HYBRID METER READING SYSTEM USING GSM,GPRS AND ZIGBEE.

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Abstract

In this paper we have presented Automatic energy meter reading using different communication protocol. The electric board are using conventional method, by sending meter readers periodic trips to each and every individual houses to note the meter readings .The meters readings will be calculated and given as Government Tariff to the customers. In our design the Energy meter readings will be sending to the base station by using the Zigbee communication. The base station will send the data to the server main via using the GSM Technology. By using this method we can reduce man power so that at different time slots we can calculate the tariff amount and the data will be stored in temporary data loader. Automatic meter reading (AMR) is used in different applications such as water meter, gas meter and energy meter. The hardware system will be made fully PIC controller and the communication protocol are ZigBee, GSM to GPRS. Frequency is 2.4 GHz and 900MHz. in this system. We are designing software based on Dotnet (.net)platform it to be maintain all customer database .The billing notification will be sent to its respective consumer through SMS, E-mail, Web portal and printed postage mailing .With this system can save cost in doing meter reading and provide better services to their customers. This system will be very much useful in hilly terrains, where the man power finds difficult to reach due the worst weather conditions. This type of meters can be implemented in taking reading in hazardous places like nuclear power plant at the time of emergency.

Keywords: ZigBee, GSM, GPRS, DOTNET

Introduction

The AMR was first tested by AT&T Corporation (American Telephone and Telegraph Corporation) in cooperation with a group of electric utilities 41 years ago in the USA. It was a successful experiment, after which AT&T offered to provide AMR service based on a telephone communication link. However, from an economical point of view, this project was unprofitable. After nine years, in 1977, a Utility Communication Division was founded in Rockwell International to develop a distribution carrier communication system. The principle of modern electricity meters is based on continuous measurements of the instantaneous values of voltage and current. These data are used to find the instantaneous value of electrical power, which has to be integrated with respect to time to give the consumed energy.[2]

As a result of the technical advance in solid-state electronics, microprocessor components and communication sphere and integration of software, a modern AMR system allows getting far more useful information beneficial for a distribution company and enables the provision of additional services. The technology is known as Smart Integrated Metering System (Smart IMS), but the basic idea of remote electricity measurement is common for both AMR and Smart systems.

System overview

The overall system for AMR its shown in figure. The complete system is made up of zigbee, GSM through GPRS communication protocol AMR in the zigbee with electronic meter module installed in every individual consumer unit and SMS gateway. The communication links that can be utilized as the medium in an AMR system is GSM network.GSM with its vast coverage in most countries, and also its competitive ever-growing market is becoming the main medium for the machine-to-machine applications, and AMR is not an exception. The meter ID and its reading (KWH) are sent to a central server using General Packet Radio Service (GPRS) technology. GRPS is the technology used the GSM network to connect mobile to the Internet.[1]

System architecture

Wireless automatic meter reading system presented in this text - comprised of a meters with ZigBee radio on one side and database management system on the other side takes into account all of the previously mentioned issues. Therewithal, certain specific demands and constraints have to be taken into consideration to provide an effective solution both for the consumer and the supplier, including long battery lifetime, signal range, packet latency, ease of installation and maintenance. The benefits of using ZigBee technology in development of the wireless automatic Power meter reading system set forth in further ext concern the very same issues: battery lifetime is extended using well defined beacon timings, wider range is gained with the appropriate network topology, the network parameters are adequately preset to avoid greater depths and high packet latency, and last but not least, the ease of installation and maintenance is achieved by avoiding cabling and by applying algorithms for quick error spotting and debugging.[4]

GSM provides recommendations, not requirements. The GSM specifications define the functions and interface requirements in detail but do not address the hardware. The reason for this is to limit the designers as little as possible but still to make it possible for the operators to buy equipment from different suppliers.

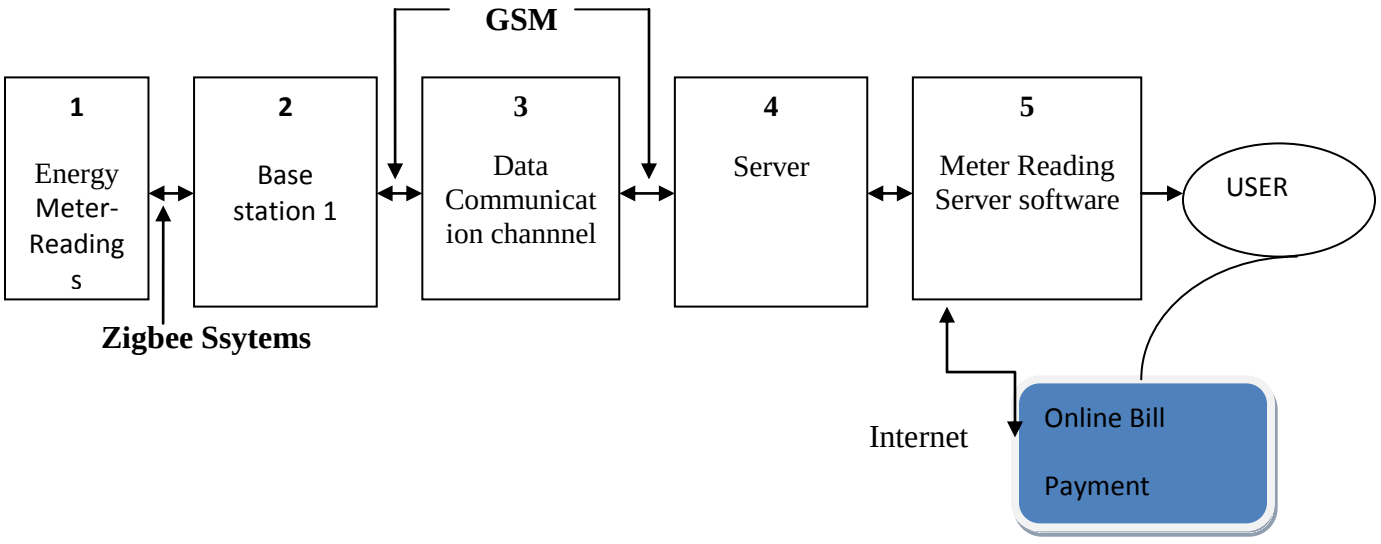


Fig 1 Block diagram for AMR

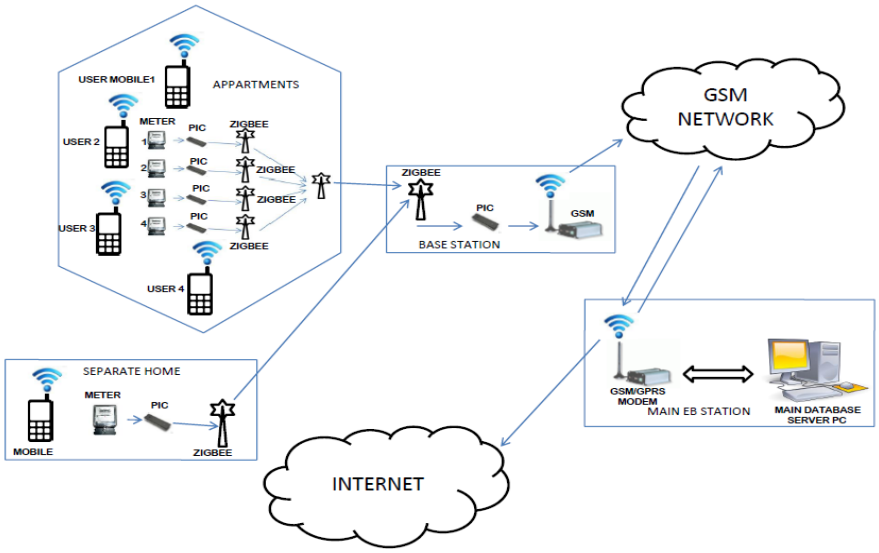


Fig 2: AMR architecture

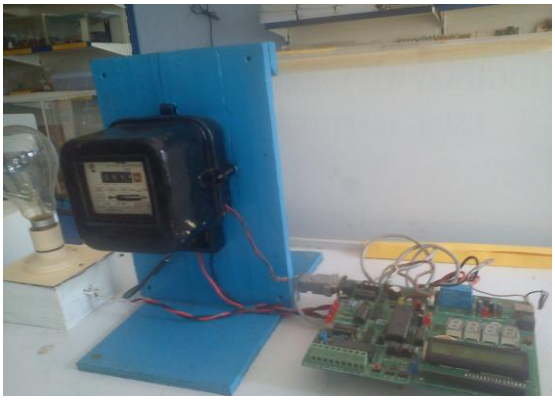
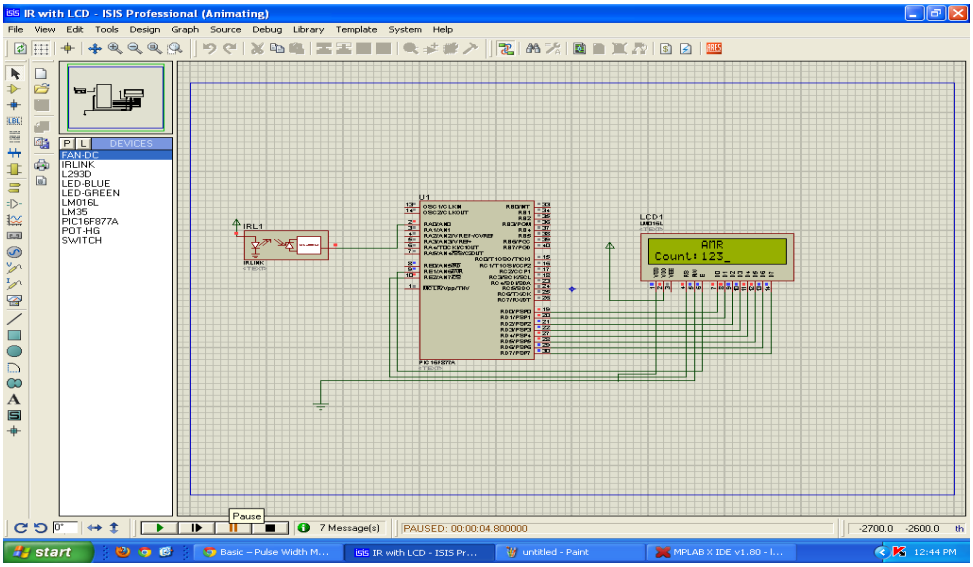
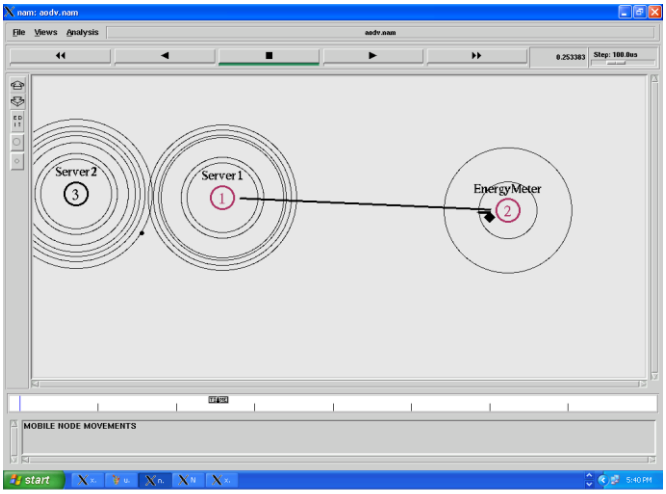


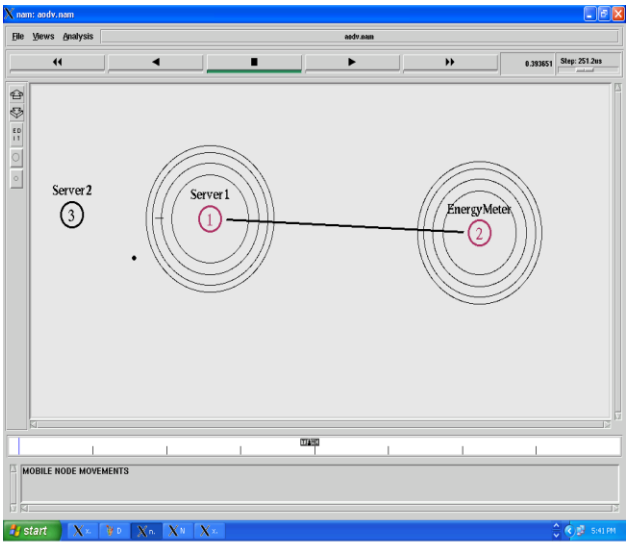
Fig.3 Prototype model of Energy Meter

Energy meter:

Smart meters go a step further than simple AMR (automatic meter reading). They offer additional functionality including a real-time or near real-time reads, power outage notification, and power quality monitoring. They allow price setting agencies to introduce different prices for consumption based on the time of day and the season.







Communication Media

For transporting the data from the energy meter to the Host PC a communication media is necessary. Communication Media itself has complex sub-elements like the local-loops on either side, series of intelligent switches, trunk-lines based on varieties of components like micro-wave, fiber-optics or VSATS. There are two broad classifications of communication media as Circuit Switch Communication Network and Packet Switch Communication Network. While

most of legacy applications work on the Circuit Switch Network, the Packet Switch Network is emerging rapidly which is where the communication technology is heading towards.[6]

The communication media should be reliable and should promise a very high up-time. Also its data integrity should be checked by asking for the error correction or any other technique deployed for the purpose

Communication protocols

The data transfer from energy meter to ZigBee, ZigBee to GSM and GSM. The overall data stores in server PC the communication needs protocols. In this system I have to used different protocols given below.

- TCP/IP
- UDP-USER DATAGRAM PROTOCOL
- ETHERNET PROTOCOL
- SIMPLE NETWORK PAGING PROTOCOL

Data processing and Billing

The collected power consumption reading is sent to the central billing server where it is stored. Many commercial servers as well as management software are available in the market. However the cost of such server and software management system are very expensive. To decrease the cost of the proposed AMR system, in-house software is developed using ASP.net and is used to control the central server. The implemented meter data management system will have the following functions:

a) Remote metering: The meter reading is sent automatically to the server and customers can remotely get their consumption at any time.

b) Bill issuing: The billing system shall provide monthly bill for customer who does not remotely access the server.

c) Customer tracking: The billing should include better customer tracking, bill forwarding, identification of customer financial accounts information, and use of monetary deposits for account closing requirements.[11]

Conclusion

This solution can be used in domestic and industrial purposes .By using this solution we can save the power theft ,man power for taking the reading and timimg.The AMER (Automatic energy meter reading system) was designed in our lab and I proposed to TNEB and waiting for reply to implement the system. ZigBee is a wireless communication technology that uses small, low-power digital radios based on the IEEE 802.15.4 standard for wireless personal area networks (WPANs) and GSM. In future I have plan to create a mobile application for TNEB to customer pay a bill directly any were and any time. The complete prototype to be design and tested successfully and also the billing process and SMS alert to be verified. Automatic Meter Reading is a challenging step for the Provincial Electricity Authority to take as it brings benefits to both customers and the organization itself and at the same time it is not easy to implement even though many AMR systems have been successfully implemented and proven worldwide. ZigBee is a wireless communication technology that uses small, low-power digital radios based on the IEEE 802.15.4 standard for wireless personal area networks (WPANs) and GSM is a wireless RF large band not interfere of different customer.

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