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Smart Grid Meter Embedded in an Internet of things Platform

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ABSTRACT

This paper is proposed to design the a prototype of smart grid meter in house. The customer domain of the smart grid naturally associated with smart and building system. But this is typically the "Distributor-domain" rather than "customer-domain" using user acceptance and are often poorly scalable. to solve this we propose the detailed architecture and implementation of the smart grid meter in the house and building environment in internet of things (IOT) platform. which provides seamless integration of the smart home applications in the same infrastructure. data gathering from the sensors. Secured data access. homogeneous communication with the smart grid environment.

Keywords: Smart grid,smart meter,internet of things, ARM,

I. INTRODUCTION

Smart Grid. "The grid," refers to the electrical grid, a network of transmission lines, substations, transformers and a lot of that deliver electricity from the facility plant to your home or business. It's what you plug into once you flip on your lightweight switch or power up your laptop. Our current electrical grid was inbuilt the Nineties and improved upon as technology advanced through every decade. [1] V. Giordano describes that smart grid Today, it consists of over 200 electrical generating units with over one million megawatts of generating capability connected to over three hundred ,thousand miles of transmission lines. though the electrical grid is taken into account associate engineering marvel, we have a tendency to square measure stretching its patchwork nature to its capability. to maneuver forward, we'd like a brand new reasonably electrical grid, one that's designed from rock bottom up to handle the groundswell of digital and computerized instrumentality and technology passionate about it—and one which will automatize and manage the increasing quality and desires of electricity within the twenty first Century.

In short, the digital technology that permits for two-way communication between the utility and its customers, and therefore the sensing on the transmission lines is what makes the grid smart. just like the web, the smart Grid can accommodates controls, computers, automation, and new technologies and instrumentality operating along, however during this case, these technologies can work with the electrical grid to retort digitally to our quickly dynamical electric demand.

[2] Chen described today, associate degree electricity disruption like a blackout will have a domino effect—a series of failures which will have an effect on banking, communications, traffic, and security. this is often a selected threat within the winter, once owners is left while not heat. a grid can add resiliency to our power System and create it better ready to deal with emergencies like severe storms, earthquakes, massive star flares, and terrorist attacks. as a result of its two-way interactive capability, the smart Grid can provide automatic rerouting once instrumentality fails or outages occur. this may minimize outages and minimize the consequences after they do happen. once an influence outage happens, smart Grid technologies can find and isolate the outages, containing them before they become large-scale blackouts.

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[3] Federal energy regulation commission stated that the new technologies will facilitate make sure that electricity recovery resumes quickly associate degreed strategically when an emergency—routing electricity to emergency services initial, as an example. additionally, the smart Grid can take bigger advantage of customer-owned power generators to provide power once it's not offered from utilities. By combining these "distributed generation" resources, a community might keep its local department, traffic lights, communication system, and grocery in operation throughout emergencies. additionally,

The smart Grid may be a thanks to address associate degree aging energy infrastructure that must be upgraded or replaced. It's some way to deal with energy potency, to bring redoubled awareness to customers regarding the association between electricity use and therefore the setting. And it's some way to bring redoubled national security to our energy System—drawing on bigger amounts of home-grown electricity that's a lot of proof against natural disasters and attack.

Smart meters offer the smart Grid interface between you and your energy supplier. put in in situ of your recent, mechanical meter, these meters operate digitally, and permit for automatic and complicated transfers of knowledge between your home and your energy supplier. for example, smart meters can deliver signals from your energy supplier which will assist you cut your energy prices. smart meters conjointly offer utilities with bigger data regarding what proportion electricity is getting used throughout their place.

II. DESCRIPTION OF THE MODULE

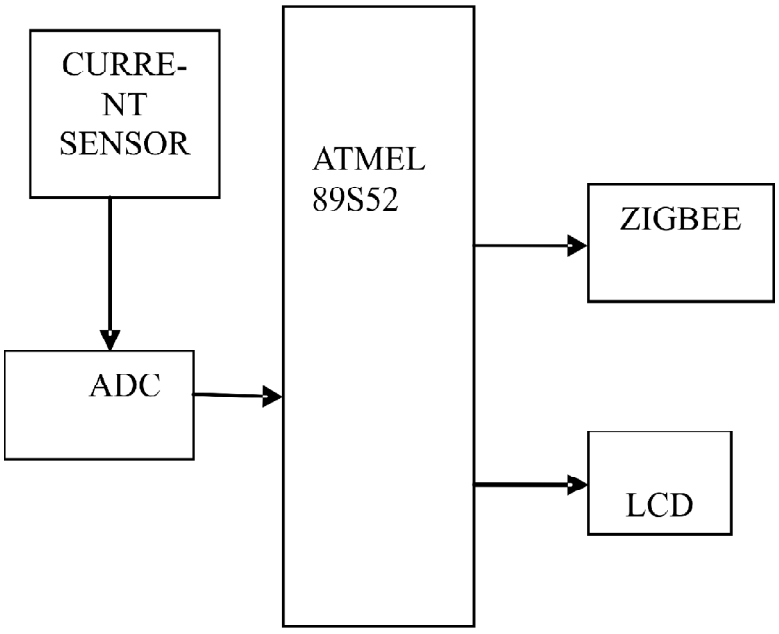

Figure 1: Block Diagram of Transmitter section

(A) Transmitter module

In the transmitter section of the system there is a current sensor. This current sensor is initialized by passing the current through the it. where this by using the techniques of high current and low current sensing calculates the amount of the current passing through it and the variance in it depending upon the current consumed by the device used. Then the analog data is send to the ADC where this analog data is converted in to the digital data. This digital data of sensor is send to the Atmel 89S52 and this microcontroller is connected to the Zigbee and Lcd. Where the load valve can be displayed. Zigbee sends this data to the receiver section on other side.

(B) Receiver Module

In the receiver section the data send by the transmitter section by using the zigbee is received by the zigbee in the receiver section. This data from zigbee is send to the ARM7 LPC2148.This data is send to ARM 7 is send to the PC using Ethernet where this data is send to the server and is uploaded in to the server so this automatically updates the information. This also is send to the bluetooth where it can be accessed by the mobile phone. In this the real time consumption of current can be viewed.

(C) Sensor module interface

A current sensor is a device that detects electrical current (AC or DC) in a wire, and generates a signal proportional to it.analog output, which duplicates the wave shape of the sensed current unipolar output, which is proportional to the average or RMS value of the sensed current unipolar, with a unipolar output, which duplicates the wave shape of the sensed current

(D) Controller module

The AT89S52 is a low-power, high-performance CMOS 8-bit microcontroller with 8K bytes of in-system programmable Flash memory. The device is manufactured using Atmel's high-density non volatile memory technology and is compatible with the Indus-try-standard 80C51 instruction set and pin out

LPC2148 is the widely used IC from ARM-7 family. It is manufactured by Philips and it is pre-loaded with many inbuilt peripherals making it more efficient and a reliable option for the beginners as well as high end application developer. 8 to 40 kb of on chip static RAM and 32 to 512 Kb of on chip flash program memory. In system programming via on chip boot loader software. Embedded ICE RT offer real time debugging with the on chip real monitor software and high speed tracing of instruction execution

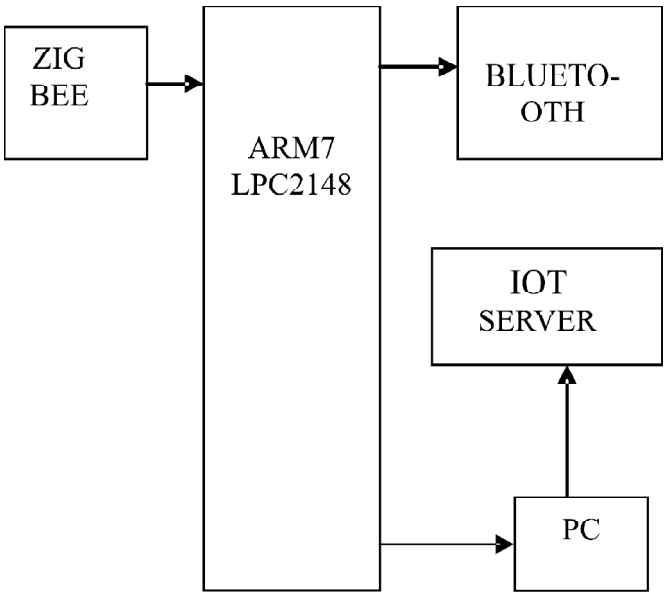

Figure 2: Block diagram of receiver section

III. IMPLEMENTATION

(A) Software Implementation

Software implementation of this prototype is mad by using the Keil ide 4.0 and Keil MDK. The program for this software is written using language c. This program is compiled and is error free. This program must be tested by using simulation software. In this the requirement for the device is made available within the

software named Proteus 8.1.In this the both sides of the project is build and program is dumped into the microcontroller. Then this software is run which shows the output by the simulation of sending the data to the other end.

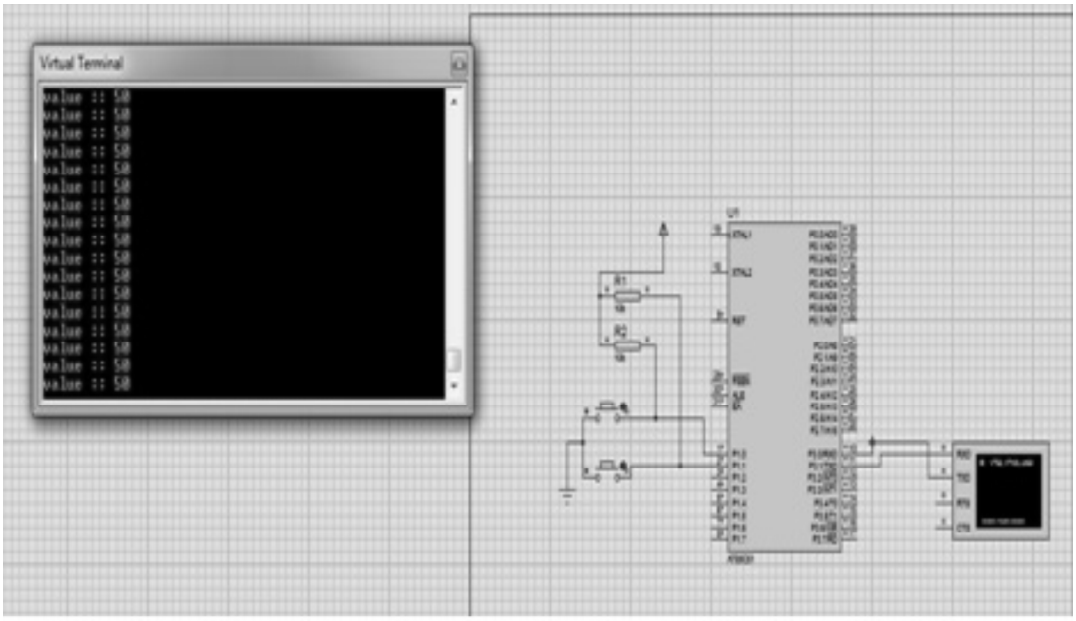

Figure 3: Simulation result of transmitter section

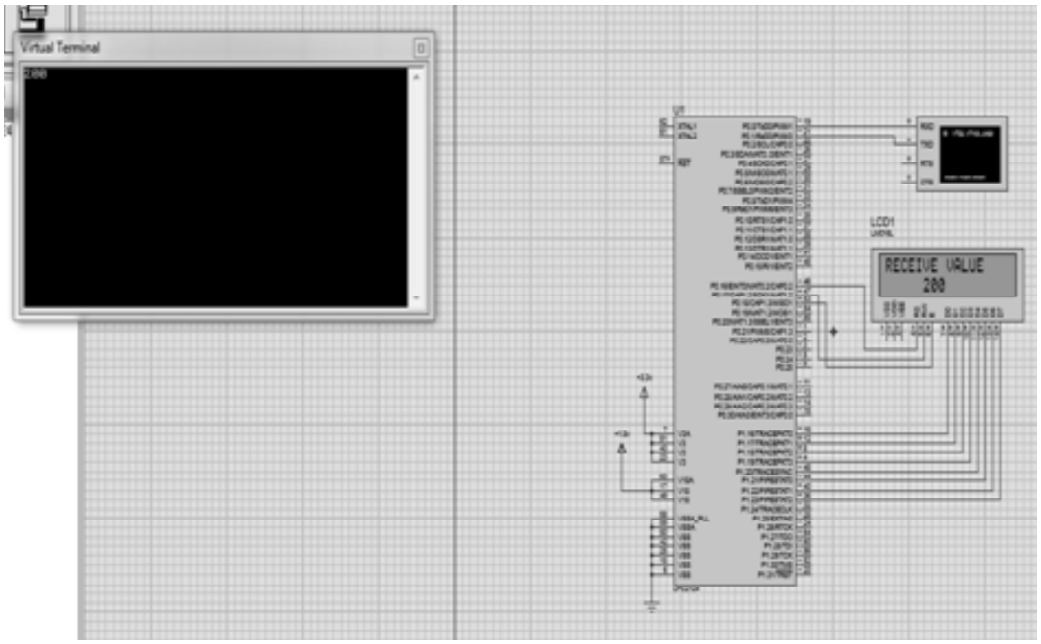

Figure 4: Simulation result of receiver section

(B) Hardware implementation

The hardware implementation of this prototype consists of the transmitter section and receiver section. In the transmitter section which does consists of the microprocessor ATMEl89S52.which is interfaced with the current sensor where the sensor is connected to the power supply of the device of which we need to measure the real time consumption of the power. This senses the power consumed by using the low and high power consumption. This actually determines the amount of the power consumed by the device.

This is actually determined and send to the processor where this information is send to the zigbee which is wireless tranreceiver which transmits the data to receiver section of the Project.

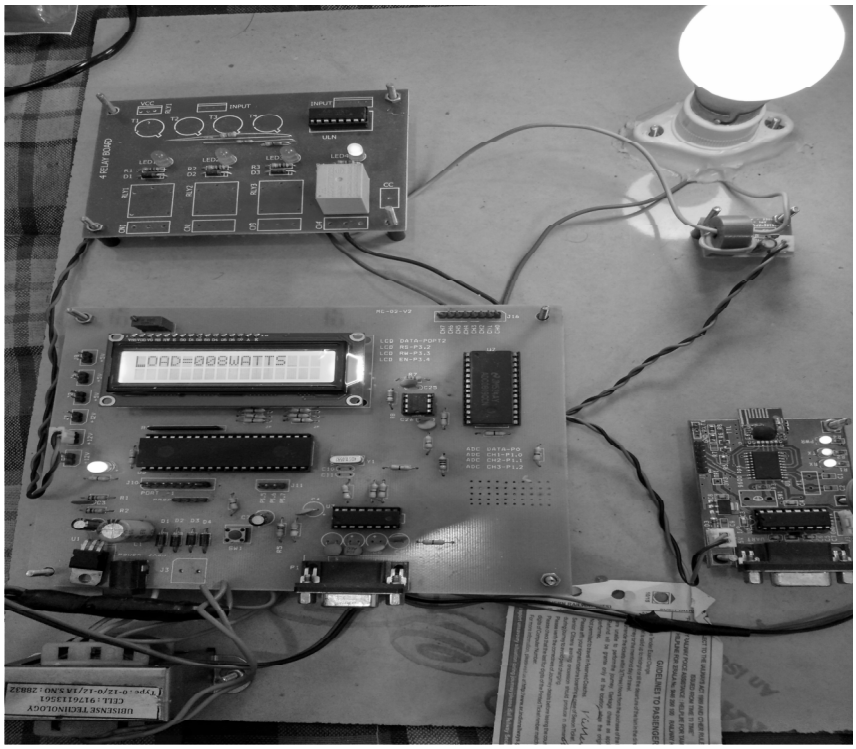

Figure 5: The Transmitter section

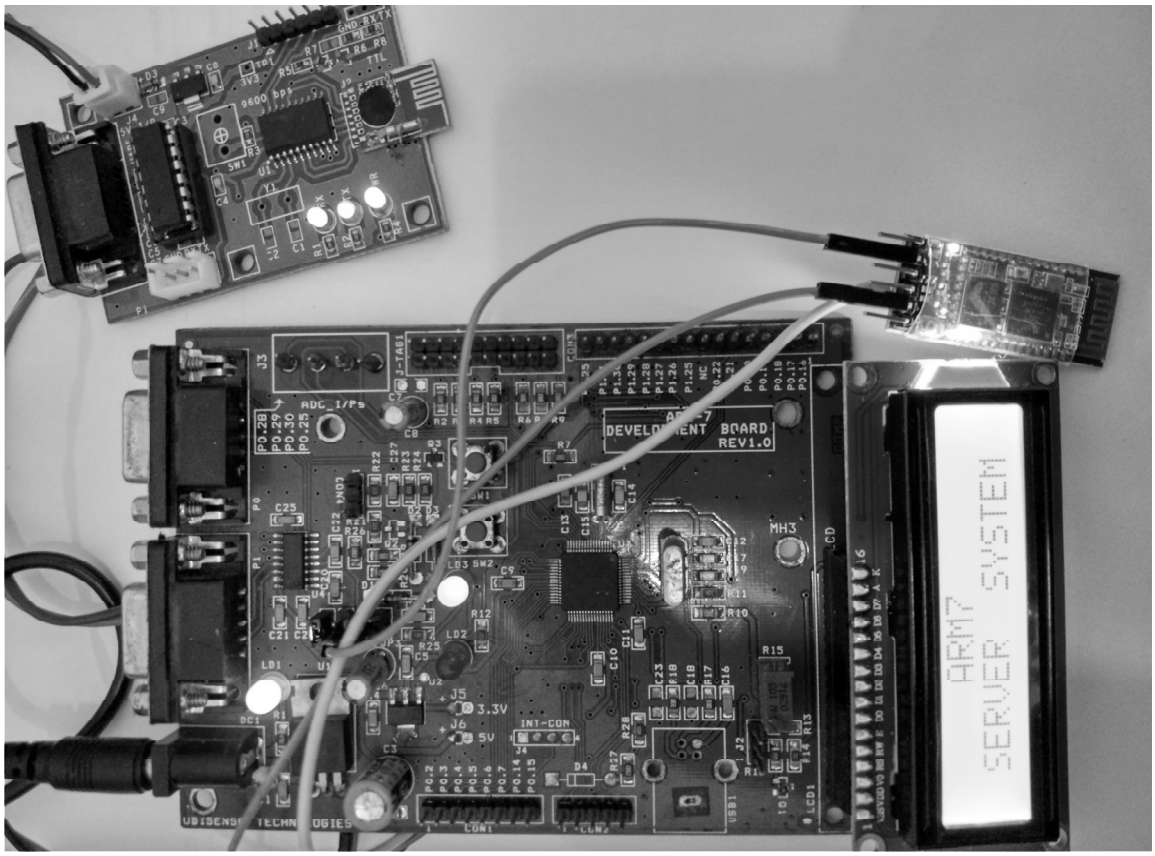

Figure 6: The receiver section

Figure 7: Data received by Bluetooth modem

The receiver section of the system is interfaced with the Bluetooth module which send the data to the mobiles or other Bluetooth interfaced device. The receiver end consists of the ARM7.This data should be sent to the server where this information is stored and can be reviewed when necessary. This is accessible by using the link provided both by the customer and the distributor. To send the data from the receiver end to the computer we use RS232 which is usb to serial connection which sends the data from ARM7 to the computer and then this data is updated into the server with internet connection.

IV. RESULTS AND DISCUSSIONS

(A) Simulation Result

In order to show the actual current consumption of the device in the real time. we use the proteus software which produces the actual simulation of the transmitter and receiver section. The figure 3 and figure 4 presents the simulation of the results of the software.

(B) Hardware result

The figure 5 and figure 6 shows us the actual hardware results which indicates both the transmitter section and receiver section. where the transmitter section sends information to the receiver section and this send to the computer and also to the mobile. then it is updated into the server

V. CONCLUSION

The aim of this project is to monitor the and show the real time consumption of the current consumed by the different devices. we have developed the simulation of this project. we developed the transmitter section which gives the valves from the sensor attached to the ADC. The microcontroller produces the result in the Lcd and passes the message to Zigbee.The future scope of this project includes development of the transmitter section in the hardware This current sensor is initialized by passing the current through the it. where this by using the techniques of high current and low current sensing calculates the amount of the current passing through it and the variance in it depending upon the current consumed by the device used. Then the analog data is send to the ADC where this analog data is converted in to the digital data. This digital data of sensor is send to the Atmel 89S52 and this microcontroller is connected to the Zigbee and Lcd.

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REFERENCES

[1] V. Giordano, F. Gangale, and G. Fulli, “Smart grid projects in Europe: Lessons learned and current developments, 2012 update”Eur. Commission, Joint Res. Centre, Inst. Energy Transp., Sci.Policy Rep., 2013.

[2] R. Ma, H. H. Chen, Y. Huang, and W. Meng, “Smart gridcommunication: Its challenges and opportunities,” IEEE Trans. SmartGrid, vol. 4, no. 1, pp. 36–46, Mar. 2013.

[3] Assessment of demand response and advanced metering,”Fed. Energy Regul. Comm., Washington, DC, USA, Tech. Rep., Dec. 2012. [Online]. Available: http://www.ferc.gov/legal/staff-reports/12-20-12-demand-response.pdf, accessed Sep. 1, 2014.

[4] K. Samarakoon, J. Ekanayake, and N. Jenkins, “Reporting available demand response,” IEEE Trans. Smart Grid, vol. 4, no. 4,pp. 1842–1851, Dec. 2013.

[5] Q. Hu and F. Li, “Hardware design of smart home energy management system with dynamic price response,” IEEE Trans. Smart Grid, vol. 4,no. 4, pp. 1878–1887, Dec. 2013.

[6] F. Viani *et al.*, “Wireless architectures for heterogeneous sensing in smarthome applications: Concepts and real implementation,” Proc. IEEE, vol. 101, no. 11, pp. 2381–2396, Nov. 2013.

[7] F. Salvadori, C. S. Gehrke, A. C. de Oliveira, M. de Campos,and P. S. Sausen, “Smart grid infrastructure using a hybrid networkarchitecture,” IEEE Trans. Smart Grid, vol. 4, no. 3, pp. 1630–1639, Sep. 2013.

[8] B. Becker, A. Kellerer, and H. Schmeck, “User interaction interface for energy management in smart homes,” in Proc. 2012 IEEE PES Innov.Smart Grid Technol. (ISGT) Conf., Washington, DC, USA, pp. 1–8.

[9] Q. Liu, G. Cooper, N. Linge, H. Takruri, and R. Sowden, “DEHEMS:Creating a digital environment for large-scale energy management athomes,” IEEE Trans. Consum. Electron., vol. 59, no. 1, pp. 62–69, Feb. 2013.

[10] S. Meiling, T. Steinbach, M. Duge, and T. C. Schmidt, “Consumerorientedintegration of smart homes and smart grids: A case formulticast-enabled Home Gateways?” in Proc. IEEE 2013 3th Int. Conf.Consum. Electron. (ICCE), Berlin, Germany, pp. 279–283.

[11] E. Spanò, S. Di Pascoli, and G. Iannaccone, “An intragrid implementation embedded in an internet of things platform,” in Proc. 2013 IEEE 18th Int. Workshop Comput. Aided Model. Design Commun. Links Netw.(CAMAD), Berlin, Germany, pp. 134–138.