

# **Liudmyla Lashchuk**

## **Brief Description of Completed Task**

In this project, I implemented an IoT sensor data processing system using Apache Kafka. The project consists of three main parts:

### **1. Creating Kafka Topics**

Three unique topics were created:

- building\_sensors\_\* - for receiving data from sensors
- temperature\_alerts\_\* - for storing overheating warnings
- humidity\_alerts\_\* - for storing alerts about incorrect humidity levels

### **2. Sensor Producer**

A Python script was written to simulate the operation of a single sensor. Each run generates:

- Random temperature (25-45°C),
- Random humidity (15-85%),
- Unique sensor\_id,
- Timestamp

### **3. Processing and Alert Generation**

Another Python script reads data and sends notifications to the appropriate topics:

- Temperature > 40°C->record in temperature\_alerts
- Humidity > 80% or <20% -> record in humidity\_alerts

### **4. Final Consumer**

A separate script subscribes to the two alert topics and outputs received alerts to the console.



```
File Edit Selection View Go Run Terminal Help ← → ⌘ q got_kafka_project
configs.py create_topics.py admin_list_topics.py ✘ sensor_producer.py alerts_processor.py alerts_consumer.py
admin_list_topics.py ...
1   from confluent_kafka.admin import AdminClient
2   from configs import kafka_config
3
PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS
Python + v 🌐 Party sunny
Sent: {'sensor_id': 1379, 'timestamp': '2025-11-19T23:32:30.712811', 'temperature': 25.03, 'humidity': 23.8}
Stopping sensor...
PS C:\Users\liudm\OneDrive\Desktop\goit_kafka_project> & "C:\Program Files\Python313\python.exe" c:/Users/liudm/OneDrive/Desktop/goit_kafka_project/alerts_processor.py
PS C:\Users\liudm\OneDrive\Desktop\goit_kafka_project> Stopping alert_processor...
PS C:\Users\liudm\OneDrive\Desktop\goit_kafka_project> python sensor_producer.py
starting sensor with ID: 3445
C:\Users\liudm\OneDrive\Desktop\goit_kafka_project\sensor_producer.py:34: DeprecationWarning: datetime.datetime.utcnow() is deprecated and scheduled for removal in a future version. Use timezone-aware objects to represent datetimes in UTC: datetime.datetime.utcnow().isoformat()
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:44:56.785534', 'temperature': 36.12, 'humidity': 46.02}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:44:59.962211', 'temperature': 36.0, 'humidity': 41.32}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:00.106556', 'temperature': 46.61, 'humidity': 45.92}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:00.205933', 'temperature': 36.0, 'humidity': 49.26}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:00.364418', 'temperature': 36.4, 'humidity': 35.34}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:08.773174B', 'temperature': 38.06, 'humidity': 55.76}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:19.919983', 'temperature': 27.77, 'humidity': 65.28}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:19.919983', 'temperature': 36.23, 'humidity': 51.03}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:20.000000', 'temperature': 36.0, 'humidity': 80.0}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:17.499277', 'temperature': 26.0, 'humidity': 27.41}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:19.688890', 'temperature': 42.5, 'humidity': 62.22}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:21.688533', 'temperature': 36.0, 'humidity': 78.65}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:23.688276', 'temperature': 36.0, 'humidity': 77.77}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:25.687919', 'temperature': 41.81, 'humidity': 41.41}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:28.457875', 'temperature': 28.73, 'humidity': 60.26}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:30.659593', 'temperature': 46.62, 'humidity': 81.47}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:30.884863', 'temperature': 33.88, 'humidity': 47.11}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:31.084514', 'temperature': 36.0, 'humidity': 67.95}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:35.226955', 'temperature': 46.01, 'humidity': 49.97}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:39.414343', 'temperature': 36.02, 'humidity': 74.73}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:41.159924', 'temperature': 34.47, 'humidity': 83.21}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:43.019657', 'temperature': 41.96, 'humidity': 80.81}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:44.869331', 'temperature': 36.0, 'humidity': 48.24}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:45.157807', 'temperature': 37.78, 'humidity': 25.78}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:45.52.373109', 'temperature': 46.89, 'humidity': 54.25}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:52.564604', 'temperature': 28.24, 'humidity': 65.92}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:53.724261', 'temperature': 36.0, 'humidity': 46.01}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:54.963203', 'temperature': 26.88, 'humidity': 25.88}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:45:55.127286', 'temperature': 37.17, 'humidity': 75.65}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:01.316658', 'temperature': 35.26, 'humidity': 72.95}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:01.594607', 'temperature': 27.13, 'humidity': 33.95}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:01.872546', 'temperature': 36.0, 'humidity': 48.79}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:01.897872', 'temperature': 39.57, 'humidity': 76.15}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:10.083559', 'temperature': 25.36, 'humidity': 48.63}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:26.233105', 'temperature': 26.98, 'humidity': 32.34}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:46.14.562216', 'temperature': 43.0, 'humidity': 75.0}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:46.14.562216', 'temperature': 36.0, 'humidity': 52.89}
Sent: {'sensor_id': 3445, 'timestamp': '2025-11-19T23:46:46.15.851933', 'temperature': 35.31, 'humidity': 19.38}
```

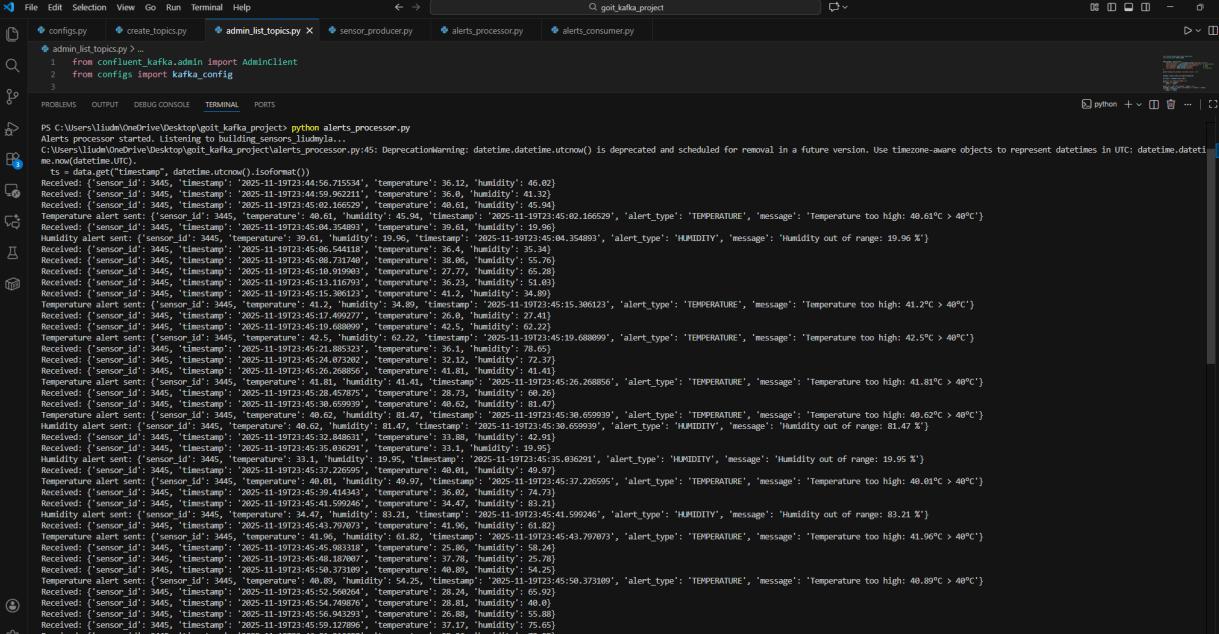
File Edit Selection View Go Run Terminal Help ↵ | goit\_kafka\_project

config.py create\_topics.py admin\_list\_topics.py sensor\_producer.py alerts\_processor.py alerts\_consumer.py

PROBLEMS OUTPUT DEBUG CONSOLE TERMINAL PORTS

python

```
admin.listTopics() ...  
from confluent_kafka.admin import AdminClient  
from configs import kafka_config  
  
starting sensor with ID: 6263  
PS C:\Users\luina\OneDrive\Desktop\goit_kafka_project> python sensor_producer.py  
starting with sensor ID: 6263  
C:\Users\luina\OneDrive\Desktop\goit_kafka_project> sensor_producer.py:34: DeprecationWarning: datetime.datetime.utcnow() is deprecated and scheduled for removal in a future version. Use timezone-aware objects to represent datetimes in UTC: datetime.datetime  
e.now('utc') + timedelta(seconds=1)).strftime('%c')  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:02.969670", "temperature": 28.48, "humidity": 72.48}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:06.275807", "temperature": 44.24, "humidity": 79.49}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:08.499787", "temperature": 41.38, "humidity": 78.13}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:10.723707", "temperature": 28.72, "humidity": 77.22}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:12.936598", "temperature": 26.72, "humidity": 68.34}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:15.222880", "temperature": 39.71, "humidity": 51.44}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:17.231628", "temperature": 39.73, "humidity": 63.14}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:20.449533", "temperature": 43.1, "humidity": 62.23}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:21.559533", "temperature": 43.74, "humidity": 62.52}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:23.761738", "temperature": 42.34, "humidity": 19.71}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:25.969699", "temperature": 26.0, "humidity": 51.05}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:28.159495", "temperature": 37.16, "humidity": 59.08}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:30.357344", "temperature": 37.24, "humidity": 59.08}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:34.742872", "temperature": 27.48, "humidity": 79.34}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:36.918307", "temperature": 35.56, "humidity": 74.14}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:39.109957", "temperature": 29.26, "humidity": 101.01}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:41.302627", "temperature": 37.4, "humidity": 62.65}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:43.499277", "temperature": 39.61, "humidity": 32.69}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:45.687273", "temperature": 41.52, "humidity": 65.95}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:47.888844", "temperature": 29.89, "humidity": 54.21}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:50.080411", "temperature": 28.16, "humidity": 77.28}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:52.290931", "temperature": 34.97, "humidity": 76.33}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:56.458607", "temperature": 34.97, "humidity": 76.33}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:56.62276", "temperature": 35.14, "humidity": 60.03}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:46:58.897181", "temperature": 44.91, "humidity": 50.65}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.089887", "temperature": 37.49, "humidity": 53.24}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.091734", "temperature": 37.49, "humidity": 53.24}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.091734", "temperature": 37.49, "humidity": 53.24}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.091734", "temperature": 37.49, "humidity": 53.24}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.103806", "temperature": 38.92, "humidity": 77.53}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.14.225471", "temperature": 38.58, "humidity": 74.12}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.16.411755", "temperature": 41.61, "humidity": 17.01}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.18.603772", "temperature": 28.1, "humidity": 50.29}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.20.780337", "temperature": 38.88, "humidity": 26.29}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.22.06807", "temperature": 36.97, "humidity": 57.02}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.25.155695", "temperature": 36.26, "humidity": 33.24}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.27.349578", "temperature": 33.55, "humidity": 65.45}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.29.575454", "temperature": 46.4, "humidity": 83.76}  
Sent: {"sensor_id": 6263, "timestamp": "2025-11-19T23:47.31.743931", "temperature": 43.59, "humidity": 38.81}
```



PS C:\Users\Uluu\OneDrive\Desktop\git\kafka\project> python alerts\_processor.py

Alerts processor started. Listening to building\_sensors\_kafka...

C:\Users\Uluu\OneDrive\Desktop\git\kafka\project> alerts\_processor.py:45: DeprecationWarning: datetime.datetime.utcnow() is deprecated and scheduled for removal in a future version. Use timezone-aware objects to represent datetimes in UTC: datetime.datetime.now(tz=UTC)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:44:56.715534', 'temperature': 36.12, 'humidity': 46.02}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:06.962211', 'temperature': 36.1, 'humidity': 41.02}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:15.306123', 'temperature': 36.08, 'humidity': 45.02}

Temperature alert sent: ('sensor\_id': 3445, 'temperature': 48.61, 'humidity': 45.94, 'timestamp': '2025-11-19T23:45:08.166529', 'alert\_type': 'TEMPERATURE', 'message': 'Temperature too high: 48.61°C > 48°C')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:04.354893', 'temperature': 30.9, 'humidity': 19.96}

Humidity alert sent: ('sensor\_id': 3445, 'temperature': 39.61, 'humidity': 19.96, 'timestamp': '2025-11-19T23:45:04.354893', 'alert\_type': 'HUMIDITY', 'message': 'Humidity out of range: 19.96 %')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:05.544118', 'temperature': 36.4, 'humidity': 35.34}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:06.956211', 'temperature': 36.4, 'humidity': 31.73}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:15.019083', 'temperature': 37.77, 'humidity': 65.28}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:13.116793', 'temperature': 36.23, 'humidity': 51.03)}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:15.306123', 'temperature': 41.2, 'humidity': 34.89}

Temperature alert sent: ('sensor\_id': 3445, 'temperature': 48.61, 'humidity': 45.94, 'timestamp': '2025-11-19T23:45:08.166529', 'alert\_type': 'TEMPERATURE', 'message': 'Temperature too high: 41.2°C > 48°C')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:04.354893', 'temperature': 30.9, 'humidity': 19.96)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:15.306123', 'temperature': 42.5, 'humidity': 62.22)

Temperature alert sent: ('sensor\_id': 3445, 'temperature': 42.5, 'humidity': 62.22, 'timestamp': '2025-11-19T23:45:15.306123', 'alert\_type': 'TEMPERATURE', 'message': 'Temperature too high: 42.5°C > 48°C')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:21.885323', 'temperature': 36.1, 'humidity': 78.65)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:24.073264', 'temperature': 36.1, 'humidity': 77.37)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:25.955656', 'temperature': 36.1, 'humidity': 41.41)

Temperature alert sent: ('sensor\_id': 3445, 'temperature': 41.81, 'humidity': 41.41, 'timestamp': '2025-11-19T23:45:26.268856', 'alert\_type': 'TEMPERATURE', 'message': 'Temperature too high: 41.81°C > 48°C')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:28.457875', 'temperature': 28.73, 'humidity': 60.26)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:30.659939', 'temperature': 40.62, 'humidity': 81.47)

Temperature alert sent: ('sensor\_id': 3445, 'temperature': 40.62, 'humidity': 81.47, 'timestamp': '2025-11-19T23:45:30.659939', 'alert\_type': 'TEMPERATURE', 'message': 'Temperature too high: 40.62°C > 48°C')}

Humidity alert sent: ('sensor\_id': 3445, 'temperature': 48.61, 'humidity': 81.47, 'timestamp': '2025-11-19T23:45:30.659939', 'alert\_type': 'HUMIDITY', 'message': 'Humidity out of range: 81.47 %')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:35.048531', 'temperature': 33.88, 'humidity': 42.91)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:35.036291', 'temperature': 33.1, 'humidity': 19.95)

Humidity alert sent: ('sensor\_id': 3445, 'temperature': 33.1, 'humidity': 19.95, 'timestamp': '2025-11-19T23:45:35.036291', 'alert\_type': 'HUMIDITY', 'message': 'Humidity out of range: 19.95 %')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:35.048531', 'temperature': 33.88, 'humidity': 42.91)

Temperature alert sent: ('sensor\_id': 3445, 'temperature': 40.61, 'humidity': 40.97, 'timestamp': '2025-11-19T23:45:37.226595', 'alert\_type': 'TEMPERATURE', 'message': 'Temperature too high: 40.61°C > 48°C')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:30.414343', 'temperature': 36.02, 'humidity': 74.73)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:41.599246', 'temperature': 34.47, 'humidity': 83.21)

Humidity alert sent: ('sensor\_id': 3445, 'temperature': 34.47, 'humidity': 83.21, 'timestamp': '2025-11-19T23:45:41.599246', 'alert\_type': 'HUMIDITY', 'message': 'Humidity out of range: 83.21 %')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:43.790763', 'temperature': 41.45, 'humidity': 61.63)

Temperature alert sent: ('sensor\_id': 3445, 'temperature': 41.06, 'humidity': 61.82, 'timestamp': '2025-11-19T23:45:43.790763', 'alert\_type': 'TEMPERATURE', 'message': 'Temperature too high: 41.06°C > 48°C')}

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:45.083318', 'temperature': 25.8, 'humidity': 58.24)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:45.187807', 'temperature': 37.78, 'humidity': 25.78)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:45.210197', 'temperature': 54.09, 'humidity': 54.09)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:45.250644', 'temperature': 28.24, 'humidity': 65.92)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:52.560264', 'temperature': 28.24, 'humidity': 65.92)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:54.749876', 'temperature': 28.81, 'humidity': 40.8)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:56.943293', 'temperature': 26.88, 'humidity': 55.88)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:45:58.127986', 'temperature': 37.01, 'humidity': 75.65)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:46.019165', 'temperature': 25.26, 'humidity': 72.53)

Received: ('sensor\_id': 3445, 'timestamp': '2025-11-19T23:46.03.596687', 'temperature': 27.13, 'humidity': 33.48)

The screenshot shows a terminal window with the following content:

```
PS C:\Users\lluan\OneDrive\Desktop\git\kafka\project> python alerts_consumer.py
Alerts final consumer started. Listening to temperature & humidity alerts...
---ALERT from topic: humidity_alerts_lluemyla ---
Sensor ID: 3445
Time: 2025-11-19T23:45:04.354893
Temperature: 39.61 °C
Humidity: 19.96 %
Type: HUMIDITY
Message: Humidity out of range: 19.96 %

---ALERT from topic: humidity_alerts_lluemyla ---
Sensor ID: 3445
Time: 2025-11-19T23:45:38.659939
Temperature: 48.62 °C
Humidity: 81.47 %
Type: HUMIDITY
Message: Humidity out of range: 81.47 %

---ALERT from topic: humidity_alerts_lluemyla ---
Sensor ID: 3445
Time: 2025-11-19T23:45:46:35.036291
Temperature: 33.1 °C
Humidity: 19.95 %
Type: HUMIDITY
Message: Humidity out of range: 19.95 %

---ALERT from topic: humidity_alerts_lluemyla ---
Sensor ID: 3445
Time: 2025-11-19T23:45:41.599246
Temperature: 34.47 °C
Humidity: 83.21 %
Type: HUMIDITY
Message: Humidity out of range: 83.21 %

---ALERT from topic: temperature_alerts_lluemyla ---
Sensor ID: 3445
Time: 2025-11-19T23:45:02.166529
Temperature: 48.61 °C
Humidity: 45.94 %
Type: TEMPERATURE
Message: Temperature too high: 48.61°C > 40°
```







