Automatic Energy Meter using WiFi-Enabled ESP-32

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Abstract: India is presently witnessing substantial rise in investments especially industrial and infrastructural areas. This growth is further being augmented by the increase in power generation capacity and reliable power distribution and measurement network. In some developed countries like united states smart meters are already deployed.Although some companies have introduced smart meters, many households have conventional meters. Our project is Automatic energy meter by using WIFI-enabled ESP32.It is a day-to-day energy monitoring system.we can check how amount power will be consumed by the consumer per day. In this project we are using ESP32. ESP32 is a combination of Arduino+ Wi-Fi + Bluetooth. This ESP32 module will be added to Blinky &Firebase. Inthis Blinky app we can check how much amount power consumption will be occur in a day

Keywords: Energy Meter, ESP32 Module, Blinky APP&Firebase

I. INTRODUCTION

In the current billing framework, the consumer can't monitor the changing energy consumptions. If the operator missed to take the reading of the electricity Help of real time automatic reading technology. This can be done by using the accurate reading and billing system based on IOT based smart energy metering. The energy consumption can't be tracked by consumers as most of the consumers are not able to understand the energy consumption by just taking the glance of the meter display. Also, the consumers have to check the meter and check for billing date in the case of missed reading from the operator. If consumers will check their energy consumption on their mobile instead of checking energy meter, it will become very suitable for electricity consumers in the space of energy consumptions, then the consumer gets the average electricity bill based on previous months, years of energy consumption. The solution for every one of these issues is to keep track of the consumer's load on timely basis, with management. The internet of things (IOT) is the internet operating things embedded with software, sensors, and network connectivity. The IOT system gathers the information and exchange the information with the appropriate framework. In the planned system, energy meter is connected to the IOT framework. There should be a provision for the consumers to trace their energy consumption from time-to-time, so that the consumer can track or manages consumption over the period of consideration. This system is useful for the permanent especially, during rainy days it is difficult to go to every house and take reading.

II. EXISTING SYSTEM

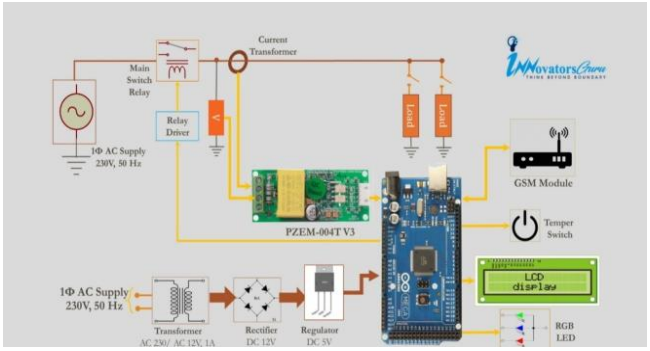
In existing system either an electronic energy meter or an electro- mechanical meter is fixed in the premise for measuring the usage. The meters currently in use are only capable of recording kWh units. The kWh units used then still have to be recorded by meter readers monthly, on foot. The recorded data need to be processed by a meter reading company. For processing the meter reading, company needs to firstly link each recorded power usage datum to an account holder and then determine the amount owed by means of the specific tariff in use[1-4]. In present system the energy meter reader visits each house and records the meter reading manually then issues the bill. In manual reading human error may possible and does not provide reliable meter reading[5-9].

III. PROPOSED SYSTEM

Smart Meters are an electronic measurement devices used by utilities to communicate information for billing customers and operating their electric systems. The combination of an electronic meter with two-way communications technology for information, monitor, and control is commonly referred to as Advanced Metering infrastructure (AMI). IOT is nothing but the source of communication between consumer and service provider i.e. web server. Since IOT is cost effective compared to SMS, monitoring of energy meters at lower cost is made possible. Current sensor is used to read the current drawn by the load from the power supply.

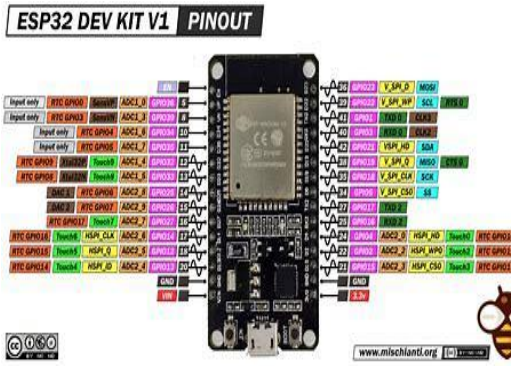
Voltage sensor is used to identify the voltage drop and apply voltage to the load from powerthis board. Arduino reacts in response to the 5V supply given by the Opto-coupler and keeps on counting the supply and then calculates the cost and also the power consumed. This data, it continuously stores on the webpage, so that users can visit anytime and can also check their consumption. It even reacts accordingly as per programmed, to the situations like message passing/sending during threshold values etc.

3.1 Block Diagram



3.2 Hardware Description

ESP32-DevKitC is a **low-footprint and entry-level development board** that is part of the **ESP32** series. This board has a rich peripheral set. The built-in **ESP32** pinout is optimized for hassle-free prototyping! The boards are qualified by Amazon Web Services (AWS). In addition to Espressif's own IoT development framework, ESP-IDF, you can use FreeRTOS on **ESP32-DevKitC**.



3.3 PZEM-004T V3 Energy Meter Module

Our project required measurements for metering and billing with high fidelity. Some of the specific features of **PZEM-004T V3** module make it first choice for this

- Overload detection function
- AC Voltage with a range of 80 ~ 260VAC which cover major country voltage range like 110V and 230V
- AC Current Measurement 0 ~ 100A current measurement capability.
- Power measurement range is 0 ~ 22kW and
- Energy range 0 ~ 9999kWh.
- Frequency measurement
- Power Factor measurement

3.4 Lcd Module

To show the measured parameters we are using LCD module. the following parameter are show on lcd screen
Voltage
Current
Power (Real time power)
Energy consumption
Power Factor
Energy Bill

3.5 Relay Module

For remote connection, disconnection, and protection purpose we need to disconnect the power from grid, for this we are using relay board.

3.6 Power Supply

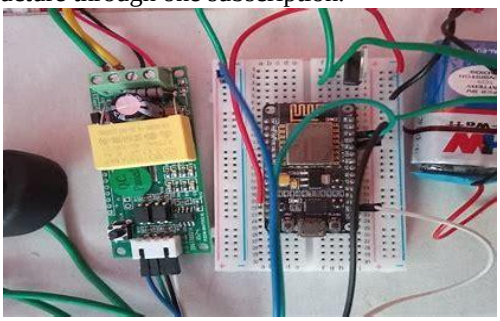
To run the projects, we need supply of 5v 1A DC. we have available power of 230V AC/110V ac we need to convert it into 5V DC. Main component of power supply is

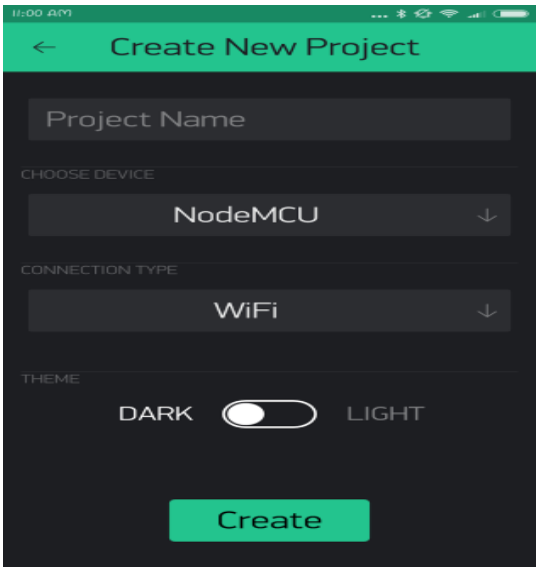
- Step down transformer
- Rectifier
- Filter capacitor

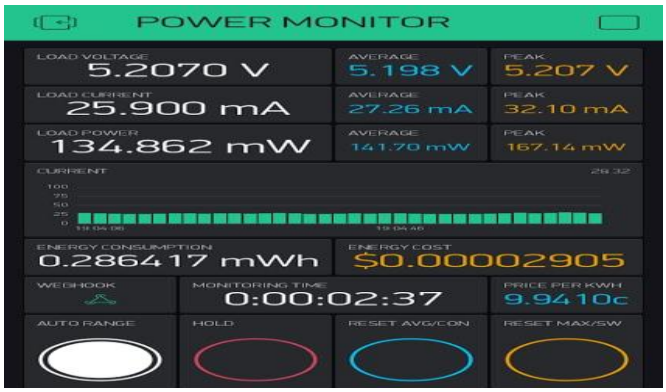
Voltage regulator

3.7 Blinky-IOT

Blynk platform powers low-batch manufacturers of smart home products, complex HVAC systems, agricultural equipment, and everyone in between. These companies build branded apps with no code and get the full back-end IoT infrastructure through one subscription.







VI. CONCLUSION

The proposed model of IOT based Smart Energy Meter is used to measure the various parameters of electrical energy like Voltage, Current & energy consumption in kWh. In addition to this, bill amount with total energy consumed (kWh) is sent to the consumer via SMS and also automatic connection/disconnection of power supply is made based on the payment of energy bill. Further, this proposed work proved that it overcome from the problems (such as large number of manpower required for making energy bill, billing errors due to carelessness of human, large time consumption to pay the bill in queue and unaware of tariff) which are all faced by the existing energy meter.

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