Faculty of Engineering & Applied Science

SOFE4630U – Cloud Computing

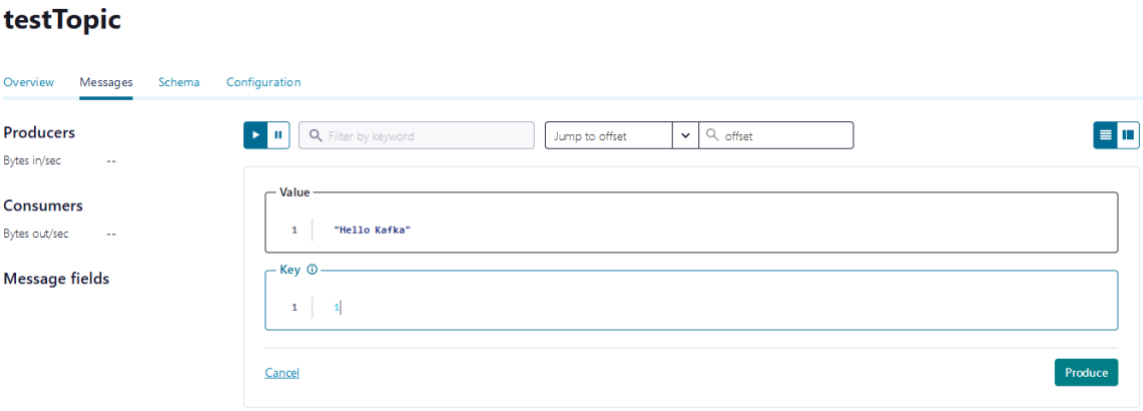
Project Milestone 1 – Data Ingestion Software – Kafka Clusters

GitHub: http://github.com/abdulbhutta/Cloud-Computing/tree/main/Final%20Project/Milestone1_KafkaClusters

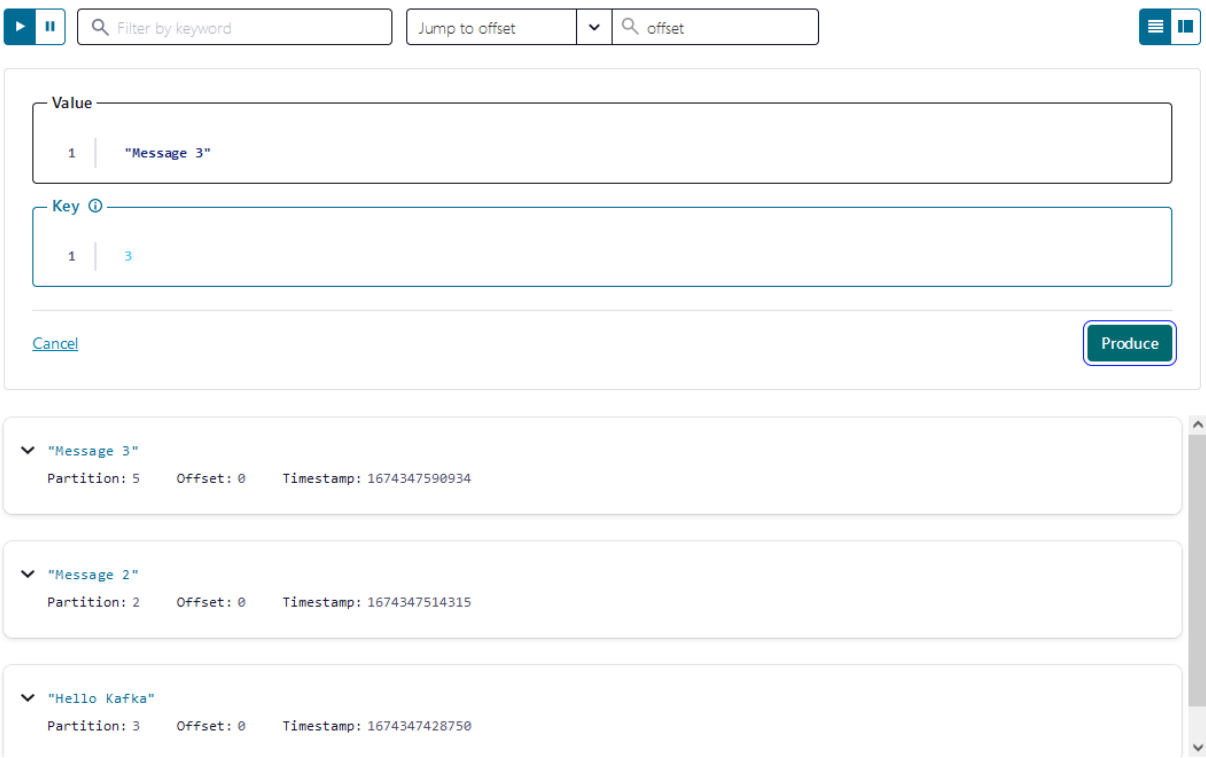
Due Date: 01/25/2023

First Name	Last Name	Student ID
Abdul	Bhutta	100785884
Andrew	Mikaeel	100525236
Anson	Tu	100655482
Owen	Musselman	100657709

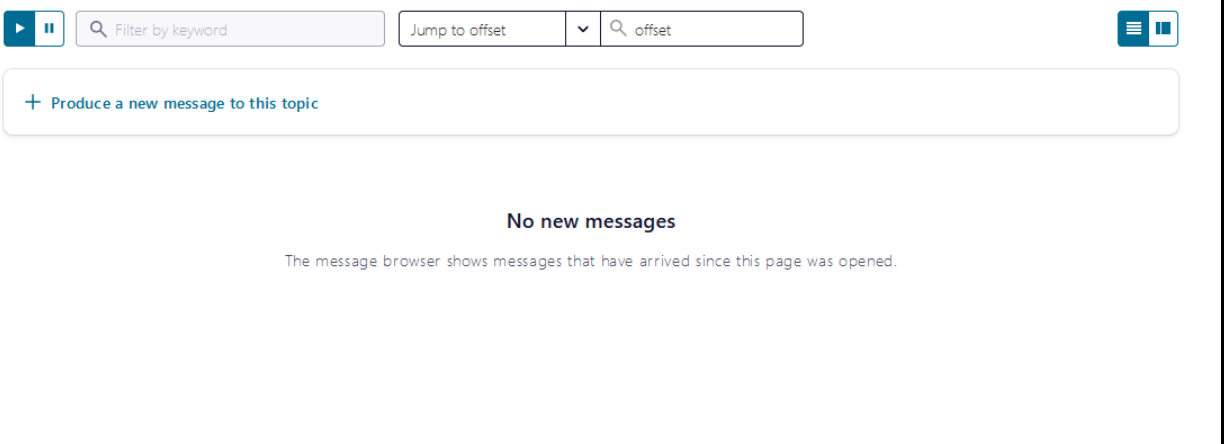
Confluent Kafka



Above is producing our first kafka message.



Above is producing more messages.



Above shows that the messages have been consumed and the topic is empty.

```
{
"bootstrap.servers":"pkc-v12gj.northamerica-northeast2.gcp.confluent.cloud:9092",
"security.protocol":"SASL_SSL",
"sasl.mechanisms":"PLAIN",
"sasl.username":"IDLACZY5CXMTUBS6",
"sasl.password":"zRlN8zqVA6S/ewLCTUlYIDBnnhVHUlktxHPhjpfgtsoZU8rv7aZvEd0jIJ8NBpj8",
"session.timeout.ms":1000
}
```

```
# Read arguments and configurations and initialize
admin_client_conf = json.load(open('cred.json'))
topic= "testTopic2"
num_partitions=6
replication_factor=3;
```

Above shows changing the topic name (for the cred) and API values.

```
# Read arguments and configurations and initialize
producer_conf = json.load(open('cred.json'))
producer = Producer(producer_conf)
topic= "testTopic2"
```

Above shows changing the topic name to testTopic2 for the producer.

```
C:\Users\Owen\Documents\SOFE4630U-MS1-main\v1>python createTopic.py
%4|1674349676.491|CONFWARN|rdkafka#producer-1| [thrd:app]: Configuration property session.timeout.ms is a consumer prop
rty and will be ignored by this producer instance
Topic testTopic2 created
```

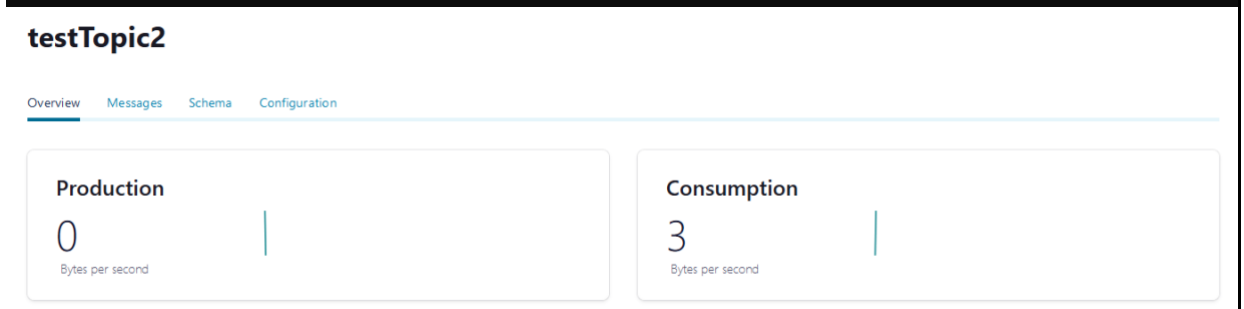
Topic name	Partitions	Production (last min)	Consumption (last min)	Schema
testTopic	6	0B/s	0B/s	Set a schema
testTopic2	6	--	--	Set a schema

Creating the topic.

```
C:\Users\Owen\Documents\SOFE4630U-MS1-main\v1>python producer.py
%4|1674349826.313|CONFWARN|rdkafka#producer-1| [thrd:app]: Configuration property session.timeout.ms is a consumer prop
rty and will be ignored by this producer instance
Enter a key (String):Hello There
Enter a value (String):Hello There
Enter a partition:2
Producing record: Hello There   Hello There
Enter a key (String):10
Enter a value (String):Hello World
Enter a partition:2
Producing record: 10    Hello World
Produced record to topic testTopic2 partition [2] @ offset 0
Enter a key (String):Traceback (most recent call last):
  File "C:\Users\Owen\Documents\SOFE4630U-MS1-main\v1\producer.py", line 22, in <module>
    record_key = input()
KeyboardInterrupt
^C
C:\Users\Owen\Documents\SOFE4630U-MS1-main\v1>consumer.py

C:\Users\Owen\Documents\SOFE4630U-MS1-main\v1>
[main 2023-01-22T01:11:37.831Z] update#setState idle


C:\Users\Owen\Documents\SOFE4630U-MS1-main\v1>python consumer.py
Consumed record with key b'Hello There' and value b'Hello There'
Consumed record with key b'10' and value b'Hello World'
```



Producing to the new topic and consuming the contents of the topic.

```
C:\Users\Owen\Documents\SOFE4630U-MS1-main\v2>python createTopic.py
%4|1674350943.978|CONFWARN|rdkafka#producer-1| [thrd:app]: Configuration property session.timeout.ms is a consumer pro
rty and will be ignored by this producer instance
Topic smartMeter created
```

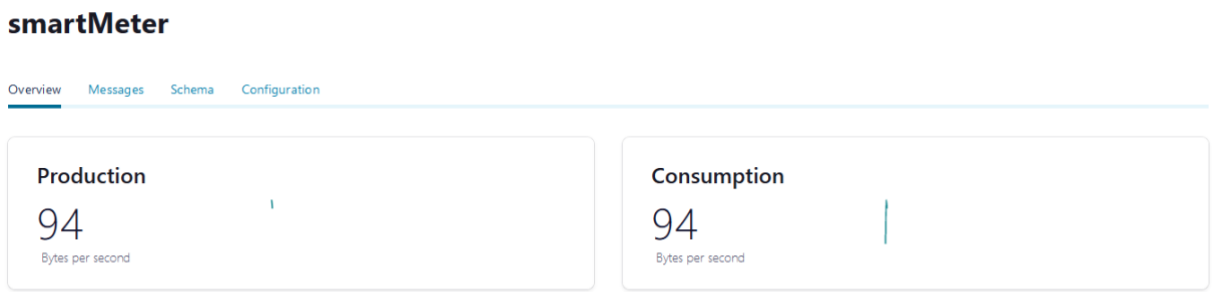
Creating the smartMeter topic.

```
C:\Users\Owen\Documents\SOFE4630U-MS1-main\v2>python consumer.py
Consumed record with key b'1' and value {'time': 1674351024.8558373, 'profile_name': 'denver', 'temperature': 50.7456409
210439, 'humidity': 19.771887273159884, 'pressure': 2.1411789945428588}
Consumed record with key b'2' and value {'time': 1674351025.3632452, 'profile_name': 'boston', 'temperature': 37.2743849
18846025, 'humidity': 90.45552067944685, 'pressure': 1.0232145425574355}
Consumed record with key b'3' and value {'time': 1674351025.8706532, 'profile_name': 'losang', 'temperature': 48.7682083
35429264, 'humidity': 73.08528456569448, 'pressure': 1.2713700067962488}
Consumed record with key b'4' and value {'time': 1674351026.3780613, 'profile_name': 'denver', 'temperature': 74.9631659
4525794, 'humidity': 3.817574968579951, 'pressure': 1.6702468411572082}
Consumed record with key b'5' and value {'time': 1674351026.8854694, 'profile_name': 'boston', 'temperature': 59.0959363
0486031, 'humidity': 72.62577875680596, 'pressure': None}
Consumed record with key b'6' and value {'time': 1674351027.3928773, 'profile_name': 'boston', 'temperature': 13.8924603
80091357, 'humidity': None, 'pressure': 0.8907590262864276}
Consumed record with key b'7' and value {'time': 1674351027.9002855, 'profile_name': 'losang', 'temperature': 76.1515634
1791332, 'humidity': 48.295104433306655, 'pressure': 0.996957136338078}
Consumed record with key b'8' and value {'time': 1674351028.4076936, 'profile_name': 'denver', 'temperature': 47.2381447
48911566, 'humidity': 31.175332679795073, 'pressure': 1.5863208499800905}
Consumed record with key b'9' and value {'time': 1674351028.9151015, 'profile_name': 'denver', 'temperature': 81.5612010
761376, 'humidity': 15.023221811660623, 'pressure': None}
Consumed record with key b'10' and value {'time': 1674351029.42251, 'profile_name': 'boston', 'temperature': 28.74690141
5419416, 'humidity': 81.57036756031407, 'pressure': 0.9476548477718895}
```

Above is the output of consumer.py for smartMeter.

```
C:\Users\Owen\Documents\SOFE4630U-MS1-main\v2>python smartMeter.py
%4|1674351024.854|CONFWARN|rdkafka#producer-1| [thrd:app]: Configuration property session.timeout.ms is a consumer prop
rty and will be ignored by this producer instance
Produced record to topic smartMeter partition [5] @ offset 0
Produced record to topic smartMeter partition [1] @ offset 0
Produced record to topic smartMeter partition [1] @ offset 1
Produced record to topic smartMeter partition [4] @ offset 0
Produced record to topic smartMeter partition [4] @ offset 1
Produced record to topic smartMeter partition [4] @ offset 2
Produced record to topic smartMeter partition [0] @ offset 0
Produced record to topic smartMeter partition [5] @ offset 1
Produced record to topic smartMeter partition [3] @ offset 0
Produced record to topic smartMeter partition [3] @ offset 1
Produced record to topic smartMeter partition [3] @ offset 2
Produced record to topic smartMeter partition [3] @ offset 3
Produced record to topic smartMeter partition [5] @ offset 2
Produced record to topic smartMeter partition [0] @ offset 1
Produced record to topic smartMeter partition [4] @ offset 3
Produced record to topic smartMeter partition [0] @ offset 2
Produced record to topic smartMeter partition [2] @ offset 0
Produced record to topic smartMeter partition [3] @ offset 4
Produced record to topic smartMeter partition [1] @ offset 2
Produced record to topic smartMeter partition [0] @ offset 3
Produced record to topic smartMeter partition [4] @ offset 4
Produced record to topic smartMeter partition [2] @ offset 1
```

Above is the output of smartMeter.py.



Above is the confluent kafka output.

Discussion

What is EDA? What are its advantages and disadvantages?

What is an event driven architecture? It is an architecture that makes use of events to allow for communication to take place between decoupled systems/services. For the EDA to work there is the need for three things: a producer (pushes events to the router), router (passes and filters events) and consumers.

One of the advantages of EDA is that it reduces the cost, as you do not pay for non-stop polling for events. The costs are reduced as there is less hardware utilization, and bandwidth usage, etc. It is easy to develop on as the router pushes to any consumers it needs to and filters events on its own. An additional advantage is that services will only know about a router. This allows for the services to be scaled proportionally with the incoming demand. This also allows the service to continue to run properly if an instance malfunctions.

One of the disadvantages of EDA is that there is a large learning curve to it. Also it is difficult to find the cause of a failure at times as the number of producers and consumers is ever changing. EDA can also have inconsistent behavior, where having an identical event can increasingly make it more troublesome to follow and monitor, which adds time in debugging the system when there is a fault in the system. Error handling can be cumbersome and with the EDA, you may need additional tools in order to efficiently observe errors in the system.

In Kafka, what's meant by cluster, broker, topic, replica, partition, zookeeper, controller, leader, consumer, producer, and consumer group?

Component	Description
Kafka Cluster	A kafka cluster is a collection of brokers, topics (and partitions).
Kafka Broker	Provides the consumer with the ability to get a message through the identification of what topic, partition, and along with the offset.
Kafka Topic	A topic is a log of events that are appended only and have an expiration on them (could be seconds or years). Topics are read using the offset.
Kafka Replication	Kafka replication is having various copies of the partition managed across various brokers.
Kafka Partition	Kafka partitioning breaks up a single topic into various smaller logs, where they can exist on a different node within the cluster.
Kafka ZooKeeper	The ZooKeeper is utilized by brokers so that they are able to discern the leader of a partition, it also is responsible for leader election. The ZooKeeper notifies kafka of any changes like broker failure, new or removed topics, etc.
Kafka Controller	It is a broker that functions as the controller, meaning it manages the states of each of the partitions, along with the replicas. It is important to know that there can only be a single controller in a cluster.
Kafka Leader	Responsible for replication of partitions, and topics.
Kafka Consumer	Act like applications where data is fetched from the kafka server where that data is published. Kafka consumers subscribe to the topic they are interested in.
Kafka Producer	It is essentially an application that generates the data that is fetched by the consumer. It is more simple than a consumer as group coordination is not necessary.
Kafka Consumer Group	A consumer group is really just a group of consumers. If the consumers have the same group id (consumer group) the data will be load balanced amongst all of the instances.

Design

```
(base) Abduls-MacBook-Pro:~ abdulbhutta$ pip install --upgrade google-cloud-pubsub
Collecting google-cloud-pubsub
  Downloading google_cloud_pubsub-2.14.0-py2.py3-none-any.whl (241 kB)
     |████████████████████████████████| 241 kB 827 kB/s
Collecting grpcio<2.0dev,>=1.38.1
  Downloading grpcio-1.51.1-cp39-cp39-macosx_10_10_x86_64.whl (4.6 MB)
     |████████████████████████████████| 4.6 MB 9.7 MB/s
Collecting proto-plus<2.0.0dev,>=1.22.0
  Downloading proto_plus-1.22.2-py3-none-any.whl (47 kB)
     |████████████████████████████████| 47 kB 11.4 MB/s
Collecting grpcio-status>=1.33.2
  Downloading grpcio_status-1.51.1-py3-none-any.whl (5.1 kB)
Collecting google-api-core[grpc]!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0dev,>=1.34
.0
  Downloading google_api_core-2.11.0-py3-none-any.whl (120 kB)
     |████████████████████████████████| 120 kB 17.4 MB/s
Requirement already satisfied: protobuf!=3.20.0,!=3.20.1,!=4.21.0,!=4.21.1,!=4.21.2,!=4.21.3,!=4.21.4,!=4.21.5,<5.0.0dev,>=3.19.5 in ./opt/anaconda3/lib/python3.9/site-packages (from google-cloud-pubsub) (4.21.12)
Collecting grpc-google-iam-v1<1.0.0dev,>=0.12.4
  Downloading grpc_google_iam_v1-0.12.6-py2.py3-none-any.whl (26 kB)
Requirement already satisfied: requests<3.0.0dev,>=2.18.0 in ./opt/anaconda3/lib/python3.9/site-packages (from google-api-core[grpc]!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0dev,>=1.34.0->google-cloud-pubsub) (2.26.0)
Collecting google-auth<3.0dev,>=2.14.1
  Downloading google_auth-2.16.0-py2.py3-none-any.whl (177 kB)
     |████████████████████████████████| 177 kB 37.0 MB/s
Collecting googleapis-common-protos<2.0dev,>=1.56.2
  Downloading googleapis_common_protos-1.58.0-py2.py3-none-any.whl (223 kB)
     |████████████████████████████████| 223 kB 17.5 MB/s
Collecting cachetools<6.0,>=2.0.0
  Downloading cachetools-5.3.0-py3-none-any.whl (9.3 kB)
Requirement already satisfied: six>=1.9.0 in ./opt/anaconda3/lib/python3.9/site-packages (from google-auth<3.0dev,>=2.14.1->google-api-core[grpc]!=2.0.*,!=2.1.*,!=2.10.*,!=2.2.*,!=2.3.*,!=2.4.*,!=2.5.*,!=2.6.*,!=2.7.*,!=2.8.*,!=2.9.*,<3.0.0dev,>=1.34.0->google-cloud-pubsub) (1.16.0)
Collecting pyasn1-modules>=0.2.1
  Downloading pyasn1_modules-0.2.8-py2.py3-none-any.whl (155 kB)
     |████████████████████████████████| 155 kB 20.5 MB/s
Collecting rsa<5,>=3.1.4
```

Install google cloud pub sub

subscriber.py > credentials_path

```python
import os
from google.cloud import pubsub_v1

#Set the environment variable to the credentials file
credentials_path = os.path.join('/Users/abdulbhutta/Desktop/Cloud Computing/Project_Milestone1/Google PUB:SUB/credentials.json')
os.environ['GOOGLE_APPLICATION_CREDENTIALS'] = credentials_path

#Create a subscriber client
subscriber = pubsub_v1.SubscriberClient()
subscription_path = 'projects/project-milestone1/subscriptions/smartMeter-sub'

#function to be called when a message is received
def callback(message):
    print("Consumed record with key {} and value {}".format(message.attributes.get('key'), message.data))

    #print(f"Received message with attributes: {}")
    message.ack() #Acknowledge the message and remove from the topic

#The subscriber listening for messages from the topic
streaming_pull_future = subscriber.subscribe(subscription_path, callback=callback)
print(f"Started listening for messages on {subscription_path}")

#Listen for messages
with subscriber:
    try:
        #Listen for messages indefinitely
        streaming_pull_future.result()
    #if error occurs, cancel
    except TimeoutError:
        streaming_pull_future.cancel()
        streaming_pull_future.result()

```

Subscriber python script

publisher.py > ...

```python
import os
import json
import time
import random
import numpy as np
from google.cloud import pubsub_v1

#Set the environment variable to the credentials file
credentials_path = os.path.join('/Users/abdulbhutta/Desktop/Cloud Computing/Project_Milestone1/Google PUB:SUB/credentials.json')
os.environ['GOOGLE_APPLICATION_CREDENTIALS'] = credentials_path

#Create a publisher client
publisher = pubsub_v1.PublisherClient()
topic_path = 'projects/project-milestone1/topics/smartMeter'

#device normal distributions profile used to generate random data
DEVICE_PROFILES = {
  "boston": {'temp': (51.3, 17.7), 'humd': (77.4, 18.7), 'pres': (1.019, 0.091) },
  "denver": {'temp': (49.5, 19.3), 'humd': (33.0, 13.9), 'pres': (1.512, 0.341) },
  "losang": {'temp': (63.9, 11.7), 'humd': (62.8, 21.8), 'pres': (1.215, 0.201) },
}
profileNames=["boston","denver","losang"];

#Key and value for the message
record_key=0
while(True):
  try:
    profile_name = profileNames[random.randint(0, 2)];
    profile = DEVICE_PROFILES[profile_name]
    # get random values within a normal distribution of the value
    temp = max(0, np.random.normal(profile['temp'][0], profile['temp'][1]))
    humd = max(0, min(np.random.normal(profile['humd'][0], profile['humd'][1]), 100))
    pres = max(0, np.random.normal(profile['pres'][0], profile['pres'][1]))

    # create dictionary
    msg={"time": time.time(), "profile_name": profile_name, "temperature": temp,"humidity": humd, "pressure":pres}

      #randomly eliminate some measurements
    for i in range(3):
        if(random.randrange(0,10)<1):
            choice=random.randrange(0,3)
            if(choice==0):
                msg['temperature']=None
            elif (choice==1):
                msg['humidity']=None
            else:
                msg['pressure']=None

    record_key=record_key+1
    record_value=json.dumps(msg)
    publisher.publish(topic_path, key=str(record_key),data=record_value.encode('utf-8'))
    time.sleep(.5)

  #if keyboard interrupt, break
  except KeyboardInterrupt:
    break

  #Print produced record
  print("Produced record to topic: {} with key {} values: {}".format(topic_path, record_key, msg))
```

Publisher python script

```
(base) Abduls-MacBook-Pro:Google PUB:SUB abdulbhutta$ python publisher.py
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 1 values: {'time': 1674606497.214408, 'profile_name': 'denver', 'temperature': 60.371087980876511, 'humidity': 42.57638031922869, 'pressure': 1.0163223038648998}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 2 values: {'time': 1674606497.720512, 'profile_name': 'losang', 'temperature': 74.959322623323519, 'humidity': None, 'pressure': 1.5265932349097581}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 3 values: {'time': 1674606498.224395, 'profile_name': 'losang', 'temperature': 68.112130707203773, 'humidity': 100, 'pressure': 1.1794237287396254}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 4 values: {'time': 1674606498.728417, 'profile_name': 'denver', 'temperature': 51.730612162104755, 'humidity': None, 'pressure': 1.8898420594942444}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 5 values: {'time': 1674606499.2361448, 'profile_name': 'losang', 'temperature': 78.396584336966603, 'humidity': 66.34402979932936, 'pressure': 1.1478665235709087}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 6 values: {'time': 1674606499.744742, 'profile_name': 'losang', 'temperature': None, 'humidity': 45.854232182928661, 'pressure': 1.1446881968332583}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 7 values: {'time': 1674606500.2506151, 'profile_name': 'denver', 'temperature': 63.594290157989015, 'humidity': None, 'pressure': None}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 8 values: {'time': 1674606500.757063, 'profile_name': 'boston', 'temperature': 32.656684828424329, 'humidity': 79.621714937277897, 'pressure': 0.9734894425032533}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 9 values: {'time': 1674606501.264786, 'profile_name': 'denver', 'temperature': 27.559251361919525, 'humidity': 35.486994218436363, 'pressure': 1.0480374257747522}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 10 values: {'time': 1674606501.775136, 'profile_name': 'denver', 'temperature': 23.694832873955793, 'humidity': None, 'pressure': 1.3688971678457105}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 11 values: {'time': 1674606502.279501, 'profile_name': 'boston', 'temperature': 41.280233824467431, 'humidity': 100, 'pressure': 0.9667648950322247}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 12 values: {'time': 1674606502.787911, 'profile_name': 'denver', 'temperature': 81.468491754483841, 'humidity': None, 'pressure': 1.4679948769688727}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 13 values: {'time': 1674606503.294506, 'profile_name': 'losang', 'temperature': 57.841848979361331, 'humidity': 47.043862551145644, 'pressure': 1.6786558773707705}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 14 values: {'time': 1674606503.802356, 'profile_name': 'boston', 'temperature': 68.892000023669251, 'humidity': 93.011638255522091, 'pressure': 1.0538009488265591}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 15 values: {'time': 1674606504.30778, 'profile_name': 'boston', 'temperature': 66.367446488863861, 'humidity': 80.101300879306581, 'pressure': None}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 16 values: {'time': 1674606504.8155311, 'profile_name': 'denver', 'temperature': 11.976238828863821, 'humidity': 45.899643029664761, 'pressure': 1.6193788164156453}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 17 values: {'time': 1674606505.3233411, 'profile_name': 'denver', 'temperature': 80.969807527177521, 'humidity': 30.741534761343704, 'pressure': 1.8326372303627991}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 18 values: {'time': 1674606505.826858, 'profile_name': 'losang', 'temperature': 54.699249152354, 'humidity': 92.234254119113171, 'pressure': 1.3756246554713761}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 19 values: {'time': 1674606506.334809, 'profile_name': 'boston', 'temperature': 52.726564098151851, 'humidity': 100, 'pressure': 0.8751077195956861}
Produced record to topic: projects/project-milestone1/topics/smartMeter with key 20 values: {'time': 1674606506.842768, 'profile_name': 'denver', 'temperature': 33.002014399371014, 'humidity': 43.774942191850926, 'pressure': None}
^C(base) Abduls-MacBook-Pro:Google PUB:SUB abdulbhutta$
```

Run the publisher script

SUBSCRIPTIONS SNAPSHOTS METRICS DETAILS MESSAGES

Jan 24, 2023, 7:28:20 PM	key	{"time": 1674606500.2506151, "profile_n	Deadline exceeded
Jan 24, 2023, 7:28:20 PM	key	{"time": 1674606500.757063, "profile_na	Deadline exceeded
Jan 24, 2023, 7:28:21 PM	key	{"time": 1674606501.264786, "profile_na	Deadline exceeded
Jan 24, 2023, 7:28:22 PM	key	{"time": 1674606502.279501, "profile_na	Deadline exceeded
Jan 24, 2023, 7:28:22 PM	key	{"time": 1674606502.787911, "profile_na	Deadline exceeded
Jan 24, 2023, 7:28:23 PM	key	{"time": 1674606503.294506, "profile_na	Deadline exceeded
Jan 24, 2023, 7:28:24 PM	key	{"time": 1674606504.30778, "profile_nam	Deadline exceeded
Jan 24, 2023, 7:28:25 PM	key	{"time": 1674606505.826858, "profile_na	Deadline exceeded
Jan 24, 2023, 7:28:26 PM	key	{"time": 1674606506.334809, "profile_na	Deadline exceeded
Jan 24, 2023, 7:28:27 PM	key	{"time": 1674606507.349601, "profile_na	Deadline exceeded

Verify data on Google Cloud Topic

```
(base) Abduls-MacBook-Pro:Google PUB:SUB abdulbhutta$ python subscriber.py
Started listening for messages on projects/project-milestone1/subscriptions/smartMeter-sub
Consumed record with key 1 and value b'{"time": 1674606497.214408, "profile_name": "denver", "temperature": 60.37108798876511, "humidity": 42.57638031922869, "pressure": 1.0163223838648998}'
Consumed record with key 2 and value b'{"time": 1674606497.720512, "profile_name": "losang", "temperature": 74.95932262332519, "humidity": null, "pressure": 1.526593234909758}'
Consumed record with key 7 and value b'{"time": 1674606500.2506151, "profile_name": "denver", "temperature": 63.59429015798915, "humidity": null, "pressure": null}'
Consumed record with key 5 and value b'{"time": 1674606499.2361448, "profile_name": "losang", "temperature": 78.39658433696603, "humidity": 66.3460297992936, "pressure": 1.1478665235709087}'
Consumed record with key 8 and value b'{"time": 1674606500.757063, "profile_name": "boston", "temperature": 32.65468482824329, "humidity": 79.62171493727897, "pressure": 0.9734894425032533}'
Consumed record with key 9 and value b'{"time": 1674606501.264786, "profile_name": "denver", "temperature": 27.5592513619525, "humidity": 35.4869942184363, "pressure": 1.0480374257747522}'
Consumed record with key 11 and value b'{"time": 1674606502.279501, "profile_name": "boston", "temperature": 41.20023302446743, "humidity": 100, "pressure": 0.9667640950322247}'
Consumed record with key 12 and value b'{"time": 1674606502.787911, "profile_name": "denver", "temperature": 81.46849175448384, "humidity": null, "pressure": 1.4679948769688727}'
Consumed record with key 13 and value b'{"time": 1674606503.294506, "profile_name": "losang", "temperature": 57.84184897936133, "humidity": 47.043862551145644, "pressure": 1.6786558773707705}'
Consumed record with key 15 and value b'{"time": 1674606504.30778, "profile_name": "boston", "temperature": 66.36744648886386, "humidity": 80.10130087930698, "pressure": null}'
Consumed record with key 21 and value b'{"time": 1674606507.349601, "profile_name": "denver", "temperature": 29.148307647851947, "humidity": 24.196764196760178, "pressure": null}'
Consumed record with key 18 and value b'{"time": 1674606505.826858, "profile_name": "losang", "temperature": 54.699249152354, "humidity": 92.2342541911317, "pressure": 1.3756246555471376}'
Consumed record with key 19 and value b'{"time": 1674606506.334809, "profile_name": "boston", "temperature": 52.72656409815185, "humidity": 100, "pressure": 0.8751877195956866}'
Consumed record with key 4 and value b'{"time": 1674606498.728417, "profile_name": "denver", "temperature": 51.730612162104755, "humidity": null, "pressure": 1.8898420594942444}'
Consumed record with key 16 and value b'{"time": 1674606504.815531, "profile_name": "denver", "temperature": 11.97623882806382, "humidity": 45.09964302966476, "pressure": 1.6193788164156453}'
Consumed record with key 3 and value b'{"time": 1674606498.224395, "profile_name": "losang", "temperature": 68.11213070720373, "humidity": 100, "pressure": 1.1794237287396254}'
Consumed record with key 17 and value b'{"time": 1674606505.3233411, "profile_name": "denver", "temperature": 80.96980752717752, "humidity": 30.741534761343704, "pressure": 1.8326372303627996}'
Consumed record with key 14 and value b'{"time": 1674606503.802356, "profile_name": "boston", "temperature": 68.89200002366925, "humidity": 93.01163825552209, "pressure": 1.0538809488265559}'
Consumed record with key 6 and value b'{"time": 1674606499.744742, "profile_name": "losang", "temperature": null, "humidity": 45.85423218292861, "pressure": 1.1446881968332583}'
Consumed record with key 10 and value b'{"time": 1674606501.775136, "profile_name": "denver", "temperature": 23.694832873955793, "humidity": null, "pressure": 1.3688971678457105}'
Consumed record with key 20 and value b'{"time": 1674606506.842768, "profile_name": "denver", "temperature": 33.002014399371014, "humidity": 43.774942191850926, "pressure": null}'
```

Run the subscriber script

Subscription name projects/project-milestone1/subscriptions/smartMeter-sub

Subscription state active

Topic name projects/project-milestone1/topics/smartMeter

METRICS DETAILS MESSAGES

Click Pull to view messages and temporarily delay message delivery to other subscribers. Select Enable ACK messages and then click ACK next to the message to permanently prevent message delivery to other subscribers.

PULL Enable ack messages

Filter Filter messages

Publish time	Attribute keys	Message body	Ordering key	Ack
No message found yet				

Verify all messages have been consumed

Videos

GitHub Repo
http://github.com/abdulbhutta/Cloud-Computing/tree/main/Final%20Project/Milestone1_KafkaClusters

Deliverable 2 - Smart Meter in Confluence Kafka
https://drive.google.com/file/d/1GnSXaZdTYWKTHhj91SjeEIlnsq3idAcQ/view?usp=sharing

Deliverable 3 - Google Pub/Sub
https://drive.google.com/file/d/1j8ZgE2hqVZnSTkCUJ8ElA94wYbXo_PM8/view?usp=share_link