MINI PROJECT:

INTERNET OF THINGS

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2ème Année GE2.

Année universitaire : 2023/2024

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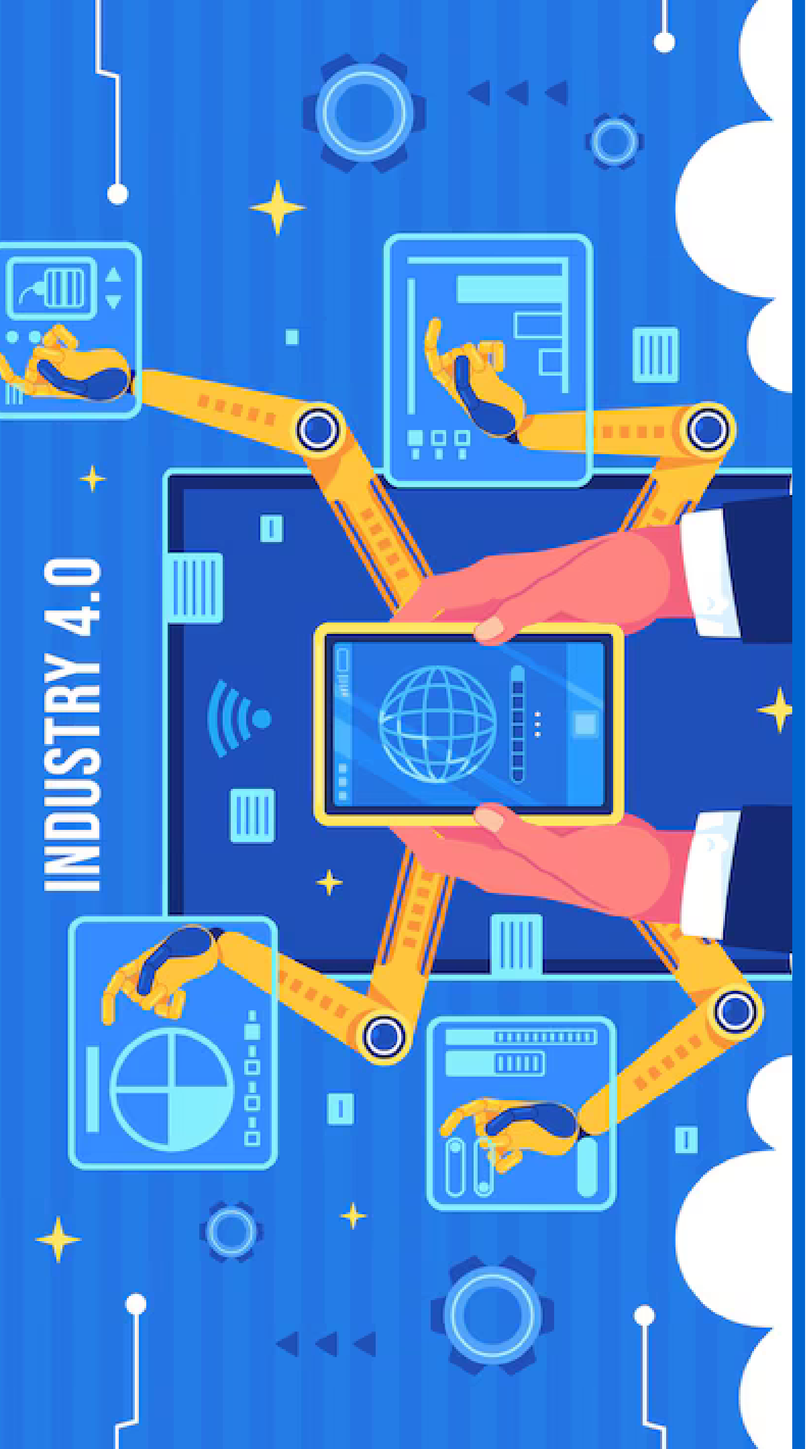


IOT

Brief Introduction

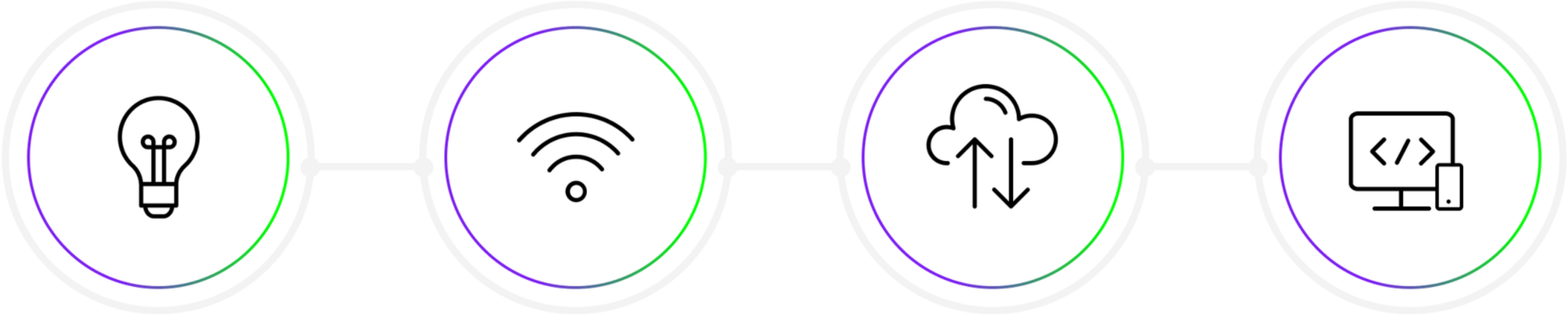
- IoT, refers to the network of I**nterconnected Devices** embedded with sensors, software, and other technologies, enabling them to **collect and exchange data over the internet**.

- These devices can range from everyday objects such as household appliances, wearable devices, and industrial equipment to vehicles, buildings, and infrastructure.

- IoT enables these devices to **communicate, interact, and autonomously** perform tasks, leading to improved efficiency, convenience, and enabling informed decision-making .

TOPIC OF THE PROJECT

This project focuses on creating a comprehensive dashboard that monitors and analyzes the energy consumption of lamps



Smart lamp

Wireless connection

Cloud network

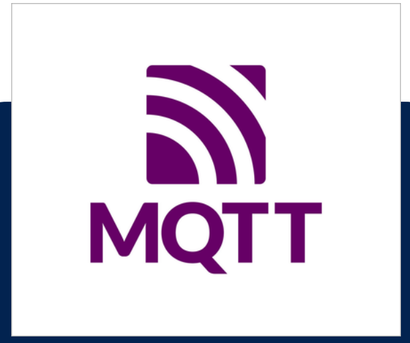
Dashboard

PROJECT OBJECTIVE

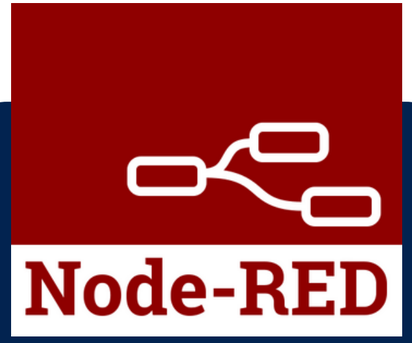
The project aims to **acquire electrical parameters** from connected lamps for **monitoring** and **analysis** purposes.

- Real-time Data Transmission: Sensors within the lamps transmit real-time data capturing various electrical parameters, including:
  - Power consumption
  - Voltage levels
  - Current usage
  - Energy consumption

IOT SOLUTION



Acts as the central communication hub for receiving real-time data from the sensors within the lamps, ensuring seamless connectivity.



Facilitates data processing and integration tasks, such as data aggregation, transformation, and forwarding.

Serves as the database for storing time-series data related to electrical parameters.

Provides a visualization platform for creating dashboards and analyzing the stored data.

PROJECT PIPELINE

(Sensor Input)

MQTT

(Message Broker)

(Data bridge)

Node-RED

influxdb

(Database)

Grafana

(Dashboard)

IMPLIMENTATION

VERIFY WITH CMD THAT THE TOPICS ARE WORKING

CREATE A DATABASE READY TO RECIEVE MEASUREMENTS

LINK MQTT TO NODE RED TO INFLUX

STORE THE DATA ON INFLUX DB

CREATE THE DASHBOARD ON GRAFANA

TESTING MQTT

- In the context of testing MQTT (Message Queuing Telemetry Transport) communication, we utilize commands such as **mosquitto_pub** and **mosquitto_sub** to assess the integrity of MQTT-based systems.

- For instance, using **mosquitto_pub -h "test.mosquitto.org" -t "/test" -m "essai"**, we can publish a message ("essai") to a designated topic ("/test") hosted on the MQTT broker at "test.mosquitto.org". This command allows us to simulate sending data within our MQTT ecosystem.

- Conversely, with **mosquitto_sub -h "test.mosquitto.org"** -t "/test", we subscribe to the same topic ("/test") on the mosquitto broker, enabling us to receive and monitor incoming messages.

- Additionally,after subscribing to the topic "/Courant 1," we can effectively verify the connectivity of our lamp 1. By monitoring this topic, we receive real-time updates from the lamp regarding the current value .

=>These commands are fundamental tools for verifying the reliability and functionality of our messaging infrastructure.

TESTING MQTT

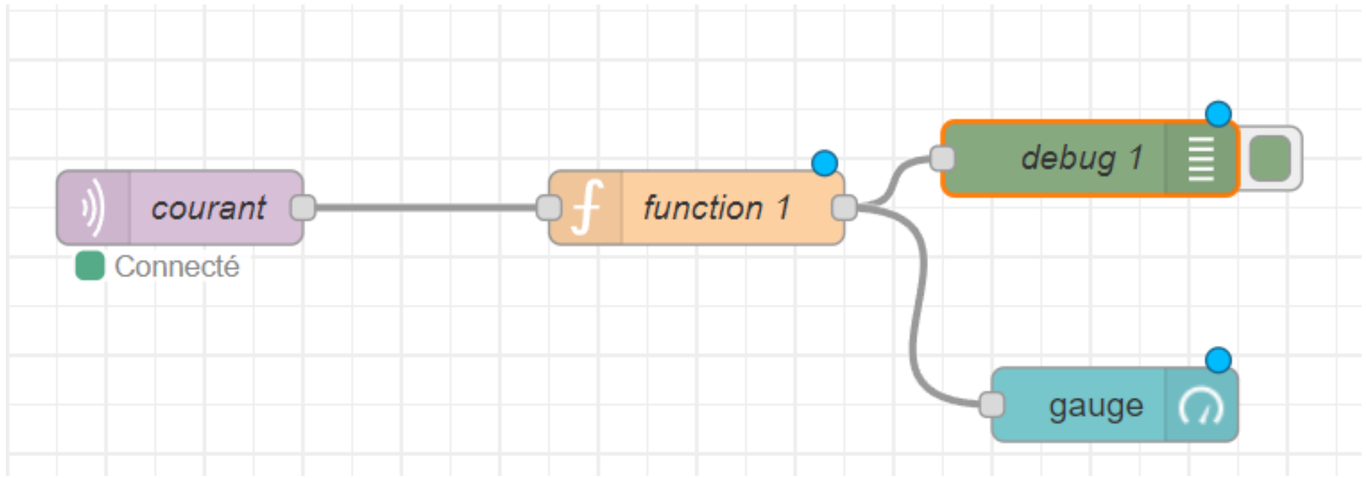
```
C:\Program Files\mosquitto>mosquitto_sub -h "test.mosquitto.org" -t "/Courant1"
0.23
0.23
0.23
0.23
```

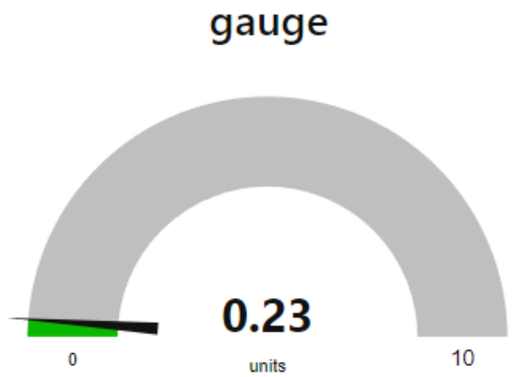
```
^C
C:\Program Files\mosquitto>mosquitto_sub -h "test.mosquitto.org" -t "/Power1"
48.8
48.8
48.7
```

```
C:\Program Files\mosquitto>mosquitto_sub -h "test.mosquitto.org" -t "/ReacPower1"
12.9
15.2
^C
```

FIRST TEST

- As a first test we tried recieving data from the current topic and visualize it using node-red to get familiar with the tool.





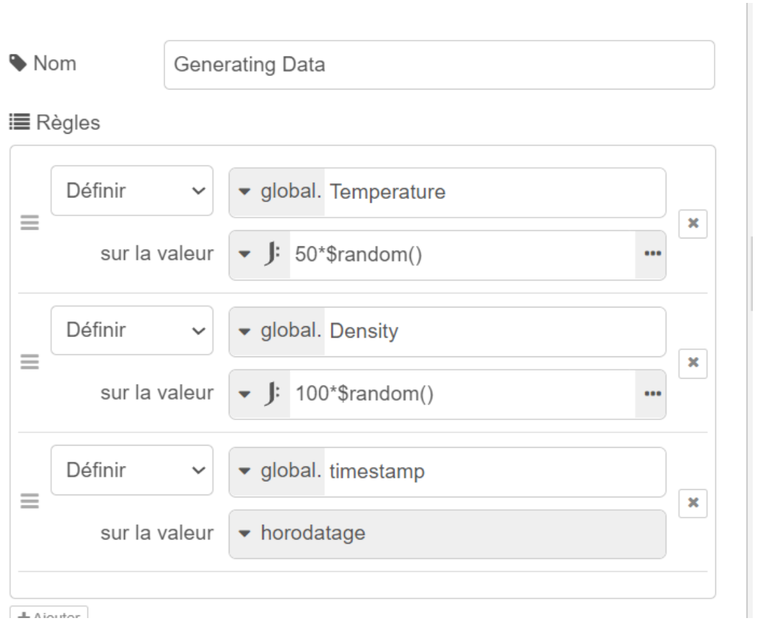
4/1/2024, 4:59:42 PM noeud: debug 1
/Courant1 : msg.payload : number
0.23

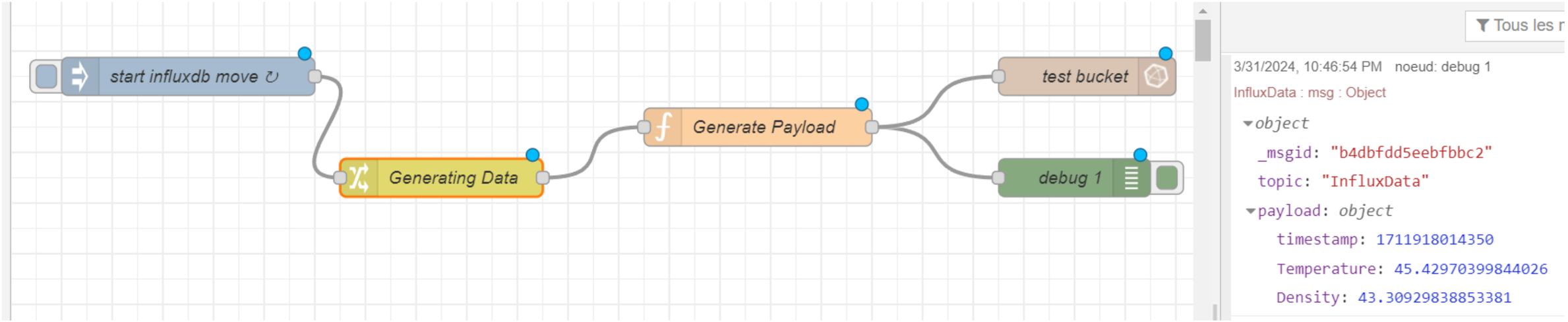
```
C:\Program Files\mosquitto>mosquitto_sub -h "test.mosquitto.org" -t "/Courant1"
0.23
```

LINKING TOOLS

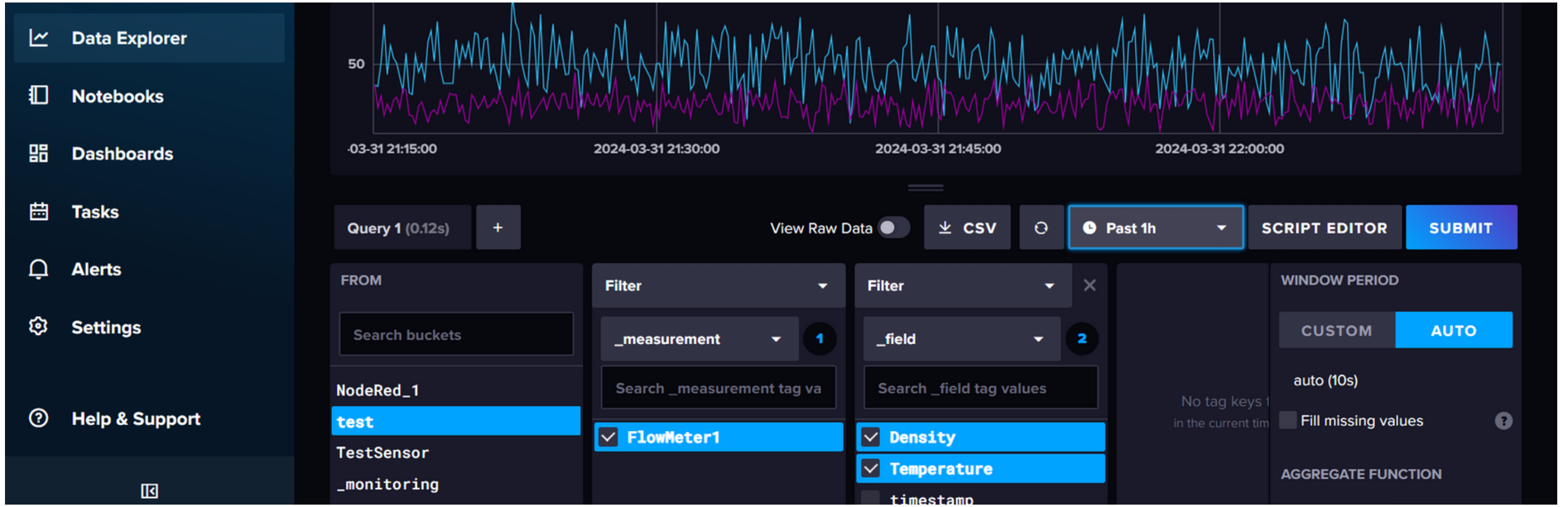
NODE-RED -> INFLUXDB -> GRAFANA

- As a second test we tried generating random data “Density and Temperature ” add them to our Bucket (DataBase in influx db) named “test” and plot a chart to visualize them in both influx and grafana.

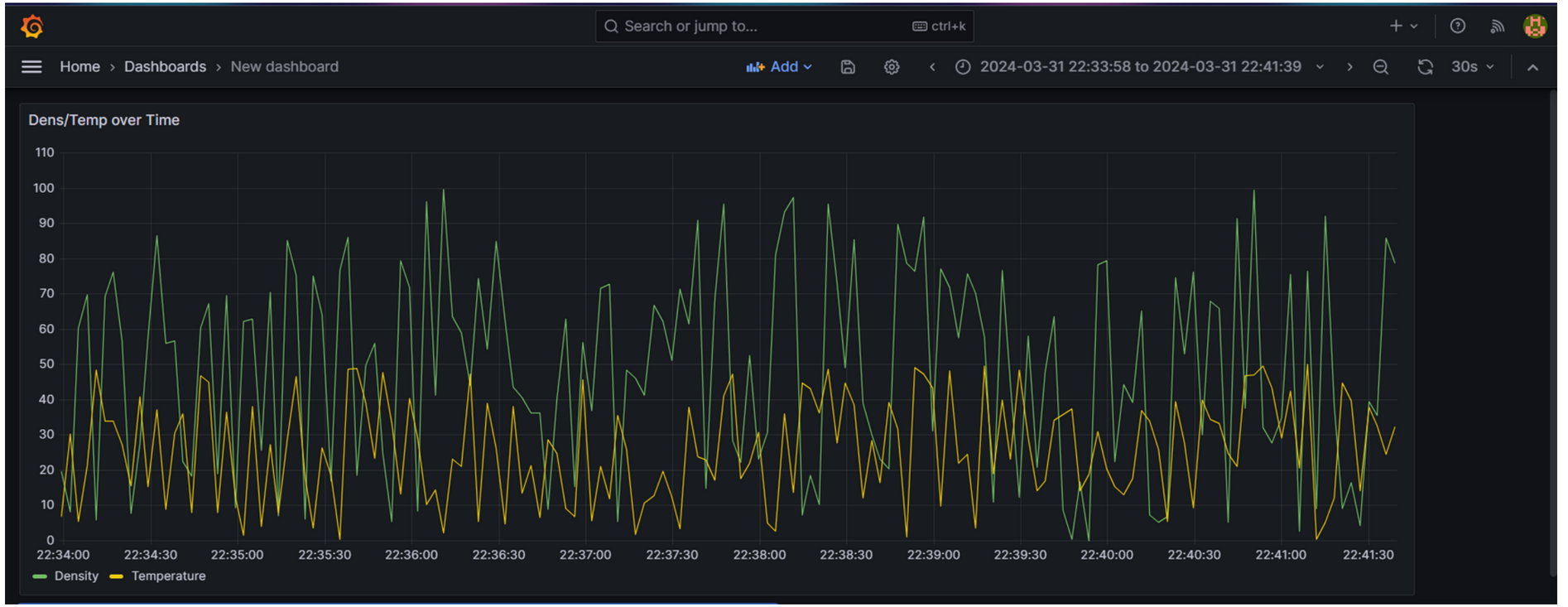




INFLUXDB DATABASE VISUALIZATION



GRAFANA DASHBOARD



/COURANT 1-DASHBOARD

1.**InfluxDB Configuration:**

Install and Set up an InfluxDB instance to serve as the time-series database : “ MP_IOT “ for storing electrical parameter data.

2.**Node-RED Setup:**

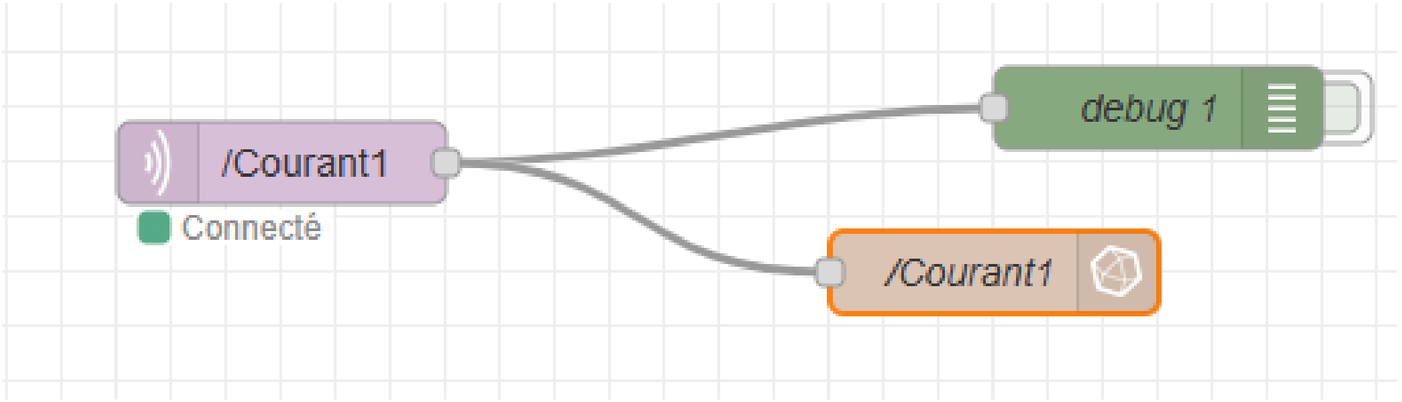
- Configure MQTT node to subscribe to the "/Courant 1" topic and receive data.
- Configure InfluxDB node to store the measurement : ”/Courant1" in the DB untitled : “ MP_IOT “ .

3.**Grafana Dashboard Creation:**

- Install and configure Grafana to visualize data from InfluxDB.
- Connect Grafana to the InfluxDB database created for Courant 1 data.
- Design a new dashboard in Grafana specifically for monitoring Courant1 measurement.

/COURANT 1-DASHBOARD

SCREENSHOTS FROM THE IMPLIMENTATION



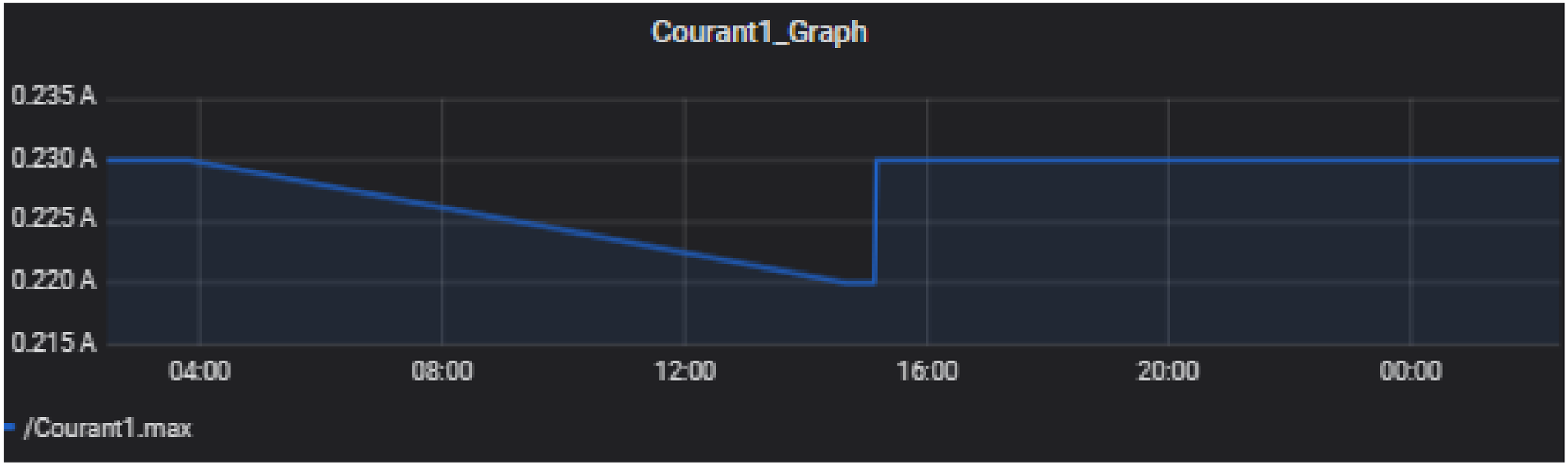
Node-Red flow

```
> USE TESTING_TUTORIAL
Using database TESTING_
> SELECT*FROM "/Courant1" LIMIT 10
name: /Courant1
time                 value
----                 -----
1712000911445734800 0.23
1712000912764682900 0.23
1712000914803169400 0.23
1712000916725324800 0.23
1712000918851464800 0.23
1712000921138616500 0.23
1712000922770691500 0.23
1712000924717276100 0.23
1712000926851083500 0.23
1712000928807150200 0.23
```

Stored Current Measurements

/COURANT 1-DASHBOARD

SCREENSHOTS OF THE RESULT



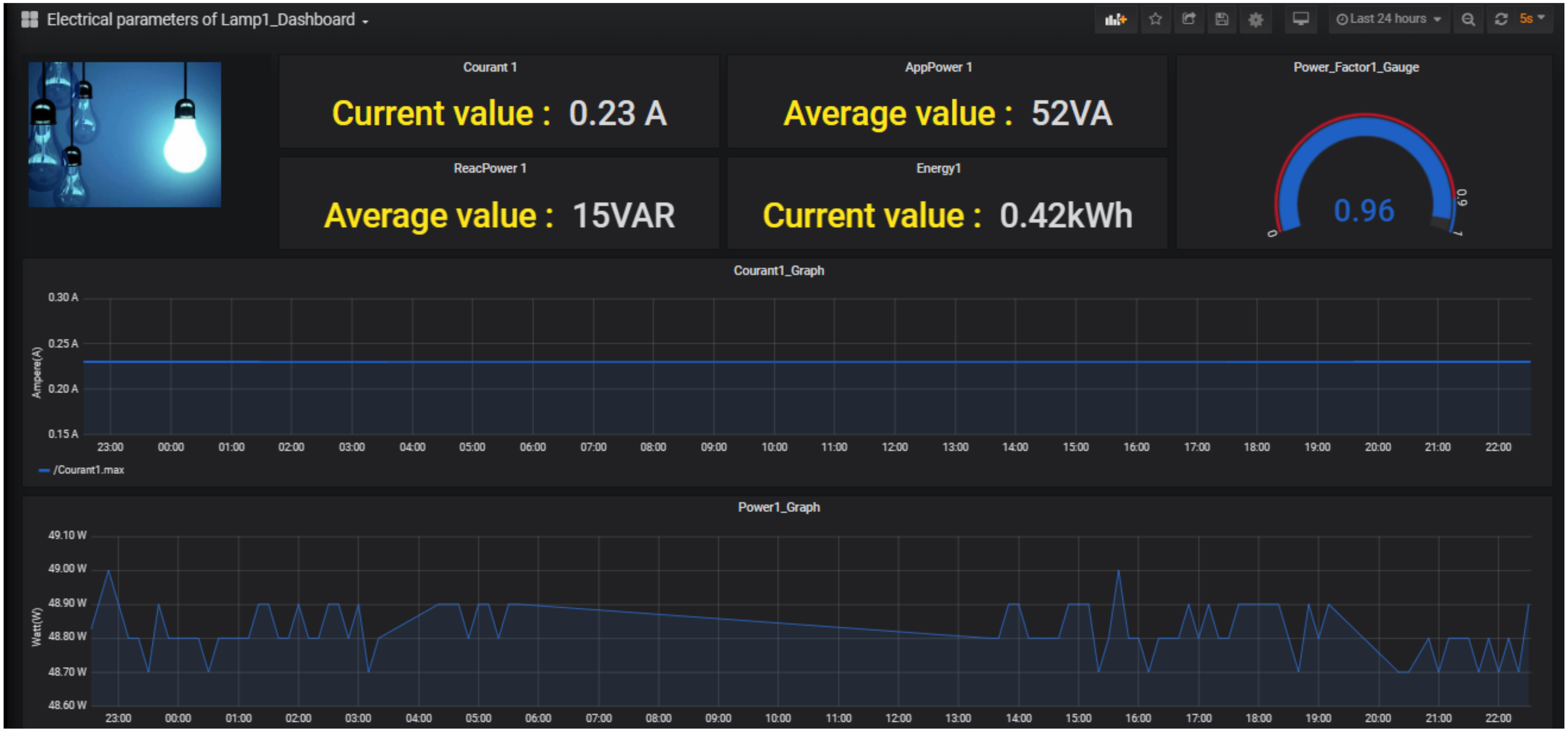
24-Hour Current Measurements Tracking: 04/04/2024

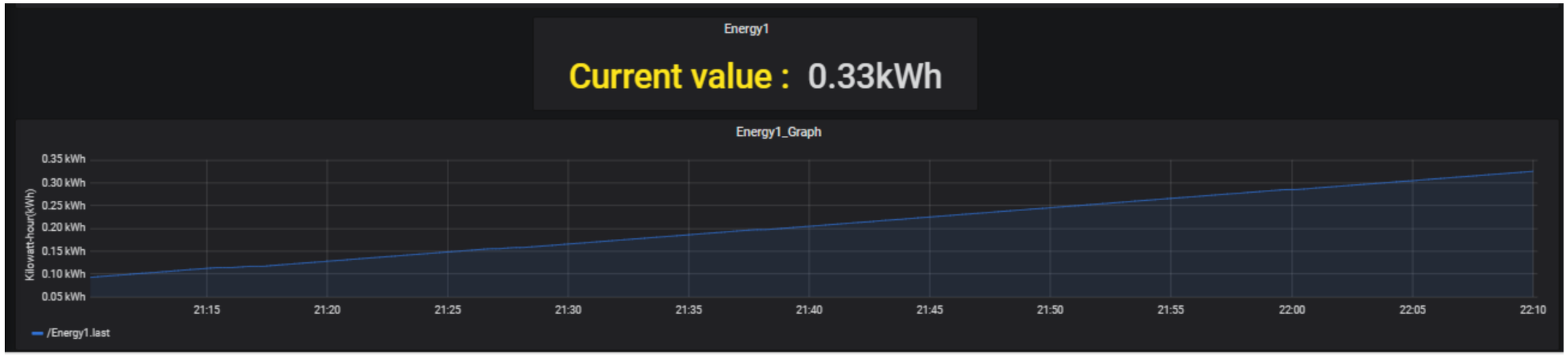
LOCAL DATABASE

WE TRIED STORING LOCALLY ENERGY DATA POINTS EACH 10 SEC INTO A CSV FILE SO WHEN DISCONNECTING WE COULD RESART FROM THE FINAL INPUT DATA .

	A	B	C	D	E
1	{"time":"4/6/2024	7:29:54 PM"	Data_energy:0.09530361111111114}		
2	{"time":"4/6/2024	7:30:04 PM"	Data_energy:0.09571083333333337}		
3	{"time":"4/6/2024	7:30:14 PM"	Data_energy:0.09666000000000007}		
4	{"time":"4/6/2024	7:30:24 PM"	Data_energy:0.09733750000000008}		
5	{"time":"4/6/2024	7:30:35 PM"	Data_energy:0.0980150000000001}		
6	{"time":"4/6/2024	7:30:45 PM"	Data_energy:0.09869250000000011}		
7	{"time":"4/6/2024	7:30:55 PM"	Data_energy:0.0993705555555557}		

FINAL DASHBOARD





Hourly Energy Consumption Analysis for Lamp 1 - 4/4/24

- The power factor tracking result for Lamp1 reveals a value of 0.96 , indicating a commendable level of power efficiency.
- A power factor close to 1, such as 0.96, signifies that the reactive power component is minimal compared to the active power, reflecting optimized power consumption and enhanced operational efficiency.
- The capacitive nature of these lamps' load enhances their ability to effectively manage electrical energy.

CONCLUSION

IOT PROJECT

MONITORING

Facilitates real-time monitoring of electrical parameters

INSIGHTS

Valuable insights into energy consumption for potential efficiency improvements, and predictive maintenance opportunities.