ISSN 2348 – 8034
Impact Factor- 3.155

GLOBAL JOURNAL OF ENGINEERING SCIENCE AND RESEARCHES

WSN-BASED EB METER MONITORING AND CONTROL USING INTERNET OF THINGS

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ABSTRACT

The design and development of a smart grid monitoring and controlling system for household electrical appliances in real time is implemented. The system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. The novelty of this system is the implementation of the controlling mechanism of appliances in different ways. The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers. The prototype has been extensively tested in real-life situations and experimental results are very encouraging.

Keywords- *Smartgrid,lowcost,flexible.*

I. INTRODUCTION

THE LAST-METER smart grid is the portion of the smart grid closer to the home, and the one with which customers, interact. It allows a two-way data flow between customers and electric utilities, transforming the "traditionally passive end-users into active players" in the energy market. Considering the seven domains of the conceptual model of smart grids proposed by the National Institute of Standards and Technology, the last-meter smart grid corresponds to the "customer domain." It enables residential, commercial, and industrial customers—based on their different energy needs—to optimize energy consumption and local generation, and to actively participate to demand-response policies, one of the most disrupting aspects of smart grids. Nontechnical customers need a simple way to control energy consumption and production, and to exchange power usage data at the proper level of granularity with energy providers or distributors. And the recent trend is when a user gets EB bill consecutively for two months and if the second month's bill is comparatively higher than that of the first, the EB department compares the two bill's and verify. When the EB department calculates the period in which the current has been used more than in the same period of the previous month, the user will receive the intimation such that they can reduce the usage accordingly.

II. HARDWARE SECTION

The EB Meter once if connected to ARDUINO UNO , the Embedded C language describing the control and monitoring of EB Meter. smart-grid architectures proposed in the literature typically focus on the needs of power distributors to manage the complete power grid . They reach customers' premises with an ad-hoc network of smart meters connected by General Packet Radio Service (GPRS) or, sometimes, with a dedicated programmable logic controller (PLC) technology. They do not take into account the possibility that customers already have other smart home infrastructures. On the other hand, some solutions proposed in the literature, based on a smart home infrastructure, are not designed to be seamlessly scalable to large deployments.

The recent trend is when a user gets EB bill consecutively for two months and if the second month's bill is comparatively higher than that of the first, the EB department compares the two bill's and verify. When the EB department calculates the period in which the current has been used more than in the same period of the previous month, the user will receive the intimation such that they can reduce the usage accordingly.

The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers. The prototype has been extensively tested in real-life situations and experimental results are very encouraging.

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BLOCK DIAGRAM

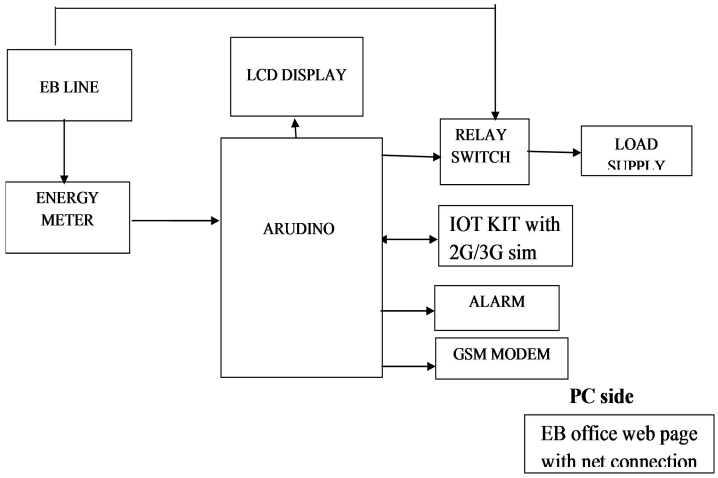

Figure 1

2.1 EB METER

This type of meter is produced as per Executive Standards

IEC 62053-21, IEC 62052-11

Salient Features

High Precision: The watt-hour meter is fully electronic type design, with core of imported dedicated energy measuring chip, assuring the accurate measurement, and the precision is impregnable against the frequency, voltage, ultra harmonics, and temperature.

Long Life: Adopt the SMT manufacture technique, applying the international well known brand, long life components; assure the usage life more than 10 years.

Low Power Consumption: Adopt the optimum design, its own power consumption is less than or equal to 0.8W. When used in a wide range, it's available to reduce the consumption of power grid, increase the efficiency of electricity supply.

Running Stably: Possesses good anti-interference performance, strong overload capacity, wide working range; make the watt-hour meter run stably.

Accurate Measurement: Adopt the register to display the active accumulated electricity quantity; be able to measure the active power for forward and reverse directions precisely.

Anti-tamper: Be able to prevent such electric larceny ways as reverse wire connection, plus magnet, sloped installation, etc.

Power Cut Control: Built-in magnet latching relay, it accomplishes meter code setting, meter-reading and switch on/off controlling of relay through RS485. (Optional)

Automatic Meter-reading: Possesses RS485, infrared and impulse output port, available for remote meter reading, while the watt-hour meter receive the. collector's meter reading instruction, return to collector the current accumulated electric use quantity and meter-reading electric use quantity from last time to current time.

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APPEARNCE AND ASSEMBLE SIZE OF EB METER

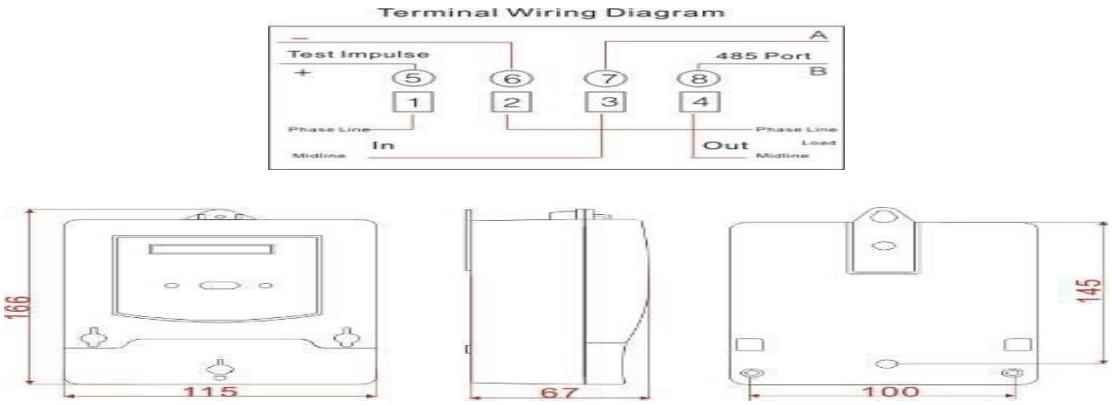

Figure 2

2.2 IoT-INTERNET OF THINGS

The Internet of Things (IoT) is an environment in which objects, animals or people are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. IoT has evolved from the convergence of wireless technologies, micro-electromechanical systems (MEMS) and the Internet. The concept may also be referred to as the Internet of Everything.

A thing, in the Internet of Things, can be a person with a heart monitor implant, a farm animal with a biochip transponder, an automobile that has built-in sensors to alert the driver when tire pressure is low -- or any other natural or man-made object that can be assigned an IP address and provided with the ability to transfer data over a network.

IOT MODULE

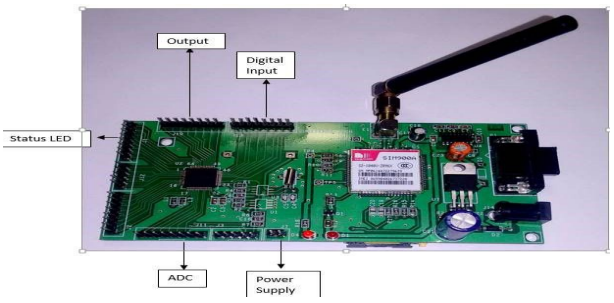

Figure 3

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PIN CONFIGURATION:

J10- 8 Digital Outputs

J11- 8 Channels ADC inputs

J13- 8 Digital Inputs

J1- Network Status LED

J7- Power Supply out (+5v DC)

Features:

Dedicated Webpage and face book community page will

be provided for every board.

Network connectivity status.

Applications:

Online Traffic monitoring

Online Health monitoring

Real time Transport monitoring

Logistics monitoring

Daily life and domestics

2.3 Buzzer:

A **buzzer** or **beeper** is a signalling device, usually electronic, typically used in automobiles, household appliances such as a microwave oven, or game shows. It most commonly consists of a number of switches or sensors connected to a control unit that determines if and which button was pushed or a preset time has lapsed, and usually illuminates a light on the appropriate button or control panel, and sounds a warning in the form of a continuous or intermittent buzzing or beeping sound. Initially this device was based on an electromechanical system which was identical to an electric bell without the metal gong (which makes the ringing noise).

Often these units were anchored to a wall or ceiling and

used the ceiling or wall as a sounding board. Nowadays, it

is more popular to use a ceramic-based piezoelectric sounder like a Sonalert which makes a high-pitched tone.

2.4 LCD:

LCD (Liquid Crystal Display) screen is an electronic display module and find a wide range of applications. A 16x2 LCD display is very basic module and is very commonly used in various devices and circuits. These modules are preferred over and other multi segment s. The reasons being: LCDs are economical; easily programmable; have no limitation of displaying special & even (unlike in seven segments), and so on.

A **16x2 LCD** means it can display 16 characters per line and there are 2 such lines. In this LCD each character is displayed in 5x7 pixel matrix. This LCD has two registers, namely, Command and Data.

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The command register stores the command instructions given to the LCD. A command is an instruction given to LCD to do a predefined task like initializing it, clearing its screen, setting the cursor position, controlling display etc. The data register stores the data to be displayed on the LCD. The data is the ASCII value of the character to be displayed on the LCD.

LCD INTERFACE

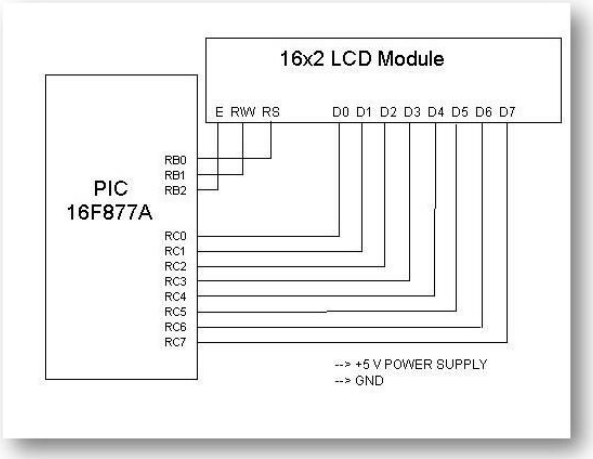

Figure 4

Features

16 characters wide, 2 rows,White text on blue background

Connection port is 0.1" pitch, single row for easy bread boarding and wiring

Pins are documented on the back of the LCD to assist in wiring it up

Single LED backlight included can be dimmed easily with a resistor or PWM and uses much less power than LCD with EL (electroluminescent) backlights

Up to 8 extra characters can be created for custom glyphs or 'foreign' language support

Can adjust contrast with the addition of a potentiometer

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2.5 PCBDESIGN

Printed circuit boards, or PCBs, form the core of electronic equipment domestic and industrial. Some of the areas where PCBs are intensively used are computers, process control, telecommunications and instrumentation.

The manufacturing process consists of two methods; print and etch, and print, plate and etch. The single sided PCBs are usually made using the print and etch method. The double sided plate through – hole (PTH) boards are made by the print plate and etch method.

The software used in our project to obtain the schematic layout is MICROSIM.

2.4 RELAY

A relay is an electrical that opens and closes under the control of another. In the original form, the switch is operated by an to open or close one or many sets of contacts. It was invented by in because a relay is able to control an output circuit of higher power than the input circuit, it can be considered to be, in a broad sense, a form of an electrical Operation.When a flows through the resulting attracts an that is mechanically linked to a moving contact. The movement either makes or breaks a connection with a fixed contact. When the current to the coil is switched off, the armature is returned by a force approximately half as strong as the magnetic force to its relaxed position. Usually this is a, but gravity is also used commonly in industrial motor starters. Most relays are manufactured to operate quickly. In a low voltage application, this is to reduce noise. In a high voltage or high current application, this is to reduce.If the coil is energized with DC, a is frequently installed across the coil, to dissipate the energy from the collapsing magnetic field at deactivation, which would otherwise generate a spike of voltage and might cause damage to circuit components. Some automotive relays already include that diode inside the relay case. Alternatively a contact protection network, consisting of a capacitor and resistor in series, may absorb the surge. If the coil is designed to be energized with AC, a small copper ring can be crimped to the end of the solenoid. This "shading ring" creates a small out-of-phase current, which increases the minimum pull on the armature during the AC cycle.

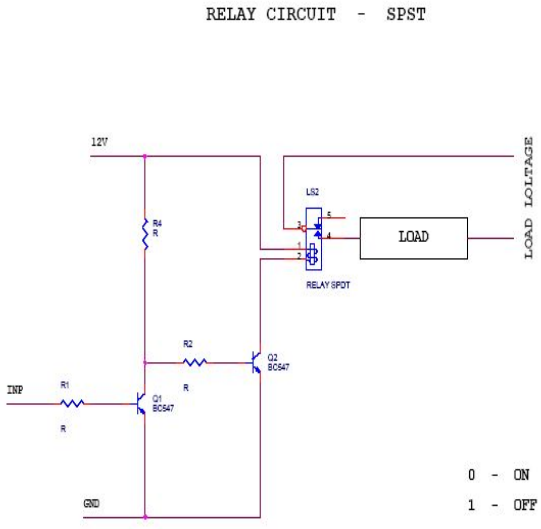

Figure 5

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Impact Factor- 3.155

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are doublethrow (changeover) switches. Relays allow one circuit to switch a second circuit which can be completely separate from the first. For example a low voltage battery circuit can use a relay to switch a 230V AC mains circuit. There is no electrical connection inside the relay between the two circuits; the link is magnetic and mechanical.

The coil of a relay passes a relatively large current, typically 30mA for a 12V relay, but it can be as much as 100mA for relays designed to operate from lower voltages. Most ICs (chips) cannot provide this current and a transistor is usually used to amplify the small IC current to the larger value required for the relay coil. The maximum output current for the popular 555 timer IC is 200mA so these devices can supply relay coils directly without amplification.

Relays are usually SPDT or DPDT but they can have many more sets of switch contacts, for example relays with 4 sets of changeover contacts are readily available. Most relays are designed for PCB mounting but you can solder wires directly to the pins providing you take care to avoid melting the plastic case of the relay. The animated picture shows a working relay with its coil and switch contacts.

III. SOFTWARE DESCRIPTION

EMBEDDED C

Embedded c is a set of language extensions for the address commonality issues that exist between C extensions for different. Historically, embedded C programming requires nonstandard extensions to the C language in order to support exotic features such as operations.

In 2008, the C Standards Committee extended the C language to address these issues by providing a common standard for all implementations to adhere to. It includes a number of features not available in normal C, such as, fixed-point arithmetic, named address spaces, and basic I/O hardware addressing.

Embedded C use most of the syntax and semantics of standard C, e.g., main() function, variable definition, datatype declaration, conditional statements (if, switch. case), loops (while, for), functions, arrays and strings, structures and union, bit operations, macros, unions, etc.

The C programming language is perhaps the most popular programming language for programming embedded systems. (Earlier we mentioned other popular programming languages).

Most C programmers are spoiled because they program in environments where not only is there a standard library implementation, but there are frequently a number of other libraries available for use. The cold fact is, that in embedded systems, there rarely are many of the libraries that programmers have grown used to, but occasionally an embedded system might not have a complete standard library, if there is a standard library at all. Few embedded systems have capability for dynamic linking, so if standard library functions are to be available at all, they often need to be directly linked into the executable. Oftentimes, because of space concerns, it is not possible to link in an entire library file, and programmers are often forced to "brew their own" standard c library implementations if they want to use them at all. While some libraries are bulky and not well suited for use on microcontrollers, many development systems still include the standard libraries which are the most common for C programmers.

C remains a very popular language for micro-controller developers due to the code efficiency and reduced overhead and development time. C offers low-level control and is considered more readable than assembly. Many free C compilers are available for a wide variety of development platforms. The compilers are part of an IDEs with ICD support, breakpoints, single-stepping and an assembly window. The performance of C compilers has improved considerably in recent years, and they are claimed to be more or less as good as assembly, depending on who you ask. Most tools now offer options for customizing the compiler optimization. Additionally, using C increases portability, since C code can be compiled for different types of processors.

ISSN 2348 – 8034
Impact Factor- 3.155

IV. RESULT AND DISCUSSION

4.1WEBPAGE OUTPUT

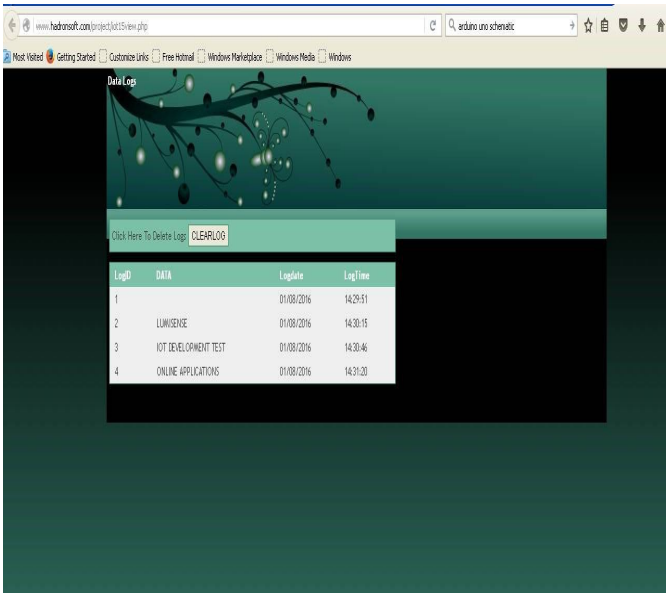

Figure 6

In this there are two webpages one webpage is to check the electrical units consumed for a particular time delay.Second webpage is to disconnect the load if the electical bill is not paid by the customers.The webpage is operated using the IOT.These webpages are kept confidentially,it has a clear log option to clear the previous data.

4.2HARDWARE OUTPUT

Figure 7

In the hardware output the unit consumed is displayed in the LCD display. It has GSM modem by which the notification regarding the electricity bill is send as a SMS to the customer. The load is disconnected using the relay by the webpage.

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Impact Factor- 3.155

V. CONCLUSION

The design and development of a smart monitoring and controlling system for household electrical appliances in real time is implemented. The system principally monitors electrical parameters of household appliances such as voltage and current and subsequently calculates the power consumed. The developed system is a low-cost and flexible in operation and thus can save electricity expense of the consumers. The recent trend is when a user gets EB bill consecutively for two months and if the second month's bill is comparatively higher than that of the first, the EB department compares the two bill's and verify. when the EB department calculates the period in which the current has been used more than in the same period of the previous month, the user will receive the intimation such that they can reduce the usage accordingly.

VI. ACKNOWLEDGEMENT

We would like to thank N.SATHISH KUMAR, MARY JANSI RANI, MUTHUKUMAR for their support, services, and fruitful discussions.

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