# IoT based Water Flow Monitoring for Apartments

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*Abstract*— This project mainly focuses on the monitoring of water flow in each house in the apartment. The usage of water becomes more lenient in apartments. These challenges arise due to high population, less water resources etc. The scarcity of water mainly occurs due to wastage and lenient usage, so it should be monitored in real time for new approach in IoT based water flow monitoring has been projected. In this, the amount of water consumed in each house will be calculated and then stored in the database. Hence the ultimate motto is to let people aware of their water usage.

***Keywords:*** IoT, Flow Monitoring, Apartments

## I. INTRODUCTION

India could potentially face a shortage of water in the near future. The designed module can be implemented on a standard water pipe at residential areas, especially in apart mental areas. In recent days, development in computing and electronics technologies has triggered Internet of Things technology. Internet of Things can be described as the network of electronics devices communicating among them by the help of a controller. The IoT is a collection of devices that work together in order to serve human tasks in an efficient manner. This paper presents a low cost water monitoring system, which is a solution for the water wastage. This project only contains a handful of components and also will be very effective in water maintenance. It practically contains water flow sensor which is used to measure the amount of water consumed and Raspberry-pi (processor) is used to calculate the water usage. This project is concerned with the efficient management of the water automatically with IoT.

## II. WATER FLOW MONITORING

In this system, a flow sensor is used to measure the amount of water flowing through the pipe. This data will be received by the processor (raspberry pi) and send the data to cloud by using IoT.

### *A. Flow Sensor*

Flow sensor is used to calculate the flow rate which is used to estimate the amount of water flowing through the sensor. Generally a Hall Effect sensor is integrated internally which outputs an electrical pulse for every revolution. Here, YF-S201 Hall Effect water flow sensor is used. Working Voltage of this sensor is 5 to 18V DC (tested voltage: 4.5 V). Output duty cycle is 50% +-10%. It has a working Flow Rate of 1 to 30 Liters per Minute. Max current draw will be 15mA at 5V.

Fig. 1: Water Flow Sensor

### *B. Raspberry PI*

Raspberry Pi 3 B+ is used in this project which was introduced by Raspberry Pi foundation on 14th March 2018. It is an advanced version of Raspberry Pi 3 B model that was introduced in 2016.Raspberry pie is a portable, powerful and minicomputer. The board length is only the processor (Raspberry pi), which will calculate the amount of water consumed in liters along with the respective time by the usage of real time clock (In-built) 85mm and width is only 56mm. It enables people of all ages to explore computing, learn to program and understand how computers work. The Raspberry Pi Model B+ provides more specifications than Modal B, like more GPIO pins and more USB. Raspberry pi 3 B+ also improves power consumption, audio circuit and SD card. It is more useful for embedded projects.

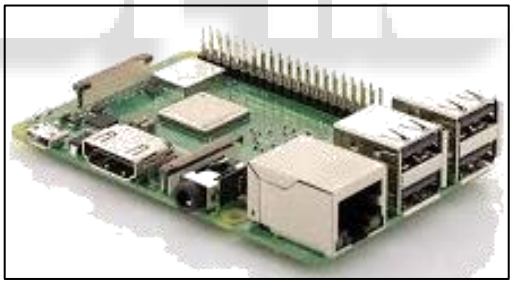

Fig. 2: Raspberry pi 3 B+

### *C. Clouding Method*

Here, firebase is considered as web application platform. It helps developers' high quality apps. It stores data in JavaScript Object Notation format which doesn't use query for inserting, updating, deleting or adding data to it. It is the backend of the system that is used as database for storing the data.

## III. PROPOSED SYSTEM

### *A. System Overview*

In this, they present the theory on real time monitoring of water quantity using IoT. The system consists of Arduino, microcontroller and water flow sensor. The Arduino is the main processor of the system which control and process the data generated by the sensors. A Wi-Fi module is additionally connected to the Arduino device which helps to transfer the data to the cloud over internet. The water flow

 

sensor measure the quantity of water flow through the pipe in a given time, this data will be sent to cloud for storage and analysis purposes. Here, they are using Arduino and a Wi-Fi module which must be connected externally and sending the data to cloud by using IoT.

### *B. System Architecture*

In this proposed system, it is clearly shown that it has several components which help to build a water monitoring system. The essential components of the system of smart home automation are:

### *C. Arduino Uno*

Here Arduino is used as the main processing circuit. Arduino is a microcontroller board based on the ATmega328P. Arduino UNO has 14 digital input and output pins, 6 analog input pins, a 16 MHz quartz crystal, a USB connection, a power jack, an In-Circuit Serial Programming header and a reset button. It contains everything need to support the microcontroller. Arduino Software (IDE) was the reference versions of Arduino, now evolved to new releases. The Uno board is the first in a series of USB Arduino board, and the reference model for the Arduino platform

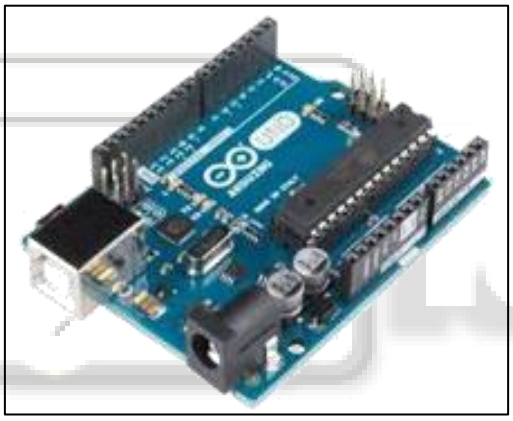

Fig. 3: Arduino UNO Board

### *D. Wi-Fi Module*

The ESP8266 Wi-Fi Module is a self SOC with integrated TCP/IP protocol s that can give any microcontroller access to your Wi-Fi network. The ESP8266 is capable of hosting an application or offloading all Wi-Fi networking functions from another application processor. Each ESP8266 module come pre-programmed with an AT command set firmware. The ESP8266 module is also cost effective.

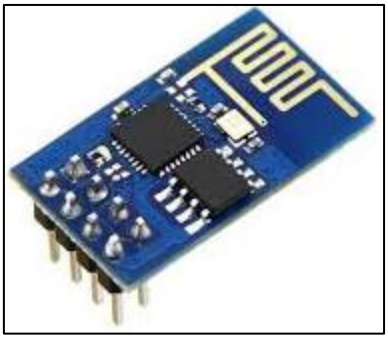

Fig. 4: Wi-Fi Module

### *E. Cloud-Based Server*

Cloud goes about as a database to store every data generated by the sensors installed in the home. This cloud server help to send email alert about different situation in home to the client.

## IV. PROCESSING UNIT

Here the main processing circuit is Raspberry pi. Main purpose of this processor is that it not only reduces the circuit complexity but also provides us to connect multiple inputs (Flow sensor) with a simple programming platform. Since it has inbuilt Wi-Fi module and real time clock, which tremendously reduces the circuit complexity and also provides simple and easy installation and maintenance. Here we are using Raspberry pi 3 B+, which generally contains 40 GPIO pins for the function. On the Raspberry Pi Model 3B+ the hardware-based serial/UART device "/dev/ttyAMA0" has been re-purposed to communicate with the built-in Bluetooth modem and is no longer mapped to the serial RX/TX pins on the GPIO header. Instead, a new serial port "/dev/ttyS0" has been provided which is implemented with a software-based UART (mini UART). For Raspberry Pi 3B+, the microchip have supported with an upgraded version and, LAN7515, which supports Gigabit Ethernet. While the USB 2.0 connection to the application processor limits the available bandwidth, roughly a threefold increase in throughput compared to Raspberry Pi 3B. We can also use more than multiple inputs with lesser circuit complexity.

Fig. 5: GPIO diagram of Raspberry pi 3 B+

### *A. Clouding Method*

Firebase Hosting is a mobile and web development platform which is a static and dynamic, launched on May 13, 2014. Firebase supports hosting static files such as CSS, HTML, JavaScript and other files, as well as support through Cloud Functions. The service delivers files over a content delivery network (CDN) through HTTP Secure (HTTPS) and Secure Sockets Layer encryption (SSL). Firebase partners with CDN, to provide the CDN backing Firebase Hosting. Here, firebase is used as a real time database.

## V. RESULT

Hence in this paper, the liquid flow can be monitored from anywhere in the world using internet through personal computer or Smartphone. The work of the paper presents the household orifice water flow meter for use in smart metering applications. The meter was manufactured and tested to measure the flow rate to an accuracy of within 1% for flow rates between 4L/min and 70L/min.

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