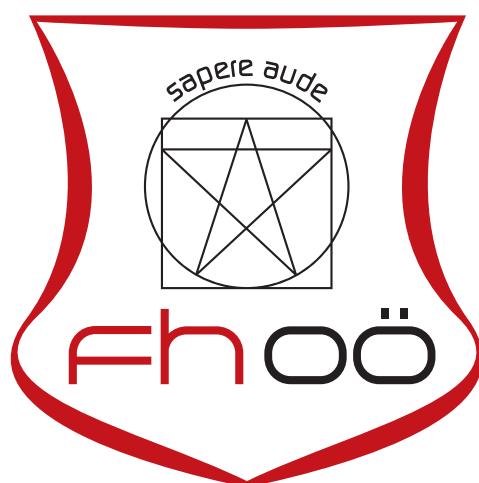


BIG DATA

ELK Stack Exercise

von
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Step 1

Clone repo and run the containers using docker compose:

```
git clone https://github.com/Digital-Media/elk-stack-dock
cd elk-stack-dock
docker compose -f docker-compose.yml up -d
```

Open bash inside logstash container and run simple pipeline:

```
docker exec -it elk-stack-dock_logstash_1 /bin/bash
whereis logstash
cd /usr/share/logstash/bin
./logstash -e 'input { stdin {} } output { stdout {} }'
```

The pipeline fails because data is already in use

```
[logstash@809634350ab2:~/bin$ logstash -e 'input { stdin {} } output { stdout {} }'
Using bundled JDK: /usr/share/logstash/jdk
Sending Logstash logs to /usr/share/logstash/logs which is now configured via log4j2.properties
[2023-03-09T17:18:01,205][INFO ][logstash.runner] Log4j configuration used is: /usr/share/logstash/config/log4j2.properties
[2023-03-09T17:18:01,213][INFO ][logstash.runner] Starting Logstash {"logstash.version"=>"8.6.1", "jruby.version"=>"jruby 9.3.8.0 (2.6.8) 2022-09-13 98d69c9461 OpenJDK 64-Bit Server VM 17.0.5+8 +indy +jit [aarch64-linux]"}
[2023-03-09T17:18:01,216][INFO ][logstash.runner] JVM bootstrap flags: [-Xms1g, -Xmx1g, -Djava.awt.headless=true, -Dfile.encoding=UTF-8, -Druby.compile.invokedynamic=true, -XX:+HeapDumpOnOutOfMemoryError, -Djava.security.egd=file:/dev/urandom, -Dlog4j2.isThreadContextMapInheritable=true, -Xms256m, -Xmx256m, -Druby.regex.interruptible=true, -Djdk.io.File.enableADS=true, --add-exports=jdk.compiler/com.sun.tools.javac.api=ALL-UNNAMED, --add-exports=jdk.compiler/com.sun.tools.javac.file=ALL-UNNAMED, --add-exports=jdk.compiler/com.sun.tools.javac.util=ALL-UNNAMED, --add-opens=java.base/java.security=ALL-UNNAMED, --add-opens=java.base/java.io=ALL-UNNAMED, --add-opens=java.base/java.nio.channels=ALL-UNNAMED, --add-opens=java.base/sun.nio.ch=ALL-UNNAMED, --add-opens=java.management/sun.management=ALL-UNNAMED]
[2023-03-09T17:18:01,389][WARN ][logstash.config.source.multilocal] Ignoring the 'pipelines.yml' file because modules or command line options are specified
[2023-03-09T17:18:01,401][FATAL][logstash.runner] Logstash could not be started because there is already another instance using the configured data directory. If you wish to run multiple instances, you must change the "path.data" setting.
[2023-03-09T17:18:01,404][FATAL][org.logstash.Logstash] Logstash stopped processing because of an error: (SystemExit) exit
org.jruby.exceptions.SystemExit: (SystemExit) exit
    at org.jruby.RubyKernel.exit(org/jruby/RubyKernel.java:790) ~[jruby.jar:?]
    at org.jruby.RubyKernel.exit(org/jruby/RubyKernel.java:753) ~[jruby.jar:?]
    at usr.share.logstash.lib.bootstrap.environment.<main>(/usr/share/logstash/lib/bootstrap/environment.rb:91) ~[?:?]
```

Rerun pipeline using the data2 directory

```
logstash --path.data data2 -e 'input { stdin {} } output {
    stdout {} }'
```

```
[2023-03-09T17:25:57.306][INFO ][logstash.agent] Pipelines running {:count=>1, :running_pipelines=>[:main], :non_running_pipelines=>[]}
elines=>[])
hello world
{
  "message" => "hello world",
  "event" => {
    "original" => "hello world"
  },
  "host" => {
    "hostname" => "809634350ab2"
  },
  "@timestamp" => 2023-03-09T17:26:05.225265845Z,
  "@version" => "1"
}
```

Check if jdbc is installed

```
logstash-plugin list --verbose | grep "jdbc"
```

```
logstash@b0edb9428e65:~/bin$ logstash-plugin list --verbose | grep "jdbc"
io/console on JRuby shells out to stty for most operations
logstash-integration-jdbc (5.4.1)
  └─ logstash-input-jdbc
    └─ logstash-filter-jdbc_streaming
      └─ logstash-filter-jdbc_static
logstash@b0edb9428e65:~/bin$
```

Check pipeline configuration

```
logstash --path.settings /usr/share/logstash/config -t
```

```
logstash@b0edb9428e65:~$ /usr/share/logstash/bin/logstash --path.settings /usr/share/logstash/config -t
Using bundled JDK: /usr/share/logstash/jdk
Sending Logstash logs to /usr/share/logstash/logs which is now configured via log4j2.properties
[2023-03-09T18:21:20,652][INFO ][logstash.runner] Log4j configuration path used is: /usr/share/logstash/config/log4j2.properties
[2023-03-09T18:21:20,667][INFO ][logstash.runner] Starting Logstash {"logstash.version"=>"8.6.1", "jruby.version"=>"jruby 9.3.8.0 (2.6.8) 2022-09-13 98d69c9461 OpenJDK 64-Bit Server VM 17.0.5+8 on 17.0.5+8 +indy +jit [arch64-linux]"}
[2023-03-09T18:21:20,672][INFO ][logstash.runner] JVM bootstrap flags: [-Xms1g, -Xmx1g, -Djava.awt.headless=true, -Dfile.encoding=UTF-8, -Djruby.compile.invokedynamic=true, -XX:+HeapDumpOnOutOfMemoryError, -Djava.security.egd=file:/dev/urandom, -Dlog4j2.isThreadContextMapInheritable=true, -Xms256m, -Xmx256m, -Djruby.regexp.interruptible=true, -Djdk.io.File.enableADS=true, --add-exports=jdk.compiler/com.sun.tools.javac.api=ALL-UNNAMED, --add-exports=jdk.compiler/com.sun.tools.javac.parser=ALL-UNNAMED, --add-exports=jdk.compiler/com.sun.tools.javac.util=ALL-UNNAMED, --add-opens=java.base/java.security=ALL-UNNAMED, --add-opens=java.base/java.io=ALL-UNNAMED, --add-opens=java.base/java.nio.channels=ALL-UNNAMED, --add-opens=java.base/sun.nio.ch=ALL-UNNAMED, --add-opens=java.management/sun.management=ALL-UNNAMED]
[2023-03-09T18:21:21,310][INFO ][org.reflections.Reflections] Reflections took 83 ms to scan 1 urls, producing 127 keys and 444 values
[2023-03-09T18:21:22,065][INFO ][logstash.javapipeline] Pipeline `main` is configured with `pipeline.ecs_compatibility: v8` setting.
All plugins in this pipeline will default to `ecs_compatibility => v8` unless explicitly configured otherwise.
Configuration OK
[2023-03-09T18:21:22,066][INFO ][logstash.runner] Using config.test_and_exit mode. Config Validation Result: OK. Exiting Logstash
```

Step 2

Clone postgres repo

```
git clone https://github.com/Digital-Media/postgres  
cd postgres
```

Create sql scripts in local folder named "scripts"

See schema.sql and data.sql in appendix.

Map the scripts folder to the container adding scripts to the volumes:

```
volumes:  
- ./scripts:/scripts  
- pgdata:/var/lib/postgresql/data
```

Start postgres container with docker compose:

```
docker compose -f docker-compose.yml up -d --build
```

Open psql inside postgres container create schema and insert data:

```
docker exec -it postgres psql -d postgres -U postgres  
\i scripts/schema.sql  
\i scripts/data.sql
```

Download jdbc driver to local machine

```
cd elk-stack-dock/logstash  
mkdir jars  
cd jars  
curl -o postgresql-42.5.4.jar https://jdbc.postgresql.org/  
download/postgresql-42.5.4.jar
```

Add this line to the end of the logstash Dockerfile

```
COPY jars/* /usr/share/logstash/logstash-core/lib/jars/
```

Run docker compose with build flag

```
docker compose -f elk-stack-dock/docker-compose.yml up -d  
--build
```

Test Postgres pipeline

```
logstash --path.data data2 -e 'input {
  jdbc {
    jdbc_connection_string => "jdbc:postgresql
      ://192.168.0.23:5432/postgres"
    jdbc_user => "postgres"
    jdbc_password => "geheim"
    jdbc_driver_class => "org.postgresql.Driver"
    statement => "SELECT * FROM order_item"
  }
} output {
  stdout {}
}'
```

```
[2023-03-12T13:23:10.283] [INFO ] [logstash.javapipeline] [main] Pipeline started {"pipeline.id"=>"main"}
[2023-03-12T13:23:17.083] [INFO ] [logstash.agent] [main] Pipelines running {:count=>1, :running_pipelines=>[:main], :non_running_pipelines=>[]}
[2023-03-12T13:23:18.103] [logstash.inputs.jdbc] [main][d2110d1b69c4aebe1a7f91994d5e2503dba2d96d234e22758d117ce65dc609d9] (6.195274s) SELECT * FROM order_item
{
  "orders_idorders" => 1,
  "product_idproduct" => 2,
  "quantity" => 1.0,
  "price" => 200.0,
  "@version" => "1",
  "@timestamp" => 2023-03-12T13:23:28.373455922Z
}
{
  "orders_idorders" => 1,
  "product_idproduct" => 1,
  "quantity" => 2.0,
  "price" => 500.0,
  "@version" => "1",
  "@timestamp" => 2023-03-12T13:23:28.336386880Z
}
{
  "orders_idorders" => 2,
  "product_idproduct" => 2,
  "quantity" => 2.0,
  "price" => 200.0,
  "@version" => "1",
  "@timestamp" => 2023-03-12T13:23:28.413378838Z
}
{
  "orders_idorders" => 2,
  "product_idproduct" => 3,
  "quantity" => 2.0,
  "price" => 500.0,
  "@version" => "1",
  "@timestamp" => 2023-03-12T13:23:28.395096547Z
}
[2023-03-12T13:23:43.685] [INFO ] [logstash.javapipeline] [main] Pipeline terminated {"pipeline.id"=>"main"}
[2023-03-12T13:23:44.478] [INFO ] [logstash.pipelinesregistry] Removed pipeline from registry successfully {:pipeline_id=>:main}
[2023-03-12T13:23:47.287] [INFO ] [logstash.runner] Logstash shut down.
```

Write the new pipeline in the pipeline configuration file:

See pipeline.conf in appendix for the pipeline

```
nvim elk-stack-dock/logstash/pipeline/logstash.conf
```

Restart the logstash container to apply the new configuration

```
docker stop elk-stack-dock_logstash_1 && docker start elk-
stack-dock_logstash_1
```

Check the logstash docker logs:

```
docker logs -f elk-stack-dock_logstash_1
```

```
[2023-04-01T14:12:39,347][INFO ][logstash.javapipeline ] [main] Starting pipeline {:pipeline_id=>"main", "pipeline.workers"=>4, "pipeline.batch.size"=>125, "pipeline.batch.delay"=>50, "pipeline.max_inflight"=>500, "pipeline.sources"=>"[/usr/share/logstash/pipeline/logstash.conf"], :thread=>#<Thread:0x31335ebe@/usr/share/logstash/logstash-core/lib/logstash/java_pipeline.rb:131 run>}
[2023-04-01T14:12:39,685][INFO ][logstash.javapipeline ] [main] Pipeline Java execution initialization time ("seconds"=>0.34)
[2023-04-01T14:12:39,942][INFO ][logstash.inputs.jdbc ] [main] ECS compatibility is enabled but `target` option was not specified. This may cause fields to be set at the top-level of the event where they are likely to clash with the Elastic Common Schema. It is recommended to set the `target` option to avoid potential schema conflicts (if your data is ECS compliant or non-conflicting, feel free to ignore this message)
[2023-04-01T14:12:39,943][INFO ][logstash.javapipeline ] [main] Pipeline started ("pipeline.id"=>"main")
[2023-04-01T14:12:39,952][INFO ][logstash.agent      ] Pipelines running {:count=>1, :running_pipelines=>[:main], :non_running_pipelines=>[]}
```

Check the data in kibana

```
GET orders/_search
1- {
2-   "_took": 0,
3-   "timed_out": false,
4-   "_shards": {
5-     "total": 1,
6-     "successful": 1,
7-     "skipped": 0,
8-     "failed": 0
9-   },
10-  "hits": [
11-    {
12-      "total": {
13-        "value": 2,
14-        "relation": "eq"
15-      },
16-      "max_score": 1,
17-      "hits": [
18-        {
19-          "_index": "orders",
20-          "_id": "orders_2",
21-          "_score": 1,
22-          "_source": {
23-            "date_ordered": "22.02.2022",
24-            "married_to": null,
25-            "idorders": 2,
26-            "user_iduser": 2,
27-            "@timestamp": "2023-04-01T14:15:00.617472422Z",
28-            "@version": "1"
29-          }
30-        }
31-      ]
32-    }
33-  ]
34-}

GET orders/_doc/orders_1
1- {
2-   "_index": "orders",
3-   "_id": "orders_1",
4-   "_version": 1,
5-   "_seq_no": 1,
6-   "_primary_term": 1,
7-   "found": true,
8-   "_source": {
9-     "date_ordered": "12.02.2021",
10-     "married_to": null,
11-     "idorders": 1,
12-     "user_iduser": 1,
13-     "@timestamp": "2023-04-01T14:15:00.617102963Z",
14-     "total_sum": 1200,
15-     "@version": "1"
16-   }
17- }
```

Add a new sql entry (between 14:45 and 14:50) then check logs -> the data in es is updated every 5 minutes:

```
docker exec -it postgres psql -d postgres -U postgres
INSERT INTO orders (idorders, user_iduser, total_sum,
date_ordered) VALUES (3, 2, 1400, '23.02.2022');
```

```
[2023-04-01T14:12:39,952][INFO ][logstash.agent      ] Pipelines running {:count=>1, :running_pipelines=>[:main], :non_running_pipelines=>[]}
[2023-04-01T14:15:00,609][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.013463s)
) SELECT * FROM orders where idorders > [redacted]
/usr/share/logstash/vendor/bundle/jruby/2.6.0/gems/manticore-0.9.1-java/lib/manticore/client.rb:284: warning: already initialized constant Manticore::Client::HttpPost
/usr/share/logstash/vendor/bundle/jruby/2.6.0/gems/manticore-0.9.1-java/lib/manticore/client.rb:536: warning: already initialized constant Manticore::Client::StringEntry
[2023-04-01T14:20:00,939][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.003809s)
) SELECT * FROM orders where idorders > [redacted]
[2023-04-01T14:20:00,147][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.002284s)
) SELECT * FROM orders where idorders > 2
[2023-04-01T14:30:00,142][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.002445s)
) SELECT * FROM orders where idorders > 2
[2023-04-01T14:35:00,121][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.003371s)
) SELECT * FROM orders where idorders > 2
[2023-04-01T14:40:00,124][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.002377s)
) SELECT * FROM orders where idorders > 2
[2023-04-01T14:45:00,144][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.002186s)
) SELECT * FROM orders where idorders > 2
[2023-04-01T14:50:00,208][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.003399s)
) SELECT * FROM orders where idorders > 2
[2023-04-01T14:55:00,262][INFO ][logstash.inputs.jdbc ] [main][5d69d240eb63fdb8d96c21c8e257955a67fce95a451f4c92529085a0ff2fe7c2] (0.002022s)
) SELECT * FROM orders where idorders > [redacted]
```

Logstash pipeline vs. MongoDB pipeline

MongoDB supports a way to import data from files e.g. json files using mongoimport. The same workflow that we implemented using logstash contains this steps using MongoDB and mongoimport:

1. Check which data is already synced to the MongoDB e.g. storing the last synced id
2. Export the "new" data from postgres to e.g. json file
3. Import the json file using mongoimport

In my opinion this is not the perfect solution, because it means, that some code has to be written and maintained if this should be done automatically. Of course, it is not very complex to sequentially fetch the new data, convert it to json and write it into MongoDB. But writing the code for the pipeline and hosting the pipeline is much more error prone than just using and configuring a tool like logstash.

Still I would not decide to use ElasticSearch just because of the advantage of logstash compared to mongoimport.

Step 3

Start Metricbeat

```
docker-compose \
  docker-compose.yml \
  -f extensions/metricbeat/metricbeat-compose.yml \
  up -d
```

Change the environments in the .env file

See the file .env file in the appendix.

```
nvim elk-stack-dock/.env
```

Run the setup container again

```
docker compose -f docker-compose.yml rm setup
docker volume rm elk-stack-dock_setup
docker-compose -f docker-compose.yml up setup
```

Check Kibana logs => http server running at...

```
[2023-03-24T16:37:39.676+00:00] [INFO ] [http.server.Kibana] http server running at http://0.0.0.0:5601
[2023-03-24T16:37:40.646+00:00] [INFO ] [plugins.fleet] Running Fleet Usage telemetry send task
[2023-03-24T16:37:41.271+00:00] [INFO ] [plugins.fleet] Fleet Usage: {"agents_enabled":true,"agents":{"total_enrolled":0,"healthy":0,"unhealthy":0,"offline":0,"updating":0,"total_all_statuses":0,"updating":0}, "fleet_server":{"total_enrolled":0,"healthy":0,"unhealthy":0,"offline":0,"updating":0,"total_all_statuses":0,"num_host_urls":1}}
[2023-03-24T16:37:42.905+00:00] [INFO ] [plugins.securitySolution.endpoint:metadata-check-transforms-task:0.0.1] no endpoint in stallation found
[2023-03-24T16:37:43.632+00:00] [INFO ] [plugins.fleet] Fleet setup completed
[2023-03-24T16:37:43.647+00:00] [INFO ] [plugins.securitySolution] Dependent plugin setup complete - Starting ManifestTask
[2023-03-24T16:37:43.742+00:00] [INFO ] [plugins.synthetics] Installed synthetics index templates
[2023-03-24T16:37:45.881+00:00] [INFO ] [status] Kibana is now available (was degraded)
[2023-03-24T16:37:45.950+00:00] [INFO ] [plugins.ml] Task ML:saved-objects-sync-task: No ML saved objects in need of synchronization
[2023-03-24T16:37:50.059+00:00] [INFO ] [plugins.security.routes] Logging in with provider "basic" (basic)
```

Restart metricbeat (as soon as Kibana is ready)

```
docker-compose \
  -f docker-compose.yml \
  -f extensions/metricbeat/metricbeat-compose.yml \
  restart metricbeat
```

Check metricbeat data in Kibana

Overview

Health Missing replica shards
Version 8.6.1
Uptime 24 minutes
Machine learning jobs 0
License Trial expires on April 26, 2023

Nodes: 1

Disk Available 74.84% 43.7 GB / 58.4 GB
JVM Heap 43.59% 223.2 MB / 512.0 MB

Indices: 18

Documents 31,159
Disk Usage 82.3 MB
Primary Shards 18
Replica Shards 0

Logs

No log data found
Set up Filebeat, then configure your Elasticsearch output to your monitoring cluster.

Kibana • Healthy

Overview

Requests 4
Max. Response Time 1975 ms
Rule Success Ratio 0.00%
Queued Rules 0

Instances: 1

Connections 16
Memory Usage 31.74% 323.2 MB / 1,018.5 MB

Logstash

Overview

Events Received 0
Events Emitted 0

Nodes: 1

Uptime 22 minutes
JVM Heap 75.45% 193.1 MB / 256.0 MB

Pipelines: 1

With Memory Queues 1
With Persistent Queues 0

Beats

Overview

Total Events 8.6k
Bytes Sent 15.9 MB

Beats: 1

Metricbeat 1

Retrieve data using curl

Please write me if you need the files response1.json and response2.json. I did not hand them in because we can upload only one document in moodle, and I guess the screenshots show the most important parts.

```
curl -X GET -u elastic:changeme "http://localhost:9200/_search?pretty" > response1.json && head -n20 response1.json
```

```
% Total    % Received % Xferd  Average Speed   Time     Time     Time  Current
                                         Dload  Upload   Total   Spent   Left  Speed
100 41438  100 41438     0      0  67700      0 --:--:-- --:--:-- --:--:-- 67931
{
  "took" : 599,
  "timed_out" : false,
  "_shards" : {
    "total" : 6,
    "successful" : 6,
    "skipped" : 0,
    "failed" : 0
  },
  "hits" : {
    "total" : {
      "value" : 378,
      "relation" : "eq"
    },
    "max_score" : 1.0,
    "hits" : [
      {
        "_index" : ".ds..monitoring-es-8-mb-2023.04.01-000001",
        "_id" : "0ylXPYcB9lx-7G-1YFdZ",
        "_score" : 1.0
      }
    ]
  }
}
```

```
curl -X GET -u elastic:changeme "http://localhost:9200/orders/_search?pretty" > response2.json && head -n20 response2.json
```

```
% Total    % Received % Xferd  Average Speed   Time     Time     Time  Current
                                         Dload  Upload   Total   Spent   Left  Speed
100 1388  100 1388     0      0  117k      0 --:--:-- --:--:-- --:--:-- 150k
{
  "took" : 1,
  "timed_out" : false,
  "_shards" : {
    "total" : 1,
    "successful" : 1,
    "skipped" : 0,
    "failed" : 0
  },
  "hits" : {
    "total" : {
      "value" : 3,
      "relation" : "eq"
    },
    "max_score" : 1.0,
    "hits" : [
      {
        "_index" : "orders",
        "_id" : "orders_2",
        "_score" : 1.0
      }
    ]
  }
}
```

Match specific entry

```
↳ curl -X GET -u elastic:changeme "http://localhost:9200/_search?pretty" -H 'Content-Type: application/json' -d '{  
  "query": {  
    "match": {  
      "_id": "orders_1"  
    }  
  }'  
  
{  
  "took" : 8,  
  "timed_out" : false,  
  "_shards" : {  
    "total" : 6,  
    "successful" : 6,  
    "skipped" : 0,  
    "failed" : 0  
  },  
  "hits" : {  
    "total" : {  
      "value" : 1,  
      "relation" : "eq"  
    },  
    "max_score" : 1.0,  
    "hits" : [  
      {  
        "_index" : "orders",  
        "_id" : "orders_1",  
        "_score" : 1.0,  
        "_source" : {  
          "date_ordered" : "12.02.2021",  
          "married_to" : null,  
          "idorders" : 1,  
          "user_iduser" : 1,  
          "@timestamp" : "2023-04-01T14:15:00.617102963Z",  
          "total_sum" : 1200.0,  
          "@version" : "1"  
        }  
      }  
    ]  
  }  
}
```

Match entry that does not exist

```
↳ curl -X GET -u elastic:changeme "http://localhost:9200/_search?pretty" -H 'Content-Type: application/json' -d '{  
  "query": {  
    "match": {  
      "_id": "orders_10"  
    }  
  }'  
[  
{  
  "took" : 1119,  
  "timed_out" : false,  
  "_shards" : {  
    "total" : 6,  
    "successful" : 6,  
    "skipped" : 0,  
    "failed" : 0  
  },  
  "hits" : {  
    "total" : {  
      "value" : 0,  
      "relation" : "eq"  
    },  
    "max_score" : null,  
    "hits" : [ ]  
  }  
}
```

Query all entries in index without match condition

```
GET orders/_search
{
  "took": 4,
  "timed_out": false,
  "_shards": {
    "total": 1,
    "successful": 1,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": {
      "value": 3,
      "relation": "eq"
    },
    "max_score": 1,
    "hits": [
      {
        "_index": "orders",
        "_id": "orders_3",
        "_score": 1,
        "_source": {
          "date_ordered": "23.02",
          "married_to": null,
          "idorders": 3,
          "user_iduser": 2,
          "@timestamp": "2023-04-04T13:45:00.5",
          "total_sum": 1400,
          "@version": "1"
        }
      }
    ]
  }
}
```

Query all entries in index with match condition

```
GET _search
{
  "query": {
    "match": {
      "_index": "orders"
    }
  }
}
{
  "took": 678,
  "timed_out": false,
  "_shards": {
    "total": 6,
    "successful": 6,
    "skipped": 0,
    "failed": 0
  },
  "hits": {
    "total": {
      "value": 3,
      "relation": "eq"
    },
    "max_score": 1,
    "hits": [
      {
        "_index": "orders",
        "_id": "orders_1",
        "_score": 1,
        "_source": {
          "date_ordered": "12.02.2021",
          "@timestamp": "2023-04-04T13:45:00.5",
          "@version": "1",
          "married_to": null,
          "idorders": 1,
          "total_sum": 1200,
          "user_iduser": 1
        }
      },
      {
        "_index": "orders",
        "_id": "orders_3",
        "_score": 1,
        "_source": {
          "date_ordered": "23.02.2022",
          "@timestamp": "2023-04-04T13:45:00.5",
          "@version": "1",
          "married_to": null,
          "idorders": 3,
          "total_sum": 1400,
          "user_iduser": 2
        }
      }
    ]
  }
}
```

Query specific entry without match condition

```
1 GET orders/_doc/orders_3 | ▶ 🔍
  1 { "index": "orders",
  2   "_id": "orders_3",
  3   "_version": 1,
  4   "_seq_no": 2,
  5   "_primary_term": 1,
  6   "found": true,
  7   "_source": {
  8     "date_ordered": "23.02.2022",
  9     "married_to": null,
 10     "idorders": 3,
 11     "user_iduser": 2,
 12     "@timestamp": "2023-04-01T14:00:00.000Z",
 13     "total_sum": 1400,
 14     "@version": "1"
 15   }
 16 }
 17 }
```

Query specific entry with match condition

```
1 GET _search | ▶ 🔍
  1 {
  2   "query": {
  3     "match": {
  4       "_id": "orders_1"
  5     }
  6   }
  7 }
  8
  9 {
 10   "took": 5,
 11   "timed_out": false,
 12   "_shards": {
 13     "total": 6,
 14     "successful": 6,
 15     "skipped": 0,
 16     "failed": 0
 17   },
 18   "hits": {
 19     "total": {
 20       "value": 1,
 21       "relation": "eq"
 22     },
 23     "max_score": 1,
 24     "hits": [
 25       {
 26         "_index": "orders",
 27         "_id": "orders_1",
 28         "_score": 1,
 29         "_source": {
 30           "date_ordered": "12.02.2021",
 31           "@timestamp": "2023-04-04T13:45:00.551797422Z",
 32           "@version": "1",
 33           "married_to": null,
 34           "idorders": 1,
 35           "total_sum": 1200,
 36           "user_iduser": 1
 37         }
 38       }
 39     ]
 40   }
 41 }
```

Sort asc

```
GET _search
{
  "query": {
    "match": {
      "_index": "orders"
    }
  },
  "sort": {
    "idorders": {
      "order": "asc"
    }
  }
}

1+ {
2   "took": 4,
3   "timed_out": false,
4   "_shards": {
5     "total": 6,
6     "successful": 6,
7     "skipped": 5,
8     "failed": 0
9   },
10  "hits": {
11    "total": {
12      "value": 3,
13      "relation": "eq"
14    },
15    "max_score": null,
16    "hits": [
17      {
18        "_index": "orders",
19        "_id": "orders_1",
20        "_score": null,
21        "_source": {
22          "date_ordered": "12.02.2021",
23          "married_to": null,
24          "idorders": 1,
25          "user_iduser": 1,
26          "@timestamp": "2023-04-01T14:15:12Z",
27          "total_sum": 1200,
28          "@version": "1"
29        },
30        "sort": [
31          1
32        ]
33      },
34      {
35        "_index": "orders",
36        "_id": "orders_2",
37        "_score": null,
38        "_source": {
39          "date_ordered": "22.02.2022",
40          "married_to": null
41        }
42      }
43    ]
44  }
45}
```

Sort desc

```
GET _search
{
  "query": {
    "match": {
      "_index": "orders"
    }
  },
  "sort": {
    "idorders": {
      "order": "desc"
    }
  }
}

1+ {
2   "took": 3,
3   "timed_out": false,
4   "_shards": {
5     "total": 6,
6     "successful": 6,
7     "skipped": 5,
8     "failed": 0
9   },
10  "hits": {
11    "total": {
12      "value": 3,
13      "relation": "eq"
14    },
15    "max_score": null,
16    "hits": [
17      {
18        "_index": "orders",
19        "_id": "orders_3",
20        "_score": null,
21        "_source": {
22          "date_ordered": "23.02.2022",
23          "married_to": null,
24          "idorders": 3,
25          "user_iduser": 2,
26          "@timestamp": "2023-04-01T14:50:00.210410546Z",
27          "total_sum": 1400,
28          "@version": "1"
29        },
30        "sort": [
31          3
32        ]
33      },
34      {
35        "_index": "orders",
36        "_id": "orders_2",
37        "_score": null,
38        "_source": {
39          "date_ordered": "22.02.2022",
40          "married_to": null
41        }
42      }
43    ]
44  }
45}
```

Appendix

schema.sql

```
DROP TABLE IF EXISTS order_item;
DROP TABLE IF EXISTS orders;

CREATE TABLE IF NOT EXISTS orders (
    idorders bigint,
    user_iduser bigint,
    married_to bigint,
    total_sum decimal(10,2) NOT NULL,
    date_ordered varchar(15) NOT NULL,
    PRIMARY KEY (idorders)
);

CREATE TABLE IF NOT EXISTS order_item (
    orders_idorders bigint,
    product_idproduct bigint,
    quantity decimal(10,2) NOT NULL,
    price decimal(10,2) NOT NULL,
    PRIMARY KEY (orders_idorders,product_idproduct)
);
```

data.sql

```
INSERT INTO orders (idorders, user_iduser, total_sum,
    date_ordered) VALUES (1, 1, 1200, '12.02.2021');
INSERT INTO orders (idorders, user_iduser, total_sum,
    date_ordered) VALUES (2, 2, 1400, '22.02.2022');

INSERT INTO order_item (orders_idorders, product_idproduct,
    quantity, price) VALUES (1, 1, 2, 500.00);
INSERT INTO order_item (orders_idorders, product_idproduct,
    quantity, price) VALUES (1, 2, 1, 200.00);
INSERT INTO order_item (orders_idorders, product_idproduct,
    quantity, price) VALUES (2, 3, 2, 500.00);
INSERT INTO order_item (orders_idorders, product_idproduct,
    quantity, price) VALUES (2, 2, 2, 200.00);
```

logstash.conf

```
input {
    jdbc {
        jdbc_connection_string => "jdbc:postgresql
            ://192.168.0.23:5432/postgres"
        jdbc_user => "postgres"
        jdbc_password => "geheim"
        jdbc_driver_class => "org.postgresql.Driver"
        statement => "SELECT * FROM orders where idorders > :
            sql_last_value"
        tracking_column => "idorders"
        use_column_value => true
        tracking_column_type => "numeric"
        schedule => "* /5 * * *"
    }
}

output {
    elasticsearch {
        hosts => "elasticsearch:9200"
        user => "elastic"
        password => "changeme"
        index => "orders"
        document_id => "orders_%{orders_idorders}"
        doc_as_upsert => true
    }
}
```

.env

ELASTIC_VERSION=8.6.1

ELASTIC_PASSWORD='changeme'
LOGSTASH_INTERNAL_PASSWORD='changeme'
KIBANA_SYSTEM_PASSWORD='changeme'
METRICBEAT_INTERNAL_PASSWORD='changeme'
FILEBEAT_INTERNAL_PASSWORD='changeme'
HEARTBEAT_INTERNAL_PASSWORD='changeme'
MONITORING_INTERNAL_PASSWORD='changeme'
BEATS_SYSTEM_PASSWORD='changeme'