# IOT Gas Meters and Management Systems

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**Abstract -** *In recent years, IoT has gained a lot of popularity in various fields. IoT has used the internet to provide connectivity between traditionally smart devices like mobile phones, computers, laptops, etc. and other not so smart, electronic devices such as refrigerators, air conditioners, gas meters, etc. Nowadays people are using IoT to make our homes and cities smart. Eminent Gas Technologies Pvt. Ltd. is one of the leading companies in manufacturing and supplying Gas System Solutions. With growing interest in IoT and with intentions to automate and simplify gas meter systems, Eminent Gas Technologies Pvt. Ltd. wanted to develop a user friendly Web Application and IoT system based on LoRa technology for gas meters to take automated readings . These readings will be used for monthly online billing system by the clients and to control/regulate the usage.*

***Key Words***: IoT, Gateway, LoRA, Gas Meters.

## 1. INTRODUCTION

Earlier the gas meter reading was to be checked physically. The staff had to personally go to the sites where every meter is installed and check the reading. Then those readings had to be used to calculate the cost of the usage of each client. Since the clients are based throughout India and each site has a minimum 50 meters installed taking the reading from each meter was a tedious and time consuming job. The proposed system will make the process simpler and faster. Also in case of high profile residential areas it is difficult to go in person to take the readings due to security reasons.

Earlier the servers and technologies of Eminent Gas Technologies Pvt. Ltd. were outsourced to Chinese based company and with the relation of China and India being uncertain, especially with the ongoing US-China trade war they wanted to make their work completely self made. Also taking the reading from each meter was a tedious and time consuming job hence the use of IoT based gas meters to automate the process of meter reading made the process faster and simple

Aim of the project is to develop a user-friendly application using IoT system for gas meters to take automated readings depending on the consumption by the users. These readings help in generating monthly online bills.

The objective of this project is to develop a web application and IoT based network that will be an interface between the users and Eminent Gas Technologies. There will be a main Network Server that will act as the central node for the IoT enabled gas meters.

## 2. Existing System

The current existing system is a prepaid gas meter system. The existing web application was not user friendly and it was difficult for users to use the features of the web application. The process of collecting meter reading was tedious and time consuming. This existing system was like the mobile phone recharges that had to be done before online transactions came into existence where the customer had to go personally to perform a recharge. The web application of the existing system is also not very user friendly, it is complicated and the users are not able to utilize all the features easily. The web application is also China based and the relation of China and India uncertain especially with the ongoing US-China trade war which makes it difficult to continue using the current application.

### 2.1 MEMS-Based Smart Gas Metering for Internet of things

Shenglong Dong, Suohang Duan, Qing Yang, Jinlong Zhang, Guoguo Li, Renyi Tao. et al [1] have developed utilities that are traditionally employed or contracted meter readers to collect natural gas usage data, which is expensive and time consuming, and thus necessitates the need of smart IOT based Gas Meters and Management System.

### 2.2 An Integrated IoT Architecture for Smart Metering

Jaime Lloret, Jesus Tomas, Alejandro Canovas, Lorena Parra. et al [2] proposes an Advanced meter infrastructures (AMIs) are systems that measure, collect, and analyze utilities distribution and consumption, and communicate with metering devices either on a schedule or on request. AMIs are becoming a vital part of utilities distribution network and allow the development of Smart Cities. With the rise of Internet Of Things an IOT integrated architecture for AMIs can be made to perform smart and automated meter readings.

### 2.3 An IoT-Based Smart Utility Meter

A. R. Al-Ali, T. Landolsi,M. H. Hassan,M.Ezzeddine, M.Abdelsalam, M. Baseet. et al [3] has proposed how the Internet of Things (IoT) technology, the consumption of electricity, water, and gas by appliances in residential

units can be collected more frequently nowadays. However, these meters are still discrete and placed in different locations in apartments or houses and there is a need to inform people about this system and need to spread this system globally.

## 3. SYSTEM DESIGN

Developing a user friendly Web Application and IoT system for gas meters to take automated readings and store it on the server. These readings will be used for the monthly online billing system of the clients and to control/regulate the usage.

The project is divided into two parts:

1) Domestic Use Meters

2) Commercial/Industrial Use Meters

The web application will be an interface between the users and Eminent Gas Technologies. The plan is to develop a user friendly website, which can be easily operated by a new user. The IOT Network Server will act as the central node for the IOT enabled gas meters. The gas meters will be connected to LoRa Gateway and the LoRa client will send data to the gateway. The Gateway will send all the data from each meter node to the network server. This will be used for the domestic meters.

The LoRa gateway is connected to the internet using GSM and/Ethernet. The LoRa gateway is used in the Domestic meters. These domestic meters consists of TarangMini LR series modules which uses popular Lora platform, which is best suited for smart water metering, Industrial automation and street lighting.

The LoRa gateway is not feasible for commercial use where a smaller number of meters will be used. For such cases Commercial/Industrial meters are used, which are connected using the LTE Module which will directly send the data to the network server. Commercial meters are used when smaller numbers of meters have to be connected. In which at a time 6 meters can be connected to one commercial gateway which uses an LTE module as a network interface.

Gas meters have an AMR (Automated Meter Reading) module attached, that consist of a reed switch for digitizing the reading of the meter.

### 3.1 SYSTEM ARCHITECTURE

As shown in Fig -1 both types of meters (Commercial Use and Domestic Use) will have network interface via which they will send data to the Network server. This data includes a unique identifier for the meter, the current reading of meter and other required information. This received data on the server will be stored in a database.

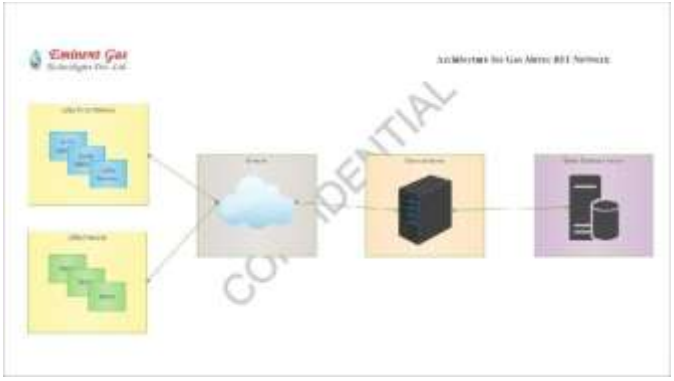

**Fig -1**: Architecture for Gas Meter IOT Network

As shown in Fig -2 the web application will provide user interface for the end-users, the service providers and the companies using the IOT Gas Meters. The web application will have functionality such as billing generation, payment portal, meter on/off control, usage logging, etc.

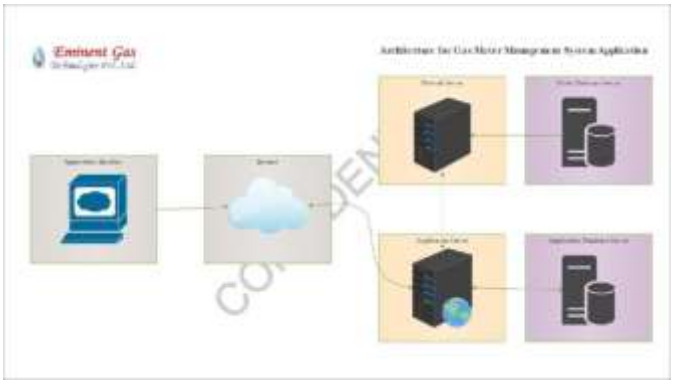

**Fig -2**: Architecture for Gas Meter Management System Application

### 3.2 BLOCK DIAGRAM

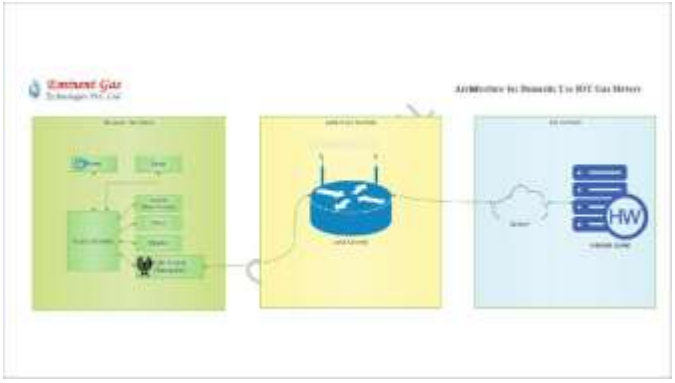


**Fig -3**: Domestic Use Gas Meter Block Diagram

As shown in Fig -3 the Domestic Use Gas Meter has a LoRa module which is the network interface for the meter. Each site will be having LoRaWAN Gateways to which the LoRa Modules will communicate. The LoRaWAN Gateway has provision for having Ethernet and GPRS interfaces for connecting it to the internet.

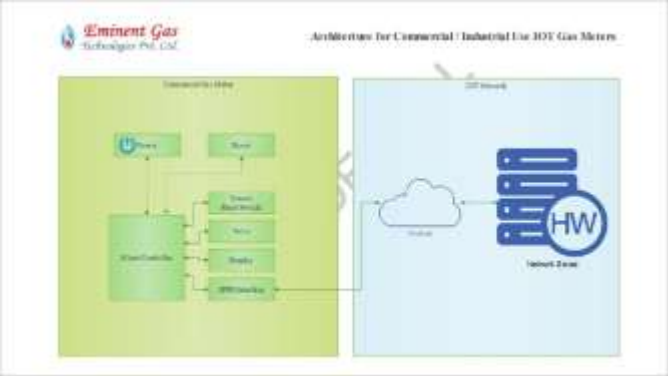


**Fig -4**: Commercial Use Gas Meter Block Diagram

As shown in Fig -4 the Commercial Use Gas Meters has a LTE module connected to the meter as a network interface, these meters directly are connected to the internet and send data to the network server.

Both the meters have an electronically controlled valve for shutting the gas flow if required. The meter also has an LCD display panel for the users to see the reading directly and this LCD will also be used to display error codes in case of failures.

## 4. CONCLUSION

This paper explains the use of IOT in the daily household needs of common people. This paper describes the methods to develop the IOT based network system. IOT based Gas meter system is an automated meter reading system that simplifies and accelerates the process of meter reading. It also provides user friendly web application interface between the users and Eminent Gas Pvt. Ltd. and provides a lot of features that were otherwise very tedious and time consuming making the process simple and saving a lot of time. The domestic gas meters are for use for civilians allowing them to easily recharge their meters and also check the amount of gas used. Whereas the commercial gas meters are for commercial use by companies that do not need a lot of gas meters as they only require at their location. The project envisages a system that will automate the readings of gas meters to simplify and accelerate the process of monthly billing, removing the tedious and time consuming process of physically taking the reading.

## 5. FUTURE SCOPE

Currently, the current aim is to develop an IOT network for the Gas Meters. This current system can be further expanded to make an IOT system for water supply meters, electricity meters etc.

The billing system can also be combined for the above mentioned types such as electricity, water supply and gas via a single portal which will bring convenience for the end users.

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## REFERENCES

[1] Qing Yang, Jinlong Zhang, Guoguo Li, Renyi Tao, Shenglong Dong, Suohang Duan. Mems based smart gas metering for the Internet of things. IEEE Internet of Things Journal, 2017.

[2] Alejandro Canovas, Lorena Parra, Jaime Lloret, Jesus Tomas. An integrated IOT architecture for smart metering. IEEE Communications Magazine, 2016.

[3] M. H. Hassan, M.Ezzeddine, M.Abdelsalam, M. Baseet, A. R. Al-Ali, T. Landolsi. An IOT based smart utility meter.2018 2nd International Conference on Smart Grid and Smart Cities (ICSGSC), 2018.