

# **ASSIGNMENT - 06**

**Traffic Monitoring Application using  
Spark, Kafka, and MapReduce  
Technology**

**IS 41248**

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# Traffic Data Monitoring Application

This document shows the development of IoT data processing and monitoring application using Spark Stream. This application takes real-time IoT data sent by connected vehicles and monitors traffic in a variety of ways. This application will be divided into three modules.

They are,

- IoT Data Producer
- IoT Data Processor
- IoT Data Dashboard

These modules are standalone Java Maven programs that can be generated and operated on their own.

## **IoT Data Producer**

IoT messages are generated by connected vehicles. These are captured by a news broker before being processed and sent to the streaming application. IoT Data Maker is a simulator application for vehicles connected to this type of application, and it generates IoT data events using Apache Kafka.

## **IoT Data Processor**

This application is a spark streaming application. It uses IoT data streams and processes them for traffic data analysis. The following measurements are provided by the IoT data processor.

- Get the total number of cars for various sorts of vehicles on various routes and store them in a Cassandra database.
- For the last 30 seconds, get a car count for different types of vehicles on various routes and save it in the Cassandra database.
- Obtain information about vehicles within a certain perimeter of specified Point of Interest (POI) and store it in the Cassandra database

## **IoT Data Dashboard**

It is a spring boot application that takes data from the Cassandra database and sends it to a webpage. This program uses web sockets and jQuery to push data into the web page at predetermined intervals, ensuring that the data is updated automatically. The data is shown in the tables and diagrams in the dashboard.

The following figure 1 shows the architecture of the Traffic Data Monitoring Application.

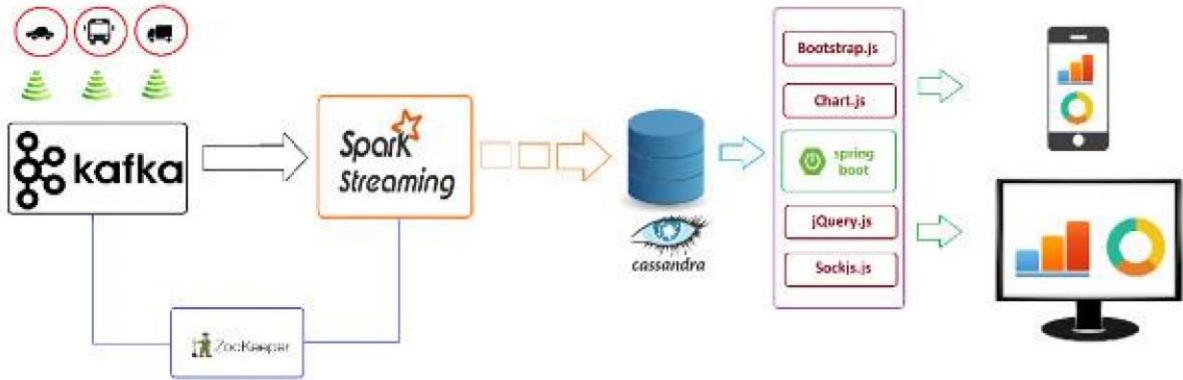


Figure 1 Architecture of Traffic Data Monitoring Application

## 1.1 Technologies and Tools

The following are the tools and technologies used in this traffic monitoring application.

- JDK
- Cassandra
- ZooKeeper
- Kafka
- Spark
- Spring Boot
- Maven

## 1.2 Java installation.

- ✚ \$ sudo apt install openjdk-8-jdk -y (install java)
- ✚ \$ java -version (Check the version of java)
- ✚ \$ nano .bashrc
- ✚ Add the java path to .bashrc file.

```

export JAVA_HOME=/usr/lib/jvm/java-1.8.0-openjdk-amd64
export PATH=$PATH:$JAVA_HOME/bin

```

In my case, already installed java so no need to install. Use the following command to verify it.

```
saji@saji-VB:~$ java -version
openjdk version "1.8.0_292"
OpenJDK Runtime Environment (build 1.8.0_292-8u292-b10-0ubuntu1~16.04.1-b10)
OpenJDK 64-Bit Server VM (build 25.292-b10, mixed mode)
```

Figure 2 Verifying Java Installation

Output shows that successfully installed because we can see the version of the installed java.

### Set path

Then to set path and JAVA\_HOME variables, add the following commands to **.bashrc** file.

- Use “**pwd**” command to get java path.
- Use **nano .bashrc** command to edit the .bashrc file
- **Source .bashrc** Use this command to apply changes into current running system.

```
saji@saji-VBox:~$ nano .bashrc
saji@saji-VBox:~$ source .bashrc
saji@saji-VBox:~$
```

Figure 3 edit the bashrc file

```
saji@saji-VB:/usr/lib/jvm/java-1.8.0-openjdk-amd64$ pwd
/usr/lib/jvm/java-1.8.0-openjdk-amd64
```

Figure 4 get java path

Edit the file as you see,

```
# sources /etc/bash.bashrc.
if ! shopt -oq posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi

export JAVA_HOME=/usr/lib/jvm/java-1.8.0-openjdk-amd64
export PATH=$PATH:$JAVA_HOME/bin
```

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos  
^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^ ^ Go To Line

Figure 5 Set path and JAVA\_HOME variables

### 1.3 Install Cassandra.

- ⊕ \$ mkdir cassandra
- ⊕ \$ cd cassandra
- ⊕ \$ wget <https://archive.apache.org/dist/cassandra/2.2.6/apache-cassandra-2.2.6-bin.tar.gz>
- ⊕ \$ tar xvf apache-cassandra-2.2.6-bin.tar.gz
- ⊕ \$ nano .bashrc
- ⊕ Add the cassandra path to .bashrc file.

```
export CASSANDRA_HOME=/home/saji/cassandra/apache-cassandra-2.2.6
export PATH=$PATH:$CASSANDRA_HOME/bin
```
- ⊕ \$ source .bashrc
- ⊕ \$ cd cassandra/apache-cassandra-2.2.6/bin
- ⊕ \$ cassandra
- ⊕ \$ cqlsh

```
saji@saji-VBox:~$ mkdir cassandra
saji@saji-VBox:~$ cd cassandra
saji@saji-VBox:~/cassandra$ wget https://archive.apache.org/dist/cassandra/2.2.6/apache-cassandra-2.2.6-bin.tar.gz
--2021-08-12 21:47:58-- https://archive.apache.org/dist/cassandra/2.2.6/apache-cassandra-2.2.6-bin.tar.gz
Resolving archive.apache.org (archive.apache.org)... 138.201.131.134, 2a01:4f8:172:2ec5::2
Connecting to archive.apache.org (archive.apache.org)|138.201.131.134|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 29553283 (28M) [application/x-gzip]
Saving to: 'apache-cassandra-2.2.6-bin.tar.gz'

apache-cassandra-2. 100%[=====] 28.18M  241KB/s   in 2m 3s

2021-08-12 21:50:05 (235 KB/s) - 'apache-cassandra-2.2.6-bin.tar.gz' saved [29553283/29553283]

saji@saji-VBox:~/cassandra$ tar xvf apache-cassandra-2.2.6-bin.tar.gz
apache-cassandra-2.2.6/bin/
apache-cassandra-2.2.6/conf/
apache-cassandra-2.2.6/conf/triggers/
apache-cassandra-2.2.6/doc/
apache-cassandra-2.2.6/doc/cql3/
apache-cassandra-2.2.6/interface/
apache-cassandra-2.2.6/javadoc/
apache-cassandra-2.2.6/javadoc/org/
apache-cassandra-2.2.6/javadoc/org/apache/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/auth/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/auth/class-use/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/cache/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/cache/class-use/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/client/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/client/class-use/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/concurrent/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/concurrent/class-use/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/config/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/config/class-use/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/cql3/
apache-cassandra-2.2.6/javadoc/org/apache/cassandra/cql3/class-use/
```

Figure 6 install cassandra

```
saji@saji-VBox:~$ nano .bashrc
saji@saji-VBox:~$ source .bashrc
saji@saji-VBox:~$ █
```

Figure 7 edit .bashrc and update editing

```

GNU nano 2.5.3          File: .bashrc          Modified

if ! shopt -oq posix; then
    if [ -f /usr/share/bash-completion/bash_completion ]; then
        . /usr/share/bash-completion/bash_completion
    elif [ -f /etc/bash_completion ]; then
        . /etc/bash_completion
    fi
fi

JAVA_HOME=/usr/lib/jvm/java-1.8.0-openjdk-amd64
export PATH=$PATH:$JAVA_HOME/bin

export CASSANDRA_HOME=/home/saji/cassandra/apache-cassandra-2.2.6
export PATH=$PATH:$CASSANDRA_HOME/bin

```

**^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify ^C Cur Pos  
 ^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell ^\_ Go To Line**

Figure 8 insert cassandra directory path

```

saji@saji-VBox:~$ cd cassandra
saji@saji-VBox:~/cassandra$ ls
apache-cassandra-2.2.6 apache-cassandra-2.2.6-bin.tar.gz
saji@saji-VBox:~/cassandra$ cd apache-cassandra-2.2.6
saji@saji-VBox:~/cassandra/apache-cassandra-2.2.6$ ls
bin  conf  doc  javadoc  LICENSE.txt  NEWS.txt  pylib
CHANGES.txt  data  interface  lib  logs  NOTICE.txt  tools
saji@saji-VBox:~/cassandra/apache-cassandra-2.2.6$ cd bin
saji@saji-VBox:~/cassandra/apache-cassandra-2.2.6/bin$ cassandra
saji@saji-VBox:~/cassandra/apache-cassandra-2.2.6/bin$ CompilerOracle: inline org/apache/cassandra/db/AbstractNativeCell.compareTo (Lorg/apache/cassandra/db/composites/Composite;)I
CompilerOracle: inline org/apache/cassandra/db/composites/AbstractSimpleCellNameType.compareUnsigned (Lorg/apache/cassandra/db/composites/Composite;Lorg/apache/cassandra/db/composites/Composite;)I
CompilerOracle: inline org/apache/cassandra/io/util/Memory.checkBounds (JJ)V
CompilerOracle: inline org/apache/cassandra/io/util/SafeMemory.checkBounds (JJ)V
CompilerOracle: inline org/apache/cassandra/utils/AsymmetricOrdering.selectBoundary (Lorg/apache/cassandra/utils/AsymmetricOrdering;Op;II)I
CompilerOracle: inline org/apache/cassandra/utils/AsymmetricOrdering.strictnessOfLessThan (Lorg/apache/cassandra/utils/AsymmetricOrdering;Op;)I
CompilerOracle: inline org/apache/cassandra/utils/ByteBufferUtil.compare (Ljava/nio/ByteBuffer;[B)I
CompilerOracle: inline org/apache/cassandra/utils/ByteBufferUtil.compare ([BLjava/nio/ByteBuffer;)I
CompilerOracle: inline org/apache/cassandra/utils/ByteBufferUtil.compareUnsigned (Ljava/nio/ByteBuffer;Ljava/nio/ByteBuffer;)I
CompilerOracle: inline org/apache/cassandra/utils/FastByteOperations$UnsafeOperations.compareTo (Ljava/lang/Object;JI;Ljava/lang/Object;JI)I
CompilerOracle: inline org/apache/cassandra/utils/FastByteOperations$UnsafeOperations.compareTo (Ljava/nio/ByteBuffer;Ljava/nio/ByteBuffer;)I
INFO 10:51:59 Node configuration:[authenticator=AllowAllAuthenticator; authorizer=AllowAllAuthorizer; auto_bootstrap=true; auto_snapshot=true ; batch_size_fail_threshold_in_kb=50; batch_size_warn_threshold_in_kb=5; batchlog_replay_throttle_in_kb=1024; broadcast_address=null; broadcast_rpc_address=null; cas_contention_timeout_in_ms=1000; client_encryption_options=<REDACTED>; cluster_name=Test Cluster; column_index_size_in_kb=64; commit_failure_policy=stop; commitlog_compression=null; commitlog_directory=null; commitlog_max_compression_buffers_in_pool=3; commitlog_perodic_queue_size=-1; commitlog_segment_size_in_mb=32; commitlog_sync=periodic; commitlog_sync_batch_window_in_ms=null; commitlog_sync_period_in_ms=10000; commitlog_total_space_in_mb=null; compaction_large_partition_warning_threshold_mb=100; compaction_throughput_mb_per_sec=16; concurrent_compactors=null; concurrent_counter_writes=32; concurrent_reads=32; concurrent_replicates=null; concurrent_writes=32; counter_cache_keys_to_save=2147483647; counter_cache_save_period=7200; counter_cache_size_in_mb=null; counter_write_request_timeout_in_ms=5000; cross_node_timeout=false; data_file_directories=null; disk_access_mode=auto; disk_failure_policy=stop; dynamic_snitch=true; dynamic_snitch_badness_threshold=0.1; dynamic_snitch_reset_interval_in_ms=60000; dynamic_snitch_update_interval_in_ms=100; enable_user_defined_functions=false; encryption_o

```

Figure 9 Run cassandra

```

saji@saji-VBox:~/cassandra/apache-cassandra-2.2.6/bin
saji@saji-VBox:~$ cd cassandra
saji@saji-VBox:~/cassandra$ ls
apache-cassandra-2.2.6 apache-cassandra-2.2.6-bin.tar.gz
saji@saji-VBox:~/cassandra$ cd apache-cassandra-2.2.6/bin
saji@saji-VBox:~/cassandra/apache-cassandra-2.2.6/bin$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042.
[cqlsh 5.0.1 | Cassandra 2.2.6 | CQL spec 3.3.1 | Native protocol v4]
Use HELP for help.
cqlsh> 

```

Figure 10 Connected to test cluster

## 1.4 Create tables in the Cassandra database.

// Create keyspace

```

CREATE KEYSPACE IF NOT EXISTS TrafficKeySpace WITH
replication = {'class':'SimpleStrategy',
'replication_factor':1};

```

```

CREATE TABLE TrafficKeySpace.Total_Traffic (routeId text, vehicleType
text, totalCount bigint, timeStamp timestamp, recordDate text, PRIMARY
KEY
(routeId, recordDate, vehicleType));

```

// Create table

```

CREATE TABLE TrafficKeySpace.Window_Traffic (routeId
text, vehicleType text, totalCount bigint, timeStamp
timestamp, recordDate text, PRIMARY KEY
(routeId, recordDate, vehicleType));

```

```

CREATE TABLE TrafficKeySpace.poi_traffic(vehicleid text ,
vehicletype text , distance bigint, timeStamp timestamp, PRIMARY
KEY (vehicleid));

```

```

saji@saji-VBox:~$ cd cassandra
saji@saji-VBox:~/cassandra$ ls
apache-cassandra-2.2.6 apache-cassandra-2.2.6-bin.tar.gz
saji@saji-VBox:~/cassandra$ cd apache-cassandra-2.2.6/bin
saji@saji-VBox:~/cassandra/apache-cassandra-2.2.6/bin$ cqlsh
Connected to Test Cluster at 127.0.0.1:9042.
[cqlsh 5.0.1 | Cassandra 2.2.6 | CQL spec 3.3.1 | Native protocol v4]
Use HELP for help.
cqlsh> //Create keyspace
cqlsh> CREATE KEYSPACE IF NOT EXISTS TrafficKeySpace WITH replication = {'class':'SimpleStrategy', 'replication_factor':1};
cqlsh>
cqlsh> //Create table
cqlsh> CREATE TABLE TrafficKeySpace.Total_Traffic (routeId text , vehicleType text, totalCount bigint, timeStamp timestamp, recordDate text,PRIMARY KEY ((routeId,recordDate,vehicleType)));
cqlsh> CREATE TABLE TrafficKeySpace.Window_Traffic (routeId text , vehicleType text, totalCount bigint, timeStamp timestamp, recordDate text,PRIMARY KEY ((routeId,recordDate,vehicleType)));
cqlsh> CREATE TABLE TrafficKeySpace.Poi_Traffic(vehicleId text , vehicleType text , distance bigint, timeStamp timestamp,PRIMARY KEY (vehicleId));
cqlsh>

```

Figure 11 Create tables in the Cassandra database

### // Select tables

- ✚ *SELECT \* FROM TrafficKeySpace.Total\_Traffic;*
- ✚ *SELECT \* FROM TrafficKeySpace.Window\_Traffic;*
- ✚ *SELECT \* FROM TrafficKeySpace.Poi\_Traffic;*

```

cqlsh>
cqlsh> //Select from table
cqlsh> SELECT * FROM TrafficKeySpace.Total_Traffic;
+-----+-----+-----+-----+
| routeid | recorddate | vehicleType | timestamp | totalcount |
+-----+-----+-----+-----+
(0 rows)
cqlsh> SELECT * FROM TrafficKeySpace.Window_Traffic;
+-----+-----+-----+-----+
| routeid | recorddate | vehicleType | timestamp | totalcount |
+-----+-----+-----+-----+
(0 rows)
cqlsh> SELECT * FROM TrafficKeySpace.Poi_Traffic;

```

Figure 12 Select tables

### // Truncate table

- ✚ *TRUNCATE TABLE TrafficKeySpace.Total\_Traffic;*
- ✚ *TRUNCATE TABLE TrafficKeySpace.Window\_Traffic;*
- ✚ *TRUNCATE TABLE TrafficKeySpace.Poi\_Traffic;*

```

(0 rows)
cqlsh>
cqlsh> //Truncate table
cqlsh> TRUNCATE TABLE TrafficKeySpace.Total_Traffic;
cqlsh> TRUNCATE TABLE TrafficKeySpace.Window_Traffic;
cqlsh> TRUNCATE TABLE TrafficKeySpace.Poi_Traffic;■

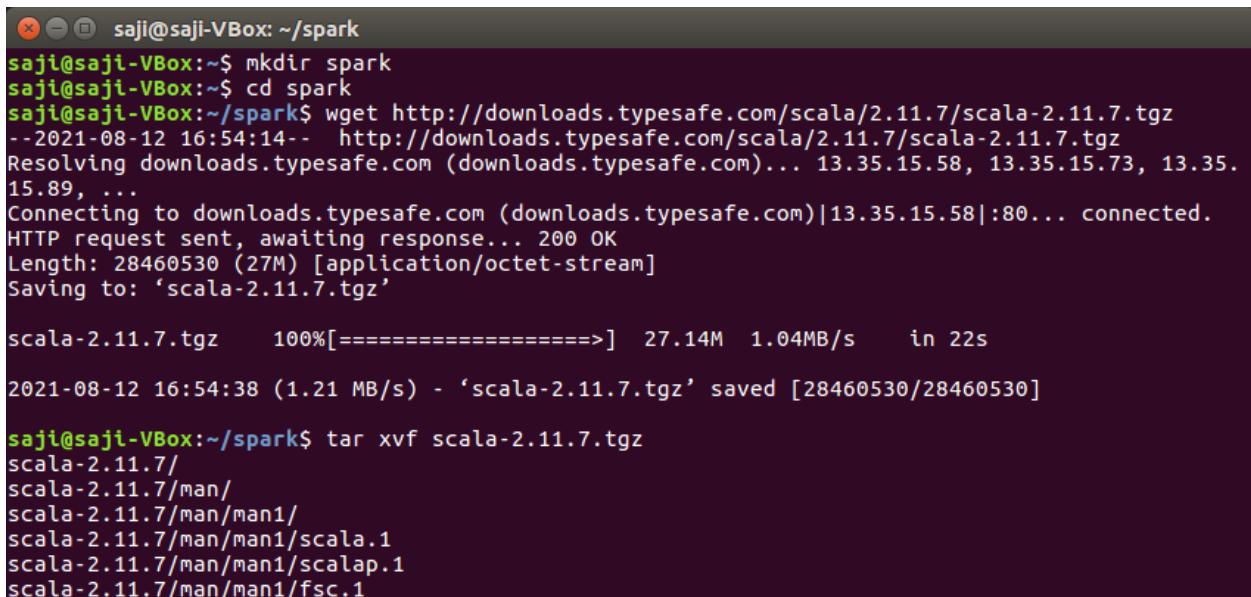
```

Figure 13 Truncate table

## 1.5 Install Spark

type the following commands to install spark.

```
+ $ mkdir spark
+ $ cd spark
+ $ wget http://downloads.typesafe.com/scala/2.11.7/scala-2.11.7.tgz
+ $ tar xvf scala-2.11.7.tgz
+ $ sudo mv scala-2.11.7 /usr/lib
+ $ sudo ln -s /usr/lib/scala-2.11.7 /usr/lib/scala
+ $ export PATH=$PATH:/usr/lib/scala/bin
+ $ scala -version
+ $ wget http://d3kbcqa49mib13.cloudfront.net/spark-1.6.0-bin-hadoop2.6.tgz
+ $ tar xvf spark-1.6.0-bin-hadoop2.6.tgz
+ $ export SPARK_HOME=$HOME/spark/spark-1.6.0-bin-hadoop2.6
+ $ export PATH=$PATH:$SPARK_HOME/bin
+ $ echo 'export PATH=$PATH:/usr/lib/scala/bin' >> .bash_profile
+ $ echo 'export SPARK_HOME=$HOME/spark/spark-1.6.0-bin-hadoop2.6' >> .bash_profile
+ $ echo 'export PATH=$PATH:$SPARK_HOME/bin' >> .bash_profile
+ $ cd $SPARK_HOME
+ $ cd bin
+ $ spark-shell
```



The screenshot shows a terminal window with a dark background and white text. The session starts with the user 'saji' at 'saji-VBox'. The user runs several commands to download and extract the Scala 2.11.7 distribution. The output shows the progress of the wget command, the extraction of the tar file, and the resulting directory structure.

```
saji@saji-VBox:~/spark
saji@saji-VBox:~$ mkdir spark
saji@saji-VBox:~$ cd spark
saji@saji-VBox:~/spark$ wget http://downloads.typesafe.com/scala/2.11.7/scala-2.11.7.tgz
--2021-08-12 16:54:14-- http://downloads.typesafe.com/scala/2.11.7/scala-2.11.7.tgz
Resolving downloads.typesafe.com (downloads.typesafe.com)... 13.35.15.58, 13.35.15.73, 13.35.15.89, ...
Connecting to downloads.typesafe.com (downloads.typesafe.com)|13.35.15.58|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 28460530 (27M) [application/octet-stream]
Saving to: 'scala-2.11.7.tgz'

scala-2.11.7.tgz    100%[=====] 27.14M  1.04MB/s   in 22s

2021-08-12 16:54:38 (1.21 MB/s) - 'scala-2.11.7.tgz' saved [28460530/28460530]

saji@saji-VBox:~/spark$ tar xvf scala-2.11.7.tgz
scala-2.11.7/
scala-2.11.7/man/
scala-2.11.7/man/man1/
scala-2.11.7/man/man1/scala.1
scala-2.11.7/man/man1/scalap.1
scala-2.11.7/man/man1/fsc.1
```

Figure 14 Install and extract Scala

```
saji@saji-VBox: ~/spark
scala-2.11.7/lib/scala-compiler.jar
scala-2.11.7/lib/scala-swing_2.11-1.0.2.jar
scala-2.11.7/lib/scala-actors-2.11.0.jar
saji@saji-VBox:~/spark$ sudo mv scala-2.11.7 /usr/lib
[sudo] password for saji:
saji@saji-VBox:~/spark$ sudo ln -s /usr/lib/scala-2.11.7 /usr/lib/scala
saji@saji-VBox:~/spark$ export PATH=$PATH:/usr/lib/scala/bin
saji@saji-VBox:~/spark$ scala -version
Scala code runner version 2.11.7 -- Copyright 2002-2013, LAMP/EPFL
```

Figure 15 move scala and check whether the scala was installed or not

```
sajil@sajil-VBox:~/spark$ wget http://d3kbcqa49mib13.cloudfront.net/spark-1.6.0-bin-hadoop2.6.tgz
--2021-08-17 03:20-- http://d3kbcqa49mib13.cloudfront.net/spark-1.6.0-bin-hadoop2.6.tgz
Resolving d3kbcqa49mib13.cloudfront.net (d3kbcqa49mib13.cloudfront.net)... 13.224.250.207, 13.224.250.84, 13.224.250.202, ...
Connecting to d3kbcqa49mib13.cloudfront.net (d3kbcqa49mib13.cloudfront.net)|13.224.250.207|:80... connected.
HTTP request sent, awaiting response... 200 OK
Length: 289160984 (276M) [application/x-compressed]
Saving to: 'spark-1.6.0-bin-hadoop2.6.tgz'

spark-1.6.0-bin-hadoop2.6.tgz      4%[=>                                spark-1.6.0-bin-hadoop2.6.  5%[          spark-1.6.0-bin-hadoop2.6.  11%[==>
=>                                         ] 32spark-1.6.0-bin-hadoop2 100%[=====] 275.76M  1.54MB/s   in 3m 44s

2021-08-12 17:07:06 (1.23 MB/s) - 'spark-1.6.0-bin-hadoop2.6.tgz' saved [289160984/289160984]

sajil@sajil-VBox:~/spark$ tar xvf spark-1.6.0-bin-hadoop2.6.tgz
spark-1.6.0-bin-hadoop2.6/
spark-1.6.0-bin-hadoop2.6/LICENSE
spark-1.6.0-bin-hadoop2.6/ec2/
spark-1.6.0-bin-hadoop2.6/ec2/README
spark-1.6.0-bin-hadoop2.6/ec2/deploy.generic/
spark-1.6.0-bin-hadoop2.6/ec2/deploy.generic/root/
spark-1.6.0-bin-hadoop2.6/ec2/deploy.generic/root/spark-ec2/
spark-1.6.0-bin-hadoop2.6/ec2/deploy.generic/root/spark-ec2/variables.sh
```

*Figure 16 install spark*

```
sejal@sejal-VBox:~/spark$ export SPARK_HOME=$HOME/spark/spark-1.6.0-bin-hadoop2.6
sejal@sejal-VBox:~/spark$ export PATH=$PATH:$SPARK_HOME/bin
sejal@sejal-VBox:~/spark$ echo 'export PATH=$PATH:/usr/lib/scala/bin' >> .bash_profile
sejal@sejal-VBox:~/spark$ echo 'export SPARK_HOME=$HOME/spark/spark-1.6.0-bin-hadoop2.6' >> .bash_profile
sejal@sejal-VBox:~/spark$ echo 'export PATH=$SPARK_HOME/bin' >> .bash_profile
```

*Figure 17 export and echo spark path*

*Figure 18 Spark shell*

## 1.6 Install Zookeeper

```
+ $ mkdir zookeeper
+ $ cd zookeeper(navigate into the zookeeper directory)
+ $ sudo wget https://downloads.apache.org/zookeeper/zookeeper-3.7.0/apache-zookeeper-3.7.0-bin.tar.gz
+ $ sudo tar -xvf apache-zookeeper-3.7.0-bin.tar.gz
+ $ cd apache-zookeeper-3.7.0-bin
+ $ sudo mkdir data (create data directory)
+ $ cd conf
+ $ cp zoo_sample.cfg zoo.cfg(copy the zoo.sample file and create zoo.cfg file)
+ $ nano zoo.cfg (edit the zoo.cfg file as you see)

    tickTime=2000
    dataDir=/home/saji/zookeeper/apache-zookeeper-3.7.0-bin/data
    clientPort=2181
    initLimit=10
    syncLimit=5
```

```
saji@saji-VBox:~$ mkdir zookeeper
saji@saji-VBox:~$ ls
cassandra  Documents  examples.desktop  Pictures  spark      Videos
Desktop   Downloads  Music          Public    Templates  zookeeper
saji@saji-VBox:~$ cd zookeeper
saji@saji-VBox:~/zookeeper$ sudo wget https://downloads.apache.org/zookeeper/zookeeper-3.7.0/apache-zookeeper-3.7.0-bin.tar.gz
[sudo] password for saji:
--2021-08-12 17:23:26-- https://downloads.apache.org/zookeeper/zookeeper-3.7.0/apache-zookeeper-3.7.0-bin.tar.gz
Resolving downloads.apache.org (downloads.apache.org)... 135.181.209.10, 135.181.214.104, 88.99.95.219, ...
Connecting to downloads.apache.org (downloads.apache.org)|135.181.209.10|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: 12387614 (12M) [application/x-gzip]
Saving to: 'apache-zookeeper-3.7.0-bin.tar.gz'

apache-zookeeper-3. 100%[=====] 11.81M 2.23MB/s in 9.8s
2021-08-12 17:23:38 (1.21 MB/s) - 'apache-zookeeper-3.7.0-bin.tar.gz' saved [12387614/12387614]

saji@saji-VBox:~/zookeeper$ sudo tar -xvf apache-zookeeper-3.7.0-bin.tar.gz
apache-zookeeper-3.7.0-bin/docs/
apache-zookeeper-3.7.0-bin/docs/skin/
apache-zookeeper-3.7.0-bin/docs/images/
apache-zookeeper-3.7.0-bin/docs/skin/basic.css
apache-zookeeper-3.7.0-bin/docs/skin/chapter.gif
```

Figure 19 install & extract zookeeper

```
saji@saji-VBox:~/zookeeper$ cd apache-zookeeper-3.7.0-bin
saji@saji-VBox:~/zookeeper/apache-zookeeper-3.7.0-bin$ sudo mkdir data
saji@saji-VBox:~/zookeeper/apache-zookeeper-3.7.0-bin$ cd conf
saji@saji-VBox:~/zookeeper/apache-zookeeper-3.7.0-bin/conf$ ls
configuration.xsl  log4j.properties  zoo_sample.cfg
saji@saji-VBox:~/zookeeper/apache-zookeeper-3.7.0-bin/conf$ cp zoo_sample.cfg zoo.cfg
saji@saji-VBox:~/zookeeper/apache-zookeeper-3.7.0-bin/conf$ nano zoo.cfg
```

Figure 20 create zoo.cfg file

```
saji@saji-VBox:~$ cd zookeeper
saji@saji-VBox:~/zookeeper$ cd apache-zookeeper-3.7.0-bin
saji@saji-VBox:~/zookeeper/apache-zookeeper-3.7.0-bin$ cd data
saji@saji-VBox:~/zookeeper/apache-zookeeper-3.7.0-bin/data$ pwd
/home/saji/zookeeper/apache-zookeeper-3.7.0-bin/data
saji@saji-VBox:~/zookeeper/apache-zookeeper-3.7.0-bin/data$ █
```

Figure 21 get the data directory

```
# The number of milliseconds of each tick
tickTime=2000
# The number of ticks that the initial
# synchronization phase can take
initLimit=10
# The number of ticks that can pass between
# sending a request and getting an acknowledgement
syncLimit=5
# the directory where the snapshot is stored.
# do not use /tmp for storage, /tmp here is just
# example sakes.
dataDir=/home/saji/zookeeper/apache-zookeeper-3.7.0-bin/data
# the port at which the clients will connect
clientPort=2181
# the maximum number of client connections.
# increase this if you need to handle more clients
#maxClientCnxns=60
#
# Be sure to read the maintenance section of the
^G Get Help      ^O Write Out    ^W Where Is     ^K Cut Text    ^J Justify
^X Exit          ^R Read File   ^\ Replace     ^U Uncut Text  ^T To Spell
```

Figure 22 edit zoo.cfg file

## 1.7 Install Kafka

- ✚ \$ sudo mkdir kafka
- ✚ \$ cd kafka (navigate into kafka directory)
- ✚ \$ sudo wget [https://mirrors.estointernet.in/apache/kafka/2.8.0/kafka\\_2.13-2.8.0.tgz](https://mirrors.estointernet.in/apache/kafka/2.8.0/kafka_2.13-2.8.0.tgz)
- ✚ \$ sudo tar -xvf kafka\_2.13-2.8.0.tgz
- ✚ \$ cd kafka\_2.13-2.8.0

Start the Zookeeper

- ✚ \$ bin/zookeeper-server-start.sh config/zookeeper.properties

Start the Kafka

- ✚ \$ bin/kafka-server-start.sh config/server.properties

```

saji@saji-VBox:~/kafka
saji@saji-VBox:~$ sudo mkdir kafka
[sudo] password for saji:
saji@saji-VBox:~$ cd kafka
saji@saji-VBox:~/kafka$ sudo wget https://mirrors.estointernet.in/apache/kafka/2
.8.0/kafka_2.13-2.8.0.tgz
--2021-08-12 17:28:10-- https://mirrors.estointernet.in/apache/kafka/2.8.0/kafk
a_2.13-2.8.0.tgz
Resolving mirrors.estointernet.in (mirrors.estointernet.in)... 43.255.166.254, 2
403:8940:3:1::f
Connecting to mirrors.estointernet.in (mirrors.estointernet.in)|43.255.166.254|:4
43... connected.
HTTP request sent, awaiting response... 200 OK
Length: 71403603 (68M) [application/octet-stream]
Saving to: 'kafka_2.13-2.8.0.tgz'

kafka_2.13-2.8.0.tg 100%[=====] 68.10M 2.09MB/s in 28s

2021-08-12 17:28:42 (2.41 MB/s) - 'kafka_2.13-2.8.0.tgz' saved [71403603/7140360
3]

```

Figure 23 install kafka

```

saji@saji-VBox:~/kafka$ sudo tar -xvf kafka_2.13-2.8.0.tgz
kafka_2.13-2.8.0/
kafka_2.13-2.8.0/LICENSE
kafka_2.13-2.8.0/NOTICE
kafka_2.13-2.8.0/bin/
kafka_2.13-2.8.0/bin/zookeeper-shell.sh
kafka_2.13-2.8.0/bin/kafka-log-dirs.sh
kafka_2.13-2.8.0/bin/zookeeper-server-stop.sh
kafka_2.13-2.8.0/bin/kafka-configs.sh

```

Figure 24 extract kafka

```

saji@saji-VBox:~/kafka$ cd kafka_2.13-2.8.0
saji@saji-VBox:~/kafka$ ./bin/zookeeper-server-start.sh config/zookeeper.properties
mkdir: cannot create directory '/home/saji/kafka/kafka_2.13-2.8.0/bin/../logs': Permission denied
OpenJDK 64-Bit Server VM warning: Cannot open file /home/saji/kafka/kafka_2.13-2.8.0/bin/../logs/zookeeper-gc.log due to No such file or directory

log4j:ERROR setFile(null,true) call failed.
java.io.FileNotFoundException: /home/saji/kafka/kafka_2.13-2.8.0/bin/../logs/server.log (No such file or directory)
    at java.io.FileOutputStream.open0(Native Method)
    at java.io.FileOutputStream.open(FileOutputStream.java:270)
    at java.io.FileOutputStream.<init>(FileOutputStream.java:213)
    at java.io.FileOutputStream.<init>(FileOutputStream.java:133)
    at org.apache.log4j.FileAppender.setFile(FileAppender.java:294)
    at org.apache.log4j.FileAppender.activateOptions(FileAppender.java:165)

```

Figure 25 start zookeeper

```

saji@saji-VBox:~$ ls
cassandra examples.desktop maven spark
Desktop iot-traffic-monitor-master Music Templates
Documents kafka Pictures Videos
Downloads master.zip Public zookeeper
saji@saji-VBox:~$ cd kafka
saji@saji-VBox:~/kafka$ ls
kafka_2.13-2.8.0 kafka_2.13-2.8.0.tgz
saji@saji-VBox:~/kafka$ cd kafka_2.13-2.8.0
saji@saji-VBox:~/kafka$ ./bin/kafka-server-start.sh config/server.properties
mkdir: cannot create directory '/home/saji/kafka/kafka_2.13-2.8.0/bin/../logs': Permission denied
OpenJDK 64-Bit Server VM warning: Cannot open file /home/saji/kafka/kafka_2.13-2.8.0/bin/../logs/kafkaServer-gc.log due to No such file or directory

log4j:ERROR setFile(null,true) call failed.
java.io.FileNotFoundException: /home/saji/kafka/kafka_2.13-2.8.0/bin/../logs/server.log (No such file or directory)
    at java.io.FileOutputStream.open0(Native Method)
    at java.io.FileOutputStream.open(FileOutputStream.java:270)
    at java.io.FileOutputStream.<init>(FileOutputStream.java:213)

```

Figure 26 start kafka

## 1.8 Install Maven.

- ⊕ \$ *mkdir maven* (create maven directory)
- ⊕ \$ *cd maven* (navigate to maven directory)
- ⊕ \$ *wget https://archive.apache.org/dist/maven/maven-3/3.3.9/binaries/apache-maven-3.3.9-bin.tar.gz*
- ⊕ \$ *tar xvzf apache-maven-3.3.9-bin.tar.gz*
- ⊕ \$ *cd apache-maven-3.3.9*
- ⊕ Add the maven path to .bachrc file

```
export MAVEN_HOME=/home/saji/maven/apache-maven-3.3.9  
export PATH=$PATH:$MAVEN_HOME/bin
```

```
saji@saji-VBox:~$ cd maven  
saji@saji-VBox:~/maven$ wget https://archive.apache.org/dist/maven/maven-3/3.3.9/binaries/apache-maven-3.3.9-bin.tar.gz  
--2021-08-12 17:37:48-- https://archive.apache.org/dist/maven/maven-3/3.3.9/binaries/apache-maven-3.3.9-bin.tar.gz  
Resolving archive.apache.org (archive.apache.org)... 138.201.131.134, 2a01:4f8:172:2ec5::2  
Connecting to archive.apache.org (archive.apache.org)|138.201.131.134|:443... connected.  
HTTP request sent, awaiting response... 200 OK  
Length: 8491533 (8.1M) [application/x-gzip]  
Saving to: 'apache-maven-3.3.9-bin.tar.gz'  
  
apache-maven-3.3.9- 100%[=====] 8.10M 183KB/s in 45s  
  
2021-08-12 17:38:36 (186 KB/s) - 'apache-maven-3.3.9-bin.tar.gz' saved [8491533/8491533]
```

Figure 27 install maven

```
saji@saji-VBox:~/maven$ tar xvf apache-maven-3.3.9-bin.tar.gz  
apache-maven-3.3.9/boot/plexus-classworlds-2.5.2.jar  
apache-maven-3.3.9/lib/maven-embedder-3.3.9.jar  
apache-maven-3.3.9/lib/maven-settings-3.3.9.jar  
apache-maven-3.3.9/lib/plexus-utils-3.0.22.jar  
apache-maven-3.3.9/lib/maven-core-3.3.9.jar  
apache-maven-3.3.9/lib/maven-model-3.3.9.jar  
apache-maven-3.3.9/lib/commons-lang3-3.4.jar  
apache-maven-3.3.9/lib/maven-settings-builder-3.3.9.jar  
apache-maven-3.3.9/lib/maven-builder-support-3.3.9.jar  
apache-maven-3.3.9/lib/plexus-interpolation-1.21.jar  
apache-maven-3.3.9/lib/plexus-component-annotations-1.6.jar  
apache-maven-3.3.9/lib/plexus-sec-dispatcher-1.3.jar  
apache-maven-3.3.9/lib/plexus-cipher-1.7.jar  
apache-maven-3.3.9/lib/maven-repository-metadata-3.3.9.jar  
apache-maven-3.3.9/lib/maven-artifact-3.3.9.jar  
apache-maven-3.3.9/lib/maven-plugin-api-3.3.9.jar  
apache-maven-3.3.9/lib/org.eclipse.sisu.plexus-0.3.2.jar  
apache-maven-3.3.9/lib/cdi-api-1.0.jar  
apache-maven-3.3.9/lib/jsr250-api-1.0.jar
```

Figure 28 extract maven

```
saji@saji-VBox:~/maven$ cd apache-maven-3.3.9-bin  
bash: cd: apache-maven-3.3.9-bin: No such file or directory  
saji@saji-VBox:~/maven$ ls  
apache-maven-3.3.9 apache-maven-3.3.9-bin.tar.gz  
saji@saji-VBox:~/maven$ cd apache-maven-3.3.9  
saji@saji-VBox:~/maven/apache-maven-3.3.9$ pwd  
/home/saji/maven/apache-maven-3.3.9  
saji@saji-VBox:~/maven/apache-maven-3.3.9$ cd  
saji@saji-VBox:~$ nano .bashrc
```

Figure 29 get maven directory

```

GNU nano 2.5.3           File: .bashrc           Modified

if ! shopt -oq posix; then
  if [ -f /usr/share/bash-completion/bash_completion ]; then
    . /usr/share/bash-completion/bash_completion
  elif [ -f /etc/bash_completion ]; then
    . /etc/bash_completion
  fi
fi

JAVA_HOME=/usr/lib/jvm/java-1.8.0-openjdk-amd64
export PATH=$PATH:$JAVA_HOME/bin

export CASSANDRA_HOME=/home/saji/cassandra/apache-cassandra-2.2.6
export PATH=$PATH:$CASSANDRA_HOME/bin

export MAVEN_HOME=/home/saji/maven/apache-maven-3.3.9
export PATH=$PATH:$MAVEN_HOME/bin

```

^G Get Help ^O Write Out ^W Where Is ^K Cut Text ^J Justify  
 ^X Exit ^R Read File ^\ Replace ^U Uncut Text ^T To Spell

Figure 30 edit .bashrc file and insert maven directory

## 1.9 Download master.zip

Download master.zip from GitHub with the appropriate files to configure using the following command:

- ✚ \$ wget <https://github.com/baghelamit/iot-traffic-monitor/archive/refs/heads/master.zip>
- ✚ \$ unzip master.zip

```

saji@saji-VBox:~$ wget https://github.com/baghelamit/iot-traffic-monitor/archive/refs/heads/master.zip
--2021-08-12 17:42:30-- https://github.com/baghelamit/iot-traffic-monitor/archive/refs/heads/master.zip
Resolving github.com (github.com)... 20.205.243.166
Connecting to github.com (github.com)|20.205.243.166|:443... connected.
Unable to establish SSL connection.
saji@saji-VBox:~$ wget https://github.com/baghelamit/iot-traffic-monitor/archive/refs/heads/master.zip
--2021-08-12 17:45:06-- https://github.com/baghelamit/iot-traffic-monitor/archive/refs/heads/master.zip
Resolving github.com (github.com)... 13.250.177.223
Connecting to github.com (github.com)|13.250.177.223|:443... connected.
HTTP request sent, awaiting response... 302 Found
Location: https://codeload.github.com/baghelamit/iot-traffic-monitor/zip/refs/heads/master [following]
--2021-08-12 17:45:09-- https://codeload.github.com/baghelamit/iot-traffic-monitor/zip/refs/heads/master
Resolving codeload.github.com (codeload.github.com)... 20.205.243.165
Connecting to codeload.github.com (codeload.github.com)|20.205.243.165|:443... connected.
HTTP request sent, awaiting response... 200 OK
Length: unspecified [application/zip]
Saving to: 'master.zip'

master.zip          [ => ] 449.13K  485KB/s   in 0.9s

2021-08-12 17:45:13 (485 KB/s) - 'master.zip' saved [459914]

```

Figure 31 download master zip from GitHub

```
sajit@saji-VBox:~$ unzip master.zip
Archive: master.zip
868346d98d4f7e265f780e481ca4c3ed988fdaf
  creating: iot-traffic-monitor-master/
  inflating: iot-traffic-monitor-master/LICENSE
  inflating: iot-traffic-monitor-master/README.md
  inflating: iot-traffic-monitor-master/iot-architecture.png
  creating: iot-traffic-monitor-master/iot-kafka-producer/
  inflating: iot-traffic-monitor-master/iot-kafka-producer/README.md
  inflating: iot-traffic-monitor-master/iot-kafka-producer/pom.xml
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/app/
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/app/kafka/
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/app/kafka/producer/
  inflating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/app/kafka/producer/IoTDataProducer.java
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/app/kafka/util/IoTDataEncoder.java
  inflating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/app/kafka/util/PropertyFileReader.java
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/app/kafka/vo/
  inflating: iot-traffic-monitor-master/iot-kafka-producer/src/main/java/com/iot/app/kafka/vo/IoTData.java
  creating: iot-traffic-monitor-master/iot-kafka-producer/src/main/resources/
  inflating: iot-traffic-monitor-master/iot-kafka-producer/src/main/resources/iot-kafka.properties
  inflating: iot-traffic-monitor-master/iot-kafka-producer/src/main/resources/log4j.properties
  creating: iot-traffic-monitor-master/iot-spark-processor/
  inflating: iot-traffic-monitor-master/iot-spark-processor/IoTData.cql
  inflating: iot-traffic-monitor-master/iot-spark-processor/README.md
  inflating: iot-traffic-monitor-master/iot-spark-processor/pom.xml
  creating: iot-traffic-monitor-master/iot-spark-processor/src/
  creating: iot-traffic-monitor-master/iot-spark-processor/src/main/
  creating: iot-traffic-monitor-master/iot-spark-processor/src/main/java/
```

Figure 32 unzip master zip

As shown in the image above, downloading master.zip includes IoT Kafka Maker, IoT Spark Maker, IoT Spring Boot Dashboard and IoT Traffic Monitor.

## 1.10 Create a Kafka topic.

Using the following command, you need to create a Kafka topic.

↳ \$ bin/kafka-topics.sh --create --zookeeper localhost:2181 --replication-factor 1 --partitions 1 --topic iot-data-event

```
sajit@saji-VBox:~/kafka/kafka_2.13-2.8.0$ bin/kafka-topics.sh --create --zookeeper localhost:2181 --replication-factor 1 --partitions 1 --topic iot-data-event
Created topic iot-data-event.
```

Figure 33 create kafka topics

## 1.11 IoT Kafka Producer

Then go to the Kafka producer and follow the instructions below to install the Maven packages.

- ↳ \$ cd iot-traffic-monitor-master/
- ↳ \$ cd iot-kafka-producer/
- ↳ \$ mvn package
- ↳ \$ mvn exec:java -Dexec.mainClass="com.iot.app.kafka.producer.IoTDataProducer"

```

● ● ● saji@saji-VBox: ~/iot-traffic-monitor-master/iot-kafka-producer
Desktop examples.desktop           master.zip Pictures Templates
Documents iot-traffic-monitor-master maven    Public   Videos
saji@saji-VBox: ~ cd iot-traffic-monitor-master/
saji@saji-VBox: ~/iot-traffic-monitor-master$ ls
iot-architecture.png iot-spark-processor      LICENSE README.md
iot-kafka-producer  iot-springboot-dashboard pom.xml
saji@saji-VBox: ~/iot-traffic-monitor-master$ cd iot-kafka-producer/
saji@saji-VBox: ~/iot-traffic-monitor-master/iot-kafka-producer$ mvn package
[INFO] Scanning for projects...
[INFO]
[INFO] -----
[INFO] Building IoT Kafka Producer 1.0.0
[INFO]
[INFO] -----
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.pom (8 KB at 1
.5 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/23/maven-plugins-23.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/23/maven-plugins-23.pom (9 KB at 10.9 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/22/maven-parent-22.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/22/maven-parent-22.pom (30 KB at 19.3 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/apache/11/apache-11.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/apache/11/apache-11.pom (15 KB at 23.7 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-resources-plugin/2.6/maven-resources-plugin-2.6.jar (29 KB at
26.4 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/compiler-plugin/3.1/maven-compiler-plugin-3.1.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-compiler-plugin/3.1/maven-compiler-plugin-3.1.pom (10 KB at 10
.2 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/24/maven-plugins-24.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/24/maven-plugins-24.pom (11 KB at 11.1 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/23/maven-parent-23.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/23/maven-parent-23.pom (32 KB at 36.0 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/apache/13/apache-13.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/apache/13/apache-13.pom (14 KB at 12.8 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-compiler-plugin/3.1/maven-compiler-plugin-3.1.jar

```

Figure 34 move to Kafka producer install maven packages

```

● ● ● saji@saji-VBox: ~/iot-traffic-monitor-master/iot-kafka-producer
2021-08-12 20:16:16 INFO IoTDataEncoder:28 - {"vehicleId": "c1659e03-75c5-43b5-9095-dc922447035d", "vehicleType": "Private Car", "routeId": "Route
-82", "longitude": "-96.331024", "latitude": "34.023983", "timestamp": "2021-08-12 07:44:56", "speed": 34.0, "fuelLevel": 31.0}
2021-08-12 20:16:18 INFO IoTDataEncoder:28 - {"vehicleId": "739776ee-29b9-404e-816c-cc52200d23c0", "vehicleType": "Small Truck", "routeId": "Route
-82", "longitude": "-96.142365", "latitude": "34.955006", "timestamp": "2021-08-12 07:44:56", "speed": 64.0, "fuelLevel": 31.0}
2021-08-12 20:16:21 INFO IoTDataEncoder:28 - {"vehicleId": "81fc135c-7d25-4ddc-8254-f244253b7596", "vehicleType": "Private Car", "routeId": "Route
-82", "longitude": "-96.70577", "latitude": "34.055885", "timestamp": "2021-08-12 07:44:56", "speed": 24.0, "fuelLevel": 36.0}
2021-08-12 20:16:22 INFO IoTDataEncoder:28 - {"vehicleId": "18f03012-66a6-47aa-ab67-dede3c4ec85d", "vehicleType": "Bus", "routeId": "Route-82", "lo
ngitude": "-96.786125", "latitude": "34.46613", "timestamp": "2021-08-12 07:44:56", "speed": 27.0, "fuelLevel": 29.0}
2021-08-12 20:16:25 INFO IoTDataEncoder:28 - {"vehicleId": "b5c4aff6d-5ba1-43a0-bf94-552f7026fd4", "vehicleType": "Large Truck", "routeId": "Route
-82", "longitude": "-96.35685", "latitude": "34.57776", "timestamp": "2021-08-12 07:44:56", "speed": 43.0, "fuelLevel": 34.0}
2021-08-12 20:16:28 INFO IoTDataEncoder:28 - {"vehicleId": "65b0437d-e0f2-4f00-99a0-138929d72d34", "vehicleType": "Small Truck", "routeId": "Route
-37", "longitude": "-95.10819", "latitude": "33.815285", "timestamp": "2021-08-12 07:44:56", "speed": 51.0, "fuelLevel": 24.0}
2021-08-12 20:16:30 INFO IoTDataEncoder:28 - {"vehicleId": "b71d96fa-9a5f-45b7-bbac-6326cd69a9ed", "vehicleType": "Bus", "routeId": "Route-43", "lo
ngitude": "-97.59173", "latitude": "35.34994", "timestamp": "2021-08-12 07:44:56", "speed": 171.0, "fuelLevel": 26.0}
2021-08-12 20:16:32 INFO IoTDataEncoder:28 - {"vehicleId": "59bde2e1-5d4f-a05-8fa2-90e6d85ca497", "vehicleType": "Small Truck", "routeId": "Route
-37", "longitude": "-95.43939", "latitude": "33.85549", "timestamp": "2021-08-12 07:44:56", "speed": 81.0, "fuelLevel": 38.0}
2021-08-12 20:16:34 INFO IoTDataEncoder:28 - {"vehicleId": "c1659e03-75c5-43b5-9095-dc922447035d", "vehicleType": "Private Car", "routeId": "Route
-82", "longitude": "-96.87356", "latitude": "34.389606", "timestamp": "2021-08-12 07:44:56", "speed": 34.0, "fuelLevel": 31.0}
2021-08-12 20:16:36 INFO IoTDataEncoder:28 - {"vehicleId": "d08547e3-47d3-48b2-bd09-2600aa616707", "vehicleType": "Large Truck", "routeId": "Route
-37", "longitude": "-95.851036", "latitude": "33.40507", "timestamp": "2021-08-12 07:44:56", "speed": 26.0, "fuelLevel": 18.0}
2021-08-12 20:16:39 INFO IoTDataEncoder:28 - {"vehicleId": "53da4b6b-fcet-4679-9072-afbc4d2467ac", "vehicleType": "Bus", "routeId": "Route-82", "lo
ngitude": "-96.67698", "latitude": "34.81283", "timestamp": "2021-08-12 07:44:56", "speed": 28.0, "fuelLevel": 18.0}
2021-08-12 20:16:40 INFO IoTDataEncoder:28 - {"vehicleId": "47ie65e4-b6b0-424e-8d94-a97d6172adee", "vehicleType": "Bus", "routeId": "Route-37", "lo
ngitude": "-95.851036", "latitude": "33.40507", "timestamp": "2021-08-12 07:44:56", "speed": 34.0, "fuelLevel": 31.0}
2021-08-12 20:16:42 INFO IoTDataEncoder:28 - {"vehicleId": "80149fc8-d1d7-4d43-ad13-c364ffffe30c4", "vehicleType": "Private Car", "routeId": "Route
-82", "longitude": "-96.96928", "latitude": "34.976772", "timestamp": "2021-08-12 07:44:56", "speed": 26.0, "fuelLevel": 38.0}
2021-08-12 20:16:43 INFO IoTDataEncoder:28 - {"vehicleId": "2c38f902-648f-4d25-bb95-57675b101660", "vehicleType": "Small Truck", "routeId": "Route
-82", "longitude": "-96.3255", "latitude": "34.7879", "timestamp": "2021-08-12 07:44:56", "speed": 64.0, "fuelLevel": 36.0}
2021-08-12 20:16:45 INFO IoTDataEncoder:28 - {"vehicleId": "e15731f3-5113-46dd-b52d-700cdb13a7e1", "vehicleType": "Private Car", "routeId": "Route
-37", "longitude": "-95.04784", "latitude": "33.969948", "timestamp": "2021-08-12 07:44:56", "speed": 62.0, "fuelLevel": 30.0}
2021-08-12 20:16:46 INFO IoTDataEncoder:28 - {"vehicleId": "585c1440-177b-4018-9059-79ef2ddab3a", "vehicleType": "Taxi", "routeId": "Route-37", "lo
ngitude": "-95.10837", "latitude": "33.984768", "timestamp": "2021-08-12 07:44:56", "speed": 55.0, "fuelLevel": 20.0}
2021-08-12 20:16:48 INFO IoTDataEncoder:28 - {"vehicleId": "368f896e-bca4-4313-9b7e-b73bcb03bf82", "vehicleType": "Small Truck", "routeId": "Route
-43", "longitude": "-97.4131", "latitude": "35.83697", "timestamp": "2021-08-12 07:44:56", "speed": 86.0, "fuelLevel": 19.0}

```

Figure 35 installing maven packages

```

s@sa:~/iot-traffic-monitor-master/iot-kafka-producer
Downloaded: https://repo.maven.apache.org/maven2/commons-io/commons-io-2.2/commons-io-2.2.jar (170 KB at 45.6 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/com/google/code/findbugs/jxr305/1.3.9/jxr305-1.3.9.jar
Downloaded: https://repo.maven.apache.org/maven2/org/eclipse/aether/aether-util/0.9.0.M2/aether-util-0.9.0.M2.jar (131 KB at 34.6 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/org/ow2/asm/asm-analysis/5.0.4/asm-analysis-5.0.4.jar (20 KB at 5.2 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/org/ow2/asm/asm-util/5.0.4/asm-util-5.0.4.jar (43 KB at 10.3 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/com/google/code/findbugs/jxr305/1.3.9/jxr305-1.3.9.jar (33 KB at 7.5 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/com/google/guava/guava/11.0.2/guava-11.0.2.jar (1610 KB at 315.2 KB/sec)
[INFO] Including org.apache.kafka:kafka_2.10:jar:0.8.1 in the shaded jar.
[INFO] Including com.yammer.metrics:metrics-annotation:jar:2.2.0 in the shaded jar.
[INFO] Including com.yammer.metrics:metrics-core:jar:2.2.0 in the shaded jar.
[INFO] Including org.slf4j:slf4j-api:jar:1.7.2 in the shaded jar.
[INFO] Including org.xerial.snappy:snappy-java:jar:1.0.5 in the shaded jar.
[INFO] Including org.apache.zookeeper:zookeeper:jar:3.3.4 in the shaded jar.
[INFO] Including jline:jline:jar:0.9.94 in the shaded jar.
[INFO] Including net.sf.jopt-simple:jopt-simple:jar:3.2 in the shaded jar.
[INFO] Including org.scala-lang:scala-library:jar:2.10.1 in the shaded jar.
[INFO] Including com.101tec:zkclient:jar:0.3 in the shaded jar.
[INFO] Including com.fasterxml.jackson.core:jackson-core:jar:2.6.6 in the shaded jar.
[INFO] Including com.fasterxml.jackson.core:jackson-databind:jar:2.6.6 in the shaded jar.
[INFO] Including log4j:log4j:jar:1.2.17 in the shaded jar.
[INFO] Including junit:junit:jar:4.12 in the shaded jar.
[INFO] Including org.hamcrest:hamcrest-core:jar:1.3 in the shaded jar.
[INFO] Replacing original artifact with shaded artifact.
[INFO] Replacing /home/saji/iot-traffic-monitor-master/iot-kafka-producer/target/iot-kafka-producer-1.0.0.jar with /home/saji/iot-traffic-monitor-master/iot-kafka-producer/target/iot-kafka-producer-1.0.0-shaded.jar
[INFO] Dependency-reduced POM written at: /home/saji/iot-traffic-monitor-master/iot-kafka-producer/dependency-reduced-pom.xml
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 04:54 min
[INFO] Finished at: 2021-08-12T18:00:18+05:30
[INFO] Final Memory: 30M/189M
[INFO]
s@sa:~/iot-traffic-monitor-master/iot-kafka-producer$ 

```

Figure 36 maven package installed success

```

s@sa:~/iot-traffic-monitor-master/iot-kafka-producer
[INFO]
[INFO] Scanning for projects...
[INFO] ------------------------------------------------------------------------
[INFO] [ saj@sa:~/iot-traffic-monitor-master/iot-kafka-producer$ mvn exec:java -Dexec.mainClass="com.iot.app.kafka.producer.IoTDataProducer"
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.pom (4 KB at 0.8 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-clean-plugin/2.5/maven-clean-plugin-2.5.jar (25 KB at 13.4 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.pom (7 KB at 8.3 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.4/maven-install-plugin-2.4.jar (27 KB at 18.5 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-deploy-plugin/2.7/maven-deploy-plugin-2.7.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-deploy-plugin/2.7/maven-deploy-plugin-2.7.pom (6 KB at 4.8 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-deploy-plugin/2.7/maven-deploy-plugin-2.7.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-deploy-plugin/2.7/maven-deploy-plugin-2.7.jar (27 KB at 19.9 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-site-plugin/3.3/maven-site-plugin-3.3.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-site-plugin/3.3/maven-site-plugin-3.3.pom (21 KB at 12.9 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-site-plugin/3.3/maven-site-plugin-3.3.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-site-plugin/3.3/maven-site-plugin-3.3.jar (122 KB at 88.1 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-antrun-plugin/1.3/maven-antrun-plugin-1.3.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-antrun-plugin/1.3/maven-antrun-plugin-1.3.pom (5 KB at 2.2 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins/12/maven-plugins-12.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-plugins-12/maven-plugins-12.pom (12 KB at 13.3 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/9/maven-parent-9.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-parent/9/maven-parent-9.pom (33 KB at 29.6 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-antrun-plugin/1.3/maven-antrun-plugin-1.3.jar

```

Figure 37 iot kafka producer run

## 1.12 IoT Spark Processor

Now move onto the iot-spark-processor directory and use the following commands.

- ✚ \$ cd iot-spark-processor/
- ✚ \$ mvn package
- ✚ \$ spark-submit --class "com.iot.app.spark.processor.IoTDataProcessor" iot-sparkprocessor-1.0.0.jar

```
saji@saJI-VBox:~$ cd iot-traffic-monitor-master
saji@saJI-VBox:~/iot-traffic-monitor-master$ ls
iot-architecture.png  iot-spark-processor          LICENSE  README.md
iot-kafka-producer    iot-springboot-dashboard  pom.xml
saji@saJI-VBox:~/iot-traffic-monitor-master$ cd iot-spark-processor
saji@saJI-VBox:~/iot-traffic-monitor-master/iot-spark-processor$ mvn package
[INFO] Scanning for projects...
[INFO]
[INFO] -----
[INFO] Building IoT Spark Processor 1.0.0
[INFO]
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/spark/spark-core_2.10/1.6.2/spark-core_2.10-1.6.2.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/spark/spark-core_2.10/1.6.2/spark-core_2.10-1.6.2.pom (20 KB at 4.3 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/spark/spark-parent_2.10/1.6.2/spark-parent_2.10-1.6.2.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/spark/spark-parent_2.10/1.6.2/spark-parent_2.10-1.6.2.pom (90 KB at 41.0 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/avro/avro-mapred/1.7.7/avro-mapred-1.7.7.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/avro/avro-mapred/1.7.7/avro-mapred-1.7.7.pom (7 KB at 8.2 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/avro/avro-parent/1.7.7/avro-parent-1.7.7.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/avro/avro-parent/1.7.7/avro-parent-1.7.7.pom (19 KB at 12.0 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/avro/avro-toplevel/1.7.7/avro-toplevel-1.7.7.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/avro/avro-toplevel/1.7.7/avro-toplevel-1.7.7.pom (10 KB at 11.2 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/avro/avro-ipc/1.7.7/avro-ipc-1.7.7.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/avro/avro-ipc/1.7.7/avro-ipc-1.7.7.pom (6 KB at 6.1 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/apache/avro/avro/1.7.7/avro-1.7.7.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/avro/avro/1.7.7/avro-1.7.7.pom (6 KB at 5.3 KB/sec)
[INFO] Downloading: https://repo.maven.apache.org/maven2/org/codehaus/jackson/jackson-core-asl/1.9.13/jackson-core-asl-1.9.13.pom
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/jackson/jackson-core-asl/1.9.13/jackson-core-asl-1.9.13.pom (2 KB at 1.1 KB/sec)
```

Figure 38 iot spark processor mvn package

```
[WARNING] - org.apache.commons.collections.FastHashMap$1
[WARNING] - org.apache.commons.collections.Buffer
[WARNING] - org.apache.commons.collections.FastHashMap
[WARNING] - org.apache.commons.collections.BufferUnderflowException
[WARNING] netty-buffer-4.0.33.Final.jar, netty-all-4.0.29.Final.jar define 79 overlapping classes:
[WARNING] - io.netty.buffer.ByteBufProcessor$5
[WARNING] - io.netty.buffer.PoolSubpage
[WARNING] - io.netty.buffer.PooledHeapByteBuf
[WARNING] - io.netty.buffer.ReadOnlyByteBuf
[WARNING] - io.netty.buffer.PooledByteBufAllocator
[WARNING] - io.netty.buffer.AbstractReferenceCountedByteBuf
[WARNING] - io.netty.buffer.PoolArenaMetric
[WARNING] - io.netty.buffer.SimpleLeakAwareByteBuf
[WARNING] - io.netty.buffer.PoolThreadCache$SubPageMemoryRegionCache
[WARNING] - io.netty.buffer.ByteBufUtil$ThreadLocalDirectByteBuf$1
[WARNING] - 69 more...
[WARNING] maven-shade-plugin has detected that some class files are
[WARNING] present in two or more JARs. When this happens, only one
[WARNING] single version of the class is copied to the uber jar.
[WARNING] Usually this is not harmful and you can skip these warnings,
[WARNING] otherwise try to manually exclude artifacts based on
[WARNING] mvn dependency:tree -Ddetail=true and the above output.
[WARNING] See http://maven.apache.org/plugins/maven-shade-plugin/
[INFO] Replacing original artifact with shaded artifact.
[INFO] Replacing /home/saji/iot-traffic-monitor-master/iot-spark-processor/target/iot-spark-processor-1.0.0.jar with /home/saji/iot-traffic-monitor-master/iot-spark-processor/target/iot-spark-processor-1.0.0-shaded.jar
[INFO] Dependency-reduced POM written at: /home/saji/iot-traffic-monitor-master/iot-spark-processor/dependency-reduced-pom.xml
[INFO]
[INFO] -----
[INFO] BUILD SUCCESS
[INFO]
[INFO] -----
[INFO] Total time: 06:40 min
[INFO] Finished at: 2021-08-12T22:20:46+05:30
[INFO] Final Memory: 40M/341M
[INFO]
[INFO] saJI@saJI-VBox:~/iot-traffic-monitor-master/iot-spark-processor$ spark-submit --class "com.iot.app.spark.processor.IoTDataProcessor" iot-sparkprocessor-1.0.0.jar
> █
```

Figure 39 iot spark processor mvn package build success

## 1.13 Iot Spring Boot Dashboard

- ✚ \$ cd iot-springoot-dashboard/
- ✚ \$ mvn package
- ✚ \$ mvn exec:java -Dexec.mainClass="com.iot.app.springboot.dashboard.IoTDataDashboard"

```
sajit@sajit-VBox:~$ cd iot-springoot-dashboard/
bash: cd: iot-springoot-dashboard/: No such file or directory
sajit@sajit-VBox:~$ ls
cassandra examples.desktop      maven    spark
Desktop   iot-traffic-monitor-master  Music    Templates
Documents kafka                  Pictures  Videos
Downloads master.zip            Public    zookeeper
sajit@sajit-VBox:~$ cd iot-traffic-monitor-master
sajit@sajit-VBox:~/iot-traffic-monitor-master$ ls
iot-architecture.png iot-spark-processor  LICENSE  README.md
iot-kafka-producer  iot-springboot-dashboard pom.xml
sajit@sajit-VBox:~/iot-traffic-monitor-master$ cd iot-springboot-dashboard
sajit@sajit-VBox:~/iot-traffic-monitor-master$ mvn package
[INFO] Scanning for projects...
Downloading: https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-starter-parent/1.3.5.RELEASE/spring-boot-starter-parent-1.3.5.RELEASE.pom
Downloaded: https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-starter-parent/1.3.5.RELEASE/spring-boot-starter-parent-1.3.5.RELEASE.pom (7 KB at 4.7 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-dependencies/1.3.5.RELEASE/spring-boot-dependencies-1.3.5.RELEASE.pom
Downloaded: https://repo.maven.apache.org/maven2/org/springframework/boot/spring-boot-dependencies/1.3.5.RELEASE/spring-boot-dependencies-1.3.5.RELEASE.pom (73 KB at 120.6 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/springframework/spring-framework-bom/4.2.6.RELEASE/spring-framework-bom-4.2.6.RELEASE.pom
Downloaded: https://repo.maven.apache.org/maven2/org/springframework/spring-framework-bom/4.2.6.RELEASE/spring-framework-bom-4.2.6.RELEASE.pom (5 KB at 13.1 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/springframework/data/spring-data-releasetrain/Gosling-SR4/spring-data-releasetrain-Gosling-SR4.pom
Downloaded: https://repo.maven.apache.org/maven2/org/springframework/data/spring-data-releasetrain/Gosling-SR4/spring-data-releasetrain-Gosling-SR4.pom (5 KB at 10.4 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/springframework/data/build/spring-data-build/1.7.4.RELEASE/spring-data-build-1.7.4.RELEASE.pom
Downloaded: https://repo.maven.apache.org/maven2/org/springframework/data/build/spring-data-build/1.7.4.RELEASE/spring-data-build-1.7.4.RELEASE.pom (3 KB at 5.9 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/springframework/integration/spring-integration-bom/4.2.5.RELEASE/spring-integration-bom-4.2.5.RELEASE.pom
Downloaded: https://repo.maven.apache.org/maven2/org/springframework/integration/spring-integration-bom/4.2.5.RELEASE/spring-integration-bom-4
```

Figure 40 Iot Spring Boot Dashboard install maven package

```
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-artifact-manager/2.0.8/maven-artifact-manager-2.0.8.jar (56 KB at 12.1 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/org/apache/commons/commons-compress/1.9/commons-compress-1.9.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-project/2.0.8/maven-project-2.0.8.jar (114 KB at 24.7 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-shade-plugin/2.2/maven-shade-plugin-2.2.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/maven-plugin-registry/2.0.8/maven-plugin-registry-2.0.8.jar (29 KB at 6.1 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/asm/asm/3.3.1/asm-3.3.1.jar
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-io/2.3.2/plexus-io-2.3.2.jar (73 KB at 14.6 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/asm/asm-commons/3.3.1/asm-commons-3.3.1.jar
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/plexus/plexus-archiver/2.8.1/plexus-archiver-2.8.1.jar (140 KB at 28.0 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/asm/asm-tree/3.3.1/asm-tree-3.3.1.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-shade-plugin/2.2/maven-shade-plugin-2.2.jar (98 KB at 19.3 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/shared/maven-dependency-tree/2.1/maven-dependency-tree-2.1.jar
Downloaded: https://repo.maven.apache.org/maven2/asm/3.3.1/asm-3.3.1.jar (43 KB at 8.3 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/org/vafer/jdependency/0.7/jdependency-0.7.jar
Downloaded: https://repo.maven.apache.org/maven2/org/commons/commons-compress/1.9/commons-compress-1.9.jar (370 KB at 71.7 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/commons-io/1.3.2/commons-io-1.3.2.jar
Downloaded: https://repo.maven.apache.org/maven2/asm/asm-commons/3.3.1/asm-commons-3.3.1.jar (38 KB at 7.1 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/asm/asm-analysis/3.2/asm-analysis-3.2.jar
Downloaded: https://repo.maven.apache.org/maven2/asm/asm-tree/3.3.1/asm-tree-3.3.1.jar (22 KB at 3.9 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/asm/asm-util/3.2/asm-util-3.2.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/nexus/shared/nexus-dependency-tree/2.1/maven-dependency-tree-2.1.jar (59 KB at 10.8 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/org/vafer/jdependency/0.7/jdependency-0.7.jar (12 KB at 2.1 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/commons-io/commons-io/1.3.2/commons-io-1.3.2.jar (86 KB at 15.5 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/asm/asm-analysis/3.2/asm-analysis-3.2.jar (18 KB at 3.1 KB/sec)
Downloaded: https://repo.maven.apache.org/maven2/asm/asm-util/3.2/asm-util-3.2.jar (36 KB at 6.2 KB/sec)
[INFO] -----
[INFO] BUILD SUCCESS
[INFO] -----
[INFO] Total time: 01:49 min
[INFO] Finished at: 2021-08-12T20:21:45+05:30
[INFO] Final Memory: 28M/138M
[INFO] -----
```

Figure 41 Iot Spring Boot maven package Build success

```
process-sources, generate-resources, process-resources, compile, process-classes, generate-test-sources, process-test-sources, generate-test-resources, process-test-resources, test-compile, process-test-classes, test, prepare-package, package, pre-integration-test, integration-test, post-integration-test, verify, install, deploy, pre-clean, clean, post-clean, pre-site, site, post-site, site-deploy. -> [Help 1]
[ERROR]
[ERROR] To see the full stack trace of the errors, re-run Maven with the -e switch.
[ERROR] Re-run Maven using the -X switch to enable full debug logging.
[ERROR]
[ERROR] For more information about the errors and possible solutions, please read the following articles:
[ERROR] [Help 1] http://cwiki.apache.org/confluence/display/MAVEN/NoGoalsSpecifiedException
sajil@sajil-VBox:~/iot-traffic-monitor-master/iot-springboot-dashboard$ mvn exec:java -Dexec.mainClass="com.iot.app.springboot.dashboard.IoTDataDashboard"
[INFO] Scanning for projects...
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-help-plugin/2.2/maven-help-plugin-2.2.pom
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-help-plugin/2.2/maven-help-plugin-2.2.pom (9 KB at 5.1 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-help-plugin/2.2/maven-help-plugin-2.2.jar
Downloaded: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-help-plugin/2.2/maven-help-plugin-2.2.jar (67 KB at 115.0 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/codehaus/mojo/xml-maven-plugin/1.0/xml-maven-plugin-1.0.pom
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/mojo/xml-maven-plugin/1.0/xml-maven-plugin-1.0.pom (8 KB at 18.5 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/codehaus/mojo/mojo-parent/28/mojo-parent-28.pom
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/mojo/mojo-parent/28/mojo-parent-28.pom (26 KB at 67.9 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/codehaus/codehaus-parent/3/codehaus-parent-3.pom
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/codehaus-parent/3/codehaus-parent-3.pom (5 KB at 11.3 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/codehaus/mojo/xml-maven-plugin/1.0/xml-maven-plugin-1.0.jar
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/mojo/xml-maven-plugin/1.0/xml-maven-plugin-1.0.jar (34 KB at 86.9 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/codehaus/mojo/build-helper-maven-plugin/1.9.1/build-helper-maven-plugin-1.9.1.pom
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/mojo/build-helper-maven-plugin/1.9.1/build-helper-maven-plugin-1.9.1.pom (7 KB at 18.0 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/codehaus/mojo/mojo-parent/33/mojo-parent-33.pom
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/mojo/mojo-parent/33/mojo-parent-33.pom (26 KB at 69.2 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/codehaus/codehaus-parent/4/codehaus-parent-4.pom
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/codehaus-parent/4/codehaus-parent-4.pom (5 KB at 12.5 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/codehaus/mojo/build-helper-maven-plugin/1.9.1/build-helper-maven-plugin-1.9.1.jar
Downloaded: https://repo.maven.apache.org/maven2/org/codehaus/mojo/build-helper-maven-plugin/1.9.1/build-helper-maven-plugin-1.9.1.jar (47 KB at 113.4 KB/sec)
Downloading: https://repo.maven.apache.org/maven2/org/apache/maven/plugins/maven-install-plugin/2.5.2/maven-install-plugin-2.5.2.pom
7/7 KB
```

*Figure 42 IoT Spring Boot IoT data dashboard*

*Figure 43* springbeet shell

## 1.14 IoT Traffic Data Monitoring Dashboard

Run <http://localhost:8080> in ubuntu browser. This is the Traffic Data Monitoring Dashboard, after all the above installation and configuration.

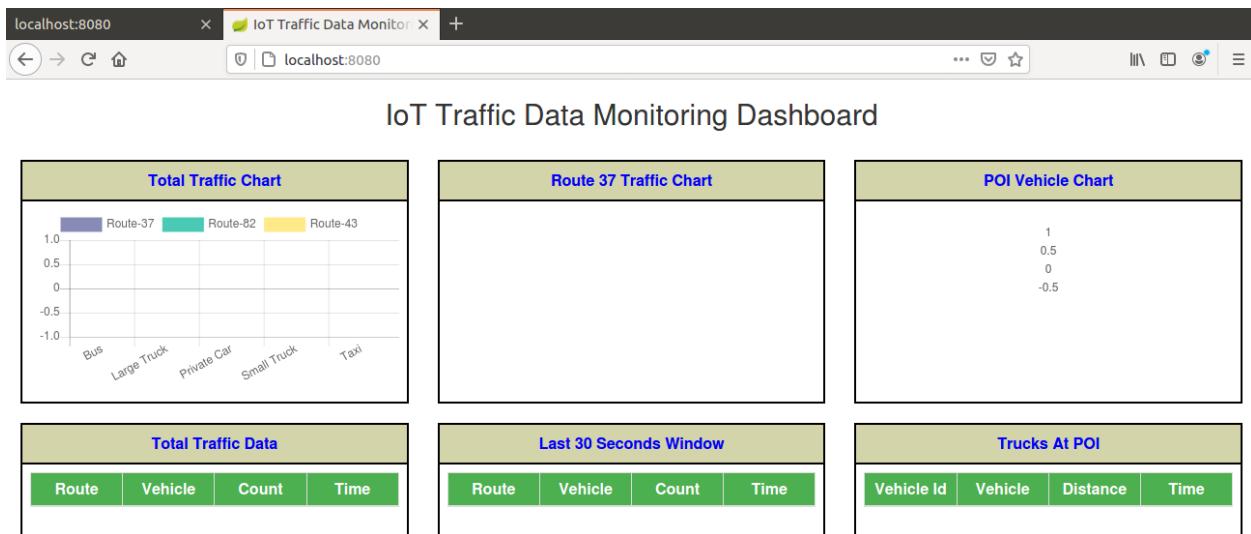


Figure 44 IoT Traffic Data Monitoring Dashboard