

Example Kafka Producer

May 7, 2023

```
[1]: import json
import uuid
import heapq
import time
from kafka import KafkaProducer, KafkaAdminClient
from kafka.admin.new_topic import NewTopic
from kafka.errors import TopicAlreadyExistsError
```

```
[2]: import sys
import os

os.environ['PYSPARK_PYTHON'] = sys.executable
os.environ['PYSPARK_DRIVER_PYTHON'] = sys.executable
```

0.0.1 Configuration Parameters

TODO: Change the configuration parameters to the appropriate values for your setup.

```
[3]: config = dict(
    bootstrap_servers=['kafka.kafka.svc.cluster.local:9092'],
    first_name='Gabriel',
    last_name='Avinaz'
)

config['client_id'] = '{}{}'.format(
    config['last_name'],
    config['first_name']
)

config['topic_prefix'] = '{}{}'.format(
    config['last_name'],
    config['first_name']
)

config
```

```
[3]: {'bootstrap_servers': ['kafka.kafka.svc.cluster.local:9092'],
      'first_name': 'Gabriel',
      'last_name': 'Avinaz',
```

```
'client_id': 'AvinazGabriel',  
'topic_prefix': 'AvinazGabriel'}
```

0.0.2 Create Topic Utility Function

The `create_kafka_topic` helps create a Kafka topic based on your configuration settings. For instance, if your first name is *John* and your last name is *Doe*, `create_kafka_topic('locations')` will create a topic with the name `DoeJohn-locations`. The function will not create the topic if it already exists.

```
[4]: def create_kafka_topic(topic_name, config=config, num_partitions=1,  
    ↪ replication_factor=1):  
    bootstrap_servers = config['bootstrap_servers']  
    client_id = config['client_id']  
    topic_prefix = config['topic_prefix']  
    name = '{}-{}'.format(topic_prefix, topic_name)  
  
    admin_client = KafkaAdminClient(  
        bootstrap_servers=bootstrap_servers,  
        client_id=client_id  
    )  
  
    topic = NewTopic(  
        name=name,  
        num_partitions=num_partitions,  
        replication_factor=replication_factor  
    )  
  
    topic_list = [topic]  
    try:  
        admin_client.create_topics(new_topics=topic_list)  
        print('Created topic {}'.format(name))  
    except TopicAlreadyExistsError as e:  
        print('Topic "{}" already exists'.format(name))  
  
create_kafka_topic('locations')  
create_kafka_topic('accelerations')
```

```
Topic "AvinazGabriel-locations" already exists  
Topic "AvinazGabriel-accelerations" already exists
```

0.0.3 Kafka Producer

The following code creates a `KafkaProducer` object which you can use to send Python objects that are serialized as JSON.

Note: This producer serializes Python objects as JSON. This means that object must be JSON serializable. As an example, Python `DateTime` values are not JSON serializable and must be

converted to a string (e.g. ISO 8601) or a numeric value (e.g. a Unix timestamp) before being sent.

```
[5]: producer = KafkaProducer(
    bootstrap_servers=config['bootstrap_servers'],
    value_serializer=lambda x: json.dumps(x).encode('utf-8')
)
```

0.0.4 Send Data Function

The `send_data` function sends a Python object to a Kafka topic. This function adds the `topic_prefix` to the topic so `send_data('locations', data)` sends a JSON serialized message to `DoeJohn-locations`. The function also registers callbacks to let you know if the message has been sent or if an error has occurred.

```
[6]: def on_send_success(record_metadata):
    print('Message sent:\n    Topic: "{}"\n    Partition: {}\n    Offset: {}'.
    ↪format(
        record_metadata.topic,
        record_metadata.partition,
        record_metadata.offset
    ))

def on_send_error(exc):
    print('I am an errback', exc_info=exc)
    # handle exception

def send_data(topic, data, config=config, producer=producer, msg_key=None):
    topic_prefix = config['topic_prefix']
    topic_name = '{}-{}'.format(topic_prefix, topic)

    if msg_key is not None:
        key = msg_key
    else:
        key = uuid.uuid4().hex

    producer.send(
        topic_name,
        value=data,
        key=key.encode('utf-8')
    ).add_callback(on_send_success).add_errback(on_send_error)
```

```
[7]: data_dir = "../../../data/processed/bdd/"
from pyspark.sql import SparkSession
from pyspark.sql.functions import to_json
from pyspark.sql.types import StructType, StructField, StringType, IntegerType
```

0.1 Assignment 8

0.1.1 Loading Locations

```
[8]: spark = SparkSession.builder.appName("ParquetToLocations").getOrCreate()
locations_df = spark.read.format("parquet").load(data_dir + "locations/")
locations_df = locations_df.sort("t")
locations_df.show(10)
```

Setting default log level to "WARN".

To adjust logging level use `sc.setLogLevel(newLevel)`. For SparkR, use `setLogLevel(newLevel)`.

23/05/07 18:56:55 WARN NativeCodeLoader: Unable to load native-hadoop library for your platform... using builtin-java classes where applicable

[Stage 2:> (0 + 40) / 40]

```
+-----+-----+-----+-----+
+-----+-----+-----+-----+
+-----+-----+-----+-----+
|          id|          ride_id|          uuid|
timestamp|      offset|      course|      latitude|
longitude|      geohash|      speed|accuracy|timelapse|
filename|    t|
+-----+-----+-----+-----+
+-----+-----+-----+-----+
+-----+-----+-----+-----+
|58682c5d48cad9d9e...|c9a2b46c9aa515b63...|19b9aa10588646b3b...|1970-01-01
00:25:...| 1.525060886522843|299.619140625|
40.76287002542555|-73.96194855681718|dr5ruuwscttz| 0.0| 10.0|
false|e2f795a7-6a7d-450...| 0.0|
|85c61911b7fe2ced1...|6760ffa3f41908695...|dad7eae44e784b549...|1970-01-01
00:25:...|1.0779125295566454| 158.203125|
40.677641336844|-73.81793000742218|dr5x2jpkmtcy| 2.119999885559082| 10.0|
false|d745b92f-aefd-467...| 0.0|
|58682c5d48cad9d9e...|c9a2b46c9aa515b63...|19b9aa10588646b3b...|1970-01-01
00:25:...|4.5250608865228426|299.619140625|
40.76287038067684|-73.96194937863832|dr5ruuwsctv3| 0.0| 10.0|
false|e2f795a7-6a7d-450...| 4.5|
|85c61911b7fe2ced1...|6760ffa3f41908695...|dad7eae44e784b549...|1970-01-01
00:25:...| 5.077912529556645| 159.9609375|
40.67788281947438|-73.81804710260948|dr5x2jpmffw| 11.75| 10.0|
false|d745b92f-aefd-467...| 4.5|
|85c61911b7fe2ced1...|6760ffa3f41908695...|dad7eae44e784b549...|1970-01-01
00:25:...| 8.077912529556645| 159.609375|
40.67819106396351|-73.81819261244854|dr5x2jppxkqj|13.149999618530273| 10.0|
false|d745b92f-aefd-467...| 7.8|
|58682c5d48cad9d9e...|c9a2b46c9aa515b63...|19b9aa10588646b3b...|1970-01-01
00:25:...| 8.525060886522843|299.619140625|
40.76286948909357|-73.96194731609269|dr5ruuwsctwg| 0.0| 10.0|
```

```

false|e2f795a7-6a7d-450...| 7.8|
|58682c5d48cad9d9e...|c9a2b46c9aa515b63...|19b9aa10588646b3b...|1970-01-01 00:25
:...|11.525060886522843|299.619140625|40.762862338920996|-
73.96193077522916|dr5ruuwsfh71|1.5099999904632568| 10.0|
false|e2f795a7-6a7d-450...|10.6|
|85c61911b7fe2ced1...|6760ffa3f41908695...|dad7eae44e784b549...|1970-01-01
00:25:...|11.077912529556645| 159.609375|40.678531159684695|-
73.81836075342616|dr5x2jr1eebd|13.800000190734863| 10.0|
false|d745b92f-aefd-467...|10.6|
|85c61911b7fe2ced1...|6760ffa3f41908695...|dad7eae44e784b549...|1970-01-01
00:25:...|12.077912529556645| 161.015625|40.678637903221585|-
73.81842395297608|dr5x2jr44p9x|14.210000038146973| 10.0|
false|d745b92f-aefd-467...|10.6|
|85c61911b7fe2ced1...|6760ffa3f41908695...|dad7eae44e784b549...|1970-01-01
00:25:...|15.077912529556645| 161.3671875| 40.67896198950771|
-73.8185656909587|dr5x2jqunspu| 10.90999984741211| 10.0|
false|d745b92f-aefd-467...|14.9|
+-----+-----+-----+-----+
---+-----+-----+-----+-----+
-----+-----+-----+-----+-----+
only showing top 10 rows

```

```

[9]: t_locations_df = [row.t for row in locations_df.select("t").collect()]
t_locations_df[:10]

[9]: [0.0, 0.0, 4.5, 4.5, 7.8, 7.8, 10.6, 10.6, 10.6, 14.9]

[10]: locations_json = locations_df.toJSON().collect()
locations_json[:10]

[10]: [{'id': '85c61911b7fe2ced1000c33c9e932706', 'ride_id': '6760ffa3f41908695d1405b776c3e8d5', 'uuid': 'dad7eae44e784b549c8c5a3aa051a8c7', 'timestamp': '1970-01-01T00:25:07.320Z', 'offset': 1.0779125295566454, 'course': 158.203125, 'latitude': 40.677641336844, 'longitude': -73.81793000742218, 'geohash': 'dr5x2jpkmtcy', 'speed': 2.119999885559082, 'accuracy': 10.0, 'timelapse': false, 'filename': 'd745b92f-aefd-467d-9121-7a71308e8d6d.mov', 't': 0.0},
{'id': '58682c5d48cad9d9e103431d773615bf', 'ride_id': 'c9a2b46c9aa515b632eddc45c4868482', 'uuid': '19b9aa10588646b3bf22c9b4865a7995', 'timestamp': '1970-01-01T00:25:03.882Z', 'offset': 1.525060886522843, 'course': 299.619140625, 'latitude': 40.76287002542555, 'longitude': -73.96194855681718, 'geohash': 'dr5ruuwscttz', 'speed': 0.0, 'accuracy': 10.0, 'timelapse': false, 'filename': 'e2f795a7-6a7d-4500-b5d7-4569de996811.mov', 't': 0.0},
{'id': '85c61911b7fe2ced1000c33c9e932706', 'ride_id': '6760ffa3f41908695d1405b776c3e8d5', 'uuid': 'dad7eae44e784b549c8c5a3aa051a8c7', 'timestamp': '1970-01-

```

01T00:25:07.320Z", "offset": 5.077912529556645, "course": 159.9609375, "latitude": 40.67788281947438, "longitude": -73.81804710260948, "geohash": "dr5x2jpmffw", "speed": 11.75, "accuracy": 10.0, "timelapse": false, "filename": "d745b92f-ae fd-467d-9121-7a71308e8d6d.mov", "t": 4.5}',

{ "id": "58682c5d48cad9d9e103431d773615bf", "ride_id": "c9a2b46c9aa515b632eddc45c4868482", "uuid": "19b9aa10588646b3bf22c9b4865a7995", "timestamp": "1970-01-01T00:25:03.882Z", "offset": 4.5250608865228426, "course": 299.619140625, "latitude": 40.76287038067684, "longitude": -73.96194937863832, "geohash": "dr5ruuwsctv3", "speed": 0.0, "accuracy": 10.0, "timelapse": false, "filename": "e2f795a7-6a7d-4500-b5d7-4569de996811.mov", "t": 4.5}',

{ "id": "85c61911b7fe2ced1000c33c9e932706", "ride_id": "6760ffa3f41908695d1405b776c3e8d5", "uuid": "dad7eae44e784b549c8c5a3aa051a8c7", "timestamp": "1970-01-01T00:25:07.320Z", "offset": 8.077912529556645, "course": 159.609375, "latitude": 40.67819106396351, "longitude": -73.81819261244854, "geohash": "dr5x2jppxkqj", "speed": 13.149999618530273, "accuracy": 10.0, "timelapse": false, "filename": "d745b92f-ae fd-467d-9121-7a71308e8d6d.mov", "t": 7.8}',

{ "id": "58682c5d48cad9d9e103431d773615bf", "ride_id": "c9a2b46c9aa515b632eddc45c4868482", "uuid": "19b9aa10588646b3bf22c9b4865a7995", "timestamp": "1970-01-01T00:25:03.882Z", "offset": 8.525060886522843, "course": 299.619140625, "latitude": 40.76286948909357, "longitude": -73.96194731609269, "geohash": "dr5ruuwsctwg", "speed": 0.0, "accuracy": 10.0, "timelapse": false, "filename": "e2f795a7-6a7d-4500-b5d7-4569de996811.mov", "t": 7.8}',

{ "id": "85c61911b7fe2ced1000c33c9e932706", "ride_id": "6760ffa3f41908695d1405b776c3e8d5", "uuid": "dad7eae44e784b549c8c5a3aa051a8c7", "timestamp": "1970-01-01T00:25:07.320Z", "offset": 11.077912529556645, "course": 159.609375, "latitude": 40.678531159684695, "longitude": -73.81836075342616, "geohash": "dr5x2jr1eebd", "speed": 13.800000190734863, "accuracy": 10.0, "timelapse": false, "filename": "d745b92f-ae fd-467d-9121-7a71308e8d6d.mov", "t": 10.6}',

{ "id": "85c61911b7fe2ced1000c33c9e932706", "ride_id": "6760ffa3f41908695d1405b776c3e8d5", "uuid": "dad7eae44e784b549c8c5a3aa051a8c7", "timestamp": "1970-01-01T00:25:07.320Z", "offset": 12.077912529556645, "course": 161.015625, "latitude": 40.678637903221585, "longitude": -73.81842395297608, "geohash": "dr5x2jr44p9x", "speed": 14.210000038146973, "accuracy": 10.0, "timelapse": false, "filename": "d745b92f-ae fd-467d-9121-7a71308e8d6d.mov", "t": 10.6}',

{ "id": "58682c5d48cad9d9e103431d773615bf", "ride_id": "c9a2b46c9aa515b632eddc45c4868482", "uuid": "19b9aa10588646b3bf22c9b4865a7995", "timestamp": "1970-01-01T00:25:03.882Z", "offset": 11.525060886522843, "course": 299.619140625, "latitude": 40.762862338920996, "longitude": -73.96193077522916, "geohash": "dr5ruuwsfh71", "speed": 1.5099999904632568, "accuracy": 10.0, "timelapse": false, "filename": "e2f795a7-6a7d-4500-b5d7-4569de996811.mov", "t": 10.6}',

{ "id": "85c61911b7fe2ced1000c33c9e932706", "ride_id": "6760ffa3f41908695d1405b776c3e8d5", "uuid": "dad7eae44e784b549c8c5a3aa051a8c7", "timestamp": "1970-01-01T00:25:07.320Z", "offset": 15.077912529556645, "course": 161.3671875, "latitude": 40.

```
.67896198950771,"longitude":-  
73.8185656909587,"geohash":"dr5x2jqunspu","speed":10.90999984741211,"accuracy":1  
0.0,"timelapse":false,"filename":"d745b92f-aefd-467d-9121-  
7a71308e8d6d.mov","t":14.9}']
```

```
[11]: heap = []  
for row in list(zip(locations_json, t_locations_df)):  
    heapq.heappush(heap, (time.time() + row[1], row[0]))  
  
while heap:  
    next_obj = heap[0]  
    next_time = next_obj[0]  
    if time.time() >= next_time:  
        obj = heapq.heappop(heap)[1]  
        send_data('locations', obj)  
        time.sleep(0.1)
```

Message sent:

```
Topic: "AvinazGabriel-locations"  
Partition: 0  
Offset: 869
```

Message sent:

```
Topic: "AvinazGabriel-locations"  
Partition: 0  
Offset: 870
```

Message sent:

```
Topic: "AvinazGabriel-locations"  
Partition: 0  
Offset: 871
```

Message sent:

```
Topic: "AvinazGabriel-locations"  
Partition: 0  
Offset: 872
```

Message sent:

```
Topic: "AvinazGabriel-locations"  
Partition: 0  
Offset: 873
```

Message sent:

```
Topic: "AvinazGabriel-locations"  
Partition: 0  
Offset: 874
```

Message sent:

```
Topic: "AvinazGabriel-locations"  
Partition: 0  
Offset: 875
```

Message sent:

```
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 876
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 877
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 878
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 879
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 880
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 881
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 882
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 883
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 884
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 885
Message sent:
Topic: "AvinazGabriel-locations"
Partition: 0
Offset: 886
```

KeyboardInterrupt

Cell In[11], line 12

Traceback (most recent call last)


```

10     obj = heapq.heappop(heap)[1]
11     send_data('locations', obj)
----> 12 time.sleep(0.1)

```

KeyboardInterrupt:

0.1.2 Loading Accelerations

```

[12]: spark = SparkSession.builder.appName("ParquetToAccelerations").getOrCreate()
accelerations_df = spark.read.format("parquet").load(data_dir + "accelerations/
↳")
accelerations_df = accelerations_df.sort("t")
t_accelerations_df = [row.t for row in accelerations_df.select("t").collect()]
accelerations_json = locations_df.toJSON().collect()
# for row in accelerations_json:
#     send_data("accelerations", json.loads(row))

```

23/05/07 18:57:53 WARN SparkSession: Using an existing Spark session; only runtime SQL configurations will take effect.

```

[13]: heap = []
for row in list(zip(locations_json, t_locations_df)):
    heapq.heappush(heap, (time.time() + row[1], row[0]))

while heap:
    next_obj = heap[0]
    next_time = next_obj[0]

    if time.time() >= next_time:
        obj = heapq.heappop(heap)[1]
        send_data('accelerations', obj)

    time.sleep(0.1)

```

Message sent:

```

Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 0

```

Message sent:

```

Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 1

```

Message sent:

```

Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 2

```

Message sent:

Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 3
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 4
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 5
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 6
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 7
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 8
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 9
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 10
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 11
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 12
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 13
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 14
Message sent:

Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 15
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 16
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 17
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 18
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 19
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 20
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 21
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 22
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 23
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 24
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 25
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 26
Message sent:

Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 27
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 28
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 29
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 30
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 31
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 32
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 33
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 34
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 35
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 36
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 37
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 38
Message sent:

Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 39
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 40
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 41
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 42
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 43
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 44
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 45
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 46
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 47
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
Offset: 48
Message sent:
Topic: "AvinazGabriel-accelerations"
Partition: 0
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KeyboardInterrupt                                Traceback (most recent call last)
Cell In[13], line 13
     10     obj = heapq.heappop(heap)[1]
     11     send_data('accelerations', obj)
--> 13     time.sleep(0.1)

KeyboardInterrupt:
```

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[ ]:
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