IOT Based Smart Energy Meter and Load Control

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Abstract: it is a proposed system designed to do away with human involvement within the power system. IOT (internet of factors) is the network of bodily things with electronics software, sensors, and connectivity to permit items to collect and change statistics. IOT based totally automated meter studying is the technology of computerized collecting facts strength meter and shifting statistics to the server for billing process and if there's any tempering then also detectable. The net related to meter collect the statistics and display records on the lcd by using which we can read and understand the things which can be occurring the device. present day drawn also calculated via the modern transformer that linked in series with the burden may be proven at the lcd. This information switch to sever unit at MSEB. MSEB isn't a technical phrase however it's far energy distribution board "Maharashtra nation power Board". The statistics is received with the aid of the net and each time a secret is pressed microcontroller send SMS thru the internet to the transmitter to get the analyzing of the meter. it's far difficult to guide studying and calculating invoice of in my opinion. this will assist for the proper and accurate studying of billing procedure. with the aid of taking these kind of functions that can be executed through IOT based clever electricity meter without difficulty.

Keywords: Internet of Things (IoT), LCD, Smart Energy Meter, Wi-Fi Module, Automatic billing.

I.   Introduction

The existing challenge "IOT based totally clever energy Meter" addresses the troubles confronted by way of both the customers and the distribution groups. The challenge specifically offers with clever power meter, which makes use of the capabilities of embedded systems i.e. combination of hardware and software so that you can enforce preferred functionality. The project discusses comparison of Arduino and other controllers, and the application of GSM and wireless modems to introduce 'smart' idea. also with the help of wireless modem the patron can display his ate up studying and might set the brink price via webpage.

This device enables the power department to examine the meter readings month-to-month with out someone visiting each house. this could be performed by means of the usage of Arduino unit that constantly display and statistics the electricity meter analyzing in its permanent (non-unstable) reminiscence place. This gadget constantly records the reading and the live meter analyzing may be displayed on web site to the purchaser on request. This gadget also can be used to disconnect the electricity supply of the house whilst needed

II.   Existing Methods

The present device simplest provides remarks to the patron at the stop of the month that how much power is ate up in the form of bill. The consumer has no way to track their electricity utilization on a extra instantaneous foundation. The customers are growing exponentially rapid and load on strength providing divisions is unexpectedly rising. within the present machine meter tampering can be accomplished without problems and it's one of the predominant downside for an electricity disaster.

III. Proposed System

In the proposed machine, patron can do electricity management via knowing strength utilization time to time. The consumer desires to pay the bill on agenda, if couldn't, the electric power connectivity can be turned off autonomously from the distant host. The proposed IoT based clever power meter and cargo control the usage of atmega328p is applied at ends, one on the patron cease for IoT operation and other at the carrier company stop for looking at energy fed on.
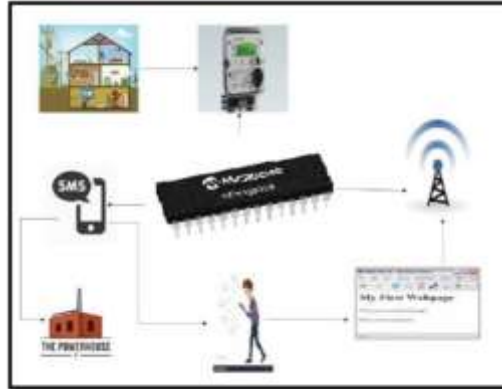
Fig 1: Architectural Diagram

Overview of the architectural model:-

Whilst the numerous home equipment of the family devour power the electricity meter reads the reading constantly and this consumed load can be seen on meter. We will see that the LED on meter continuously blinks which counts the meter reading based at the blinking, the devices are counted normally, 3200 blinks is one unit. In our challenge we're trying to broaden,

A machine in which Arduino Uno act as primary controller, which continuously screen strength meter. As in line with the blinking of LED on electricity meter the Arduino will degree the unit consumption. The measured studying with the calculation of the value can be constantly displayed on web page that we've got designed. Threshold price may be set on website with the help of Wi-Fi, as per the consumer's requirement. When the consumers analyzing could be close to approximately to the set threshold fee it's going to send a notification cost to the patron. When the patron gets the notification he can go to the website and trade the threshold fee.
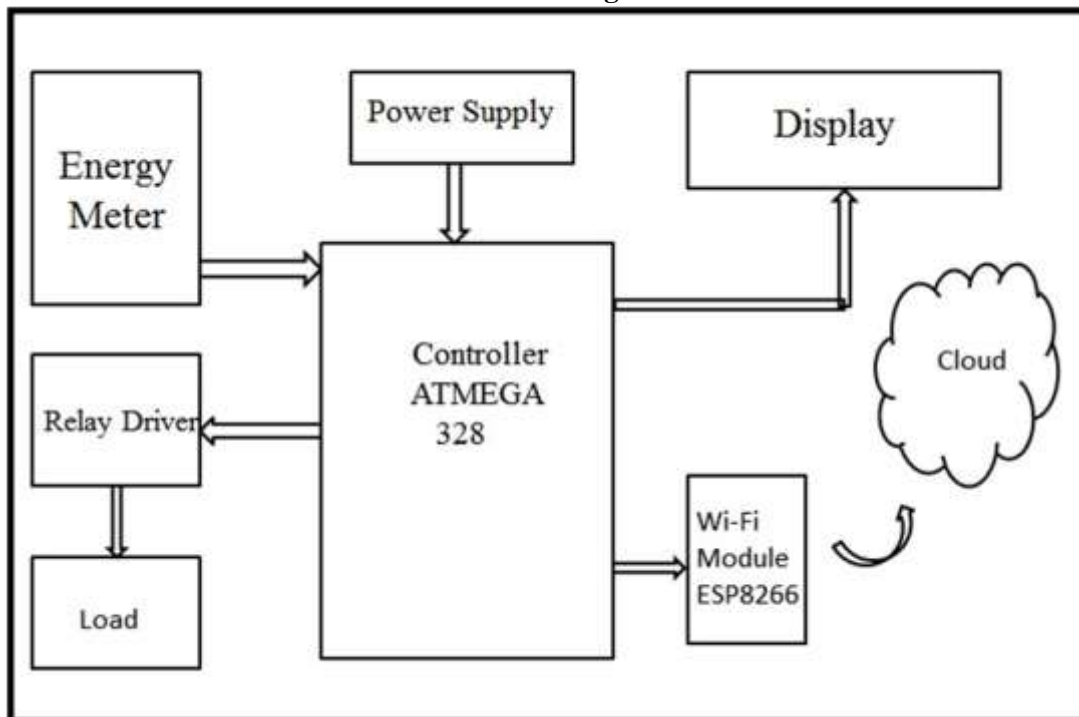
IV. Block Diagram

Fig 2: Block Diagram

V. Hardware description

1] Atmega328

ATmega-328 is largely a sophisticated digital RISC (AVR) micro-controller. It supports the statistics up to eight (eight) bits. ATmega-328 has 32KB inner built-in memory. This micro-controller has a variety of different characteristics.

Atmega 328 has 1KB Electrically Erasable Programmable examine handiest reminiscence (EEPROM). This property shows if the electric supply supplied to the micro-controller is eliminated, even then it can store the information and can provide consequences after providing it with the electric deliver. Furthermore, ATmega-328 has 2KB Static Random get entry to memory (SRAM). Other characteristics may be explained later. ATmega 328 has numerous unique features which make it the maximum famous tool in today's marketplace. Those features include advanced RISC structure, proper overall performance, low energy intake, real timer counter having separate oscillator, 6 PWM pins, programmable Serial USART, programming lock for software program security, throughput up to 20 MIPS and so on. ATmega-328 is usually utilized in Arduino. ATmega328 is an eight (8) bit Microcontroller. it is able to take care of the information sized of up to eight (8) bits. it's far an AVR based micro-controller. Its constructed in internal reminiscence is round 32KB. It operates starting from three.3V to 5V. It has an capacity to keep the statistics even when the electric supply is eliminated from its biasing terminals.. ATmega-328 is shown within the discern given below.
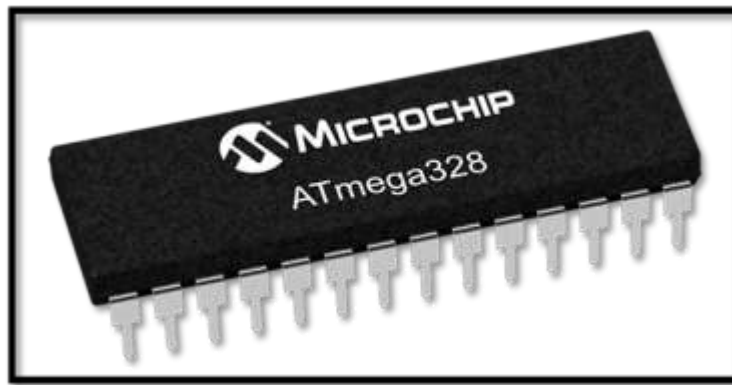

Fig 3: Atmega328p Microcontroller

Pin Discription Of Atmega328 microcontroller:

ATmega328 Pins			
Pin Number	Pin Name	Pin Number	Pin Name
1	PC6	15	PB1
2	PD0	16	PB2
3	PD1	17	PB3
4	PD2	18	PB4
5	PD3	19	PB5
6	PD4	20	AVCC
7	V_{CC}	21	A_{REF}
8	GND	22	GND
9	PB6	23	PC0
10	PB7	24	PC1
11	PD5	25	PC2
12	PD6	26	PC3
13	PD7	27	PC4
14	PB0	28	PC5

2] ESP8266 Wi-Fi Module

The ESP8266 wireless Module is a self-contained SOC with included TCP/IP protocol stack. it can give any microcontroller access in your Wi-Fi community. It helps the 802.11 b/g/n protocol. it could connect with your router and paintings as a consumer or it could be an get entry to point itself or both! it's miles IP addressable and can be a web Server. The "widespread" version has 2 digital pins that can be used for enter or output. E.g.: to drive LED's or relays. those pins can also be used for PWM
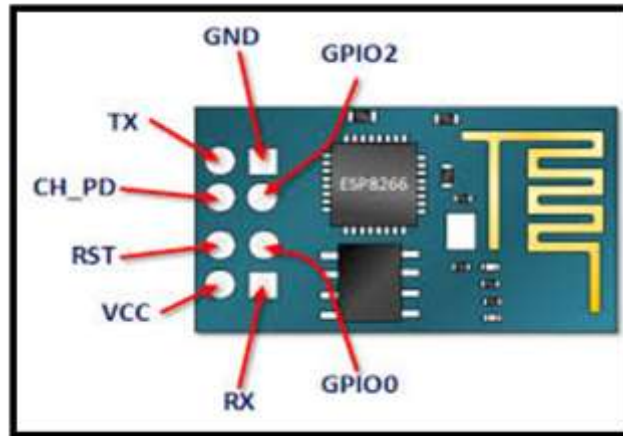

Fig 4: ESP 8266 (Node MCU)

3] Energy Meter

Power meter is a tool that measures the amount of electric power fed on via a house. they're usually calibrated in billing units, the maximum commonplace one being the kilowatt hour (kWh). two fundamental classes, electromechanical and electronic, the most common kind of strength Meter is the electromechanical watt-hour meter
.

Fig 5: Energy Meter

4] LCD Display-

Working and good judgment for liquid crystal display:-

LCD can add a lot to your software in phrases of offering a beneficial interface for the user, debugging an application or just giving it a "expert" appearance. LCD's can be added pretty easily to a utility and use as few as three digital output pins for control. As for cost, liquid crystal displays may be frequently pulled out of vintage devices or determined in surplus shops for much less than a dollar.

The LCD pins given in table

Pins	Description
1	Ground, (VSS)
2	+5 V power supply, (VCC)
3	Power supply to control contrast voltage, (VEE)
4	"R/S" _Instruction/Register Select
5	"R/W" _Read/Write LCD Registers
6	"E" Enable Clock
7 – 14	The 8 bit Data Bus (I/O Pins)

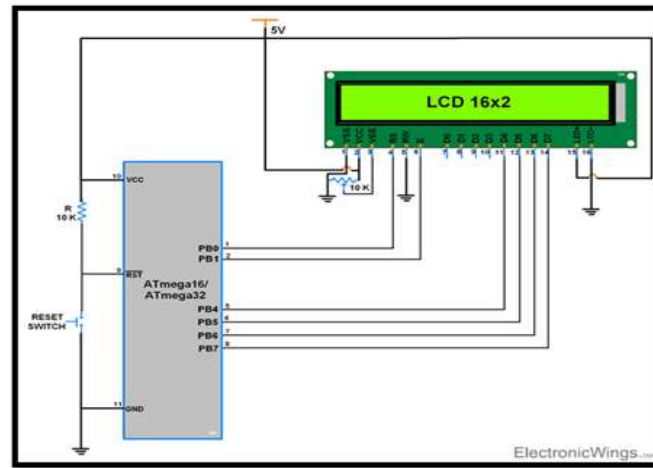**Table1:** LCD pin description.

Fig 6: LCD Display

VI. Software requirements

1]Arduino Ide-

    The open-supply Arduino software (IDE) makes it smooth to jot down code and upload it to the board. It runs on home windows, Mac OS X, and Linux. The environment is written in Java and based totally on Processing and other open-source software program. This software can be used with any Arduino board. refer to the Getting commenced web page for installation commands.

Fig 7: Arduino Ide

2] Proteus Design Suite –

The Proteus layout Suite is a proprietary software device suite used commonly for electronic design automation. The software is used in particular by electronic layout engineers and technicians to create schematics and electronic prints for manufacturing revealed circuit forums..

Fig 8: Proteus Design Suite

3] Dip Trace-

Convert schematic to PCB and lower back annotate without problems. speedy and clean introduction and import of recent additives. real-time 3D PCB preview on any stage of development.
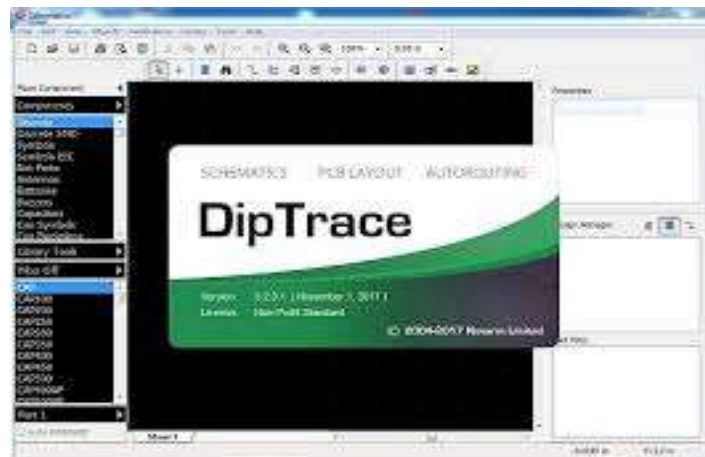

Fig 9: Dip Trace

VII.   Advantages

1. Eliminates manual monthly meter readings
2. Monitors the electric system much more quickly
3. Makes it possible to use power resources more efficiently
4. Provides real-time data that is useful for balancing electric loads while reducing power outages
5. Enables dynamic pricing, which raises or lowers the cost of electricity based on demand
6. Avoids the capital expense of building new power plants
7. Helps to optimize income with existing resources

VIII.   Applications

1. Home
2. Commercial
3. College

4. Society
5. Industrial
6. Medical

IX. Future Scope

The undertaking specially pursuits at supplying normal infrastructure of the strength meter presently used for the clever city concept. the primary improvement for the destiny goes to make energy meter readings, Tampering identity techniques, and connection and disconnection and additionally the pre-records.

Providing to the users all is going to take place on wireless internet. in which we're going to increase some Wireless hotspots in every area through which all the power meters are get linked and set four to five Parameters which is also going to be monitored.

X. Conclusion

In this discussion we proposed the clever energy meter machine may be used extra comfortably to avoid mismatch inside the billing system also It offers the connection among the power board segment and client phase using IOT. With this advances the device can be used more quite simply in rural location in addition to in commercial vicinity.

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