EVENT MANAGEMENT SYSTEM IN SMART GRIDS VIA THE INTERNET OF THINGS

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***Abstract*:** The customer domain of the smart grid naturally blends with smart home and smart building systems, but typical proposed approaches are "distributor-centric" rather than "customer-centric," undermining user acceptance, and are often poorly scalable. To solve this problem, we propose a detailed architecture and an implementation of a "last-meter" smart grid—the portion of the smart grid on customer premises—embedded in an internet-of-things (IoT) platform. Our approach has four aspects of novelty and advantages with respect to the state of the art: 1) seamless integration of smart grid with smart home applications in the same infrastructure; 2) data gathering from heterogeneous sensor communication protocols; 3) secure and customized data access; and 4) univocal sensor and actuator mapping to a common abstraction layer on which additional concurrent applications can be built. A demonstrator has been built and tested with purposely-developed ZigBee smart meters and gateways, a distributed IoT server, and a flexible user interface.

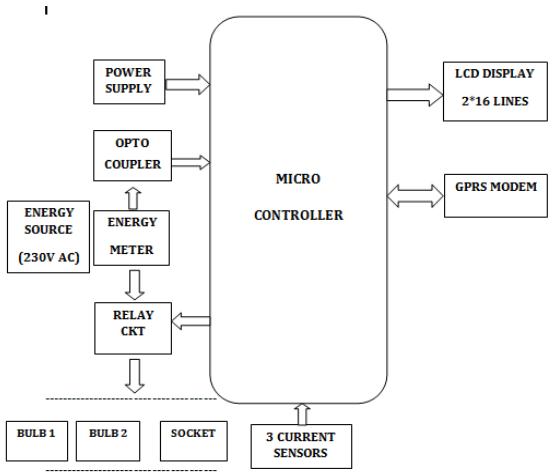
Key words: *Energy meter, Optocoupler,GPRS, sensors*.

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" [1] in the energy market. Considering the seven domains of the conceptual model of smart grids proposed by the national institute of standards and technology [2], [3], 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 [4], 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. From the point of view of market acceptance and penetration, the last-meter smart grid is just one aspect of the broader concept of smart home and smart buildings. The consequence of this consideration is that one can hardly imagine a situation in which the consumer side of the smart grid and other smart home applications rely on different and separate infrastructures or platforms.

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.



PROJECT DIAGRAM

II. BOARD HARDWARE SYSTEM FEATURES

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.

ARM7TDMI: ARM is the abbreviation of Advanced RISC Machines, it is the name of a class of processors, and is the name of a kind technology too. The RISC instruction set, and related decode mechanism are much simpler than those of Complex Instruction Set Computer (CISC) designs.

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.

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 ó 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 Optocoupler. These use a beam of light to transmit the signals or data across an electrical barrier, and achieve excellent isolation.

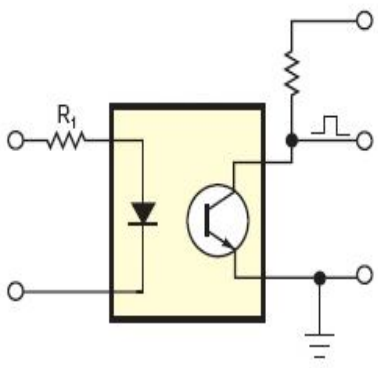


Fig 3: Optocoupler structure

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 establishes 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.

CURRENT SENSORS:

Measuring a voltage in any system is a "passive" activity as it can be done easily at any point in the system without affecting the system performance. However, current measurement is "intrusive" as it demands insertion of some type of sensor which introduces a risk of affecting system performance. Current measurement is of vital importance in many power and instrumentation systems. Traditionally, current sensing was primarily for circuit protection and control. However, with the advancement in technology, current sensing has emerged as a method to monitor and enhance performance. Knowing the amount of current being delivered to the load can be useful for wide variety of applications. Current sensing is used in wide range of electronic systems, viz., Battery life indicators and chargers, 4-20 mA systems, over-current protection and supervising circuits, current and voltage regulators, DC/DC converters, ground fault detectors, programmable current sources, linear and switch-mode power supplies, communications devices , automotive power electronics, motor speed controls and overload protection, etc.

PASSIVE ELEMENT BASED CURRENT SENSING TECHNIQUES

1. Sense Resistors

Current sensing means developing a voltage signal which is representative of the current flowing at the particular place of interest

inthe circuit. The traditional way of current sensing introduces a resistor in the path of the current to be sensed. The sense resistor can be placed in series with the inductor, switches, and the load.Thus, a current sensing resistor should be considered as current-to-voltage converter

The current sensing resistor should have following attributes

· **Low value in order to minimize power losses**

Value of the current sense resistors primarily depend upon the voltage threshold of the following circuitry which is going to operate based upon the sensed current information. In circuits where amplification is available, emphasis is to minimize the voltage drop across the resistor.

Typical resistance values utilized in various control ICs are 20m? to 25m? .

· **Low inductance because of high di/dt.**

Any inductance in the resistor, when exposed to high slew rate (di/dt), an inductive step voltage is superimposed upon the sense voltage and may be a cause of concern in many circuits. Hence sense resistors should have very low inductance.

· **Tight tolerance**

For maximizing the current supply within the limit of acceptable current, the tolerance of the sense resistor must be ±1% or tighter.

· **Low temperature coefficient for accuracy**

Normally specified in units of parts per million per degree centigrade (ppm/°C), temperature coefficient of resistance (TCR) is an important parameter for accuracy. Resistors with TCRs closer to zero, in the entire operating range should be used.

· **High peak power rating to handle short duration high current pulses.**

Power rating is a driving factor for the selection of appropriate technology for sense resistors. Though the device may be intended to sense DC current, it may often experience transients.

Power derating curve provides allowable power at different temperatures. But peak power capability is a function of energy; hence energy rating curve should be taken into account.

III. CONCLUSION

We have presented architecture, an implementation, and a demonstration of the Customer Domain of the smart grid, based on a platform for the IoT that can host a broad range of smart home applications. Hence, by implementing this project it is easy for monitoring and controlling the power, towards the implementation of an intelligent building.

V. REFERENCES

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