

IOT Based Electricity Power Tracker System

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Abstract:

This paper considers electricity consumption usage monitoring through IOT devices. And this IOT devices are one of the smart gadgets in this world .usage of electricity is one of the important aspect we need to monitor and find a way to reduce the consumption. While we are consuming this electricity it is important to monitor and analyze the same , this may help us to reduce the electricity consumption in coming future. To accomplish this goal, a complete system which includes a front-end to back-end system that includes a smart device application (Android platform), a cloud-based database, an Application Programming Interface (API), and a hardware development is proposed. A programmable device (e.g., Node MCU or Arduino) for pre testing. This NODE MCU was chosen due to familiarity, and its capabilities, such as general purpose pins. And built-in Wi-Fi chip module. The current sensor is fixed on the phase or line supply which we are going go monitor the power consumption and this currents sensors will transfer the information to NODE MCU , and NODE MCU will send the data to server through Ethernet shield. The transmitted data is monitored and analyzed remotely using application on a android device. This helps users to view and monitor the data from anywhere with the help of internet connection. As this device is IOT enabled electricity Power tracker system it is very efficient, cheaper and flexible in operation and it can save electricity cost of the end users and inform them about the usage.

Keywords —IOT, Energy management, Node MCU, Ethernet Shield, Android, current sensor.

I. INTRODUCTION

We are very much aware of electricity meters which are installed in everyone’s house or offices to measure the electricity consumption. At every month end many of us get worried about the high electricity bill and we have to track the the energy consumption once in a while which is not very productive for normal person as keeping track of electricity measurements in uits is not easy process and time consuming tool. It would be great if we can monitor our electricity usage and access the energy consumption data from anywhere in the

world and get an E-mail when our energy consumption reaches to a certain threshold value. Here we are building an IoT based Project .As in the 21st century use of electricity/power is increasing day by day. Power is essential in every field, industry and also for home appliances. But the power which we are using we are not aware of how much power is needed and how much we are using. So we decided to make some product which will measure what amount of electricity we are using so that we can avoid wastage or can do less consumption also it will help us to monitor indirectly the theft of power is taking

LITERATURE SURVEY

place or not. This will help many organizational systems to improve efficiency, According to researchers, “Internet of Things” is a system of interrelated computing devices, mechanical and digital machines, objects, animals, or people.

that are provided with unique digital id's and the ability to transfer data over a network which does not require any human-to-human or human to computer interaction. computing , machines , robotics and database software's have a scope in field of IOT technology . Usage of electricity can be reduced to a great extent if it is possible to monitor our power usage and change the status of the component from ON to OFF and vice versa. This paper shines light on designing and development of energy monitoring system using IoT.

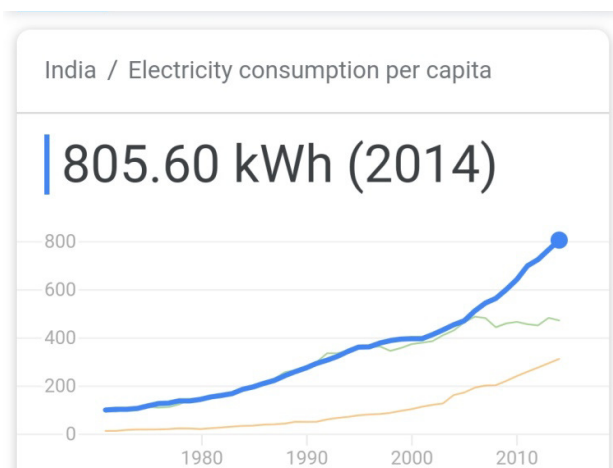
Internet of Things (IoT) is a recent revolutionary technology which have many features such as to send and receive the data or commands through the help of the internet. Various important parameters such physical, electrical or environmental can be monitored using iot enable devices. The monitored information is then used to analyze, identify and solve different problems related to everyday life . Electricity power consumption is one for the growing problem in the world. IoT enabled devices or projects can be used to monitor the power consumptions as well as it can also be used to give a pop-ups to individual Email .Nowadays the Indian market uses conventional OLD meters which we need to go and collect the readings manually. These meters cannot store the data and we need to see the real time readings also it is not possible to give up a notifications. Due to absence of this IOT feature in the meter, power consumption has to be noted down manually at each meter location for billing purpose. This process itself is prone to human error.

Due to rapid development in intelligent digital smart meters, monitoring energy consumption in detail have never been seen before. The intelligent meters are become a part of digitized society, this meters are being used over the last two decades, wherein home electrical appliances, smart home and the smart meters make it possible to watch energy consumption all the way down to the second. Historically we've got measured energy consumption at the household level with analog meters installed at every consumer, and biannually the patron has reported the meter reading to the utility company for billing purposes. Conversely, intelligent meters are directly connected to the utility company and are able to measure consumption autonomously all the way down to seconds, made possible by the technological development and also pushed by legislation. The smart meters enable the energy consumption to be fast and very accurate billing is achieved and also offer a unique way to log and analyze electricity consumption at the consumer level.

The old analog meters were fixed outside of the consumers houses and at annually/monthly the consumer has reported the meter reading to the electricity company for billing purposes. Or the electricity provider will hire people to go and note down the readings. Were as the intelligent meters are directly connected to the power providing company and are able to measure consumption autonomously down to seconds, with the help of IOT technology

In the year 2018-19 the utilities in India grossly generated around 1372TW/h of electrical energy and the in all the total electricity generation was around 1547TW/h. The gross power consumption was 1181 KWh per capita. In 2014 it was recorded that Indian households consumed 90 units KWh per month so 90 units is almost enough to run the basic households' utility equipment's such as tube lights , fans , television .

Indian power sector losses approx. 16 billion dollars due to theft of electricity every year . and it is considered as the largest electricity theft in the world . the most of electricity theft is observed in the village areas or urban areas where the income of people is less also there is less security to power or electricity poles which are above the ground and due to less security purposes it is easily possible theft.



The Maharashtra state board electricity has approx. 66521 employees and thousands of employees only travel house to house for getting the readings on monthly basis .where as if these old analog meters are smart IOT based meters this cost of travelling and employees works can be saved .there are also some disadvantages of smart meters such as there will be new cost for fixing the new meters , also public should accept the new cost for upgrading their system..

II. PROPOSED SYSTEM

Current sensor is installed in between our home power meter and various home appliances for measuring electrical Current consumption of the appliances. The Current which consumed by each device is calculated using a product of measured current and a static voltage value which is 230V AC in India. Before implementing the system the components such as ACS712 hall effect current sensor module ,wifi module are ordered and tested standalone if they perform as expected, this becomes the hardware aspect of the project. A small programmable specialized computing device, the Node MCU, was used for preliminary testing.

III. NODE MCU

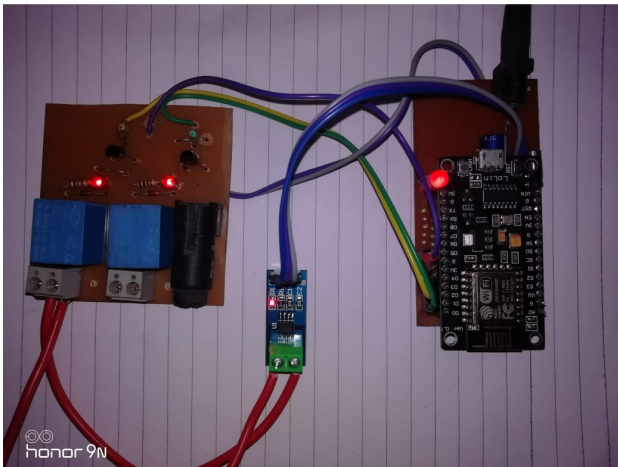
NodeMCU or ESP8266 is a low-cost wifibased open source Internet of Things platform. It initially has included firmware which runs on the ESP8266 Wi-Fi System on Chip from Espressif Systems, and the hardware which is based on the ESP-12 module.



Espressif's ESP8266 is designed to deliver integrated Wi-Fi System on Chip solution this helps in meeting continuous users demands for efficient usage of power, compact formfactor and performance is also reliable in the Internet

of Things world. ESP8266 has the complete Wi-Fi networking capability, ESP8266 can perform in two modes either as a standalone application or as the slave to a host MCU. Wi-Fi Key Features: 802.11 b/g/n support, 802.11 n support (2.4 GHz) up to 72.2 Mbps, Defragmentation, 2 x virtual Wi-Fi interface, Automatic beacon monitoring (hardware TSF), Support Infrastructure BSS Station mode/SoftAP mode/Promiscuous mode

The completed preliminary hardware configuration is shown in Figure II below



The Current sensors readings were calibrated against a calibrated multi-meter that measures current. The load current was varied using incandescent lamp light dimmer serving as a variable load. The measurements were recorded, and a calibration offset value was added. The calibration formula was implemented within the code on the Node MCU for monitoring purposes. The code written for the Node MCU also referenced the voltage of the device to be monitored/controlled to generate an energy consumption power rating seen in formulas.

$$\text{Power} = \text{Current} * \text{Voltage}$$

$$\text{Power} = [\text{Calibration Factor} * \text{CT Clamp Reading} - \text{Offset}] * \text{device_voltage_rating}$$

The NODE MCU were made to talk with the

various hardware components for the intention of sending the data in specific or desired intervals to a server which will be having a database and that database will be storing our data or forwarding it to the Android application for viewing. Once the data is inserted and stored in the database, it can then be sent through the IoT server and access and read from the IoT Android app. Additionally, the Android application has the functionality of sending data to the database to change a device's status (e.g., On/Off), which is the advantage of working on IOT platform, due to this human energy and travel cost can be reduced.

for the Successful installation we need some hardware components which can be Charger or lamp without any components we will be not able to calculate the load or power consumption of the electricity which we are consuming. So we have arranged various components for the testing and all these components should be interconnected to a single phase or line on which we have fixed the current sensor. The implementation consisted of 4 total units, which included 2 A/C units with energy monitoring capabilities, 2 lighting units.

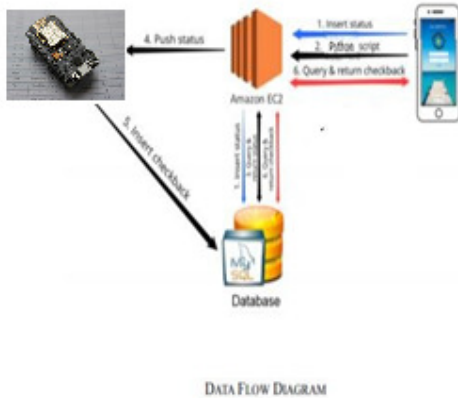


THE ARCHITECTURE DIAGRAM OF THE IOT MONITORING AND CONTROL SYSTEM

INSTALLATION AND DEPLOYMENT

Information about wifi reliability, A/C electricity unit specification, tools, equipments and necessary

material which includes energy monitoring capability were gathered, and spare units kept in backup in the event of malfunction or damage to a smart node. All units were switchable through an Android application from any location. The data flow can be seen for controlling any specific device in Figure below



IV. CONCLUSION

Electricity power tracker system using IOT is an great application to view and monitor the electricity power consumption through internet or cloud based .as it is on cloud with the help of internet it becomes more faster to get the updates In this project current sensor (CS) is used to sense the current and then transform the data to NODE MCU and the NODE MCU will help to display it on web page or the android application using IoT. The system updates the information in every 1 to 2 seconds on the internet using public cloud BLYNK

In the present system, electricity consumption for home appliances is accessed using Wi-Fi and it will help consumers to avoid unwanted use of electricity. We can develop application which is

able to send Email to the concerned man of that house when theft is detected . Also using this IOT technology we can keep a track of our consumption of electricity and avoid the excess usage and can predict or plan future power consumption.

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