

Minimizing Electricity Theft by Internet of Things

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Abstract: IOT use things to things connection to access the internet of things, allow data to store and access services. Services over internet of things development according to need of person to person and thing to person, machine to machine interaction without human interaction. As there is limited non-renewable resources are present in our daily life, Electricity is one of them which utilized in every country that results abundant losses due to electricity larceny. Power theft is going to be the key challenges. A smart energy meter is used to minimize the electricity larceny. Basically energy meter is a device that calculates the cost of electricity consumed by homes, business, or an electrical device. It reduces the theft of electricity. In this paper a government person can find the dishonest user by showing the status of energy meter at the back end of electricity office. To attain this, energy meter communicate with raspberry pi through GPIO pins. GPIO pins fetch the effective data from energy meter and it send effective data to the raspberry pi and connect raspberry pi with the internet. At the backend, government person can see the status of energy meter in the form of graphs.

Keywords: IOT (Internet of Things), Electric Energy, Energy Meter, Raspberry pi.

I. INTRODUCTION

With the increasing of internet connectivity in home environment electronic gadget used to create home network services. IOT use things to things connection to access the internet of things, allow data to store and access services, such as remote home sensor [1]. Services over internet of things development according to need of person to person and thing to person, machine to machine interaction without human interaction. Technology used in this system is radio frequency identification. Transmission and delivery of electricity is smartness from the utilize of renewable energies and advanced measurement and latest communication technologies as well utilities grow to be smart. So with smart utility latest measurement and energy sources and load efficiently manage.[2].The key element of such a measurement and control network could be a smart meter. A smart energy meter is used to minimize the electricity larceny. Basically energy meter is a device that calculates the cost of electricity consumed by homes, business, or an electrical device. It reduces the theft of electricity. Electronic energy meter measures current in both Phase and Neutral lines and calculate power consumption.

II. SOFTWARE AND HARDWARE USED

A. IOT

With the increasing of internet connectivity in home environment electronic gadget used to create home network services. IOT use things to things connection to access the internet of things, allow data to store and access services, such as remote home sensor [1]. Moreover lights will automatically shut off when leaving a room or apartment when exiting for work. In addition, the room temperature can be reduced when leaving for work and increased in advance of coming home. Other functions that

can be controlled away from home include determining whether or not the apartment windows are closed or the coffee maker is shut off. An energy provider can read the energy consumption for a day, week, or month. Services over internet of things development according to need of person to person and thing to person, machine to machine interaction without human interaction.

Technology used in this system is radio frequency identification. The operation of buildings and/or homes will be more simple, safe, reliable, environmentally friendly, and cost effective by using smart devices in conjunction with IOT.

B. ELECTRIC ENERGY

Electric Energy is a necessary resource in everyday life and a backbone of the industry. Its limited, so proper use and measurement is very important. Before utilization of electricity it passes some phases. It is first Generated (G) then Transmitted (T) over long distances and finally Distributed (D) to consumers. In this process of GTD energy losses take place. Energy loss is defined as the difference between energy generated and consumption.

There are mainly two types of losses [3]-[4].

- i) Technical losses.
- ii) Non-Technical losses [4].

i) Technical losses

Technical losses are those losses which occur due to properties of materials used in transmission and distribution system.

For example, energy dissipated due to resistance of conductor used in transmission lines Technical losses are easy to simulate and calculate; computation tools for calculating power flow, losses, and equipment status in

power systems have been developed for some time. Improvements in information technology and data acquisition have also made the calculations and verifications easier. [5]

ii) Non-technical losses

Non-technical losses are electricity theft and non-payment [8], [9], [10], [11]. Electricity theft is defined as a conscience attempt by a person to reduce or eliminate the amount of money he or she will owe the utility for electric energy. This could range from tampering with the meter to create false consumption information used in billings to making unauthorized connections to the power grid.[5] Non-technical losses are difficult to quantify. They refer to losses that occur independently of technical losses in the power system. Two easy examples of sources of such losses are component breakdowns that drastically increase losses before they are replaced in time, and electricity theft. [5] The reason that meter inspection is the main method of NTL detection is because the utilities consider electricity theft to be the major source of NTL and the majority of electricity theft cases involves meter tampering or meter destruction [8], [9], [10], [5]

Main reasons for non-technical losses

1. Electricity theft: Electricity theft means that electric energy distributes to consumer that is not calculate by energy meter of consumer. Consumer break the mechanically, place a strong magnet also by remote control try to stop meter.
2. Metering inaccuracies: Metering inaccuracies define as difference between actually energy deliver to the energy meter and energy measured by energy meter. Small amount of Error are present in all energy meter.

C. ENERGY METER

Energy meter and watt hours meter is a device which calculate amount of electricity energy which is utilized by consumer. Energy meter is install at each place like as home, organization and industries to measured the consumption of electricity by load like fans, lights and many more. Being a limited and very important resource the metering of electricity consumption is essential. Generally people don't care for the consumption of electricity in their day to day processes and are concerned about it when they get their electricity bills or in case of power shortage. Measuring of electricity consumption was started with Electromechanical Induction meter which operates by counting the revolutions of a metal disc rotating at a speed proportional to the power. The number of revolutions is proportional to the energy usage. The electric meter had taken more important roles in power system. The power meter can be utilized to detect or measure the presence of voltage, current, power and other parameters. [2] The electric energy meter is the most important in the accuracy [2]

i) Electronic Energy meters

Electronics energy meter are highly accurate and reliable energy measurement device as compare to other mechanical meter. It utilize very small amount of power and its start calculating energy consumption immediately

when attach with load. Those meter are either analog or digital. In the analog energy meter power is changed to relative frequency and it converted by counter which located inside it.

But in digital energy meter processor are used to measure the electricity. Logic circuits are used to integrate the power to get energy and also help for testing. Then it change frequency or pulse rate.

In analog energy meter phase divider is used to obtain value of current and voltage and current transformer directly join to load.



Fig.1. Types of Energy meters

D. Raspberry pi

The raspberry pi is small in size and it is a cheap computer which is launch by raspberry pi foundation with the help of Broadcom and university of Cambridge laboratory for the propagate of computer training in school. [6] raspberry pi is not only helps us in study but also helps in number of tasks. The raspberry module also called microcomputer and this microcomputer is stand on Broadcom BCM2835 SoC unit. SoC means system on the chip in which all configuration of microprocessor is included. So there is RAM(random access memory), ROM (read only memory), CPU(central processing unit), and also A to D(analog to digital) and D to A(digital to analog) converter in addition serial interfaces[7]

The thing that is distinct SoC from microcontroller is that, SoC devices are directly connect with CPU so huge computational ability which build it feasible to run operational manner. The Broadcom BCM2835 have ARM1176JZFS processor, 512 MB RAM and GPU (graphics processing unit) .raspberry pi does not have any solid state drive only SD card is used for install the operating system on it and this SD card is also help to store all data[7] The raspberry pi operating system is open source LINUX (Raspbian) [7]LINUX operating system provide communication with external device [7] Microsoft window is not install on it. But we can install many other linux versions on it and it seems similar to window. Raspberry pi used to send electronic mail or surf internet. Raspberry pi only required 5V 1A power supply to operate and this power supply provide by micro USB port. The secret of the less power is required is that ARM based BCM2835 is used. We cannot see the heat sink on this device because it generate very less heat even during complex operation is performed. On the laptop and desktop mostly two operating system are run, apple or

Microsoft window operating system but these both operating system are closed source. In the close source operating system we cannot change the source code according to our requirement but in open source Linux operating system we can make changes according to our desire. Nothing is conceal in open source. There are several version of Linux including fedora remix, arch Linux and Debian.

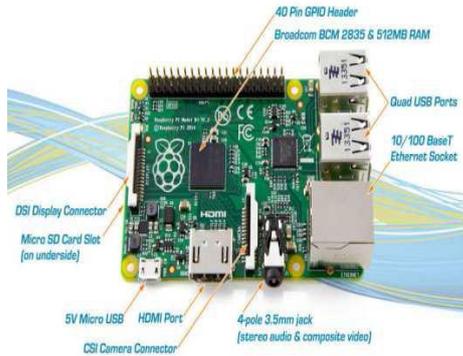


Fig.2. Raspberry Pi model

III. ALGORITHM USED

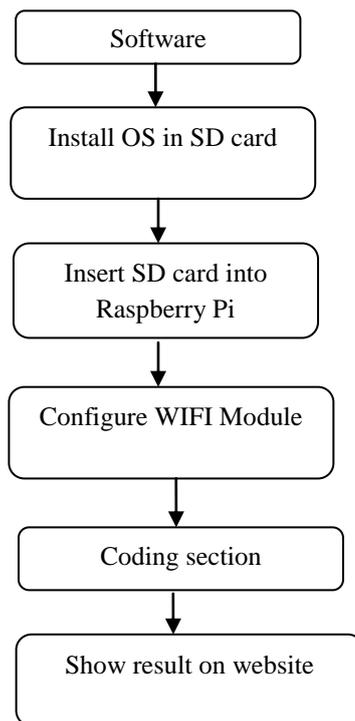


Fig.3. Algorithm used to design the system

Above figure shows the algorithm used. In this there are two sections software and hardware.

A. SOFTWARE

Software is a general term for the various kinds of programs used to operate related devices. Software consists of carefully organized instructions and code written by programmers in any of various special computer languages.

i) Install OS in SD card

Firstly we have to download operating system which is recommended and then extract the downloaded file . After this download another software win 32diskimager and insert SD card into PC. Then open win 32diskimager software and select the extracted select derive where extract file have to written.

ii) Configure WIFI Module

Make sure our Wi-Fi adapter is plugged into the Raspberry Pi. Before the Wi-Fi adapter can be configured it needs to check that the correct drivers are installed. With the help of SSH connection establish wifi USB dongle provide raspberry pi remote desktop application. This provides a major role because with this remote desktop application we able to connect raspberry pi over the everywhere in word.

iii) Coding section: Coding section is divided into two parts.

- 1) Write code: In this we write the code in python language according to the application and save it with extension .py.
- 2) Run Code: To run the code firstly open the LX terminal which is placed on the raspberry pi desktop. Now enter the command to run the program.

iv) Show result on website: Now login your website page by user id and password. After login meter status is show.

IV. RESULTS

As we used the IOT for the purpose to implement minimize electricity theft because electric energy is a necessary resource in everyday life. This can be designed by installing OS on raspberry pi and energy meter communicate with raspberry pi through GPIO pins. After this, raspberry pi connect with the internet. At the backend, government person see the status of energy meter in the form of graphs. This paper supports two energy meters. The results obtained after execution are shown below.

In below figures, level 0 shows that meter condition is ok and nobody tries to theft the electricity. But at level 10, it shows that someone theft the electricity.

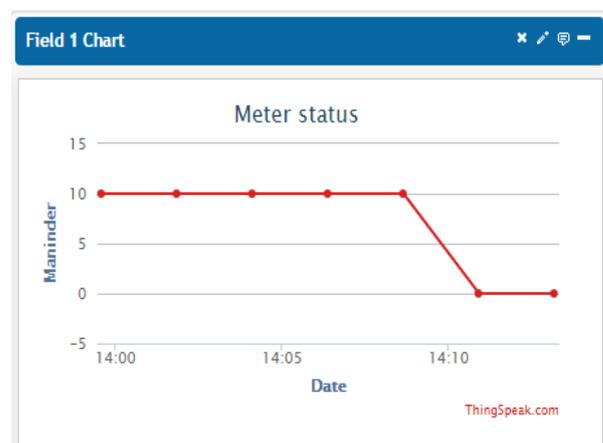


Fig.4. Status of Maninder's energy meter

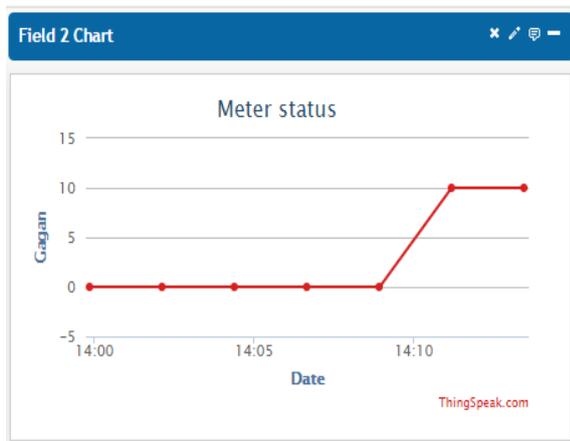


Fig.5. Status of Gagan's energy meter

V. CONCLUSION AND FUTURE SCOPE

The planned system has mentioned implementation of IOT. It is concluded that by using IOT technology the government person can find the dishonest user, it can make the assignment of the agents impracticable to steal the electricity. This analysis work has been implemented to find the dishonest user. To implement our objective, get hardware raspberry pi and install the operating system. Energy meter communicate with raspberry pi through GPIO pins. GPIO pins fetch the effective data from energy meter and it send effective data to the raspberry pi, then connect wifi module with raspberry pi. After this, connect raspberry pi with the internet. At the backend, where government person see the status of energy meter after successfully login with username and password and the status of energy meter are shown in the form of graphs. The entire implementation is being taken place in PYTHON surroundings. From the results it has been concluded that if there is any dishonest user then government person can find that dishonest user.

In further implementation smart meter automatically cut electricity when any one tried to theft and it also monitor the electricity consumption through smart phone and smart meter that sends status if any fault occurred in transmission line. Furthermore it create bill by our self and also pay it and anyone can check the online status of energy meter as well as the consumption of energy.

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BIOGRAPHIES



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