

DOMAIN: DATABASE MANAGEMENT SYSTEM

PROJECT: ENERGY-METER PREDICTOR

CONTENTS

- SOFTWARES REQUIRED
- INSTALLATION OF RASPBERRY PI OPERATING SYSTEM
- INSTALLATION OF ADVANCE IP SCANNER
- INSTALLATION OF VNC VIEWER
- TO CONNECT WITH RASPBERRY PI OS
- ABOUT MQTT
- INSTALLATION OF MQTT
- EXECUTION OF MQTT
- DATABASE MANAGEMENT SYSTEM
- ABOUT SQL
- ABOUT MYSQL
- ABOUT XAMPP
- INSTALLATION & EXECUTION OF XAMPP
- ANOTHER WAY TO CREATE DATABASE
- ABOUT GRAFANA
- DISPLAYING THE DATABASES IN GRAPHICAL VIEW
- INTEGRATING THE MQTT PROTOCOL'S DATA WITH THE MYSQL DATABASE
- REFERENCE

SOFTWARES REQUIRED

- RASBERRY PI OS
- ADVANCED IP SCANNER
- VNC VIEWER
- MQTT BOX
- XAMPP CONTROL PANEL
- GRAFANA APPLICATION
- PYTHON IDLE

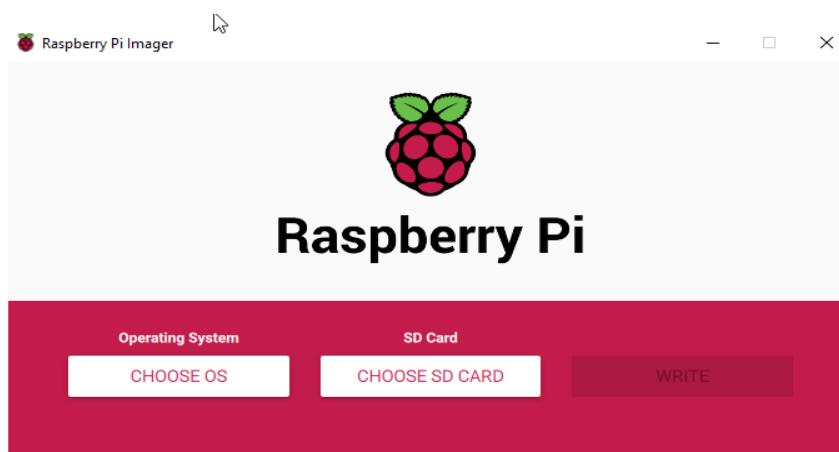
INSTALLATION OF RASPBERRY PI OPERATING SYSTEM:

STEP 1: OPEN WEB BROWSER AND TYPE “RASPBERRY PI OS INSTALLATION” AND CLICK THIS LINK
(<https://www.raspberrypi.com/software>)

STEP 2: YOU CAN SEE THE (RASPBERRY PI IMAGER) AND SELECT THE OS TYPE AND VERSION

STEP 3: INSERT THE SD CARD TO YOUR COMPUTER

STEP 4: AFTER INSTALLATION RUN THE RASPBERRY PI IMAGER IT SHOWS TWO OPTIONS AS SHOWN BELOW



STEP 5: NOW CLICK THE "CHOOSE SD CARD" OPTION AND SELECT THE TARGET SD CARD

Note:

- i. IF YOU CHOOSE OS YOUR COMPUTER OS CAN BE ERASED
- ii. IT IS RECOMMENDED OF 32-BIT PROCESSOR
- iii. BE PATIENT AND WAIT FOR THIS PROCESS TO COMPLETE. IF YOU REMOVE THE SD CARD, UNPLUG THE CARD READER, OR SHUT DOWN THE COMPUTER AT ANY POINT DURING THIS PROCESS, THE CARD WILL BECOME BRICKED AND UNUSABLE.

STEP 7: WHEN THE VERIFICATION PROCESS IS COMPLETE, A NOTIFICATION WINDOW WILL OPEN LETTING YOU KNOW THAT THE WRITE WAS SUCCESSFUL

STEP 8: AFTER FLASH THE RASPBERRY PI OS IS BOOTED TO YOUR SD CARD AND THAT IT'S NOW SAFE TO REMOVE THE SD CARD.

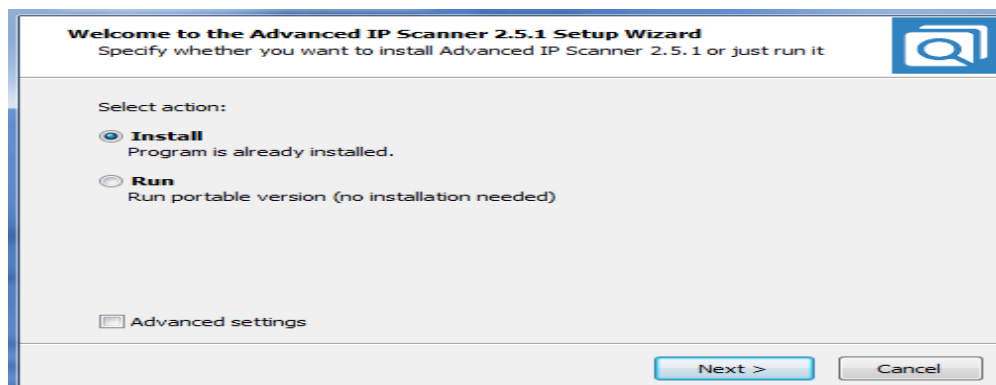
STEP 9: INSERT THE MEMORY CARD IN THE SLOT OF THE SUITABLE PORT.

INSTALLATION OF ADVANCE IP SCANNER

STEP 1: OPEN WEB BROWSER AND COPY THIS LINK (<https://www.advanced-ip-scanner.com/>) AND PASTE IT. THEN CLICK ENTER

STEP 2: YOU CAN SELECT THE OS TYPE AND VERSION TO DOWNLOAD

STEP 3: AFTER DOWNLOAD OPEN SEARCH BAR AND TYPE ADVANCE IP SCANNER YOU CAN SEE THE ADVANCE IP SCANNER IS SUCCESSFULLY INSTALLED

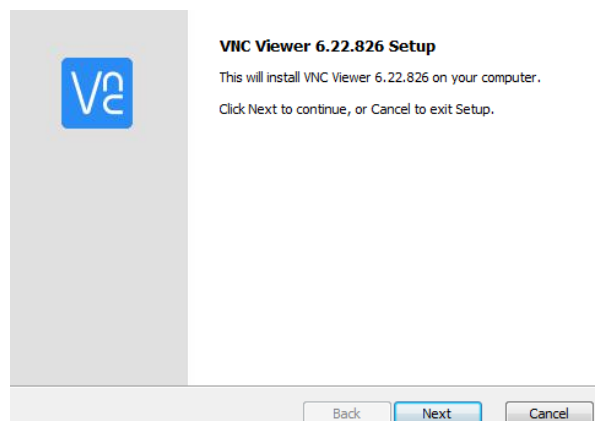


INSTALLATION OF VNC VIEWER

STEP 1: OPEN WEB BROWSER AND COPY THIS LINK
(<https://www.realvnc.com/en/connect/download/viewer/>) AND PASTE IT.
THEN CLICK ENTER

STEP 2: YOU CAN SELECT THE OS TYPE AND VERSION TO
DOWNLOAD

STEP 3: AFTER DOWNLOAD OPEN SEARCH BAR AND TYPE VNC
VIEWER YOU CAN SEE THE VNC VIEWER IS SUCCESSFULLY
INSTALLED

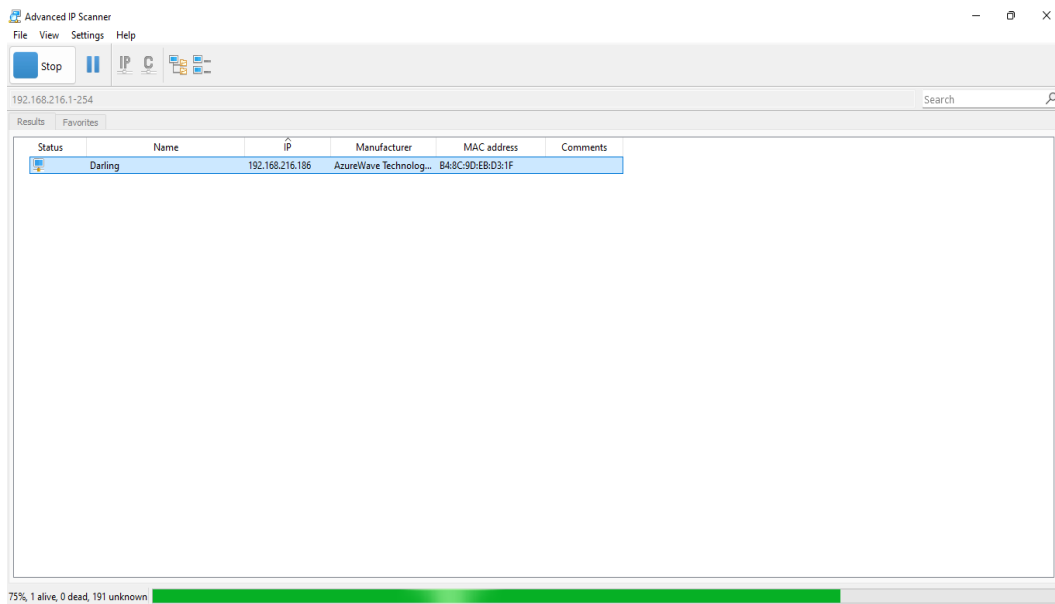


TO CONNECT WITH RASPBERRY PI OS:

STEP 1: OPEN THE ADVANCE IP SCANNER

STEP 2: ENTER THE IP ADDRESS “192.168.29-254” IN THE SEARCH
BAR AND HIT ENTER

STEP 3: SELCT AND COPY THE LINK OF (192.168.29.102) RASPBERRY
MANUFACTURER IN THE WINDOW



ADVANCE IP SCANNER

STEP 4: OPEN THE VNC VIEWER APPLICATION AND PASTE THE LINK IN THE SEARCH BAR AND HIT ENTER.

STEP 5: ENTER THE USERNAME AND PASSWORD AS “PI” AND “RASPBERRY” RESPECTIVELY.

STEP 6: THE VIRTUAL SPACE FOR THE LINK WILL BE CREATED AND WE CAN EXECUTE THE TASK



VNC VIEWER

ABOUT MQTT

[Message Queuing Telemetry Transport]

- It is a machine-machine protocol, i.e., It provides communication between the devices.
- It is designed as a simple and lightweight messaging protocol that uses a publish/subscribe system to exchange the information between the client and the server like how YouTube channels and their subscribers works
- It does not require that both the client and the server establish a connection at the same time.
- It provides faster data transmission.
- It allows the clients to subscribe to the narrow selection of topics so that they can receive the information they are looking for.

INSTALLATION OF MQTT

STEP1: OPEN MS STORE

STEP 2: TYPE “MQTT BOX” AND CLICK “GET” TO INSTALL THE APPLICATION.

EXECUTION OF MQTT

- IT'S A JSON APPLICATION AND DATA WERE DISPLAYED IN DICTIONARY FORMAT (KEY AND VALUE)
- CREATE A NEW CLIENT ID
- ENTER THE CLIENT NAME AS YOUR WISH
- SELECT THE PROTOCOL AS “MQTT/TCP”
- ENTER THE HOST AS (broker.emqx.io)(THIS HOST CAN BE ACCSSED GLOBALLY)
- HIT “SAVE” BUTTON AND YOUR CLIENT ID WILL BE CREATED.

MQTT CLIENT SETTING

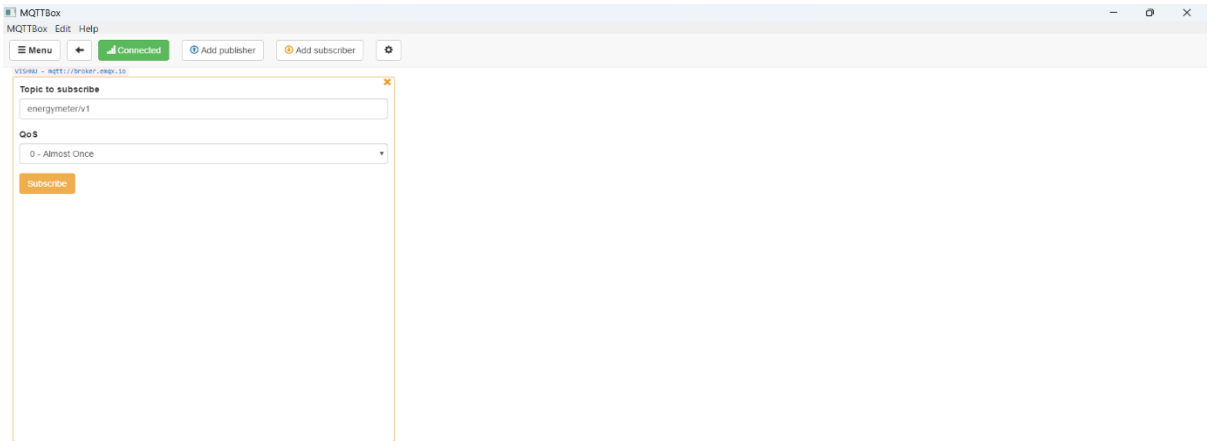
The screenshot shows the MQTTBox application window with the 'MQTT CLIENT SETTINGS' tab selected. The settings are organized into a grid of input fields and checkboxes. The fields include: MQTT Client Name (VISHNU), MQTT Client Id (13017581-aa76-47fd-bcd7-b82581bf94c9), Protocol (mqtt / tcp), Host (broker.emqx.io), Username (Username), Password (Password), Reconnect Period (1000), Connect Timeout (30000), Will - Topic (Will - Topic), Will - QoS (0 - Almost Once), Will - Retain (No), and Will - Payload. Checkboxes for 'Append timestamp to MQTT client id?', 'Clean Session?', 'Reschedule Pings?', 'Broker is MQTT v3.1.1 compliant?', 'Auto connect on app launch?', and 'Queue outgoing QoS zero messages?' are all checked. The 'KeepAlive (seconds)' field is set to 10. There are 'Save' and 'Delete' buttons at the bottom.

MQTT Client Name	MQTT Client Id	Append timestamp to MQTT client id?	Broker is MQTT v3.1.1 compliant?
VISHNU	13017581-aa76-47fd-bcd7-b82581bf94c9	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes
Protocol	Host	Clean Session?	Auto connect on app launch?
mqtt / tcp	broker.emqx.io	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes
Username	Password	Reschedule Pings?	Queue outgoing QoS zero messages?
Username	Password	<input checked="" type="checkbox"/> Yes	<input checked="" type="checkbox"/> Yes
Reconnect Period (milliseconds)	Connect Timeout (milliseconds)	KeepAlive (seconds)	
1000	30000	10	
Will - Topic	Will - QoS	Will - Retain	Will - Payload
Will - Topic	0 - Almost Once	<input type="checkbox"/> No	

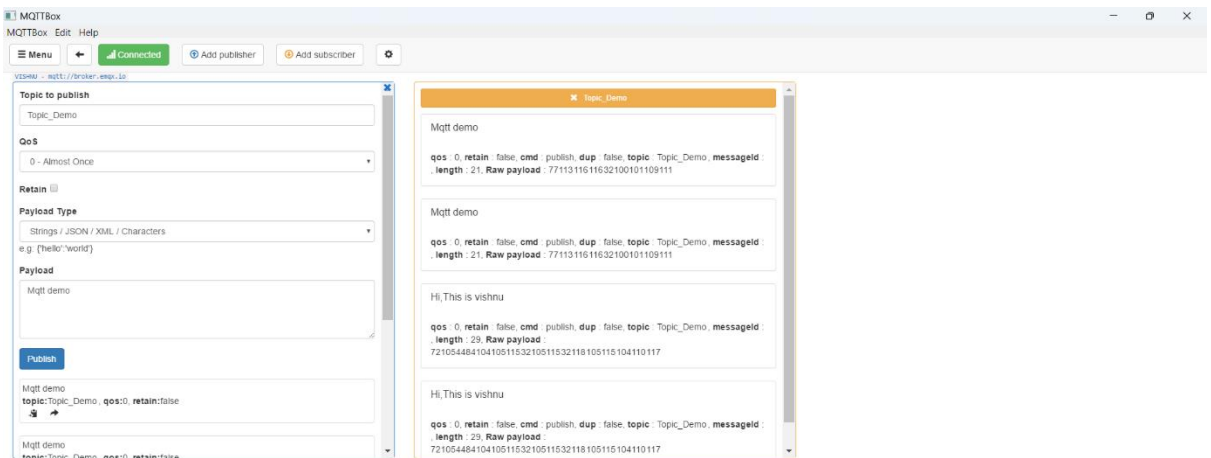
Save Delete

- NOW ADD THE SUBSCRIBER AND ENTER THE TOPIC TO SUBSCRIBE AS “energymeter/v1” AND HIT THE SUBSCRIBE TAB.
- THE VALUES OF THE RESPECTED TOPIC WILL BE PUBLISHED TO YOUR ID.

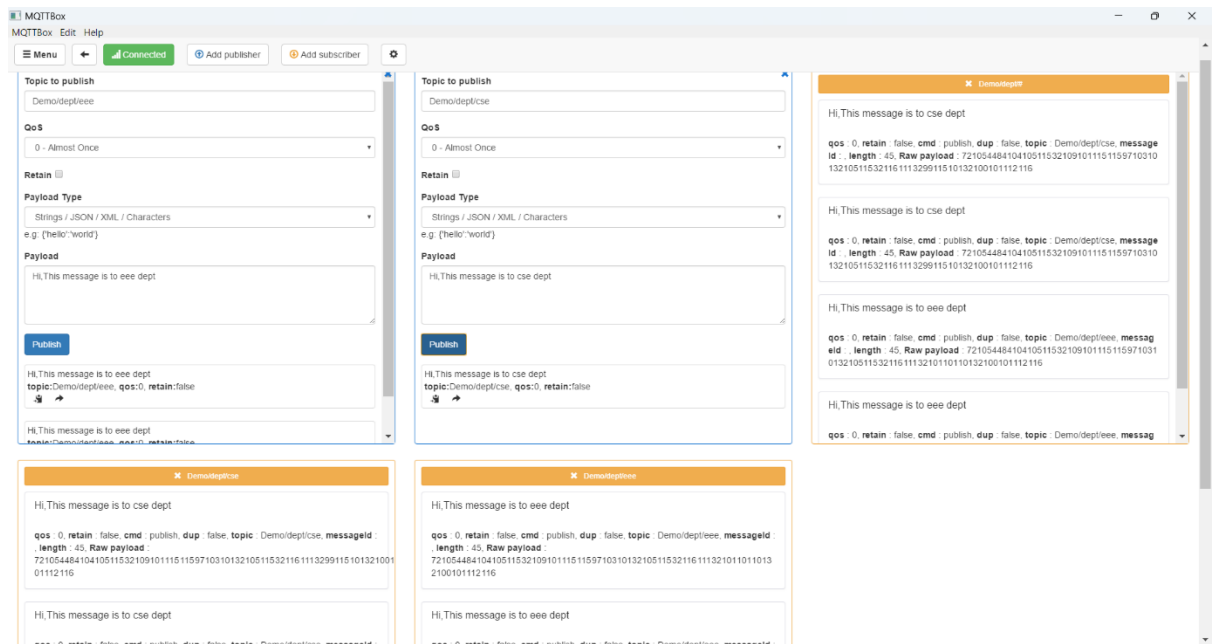
SUBSCRIBER WORKING



WORKING OF MQTT INTERNALLY



THE “#” IS USED TO ACCESS ALL THE MESSAGES THAT ARE CONNECTED TO SAME HOST



DATABASE MANAGEMENT SYSTEM

- A database management system (DBMS) refers to the technology for creating and managing databases.
- DBMS is a software tool to organize (create, retrieve, update, and manage) data in a database

ABOUT SQL:

- SQL stands for Structured Query Language,
- Designed specifically for interacting with relational databases.
- SQL is a language for storing, manipulating, and retrieving data in relational database management systems.
- You can use the SQL language to modify and create tables in the database, insert new data, modify existing data, delete data from the tables, and query those tables for specific information.

ABOUT MYSQL:

- MySQL is a relational database management system.
- You use it to store data in tables, and the rows of those tables can be related to each other by common information in the columns.

- The basic idea is that you have one or more "tables" (or "databases") and a set of rows (records) and columns (fields).
- Other elements, like keys and indexes, help you define them further.

TASK: CREATE AND STORE A DATABASE USING MYSQL

SOFTWARE REQUIRED: XAMPP CONTROL PANEL

ABOUT XAMPP:

- It is initially released in 4th sep,2002
- XAMPP Stands for
 - X-Cross Platform
 - A-Apache
 - M-Maria DB
 - p-PHP
 - p-Perl
- XAMPP is a free and open-source cross platform
- It is the Integration of MariaDB, PHP and Perl

INSTALLATION & EXECUTION OF XAMPP

STEP1: Open web browser and type “XAMPP Control Panel download” and go through this link(<https://www.apachefriends.org/download.html>)

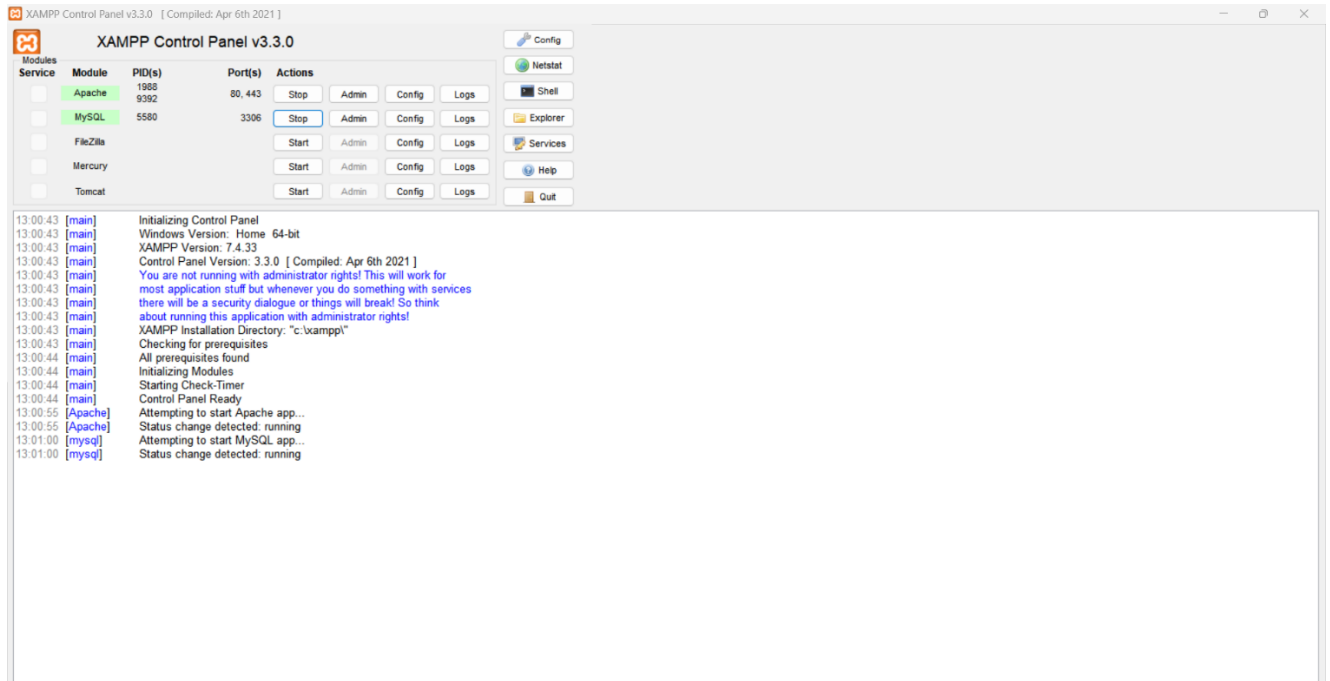
STEP 2: Open the website and select the download link suitable for your OS

STEP 3: Install the application in your system.

STEP 4: Search the XAMPP Application in Search Button and Open it

STEP 5: Press the START icon of the respective modules to execute their services.

(Here we are going to Start the “Apache” and “MySQL” modules).



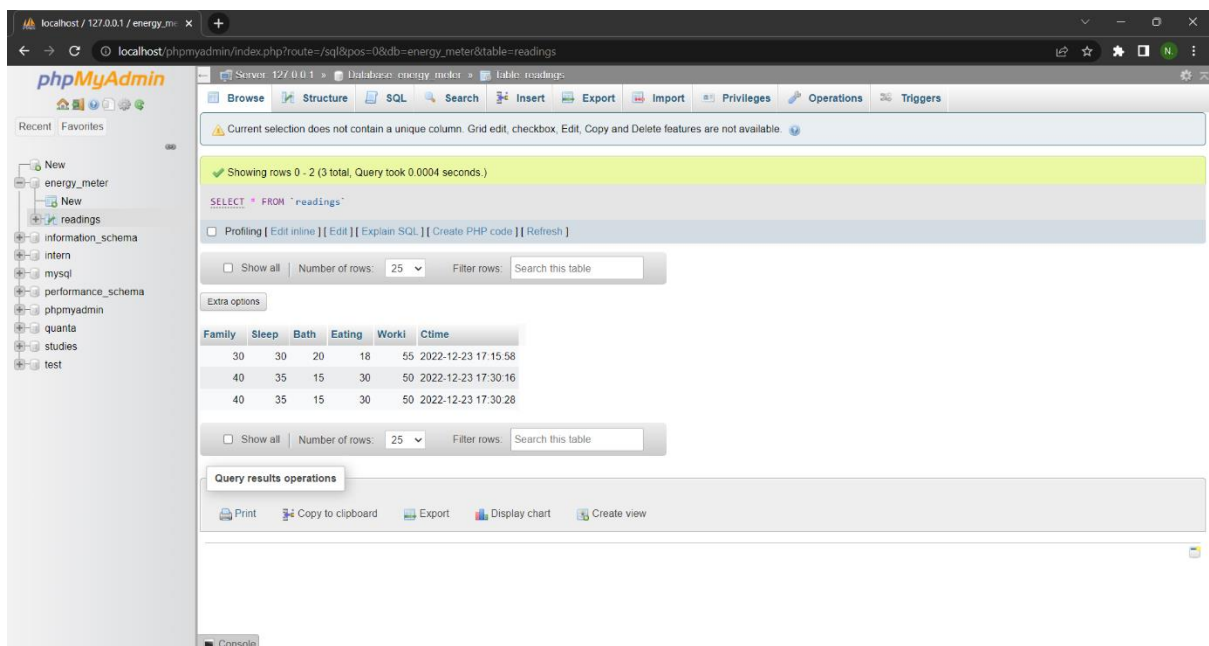
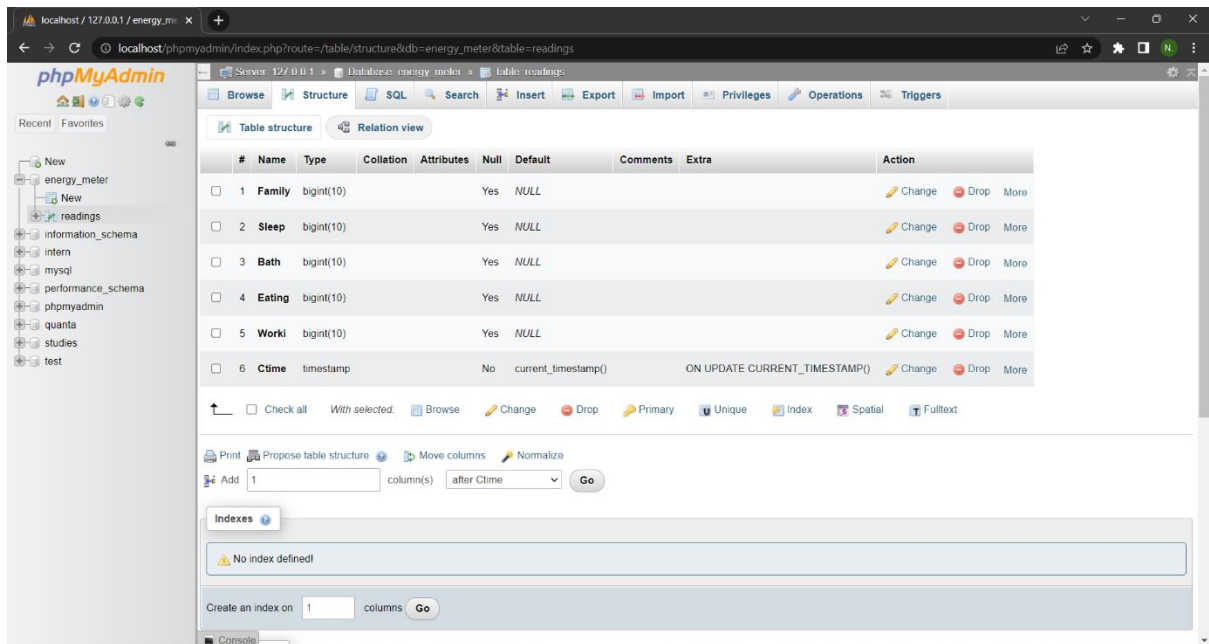
STEP 5: Open the browser and type 'localhost/PHPmyadmin '(the link will be directed us to the Apache website to create database)

STEP6: Create a new database and create a table within that database.

STEP 7: Create columns by specifying name, datatype and length for each column.

STEP 8: Insert the data and press 'GO' icon.

YOUR DATABASE HAS BEEN CREATED AND DISPLAYED IN TABLE SECTION



ANOTHER WAY TO CREATE DATABASE [BY WRITING SQL]

- It works on [CRUD]

C-Create
R-Read
U-Update
D-Delete

- In PHPmyadmin select “SQL” TAB and write the following commands to create database

STEP 1: To Create a new Database

[CREATE DATABASE database-name]

STEP 2: To Create a new table

[CREATE TABLE database-name (column_name1 type(value), column_name2 type(value), column_name3 type(value))]

STEP 3: To Insert the Value

[INSERT INTO database-name ((column_name1, column_name2, column_name3)VALUES (value-1,value-2,value-3)]

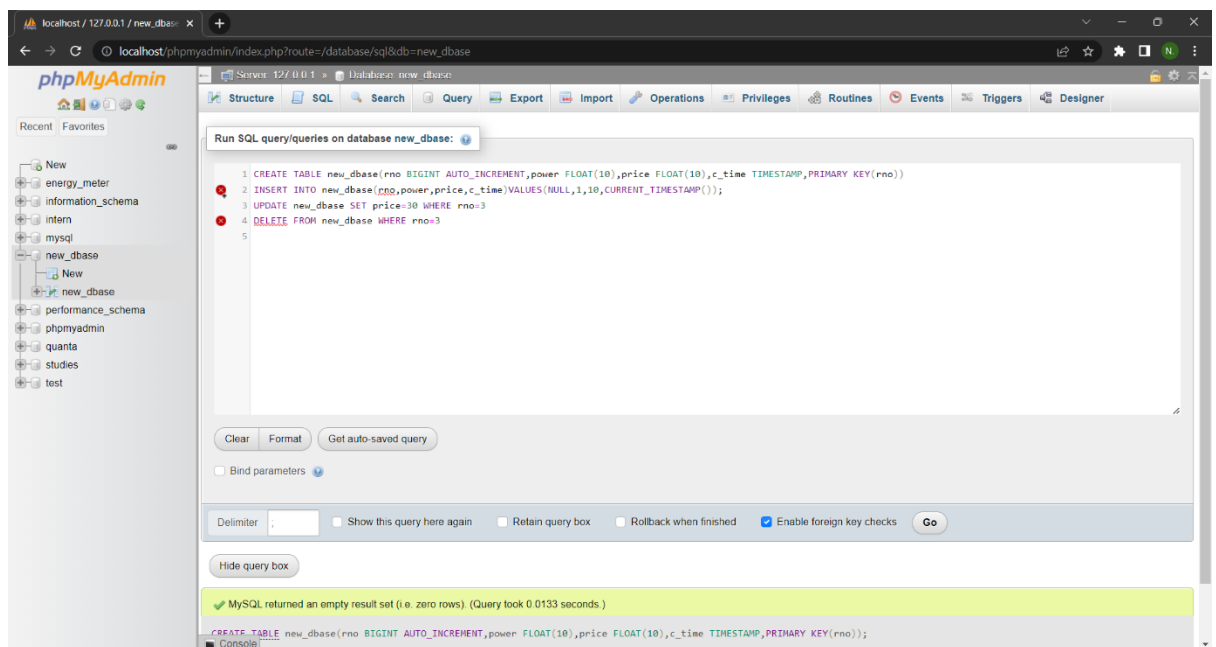
STEP 4: To Update the value

[UPDATE database-name SET column_name=value, WHERE Row_number=value]

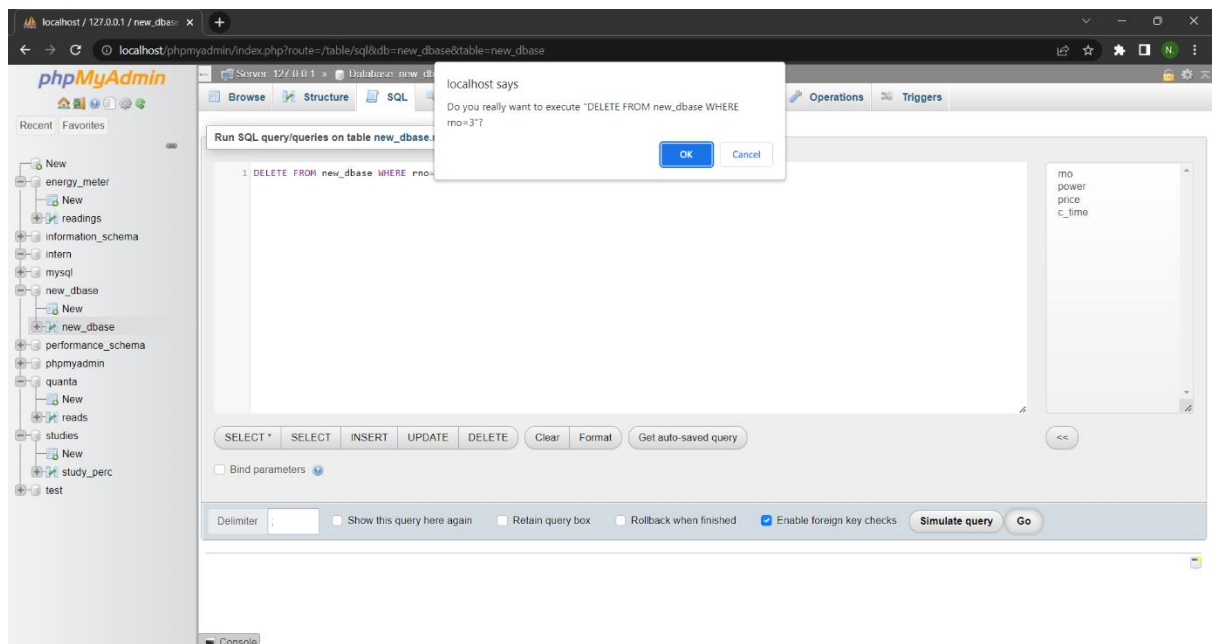
STEP 5: To Delete the value

[DELETE FROM database-name WHERE Row_number=value]

EXAMPLE OF SQL

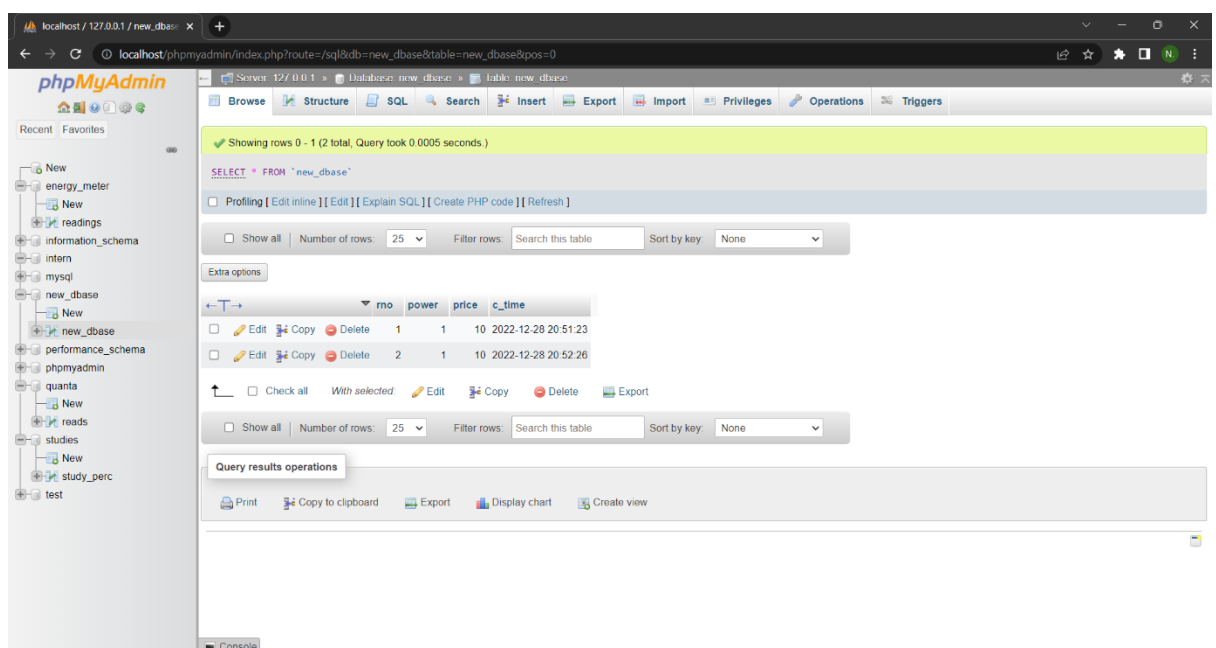


DELETION OF ROW USING SQL



TO VERIFY DELETION AND CLICK “OK”TO DELETE

DATABASE IS CREATED USING SQL



ABOUT GRAFANA

- Grafana is a multi-platform open-source analytics and interactive visualization web application
- It provides Charts, Graphs and alerts for the Web when connected to supported data source
- System development life cycle and provide continuous delivery with high software quality

DISPLAYING THE DATABASES IN GRAPHICAL VIEW

SOFTWARE REQUIRED: GRAFANA

EXECUTION:

STEP 1: Open browser and copy this link(<https://grafana.com/grafana/download>)and paste it to install Grafana in your system.

STEP 2: Open the service window and restart the Grafana application.

STEP 3: Open the browser and type 'local host:3000/' and it will be redirected to the Grafana website

STEP 4: Initially give the USER NAME and PASSWORD as "admin" and "admin" respectively

STEP 5: Give your own Password in New Password tab and access it by the same password

STEP 6: Click on settings icon on left side of the window and click the DATA SOURCES in the list.

STEP 7: Press the 'add data source' icon on right side to create new data source of MySQL

STEP 8: Fill the required data of

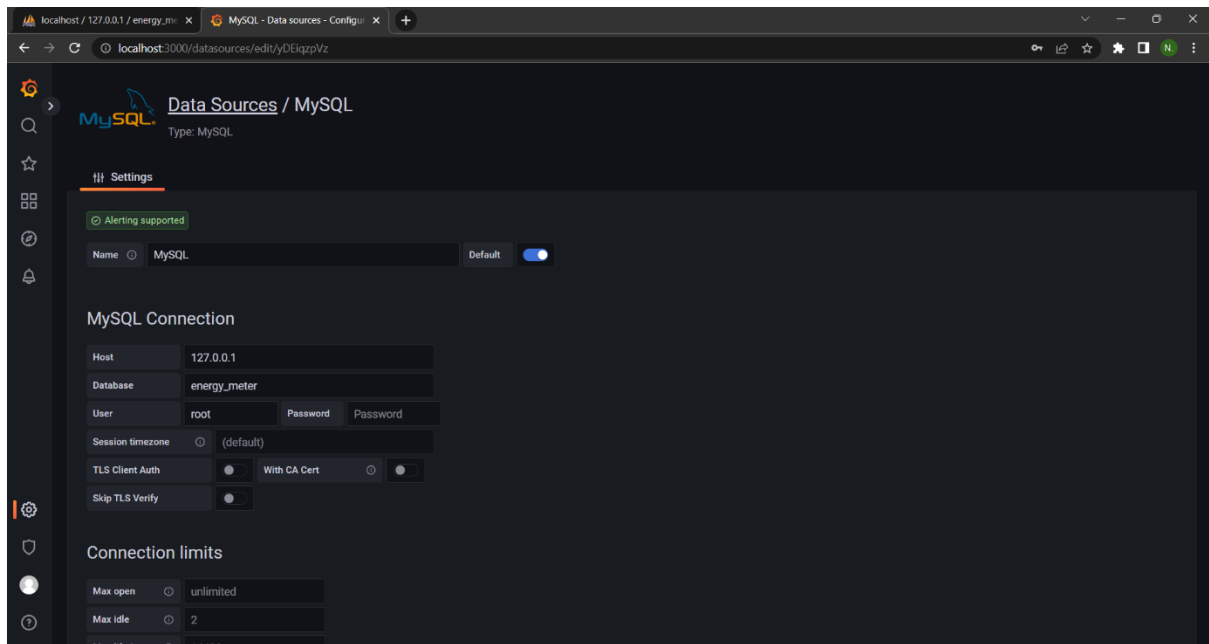
HOST:127.0.0.1

DATABASE: Your database name

USER: root

and click 'save and test' icon

[your data source will be created]



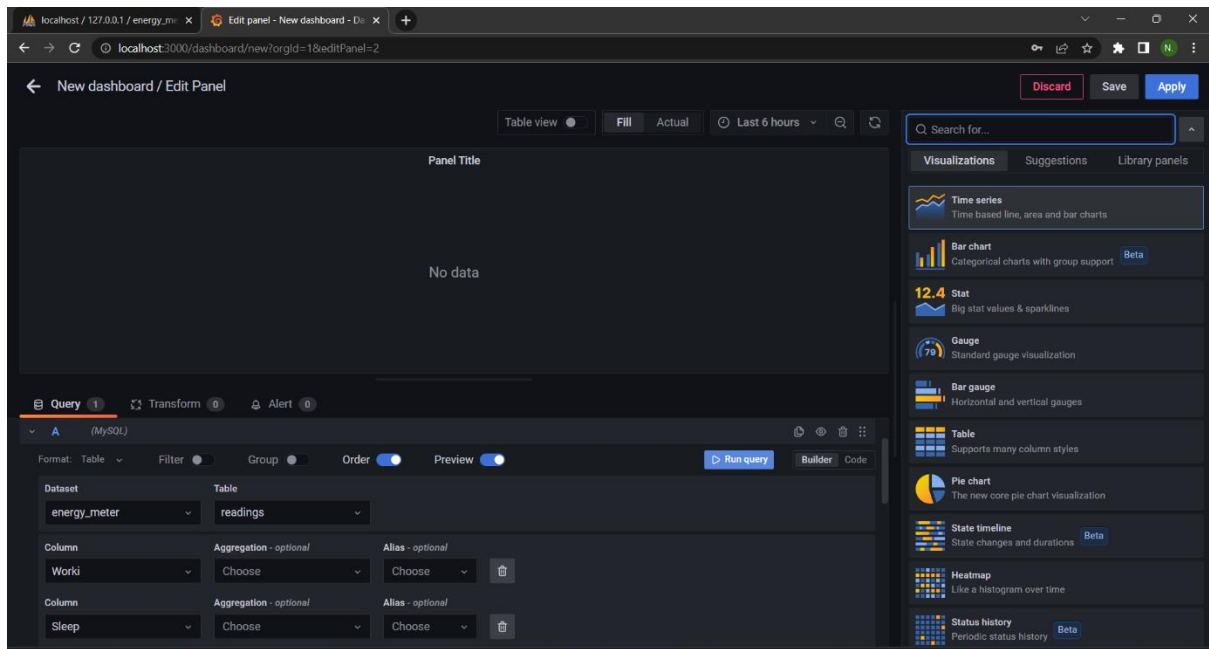
STEP 7: Click on the dashboard icon and select the new dashboard.

STEP 8: Select the new panel and fill respective information in query section such as:

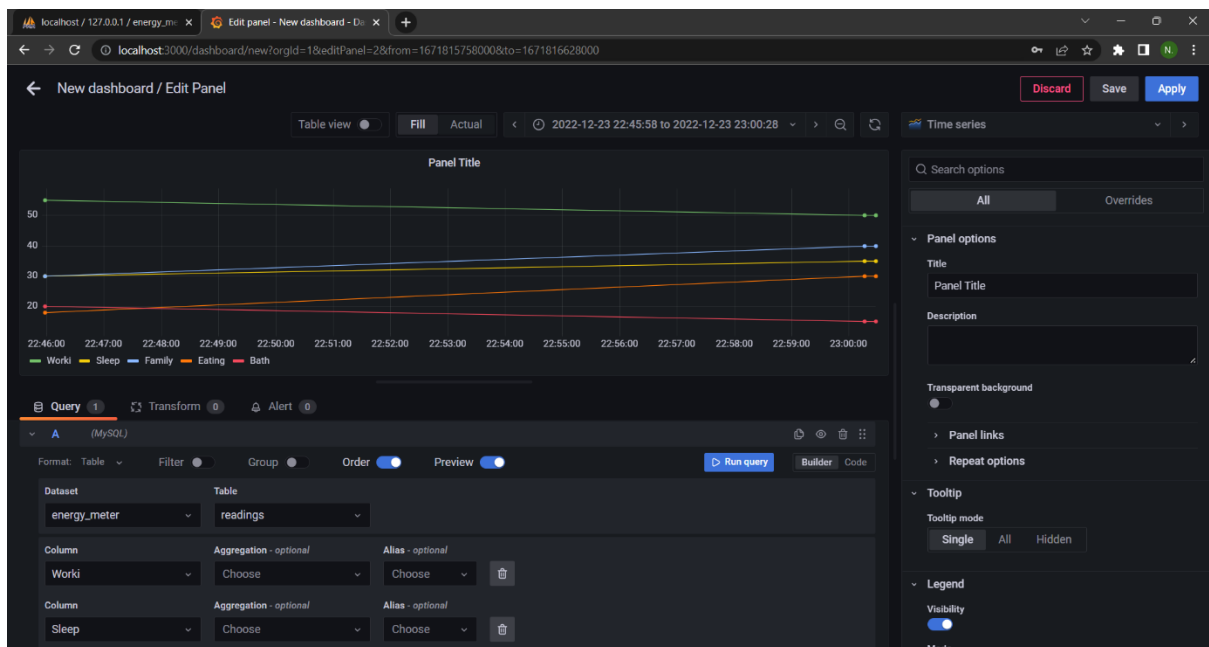
- Data source
- Data set
- Table name
- Column name
- Aggregation
- Order

After Completing the Required data's Click "Run query"

STEP 9: Select graphical representation option and click on save and apply icon



THE OUTPUT WILL BE DISPALYED IN THE PANEL SCREEN



MULTIPLE GRAPH IN THE SAME PANEL



**EXAMPLES TO WORKOUT WITH THE XAMPP AND GRAFANA
INTERFACE USING THE BELOW MENTIONED STEPS.**

phpMyAdmin

Server: 127.0.0.1 » Database: quanta » Table: energy_m_p

Current selection does not contain a unique column. Grid edit, checkbox, Edit, Copy and Delete features are not available.

Showing rows 0 - 5 (6 total, Query took 0.0005 seconds.)

SELECT * FROM `energy_m_p`

Profiling [Edit inline] [Edit] [Explain SQL] [Create PHP code] [Refresh]

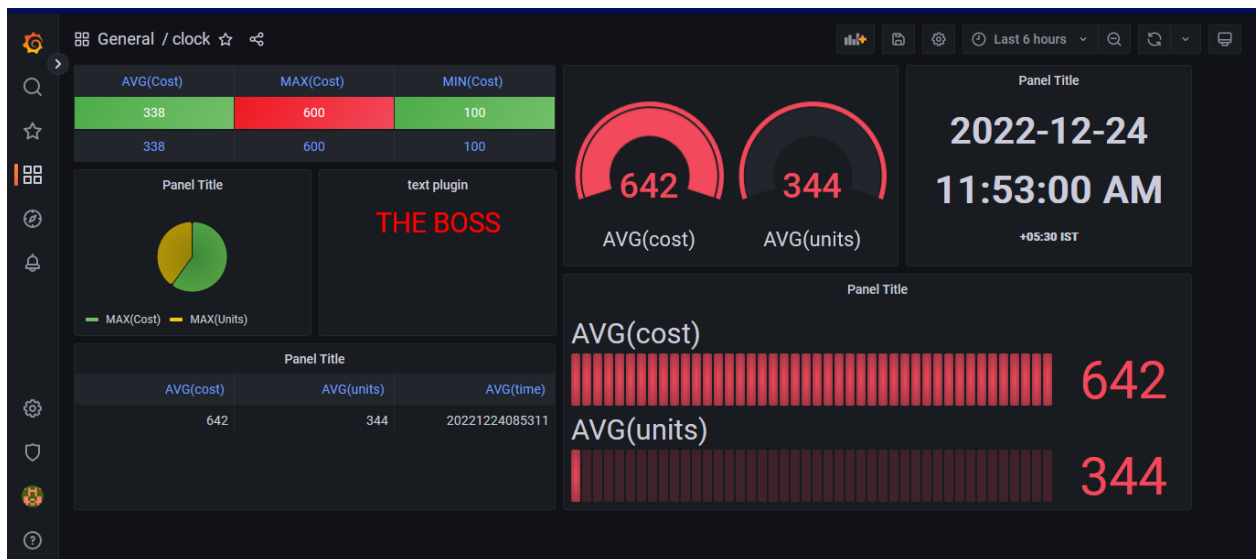
Show all | Number of rows: 25 | Filter rows: Search this table

Extra options

EBno	units	cost	time
1100234	150	50	2022-12-24 08:52:15
1100235	510	1000	2022-12-24 08:52:15
1100236	350	800	2022-12-24 08:53:11
1100237	439	799	2022-12-24 08:53:11
1100220	395	840	2022-12-24 08:54:08
1100243	220	360	2022-12-24 08:54:08

Show all | Number of rows: 25 | Filter rows: Search this table

Console



INTEGRATING THE MQTT PROTOCOL'S DATA WITH THE MYSQL DATABASE

USING PYTHON CODE:

```

1 import mysql.connector
2 import paho.mqtt.client as mqttClient
3 from threading import Thread
4 import json
5
6 class Mqtt:
7     def __init__(self):
8         self.json_data = {}
9         self.db = mysql.connector.connect(
10             host="localhost",
11             user="root",
12             password="",
13             db="quantanics")
14         mqttclient = mqttClient.Client("21104080")
15         mqttclient.on_connect = self.on_connect
16         mqttclient.on_message = self.on_message
17         mqttclient.username_pw_set(username="", password="")
18         mqttstatus = mqttclient.connect("broker.emqx.io", 1883, 60)
19         mqttclient.subscribe("energymeter/v1", 2)
20         mqttclient.loop_forever()
21
22     def upload(self, msg):
23         mqtt_msg = str(msg.payload).replace("b'", "").replace("'", "").replace(" ", "").replace("\n", "").replace("\n", '')
24         mqtt_msg = str(mqtt_msg).replace("\\", "")
25         mqtt_msg = str(mqtt_msg).replace("'", '"')
26         mqtt_msg = str(mqtt_msg).replace("{", '{')
27         mqtt_msg = str(mqtt_msg).replace("}", '}')
28         mqtt_msg = str(mqtt_msg).replace("'", '"')
29         mqtt_msg = str(mqtt_msg).replace("'", '"')
30         mqtt_msg = mqtt_msg.split(",")
31

```

DESCRIPTION: THE DATA HAS BEEN INSERTED AUTOMATICALLY IN THE DATABASE FROM THE MQTT PROTOCOL USING THE PYTHON CODE WHICH IS RUN BY COMMAND PROMPT.

rollno	current_factor	time
0	10.6789	2022-12-26 11:40:57
0	10.6837	2022-12-26 11:41:04
0	10.7437	2022-12-26 11:41:10
0	10.7575	2022-12-26 11:41:17
0	10.7705	2022-12-26 11:41:23
0	10.7533	2022-12-26 11:41:29
0	10.7418	2022-12-26 11:41:36
0	10.7732	2022-12-26 11:41:42
0	10.8174	2022-12-26 11:41:49
0	10.845	2022-12-26 11:41:55
0	10.8064	2022-12-26 11:42:01
0	10.7693	2022-12-26 11:42:08
0	10.7719	2022-12-26 11:42:14
0	10.7267	2022-12-26 11:42:20
0	10.7009	2022-12-26 11:42:27
0	10.6644	2022-12-26 11:42:33
0	10.6707	2022-12-26 11:42:40
0	10.664	2022-12-26 11:42:46

THE GRAPHICAL VIEW OF THE DATABASE IS DISPLAYED HERE AND THE GRAPH WILL BE UPDATE FOR EACH 5 SECONDS.



REFERENCE

Refer the below website

- [tutorialspoint.com](https://www.tutorialspoint.com)
- [w3schools.com](https://www.w3schools.com)

for further studies

THANK YOU

BY,

VISHNU N,

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