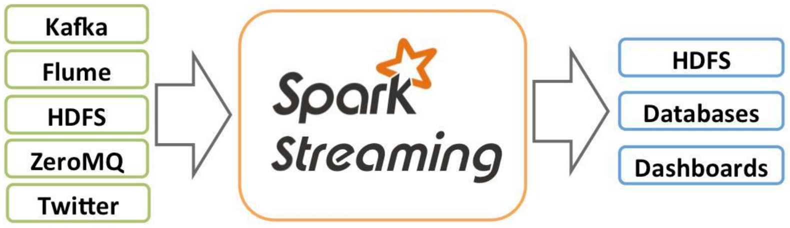
BIG DATA
& INTELLIGENT ANALYTICS

DATA INGESTION REPORT



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Introduction

The following report consists of different streaming algorithms performed in Apache Spark on AWS EMR, namely:

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HDFS –wordcount (Scala & Python)
MQTT –Hello world (Scala)
Twitter –Twitter Popular Tags (Scala)
ZeroMQ-wordcount (Scala)

Disclaimer:

Some of the algorithms work in Spark 1.3.1 and some work in 1.4.1

We have mentioned the Spark version in which algorithms work in their respective documents.

1: Kafka Wordcount

Tested in
Spark version: 1.3.1
Kafka version: 2.11-0.8.2.1

Scala Implementation

Start Zookeeper server

```
bin/zookeeper-server-start.sh /home/hadoop/kafka_2.11-0.8.2.1/kafka_2.11-
0.8.2.1/config/zookeeper.properties
```

In a parallel terminal, Start Kafka Server

```
bin/kafka-server-start.sh /home/hadoop/kafka_2.11-0.8.2.1/kafka_2.11-
0.8.2.1/config/server.properties
```

In a parallel terminal, Make Kafka Topic (for eg: bigdatatopic)

```
bin/kafka-topics.sh --create --zookeeper localhost:2181 --replication-factor 1 --partitions 1 --topic
bigdatatopic
```

In a parallel terminal, Start Producer

```
bin/kafka-console-producer.sh --broker-list localhost:9092 --topic bigdatatopic
```

In a parallel terminal, Start Consumer

```
bin/kafka-console-consumer.sh --zookeeper localhost:2181 --topic bigdatatopic --from-
beginning
```

In a parallel terminal, Run in spark directory

```
bin/run-example org.apache.spark.examples.streaming.KafkaWordCount localhost:2181 my-
consumer-group bigdatatopic
```

Python Implementation

Could implement this only in local system with spark version 1.4.0
The issue with EMR Cluster running Spark 1.4.1 was that Zookeeper server kept getting timed out.

Start Zookeeper server

```
bin/zookeeper-server-start.sh /home/hadoop/kafka_2.11-0.8.2.1/kafka_2.11-
0.8.2.1/config/zookeeper.properties
```

In a parallel terminal, Start Kafka Server

```
bin/kafka-server-start.sh /home/hadoop/kafka_2.11-0.8.2.1/kafka_2.11-
0.8.2.1/config/server.properties
```

In a parallel terminal, Make Kafka Topic (for eg: bigdatatopic)

```
bin/kafka-topics.sh --create --zookeeper localhost:2181 --replication-factor 1 --partitions 1 --topic
bigdatatopic
```

In a parallel terminal, Start Producer

```
bin/kafka-console-producer.sh --broker-list localhost:9092 --topic bigdatatopic
```

In a parallel terminal, Start Consumer

```
bin/kafka-console-consumer.sh --zookeeper localhost:2181 --topic bigdatatopic --from-
beginning
```

In a parallel terminal, Run in spark directory

```
bin/spark-submit --packages org.apache.spark:spark-streaming-kafka_2.10:1.3.1 --
jars $(echo /home/hadoop/spark/lib/*.jar | tr ' '
',')examples/src/main/python/streaming/kafka_wordcount.py localhost:2181 bigdatatopic
```

2: Flume Wordcount

Tested in
Spark version: 1.3.1
Flume version: 1.6.0
We could not completely executed Flume Event Count in scala, as flume word count is not present.

Scala Implementation

First we have to create a configuration file by the name avro_spark.conf in flume/conf/ directory

```
a1.sources = r1
a1.channels = c1
a1.sources.r1.type = avro
a1.sources.r1.channels = c1
a1.sources.r1.bind = 172.31.37.177
a1.sources.r1.port = 4141
a1.sinks = k1
a1.sinks.k1.type = avro
a1.channels.c1.type = memory
a1.channels.c1.capacity = 1000
a1.channels.c1.transactionCapacity = 100
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
a1.sinks.k1.hostname = 172.31.37.177
a1.sinks.k1.port = 6666
a1.sources = r1
a1.sinks = spark
a1.channels = c1
```

The configurations mentioned in the above file are not completely correct. We tried various configurations but did not succeed.
In flume/bin directory execute the following command to configure the above properties

```
flume-ng agent -c . -f conf/avro_spark.conf -n a1 Start Spark-streaming
```

In spark directory, execute the following command to run the Flume event listener

```
bin/run-example org.apache.spark.examples.streaming.FlumeEventCount 172.31.37.177 6666
```

In Parallel terminal, create a wordcount.txt file and execute the following command through an avro client in flume/bin directory

```
flume-ng avro-client -c . -H 172.31.37.177 -p 4141 -F wordcount.txt
```

Python Implementation

First we have to create a configuration file by the name avro_spark.conf in flume/conf/ directory

```
a1.sources = r1
a1.channels = c1
a1.sources.r1.type = avro
a1.sources.r1.channels = c1
a1.sources.r1.bind = 172.31.37.177
a1.sources.r1.port = 4141
a1.sinks = k1
a1.sinks.k1.type = avro
a1.channels.c1.type = memory
a1.channels.c1.capacity = 1000
a1.channels.c1.transactionCapacity = 100
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
a1.sinks.k1.hostname = 172.31.37.177
a1.sinks.k1.port = 6666
a1.sources = r1
a1.sinks = spark
a1.channels = c1
```

The configurations mentioned in the above file are not completely correct. We tried various configurations but did not succeed.
In flume/bin directory execute the following command to configure the above properties

```
flume-ng agent -c . -f conf/avro_spark.conf -n a1 Start Spark-streaming
```

In spark directory, execute the following command to run the Flume event listener

```
bin/spark-submit --jars external/flume-assembly/target/scala-*/ spark-streaming-flume-assembly-*.jar
examples/src/main/python/streaming/flume_wordcount.py localhost 172.31.37.177
```

In Parallel terminal, create a wordcount.txt file and execute the following command through an avro client in flume/bin directory

```
flume-ng avro-client -c . -H 172.31.37.177 -p 4141 -F wordcount.txt
```

3:Kinesis Clickstream Analysis

Tested in
Spark version: 1.4.1

Scala Implementation

Run the generator

```
bin/run-example org.apache.spark.examples.streaming.clickstream.PageViewGenerator 44444 10
```

In a parallel terminal , To process the generated stream

For PageCounts

```
bin/run-example org.apache.spark.examples.streaming.clickstream.PageViewStream pageCounts localhost 44444
```

For Sliding Page Counts

```
bin/run-example org.apache.spark.examples.streaming.clickstream.PageViewStream slidingPageCounts localhost 44444
```

For Error Rate Per ZipCode

```
bin/run-example org.apache.spark.examples.streaming.clickstream.PageViewStream errorRatePerZipCode localhost 44444
```

For Active User Count

```
bin/run-example org.apache.spark.examples.streaming.clickstream.PageViewStream activeUserCount localhost 44444
```

For Popular Users Seen

```
bin/run-example org.apache.spark.examples.streaming.clickstream.PageViewStream popularUsersSeen localhost 44444
```

4: HDFS Wordcount

Tested in
Spark version: 1.4.1

Scala Implementation

Create wordcount.txt file in local AWS directory
To edit the textfile

```
 sudo vi wordcount.txt
```

Create a directory in HDFS to put the file later on:

```
hadoop fs -mkdir /user/ani
hadoop fs -mkdir /user/ani/localdir
```

Run the Scala script

```
bin/run-example org.apache.spark.examples.streaming.HdfsWordCount /user/ani/localdir
```

In parallel terminal, move the wordcount.txt file from local AWS directory to HDFS directory created above, using the following command

```
hadoop fs -put wordcount.txt /user/ani/localdir
```

Python Implementation

Create wordcount.txt file in local AWS directory
To edit the textfile

```
 sudo vi wordcount.txt
```

Create a directory in HDFS to put the file later on:

```
hadoop fs -mkdir /user/ani
hadoop fs -mkdir /user/ani/localdir
```

Run the Python script

```
bin/spark-submit examples/src/main/python/streaming/hdfs_wordcount.py /user/ani/localdir
```

In parallel terminal, move the wordcount.txt file from local AWS directory to HDFS directory createdabove, using the following command

```
hadoop fs -put wordcount.txt /user/ani/localdir
```

5: MQTT – Hello World

Tested in
Spark version: 1.3.1
MQTT version: 1.4.2

Scala Implementation

Initial Setup:
Copy mosquitto-1.4.2.tar.gz to AWS

Unzip the file using the command:

```
tar -vxzf mosquitto-1.4.2.tar.gz
```

Navigate to mosquitto-1.4.2 directory

```
cd mosquitto-1.4.2
```

Install cmake to build mosquito using the following commands

```
sudo yum install cmake
cmake .
sudo make install
```

Run the following command to start mosquitto broker

```
mosquitto
```

In a parallel terminal, run the publisher

```
bin/run-example org.apache.spark.examples.streaming.MQTTPublisher tcp://localhost:1883 foo
```

In a parallel terminal, run the consumer

```
bin/run-example org.apache.spark.examples.streaming.MQTTWordCount tcp://localhost:1883 foo
```

6: Twitter- Twitter Popular Tags

Tested in
Spark version: 1.3.1

Scala Implementation

Create a twitter applicationhere**(to get access key and token)**

Make a twitter4j.properties file and store in Spark directory

twitter4j.properties file should contain :

```
oauth.consumerKey=RLDuPu9vwZ2ZZtLuFk079NA3Z
oauth.consumerSecret=hEs7rCWkZshBokJrAedZ6ED9iBA5hZqGIKj123OWyUl7HLrdKj
oauth.accessToken=67358709-QnsxyrZLQBlwjxBdllD5mBRcDsEAUZOQ9NDUJrFiC
oauth.accessTokenSecret=gKpiYnrgo4EmefLw1NAUua70DaP15Ar5cL0kYS9ksPpuC
```

Run the scala script by passing the authentication keys as arguments

```
bin/run-example org.apache.spark.examples.streaming.TwitterPopularTags
RLDuPu9vwZ2ZZtLuFk079NA3ZhEs7rCWkZshBokJrAedZ6ED9iBA5hZqGIKj123OWyUl7HLrdKj67358709-
QnsxyrZLQBlwjxBdllD5mBRcDsEAUZOQ9NDUJrFiCgKpiYnrgo4EmefLw1NAUua70DaP15Ar5cL0kYS9ksPpu
C
```

7: ZeroMQ- Wordcount

Tested in
Spark version: 1.3.1
ZeroMQ version: 2.2.0

Scala Implementation

Install the following prerequisite packages

```
sudo yum install libtool
sudo yum install autoconf
sudo yum install automake
sudo yum install gcc-c++
sudo yum install libuuid-devel
```

Copy the following ZeroMQ packages

zeromq-2.2.0
jzmq-master
libzmq-master

Navigate to zeromq-2.2.0 directory

```
./autogen.sh
./configure --prefix=/home/hadoop/
make
make install
sudo ldconfig -v
```

Navigate to libzmq-master directory

```
./autogen.sh
./configure --without-libsodium --prefix=/home/hadoop/
make
make install
sudo ldconfig -v
```

Navigate to jzmq-master

```
./autogen.sh
./configure --without-libsodium --prefix=/home/hadoop/
```

We are getting error here quoting unable to find zmq file. We tried adding the library path to refer to library files but still didn't work.
Rest of the steps if this works, are as follows:

```
make
make install
sudo ldconfig -v
```

Run the following commands in spark directory

```
bin/run-example org.apache.spark.examples.streaming.SimpleZeroMQPublisher
tcp://127.0.1.1:1234 foo.bar
bin/run-example org.apache.spark.examples.streaming.ZeroMQWordCount tcp://127.0.1.1:1234
foo
```

Lessons learnt and challenges faced

Apache Spark 1.4.1 did not support most of the streaming algorithms as a lot of the jars (although present) were not referenced during compile time.

Conclusion

Thus Spark streaming algorithms integrated with different streaming applications were explored successfully.