International Journal of Infinite Innovations in Technology|ISSN:2278-9057
IJIIT|Volume-I|Issue-II|2012-2013 October|Paper-07
Reg. No.:20120907|DOI:V1I2P07

Power Theft Capturing through Live Data Transmission

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ABSTRACT

***Abstract*— Considering electricity theft problem, electric theft capturing technology is proposed in this paper based on live data transmission from source to destination technique. The system consists of two area consumer side and supplier side, both the area side communicate with each other through live data transmission technique. The proposed software module also incorporates different data aggregation algorithms, electricity measuring and information transmission foot marks. This design incorporates effective solutions for problems faced by electricity supplier such as power theft, and transmission line fault.**

I. INTRODUCTION

Many developing countries confront wide spread theft of electricity from government owned power utilities. In India electricity theft leads to annual losses estimated at US$4.5 billion, about 1.5 percent of GDP. Who are the losers? Honest consumers, poor people, and those without connections, who bear the burden of high tariffs, system inefficiencies, and inadequate and unreliable power supply. Line faults may be caused due to over current or earth fault. If there happens to be a connection between two phase lines then over current fault occurs. Earth fault occurs due to the earthing of phase line through cross arm or any other way. Now in India, there is not any technique to detect the specific location of the fault immediately. Power theft is another major problem faced by Indian electrical system.

II. THE PROPOSED ARCHITECTURE

The whole proposed system architecture based on GSM/GPRS network and electric grid. The architecture consist of two areas namely consumer side and supplier side. The proposed system architecture shown in Figure 1.

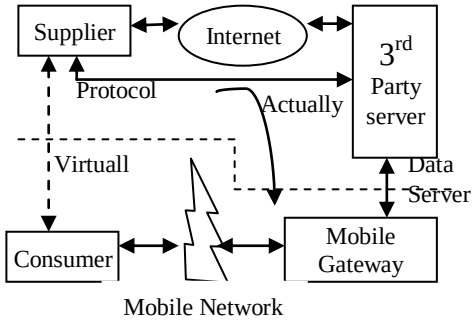

Figure 1. Proposed Architecture

Supplier communicate consumer through various network. Network consists of internet and mobile network. Supplier communicates to 3rd party for data regarding consumer meter, 3rd party collect that data from consumer meter through mobile network. Virtually it shows that consumer directly sending data to supplier but actually it happen through various networks [1].

III. BLOCK DIAGRAM

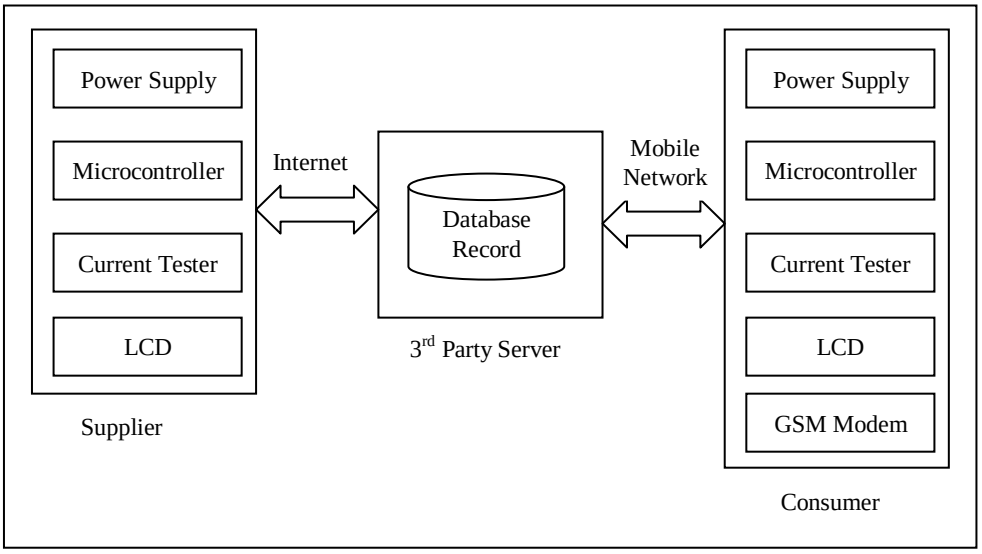

Figure 2. Block Diagram of electric theft capturing system

A. Microcontroller:

The LPC214148 microcontrollers are based on a 16-bit ARM7TDMI-S CPU with real-time emulation and embedded trace support, which combine microcontroller with embedded high speed flash memory ranging from 32 kb to 512 kb. A 128-bit wide memory interface and unique accelerator architecture enable 32-bit code execution at the maximum clock rate. For critical code size applications, the alternative 16-bit Thumb mode reduces code by more than 30 % with minimal performance penalty.

Due to their tiny size and low power consumption, LPC214148 are ideal for applications where miniaturization is a key requirement, such as access control and point-of-sale. Serial communications interfaces ranging from a USB 2.0 Full-speed device, multiple UARTs, SPI, SSP to I2C-bus and on-chip SRAM of 8 kb up to 40 kb, make these devices very well suited for communication gateways and protocol converters, soft modems, voice recognition and low end imaging, providing both large buffer size and high processing power. Various 32-bit timers, single or dual 10-bit ADC(s), 10-bit DAC, PWM channels and 45 fast GPIO lines with up to nine edge or level sensitive external interrupt pins make these microcontrollers suitable for industrial control and medical systems [3].

B. Current Tester:

The Winson WCS2702 provides economical and precise solution for both DC and AC current sensing in industrial, commercial and communications systems.

The WCS2702 consists of a precise, low-temperature drift linear hall sensor IC with temperature compensation circuit and a current transformer with 110 mΩ typical internal conductor resistance. This extremely low resistance can effectively reduce power loss, operating temperature and increase the reliability greatly. Applied current flowing through this conduction path generates a magnetic field which is sensed by the integrated Hall IC and converted into a proportional voltage [4].

The terminals of the conductive path are electrically isolated from the sensor leads. This allows the WCS2702 current sensor to be used in applications requiring electrical isolation without the use of opto-isolators or other costly isolation techniques and make system more competitive in cost.

C. GSM Modem:

GSM/GPRS TTL -Modem from rhydoLABZ is built with SIMCOM Make SIM900 Quad-band GSM/GPRS engine, works on frequencies 850 MHz, 900 MHz, 1800 MHz and 1900 MHz It is very compact in size and easy to use as plug in GSM Modem. The Modem is designed with 3V3/5V TTL interfacing circuitry, which allows you to directly interface to 5V microcontrollers (PIC,Arduino,AVR ect) as well as 3V3 Microcontrollers (ARM,ARM Cortex XX, ect) .The baud rate can be configurable

from 9600-115200 through AT command. Initially Modem is in Auto baud mode. This GSM/GPRS TTL Modem is having internal TCP/IP stack to enable you to connect with internet via GPRS. It is suitable for SMS as well as DATA transfer application in M2M interface. The modem needed only two wires (Tx,Rx) except Power supply to interface with microcontroller/Host. The built in Low Dropout Linear voltage regulator allows you to connect wide range of unregulated power supply (4.2V -13V). Yes, 5 V is in between. Using this modem, you will be able to send & Read SMS, connect to internet via GPRS through simple AT commands [5].

There are two modes of IP application for SIM900: APPTCP and SAPBR. APPTCP and SAPBR can be worked at the same time. When in APPTCP mode, it contains TCP/UDP application. When in SAPBR mode, it contains FTP and HTTP applications. Shown in Figure 3 [6].

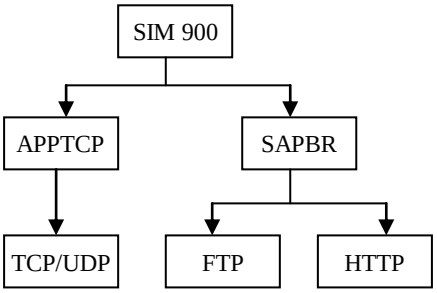

Figure 3. SIM900 IP Application Structure

D. LCD:

LCD stands for Liquid Crystal Display. As the output of our circuit should be displayed in some form or the other, so we have selected LCD display as it can display 16 characters at a time. It is also easy to interface with the microcontroller without any decoder. So it is better than the seven segment display.

IV. ALGORITHM

A. Area Side

1. System initialization
2. Beep verification
3. Serial port initialization
4. ADC port initialization
5. LCD verification
6. SIM modem initialization
7. SIM GPRS initialization to open GPRS context.
8. Initialize HTTP service to establish connection with 3rd party server.
9. If step 4, 5, 6 executed successfully then system started.
10. Read ideal voltage
11. Start monitoring
12. Calculate power (convert analog voltage into digital voltage, subtract it from reference voltage and calculate power)
13. Calculated power sends it to 3rd party server via HTTP Post.

B. HTTP Post

1. Calculate length of sending data. (sending data contains userid and packet)
2. Post data (Length of sending data).
3. Wait for respond
4. Start sending data now.
5. Total packets send as per length of packet.
6. Wait for respond
7. Flush data

C. Department side

1. System initialization
2. Beep verification
3. Serial port initialization
4. ADC port initialization
5. LCD verification
6. Read ideal voltage
7. Start monitoring
8. Calculate power (convert analog voltage into digital voltage, subtract it from reference voltage and calculate power)
9. Send identification bits for synchronization via serial port.
10. Send length of data via serial port.
11. Send calculated power via serial port.

V. FEATURES AND LIMITATION

A. Features

- The proposed system provides the solution for some of the main problems faced by the existing electricity supply system, such as

wastage of energy, power theft, manual billing system, and transmission line fault.

- This method will reduce the energy wastage and save a lot of energy for future use.
- We can detect the location from where the power is being stolen which was not possible before.
- Optimized use of energy.
- Real time theft capturing.
- Currently used energy meters can be modified into this sensor, so no need to replace currently used energy meters.

B. Limitations

- One major disadvantage of this project is that it is not capable of detecting the exact location from where the power is being stolen.
- Cannot determine who is stealing, but no any other existing system is capable.
- If implemented on a large scale it may take a lot of time and manual input.

VI. RESULT

Power theft can be calculated by using the following formula:

- Difference = Electricity Supply – Electricity Consume

Where, Electricity Consume is stored at 3rd party sever database transmitted by consumer meter and Electricity supply measured at Department side.
If difference is negligible then there is no power theft otherwise there is a power theft.

VII. CONCLUSION

This paper is aimed at reducing the heavy power and revenue losses that occur due to power theft by the customers. By this design it can be concluded that power theft can be effectively curbed by detecting where the power theft occurs and informing the authorities. Also an automatic circuit breaker may be integrated to the unit so as to remotely cut off the power supply to the house or consumer who tries to indulge in power theft. The ability of proposed system is to inform or send data digitally to a remote station using live data transmission through GSM/GPRS technique. The proposed system provides the solution for some of the main problems faced by the existing electric supply system, such as wastage of energy, power theft, and transmission line fault.

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