STEP: - 1

INSTALL REQUIRED TOOLS TO PROCEED WORK

sudo apt-get install openjdk-8-jdk
wget https://dlcdn.apache.org/spark/spark-3.1.2/spark-3.1.2-bin-hadoop3.2.tgz
tar xvzf spark-3.1.2-bin-hadoop3.2.tgz
wget https://archive.apache.org/dist/kafka/2.0.0/kafka_2.11-2.0.0.tgz
tar xvzf kafka_2.11-2.0.0.tgz

STEP: - 2

SET PATH

#JAVA PATH
export JAVA_HOME=/usr/lib/jvm/java-8-openjdk-amd64/
set PATH="$PATH:JAVA_HOME/bin"

export HADOOP_HOME=/home/usr/hadoop-2.7.0
export PATH=$HADOOP_HOME/bin:$HADOOP_HOME/sbin:$PATH
#spark path
export SPARK_HOME=/home/ubuntu/spark-3.1.2-bin-hadoop3.2
export PATH=$PATH:$SPARK_HOME/bin

STEP: - 3

FOLLOW THIS LINK INSTALL JUPYTER NOTEBOOK ON UBUNTU

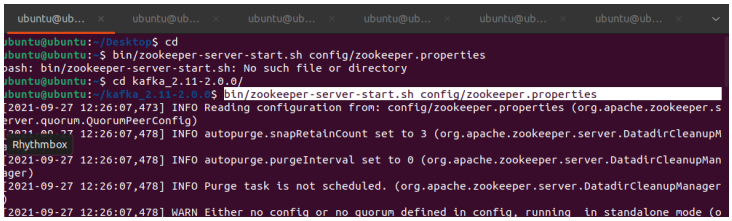
https://www.digitalocean.com/community/tutorials/how-to-set-up-jupyter-notebook-with-python-3-on-ubuntu-20-04-and-connect-via-ssh-tunneling

STEP: - 4

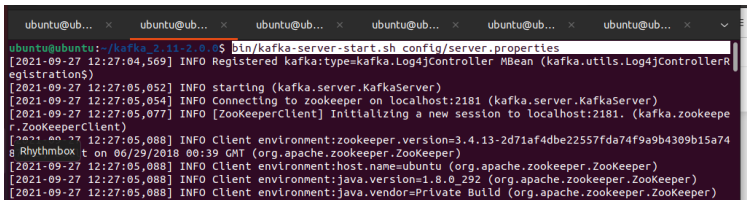
GOTO KAFKA DIRECTORY AND RUN ZOOKEEPER AND KAFKA SERVER

cd kafka_2.11-2.0.0/

bin/zookeeper-server-start.sh config/zookeeper.properties



bin/kafka-server-start.sh config/server.properties



STEP: - 5

CREATE A TOPIC project3 WITH REPLICATION FACTOR 1 AND PARTITION 1

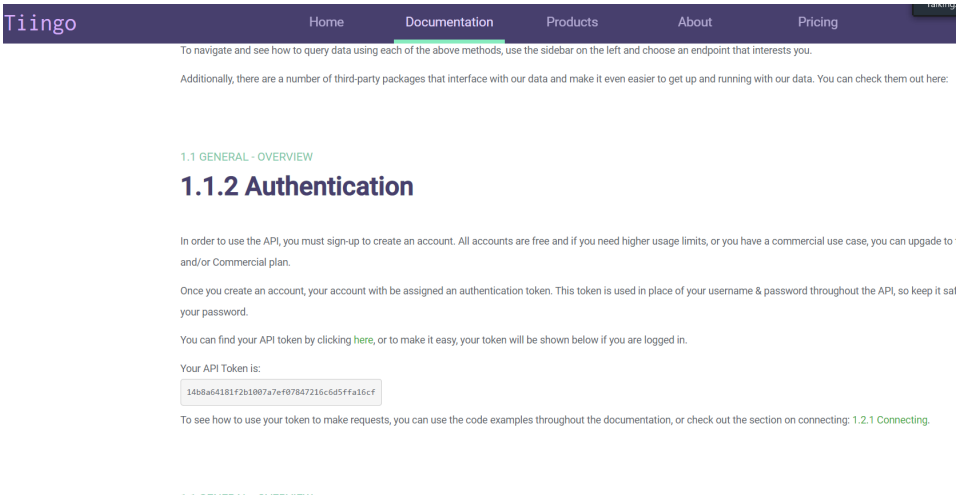
bin/kafka-topics.sh --create --zookeeper localhost:2181 --topic project3 --replication-factor 1 --partitions 1

STEP: - 6

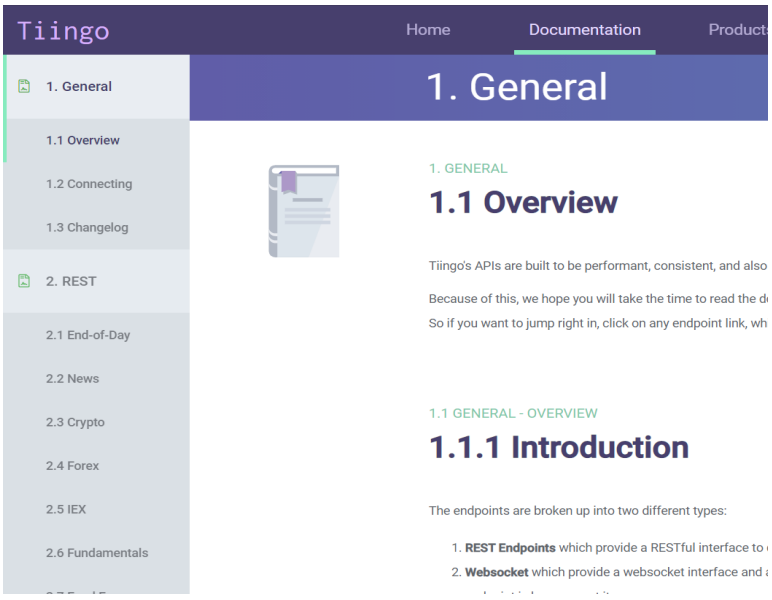
CREATE A producer.py FILE TO FETCH DATA FROM API AND PASS TO TOPIC project3

1. **CREATE ACCOUNT ON api.tiingo.com**
   https://api.tiingo.com/

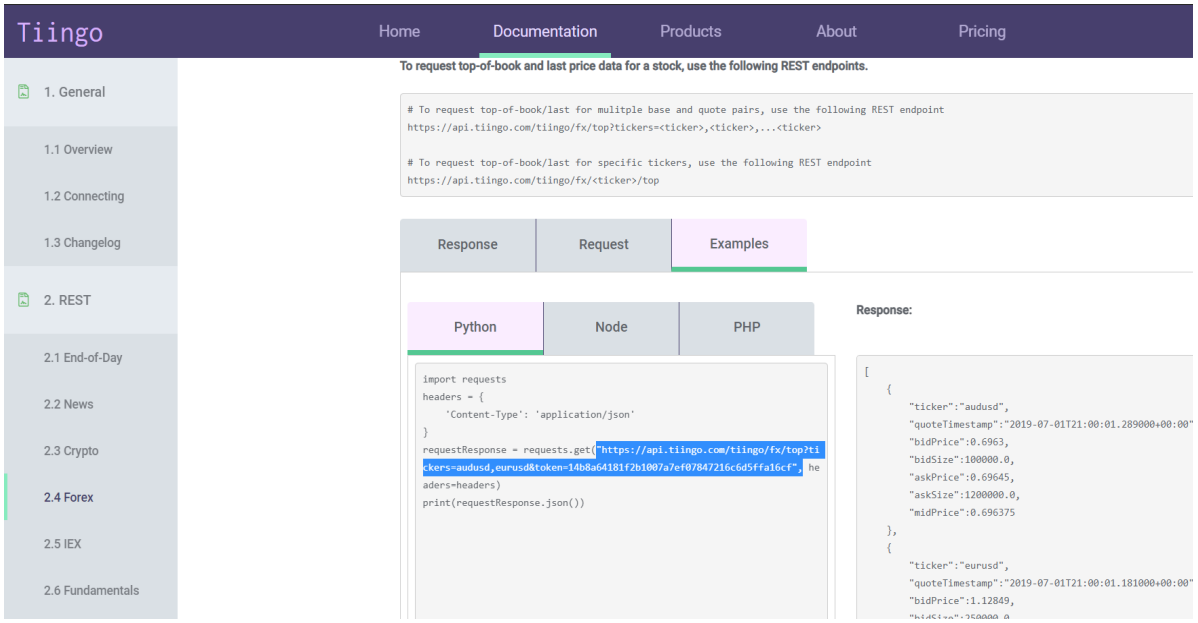
2. **GOTO DOCUMENTATION SECTION AND COLLECT YOUR API KEY**



3. **COLLECT FOREX DATA API FROM REST SECTION**



4. **SCROLL DOWN AND COLLECT YOUR API FROM EXAMPLES SECTION**



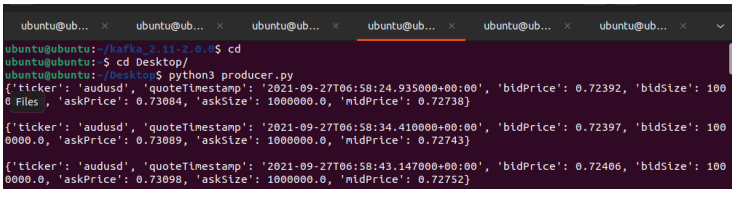
5. **producer.py**

#This file is going to be used for producer
#first create a topic name as 'project3'

```
from kafka import KafkaProducer
import requests
from json import dumps
import time
kafka_data_producers = KafkaProducer(bootstrap_servers=['localhost:9092'],value_serializer=lambda x: dumps(x).encode('utf-8') )
while True:
  response_data = requests.get("https://api.tiingo.com/tiingo/fx/top?tickers=audusd,eurusd&token=<PASS UR API KEY HERE> ")
  #response_data=response_data.json()

  data = {'Lagos' : response_data.json()}
  data=data['Lagos'][0]
  kafka_data_producers.send('project3', value=data)
  print(data)
  print()
  time.sleep(10)
```

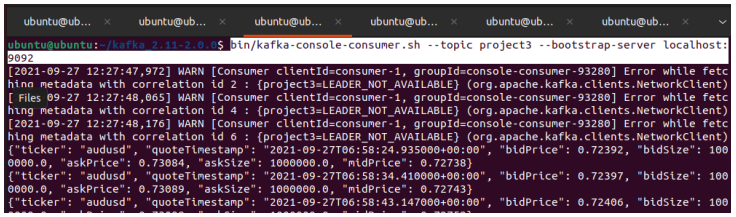
6. **RUN producer.py file**



STEP: - 7

START CONSUMER API IN NEW TERMINAL

bin/kafka-console-consumer.sh --topic project3 --bootstrap-server localhost:9092



STEP: - 8

CREATE ANOTHER .py FILE TO STRUCTURE THE JSON DATA INTO SPARK DATAFRAME AND DO SOME OPERATION OR A USECASE

1. **CREATE TOPIC askPriceOutput**

bin/kafka-console-consumer.sh –topic askPriceOutput --bootstrap-server localhost:9092

2. **usecase2.py**

```
# Import Required Libraries
from pyspark.sql import SparkSession
from pyspark.sql.functions import *
from pyspark.sql.types import *
# Created spark session
spark = SparkSession \
   .builder \
   .appName("activeCitiesInUs") \
   .getOrCreate()

# Created kafka consumer using spark readStream
raw_df = spark \
   .readStream \
   .format("kafka") \
   .option("kafka.bootstrap.servers", "localhost:9092") \
   .option("subscribe", "project3") \
   .option("startingOffsets", "latest") \
   .load() \
   .selectExpr("CAST(value AS STRING)")

# Created Schema for Structured Streaming

schema = StructType(
   [
         StructField("ticker", StringType()),
         StructField("quoteTimestamp", StringType()),
         StructField("bidPrice", FloatType()),
         StructField("bidSize", FloatType()),
         StructField("askPrice", FloatType()),
         StructField("askSize", FloatType()),
         StructField("midPrice", FloatType())
   ])
schema_df = raw_df.select(from_json(raw_df.value, schema).alias("data"))
output_df = schema_df.select(to_json(struct(col("data.quoteTimestamp"),col("data.askPrice"))).alias("value"))
# Sending the data to kafka brocker
```

query = output_df.writeStream.format("kafka").option("kafka.bootstrap.servers", "localhost:9092").option("checkpointLocation", "/tmp/checkpoint1").option("topic", "askPriceOutput").start()

# Waits for the termination signal from user.outputMode("complete")
query.awaitTermination()

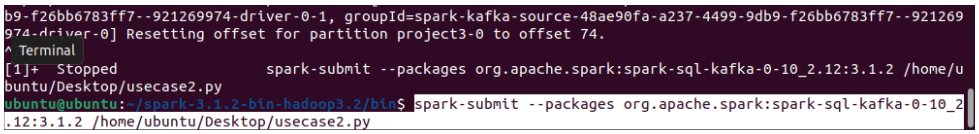
STEP: - 9

1. **GOTO SPARK BIN FOLDER**

cd /spark-3.1.2-bin-hadoop3.2/bin/

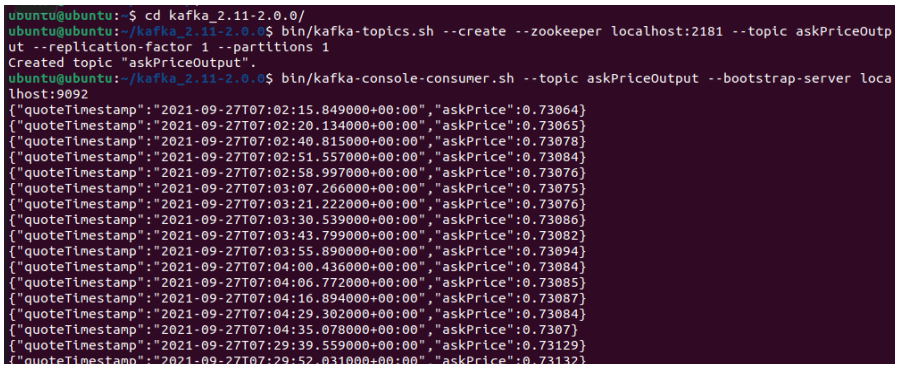
2. **RUN SPARK-SUBMIT JOB WITH usecase.py FILE AND STORE THE OUTPUT ON askPriceOutput TOPIC**

spark-submit --packages org.apache.spark:spark-sql-kafka-0-10_2.12:3.1.2 /home/ubuntu/Desktop/usecase2.py



STEP: - 10

OUTPUT WILL BE SHOWING ON askPriceOutput TOPIC'S CONSUMER



STEP: - 11

OPEN JUPYTER NOTEBOOK AND INSTALL matplotlib library and kafka-python ON IT

import findspark
findspark.init()

from kafka import KafkaConsumer
import matplotlib.pyplot as plt

```
import json
import threading

consumer = KafkaConsumer('askPriceOutput', group_id='askPriceOutput',
bootstrap_servers=['localhost:9092'],
)
print("consumer started ...")


x = {}

def plot():
    global x
    for message in consumer:
        x[json.loads((message.value).decode("utf-8"))["quoteTimestamp"]] =
json.loads((message.value).decode("utf-8"))["askPrice"]

plot_thread = threading.Thread(target=plot)

plot_thread.start()

try:
    fig = plt.figure(figsize = (12, 6))
    x = dict(sorted(x.items(), key=lambda item: item[1], reverse=True))
    plt.plot([*x.keys()][:10], [*x.values()][:10])
    plt.xlabel("time stamp", fontsize=15)
    plt.ylabel("Ask Price", fontsize=15)
    plt.title("Ask price with time", fontsize=15)
    plt.xticks(rotation = 90)
    plt.show()
except:
    print(f"atleast 10 data needed but {len(x)} data is there")
```

In [2]:
```
import findspark
findspark.init()
```

In [3]:
```
#pip install kafka-python
```

In [4]:
```
from kafka import KafkaConsumer
import matplotlib.pyplot as plt
import json
import threading
```

In [5]:
```
consumer = KafkaConsumer('askPriceOutput',
                         group_id='askPriceOutput',
                         bootstrap_servers=['localhost:9092'],
                        )
print("consumer started ...")
```

```
consumer started ...
```

In [6]:
```
x = {}
```

In [7]:
```
def plot():
    global x
    for message in consumer:
        x[json.loads((message.value).decode("utf-8"))["quoteTimestamp"]] = json.loads((message
```

In [8]:
```
plot_thread = threading.Thread(target=plot)
```

In [9]:
```
plot_thread.start()
```

In [14]:
```
try:
    fig = plt.figure(figsize = (12, 6))
    x = dict(sorted(x.items(), key=lambda item: item[1], reverse=True))

    plt.plot([*x.keys()][:10], [*x.values()][:10])

    plt.xlabel("time stamp", fontsize=15)
    plt.ylabel("Ask Price", fontsize=15)
    plt.title("Ask price with time", fontsize=15)
    plt.xticks(rotation = 90)
    plt.show()
```