CSCI 5408 Data Management Warehousing and Analytics

Assignment 1

Search Query Implementation using Relational Database and Elastic Search

Date of Submission: May 24, 2018

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Srisaichand Singamaneni (B00792835)

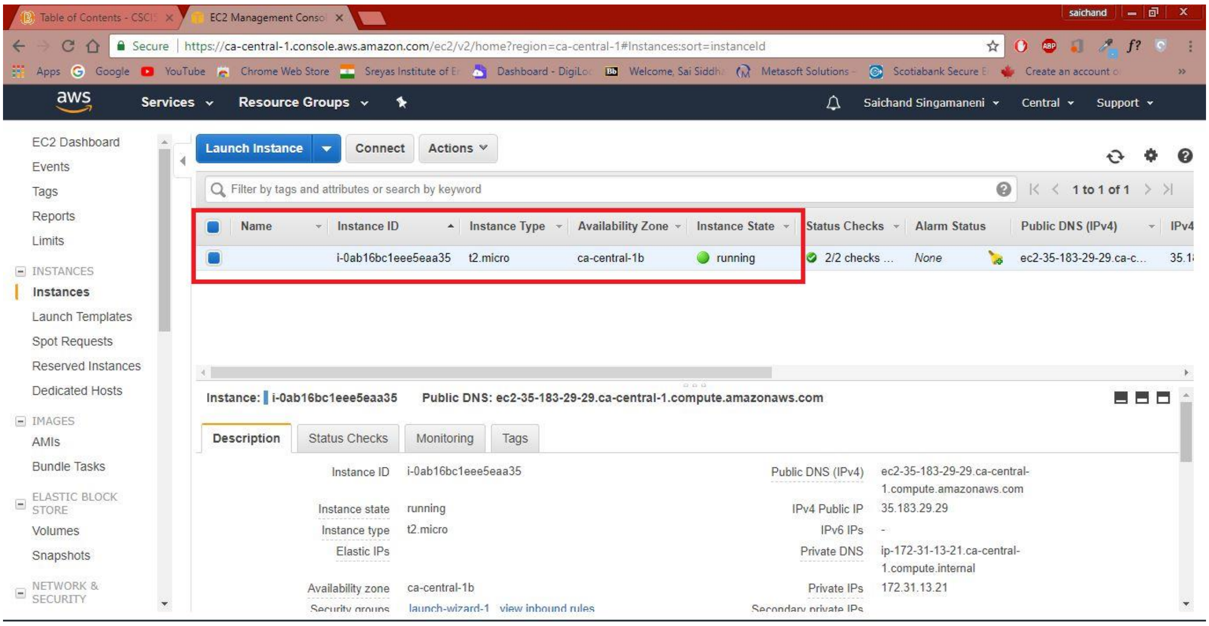
GitHub URL: https://github.com/singamanenisrisai/MySQL-and-Elastic-Search.git

1. TASK DESCRIPTION:

The purpose of the task is to analyse the most efficient data retrieval tool by comparing relational database system and cloud database. The Halifax transit data was used for the analysis.

Applications & Requirements

- Amazon AWS cloud service
- Virtual machine

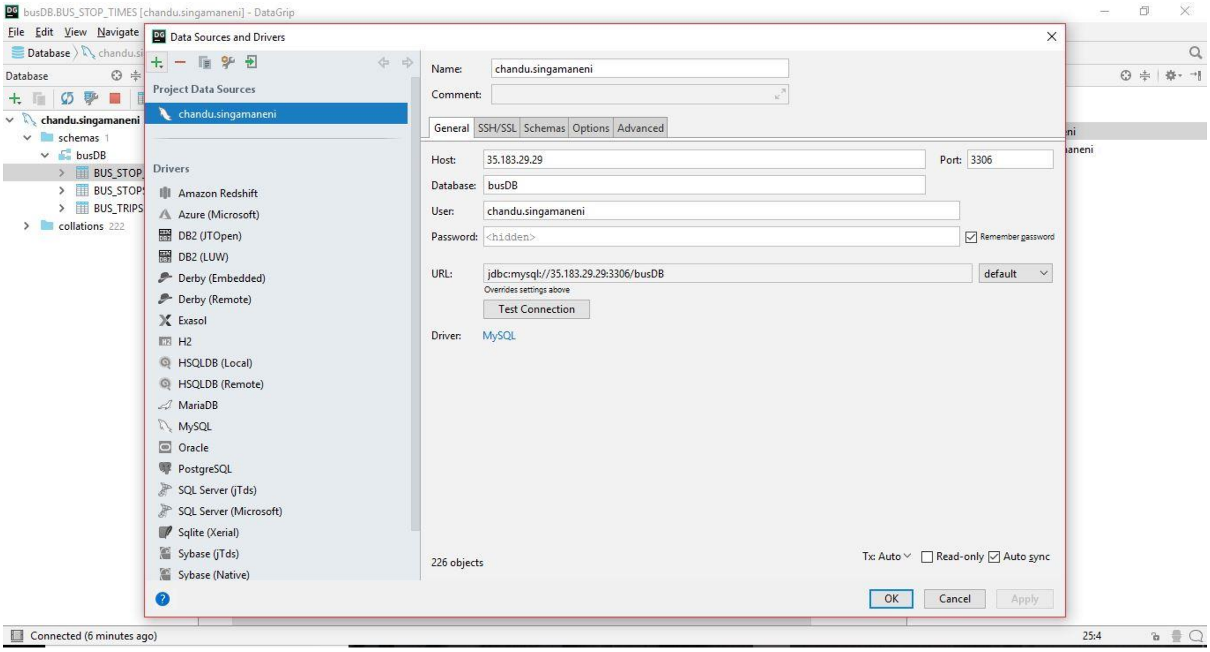


Name	Instance ID	Instance Type	Availability Zone	Instance State	Status Checks	Alarm Status	Public DNS (IPv4)	IPv4
	i-0ab16bc1eee5eaa35	t2.micro	ca-central-1b	● running	✓ 2/2 checks ...	None	ec2-35-183-29-29.ca-c...	35.1

Instance: i-0ab16bc1eee5eaa35   Public DNS: ec2-35-183-29-29.ca-central-1.compute.amazonaws.com

Instance ID	i-0ab16bc1eee5eaa35	Public DNS (IPv4)	ec2-35-183-29-29.ca-central-1.compute.amazonaws.com
Instance state	running	IPv4 Public IP	35.183.29.29
Instance type	t2.micro	IPv6 IPs	-
Elastic IPs		Private DNS	ip-172-31-13-21.ca-central-1.compute.internal
Availability zone	ca-central-1b	Private IPs	172.31.13.21
Security groups	launch-wizard-1 view inbound rules	Secondary private IPs	

- DataGrip 2018.1



Name: chandu.singamaneni

Comment:

Host: 35.183.29.29   Port: 3306

Database: busDB

User: chandu.singamaneni

Password: <hidden>   ☑ Remember password

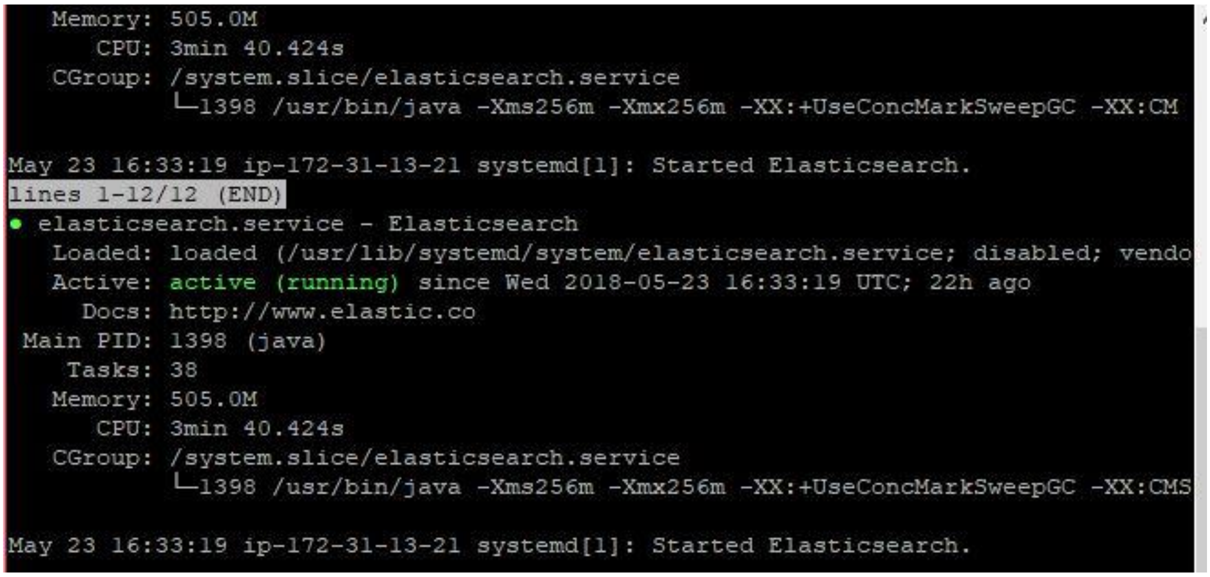
URL: jdbc:mysql://35.183.29.29:3306/busDB   default

Driver: MySQL

226 objects

Tx: Auto   ☐ Read-only   ☑ Auto sync

- Elastic Search



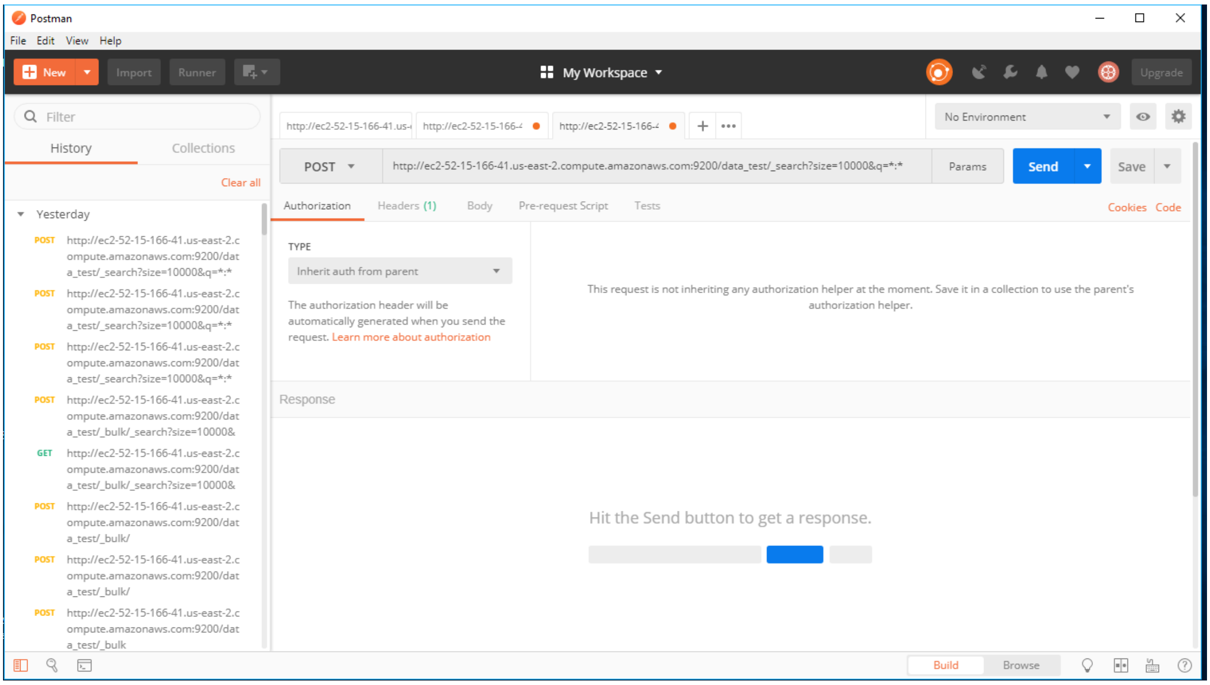
```
   Memory: 505.0M
      CPU: 3min 40.424s
   CGroup: /system.slice/elasticsearch.service
           └─1398 /usr/bin/java -Xms256m -Xmx256m -XX:+UseConcMarkSweepGC -XX:CM

May 23 16:33:19 ip-172-31-13-21 systemd[1]: Started Elasticsearch.
lines 1-12/12 (END)
● elasticsearch.service - Elasticsearch
   Loaded: loaded (/usr/lib/systemd/system/elasticsearch.service; disabled; vendo
   Active: active (running) since Wed 2018-05-23 16:33:19 UTC; 22h ago
     Docs: http://www.elastic.co
 Main PID: 1398 (java)
    Tasks: 38
   Memory: 505.0M
      CPU: 3min 40.424s
   CGroup: /system.slice/elasticsearch.service
           └─1398 /usr/bin/java -Xms256m -Xmx256m -XX:+UseConcMarkSweepGC -XX:CMS

May 23 16:33:19 ip-172-31-13-21 systemd[1]: Started Elasticsearch.
```

- PostMan

The Postman API development application used to interact with elastic search in the AWS.



POST http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_search?size=10000&q=*:*

TYPE

Inherit auth from parent

The authorization header will be automatically generated when you send the request. Learn more about authorization

This request is not inheriting any authorization helper at the moment. Save it in a collection to use the parent's authorization helper.

Response

Hit the Send button to get a response.

POST http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_search?size=10000&q=*:*

POST http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_search?size=10000&q=*:*

POST http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_search?size=10000&q=*:*

POST http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_bulk/_search?size=10000&

GET http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_bulk/_search?size=10000&

POST http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_bulk/

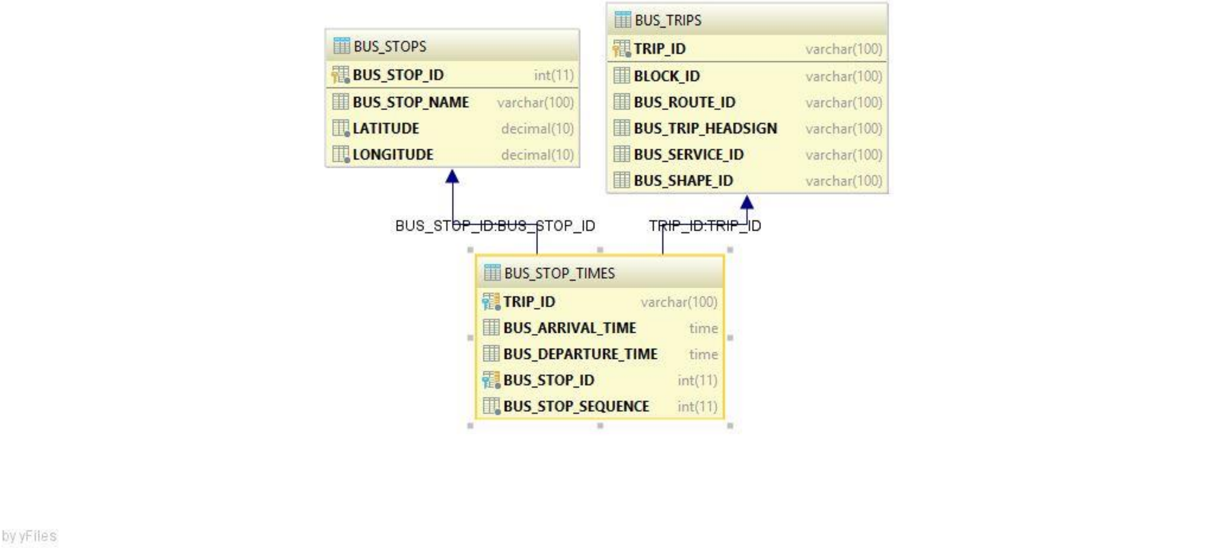
POST http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_bulk/

POST http://ec2-52-15-166-41.us-east-2.compute.amazonaws.com:9200/data_test/_bulk

We also generated RSA keys by using PuTTYgen on Windows for secure SSH authentication with OpenSSH. This is used for secure SSH access to the cloud server by using public-private key pair.

2. RELATIONAL DATABASE DESIGN:

Data Grip 2018 is used for relational data base. As we encounter some issues while importing large csv file in MySQL workbench, we found that Data Grip provides a dedicated UI for importing csv and tsv files and better performance when compared to workbench.



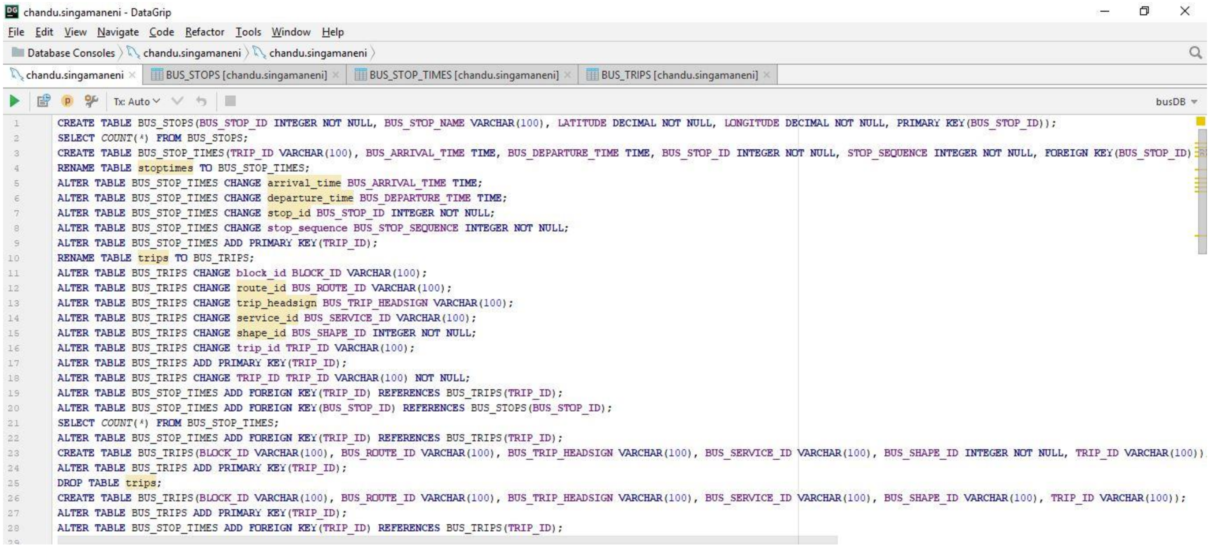
Screenshot: ER Diagram of the relational databases

Table1: BUS_STOPS (Primary Key: BUS_STOP_ID)

Table2: BUS_TRIPS (Primary Key: TRIP_ID)

Table3: BUS_STOP_TIMES (Foreign Keys: BUS_STOP_ID, TRIP_ID)

Data Formatting and setup


chandu.singamaneni - DataGrip
File Edit View Navigate Code Refactor Tools Window Help
Database Consoles 〉chandu.singamaneni 〉chandu.singamaneni 〉
chandu.singamaneni
BUS_STOPS [chandu.singamaneni]
BUS_STOP_TIMES [chandu.singamaneni]
BUS_TRIPS [chandu.singamaneni]
Tx: Auto
busDB

```
CREATE TABLE BUS_STOPS(BUS_STOP_ID INTEGER NOT NULL, BUS_STOP_NAME VARCHAR(100), LATITUDE DECIMAL NOT NULL, LONGITUDE DECIMAL NOT NULL, PRIMARY KEY(BUS_STOP_ID));
SELECT COUNT(*) FROM BUS_STOPS;
CREATE TABLE BUS_STOP_TIMES(TRIP_ID VARCHAR(100), BUS_ARRIVAL_TIME TIME, BUS_DEPARTURE_TIME TIME, BUS_STOP_ID INTEGER NOT NULL, STOP_SEQUENCE INTEGER NOT NULL, FOREIGN KEY(BUS_STOP_ID)
RENAME TABLE stoptimes TO BUS_STOP_TIMES;
ALTER TABLE BUS_STOP_TIMES CHANGE arrival_time BUS_ARRIVAL_TIME TIME;
ALTER TABLE BUS_STOP_TIMES CHANGE departure_time BUS_DEPARTURE_TIME TIME;
ALTER TABLE BUS_STOP_TIMES CHANGE stop_id BUS_STOP_ID INTEGER NOT NULL;
ALTER TABLE BUS_STOP_TIMES CHANGE stop_sequence BUS_STOP_SEQUENCE INTEGER NOT NULL;
ALTER TABLE BUS_STOP_TIMES ADD PRIMARY KEY(TRIP_ID);
RENAME TABLE trips TO BUS_TRIPS;
ALTER TABLE BUS_TRIPS CHANGE block_id BLOCK_ID VARCHAR(100);
ALTER TABLE BUS_TRIPS CHANGE route_id BUS_ROUTE_ID VARCHAR(100);
ALTER TABLE BUS_TRIPS CHANGE trip_headsign BUS_TRIP_HEADSIGN VARCHAR(100);
ALTER TABLE BUS_TRIPS CHANGE service_id BUS_SERVICE_ID VARCHAR(100);
ALTER TABLE BUS_TRIPS CHANGE shape_id BUS_SHAPE_ID INTEGER NOT NULL;
ALTER TABLE BUS_TRIPS CHANGE trip_id TRIP_ID VARCHAR(100);
ALTER TABLE BUS_TRIPS ADD PRIMARY KEY(TRIP_ID);
ALTER TABLE BUS_TRIPS CHANGE TRIP_ID TRIP_ID VARCHAR(100) NOT NULL;
ALTER TABLE BUS_STOP_TIMES ADD FOREIGN KEY(TRIP_ID) REFERENCES BUS_TRIPS(TRIP_ID);
ALTER TABLE BUS_STOP_TIMES ADD FOREIGN KEY(BUS_STOP_ID) REFERENCES BUS_STOPS(BUS_STOP_ID);
SELECT COUNT(*) FROM BUS_STOP_TIMES;
ALTER TABLE BUS_STOP_TIMES ADD FOREIGN KEY(TRIP_ID) REFERENCES BUS_TRIPS(TRIP_ID);
CREATE TABLE BUS_TRIPS(BLOCK_ID VARCHAR(100), BUS_ROUTE_ID VARCHAR(100), BUS_TRIP_HEADSIGN VARCHAR(100), BUS_SERVICE_ID VARCHAR(100), BUS_SHAPE_ID INTEGER NOT NULL, TRIP_ID VARCHAR(100))
ALTER TABLE BUS_TRIPS ADD PRIMARY KEY(TRIP_ID);
DROP TABLE trips;
CREATE TABLE BUS_TRIPS(BLOCK_ID VARCHAR(100), BUS_ROUTE_ID VARCHAR(100), BUS_TRIP_HEADSIGN VARCHAR(100), BUS_SERVICE_ID VARCHAR(100), BUS_SHAPE_ID VARCHAR(100), TRIP_ID VARCHAR(100));
ALTER TABLE BUS_TRIPS ADD PRIMARY KEY(TRIP_ID);
ALTER TABLE BUS_STOP_TIMES ADD FOREIGN KEY(TRIP_ID) REFERENCES BUS_TRIPS(TRIP_ID);
```

3. APPLICATION QUERIES:

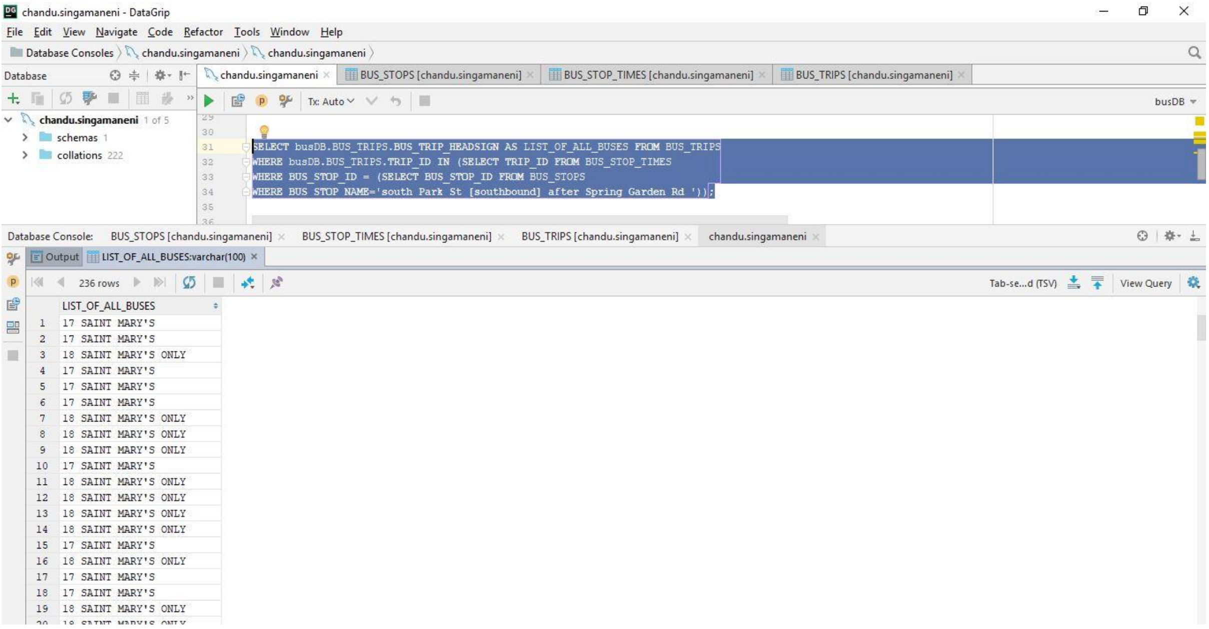
The comparison is made between the RDBMS and Elastic search in Amazon services (Amazon AWS).

- ***a. Find all buses for a particular Bus Stop***
  - ***1.Input: Bus Stop Name***
  - ***2.Output: List of all buses, response time for the search query***

SQL Query

```
SELECT busDB.BUS_TRIPS.BUS_TRIP_HEADSIGN AS LIST_OF_ALL_BUSES FROM
BUS_TRIPS WHERE busDB.BUS_TRIPS.TRIP_ID IN (SELECT TRIP_ID FROM
BUS_STOP_TIMES WHERE BUS_STOP_ID = (SELECT BUS_STOP_ID FROM BUS_STOPS
WHERE BUS_STOP_NAME='south Park St [southbound] after Spring Garden Rd
'));
```

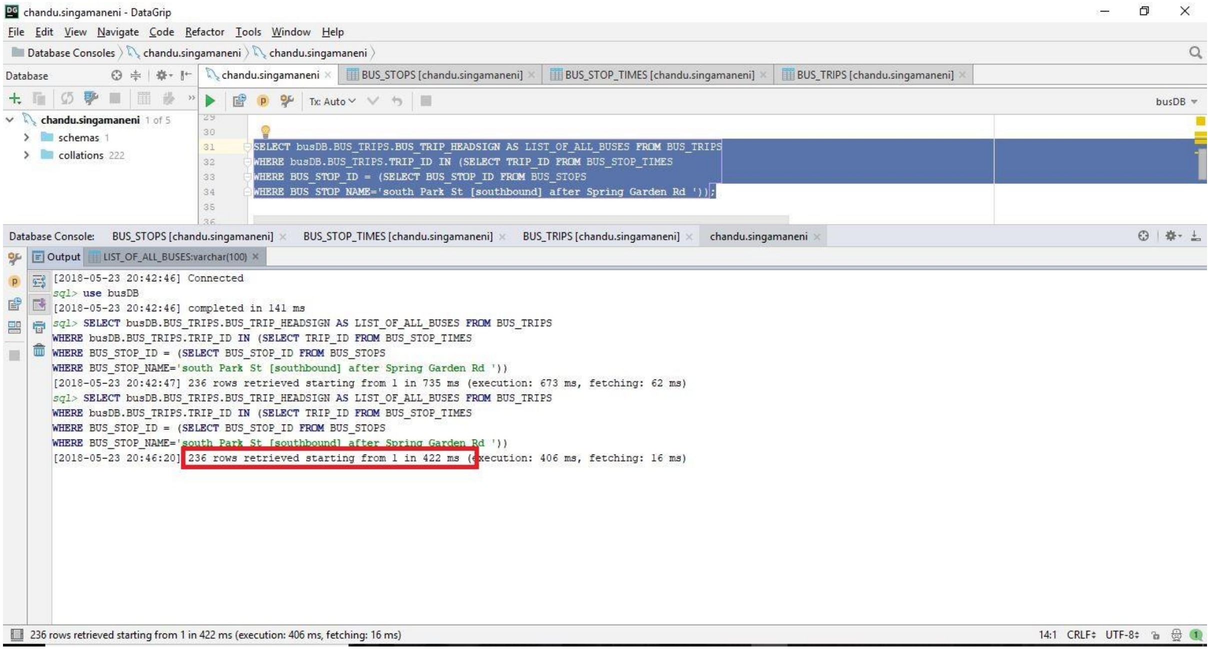
SQL Output



chandu.singamaneni - DataGrip
File Edit View Navigate Code Refactor Tools Window Help
Database Consoles 〉 chandu.singamaneni 〉 chandu.singamaneni 〉
Database
chandu.singamaneni 1 of 5
schemas 1
collations 222
chandu.singamaneni
BUS_STOPS [chandu.singamaneni]
BUS_STOP_TIMES [chandu.singamaneni]
BUS_TRIPS [chandu.singamaneni]
Tx: Auto
busDB
Database Console:
Output
LIST_OF_ALL_BUSES:varchar(100)
236 rows
Tab-se...d (TSV)
View Query

```
SELECT busDB.BUS_TRIPS.BUS_TRIP_HEADSIGN AS LIST_OF_ALL_BUSES FROM BUS_TRIPS
WHERE busDB.BUS_TRIPS.TRIP_ID IN (SELECT TRIP_ID FROM BUS_STOP_TIMES
WHERE BUS_STOP_ID = (SELECT BUS_STOP_ID FROM BUS_STOPS
WHERE BUS_STOP_NAME='south Park St [southbound] after Spring Garden Rd '));
```

	LIST_OF_ALL_BUSES
1	17 SAINT MARY'S
2	17 SAINT MARY'S
3	18 SAINT MARY'S ONLY
4	17 SAINT MARY'S
5	17 SAINT MARY'S
6	17 SAINT MARY'S
7	18 SAINT MARY'S ONLY
8	18 SAINT MARY'S ONLY
9	18 SAINT MARY'S ONLY
10	17 SAINT MARY'S
11	18 SAINT MARY'S ONLY
12	18 SAINT MARY'S ONLY
13	18 SAINT MARY'S ONLY
14	18 SAINT MARY'S ONLY
15	17 SAINT MARY'S
16	18 SAINT MARY'S ONLY
17	17 SAINT MARY'S
18	17 SAINT MARY'S
19	18 SAINT MARY'S ONLY
20	18 SAINT MARY'S ONLY



chandu.singamaneni - DataGrip
File Edit View Navigate Code Refactor Tools Window Help
Database Consoles 〉 chandu.singamaneni 〉 chandu.singamaneni 〉
Database
chandu.singamaneni 1 of 5
schemas 1
collations 222
chandu.singamaneni
BUS_STOPS [chandu.singamaneni]
BUS_STOP_TIMES [chandu.singamaneni]
BUS_TRIPS [chandu.singamaneni]
Tx: Auto
busDB
Database Console:
Output
LIST_OF_ALL_BUSES:varchar(100)

```
SELECT busDB.BUS_TRIPS.BUS_TRIP_HEADSIGN AS LIST_OF_ALL_BUSES FROM BUS_TRIPS
WHERE busDB.BUS_TRIPS.TRIP_ID IN (SELECT TRIP_ID FROM BUS_STOP_TIMES
WHERE BUS_STOP_ID = (SELECT BUS_STOP_ID FROM BUS_STOPS
WHERE BUS_STOP_NAME='south Park St [southbound] after Spring Garden Rd '));
```

```
[2018-05-23 20:42:46] Connected
sql> use busDB
[2018-05-23 20:42:46] completed in 141 ms
sql> SELECT busDB.BUS_TRIPS.BUS_TRIP_HEADSIGN AS LIST_OF_ALL_BUSES FROM BUS_TRIPS
WHERE busDB.BUS_TRIPS.TRIP_ID IN (SELECT TRIP_ID FROM BUS_STOP_TIMES
WHERE BUS_STOP_ID = (SELECT BUS_STOP_ID FROM BUS_STOPS
WHERE BUS_STOP_NAME='south Park St [southbound] after Spring Garden Rd '))
[2018-05-23 20:42:47] 236 rows retrieved starting from 1 in 735 ms (execution: 673 ms, fetching: 62 ms)
sql> SELECT busDB.BUS_TRIPS.BUS_TRIP_HEADSIGN AS LIST_OF_ALL_BUSES FROM BUS_TRIPS
WHERE busDB.BUS_TRIPS.TRIP_ID IN (SELECT TRIP_ID FROM BUS_STOP_TIMES
WHERE BUS_STOP_ID = (SELECT BUS_STOP_ID FROM BUS_STOPS
WHERE BUS_STOP_NAME='south Park St [southbound] after Spring Garden Rd '))
[2018-05-23 20:46:20] 236 rows retrieved starting from 1 in 422 ms (execution: 406 ms, fetching: 16 ms)
```

236 rows retrieved starting from 1 in 422 ms (execution: 406 ms, fetching: 16 ms)

Response Time: 422ms

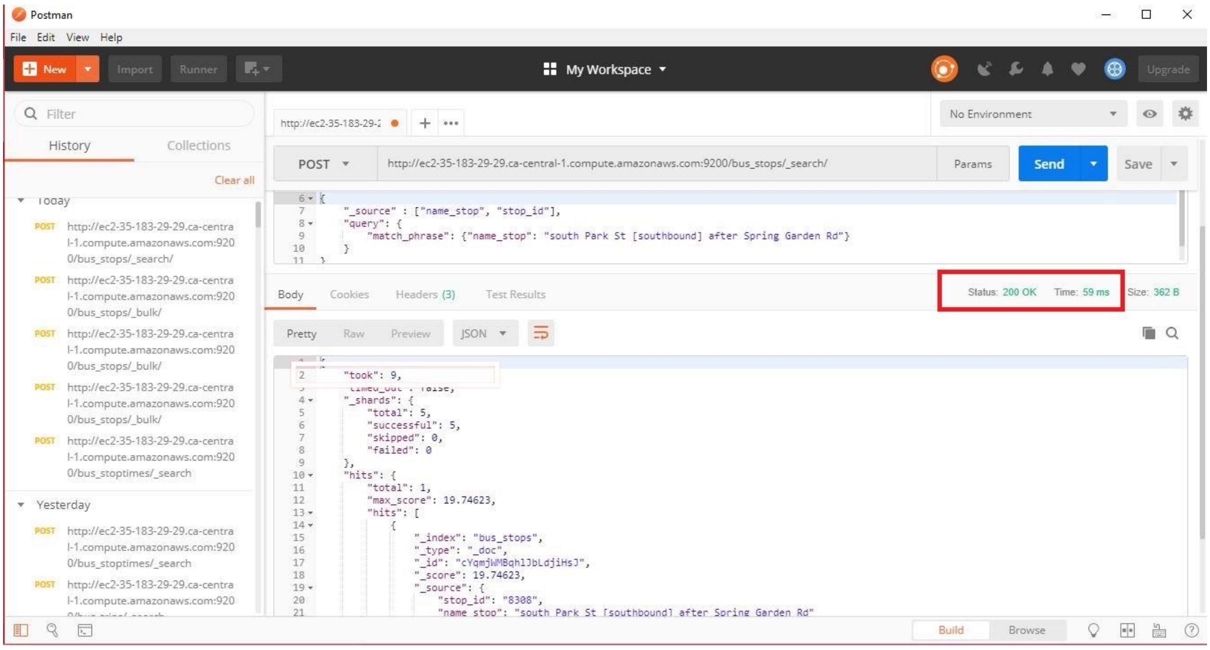
Elastic Search Query

Sub Query 1:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

```
{
        "_source" : ["name_stop", "stop_id"],
   "query": {
      "match_phrase": {"name_stop": "south Park St [southbound] after Spring Garden Rd"}
   }
}
```

Output



POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search/
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_bulk/
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_bulk/
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_bulk/
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:920

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search/

```
{
    "_source" : ["name_stop", "stop_id"],
    "query": {
        "match_phrase": {"name_stop": "south Park St [southbound] after Spring Garden Rd"}
    }
}
```

Status: 200 OK Time: 59 ms Size: 362 B

```
{
    "took": 9,
    "timed_out": false,
    "_shards": {
        "total": 5,
        "successful": 5,
        "skipped": 0,
        "failed": 0
    },
    "hits": {
        "total": 1,
        "max_score": 19.74623,
        "hits": [
            {
                "_index": "bus_stops",
                "_type": "_doc",
                "_id": "cYqmjWMBqhlJbLdjiHsJ",
                "_score": 19.74623,
                "_source": {
                    "stop_id": "8308",
                    "name_stop": "south Park St [southbound] after Spring Garden Rd"
```

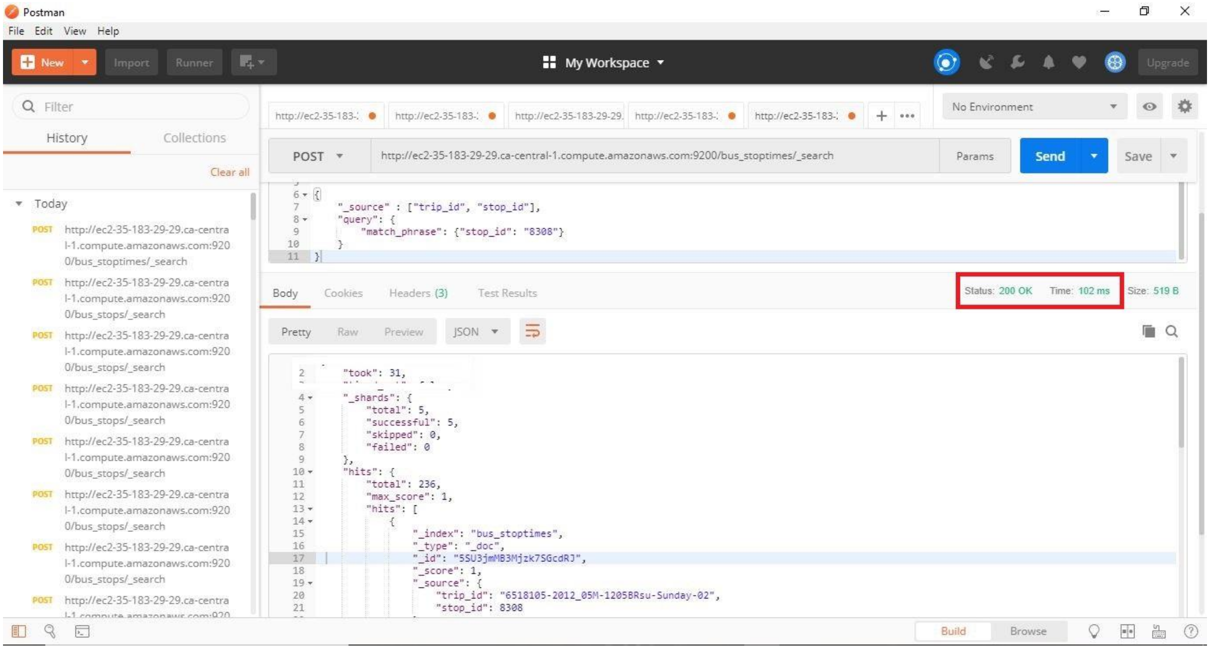
Response Time: 59ms

Sub Query 2:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

```
{
            "_source" : ["trip_id", "stop_id"],
   "query": {
      "match_phrase": {"stop_id": "8308"}
   }
}
```

Output



POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

```
{
    "_source" : ["trip_id", "stop_id"],
    "query": {
        "match_phrase": {"stop_id": "8308"}
    }
}
```

Status: 200 OK Time: 102 ms Size: 519 B

```
    "took": 31,
    "_shards": {
        "total": 5,
        "successful": 5,
        "skipped": 0,
        "failed": 0
    },
    "hits": {
        "total": 236,
        "max_score": 1,
        "hits": [
            {
                "_index": "bus_stoptimes",
                "_type": "_doc",
                "_id": "5SU3jmMB3Mjzk7SGcdRJ",
                "_score": 1,
                "_source": {
                    "trip_id": "6518105-2012_05M-1205BRsu-Sunday-02",
                    "stop_id": 8308
```

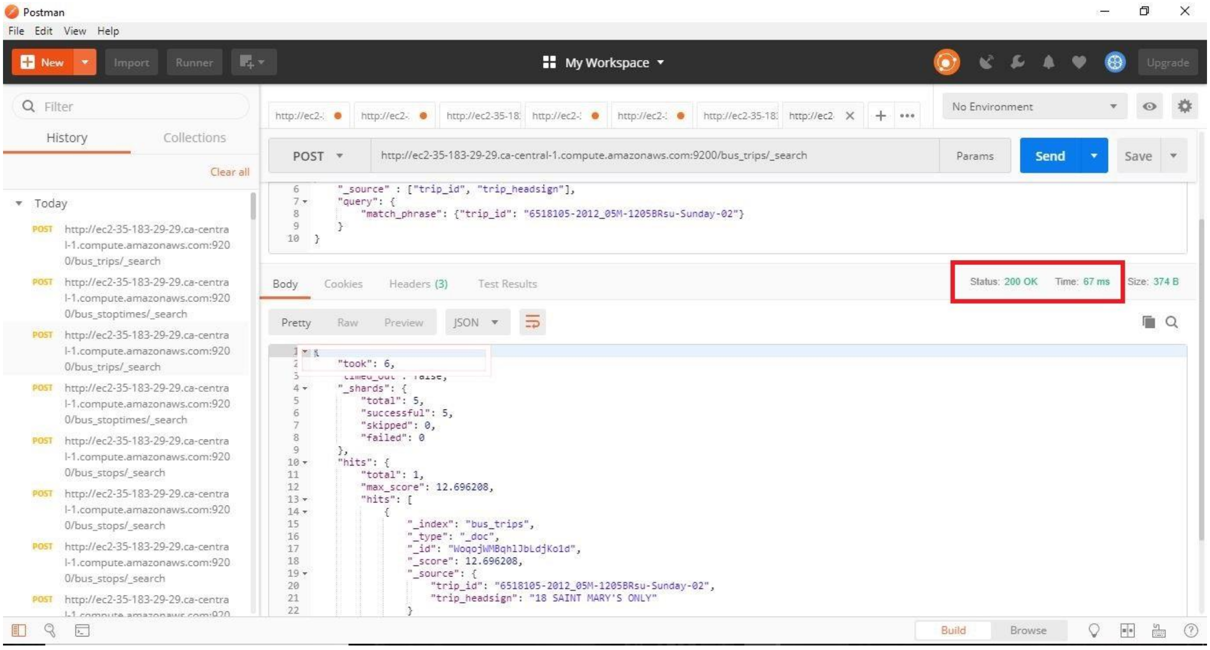
Response Time: 102ms

Sub Query 3:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search

```
{
        "_source" : ["trip_id", "trip_headsign"],
   "query": {
      "match_phrase": {"trip_id": "6518105-2012_05M-1205BRsu-Sunday-02"}
   }
}
```

Output



POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:920

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search

```
    "_source" : ["trip_id", "trip_headsign"],
    "query": {
        "match_phrase": {"trip_id": "6518105-2012_05M-1205BRsu-Sunday-02"}
    }
}
```

Status: 200 OK Time: 67 ms Size: 374 B

```
{
    "took": 6,
    "timed_out": false,
    "_shards": {
        "total": 5,
        "successful": 5,
        "skipped": 0,
        "failed": 0
    },
    "hits": {
        "total": 1,
        "max_score": 12.696208,
        "hits": [
            {
                "_index": "bus_trips",
                "_type": "_doc",
                "_id": "WoqojWMBqhlJbLdjKo1d",
                "_score": 12.696208,
                "_source": {
                    "trip_id": "6518105-2012_05M-1205BRsu-Sunday-02",
                    "trip_headsign": "18 SAINT MARY'S ONLY"
                }
```

Response Time: 67ms

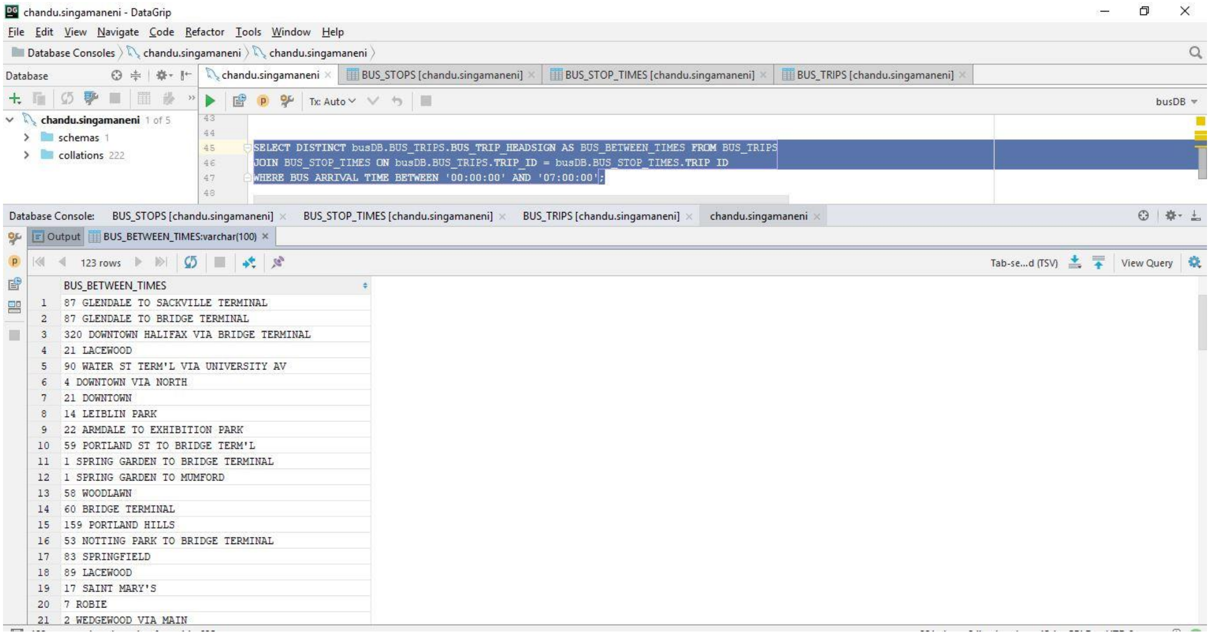
When compared both SQL and Elastic search response times (422ms, 228ms), the elastic search is more time efficient.

b. ***Find buses between two-time ranges***
1.Input: Time Range 1 (hh:mm:ss), Time Range 2 (hh:mm:ss)
2.Output: List of all buses, response time for the search query

SQL Query

```
SELECT DISTINCT busDB.BUS_TRIPS.BUS_TRIP_HEADSIGN AS BUS_BETWEEN_TIMES
FROM BUS_TRIPS JOIN BUS_STOP_TIMES ON busDB.BUS_TRIPS.TRIP_ID =
busDB.BUS_STOP_TIMES.TRIP_ID WHERE BUS_ARRIVAL_TIME BETWEEN '00:00:00'
AND '07:00:00';
```

SQL Output

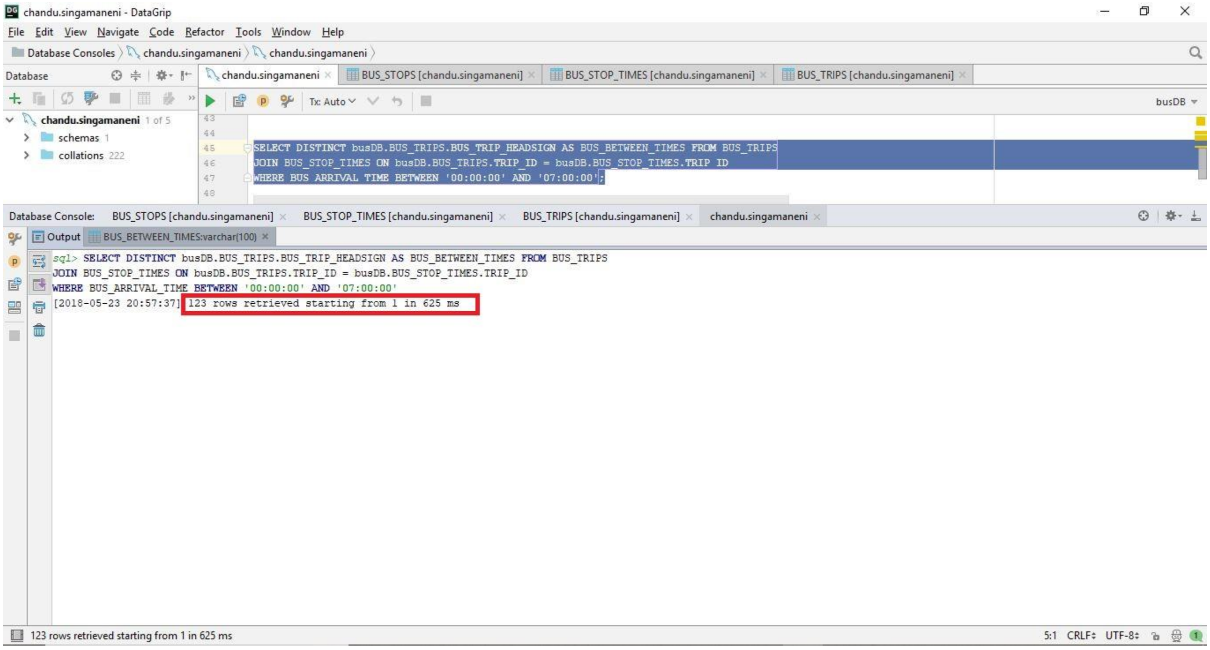


```
SELECT DISTINCT busDB.BUS_TRIPS.BUS_TRIP_HEADSIGN AS BUS_BETWEEN_TIMES FROM BUS_TRIPS
JOIN BUS_STOP_TIMES ON busDB.BUS_TRIPS.TRIP_ID = busDB.BUS_STOP_TIMES.TRIP_ID
WHERE BUS_ARRIVAL_TIME BETWEEN '00:00:00' AND '07:00:00';
```

123 rows

	BUS_BETWEEN_TIMES
1	87 GLENDALE TO SACKVILLE TERMINAL
2	87 GLENDALE TO BRIDGE TERMINAL
3	320 DOWNTOWN HALIFAX VIA BRIDGE TERMINAL
4	21 LACEWOOD
5	90 WATER ST TERM'L VIA UNIVERSITY AV
6	4 DOWNTOWN VIA NORTH
7	21 DOWNTOWN
8	14 LEIBLIN PARK
9	22 ARMDALE TO EXHIBITION PARK
10	59 PORTLAND ST TO BRIDGE TERM'L
11	1 SPRING GARDEN TO BRIDGE TERMINAL
12	1 SPRING GARDEN TO MUMFORD
13	58 WOODLAWN
14	60 BRIDGE TERMINAL
15	159 PORTLAND HILLS
16	53 NOTTING PARK TO BRIDGE TERMINAL
17	83 SPRINGFIELD
18	89 LACEWOOD
19	17 SAINT MARY'S
20	7 ROBIE
21	2 WEDGEWOOD VIA MAIN

chandu.singamaneni - DataGrip
File Edit View Navigate Code Refactor Tools Window Help
Database Consoles › chandu.singamaneni › chandu.singamaneni
Database
chandu.singamaneni 1 of 5
schemas 1
collations 222
BUS_STOPS [chandu.singamaneni]
BUS_STOP_TIMES [chandu.singamaneni]
BUS_TRIPS [chandu.singamaneni]
Tx: Auto
busDB
Database Console:
Output
BUS_BETWEEN_TIMES:varchar(100)
Tab-se...d (TSV)
View Query



```
sql> SELECT DISTINCT busDB.BUS_TRIPS.BUS_TRIP_HEADSIGN AS BUS_BETWEEN_TIMES FROM BUS_TRIPS
JOIN BUS_STOP_TIMES ON busDB.BUS_TRIPS.TRIP_ID = busDB.BUS_STOP_TIMES.TRIP_ID
WHERE BUS_ARRIVAL_TIME BETWEEN '00:00:00' AND '07:00:00'
[2018-05-23 20:57:37] 123 rows retrieved starting from 1 in 625 ms
```

123 rows retrieved starting from 1 in 625 ms

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File Edit View Navigate Code Refactor Tools Window Help
Database Consoles › chandu.singamaneni › chandu.singamaneni
Output
BUS_BETWEEN_TIMES:varchar(100)
5:1 CRLF÷ UTF-8÷

Response Time: 625ms

Elastic Search Query

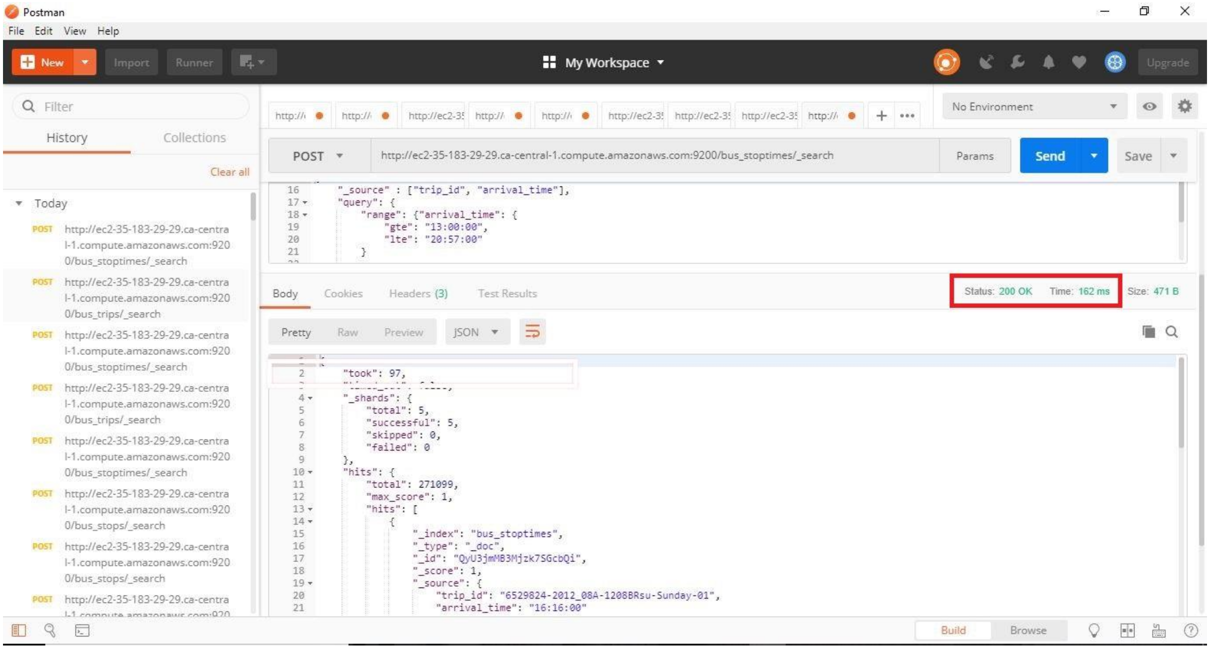
Sub Query 1:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

```
{
        "_source" : ["trip_id", "arrival_time"],
    "query": {
        "range": {"arrival_time": {
            "gte": "13:00:00",
            "lte": "20:57:00"
        }

        }
    }
}
```

Output



POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

```
"_source" : ["trip_id", "arrival_time"],
"query": {
    "range": {"arrival_time": {
        "gte": "13:00:00",
        "lte": "20:57:00"
    }
```

Status: 200 OK Time: 162 ms Size: 471 B

```
{
    "took": 97,
    "timed_out": false,
    "_shards": {
        "total": 5,
        "successful": 5,
        "skipped": 0,
        "failed": 0
    },
    "hits": {
        "total": 271099,
        "max_score": 1,
        "hits": [
            {
                "_index": "bus_stoptimes",
                "_type": "_doc",
                "_id": "QyU3jmMB3Mjzk7SGcbQi",
                "_score": 1,
                "_source": {
                    "trip_id": "6529824-2012_08A-1208BRsu-Sunday-01",
                    "arrival_time": "16:16:00"
```

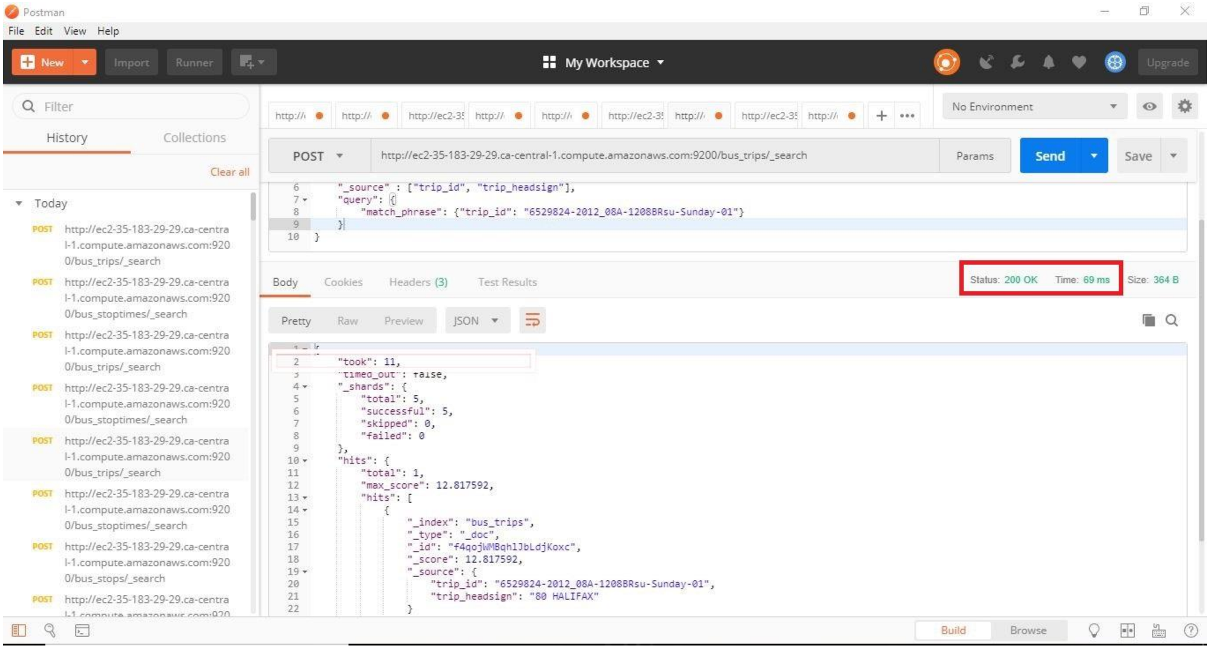
Response Time: 162ms

Sub Query 2:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search

```
{       "_source" : ["trip_id", "trip_headsign"],
    "query": {
        "match_phrase": {"trip_id": "6529824-2012_08A-1208BRsu-Sunday-01"}
    }
}
```

Output



POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:920

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search

```
    "_source" : ["trip_id", "trip_headsign"],
    "query": {
        "match_phrase": {"trip_id": "6529824-2012_08A-1208BRsu-Sunday-01"}
    }
}
```

Status: 200 OK Time: 69 ms Size: 364 B

```
{
    "took": 11,
    "timed_out": false,
    "_shards": {
        "total": 5,
        "successful": 5,
        "skipped": 0,
        "failed": 0
    },
    "hits": {
        "total": 1,
        "max_score": 12.817592,
        "hits": [
            {
                "_index": "bus_trips",
                "_type": "_doc",
                "_id": "f4qojWMBqhlJbLdjKoxc",
                "_score": 12.817592,
                "_source": {
                    "trip_id": "6529824-2012_08A-1208BRsu-Sunday-01",
                    "trip_headsign": "80 HALIFAX"
                }
```

Response Time: 69ms

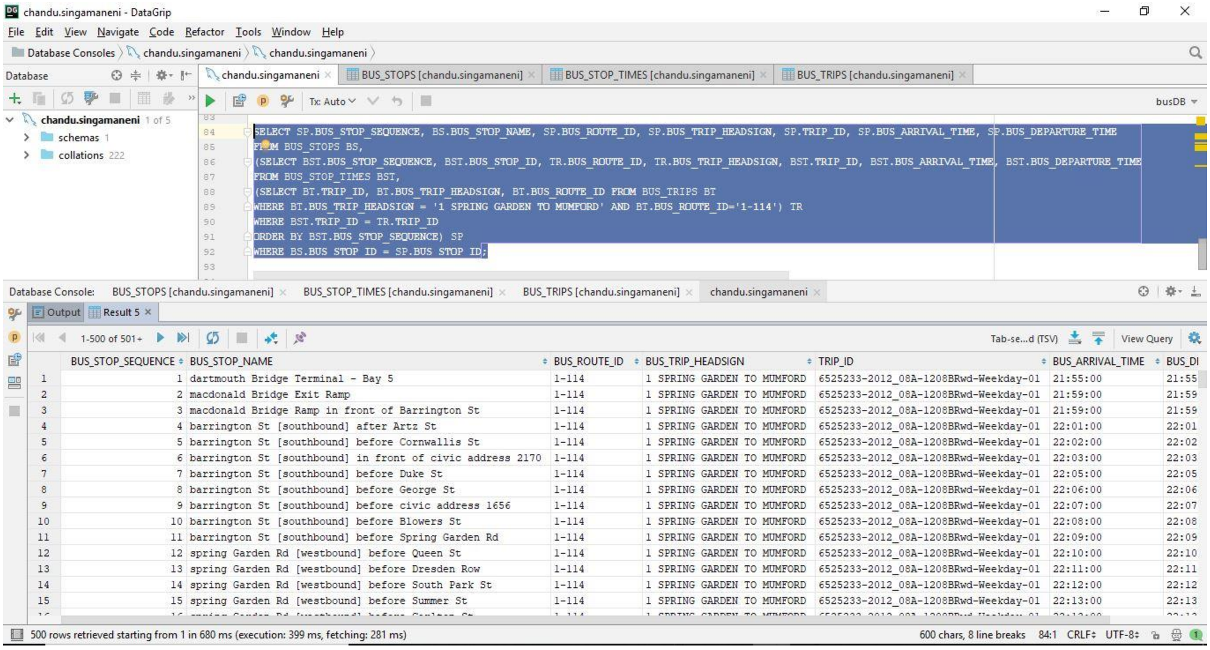
When compared both SQL and Elastic search response times (625ms, 231ms), the elastic search is more time efficient.

c. ***Find route information of a particular bus on a particular route***
1.Input: Bus Name, Route Name
2.Output: List of all routes, response time for the search query

SQL Query

```
SELECT SP.BUS_STOP_SEQUENCE, BS.BUS_STOP_NAME, SP.BUS_ROUTE_ID,
SP.BUS_TRIP_HEADSIGN, SP.TRIP_ID, SP.BUS_ARRIVAL_TIME,
SP.BUS_DEPARTURE_TIME FROM BUS_STOPS BS,(SELECT BST.BUS_STOP_SEQUENCE,
BST.BUS_STOP_ID, TR.BUS_ROUTE_ID, TR.BUS_TRIP_HEADSIGN, BST.TRIP_ID,
BST.BUS_ARRIVAL_TIME, BST.BUS_DEPARTURE_TIME FROM BUS_STOP_TIMES
BST,(SELECT BT.TRIP_ID, BT.BUS_TRIP_HEADSIGN, BT.BUS_ROUTE_ID FROM
BUS_TRIPS BT WHERE BT.BUS_TRIP_HEADSIGN = '1 SPRING GARDEN TO MUMFORD'
AND BT.BUS_ROUTE_ID='1-114') TR WHERE BST.TRIP_ID = TR.TRIP_ID ORDER BY
BST.BUS_STOP_SEQUENCE) SP WHERE BS.BUS_STOP_ID = SP.BUS_STOP_ID;
```

SQL Output

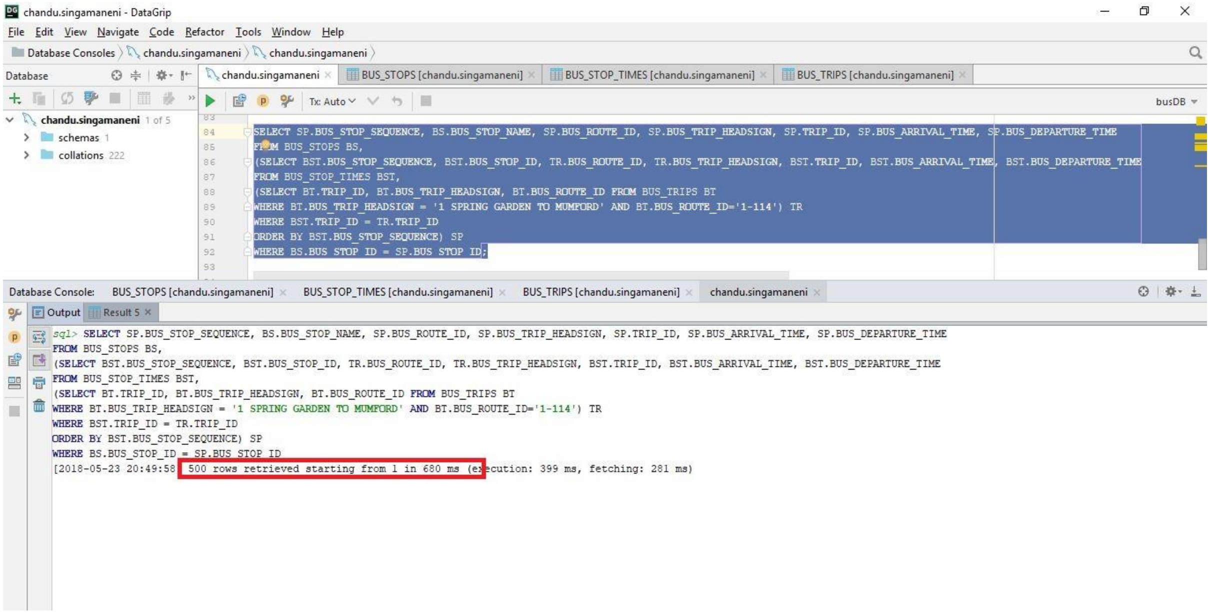


```
SELECT SP.BUS_STOP_SEQUENCE, BS.BUS_STOP_NAME, SP.BUS_ROUTE_ID, SP.BUS_TRIP_HEADSIGN, SP.TRIP_ID, SP.BUS_ARRIVAL_TIME, SP.BUS_DEPARTURE_TIME
FROM BUS_STOPS BS,
(SELECT BST.BUS_STOP_SEQUENCE, BST.BUS_STOP_ID, TR.BUS_ROUTE_ID, TR.BUS_TRIP_HEADSIGN, BST.TRIP_ID, BST.BUS_ARRIVAL_TIME, BST.BUS_DEPARTURE_TIME
FROM BUS_STOP_TIMES BST,
(SELECT BT.TRIP_ID, BT.BUS_TRIP_HEADSIGN, BT.BUS_ROUTE_ID FROM BUS_TRIPS BT
WHERE BT.BUS_TRIP_HEADSIGN = '1 SPRING GARDEN TO MUMFORD' AND BT.BUS_ROUTE_ID='1-114') TR
WHERE BST.TRIP_ID = TR.TRIP_ID
ORDER BY BST.BUS_STOP_SEQUENCE) SP
WHERE BS.BUS_STOP_ID = SP.BUS_STOP_ID;
```

1-500 of 501+

	BUS_STOP_SEQUENCE	BUS_STOP_NAME	BUS_ROUTE_ID	BUS_TRIP_HEADSIGN	TRIP_ID	BUS_ARRIVAL_TIME	BUS_DI
1	1	dartmouth Bridge Terminal - Bay 5	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	21:55:00	21:55
2	2	macdonald Bridge Exit Ramp	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	21:59:00	21:59
3	3	macdonald Bridge Ramp in front of Barrington St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	21:59:00	21:59
4	4	barrington St [southbound] after Artz St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:01:00	22:01
5	5	barrington St [southbound] before Cornwallis St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:02:00	22:02
6	6	barrington St [southbound] in front of civic address 2170	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:03:00	22:03
7	7	barrington St [southbound] before Duke St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:05:00	22:05
8	8	barrington St [southbound] before George St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:06:00	22:06
9	9	barrington St [southbound] before civic address 1656	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:07:00	22:07
10	10	barrington St [southbound] before Blowers St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:08:00	22:08
11	11	barrington St [southbound] before Spring Garden Rd	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:09:00	22:09
12	12	spring Garden Rd [westbound] before Queen St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:10:00	22:10
13	13	spring Garden Rd [westbound] before Dresden Row	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:11:00	22:11
14	14	spring Garden Rd [westbound] before South Park St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:12:00	22:12
15	15	spring Garden Rd [westbound] before Summer St	1-114	1 SPRING GARDEN TO MUMFORD	6525233-2012_08A-1208BRwd-Weekday-01	22:13:00	22:13

500 rows retrieved starting from 1 in 680 ms (execution: 399 ms, fetching: 281 ms)



```
SELECT SP.BUS_STOP_SEQUENCE, BS.BUS_STOP_NAME, SP.BUS_ROUTE_ID, SP.BUS_TRIP_HEADSIGN, SP.TRIP_ID, SP.BUS_ARRIVAL_TIME, SP.BUS_DEPARTURE_TIME
FROM BUS_STOPS BS,
(SELECT BST.BUS_STOP_SEQUENCE, BST.BUS_STOP_ID, TR.BUS_ROUTE_ID, TR.BUS_TRIP_HEADSIGN, BST.TRIP_ID, BST.BUS_ARRIVAL_TIME, BST.BUS_DEPARTURE_TIME
FROM BUS_STOP_TIMES BST,
(SELECT BT.TRIP_ID, BT.BUS_TRIP_HEADSIGN, BT.BUS_ROUTE_ID FROM BUS_TRIPS BT
WHERE BT.BUS_TRIP_HEADSIGN = '1 SPRING GARDEN TO MUMFORD' AND BT.BUS_ROUTE_ID='1-114') TR
WHERE BST.TRIP_ID = TR.TRIP_ID
ORDER BY BST.BUS_STOP_SEQUENCE) SP
WHERE BS.BUS_STOP_ID = SP.BUS_STOP_ID;
```

```
sql> SELECT SP.BUS_STOP_SEQUENCE, BS.BUS_STOP_NAME, SP.BUS_ROUTE_ID, SP.BUS_TRIP_HEADSIGN, SP.TRIP_ID, SP.BUS_ARRIVAL_TIME, SP.BUS_DEPARTURE_TIME
FROM BUS_STOPS BS,
(SELECT BST.BUS_STOP_SEQUENCE, BST.BUS_STOP_ID, TR.BUS_ROUTE_ID, TR.BUS_TRIP_HEADSIGN, BST.TRIP_ID, BST.BUS_ARRIVAL_TIME, BST.BUS_DEPARTURE_TIME
FROM BUS_STOP_TIMES BST,
(SELECT BT.TRIP_ID, BT.BUS_TRIP_HEADSIGN, BT.BUS_ROUTE_ID FROM BUS_TRIPS BT
WHERE BT.BUS_TRIP_HEADSIGN = '1 SPRING GARDEN TO MUMFORD' AND BT.BUS_ROUTE_ID='1-114') TR
WHERE BST.TRIP_ID = TR.TRIP_ID
ORDER BY BST.BUS_STOP_SEQUENCE) SP
WHERE BS.BUS_STOP_ID = SP.BUS_STOP_ID
[2018-05-23 20:49:58] 500 rows retrieved starting from 1 in 680 ms (execution: 399 ms, fetching: 281 ms)
```

Response Time: 680ms

Elastic Search Query

Sub Query 1:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search

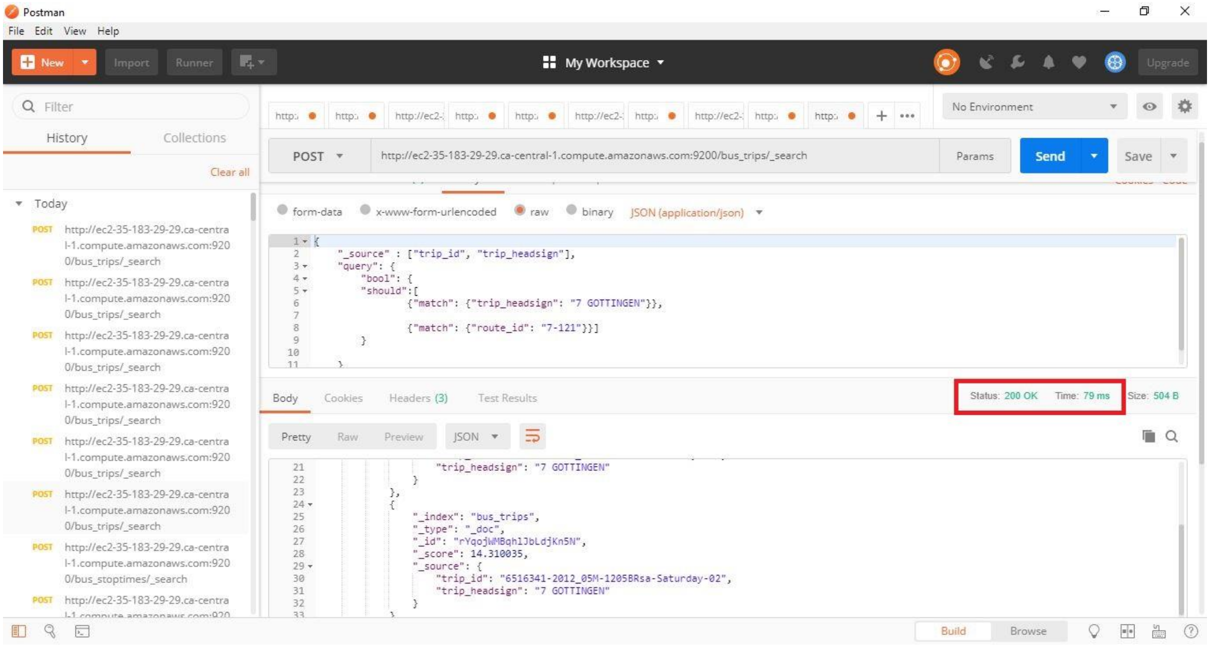
```
{
        "_source" : ["trip_id", "trip_headsign"],
  "query": {
```

```
            "bool": {
                        "should":[
                                    {"match": {"trip_headsign": "7 GOTTINGEN"}},


                                    {"match": {"route_id": "7-121"}}]
            }


    }
}
```

Output



POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
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POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:920

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search

```
{
    "_source" : ["trip_id", "trip_headsign"],
    "query": {
        "bool": {
        "should":[
                {"match": {"trip_headsign": "7 GOTTINGEN"}},

                {"match": {"route_id": "7-121"}}]
        }

    }
```

Status: 200 OK   Time: 79 ms   Size: 504 B

```
                        "trip_headsign": "7 GOTTINGEN"
                    }
                },
                {
                    "_index": "bus_trips",
                    "_type": "_doc",
                    "_id": "rYqojWMBqhlJbLdjKn5N",
                    "_score": 14.310035,
                    "_source": {
                        "trip_id": "6516341-2012_05M-1205BRsa-Saturday-02",
                        "trip_headsign": "7 GOTTINGEN"
                    }
                }
```

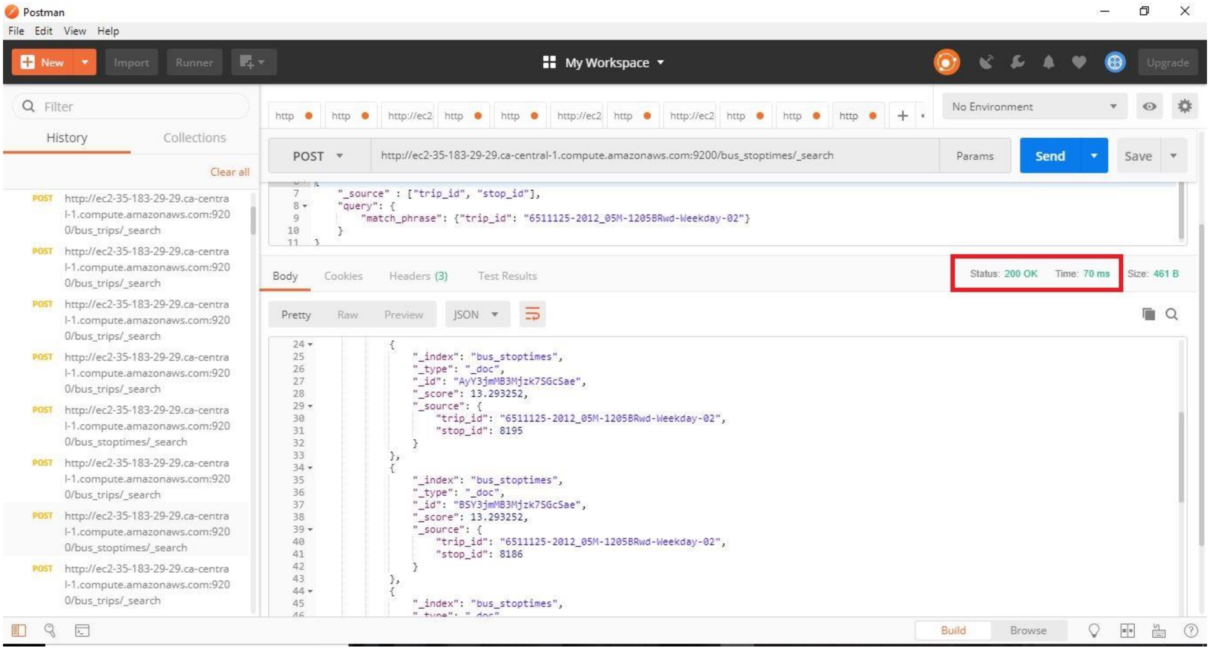
Response Time: 79ms

Sub Query 2:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

```
{
            "_source" : ["trip_id", "stop_id"],
    "query": {
        "match_phrase": {"trip_id": "6511125-2012_05M-1205BRwd-Weekday-02"}
    }
}
```

Output



POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

```
{
    "_source" : ["trip_id", "stop_id"],
    "query": {
        "match_phrase": {"trip_id": "6511125-2012_05M-1205BRwd-Weekday-02"}
    }
}
```

Status: 200 OK Time: 70 ms Size: 461 B

```
            {
                "_index": "bus_stoptimes",
                "_type": "_doc",
                "_id": "AyY3jmMB3Mjzk7SGcSae",
                "_score": 13.293252,
                "_source": {
                    "trip_id": "6511125-2012_05M-1205BRwd-Weekday-02",
                    "stop_id": 8195
                }
            },
            {
                "_index": "bus_stoptimes",
                "_type": "_doc",
                "_id": "BSY3jmMB3Mjzk7SGcSae",
                "_score": 13.293252,
                "_source": {
                    "trip_id": "6511125-2012_05M-1205BRwd-Weekday-02",
                    "stop_id": 8186
                }
            },
            {
                "_index": "bus_stoptimes",
```

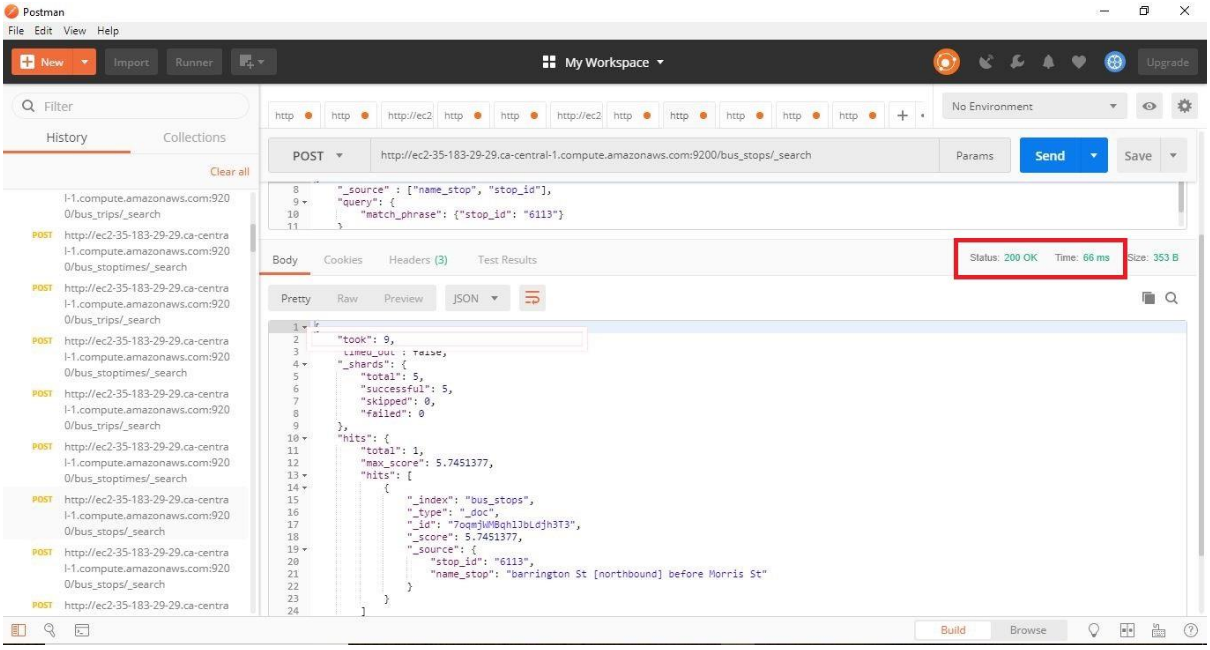
Response Time: 70ms

Sub Query 3:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

```
{
            "_source" : ["name_stop", "stop_id"],
    "query": {
        "match_phrase": {"stop_id": "6113"}
    }
}
```

Output


Postman
File Edit View Help
New
Import
Runner
My Workspace
Upgrade
Filter
History
Collections
Clear all
l-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-centra
http
http://ec2
No Environment
Params
Send
Save
Body
Cookies
Headers (3)
Test Results
Pretty
Raw
Preview
JSON
Build
Browse

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

```
    "_source" : ["name_stop", "stop_id"],
    "query": {
        "match_phrase": {"stop_id": "6113"}
    }
```

Status: 200 OK Time: 66 ms Size: 353 B

```
{
    "took": 9,
    "timed_out": false,
    "_shards": {
        "total": 5,
        "successful": 5,
        "skipped": 0,
        "failed": 0
    },
    "hits": {
        "total": 1,
        "max_score": 5.7451377,
        "hits": [
            {
                "_index": "bus_stops",
                "_type": "_doc",
                "_id": "7oqmjWMBqhlJbLdjh3T3",
                "_score": 5.7451377,
                "_source": {
                    "stop_id": "6113",
                    "name_stop": "barrington St [northbound] before Morris St"
                }
            }
        ]
```

Response Time: 66ms

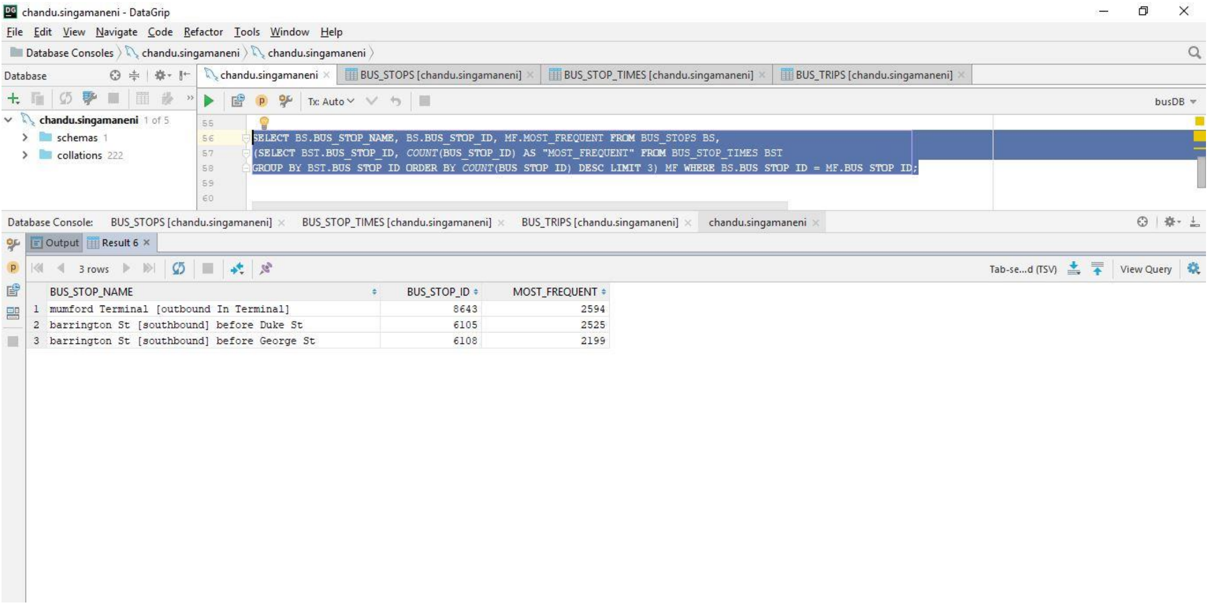
When compared both SQL and Elastic search response times (680ms, 215ms), the elastic search is more time efficient.

d. Find top 3 bus stops that are the busiest throughout the day in terms of bus routes. (Hint: The bus stops with high volume of bus routes and close time gaps would be considered as busiest).
1.Input: None
2.Output: List of Bus Name, response time for the search query

SQL Query

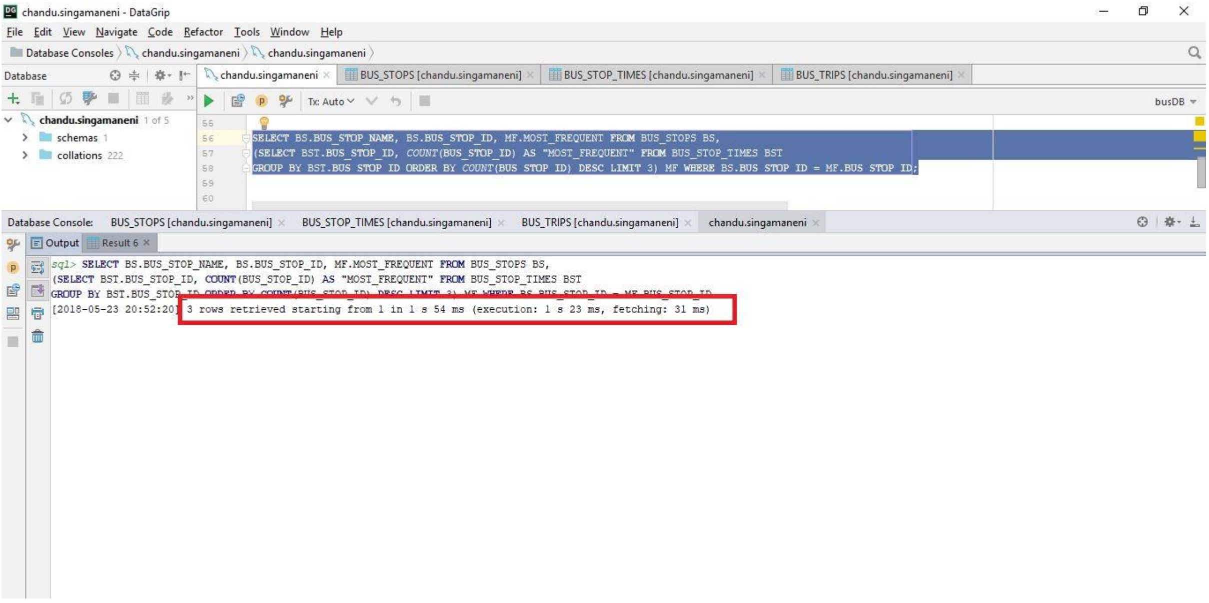
```
SELECT BS.BUS_STOP_NAME, BS.BUS_STOP_ID, MF.MOST_FREQUENT FROM
BUS_STOPS BS,(SELECT BST.BUS_STOP_ID, COUNT(BUS_STOP_ID) AS
"MOST_FREQUENT" FROM BUS_STOP_TIMES BST GROUP BY BST.BUS_STOP_ID ORDER
BY COUNT(BUS_STOP_ID) DESC LIMIT 3) MF WHERE BS.BUS_STOP_ID =
MF.BUS_STOP_ID;
```

SQL Output


chandu.singamaneni - DataGrip
File Edit View Navigate Code Refactor Tools Window Help
Database Consoles 〉 chandu.singamaneni 〉 chandu.singamaneni
Database
chandu.singamaneni 1 of 5
schemas 1
collations 222
chandu.singamaneni
BUS_STOPS [chandu.singamaneni]
BUS_STOP_TIMES [chandu.singamaneni]
BUS_TRIPS [chandu.singamaneni]
Tx: Auto
busDB
Database Console:
Output
Result 6
3 rows
Tab-se...d (TSV)
View Query

```
SELECT BS.BUS_STOP_NAME, BS.BUS_STOP_ID, MF.MOST_FREQUENT FROM BUS_STOPS BS,
(SELECT BST.BUS_STOP_ID, COUNT(BUS_STOP_ID) AS "MOST_FREQUENT" FROM BUS_STOP_TIMES BST
GROUP BY BST.BUS_STOP_ID ORDER BY COUNT(BUS_STOP_ID) DESC LIMIT 3) MF WHERE BS.BUS_STOP_ID = MF.BUS_STOP_ID;
```

	BUS_STOP_NAME	BUS_STOP_ID	MOST_FREQUENT
1	mumford Terminal [outbound In Terminal]	8643	2594
2	barrington St [southbound] before Duke St	6105	2525
3	barrington St [southbound] before George St	6108	2199


chandu.singamaneni - DataGrip
File Edit View Navigate Code Refactor Tools Window Help
Database Consoles 〉 chandu.singamaneni 〉 chandu.singamaneni
Database
chandu.singamaneni 1 of 5
schemas 1
collations 222
Tx: Auto
busDB
Database Console:
Output
Result 6

```
sql> SELECT BS.BUS_STOP_NAME, BS.BUS_STOP_ID, MF.MOST_FREQUENT FROM BUS_STOPS BS,
(SELECT BST.BUS_STOP_ID, COUNT(BUS_STOP_ID) AS "MOST_FREQUENT" FROM BUS_STOP_TIMES BST
GROUP BY BST.BUS_STOP_ID ORDER BY COUNT(BUS_STOP_ID) DESC LIMIT 3) MF WHERE BS.BUS_STOP_ID = MF.BUS_STOP_ID
[2018-05-23 20:52:20] 3 rows retrieved starting from 1 in 1 s 54 ms (execution: 1 s 23 ms, fetching: 31 ms)
```

Response Time: 1054ms

Elastic Search Query

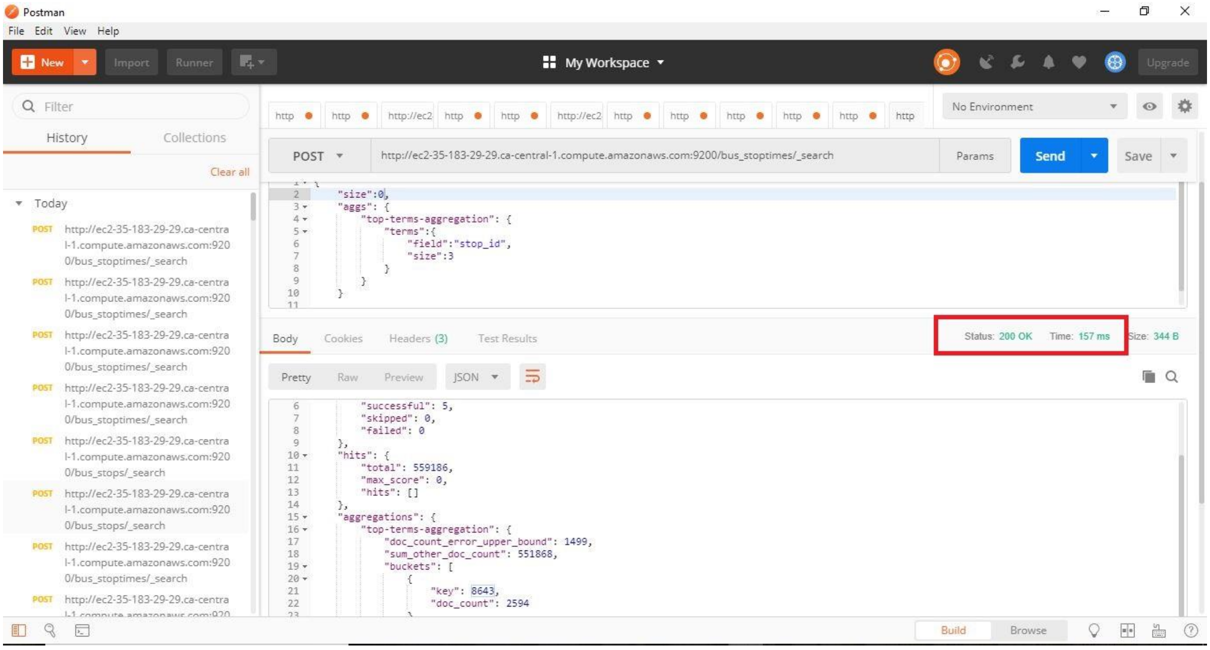
Sub Query 1:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

```
{
        "size":0,
        "aggs": {
                "top-terms-aggregation": {
                        "terms":{
                                "field":"stop_id",
                                "size":3
                        }
                }
        }

}
```

Output



Postman
File Edit View Help
New
Import
Runner
My Workspace
Upgrade
Filter
History
Collections
Clear all
Today
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:920
No Environment
Params
Send
Save
Body
Cookies
Headers (3)
Test Results
Pretty
Raw
Preview
JSON
Build
Browse

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search

```
    "size":0,
    "aggs": {
        "top-terms-aggregation": {
            "terms":{
                "field":"stop_id",
                "size":3
            }
        }
    }
```

Status: 200 OK Time: 157 ms Size: 344 B

```
        "successful": 5,
        "skipped": 0,
        "failed": 0
    },
    "hits": {
        "total": 559186,
        "max_score": 0,
        "hits": []
    },
    "aggregations": {
        "top-terms-aggregation": {
            "doc_count_error_upper_bound": 1499,
            "sum_other_doc_count": 551868,
            "buckets": [
                {
                    "key": 8643,
                    "doc_count": 2594
```

Response Time: 157ms

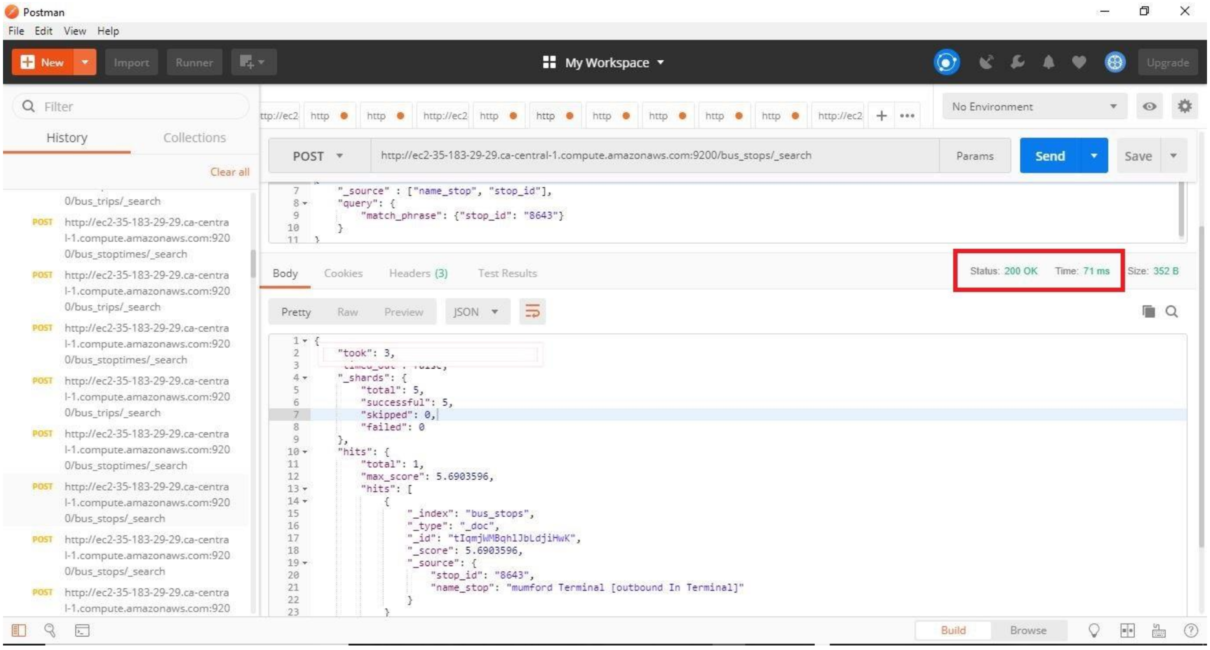
Sub Query 2:

URL: http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

```
{
        "_source": ["name_stop", "stop_id"],
  "query": {
    "match_phrase": {"stop_id": "8643"}
  }
```

}

Output



0/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_trips/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stoptimes/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search
POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:920

POST http://ec2-35-183-29-29.ca-central-1.compute.amazonaws.com:9200/bus_stops/_search

```
    "_source" : ["name_stop", "stop_id"],
    "query": {
        "match_phrase": {"stop_id": "8643"}
    }
}
```

Status: 200 OK Time: 71 ms Size: 352 B

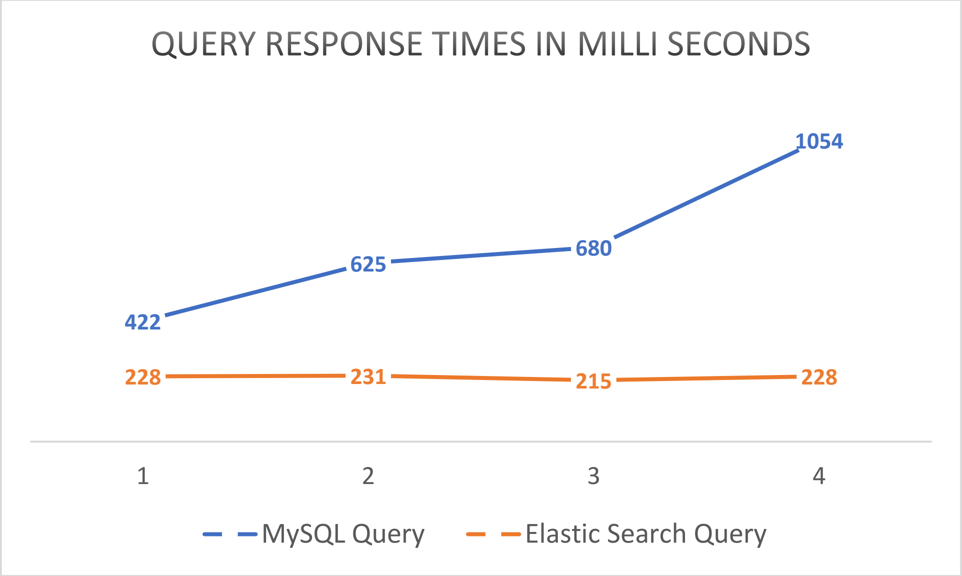
```
{
    "took": 3,
    "timed_out": false,
    "_shards": {
        "total": 5,
        "successful": 5,
        "skipped": 0,
        "failed": 0
    },
    "hits": {
        "total": 1,
        "max_score": 5.6903596,
        "hits": [
            {
                "_index": "bus_stops",
                "_type": "_doc",
                "_id": "tIqmjWMBqhlJbLdjiHwK",
                "_score": 5.6903596,
                "_source": {
                    "stop_id": "8643",
                    "name_stop": "mumford Terminal [outbound In Terminal]"
                }
            }
```

Response Time: 71ms

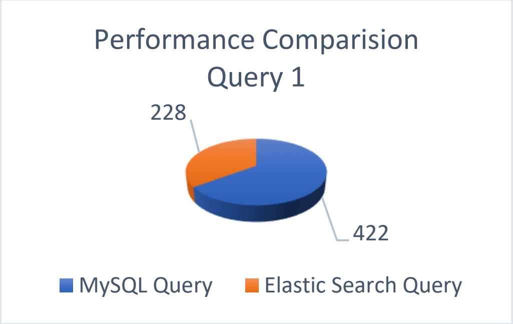
When compared both SQL and Elastic search response times (1054ms, 228ms), the elastic search is more time efficient.

4. TEST RESULTS:

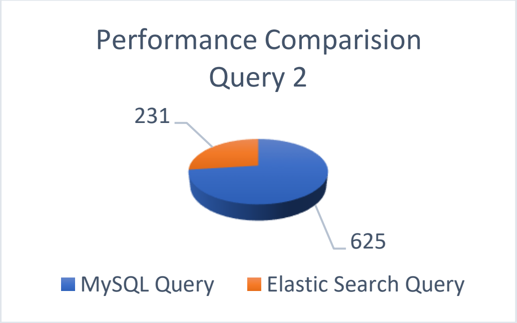
The below diagram is the timeline for the time taken by all the queries to execute and fetch the data from the server.



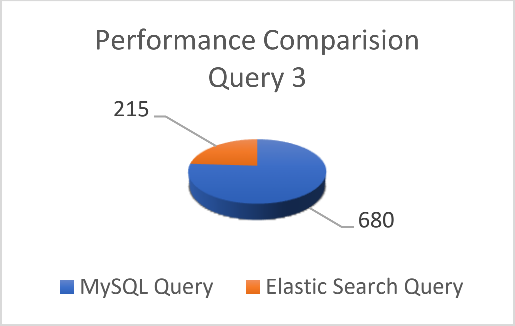
The below diagrams are the comparison of the performance of MySQL and Elastic Search query on the basis execution and fetch time



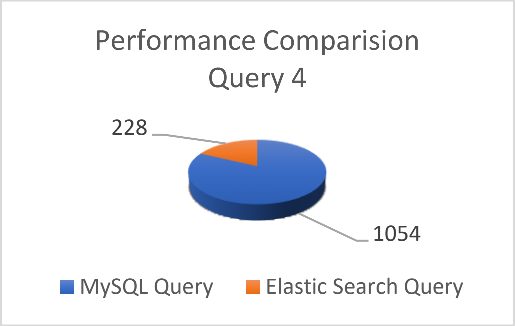
ELASTIC SEARCH QUERY IS 1.8 FASTER THAN SQL QUERY



ELASTIC SEARCH QUERY IS 2.7 FASTER THAN SQL QUERY



ELASTIC SEARCH QUERY IS 3.1 FASTER THAN SQL QUERY



ELASTIC SEARCH QUERY IS 4.6 FASTER THAN SQL QUERY

5. SUMMARY:

This assignment helped us to explore different applications such as Amazon could services, MySQL Workbench, Data Grip, Elastic search and Postman. The Halifax transit data was used in classical relational database and compared with the elastic search i.e., NoSQL database to analyse the performance and execution of queries in retrieving data. After using all these tools, we had an opportunity to learn how to use the infrastructure services on amazon cloud and implementation and connectivity of different databases on cloud. Finally, comparing both the response times of MySQL and Elastic search, we analysed that queries in elastic search executed more rapidly and is better and faster mechanism to retrieve and store data. Although, the implementation in traditional databases are easier than the NoSQL databases.

References

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