Smart Grid Communication

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Abstract Electric Vehicles (EV)play a vital role in developing a green future of our mother world. So, there comes the requirement of utilizing such type of EVs in our day-to-day travel life. These electric vehicles are equipped with the smart grid(SG) technology. So, the smart-grid technology is used in electric vehicles, which tends to improve the performance of charging stations along with ease in installation. The proposed system is an composition for Electric Vehicle (EV) charging stations. The system maintains the stability of power grid for power stations, regulating electric supply for charging stations through support planning. Even though the current electrical grid is not able to provide the required power demand to the vehicle , one can make use of charging station to meet the required power demand and charge the vehicle through it .The main motive behind this system is to develop and analyze an Electric Vehicle (EV) charging management model system for a charging station network in a smart grid environment. The main feature of the proposed system is its capability of the charging stations to store excess power obtained from the power station.

Keywords — Internet Of Things , Charging station , Power station, Smart grid

I. INTRODUCTION

In EV Charging Station refined petroleum costs is very high, oil province controlled by foreign and care about increasing radiation of greenhouse are the main factor of the more interest in EV(Electric Vehicle).In future smart grid ,public EV charging stations will become very important. In the presence of charging station, the charge resources range is up to 13 mile. Electrical vehicle charging is an important topic now a days. This electrical vehicle are fixed in the users data and the maximize use of the grid resources or the delay are present in charging scheduling. So, small attention has been given on the charging stations design. The smart grid will used to convey that happen on a longer time scaled than EVs, it is important to avoid failures or when power supply is not available due to different error like peaks in power of EV charging stations Basically , Smart Grid is an evolution of the previous electricity grid. It is two-way communication where information and electricity is exchanged by the consumer and utilization of more efficiency.The Smart Grid is the intelligent power grid, smart grid is large installation of the IoT network in the future. The whole power grid chain, including power network distribution and transmission,will be completely filled with two-way communication and intelligence capabilities to control and monitor the power grid .basically SG is automated electricity delivery and control system located along with the various power line and it can interact with each other. which is given in.[1]

II. LITURATURE SURVEY

The literature survey is conducted on different charging strategies , charging station or energy management and control of electric vehicle charging. Based on the different papers This literature survey forms the basis of our future study on some functions of Smart Grid

LITERATURE SURVEY ON CHARGING MANAGEMENT FOR SMART GRID

John S. Vardakas.,[2] et al.in this paper has presented the network of charging station in a smart grid. Which explain the charging management .It can be used for the resolution of the number of charging station that should be located in identified geographical area. which can be used for the identification of number of charging failure being the case in all charging stations . EV are becoming more famous as we move toward a greener future of our mother world. rechargeable batteries are equipped in EVs, It can be charged by connecting it to an electric power source. a various dynamic optimal power flow problem can be solved, PHEVs is blended with number of loads. This problem also mention as joint Optimal power flow charging problem takes place, it can be resolved properly in desired time through its dual if the problem have duality gap is zero which is presented in [3]. There is various problem of

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large-scale charging of electric vehicles. which have consumer-commitment charging deadlines is considered. An architecture for the iEMS (intelligent energy management system) is introduced for EVs. The iEMS consists of two factor first one is an admission control and second one is pricing module, The charging sequence determines by the scheduling module, there is a power module for sending that draws many power from a mix of storage, local RE(renewable energy)sources, and buy the power from the grid which is mention in [4]. vehicles already communicate with the power grid to pass or send information about their different charging status, and create a model of handling the different requests. which charge the vehicle at general charging station .it can be based on queuing theory. After that we propose an algorithm and flowchart for control the operation of EVs(electric vehicles) to charging stations in a this way to minimize their waiting time to charge completion which described in [5]. To maintain the power grid stability of power station, maintain the speed of electric supply for charging stations. In this way, we calculate improved QoS and it can provide the flowchart which presented in [6]. a general architecture is to design which will be able to maintain the grid stability of charging station , also providing a required level of QoS ,and it can be describe a common methodology to present and analyze the performance of such type of CS (charging stations).It represents the useful storage size and significant gains in less cost or more profit and. So it is very essential to designing the SG and charging which is given in [7].

III. MQTT

MQTT stands for Message queueing transport protocol.Which is lightweight protocol. as its name implies, is suited for the sending of telemetry data. MQTT is very easy to understand and thus suited for WSN (Wireless sensor network),M2M (Mobile to Mobile), and the sensor and actor node of IoT(Internet of Things)scenarios communicate with applications through the MQTT message broker[8]

The convention utilizes a distribute/buy in design as opposed to HTTP with its demand/reaction paradigm.Publish/Subscribe is occasion driven and empowers messages to be pushed to clients. The central communication point is the MQTT broker, it is responsible for dispatching all messages between the senders and the legitimate beneficiaries. Every customer that distributes a message to the dealer, incorporates a theme into the message. The theme is the steering data for the specialist. Every customer that needs to get messages buys in to a specific point and the specialist conveys all messages with the coordinating theme to the client.Therefore the customers dont need to know each other, they just impart over the subject. This engineering empowers exceedingly adaptable arrangements without conditions between the information makers and the information purchasers. ThedifferencetoHTTPisthataclientdoesnthavetopulltheinformationit needs, however the agent pushes the data to the customer, for the situation there is something new. Subsequently each MQTT customer has a for all time open TCP association with the broker. If this connection is interrupted by any circumstances ,the MQTT broker can cradle all messages and send them to the customer when it is back on the web.

MQTT Key features:

- It is Lightweight message protocol
- Publish / Subscribe (PubSub) model
- Simple protocol, aimed at low power, low complexity
- It Runs on connection-oriented transport(TCP) Protocol
- It connect device and network with application[9,10]

IV. BLOCK DIAGRAM

The block diagram of proposed system as shown in fig.1 ,The diagram show the communication between Power Station and Smart grid environment through the MQTT protocol. The MQTT protocol enables the communication between power station and charging station within milliseconds; which is one of the advantage to the system.

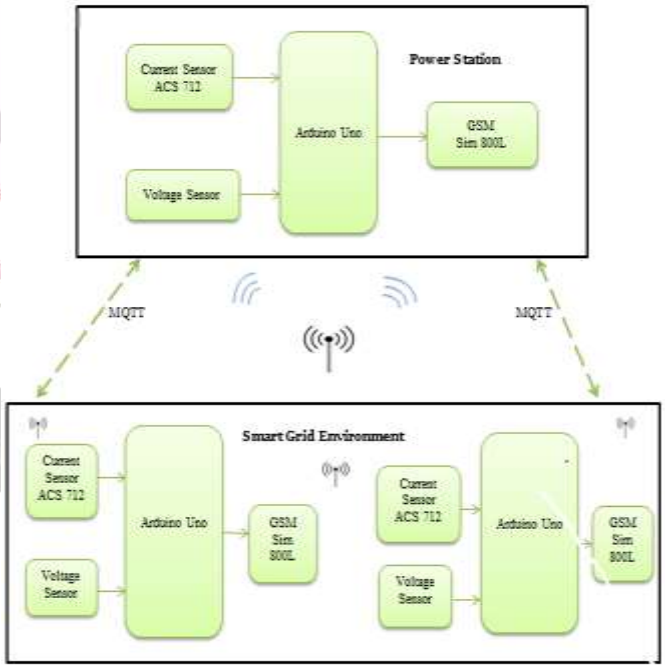

Fig.1 Block diagram of Proposed System

V. WORKING OF CHARGING STATION AND POWER STATION

In the Proposed system , power station supplies energy to different charging stations which is smart grid network . The controller of charging station 1 (CS1) keeps the current in check. It also keeps the voltage in check.. If the current supplied is low then CS1 publishes a message due to the

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MQTT protocol. The controller send the message that that the current is low to the server. The server then subscribes message to the power station. After the subscription of message . it publish the message regarding the required amount of energy to the charging station . All the communication between power station and smart grid takes place through the MQTT Protocol. The same process is applicable for more number of charging stations.

The Internet Of Things platform; Thingspeak and its android application; provides graphical format for voltage, rrent, power level & amount to be paied by consumer. Also, monitoring of the power station and charging station takes place continuously

VI. HARDWARE REQUIREMENTS

A.Arduino UNO processor

Arduino is a prototype platform (open-source) based on software and easy-to-use hardware. It consists of hardware i.e. microcontroller which can be easily programmed and software i.e. Arduino integrated development environment(IDE). This Arduino software is used to write and upload the code to the circuit board.. It has digital input/output 14 pins in which PWM outputs pin is 6 , analog inputs are 6,. It posses all the necessary mechanism required to support the microcontroller .USB cable is used to easily connect UNO processor to the computer .

B. Current Sensor –ACS712

The internet offered the current sensor ACS712 are implemented to be easily used with Raspberry Pi,Arduino etc, micro Controllers. These sensors are based on the Allegro ACS712ELC chip. full scale values of 5A, 20A and 30A offered by current sensors.The functional operation of each of these devices or sensor is identical.

C.GSM Sim 800L

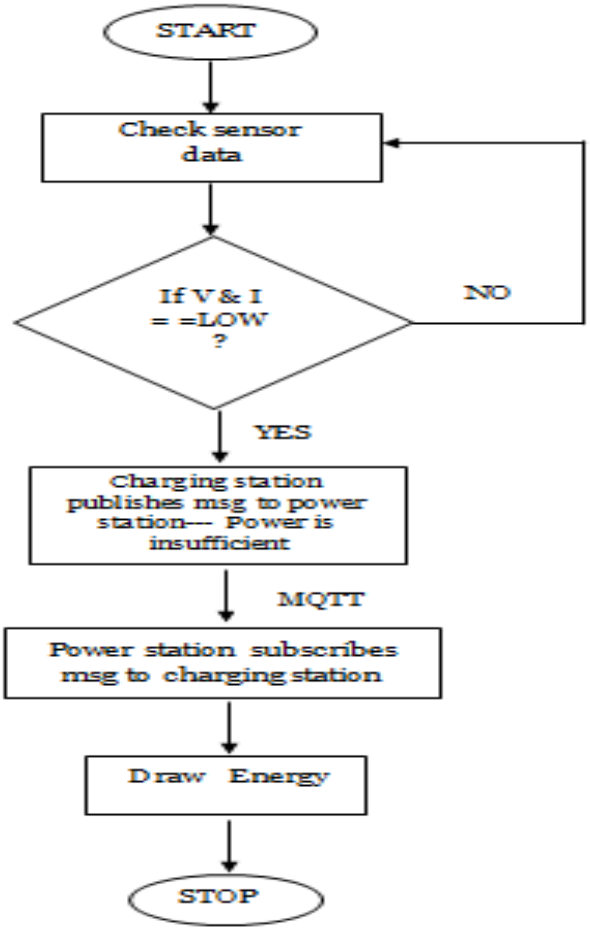
GSM stands for Global System for Mobile Communication .there are various module of GSM like GSMSIM 900,SIM300,,SIM800L etc,in our proposed system used GSM800L module which have GSM/GPRS network,. The GSM Sim 800L communicates with microcontroller through Universal Asynchronous Receiver Transmitter port, supports various command like enhanced AT Commands

D.Voltage sensor

Basically,Voltage sensors are used to calculate the difference between an electrical component in a system. it can be used to measure both DC and AC circuits. Voltage Sensors are used with a microcontroller like Raspberry pi,Arduino etc, improves the accuracy of sensor, consistency and precision of the readings also increase the efficiency.The Arduino analog input is limited to a 5 VDC input

VII. FLOWCHART

The flowchart of the process is as follows:



In the Proposed system, first start the controller check all the sensors i.e,current, voltage sensor if current is low signal goes to power station through the MQTT protocol that means charging station publishes message current is low to power station. then power station subscribe message to the charging station draw the energy to the charging station.all process takes place through the MQTT protocol

VIII. RESULT

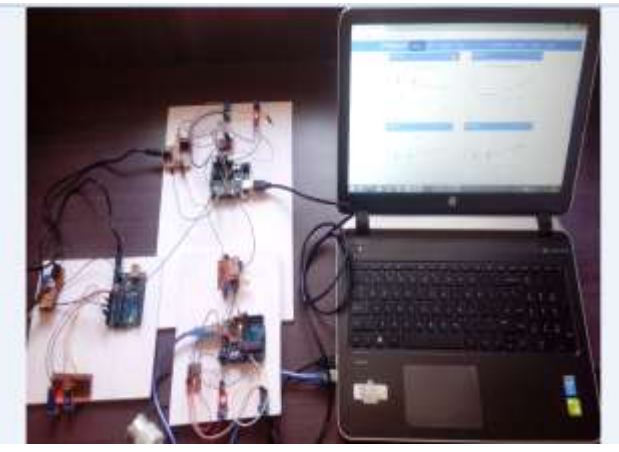


Fig.3 Experimental setup of Proposed system

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Thingspeak and its android application; provides graphical format for voltage, Current, power level & amount to be paid by consumer. It can be shown in following graph .Also, monitoring of the power station and charging station takes place continuously.

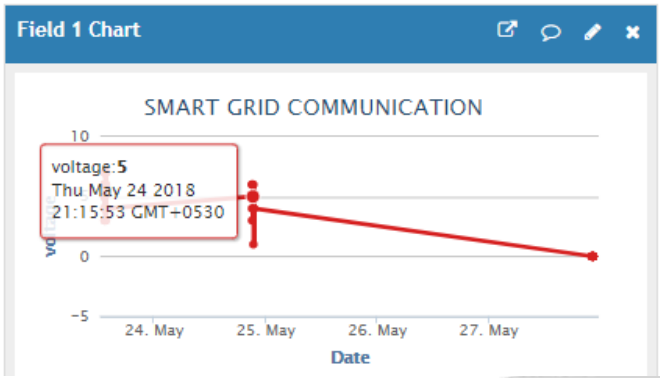

Fig.4 output of voltage sensor

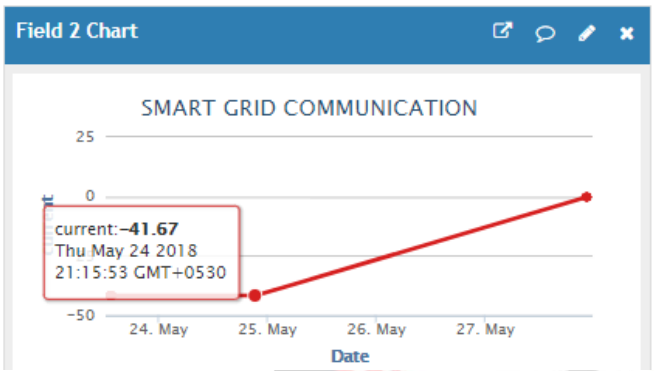

Fig.4 output of Current sensor

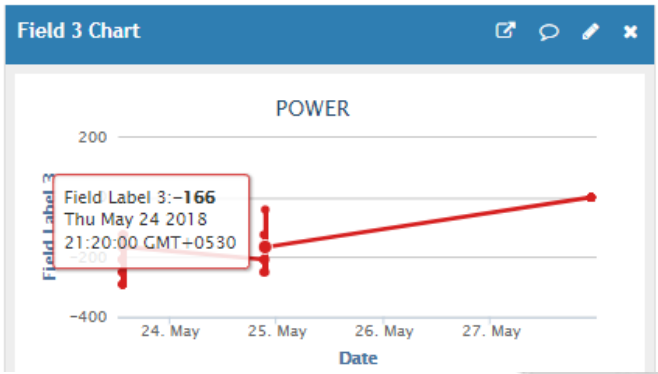

Fig.6 Output of power consumption

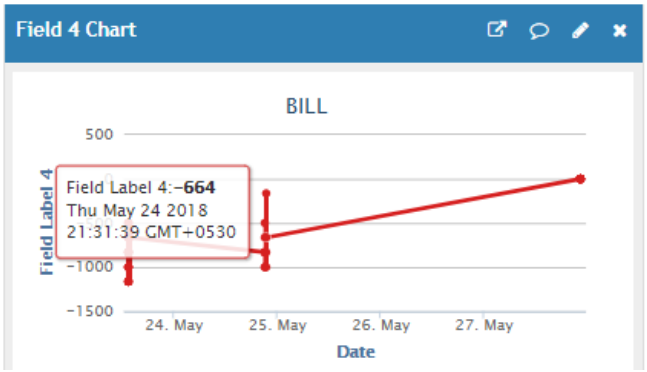

Fig.7 Output of amount to be paid by consumer

IX. CONCLUSION

The proposed system can provide the energy monitoring system for charging station. All the information of current, voltage and power consumption of power station and charging station can be send to the cloud .We have monitored power and charging station. The system also provides billing information to the customer. Also system enabling controlled flow of energy and power through safe, secure, energy efficient and convenient transfer of electricity and data. The thingspeak IoT cloud is used in the system which helps to provide the information of voltage, current and power consumption in graphical format making it more readable to the user. Also, the user can view the data history with the help of thingspeak IoT cloud. The entire communication is based on MQTT protocol which is one of the fastest communication protocol used in IoT systems. The MQTT protocol enables the communication between power station and charging station within milliseconds; which is one of the advantage to the system.

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