



AN IOT-AWARE ARCHITECTURE FOR COLLECTING AND MANAGING DATA RELATED ELECTRICITY DEPARTMENT

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ABSTRACT: It is realized that one of the defective subsystems adding to the tremendous budgetary loss in Power Supply Company is the conventional metering and charging framework. Mistakes get presented at each phase of charging the energy rates, similar to blunders with conventional meters, reading errors by human while noticing the consumed energy; and blunder during the preparation of paid and the due bills. The solution for this downside is a prepaid charging or billing framework of consumed energy. Most of the developing countries are shifting their conventional energy management practices to the modern one by replacing the old and conventional energy meters with the smart meters outfitted with the prepaid facility to quantify the power consumption so as to decrease the income deficits looked by utilities because of customer unwillingness to make consumed energy payments on time. Our proposed design embedded with Arduino and NODEMCU technology is advancement over conventional energy meter, which enables consumer to effectively manage their electricity usage. Normal exiting energy meter are Analog. This type of Energy meter needs the Electricity Bill (EB) Employee for directly come to home to calculate the Amount for unit of Energy consumed by the consumer. Some time the EB Employer may enter the wrong consumed unit value. So it cause calculated amount for Energy unit may be higher or lower so it affects both EB and Consumer. The Objective of this project is to get easy access in EB office instead of standing in the queue in front of the EB office.

INTRODUCTION:

Electric energy consumed by the power devices is measured by a gadget known as an energy meter. Since 1980s, the energy meter's journey started. When there were large energy meters which have been made with lots of innovations in energy meters to reduce its size and also the weight. Particularly, enhancement in accuracy, specifications and features of energy meters has been a topic of discussion. In Pakistan, electromechanical energy meters were used for a long

time. These meters work by checking and figuring the quantity of turns of an electrically directing metal plate which is made to rotate at a speed in respect to the power experiencing the meter. Those electromechanical energy meters are being supplanted by the newly digitized meters due to different problems like there is no way to upgrade those energy meters, its accuracy was limited and those meters were easy to manipulate because direction of revolving disc can be easily reversed. Nowadays, digital energy

meters can measure voltage, current and power also but electromechanical energy meters can only measure active power. Digital meters measure energy usage by highly integrated circuits, by capitalizing the voltage and current that gives the instantaneous power in watts. Digital meters show usage of electricity in digits on a liquid crystal display and those meters are highly accurate, inexpensive, theft reluctant, etc. Prepaid Electricity Energy Meter is a good concept in which you can recharge its balance, like we do in our mobile phones. In this project we are building an automated system by using Arduino and GSM module. You can recharge the electricity balance through this system, just by sending a SMS. It can also disconnect the home power supply connection, if there is low or zero balance in the system. And this system will reads the energy meter readings and automatically send some updates to user's mobile phone like low balance alert, cut off alert, resume alert and recharge alert. The prepaid energy meter uses a recharge which is available in various ranges (i.e. Rs. 50, Rs. 100, Rs. 200, etc.). The recharge is done by using a mobile and the meter is charged with the amount. According to the power consumption, the amount will be reduced. A relay system has been used which shut down or disconnect the energy meter and load through supply mains when the recharge amount is depleted. A buzzer is used as an alarm which starts before the recharge amount reaches a minimum value. Prepaid energy meter has many advantages both from suppliers as well as consumer's point as follows:- Why Prepayment – From supplier point of view? Pay before use Keep customers on supply Recover money owed (debt) Lower overhead No bill production No bill distribution No need to chase payments No further actions such as disconnections

Social acceptability Customer responsible for disconnection Load and demand side management.

LITERATURE SURVEY:

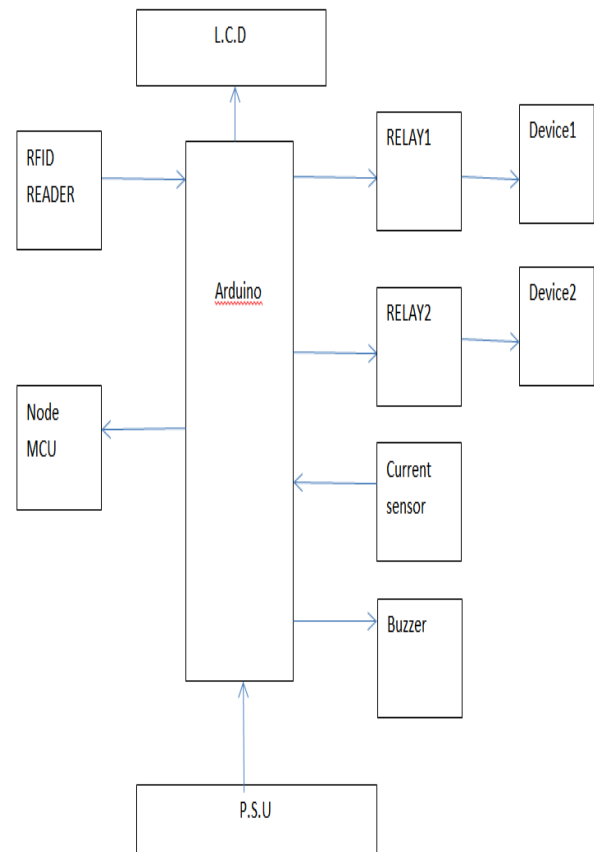
The prolonged discussion clearly defines the architecture of smart metering system. The architecture proposed in this study is a multifunctional approach to read the energy meters Located at the consumer sites. This report states that out of total energy generated only 55% is billed and only 41% is realized [1]. Each customer equipment provides the energy consumption to the MCIC that keeps the details of individual users. The meter tampering is easily detected by this approach. But the implementation cost is high. This paper discusses simulations and models based on data from pre-paid meters in order to determine the feasibility and method of Operation for remote check meter. The resolution of illegal consumers detected depends on the deviation of the losses and the connected time of the check meter. This report gives only the simulation result. It would be the better method for minimum amount of users. The further improvements to detect the electricity theft lead to grouping of customers by means of Support Vector Machine (SVM) [3]. This methodology insists data processing and data mining methods to detect the customers with abnormal consumption of electricity. It involves many complicated mathematical calculations that may provide erroneous results and can detect only 60% fraudulent customers. The previous methodologies are apt for the traditional power systems. Sudarshan K. Vallurup[4] proposed the Design and Assemble of Low Cost Prepaid Smart Card Energy meter. In this type of prepaid energy meter, there are two main components; one is smart card and another one is smart card reader. Smart card is like credit cards made

of plastic and it consists of different components like CPU, ROM, EEPROM, etc. so basically integrated circuit is embedded on a smart card [3]. There is a whole smart card operating system through which data is controlled of a smart card. In this kind of scheme, the consumer must recharge his card as much number of units he wants. Later, that card is inserted into card reader which is embedded with energy meter like a whole package. Afterwards, card reader does its work and stores the units which are available in smart card, energy meter reduces the units as much electricity is being consumed. When unit reaches to zero, it disconnects the electricity until recharge. Traditional meter reading is done by the human operator, this require a more number of labour operator and long working hour to achieve the complete area data reading and billing. Due to the increase in the development of residential building and commercial building the meter reading task increases which require more number of human operators. It should be clear that such methods are very time consuming and does not satisfy the business requirements for the power company, in addition to the large number of errors incorporated in the reading process. This type of systems cannot provide transparency.

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PROPOSED ARCHITECTURE:



Usually the households have post paid electricity connections. On the consumer side, post paid connections have drawback that the consumption of electricity is not tracked by the consumers and many times they are shocked, when they receive high bills. The cause of getting high bills is usually not the high electricity rates but is the unconscious overuse of electricity. Prepaid electricity connections are usually suggested as the viable solution to this problem. In a prepaid electricity connection, consumer would need to recharge the amount of electricity they want to

consume. In such a system, the household electricity meters need to be equipped with a system that could be acknowledged of the amount recharged by the consumer and could count down the electricity consumption from the recharged amount to zero. Once the meter reaches zero, the main supply would be automatically cut off and could be resumed only after the next recharge.

This project is an attempt to realize a similar system. In this project a circuit is designed that would work as electricity recharge station and an additional circuit is designed that could integrate with the regular household energy meters and capable of counting down energy usage and cut off the main supply once the energy usage countdown reaches zero. A memory stick is used as an alternative to smart card which will store the recharge information from the recharge station and could be plugged to the circuit integrated to energy meters for regulating main supplies.

ARDUINO: The Arduino Software (IDE) allows you to write programs and upload them to your board. In the Arduino Software page you will find two options:

1. If you have a reliable Internet connection, you should use the online IDE (Arduino Web Editor). It will allow you to save your sketches in the cloud, having them available from any device and backed up. You will always have the most up-to-date version of the IDE without the need to install updates or community generated libraries.
2. If you would rather work offline, you should use the latest version of the desktop IDE. Code online on the Arduino Web Editor To use the online IDE simply follow these instructions. Remember that boards work out-of-the-box on the Web Editor, no need to install anything. Install the Arduino Desktop IDE

LIQUID CRYSTAL DISPLAY: The LCD is used for the purpose of displaying the words which we are given in the program code. This code will be executed on microcontroller chip. By following the instructions in code the LCD display the related words. Fig shows the LCD display.

INTRODUCTION:



Fig. : LCD Display

The LCD display consists of two lines, 20 characters per line that is interfaced with the PIC16F73. The protocol (handshaking) for the display is as shown in Fig. The display contains two internal byte-wide registers, one for commands (RS=0) and the second for characters to be displayed (RS=1). It also contains a user-programmed RAM area (the character RAM) that can be programmed to generate any desired character that can be formed using a dot matrix. To distinguish between these two data areas, the hex command byte 80 will be used to signify that the display RAM address 00h will be chosen. Port 1 is used to furnish the command or data type, and ports 3.2 to 3.4 furnish register select and read/write levels.

NODEMCU ESP8266:

The ESP8266 series, or family, of Wi-Fi chips is produced by Espressif Systems, a fabless semiconductor company operating out of Shanghai,

China. The ESP8266 series presently includes the ESP8266EX and ESP8285 chips. **ESP8266EX** (simply referred to as ESP8266) is a system-on-chip (SoC) which integrates a 32-bit Tensilica microcontroller, standard digital peripheral interfaces, antenna switches, RF balun, power amplifier, low noise receive amplifier, filters and power management modules into a small package. It provides capabilities for 2.4 GHz Wi-Fi (802.11 b/g/n, supporting WPA/WPA2), general-purpose input/output (16 GPIO), Inter-Integrated Circuit (I²C), analog-to-digital conversion (10-bit ADC), Serial Peripheral Interface (SPI), I²S interfaces with DMA (sharing pins with GPIO), UART (on dedicated pins, plus a transmit-only UART can be enabled on GPIO2), and pulse-width modulation (PWM). The processor core, called "L106" by Espressif, is based on Tensilica's Diamond Standard 106Micro 32-bit processor controller core and runs at 80 MHz (or overclocked to 160 MHz). It has a 64 KiB boot ROM, 32 KiB instruction RAM, and 80 KiB user data RAM. (Also, 32 KiB instruction cache RAM and 16 KiB ETS system data RAM.) External flash memory can be accessed through SPI. The silicon chip itself is housed within a 5 mm × 5 mm Quad Flat No-Leads package with 33 connection pads – 8 pads along each side and one large thermal/ground pad in the center. The ESP8266 is a System on a Chip (SoC), manufactured by the Chinese company Espressif. It consists of a Tensilica L106 32-bit **micro controller** unit (MCU) and a **Wi-Fi transceiver**. It has **11 GPIO pins*** (General Purpose Input/Output pins), and an **analog input** as well. This means that you can program it like any normal Arduino or other microcontroller. And on top of that, you get Wi-Fi communication, so you can use it to connect to your Wi-Fi network, connect to the Internet, host a web

server with real web pages, let your smartphone connect to it, etc ... The possibilities are endless! It's no wonder that this chip has become the most popular IOT device available. The ESP8266 WiFi Module is a self contained SOC with integrated TCP/IP protocol stack that can give any microcontroller access to your WiFi network. The ESP8266 is capable of either hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module comes pre-programmed with an AT command set firmware, meaning, you can simply hook this up to your Arduino device and get about as much WiFi-ability as a WiFi Shield offers (and that's just out of the box)! The ESP8266 module is an extremely cost effective board with a huge, and ever growing, community.

CONCLUSION:

This paper present wireless communication based prepaid energy meter can control the usage of electricity on consumer side to avoid wastage of power. Prepaid energy meter is a concept to minimize the electricity theft with a cost efficient manner. The users are not bound to pay excesses amount of money, users have to pay according to their requirement. It can reduce problems associated with billing consumers living in isolated areas and reduce deployment of manpower for taking meter readings. Prepaid energy meter is more reliable and user friendly. From all these we can conclude that if we implement this prepaid energy meter then it can become more beneficial.

REFERENCES:

- [1] Ashvini Alhat, Madhuri Dighe, Dhanashri Mane, Manisha Narsale;, Prepaid Energy Meter with GSM Technology International Journal of Innovative Research in Computer and Communication Engineering , vol.4, Issue 5, May 2016.

[2] S Ezhilarasu, K Riju, K Venkatesh, M Varatharaj;, An Enhancement of Prepaid Energy Meter Using Smart Card And GSM Module Techniques International Journal of Research in Electronics , vol.2 , Issue 3, March 2015.

[3] Jignesh Somabhai Prajapati,Ashwin P Patel,Vyom M Bhankhariya;, Prepaid Electricity Billing System Journal Of Information, Knowledge And Research In Electronics And Communication Engineering , vol.2, Issue 2, October 2013.

[4] Sudarshan K Valluru;,Design and Assembly of Low Cost Prepaid Smart Card Energy Meter-A Novel Design, International Journal on Electrical Engineering and Informatics , vol.23, 2013.

[5] Nabil Mohammad,Anomadarsini Barua and Muhammad Abdullah Arafat;,A Smart Prepaid Energy Metering System to control Electricity Theft, International Conference on Power, Energy and Control , vol.13, 2011

[6] Prepaid Energy Meter (AT89S52) 8051 Microcontroller Indian engineer. wordpress.com/.../prepaid-energymeter at89s52.

[7] L. Li , X. Hu, W. Zhang, Design of an ARM-Based Power Meter having WIFI Wireless Communication Module, Proc. IEEE 4th International Conference on Industrial Electronics and Applications, Xi'an, May 2009, 403-407.

[8] LDR <http://www.technologystudent.com/elec1/ldr1.html>.

[9] P. Prudhvi, D. Bhalodi, M. Manohar, V. Padidela and S. Adapa, A Smart Energy Meter Architecture in Indian Context, Proc.IEEE 11th International Conference on Environment and Electrical Engineering (EEEIC), Venice, May, 2012, 217-222.

[10]S. Arun and S. Naidu, Hybrid Automatic Meter Reading System, International Journal of Advanced

Research in Computer Science and Software Engineering, 2(7) ,July, 2012, 361-365.