ZigBee-based energy monitoring and control system development

Mr. Shrikant Vaishnav, Dept. of Electronic & Communication Engineering
Rabindranath Tagore University, Bhopal

Abstract: - New and creative techniques have created a high standard of housing and a high standard of performance of life. The use of electronic and electric devices is part and parcel of modern lifestyle. Increases in the use of electrical and electronic equipment have, however, lead to unprecedented energy consumption rises. The cost earned by the end user subsequently remains to rise quarterly owing to the demand supply difference. As a consequence, energy consumption needs to be optimized and more energy-efficient techniques and electronic devices developed. The need has led to the growth of fresh basic and implemented energy conservation study areas. The development of sophisticated embedded surveillance and tracking systems with the capacity to properly monitor and regulate power consumption is part of those study fields that could bring important energy consumption trends so that the consumers can readily assess the power consumption of electronic appliances and optimize their utilization to increase their efficiency in energy consumption.

Keyword: - Energy consumption, Surveillance, Embedded, Efficiency

- **Introduction: -**

  Energy surveillance is vital to understand consumption factors within a construction and to adopt adequate energy saving steps. Construction energy monitoring and efforts on control can generally be divided into two broad categories: hardware and software. Hardware and software-based technologies merge the inputs of our suggested scheme. Firstly, our scheme adapts both traditional building energy meters and climate detectors to wireless and embedded data transmission and governance, enabling the compilation and control of multiple kinds of measures reflecting energy consumption and

construction climate position. Secondly, web-based leadership software extends this scheme further.

- **System Architecture: -**

  As shown in The Gateways, the Client is also referred to as the ZBEMCS[1], and it is intended to connect sensor nodes to an existing Ethernet Network[2], [3]. A link between the sensor nodes and the entrance is provided by the base station. Sensors track, regulate and transfer information to the base station to monitor energy use of electrical equipment.

  The ground station is the surveillance and command center for all branch systems and the internal messaging hub and customer device; its primary tasks are to:

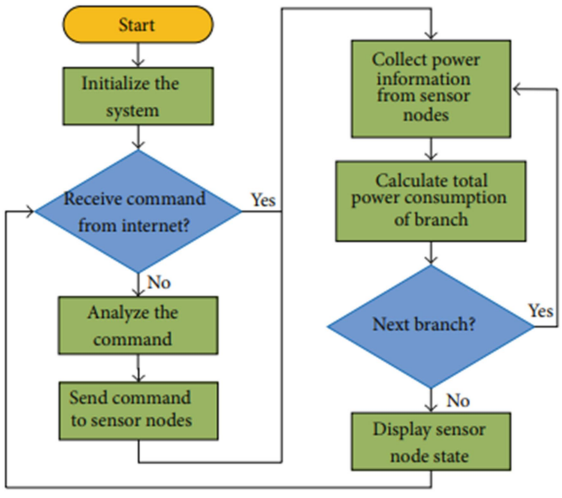
  (1) Implement command directions via the Internet.

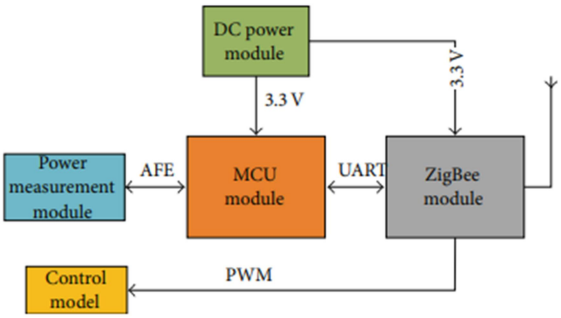
  (2) Tracking device stations energy usage

  (3) Calculating each branch circuit's residual power capability.

  (4) Showing all energy consumption.

  Nodes sensor shows the sensor node, the measurement and control node. The sensor node consists of a power module with direct current, a MCU, an AC module and a ZigBee module[4]–[6]. The MCU Module[7]–[9] communicates through internal asynchronous receiver / sender (UART) links with the energy assessment module via an intrinsic front interface (AFA) and with the ZigBee module. Pulse width measurement (PWM)[10], [11] method ensures communication between ZigBee module and the control module.





Flow chart of base station and node sensor

- **Conclusion: -**

  It includes a gate, a base station and detectors. A fresh energy detector device Hardware Platform for measuring local / remote energy parameters and on/ off energy switches for powered devices is specifically created. The laboratory findings show that ZBEMCS can readily track power consumption with elevated precision. There are two typical ZBEMCS apps such as subentry measurement and family measurement of construction energy. The first involves electricity supply, HVAC energy, energy and unique electricity.

Reference:

[1] C. Peng and K. Qian, "Development and Application of a ZigBee-Based Building Energy Monitoring and Control System," *Sci. World J.*, 2014.

[2] K. Agarwal, C. Dixon, E. Rozner, and J. Carter, "Shadow MACs: Scalable label-switching for commodity ethernet," in *HotSDN 2014 - Proceedings of the ACM SIGCOMM 2014 Workshop on Hot Topics in Software Defined Networking*, 2014.

[3] P. Hank, O. Vermesan, S. Müller, and J. Van Den Keybus, "Automotive ethernet: In-vehicle networking and smart mobility," in *Proceedings -Design, Automation and Test in Europe, DATE*, 2013.

[4] M. S. Mahmoud and A. A. H. Mohamad, "A Study of Efficient Power Consumption Wireless Communication Techniques/ Modules for Internet of Things (IoT) Applications," *Adv. Internet Things*, 2016.

[5] A. Kumar and G. P. Hancke, "A zigbee-based animal health monitoring system," *IEEE Sens. J.*, 2015.

[6] X. Li and X. Lu, "Design of a ZigBee wireless sensor network node for aquaculture monitoring," in *2016 2nd IEEE International Conference on Computer and Communications, ICCC 2016 - Proceedings*, 2017.

[7] W. Yang, S. Qiao, Q. Song, Z. Liu, and J. Yang, "The design and implementation of wireless temperature and humidity control system based on nRF905," in *Proceedings of the 2015 10th IEEE Conference on Industrial*

Electronics and Applications, ICIEA 2015, 2015.

[8] R. li Tang, Z. Wu, and Y. jun Fang, "Maximum power point tracking of large-scale photovoltaic array," *Sol. Energy*, 2016.

[9] T. V. Tran, N. T. Dang, and W. Y. Chung, "Battery-free smart-sensor system for real-time indoor air quality monitoring," *Sensors Actuators, B Chem.*, 2017.

[10] M. Chioccioli, B. Hankamer, and I. L. Ross, "Flow cytometry pulse width data enables rapid and sensitive estimation of biomass dry weight in the microalgae Chlamydomonas reinhardtii and Chlorella vulgaris," *PLoS One*, 2014.

[11] M. Nitzan *et al.*, "Calibration-free pulse oximetry based on two wavelengths in the infrared - A preliminary study," *Sensors (Switzerland)*, 2014.