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Smart Water Monitoring System Using Cloud Service

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ABSTRACT

Water is the basic need for survival. Hence, the wastage of it is not tolerable. Water scarcity is the lack of sufficient available water resources to meet water needs within a region. Its effects are spread all over the world and around 2.8 billion people are affected by it. More than 1.2 billion people lack access to clean drinking water. Therefore, water monitoring has become an important subject of matter.

The project Water Monitoring System for Smart Village using cloud service, as the name says it is all about monitoring of water right from small villages, townships to entire urban infrastructure. The project deals with the efficient monitoring of water using Internet of Things (IoT) technology enabled by sensors. The sensor network can be flexible expanded and shrunk according to the requirements of setup. It is used for remotely controlling the water flow, cutting the water supply, monitoring and analyzing the water usage across the nodes, with the help of cloud connectivity. Further, more statistical data can be gathered and can be used by govt. authorities for defining policies, strategies and billing calculations. So ultimately, this will help to conserve and efficiently utilize the natural resource. Using IoT takes into account of waste wastage right from small village to large scale. It can also control the water usage in a precise way. Usually the water flow to each village is not measured, but this product enables the measure of water to each village so that water monitoring is easy. If there is inappropriate usage of water from tank is detected monitor of that village can be notified.

I. INTRODUCTION

The Internet of Things (IoT) is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers and the ability to transfer data over a network without requiring human-to-human or human-to-computer interaction. Internet, a revolutionary invention, is always transforming into some new kind of hardware and software making it unavoidable for anyone. The form of communication that we see now is either human-human or human-device, but the Internet of Things (IoT) promises a great future for the internet where the type of communication is machine-machine (M2M).

The basic idea of IoT is to allow autonomous exchange of useful information between invisibly embedded different uniquely identifiable real world devices around us, fueled by the leading technologies like Radio-Frequency Identification (RFID) and Wireless Sensor Networks (WSNs) [2] which are sensed by the sensor devices and further processed for decision making, on the basis of which an automated action is performed [1]. IoT projects are under way that promise to improve distribution of the world's resources to those who need them most and help us

understand our planet so we can be more proactive and less reactive.

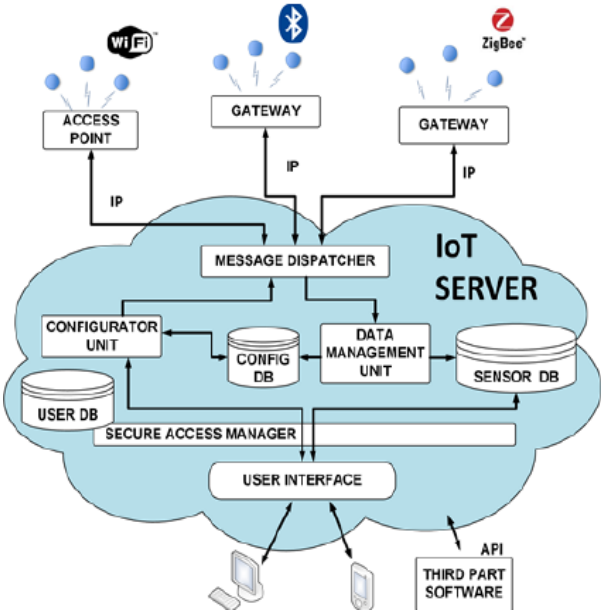

Figure 1

II. PROBLEM STATEMENT

The project aims at automating the process of water monitoring in each village and thereby cause regulated usage of the same using cloud service.Water is one of the important substances used in crop production. It must be saved to avoid water shortage in future. One such way to save water is to monitor and study its usage and accordingly its utilization should be managed. Monitoring water level of a water source, such as water tank plays a key role in water management. Keeping track of water level in a water source can be used to preserve water and to study the water usage. Thus monitoring water level is an important task in agricultural.

Villages in India will soon be transforming to smart villages as Government of India brings Smart Village initiative to the country. The smart village initiative will promote Digital inclusion which will enable the enhanced access to services through Information Technology (IT) enabled platforms. Thus the Internet of Things (IoT) has a major role to play in Smart Village in India. In IoT enabled Smart Village every physical object, a thing, will be connected to the Internet and enable users to keep track of its status and to control it remotely. This will help users to access to services provided by such objects as and when required.Water is a limited resource and is essential for agriculture, industry and for creature's existence on earth including human beings. Lots of people don't realize the true importance of drinking enough water every day. More water is wasted by many uncontrolled way. This problem is quietly related to poor water allocation, inefficient use, and lack of adequate and integrated water management. Therefore, efficient use and water monitoring are potential constraint for village water management system.

III. EXISTING SYSTEM

Over the years, several methods have come up for efficient management of water. Basically In each different method a more advanced water meter is installed to improve the accuracy of water measurement. The water meter calculates the amount of water own through the main pipe and takes a reading. Every month, the concerned authority from the water department takes the reading from each house/building. A standard water meter uses two common types of registers - straight and circular - to read the flow of water in cubic feet or inches. The registers can be observed on the surface of the meter. The straight registers can be read like an odometer in a car. On some larger meters, a multiplier will be present on the register face, which can be noted as 10X, 100X, or 1000X based on the size of the meter. Circular registers, on the other hand, are more complex to calculate water usage. They employ a series of dials marked with divisions of ten. How a water meter works depends on the style, purpose, and size of the meter[3].Some of the drawbacks of the current methods are It involves a lot of manual work, the amount of water used for a particular instant cannot be determined, the present water meters cannot determine any leakages[5] and It can't detect pollutants[6].

IV. METHODS AND MATERIALS

1. SENSORS USED

G ½ water flow sensor

Water flow sensor consists of a plastic valve body, a water rotor, and a hall-effect sensor. When water flows through the rotor, rotor rolls. Its speed changes with different rate of flow. The hall-effect sensor outputs the corresponding pulse Signal. The working voltage is 5v-24v.The maximum current that can flow through is 15mA (DC 5v).The external diameter of this flow sensor is 20mm and its weight is 43g.It can be stored in the temperature range of 25°C～+80°C.

Figure 2. G 1/2 Water Flow sensor

pH meter:

pH meter,electric device used to measure hydrogen-ion activity (acidity or alkalinity) in solution. Fundamentally, a pH meter consists of a voltmeter attached to a pH-responsive electrode and a reference (unvarying) electrode. The pH-responsive electrode is usually glass, and the reference is usually a mercury–mercurous chloride (calomel) electrode, although a silver–silver chloride electrode is sometimes used. When the two electrodes are immersed in a solution, they act as a battery. The glass electrode develops an electric potential (charge) that is directly related to the hydrogen-ion activity in the solution (59.2 millivolts per pH unit at 25 °C [77 °F]), and the voltmeter measures the potential difference between the glass and reference electrodes.The figure is as shown below:

Figure 3. pH meter

PIR sensor:

PIR stands for Passive InfraRed. PIR sensors are often used in the construction of PIR-based motion detectors. These sensors measure infrared radiation emanating from objects in the field of view. All objects emits what is known as black body radiation. It is usually infrared radiation that is invisible to the human eye but can be detected by electronic devices designed for such a purpose. The term passive in this instance means that the PIR device does not emit an infrared beam but merely passively accepts incoming infrared radiation.

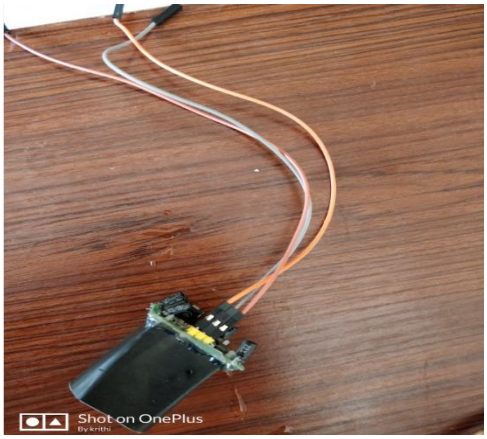

Figure 4. PIR sensor

2. HARDWARE

RENESAS MICROCONTROLLER BOARD

Renesas microcontroller surpasses its predecessor i.e. 8051 family of microcontrollers, with various in-built features as mentioned below:

- ✓ Renesas is a 16-bit microcontroller.
- ✓ Minimum instruction time can be changed from ultra-low speed (30.5us) to high speed (0.03125us).
- ✓ 16 to 512KB of ROM and 2 to 32KB of RAM are available depending upon the series and number of pins.

- ✓ On-chip high-speed (32 MHz to 1 MHz) as well a low-speed (15 KHz) oscillator is present.
- ✓ 10-bit resolution A/D converter (6 to 26 channels depending upon the series) is present.
- ✓ Totally 3 UART for Serial Interface is available.
- ✓ Totally 0-7 channels for timer is available.

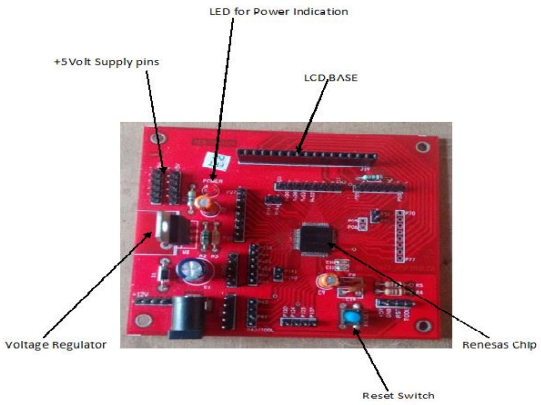

Figure 5. 64 pin Renesas Microcontroller board

GSM (Global System for Mobile communications) :

GSM is an open, digital cellular technology used for transmitting mobile voice and data services. GSM supports voice calls and data transfer speeds of up to 9.6 kbps, together with the transmission of SMS (Short Message Service). GSM is a cellular network, which means that cell phones connect to it by searching for cells in the immediate vicinity. GSM was intended to be a secure wireless system. It has considered the user authentication using a pre-shared key and challenge-response.

Figure 6. Global system for mobile communication (GSM)

GENERAL PACKET RADIO SERVICES (GPRS)

General Packet Radio Services (GPRS) is a packet-based wireless communication service that promises data rates from 56 up to 114 Kbps and continuous connection to the Internet for mobile phone and computer users.

In order to set up a GPRS connection for wireless modem, a user must specify an APN, optionally a user name and password, and very rarely an IP address provided by the network operator.

LIQUID CRYSTAL DISPLAY

The liquid-crystal display has the distinct advantage of having a low power consumption than the LED. It is typically of the order of microwatts for the display in comparison to some order of milliwatts for LEDs. Low power consumption requirement has made it compatible with MOS integrated logic circuit. Its other advantages are its low cost, and good contrast.

Basic structure of an LCD A liquid crystal cell consists of a thin layer (about 10 u m) of a liquid crystal sandwiched between two glass sheets with transparent electrodes deposited on their inside faces.

3. SOFTWARE

The Integrated Development Environment (IDE), Cube Suite is used to generate the embedded code for the hardware mentioned. It offers the ultimate in simplicity, usability, and security for the repetitive editing, building and debugging of codes.

CubeSuite+ bundles all the basic software necessary for Renesas MCU software development in one convenient package, ready to use immediately after initial installation. CubeSuite+ is also compatible with Renesas hardware tools, such as on-chip debugging emulator E1, facilitating advanced debugging.

V. RESULTS AND DISCUSSION

METERING AND ALERTING SYSTEM FOR RESOURCE CONSUMPTION

This project aims at monitoring one's energy consumption and warns consumer if he/she is expected to increase beyond him/her pre-fixed energy units. This monitoring is done on a regular basis, so that if consumer is at the brink of exceeding his/her specified consumption limits, they will be warned. This is implemented using WSN technology, In WSNsensors are equipped with wireless interfaces with which they can communicate with one another to form a network. It has sensor nodes working together to monitor a region to obtain data about the environment. According to David Culler, Estrin and Mani Srivastava WSNs offer an alternative approach: performing Local processing at each device and transporting the data continuously to master node [2].

By fixing one's consumption below a fixed slab rate category and continuously checking that the consumption has not exceeded this limit for a time lapse, we can cut down the consumer's bill as well as the load on the system, if we succeed in limiting the consumption below the slab rate. This project constantly alerts consumer if their consumption has reached beyond the preplanned units on a regular basis [6], so that the consumer is aware of his consumption and voluntarily controls his consumption.

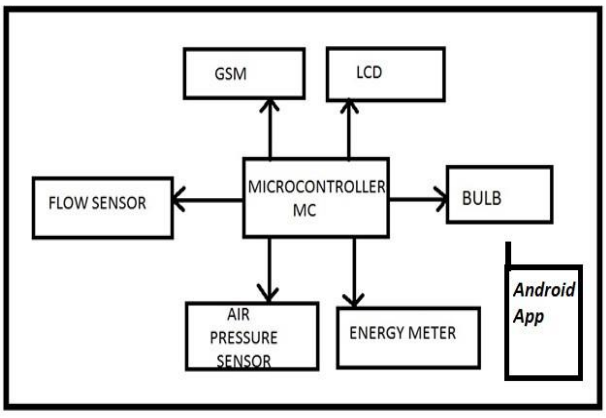

Figure 7. Representation of metering system

In this project we use respective sensors to measure the amount of usage of water, electricity and LPG in home. Electric meter can be configured to measure electricity consumption of a load [7].This information is stored in the database [3]. Whenever the consumption will exceed the threshold, the user will be notified the amount of usage in that time span. This application is not only for common people but also for the higher authorities. The user and admin have their respective accounts. The user can only view his/her usage and the admin can view usage on locality basis.

VI. CONCLUSION

The proposed system is used to acquire water level and other details of a water source in real time from any location, any device connected to Internet. These information which is stored in cloud(Aws) can be used for various purposes for better monitoring of water source. Monitoring water tank from remote location may be very useful when it is not possible to visit location physically every time.By using the monitoring system we can easily control the usage of water and the **water will be saved to our future generations.**

VII. REFERENCES

[1] Somayya Madakam, R. Ramaswamy, Siddharth Tripathi, "Internet of Things (IoT): A Literature Review", IT Applications Group, National Institute of Industrial Engineering (NITIE), Vihar Lake, Mumbai, India, Published Online " May 2015".

[2] David Culler, Deborah Estrin Mani Srivastava , "Overview of sensor networks", Published by the IEEE Computer Society, IEEE August 2004.

[3] Sujatha.D, Sushma Padmanabha, Simanta Nigam Nayak, "Smart Liquified petroleum gas system", International Journal of Engineering Research and Science, [vol-2, Issue5, May 2016].

[4] Cheng-Li Cheng,"Study of inter-relationship between water use and energy conservation for a building", Received 5 May 2001.
[5] Er.Harpreet Kaur, Ms Kamaldeep Kaur,"Energy conservation: An Effective way of energy utilization", Volume 2 Issue 5, Received May 2012.
[6] Kirori Mindo,Moses M Thiga, Simon M Karume ,"A scalable ZigBee WPAN for water flow telemetry" ,IST-Africa Week Conference (IST-Africa), 09 November 2017.
[7] Thomas D. Pitite, Richard M.Huff, "Systems and methods for providing remote monitoring of electricity consumption for an electric meter", 24 April 2007.
[8] M.A. Matin and M.M. Islam, "Overview of Wireless sensor network"