

IOT BASED ENERGY METER ANDROID APPLICATION.

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Abstract : This paper presents an android application for smart energy meter. This android application will be useful for online monitoring of domestic electricity consumption or usage by consumer. This system provides a special feature, where a user can monitor each device in the power consumption. An IOT based energy meter reading system based on raspberry pi and data collaborated with an android facility is proposed in this paper. This application is useful to obtain meter readings whenever required, so that meter readers do not need to visit each customer for the consumed energy data utilized and to distribute the bill slips to each customer at their places. Also this function can be installed in handheld devices such as Mobile Phones and provides ease of access. Microcontroller can be used to monitor and record the meter readings. Utility can cut off and reconnect the customer connection by Android Application. Though, the customer can check the status of electricity consumption as the usage pattern from anywhere using his /her smartphone. In this system readings of an energy meter are being transferred by making use of dynamic readings.

IndexTerms - Smart meter, Android Application, Modbus Protocol, raspberry pi.

I. INTRODUCTION

For the purpose of recording the electricity usage by smart meter microcontroller is installed to continually measure data for different devices. The captured electricity usage data needs to be uploaded by the microcontroller to an online database, which can then be viewed by users on their Android devices installed in smartphone. Through this monitoring system, the objectives are achieved such that the users are able to know how much energy are being consumed for a particular device of an area in the house. The Android application provides an interface to show the analysis of various measurements of electricity consumption for different areas of a house in terms of voltage, current, power consumption and the corresponding pricing based on consumption for specified duration. The entire architecture of real time reading fetching system is developed as an Android app and is deployed to the smart devices which are easily access by user from anywhere and anytime. The proposed paper states the system's feature that gathers data of monitoring module of the app at specific interval of time from the devices and stores them locally on database.

A learning engine then enables operations on the raw data and generates various usage patterns over, which signalize the user about usage.

Utility billing is another useful method in the World as for concern post-paid bills energy meter. In Pakistan, conventional way of billing is used by utilities for assignment of specific consumer usage. In traditional way a meter reader goes place to place and takes the meter reading and note it down. This task is for decade is done manually. These readings are then brought to utility administration office for further procedure. According to the utility service rules and regulations the characterization of utility billing is applied on usage patterns. The employee of the utility or organization which provide utility goes door to door again to give the bill slips of the utility to the specified consumer. [1-3].

Though load flow can be provided by smart energy meters through android with responsive design to the consumers so they can manage their load and minimize usage as per their need effectively [4]. In context with increasing accuracy in reading, Smart energy meter are used for Automatic Meter Reading (AMR). For instance, a utility person might fail read the correct value of the total energy usage consumed that is displayed on energy meter or may knowingly report lower value than the specified read one [5]. For obtaining the meter readings Power Line Communication (PLC) can also be come into picture used but interference with noise makes it inadequate to sense data metering information could be transmitted via Modbus and raspberry pi but the range of WIFI is limited however, they do provide a cost effective solution[6]. As a solution firebase online data extraction system would provide the best solution for lager remote distance. Auto billing can replace conventional billing, but use of conventional billing can result in wastage of time and resources .Where as auto billing do not need manual meter reading as well as bill reports.

II. MONITORING USAGE

User will be able to monitor consumption of energy meter.

III. EASE OF USE

The application will be easy to use as the user have to logon to the application using his or her credentials and enter other required data to fetch the specific information about his meter consumption.

3.1Project Objectives and Benefits.

To design a system for measuring the real time readings of IOT based Enegry Meter through the Android Application. The billing and monitoring of usage is shown to specific user according to their meter id number.

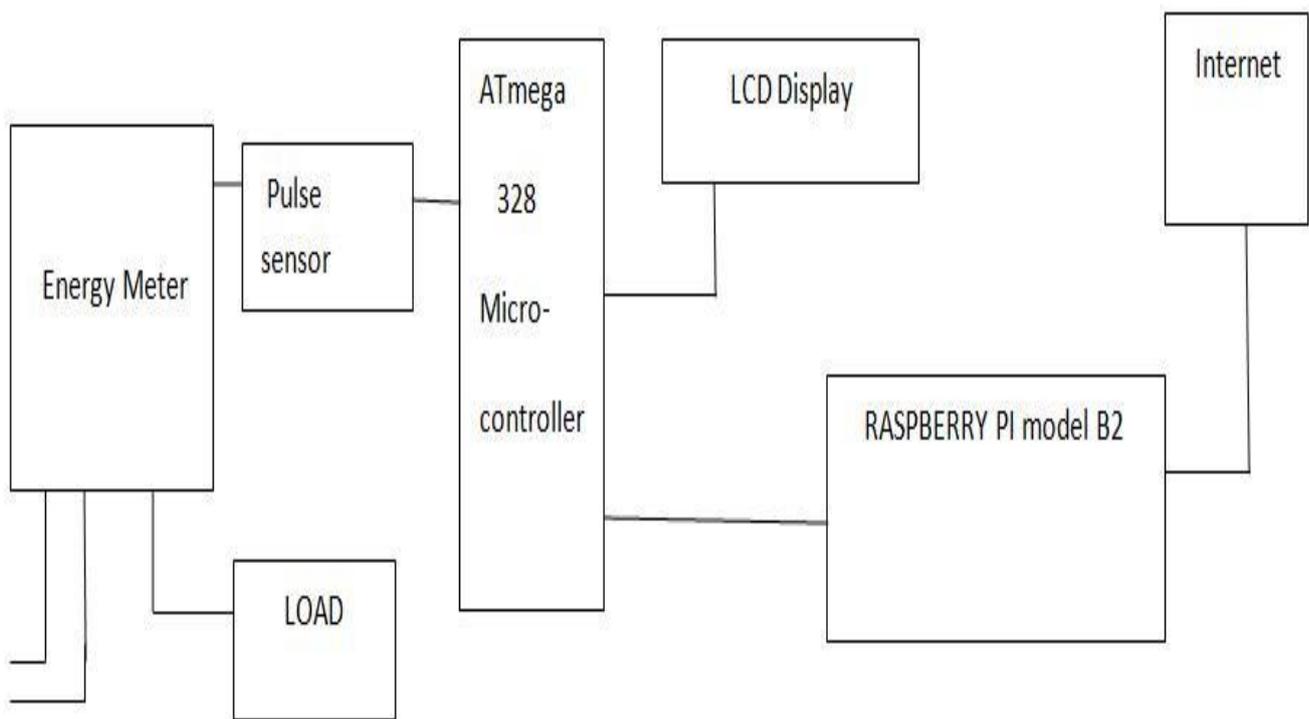
3.2 Methodology

In the initial stage of the work, we aimed to develop an Android-based application that will be able to provide a friendly user interface to display the electricity consumption of a house in terms of voltage, current, power and also monetary value. The electricity consumption in each different area of the house will be displayed so that the user can determine which part of the house is consuming the largest amount of energy. The motive for having the mobile application, specifically on Android platform is simply due to the advantages it offers, where the mobile phone is portable and always handy with the user. So by having the application installed on the phone, the user is free to launch the application and monitor the electricity consumption analysis at anywhere and anytime easily.

Smart electricity meter or smart monitory electricity is a type of device that helps to support real-time communication between customers and the utility company to monitor and record energy consumptions by the customers [12]. Such electric power metering and monitoring device can be installed, not only to help the customers to become more aware and reduce their electricity consumption, but also to improve the reliability and efficiency in the development and further improvement of wireless sensors network [13]. Nowadays, the increase of electricity utilization will greatly affect users' financial due to the increase of electricity tariff. This issue can be alleviated if the users can properly manage the usage of their electricity.

- Raspberry pi must be integrated so that it will transmit data to online database.
- Power factor and watt must be measured by different techniques.
- Linking of the data received by raspberry pi to computer and developing a program which incorporates the tariff related to specific consumer and calculating the bill directly on the computer. In this way the computer will calculate the bill directly using the data received through Modbus protocol used by Energy meter.
- Smart energy Meter can be modified for the detection of illegal use of electricity.

3.1 Overall System Architecture for implementation

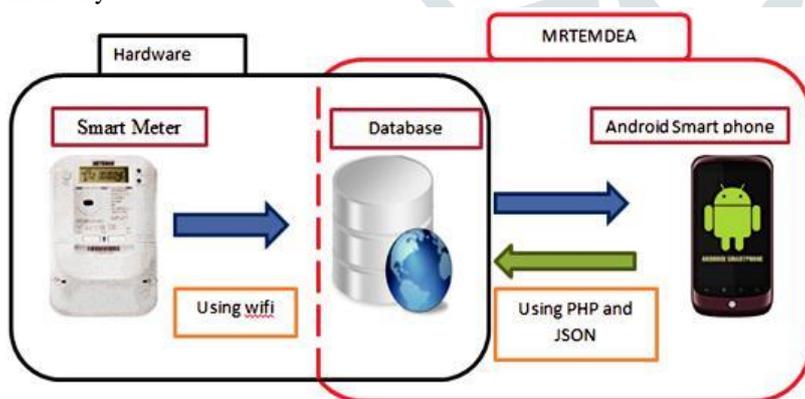


3.3 Comparison.

Attributes	Present AMR systems	Proposed Work	Remarks
Communication Protocol	GSM - Stable ZigBee - Least Stable PLC - Very Stable [9]	Very Stable	MQTT protocol used is a supreme contender for communication in embedded devices [7]
Reliable	GSM - High ZigBee - Low PLC - Low [8]	High	High performance ARM CortexM4 controller integrated to Energy Meter with IOT enhances reliability.
Cost	GSM - Low ZigBee - Medium PLC - Low [7]	Low	The main need of proposed work is a controller and IOT MQTT protocol, hence cost is low
Format of bill generated	SMS/ Smart Meter LCD display	Notification along with descriptive bill at consumer premises	There is no problem of missing SMS. Descriptive bill generation enhances much transparency in the system
Day/ Month wise analysis of load	Not Possible	Possible	Future load prediction and energy conservation can be achieved.
Fetch real-time load data	Not Possible	Possible	

3.4.1 Proposed System.

The following block diagram consist of the working flow of the proposed system. This work flow consists of step by step description of the system. The proposed system consists of fields which are dynamic and help the user to reduce the task done manually.



Proposed framework utilizes IR sensors to take programmed meter perusing. For catching heartbeats is put before vitality meter of house. To get digits isolate out and to ascertain the bill for the month processor is utilized with form calculation. In this paper, Raspberry Pi is utilized on the grounds that it is a kind of minicomputer. We can't introduce Microsoft Windows on it as it utilizes an alternate sort of processor. In any case, you can introduce a few adaptations of the Linux working framework which feels especially like Windows. On the off chance that we need to, we can utilize the Raspberry Pi to surf the web, send an email and numerous all the more utilizing a word processor. Simple to utilize however intense, moderate and hard to break, the Raspberry Pi is the ideal for seeking after PC researchers.

3.4.2.1 Hardware Requirement

- ENERGY METER
- ADAPTER 12V

- LOAD
- RS485
- Display (16x2)
- Raspberry pi 3
- Power supply
- Wi-Fi module (ESP8266)
- Two electric bulb
- Two holders

3.4.2.2 Software Requirement

- PHP
- Android
- Node JS

3.4.2.3 Energy Meter

An electric meter is generally used to get our monthly reading of our home and society . In the project the meter is used for reading purpose .The electric meter device used is EM1000/EM1200/EM1220 is a compact and rugged package digital meter that offers basic power and energy measurement capabilities required to monitor an electrical installation. The systems main features and the operating instructions of the energy meter. The remaining chapters explain the installation and setup steps required before the meter is ready for use, and the recommended maintenance and troubleshooting procedures for meter after installation.



Fig: Energy Meter EM1200

3.4.2.4 Raspberry Pie

The Raspberry Pi is a small but full-featured computer on a single board. It plugs into a monitor and you attach a keyboard, mouse and speakers. The Raspberry Pi can be used for browsing the web, creating documents and spreadsheets, playing games, watching videos and lots more. The raspberry pi is a progression of little single board PCs created in the unified kingdom by the raspberry pi establishment to advance the instructing of fundamental PCs science in school in creating nations the first model turn out to be more prominent at that point expected offering outside its objective market as apply autonomy.

OPERATING SYSTEM	ANDROID THINGS LINUX WINDOWS 10
SYSTEM-ON-CHIP USED	BROADCOM BCM2837
CPU	1.2GHZ 64/32 BIT QUAD-CORE ARM
MEMORY	1GB LPDDR2 RAM
STORAGE	MICROSDHC SLOT
GRAPHICS	BROADCOM VIDEOCORE
POWER	1.5W TO MAX 6.7W

3.4.4.1 Future Work

- To design an IOT framework where a client can screen energy utilization continuously and to send SMS, when the deadline to pay the power charge is over.
- Implementation can further include Payment mode options for user through application itself.
- The plan can enhance system by adding more load specific accounts and their usage consumption.

IV. RESULTS AND DISCUSSION

4.1 Results

- The user will be able to view the live reading of energy meter.
- User will be able to make online payment of the bill.
- User will be able to install the android application on any new handheld devices like cell phones.

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