HU Extension Assignment 09 E63 Big Data Analytics

Handed out: 10/28/2017 Due by 4:00 PM EST on Saturday, 11/04/2017

Problem 1. Install Kafka on you Linux VM**.** If on your own VM with CentOS7.4 you should be able to install Kafka using yum:

```
$ sudo yum install kafka
```

Kafka code is most probably installed in the directory `/usr/hdp/current/kafka-broker`. Create an environmental variable KAFKA_HOME pointing to that directory. Place the directory `/usr/hdp/current/kafka-broker/bin` in the PATH variable in the `.bash_profile` file in your home directory. Source `.bash_profile` (e.i. issue command `$ source .bash_profile`), so that you can invoke Kafka scripts from any directory. Make sure that Zookeeper server is started. Kafka configuration files reside in the directories: `$KAFKA_HOME/config`. Create a topic**.** Demonstrate that provided scripting client `kafka-console-producer.sh` receives and displays messages produced by `kafka-console-consumer.sh` client.

START ZOOKEEPER

```
[cloudera@quickstart zookeeper]$ sudo service zookeeper-server start
JMX enabled by default
Using config: /etc/zookeeper/conf/zoo.cfg
Starting zookeeper ... already running as process 21220.
```

START KAFKA

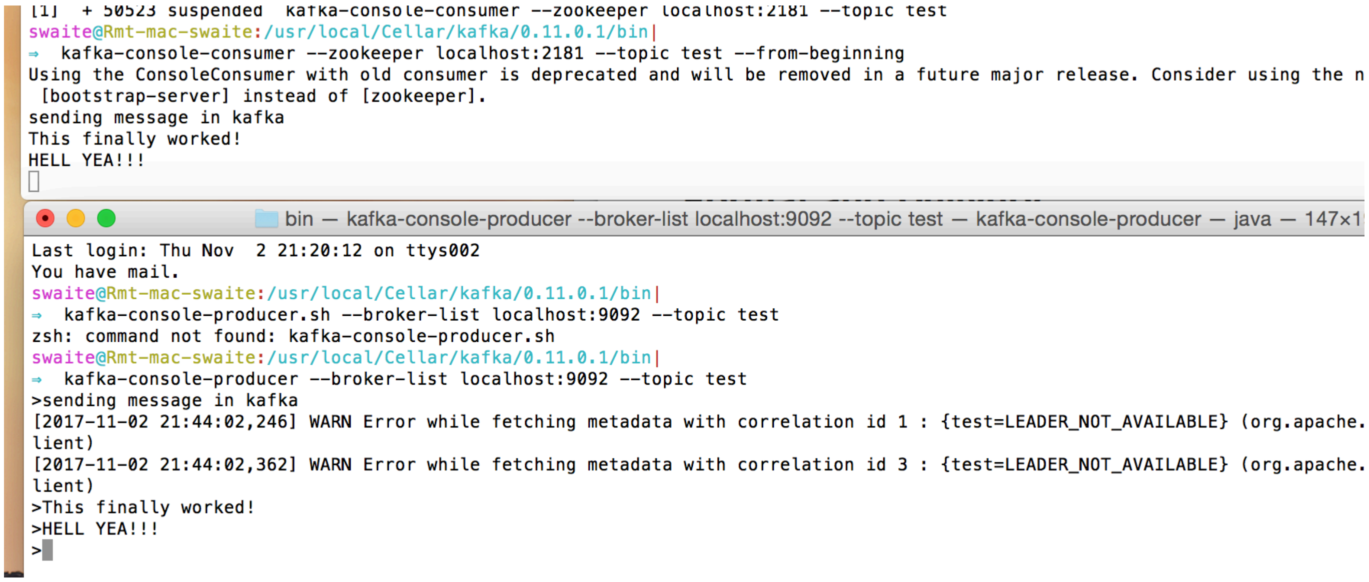
```
[cloudera@quickstart tmp]$ sudo service kafka-server start
Starting Kafka Server (kafka-server):                    [  OK  ]
Kafka Server is running                            [  OK  ]
```

CREATE TOPIC

```
[cloudera@quickstart config]$ $KAFKA_HOME/bin/kafka-topics.sh --list --
zookeeper localhost:2181
SLF4J: Class path contains multiple SLF4J bindings.
SLF4J: Found binding in [jar:file:/usr/lib/kafka/libs/slf4j-log4j12-
1.7.21.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: Found binding in [jar:file:/usr/lib/kafka/libs/slf4j-log4j12-
1.7.5.jar!/org/slf4j/impl/StaticLoggerBinder.class]
SLF4J: See http://www.slf4j.org/codes.html#multiple_bindings for an explanation.
SLF4J: Actual binding is of type [org.slf4j.impl.Log4jLoggerFactory]
test
test2
```

I had issues with KAFKA in cloudera VM so I installed it on my Macbook to continue

```
brew install kafka
brew services start zookeeper
brew services start kafka

swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-9|master⚡
⇒  brew services start zookeeper
==> Successfully started `zookeeper` (label:
homebrew.mxcl.zookeeper)
swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-9|master⚡
⇒  brew services start kafka
==> Successfully started `kafka` (label: homebrew.mxcl.kafka)
```



```
[1]  + 50523 suspended  kafka-console-consumer --zookeeper localhost:2181 --topic test
swaite@Rmt-mac-swaite:/usr/local/Cellar/kafka/0.11.0.1/bin|
⇒  kafka-console-consumer --zookeeper localhost:2181 --topic test --from-beginning
Using the ConsoleConsumer with old consumer is deprecated and will be removed in a future major release. Consider using the n
 [bootstrap-server] instead of [zookeeper].
sending message in kafka
This finally worked!
HELL YEA!!!
```

```
bin — kafka-console-producer --broker-list localhost:9092 --topic test — kafka-console-producer — java — 147×1
Last login: Thu Nov  2 21:20:12 on ttys002
You have mail.
swaite@Rmt-mac-swaite:/usr/local/Cellar/kafka/0.11.0.1/bin|
⇒  kafka-console-producer.sh --broker-list localhost:9092 --topic test
zsh: command not found: kafka-console-producer.sh
swaite@Rmt-mac-swaite:/usr/local/Cellar/kafka/0.11.0.1/bin|
⇒  kafka-console-producer --broker-list localhost:9092 --topic test
>sending message in kafka
[2017-11-02 21:44:02,246] WARN Error while fetching metadata with correlation id 1 : {test=LEADER_NOT_AVAILABLE} (org.apache.
lient)
[2017-11-02 21:44:02,362] WARN Error while fetching metadata with correlation id 3 : {test=LEADER_NOT_AVAILABLE} (org.apache.
lient)
>This finally worked!
>HELL YEA!!!
>
```

Problem 2. Make supplied python script `kafka_consumer.py` receive messages produced by supplied python script `kafka_producer.py`. Modify `kafka_producer.py` so that you can pass server name and the port of the Kafka broker and the name of Kafka topic on the command line. Also, modify that script so that it continuously reads your terminal inputs and sends every line to Kafka consumer. Demonstrate that kafka_consumer.py can read and display messages of modified `kafka_producer.py`. Provide working code of modified `kafka_producer.py`. Describe to us the process of installing Python packages, if any, you needed for this problem.

KAFKA_PRODUCER.py Code

```
from kafka import KafkaProducer
import time
import sys
```

```
if len(sys.argv) != 4:
    print "Please pass 3 arguments to script ex: python2.7 kafka_producer.py localhost 9092 topic1"
    exit(1)

producer = KafkaProducer(bootstrap_servers=str(sys.argv[1]) + ':' + str(sys.argv[2]))
kafka_topic = str(sys.argv[3])

inp = raw_input("\nPlease type a message or EXIT to exit script:\n")
while inp != "EXIT":
    inp = raw_input()
    producer.send(sys.argv[3], b"" + str(inp))
```

Command Line Input Kafka Producer

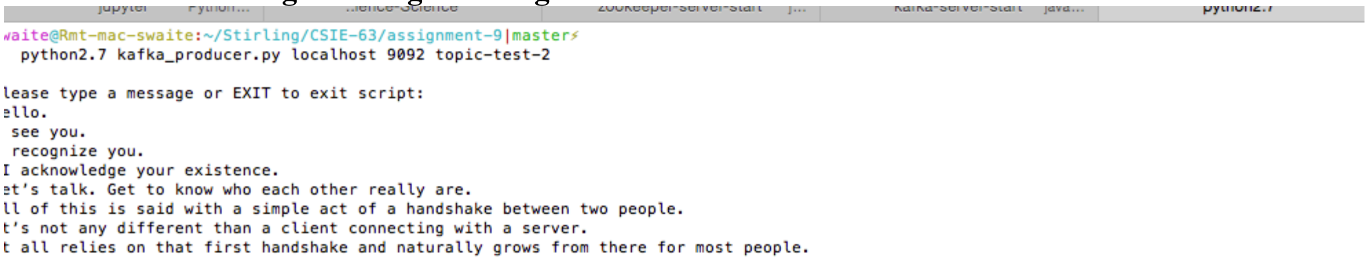
```
swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-9|master⚡
⇒  python2.7 kafka_producer.py localhost 9092 topic-test-2

Please type a message or EXIT to exit script:
Hello.
I see you.
I recognize you.
I acknowledge your existence.
Let’s talk. Get to know who each other really are.
All of this is said with a simple act of a handshake between two
people.
It’s not any different than a client connecting with a server.
It all relies on that first handshake and naturally grows from
there for most people.
```

Command Line Input Kafka Consumer

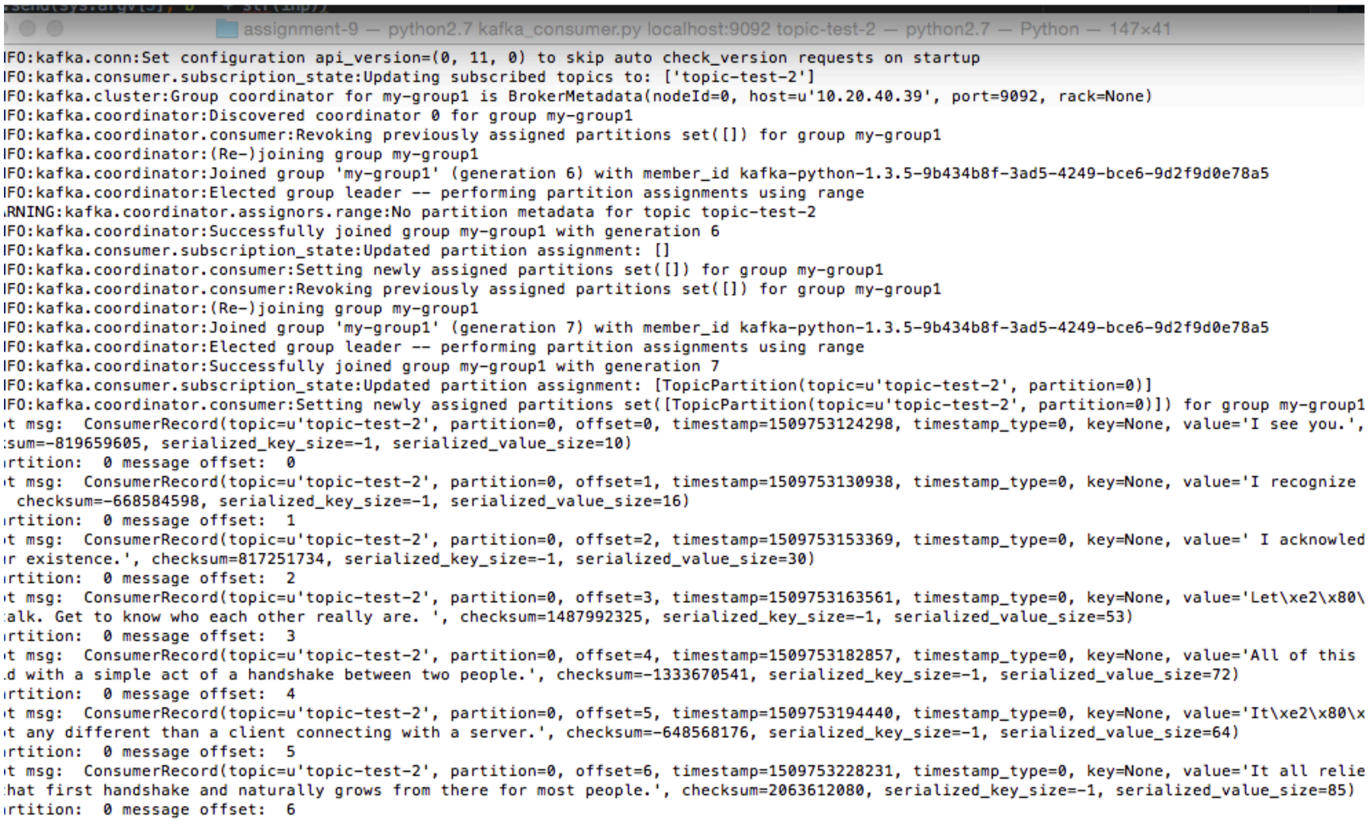
```
swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-9|master⚡
⇒  python2.7 kafka_consumer.py localhost:9092 topic-test-2
Topic is:  topic-test-2
Group is:  my-group1
INFO:kafka.client:Bootstrapping cluster metadata from
[('localhost', 9092, 0)]
INFO:kafka.conn:<BrokerConnection node_id=bootstrap
host=localhost/::1 port=9092>: connecting to ::1:9092
INFO:kafka.client:Bootstrap succeeded: found 1 brokers and 5
topics.
INFO:kafka.conn:<BrokerConnection node_id=bootstrap
host=localhost/::1 port=9092>: Closing connection.
INFO:kafka.conn:<BrokerConnection node_id=0
host=10.20.40.39/10.20.40.39 port=9092>: connecting to
10.20.40.39:9092
INFO:kafka.conn:Broker version identifed as 0.11.0
INFO:kafka.conn:Set configuration api_version=(0, 11, 0) to skip
auto check_version requests on startup
INFO:kafka.consumer.subscription_state:Updating subscribed topics
```

```
to: ['topic-test-2']
INFO:kafka.cluster:Group coordinator for my-group1 is
BrokerMetadata(nodeId=0, host=u'10.20.40.39', port=9092,
rack=None)
INFO:kafka.coordinator:Discovered coordinator 0 for group my-
group1
INFO:kafka.coordinator.consumer:Revoking previously assigned
partitions set([]) for group my-group1
INFO:kafka.coordinator:(Re-)joining group my-group1
INFO:kafka.coordinator:Joined group 'my-group1' (generation 6)
with member_id kafka-python-1.3.5-9b434b8f-3ad5-4249-bce6-
9d2f9d0e78a5
INFO:kafka.coordinator:Elected group leader -- performing
partition assignments using range
WARNING:kafka.coordinator.assignors.range:No partition metadata
for topic topic-test-2
INFO:kafka.coordinator:Successfully joined group my-group1 with
generation 6
INFO:kafka.consumer.subscription_state:Updated partition
assignment: []
INFO:kafka.coordinator.consumer:Setting newly assigned partitions
set([]) for group my-group1
INFO:kafka.coordinator.consumer:Revoking previously assigned
partitions set([]) for group my-group1
INFO:kafka.coordinator:(Re-)joining group my-group1
INFO:kafka.coordinator:Joined group 'my-group1' (generation 7)
with member_id kafka-python-1.3.5-9b434b8f-3ad5-4249-bce6-
9d2f9d0e78a5
INFO:kafka.coordinator:Elected group leader -- performing
partition assignments using range
INFO:kafka.coordinator:Successfully joined group my-group1 with
generation 7
INFO:kafka.consumer.subscription_state:Updated partition
assignment: [TopicPartition(topic=u'topic-test-2', partition=0)]
INFO:kafka.coordinator.consumer:Setting newly assigned partitions
set([TopicPartition(topic=u'topic-test-2', partition=0)]) for
group my-group1
got msg:  ConsumerRecord(topic=u'topic-test-2', partition=0,
offset=0, timestamp=1509753124298, timestamp_type=0, key=None,
value='I see you.', checksum=-819659605, serialized_key_size=-1,
serialized_value_size=10)
partition:  0 message offset:  0
got msg:  ConsumerRecord(topic=u'topic-test-2', partition=0,
offset=1, timestamp=1509753130938, timestamp_type=0, key=None,
value='I recognize you.', checksum=-668584598,
serialized_key_size=-1, serialized_value_size=16)
partition:  0 message offset:  1
got msg:  ConsumerRecord(topic=u'topic-test-2', partition=0,
offset=2, timestamp=1509753153369, timestamp_type=0, key=None,
value=' I acknowledge your existence.', checksum=817251734,
serialized_key_size=-1, serialized_value_size=30)
partition:  0 message offset:  2
got msg:  ConsumerRecord(topic=u'topic-test-2', partition=0,
offset=3, timestamp=1509753163561, timestamp_type=0, key=None,
value='Let\xe2\x80\x99s talk. Get to know who each other really
are. ', checksum=1487992325, serialized_key_size=-1,
serialized_value_size=53)
partition:  0 message offset:  3
got msg:  ConsumerRecord(topic=u'topic-test-2', partition=0,
offset=4, timestamp=1509753182857, timestamp_type=0, key=None,
value='All of this is said with a simple act of a handshake
between two people.', checksum=-1333670541, serialized_key_size=-
1, serialized_value_size=72)
partition:  0 message offset:  4
got msg:  ConsumerRecord(topic=u'topic-test-2', partition=0,
offset=5, timestamp=1509753194440, timestamp_type=0, key=None,
value='It\xe2\x80\x99s not any different than a client connecting
with a server.', checksum=-648568176, serialized_key_size=-1,
serialized_value_size=64)
partition:  0 message offset:  5
got msg:  ConsumerRecord(topic=u'topic-test-2', partition=0,
offset=6, timestamp=1509753228231, timestamp_type=0, key=None,
value='It all relies on that first handshake and naturally grows
from there for most people.', checksum=2063612080,
serialized_key_size=-1, serialized_value_size=85)
partition:  0 message offset:  6
```

Screenshot of Message Passing Exchange



```
waite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-9|master⚡
  python2.7 kafka_producer.py localhost 9092 topic-test-2

lease type a message or EXIT to exit script:
ello.
 see you.
 recognize you.
I acknowledge your existence.
et's talk. Get to know who each other really are.
ll of this is said with a simple act of a handshake between two people.
t's not any different than a client connecting with a server.
t all relies on that first handshake and naturally grows from there for most people.
```



```
assignment-9 — python2.7 kafka_consumer.py localhost:9092 topic-test-2 — python2.7 — Python — 147×41
IFO:kafka.conn:Set configuration api_version=(0, 11, 0) to skip auto check_version requests on startup
IFO:kafka.consumer.subscription_state:Updating subscribed topics to: ['topic-test-2']
IFO:kafka.cluster:Group coordinator for my-group1 is BrokerMetadata(nodeId=0, host=u'10.20.40.39', port=9092, rack=None)
IFO:kafka.coordinator:Discovered coordinator 0 for group my-group1
IFO:kafka.coordinator.consumer:Revoking previously assigned partitions set([]) for group my-group1
IFO:kafka.coordinator:(Re-)joining group my-group1
IFO:kafka.coordinator:Joined group 'my-group1' (generation 6) with member_id kafka-python-1.3.5-9b434b8f-3ad5-4249-bce6-9d2f9d0e78a5
IFO:kafka.coordinator:Elected group leader -- performing partition assignments using range
RNING:kafka.coordinator.assignors.range:No partition metadata for topic topic-test-2
IFO:kafka.coordinator:Successfully joined group my-group1 with generation 6
IFO:kafka.consumer.subscription_state:Updated partition assignment: []
IFO:kafka.coordinator.consumer:Setting newly assigned partitions set([]) for group my-group1
IFO:kafka.coordinator.consumer:Revoking previously assigned partitions set([]) for group my-group1
IFO:kafka.coordinator:(Re-)joining group my-group1
IFO:kafka.coordinator:Joined group 'my-group1' (generation 7) with member_id kafka-python-1.3.5-9b434b8f-3ad5-4249-bce6-9d2f9d0e78a5
IFO:kafka.coordinator:Elected group leader -- performing partition assignments using range
IFO:kafka.coordinator:Successfully joined group my-group1 with generation 7
IFO:kafka.consumer.subscription_state:Updated partition assignment: [TopicPartition(topic=u'topic-test-2', partition=0)]
IFO:kafka.coordinator.consumer:Setting newly assigned partitions set([TopicPartition(topic=u'topic-test-2', partition=0)]) for group my-group1
t msg:  ConsumerRecord(topic=u'topic-test-2', partition=0, offset=0, timestamp=1509753124298, timestamp_type=0, key=None, value='I see you.',
sum=-819659605, serialized_key_size=-1, serialized_value_size=10)
rtition:  0 message offset:  0
t msg:  ConsumerRecord(topic=u'topic-test-2', partition=0, offset=1, timestamp=1509753130938, timestamp_type=0, key=None, value='I recognize
 checksum=-668584598, serialized_key_size=-1, serialized_value_size=16)
rtition:  0 message offset:  1
t msg:  ConsumerRecord(topic=u'topic-test-2', partition=0, offset=2, timestamp=1509753153369, timestamp_type=0, key=None, value=' I acknowled
r existence.', checksum=817251734, serialized_key_size=-1, serialized_value_size=30)
rtition:  0 message offset:  2
t msg:  ConsumerRecord(topic=u'topic-test-2', partition=0, offset=3, timestamp=1509753163561, timestamp_type=0, key=None, value='Let\xe2\x80\
alk. Get to know who each other really are. ', checksum=1487992325, serialized_key_size=-1, serialized_value_size=53)
rtition:  0 message offset:  3
t msg:  ConsumerRecord(topic=u'topic-test-2', partition=0, offset=4, timestamp=1509753182857, timestamp_type=0, key=None, value='All of this
d with a simple act of a handshake between two people.', checksum=-1333670541, serialized_key_size=-1, serialized_value_size=72)
rtition:  0 message offset:  4
t msg:  ConsumerRecord(topic=u'topic-test-2', partition=0, offset=5, timestamp=1509753194440, timestamp_type=0, key=None, value='It\xe2\x80\x
t any different than a client connecting with a server.', checksum=-648568176, serialized_key_size=-1, serialized_value_size=64)
rtition:  0 message offset:  5
t msg:  ConsumerRecord(topic=u'topic-test-2', partition=0, offset=6, timestamp=1509753228231, timestamp_type=0, key=None, value='It all relie
hat first handshake and naturally grows from there for most people.', checksum=2063612080, serialized_key_size=-1, serialized_value_size=85)
rtition:  0 message offset:  6
```

Problem 3. Rather than using `splitAndSend.sh` bash script to generate traffic towards Spark Streaming engine, write a Kafka Producer which will read `orders.txt` file and send 1,000 orders to a Kafka topic every second. Write a Kafka consumer that will deliver those batches of orders to Spark Streaming engine. Base your Kafka consumer on provided `direct_word_count.py` script. Let Spark streaming engine count the number of orders different stocks where bought in each batch. Display for us a section of results in your solution. Describe to us the process of installing and invoking Python packages, if any, you needed for this problem.

python2.7 kafka-orders-producer.py localhost:9092 p3-topic-1

CODE

```
from kafka import KafkaProducer
from itertools import islice
import time
import sys

infile_path = "/Users/swaite/Stirling/CSIE-63/assignment-9/data/orders.txt"
chunk_size = 1000
producer = KafkaProducer(bootstrap_servers=str(sys.argv[1]))
topic = str(sys.argv[2])
# topic = "p3-topic-1"
# producer = KafkaProducer(bootstrap_servers="localhost:9092")

order_count = 0
with open(infile_path) as f:
    while True:
        chunks = list(islice(f, chunk_size))
        order_count += 1
        print("message_count: " + str(order_count) + "\n" + "chunk_size: " +
str(len(chunks)))
        chunked_message = "".join(chunks)
        print(chunked_message)
        producer.send(topic, chunked_message)
        if not chunks:
            break
        time.sleep(1)
```

OUTPUT

```
2016-03-22 20:25:29,82975,46,KMI,591,101.00,B
2016-03-22 20:25:29,82976,92,YHOO,74,90.00,S
2016-03-22 20:25:29,82977,6,MRO,997,15.00,S
2016-03-22 20:25:29,82978,63,AFFX,243,2.00,S
2016-03-22 20:25:29,82979,11,Z,714,25.00,B
2016-03-22 20:25:29,82980,76,WYNN,899,46.00,S
2016-03-22 20:25:29,82981,27,SBGL,290,88.00,B
2016-03-22 20:25:29,82982,70,KGC,771,16.00,B
2016-03-22 20:25:29,82983,79,OPK,36,35.00,S
2016-03-22 20:25:29,82984,11,INO,140,94.00,S
2016-03-22 20:25:29,82985,63,FB,883,64.00,S
2016-03-22 20:25:29,82986,72,AMD,441,98.00,S
2016-03-22 20:25:29,82987,18,NFLX,659,74.00,B
2016-03-22 20:25:29,82988,96,AG,101,90.00,S
2016-03-22 20:25:29,82989,58,UAL,500,37.00,B
```

```
2016-03-22 20:25:29,82990,38,PETX,808,93.00,B
2016-03-22 20:25:29,82991,56,WNC,328,94.00,B
2016-03-22 20:25:29,82992,64,AU,889,26.00,B
2016-03-22 20:25:29,82993,3,AMD,283,48.00,S
2016-03-22 20:25:29,82994,43,BP,834,16.00,B
2016-03-22 20:25:29,82995,93,NEM,606,61.00,S
2016-03-22 20:25:29,82996,83,GG,929,81.00,B
2016-03-22 20:25:29,82997,7,FB,134,11.00,B
2016-03-22 20:25:29,82998,81,BHP,823,68.00,B
2016-03-22 20:25:29,82999,13,AAPL,375,90.00,B
2016-03-22 20:25:29,83000,14,AG,478,62.00,S
```

python2.7 kafka-orders-consumer.py localhost:9092 p3-topic-1

CODE

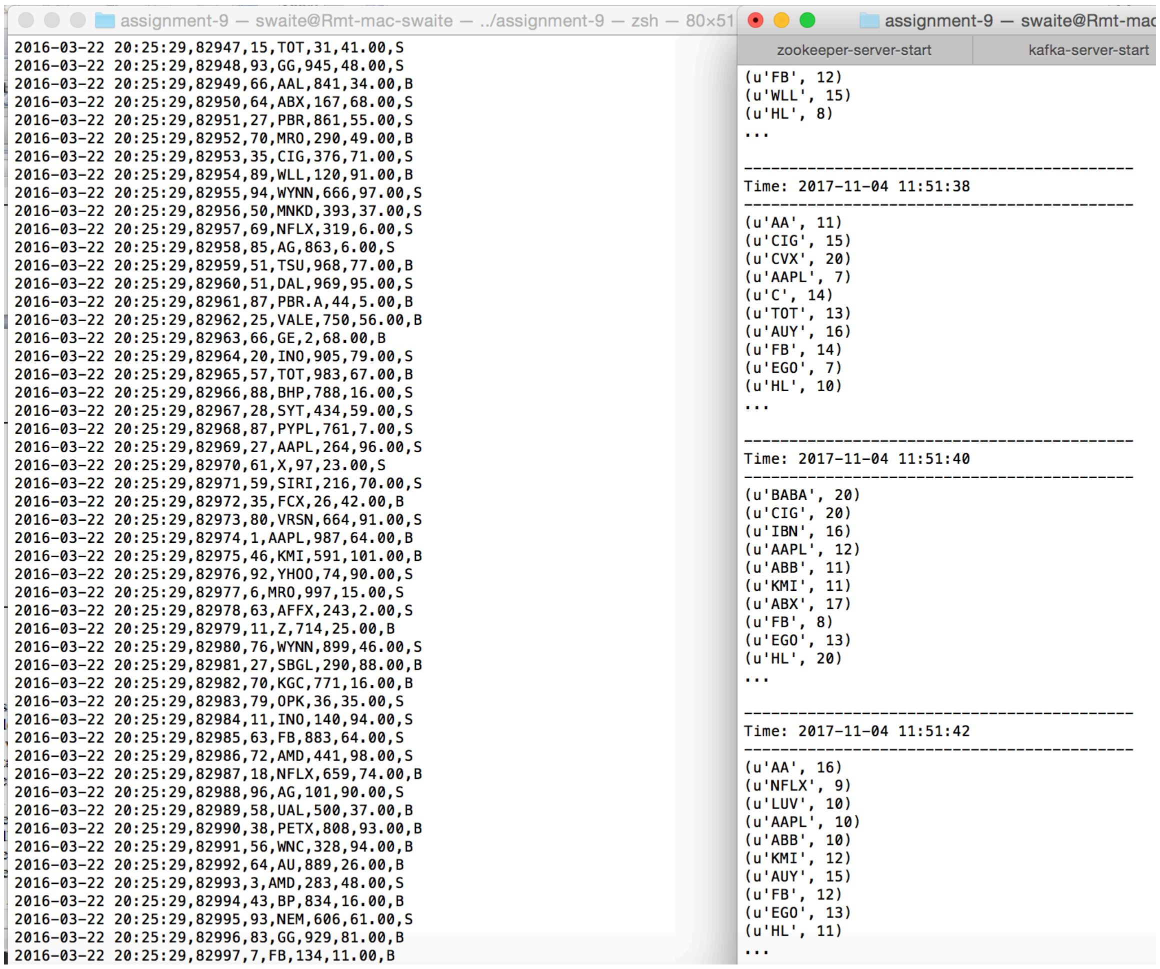
```
from pyspark import SparkContext
from pyspark.sql import SQLContext, SparkSession, Row
from pyspark.streaming import StreamingContext
from pyspark.streaming.kafka import KafkaUtils
from itertools import islice
from datetime import datetime
from operator import add

# Base your Kafka consumer on provided direct_word_count.py script.
# Let Spark streaming engine count the number of orders different stocks where bought
in each batch.
# Display for us a section of results in your solution.
# Describe to us the process of installing and invoking Python packages, if any, you
needed for this problem.

def parse_order(line):
    # Need to split line into an array
    l = line.split(",")
    try:
        # Getting some none orders wierdness
        # Need to break out
        if l[6] != u"B" and l[6] != u"S":
            raise Exception("Bad line: ({0})".format(line))
        # return parsed line
        return [{
                "order_date": datetime.strptime(l[0], "%Y-%m-%d %H:%M:%S"),
                "order_id": long(l[1]),
                "client_id": long(l[2]),
                "stock_symbol": l[3],
                "amount": int(l[4]),
                "stock_price": float(l[5]),
                "order_type": l[6]
            }]
    except Exception as err:
        print("Bad line: ({0})".format(line))
        return []

if __name__ == "__main__":
    if len(sys.argv) != 3:
        print("Usage: direct_kafka_wordcount.py <broker_list> <topic>", file=sys.stderr)
        exit(-1)

    # ### Initialize streaming context
    # Base your Kafka consumer on provided direct_word_count.py script.
    # 1. Let Spark streaming engine count the number of orders different stocks where
bought in each batch.
    # 2. Display for us a section of results in your solution.
    # 3. Describe to us the process of installing and invoking Python packages,  if any, you
needed for this problem.

    conf = SparkConf() \
        .setMaster("local[2]") \
        .setAppName("KafkaSparkStreaming") \
        .set("spark.executor.memory", "2g") \
        .set("spark.driver.extraClassPath", "./libs/spark-streaming-kafka-0-8-assembly_2.11-
2.2.0.jar") \
        .set("spark.executor.extraClassPath", "./libs/spark-streaming-kafka-0-8-
assembly_2.11-2.2.0.jar")
    sc = SparkContext(conf=conf)
    sc.setLogLevel("ERROR")
    sqlContext = SQLContext(sc)
    spark = SparkSession.builder.appName("spark play").getOrCreate()
    ssc = StreamingContext(sc, 2)

    brokers, topic = sys.argv[1:]
    kvs = KafkaUtils.createDirectStream(ssc, [topic], {"metadata.broker.list": brokers})
    lines = kvs.map(lambda x: x[1]) \
            .flatMap(lambda x: [line for line in x.splitlines()])\
            .flatMap(parse_order)

    # https://stackoverflow.com/questions/35582516/spark-counting-distinct-values-by-
key
    # Filtering buys by order batch chunks of 1000
    # Let Spark streaming engine count the number of orders different stocks where
bought in each batch.
```

```
    count_buys = lines.filter(lambda b: b["order_type"] == u"B")\
                    .map(lambda x: (x["stock_symbol"], 1))\
                    .reduceByKey(add)
    # printing stocks sold per order
    count_buys.pprint()

    ssc.start()

ssc.awaitTermination()
```

OUTPUT

```
-------------------------------------------
Time: 2017-11-04 11:51:38
-------------------------------------------
(u'AA', 11)
(u'CIG', 15)
(u'CVX', 20)
(u'AAPL', 7)
(u'C', 14)
(u'TOT', 13)
(u'AUY', 16)
(u'FB', 14)
(u'EGO', 7)
(u'HL', 10)
...

-------------------------------------------
Time: 2017-11-04 11:51:40
-------------------------------------------
(u'BABA', 20)
(u'CIG', 20)
(u'IBN', 16)
(u'AAPL', 12)
(u'ABB', 11)
(u'KMI', 11)
(u'ABX', 17)
(u'FB', 8)
(u'EGO', 13)
(u'HL', 20)
...

-------------------------------------------
Time: 2017-11-04 11:51:42
-------------------------------------------
(u'AA', 16)
(u'NFLX', 9)
(u'LUV', 10)
(u'AAPL', 10)
```

```
(u'ABB', 10)
(u'KMI', 12)
(u'AUY', 15)
(u'FB', 12)
(u'EGO', 13)
(u'HL', 11)
...
```


assignment-9 — swaite@Rmt-mac-swaite — ../assignment-9 — zsh — 80×51
assignment-9 — swaite@Rmt-mac
zookeeper-server-start
kafka-server-start

```
2016-03-22 20:25:29,82947,15,TOT,31,41.00,S
2016-03-22 20:25:29,82948,93,GG,945,48.00,S
2016-03-22 20:25:29,82949,66,AAL,841,34.00,B
2016-03-22 20:25:29,82950,64,ABX,167,68.00,S
2016-03-22 20:25:29,82951,27,PBR,861,55.00,S
2016-03-22 20:25:29,82952,70,MRO,290,49.00,B
2016-03-22 20:25:29,82953,35,CIG,376,71.00,S
2016-03-22 20:25:29,82954,89,WLL,120,91.00,B
2016-03-22 20:25:29,82955,94,WYNN,666,97.00,S
2016-03-22 20:25:29,82956,50,MNKD,393,37.00,S
2016-03-22 20:25:29,82957,69,NFLX,319,6.00,S
2016-03-22 20:25:29,82958,85,AG,863,6.00,S
2016-03-22 20:25:29,82959,51,TSU,968,77.00,B
2016-03-22 20:25:29,82960,51,DAL,969,95.00,S
2016-03-22 20:25:29,82961,87,PBR.A,44,5.00,B
2016-03-22 20:25:29,82962,25,VALE,750,56.00,B
2016-03-22 20:25:29,82963,66,GE,2,68.00,B
2016-03-22 20:25:29,82964,20,INO,905,79.00,S
2016-03-22 20:25:29,82965,57,TOT,983,67.00,B
2016-03-22 20:25:29,82966,88,BHP,788,16.00,S
2016-03-22 20:25:29,82967,28,SYT,434,59.00,S
2016-03-22 20:25:29,82968,87,PYPL,761,7.00,S
2016-03-22 20:25:29,82969,27,AAPL,264,96.00,S
2016-03-22 20:25:29,82970,61,X,97,23.00,S
2016-03-22 20:25:29,82971,59,SIRI,216,70.00,S
2016-03-22 20:25:29,82972,35,FCX,26,42.00,B
2016-03-22 20:25:29,82973,80,VRSN,664,91.00,S
2016-03-22 20:25:29,82974,1,AAPL,987,64.00,B
2016-03-22 20:25:29,82975,46,KMI,591,101.00,B
2016-03-22 20:25:29,82976,92,YHOO,74,90.00,S
2016-03-22 20:25:29,82977,6,MRO,997,15.00,S
2016-03-22 20:25:29,82978,63,AFFX,243,2.00,S
2016-03-22 20:25:29,82979,11,Z,714,25.00,B
2016-03-22 20:25:29,82980,76,WYNN,899,46.00,S
2016-03-22 20:25:29,82981,27,SBGL,290,88.00,B
2016-03-22 20:25:29,82982,70,KGC,771,16.00,B
2016-03-22 20:25:29,82983,79,OPK,36,35.00,S
2016-03-22 20:25:29,82984,11,INO,140,94.00,S
2016-03-22 20:25:29,82985,63,FB,883,64.00,S
2016-03-22 20:25:29,82986,72,AMD,441,98.00,S
2016-03-22 20:25:29,82987,18,NFLX,659,74.00,B
2016-03-22 20:25:29,82988,96,AG,101,90.00,S
2016-03-22 20:25:29,82989,58,UAL,500,37.00,B
2016-03-22 20:25:29,82990,38,PETX,808,93.00,B
2016-03-22 20:25:29,82991,56,WNC,328,94.00,B
2016-03-22 20:25:29,82992,64,AU,889,26.00,B
2016-03-22 20:25:29,82993,3,AMD,283,48.00,S
2016-03-22 20:25:29,82994,43,BP,834,16.00,B
2016-03-22 20:25:29,82995,93,NEM,606,61.00,S
2016-03-22 20:25:29,82996,83,GG,929,81.00,B
2016-03-22 20:25:29,82997,7,FB,134,11.00,B
```

```
(u'FB', 12)
(u'WLL', 15)
(u'HL', 8)
...

-------------------------------------------
Time: 2017-11-04 11:51:38
-------------------------------------------
(u'AA', 11)
(u'CIG', 15)
(u'CVX', 20)
(u'AAPL', 7)
(u'C', 14)
(u'TOT', 13)
(u'AUY', 16)
(u'FB', 14)
(u'EGO', 7)
(u'HL', 10)
...

-------------------------------------------
Time: 2017-11-04 11:51:40
-------------------------------------------
(u'BABA', 20)
(u'CIG', 20)
(u'IBN', 16)
(u'AAPL', 12)
(u'ABB', 11)
(u'KMI', 11)
(u'ABX', 17)
(u'FB', 8)
(u'EGO', 13)
(u'HL', 20)
...

-------------------------------------------
Time: 2017-11-04 11:51:42
-------------------------------------------
(u'AA', 16)
(u'NFLX', 9)
(u'LUV', 10)
(u'AAPL', 10)
(u'ABB', 10)
(u'KMI', 12)
(u'AUY', 15)
(u'FB', 12)
(u'EGO', 13)
(u'HL', 11)
...
```

Problem 4. Install Cassandra server on your VM. Use Cassandra SQL Client, `cqlsh`, to create and populate table `person`. Let every `person` by described by his or her first and last name, and city where he or she lives. Let every person possess up to three cell phones. Populate your table with three individuals using `cqlsh` client. Demonstrate that you can select the content of your table `person` including individuals' cell phones. Write a simple client in a language of your choice that will populate 3 rows in Casandra's table `person`, subsequently update one of those rows, for example change the city where a person lives, and finally retrieve that modify row from Cassandra and write its content to the console. Describe to us the process of installing and invoking Java, Scala or Python packages, if any, you needed for this problem.

Installing CQL and Cassandra

```
swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-
9|master⚡
⇒  sudo pip install cql
swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-
9|master⚡
⇒  brew install cassandra
```

Starting/Stopping Cassandra

```
swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-9|master⚡
⇒  brew services start cassandra
swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-9|master⚡
⇒  brew services stop cassandra
```

Use Cassandra SQL Client, `cqlsh`, to create and populate table `person`.

```
swaite@Rmt-mac-swaite:/usr/local/Cellar/cassandra/3.11.1/bin|
⇒  cd /usr/local/Cellar/cassandra/3.11.1/bin
swaite@Rmt-mac-swaite:/usr/local/Cellar/cassandra/3.11.1/bin|
⇒  ./cqlsh
```

Create keyspace

```
cqlsh> create keyspace mykeyspace with replication = { 'class' :
'SimpleStrategy', 'replication_factor' : 1 };
cqlsh> use mykeyspace;
```

Let every `person` by described by his or her first and last name, and city where he or she lives.

```
cqlsh:mykeyspace> CREATE TABLE person (
              ... person_id int,
              ... first_name text,
              ... last_name text,
              ... city text,
              ... cell_1 text,
              ... cell_2 text,
              ... cell_3 text,
              ... PRIMARY KEY (person_id));
```

```
cqlsh:mykeyspace> insert into person (person_id, first_name,
last_name, cell_1, cell_2, cell_3, city) VALUES (1, 'Stirling',
'Waite', '234234', '324234', '34235', 'SLC');
insert into person (person_id, first_name, last_name, cell_1,
cell_2, cell_3, city) VALUES (2, 'Jack', 'Smith', '48383',
'58484', '2933', 'LAX');
insert into person (person_id, first_name, last_name, cell_1,
cell_2, cell_3, city) VALUES (3, 'Elliott', 'Robot', '2343',
'3244542', '3434234', 'NYC');

cqlsh:mykeyspace> select * from person
              ... ;

 person_id | cell_1 | cell_2  | cell_3  | city | first_name |
last_name
-----------+--------+---------+---------+------+------------+----
-------
         1 | 234234 |  324234 |   34235 |  SLC |   Stirling |
Waite
         2 |  48383 |   58484 |    2933 |  LAX |       Jack |
Smith
         3 |   2343 | 3244542 | 3434234 |  NYC |    Elliott |
Robot
```

Write a simple client in a language of your choice that will populate 3 rows in Casandra's table `person`, subsequently update one of those rows, for example change the city where a person lives, and finally retrieve that modify row from Cassandra and write its content to the console.

```
swaite@Rmt-mac-swaite:/usr/local/Cellar/cassandra/3.11.1/bin|
⇒  sudo pip install cassandra-drive
```

CODE

See p4.py

```
from cassandra.cluster import Cluster
cluster = Cluster()
session = cluster.connect('mykeyspace')
session.execute("INSERT INTO person (person_id, first_name, last_name, city, cell_1,
cell_2, cell_3) VALUES (4, 'Tony', 'Tiger', 'PHX', '111', '2222', '3333')")
session.execute("INSERT INTO person (person_id, first_name, last_name, city, cell_1,
cell_2, cell_3) VALUES (5, 'John', 'Claxton', 'SFO', '444', '5555', '6666')")
session.execute("UPDATE person set city = 'NYC' where person_id=5")
result = session.execute("SELECT * FROM person WHERE person_id=5")
row = result[0]
print row
```

OUTPUT

```
swaite@Rmt-mac-swaite:~/Stirling/CSIE-63/assignment-9|master⚡
⇒  python2.7 p4.py
Row(person_id=5, cell_1=u'444', cell_2=u'5555', cell_3=u'6666',
city=u'NYC', first_name=u'John', last_name=u'Claxton')
```

TABLE CHECK

```
cqlsh:mykeyspace> select * from person
              ... ;

 person_id | cell_1 | cell_2  | cell_3  | city | first_name |
last_name
-----------+--------+---------+---------+------+------------+----
-------
         5 |    444 |    5555 |    6666 |  NYC |       John |
Claxton
         1 | 234234 |  324234 |   34235 |  SLC |   Stirling |
Waite
         2 |  48383 |   58484 |    2933 |  LAX |       Jack |
Smith
         4 |    111 |    2222 |    3333 |  PHX |       Tony |
Tiger
         3 |   2343 | 3244542 | 3434234 |  NYC |    Elliott |
Robot
```

Please, describe every step of your work and present all intermediate and final results in a Word document. **Please, copy and past text version of all essential command and snippets of results into the Word document with explanations of the purpose of those commands. We cannot retype text that is in JPG images**. Please, always submit a separate copy of the original, working scripts and/or class files you used. Sometimes we need to run your code and retyping is too costly. Please include in your MS Word document only relevant portions of the console output or output files. Sometime either console output or the result file is too long and including it into the MS Word document makes that document too hard to read. PLEASE DO NOT EMBED files into your MS Word document. For issues and comments visit the class Discussion Board. If you use some other language other than Python in your daily work with NLP, please be free to use that language and a framework of your choice to do this assignment.