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A Review on: Live Electricity Meter Monitoring with Theft Detection System

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Abstract: ***This research mainly focuses on the measurement of electricity consumption and providing data for billing and a system for payment without human power. In this paper, we present a simple design for Automatic Electric Meter reading (AMR) with the help of Zigbee communication technology. By this technology we can communicate at faster rate without any data loss and it provides high security in serial communication. In this system the energy is measured in units and the data is fed to a server where a software solution is provided to generate bill for electricity consumed. The theft detection system which can detect temper as soon as it finds any unusual vibrations in it. Theft Detection Algorithms such as LTL (Linear Temporal Logic), CTL (Computation Tree Logic) are used in theft detection system.***
Keywords: Zigbee, AMR. LTL, CTL.

I. INTRODUCTION

Advanced Electric Meter using ZigBee is a technique of reading and processing data automatically. The energy meter reading is a difficult job where the meter reader has to travel on foot and take the readings from each consumer manually to generate the bill. Also this method of collecting data becomes problematic and costly when readings have to be collected from vast and often scattered rural areas. For households at the top of huge buildings, individual housing plots etc. the traditional meter reading process is inefficient. There are chances for missing the bills, absence of consumer etc. Automating this manual system not only may relieve reading person's labor intensity, reduce the reading mistake, but also has the advantage of high speed and good real-time, with the project of the wireless Energy Meter reading for wireless communication technology, complete the design of smart Energy Meter reading system. Through researching the characteristic of main wireless communication protocol, ZigBee is chosen as lower layer communication protocol. With these applications, the standard is optimized for data rate, low power consumption, security and reliability. Here describes the functional requirements to solve the technical issues related to the market applications [2].

In Maharashtra, there are more than crore meters for electricity that are read every month, at a cost in salaries, transportation and other expenses that tops Rs. 3848.4 crore. Current meter reading system is still dependent on the person who goes to the customer's place and take picture of the reading of meter with the help of camera or mobile, a newer technology i.e. an automatic meter reading system would eliminate even the need of the person who is required for taking the picture of the reading [21].

Today there has been a rapid growth in the wireless networking which is based on high speed communications and relatively long range applications like IEEE 802.11 wireless local area network (WLAN) standards. For such wireless applications we prefer to have lower data rates, longer battery life and less complexity than those existing earlier such as Bluetooth, Wi-Fi, GPRS and GSM etc. Hence we move on to a new standard IEEE 802.15.4 which is called as ZigBee. ZigBee used for wide development of long battery life devices in wireless control and monitoring applications. The energy meter delivers the reading details to the central office through the ZigBee as and when it is demanded by the controller which is installed along with the meter. By identifying the consumer's number, the communication channel and thereby the information regarding energy consumption of each individual consumer can be noticed. Thus the central office can verify the energy meters performance as and when required. This will also help to avoid any misuse or break down of energy meter [5]. Advanced Electric Meter is a sophisticated communication link directly from the meters to the central office computers that will also speed locating service interruptions, faulty meters and service theft, as well as allowing for expanded services, such as flexible billing dates, time-of-use rates and prepaid accounts. Meters could also be turned on or off directly from the office rather than having to send out an employee to do it manually [8]. In this, wireless automatic meter reading technology saves human resources and also improve the accuracy and real time of the meter, enabling management sector to access to data messages timely and accurately. Material resources, so investment is considerably economical. Wireless communication links can be quickly built, engineering cycle significantly shortened, and has better scalability compared to a wire-line system. In case of any error or fault we only need to check wireless data module and restore the system back to normal operation.

A. Current Manual System

There are many problems in manual meter reading system such as time to reach the site. Places such as villages and hilly areas are difficult to reach and take the reading. Meter which are placed inside the houses of the consumers are also difficult to access. Clarity of the camera is also an issue, photos which are clicked by the cameras are not very clear, which are prone to errors and hence the bills generated gets affected. Manual meter reading system does not have proper theft detection system i.e. it completely depends on the loyalty of the reader who visits the site to take the reading. And in case if the tamper is reported, time to take the action against it will be delayed. A payment which has to be paid to the reader's is an extra expense. This project is overcoming all the issues which are present in the current manual system.

B. Proposed System

A device which remotely obtain meter readings and transmits this data to the system's computer via communication media such as phone lines, power lines, GSM. Automatic Meter Reading system can detect remotely connect and disconnect the electricity supply from the meter and it can also detects tampering. Economic benefits include increased cash flow, lower labour and equipment cost, increased accuracy and lower costs. Some customer satisfaction benefits include improved service quality and faster response time. A typical Automatic Meter Reading System can be explained by the following block diagram.

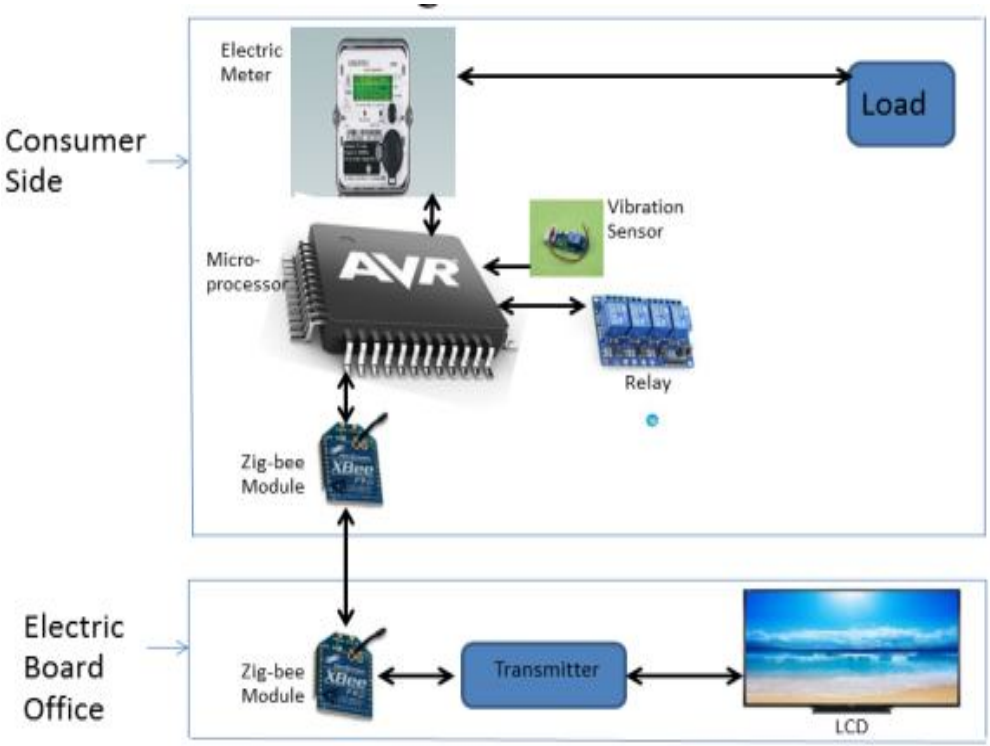
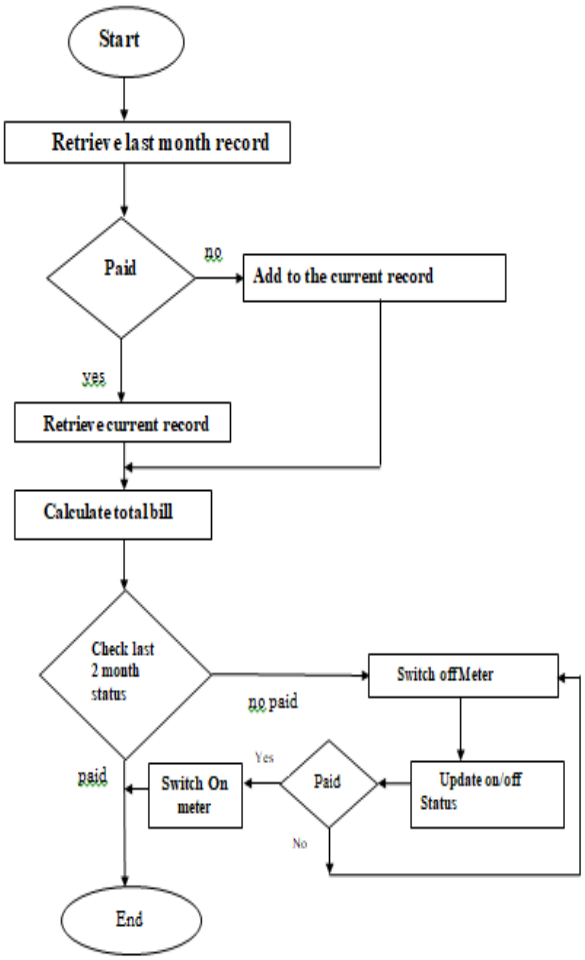


Fig 1: Block Diagram of AMR system.

Relay switch is used to connect or disconnect the power supply of an electric meter. A relay switch is used to switch the states form ON to OFF & vice versa. At normal conditions the power remains ON and a load is connected to supply meters and consumes the energy. But when tamper is detected or if someone fails to pay bill within time then in such case an operator from base station generates a command to disconnect the line. For disconnecting the relay switch one LED light glow which generates and light energy. And this light energy completes the circuit for MCT2E on chip transistor; the output of this transistor is connected to the base of second transistor. When a base voltage is generated and emitter is connected to ground then the collector pin produces output and a relay changes its state from normally close to normally open. Then a magnet activates and the arm of relay goes down.
When the bills are fully paid or the problem is solved at the tampering end the again a signal is generated by the base station and it deactivates the LED supply. When there is no light source then MCT2E transistor becomes off and the second transistor stops to produce a voltage at its collector pin and in turns the electromagnet of relay de- energizes and the arm of relay goes to upward position and a power line is connected to energy meter. Tamper detection circuit is made of a transducer circuit which senses the

physical such as vibration and converts those signals into voltage. A piezo electric transducer is generally used for vibration detection. In this model, ZigBee based meter demonstrate how to replace old traditional meters. This new model eliminates the difficulties which are present in current system like saving of money and labour resources. The data is secured due to its unique ID technique. Zigbee based meter have additional feature which can connects and disconnects the power line from server. One of the advance technique used in this model is tamper detection and control system.

C. Flow chart



D. Algorithm

BEGIN
Select a Zigbee Network Interface and Start capturing of packets
Check for type of packet
If packet=Data
then If SYN=1 and No. of packets> threshold then
Else if (source Port, Destination Port, Flags, TTL, total length, checksum) = invalid then
Else if Packet= data
If (source port, Destination Port, checksum, length) = Else if Packet=LNAD
If (Source post=Destination post)= data received
END

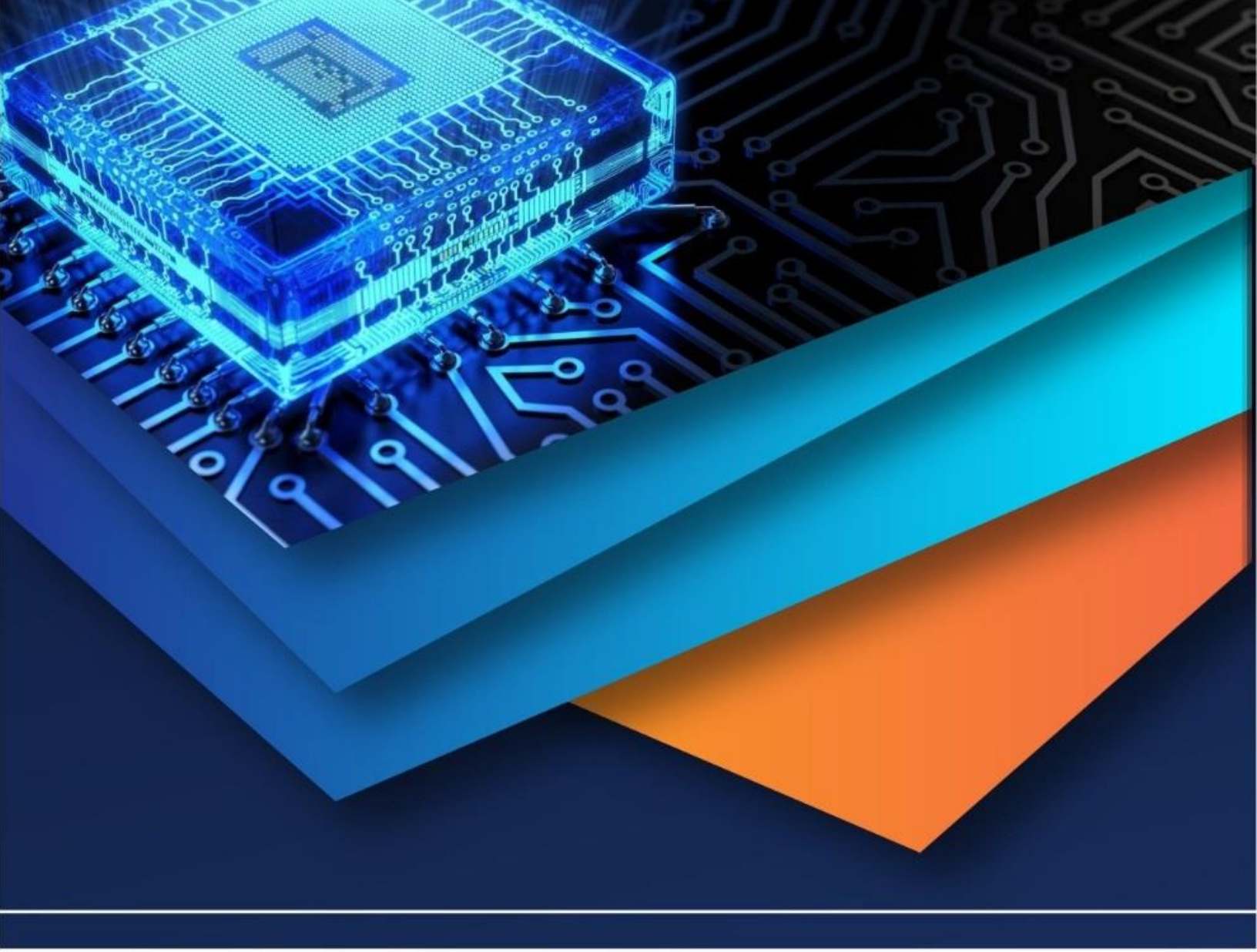
Sometimes we have to serialize objects, e.g. to send them over a network, store and restore them locally or for any other reason. If we know how to restore the objects by reversing the serialization of object. Especially if you have objects which have internal states or if you must manage multiple instances of a class. A possible solution to this problem is using the System.

II. CONCLUSION

Automatic Meter Reading (AMR) is a proper solution for overcoming all the drawbacks of the existing electric meter reading system. All the errors which are commonly occurs in existing system are eliminated in the proposed system. Errors such as blurred or unclear image of meter, transportation cost of the person who takes reading every month and also the chances of stealing or doing any illegal activity to get less bill are overcome with theft detection part of our system. Standalone AMR system is most suitable to implement transfer of reading timely. Economic benefits include lower labor and equipment cost, increased accuracy. And some customer satisfaction benefits include improved service quality and faster response time.

REFERENCES

[1] Muhammad Saad, Muhammad Faraz Tariq, Amna Nawaz, Muhammad Yasir Jamal "Theft Detection Based GSM Prepaid Electricity System", National University of Sciences and Technology, Islamabad, Pakistan and University of Engineering and Technology, Lahore, Pakistan, IEEE 3rd International Conference on Control Science and Systems Engineering 2017.
[2] Pramod Ashtankar, Akshay Damahe, Akshay Maske, Arati Admane, department of Electronics & Telecommunication NIT Nagpur India(Reserch Article)2017.
[3] Nitesh Rawat, Bhuvesh Yadav, Sonia Rana, Neha Yadav, "A Review Paper on Automatic Energy Meter Reading System" , Dronacharya College of Engineering, Gurgaon, India, International Conference on Computing for Sustainable Global Development 2016.
[4] V.Preethi, G,Harish, "Design And Implementation of Smart Energy Meter", Vignan's Lara Institute of Technology and Science Vadlamudi, Guntur, A.P., IEEE 2016.
[5] Sreelakshmi Ravari Veettil1, Nibin Thomas, "Automatic Energy Meter Reading System Using Zigbee and GSM", Vedavyasa Institute of Technology,Malappuram, Kerala, India , April 2015 International Journal of Engineering Science and Computing.
[6] Sanujit Sahoo, Daniel Nikovski, Toru Muso and Kaoru Tsuru, "Electricity Theft Detection Using Smart Meter Data", 2015 IEEE.
[7] R. Dhananjayan, E. Shanthi, "Smart Energy Meter with Instant Billing and Payment", Bannari Amman Institute of Technology, Sathyamangalam, India, 2014 International Journal of Innovative Research in Computer and Communication Engineering
[8] Chaitali Khisti , Bhagyashri Kene, Shantanu Kene," Automatic Electrical Meter Reading System and Remote Monitoring Using Zigbee", International Journal of Electrical, Electronics and Computer Systems, 2014
[9] http://stopsmartmeters.org
[10] https://plotwatt.com
[11] V. Chadwick, C. Butt, and H. Cook, "Smart meter data shared far and wide," The Age, Docklands, VIC, Australia, Sep. 2012. [Online].
[12] Corral, P. Coronado, B., de Castro Lima, A.C.; Ludwig, O, "Design of Automatic Meter Reading based on Zigbee", Miguel Hernandez Univ., Elche, Spain, Latin America Transactions, IEEE (Revista IEEE America Latina),PP.1150-1155,Jan-2012.
[13] W. Yang et al., "Minimizing private data disclosures in the smart grid," in Proc. ACM Conf. Comput. Commun. Security (CCS), Raleigh, NC,USA, 201
[14] S. McLaughlin, P. McDaniel, and W. Aiello, "Protecting consumer privacy from electric load monitoring," in Proc. 18th ACM Conf. Computer Communication. Security (CCS), Chicago, USA, 2011
[15] A. Molina-Markham, P. Shenoy, K. Fu, E. Cecchet, and D. Irwin, "Private memoirs of a smart meter," in Proc. 2nd ACM Workshop Embedded Sens. Syst. Energy-Efficien. Build. (BuildSys), Zurich, Switzerland, 2010
[16] P. McDaniel and S. McLaughlin, "Security and privacy challenges in the smart grid," IEEE Security Privacy, vol. 7, May/Jun. 2009
[17] Shang-Wen Luan Jen-HaoTeng Shun-Yu Chan* Lain-ChyrHwang ,**"**Development of a Smart Power Meter for AMI Based on ZigBee Communication", Department of EnergyalEngineering,I-Shou University, Kaohsiung, Taiwan, 2009
[18] YujunBao and Xiaoyan Jiang, "Design of electric Energy Meter for long-distance data information transfers which based upon GPRS", ISA 2009. International Workshop on Intelligent Systems and Applications, 2009.
[19] H.G.RodneyTan,C.H. Lee,V.H.Mok," Automatic power meter reading system using GSM network", The 8Conference (IPEC 2007). International Power Engineering
[20] B. S. Koay, S. S. Cheah, Y. H. Sng, P. H. J. Chong, P. Shum, Y. C. Tong, X.Y. Wang, Y.X. Zuo and H. W. Kuek," Design and Implementation of Bluetooth Energy Meter", Network Technology Research Centre, School of Electronics & Electrical Engineering,Nanyang Technological University, ICICS-PCM 200
[21] Vivek Kumar Sehgal,Nitesh Panda, Nipun Rai Handa, "Electronic Energy Meter with instant billing",UKSim Fourth European Modelling Symposium on Computer Modelling and Simulatio
[22] Prof. Mangesh Shelke, Shilkesha Nitnaware, Anuradha Goradwar, "Smart Live Electricity Meter with data intelligence for power system Calculation with tempering proof", International Journal of Research In Science & Engineering, Volume: 2 Issue:
[23] P. Kadurek, J.Blom, J.F.G. Cobben, W.L. Kling," Theft detection and smart metering practices and expectations in the Netherlands
[24] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3946478



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