
Chapter 5

Smart Water Metering System

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Abstract

One of the characteristics of a smart city is managing the city assets by using urban informatics and technology which includes management of water supply network. An efficient water supply network will be achieved through integration of smart devices and equipment for monitoring and measuring water. In this process, consumer and water provider collaborated where client is in charge of their conduct while provider monitor and maintain their operation. At consumer side, the device provides daily consumption report with forecasted savings of that particular month base on changes in consumption habits. As for the provider, they utilised the system to provide automatic monthly billing to prevent late and inaccurate billing. It also enhances the company maintenance capability through pressure and leakage management. In this project, development of robust outdoor sensor node has been proposed to collect real-time water consumption data in consumer daily usage. By using IoT system, the water usage level, water supply level and their respective GPS location will be sent to the IoT Cloud infrastructure and analysed by using data science tools for further action.

Introduction

Throughout the years, the world is facing water crisis that leads to water shortage due to the climate changes, population growth, standard of living improvement and also growing of industrial demand (Bari, M. et al, 2015). The amount of water consumption suggested by World Health Organisation (WHO) is 165 litres per capita per day, however average of water consumption in Malaysia is higher than the recommended amount which is 210 litres per capita per day (Howard, G. et al, 2003).

Hence, obtaining information of daily water consumption is vital in order to control and analyse water supply and usage. At present, water utility management is monitored manually by the Malaysian water companies. The company will monitor any of the water infrastructures by schedule or through complain by consumer. Thus, the maintenance and repairing process takes a longer time (SADA). Besides, it is necessary to provide an automatic system for monitoring the consumer daily water usage since the current manual meter reading occasionally inaccurate due to systematic error such as equipment and observation error. Apart from that, the monthly water billing also takes time to be generated and it is not suitable for the purpose of water consumption estimation.

The public should be educated to consume certain amount of water daily depending of their family size and their locality. Furthermore, by controlling their daily usage of water can also reduce the water bill. The daily water consumption can be monitored and triggered an alarm to house owner if they utilised water excessively.

System Structure

This project can be divided into three phases; sensor node development, smart water metering system development and performance evaluation of water metering system. During the development of the sensor node, selection of suitable water metering sensor and GPS sensor on Intel Edison platform is

vital in order to ensure the prototype hardware are compatible with the developed system. A number of container boxes are design to housing the Intel Edison and all related sensors.

In developing the water metering system, Intel Edison Wi-Fi is connected to YES WiMAX router gateway and furthered to Ubidots IoT Cloud as shown in Fig. 1. Water metering data is collected from Intel Edison to Ubidots IoT Cloud based on daily and month water consumption. The water metering data is visualised on Ubidots Dashboard. The system administrator can monitor the water metering data of water consumption volume, and also abnormality water usage between house area and distribution centre.

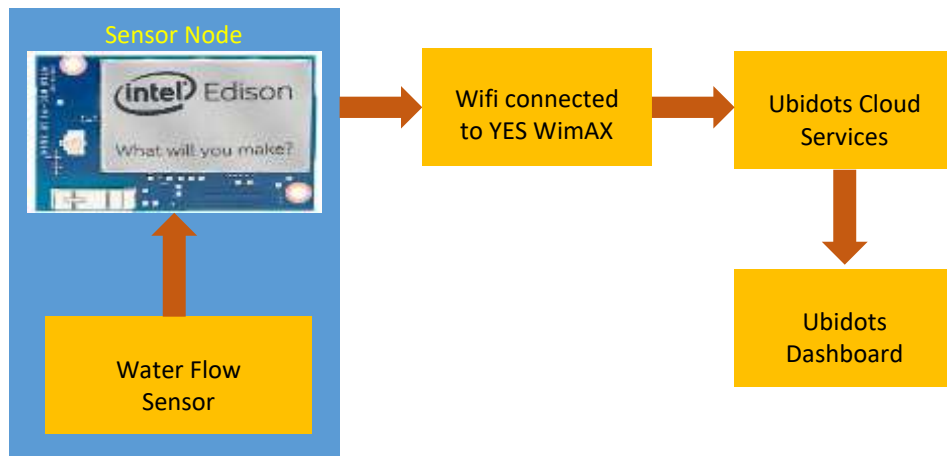


Fig. 1 System structure of smart water metering system

The water metering system is evaluated based on the data collection from on-site sensor node to IoT Cloud. An alert notification can be sent via Telegram, email or Short Message Service (SMS) to notify the house owner when the water reading exceed the average water usage charge in a month. Other than monthly water consumption, the system can generate monthly water bill and notify the bill to the house owner. Furthermore, the system can also detect any abnormality of water usage within the housing area or at the distribution centre which possibly due to the water pipe leaking and directly notify the house owner or the water company personnel, respectively.

System Implementation

The dashboard of Ubidots IoT platform will show water consumption per day and per month in a household; when the water start flowing through the sensors, it start measuring the volume of water and send the data to Ubidots cloud.

The system will eliminate manual water metering reading to provide better efficiency and accurate data reading. Time consumption in generating water billing is reduced by implementing the data visualisation through the Ubidots dashboard that can remotely and constantly generate the daily and monthly water consumption for housing area as well as the reading of water distribution at the distribution centre.

For social benefits, the consumer and water provider can monitor the water consumption in real-time manner and can limit unnecessary daily water usage especially in high dense population where water consumption is excessive. Automated water billing and alert notification will ease the management of water provider and also deliver effective services to the consumer.

Conclusion

This article presents a solution to monitor the water consumption and water distribution at housing area using IoT platform via Ubidots cloud. The developed system provides a real-time water metering

function in order to generate rapid analysis on the water metering data at each house and also between distribution centre and housing area data for any abnormality related to water distribution problem. The system can be commercialized by enhancing the prototype system using a set of robust sensor nodes in detecting the water flow and integrating the system into current system in used by the water provider company and Joint Management Board (JMB) of strata building. Thus, more actual on-site data can be obtained and analyse.

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