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IOT Based Automatic Reading & Billing System of Energy Meter

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Abstract: ***India presently has the largest population of blind people in the world. This project describes Microcontroller based design and implementation of energy meter using IOT concept. The propose system design eliminates the human involvement in electricity maintenance. Thee buyer needs to pay for the usage of electricity n schedule, in case that he couldn't pay, the electricity transmission can be turned off autonomously from the distant server.***
The user can monitor the energy consumption in units from a web page by providing device IP address. Theft detection unit connected to energy meter will notify company side when meter tampering occurs in energy meter and it will send theft detect information through modem and theft detected will be displayed on the terminal window o the company side. WiFi unit performs the IOT operation by sending energy meter data to web page which can be accessed through IP address.
The Hardware interface circuit consists of ATMEGA328 Microcontroller, MAX232, LCD display, ESP8266 WiFi module, GSM Modem. WiFi unit performs the IOT operation by sending energy meter data to web page.
Keywords: ARMS(Automatic Meter Reading System), IOT(Wi-Fi) as communication, Real Time Clock(RTC), Arudino IDE, etc.

I. INTRODUCTION

In the Internet of Things (IoT) model, many of the living and non-living things that encompass us will be on the internet in one form or another. Driven by the popularity of gadgets empowered by wire-less technological innovation such as Wireless Bluetooth, Radio Frequency Identification, Wireless-Fidelity, embedded sensor, IoT has moved out from its beginning stage and it is actually on the edge of changing the present fixed inter-net into a well featured upcoming Internet. Currently there are almost nine billion inter-connected gadgets and it is estimated to touch almost fifty billion gadgets by 2020. Today the world is facing such an environment that offers challenges.

Energy crisis is the main problem faced by our society. A relevant system to control and monitor the power usage is one of the solutions for this problem. One approach through which today's energy crisis can be addressed is through the reduction of power usage in households. The consumers are increasing rapidly and also burden on electricity offering divisions is sharply increasing. The consumers must be facilitated by giving them an ideal solution: - i.e. the concept of IoT (Internet of Things) meters and on the other hand service provider end can also be informed about electricity thefts using theft detection unit. By keeping above factors, the concept of IoT meters thrived consisting Microcontroller unit, Wi-Fi unit. The user can monitor the energy consumption in units from a web page by providing device IP address.

II. PROBLEM STATEMENT

The Electric Meter Readings are nowadays are read by manually. The person of electric power company comes to every house for taking reading. Its takes lots of time for taking readings of every house. This manually system has to be replaced by taking advantages of existing technologies likes Internet, Mobile Computing

III. AIM/OBJECTIVE

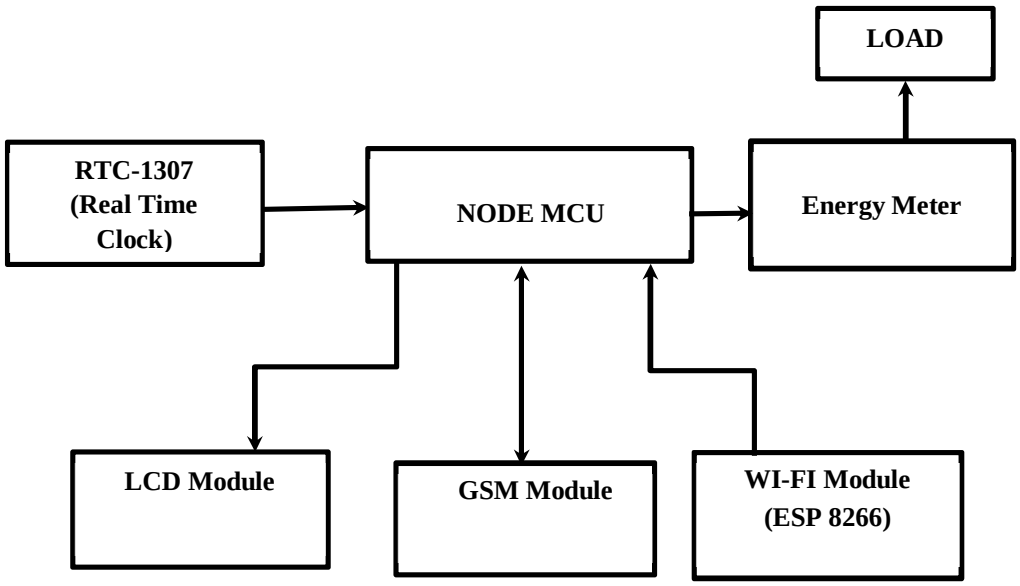
To develop an IoT based smart energy meter and billing system. To develop an existing energy meter into smart meter and sending the electric units to the consumer number and generating bill automatically.

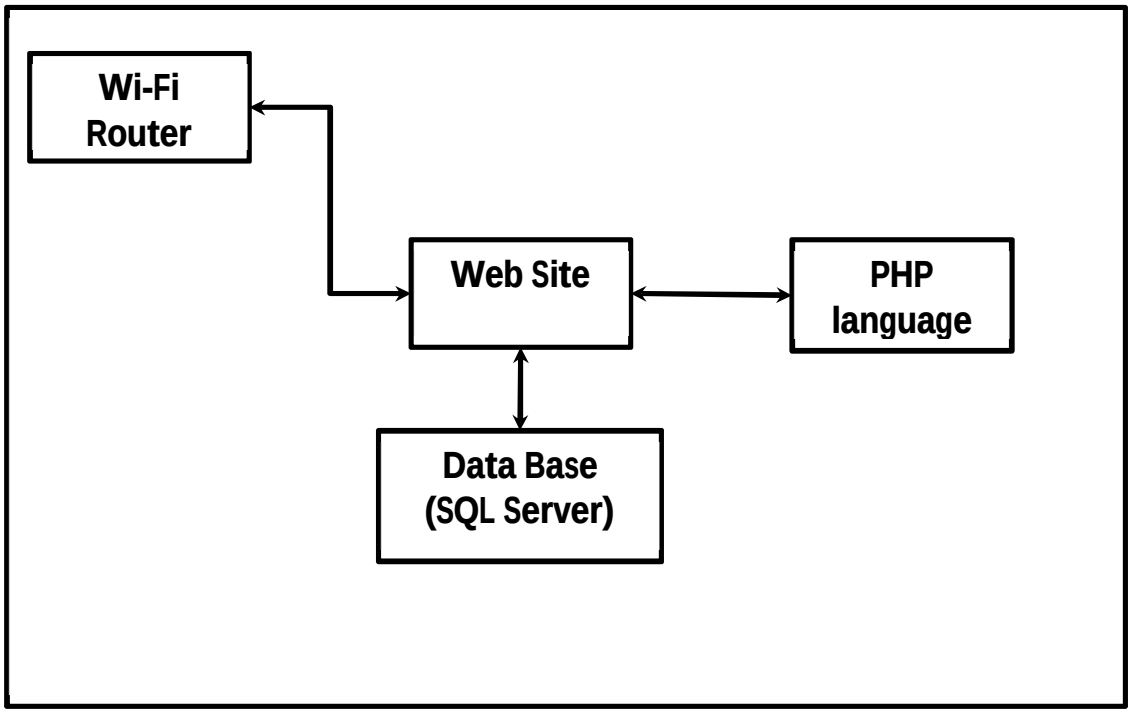
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IV. PROPOSED APPROACH/WORK

A. Proposed Architecture





B. Proposed Module

1) Hardware Module

a) Interfacing RTC (Real Time Clock) with NODE MCU

b) Interfacing LCD with Energy Meter

c) Make the Energy Meter WI-FI based

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2) Software Module for Firmware
a) Code for interfacing the WI-FI with Internet Router
b) Program for calculating the energy power units month wise

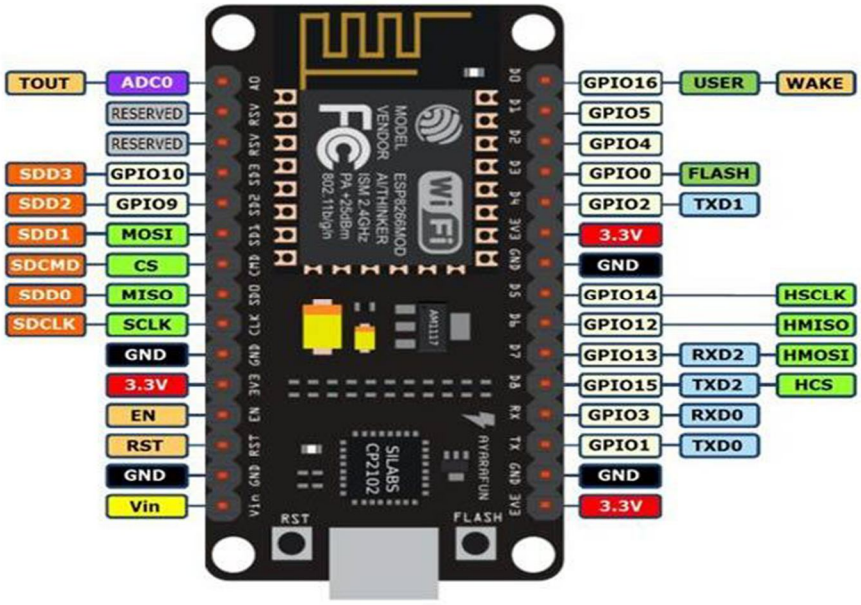
3) Website Mode
a) Login Page
b) Create Consumer Page
c) Bill page

V. SOFTWARE/HARDWARE REQUIREMENTS

A. Hardware Requirement
1) Energy Meter
2) NODE MCU
3) OPTO Coupler
4) GSM Modem
5) RTC Module 1307
6) Relay 12 Volt
7) Copper Clad
8) Etching Powder (FECL3)
9) BC 547 Transistor
10) Internet Router

B. Software Requirement
1) ARDUINO IDE Compiler
2) C++ Language
3) PHP Language

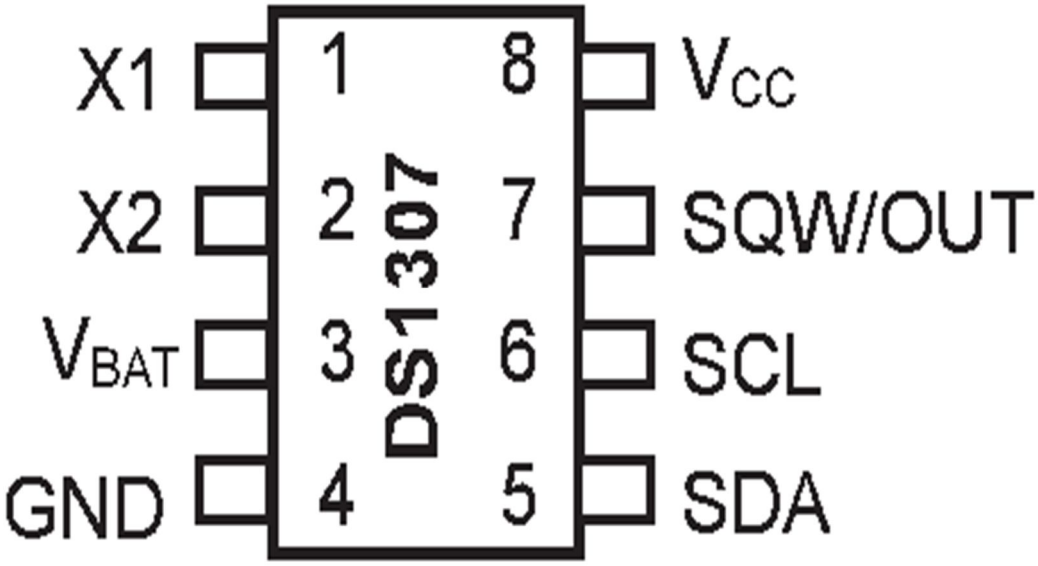
C. Data Base
MySQL
1) NODE MCU



Pin Diagram of NODE MCU

NodeMCU is an open source firmware for which open source prototyping board designs are available. The name "NodeMCU" combines "node" and "MCU" (micro-controller unit). The term "NodeMCU" strictly speaking refers to the firmware rather than the associated development kits.

2) DS1307 I2C Real Time Clock (RTC)



The **DS1307** is a low power Full Binary (BCD) Real Time Clock (RTC) IC with 56 bytes of SVRAM that communicates through I2C Protocol. The IC can work from directly supply on Vcc and switch to Battery automatically when required.

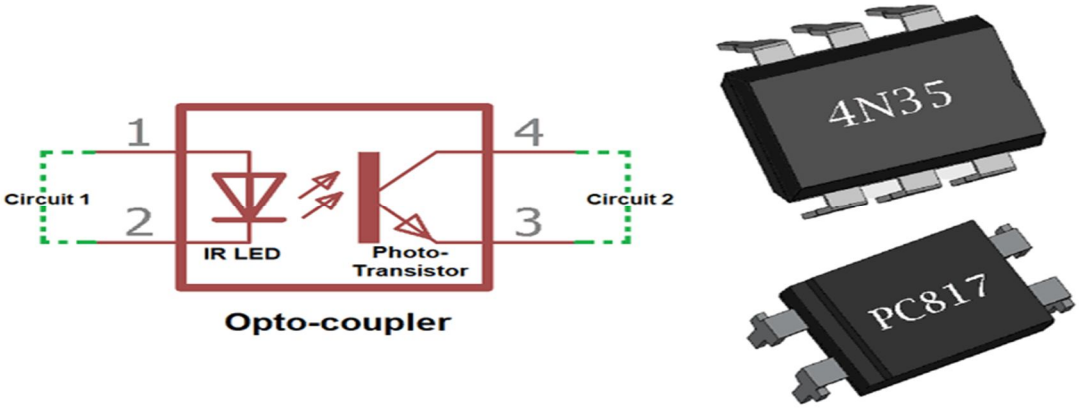
3) Pin Configuration

Pin Number	Pin Name	Description
1,2	X1 , X2	Crystal Oscillator should be connected to these pins
3	V-Bat	Connected to Positive terminal of the battery
4	Ground	Ground pin of the IC
5,6	SCL and SDA	Pins for I2C communication with CPU
7	SQW / Out	Square wave output driver pin to obtain square wave frequencies.
8	Vcc	Powers the IC typically 5V

4) DS1307 Specifications

a) I2C Interface RTC IC
b) Operating Voltage: 5V
c) Less than 500nA current when operating with battery
d) 56bytes SVRAM
e) Operates in power or battery mode
f) Programmable square wave output pin
g) Available in PDIP and SO package

5) OPTO Coupler



Opto-coupler is an electronic component that transfers electrical signals between two isolated circuits. Optocoupler also called Opto-isolator, photo coupler or optical isolator.

6) PHP Language

- PHP is an acronym for "PHP: Hypertext Pre-processor"
- PHP is a widely-used, open source scripting language
- PHP scripts are executed on the server
- PHP is free to download and use
- PHP files can contain text, HTML, CSS, JavaScript, and PHP code
- PHP code is executed on the server, and the result is returned to the browser as plain HTML
- PHP files have extension ".php"
- PHP can generate dynamic page content
- PHP can create, open, read, write, delete, and close files on the server
- PHP can collect form data
- PHP can send and receive cookies
- PHP can add, delete, modify data in your database
- PHP can be used to control user-access
- PHP can encrypt data
- PHP runs on various platforms (Windows, Linux, Unix, Mac OS X, etc.)
- PHP is compatible with almost all servers used today (Apache, IIS, etc.)
- PHP supports a wide range of databases
- PHP is free. Download it from the official PHP resource: www.php.net
- PHP is easy to learn and runs efficiently on the server side

7) MySQL:

MySQL is a widely used relational database management system (RDBMS).MySQL is free and open-source. MySQL is ideal for both small and large applications. MySQL is a relational database management system based on the Structured Query Language, which is the popular language for accessing and managing the records in the database. MySQL is open-source and free software under the GNU license. It is supported by **Oracle Company**. It is fast, scalable and easy to use database management system in comparison with Microsoft SQL Server and Oracle Database. It is commonly used in conjunction with PHP scripts for creating powerful and dynamic server-side or web-based enterprise applications.

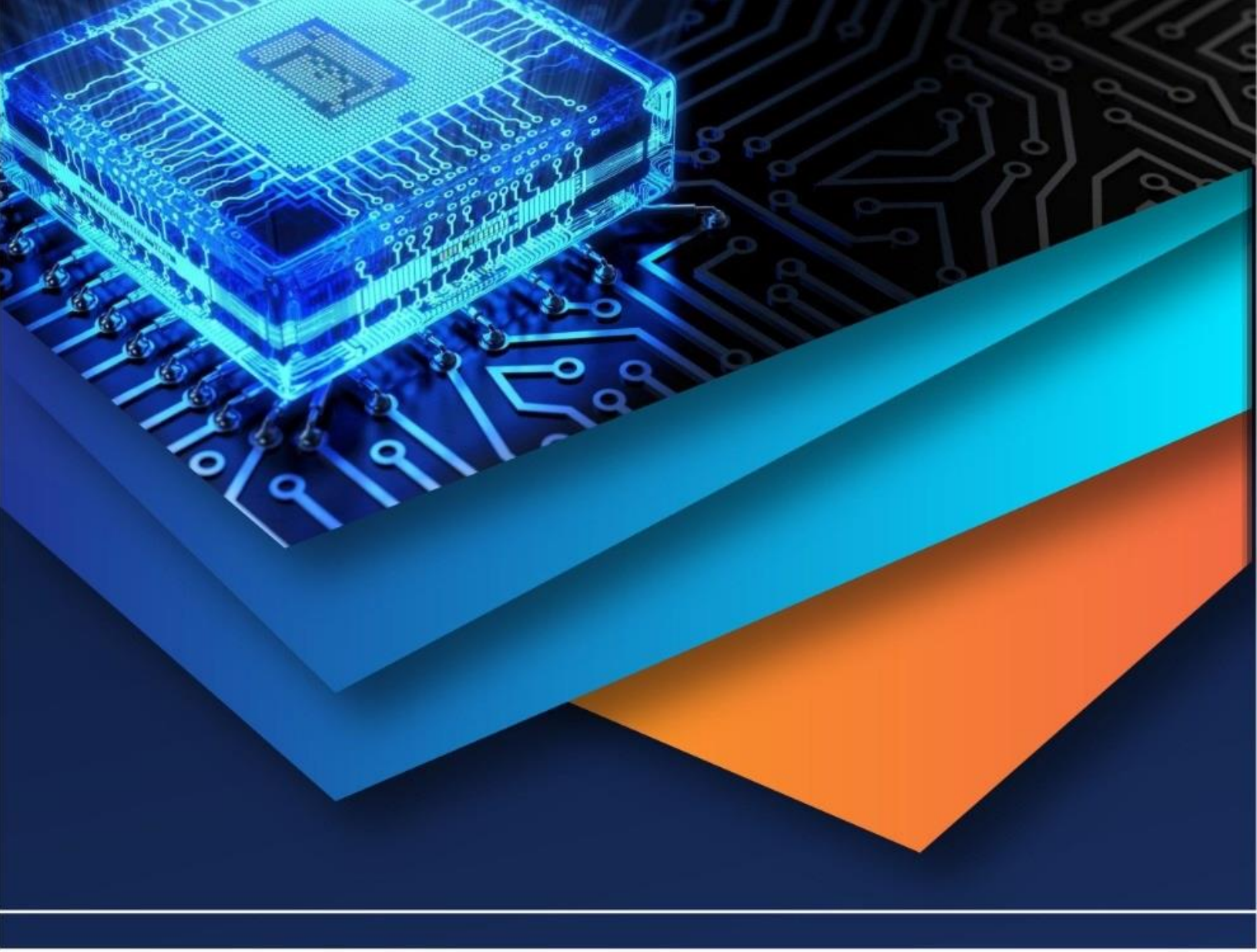
VI. APPLICATIONS

1) The system is automatic, so no labour is requirement for reading the meters
2) The system is cost effective, and will be access through remote side.
3) The alert system about billing system
4) The billing system can be viewed through website as well as get SMS on the mobile.
5) The activation and deactivation of the meter will be done through SMS

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