Journal of Engineering Design and Analysis
Volume 2, Issue 2 - 2019, Pg. No. 7-9
Peer Reviewed Journal

Research Article

IOT-based Electric Energy Monitoring Smart Energy Meter

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I N F O

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How to cite this article:
Saleh F, Kaur S, Kaur J. IOT-based Electric Energy Monitoring Smart Energy Meter. *J Engr Desg Anal* 2019; 2(2): 7-9.

Date of Submission: 2019-12-08
Date of Acceptance: 2019-12-23

A B S T R A C T

Electricity is a paid service and must be used with caution. To save energy and to meet the requirement of all the consumers, there are continuous improvements in communication technology and information. The consumers nowadays are very particular about bills, timely data and better services. In this paper, the researchers advanced the idea of the Arduino UNO board and Internet of Things (IoT) system with Wi-Fi for controlling the consumption of electricity. According to this concept there would be no human interference in the maintenance of electricity. The prototype provides data about the Electrical Energy Meter (EMM) using Internet of Things (IoT) which is highly precise and consistent.

Keywords: Smart Meter, Internet of Things (IoT), Power Reliability, Electrical Energy

Introduction

Internet of Things (IOT) - Although the concept is not new and has been a hot topic of discussions decades, going back to late 1980s, it has started to grow and is spreading like a wildfire. But what exactly is IoT (Internet of Things) in the most generic sense? The literal core meaning is very simple, Internet of things, that is it. It is nothing fancy but a bunch of devices connected to the internet that can interact with each other, us and various applications. IoT is the future of internet with vast global network infrastructure where physical and virtual things have identities and are connected to each other through the internet. Electricity energy meters are mounted at all the end-user's location to keep track of the consumption of electricity. The bills are generated bi-monthly or monthly, the time when we get anxious about the consumptions and we are forced to have a look at the meter atleast once in a while. This prototype will give the consumer an exact idea about the energy consumption at the end of billing cycle. The distribution companies are facing a lot of challenges because of the ever increasing demand by the consumers. The loads on the sub-stations are increasing at an alarming rate due to the non-stop increase in the consumers' demand. The consumers are therefore at the receiving end and harassed due to bill payment related issues. Even the quality and consistence of the electricity supplied is not up-to the mark in most instances. The only solution for all these problems is to keep track of the consumptions on timely basis, which will also provide precise billing, and threshold value alongwith maximum demand. The above variables have been taken into consideration in making a prototype for the electricity billing system.

Proposed System

The issues currently being faced by consumers and also the distribution companies have been tackled in this study "IoT Based Electric Energy Meter". Combinations of hardware and software have been implanted to make a smart energy meter to execute the anticipated functioning. The 'Smart' concepts have been introduced with the implementation

of Wi-Fi modems along with evaluation of Arduino and other controllers. The prime aim of this project is to make a fully automated system with maximum accuracy and minimal human supervision. A networked system is always vulnerable to tampering and can be misused, to prevent this, a theft and tampering detection system can be implemented.

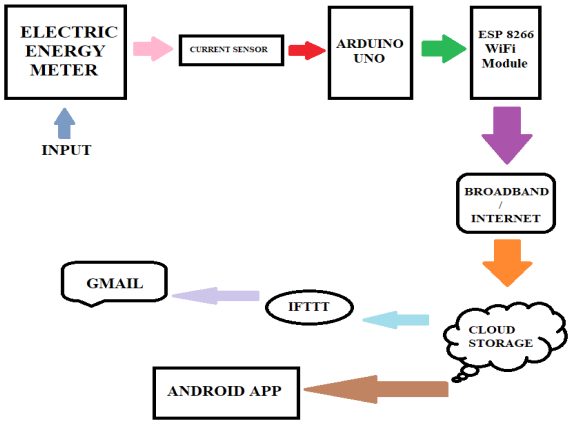

Figure 1.Simplified block diagram of system

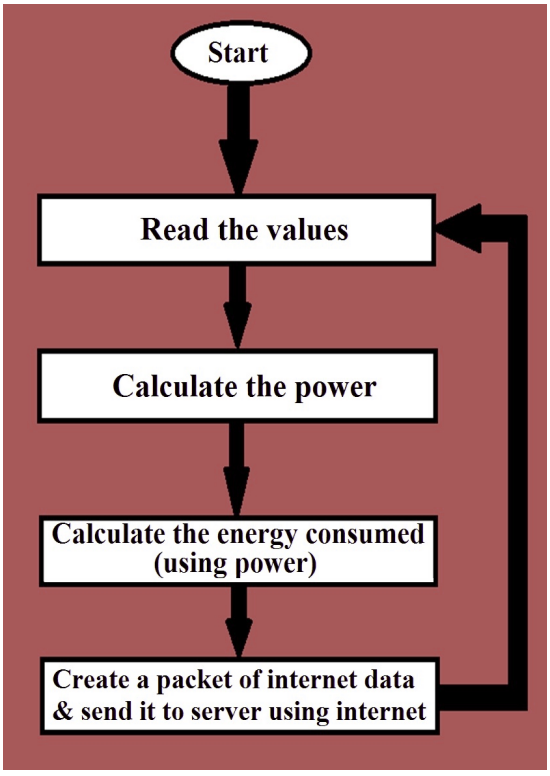

Figure 2.Flowchart of the Process

By using this system, the consumers and the distributors will get the breakup details of consumptions in an electronic form i.e. mail or text, the consumers will also be notified when they are about to reach the preset threshold value. The consumers can also use the dedicated webpage to monitor the consumptions and can also change the threshold value. The Wi-Fi modem continuously displays the electricity consumption on the webpage, and the power supply to the house can be disconnected whenever desired by the consumer.

The readings from the webpage and the Android App are given below:

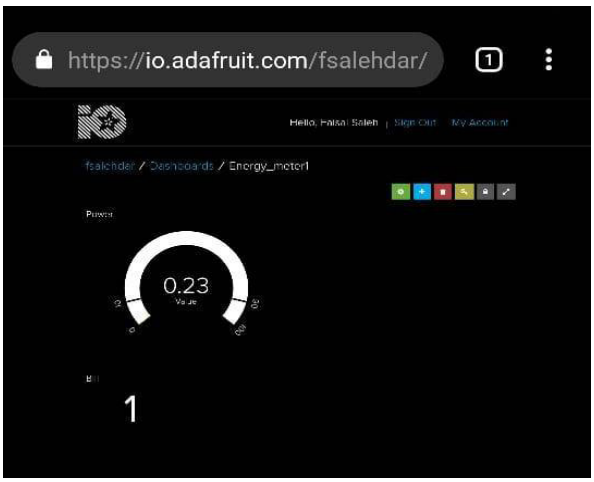

Figure 3.Dashbord Reading 1

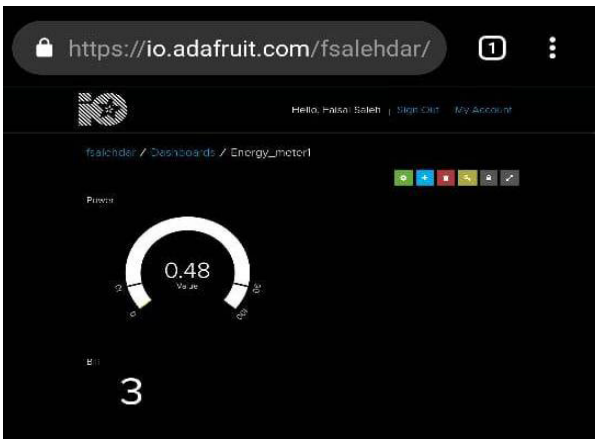

Figure 4.Dashbord Reading 2

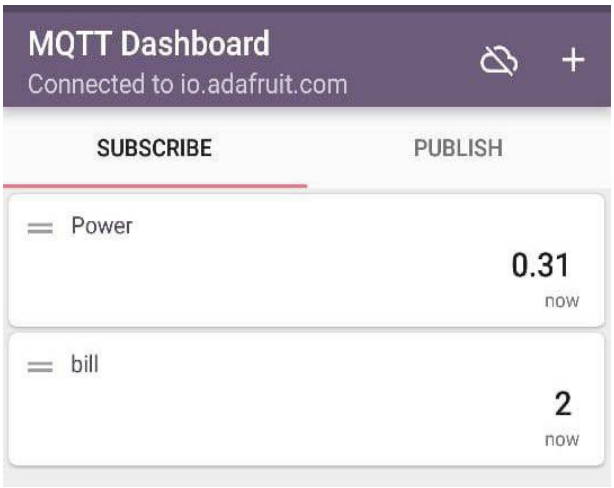

Figure 5.APP Reading 1

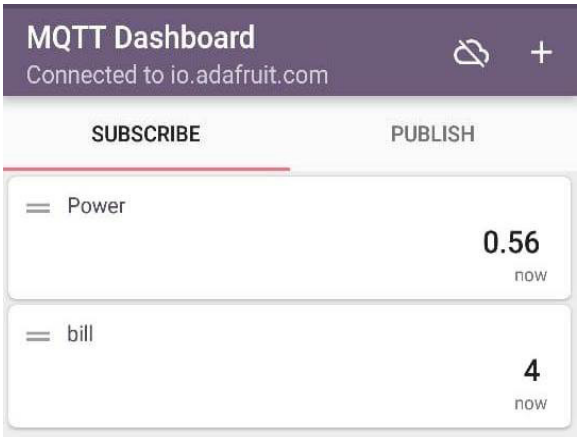

Figure 6.APP Reading I

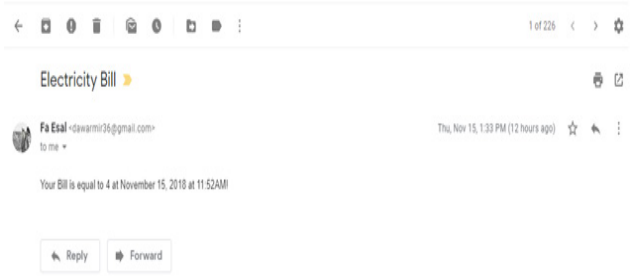

Figure 7.APP Reading I

Conclusion

The study designed an IoT Based Electric Energy Meter, which can be used to calculate electricity consumption in a household. This system can help in rising awareness among the consumers and prevent wastage of electricity.

This system also provides the consumer with power management option. Real time bill monitoring system and energy usage time can be tracked by the consumer directly from the comfort of their house. The time taken to do the billing process is also reduced.

Future Scope

In the current world every device is being automated, the IoT Energy Meter can also be used for automated switching of devices and monitor their status and faults like in air conditioners which consume high electric energy. The consumption data can also be used, not just for billing but also by the power distributors for forecasting the consumption and plan their resources accordingly using data mining techniques.

References

1. Cheng Y, Yang H, Xiao J et al. Running State Evaluation of Electric Energy Meter. Workshop on Electronics, Computer and Applications. *IEEE* 2014; 978-1-4799-4565-8.
2. Widmer J. Billing metering using sampled values according IEC 61850-9-2 for substations. In 2014 Saudi Arabia Smart Grid Conference (SASG) IEEE 2014; 1-7.
3. Sahana MN, Anjana S, Ankith S et al. Home energy management leveraging open IoT protocol stack. In *IEEE Recent Advances in Intelligent Computational Systems (RAICS)*. *IEEE* 2015; 370-375.
4. Rani S, Ahmed SH, Talwar R et al. IoMT: A reliable cross layer protocol for internet of multimedia things. *IEEE Internet of things Journal* 2017; 4(3): 832-839.
5. Rani S, Ahmed SH, Malhotra J et al. Energy efficient chain based routing protocol for underwater wireless sensor networks. *Journal of Network and Computer Applications* 2017; 92: 42-50.
6. Pang C, Vyatkin V, Deng Y et al. Virtual smart metering in automation and simulation of energy-efficient lighting system. In 2013 IEEE 18th Conference on Emerging Technologies & Factory Automation (ETFA). *IEEE* 2013; 1-8.
7. Nyirenda CN, Nyandowe I, Shitumbapo L et al. A comparison of the Collection Tree Protocol (CTP) and AODV routing protocols for a Smart Water Metering Network in Tsumeb, Namibia. In 2016 IST-Africa Week Conference. IEEE 2016; 1-8.
8. Martirano L, Manganelli M, Sbordone D. Design and classification of smart metering systems for the energy diagnosis of buildings. In *2015 IEEE International Conference on Smart Energy Grid Engineering (SEGE)* IEEE; 2015; 1-7.
9. Akhai S, Singh VP, John S. Investigating indoor air quality for the split-type air conditioners in an office environment its effect on human performance. *Journal of Mechanical Civil Engineering* 2016; 13(6): 113-118.