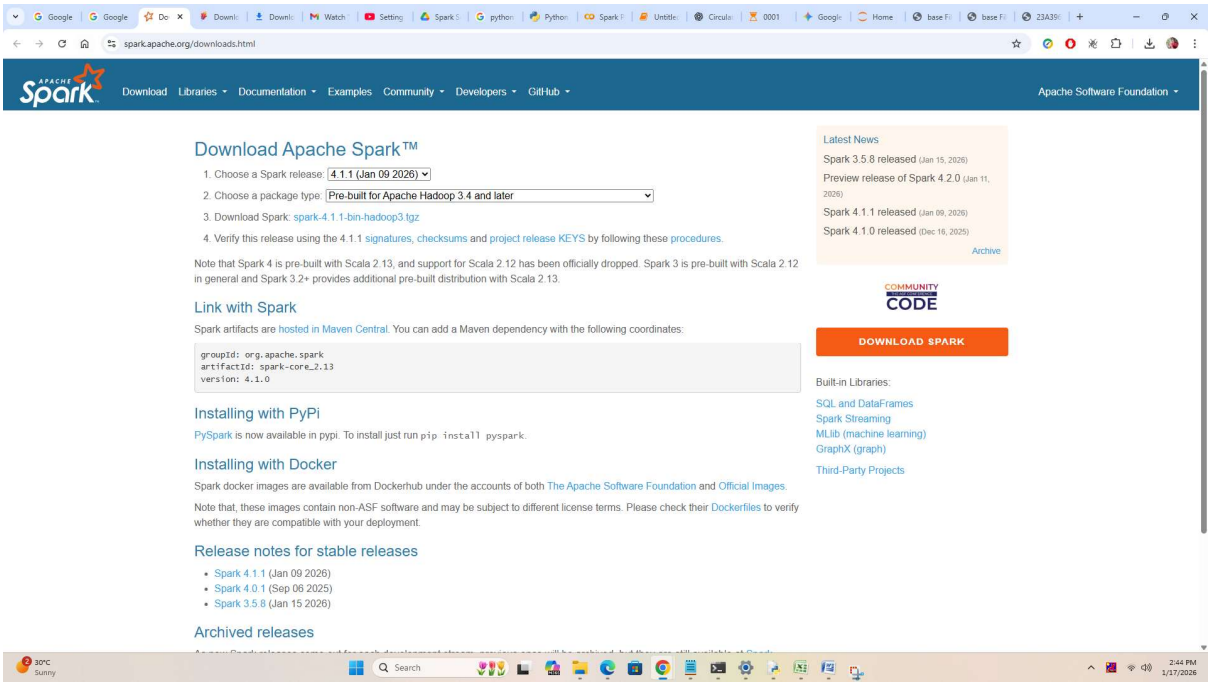
Lab: EDGE COMPUTING LAB (23A39605)

College: Andhra Engineering College

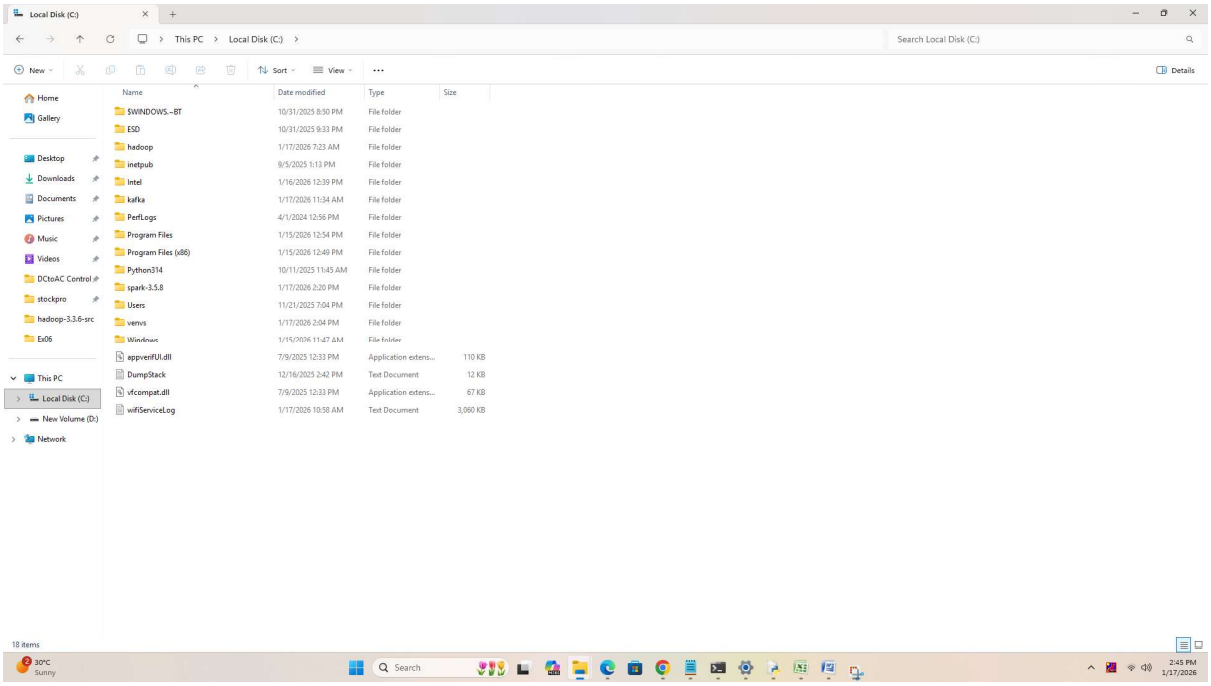
9. Streaming Data Analytics on Edge o Local aggregation and event processing with Kafka or lightweight alternatives

Download

https://spark.apache.org/downloads.html
https://kafka.apache.org/community/downloads/



After Download Extract and Past on C:



Install **Java 17**

After

Set Env Varible on **system path**

JAVA_HOME	C:\Program Files\Java\jdk-17
HADOOP_HOME	C:\hadoop
SPARK_HOME	C:\spark-3.5.8
path	%HADOOP_HOME%\bin
	%SPARK_HOME%\bin
	%JAVA_HOME%\bin
	%KAFKA_HOME%\bin
KAFKA_HOME	C:\kafka

Next Go to C:

C:\kafka\config
CHANGE HERE server file

log.dirs=/tmp/kraft-combined-logs
to
log.dirs=C:/kafka/kraft-combined-logs

Production Point of view change Here

############################## Server Basics ##############################

process.roles=broker,controller
node.id=1

controller.quorum.bootstrap.servers=10.208.87.140:9093

############################## Socket Server Settings ##############################

# Bind to all interfaces
listeners=PLAINTEXT://0.0.0.0:9092,CONTROLLER://0.0.0.0:9093

# Only advertise broker listener (VERY IMPORTANT)
advertised.listeners=PLAINTEXT://10.208.87.140:9092

# Required for KRaft
controller.listener.names=CONTROLLER
inter.broker.listener.name=PLAINTEXT

listener.security.protocol.map=CONTROLLER:PLAINTEXT,PLAINTEXT:PLAINTEXT

############################## Log Basics ##############################

log.dirs=C:/kafka/kraft-combined-logs
num.partitions=1

############################## Internal Topics ##############################

offsets.topic.replication.factor=1
transaction.state.log.replication.factor=1
transaction.state.log.min.isr=1

Go to this Path C:\kafka
C:\kafka>**.\bin\windows\kafka-storage.bat random-uuid**

2026-01-17T05:45:46.755244Z main ERROR
Reconfiguration failed: No configuration found for
'266474c2' at 'null' in 'null'
RDowQE9sSl22VfkPmBWLIw

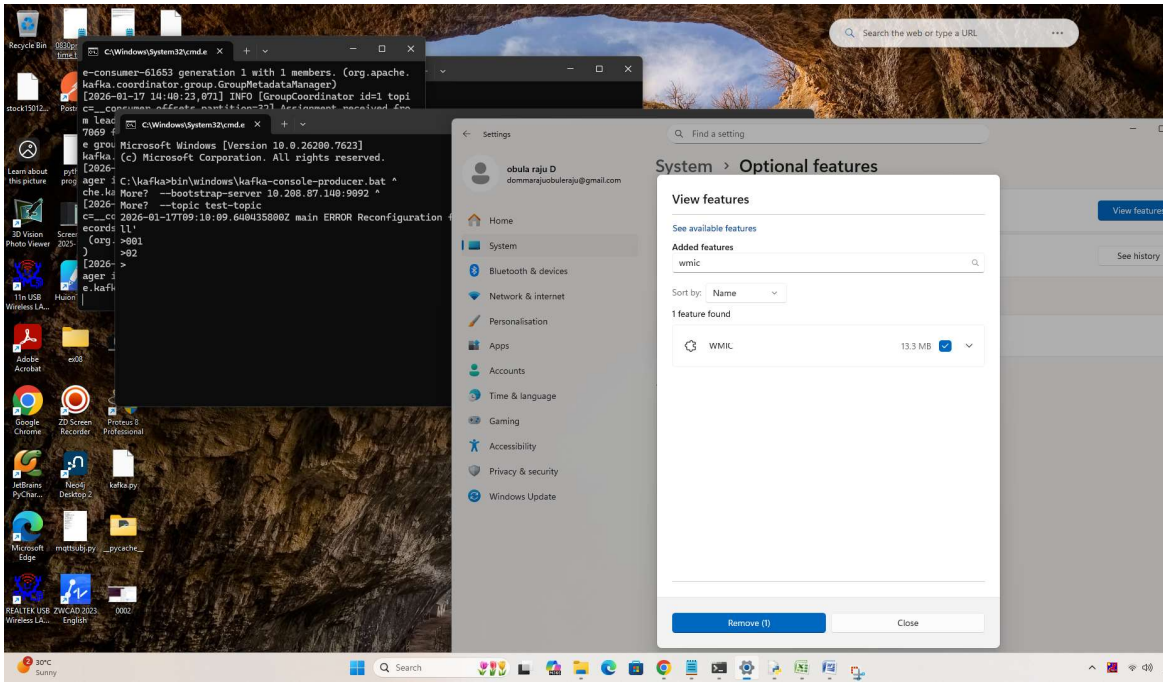
C:\kafka> **.\bin\windows\kafka-storage.bat format --standalone -t RDowQE9sSl22VfkPmBWLIw -c config\server.properties**
2026-01-17T05:47:33.696916700Z main ERROR Reconfiguration failed: No configuration found for '266474c2' at 'null' in 'null'
Formatting dynamic metadata voter directory C:/kafka/kraft-combined-logs with metadata.version 4.1-IV1.

command line untilitiy function

settings->system->optional features ->view features

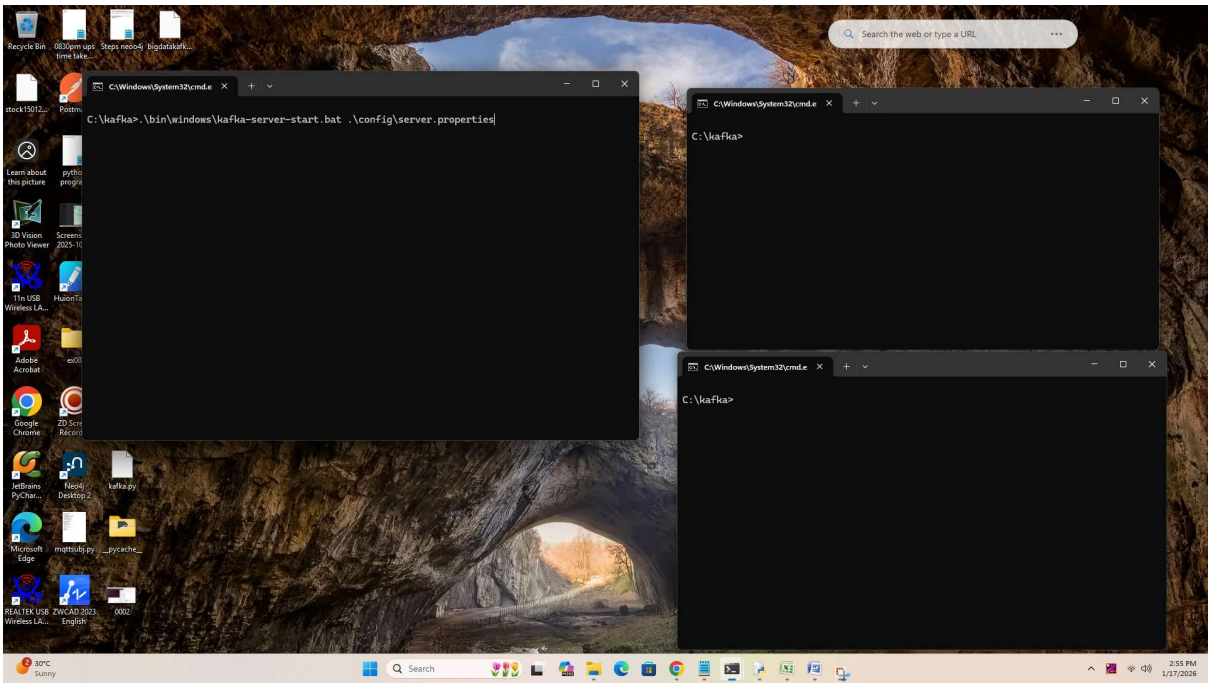
Search

wmic add it



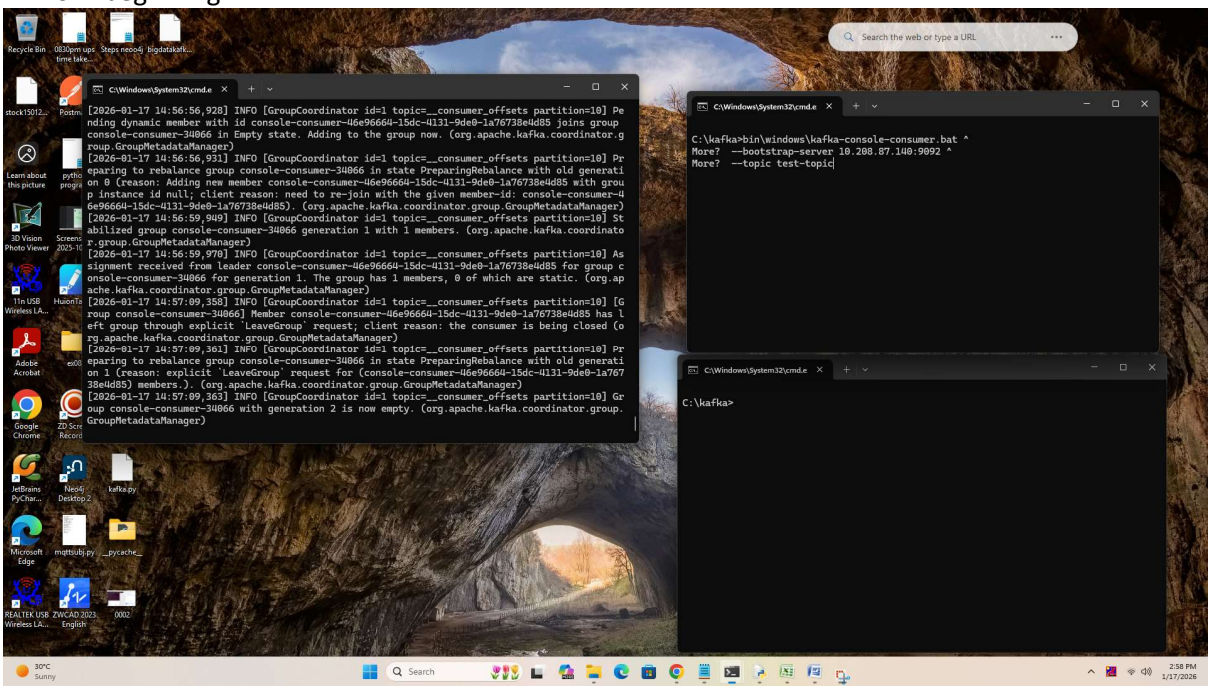
Start Kafka

C:\kafka>.\bin\windows\kafka-server-start.bat .\config\server.properties



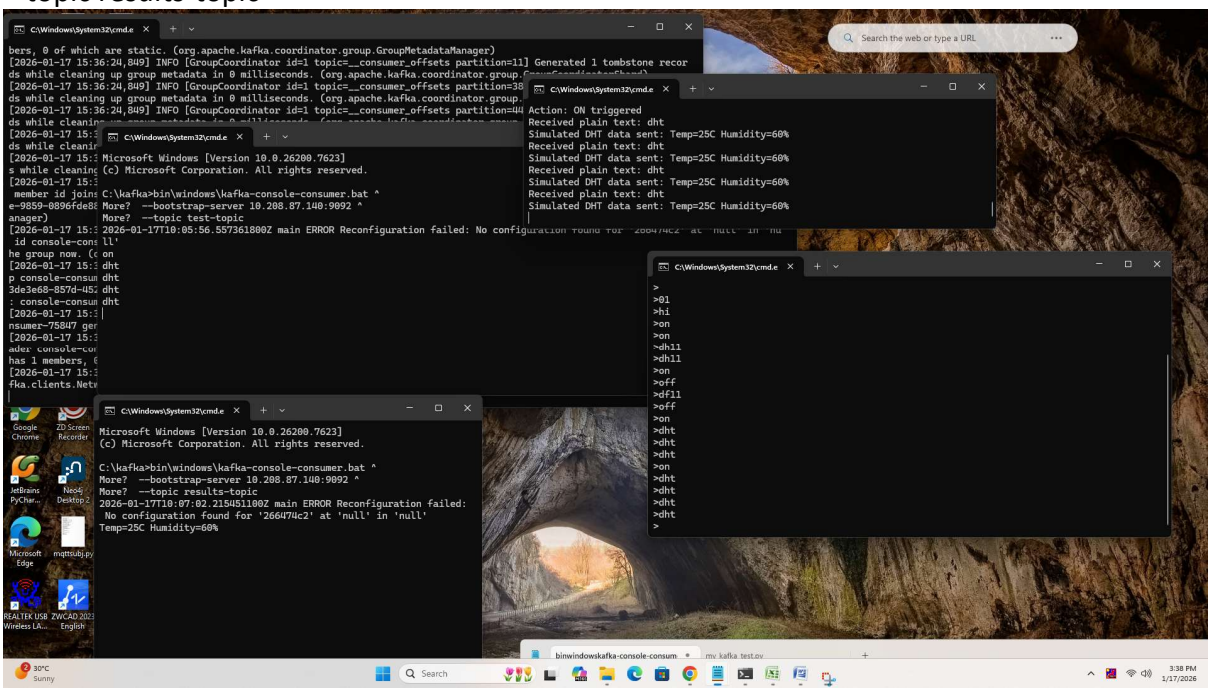
Consumer (new CMD window)

bin\windows\kafka-console-consumer.bat ^
 --bootstrap-server 10.208.87.140:9092 ^
 --topic test-topic ^
 --from-beginning



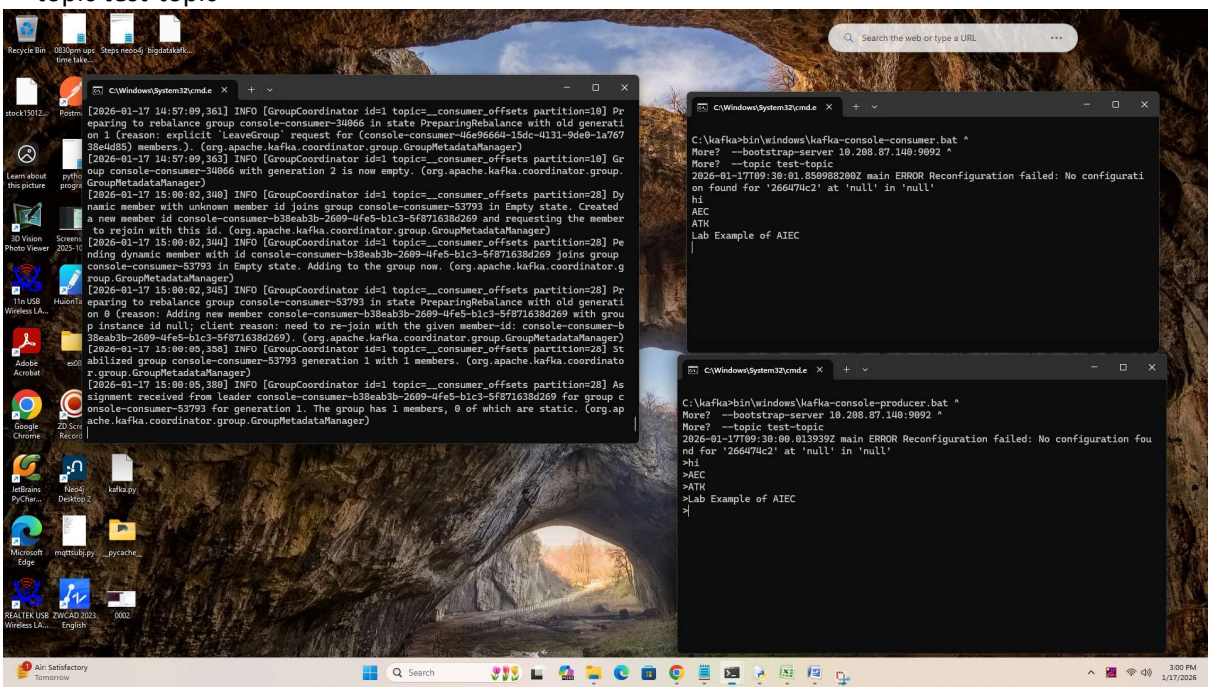
Consumer 02

bin\windows\kafka-console-consumer.bat ^
 --bootstrap-server 10.208.87.140:9092 ^
 --topic results-topic



Producer

bin\windows\kafka-console-producer.bat ^
 --bootstrap-server 10.208.87.140:9092 ^
 --topic test-topic



Using Edge End Control

C:\spark-3.5.8>pip install kafka-python
 Collecting kafka-python
  Downloading kafka_python-2.3.0-py2.py3-none-any.whl.metadata (10.0 kB)
 Downloading kafka_python-2.3.0-py2.py3-none-any.whl (326 kB)
 Installing collected packages: kafka-python
 Successfully installed kafka-python-2.3.0

 [notice] A new release of pip is available: 24.3.1 -> 25.3
 [notice] To update, run: python.exe -m pip install --upgrade pip

Python Code

```
from kafka import KafkaConsumer, KafkaProducer
import json

# ---------------- CONFIG ----------------
KAFKA_BOOTSTRAP = "10.208.87.140:9092"
INPUT_TOPIC = "test-topic"
RESULT_TOPIC = "results-topic"

# ---------------- PRODUCER ----------------
```

```
producer = KafkaProducer(
    bootstrap_servers=KAFKA_BOOTSTRAP,
    value_serializer=lambda x: json.dumps(x).encode("utf-8")
        if isinstance(x, dict) else str(x).encode("utf-8"),
    acks="all",
    retries=3
)

# ---------------- SAFE PARSER ----------------
def parse_message(x):
    try:
        return json.loads(x.decode("utf-8"))
    except Exception:
        return x.decode("utf-8")

# ---------------- PROCESSING ----------------
def on_message(msg):

    # ----- JSON messages -----
    if isinstance(msg, dict):
        event = msg.get("event")

        if event == "predict":
            data = msg.get("data", [])
            if not data:
                return

            result = sum(data) / len(data)
            producer.send(
                RESULT_TOPIC,
                {"event": "prediction", "value": result}
            )
            print("JSON prediction:", result)

        else:
            print("Unknown JSON:", msg)

    # ----- Plain text messages -----
    else:
        payload = msg.strip().lower()
        print("Text received:", payload)

        if payload == "on":
            producer.send(RESULT_TOPIC, "Action: ON triggered")

        elif payload == "off":
            producer.send(RESULT_TOPIC, "Action: OFF triggered")
```

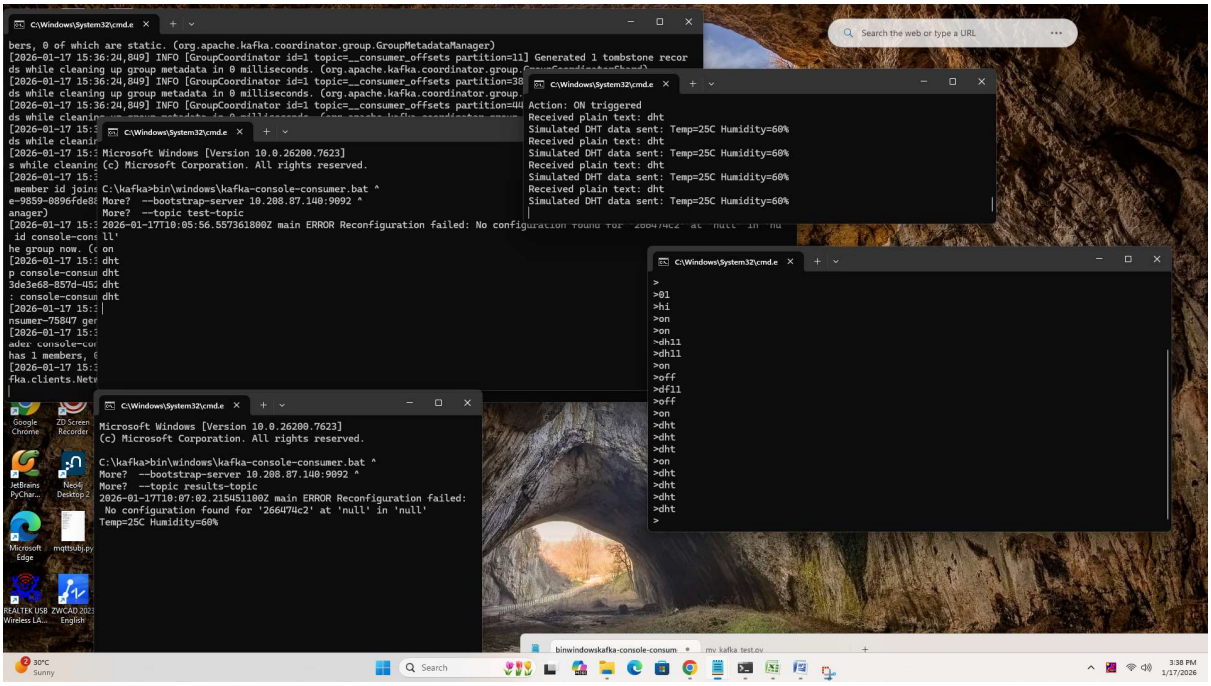
```
        elif payload == "dht":
            temp, hum = 25, 60
            producer.send(
                RESULT_TOPIC,
                f"Temp={temp}C Humidity={hum}%"
            )

        else:
            producer.send(
                RESULT_TOPIC,
                f"Message received: {payload}"
            )

    producer.flush()

# ---------------- CONSUMER ----------------
consumer = KafkaConsumer(
    INPUT_TOPIC,
    bootstrap_servers=KAFKA_BOOTSTRAP,
    group_id="mixed-group-v2",
    value_deserializer=parse_message,
    auto_offset_reset="earliest",
    enable_auto_commit=True
)

# ---------------- RUN ----------------
print("Kafka consumer started...")
for msg in consumer:
    if msg.value is not None:
        on_message(msg.value)
```



If Any Input get from **Producer to Consumer (new CMD window)**

Do Action process USING ML OR DL Inference

If need Hbase or pyspark or needed do Integration Based on Need