Braund,0,3,male,22,1,0,A/5 21171,7.25,S",
       "@version" => "1",
            "Sex" => "male",
           "path" => "/usr/share/logstash/data/titanic-header.csv",
       "Survival" => "0",
            "Age" => "22",
         "Pclass" => "3",
           "Name" => "Braund"
}
```

After

```
{
          "Parch" => "0",
       "@version" => "1",
       "Survival" => 0,
           "host" => "fef3405d41af",
          "SibSp" => "1",
         "Ticket" => "A/5 21171",
           "path" => "/usr/share/logstash/data/titanic-header.csv",
           "Name" => "Braund",
       "Embarked" => "S",
          "Index" => 1,
         "Pclass" => 3,
            "Sex" => "male",
        "message" => "1,Braund,0,3,male,22,1,0,A/5 21171,7.25,S",
     "@timestamp" => 2018-07-16T02:43:50.871Z,
           "Fare" => 7.25,
            "Age" => "22"
}
```

elasticsearch mapping과 겹치면? **심화**

Q. elasticsearch output과 함께 사용시 mapping과 convert type이 다르면 어떻게 되는지?

A.

- mapping (o), convert (o) : mapping 우선
- mapping (x), convert (o) : convert에서 설정한 data type 우선
- mapping (x), convert (x) : dynamic mapping (elasticsearch 자동 설정)

Filter - mutate

- Field data의 값을 변형할 때 사용하는 강력한 plugin
- 여러가지 option을 혼합해서 같이 사용한다

아래와 같은 데이터가 있다고 하자

```
13.124.230.195:5601
13.124.230.195:3306
13.124.230.195:9200
13.124.230.195:9300
```

아래와 같이 변경하고 싶다면?

```
{
  "ip" : 13.124.230.195,
  "port" : 5601
},
{
  "ip" : 13.124.230.195,
  "port" : 3306
},
{
  "ip" : 13.124.230.195,
  "port" : 9200
},
{
  "ip" : 13.124.230.195,
  "port" : 9300
}
```

우선 하나의 field를 특정 separator를 기준으로 나누자

logstash configuration을 확인하자 👑 **심화**

```
input {
  file {
    path => "/usr/share/logstash/data/ip-address.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  mutate {
    split => {
      "message" => ":"
    }
  }
}

output {
  stdout {
  }
}
```

☞ **message field를 : separator로 나누기**

logstash를 실행하자

```
$ bin/logstash -f code/filter/mutate/split.conf
```

logstash를 실행하면…

Before

```
{
          "host" => "fef3405d41af",
       "message" => "13.124.230.195:5601",
    "@timestamp" => 2018-07-16T04:54:44.018Z,
          "path" => "/usr/share/logstash/data/ip-address.log",
      "@version" => "1"
}
```

After

```
{
      "@version" => "1",
    "@timestamp" => 2018-07-16T04:49:25.645Z,
       "message" => [
        [0] "13.124.230.195",
        [1] "5601"
    ],
          "path" => "/usr/share/logstash/data/ip-address.log",
          "host" => "fef3405d41af"
}
```

split 결과를 활용해서 새로운 field를 생성하자

logstash configuration을 확인하자 👑 **심화**

```
input {
  file {
    path => "/usr/share/logstash/data/ip-address.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  mutate {
    split => {
      "message" => ":"
    }
    add_field => {
      "ip" => "%{message[0]}"
      "port" => "%{message[1]}"
    }
  }
}

output {
  stdout {
  }
}
```

👉 **split된 message의 첫 번째 데이터**

👉 **split된 message의 두 번째 데이터**

logstash를 실행하자

```
$ bin/logstash -f code/filter/mutate/add_field.conf
```

logstash를 실행하면…

Before

```
{
      "@version" => "1",
    "@timestamp" => 2018-07-16T04:49:25.645Z,
       "message" => [
        [0] "13.124.230.195",
        [1] "5601"
    ],
          "path" => "/usr/share/logstash/data/ip-address.log",
          "host" => "fef3405d41af"
}
```

After

```
{
      "@version" => "1",
          "host" => "fef3405d41af",
          "path" => "/usr/share/logstash/data/ip-address.log",
          "port" => "5601",
       "message" => [
        [0] "13.124.230.195",
        [1] "5601"
    ],
    "@timestamp" => 2018-07-16T05:07:07.955Z,
            "ip" => "13.124.230.195"
}
```

불필요한 field를 제거하자

logstash configuration을 확인하자 👑 **심화**

```
input {
  file {
    path => "/usr/share/logstash/data/ip-address.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  mutate {
    split => {
      "message" => ":"
    }
    add_field => {
      "ip" => "%{message[0]}"
      "port" => "%{message[1]}"
    }
    remove_field => ["path", "@timestamp", "@version", "host", "message"]
  }
}

output {
  stdout {
  }
}
```

☝ **제거할 field 이름을 직접 나열**

logstash를 실행하자

```
$ bin/logstash -f code/filter/mutate/remove_field.conf
```

logstash를 실행하면…

Before

```
{
      "@version" => "1",
          "host" => "fef3405d41af",
          "path" => "/usr/share/logstash/data/ip-address.log",
          "port" => "5601",
       "message" => [
        [0] "13.124.230.195",
        [1] "5601"
    ],
    "@timestamp" => 2018-07-16T05:07:07.955Z,
            "ip" => "13.124.230.195"
}
```

After

```
{
        "ip" => "13.124.230.195",
      "port" => "5601"
}
```

Filter - grok

- 구조화되어 있지 않은 데이터를 처리하는데 사용
- 실제 **production log** 분석할 때 **grok + 다른 plugin** 조합 활발히 사용

아래와 같은 로그가 생긴다고 하자 **심화**

time client_ip res_time status_code req

```
1  2018-02-05T05:49:53.859060Z 172.30.39.133 0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"
2  2018-02-05T06:49:53.859060Z 172.29.43.253 0.1 404 "GET https://helloworld.com/users/3 HTTP/1.1"
3  2018-02-05T07:49:53.859060Z 172.30.40.210 0.052 503 "GET https://helloworld.com/users/2 HTTP/1.1"
4  2018-02-05T08:49:53.859060Z 172.31.40.131 0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
```

이런 로그를 분석하려면 다음의 과정을 거친다 **심화**

- 가지고 있는 로그 파일 패턴을 발견한다 (~~최소한 노력한다~~)
- **grok-patterns** 👑에서 가서 **match** 할 수 있는 **pattern**을 찾는다
- **grok debugger** 👑를 이용해서 시도해본다
- **grok debugger**에서 발견한 **pattern**을 활용해서 **logstash grok filter**을 작성한다
- 필요한 경우 다른 **filter plugin**을 함께 사용한다

1. 가지고 있는 로그 파일 패턴을 발견한다 (~~노력한다~~) **심화**

time client_ip res_time status_code req

```
1  2018-02-05T05:49:53.859060Z 172.30.39.133 0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"
2  2018-02-05T06:49:53.859060Z 172.29.43.253 0.1 404 "GET https://helloworld.com/users/3 HTTP/1.1"
3  2018-02-05T07:49:53.859060Z 172.30.40.210 0.052 503 "GET https://helloworld.com/users/2 HTTP/1.1"
4  2018-02-05T08:49:53.859060Z 172.31.40.131 0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
```

- time — 날짜/시간
- client_ip — ip 주소
- res_time → 0보다 큰 소수점
- status_code — 정수
- req — HTTP 메서드 + protocol://host:port/uri + HTTP 버전

2. grok-patterns에서 가서 match 할 수 있는 pattern을 찾는다 👑 심화

(각 pattern이 무엇을 의미하는지 사전 학습 필요)

time client_ip res_time status_code req

```
1  2018-02-05T05:49:53.859060Z 172.30.39.133 0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"
2  2018-02-05T06:49:53.859060Z 172.29.43.253 0.1 404 "GET https://helloworld.com/users/3 HTTP/1.1"
3  2018-02-05T07:49:53.859060Z 172.30.40.210 0.052 503 "GET https://helloworld.com/users/2 HTTP/1.1"
4  2018-02-05T08:49:53.859060Z 172.31.40.131 0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
```

- time — 날짜/시간 → TIMESTAMP_ISO8601
- client_ip — ip 주소 → IPORHOST
- res_time — 0보다 큰 소수점 → NUMBER
- status_code — 정수 → NUMBER
- req — HTTP 메서드 + protocol://host:port/uri + HTTP 버전 → QS

3. grok debugger를 이용해 시도해본다 👑 심화

Grok Debugger | Debugger | Discover | Patterns

2018-02-05T05:49:53.859060Z 172.31.40.153 0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"

%{TIMESTAMP_ISO8601:time} %{IPORHOST:clientip} %{NUMBER:response_time} %{NUMBER:status_code} %{QS:request}

☐ Add custom patterns ☐ Keep Empty Captures ☐ Named Captures Only ☐ Singles ☐ Autocomplete Go


```
{
  "time": [
    [
      "2018-02-05T05:49:53.859060Z"
    ]
  ],
  "YEAR": [
    [
      "2018"
    ]
  ],
  "MONTHNUM": [
    [
      "02"
    ]
  ],
  "MONTHDAY": [
    [
      "05"
    ]
  ],
```


☞ log 입력

☞ pattern 입력

☞ 결과 표시

- 문법 : %{매칭하려는 패턴:임의의 Field 이름}
- 예시 : %{NUMBER:response_time}
- 의미 : NUMBER에 매칭되면 response_time이라는 Field에 저장

logstash configuration을 확인하자 👑

```
input {
  file {
    path => "/usr/share/logstash/data/access.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  grok {
    match => {
      "message" =>
      '%{TIMESTAMP_ISO8601:time} %{IPORHOST:clientip} %{NUMBER:res_time} %{NUMBER:status_code} %{QS:req}'
    }
  }
}

output {
  stdout {
  }
}
```

grok debugger에서 작성했던 코드를 입력한다

logstash를 실행하자

```
$ bin/logstash -f code/filter/grok/access.conf
```

logstash를 실행하면…

```
{
       "res_time" => "0.079",
     "@timestamp" => 2018-07-16T05:47:08.357Z,
            "req" => "\"GET https://helloworld.com/users/1 HTTP/1.1\"",
      "clientip" => "172.30.39.133",
      "@version" => "1",
          "time" => "2018-02-05T05:49:53.859060Z",
       "message" => "2018-02-05T05:49:53.859060Z 172.30.39.133 0.079 200 \"GET https://helloworld.com/users/1 HTTP/1.1\"",
          "path" => "/usr/share/logstash/data/access.log",
    "status_code" => "200",
          "host" => "fef3405d41af"
}
{
       "res_time" => "0.1",
     "@timestamp" => 2018-07-16T05:47:08.431Z,
            "req" => "\"GET https://helloworld.com/users/3 HTTP/1.1\"",
      "clientip" => "172.29.43.253",
      "@version" => "1",
          "time" => "2018-02-05T06:49:53.859060Z",
       "message" => "2018-02-05T06:49:53.859060Z 172.29.43.253 0.1 404 \"GET https://helloworld.com/users/3 HTTP/1.1\"",
          "path" => "/usr/share/logstash/data/access.log",
    "status_code" => "404",
          "host" => "fef3405d41af"
}
```

(이번에는) 아래와 같은 로그가 생긴다고 하자 **심화**

```
127.0.0.1 - - [13/Dec/2015:03:02:45 -0800] "GET /xampp/status.php HTTP/1.1" 200 891 "http://cadenza/xampp/navi.php" "Mozilla/5.0 (Macintosh; Intel Mac OSX 10.9; rv:25.0) Gecko/20100101 Firefox/25.0"
123.222.333.123 HOME - [01/Feb/1998:01:08:46 -0800] "GET /bannerad/ad.htm HTTP/1.0" 200 2808 "http://www.referrer.com/bannerad/ba_intro.htm" "Mozilla/4.01 (Macintosh; I; PPC)"
daum.net HOME - [01/Apr/1998:01:09:14 -0800] "GET /bannerad/click.htm HTTP/1.0" 200 2070 "http://www.referrer.com/bannerad/menu.htm" "Mozilla/4.01 (Macintosh; I; PPC)"
111.222.333.123 AWAY - [01/Apr/1998:01:09:14 -0800] "GET /bannerad/click.htm HTTP/1.0" 200 2070 "http://www.referrer.com/bannerad/menu.htm" "Mozilla/4.01 (Macintosh; I; PPC)"
unicomp6.unicomp.net AWAY - [01/Apr/1998:01:09:14 -0800] "GET /bannerad/click.htm HTTP/1.0" 200 2070 "http://www.referrer.com/bannerad/menu.htm" "Mozilla/4.01 (Macintosh; I; PPC)"
123.222.333.123 AWAY - [01/Feb/2003:01:08:53 -0800] "GET /bannerad/ad7.gif HTTP/1.0" 200 332 "http://www.referrer.com/bannerad/ba_ad.htm" "Mozilla/4.01 (Macintosh; I; PPC)"
```

아래와 같은 결과를 얻으려면 어떻게 grok을 작성해야 할까? **심화**

```
{
       "clientip" => "123.222.333.123",
           "host" => "fef3405d41af",
           "path" => "/usr/share/logstash/data/apache.log",
       "@version" => "1",
          "bytes" => "332",
          "ident" => "AWAY",
       "referrer" => "\"http://www.referrer.com/bannerad/ba_ad.htm\"",
     "@timestamp" => 2018-07-16T05:52:52.890Z,
           "verb" => "GET",
           "auth" => "-",
    "httpversion" => "1.0",
       "response" => "200",
        "request" => "/bannerad/ad7.gif",
      "timestamp" => "01/Feb/2003:01:08:53 -0800",
        "message" => "123.222.333.123 AWAY - [01/Feb/2003:01:08:53 -0800] \"GET /bannerad/ad7.gif HTTP/1.0\" 200 332
          "agent" => "\"Mozilla/4.01 (Macintosh; I; PPC)\""
}
```

(다행히) 자주/많이 사용되는 패턴은 등록되어 있다

logstash configuration을 확인하자 👑

```
input {
  file {
    path => "/usr/share/logstash/data/apache.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  grok {
    match => { "message" => "%{COMBINEDAPACHELOG}" }
  }
}

output {
  stdout {
  }
}
```

logstash를 실행하자

```
$ bin/logstash -f code/filter/grok/apache.conf
```

Filter - date 👑

- elasticsearch는 기본적으로 입력된 시간을 utc로 생각한다
- 만약에 log data에 현지 시간으로 값이 입력되어 있으면 어떻게 될까?
- date filter를 사용하면 쉽게 해결할 수 있다

아래와 같은 로그가 생긴다고 하자

```
1    2018-02-12T16:03:38 Ben
2    2018-02-13T03:25:31 John
3    2018-02-14T13:31:11 Leo
```

한국 시간 기준

date filer를 사용한 것과 그렇지 않은 경우를 비교하자

mapping 설정

default

```
PUT exercise4
{
  "mappings" : {
    "exercise4" : {
      "properties" : {
        "time" : {
          "type" : "date"
        },
        "name" : {
          "type" : "keyword"
        }
      }
    }
  }
}
```

date filter

```
PUT exercise5
{
  "mappings" : {
    "exercise5" : {
      "properties" : {
        "time" : {
          "type" : "date"
        },
        "name" : {
          "type" : "keyword"
        }
      }
    }
  }
}
```

아래와 같은 logstash.conf로 데이터를 전송하자

default ♕

```
input {
  file {
    path => "/usr/share/logstash/data/date.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  grok {
    match => {
      "message" => '%{TIMESTAMP_ISO8601:time} %{WORD:name}'
    }
    remove_field =>
        ["path", "@timestamp", "@version", "host", "message"]
  }
}

output {
  elasticsearch {
    hosts => ["elasticsearch:9200"]
    index => "exercise4"
    document_type => "exercise4"
  }
}
```

date filter ♕

```
input {
  file {
    path => "/usr/share/logstash/data/date.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  grok {
    match => {
      "message" =>
        '%{TIMESTAMP_ISO8601:time} %{WORD:name}'
    }
    remove_field =>
      ["path", "@timestamp", "@version", "host", "message"]
  }
  date {
    match => ["time", "YYYY-MM-dd'T'HH:mm:ss"]
    timezone => "Asia/Seoul"
    target => "time"
  }
}

output {
  elasticsearch {
    hosts => ["elasticsearch:9200"]
    index => "exercise5"
    document_type => "exercise5"
  }
}
```

logstash를 실행하자

default

```
$ bin/logstash -f code/filter/date/deafult.conf
```

date filter

```
$ bin/logstash -f code/filter/date/date.conf
```

date filter 적용 전/후 elasticserch 저장된 값을 비교하자

입력값	default	date filter

2018-02-12 16:03:38	{
	"_index": "exercise4",
	"_type": "exercise4",
	"_id": "AWL0hVoszMQVnr-9MyRS",
	"_score": 1,
	"_source": {
	"name": "Ben",
	"time": "2018-02-12T16:03:38"
	}
	},
		{
		"_index": "exercise5",
		"_type": "exercise5",
		"_id": "AWL0hnY-zMQVnr-9MyRV",
		"_score": 1,
		"_source": {
		"name": "Ben",
		"time": "2018-02-12T07:03:38.000Z"
		}
		},

2018-02-13 03:25:31	{
	"_index": "exercise4",
	"_type": "exercise4",
	"_id": "AWL0hVoszMQVnr-9MyRT",
	"_score": 1,
	"_source": {
	"name": "John",
	"time": "2018-02-13T03:25:31"
	}
	},
		{
		"_index": "exercise5",
		"_type": "exercise5",
		"_id": "AWL0hnZ9zMQVnr-9MyRW",
		"_score": 1,
		"_source": {
		"name": "John",
		"time": "2018-02-12T18:25:31.000Z"
		}
		},

2018-02-14 013:31:11	{
	"_index": "exercise4",
	"_type": "exercise4",
	"_id": "AWL0hVoszMQVnr-9MyRU",
	"_score": 1,
	"_source": {
	"name": "Leo",
	"time": "2018-02-14T13:31:11"
	}
	}
		{
		"_index": "exercise5",
		"_type": "exercise5",
		"_id": "AWL0hnZ9zMQVnr-9MyRX",
		"_score": 1,
		"_source": {
		"name": "Leo",
		"time": "2018-02-14T04:31:11.000Z"
		}
		}

Filter - drop 👑

- 특정한 event 자체를 무시할 경우 사용
- 예를 들어 log를 수집할 때 INFO 레벨은 무시하고 싶을 때 사용 가능

logstash configuration을 확인하자 👑

```
1  input {
2    stdin {}
3  }
4
5  filter {
6    if [message] == "hello" {
7      drop {}
8    }
9  }
10
11 output {
12   stdout {
13   }
14 }
```

message가 정확히 hello이면 해당 event 무시

logstash를 실행하자

```
$ bin/logstash -f code/filter/drop/drop1.conf
```

logstash를 실행하면…

```
The stdin plugin is now waiting for input:
[2018-07-16T06:37:56,988][INFO ][logstash.agent           ]
hello
hi
{
       "message" => "hi",
    "@timestamp" => 2018-07-16T06:38:28.286Z,
      "@version" => "1",
          "host" => "fef3405d41af"
}
bye
{
       "message" => "bye",
    "@timestamp" => 2018-07-16T06:38:34.552Z,
      "@version" => "1",
          "host" => "fef3405d41af"
}
```

message가 hello인 event는 무시된다

access.log에서 status code가 200인 event는 무시해보자

logstash configuration을 확인하자 👑

```
input {
  file {
    path => "/usr/share/logstash/data/access.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
 }
}

filter {
  grok {
    match => {
      "message" =>
       '%{TIMESTAMP_ISO8601:time} %{IPORHOST:clientip} %{NUMBER:res_time} %{NUMBER:status_code} %{QS:req}'
    }
  }
  if [status_code] == "200" {
    drop {}
  }
}

output {
  stdout {
  }
}
```

status code가 200인, 즉 정상인 결과는 수집하지 않고 에러 로그만 수집

logstash를 실행하자

```
$ bin/logstash -f code/filter/drop/drop2.conf
```

logstash를 실행하면…

```
{
       "res_time" => "0.1",
            "req" => "\"GET https://helloworld.com/users/3 HTTP/1.1\"",
           "path" => "/usr/share/logstash/data/access.log",
     "@timestamp" => 2018-07-16T06:43:56.669Z,
    "status_code" => "404",
       "@version" => "1",
        "message" => "2018-02-05T06:49:53.859060Z 172.29.43.253 0.1 404 \"GET https://helloworld.com/users/3 HTTP/1.1\"",
           "host" => "fef3405d41af",
           "time" => "2018-02-05T06:49:53.859060Z",
       "clientip" => "172.29.43.253"
}
{
       "res_time" => "0.052",
            "req" => "\"GET https://helloworld.com/users/2 HTTP/1.1\"",
           "path" => "/usr/share/logstash/data/access.log",
     "@timestamp" => 2018-07-16T06:43:56.680Z,
    "status_code" => "503",
       "@version" => "1",
        "message" => "2018-02-05T07:49:53.859060Z 172.30.40.210 0.052 503 \"GET https://helloworld.com/users/2 HTTP/1.1\"",
           "host" => "fef3405d41af",
           "time" => "2018-02-05T07:49:53.859060Z",
       "clientip" => "172.30.40.210"
}
```

Filter - ruby 👑

- ruby code를 이용해 custom filter 작성
- logstash는 ruby로 되어 있음 👑
- 종류
  - Inline ruby code 👑
  - ~~ruby script file (수업)~~

단, ruby code를 다 볼 순 없으므로

Event API의 기본문법만 익히고

몇 가지 예시를 통해 어떻게 사용하는지 보자

Event API - SET

문법

`event.set(‘필드명’, 값)`

`event.set(‘[상위필드][하위필드]’, 값)`

(※ object 형태)

예시

`event.set(‘new field’, 100)`

`event.set(‘[foo][bar]’, ‘hello’)`

새로운 필드 생성하고 값 부여

Event API - GET

문법

`event.get(‘필드명’)`

`event.get(‘[상위필드][하위필드]’)`

(※ object 형태)

예시

`event.get(‘new field’)` → 100

`event.get(‘[foo][bar]’)` → ‘hello’

이미 존재하는 특정 Field의 값 조회

예시1. time object에 시간을 더하거나 빼기

logstash configuration을 확인하자 👑

```
 1 input {
 2   file {
 3     path => "/usr/share/logstash/data/date.log"
 4     start_position => "beginning"
 5     sincedb_path => "/dev/null"
 6   }
 7 }
 8
 9 filter {
10   grok {
11     match => {"message" => '%{TIMESTAMP_ISO8601:time} %{WORD:name}'}
12     remove_field => ["path", "@timestamp", "@version", "host", "message"]
13   }
14   date {
15     match => ["time", "YYYY-MM-dd'T'HH:mm:ss"]
16     timezone => "Asia/Seoul"
17     target => “time2"
18     remove_field => [“time”]
19   }
20   ruby {
21     code =>
22       "event.set('_time2', event.get('time2').time.localtime('+09:00').strftime('%Y-%m-%dT%H:%M:%S'))"
23   }
24 }
25
26 output {
27   stdout {}
28 }
```

- _time2라는 field를 생성하고
  - time2 field를
  - time object로 변환하고
  - 9시간을 더한 뒤
  - ‘%Y-%m-%dT%H:%M:%S’ format으로 변환한 값을 갖도록 하자

logstash를 실행하자

```
$ bin/logstash -f code/filter/ruby/example1.conf
```

logstash를 실행하면…

```
{
     "_time2" => "2018-02-12T16:03:38",
      "time2" => 2018-02-12T07:03:38.000Z,
       "name" => "Ben"
}
{
     "_time2" => "2018-02-14T13:31:11",
      "time2" => 2018-02-14T04:31:11.000Z,
       "name" => "Leo"
}
{
     "_time2" => "2018-02-13T03:25:31",
      "time2" => 2018-02-12T18:25:31.000Z,
       "name" => "John"
}
```

예시2. 특정 separator로 문장을 split하고 특정 위치의 값 접근하기

```
1 2018-02-05T05:49:53.859060Z 172.30.39.133 0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"
2 2018-02-05T06:49:53.859060Z 172.29.43.253 0.1   404 "GET https://helloworld.com/users/3 HTTP/1.1"
3 2018-02-05T07:49:53.859060Z 172.30.40.210 0.052 503 "GET https://helloworld.com/users/2 HTTP/1.1"
4 2018-02-05T08:49:53.859060Z 172.31.40.131 0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1”
```

ex) status code

logstash configuration을 확인하자 👑

```
1 input {}
2   file {
3     path => "/usr/share/logstash/data/access.log"
4     start_position => "beginning"
5     sincedb_path => "/dev/null"
6   }
7 }
8
9 filter {
10   ruby {
11     code => "event.set('status code', (event.get('message').split(' ')[3]).to_i)"
12     remove_field => ["path", "@version", "host", "@timestamp"]
13   }
14 }
15
16 output {
17   stdout {}
18 }
```

- status_code 라는 field를 생성하고
  - message field를
  - white space를 기준으로 나눈 후에
  - 4번째 (zero indexing) 값을
  - integer로 변한한 뒤 (default : string)
  - 값을 할당하자

logstash를 실행하자

```
$ bin/logstash -f code/filter/ruby/example2.conf
```

logstash를 실행하면…

```
{
    "status code" => 404,
       "message" => "2018-02-05T06:49:53.859060Z 172.29.43.253 0.1 404 \"GET https://helloworld.com/users/3 HTTP/1.1\""
}
{
    "status code" => 200,
       "message" => "2018-02-05T08:49:53.859060Z 172.31.40.131 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\""
}
{
    "status code" => 200,
       "message" => "2018-02-05T05:49:53.859060Z 172.30.39.133 0.079 200 \"GET https://helloworld.com/users/1 HTTP/1.1\""
}
{
    "status code" => 503,
       "message" => "2018-02-05T07:49:53.859060Z 172.30.40.210 0.052 503 \"GET https://helloworld.com/users/2 HTTP/1.1\""
}
```

Filter - elasticsearch 👑

- 현재 event의 데이터를 이용해 elasticsearch에 search/aggregation 수행
- 위에서 수행한 search/aggregation 결과를 현재 event에 field로 추가

예시1.

access log에서 ip 정보를 elasticsearch에서 조회하여

(접속 이력이 있는 ip의 경우) 가장 최근 접속 일자를 새로운 field에 추가하자

```
1 2018-09-10T05:49:22.859Z 178.73.215.171  0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"
2 2018-09-10T16:51:42.119Z 115.127.73.2    0.1 404 "GET https://helloworld.com/users/3 HTTP/1.1"
3 2018-09-10T07:41:39.239Z 207.148.120.201 0.052 503 "GET https://helloworld.com/users/2 HTTP/1.1"
4 2018-09-10T08:09:03.779Z 93.117.2.7      0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
5 2018-09-10T08:19:13.989Z 93.115.2.7      0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
```

이 값으로 elasticsearch에 검색

logstash configuration을 확인하자 👑

```
input {
  file {
    path => "/usr/share/logstash/data/access2.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  grok {
    match => {
      "message" =>
       '%{TIMESTAMP_ISO8601:current_time} %{IPORHOST:clientip} %{NUMBER:res_time} %{NUMBER:status_code} %{QS:req}'
    }
  }
  elasticsearch {
    hosts => ["elasticsearch.higee.co"]
    index => "nginx-*"
    query => "nginx.access.geoip.ip:%{[clientip]}"
    sort => "@timestamp:desc"
    fields => {"@timestamp" => "previous_time"}
    remove_field => ["status_code", "path", "@timestamp", "req", "res_time", "@version", "host"]
  }
}

output {
  stdout {
  }
}
```

clientip 값으로 검색이 수행된다

previous_time field를 생성하고 return된 document에서 @timestamp 값을 할당해라

logstash를 실행하자

```
$ bin/logstash -f code/filter/elasticsearch/example1.conf
```

logstash를 실행하면…

① ②

```
{
     "current_time" => "2018-09-10T16:51:42.119Z",
         "clientip" => "115.127.73.2",
    "previous_time" => "2018-09-09T17:10:09.000Z",
          "message" => "2018-09-10T16:51:42.119Z 115.127.73.2 0.1 404 \"GET https://helloworld.com/users/3 HTTP/1.1\""
}
{
     "current_time" => "2018-09-10T08:09:03.779Z",
         "clientip" => "93.117.2.7",
    "previous_time" => "2018-09-09T15:53:08.000Z",
          "message" => "2018-09-10T08:09:03.779Z 93.117.2.7 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\""
}
{
     "current_time" => "2018-09-10T05:49:22.859Z",
         "clientip" => "178.73.215.171",
    "previous_time" => "2018-09-09T19:34:55.000Z",
          "message" => "2018-09-10T05:49:22.859Z 178.73.215.171 0.079 200 \"GET https://helloworld.com/users/1 HTTP/1.1\""
}
{
     "current_time" => "2018-09-10T07:41:39.239Z",
         "clientip" => "207.148.120.201",
    "previous_time" => "2018-09-09T15:11:18.000Z",
          "message" => "2018-09-10T07:41:39.239Z 207.148.120.201 0.052 503 \"GET https://helloworld.com/users/2 HTTP/1.1\""
}
{
     "current_time" => "2018-09-10T08:19:13.989Z",
          "message" => "2018-09-10T08:19:13.989Z 93.115.2.7 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\"",
         "clientip" => "93.115.2.7"
}
```

① 기존에 접속한 적이 있는 ip를 가진 event ⟶ previous_time field 추가

② 기존에 접속한 적이 없는 ip를 가진 event

예시2.

지난 번 접속 시간과 이번 접속 시간의 차를 구해서

새로운 필드를 생성하자

```
1 2018-09-10T05:49:22.859Z 178.73.215.171  0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"
2 2018-09-10T16:51:42.119Z 115.127.73.2    0.1 404 "GET https://helloworld.com/users/3 HTTP/1.1"
3 2018-09-10T07:41:39.239Z 207.148.120.201 0.052 503 "GET https://helloworld.com/users/2 HTTP/1.1"
4 2018-09-10T08:09:03.779Z 93.117.2.7      0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
5 2018-09-10T08:19:13.989Z 93.115.2.7      0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
```

이 값으로 elasticsearch에 검색

logstash configuration을 확인하자 👑

```
input {
  file {
    path => "/usr/share/logstash/data/access2.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  grok {
    match => {
      "message" =>
        '%{TIMESTAMP_ISO8601:current_time} %{IPORHOST:clientip} %{NUMBER:res_time} %{NUMBER:status_code} %{QS:req}'
    }
  }
  elasticsearch {
    hosts => ["elasticsearch.higee.co"]
    index => "nginx-*"
    query => "nginx.access.geoip.ip:%{[clientip]}"
    sort => "@timestamp:desc"
    fields => {"@timestamp" => "previous_time"}
  }
  if [previous_time] {
    date {
      match => ["current_time", "YYYY-MM-dd'T'HH:mm:ss.SSSZ"]
      target => "current_time"
    }
    date {
      match => ["previous_time", "YYYY-MM-dd'T'HH:mm:ss.SSSZ"]
      target => "previous_time"
    }
    ruby {
      code => "event.set('access_interval', ((event.get('current_time') - event.get('previous_time'))/3600).round(2))"
      remove_field => ["status_code", "path", "@timestamp", "req", "res_time", "@version", "host"]
    }
  }
}

output {
  stdout {
  }
}
```

현재 접속 시간과 지난 번 접속 시간의 차를 구해 얼마 만에 방문했는지를 기록

logstash를 실행하자

```
$ bin/logstash -f code/filter/elasticsearch/example2.conf
```

logstash를 실행하면…

```
{
          "clientip" => "115.127.73.2",
     "previous_time" => 2018-09-09T17:10:09.000Z,
           "message" => "2018-09-10T16:51:42.119Z 115.127.73.2 0.1 404 \"GET https://helloworld.com/users/3 HTTP/1.1\"",
      "current_time" => 2018-09-10T16:51:42.119Z,
    "access_interval" => 23.69
}
{
          "clientip" => "93.117.2.7",
     "previous_time" => 2018-09-09T15:53:08.000Z,
           "message" => "2018-09-10T08:09:03.779Z 93.117.2.7 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\"",
      "current_time" => 2018-09-10T08:09:03.779Z,
    "access_interval" => 16.27
}
{
          "clientip" => "178.73.215.171",
     "previous_time" => 2018-09-09T19:34:55.000Z,
           "message" => "2018-09-10T05:49:22.859Z 178.73.215.171 0.079 200 \"GET https://helloworld.com/users/1 HTTP/1.1\"",
      "current_time" => 2018-09-10T05:49:22.859Z,
    "access_interval" => 10.24
}
{
          "clientip" => "207.148.120.201",
     "previous_time" => 2018-09-09T15:11:18.000Z,
           "message" => "2018-09-10T07:41:39.239Z 207.148.120.201 0.052 503 \"GET https://helloworld.com/users/2 HTTP/1.1\"",
      "current_time" => 2018-09-10T07:41:39.239Z,
    "access_interval" => 16.51
}
{
          "clientip" => "93.115.2.7",
           "message" => "2018-09-10T08:19:13.989Z 93.115.2.7 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\"",
      "current_time" => "2018-09-10T08:19:13.989Z"
}
```

첫 방문이므로 access_interval이 존재하지 않음

예제3. Query DSL을 사용해보자

```
1 2018-09-10T05:49:22.859Z 178.73.215.171  0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"
2 2018-09-10T16:51:42.119Z 115.127.73.2    0.1 404 "GET https://helloworld.com/users/3 HTTP/1.1"
3 2018-09-10T07:41:39.239Z 207.148.120.201 0.052 503 "GET https://helloworld.com/users/2 HTTP/1.1"
4 2018-09-10T08:09:03.779Z 93.117.2.7      0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
5 2018-09-10T08:19:13.989Z 93.115.2.7      0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
```

이 값으로 elasticsearch에 검색

logstash configuration을 확인하자 👑

```
input {
  file {
    path => "/usr/share/logstash/data/access2.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  grok {
    match => {
      "message" =>
       '%{TIMESTAMP_ISO8601:current_time} %{IPORHOST:clientip} %{NUMBER:res_time} %{NUMBER:status_code} %{QS:req}'
    }
  }
  elasticsearch {
    hosts => ["elasticsearch.higee.co"]
    index => "nginx-*"
    query_template => "/usr/share/logstash/code/filter/elasticsearch/example3.json"
    fields => {"@timestamp" => "previous_time"}
    remove_field => ["status_code", "path", "@timestamp", "req", "res_time", "@version", "host"]
  }
}

output {
  stdout {
  }
}
```

query DSL을 작성한 파일 참조

query template을 확인하자 👑

```
{
  "size": 1,
  "sort" : [ { "@timestamp" : "desc" } ],
  "_source" : ["@timestamp"],
  "query": {
    "term": {
      "nginx.access.geoip.ip" : "%{[clientip]}"
    }
  }
}
```

각 event의 clientip로 검색 수행

logstash를 실행하자

```
$ bin/logstash -f code/filter/elasticsearch/example3.conf
```

logstash를 실행하면…

```
{
          "message" => "2018-09-10T16:51:42.119Z 115.127.73.2 0.1 404 \"GET https://helloworld.com/users/3 HTTP/1.1\"",
         "clientip" => "115.127.73.2",
     "current_time" => "2018-09-10T16:51:42.119Z",
    "previous_time" => "2018-09-09T17:10:09.000Z"
}
{
          "message" => "2018-09-10T08:09:03.779Z 93.117.2.7 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\"",
         "clientip" => "93.117.2.7",
     "current_time" => "2018-09-10T08:09:03.779Z",
    "previous_time" => "2018-09-09T15:53:08.000Z"
}
{
          "message" => "2018-09-10T05:49:22.859Z 178.73.215.171 0.079 200 \"GET https://helloworld.com/users/1 HTTP/1.1\"",
         "clientip" => "178.73.215.171",
     "current_time" => "2018-09-10T05:49:22.859Z",
    "previous_time" => "2018-09-09T19:34:55.000Z"
}
{
          "message" => "2018-09-10T07:41:39.239Z 207.148.120.201 0.052 503 \"GET https://helloworld.com/users/2 HTTP/1.1\"",
         "clientip" => "207.148.120.201",
     "current_time" => "2018-09-10T07:41:39.239Z",
    "previous_time" => "2018-09-09T15:11:18.000Z"
}
{
         "clientip" => "93.115.2.7",
    "current_time" => "2018-09-10T08:19:13.989Z",
          "message" => "2018-09-10T08:19:13.989Z 93.115.2.7 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\""
}
```

예시4 Aggregation 결과도 event에서 사용 가능한가?

```
1 2018-09-10T05:49:22.859Z 178.73.215.171  0.079 200 "GET https://helloworld.com/users/1 HTTP/1.1"
2 2018-09-10T16:51:42.119Z 115.127.73.2    0.1 404 "GET https://helloworld.com/users/3 HTTP/1.1"
3 2018-09-10T07:41:39.239Z 207.148.120.201 0.052 503 "GET https://helloworld.com/users/2 HTTP/1.1"
4 2018-09-10T08:09:03.779Z 93.117.2.7      0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
5 2018-09-10T08:19:13.989Z 93.115.2.7      0.038 200 "POST https://helloworld.com/users/5 HTTP/1.1"
```

이 값으로 elasticsearch에 검색

logstash configuration을 확인하자 👑

```
input {
  file {
    path => "/usr/share/logstash/data/access2.log"
    start_position => "beginning"
    sincedb_path => "/dev/null"
  }
}

filter {
  grok {
    match => {
      "message" =>
       '%{TIMESTAMP_ISO8601:current_time} %{IPORHOST:clientip} %{NUMBER:res_time} %{NUMBER:status_code} %{QS:req}'
    }
  }
  elasticsearch {
    hosts => ["elasticsearch.higee.co"]
    index => "nginx-*"
    query_template => "example4.json"
    fields => {"@timestamp" => "previous_time"}
    remove_field => ["status_code", "path", "@timestamp", "req", "res_time", "@version", "host", "current_time"]
    aggregation_fields => {
      "this_is_avg" => "elasticsearch_aggregation"
    }
  }
  if ![elasticsearch_aggregation][value] {
    mutate {
      remove_field => ["elasticsearch_aggregation"]
    }
  }
  else {
    ruby {
      code => "event.set('average_byte', event.get('[elasticsearch_aggregation][value]').round(0))"
      remove_field => ["elasticsearch_aggregation"]
    }
  }
}

output {
  stdout {
  }
}
```

this_is_avg 라는 aggregation 값을 elasticsearch_aggregation field에 저장

[elasticsearch_aggregation][value] 라는 field가 존재하지 않는 경우 (=검색 결과 없는 경우)

logstash configuration을 확인하자 👑

```
{
  "size": 0,
  "sort" : [ { "@timestamp" : "desc" } ],
  "query": {
    "term": {
      "nginx.access.geoip.ip" : "%{[clientip]}"
    }
  },
  "aggs": {
    "this_is_avg": {
      "avg": {
        "field": "nginx.access.body_sent.bytes"
      }
    }
  }
}
```

search

aggregation

aggregation 문법은 수업에 배우지는 않았지만 향후 참고!

logstash를 실행하자

```
$ bin/logstash -f code/filter/elasticsearch/example4.conf
```

logstash를 실행하면…

```
{
        "message" => "2018-09-10T07:41:39.239Z 207.148.120.201 0.052 503 \"GET https://helloworld.com/users/2 HTTP/1.1\"",
   "average_byte" => 189.0,
       "clientip" => "207.148.120.201"
}
{
     "message" => "2018-09-10T08:19:13.989Z 93.115.2.7 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\"",
   "clientip" => "93.115.2.7"
}
{
        "message" => "2018-09-10T05:49:22.859Z 178.73.215.171 0.079 200 \"GET https://helloworld.com/users/1 HTTP/1.1\"",
   "average_byte" => 436.0,
       "clientip" => "178.73.215.171"
}
{
         "message" => "2018-09-10T16:51:42.119Z 115.127.73.2 0.1 404 \"GET https://helloworld.com/users/3 HTTP/1.1\"",
   "average_byte" => 436.0,
       "clientip" => "115.127.73.2"
}
{
         "message" => "2018-09-10T08:09:03.779Z 93.117.2.7 0.038 200 \"POST https://helloworld.com/users/5 HTTP/1.1\"",
   "average_byte" => 436.0,
       "clientip" => "93.117.2.7"
}
```

질문 및 Feedback은

gshock94@gmail.com로 주세요