



“ IOT BASED SMART METERING AND SECURITY SYSTEM ”

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Abstract-

The technology of smart metering has gone through rapid technological advancements and there is increased demand for a reliable and efficient metering system. This project presents the design of a simple low cost wireless GSM energy meter based on IOT and its associated web interface, for automating billing and managing theft control. The proposed system replaces traditional meter reading methods and enables remote access of existing energy meter by the energy provider. IOT based wireless communication module is integrated with smart meter of each entity to have remote access over the usage of electricity. Live meter reading from the GSM enabled energy meter is sent to this billing point periodically and these details are updated in a central database. A new interactive, user friendly graphical user interface is developed using Proteus, Microsoft visual studio .NET framework.

Keywords—*IOT(Internet Of Things); Smart Meter system; GSM module;PIC(Peripheral Interface Controller); Visual Studio .NET; Proteus.*



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I. INTRODUCTION

Electrical power has become indispensable to human survival and progress. Apart from efforts to meet growing demand, automation in the energy distribution is also necessary to enhance people's life standard. Traditional meter reading by human operator is inefficient to meet the future residential development needs. So there is increased demand for Smart Meter systems which collect meter readings electronically, and its application is expanding over industrial, commercial and utility environment.

Electronic utility meters are an important step towards automating the utility metering process. Automated utility meters have many new features that help to reduce the cost of utilities to customers and the cost of delivering utilities to the utility provider. The onset of rural electrification provides opportunities for new and more efficient metering technologies to be implemented.

Traditional electro-mechanical meters, still as a result of the analogue and mechanical nature of the components in these meters. Collection of meter readings is also inefficient, because a meter reader has to physically be onsite to take the readings. This method of collecting of meter readings becomes more problematic and costly when readings have to be collected from vast, and often scattered rural areas. Meter readers are reluctant to make the effort to travel to such areas and will often submit inaccurate estimations of the amount of electricity consumed. For households at the top of high buildings and luxury housing plots,



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traditional meter reading is highly inefficient. There exists chance for missing bills, absence of consumer etc.

Related works

There has been several smart metering or communication protocol conversion solutions provided by some world-famous adriano, GSM system. When developing a technology that might replace one which has been in use for more than thirty years, not only the key issue needs to be addressed, but added functionality and solutions to other obstacles presented by the previous technology need to be addressed. Even existing meter readers and other employers have to accept the quality and effectiveness of the proposed system.

TO CALCULATE ELECTRICITY BILL:

To calculate number of units,

$$N=p*t$$

To calculate energy consumptions,

$$E=p*t$$

To calculate cost

$$\text{Cost}=E*\text{cost}/100$$



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where, p =power

t = time usage.

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.

II. BENIFITS OF SMART METERING

In recent years, power quality is concerned with level and study of problems in electrical energy. New electronic devices are more susceptible for low power quality events, like sags, swells, transients, flickers and harmonics distortion. These problems can impact in operation costs by downtimes and lost productions. The challenge of any industry that depends on electrical energy for production is the low consumption with high power quality and low costs. Electrical energy managers were created with purpose of maximizes the electrical energy utilization and help fault detection. According to the higher competition, more and more industrial consumers are adopting monitoring systems that helps to obtain



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information to minimize costs, maximize power quality and insure that the manufacturing process proceeds with correct operation. Researches show that power quality is serious and relevant subject in respect of operational costs, having losses about million dollars every year.

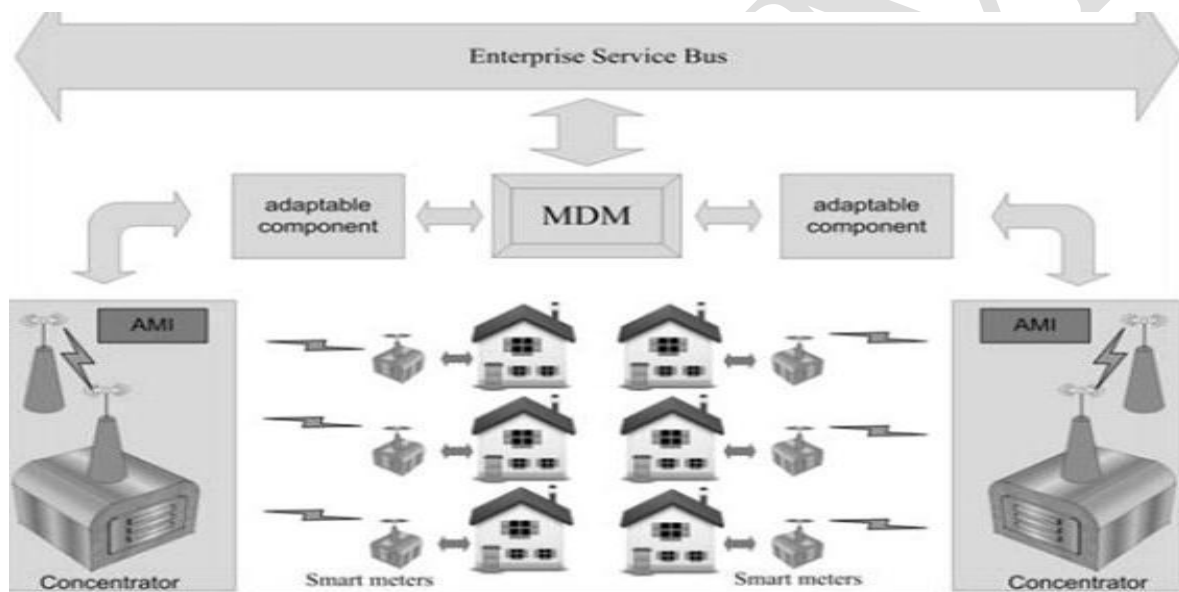


Figure 1: Architecture of smart metering system

III. THE PROPOSED IOT

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique



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identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. The Internet of things (IoT) is the inter-networking of physical devices, vehicles (also referred to as "connected devices" and "smart devices"), buildings, and other items embedded with electronics, software, sensors, actuators, and network connectivity which enable these objects to collect and exchange data.

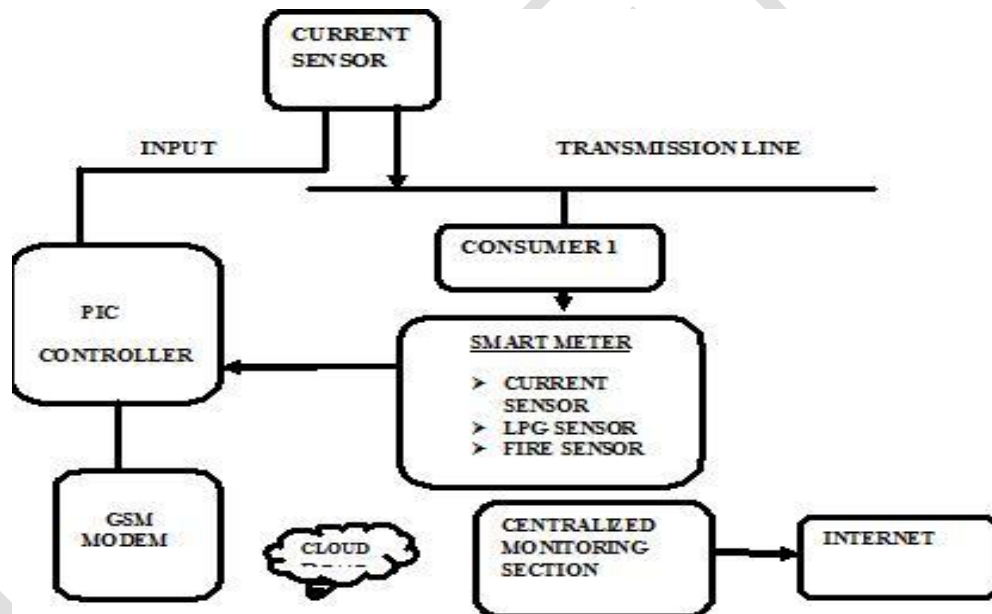


Figure 2 : The architecture of IOT



Reducing theft: In some areas, theft detection and prevention is one of the single biggest aspects driving the move toward auto billing system are seen every year due to increasing theft inclusive of distribution asset management and threshold monitoring for usage provides the utilities with a valuable tool in eliminating, or at a minimum greatly reducing these losses.

Reducing late payments: In other areas, where late payment or nonpayment is a significant problem, some utilities are including in ACEM systems the ability to directly control consumption on a premise-by-premise basis by setting thresholds that cannot be exceeded without tripping a breaker at the premise. This approach will allow utilities to avoid the huge revenue losses incurred in the past.

Increased Data Security: Automatic meter reading provides increased performance in the data collection. You avoid reading errors and missing meter readings. Reading data automatically also provides increased security of data flow and other applications. Avoiding manual data entry or manual data transfer a potential source of error is eliminated.

Power Supply

The microcontroller and other devices get power supply from AC to DC adapter or from direct ac lines through voltage regulator. The adapter output voltage will be 12V DC no



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regulated. The 7805 voltage regulators are used to convert 12 V to 5V DC. The low cost DC power supply circuit included in this system

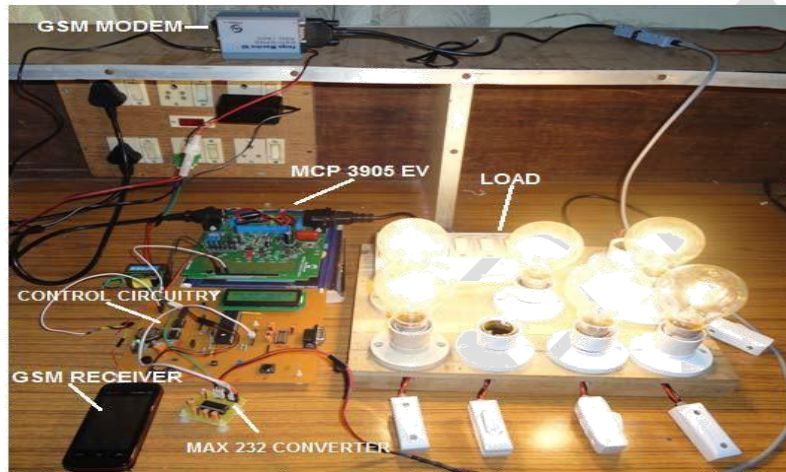


figure 3:GSM interfacing with smart meter

MS access is designed to scale and support more data and users by linking to multiple access databases. It is also using a back-end database like Microsoft SQL Server.



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Figure 4: IOT BOARD

Advantages of the Proposed System

The proposed system eliminates the human involvement in electricity maintenance. The current system is inefficient in terms of monitoring our energy consumption. Also, the provision for generating bills automatically is limited and inefficient. At present, SMS is used for transmitting the data to a central server in Automatic Meter Reading system. But the proposed system uploads the readings periodically to a central public server through GPRS. GPRS is more cost effective than SMS. GPRS is also more efficient for frequently updating the data. Human involvement in metering can be avoided using this method. The users can



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also monitor their energy meter reading online from anywhere on the globe 24*7. By using this system, consumers will be aware of the electricity usage in their home which will leads to effective control of power consumption.

IV. EXPERIMENTAL RESULTS

Since the deployment of the wireless system with the help of smart meter specification is still in its development stage, the wired version of the system described is developed and tested in the laboratory. A PCB is designed and fabricated based on the hardware circuit. The received energy meter data through this system is compared with the data of a connected calibrated wattmeter. The software is working satisfactorily. The results correspond to a sample test are presented in the Table I.

<i>Observation Condition</i>	<i>Theoretical Calculated Value Unit (KWhHr)</i>	<i>Display Result (KWHr)</i>
1. Supplied voltage= 220V Current = 1A	0.54	0.54
2. Supplied		

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voltage= 200V Current =1.5A	0.78	0.80
3. Supplied voltage= 220V Current = 2A	1.40	1.43
4. Supplied voltage= 220V Current = 2.6A	2.20	2.26

Table I: Experimental results





Figure 5:Data transmission

V.CONCLUSION

The proposed system for energy billing for security purpose is automatic without human intervention and consumer can directly know the amount they has to pay. So it is both consumer and power station friendly. The replaced meter reading is faster and accurate. The hardware can developed very easily with the present technology using IOT.By this method we can monitor the output from all over the world. Here the security measures are taken in consideration so that this system overcomes the drawbacks in present system. In thisproject work, wireless meter reading system is calculated to endlessly monitor the meter reading and cost. It avoids the human involvement, provides capable meter reading, and avoids the billing mistake and human intervention. The advantages of this project are it requires less manpower, cost and units are displayed on the website.

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