

INTEGRATION OF REMOTE EB MONITORING WITH AUTO PAYMENT SYSTEM

A.Arun¹, A.Vidhya²

^{1,2}Department of Computer Science and Engineering,

^{1,2}Valliammai Engineering College, Chennai, India.

ABSTRACT-Traditional electro-mechanical meters, still widely used today, are prone to drift over temperature and time. EB Person has to come home and take the Meter Readings manually. GSM network is used to detect the EB Meter Readings and Automatic SMS Alert is send to the Customer. GSM Modem is connected to the EB Meter; EB Staff will send a Request to the EB Meter through GSM Service. Embedded Hardware connected to the EB Meter will obtain the Meter Readings and communicates to the EB Server via SMS Service. The Meter Reading will be updated in the User's Records. EB Server will calculate the EB Reading and Amount to be paid and updates to the User via SMS Alert. We implement Lifi Technology instead of GSM as it is cheaper and will be useful even Not Reachable Tower Accessibility Areas also. One Lifi is connected to the EB Server and another is connected to the Home EB Meter. EB Meter Readings are obtained using Lifi Network. Meter Utility Checking is also implemented in this Project.

Keywords-GSM, LiFi Network, SMS Services, Embedded Hardware.

I.INTRODUCTION

Over the years, the need for electricity has grown in rapid proportions. Electric meters are devices responsible for determining these billing charges, usually on a monthly basis and are computed in kilowatt-hours (kWh). From manual meters dedicated electromechanical principles, scientific advancements have prompted the advent of automatic meter reading systems. Automatic meter reading (AMR) is the technology of automatically collecting data from energy metering and the transfer of the collected data for billing and analysis.

The primary driver for the mechanization of meter reading is not to reduce labor costs, but to reduce data difficult to obtain. AMRs are not only used to measure power consumption, it can also be used to read water consumption, like in New York City

where low-power radio transmitters installed on household water meters which send readings to a central server for billing to up to four times a day. The AMR system to be designed and artificial in this study is intended to demolish problems in accuracy of meter reading information and to usher in wireless systems automation in the Philippines. To achieve these, LiFi technology will be integrated in a Raspberry Pi single-board computer (SBC). The security features and data transmission capabilities of LiFi combined with Raspberry Pi's size and programmability are some pointers considered in hypothesizing the proposed system.

A. Network Security

Network security consists of the provisions and policies adopted by a network administrator to prevent and monitor unauthorized access, misuse, modification, or denial of a computer network and network-accessible resources. Network security implicates the legal document of access to data in a network, which is obsessed by the network administrator. Users choose or are assigned an ID and password or other authenticating information that allows them access to information and programs within their authority. Network security canvas an aggregation of computer networks, both public and private that are used in everyday jobs conducting transactions and communications among businesses, government agencies and individuals. Networks can be private, such as within a company, and others which might be open to public access.

Network security starts with legal document, commonly with a customer name and a password. Since this requires just one detail authenticating the user name i.e. the password this is sometimes termed one-factor authentication. With two-factor authentication, something the user 'has' is also used a security token or 'electronic device', an ATM card, or a mobile phone and with three-factor unauthenticated,

something the user 'is' is also used a fingerprint or retinal scan.

Once authenticated, a firewall enforces access policies such as what services are allowed to be accessed by the network users. Though effective to prevent unauthorized access, this component may fail to check potency harmful content such as computer worms or Trojans being transmitted over the network. Anti-virus software or a prescription prevention system (IPS) help detect and inhibit the action of such malware. An anomaly-based intrusion perception system may also monitor the network like wire shark traffic and may be logged for audit purposes and for later high-level analysis. Communication between two hosts using a network may be enciphered to preserve privacy.

B. Security Management

Security management for networks is different for all kinds of situations. A home or small office may only require basic security while extensive may postulate high-maintenance and advanced software and hardware to prevent malicious attacks from hacking and spamming.

Types of Attacks

Networks are subject to attacks from malicious sources. Attacks can be from two categories: "Passive" when a network intruder intercepts data traveling through the network, and "Active" in which an intruder initiates commands to disrupt the network's normal operation.

- Port scanner
- Idle scan
- Active
- Denial-of-service attack
- Spoofing
- Man in the middle

C. The ISO/OSI Reference Model

The discuss about Figure 1 International Standards Organization (ISO) Open Systems Interconnect (OSI) Reference Model defines seven layers of communications types, and the interfaces among them. Each layer depends on the services provided by the layer below it, all the way down to the physical network hardware, such as the computer's network interface card, and the wires that connect the cards together. An easy way to look at this is to analyze this model with something we use daily: the telephone. In order for you and to talk when we're out of earshot, we need a device like a telephone. (In

the ISO/OSI model, this is at the application layer.) If I place a call to you, I pick up the receiver, and dial your number. This number specifies which central office to which to send my request, and then which phone from that central office to ring. Once you answer the phone, we begin talking, and our session has begun. Conceptually, computer networks function exactly the same way.

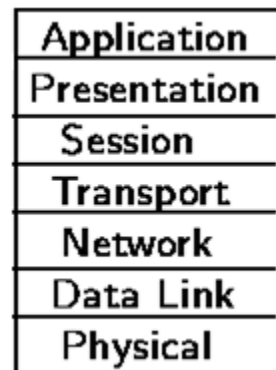


Fig 1 the ISO/OSI Reference Model

II. RELATED WORK

Fariba Aalamifar describes there is an international effort to develop smart grids to overcome the problems caused by aging power grids. However, to migrate to the new grid, the IT system has to be incorporated with the current power grid. There is currently an ongoing debate surrounding what would be the best choice for smart grid communication technology. One of the likely communication technologies for smart grid actualization is power line communication (PLC). PLC provides utilities the possibility of managing their own network system. Power cables are everywhere; even rural areas are covered with power cables. [1]

Renjish Kaleelazhichathu describes M2M applications have been in existence for the past many years. However, its provisioning using mobile technologies is a recent and emerging phenomenon. In this paper, we discuss the concept of M2M in brief, the services and technologies involved, identify the key players required to provide these services and example tariff models. Recently, regulatory requirements have acted as drivers for the adoption of M2M solutions. Vattenfall, the Swedish utility provider's installation of automatic meter reading (AMR) [2] Tariq Jamil describes nowadays wireless communication has become ubiquitous around the world and its application for gauging consumption of utilities by customers is rapidly gaining pace, not only in the developed world but also in the developing countries. [3]

Li Gang describes because of the traditional way of metering error and low efficiency, we propose household metering system design based on Zigbee and GPRS technologies, using PIC18LF4620 as the core processor and CC2430 chip as close communication function, using SIM300 chip as communication function in distance. Clustering structure of the network to reduce data traffic, Energy-saving sleep cycle has been achieved. Experiments have proved that this system can be safely. [4]

S.Arundescribes designing and implementing commercial as well as industrial systems based on Wireless communication has always been a prominent field of interest among many researchers and developers. This paper presents an execution technique for a wireless self acting meter reading system WAMRS incorporating the widely used GSM and Zigbeetwork. In many countries GSM and GPRS network is widely known for its vast coverage area, cost effectiveness and also for its competitive ever growing market. Using GSM as the moderate for WAMRS canalize a cost-effectual, wireless, always-attached, two-way data link between utility company and WAMRS, the WAMRS sends information of utility usage, power quality and outage alarm to utility company, tampering detection to the utility servers. [5]Tariq Jamil describes Nowadays wireless communication has become ubiquitous around the world and its application for gauging consumption of utility Aies by customers is rapidly gaining pace, not only in the developed world but also in the developing countries.[6]

III.SYSTEM PROCESS

The proposed System, in this project GSM network is used to detect the EB Meter Reading and Automatic SMS Alert is send to the customer. GSM Modem is connected to the EB Meter; EB Staff will send a Request to the EB Meter through GSM Service. Embedded Hardware connected to the EB Meter will obtain the Meter Readings and communicates to the EB Server via SMS Service. The Meter Reading will be updated in the User's Records. EB Server will calculate the EB Reading and Amount to be paid and updates to the User via SMS Alert. In the modification part we implement LiFi Technology instead of GSM as it is cheaper and the major advantage is there is no separate Hardware is required. We can use the Existing Light based Communication Channel for the Data Transfer. Another Process is usage of Zigbee which is Tranreceiver, so cost of implementation is still reduced when compared with GSM Modem. We all

know GSM Communication has lot Tower problem which Zigbee / LiFi will not have. It requires less Time. We also implement Tampering part in this Project. This will avoid Current theft and reduces illegal Usage.

Advantages

1. No manual Process of Taking Reading in House physically is required.
2. Automatic Tampering Detection is achieved.
3. Android based Payment system is developed for easy Payment Solution.

A. Processors in Embedded Systems

Embedded processors can be broken into two broad categories: ordinary microprocessors (μ P) and microcontrollers (μ C), which have many more peripherals on chip, reducing cost and size. Contrasting to the personal computer and server markets, a fairly large number of basic CPU architectures are used; there are Von Neumann as well as various degrees of Harvard architectures, RISC as well as non-RISC and VLIW; word lengths vary from 4-bit to 64-bits and beyond (mainly in DSP processors) although the most typical remain 8/16-bit. Most system process comes in a large number of different and angularity, many of which are also manufactured by several different companies.

B. Peripherals

Embedded Systems talk with the outside world via peripherals, such as:

- Serial Communication Interfaces (SCI): RS-232, RS-422, RS-485etc
- Synchronous Serial Communication Interface: I2C, SPI, SSC and ESSI (Enhanced Synchronous Serial Interface)
- Universal Serial Bus (USB)
- Multi Media Cards (SD Cards, Compact Flash etc)
- Networks: Ethernet, Controller Area Network, LonWorks, etc
- Timers: PLL(s), Capture/Compare and Time Processing Units
- Discrete IO: aka General Purpose Input/output (GPIO)
- Analog to Digital/Digital to Analog (ADC/DAC)
- Debugging: JTAG, ISP, ICSP, BDM Port, BITP DP9 port ...

C. EB Meter

- A **power meter**, energy **meter** is a device that triangulates the amount of electric energy consumed by a residence, business, or an electrically powered indicator.
- Electric utilities use electric meters installed at customers' premises to measure electric energy delivered to their customers for billing purposes. They are typically graduated in billing units, the highest common one being the kilowatt hour [kWh]. They are usually read once each billing period.
- In settings when energy savings during certain periods are desired, meters may measure demand, the maximum use of power in some interval. "Time of day" metering allows electric amount to be convert during a day, to record usage convey peak high-cost periods and off-peak, lower-cost, periods. Also, in some areas meters have relays for demand response load shedding during peak load periods.

D. Unit of measurement



Fig 2 EB Meter

The discuss about Figure 2 how an electric meter works Well, before doing so, let us see what is an electric meter and what does it do.An electric meter more ordinarily used word, the electricity meter is meant for algometry the total electrical energy consumed in a house, shop, offices etc. The units of measure are usually kilowatt-hour (KWh)..This

electrical power is measured by enactment the stock of the line current in Amps and the line voltage in Volts.Let us know have a perform at the working of an electric meter. The electric meters generally consist of two parts a mosaic to convert the power into a mechanical or electrical signal, and a counter to integrate and display the value of the total energy that has passed through the meter. One of the easiest and the simplest ways to caliper the line current and voltage for single phase electronic meters are line current and line voltage, In multi-phase meters voltage and current measurements have to be electrically isolated for each phase and transformers are used instead of shunts for current sensing. Basically domestic electric meter is enclosed in a glass case in which includes a revolving disk which in turn rotates a series of numbers or dials. When the electric current passes through the meter, the disk revolve to decide the exact amount of kilowatts used. The speed of proration varies base on how much electricity you are using in your house for particular device such as running a washing machine, microwave and water heater etc. It valuable to note that different electric appliance uses variant amount of electricity for its operating. More the practice of electric power, the faster the speed of rotation of disks.

IV. SYSTEM ARCHITECTURE

A. EB meter Section

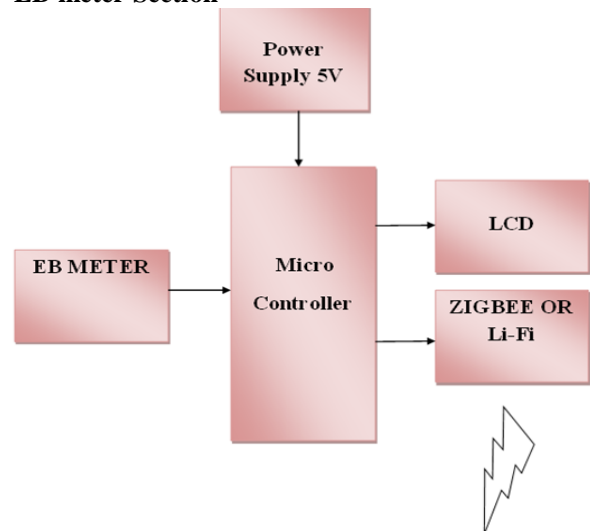


Fig 3 EB Meter section

LCD

LCD (Liquid Crystal Display) screen is an electronic display spacecraft and find a wide previewof

applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are like over seven portions and other multi segment LEDs.

B. EB Office Section

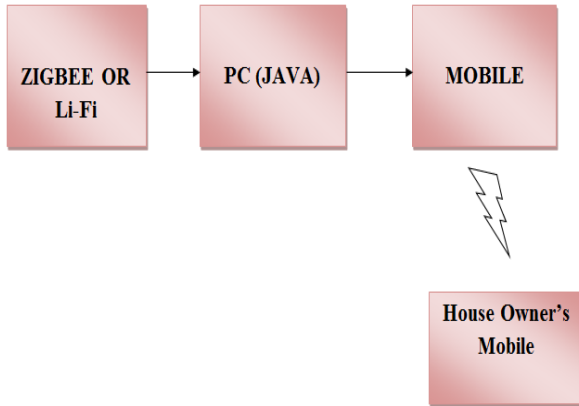


Fig 4 EB Office section

Li-Fi Technology

Transfer of data from one place to another is one of the most important day-to-day activities. The actual wireless networks that connect us to the internet are very slow when treble devices are connected. As the number of devices that access the internet increases, the fixed bandwidth available makes it more and more difficult to enjoy high data transfer rates and connect to a secure network.



Fig 5 LiFi technology

The discuss about Figure 5LiFi stands for Light-Fidelity. Li-Fi profession, proposed by the German physicist Herald Haas, surfeit transmission of data through illumination by sending data through an LED light bulb that varies in intensity faster than the human eye can follow. This paper focuses on developing a Li-Fi based system and analyzes its performance with respect to existing technology. Wi-Fi is great for general wireless coverage within buildings, whereas Li-Fi is ideal for high density wireless data coverage in confined area and for relieving radio interference issues. Li-Fi provides

better bandwidth, efficiency, availability and security than Wi-Fi and has already achieved

Advantages of LI-FI

1. Li-Fi can solve problems related to the insufficiency of radio frequency bandwidth because this technology Uses Visible light spectrum that has still not been greatly utilized.
2. High data transmission rates of up to 10Gbps can be achieved.
3. Since light cannot permeate walls, it surfeits privacy and security that Wi-Fi artillery.
4. Li-Fi has low implementation and maintenance costs.
- 5.It is safe for humans since light, unlike radiofrequencies, cannot penetrate human body. Hence, concerns of cell Mutations are mitigated.

Limitations of LI-FI

1. Only works if there is direct line of sight (LOS) between the transmitter and receiver.
2. Data transmittal can be easily chokedby opaque hurdle.
3. The use of very high frequencies (400-800THz) limits it to vey short distances and point to point communications only.

Applications of LI-FI

1. Healthcare sector
2. Road Safety and Traffic Management
3. Smart Lighting
4. Aviation
5. Underwater Communication

V.RESULT

1.User Registration

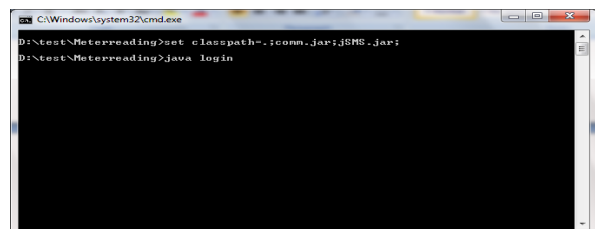


Fig 6 User Registration

The discuss about Figure 5 Register with the Server. So user has to give User Name, Password, Address, Mobile number and other details.

User Login



Fig 7 User Login

The Discuss about Figure 7 Login module mobile user can login by their User Id and password and make request for their home, office or firm electric bill details. This request will send to the central server mobile and collect data from it and response to the end user.

2. EB Server

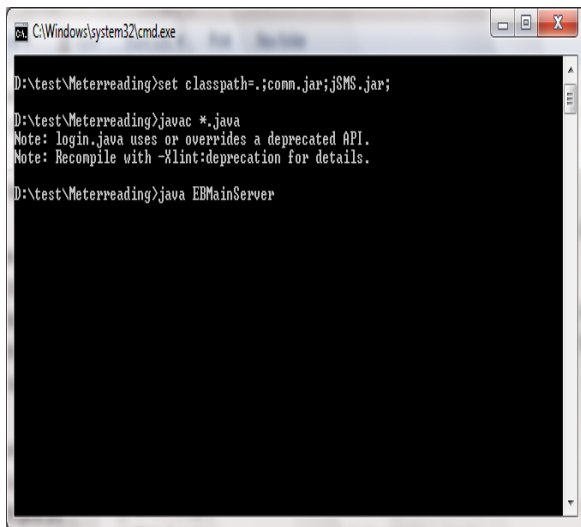


Fig 8 EB Server

The Discuss about Figure 8 Main EB Server all the details of the user are stored. Zigbee boards are connected with the RS 232 Serial Port of the EB Server. Real-time time Mobile phone is connected with the EB Server for sending SMS to the customers regarding the amount information. This server will have the entire data of all the customers' information.

3. Wireless Communication

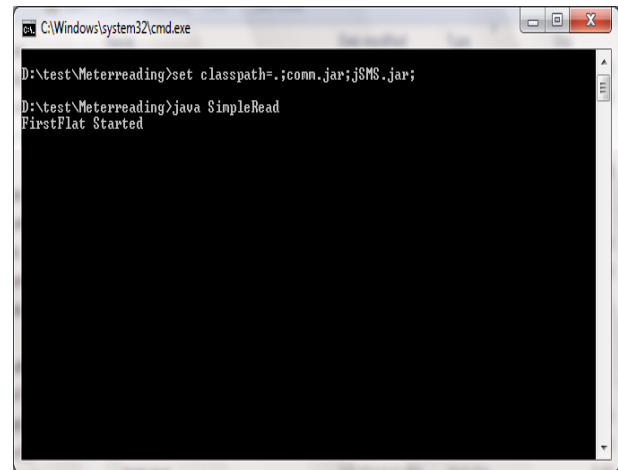


Fig 9 Wireless Communication

The discuss about Figure 9 We use two process of Wireless communication in this project. First part is proceeds using Zigbee between the EB Server and with the House where EB Meter is connected. Zigbee supports Mesh & Star Topology. In order to avoid EB person to come home and take the reading we use automatic Meter Reading through Zigbee. Second part of Wireless communication is sending Alert SMS to the User Mobile number.

4. SMS Alert



Fig 10 SMS alert

The discuss about Figure 10 SMS mobile module provides electric bill reading details of house, firm or office meters to the mobile user through SMS directly which has requested by the mobile user.

5. Auto Payment System

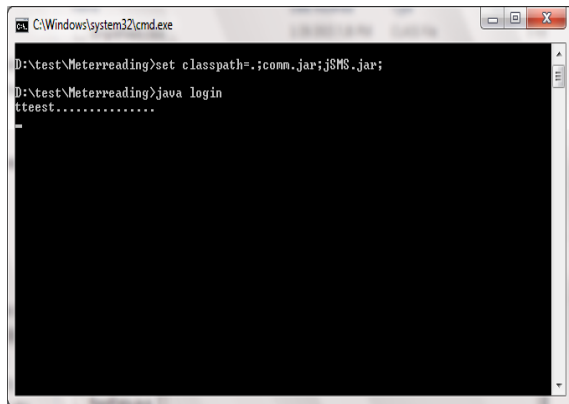


Fig 11 Auto payment System

The Discuss about Figure 11 User once receives the SMS alert regarding the payment; user can give the payment through online itself. So that this process reduces customers going directly standing in the queue to pay money.

VII.CONCLUSION

The proposed AMR system, which incorporates LiFi module in a Raspberry Pi, has been successfully implemented. The Raspberry Pi / OIC Micro controller is used in this Project. The use of the LiFi module made the wireless transmission of the meter data possible. The transmitted data were received by the Server LiFi and were convert Meter Reading to amount that was utilized so data, specifically the voltage consumption, can be accessed by consumer through SMS alert.

Blind People can read their incoming through voice output. And also they can identify the phone number. They can identify the incoming phone number through voice output. Identify the current location when they travel to different place through voice output of every two minutes. The blind people can also access the smart phone through my application. Missed call cannot able to define by blind people. Unread SMS cannot able to define and read. Satellite breakage happen means they cannot able to find the location.

In the traditional electro-mechanical meters, still widely used today, are prone to drift over temperature and time. EB Person has to come home and take the Meter Readings manually. GSM network is used to detect the EB Meter Readings and Automatic SMS Alert is send to the Customer.LiFi technology is also used in not reachable tower areas also.

REFERENCES

- 1) Automatic electric meter reading system: A cost-feasible alternative approach in meter reading for Bangladesh Perspective using low-cost digital wattmeter and WiMax technology," W.L. Sunshine, (no date). Pros and cons of smart Meters [On lin e]. Available: <http://energy.about.com/od/metering/a/Pros-AndCons-Of-Smart-Meters.htm>
- 2) T. Ahmed et a, "Automatic electric meter reading system: A cost-feasible alternative approach in meter reading for Bangladesh perspective using low-cost digital wattmeter and WiMax technology," M.S. thesis, Dept. Comp. Science, American International University, Dhaka, Bangladesh, 2010.
- 3) L. Quan-Xi and L. Gang, "Design of remote automatic meter reading system based on ZigBee and GPRS," in Third futernational Symposium on Computer Science and Computational Technology, P. R China, 2010, pp. 186 -189.
- 4) T. Tamarkin, "Automatic Meter Reading,"Public Power, vol. 50, no. 5, Sept.-Oct. 2002.
- 5) T. Jamil, "Design and implementation of a wireless automatic meter reading system," presented at World Congress on Engineering, London, United Kingdom, 2008.
- 6) C. Dayao. (2010, July 25). The high cost of electricity [Online]. Available: <http://www.thepoc.net/commentaries/8970-Th e-h ighcost-of-electricity .html>.
- 7) "FAQs." Internet: <http://www.raspberrypi.org/faqs>, nd [March 18,2013].
- 8) B. Regassa et al. "Upgrading of Traditional Electric Meter futo Wireless Electric Meter Using ZigBee Technology." "M.A. Thesis, EscuelaTecnica Superior de fugenieriafufornitica, Spain, nd.
- 9) T. Andersen. "Technical and economical aspects of remote data transmission ways for smart metering." M.A. Thesis, Chalmers University of Technology, Germany, 2009.
- 10) F. Aalamifar. "Viabilityofpwerline communication for smart grid realization." M.A. Thesis, Queen's University, Canada, 2012.