IOT BASED SMART ENERGY METER USING ARDUINO AVR AND NODE MCU

Project report submitted in fulfillment of the requirement for the degree of

Bachelor of Technology
in
Information Technology

By

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Under the supervision of
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to

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CERTIFICATE

Candidate's Declaration

I hereby declare that the work presented in this report entitled **" IOT Based Smart Energy Meter using Arduino AVR and Node MCU"** in partial fulfillment of the requirements for the award of the degree of **Bachelor of Technology** in **Computer Science and Engineering/Information Technology** submitted in the department of Computer Science & Engineering and Information Technology**,** Jaypee University of Information Technology Waknaghat is an authentic record of my own work carried out over a period from August 2017 to May 2018 under the supervision of **Dr. Ruchi Verma** , Assistant Professor (Senior Grade), Department of Computer Science & Engineering and Information Technology.
The matter embodied in the report has not been submitted for the award of any other degree or diploma.

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This is to certify that the above statement made by the candidate is true to the best of our knowledge.

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ACKNOWLEDGEMENT

The satisfaction that accompanies the successful completion of any task would be incomplete without the mention of people whose ceaseless cooperation made it possible, whose constant guidance and encouragement crown all efforts with success. We are grateful to our project guide **Dr. Ruchi Verma** for the guidance, inspiration and constructive suggestions that helped us in the preparation of the project.

We also thank our colleagues who have helped us in successful completion of the project.

Date: 14.05.2018

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LIST OF ABBREVIATIONS

Abbreviation	Word
FDI	Fault Detection Isolation
IoT	Internet Of Things
IoE	Internet of Everything
IIoT	Industrial Internet of Things

LIST OF FIGURES

ABSTRACT

In the project, we will measure the energy being consumed in the house and will generate its bill automatically using telemetric communication. This will help in reducing the consumption of energy in the house as the owner will continuously be notified about the number of units that are being consumed. The main objective is to generate the bill automatically by checking the electricity unit's consumption of the house in order to reduce the manual labor. The calculations will be performed automatically and the bill will be updated on to the internet by using a network of Internet of Things. The bill amount can be checked by the user anywhere remotely.

CHAPTER- 1
INTRODUCTION

1.1 INTRODUCTION

In the world of advancement and development in technology and intelligence, individuals currently a days don't have that abundant of spare time to cope with issues occurring with their manage electrical devices and alternative electrical devices that area unit being employed oftentimes. As we all know automatic fault detection of electrical devices may be a difficult task therefore to cope with those faults occurring in any specific device we've got come back up with this project of automatic fault detection in any device with the assistance of IoT, which is able to scale back the chaos of career any trained worker for detection initial so obtaining it repared and thus enhancing the potency of the device, saving time and energy still additionally.

In the gift request system the distribution firms area unit is not able to stay track of the dynamic most demand of customers. the patron is facing issues like receiving due bills for bills that have already been paid likewise as poor responsibility of electricity provide and quality though bills area unit paid frequently. The remedy for of these issues is to stay track of the customers load on timely basis, which is able to command to assure correct request, track most demand and to sight threshold price. These area unit all the options to be taken into consideration for planning AN economical energy request system. The current project "IoT primarily based sensible Energy Meter" addresses the issues two-faced by each the customers and also the distribution firms. The paper in the main deals with sensible energy meter, that utilizes the options of embedded systems i.e. combination of hardware and code so as to implement desired practicality. The paper discusses comparison of Arduino and alternative controllers, and also the application of GSM and Wi-Fi modems to introduce 'Smart' conception. With the employment of GSM electronic equipment the patron likewise as service supplier can get the used energy reading with the individual quantity, customers can even get notification within the type text through GSM after they area unit getting ready to reach their threshold price, that they need set. conjointly with the assistance of Wi-Fi electronic equipment the patron will monitor his consumed reading and might set the brink price through webpage. this method permits the electricity department to scan the meter readings monthly while notsomeone visiting every house. this could be achieved by the employment of

Arduino unit that unendingly monitor and records the energy meter reading in its permanent (non-volatile) memory location.This system unendingly records the reading and also the live meter reading will be displayed on webpage to the patron for the asking. this method can also be accustomed disconnect the ability provide of the house once required.

Energy crisis is one among the foremost issues that the worldfaces these days. the most effective remedy for this can be not the rise inenergy production, however the effective use of accessible energy.By properly watching our energy consumption andavoiding energy wastage, energy crisis will be reduced to acertain extent. however energy watching can't be doneefficiently primarily as a result of shoppers don't seem to be awake to theirenergy consumption. they'll get an inspiration regardingtheirconsumption only if the electricity bills area unit issued. InIndia, bill is issued one time in an exceedingly month or 2 months. Sothe shoppers are in dark throughout this era of your time abouttheir energy usage. during this era of complete medical care, noone can take the pain to travel and check their electricity meterreading and compare it with the previous reading thereforeon getan plan regarding their consumption. This whole procedure has tobe perennial many times in an exceedingly month to with efficiency management theenergy usage. If shoppers will check their energyconsumption victimisation their movable or laptop computer instead ofchecking energy meter, it'll be a good leap within the space of energy management. Since most of the folks area unit these days 24*7 on-line, it'll be very a boon ifthey will monitor their energy consumption on-linefromanywhere on the world. during this paper, we have a tendency to area unit describing amethod of electricity energy meter reading victimisation IoTconcept.This is a PIC16F877A small controller based mostly style andimplementation of energy meter victimisation IoT construct. TheInternet of things (stylized web of Things or IoT) is theinternet operating of physical devices, vehicles (alsoreferred to as "connected devices" and "smart devices"),buildings, and different things embedded with physical science,software, sensors, actuators, and network connectivitythat change these objects to gather and exchange information. Inthe planned system, energy meters area unit connected to theinternet victimisation IoT construct. therefore there's a provision for theconsumers to trace their energy consumption from time-to-time so they'll management their consumption as they want. This methodology is beneficial for each the patron andthe provider. this technique permits the provider to disconnectthe association from a foreign server just in case the consumerfails to pay his/her electricity bill. This methodology eliminate sthe want of human power throughout disconnection andreconnection of the load. Another major

advantage of this methodology is that it'll inform the provider aspect regarding any stealing that's happening within the system.

1.1.1Internet of Things(IoT)

IoT describes a system wherever things within the physical world, and sensors at intervals or hooked up to those things, square measure connected to the web via wireless and wired net connections. These sensors will use numerous sorts of native spaceconnections like RFID, NFC, Wi-Fi, Bluetooth. Sensors also can have wide space property like GSM, GPRS, 3G, and LTE.

- Connect each inanimate and living things. Early trials and deployments of net of Things networks began with connecting industrial instrumentation. Today, the vision of IoT has distended to attach everything from industrial instrumentation to everyday objects. the kinds of things vary from gas turbines to vehicles to utility meters. wearable computing and digital health devices, like Nike+ Fuel band and Fitbit, square measure samples of however folks square measure connecting within the net of Things landscape. Cisco has distended the definition of IoT to the (IoE), which incorporates folks, places, objects and things. essentially something{you will|you'll|you'll be able to} attach a detector and property to can participate within the new connected ecosystems.
- Use sensors for information assortment. The physical objects that ar being connected can possess one or additional sensors. every device can monitor a particular condition like location, vibration, motion and temperature. In IoT, these sensors can connect with one another and tosystems which will perceive or gift data from the sensor's information feeds. These sensors can offer new data to a company's systems and to individuals.Change what kinds of item communicate over associate degree informatics Network. within the past, individualscommunicated with individuals and with machines.

Imagine if all of your instrumentality had the power to speak. What would it nottell you? IoT-enabled objects can share info concerning their condition and also the encompassing surroundings with individuals, code systems and different machines. This info is shared in realtime or collected

and shared at outlined intervals. Going forward, everything can have a digital identity and property, which implies you'll determine, track and communicate with objects.

The Three Cs of IoT

- Communication.IoT communicates info to folks and systems, like state and health of kit (e.g.it's on or off, charged, full or empty) and knowledge from sensors that may monitor a person's important signs. In most cases, we tend to didn't have access to the current info before or it had been collected manually and often. Forexample, AN IOT-enabled HVAC system will report if its filter is clean and functioning properly. virtually each company includes a category of assets it may track. GPS-enabled assets willcommunicate their current location and movement. Location is very important for things that move, like trucks, however it's additionally applicable for locating things and folks at intervals a company. within the health care business, IoT will facilitate a hospital track the placement of everything from wheelchairs to internal organ defibrillators to surgeons. within the transportation business, a business will deliver period of time pursuit and condition of parcels and pallets. as an example, Maersk will use sensors to trace the placement of a cold shipping instrumentality and its current temperature.

- Control and Automationduring a connected world, a business can have visibility into a device's condition. In several cases, a business or client also will be ready to remotely management a tool. as an example, a business will remotely activate or close upa selected piece of apparatus or regulate the temperature during a climate-controlled surroundings. Meanwhile, a client will use IoT to unlock their automotive or begin the washer. Once a performance baseline has been established, a method will send alerts for anomalies and presumably deliver an automatic response. as an example, if the constraint on a truck ar close to fail, it willprompt the corporate to require the vehicle out of service and mechanically schedule maintenance.
- Cost Saving : several firms can adopt IoT to avoid wasting cash. measure provides actual performance information and instrumentality health, rather than simply estimates. Businesses, significantly industrial firms, lose cash once instrumentalityfails. With new device info, IoT will facilitate an organization save cash by minimizing breakdown and permitting the business to perform planned maintenance. Sensors may also activity things, like driving behavior and speed, to cut back fuel expense and wear and tear on consumables. New good meters in homes and businesses may also offer information that helps individuals perceiveenergy consumption and opportunities for value savings.

1.2 PROBLEM STATEMENT

Automatic thievery detection of energy and request of electricity consumption area unit difficult and has recently attracted attention. This project aims to resolve the issues baby-faced by the shoppers in addition because the distributing corporations .

This system permits the electricity department to scan the monthly scanings while not having to send someone to read the reading at every house .It conjointly helps the shoppers to stay track of load consumption on a timely basis.

1.3 METHODOLOGY

IoT contains a terribly wide domain of application which has military services, health care, observation pollution, manufactory instrumentation, etc. Associate in Nursingd in terribly explicit project we've got enforced a hardware wherever it's operating to sight faults occurring within the

device mechanically via IoT victimization an interface. The project in the main deals with goodenergy meter, that utilizes the options of embedded systems i.e. combination of hardware and software system so as to implement desired practicality. It additionally discusses the appliance of GSM and Wi-Fi modems to introduce 'Smart'concept. With the employment of GSM electronic equipment the buyer additionally because the service supplier can get the used energy reading with therespective quantity, shoppers can even get a notification within the kind text through GSM after they square measure on the point of reach the brink worth set by them. additionally with the assistance of Wi-Fi electronic equipment the buyer willmonitor the energy reading of the consumed energy and may set the brink worth with the assistance of webpage.

1.4 ORGANISATION

This report is organized as follows: In Chapter two, we've got given a summary of the analysis papers we've got browse. The Chapter three briefs regarding the assorted system development phases of the project. The Chapter four contains the performance analysis of our project . and that we conclude our discussion in Chapter five, more discussing regarding the long run scope of the project.

CHAPTER-2
LITERATURE SURVEY

To get acquainted with the given topic, we tend to studied varied analysis papers that are already projected. we tend to collected varied papers associated with the subject to assemble all the knowledge regarding the various forms of fault detection strategies, algorithms and techniques that ar related to it. Following is that the abstract of few papers that we tend to surveyed:

2.1 IoT Based Electricity Energy Meter Reading, Theft Detection and Disconnection using PLC modem and power Optimization(Dr. K A RadhakrishnaRao,DarshanIyer N1 M.Tech student, Deptartment of EC, PES College of Engineering, Mandya, Karnataka, India Professor, Dept. of ECE, PES College of Engineering, Mandya, Karnataka, India) : Vol. 4, Issue 7, July 2015

This paper portrays PIC18F46k22 Microcontroller based for the most part style and execution of vitality meter abuse IoT origination. The arranged framework style dispenses with the human association in Electricity upkeep. the customer needs to buy the use of power on plan, just on the off chance that that he couldn't pay, the power transmission will be killed self-governingly from the far off server. The client will screen the vitality utilization in units from a web page by giving gadget IP address. felonynoticeion unit associated with vitality meter can inform organization angle once meter intruding occurs in vitality meter and it'll send lawful offense identify information through PLC electronic hardware and crime identified will be shown on the terminal window of the corporate perspective. Wi-Fi unit plays out the IoT task by causation vitality meter data to online page which may be gotten to through IP address. The Hardware interface circuit comprises of PIC18F46k22 Microcontroller, MAX232, fluid precious stone {display|LCD|digital display|alphanumeric display} show, crime identification unit,Triac switch

circuit, DB18B20 temperature gadget, PIR sensor, PLC modem, and ESP8266 Wi-Fi moduleWi-Fi unit plays out the IoT activity by causation vitality meter informationto online page which may be gotten to through IP address.In this undertaking we keep an eye on ar exploitation 3

Microcontrollers, 2 on the supporter perspective for stealing discovery and IoT, one on the corporate viewpoint for PLC

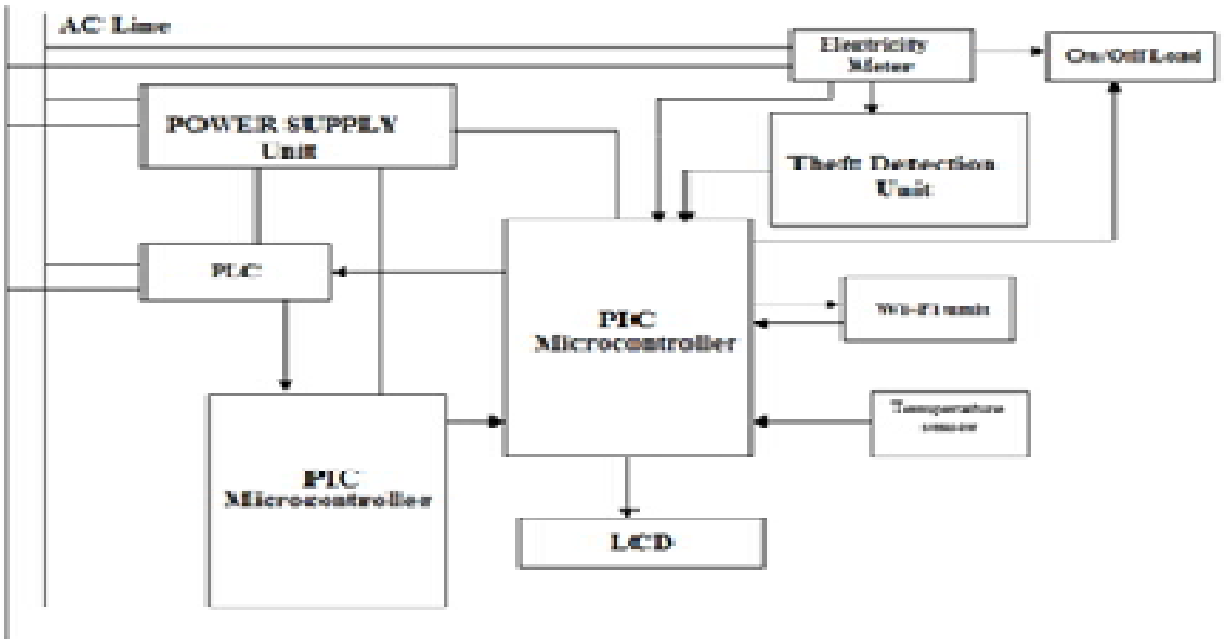


Fig : Proposed IoT based electricity energy meter (consumer end)

The task in the primary spotlights on taking location, control improvement and giving the pertinent vitality utilization information to client. Here the client will screen the vitality utilization units from an online page by giving gadget science address. stealingdetection unit associated with vitality meter can send word organization aspect once meter change of state and taking recognition occurs in vitality meter through PLC electronic gear and taking distinguished will be displayed on the terminal window.

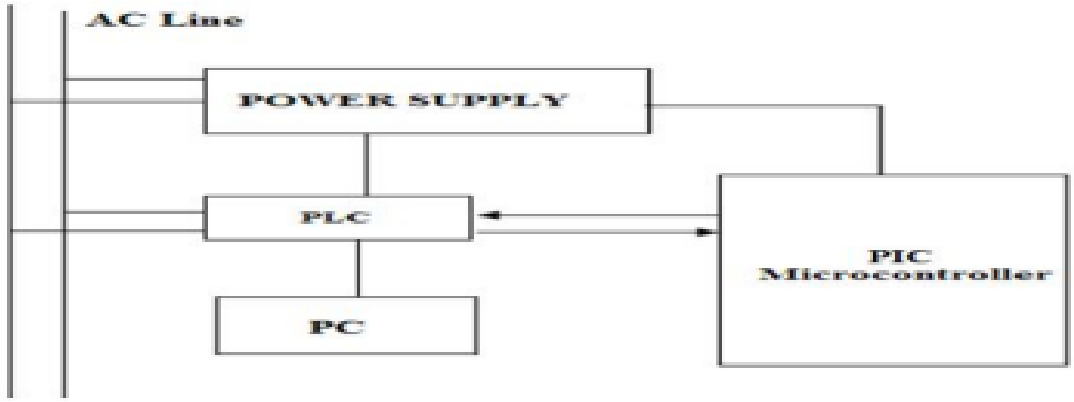


Fig : Proposed PLC communication (service provider end).

2.2 Internet of Things based Smart Electricity Meters

PratibhaVarshney (BharatiVidyapeeth's College of Engineering, New Delhi),ShikhaRastogi (BharatiVidyapeeth's College of Engineering, New Delhi), Manisha Sharma(BharatiVidyapeeth's College of Engineering, New Delhi) ,8, January 2016

Since vitality sources zone unit limited and it's turned into our got the opportunity to spare the greatest sum vitality as feasible. amid thisstate of issues, sensible meter comes into the picture. a shrewd meter catches unit devoured amid a particular time span, showresults and thus offer ongoing contributions to the asking unit. the work of such sensible meters has been developing rapidly as of late. Truth be told, bound market onlookers gauge the overall commercial center for sensible meters can quicken from $4 billion of every 2011 to near $20 billion out of 2018.[1] Direct U.S. fares of sensible meters even have indicated strong development as of late, however from atiny low base, ascending from relate measurable $180 million to $240 million all through 2008–13[2]. sensible meters zone unit much superior to anything those mechanical gadget meters utilized aforesaid by the customers. amid thispaper, we keep an eye on zone unit clarifying the possibility of sensible meters, varying sorts of correspondence, correspondence usingPLC, security and fakes identification, value streamlining and data sets.

With the great advancements inside the field of web and innovations, everything has turned out to be computerized. web has turned into a pivotal a piece of our lives. a substitution innovation has gone into this picture called web of Things (IoT). web of Things might be a system incorporates of the numerous electronic gadgets and sensors that ar associated along to trade some information over the net. The gadgets upheld IoT show up talking and offering data to each other. great Meter is one in every one of the utilizations of IoT. It records the utilization and sends the readings to the utility working environment on consistent reason for recognition and charge. For an extended time, old mechanical gadget meters are utilized (see Figure 1). Meter readings were noted down on the month to month premise. howevercurrently with the advancement of good power meters, things ar dynamical. edges of good meter over old mechanical devicemeters:

1. Great meters are less blunder inclined. Redress readings are gotten by the customers and utility providers.

2. Readings might be sent remotely finished the net to the utility providers. Laborers needn't to be physically blessing at the area.

3. Change of condition of those meters might be basically identified by the specialists

COMMUNICATION

Shrewd meter should be prepared to convey to the Utility providers. It should send the data peruse from the meter to the server of the analyzer and get the operational reaction. there's need of a correspondence framework that should be extremelyreliable and secure to exchange high volume of learning. The framework should be prepared to gather the data from all the local sensible meters and send it to the specialists required for it . shifted correspondence advances might be used in this technique like:•Power Line Carrier (PLC).

•Broadband over Power Lines (BPL).

•Copper or optical fibre.

•Cellular.

•WiMax

•Bluetooth.

• General Packet Radio Service (GPRS).

•Internet.

- Satellite.
- P2P.
- Zigbee.

Electrical cable affiliation (PLC) is best to find out correspondence amongst meter and furthermore the social unit because of it doesn'tneed a different correspondence line and might be placed in exploitation line framework. amid this paper, the security of PLC is clarified. This convention utilizes open key science approach. This convention include 2 stages:

1. Check the security of the affirmation of people in general key.

2. Bounce to-jump confirmation so as to lessen the danger of Denial-Of-Service (DoS).

Parts of this Protocol:

ServerThe Destination to send the gathered information for analysis.Manufacturer: Manufactures the PLC Modems and IRM. PLC Modem: It gathers the meter perusing from the home meters and sends them to the IRM. IRM: It goes about as AN interface amongst PLCs and Server

Socio-demographic variables	Description	Number of categories	Example(s)
GSP group	Grid supply point group in UK which are regional electricity distribution networks	Total 14 3 in datasets	Southern; South Wales; North Scotland
Age	Age of head of household	6	Age 26-35
Decision maker type	Type of person deciding household matters	13	Young Couple
Family lifestage	The combined stage of life and family status including children	14	Young family with children
Household composition	People living together and their relationships to one another	13	Male home shares
Household income band	Total household income per year	10	£30,000 to £39,999
Mains gas flag	Whether a household is connected to the Main gas network; if Yes, it's assumed that household uses gas	2	Connected to gas; not connected to gas
Mosaic public sector group	Classification on citizen's location, demographics, lifestyles and behaviors	15	Young, well-educated city dwellers; Wealthy people living in the most sought after neighborhoods
Mosaic public sector type	Subcategories of Mosaic Public Sector Group	69	Young professional families settling in better quality older terraces
Number of bedrooms	Number of bedrooms of the property	5	5 + bedrooms
Property age	When the property was built	6	1871-1919
Property type 2011	Type of property in 2011	5	Purpose built flats; Farm
Property value fine	Estimated property value	25	£500,001 to £600,000
Tenure 2011	Property ownership in 2011	3	Privately rented

2.3 A REVIEW ON IOT BASED SMART ELECTRICITY ENERGY METER

Mr. Rakesh P. Sukhadia Mr. Rakeshkumar D. Modi

International Journal For Technological Research In Engineering Volume 4, Issue 1, September-2016

This Review focus on the look and execution of IoT based for the most part sensible power vitality meter. This style may beeliminate the individual power inclusion to deal with the power. The clients of power must be constrained to pay according to the work of power on plan, by one means or another clients neglect to pay, the transmission of power might be diverted standoffish from the removed server mechanically. Vitality meter gives arrangement to the clients that they will screen the vitality utilization in units by misuse web content giving gadget science address. Vitality meter comprises lawful offense recognition world organizationit can apprize company aspect inside the occasion of meter hardening or lawful offense watch happen in vitality meter and conjointly it'll

send information concerning lawful offense location by abuse PLC electronic hardware and along these lines the felonydetected will be shown on the terminal screen or window of the corporate feature. IoT activity might be performed by Wi-Fi gadget that causing vitality meter learning to the online page through the science address. This sensible power vitality meter comprises Microcontroller, fluid precious stone {display|LCD|digital display|alphanumeric display} show, lawful offense location unit, MAX232, Triac switch circuit, temperature detecting component, PLC electronic gear and Wi-Fi module. Watchwords :IoT(Internet of Things), Microcontroller, fluid precious stone {display|LCD|digital display|alphanumeric display} show, crime identification unit, MAX232, Triac switch circuit, temperature detecting component, PLC electronic gear and Wi-Fi module.

CONCEPT AND DESIGN

The develop of Internet of Things (IoT) from it introductory stage dynamical the present web into all around included future web. these days there zone unit billions of contraptions (around 9 billions) interconnected devices and one expectation is that it'll reach upto fifty billions devices in 2020. The IoT based generally sensible vitality meter incorporates primarily four modules (units).

1. Micro controller unit

2. Theft detection unit

3. PLC modem unit

4. Wi-Fi unit

In the style of this sensible power vitality meter we've utilized 3 microcontrollers, 2 microcontrollers region unit send at the patronfinish for the point of stealing recognition and IoT

and one microcontroller is placed in at the supplier complete for the PLC electronic gear correspondence. inside the present situation the necessity is to get to the normal for gadget remotely however in an exceptionally solid way. to achieve the normal for gadget remotely we need to join an apparatus (here vitality meter) to web by giving science address thereto. amid this paper we've focusing on the stealing identification, ideal use of energy and pass on the vitality utilization information to the use wrap up. we can see inside the chart as appeared in figure-1, the IoT based for the most part sensible power vitality meter at customer complete comprise the AC line (single section two wire) , PLC correspondence electronic gear, stealing identification unit and Wi-Fi unit. we can see inside the graph as appeared in figure-2, the supplier complete comprises the AC line (single section two wire), PLC correspondence electronic hardware, microcontroller, and personal laptop.

PROCESS AT CONSUMER END

At the purchaser complete, control offer unit offer the office to any or every one of those component which needs control. Microcontroller gain the pertinent information from the power vitality meter and also play out the administration strategy and sends the coveted information likerange of units overwhelmed by the help of Wi-Fi unit. the point of advanced show module is to incite visual information concerning the measure of units, temperature and Wi-Fi design

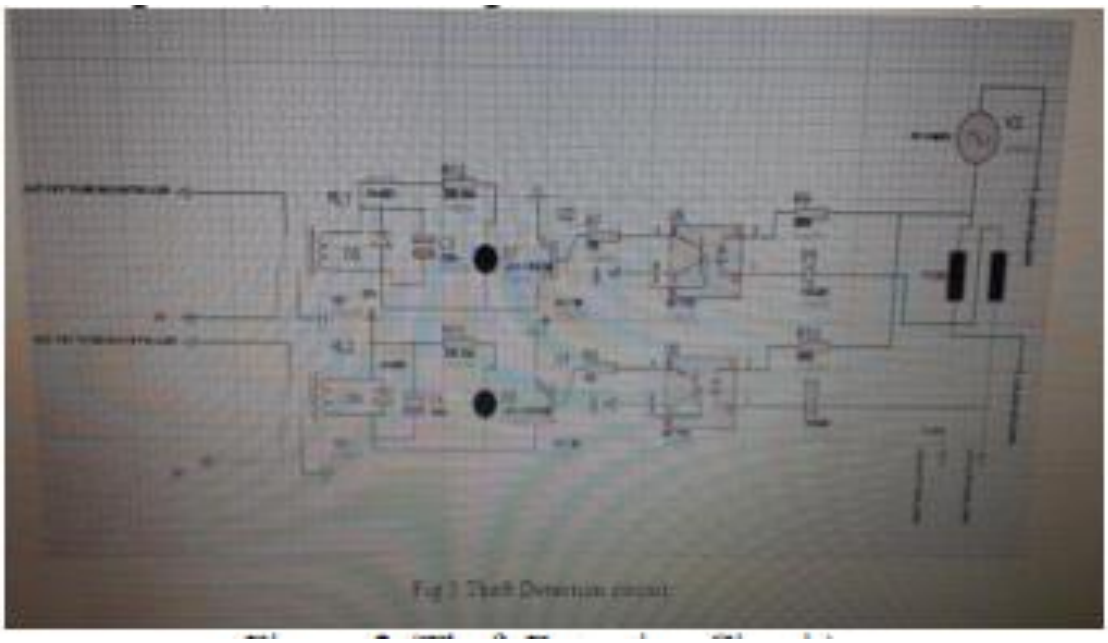
PROCESS AT SUPPLIER END

At the supplier complete, if any taking is recognized the PLC goes about as an electronic gear and it sends the compulsory summon. On the off chance that customer neglects to pay the power charge amount among the point of confinement specified by the supplier the disengagement and reconnection may likewise done by causation the worthy summon to the controller. In a roundabout way we will state that it disposes of the prerequisite of physically separation and reconnection of transmission line

COMPARISON BETWEEN EXISTING ELECTRICITY ENERGY METERING METHOD AND SMART ELECTRICITY ENERGY METERING METHOD

(a**) Existing Electricity Energy Metering Method**:- As we as a whole know in our nation the power vitality ask for period is either complete of 1 month or complete of 2 months. During the time power customer can't what amount control devoured, they will comprehend at the tip of 1 or 2 months once the bill issue. The chief inconvenience of this strategy is utilize can't deal with the capacity utilization. Another disservice of this method is treating with vitality meter is done basically and such practices ar happening and expanding apace that is one among the principal explanation behind power emergencies.

(b**) Smart Electricity Energy Metering Method**:- In this system we tend to tries to take out the inconvenience and impediments of existing power vitality metering philosophy. Amid this philosophy there's an arrangement for the purchaser that they will see their energy utilization time to time all together that they have an opportunity to deal with the office utilization as they need. This approach isn't exclusively enable to customer complete however moreover it's extra helpful to supplier complete also. On the off chance that the purchaser neglects to pay their power curved amount at interims the period said by the supplier, the supplier is detach the office mechanically from the far off wrap up. This strategy take out the physical detachment system at customer site along these lines it'll be helpful to keep away from strife amongst customer and supplier at the season of disengagement. This strategy additionally can give the capacity of the reconnection of the office from the inaccessible wrap up. Another significant favorable position of this procedure is that it gives the learning at the occasion meter hardening and power robbery. Such information are horrendously useful to deal with the acts of energy burglary and cut back the office emergencies.



Theft Detection Circuit

2.4 IoT Based Smart Energy Meter

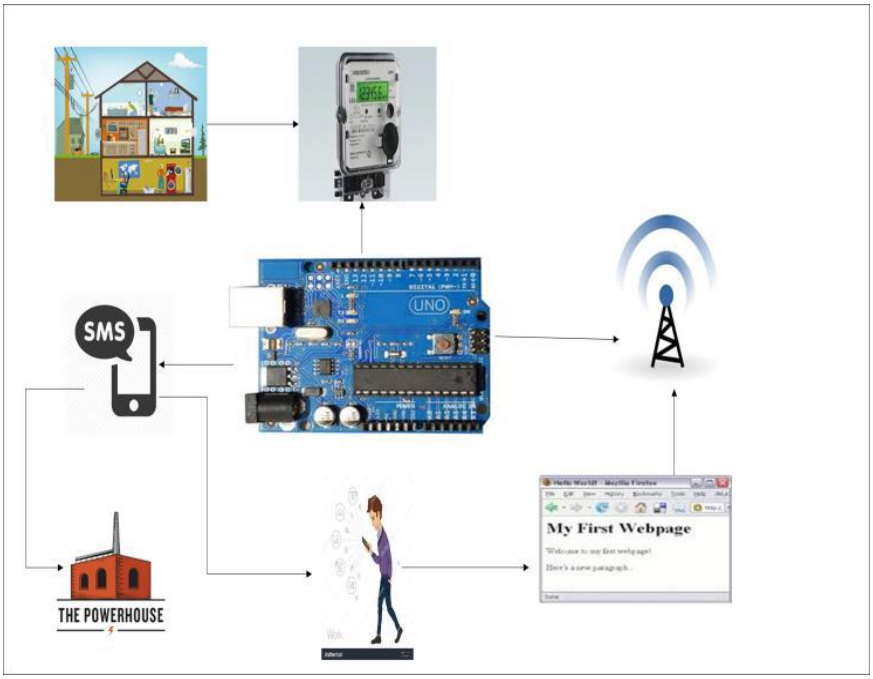
TejashreeRavi ,BirendrakumarSahani, AkibjavedTamboli, Professor R.S. Pisal
International Research Journal of Engineering and Technology (IRJET)
Volume: 04 Issue: 04 | Apr -2017

We can see somebody remaining in front of our home from power board, whose obligation is to peruse the vitality meter and surrendering the bills to the proprietor of that house month to month. this can be nothing however meter perusing. According to that understanding we must pay the bills. the most drawback of this strategy is that individual must go space by space and he should peruse the meter of each house and giving up the bills. over and over mistakes like further bill amount, or notice from electrical board notwithstanding assuming the bills ar paid ar regular blunders. to beat this drawback we have returned up with an arrangement which can take out the outsider between the purchaser and repair provider, even the mistakes are overcome.

In this paper the possibility of sensible vitality meter abuse IoT and Arduino are presented. amid this system we tend toar misuse Arduino because of it's vitality temperate i.e. it expend less power, it's snappiest and has 2 UARTS. amid this paper, vitality meters that is as of now put in at our homes don't appear to be supplanted, however atiny low adjustment on the already put in meters

will adjustment the overarching meters into sensible meters. the use of GSM module gives a component of warning through SMS. One will basically get to the meter working through site that we have a tendency to composed. Current perusing with cost will be seen on site. Programmed ON and OFF of meter is achievable. Limit worth setting and causing of warning is that the additional undertaking that we have a tendency to are performing).

ARCHITECHURAL MODEL



•When the different machines of the family devour vitality the vitality meter peruses the perusing persistently and this expended load can be seen on meter.

•We can see that the LED on meter constantly flickers which checks the meter perusing. In light of

•The flickering, the units are checked. Ordinarily, 3200 flickers is one unit.

•In our undertaking we are endeavoring to develop, a structure in which Arduino Uno go about as standard controller, which reliably screen imperativeness meter.As per the flickering of LED on vitality meter the Arduino will gauge the unit utilization.

•The estimated perusing with the count of the cost will be constantly shown on website page that we have composed.

•Threshold esteem can be determined to site page with the assistance of Wi-Fi, according to the shopper's prerequisite. At the point when the purchasers perusing will be close going to the set limit esteem it will send a notice an incentive to the buyer.

•This edge esteem notice will build the mindfulness among the buyer about the vitality.

•When the buyer gets the notice he can visit the website page and change the edge esteem.

•If the shopper doesn't know with the limit notice, at that point the meter will naturally get off. At that point the purchaser needs to visit the site page again and increase the limit esteem. By the incrementation, the meter will naturally get ON.

•Finally the general month to month charge with cost will be sent to client and specialist co-op as content at first day of consistently.

An endeavor has been made to make a sensible model of 'IoT fundamentally based sensible Energy Meter.' The spread model is utilized to figure the vitality utilization of the house, and even make the warmth unit perusing to be convenient.

Consequently it decreases the wastage of vitality and deliver mindfulness among all. Indeed, even it'll deduct the manual intercession.

2.5(IOT) Internet of Things Based Energy Meter

Gowthami.P ,Gobhinath.S ,Gunasundari.N ,

International Research Journal of Engineering and Technology (IRJET)

Volume: 03 Issue: 04 | Apr-2016

The Existing household Energy meter perusing frameworks all around exist a few issues, similar to issue in development, excessively slim data measure, too low rate, poor constant, not 2 implies correspondence rapidly and so forth to disentangle higher than issues, this paper utilizes the remote innovation for Automatic Meter Reading framework. An arranged procedure gives the correspondence between the Electricity Board area and along these lines the customer segment abuse net of things (IOT) for transmittal the client's power utilization and bill information that is figured abuse ARM7 microcontroller. the capacity variances are observed abuse the voltage detecting component and current detecting component ar bolstered to the microcontroller that demonstrates it to the Electricity Board. relying on the capacity age, the house hold gadgets ar controlled mechanically. From Electricity Board area the information identifying with the bill amount and installment ar imparted to the purchaser by means of universal System for Mobile correspondence. the capacity and asking information is unendingly transmitted by the work of net of Things and checked by the Electricity Board area. At whatever point there's energy robbery known is sent from the Electricity Board segment to hack the arrangement to the customer.

PRESENTATION

Installed frameworks and Real Time in activity frameworks (RTOS) territory unit 2 among the numerous innovations that may assume a critical part in making these thoughts possible. a larger than usual scope of people territory unit officially wagering on in operationsystems for constant applications, these 'eyes inside the sky' zone unit right now taking care of make an impact on our regular daily existences in an extremely extra essential way. Installed frameworks territory unit pre-outlined while not associations and work according to the predefined errand. however in activity frameworks guideline is configuration arranged. These frameworks zone unit primarilyplatform-less frameworks. Installed frameworks zone unit the unsung saints of plentiful of the innovation we have an inclination touse these days the PC diversion we tend to play, or the

electronic gear or the clothing machines we tend to utilize them. while not relate inserted framework we'd not have the capacity to sign on exploitation electronic gear about each car that moves off the mechanical production system of late makes utilization of installed innovation in one kind or the other; the vast majority of the implanted frameworks in autos territory unit tough in nature, as a large portion of those frameworks zone unit made of one chip. No driver conflicts or 'frameworks occupied' conditions occur in these frameworks. Their reduced profiles adjust them to suit simplyunderneath the incommodious hood of a car. These frameworks are frequently acclimated actualize choices beginning fromadjustment of the suspension to suit street conditions and subsequently the hydrocarbon content inside the fuel to electronically monitored slowing mechanisms (ABS) and security frameworks. Installed frameworks zone unit intended to attempt and do some particular undertaking, rather than be a general pc for numerous errands. Some even have ongoing execution limitations that must be met, for reasons like wellbeing and ease of use; others may have low or no execution necessities, allowing the framework equipment to be rearranged to downsize costs. Installed frameworks don't appear to be interminably independent gadgets. a few installed frameworks incorporate modest, handled segments among a greater gadget that fills an extra broad need. for example, the Gibson automatonGuitor alternatives relate implanted framework for institutionalization the strings, however the broadly useful of the automatonstringed instrument is, obviously, to play music. Likewise, relate implanted framework in relate vehicle gives a specific work as an arrangement of the car itself installed frameworks region unit intended to attempt and do some particular undertaking, rather than be a general pc for different errands . Some even have ongoing execution requirements that must be met, for reasons like security and ease of use; others may have low or no execution necessities, allowing the framework equipment to be improved to downsize costs.

SYSTEM DESIGN

The outlined vitality meter incorporates a simple vitality meter, a GSM electronic hardware (SIM-900), relate degree ARM7 LPF 2129 (ace controller), 8051 microcontroller (measure electrical heartbeat), web entry with data and golem application place in client's versatile . The framework will be isolated into a couple of parts:

The venture is chiefly isolated into 2 modules:

(a) Hardware design

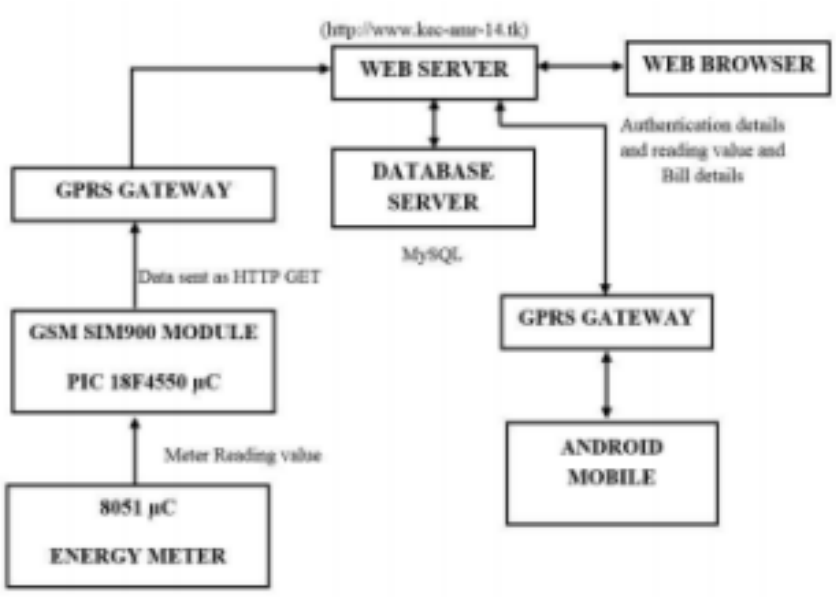
(b) Web Server interface design

A. **Hardware Design**

Web of things (IOT) is that the principle procedure of correspondence between the vitality meter and in this way the net server. IOT, being a 2.5G portable innovation, is offered wherever the globe. it's conjointly preferably suitable for information move over Associate in Nursing interminably on-line relationship between a focal area and cell phones. the cost is per PC memory unit of data exchanged, contrasted with SMS wherever the cost is per message. The perusing data from the vitality meter continuously is transferred to a focal data by means of IOT [5]. each client of the framework could get to this data by means of the web.8051 microcontroller is interfaced with vitality meter and PIC 18F4550 that demonstrations on the grounds that the ace controller through RS-232. The get stick of RS-232 of PIC is associated with the transmit stick of RS-232 of 8051. The transmit stick of RS-232 of PIC is associated with the get stick of RS-232 of SIM900 module.8051 microcontroller screens each beat of the vitality meter. It sends the deliberate perusing to PIC 18F4550 whenever the value is changed. PIC 18F4550 gets the perusing from 8051 so speaks with SIM900 through AT charges and transmits the perusing data through IOT to the focal server. From fig three we can see, once client attempt andtamper meter, the robbery identification unit identifies burglary and it sends theft distinguished data to Texas PLC through µc, that is then shown on windows virtual terminal of the administration provider misuse Rx PLC

B. Web Server interface design

The beat for every unit from the vitality meter is observed misuse 8051 microcontroller. This observed cost is disseminated to the PIC controller that demonstrations on the grounds that the Master. for every thirty seconds, the PIC controller tries to send the valuegot to the focal openserver through IOT misuse GSM electronic hardwar**e.**



The GSM yield organize has been analyzed.ThePIC-16F877A Microcontroller the tasks were considered and it's modified and in this way the framework working model was produced in order to achieve the objective. "The IOT based for the most part Energy meter" spares the client's opportunity by making them work "less fatty". The activity of the calculative the office cost is clear and doesn't include delays. as opposed to misuse DAQ that is to a great degree expensive amid this task PIC (16F877A) microcontroller besideserial correspondence has been acclimated interface with the virtual terminal. The IOT based generally Energy meter for calculativeprice and showed in fluid precious stone show has been accomplished misuse MPLAB and PIC 16F877A. the office cost is send through serial correspondence to the Virtual terminal made in PROTEUS. This task will so illuminate administration concerningwasted time, and uncalled-for ventures, accounting Associate in Nursingd ask for because of it gives a correctaccounting of units driven because of the obstruction of negligence .

.2.6 IOT BASED ENERGY METER READING

Prof. S B Kulkarni , Pooja D Talwar

This paper is spoken to live vitality utilization inside the house and create its bill mechanically exploitation telemetric correspondence. this could encourage in lessening vitality utilization in house on the grounds that the proprietor is unendingly being informed concerning the quantity of units that ar expended. It objective is to get charge mechanically by checking the power unit's

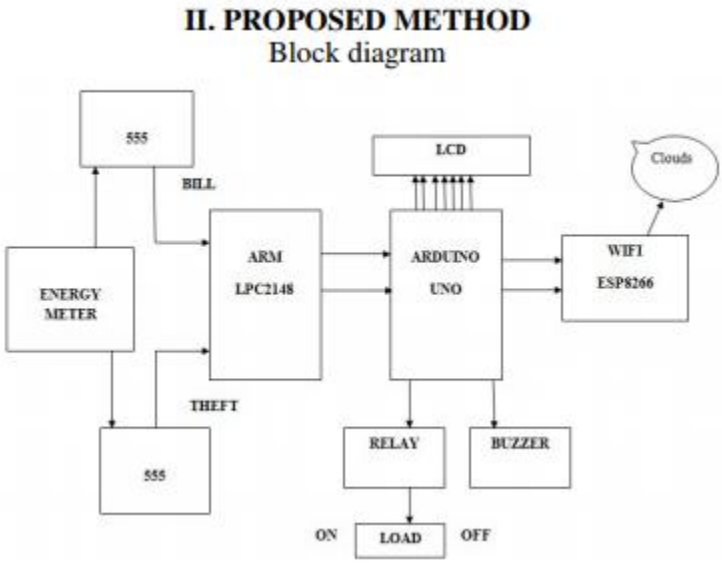
utilization in an exceptionally house and in an extremely on account of cut back the drudge. The counts ar performed mechanically and furthermore the bill is refreshed on the net by utilizing a system of web of Things. The bill amount might be checked by the proprietor wherever universally. style and execution of undertaking is mainly bolstered ARM controller exploitation IOT thought. In power transmission human inclusion isn't required. customer pays the power charge for the devoured control. On the off chance that just on the off chance that customer neglects to pay the bill on time then power transmission will mechanically killed. conjointly control taking might be distinguished if any difference in statehappens can|it'll} send the information to the server moreover in light of the fact that it will cut the power mechanically. WLAN plays out the IOT task wherever and through that the learning is delivered to the net server.

INTRODUCTION

the web of factor licenses protest be seen and controlled remotely crosswise over existing system framework, makingopportunities for extra direct combination between the physical world and PC based for the most part frameworks, and prompting enhanced strength, exactness and monetary benefit. The expanding age needs approved contraptions by remote innovation which consolidates Bluetooth, frequence Identification, Embedded sensors and loads of extra. in this IOT innovation has full-grownfrom its beginning and at present by and by wide exploitation it. The power assumes an essential part in our life. Presently a-days in light of the fact that the customers square measure expanding rapidly it turned out to be unpleasantly challenging to deal with the power needs. while notelectricity it's unrealistic to survive and conjointly it's crucial to spare loads of the power misfortune. since the age is will build the shopper's needs conjointly expanding therefore as per it the innovation change is required. hence we have a tendency to built up the framework with snappier and enhanced innovation i.e. IOT. The power conjointly contains a few issues like power robbery. Power burglary might be a live wrongdoing and it conjointly specifically influences the economy of our nation. Transmission, age and dispersion of power epitomize the loss of power. To dodge the misfortunes we need to watch the office utilization and misfortunes, all together that we can with effectiveness use the created influence.Meter treating is a segment of energy burglary and conjointly extralegal wrongdoing that we can limit. charge might be a technique by and large the human administrator goes to every customer's home at that point giving bill it'll take pile of your chance. To determine these issues we have a tendency to created framework on the base of

IOT vitality meter perusing. IOT based for the most part vitality meter perusing comprises of 3 sections: Controller, thieverydetection and remote devotion half. Controller half assumes a noteworthy part inside the framework. wherever every one of the information will send through this controller to the inverse a piece of the framework and it conjointly stores the information in it. remote devotion half performs IOT activity as per the Arduino controller. The vitality meter associated with burglary identification half if any temper happens can|it'll} send the information to the corporate likewise on the grounds that it will make programmed move by making power off.

METHOD



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SYSTEM IMPLEMENTATION

The proposed IOT based Energy Meter Reading is actualized utilizing two hubs, one on the buyer end and one for the Web server.

1) Consumer complete Implementation amid this undertaking we tend to zone unit exploitation ARM seven LPC2148 microcontroller, Aduino controller and neighborhood

2)network ESP8266 module for the IOT task. The venture in the fundamental spotlights on the asking, and power lawful offense.

A.)ARM seven LPC2148

The ARM7 might be an a piece of Advanced diminished direction set figuring Machine (ARM) group of universally useful 32-bit microchips, that offers low power utilization for and low an incentive for prime execution gadgets. it completely was produced in Nineteen Eighties and as of now wide utilized 32-bit direction outline. ARM seven processor needs impressively lesser transistors because of in light of the fact that it construct mostly|is predicated|relies} in light of lessened direction set figuring based approach. Diminished intricacy and style grants organization to make a low-vitality framework on chip for implanted framework joining memory, interface, and so forth. ARM7 processor is wide utilized because of it gives bring down esteem, less warmth and less power use. Functionalities of LPC2148 board

1. 16/32 bit ARM7TDMI-S MCU from Philips (NXP).

2. It has RS232 Communication for UART0 and UART1.

3. It bolster USB gadget.

4. It has JTAG association which performs investigating/programming application.

5. EEPROM interface should be possible utilizing I2C.

6. On board contains Buzzer and Relay work.

7. 7 Segment shows by means of I2C (Inter-Integrated Circuit).

B. Arduino Uno

Arduino Uno Arduino might be a microcontroller board and it's bolstered ATmega328P. Board comprises of fourteen computerized input/yield pins. Out of that about six info pins ar utilized as PWM yields, about six as simple data sources, quartz of 16MHz, having USB affiliation, control offer jolt, AN ICSP header and push catch. simply we can interface the Arduino board to the

pcvictimisation USB relationship to encourage start. conjointly we can offer energy to that with AC – to – DC connector or we can utilize battery to ask began. As we tend to contrast Arduino UNO board and elective it varies from the proceeding with board that doesn't utilize FTDI USB – to – serial driver chip. as opposed to that the ATmega8U2 is modified as USB – to – serial convertor.

C. WIFI ESP8266

WIFI module remote constancy ESP8266 could be a low value chip with TCP/IP stack and microcontroller. In our venture fundamental significance of remote constancy is it performs IOT activity. the clear gadget is associated from microcontroller to send the information.

2) Web server

In our task we tend to territory unit showing the information concerning the vitality devoured as far as units, concerning the bill and if any taking happens that might be shown inside the site. thus every client will check the learning any wherever all inclusive. Thingspeak online page is utilized for showing the information of the undertaking.

CHAPTER 3

SYSTEM DEVELOPMENT

Internet of Things Based Smart Power meter with Power Factor using NodeMCU and AVR.

This unit discusses the essential definitions expected to comprehend the Project better and further characterizes the specialized criteria to be actualized as a piece of this venture.

With progression of innovation things are getting to be less difficult and less demanding for us. Programmed frameworks are being favored over manual framework. Through this task I have endeavored to indicate Internet of Things Based Smart Power meter with Power Factor utilizing NodeMCU and AVR.

Why automation?

Prior, we investigated the substance of future when we discussed robotized gadgets, which could do anything on induction of a controller, however today it has turned into a reality.

An robotized gadget can supplant great measure of human working power, additionally people are more inclined to mistakes and in serious conditions the likelihood of blunder increments. Though a computerized gadget can work with industriousness, flexibility and with very nearly zero blunder.

Why IOT?

Prior, we investigated the substance of future when we discussed robotized and iot gadgets, which could do anything on induction of a controller, however today it has turned into a reality.

1. A mechanized and iot gadget can supplant great measure of human working power, in addition people are more inclined to mistakes and in escalated conditions the likelihood of blunder increments. Though a mechanized and iot gadget can work with determination, adaptability and with just about zero blunder And transfer the right information on cloud

2. This is the reason this undertaking investigates development and execution of a framework including equipment to control an assortment of electrical and hardware framework.

This Expensive Thing to be planned and estimating perusing isn't simple as today people need I am will send AVR based Real time current and load meaurenment on gadgets and transfer the incentive on cloud .in this undertaking human check there perusing of load ,power and charging at anyplace of the world .

- **MEASUREMENT WITH AVR AND NODE-MCU**

The human note down the perusing of their heap utilizing by the home meter .for this work he/she will go close to the meter and note down the perusing yet he/she can't ascertain the perusing charging or ampere. They can just note down the perusing of meter that how much or long it function.

So we have composed a task which name have

"AVR based Real time current and load estimation of the gadgets"

In this task we have utilized the avr, hub mcu, power and current sensor, which measure the power and current of the gadgets.

The perusing are transfer on cloud "io.adafruit".

The count of energy, charging and current ascertain by the avr and this esteem send to the cloud.

Power ascertain in watts, current compute in ampere and charging figure in rupees.

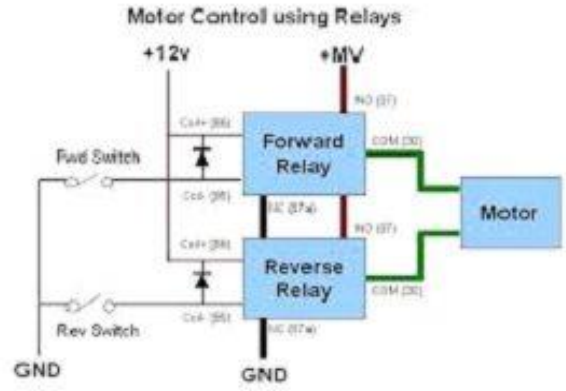
3.1 COMPONENTS

3.1.1 MOTOR DRIVER (relay):

Transfers are electrically worked switches. They utilize an electromagnetic curl to pull the shafts of the switch into position. Most transfers come back to the typically shut position by a spring when the loop is de-empowered, so hand-off contacts are generally recognized as a transient contact switch.

Inward perspective of a hand-off:

The transfers activated utilizing the ULN2803 IC .ULN2803 IC is an eight NPN Darlington associated transistors. This group of exhibits are in a perfect world suited for interfacing between low rationale level computerized hardware, (for example, TTL, CMOS or PMOS/NMOS) and the higher current/voltage necessities of lights, transfers and printer hammers.



3.1.2. CERAMIC CAPACITOR:

A fired capacitor is a settled esteem capacitor in which artistic material goes about as the dielectric. It is built of at least two rotating layers of earthenware and a metal layer going about as the anodes. The structure of the clay material characterizes the electrical conduct and subsequently applications

Clay capacitors are most normally found in each electrical gadget and it utilizes an earthenware material as the dielectric. The fired capacitor is a non-extremity gadget, that implies they do no have polarities. So we can interface it toward any path on a circuit board.

Therefore, they are by and large considerably more secure than electrolytic capacitors

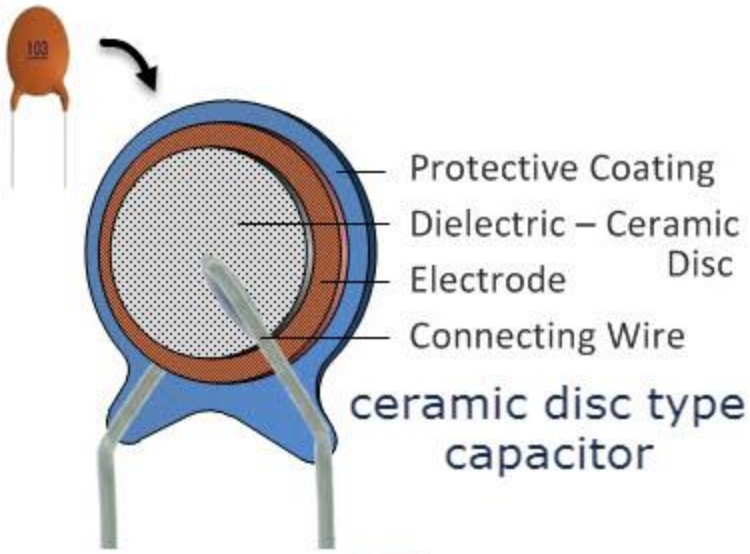
Clay capacitors are accessible in three kinds, albeit different styles are accessible:

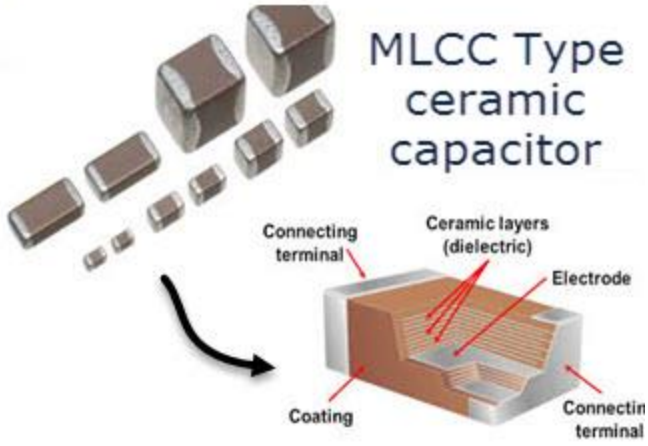
•Leaded circle clay capacitors for through gap mounting which is tar covered.

•Surface mount Multi-Layer Ceramic Capacitors (MLCC).

•Special write microwave exposed lead-less circle fired capacitors that are planned to sit in a space on the PCB.


104


103
Protective Coating
Dielectric – Ceramic Disc
Electrode
Connecting Wire
ceramic disc type capacitor


MLCC Type ceramic capacitor
Connecting terminal
Ceramic layers (dielectric)
Electrode
Coating
Connectin terminal

3.1.3 CT SENSOR:

- Basics

“Current transformers (CTs) are sensors that measure substituting current (AC). They are especially valuable for estimating entire building power utilization or age.

The split center compose, for example, the CT in the photo above can be cut onto either the live or nonpartisan wire coming into the working, without the necessity of very high electrical voltage done work.

Like some other transformer, a present transformer has an essential winding, an attractive center, and an auxiliary winding.

On account of entire building checking, the essential winding is the live or impartial wire (NOT both!) coming into the building, that is gone through the opening in the CT. The optional winding is made of numerous turns of fine wire housed inside the transformer case.

The exchanging current streaming in the essential delivers an attractive field in the center, which prompts a current in the optional winding circuit [1].

The current in the auxiliary winding is relative to the present streaming in the essential winding:

$$I_{secondary} = CTturnsRatio \times I_{primary}$$

$$CTturnsRatio = Turns_{primary} / Turns_{secondary}$$

The quantity of auxiliary turns in the CT presented above, is 2000, so the current in the optional is one 2000th of the current in the essential.

Ordinarily, this proportion is composed as far as streams in Amps e.g. 100:5 (for a 5A meter, scaled 0 - 100A). The proportion for the CT above would typically be composed as 100:0.05.

- Burden resistor

A "present yield" CT should be utilized with a weight resistor. The weight resistor finishes or shuts the CT auxiliary circuit. The weight esteem is given a voltage corresponding to the

auxiliary current. The weight esteem should be sufficiently low to anticipate CT center immersion.

- Isolation

The secondary circuit is galvanically isolated from the primary circuit. (i.e. it has no metallic contact)

- Safety

When all is said in done, a CT should never be open-circuited once it's joined to a current-conveying conductor. A CT is conceivably risky if open-circuited.

In the event that open-circuited with current streaming in the essential, the transformer auxiliary will endeavor to keep driving current into what is viably an interminable impedance. This will deliver a high and possibly perilous voltage over the optional

Some CT'shave worked in assurance. Some have defensive Zener diodes similar to the case with the SCT-013-000 prescribed for use in this undertaking. On the off chance that the CT is of the 'voltage yield' type, it has a worked in trouble resistor. In this manner, it can't be open-circuited.

- Installing a CT

The essential twisting of the CT is the wire conveying the present you need to quantify. In the event that you cut your CT around an a few center link that has wires conveying a similar current however in inverse ways, the attractive fields made by the wires will wipe out each other, and your CT will have no yield.

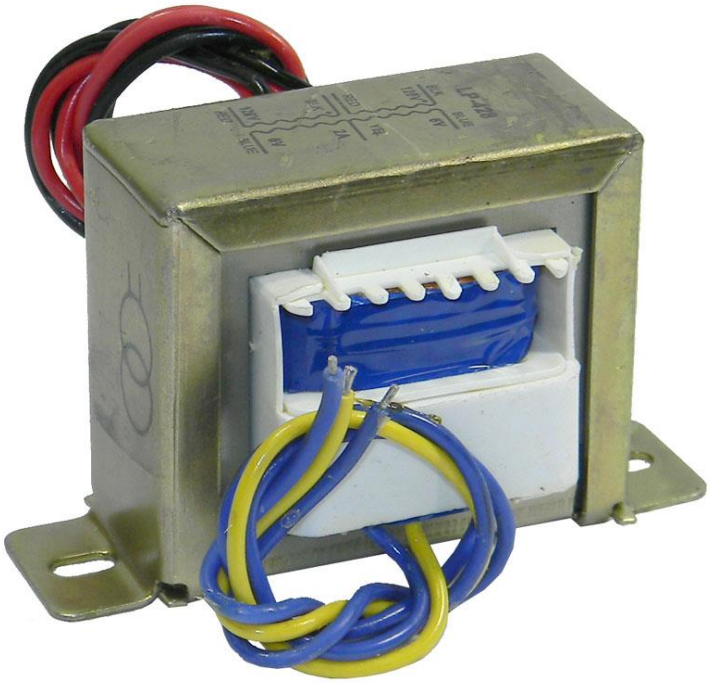
A split-center CT, particularly one that has a ferrite center, (for example, the ones made by YHDC) ought to never be "cinched" to the link utilizing any kind of pressing material, in light of the fact that the weak idea of the ferrite center implies that it may effortlessly be broken, along these lines devastating the CT. You should just cinch the CT to the link or busbar if the lodging is particularly intended to do as such. Essentially, a ring-center CT ought to never be constrained onto a link that is too extensive to go openly through the middle. The position and introduction of the link inside the CT opening does not influence the yield.

3.1.4 TRANSFORMER:

It is a universally useful skeleton mounting mains transformer. Transformer has 240 V essential windings and focus tapped optional winding. The transformer has flying hued protected interfacing leads (Approx 100 mm long). The Transformer go about as venture down transformer lessening AC - 240V to AC - 9V

The Transformer gives two yields of 9V, 9V and 0V. The Transformer's development is composed underneath with points of interest of Solid Core and Winding

The transformer is a static electrical gadget that exchanges vitality by inductive coupling between its winding circuits. A shifting current in the essential winding makes a changing attractive transition in the transformer's center and in this way a differing attractive motion through the auxiliary winding. This changing attractive transition incites a differing electromotive power (E.M.F) or voltage in the auxiliary winding . The transformer has centers made of high penetrability silicon steel. The steel has a porousness commonly that of free space and the center in this way serves to incredibly diminish the charging current and restrict the motion to a way which nearly couples the windings.



3.1.5 NODEMCU :

NodeMCU is an open source LUA based firmware produced for ESP8266 wifi chip. By investigating usefulness with ESP8266 chip, NodeMCU firmware accompanies ESP8266 Development board/pack i.e. NodeMCU Development board.

NodeMCU Development Board/pack v0.9 (Version1)

Since NodeMCU is open source stage, their equipment configuration is open for alter/adjust/manufacture.

NodeMCU Dev Kit/board comprise of ESP8266 wifi empowered chip. The ESP8266 is a minimal effort Wi-Fi chip created by Espressif Systems with TCP/IP convention. For more data about ESP8266, you can allude ESP8266 WiFi Module.

There is Version2 (V2) accessible for NodeMCU Dev Kit i.e. NodeMCU Development Board v1.0 (Version2), which as a rule comes in dark shaded PCB.

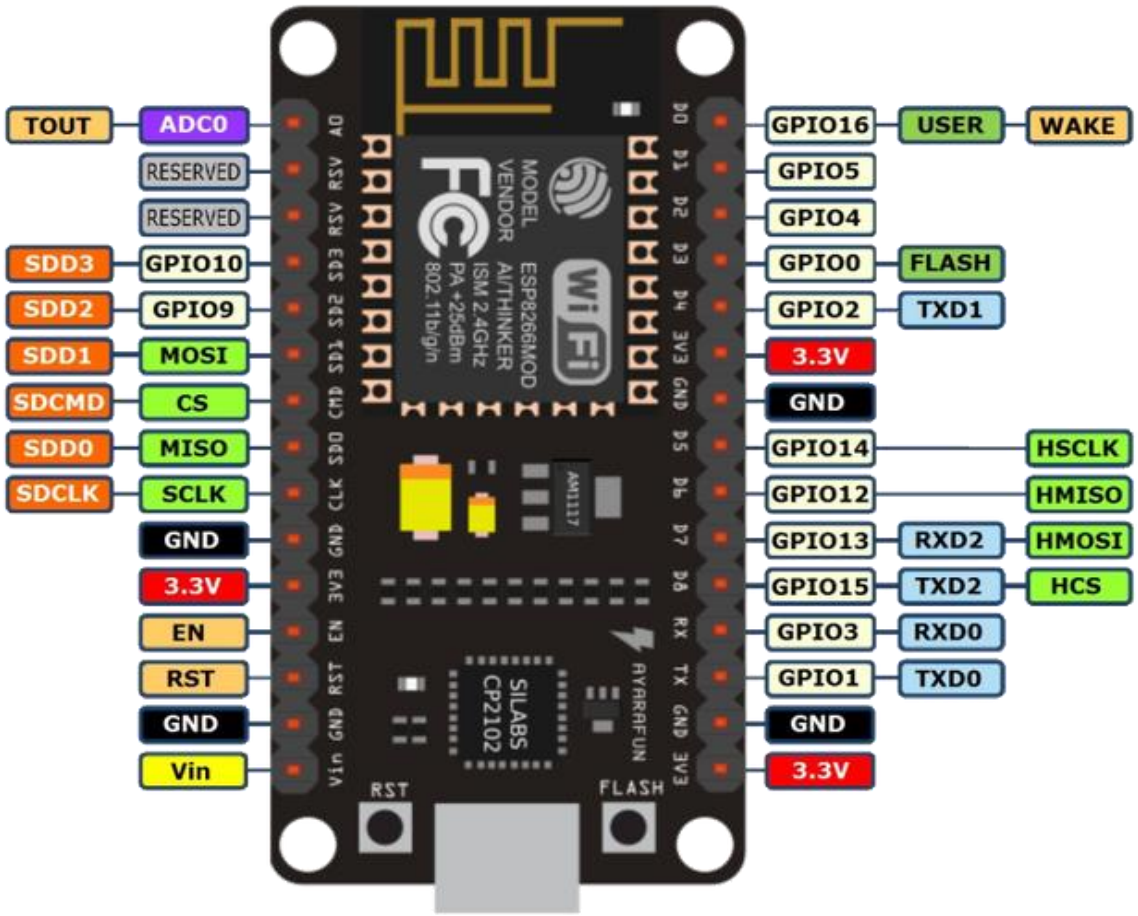
NodeMCU Development Board/pack v1.0 (Version2)

For more data about NodeMCU Boards accessible in showcase allude NodeMCU Development Boards

NodeMCU Dev Kit has Arduino like Analog (i.e. A0) and Digital (D0-D8) sticks on its board.

It underpins serial correspondence conventions i.e. UART, SPI, I2C and so on.

Utilizing such serial conventions we can interface it with serial gadgets like I2C empowered LCD show, Magnetometer HMC5883, MPU-6050 Gyro meter + Accelerometer, RTC chips, GPS modules, touch screen shows, SD cards and so forth.



3.1.6 MICROCONTROLLER:

We would utilize AVR microcontroller in light of Arduino stage. Arduino is an open-source gadgets prototyping stage in view of adaptable, simple to-utilize equipment and programming. The Arduino programming dialect (in view of Wiring) and the Arduino advancement condition (in light of Processing). Arduino activities can be remain solitary or they can speak with programming running on a PC (e.g. Streak, Processing, MaxMSP).

Highlights:

• High Performance, Low Power AVR8-Bit Microcontroller

• Advanced RISC Architecture

– 131 Powerful Instructions – Most Single Clock Cycle Execution

– 32 x 8 General Purpose Working Registers

– Fully Static Operation

– Up to 20 MIPS Throughput at 20 MHz

– On-chip 2-cycle Multiplier

• High Endurance Non-unpredictable Memory Segments

– 4/8/16/32K Bytes of In-System Self-Programmable Flash program memory

– 256/512/512/1K Bytes EEPROM

– 512/1K/1K/2K Bytes Internal SRAM

– Write/Erase Cycles: 10,000 Flash/100,000 EEPROM

– Data maintenance: 20 years at 85°C/100 years at 25°C

– Optional Boot Code Section with Independent Lock Bits

– In-System Programming by On-chip Boot Program

– True Read-While-Write Operation

– Programming Lock for Software Security

• Peripheral Features

– Two 8-bit Timer/Counters with Separate Prescaler and Compare Mode

– One 16-bit Timer/Counter with Separate Prescaler, Compare Mode, and Capture Mode

– Real Time Counter with Separate Oscillator

– Six PWM Channels

– 8-direct 10-bit ADC in TQFP and QFN/MLF bundle Temperature Measurement

– 6-direct 10-bit ADC in PDIP Package Temperature Measurement

– Programmable Serial USART

– Master/Slave SPI Serial Interface

– Byte-arranged 2-wire Serial Interface (Philips I2C perfect)

– Programmable Watchdog Timer with Separate On-chip Oscillator

– On-chip Analog Comparator

– Interrupt and Wake-up on Pin Change

• Special Microcontroller Features

– Power-on Reset and Programmable Brown-out Detection

– Internal Calibrated Oscillator

– External and Internal Interrupt Sources

– Six Sleep Modes: Idle, ADC Noise Reduction, Power-spare, Power-down, Standby, and Extended Standby

(i) Transformer:

The primary wellspring of energy supply is a transformer. The greatest yield energy of energy supply is reliant on most extreme yield energy of transformer .We decide control from its current and voltage rating. e.g.: if there is a transformer of 12V, 500mA then greatest power conveyed by transformer is 6Watt.

It implies we can drive a heap from this transformer up to 6w. In our task our most extreme power necessity is 1watt. So to give this power we utilize 12V/250mA transformer. The most extreme yield energy of this transformer is 4watt.it means it can without much of a stretch drive stack up to 4 watt.

(ii) Rectifier:

Rectifier is a circuit which is used to convert ac to dc. Every electronic circuit requires a dc power supply for rectification. We have used four diodes

(iii) Input filter:

After amendment we acquire dc supply from air conditioning yet it isn't unadulterated dc it might have some air conditioner swells .To lessen these swells we utilize channels. It involves two channels – low recurrence swell channel and high recurrence swell channel. To lessen low recurrence swells we utilize electrolytic capacitor. The voltage rating of capacitor must be double from incoming dc supply. It blocks dc and passes ripples to ground.

(iv) Regulator:

Controller is a gadget which gives steady yield voltage differing input voltage. There are two sorts of controllers

(a) Fixed voltage controller

(b) Adjustable controller

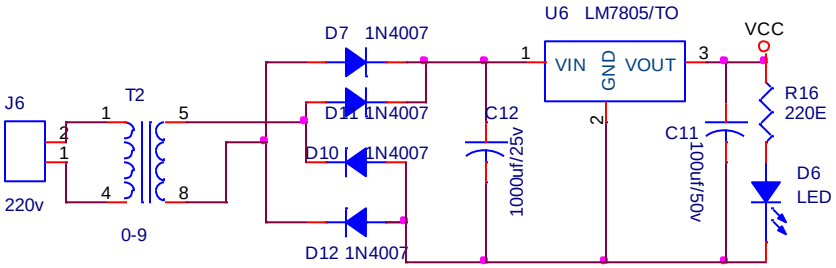
We have utilized settled voltage controller LM78XX last two digits connote yield voltage. The voltage for our framework is 5V that is the reason we have utilized 7805 controller which gives 5V from 12V dc

(v) Output filter

It is used to filter out output ripple if any.

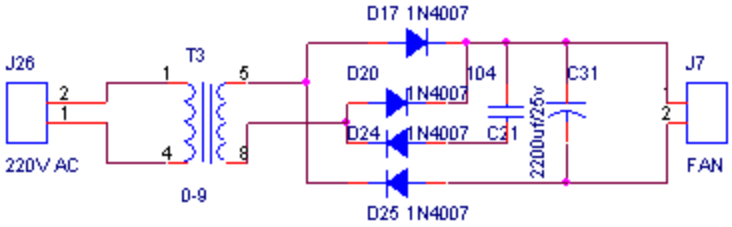
(vi) Output indication:

We utilize LED to watch the working of our framework. On the off chance that the LED gleams it affirms legitimate working of our supply. We have utilized four power supply units.the diagrammatical portrayal of the principal supply unit is given beneath:



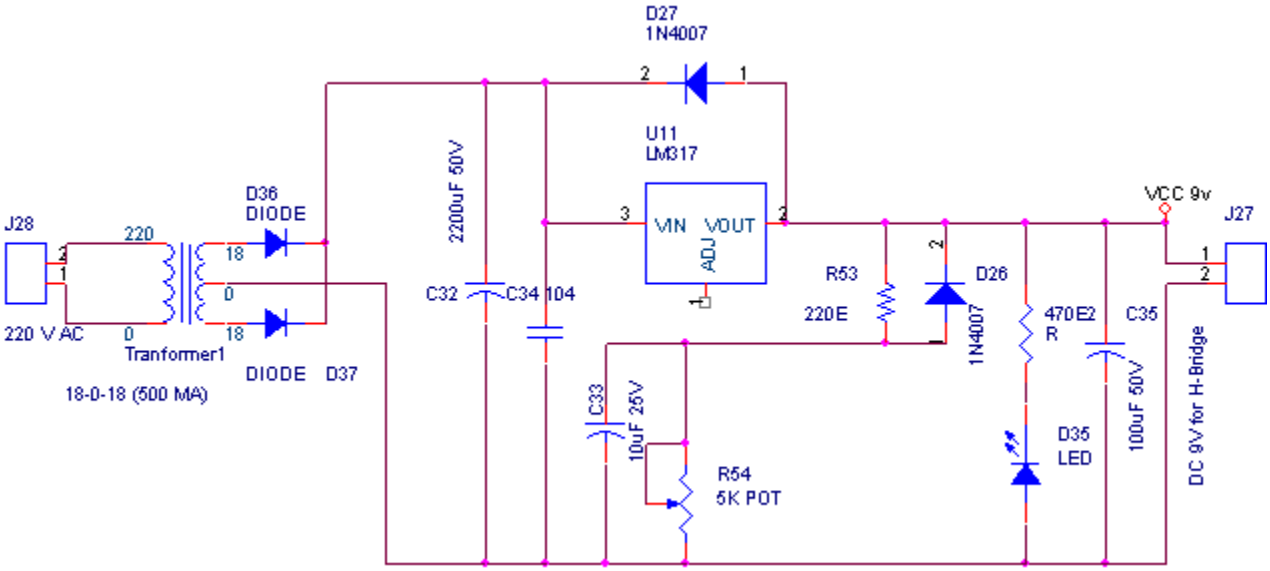
5-volt DC supply

This supply is for the microcontroller, display and relay unit.. The microcontroller requires 5 volt supply to perform any desired task.

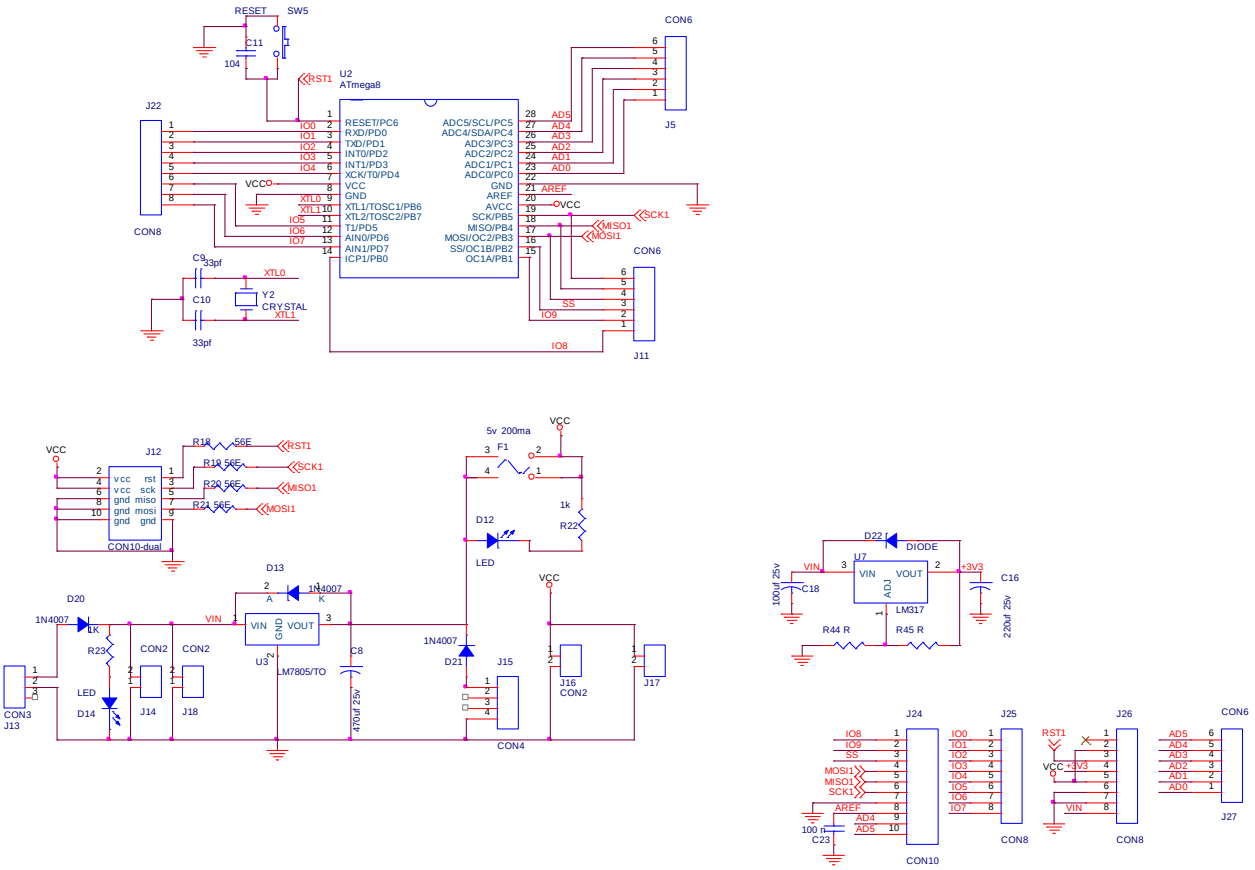


9- volt DC supply for Fan

We have made this 9 volt supply for the fan. Since there is no availability of ac fan so we have used dc fan for depiction. We have used another supply unit which provides the 18 volt ac to the porch lights. And 10 volts dc to motor drive circuit for locking system.



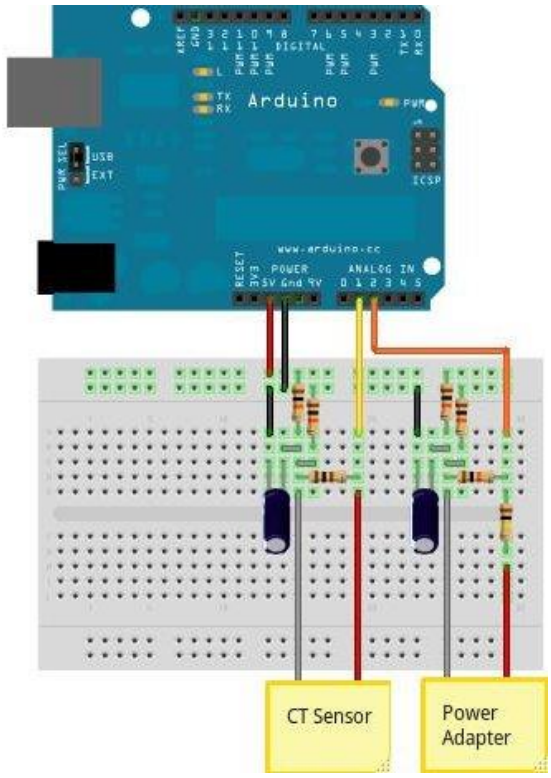
18 –volt ac and 10volt dc power supply



Basic Circuit developed for AVR base circuit

How to build - measuring mains voltage and current

Counting voltage estimation by means of AC-AC voltage connector and current estimation by means of a CT sensor



It quantifies voltage with an AC to AC control connector and current with a clasp on CT sensor, making the setup very protected as no high voltage work is required.

The vitality screen can compute genuine power, evident power, control factor, rms voltage, rms current. Every one of the counts are done in the computerized space on an Arduino.

VOLTAGE SENSING ELECTRONICS:

1x 9V AC-AC Power Adapter

1x 100kOhm resistor for step down voltage divider.

1x 10kOhm resistor for step down voltage divider.

2x 470kOhm (for voltage divider, any matching value resistor pair down to 10K)

1x 10uF capacitor

CURRENT SENSING ELECTRONICS

1x ct sensor sct-013-000

1x burden resistor 18 ohms if supply voltage is 3.3v or 33 ohms if supply voltage is 5v.

2x 470kohm (for voltage divider, any matching value resistor pair down to 10k)

1x 10uf capacitor

In this venture we utilize two sensor ct sensor for current estimating and transformer for voltage estimating.

This deliberate perusing passing thorugh the uncommon outlined circuit.

This uncommon outlined circuit associate with avr

Presently avr passing thourgh the program and ascertain the outcome .

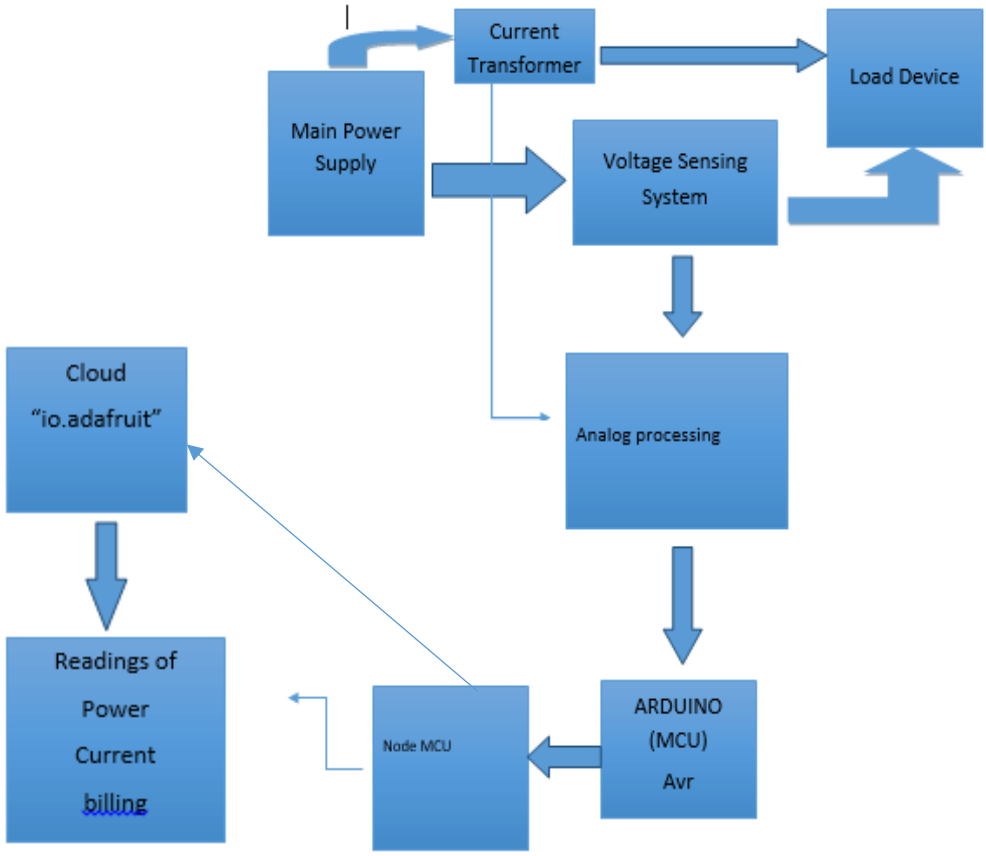
After estimation of perusing ,avr sed the information to nodemcu.

Nodemcu send this esteem or perusing to the cloud "io.adafruit"

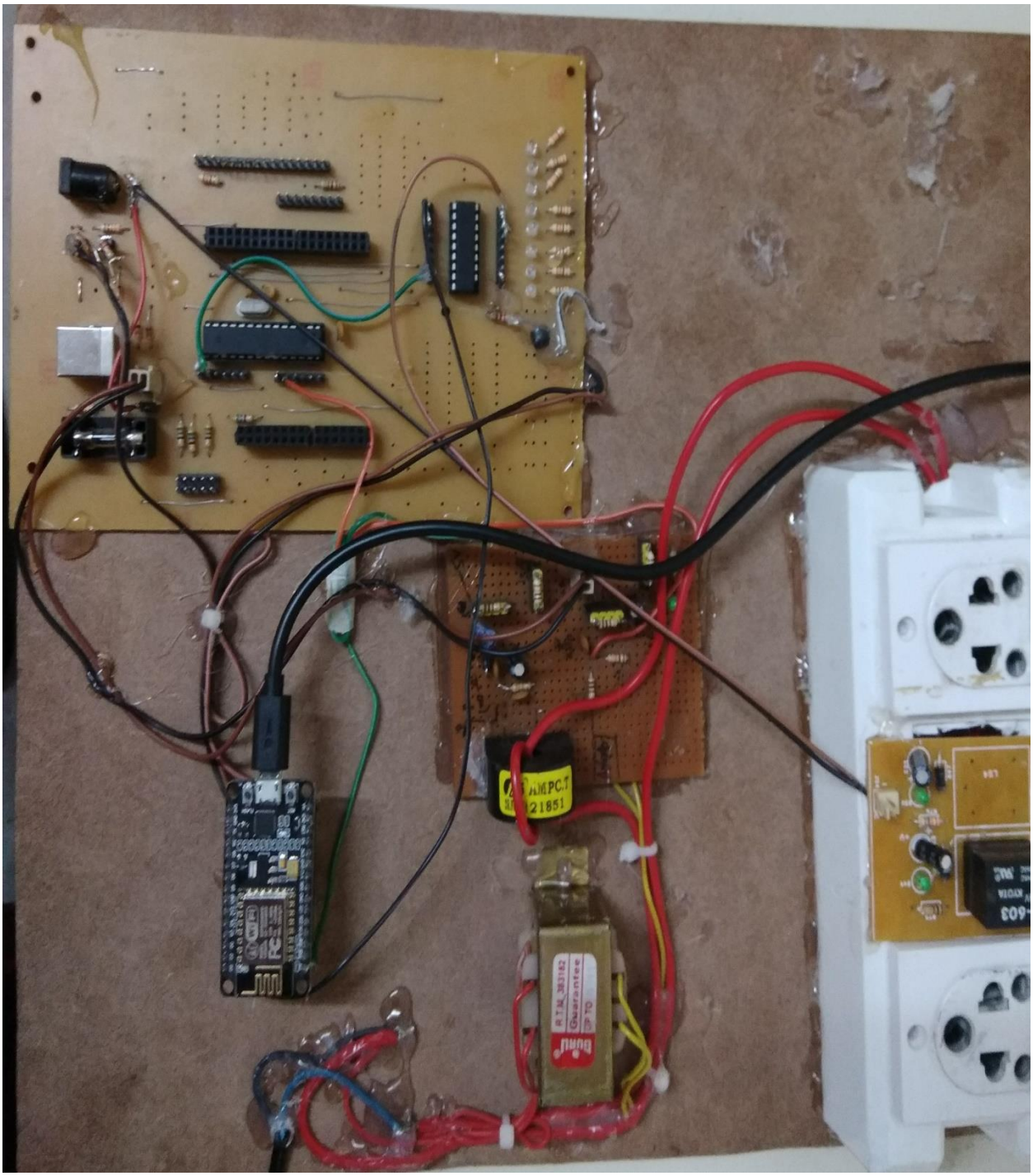
Presently we open the cloud "io.adafruit" on our pc or versatile with the goal that we can see the perusing/esteem.

The last yield how to appear on cloud ,

CHAPTER-4
PERFORMANCE ANALYSIS



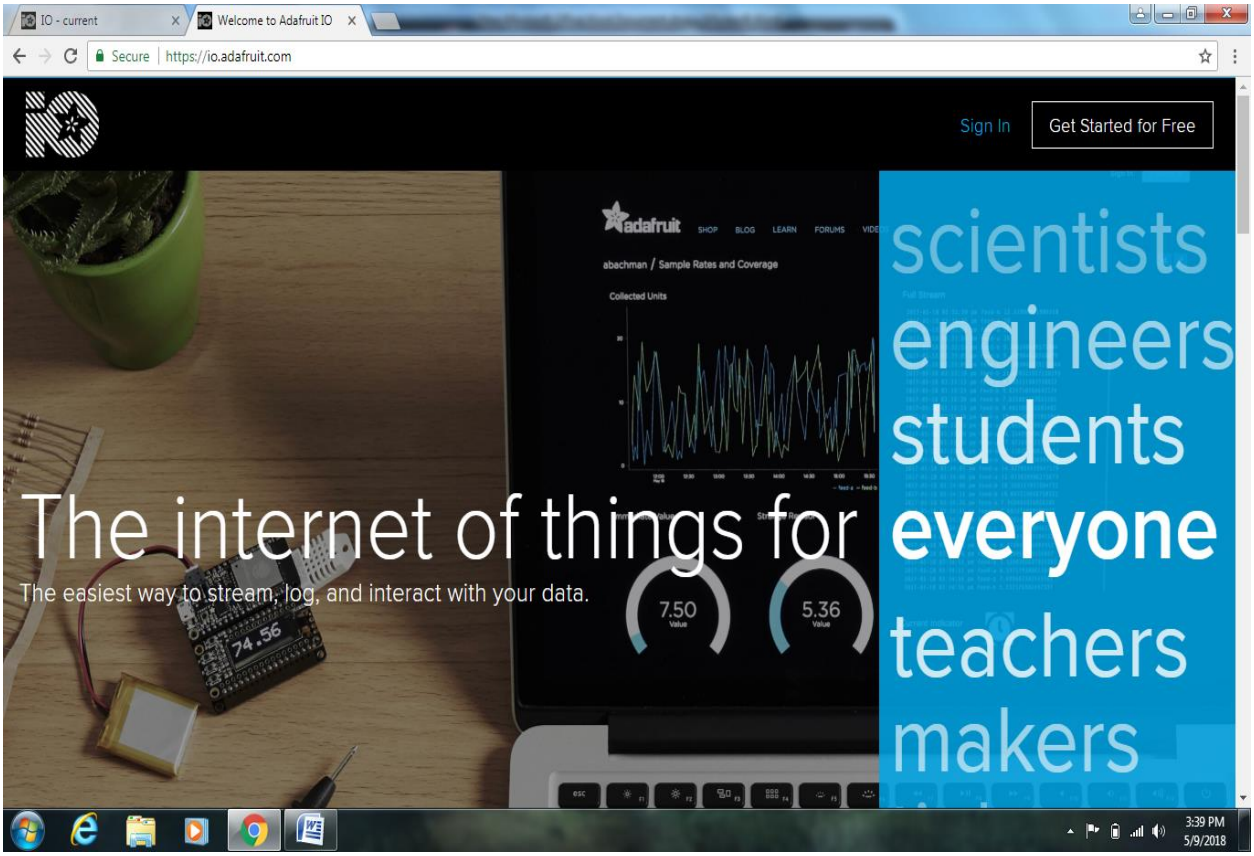
BLOCK DIAGRAM OF THE CIRCUIT



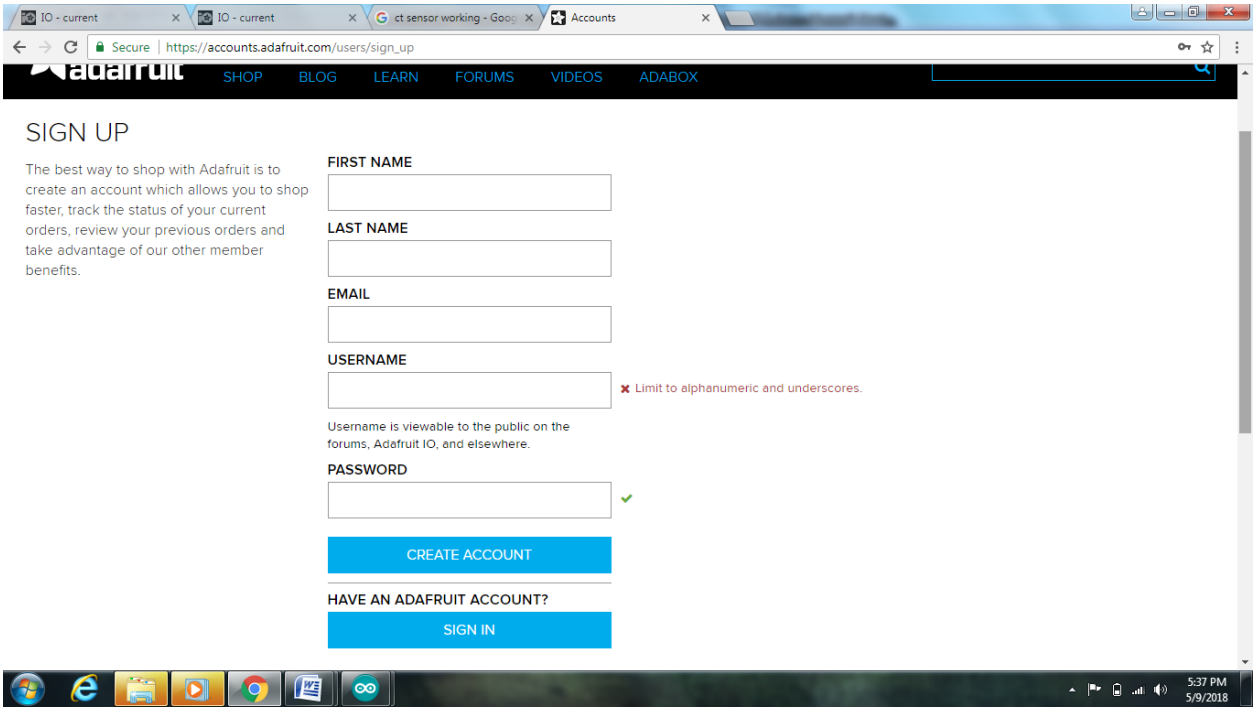
Original Picture of the Circuit Board

HOW TO CONNECT TO THE CLOUD?

First we go to the server cloud “io.adafruit” and open the link
The first page of io.adafruit cloud looks as shown below.



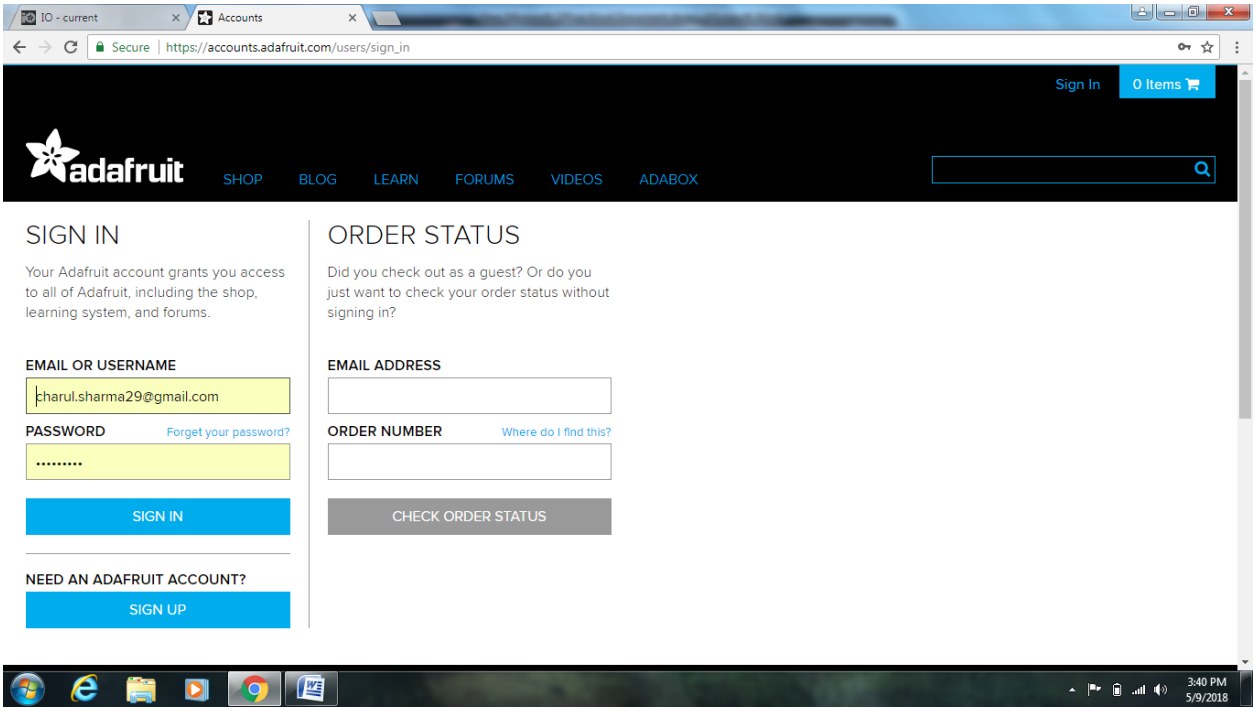
Now we sign up for the account on io.adafruit with the details in the format shown below



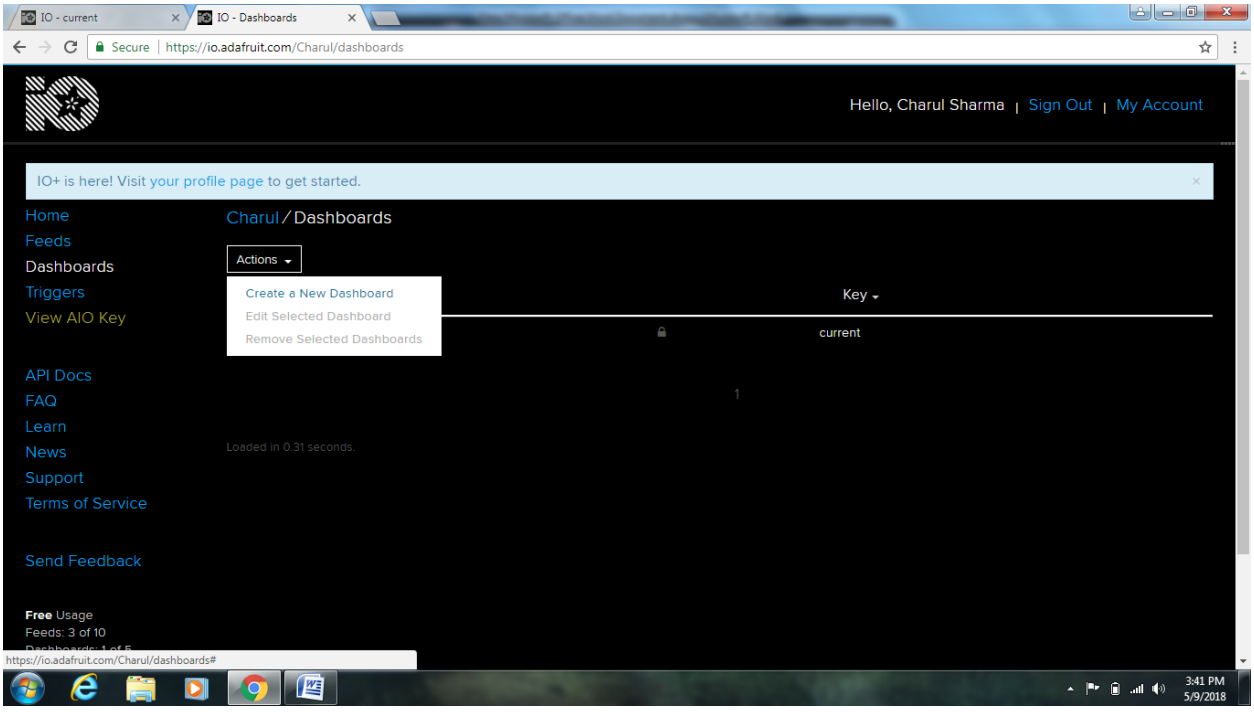
For example:

Name:xyz
Email:xyz12@gmail.com
Username:xyz12
Password:123456

If we have already sign up then we simply sign in the cloud
The format view of sign in given below



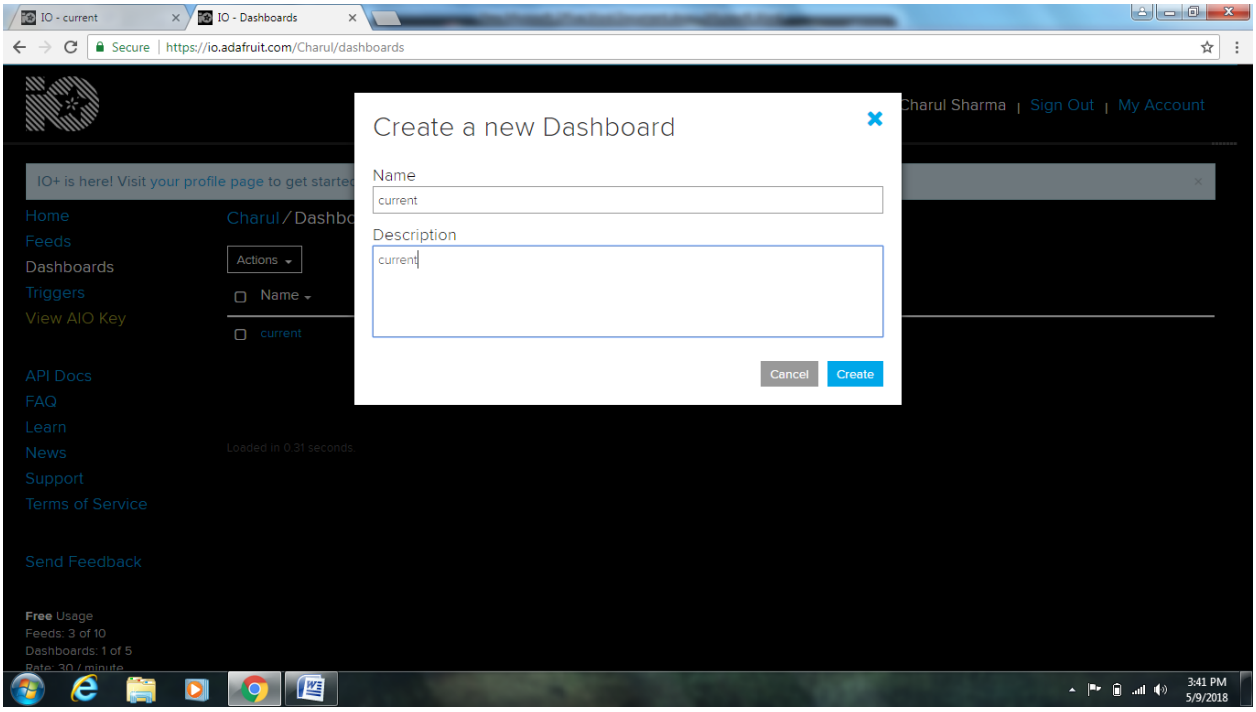
When we create an ccount on cloud io.adafruit. The next view of cloud is shown below



Now go to the action button
There are 3 option given as we select the action.

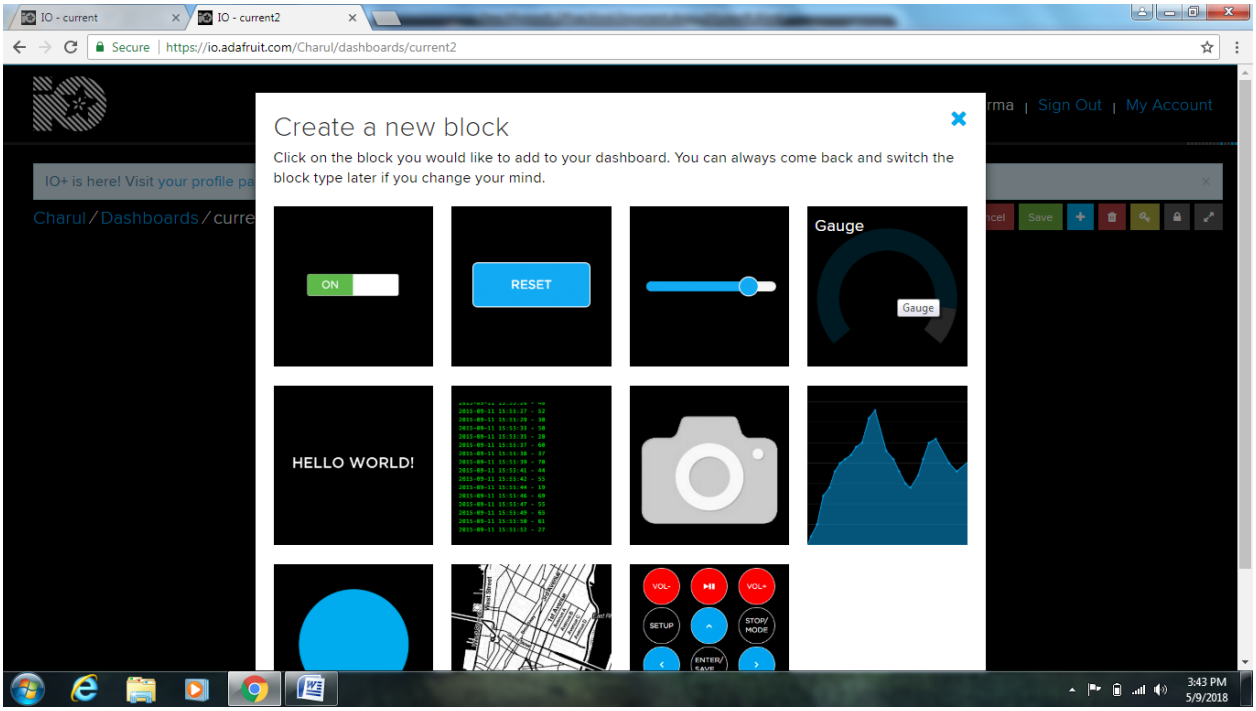
1. Create a new dashboard
2. Edit the selected dashboard
3. Remove the selected dashboard

choose the create a New dashboard option.



Fill the “name” & ”Description”
And left click of mouse on the create
After creating the dashboard there will come various block for different type of view of reading or signal
We select two type of block

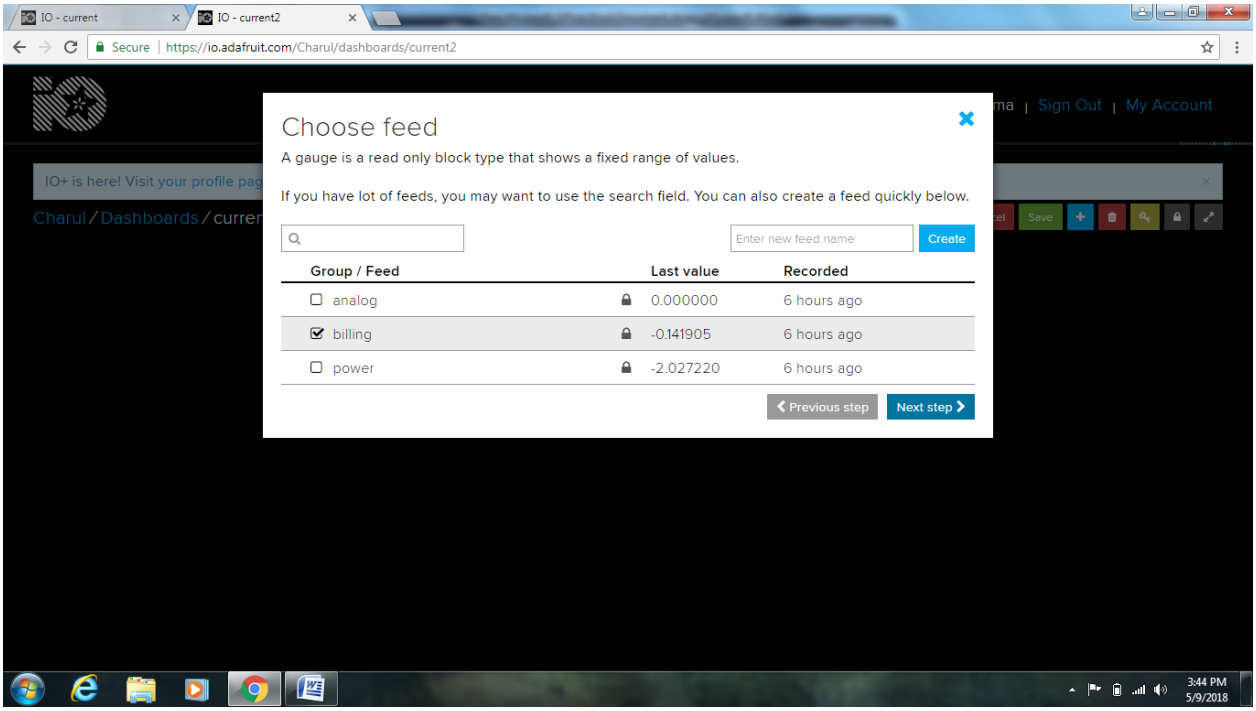
1. Gauge
2. stream



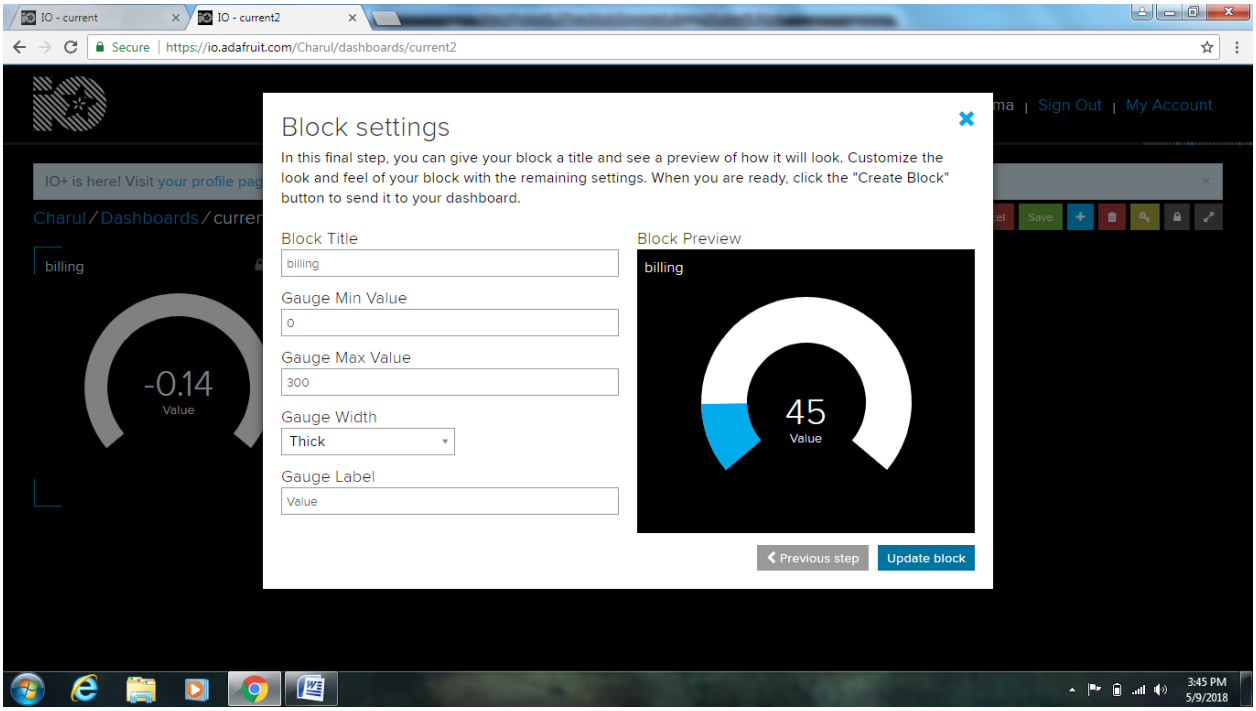
After having chosen the gauge block we need the section of feed.
There will avialble feed or signal which we will be sending through the node mcu to cloud.
We have been sending three kinds of feed

1. Analog
2. Billing
3. Power

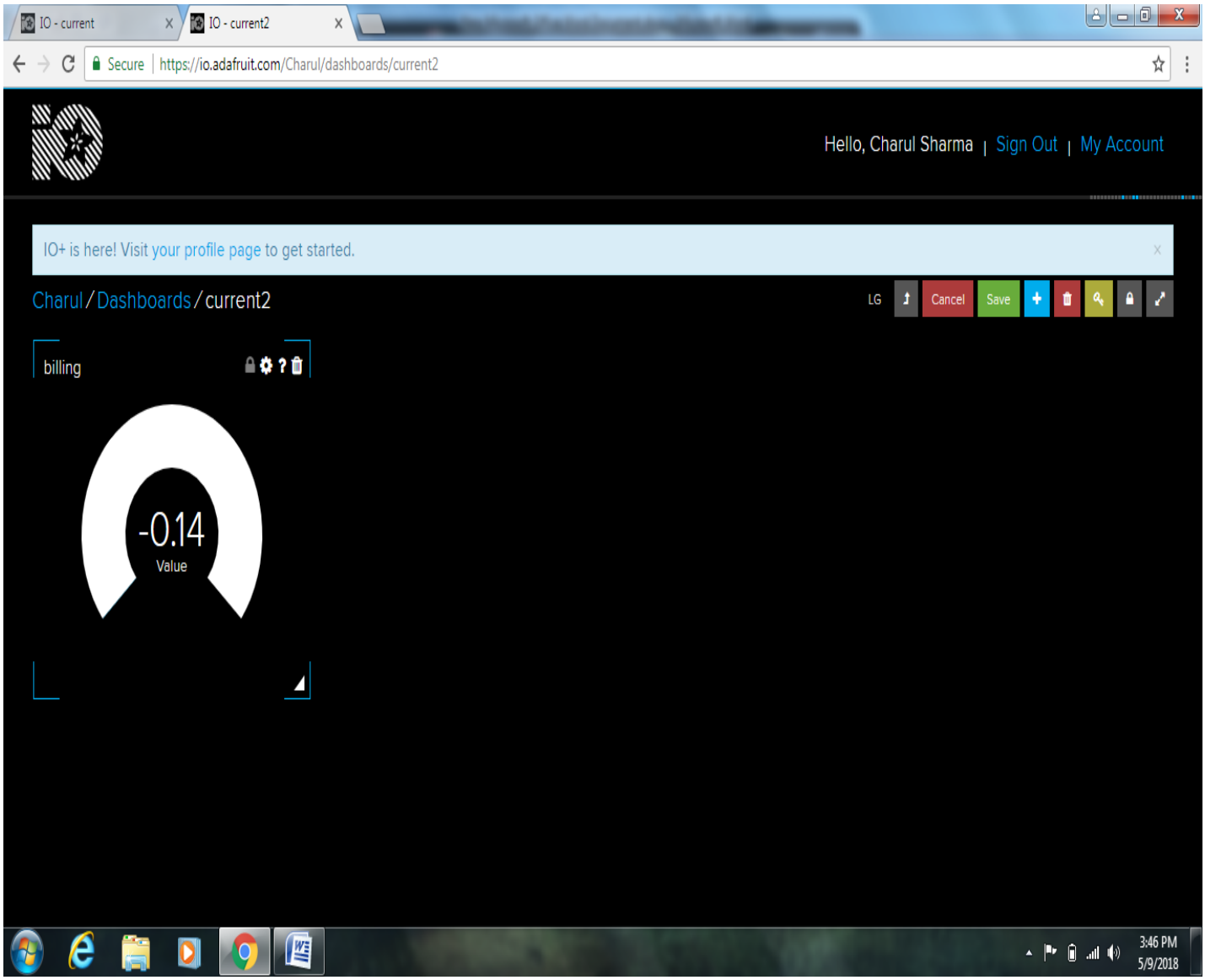
Analog show the current in ampere
Billing show the cost of load if and load working for 10 hrs.
Power will show the watts of load
All those we select one by one. First I select the billing and then click on next step.



After it is shown, we see the next view of the cloud .
We fill the name of block title, for example, -billing
Now we define the maximum or minimum value/price of the billing. In the gauge level we define the value name in which we want to measure the quantity



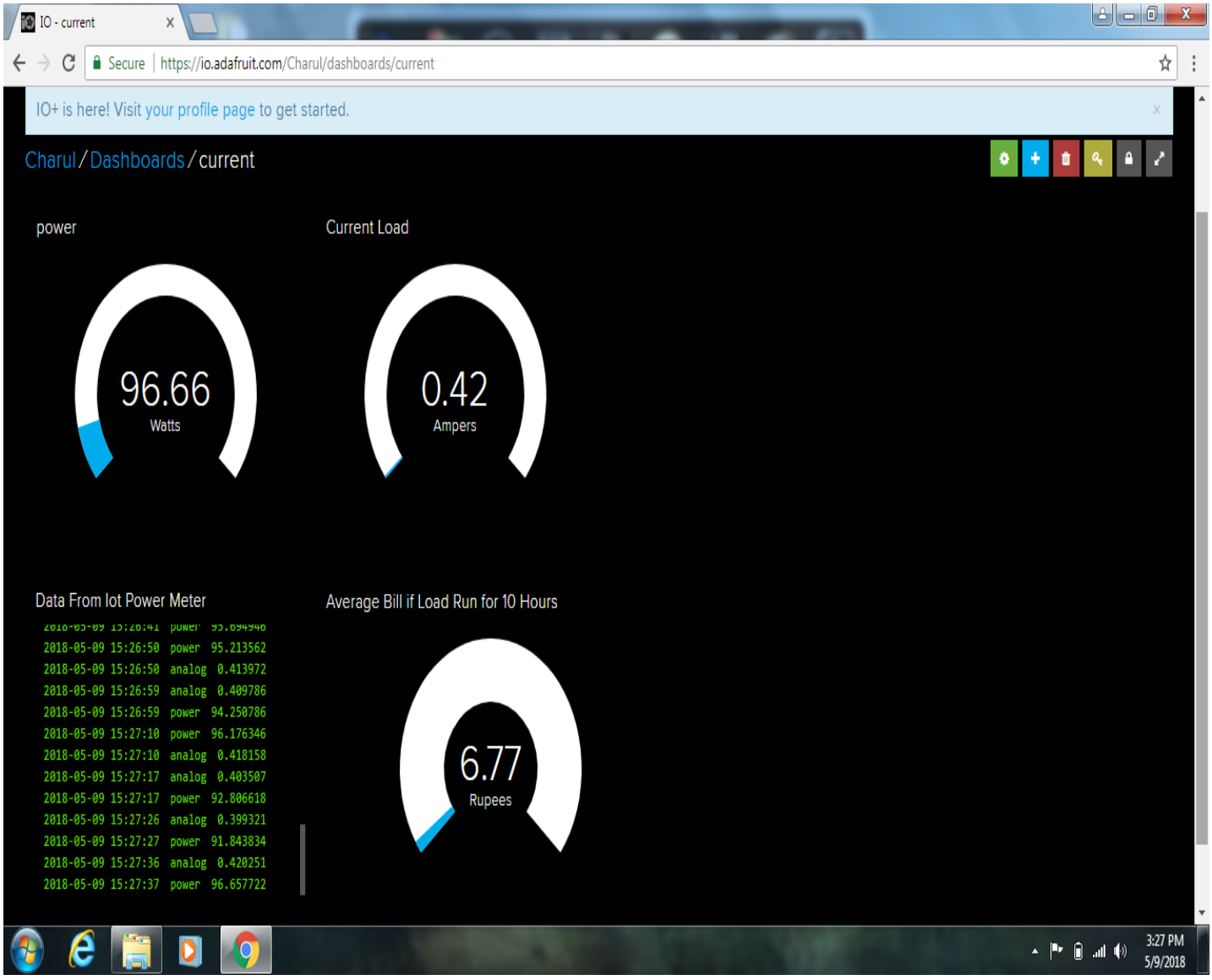
Now the block of gauge is created and shown as show below.



After saving this two more signals are created to show their values.

The remaining signals are power and analog

Final Output:



FINAL DASHBOARD

CHAPTER 5
CONCLUSIONS

5.1 Conclusion

An endeavor has been made to frame a sensible model of 'IoT based generally sensible Energy Meter.' The spread model is utilized to ascertain the vitality utilization of the social unit, and even make the unit perusing to be helpful.

It lessens the wastage of vitality and deliver mindfulness among all. Indeed, even it'll deduct the manual mediation.

The GSM yield design has been analyzed.The Microcontroller the tasks were contemplated and it's modified and furthermore the framework working model was produced in order to achieve the objective. "The IOT based for the most part Energy meter" spares the client's opportunity by making them work "more slender". The task of the conspiring the capacity cost is direct and doesn't include delays. as opposed to exploitation DAQ that is to a great degree costly amid this task microcontroller together with serial correspondence has been acclimated interface with the virtual terminal.

The IOT based generally Energy meter for conspiring cost and showed in computerized show has been accomplished exploitation MPLAB. the capacity cost is send through serial correspondence to the Virtual terminal made in PROTEUS. This venture will therefore edify administration concerning sat around idly, and surplus adventures, accounting partner degreed soliciting subsequently from it gives a right bookkeeping of units driven because of the bar of negligence.

The enormous choice of use makes sensible vitality meters to be used in all the individual and open parts. The use of vitality meter can downsize control utilization. This sparing in control are frequently viably used in various space, wherever there's scarceness of power.

.

The paper depicts the arranging and managing of good Energy Meter and speaks to however great Energy Meter is utilized for Automatic Meter Reading. it's the chief efficient usage to create mankind amid this period of innovation. With the present sweetening inside the utilization of innovation to encourage mankind, it's partner efficient and sensible use of blessing systems. This paper moreover demonstrates that however customer will deal with the heap by abuse great Energy Meter. It gives ease in taking the meter readings, precision, recognition of defective.

The paper portrays the arranging and managing of sensible Energy Meter and speaks to however sensible Energy Meter might be utilized for Automatic Meter Reading. it's the first conservative usage to create mankind amid this period of innovation. With this change inside the utilization of innovation to encourage mankind, it's partner degree conservative and sensible use of blessing systems. This paper conjointly demonstrates that however customer will deal with the heap by exploitation sensible Energy Meter. It gives ease in taking the meter readings, precision,

recognition of flawed conditions, control issue computation, less task cost and evacuation of potential debasement related with meter perusing.

5.2 Future Scope

Future contextual analyses are frequently led on Artificial Neural Network, Generalized

Autoregressive Conditional Heteroscedastic display and Autoregressive Moving Average

with exogenous Inputs for anticipating entirely unexpected information sets. the most imperative favorable position of thosemodels when put alongside various models ar conclusive progressed nonlinear relationshipsbetween needy and independent factors, demonstrating of instability dissemination, flexibilityand up the long run estimates misuse past conjecture blunders. Also, this work might be reached out with advancement of a wide range of constant learning got from gas and water meters without a doubt with an additional created straightening method.

The wide determination of utilization makes sensible vitality meters to be used in all the individual and open divisions. The utilization of vitality meter can curtail control utilization. This sparing in power will be viably used in various space, wherever there's deficiency of power.

5.3 Benefits

1. There is no need fo the user to estimate the bills anymore. The user would be charged according to it’s power consumption.

2. In case any technical difficulty occurs or there is any electrical issue, that would be notified to the user.

3. The bill can be paid in advance.

4. The provider companies can offer various schemes and offers for energy consumption.

5. It offers the ability to check the power consumption remotely.

6. It will help to provide the accurate power consumption.

7. As soon as there is an exceed in the power consumption with respect to the set threshold consumption value, the relay will be cut off the power supply.

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