

IOT BASED DISTRIBUTION METERING SYSTEM FOR MONITORING AND CONTROLLING

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Abstract- Now a days everyone talks about the problem faced by the people that is consumer regarding electricista but supplier too faces problems. At present time, the government faces heavy economical losses supplied to the consumers. People at this present days use electricity but fails to pay the bills. When lineman goes to their house they are often attack and not allowed to cut the power supply. So to avoid such heavy loss, we have designed such a system which will cut off electricity connection directly without any human interface. Based on this situation, it becomes an superficial impulse to develop an IOT based system for residential electricity device. The system consists of an wi-fi based module device to control power supply main switch and update the data into data centre. The consumer able to view updated power consumption as well as billing information in the provider web services. Cut-off warning message is send to users via email and short message services. Once the payment of bill is done, the power supply is given to the consumer. This project helps the government by gaining the profit by receiving the bill on time.

Key words: *Internet of Things(TOT); Wi-Fi module; Superficial*

I. INTRODUCTION

Life without Electricity is beyond our Imagination. Lives aren't complete without electricity. Electricity is one of the energy needed that empowers almost all machines surrounding us. At the residential level, it helps mothers doing their daily duties, children studying comfortably with aircond and fathers doing their works efficiently. While at the commercial level, it empowers huge infrastructure of computer machine that keep the program running and manage of everything from the tiny stuff to the mega buildings. If for some reason there was no electricity in the world, chaos and disasters would instantaneously take hold.

In this paper we introduce a prototype system to provide early warning to the users of electricity. Today user of electricity to resedential, have no way of knowing how much electric power consumed by each of their devices electrical connected to the network by the mere fact of being connected, even when not operating, making it difficult they can have control of energy consumption from their homes. The system consist of wemos- ESP8266, GSM module, Relay, Solar Pannel, Battery.

Furthermore, most users spend too time away from home for its various activities, and nor has so connecting or disconnecting their devices electrical remotely during optimum periods of time, depending on the various applications of each apparatus electric. In this system, it will alert user to pay bill on time period they have allocated. The MSEB have the authority to cut-off the electricity supply. The system is expected to help the Operating Cost and it reduce manual meter reading jobs, and reduce work manually for connection/disconnection of supply. By controlling wired devices using the wireless devices have achieved greater flexibility and extensibility, it can be applied to any electrical appliance at home.

II. RELATED WORK

Paraskevagos, developed a sensor monitoring system which used digital transmission for security, fire and medical alarm systems as well as meter reading capabilities for aa utilities. This technology was a spin-off of the automatic telephone line identification system, now known as Caller ID.

In 2003, Koay et al [10], had been successfully designing and implementing Automatic Meter Reading systems using a Bluetooth device, or Bluetooth-Enabled Energy Meter.

Tan *et al.* [6] had developed a GSM automatic power meter reading (GAPMR) system. The GAPMR System is consists of GSM Digital Power Meters installed in every consumer unit and an Electricity eBilling System at the energy provider side. The GSM Digital Power Meter (GPM) is a single phase standard compliance digital kWh power meter with embedded GSM modem which utilizes the GSM network to send its power usage reading using Short Messaging System (SMS) back to the energy provider wireless. At the power provider side, an eBilling system is used to manage all received SMS meter reading, compute the billing cost, update the database, and to publish billing.

III. PROPOSED DESIGN

In this paper we proposed a system to improve government services efficiency by implementing the automatic cut off system for Non bill paid consumer. It consists of network embedded devices which are integrated with the main management system in data center. The management system includes billing module and alert module. The general prototype system is as shown in Figure 1.

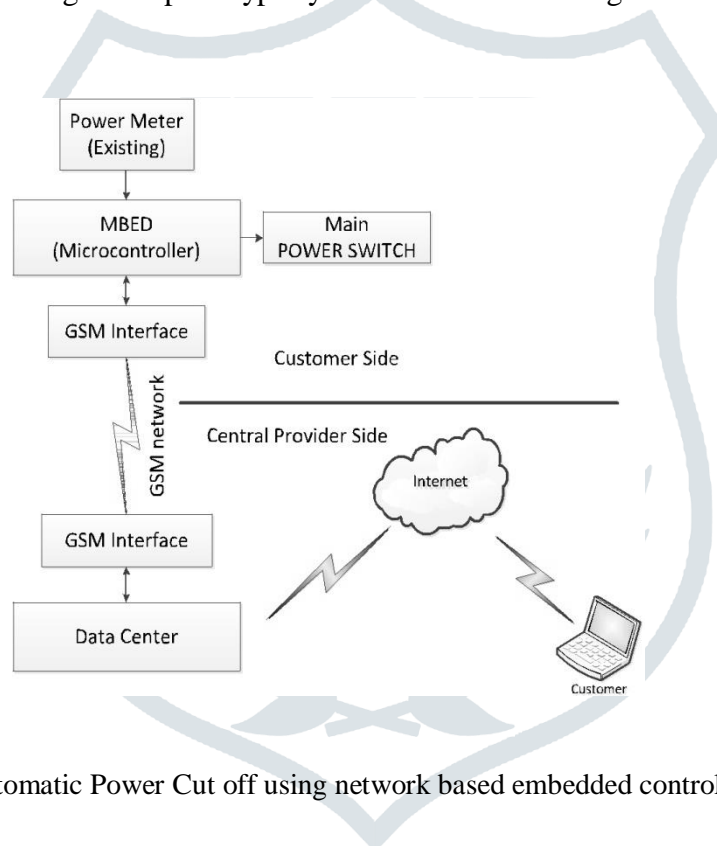


Fig 1. Automatic Power Cut off using network based embedded controller

Wemos D1 is ESP8266 Wi-Fi based board that uses the arduino layout with a operating voltage 5V. This amazing board is not bigger than a quarter and include 11 digital I/P & O/P pin as well as single analog pin. The wemos is better than a normal esp board and we can program it directly. In this system microcontroller Esp8266 gives signal to the relay. The wemos is connected to the network and access by the IP address in the network. By receiving the signal from the Wemos it has interfacing with the Relay. Relays are used for disconnecting the circuits by manual or automatic operation. Relay consist of the coil which is excited or energized and such that making the contacts of relay closed activates the relay to break or make the circuit connection. There are different types of relays such as over current relays, definite relays, and inverse time over current relays, microcontroller relays etc. In our Prototype system we have used four relays. Basically it is used to control two separate circuits.

Since relays are switches, the terminology applied to switches is also applied to relays; a relay switches one or more poles, each of whose contacts can be thrown by energizing the coil. Normally open (NO) contacts connects the circuits, when the relay is activated the circuit is disconnected when the relay is inactivated. When a microcontroller gives a signal to the relay, it is operated and it cuts the supply of the particular consumer who does not pay the bill. Before the relay cuts off the supply to the consumer, the GSM sends the message to alert the consumer to pay the bill on time. If a consumer fails to pay a bill on time, the Wemos gives a signal to the relay to cut the supply. The message to the consumer is given through GSM. Mini GSM/GPRS breakout board is based on SIM 800L module, The network is available for SMS message data remote transmission. The board features compact size and low current consumption. With power saving technique, the current consumption is as low as 1mA in sleep mode. It communicates with a microcontroller via UART port. Supports commands including 3GPP TS 27.007, 27.005 and SIMCOM enhanced AT commands. Its operating voltage is 3.7~4.2V, peak current: 1A. SIM800 is one of the most commonly used GSM modules among hobbyists and the Wemos community.

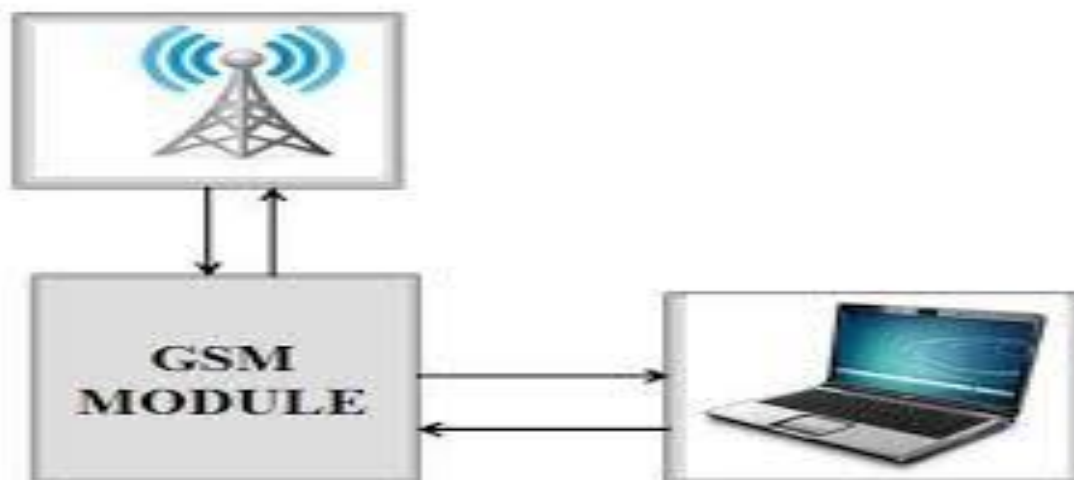


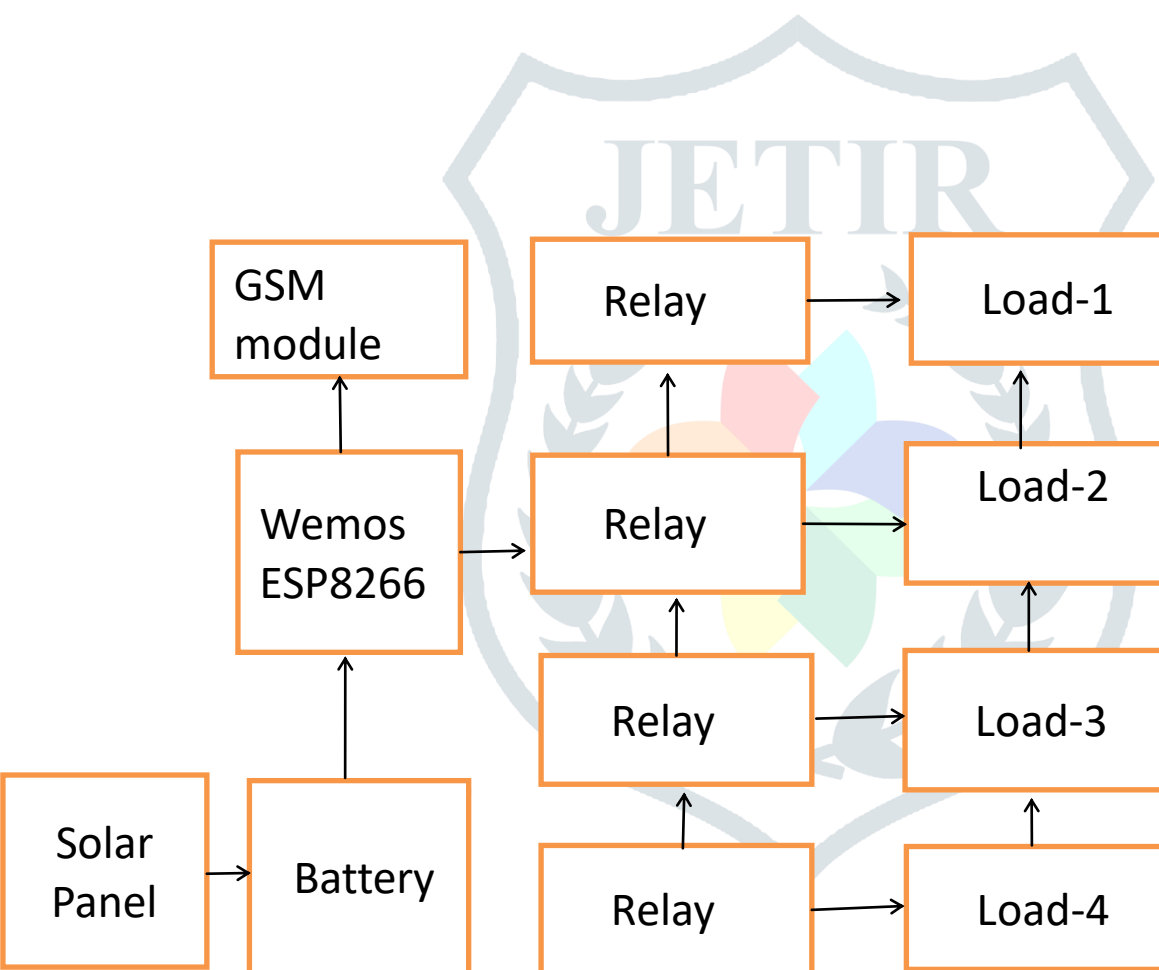
Fig 2. GSM interfacing with Wi-Fi

Our main objective is to design and control a system which will cut off the electricity connections. In today's time, the government is trying to remove all the poles because of their shabby appearance. Underground cables are used for power appliances where it is impractical, difficult, or dangerous to use the overhead lines. The system is for underground. It has several advantages such as small voltage drop, low chances of developing faults, and low maintenance cost. The particular IP address of the consumer is there in the MSEB.

IV. SYSTEM DESIGN

Basically, a circuit will be fitted, i.e., system in consumers' home so that we will acquire data and after acquiring we will upload/update the data on cloud service so that the owner of smart grid (MSEB) and customer can access that data. The system consists of an ESP8266 module which is a microcontroller and it controls the whole system. The system is connected between the Mains Line and the Home incoming supply to the energy meter. In the circuit, we give 230V supply as AC input to the meter. Input part and Output part of meter each have one phase and one neutral port. This output phase wire is connected to the load (bulb) through a relay. The relay by default is in a closed condition. The circuit starts working when the relay is in a closed condition.

But if relay triggered then relay will get open and immediately circuit stops working. Relay has a particular Id of the consumer. Microcontroller gives the command/signal to the relay. If particular consumer doesn't pay bill on time then Esp8266 gives signal to the relay to switch off the supply. In Esp8266 we will code the particular consumer data about electricity bill. The warnings to the customer is given through GSM. The MSEB directly doesn't cut off the power supply, it will give users warning to pay bill on time. If the consumer failed to pay bill on time then MSEB cut off the power supply. The wemos is the Wi-Fi programmable device can be programmed using arduino Id. The wemos is connected to the network and access by the IP address in the network. The web browser will show the control panel to control the relays connected to wemos to switching ON/OFF. Solar panel is used to charge the battery and battery acts as a power bank to the system.



Electricity power loss is very common problem in country, where population is very high and the use of electricity are ultimately tremendous, which results in loss of electricity companies energy and because of which we are facing the frequent problems of load shading in urban areas as well as rural areas so as to overcome the need of electricity for whole state. In this proposed system Wemos technology used to transmit with the meter reading to the customer and government with the required cost. It cuts the power supply automatically as per request of authorized server mobile. To program a PIC controller to cut off the power on following flow chart as shown in fig 4.

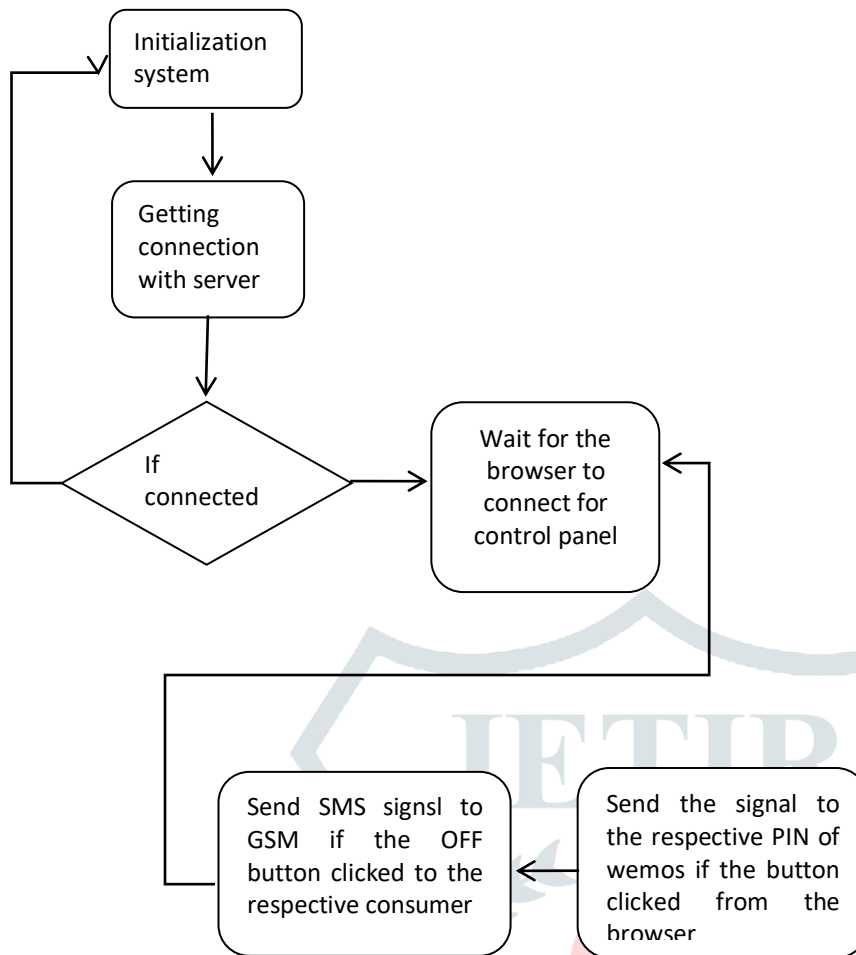


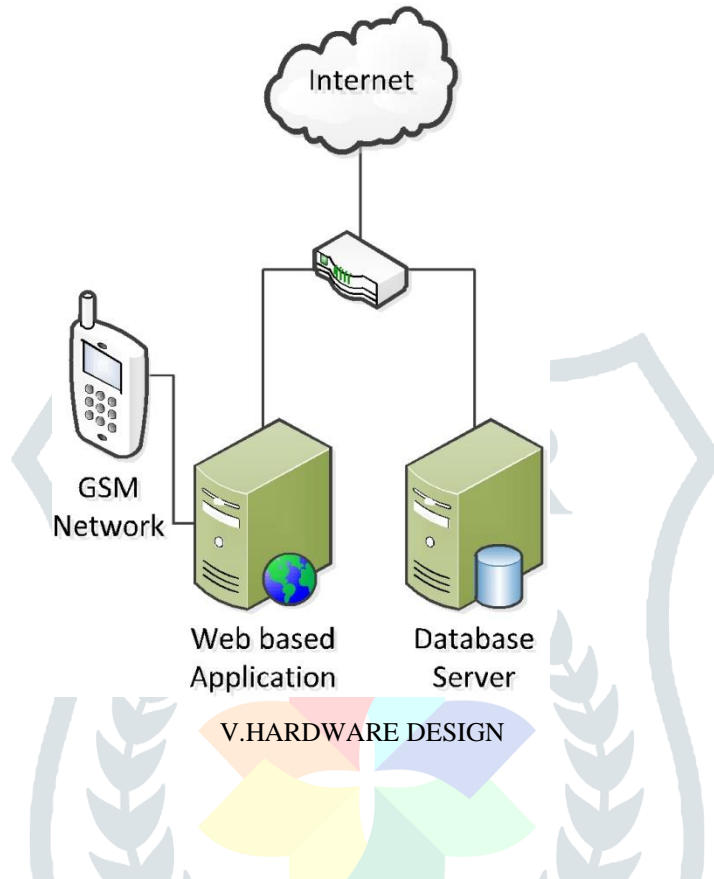
Figure 4. Flowchart of MBED microcontroller application

Figure 4 describes the process of microcontroller when electricity bill doesn't pay on time the service provider will automatically send out a warning message to alert the customer via sms. The first and second warning will send to the customer.

If there is no command to send data out, the data will be kept inside microcontroller. The FLASH with size 512KB inside microcontroller is more than enough to save that data permanently, and still remain if the power of Esp module is down. With that memory, we can even keep a log of daily use of electrical power. For example one line of log data consists of 100 bytes, then for one year only requires 36 KB of memory locations. Furthermore the user can use this data to evaluate patterns of use of electrical power, while the government can use this data to improve service quality.

Another function of this subsystem is when customers have problems and do not pay the bill after 7 days of receiving a disconnection notice from MSEB. Then the central office will send a signal to microcontroller, and microcontroller will provide an output signal to the relay to disconnect the power supply. Management central office will provide a signal to re-

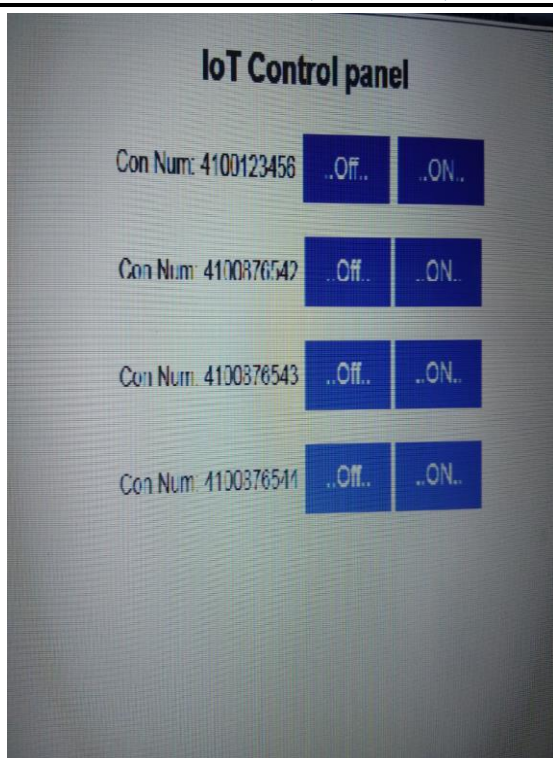
connect the power supply if the customer has paid all the unpaid bills. Subsystem at central provider side consist of database server and web based application (see Figure 5) to maintain customer registration, warning management, billing system, monitoring power consumption, and control main switch of power supply at customer side.



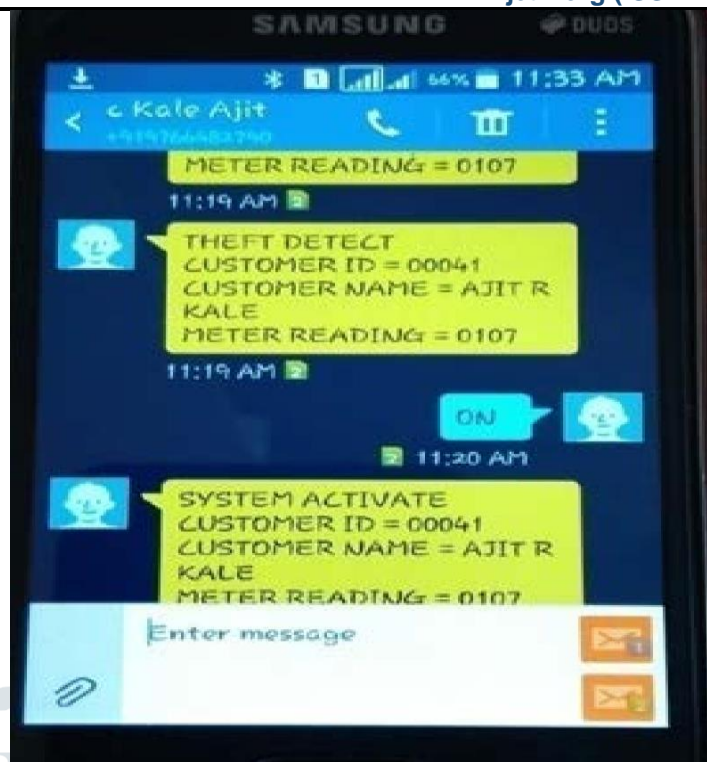
Prototype System



System is On



Control Panel for ON/OFF



Message to the Customer

VI. CONCLUSION

The project model reduces the manual manipulation work. Use of Esp8266 in our system provides the numerous advantages of wireless network systems. In this paper we proposed a system to provide early warning to the users of electric power which is provided by government. In the present situation all customers are using manual communication. To reduce the manual efforts and human errors, we need to have some kind of automated system monitoring all the parameters and functioning of connections between the customers and electricity board. Also by implementing this system we can control the usage of electricity on consumer side to avoid wastage of power.

Since there is a need to utilize energy in a better and efficient way which is beneficial in the power sector.

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