



Real Time Embedded Energy Meter-A New Concept of Measure the Energy & To Pay the Bill Using Android Application

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ABSTRACT: Every month we can see a person standing in front of our house from Electricity Board whose duty is to read the energy meter and handover the bills to the owner of that house. This is nothing but meter reading. In this paper, Automatic meter reading is used for meter reading. Automatic meter reading is the technology of automatically collecting data from energy meter and transferring that data to a central database for billing and/or analysing. The Transmitter circuit is connected to the meter which counts the pulses from it and displays it over the LCD display. The transmitter circuit containing a GSM/GPRS modem for data transforming, this transforms the meter reading through Mobile Application, for front end designing Java is used. User friendly and the employees can work on this software with minimum knowledge of Computers. Employees can read the meter by sitting in the Office.

KEYWORDS: GPRS, WSN, Zigbee, MSP430, Energy meter, Android, Billing automation, database MySQL

I. INTRODUCTION

An Electricity Meter, Electronic Meter, Electrical Meter or Energy Meter is a device that measures the amount of electric energy consumed by a residence, business, or an electrically powered device. Electric utilities use electric meters installed at customer's premises to measure electric energy delivered to their customers for billing units, the most common one being the kilowatt hour (kWh).

Electricity meters operate by continuously measuring the instantaneous voltage (volts) and current (amperes) to give energy used (in joules, kilowatt-hours etc.). Meters for smaller services (such as small residential customers) can be connected directly in-line between source and customer. For larger loads, more than about 200 ampere of load, current transformers are used, so that the meter can be located other than in line with the service conductors.

A. Motivation:

The use of AMR (Automatic Meter Reading) communication is an advantage over the traditional Electronic Meter Reading as the monitoring and controlling can be done without human intervention^[2]. As the system becomes fully automatic so the amount of error decreases and the efficiency of the system increases drastically.

B. Advantages:

It handles a flood of data every day and entering that data manually can increase the chance for human error. Making sure your data is accurate, on time and analysed is key to increasing cash flow, not to mention customer satisfaction. Just because all of those weak points of the surveillance system, an energy efficient portable system is used, that can be pictures when robbery of electricity and demand analysis, energy audit, losses happens and pinpointing losses at the same time is much better than the current in use surveillance systems. It is simple to implement, small size portable stand-alone device with its own power source, accurate, stable, reduced cost of meter maintenance, communication upgraded path for residential energy meter.

Suppose owner place a meter at his/her home or resident which is to me monitored how much power can be consumed by users, if users wants to go remote location and still wants to monitor that meter, then he/she can make use of remote surveillance system by use of mobile through internet facility. However, the project can be used for security purpose which is limited to specific location monitor meter reading.

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C. Why Android?:

In the field of android operating system, the Android 1.0 was the first Android Operating System, which was commercially released in September 2008. This mobile application development platform was open source. The collaboration of the Google with the Open Handset Alliance was designed this Android Platform. The Android SDK has many tools and different APIs, which can be used in designing and developing different mobile apps. Android has grown as a main mobile platform because of its updated and software features. The latest version of the Android was Android L API level 23 which was released on 16 June, 2014 and updated on September 29, 2015 to Android Marshmallow 6.0.

Linux is used as the operating system for Android OS. This android OS is used in mobile, smart phone and tablets. The developers can use the full features of the hardware system because it is an open source platform for mobile applications.

II. RELATED WORK

Existing meter reading techniques are managed, investigated and evaluated in an extensive study and different energy measuring instruments in India. In the existing system either an electronic energy meter or an electro-mechanical meter is fixed in the zone for measuring the energy usage by the users. Now a day's energy meter records energy in terms of KWh units. The energy KWh units are still recorded by meter readers monthly in feet. The recorded data are recorded by the electricity company and processed. The company needs to first collect each recorded data to an account holder and determine the amount owed by means of a specific tariff in use.

Many systems collect the total electricity consumption data as well as data from main electric appliances. In this paper, they use the collected data to evaluate two methods. The two methods are: 1) 0-1 sparse coding method, 2) The short-interval data were collected by the smart metering system [1]. There are two types of AMR (Automatic Meter Reading) systems: 1) Wire-based AMR system, 2) Wireless AMR system. Power Line Carrier (PLC) and Telephone Line Network (Optical/cable) are wire-based AMR systems and several related works are available. Many e-metering systems have now been proposed using Zigbee, Bluetooth, GSM, GPRS as explained in [6], [2], [3], [4], [7] and [5]. For long distance data or information transfer through GPRS, which is proposed in [3]. Remote control and monitoring of the data through Zigbee is proposed in [2] and [6]. And also for the small distance data transferring through Zigbee wireless system. GSM wireless system is introduced in [5] and [7], but still it has a problem of missing short message service degraded the performance and accuracy.

III. PROPOSED WORK

The aim is to make an AMR system which can be monitored by the owner remotely through an android application. In the proposed system, installing a GPRS modem is very costly. So, the energy meter transfers all the collected/recorded data through a Wireless Sensor Network. All collected data from the WSN is transferred to the Electricity Company and the Android Application. The owner can read the energy units which can be consumed by themselves by sitting anywhere and pay the bill using an android application. Also, employees can read the meters by sitting in their office. The proposed system block diagram is shown in Fig 1.

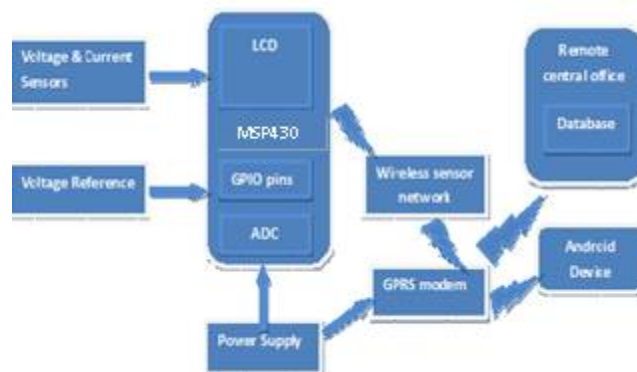


Fig. 1. Energy Consumption by Each Node

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A. System Overview:

The WSN, GPRS energy meter is constructed using the microchip single and three phase dedicated energy metering IC, 16-bit MSP microcontroller MSP430FR4133, Zigbee based WSN and GPRS modem. A 16 bit microcontroller is designed with embedded WSN to send its power usage. And WSN is embedded with GPRS network to send power usage and bill to electricity board and Android Application. RTC, 10 channel 10-bit ADC, 256-segment LCD are inbuilt in MSP430 microcontroller.

B. Project Implementation:

The primary function of my project is:

Step 1: Setting up Zigbee for WSN.

So get XBee S2, I will need to have two units in order to get communication up. As mentioned earlier, XBee S1 and S2 cannot communicate, so you need to have a pair of XBee S2. Do not mix them up. In this case, one is behave as a transmitter and one is receiver. Setup of zigbee and Both the XBee S1 and XBee S2 are shown in Fig. 2.



Fig. 2. Setup of Zigbee & Transmitter and receiver Zigbee for WSN

Step 2: Operating Zigbee without

- 1) Open X-CTU Software Which is use for ZigBee Communication. Select COM PORT, Baud rate, Flow Control, Data bit, Parity, Stop Bit. This all perimeter use for serial communication. After that click on terminal. One window is open which is in Fig. 3. After that all the configuration like Pan Id, Destination Address High & Low, Serial Number High & Low is to be set.

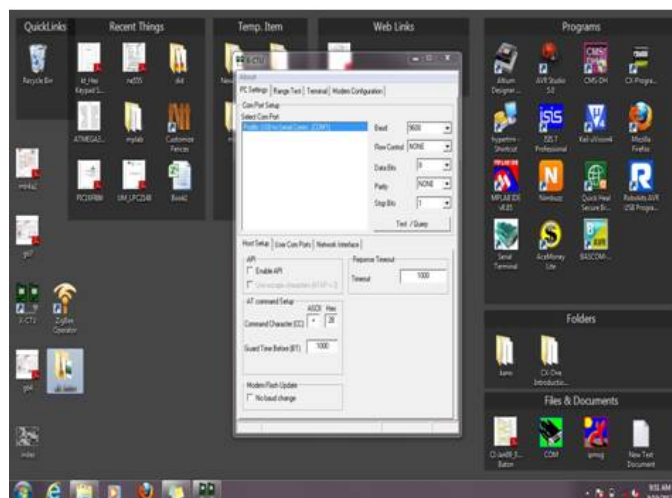


Fig. 3. Zigbee hardware installation

- 2) After that click on test/query button. If device is connected then this kind of message is display. All data will correct as per deice datasheet then click on ok otherwise click on Retry. After that click on terminal.

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- 3) Type “+++” replay from device is “OK” if your communication is done otherwise nothing to be replay from device. Change some of device parameter. Then connect Rx-Tx short in other device. After that click on start button.
- 4) Write data on transmitter terminal and the same data I get on receiver terminal in Fig. 4.

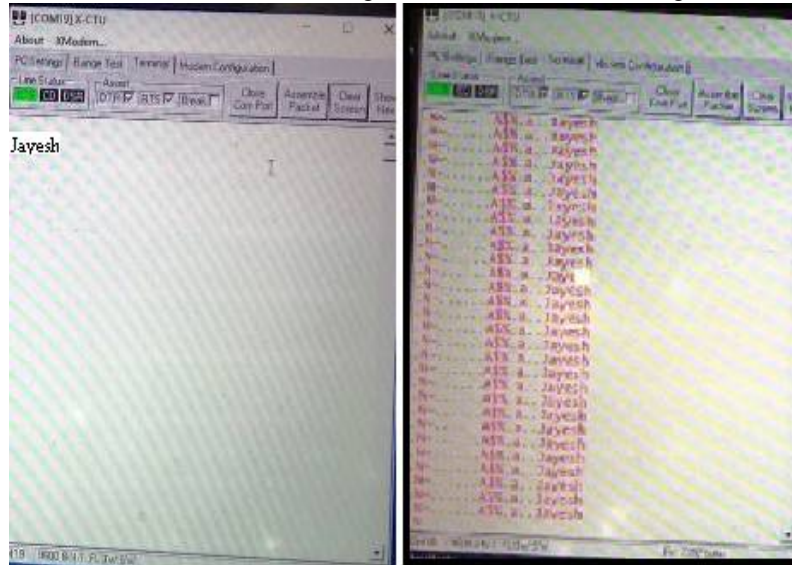


Fig. 4. Communication between zigbee S1 and zigbee S2 on Rx-Tx Terminal for WSN

IV. CONCLUSION

In this paper we design implement and develop an Android application for power measuring and payment a bill using a wireless plug. This system is designed to monitor the energy consumption and sent the consumption to the smart phone and also electricity office. We can pay our bill of consumption of power using android application without going to the bill payment office. Users can monitor consumption of energy units and its bill at anywhere and any point of time using android application. This system consists of three main parts which include data gathering and data processing and smart phone.

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