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Smart IoT Based Energy Monitoring and Controlling Household Appliances

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ABSTRACT:
The objective of this paper is to describe about the implementation of an intelligent energy monitoring and controlling system using internet of things. Our proposed system design can be installed at home to solve and management problems which occur in wastage of electricity maintenance and shortens at the mean time to repair. We have designed a smart home energy monitoring system based on internet of things for monitoring and controlling the usage of power. This system had incorporated energy monitoring for household appliances through internet using host, network global positioning radio service, embedded system gateway and other components. The result of our demonstration shows that, the system can monitor and control the power of household appliances. Thus, the energy monitoring functions are realized in real-time. This article also describes the realization of system hardware and software in detail with the combined system of embedded technique and global system for mobile communication.

KEYWORDS: Energy Monitoring, IoT, GPRS, Embedded System, GSM.s

I. INTRODUCTION

Electricity is the most basic need of everyone in this modern world. Energy consumption graph is increasing day by day where as the resources of energy are diminishing parallel. Usage of power is growing drastically paving the way for energy efficient technologies and digging for renewable energy sources. Since prevention is better than cure awareness of energy consumption should be brought into every place before resources get extinguished. Internet of things reduces the effort of human by introducing machine to machine interaction. This work has been designed to implement smart energy monitoring and control home appliances through IoT (Internet of Things) using cloud data storage. Power consumed by various appliances is monitored through a microcontroller interfaced to Hall Effect current sensors and stored in a cloud data base. Power control of home appliances is achieved through actuators such as relays which can be controlled by client with the help of a web server. The web server is designed using Hyper Text Transfer Protocol for communication between client and server by establishing Remote Procedure Calls between client and server.

II. LITERATURE REVIEW

A Zigbee-based wireless sensor network node for ultraviolet detection of flame has presented a low cost and low power Zigbee based WSN node for the UV detection of flame, contributing to the fire safety protection industry. In this context, this paper reports a WSN node for safety and also they characterized the emission spectrum from flames using a spectroscopic technique. Radiations from a common hydrocarbon flame are analyzed and used as flame reference of this study. [6] Networking and application interface technology for wireless sensor network surveillance and monitoring Present a cross-layer approach and highlight techniques that have potential to enable NCC operation within a mission-oriented UGS surveillance setting. Distributed unattended ground sensor networks used in battlefield surveillance and monitoring missions, have proven to be valuable in providing a tactical information required for command and control, intelligence, surveillance, and reconnaissance planning [7] Wireless sensor networks for cost-efficient residential energy management in the smart grid presented an approach in which regular household appliances are monitored and controlled by WSNs installed in the home. New technologies include cutting-edge advancements in information technology, sensors, metering, transmission, distribution, and electricity storage technology, as well as providing new information and flexibility to both consumers and providers of electricity. [8] To create smart homes that improve energy management and efficiency ZigBee alliance examining Japan's new smart home recommendations the ZigBee Alliance, wireless communication platform is presently examining Japan's new smart home wireless system implication by having a new initiative with Japan's

Government that will evaluate use of the forthcoming ZigBee, Internet Protocol (IP) specification and the address Zigbee module IEEE 802.15.4g. [9] Smart home energy management system using IEEE 802.15.4 and Zigbee contributes work towards the development of ubiquitous home networks, energy savings and user happiness are two major design considerations for modern lighting systems. This paper introduces smart home interfaces and device definitions to allow interoperability among Zigbee devices produced by various manufacturers of electrical equipment [10]

III. SYSTEM ANALYSIS

A. *Internet of Things*

The Internet of things is the internetworking of physical devices, vehicles buildings, and other item embedded with electronics, software, sensors, actuators, and network connectivity that enable these objects to collect and exchange data. [1][2][3] Typically, IoT is expected to offer advanced connectivity of devices, systems, and services that goes beyond machine-to-machine (M2M) communications and covers a variety of protocols, domains, and applications.[4] The rapid advancements in Internet technologies, a new implication in the age of ubiquity is being realized. A Massive increase in users of the Internet and alterations on the internet engaged technologies enables networking of everyday objects. The Key technologies that will motivate the future IoT will be correlated to Smart sensor technologies including WSN, Nanotechnology and Miniaturization [5].

B. *Problem Definition*

Energy-efficient solution using new concept of CPS (Communicating Power Supplies) to facilitate the information transfer about energy and control the information between the device and building management system. The components of CPS are an embedded controller to control all the information and a RF transceiver to communicate to user. All the data obtained can be stored in the cloud data base using IoT platform. The system is tested on three devices i.e. Television, video player and LED light. It has a major limitation of communication problem. The RF and Zigbee based systems are limited into short range and the signals can loss due to the barriers.

C. *Features of Proposed System*

In this paper, we present a low cost and flexible home control and monitoring system using an embedded micro-web server, with IP connectivity for accessing and controlling devices and appliances remotely using web server app. The proposed system does not require a dedicated service machine with respect to similar systems and offers a novel communication protocol to monitor and control the home environment with more than just the switching functionality. We have utilized REST full based Web services as an interoperable application layer that can be directly integrated into other application domains like e-health care services, utility, distribution, or even vehicular area networks (VAN).

IV. SYSTEN DESIGN AND IMPLEMENTATION

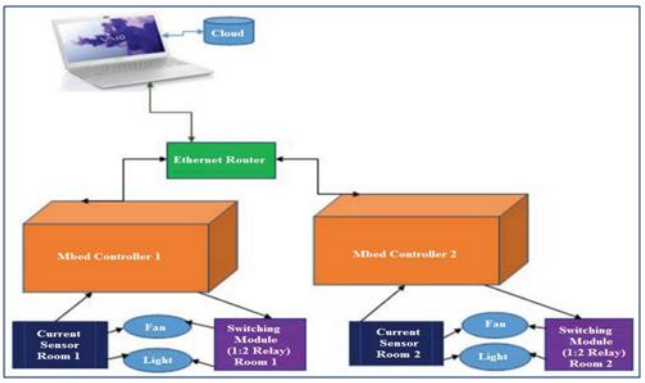

Fig. 1 Proposed System for Energy Monitoring and Controlling

Cloud is nothing but the practice of using a network of remote servers hosted on the Internet to store, manage, and process data, rather than a local server or a personal computer. Cloud computing applies traditional supercomputing, or high-performance computing power. In consumer-oriented applications such as financial portfolios, to deliver personalized information, to provide data storage or to power large, immersive online computer games we are using cloud. A router is a networking device that forwards data packets between computer networks. Routers perform the traffic directing functions on the Internet. A router is connected to two or more data lines from different networks. When a data packet comes in on one of the lines, the router reads the address information in the packet to determine the ultimate destination. Then, using information in its routing or routing policy, it directs the packet to the next network on its journey. This creates an overlay internetwork. Mbed is a platform and operating system for internet-connected devices based on 32-bit ARM Cortex-M microcontrollers. Such devices are also known as Internet of Things devices. The project is collaboratively developed by ARM and its technology partners. Applications for the Mbed platform can be developed using the Mbed online IDE, a free online code editor and compiler. Only a web browser needs to be installed on the local PC, since a project is compiled on the cloud, i.e. on a remote server, using the ARMCC C/C++

compiler. The Mbed IDE provides private workspaces with ability to import, export, and share code with distributed Mercurial version control, and it can be used also for code documentation generation. Applications can be developed also with other development environments such as Keil µVision, IAR Embedded Workbench, and Eclipse with GCC ARM Embedded tools. A current sensor is a device that detects electric current (AC or DC) in a wire, and generates a signal proportional to it. The generated signal could be analog voltage or current or even digital output. The broadest definition, a sensor is an electronic component, module, or subsystem whose purpose is to detect events or changes in its environment and send the information to other electronics, frequently a computer processor. A sensor is always used with other electronics, whether as simple as a light or as complex as a computer. Sensors are used in everyday objects such as touch-sensitive elevator buttons (tactile sensor) and lamps which dim or brighten by touching the base, besides innumerable applications of which most people are never aware. With advances in micro machinery and easy-to-use microcontroller platforms, the uses of sensors have expanded beyond the traditional fields of temperature, pressure or flow measurement [1] for example into MARG sensors

A. Implementation Setup

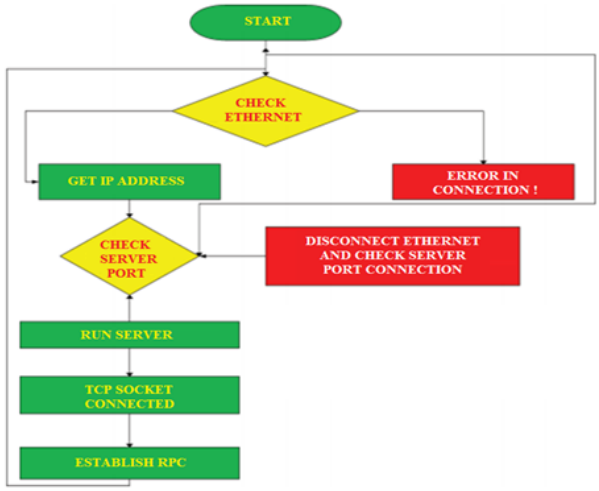

Fig. 2 Implementation setup for Energy Monitoring and Controlling

PIC microcontrollers are a family of specialized microcontroller chips produced by Microchip Technology in Chandler, Arizona. The acronym PIC stands for "peripheral interface controller," although that term is rarely used nowadays. The hardware capabilities of PIC devices range from 6-pin SMD, 8-pin DIP chips up to 144-pin SMD chips, with discrete I/O pins, ADC and DAC modules, and communications ports such as UART, I2C, CAN, and even USB. Low-power and high-speed variations exist for many types. In order to measure the power consumed in each appliance, current should be monitored. To serve this purpose Electricity sensor module based on the TA12-200 current transformer that has capability to change large alternating current into small amplitude. This sensor can measure alternating current up to 12A. Relay can control any appliance using the magnetic circuit present in it. A two-channel relay can basically control 2 appliances. It needs 12v power supply. When relay gets triggered it opens the magnetic circuit inside and turns off the device. 2 channel relay can control two devices at a time. In this application, a two channel relay is used in each node.

I. CONCLUSIONS

Based on the above system design and implementation analysis the following conclusions were arrived.

- By employing the proposed automation system, the total energy consumption was reduced.
- The power consumption may be reduced in a single day for home appliances.
- On a whole in a year up to 15 percent of energy can be saved in residential building by implementing smart power monitoring and control system through IoT.
- The monitored values from sensors can be continuously stored and updated in a cloud database.
- Our proposed designed system will be helpful in reducing the energy wastage by continuously monitoring and controlling the home electrical appliances.

II. REFERENCES

[1] Brown, Eric (13 September 2016). "Who Needs the Internet of Things?". Linux.com. Retrieved 23 October 2016.

[2] Jump up to:[a b] Brown, Eric (20 September 2016). "21 Open Source Projects for IoT". Linux.com. Retrieved 23 October 2016.

[3] Jump up to:[a b] "Internet of Things Global Standards Initiative". ITU. Retrieved 26 June 2015.

[4] Höller, J.; Tsiatsis, V.; Mulligan, C.; Karnouskos, S.; Avesand, S.; Boyle, D. (2014). From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence. Elsevier. ISBN 978-0-12-407684-6.

[5] Ref 1 in base paper changed to ref 5 in new paper

[6] 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.

[7] 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.

[8] 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.

[9] 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.

[10] M. 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.