

# Automation of Residential Electricity Cut off Using Network Based Embedded Controller

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**ABSTRACT-** At the present time, with the development of the Internet, automation becomes a very interesting topic for debate. This paper discusses the development of the automation system for the residential power cut off using the network based embedded controller. Nowadays, various types of devices depend on home electrical power to control the signals for resetting the state of the input. Based on this situation, it becomes an external inspiration to develop an automated system for residential power equipment. The system has an embedded device to control the power supply main switch and update the data in the data center. User providers are able to see billing information along with updated power consumption in web services. The cut off warning message sends users through email and short message services. The system helps the electricity provider reduce the operation cost because the system can automatically cut the power when the usage limit is exceeded.

**Key words - Automation system, TNB; Embedded**

## I. INTRODUCTION

Lives are not without electricity Electricity Energy is a requirement that gives strength to almost all the machines around us. At the residential level, it helps mothers to study their daily duties, children comfortably and the father is doing his work skillfully. At the commercial level, this computer enables the vast infrastructure of the machine which runs and manages the program from small materials to mega buildings. If there was no electricity in the world for any reason, chaos and disasters will catch immediately. Tenaga National Berhad (TNB) used a digital power meter for the home user, which has no connectivity between the power meter and the system used by TNB. Meaning, they will send the meter reader officer for the meter reading on the monthly basis for the billing receipt. If the staff can't read the meter device, (TNB) will post the 'E' bill that Based on estimates of power consumption in a month [1]. Power meter is not monitored. The domestic user can still use electricity if the bill has not been paid for the previous month. This is because the device used by TNB does not include a warning system, which will alert the user to pay the bill directly to avoid the penalty fee when paid after 30 days of the payment date. If and only the user has not billed more than three months, the technician will come home to cut electricity manually [2].

In this paper we present prototype systems in Malaysia to provide initial warning to electric power users. We Residential electricity is called cut off automation using a network based embedded controller. Through this system, it will warn the user only if the user reaches the limit of allocated power usage only. Once the user exceeds the limit of power usage with unpaid bills, then the administrator has the power to cut the power supply. The system hopes that Malaysian users will be able to manage power consumption with their electricity and help them with electricity. TNB manual meter can reduce reading jobs, and can reduce the work manually for connection / disconnection of the supply. Customers and TNBs will be able to monitor the real-time use of electricity.

## II. RELATED WORK

Primicanta et al. [3] [4] Hybrid automated metering reading (AMR) system is proposed, which is a combination of ZigBee and GSM technology. In that system, the ZigBee module is connected to the meter using the interface board and the data collector is connected to the central computer using GSM. This system is suitable with Malaysian status, which has implemented GSM-based AMR in LP

Tenaga National Berhad was the leading leader in the use of ICT in supporting its business and service delivery. TNB uses ICT to support its end-to-end business life cycle including plan development, operation and customer service processes. ICT also uses widely in the areas of finance, procurement and human resources management to support management and administrative processes within TNB. In 2003, Koey et al was successfully designing and implementing automatic meter reading system using [10], a Bluetooth device, or Bluetooth-enabled energy meter. Tan et al. [6] developed the GSM automatic power meter reading (GAPMR) system. The GAPMR system includes the GSM digital power meter installed in each consumer unit and the power eBilling system in the energy provider side. GSM Digital Power Meter (GPM) is a single-stage standard compliance digital KWH power meter with embedded GSM modem, which uses GSM networks to send power consumption to the reader using the Short Message System (SMS) on wireless provider. In the power provider side, an eBilling system is used to read all received SMS meters, calculate billing costs, update the database and publish billing notification to your respective consumer through SMS, email, web portal and printed postal mailing. A working prototype of GAMMR system was created to demonstrate the efficacy and efficiency of automatic meter reading, billing and notification through the use of GSM networks.

K et al. [7] Developed an automated meter reading system using the power line broadband carrier as the media to transmit data from the customer line to the central data. Operating experience and practice indicate: The meter reading system has properties, such that the transmission speed is faster, the reliability is high, the real time is strong and the operating cost is low.

### III. PROPOSED DESIGN

In this paper, we propose a system to improve the efficiency of TNB services by applying automatic cut off .Limit. The systems have network embedded devices that integrate with the main management system in the data center. The management system includes billing modules, alert modules and application modules. This system consists of two subsystems; Central provider parties and client parties as shown in Figure 1

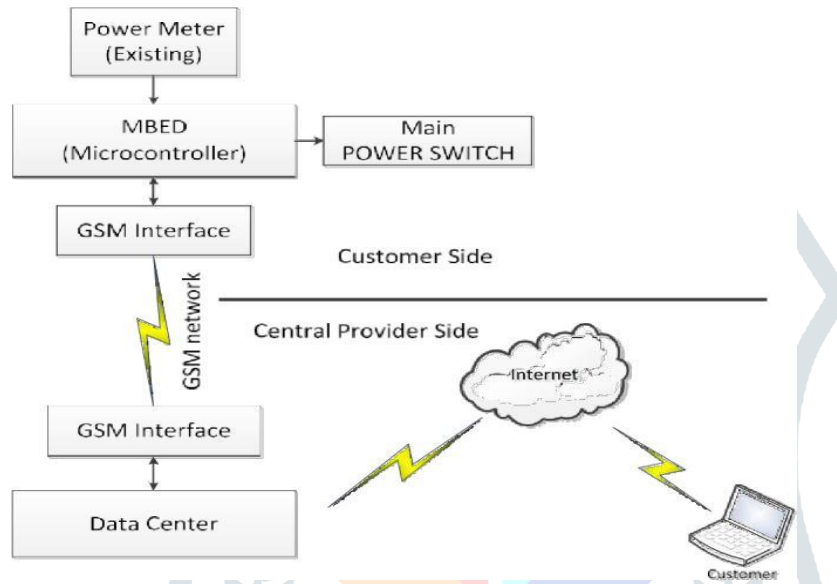


Figure 1. Automation of Residential Electricity Cut Off Using Network Based Embedded Controller

Meanwhile, in the customer side, the subsystem, which is read in the meter, is done by the MBED microcontroller. The MBED microcontroller is a series of ARM-based microcontroller development boards that are designed for rapid, flexible and lowrisk professional rapid prototypes [8]. We have especially used the MBED NXP LPC 1768, especially designed to prototype all types of devices, Especially with the flexibility of Ethernet, USB, and peripheral interfaces and flash memory. It is packaged as a small DIP form-factor, through which the hole is prototyped with PCB, strip board and breadboard, and includes a built-in USB flash programmer. This NXP is based on LPC 1768, in which the 32-bit ARM Cortex-M3 core is running at 96 MHz. It includes built-in interface with 512 kb flash, 32 kb of RAM and internet, USB host and device, CN, SPI, I2C, ADC, DAC, PWM and other I/O interface. Figure 2 shows the pins as show, commonly used interfaces and their locations. Note that all numbered zeros (P5-P30) can also be used as digital line and digital auto interface.

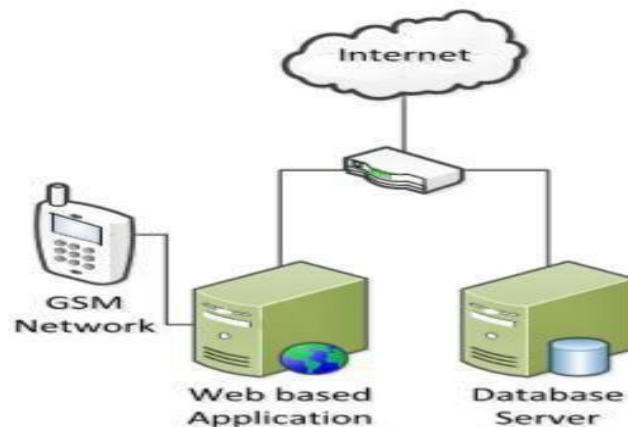


Figure 2. MBED Microcontroller Pinout

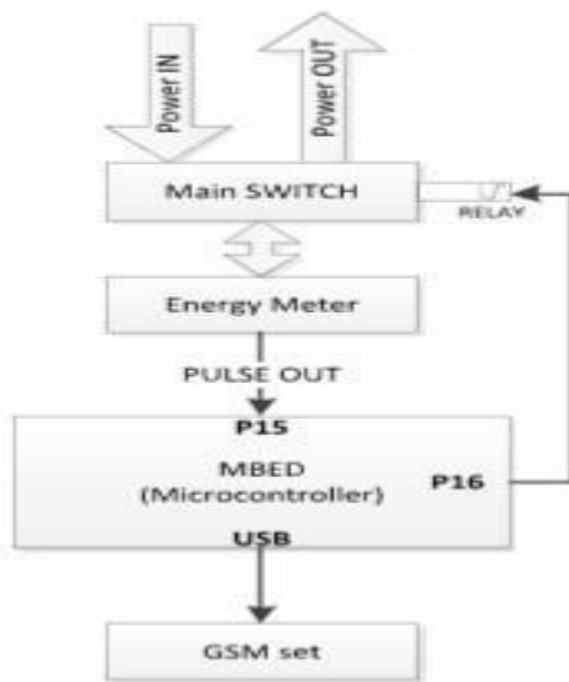


Figure 3. The Circuit at Customer Side

We chose MBE because in addition to the full hardware features; There is also support for the standard library. The MBED SDK provides a solid C / C + startup environment and peripheral intangible library to enable clean API-driven coding for microcontrollers. There is active support from the community developer. The Mbed.org developer website is home to a friendly and active community. Along with the forum and community wiki, thousands of users contributed programs and libraries [8]. TNB already uses GSM for AMR for its big power Another new technology infrastructure needs to be built and tested [4]. Based on Malaysian Intelligent Metering (MIM) dataTNB no longer buys new analog meters and is ready to use solid client meters as a meter device for its customer [9]. That's why the prototype system will we solid state meter as reference But there is a chance that this system can be used in addition to the sensor to read the disk speed in the analog meter. Solid state meter reads current and voltage and is digitally processed to calculate power consumption.

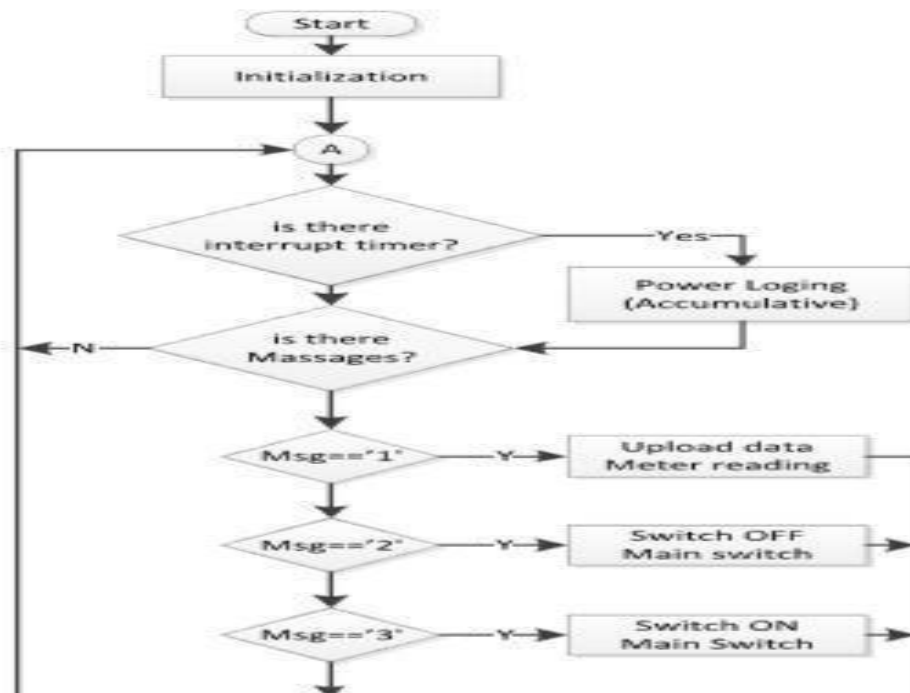


Figure 4. Flowchart of MBED microcontroller application

Figure 4 describes the process of power consumption control. When the use of electricity has reached its consumption limit, then the service provider will automatically send a warning message to alert the customer through email or SMS. The first and second warnings will be sent to the customer when the consumption will reach 80 and 90 percent usage. When power consumption reaches 100 percent usage, the system will automatically cut the supply. Till the customer pays the bill, the system automatically adds the supply again.

If there is no order to send the data, the data will be kept inside the MBED. microcontroller. Flash within the MBED is sufficient to save that data permanently with 512kb, and remains still if the power of the MBED is low. With that memory, we can also keep a log of the daily use of electric power. For example, log data contains 100 bytes in a row, Then only 36 KB of storage locations are required for one year. Apart from this, users can use this data to evaluate the pattern of use of electrical data, while TNB can use this data to improve the quality of the service. at the beginning of next month. The bill also includes details of the use of electric power every day. Therefore it can be used by customers to evaluate the pattern of electricity usage and then can be used as a reference to the power saving. Alert management is used to help customers know the current state of electrical power utilization. There are many ways to send messages to users like SMS, email and website. Types of warnings include the use of electric power which is more than the maximum limit, the arrival time to pay the bills, payment from the first day to the late 30 days, the warning for the payment of seven days power supply connection before the payment.

If after seven days of issue of the termination power supply connection, the customer still does not pay the bill and the system will send the signal to the power supply disconnection MBED microcontroller located on the power meter customers. Technical Support Center, then the customer Will send a notification The power supply will be sent by the signal system to re-add electricity, when the customer has paid all the bills to the MBED microcontroller. The initial warning system is also used to assist the customer in monitoring the situation at the customer's home.



Figure 5. Diagram subsystem at Central Provider Side

By filling e-forms and appointing an electrical contractor online, customers can apply online for electricity using the internet. The billing system module is used by the customer to record the amount of electrical energy. Bills will be issued every month. E-service components are billing modules, alert modules, power consolidation modules and application modules. Billing module is the monthly bill issuance process and sends customer preferred distribution through electronic mail or snail mail. The alert module covers the process of sending warnings to customers on their mobile phones via email or short message service when the power usage reaches the limit and demands payment. Power consumption module runs a part of the cut off process and is sending the power data usage database to the microcontroller. Application modules included the process of a new customer registration and new supply application for their residential.

#### IV. SIMULATION AND EXPERIMENT RESULT

Implementation of the main management system has been developed using VB.Net and MySQL Server 5. Web services were hosted by Microsoft IIS in Windows 7. Figure 7 shows the actual embedded device on the Proto Board.



Figure 6. MBED microcontroller in a proto board

In this simulation, we run the system in the MBED to calculate the power consumption, then send the results to the central data base. Meter readings can be done every second. The time interval for every data entry can be set in the configuration file, in which the distance from one second to one month can be connection-disconnectionof-supply.html, access date 24/02/2012. During the writing of this paper, we are not able to fully imitate the entire system. But at least the main part of this system is already capable of working well.

## V. CONCLUSION

In this letter we propose a system to provide initial warning to users of electric power in Malaysia provided by TNB. We use an MBED, an embedded microcontroller to control the main switch of the power meter which connects the automatic meter reading and the main power supply. The meter reading data is sent to the central office using GSM network. The web-based application system located at the central office can be used to manage customer registration, can be used to save the reading meter, issue a bill, and manage the warning of users of electrical power. Although the whole system has not been simulated, but the main part of the system simulation has shown that the system will be able to work well.

This initial warning system is expected to help electricity users in Malaysia manage their daily electrical energy consumption. Then the TNB can reduce the reading of the manual meter, and works manually for the connection / disconnection of the supply. Customers and TNBs may be able to monitor the real-time use of electricity.

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