IOT and WSN Based Power Management with Monitoring and Controlling Remotely in Smart Buildings

A.MANASA, S ANUSHA, J.RAMESH

Student, Department of ECE, Vaageswari College of Engineering, Karimnagar
mail2manasa.14@gmail.com
Student, Department of ECE, Vaageswari College of Engineering, Karimnagar
Sripathianushaf5@gmail.com
Assistant Professor, Department of ECE, Vaageswari College of Engineering, Karimnagar
ramesh471@gmail.com

Abstract: In this project we designed an efficient power management system with remote monitoring and controlling using IOT and Wireless Sensor Networks. Electrical parameters such as voltage ,current and Household electrical Appliances power consumption are monitored by the proposed system. By using Zigbee and Internet Of Things(IOT) electrical parameters are controlled and monitored remotely. By using Visual basic GUI application from anywhere in the world we control appliances because the system that is proposed is efficient and flexible. By using proposed prototype we get better results when compared to existing systems.

Keywords: ACS712, LPC2148, ZIGBEE, Visual basic GUI App.

I. INTRODUCTION

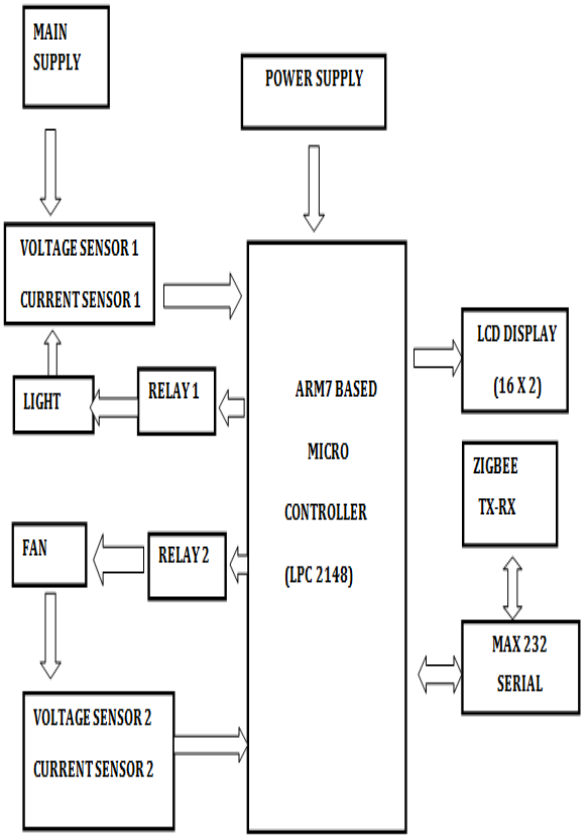
The universal wireless communication network can be utilized for the Advanced Metering Infrastructure (AMI). New wireless communication technologies are used in this project to design and implement a smart power meter based on zigbee

The full system is classified into two types that is power meter based on zigbee and the control system. Firstly, by using data acquisition module current waveforms of loads and voltage are acquired by using the ADC module of MCU it is converted into digital signal. The obtained analog data fed

to ADC of microcontroller. Power consumption calculation carried out by using digital information captured in the memory (such as Active, Reactive Power and Phase angle) and if necessary outage event recording is performed. Proposed smart power meter software and zigbee coordinator forms the control system. To establish the power consumption by using proposed control system and blackout occasion database and in addition to offer the request of force utilization information and blackout information recorded in the proposed savvy power meter which are displayed on LCD and PC. By using IOT Graphical User Interface we monitor the electrical parameters like Voltage and Current and also control electrical appliances Remotely from anywhere in the world . By using internet from anywhere we can access parameters with email this is the main advantage of our proposed system.

II. BLOCK DIAGRAM

(a) Building Monitoring Section



(b)MONITORING SECTION

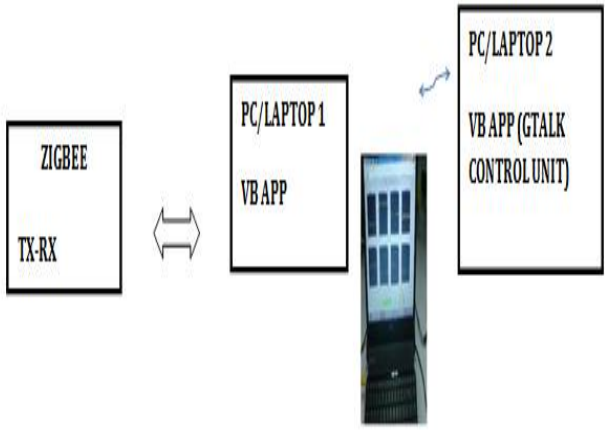


Fig1. Proposed System block diagram

III. EMBEDDED SYSTEM BLOCKS

(a)ARM7 BASED LPC 2148 MICROCONTROLLER

The Main Control Module: In this design, we choose an ARM7TDMI-S core based microcontroller called LPC2148, which is the production of NXP Semiconductors. The LPC2148 microcontroller is high-performance RISC Microcontroller of 32 bit with Thumb extensions ,it has inbuilt 512KB Flash Memory and 40KB Static RAM, because of it's 12.00MHz Crystal it can process data with the maximum high speed at 60MHz when using it with Phase-Locked Loop (PLL) internal MCU. It has Real Time Clock circuit with 32.768 KHz XTAL and Battery Backup. Support In-System Programming (ISP) and In-Application Programming (IAP) through On-Chip Boot-Loader Software via Port UART-0 (RS232), circuit to connect with standard 20 Pin JTAG ARM for Real Time Debugging. Has standard 2.0 USB as Full Speed inside, has Circuit to connect with Dot-Matrix LCD with circuit to adjust its contrast by using 16 PIN Connector. RS232 Communication Circuit by using 2 Channel. SD/MMC card connector circuit by using SSP. EEPROM interface using I2C. It has PS2 keyboard interface and general purpose I/O pins.

B. CURRENT SENSOR

The ACS712 provides economical and precise solutions for AC or DC current sensing in industrial, commercial, and communications systems. The device package allows for easy implementation by the customer. Typical applications include motor control, load detection and management, switch mode power supplies, and over current fault protection. The device is not intended for automotive applications. The device consists of a precise, low-offset, linear Hall circuit with a copper conduction path located near the surface of the die. Applied current flowing through this copper conduction path generates a magnetic field which the Hall IC converts into a proportional voltage.

Fig2. Current Sensor

C. VOLTAGE SENSOR

The *Smart Q* Voltage Sensors are used to measure the potential difference between the ends of an electrical component. This range of Voltage Sensors can be used to measure both DC and low-

voltage AC circuits. The *Smart Q* Voltage Sensors are equipped with a micro controller that greatly improves the sensor accuracy, precision and consistency of the readings. They are supplied calibrated and the stored calibration (in Volts) is automatically loaded when the Voltage Sensor is connected.

Fig3. Voltage Sensor

D. ZIGBEE

ZigBee wireless communication network has been implemented with the utilization of radio frequency modules. They operate within the ISM band at the frequency of 2.4 GHz. The receiver sensitivity is high and therefore the chance of receiving bad packets is low (about 1%). The modules ought to be provided by 3V DC supply, and then the power consumption is within the order of 50 mA.

E) GUI UNIT

Here we use Graphical user interface(GUI) to control and monitor the electrical appliances from remote location. We used Gtalk app as GUI in this project. By using Gtalk app we access the control by simply login into our Gmail account. Here in our project we used it for monitor consumption of voltage and current from remote location.

IV. RESULTS

The prototype of proposed system is shown in below figure. Here we used two different electrical appliances i.e 60W,100W bulbs to test. Whose power consumption is less than 200Wcan be used in developed system.

Fig-4: kit in operating condition gives values of voltage &current

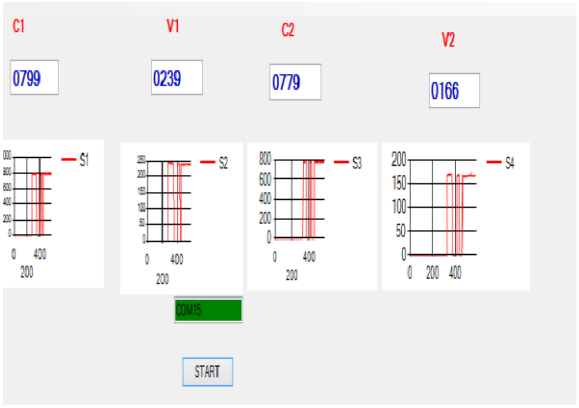


Fig-5: controlling the values and waveforms in application

Fig.4 is the Smart power monitoring and control system at the residence. Fig. 5 is Graphical user interface of smart power monitoring and control system. GUI data base stores the all values in periodic waveform. If there is any change in voltage or current we find easily and also it's possible for us to find failure of any Electrical appliances from remote location. Because of the use of IOT and Zegbee the system works effectively.

V. CONCLUSION

An efficient and smart power management and control system has been developed to improve the intelligent home automation. The proposed power management system monitors and controls effectively when compared to previous systems. By using this it's possible for us to predict the power usage of entire home and also particular device because of the powerful graphical user interface(GUI). The real-time monitoring of the electrical appliances can be viewed through GUI from Anywhere in world because of web interface. Here we used zegbee as communication medium between the sensor network and PC then there is no cabling required. It's possible for us to control the electrical appliances from remote location the power consumption is minimized by providing periodic alerts. It's possible to extend to hole building and manage effectively.

VI. REFERENCES

[1] Nagender Kumar Suryadevara, Subhas Chandra Mukhopadhyay, Tebje Kelly, and Satinder Pal Singh Gill, "WSN-Based Smart Sensors and Actuator for Power Management in Intelligent Buildings", IEEE/ASME TRANSACTIONS ON MECHATRONICS, VOL. 20, NO. 2, APRIL 2015.

[2] D. S. Ghataoura, J. E. Mitchell, and G. E.Matich, "Networking and application interface technology for wireless sensor network surveillance and monitoring," IEEE Commun. Mag., vol. 49, no. 10, pp. 90–97, Oct. 2011.

[3] 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.

[4] J. Misic and V. B. Misic, "Bridge performance in a multitier wireless network for healthcare monitoring," IEEE Wireless Commun., vol. 17, no. 1, pp. 90–95, Feb. 2010.

[5] X. P. Liu, W. Gueaieb, S. C. Mukhopadhyay, W. Warwick, and Z. Yin, "Guest editorial introduction to the focused section on wireless mechatronics, "IEEE ASME Trans. Mechatronics, vol. 17, no. 3, pp. 397–403, Jun. 2012.

[6] M. Erol-Kantarci and H. T. Mouftah, "Wireless sensor networks for costefficient residential energy management in the smart grid," IEEE Trans.Smart Grid, vol. 2, no. 2, pp. 314–325, Jun. 2011.

[7] L. Li, H. Xiaoguang, H. Jian, and H. Ketai, "Design of new architecture of AMR system in Smart Grid," in *Proc. 6th IEEE Conf. Ind. Electron.Appl.*, 2011, pp. 2025–2029.

[8] E. Andrey and J. Morelli, "Design of a smart meter techno-economic model for electric utilities in Ontario," in *Proc. IEEE-Electric PowerEnergy Conf.*, 2010, pp. 1–7.

[9] 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.