International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395 -0056
Volume: 04 Issue: 06 | June -2017 www.irjet.net p-ISSN: 2395-0072

IOT Based Smart Power Management System Using WSN

Pallavi Ravindra Joshi[1], Prof. M S khan[2]

[1]*M. E Student, Department of ECE, G S Mandal's MIT COE, Aurangabad, Maharastra, India*

[2]*Associate Professor, Department of ECE, G S Mandal's MIT COE, Aurangabad, Maharastra, India*

Abstract – *In this paper, we have reported an effective implementation for Internet of Things used for monitoring home appliances. we presents wireless sensor networks based real time power management system to control and monitor the power consumption of electrical appliances in a home. Current sensor and voltage sensor is placed at electrical load to sense the current and voltage , it calculates the power consumption of electrical appliances. This data will be transmitted wirelessly using Zigbee protocol to the Ethernet shield. The transmitted data is monitored and controlled remotely using IOT. This enables user to have flexible control mechanism remotely through a secured internet web connection. This system helps the user to control the electric appliances automatically, manually and remotely using smart phone or personal computer.. This system is very efficient, cheaper and flexible in operation and thus can save electricity expense of the consumers.*

***Key Words*: IOT,Energy management, home automation, wireless sensor network, ZigBee, Ethernet Shield.**

1. INTRODUCTION

Electric energy is the main source for the development and advancement in this technological world . The technology develops the power requirement and day by day power demand is increasing . These power demands occur in both domestic and industrial sectors. According to the recent Annual Energy report it is observed that residential electricity demand is forecasted to increase by 24% within the following several decades, while the global electricity consumption trend is also reported to be increasing continuously . Electric Energy demand is increasing and the fossil fules are diminishing due to rising consumption of energy. Moreover, the mismatch between demand and supply and lack of automation and monitoring tools have already caused major blackouts worldwide As we have seen that more and more home appliances and consumer electronics are installed, residential energy consumption tends to grow very rapidly.

In recent years internet technologies and WSN are expanding rapidly. Hence home environment has seen a rapid introduction of network enabled digital technology which offers new and exciting opportunities to enhance the connectivity of devices within the home for purpose of home automation. For reducing the energy consumption wireless sensor networks (WSNs)is widely re commanded for environmental monitoring, health monitoring and industrial monitoring . WSNs are also highly flexible. Wireless sensor network (WSN) supports power management using Web services and middleware technologies.

This system is designed by the integration of WSNs with Web Service communications to acknowledge the power management and provide information services using IOT platform. Energy information is collected from various wireless devices which operates with different communication standards. This is very essential as there is various communication standards developed for WSNs including ZigBee .The demand of WSNs are increasing rapidly in the hoses for energy controlling services . With the help of WSN household appliances are monitored and controlled by in the home. With the advancement in information technology provide sensors, metering, transmission, Distribution, and electricity storage technology, as well as providing new information and flexibility to all consumers and providers of electricity.

2. LITERATURE SURVEY

Guangming Song and Aiguo Song presents the design and implementation of a home monitoring system based on hybrid sensor networks. The system follows a three-layer architecture which combines hybrid-node networking with web access. An enhanced sensor node has been designed and fabricated to add controlled mobility to wireless sensor networks. The mobile node is capable of simple planar motions and is easy to be controlled through different user interfaces. A test bed including the static nodes as well as the mobile node has also been created for validating the basic functions of the proposed hybrid sensor network system. Network repair and event tracking capabilities of the mobile sensor node were tested. Stability of the proposed system in longtime home monitoring tasks was also verified.

Meng-Shiuan Pan and Lun-Wu Yeh proposed a WSN-based intelligent light control system for indoor environments. Wireless sensors are responsible for measuring current illuminations. Two kinds of lighting devices, namely, whole lighting and local lighting devices, are used to provide background and concentrated illuminations, respectively. Users may have various illumination requirements according to their activities and profiles. An illumination requirement is as the combination of background and concentrated illumination demands and users locations. We consider two

requirement models, namely, binary satisfaction and continuous satisfaction models, and propose two decision algorithms to determine the proper illuminations of devices and to achieve the desired optimization goals. Then, a closed-loop device control algorithm is applied to adjust the illumination levels of lighting devices. The prototyping results verify that our ideas are practical and feasible.

Khusvinder Gill and Shuang-Hua proposed A ZigBee Based Home Automation System This technology offers new and exciting opportunities to increase the connectivity of devices within the home for the purpose of home automation. Moreover, with the rapid expansion of the Internet, there is the added potential for the remote control and monitoring of such network enabled devices. However, the adoption of home automation systems has been slow. This paper identifies the reasons for this slow adoption and Evaluates the potential of ZigBee for addressing these problems through the design and implementation of a flexible home automation architecture. A ZigBee based home automation system and Wi-Fi network are integrated through a common home gateway. The home gateway provides network interoperability, a simple and flexible user interface, and remote access to the system. A dedicated virtual home is implemented to cater for the system's security and safety needs. To demonstrate the feasibility and effectiveness of the proposed system, four devices, a light switch, radiator valve, safety sensor and ZigBee remote control have been developed and evaluated with the home automation system.

Dae-Man Han and Jae-Hyun Lim introduced the home energy control system design that provides intelligent services for users and demonstrate its implementation using a real testbed. This paper designs smart home device descriptions and standard practices for demand response and load management "Smart Energy" applications needed in a smart energy based residential or light commercial environment. The control application domains included in this initial version are sensing device control, pricing and demand response and load control applications. This paper introduces smart home interfaces and device definitions to allow interoperability among ZigBee devices produced by various manufacturers of electrical equipment, meters, and smart energy enabling products.

Francesco Benzi and Lucia Frosini reported electricity Smart Meters Interfacing the Households. They addresses this topic by proposing the definition of a local interface for smart meters, by looking at the actual European Union and international regulations, at the technological solutions available on the market, and at those implemented in different countries, and, finally, by proposing specific architectures for a proper consumer-oriented implementation of a smart meter network.

Pedro Cheong and Ka-Fai Chang describes a ZigBee-based wireless sensor network node for the ultraviolet (UV) detection of flame. The sensor node is composed of a ZnSSe UV photodetector, a current-sensitive front end including a high-gain current-to-voltage amplifier with 120 dB and a logarithm converter, and a transceiver operated at a 2.4-GHz industrial, scientific, and medical band. A passive photodetector is designed to have a cutoff at 360 nm and convert the UV emission of flame into picoamperes. Including mixed signal processing and ZigBee transmission, the speed of flame detection is as fast as 70 ms. The sensor node consumes only an average of 2.3 mW from a 3.3-V supply. The performance of a prototype sensor node was verified when the luminous flame was imaged onto the sensor node with different angles ranging from −30◦to 30◦and distances of 0.1, 0.2, and 0.3 m enabling effectivefire safety applications.

Melike Erol-Kantarci and Hussein T. Mouftah reported Wireless Sensor Networks for Cost-EfficientResidential Energy Management in the Smart Grid. The performance of in home energy management (iHEM)is compared with an optimization-based residential energy management (OREM) scheme whose objective is to minimize the energy expenses of the consumers. It shows that iHEM decreases energy expenses, reduces the contribution of the consumers to the peak load, reduces the carbon emissions of the household, and its savings are close to OREM. On the other hand, iHEM application is more flexible as it allows communication between the controller and the consumer utilizing the wireless sensor home area network (WSHAN). This paper evaluate the performance of iHEM under the presence of local energy generation capability, prioritized appliances, and for real-time pricing. We show that iHEM reduces the expenses of the consumers for each case. Furthermore, we show that packet delivery ratio, delay, and jitter of the WSHAN improve as the packet size of the monitoring applications, that also utilize the WSHAN, decreases.

Sean Dieter Tebje Kelly, Nagender Kumar Suryadevara, and Subhas Chandra Mukhopadhyay reported an effective implementation for Internet of Things used for monitoring regulardomestic conditions by means of low cost ubiquitous sensing system. The description about the integrated network architecture and the interconnecting mechanisms for the reliable measurement of parameters by smart sensors and transmission of data via internet is being presented. The longitudinal learning system was able to provide a self-control mechanism for better operation of the devices in monitoring stage. The framework of the monitoring system is based on a combination of pervasive distributed sensing units, information system for data aggregation, and reasoning and context awareness. Results are encouraging as the reliability of sensing information transmission through the proposed integrated network architecture is 97%.

3. PROPOSED SYSTEM

Current sensor and voltage sensor are interfaced to the home appliances for measuring electrical parameters of the appliances. Power consumed by each device is calculated

using measured current and voltage.The details of the design and development of the proposed system is provided in the following sections. Fig3.1 and Fig 3.2 describes the functional description of developed system. Zigbee module is used to transmit the electrical parameters data wirelessly, which is collected from the sensor modules. The zigbee transmitter are interfaced with various sensing devices and reliable data reception at a receiver side of zigbee module. The zigbee receiver has been interfaced through the Serial port of the Ethernet Shield. The collected data from Ethernet shield have been sent to LAN by using Wi-Fi Router. The home appliances can be monitored and controlled remotely. The controlling operation is performed in three ways. Those are manual controlling, automatic controlling and Remote controlling.

1) Automatic control: In automatic control appliances can be controlled with the help of smart software based on the electricity tariff conditions .In this mode user can save electricity by auto switch of appliances after predefined usage of electricity.

2) Manual control: An on/off switch is provided directly to the devices. In this mode user can manually operates the appliances without following automatic control .Manual control is very flexible.

3) Remote Control: In remote conrol user can interact with the appliances remotely with smart phone or personal computer using secured internet web connection. User can operates devices when he is away from home. This feature also reduces manual efforts and time by controlling all devices from one place.

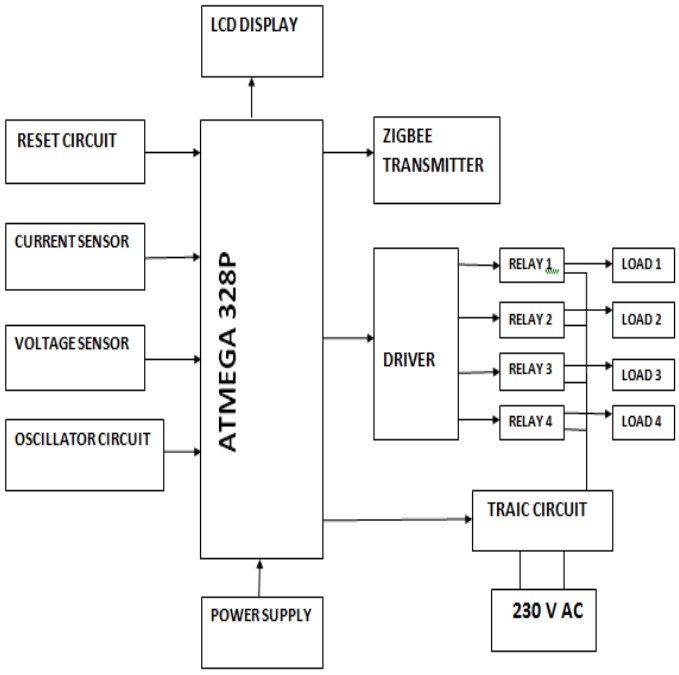

Fig 3.1: Transmitter Section of Smart Power Management System

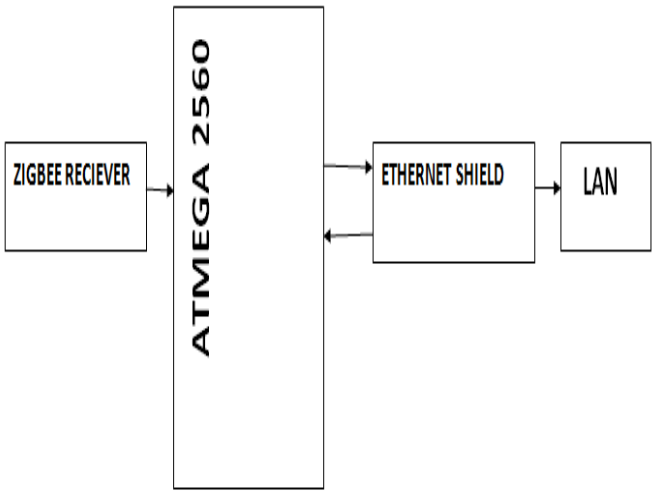

Fig 3.2: Receiver Section of Smart Power Management System

3.1 ETHERNET SHIELD

The Ethernet Shield is an Arduino-compatible expansion board ("shield") that gives your Arduino the ability to communicate as either a client or a server on an Ethernet network.

3.2 ZIGBEE MODULE

A transmission protocol is used to transmit the collected data wirelessly. To transmit the data, it should posses low power consumption, and consists of more number of devices in the network and provides large range communication. Zigbee is an 802.15.4 standard WPAN protocol which transmits the data to the distance of 100m. It consumes less power and it can be operated at three different band of frequencies (2.4GHz, 915MHz, 868MHz).A zigbee network consists of a coordinator and end devices. It supports maximum 65,000 devices in a Zigbee network. Its data rate is 256 kbps. Generally it is suitable for sensing and controlling applications. In the Zigbee network end devices are the sensor nodes which communicate wirelessly with the coordinator in the form of mesh topology.

3.3 ROUTER

Router is interfaced with RJ45 Jack controller. It is a networking device which forwards the data packets between computer networks. Routers perform the "traffic directing" functions on the Internet. A data packet is typically forwarded from one router to another through the networks that constitute the inter-network until it reaches its destination node.

3.4 ATMEGA 328

The ATmega 328 is a single chip microcontroller created by Atmel in the mega AVR family. It is commonly used in projects and autonomous systems where a simple ,low powered, low cost microcontroller is needed. perhaps yhe most common implementation of this chip is he popular aurduino development platform.

3.5 CURRENT SENSOR

Current sensor is a device that detects electric current in a wire and generates a signal proportional to it. Here we are using 1000:1 current transformer. It has high saturation point, high quality of temperature stability, high withstand of voltage range.

4. CONCLUSION

An IOT based smart power management system has been developed .This system monitors and controls the power consumption of home appliances automatically, manually, and remotely by using wireless network. The system is easy to design and consume less power, and provides at low cost with portable size. Thus, the real-time monitoring of the electrical appliances can be viewed through a website. In future the system can be extended for monitoring the whole institute, schools, colleges, companies etc.

5. REFERANCES

1. G. Song, Z. Wei, W. Zhang, and A. Song, "A hybrid sensor network system for home monitoring applications," IEEE Trans. Consumer Electron.,vol. 53, no. 4, pp. 1434–1439, Nov. 2007.
2. M. S. Pan, L. W. Yeh, Y. A. Chen, Y. H. Lin, and Y. C. Tseng, "A WSN based Intelligent light control system considering user activities and profiles," IEEE Sensors J., vol. 8, no. 10, pp. 1710–1721, Oct. 2008.
3. K. Gill, S. H. Yang, F. Yao, and X. Lu, "A zigbee-based home automation system," IEEE Trans. Consumer Electron., vol. 55, no. 2, pp. 422–430,May 2009M.
4. D. Man Han and J. Hyun Lim, "Smart home energy management system Using IEEE 802.15.4 and zigbee," IEEE Trans. Consumer Electron., vol. 56, no. 3, pp. 1403–1410, Aug. 2010.
5. F. Benzi, N. Anglani, E. Bassi, and L. Frosini, "Electricity smart meters interfacing the households," IEEE Trans. Ind. Electron., vol. 58, no. 10,pp. 4487–4494, Oct. 2011.
6. P. Cheong, K.-F. Chang, Y.-H. Lai, S.-K. Ho, I.-K. Sou, and K.-W. Tam,"A zigbee-based wireless sensor network node for ultraviolet detection of flame," IEEE Trans. Ind. Electron., vol. 58, no. 11, pp. 5271–5277, Nov.2011.
7. Erol-Kantarci and H. T. Mouftah, "Wireless sensor networks for cost efficient residential energy management in the smart grid," IEEE Trans. Smart Grid, vol. 2, no. 2, pp. 314–325, Jun. 2011
8. Nagender Kumar Suryadevara, Subhas Chandra Mukhopadhyay, Sean Dieter Tebje Kelly, and Satinder Pal Singh Gill „WSN-Based Smart Sensors and Actuator for Power Management in Intelligent Buildings" 1083-4435, 2014 IEEE.

BIOGRAPHIES

Ms. Pallavi Ravindra Joshi is ME final year student of ECE department of of G S Mandal's MIT COE Aurangabad, Maharashtra ,India.

Prof. MR. M S Khan is Associate Professor at ECE department of G S Mandal's MIT COE Aurangabad, Maharashtra ,India. Area Of Specialization- Wireless Communication And Networking