



ENERGY MANAGEMENT IN SMART GRIDS USING IOT

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Abstract:

Lack of resources established in the present world is initiating everyone towards energy efficient technologies. Among all these resources, power is one which needs to be monitored and controlled as per the need since electricity consumption is increasing day-by day. Methods/Statistical Analysis: Internet of things reduces the effort of human by introducing machine to machine interaction. This work has been designed to implement smart power monitoring and control system through IoT using cloud data storage. Findings: Power consumed by various appliances is monitored through an ARM based controller interfaced to Hall Effect current sensors and stored in a cloud data. 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.

Key words: Energy meter, GPRS, sensors.

I. INTRODUCTION

Web of things is in which the networks are interconnected on the web providing an IP address so as to access the data which is to be required. Now a day the use of web is increasing in great amount so as to get the information. In similar fashion we can even control the home appliances with the help of web as well as we can monitor the devices. The web is considered the helper in day today life. The web it provides the page which

is to be access with the help of the IP address. In earlier days the supply of power was one way communication so if there is any problem regarding to the electricity it was difficult. But now a day the word smart grid is playing an important role. Smart grid it provide us a two way communication and it is an electrical network in which self testing as well as monitoring is done and reported to the system. Because of this method the automated word is being introduced. The rapidly growing population over the past decades has resulted number of houses as well as

The use of electricity is increase. Supply from the smart grid is unable to match the demand of electricity. The smart grid is an advanced platform to the way we receive electricity today. In earlier times the demand for electricity was substantial compared to that presently. Since the demand for electricity has tremendously increased, a redesign of the current grid system is much needed. With the technology available in these modern times, the smart grid could be designed in such a manner, that it uses digital communications technology to detect and react to local changes in usage. The system will feature a two way dialog where electricity and information can be exchanged between the consumer and utility. This can increase or decrease the amount of energy a consumer needs by analyzing the feedback of the two-way dialog.

LITERATURE REVIWE

Y. E. Wu and K. C. Huang present the design of a smart household illumination dimming-control. The control can be operated using either an Android

application or a computer using either Zigbee or through Wi-fi to connect to a Database Management System (DBMS). In the paper, a linear dimming scheme was used to reduce the light gleaming. In order to achieve variations in the illumination environment, a LED with highly efficient three colors was used as the light source. The paper covers the designs of six environment illumination for user's control who can deliver the control states to the central controller and mobile phone [8].

M. Montesoglu, A. Kavak, M. Yakut, A. Tangel, S. Sahin and H. Ozcan proposed mobile device controlled smart home management system to design and implement using communication protocol. A handshaking mechanism between a mobile device and control unit and for messaging packet structure is used between control unit and sensors/actuators are explained. With the system, the controlling of smart home. system can be done over a wireless LAN by authorized users using an Android based device on which the implemented GUI software is running [9].

N. Datta, T et.al. describes a project in which an electrical circuit is developed by which an user can turn on or off any electrical devices i.e. fans, lights and can lock or unlock windows, doors etc. of the house or office through sending message using a custom built android application to a specific phone number connected to the microcontroller. In the system an android application is used to send instruction through message. At the receiving end, a GSM module receives the message and sends the particular hexadecimal codes to a microcontroller. Then the code is read by microcontroller and sends the signals to relays for performing action according to the specified logic [10].

PROPOSED METHODOLOGY

This system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. As WSN's are having many advantages, here we have designed smart meters predicting the usage of power consumption. However it is low-cost, flexible, and robust system to continuously monitor

and control based on consumer requirements, GPRS technology for networking and communication, because it has low-power characteristics, which enable it to be widely used in home and building environments.

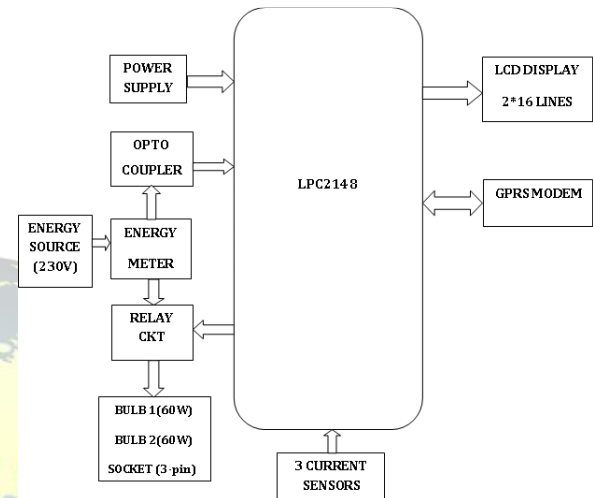


Fig 1: Block Diagram

In this system a smart energy meter is installed in every consumer unit and a server is maintained at the service provider side. Both the meter side and the server side are communicating by using IOT Technology which facilitates communication between the two ends. The Controller gets the units data from the Energy meter and sends the acquired data to the server via GPRS. The server in the transmission system is connected to the cloud, through this we can able to monitor and control the EB lines of every consumer through Internet. This system, also serves to shut off the consumer's particular product which consumes more units. This system also helps the consumers to monitor their daily usage of electricity through the Internet. The transfer of electricity and information between consumer and utility would increase efficiency, reliability and security.

HARDWARE REQUIREMENT

Micro controller: This section forms the control unit of the whole project. This section basically consists of a Microcontroller with its associated circuitry like

Crystal with capacitors, Reset circuitry, Pull up resistors (if needed) and so on. The Microcontroller forms the heart of the project because it controls the devices being interfaced and communicates with the devices according to the program being written.

Liquid-crystal display (LCD) is a flat panel display, electronic visual display that uses the light modulation properties of liquid crystals. Liquid crystals do not emit light directly. LCDs are available to display arbitrary images or fixed images which can be displayed or hidden, such as preset words, digits, and 7-segment displays as in a digital clock.

GPRS: GPRS (general packet radio service) is a packet-based data bearer service for wireless communication services that is delivered as a network overlay for GSM, CDMA and TDMA (ANSI-I36) networks. GPRS applies a packet radio principle to transfer user data packets in an efficient way between GSM mobile stations and external packet data networks. Packet switching is where data is split into packets that are transmitted separately and then reassembled at the receiving end. GPRS supports the world's leading packet-based Internet communication protocols, Internet protocol (IP) and X.25, a protocol that is used mainly in Europe. GPRS enables any existing IP or X.25 application to operate over a GSM cellular connection. Cellular networks with GPRS capabilities are wireless extensions of the Internet and X.25 networks. [5] discussed about a project, in this project an automatic meter reading system is designed using GSM Technology. The embedded micro controller is interfaced with the GSM Module. This setup is fitted in home. The energy meter is attached to the micro controller. This controller reads the data from the meter output and transfers that data to GSM Module through the serial port. The embedded micro controller has the knowledge of sending message to the system through the GSM module. Another system is placed in EB office, which is the authority office. When they send "unit request" to the microcontroller which is placed in home. Then the unit value is sent to the EB office PC through GSM module. According to the readings, the authority officer will send the information about the bill to the customer. If the customer doesn't pay bill on-time, the power supply to the corresponding

home power unit is cut, by sending the command through to the microcontroller. Once the payment of bill is done the power supply is given to the customer. Power management concept is introduced, in which during the restriction mode only limited amount of power supply can be used by the customer.



Fig 2: GPRS module

OPTO COUPLERS:

There are many situations where signals and data need to be transferred from one system to another within a piece of electronics equipment, or from one piece of equipment to another, without making a direct electrical connection. Often this is because the source and destination are (or may be at times) at very different voltage levels, like a microcontroller which is operating from 5V DC but being used to control a triac which is switching 230V AC. In such situations the link between the two must be an isolated one, to protect the microprocessor from over voltage damage. Relays can of course provide this kind of isolation, but even small relays tend to be fairly bulky compared with ICs and many of today's other miniature circuit components. Because they are electro-mechanical, relays are also not as reliable and only capable of relatively low speed operation. Where small size, higher speed and greater reliability are important, a much better alternative is to use an Opt coupler. These use a beam of light to transmit the signals or data across an electrical barrier, and achieve excellent isolation.

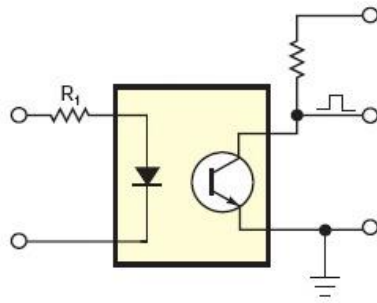


Fig 3: Optocoupler structure

ENERGY METER

An electricity meter or energy meter is a device that measures the amount of electric energy consumed by a residence, business, or an electrically powered device. Electricity meters are typically calibrated in billing units, the most common one being the kilowatt hour. Periodic readings of electric meters establish billing cycles and energy used during a cycle. In settings when energy savings during certain periods are desired, meters may measure demand, the maximum use of power in some interval. In some areas the electric rates are higher during certain times of day, reflecting the higher cost of power resources during peak demand time periods. Also, in some areas meters have relays to turn off nonessential equipment.

ALGORITHM

- (1)Start
- (2)Connect the main supply to the system
- (3)Connect the 12v dc supply to arm board from battery.
- (4)The system will initialize & message will be send to monitor.
- (5)Connect GPRS module to the UART of controller.
- (6)GSM/GPRS module will transferred this value on server system.
- (7)If current value exceeds 100ma then turn on the Bulb and go to the step 4 and step 13.

- (8)WEB page will be created & it can be monitor.
- (9)Stop.

CONCLUSION

A revolution in energy domain is underway, namely the Smart Grid. Smart Grid is owner as well as user friendly technology. User can check daily consumption from any location using internet. Owner can control customer meter from control unit. Smart grid speaks to a standout amongst the most encouraging and prominent IOT applications. More efficient transmission of electricity. Snappier rebuilding of power after power disturbances. Lessened operations and administration costs for utilities, and eventually bring down power costs for consumers. Time saving technology. Control on Meter tempering. Thus we have presented internet connected energy monitoring and controlling system that increases awareness of energy consumption amongst devices and users. Energy awareness enables the user to control the power state of the devices as per their needs which minimizes the energy use. In the coming future, each individual device will have their own identity that can share and communicate the information over the IP network.

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