

Electricity Energy Meter Alert System Using IOT (EEMA)

Manoj Kumar V¹, Manju M², Swetha V³, Vanthana N⁴

¹Assistant Professor – Information Technology, Saranathan College of Engineering, Trichy
^{2,3,4} Information Technology, Saranathan College of Engineering, Trichy

Abstract- A smart city is an urban area that makes use of multiple types of electronic data from the collection of sensors that are integrated to supply the information which is used to manage the assets and resources efficiently. Every one of us known about the Electricity Energy Meters which are installed in everyone's house or offices to measure the electricity consumption. At the end of every month, many of us get annoyed about the high electricity bill and we need to look at the energy meter once in a while. But what if could be done monitor the electricity consumption from anywhere in the world and get a SMS/Email when the energy consumption reaches to a fixed threshold value when the energy crosses the threshold value, the consumer will receive the SMS/Email. In Smart Electricity Energy Meter, with the help of Arduino UNO and ESP12 Wi-Fi module, current sensor ACS712 to measure the energy consumption. We will take help of IFTTT platform to link our Wi-Fi to SMS/Email notification. In case of SMS, IFTT android application is used to trigger message. MQTT Dashboard Android App will be used to monitor our energy uses. To monitor the energy uses over the internet, MQTT broker needed to be used. We will use MQTT broker as Adafruit IO platform. By setting up an Adafruit account for storing the electricity meter readings. Create an applet in IFTTT for triggering the SMS/Email for Energy meter Reading. This smart meters and home energy management systems allow the customers to program how and use energy efficiently at and workplaces.

Index terms- IoT, Adafruit, MQTT, IFTTT

I.INTRODUCTION

The Internet of Things (IoT) is a system of interrelated computing devices, digital machines, mechanical devices objects or people that are provided with different types of identifiers and capable of transferring the data over a network without the need of any human-to-computer interaction. The IoT has attained a progression due to

the convergence of vast technologies, real-time analytics, machine learning, commodity sensors, embedded systems, wireless sensor networks, Adhoc networks, automation and others all helps in enabling the Internet of Things. In the consumer market, the Internet of Things technology is the most synonymous with the products pertaining to the concept of "Smart home", covering the devices and appliances that support one or more common ecosystem, such as smart phones and smart speakers. There are a number of serious considerations about obstacles in the growth of IoT, especially in the areas of seclusion and surveillance, and consequently industry and governmental moves to begin address these. A progressing part of the IoT devices are developed for the customer utility which includes the connected vehicles, home automation, wearable technology, connected health and appliances with remote monitoring features.

MQTT stands for message Queuing Telemetry Transport. It is a publish or subscribe which is quite simple and light weighted messaging protocol, designed for the devices that hold back and low-bandwidth, high latency or unreliable networks. The principles of design are to reduces the bandwidth of the network and the device resource requirements list also claiming to ensure the reliability of the system.

IFTTT stands for If This Then That. It is a free web-based service to generate the blocks of simple conditional statements (if-else) called applets. An applet is actuated by the changes that occur within another web services such as Gmail, Facebook, Telegram, or Pinterest For example, an applet may send an e-mail notification if the user tweets with a hashtag, or copy a photo on Facebook to a user's records if someone tags a user tweets with a hashtag, or copy a photo on Facebook to a user's records if someone tags a user in a photo. Along with the web-

based applications, the services runs on the iOS and android in February 2019, IFTTT renamed its original application to IF, and released a new version of applications called Do, which lets users create shortcut applications and actions. As of 2015, IFTTT users created about 2 billion recipes every day. Every functionality of the Do suite applications have been integrated together into a redesigned application of IFTTT.

In computerized networks, which are built in accordance to an open system architecture requirements, the protocol determines behavior of the one layer entity during the transmission of data.

Data Transmission in the IoT is a tedious process that can consume a large amount of network resources for its purposes. Information may vary depending on the type of device and transmission protocols. Holders of the system must choose between the compact messages in the IoT environment, spending enormous computing resources on data decryption or just sending the full-size messages that can overburden the traffic network. Designed for network document it makes information look more convenient and facility process.

II.EXISTING SYSTEM

Using the GSM modem the customer and service provider will receive the energy used along with the electricity consumption charge. Customers will receive the notification as SMS when it reaches a fixed threshold value that is set up. With the help of Wi-Fi modem we can monitor the electricity consumption reading and can set up the threshold value. Without visiting the customer's house the Department of Electricity can get the electricity consumption with this module. This is performed with the help of Arduino which untiringly monitors and tracks record on the energy meter reading in its permanent memory location. This module continuously monitors the reading and live meter of current reading will be displayed to the customer as per their request on the webpage. Disconnection of power supply is enabled when needed. Using this module the power supply can be disconnected indeed. This system reduces the energy wastage and brings awareness to all. Besides it deducts the human intervention.

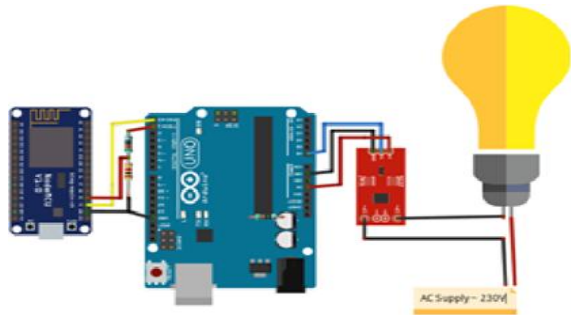
When the different appliances of the household consume energy the energy meter takes the reading continuously and the consumed load could be seen on energy meter. The LED on energy meter continuously blinks which counts the energy meter reading. The blinking, the units are counted. Normally 3200 blinks are considered as one unit. In this system the Arduino UNO acts as the main controller, which untiringly monitors the energy meter. As per the blinking of the LED on energy meter the Arduino will measure the measure of unit consumed. The measured reading with the calculation of the cost will be displayed continuously on webpage that is designed. The threshold value can be set up on the webpage with the help of Wi-Fi, as per the consumer's requirement. When the customers will be near about to the threshold value that has been set up it will send a notification value to the customer. This notification on threshold value increases the awareness amongst the consumers about the energy consumption. When the customers get the notification they can visit the webpage and can change the threshold value. If the customer is not aware of the threshold notification, then the meter will automatically get off. Then the customer has to visit the webpage again and increase the fixed threshold value. Due to incrementing, the energy meter will automatically get ON. Finally the overall monthly bill with cost will be sent to customer as well as service provider in the form of text at the first day of every month.

III.PROPOSED SYSTEM

A smart city is an urban area that makes use of different types of electronic data from the collection sensors to supply information which is used to manage assets and resources efficiently. An electricity energy meter installed in houses or offices to measure the electricity consumption charge and it is needed to monitor the electricity usage from anywhere and get an e-mail or SMS when energy consumption reaches to a threshold value. A smart electricity energy meter is built using Arduino UNO, ESP12 Wi-Fi module and Current Sensor ACS712. With the help of IFTTT platform the Wi-Fi to e-mail or SMS will be linked. MQTT dashboard Android Application will be used to monitor energy consumption. To monitor the energy consumption

over the internet, MQTT broker needed to be used and Adafruit IO platform is used as MQTT broker. An Adafruit account is set up for Electricity meter readings. An applet in IFTTT for triggering SMS or e-mail from energy meter has been created. This smart meter and home energy management system allows the customer to use energy efficiently at workspace.

IV.CIRCUIT DIAGRAM



V.SYSTEM ARCHITECTURE



VI.MODULES

Sensor Data Collection:-In this module, current sensor is the major key component. Measuring the

current especially the AC current has always been a tough task due to the noise coupled with it improper isolation problem. With the help of ACS712 module this task has become a lot easier. The sensor data collection module works on the principle of Hall-effect. In accordance with this principle, when a current carrying conductor is placed into a magnetic field, a voltage is generated across its edges perpendicular to the direction of both the current and the magnetic field. A hall sensor is used to measure the magnetic field in terms of millivolts which is called as hall-voltage. This measured hall-voltage is proportional to the current that was flowing through the conductor.

Interfacing the hardware system with cloud :-A cloud computing model is a service provider which makes all the resources of computing such as hardware and storage, along with the management of infrastructure, which is available to the customer on an as needed basis. The service provider typically charges for a specific resource usage rather than a flat rate. The Arduino sends the data to Wi-Fi module. The Wi-Fi module is connected to a cloud to store the data. The user will create a username and password for accessing the Adafruit cloud. Using the AIO keys which are security keys where the Wi-Fi module and the cloud are connected. A feed in Adafruit IO is made. The feed stores the data sent by IFTTT.

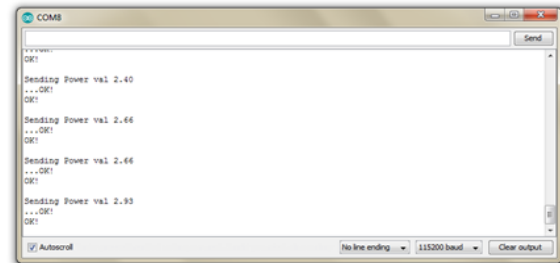
Protocol Activation :- Protocol activation admits both the desktop and modern applications to register themselves as handlers for a protocol or URL scheme which are known well and understandable. Include all the libraries essential for ESP12 Wi-Fi module and Adafruit MQTT. Define the SSID and password for the Wi-Fi from which we want to connect the ESP12. It defines the Adafruit server and server port which is fixed. Replace few fields with the respective username and AIO keys which are from Adafruit site while making the feed. Create an ESP12 Wi-Fi client class to connect to the MQTT server and login details. Make a set up over the MQTT client class by passing in the Wi-Fi client and MOTT server and login details. Make a setup called MQTT client class by passing in the Wi-Fi client and MQTT server and login details. Setup the feed called Power and bill for publishing to the changes. Then we have created an ESP12 Wi-Fi client class to connect to the MQTT server.

Displaying the meter reading values:-The meter which is used for measuring the energy utilizes but the electric load is called as the energy meter. The total energy is the total power consumed and utilized by the load at any particular interval of time. It is used in the domestic and industrial AC circuit for measuring the consumption of power. In order to the meter reading value to be displayed open the application and click on '+' sign and fill up the client id anything. The server port remains the same. A username and password which are active keys will be displayed. Select the Electricity meter and select subscribe. In subscription, give friendly name and topic. Topic format must be followed and make a click on create. Similarly, make subscription for the bill feed. As the appliances consume the energy, the updated values will be displayed under the power and bill.

VII.IMPLEMENTATION

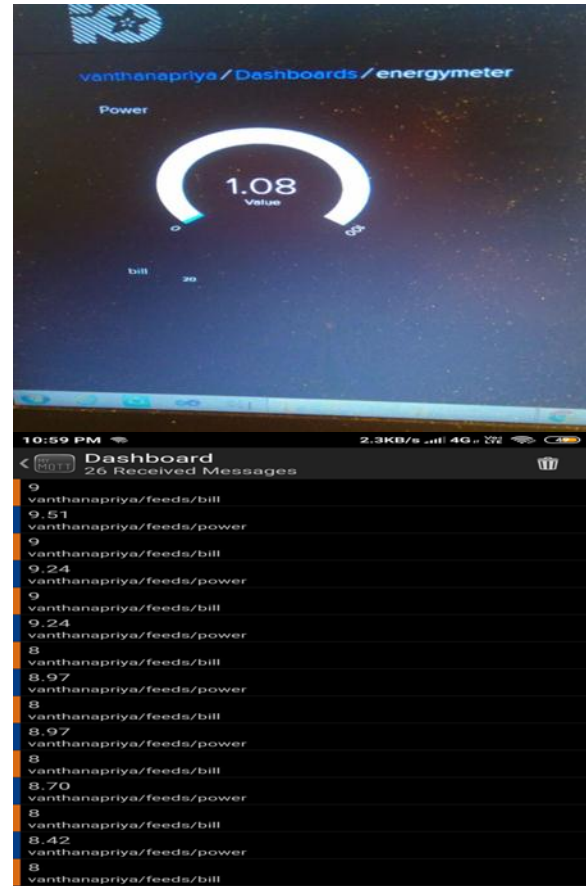
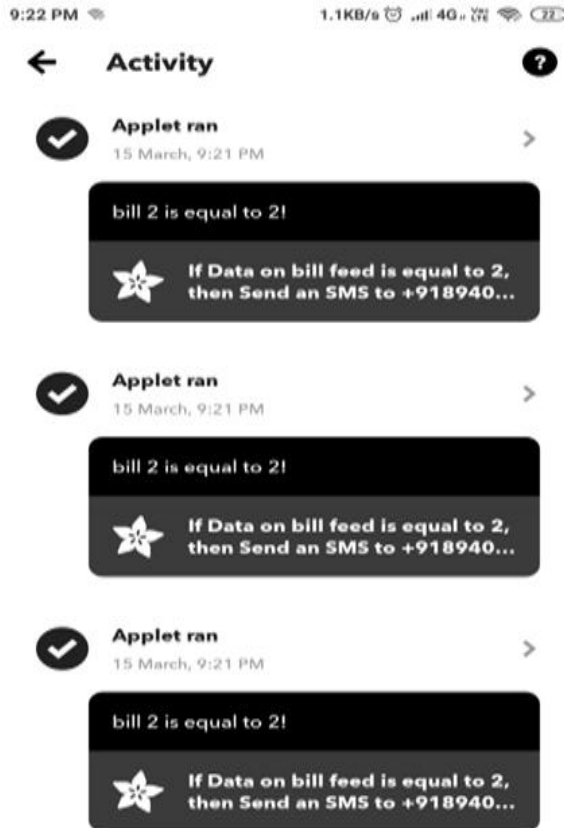
Sensor Data Collection:- The Sensor data is the output of a device or microcontroller that detects and responds to some type of input from the physical environment. The output may be used to provide the information or input to another system or to guide a wholesome process. A sensor is an entity or object of an artificial implementation of what is called a sense in biology. With a sensor, a machine can observe the environment and the information can be collected. A sensor measures a physical quantity of any entity accordingly and converts it into a signal. Sensors are translating the measurements from the real world into data for the digital domain. An electronic appliance is connected to the current sensor. The generated signal could be either analog voltage or current in ampere or even a digital voltage output. The generated signal could be then used to display the current measured in an ammeter, or can be stored for the purpose of further analysis in a data acquisition system, or it can be used for the purpose of controlling over. In this module, current sensor is the major key component. Measuring the current especially the AC current has always been a tough task due to the noise coupled with it improper isolation problem. With the help of ACS712 module this task has become a lot easier. The sensor data collection module works on the principle of Hall-effect. In accordance with this principle, when a current carrying conductor is placed into a magnetic field, a voltage is generated

across its edges perpendicular to the direction of both the current and the magnetic field. A hall sensor is used to measure the magnetic field in terms of millivolts which is called as hall-voltage. This measured hall-voltage is proportional to the current that was flowing through the conductor.



Interfacing the hardware system with cloud:-A hardware interface is an architecture used to interconnect two devices together. Each and every hardware interface includes the design of the plug and socket, the type, the number and purpose or usage of the wires and the electrical signals which are passed across them. A cloud computing model is a service provider which makes all the resources of computing such as hardware and storage, along with the management of infrastructure, which is available to the customer on an as needed basis. The service provider typically charges for a specific resource usage rather than a flat rate. The Arduino sends the data to Wi-Fi module. The Wi-Fi module is connected to a cloud to store the data. The user will create a username and password for accessing the Adafruit cloud. Using the AIO keys which are security keys where the Wi-Fi module and the cloud are connected. A feed in Adafruit IO is made. The feed stores the data sent by IFTTT.

Login to the Adafruit IO with the credentials or sign up if there is no account. Make a click on My account and proceed to the dashboard. Make a click on the action and create a new dashboard. Give the name and respective description to the feed and click on create and generate a message over the description. Make a click on the key button and note down the AIO keys, we can use the key in the code. Make a click on '+' button to create a new block and click on Gauge to display the energy usage level. A simple text box can be used to display the energy. Then enter the name or feed and click on create. Then select the feed and click on the next step. In block settings, fill the minimum and maximum values as 0 and 100



Displaying the meter reading values :-Meter Reading is the act of collecting datum from a meter or an equivalent device that represents the data about the changes that occur. In simple terms, the meter which is used for measuring the energy utilizes but the electric load is called as the energy meter. The total energy is the total power consumed and utilized by the load at any particular interval of time. It is used in the domestic and industrial AC circuit for measuring the consumption of power. In order to the meter reading value to be displayed open the application and click on '+' sign and fill up the client id anything. The server port remains the same. A username and password which are active keys will be displayed. Select the Electricity meter and select subscribe. In subscription, give friendly name and topic. Topic format must be followed and make a click on create. Similarly, make subscription for the bill feed. As the appliances consume the energy, the updated values will be displayed under the power and bill. That is how a Smart Electricity Energy Meter, which can not only be monitored from anywhere in the world but also trigger an e-mail when there is a high electricity consumption.

Data extraction :-Extraction of data is the process of retrieving the data out of the sources of the data for the further data processing or data storage. The drifting over to the intermediate extracting system which is usually followed by the transformation of data and possibly the addition of metadata prior to export to another stage in the data workflow. Thereby the data over the electricity consumption will be extracted. Here the data is retrieved from cloud database and the analysis is done WEKA tool.

Information gathering:-In this process the ultimate goal is to support the planning of the project to get the resultant value. In prior the target systems are well identified and accordingly the process is started over. The wholesome process is completely operational. Finally, using FP growth algorithm and Apriori algorithm analysis is made.

VIII.CONCLUSION

In conclusion, hope majority of people would find useful while the Smart Electricity Energy Meter Alert System being used are as they give the alert on the

electricity consumption and well informed and being able to monitor their electricity consumption. We can control and reduce the consumption of electricity on the consumer side to avoid the wastage of the power. The efficient remote transmission of the reading and automatic processing ensures errorless billing system. This would encourage them to be more preserved in their energy as well as financial practice. This is designed in such a way that it would telemeter and monitor. It makes the relation between the utility and user more transparent and reliable. Power saving is possible which contributes towards the minimization of the problem of the energy crisis. Besides it would deduct the manual intervention.

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