IoT - Smart Meter Reading

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Abstract— IoT is a concept, which is coined by a member of RFID in 1999. IoT is a environment in which the physical objects are networked together to collect and exchange data, it can be used to provide more information which helps making better decision, monitoring amount of time and saving money. Simply IoT is a concept that can be easily explained by the term "Communication between devices". This can be explained by giving an example which will be routine in our daily life assume that your alarm wakes you at 6 A.M in the morning and after that the alarm sends a message to the coffee maker machine to make coffee. This simple example describes IoT very simply. The application of IoT is very vast like ocean for e.g. smart city, smart buildings etc. behind all this IoT working and its technology its main objective is to make life in a simpler and a easier way but taking the concept used is electric board, the way they measure the amount of units consumed by each home and industry still exist in the old way by a person who comes and take the reading for every two months.

This old way can be overcome by using the concept of IoT. Since IoT is used to communicate between the devices this problem can be solved easily. The main advantage of this method is the Electric board bill does not need to depend upon manpower for taking the reading in each home and other commercial purposes, so that the economy can be increased.

Keywords— IoT (Internet of Things), RF (Radio Frequency).

I. INTRODUCTION

IoT concept was initiated about 18th months ago under development process and there is many successful researches done in European countries. IoT concept can be explained by a device and device communication, which makes the human life simpler and easier than the present. The devices, which are connected in internet, can sense, communicate, and share information using a IP (internet Protocol). The IoT refers to the use of intelligently connected device and systems to gather large amount of data. IoT is expected to spread rapidly over the upcoming years. The IoT has the potential to deliver solution that dramatically improve energy efficiency, security, health, education, and many other aspects of our daily life clearly the internet of things is one of the most important and powerful development

Already IoT projects are underway that promise to close the gap between poor and rich improve distribution of the world resource for those who need them most. IoT has key attributes that distinguish it from regular internet as captured by sense framework.

Imagine that all the devices are connected in internet and programmed to share information and data, which they can perform this process automatically to make our routine life in a different way, which we had only dreamt of it. This dream can be emerged as a new upcoming technology where there is a possibility of communication between electronic devices.

A. Features of IoT

- Machine to machine communication
- Machine to infrastructure communication
- Tele health
- Continuous monitoring of and firmware upgrades for vehicles
- Asset tracking of goods on the move
- Automatic traffic management
- Remote security and control
- Environmental monitoring and control
- Home and industrial building automation

B. Application of IoT

- Smart food/water monitoring
- Smart health and living
- Smart environment monitoring
- Smart manufacturing
- Smart energy and buildings
- Smart transport and mobility
- Smart industry

II. LITERATURE REVIEW

Smart Meters and Smart Meter Systems are being deployed throughout North America, and utilities are continuing their efforts to improve grid reliability and promote energy efficiency while providing improved services to their customers. However, concerns have been raised regarding not only the accuracy, security and integrity of these meters, but also with respect to the potential impacts of radio frequency (RF) exposure on the public. Hence, this paper provides a basic overview for understanding how the electric utility industry seeks to ensure the appropriate level of accuracy, safety, and security. It also makes evident that before being accepted and deployed Smart Meters must meet a number of national standards and comply with state and local codes designed to ensure proper operation, functionality and safety.

A. Meter Accuracy

While there are technological differences between Smart Meters and older mechanical metering devices, the electric industry exercises the same due diligence and precision for ensuring the accuracy of Smart Meters as it has to older mechanical metering devices for revenue billing application. The accuracy of Smart Meters, both in development and practice, has been confirmed to improve on the older electro-mechanical meter technology. All meters, regardless of technology and design, are required to meet national standards such as ANSI C12 for meter accuracy and operation before being installed.

This paper proposes a framework to mine probable and feasible business solutions from the enormous data generated

from Internet of Things (IoT) devices. Smart meters are one such device which may be categorized as initial examples of IoT's that may soon become an integral part of households (Depuru, Wang, Devabhaktuni, & Gudi, 2011; Greveler, Glosekotter, Justus, & Loehr, 2012). Smart meters are capable of transferring electrical consumption metering details of a household on real time basis to electricity provider. Furthermore, this meter can also transfer equipment wise recording of the consumption pattern, in case the house is equipped with smart devices. Due to this capability of the smart meter, adoption time of various smart electrical devices installed in a residence can be recorded very easily (Nezhad, Wijaya, Vasirani, & Aberer, 2014). This recording, if mined following data mining techniques, may provide various useful adoption patterns that remain unknown otherwise. Current electric meter does not offer this facility of observing and recording electricity consumption of different electrical devices. The importance of this research becomes evident since electric meters are part of every household numbering thousands of millions in number. Moreover, every house is equipped with several electrical devices.

The proposed topic becomes more important due to three reasons. First, IoT's are the future of the world. Second, IoT's will generate huge amount of data, the use of which is not thought of at present. Third, there is no prior research work on a similar topic. Examples of IoT's i.e., smart meter and smart devices are to become common in the event of the present electric meter being replaced for effectiveness and efficiency. The data generated by the combination (smart meter and smart devices) will be enormous in size. This data will have record of all the operations of all the devices on 24*7*365 basis. The size of the data will be huge; conventional analytical techniques cannot handle it. Therefore, this data offers a unique opportunity to data scientists to explore techniques that may be of help to the various stakeholders involved. An example of such trends is, mining the adoption pattern of various smart electrical devices within the household. Mining these patterns will not only be of help to equipment manufacturers to understand their customers better, but also to policy makers to frame suitable policies in alignment with their long term socio-environmental objectives.

Once smart meters are part of society huge data will be generated with the potential to mine useful insights, for not only manufacturers of smart devices, owners of electricity supply, government for policy formation, but also to the owners of the houses consuming electricity, to bring the consumption to more efficient and economical levels. The nature of data obtained from this process is big is size in comparison to the data available from say, retail stores. The number of consumers, in case of retail stores, is mostly in thousands whereas the consumers of smart meter will be millions in size. The complexity of the data is also much more compared to retail data. Retail data is mostly cross sectional in nature whereas smart meter data has time as another component. For simplification, this study only uncovers one aspect of the problem, adoption mining of the smart devices in a home. There are several other further complex mining activities that can be performed with the same data. We

presume that this field will mature in due course of time and researchers in future will bridge dimensions not touched in the present paper.

There are four major stakeholders for this study. First, manufactures of smart devices who are concerned with the marketing of their product. Second, electricity-distributing companies whose main concern is the elimination of existing problems associated with the distribution of electricity, especially in developing countries. Third, the government or policy makers who are enabled and are in a position to formulate appropriate policy; policy that is not only capable of eradicating existing problems of electricity generation, distribution and consumption, but is also acceptable by society. Fourth, consumers of electricity, who, in present scenario, are unaware of their own segregated and detailed electricity consumption,. This awareness may help them to take appropriate electricity consumption decisions to optimize the level of consumption. This paper mainly focuses on manufactures of smart devices as its subject of concern. This study will help manufacturers of smart devices to know adoption patterns and understand the consumer's segment. This understanding will help them to better formulate their marketing strategy.

Furthermore, the proposed study will help the manufacturers in two ways. First, it will mine the profiles of customers as initial adopters of their product. Second, this study will mine the association pattern between two or more launched products. Understanding of the temporal association between devices will let the manufacture know the average time lag between the adoptions of these devices. This information will guide future manufacturing and marketing strategy of the product. Present study explains a very limited potential use of the data available from smart meters. Data simulation done for this study is also very simplistic. That is only good enough to explain a few applications. Research has found that electricity consumption variations, daily and seasonal, are capable of giving insights about the demographic and social details of households. In the present attempt, we have not covered these aspects of smart meter data mining. In the next attempt, we propose to integrate this complexity. Furthermore, in the next step of the study we aim to propose an algorithm to get insights from the simulated data.

III. PROPOSED WORK

The main global idea behind the concept of electronic meter is to allow the transfer of units consumed either for commercial and non-commercial purposes. Till now the electric board has employed the concept of measuring the units by the help of humans but according to this concept the units consumed by each particular will be transferred automatically by updating the readings for every two months or can be changed according to the need.

This is possible by the IoT concept, which can communicate between devices; the same concept is used here for transmitting the units consumed in commercial and non-commercial areas.

This concept will be employed with the help of internet and by making the electronic meter smart, which calculates

the total units consumed and send the units to the server or databases in the electric board. In the figure 1 the smart meter is the one, which is connected to the main electric board to measure the total units consumed by a particular, and the program, which makes the meter to work smart, will trigger the reading to the server in the electric board center.
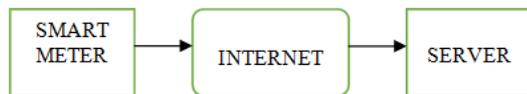

Fig. 1. Homes/Industry electric board.

The above figure say the flow of how an smart meter will transmit the unit to the server in the electric board. This concept can be achieved fully by collecting all the data of the person who is using the smart meter in their home or industry to transmit their units in a smart way to the electric board. The proposed way will make the electric board to work in a smart way thus reducing the work of the human to check the units.

By implementing this method the man power work Is considerably reduced but still only a very less number of person will be needed to check. and ensure about the received data in the server and to maintain the server.

This also includes there is very less possibilities of error which could occur while transmitting the readings to the server.

The smart meter consists of transmitter to transmit the unit consumed in the house to the electric board and a receiver can also be attached with it which may used to remind the people to pay their bills within due date& it also consist of memory element to store the units send by the meter for later reference. The main purpose for applying this technique is to make the simple work to do it in the same way. By applying this technique, we can reduce the work of the electric board city, which still depends on humans for calculating the units that is consumed at every home.

By using the concept of smart meter with IoT we can transmit not only the electric units consumed by the house, by using the same concept we can also do the same process for also calculating water consumption in the homes. This simple works still depends on the humans to take a note on the readings and to calculate the bills for each home. By making this technique in real life the regarding board can gain, a profit which will also considerably increases the country's growth.

A. *Application*

- Used to transmit the units of electric current consumed in each home without the help of human.
- It can be also used to transmit the same units of water consumed in each home to the server to calculate the amount.

B. *Advantages*

- Less man power is needed
- Maintenance is easy
- Work load is less

IV. CONCLUSION

By implementing this technology with the help of IoT every simple work can be minimized. IoT is a new emerging technology on which the future world will depend on. IoT will reduce every work of the human by making the electronic devices smart and all are interconnected under a network. By doing so every device can communicate between them. This smart meter technology will be very useful for solving simple thing, which can replace human, by doing so time can be saved and implements to a new way of transmitting the units or quantity of electric or water consumed by each house. Smart meter has man advantages as well as dis-advantages, which can be overcome by researching many ideas in it and can be used to a far end.