## **Project Report**

# Intelligent Water Distribution Monitoring System

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Under the Mentor Supported by SmartBridge Pvt.Ltd.

Abstract
For the past decade, requirement of the water is increased and its availability is unpredictably in India. The water demand is the most challenges in the world nowadays. So there should be Conservation of water and how to manage the resource available in world is the most importance. In this proposed work, an IoT design for water monitoring and control approach which supports internet-based data collection on real time and generate the bill for each house. In this project, developed a prototype based IoT system using IBM Watson Studio which was control the water flow and generating the bill for particular house. This project gives the idea how intelligently monitoring and distribution of water for every house segment. This will also possible to implemented using NodeMCU.

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## Introduction

#### 1.1 Overview

Water is the most essential one in our world. Water is required for all basic purposes and needs. In day to day life water plays a major role. For drinking, bathing, cleaning, agriculture fields, industries and construction each and every work needs water. Water is naturally abundant and readily available source in nature. But now a day's lot of ground water level is decreased because of excess amount of water wastage. More bore wells were drilled for private water usage. So the ground water level decreased greatly. In industries water plays major role in manufacturing, and processing unit. Some industries which build nearer to bed of the rivers will greatly use the river water without any permission and they will consume more water more water than their permissible limits. So industries like small scale and large scale industries consume more amount of water, the water regulation management should take necessary activities to protect over usage of water by industries. Another major issue is water pollution, most of industries release the toxic wastes and chemical wet wastes to rivers and drainage, it greatly affects the life of people who lives near to the banks and people who consumes that water. The pollution control act should take necessary actions to reduce the water contamination. Another major issue is excess usage of water, so everyone should preserve the water. Though water is naturally available source, it should be preserved for future generation, without water nothing can be done. So, people should involve in water management system, government should create more awareness on conservation of water. More awareness programs and camp should be created. A special subject about water Water is the most essential one in our world. Water is required for all basic purposes and needs. In day to day life water plays a major role. For drinking, bathing, cleaning, agriculture fields, industries and construction each and every work needs water. Water is naturally abundant and readily available source in nature. But now a day's lot of ground water level is decreased because of excess amount of water wastage. More bore wells were drilled for private water usage. So the ground water level decreased greatly. In industries water plays major role in manufacturing, and processing unit. Some industries which build nearer to bed of the rivers will greatly use the river water without any permission and they will consume more water more water than their permissible limits. So industries like small scale and large scale industries consume more amount of water, the water regulation management should take necessary activities to protect over usage of water by industries. Another major issue is water pollution, most of industries release the toxic wastes and chemical wet wastes to rivers and drainages, it greatly affects the life of people who lives near to the banks and people who consumes that water.

The pollution control act should take necessary actions to reduce the water contamination. Another major issue is excess usage of water, so everyone should preserve the water. Though water is naturally available source, it should be preserved for future generation, without water nothing can be done. So, people should involve in water management system, government should create more awareness on conservation of water. More awareness programs and camp should be created. A special subject about water management system should be implemented for school students in their syllabus. This is not easy task water management in today's scenario. Increase in population is major problem in water conservation everything is commercialized and modern. In every construction field more amount of water is consumed every day. Without water construction works cannot be done. The next most water consuming process is making raw materials; it requires lot of water usage for cleaning and furnishing of metals and depending on their availability[2].

#### 1.2 Motivation

Environment around us consists of five key elements. These are soil, water, climate, natural vegetation and land forms. Among these water the most essential element for human to live. It is also important for the survival of other living habitants. Whether it is used for drinking, domestic use, and food production or recreational purposes, safe and readily available water is must for public health. So it is highly imperative for us to maintain water quality balance. Otherwise it would severely damage the health of the humans and at the same time affect the ecological balance among other species. In the 21st century providing pure drinking water is becoming a major challenge worldwide. International governing bodies such as United Nations (UN) and World Health Organization (WHO) also recognized human right to sufficient, continuous, safe, and acceptable, physically accessible, and affordable water for personal and domestic use. According to research of WHO 844 million people lack even a basic drinking -water service, including 159 million people who are dependent on surface water. Impure drinking can cause life threatening disease such diarrhea, cholera, dysentery, typhoid, and polio. The research alarmingly estimates that every year diarrhea alone is causing around death of five lakh people. Figure 1 illustrates how water crisis becoming an epidemic in twenty first century.

Now a day's Internet of things is a revolutionary technological phenomenon. It is shaping today's world and is used in different fields for collecting, monitoring and analysis of data from remote locations. Internet of things integrated network if everywhere starting from smart cities, smart power grids, and smart supply chain to smart wearable. Though internet of things is still under applied in the field of environment it has huge potential.

Water is an essential resource for life and it is now a matter of important day. This problem affects various processes such as water management, water consumption, distribution, system detection and equipment maintenance. It is uncomfortable and often effective for periodic human intervention to maintain for the traditional water measuring system. For lack of existing models, its time to implement water management system for each house segment in a city using IoT. So, using IoT we can design the system in a intelligent manner, then it will control smartly. This type of requirement is more useful for the Smart City development. The project Intelligent water distribution system, as the name says it is all about management of water supply throughout the scale, right from small societies, townships to entire urban infrastructure and also for irrigation water supply management. Main task of the water distribution system is to maintain the water in the tank and also generate the water bills to the individual households which involves human efforts. This system can be automated using

the Internet of things.		
1.3 Objectives		
1. Understand the IBM Watson frame work for AI,ML and IoT.		
2. Create the web app using NOdered and Cloudant database.		
3. Retrieve the sensor values form Cloudant database and generate the bill for each house.		

## **Literature Survey**

#### 2.1 Related Work

Nowadays, one of the most serious challenges to solving is to manage water shortages. Current water management ICT systems are supported by equipment of specific vendors without considering any interchangeable value. The lack of quality of the producer's water ICT tools prevents proper monitoring and control, which reduces water distribution and cost, system maintenance and improvements and detection of a failure. This paper making a decision that the decisionmaking system resolves decision-making and a smart water management model that combines the Internet of Things Technology for monitoring business processes and for subsistence implementation. The proposed Smart Water Management model makes devices of specific vendors manageable in an interactive and manageable manner in a water management domain in an individual way. (IEEE Xplore, 2014). In the last decade, water demand has increased in India. The rising demand for water supply has become a big challenge for the world. The use of water, climate change and misuse of the city also reduced resources. Reservations and management of resources are of great importance. In this paper, we present an IOT design for water monitoring and control systems that support Internet-based data collection on a real-time basis. This system deals with new challenges in the water sector - the need to conduct a water supply survey to measure the flow rate and to control water conservation and encourage its conservation. We also measure the quality of water distributed by each family by establishing ph and conductive sensors. It is uncomfortable and often effective for periodic human intervention to maintain for the traditional water measuring system. The lack of existing models for wireless access to wireless systems and wireless data communication for monitoring smart quality. (International Journal of Advanced Research, Innovation in Ideas and Technology, 2017). Water management is considered the best way to plan, develop, distribute and manage water resources. It affects people's life, food production, water consumption, irrigation, nutrition, energy generation, and various important issues. Based on this quality they offer smart processing models that combine business processes with Internet Things technologies. Decision Support System We provide an architecture for details of sub-system interaction and physical scene detailing that we will examine our implementation, especially the vendors' vendor's tools are manageable and can be interactive, in the special context of the water management process. There are various important issues of living and water management impact on different situations like cities, natural areas, agriculture etc. Some tasks focus on the lack of ICT services and tools for water management, which will enable policy revision and reuse of the information available to the organization. Observation. (Raman Alcariya, 2016). In this proposed system contribute towards water management system, this proposed system use IoT based automated system for controlling and monitoring of water management systems. This proposed system implements our system in highly populated residential buildings like hotels, lodge, student hostels, dormitory, apartments, shopping malls etc. in our system a complete survey of the usage of every individual rooms will be taken, based on the needs amount of water is presented for their rooms. The details of consumption of water and bill will be generated for each house on web-pages. The ultimate aim is to save water for future generation, so our system will greatly helpful in water conservation for future generation[3].

#### 2.2 Existing System

The existing system contains hardware for each house and gives the reading how much water consumed by the each house. Then a person visit the house generate the bill. In this system, as an authority facing lot of challenges of generating the billing for each individual house. Because its simple embedded system contains some hardware and processing the information based on senors data. However, this system fails connect to the cloud mean to say to store the sensor data on every desired time base and calculate the bill on usage of water., Suppose this system connects Cloud then task is simple and takes less time for generating the billing for large communities like metro cities.

#### List of issues faced by the Existing Water Management System:

- Difficult to collect the data from each house segment monthly-wise.
- More laborious needed.
- Cost of analysis is very high.
- Some times results may not reflects to real time water usage by the each house.
- The process is time consuming due to slow process of manual data collection from different locations of the water body.
- The method is prone to human errors of various forms.

### 2.3 Proposed System

The proposed system implemented using IoT based water management and monitoring system. Nowadays, most of the authorities in urban or metro cities facing to control the consumption of water by each house. There is no exact solution to resolve this issue. But, with rapid advancement in Internet of Things(IoT), this issue will be tackled an easy way. This project design of a prototype system for real-time monitoring of water quantity using the Internet of things. First, collected the water consumed by each house and then generate the bill based on their utility. Here, using IBM Watson Studio design the solution to this problem.

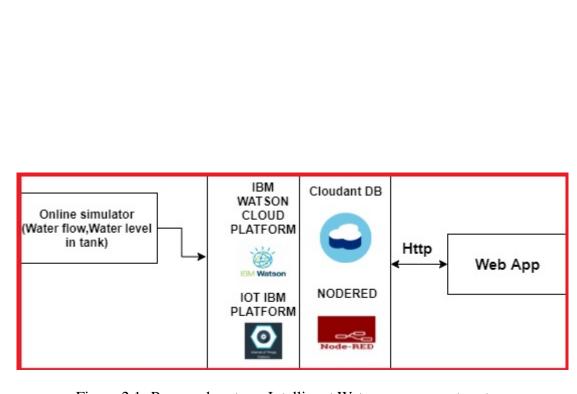


Figure 2.1: Proposed system: Intelligent Water management system

## **Theoretical Analysis**

#### 3.1 Introduction

By using water monitoring system, we avoid the water wastage, power consumption and easily prevent the water for our generation. Water monitoring day was established in 2003 by America's clean water foundation as a global educational outreach program that aims to build public awareness and involvement in protecting water resources around the world. world water monitoring day is celebrated on September 18. Tank Water Level Monitoring, is used to avoid overflowing and intimate level of water in the tank. Water controlling system implementation makes potential significance in home applications. The existing automated method of level detection is described and that can be used to make a device on/off. Moreover, the common method of level control for home appliance is simply to start the feed pump at a low level and allow it to run until a higher water level is reached in the water tank. This is not properly supported for adequate controlling system. Besides this, liquid level control systems are widely used for monitoring of liquid levels, reservoirs, silos, and dams etc.

## 3.2 SYSTEM ARCHITECTURE OF WATER MONITOR-ING SYSTEM

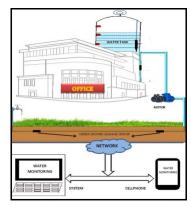


Fig-1: Architecture Of Water Monitoring

Figure 3.1: System architecture for Monitoring system

In Fig depicts, defines the overall architecture of water monitoring system. Actually this system represents the real hardware for this problem. But in this work, design the system using IBM Watson Studio with the help NodeRed. In this simulation work, the sensors get the random values and stored in the CluodantdB database. From that database every one minute store the sensor data into the database. Then calculate the and generate the bill for monthly for each house segment.

#### 3.3 Software Designing Methodology

- 1. Main tank water level and Water flow to individual houses is continuously updated to IBM IoT platform (Use Online simulator sensor for water flow and water level)
- 2. Create a Node-RED flow to get the data from IBM IoT platform and store it in cloudant DB.
- 3. Display the tank water level in the UI
- 4. Retrieve the flowrate of individual houses and generate bills and display them in UI.

### 3.4 Design Flow

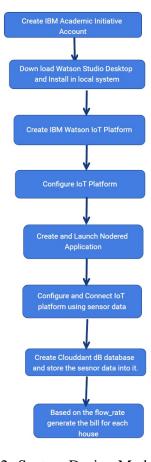


Figure 3.2: System Design Methodology

# **Design Results**

1. Step1: Created IBM academic initiative account and installed IBM Watson Studio in the local system.

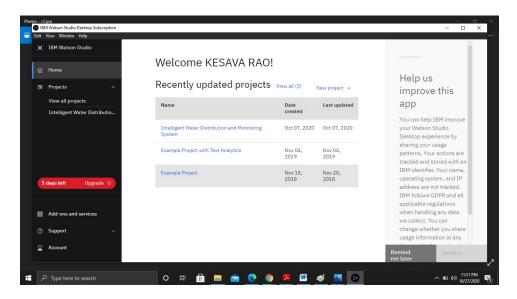


Figure 4.1: IBM Watson Studio in Local desktop system

2. **Step2:** Open cloud.ibm.com and sign in for create the project.

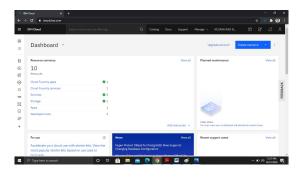


Figure 4.2: Signing on cloud.ibm.com for project creation

3. Step3: Create the IBM IOT Watson platform for reading the sensor data

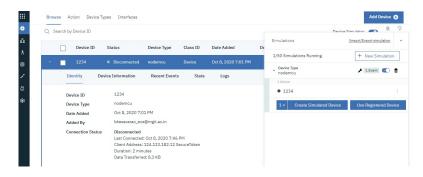


Figure 4.3: IBM IoT Watson Platform

4. **Step4:** Create the Node Red for web application development.

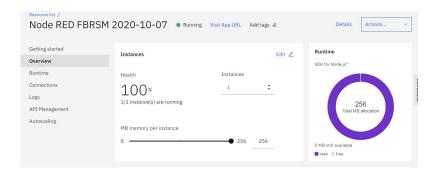


Figure 4.4: Node Red Application for Web page development

5. **Step5:** In the Node Red create the flow and read the simulation data.

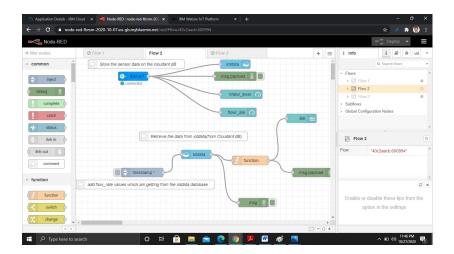


Figure 4.5: Read the sensor simulation data using Nodered Editor flow

6. **Step5:** Create the database in Clodant dB with the name of iotdata and store all the simulated data on to it. Using Node Red read the data from database and display on the Node Red work flow.

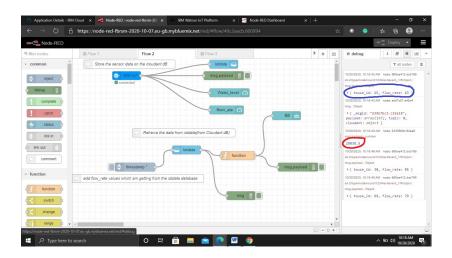


Figure 4.6: Node-Red Work flow

7. **Step6:** The same can be obeserved in web-page using this node-red link.



Figure 4.7: Web-application for Water Management System

So, finally read the sensor data from tank level and generate the consumption of water for each house segment.

# Advantages, Disadvantages and Applications

#### 5.1 Advantages

- 1. **Cost-Efficient:** With the emergence of low-cost, low energy consuming sensors in IoT Water, assets can be connected to one another and can be monitored in real-time, even in the remote areas. Tracking the health of assets like a pipeline, pumps etc. has become easy and also it became easy to know that where and which asset in the complete water management system needs maintenance or replacement well before time by sending alerts.
- 2. **Preventive Maintenance:** It is better to be preventive than reactive, IoT Water helps in the preventive maintenance of the pipes-whether they are above the ground or below the ground. A huge amount of data is collected from the sensors and then communicated to the cloud, further is is sent to the respective administrator to act before any disruption occurs.
- 3. Increased productivity and efficiency: The smart business decisions and real-time control by adopting IoT Water, have reduced the operational cost and optimized the processes and resources. Undoubtedly, IoT Water has expanded many business models and has generated newbies too, hence generating more profits day by day. Not only this, but many water management companies use real-time operational control system which increases the efficiency.
- 4. **Improvement in safety and reliability of network operations:** Few of the system maintenance studies claim that maintenance activities are carried out very frequently in water management system and among those around 45 percent of total effort is ineffective and may lead to asset failure.IoT Water has a unique feature of predictive maintenance which fetches the data from the sensors and predict when an asset is going to need maintenance to eliminate the breakdown by approx.
- 5. **Reduce wasting water** used in high volumes in such areas as manufacturing, agriculture, power production. It implies the introduction of high-tech practices like precision farming, smart irrigation and real-time water metering. Learn about our agriculture software development services.

6. **Practice consumption monitoring** to optimize and keep under control the usage of water resources at different levels — in a household, industry, the country or the whole planet.

## 5.2 Disadvantages

- 1. The additional cost to train personal, develop equipment, and implement new processes for data storage.
- 2. Making a long-term financial commitment to new hardware/software.
- 3. Ensuring the security and privacy of metering data.
- 4. Requires more cloud data storage which more expensive.

## 5.3 Applications

- Smart Cities
- Smart irrigation
- Detect and fix wasteful leaks with flow monitoring.
- Water Bodies: Improve revenue and efficiency
- Industrial and domestic applications.

## **Conclusion and Future Scope**

### **6.1** Conclusion and Future Scope

Earlier conventional techniques of conservation were used to conserve water but the right apparatus leveraging IoT technology is the reply to get water conservation to a new level. Hence, this project gives the new direction of management of water monitoring in smarter way.IoT technology will enable smart water meters, detectors, and irrigation methods to be deployed in home, farms, and water distribution systems. Unlike other development environment, this IBM IoT Watson platform gives more reliable, privacy and performance. Finally, in this project measure the water level in the tank and at the same time calculate the consumption of water by each house segment, mean to say generation of bill. So, this type of water management systems more useful in the present applications ike Smart Cities, Smart Irrigation and Smart Industry etc. This proposed system designed a system for conserving the water resource. Our system consists of systematic control using various devices. The quantity of water consumption can be obtained by flow sensor and if the given limit is consumed by the user the solenoid valve will get closed and water will not be supplied. So, by this method the user will get aware about water usage and conservation will be done by every user. Highly populated residential buildings like student hostels, apartments. The demand for advanced solutions to enable more efficient utilization of water sources, enhance drinking water quality, and enhance water resource planning is increasing and the IoT came as a disruption in the water management. The implementation is done for few tanks and in future it can be extended to all houses in a city and the data collected can be used for further analytics like consumption forecasting, water leakage detection and pipeline maintaining etc.

## References

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