IOT BASED AUTOMATIC ENERGY METER READING AND THEFT DETECTION

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Abstract: The proposed system design eliminates the human involvement in electricity maintenance. Internet of things (IOT) is the network of physical objects or "things" embedded with electronic software, sensors and connectivity to enable objects to collect and exchange data.IOT based automatic meter reading, or AMR, is the technology of automatic collecting data energy meter and transferring the data to central data base for billing or analyzing. The internet is connected to meter and it counts the pulses from it and displays it over the LCD display. Also the current drawn by the load is calculated by current transformer which is connected in series with the load which will be displayed on the LCD. This data is then transmitted to the server unit at MSEB .The data is received by internet and it is displayed over the LCD. Whenever the key is pressed microcontroller will send sms through internet to transmitter to get the meter and current readings. The meter reading can be obtained at zero cost.

I.INTRODUCTION

In the Internet of things (IoT) model, many of the living and non-living things that encompass us will be on the internet in one form or another. Driven by the popularity of gadgets empowered by wire-less technological innovation such as Wireless Bluetooth, Radio Frequency Identification, Wireless-Fidelity, embedded sensor, IoT has moved out From its beginning stage and it is actually on the edge of changing the present fixed inter-net into a well featured upcoming Internet. Currently there are almost nine billion inter-connected gadgets and it is estimated to touch almost fifty billion gadgets by 2020.Today the world is facing such an environment that offers challenges. Energy crisis is the main problem faced by our society. A relevant system to control and monitor the power usage is one of the solutions for this problem. One approach through which today's energy crisis can be addressed is through the reduction of power usage in households. The consumers are increasing rapidly and also burden on electricity offering divisions is sharply increasing. The consumers must be facilitated by giving them an ideal solution: - i.e. the concept of IoT (Internet of Things) meters and on the other hand service provider end can also be informed about electricity thefts using theft detection unit. The IOT is connected to the meter and it counts the pulses from it and displays it over the LCD display. Also the current drawn by the loads is calculated by current transform which is connected in serieswith the load which will be displayed on the LCD. This data is then transmitted to the server unit at MSEB. The data is received by a Internet and it is displayed over the LCD.

II.RELATED WORK

From thorough review of related work and published literature, we have observed that many researchers have done rigorous work on Internet Of Things. It is observed from the careful study of reported work that in the real world, IoT based meter can improve the efficiency of power system and can help to analyse the unnecessary loss of power in different areas.The paper by Landi C, Merola P, Ianniello G on ARM-based energy management system using smart meter and Web server gave us the basic idea for IoT based energy meter.

A. Existing method
The present system only provides feedback to the customer at the end of the month that how much power is consumed in the form of bill. The consumer has no way to track their energy usage on a more immediate basis. The consumers are growing exponentially fast and load on power providing divisions is rapidly rising. In the existing system meter tampering can be done easily and it's one of the major drawback for an energy crisis.

B. Proposed method
In the proposed system, consumer can do power management by knowing energy usage time to time. The Customer needs to pay the bill on schedule, if couldn't, the electric power connectivity can be turned off autonomously from the distant host.

III.PROPOSED SYSTEM

### 1.METER CONFIGURATION FOR THEFT DETECTION
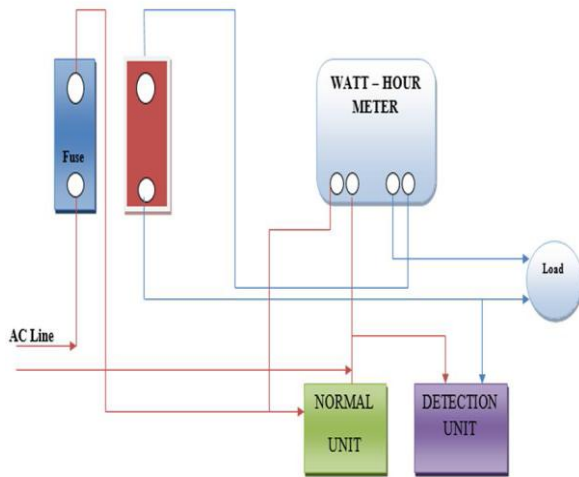
The theft detection module has 2 circuits in it one is theft unit and other is normal unit. The theft detection circuit comprises of 1N4007 diode, MCT2E, transistor and Relay. 1N4007 diode is connected to MCT2E which has High Current Capability, Low Forward Voltage Drop and Low Reverse Leakage Current. MCT2E is an optocoupler. Relay output is connected to the microcontroller for theft identification. Theft identification is done on the basis of below truth table.

TABLE I
Theft Identification Truth Table

Normal Unit	Theft Detection Unit	Status
OFF	OFF	Normal
ON	ON	Normal
ON	OFF	Normal
OFF	ON	Theft Detected

2.ESP8266
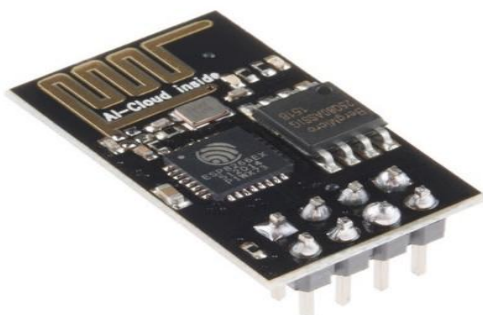
The PIC18F452 microcontroller module takes the calibration pulse data from the energy meter and performs the necessary control operations and sends the required information like number of units through Wi-Fi module.ESP8266 module is extremely cost effective board with a huge, and ever growing, community.
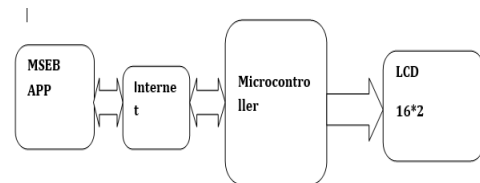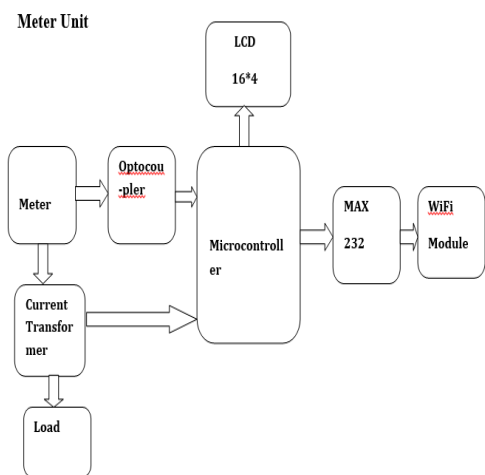
HARDWARE DEVELOPMENT

Block diagram
Following block diagram shows all the elements of our system. It contains the mainly six elements which are as follows:

- LCD 16*2
- ESP8266 Wi-Fi module
- PIC18F452
- MCT2E Optocoupler
- Current transformer
- MAX232

BLOCK DIAGRAM

LCD Display:LCD is used in the project to visualize the output of the application. We have used 16x2 LCD which indicates 16 columns and 2 rows. So, we can write 16 characters in each line. So, total 32 characters we can display on 16x2 LCD.

PIC18F452

The 8 bit microcontroller called the PIC, which stands for peripheral interface controller. This microcontroller had small amount of data RAM,.The PIC18F family has the highest performance of all the families of 8-bit PIC microcontrollers.PIC 18F is available in 18 to 80 pins

packages makes it an ideal choice for new designs because it allows any easy migration to more powerful versions of chip without losing software compatibility.The IOT is connected to the meter and it counts the pulses from it and displays it over the LCD display through PIC18F. In MSEB server we also use PIC18F for detecting the theft and for the purpose of readings.

MAX 232 (DS 14C232)

The DS14C232 is a low power dual driver/receiver featuring an onboard DC to DC converter, eliminating the need for ±12V power supplies. The device only requires a +5V power supply. ICC is specified at 3.0 mA maximum, making the device ideal for battery and power conscious applications. The drivers' slew rate is set internally and the receivers feature internal noise filtering, eliminating the need for external slew rate and filter capacitors. The device is designed to interface data terminal equipment (DTE) with data circuit-terminating equipment (DCE).

WI-FI MODULE

ESP8266 WI-FI module is a self-contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions for another application processor.ESP8266 module is extremely cost effective board with a huge, and ever growing, community.

IV. APPLICATIONS

- It is used for electricity theft detection purpose
- For MSEB application.
- For household application.
- For industrial application.

V. CONCLUSION

In the era of smart city advancement, this project is concentrated on the connectivity &networking factor of the IoT. In this project, an energy consumption calculation based on the counting of calibration pulses is designed and implemented using PIC18F452 MCU in embedded system domain.

In the proposed work, IoT based meter reading system is designed to continuously monitor the meter reading and service provider can disconnect the power source whenever the customer does not pay the monthly bill and also it eliminates the human involvement, delivers effective meter reading, prevent the billing mistake.

The Project has achieved following objectives:-
• Ease of accessing information for consumer from energy meter through IoT.
• Theft detection at consumer end in real time.
• LCD displays energy consumption units and temperature.
• Disconnection of service from remote server.

VI. FUTURE ENHANCMENT

In the present system, IoT energy meter consumption is accessed using Wi-Fi and it will help consumers to avoid unwanted use of electricity. The performance of the system can be enhanced by connecting all household electrical appliances to IoT.
So, in future following objectives can be achieved to save power and avoid thefts:
• We can make an IoT system where a user can monitor energy consumption and pay the bill Online.
• We can make a system where a user can receive SMS, when he/she crosses threshold of electricity usage slab.
• We can make a system which can send SMS to the concerned meter reading man of that area when theft detectedat consumer end.

VII.REFERENCES

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