Automated and Decentralized Blockchain Water Level Audit System

[1*]Mr.Mruthyunjayam , Dr. G. Jawaherlal Nehru[2] , Mr.D.Srinivas[3],[*]Dr.T.Poongothai[4], Dr.M. Narayanan[5]

[2,4,5]*Associate Professor, Dept Of CSE ,*
St.Martin's Engineering College, Dulapally, Kompally, Secunderabad, Telangana.

[1,3]*Assistant Professor, Dept Of CSE ,*
*GokarajuRangarraju Institute of Engineering and Technology,*Nizampet Rd, Kukatpally,*Hyderabad, Telangana.*

Abstract-This work proposes an IoT and Blockchain based, distributed system, for automated measuring and monitoring of water level in environments such as lakes, rivers, and oceans. The proposed water level audit system here is designed to be fully decentralized by using the Ethereum Block Chain to store and retrieve the data recorded by IoT sensors. Thus, data integrity is provided without the need for a Trusted Third Party (TTP) and data is collected and captured automatically without any manual operations needed.

Keywords—Internet of Things, Block Chain, Ethereum Block Chain, Data Integrity

I. INTRODUCTION

Due to exploitation of water resources and speeding of climate change due to human activities, water becoming a luxury these days and keeping tab on water consumption is a necessity now. We know that water conservation starts from a family and a person in a family can easily track their water consumption either by observing day-to-day activities or checking water level of their overhead tank every day. It is a human nature to get inert sometimes or many times and one could manipulate the readings and could push the idea of water consumption of an area in wrong direction and this could alsodelay the water supply because the actual water level could vary significantly from the manipulated readings which could lead to unexpected shutdown of water supply.

By installing IoT based water level monitoring systems in all the important municipal water tanks the local government can know the level of water in real time and they can fill the tank on time and also can understand the consumption of water in the area. IoT based water level monitoring system can also be installed on individual houses / apartments so that one can check water level of their tank in real timefrom
their own comfort and track their consumption overtime along with the particular time and month.

TaditionalIoT [12] systems are dependent on a centralized architecture. Information is sent from the device to the cloud where the data is processed using analytics and then sent back to the IoT devices. With billions of devices set to join IoT networks in the coming years, this type of centralized system has verylimited scalability, exposes billions of weak points that compromise network security and will become incredibly expensive and slow if third-parties have to constantly check and authenticate each and every micro-transaction between devices.

Smart contracts in blockchain networks [13][14] will allow devices to function securely and autonomously by creating agreements that are only executed upon completion of specific requirements. It not only allows for greater automation, scalability and cheaper transfers (no third party needed to oversee transactions) but these smart contracts can also prevent overrides by individuals that want to use the data for their own benefit. Information is shared across a decentralized, cryptographically secured network, meaning it becomes very difficult to compromise the network security.

MOTIVATION

OVERVIEW OF EXISTING SYSTEM Measuring and monitoring solutions are based
on applications which, require directhuman interaction

and they are designed based on centralized architectures which, mandate users to communicate with a central entities for storing and retrieving data as known as, Trusted Third Parties (TTP).

Drawbacks of existing system

• Implementation cost
• high space requirements
• mobility
• human-interaction dependence
• centralization
• high power consumption
• lack of public access

OVERVIEW OF PROPOSED SYSTEM Whenever

the water level rises or decreases
and comes in contact of any sensor, a LCD is provided to inform the user about the status of the water level in the tank.To solve the problem of single point of failure (centralization) a blockchain-based solution is proposed which, automatically integrates the data received from IoT sensors into the EthereumBlockchain (BC) [13][14]. Blockchain provides solutions for storing back-linked blocks of data in a decentralized and distributed fashion. For the first time, by using Blockchain-based applications, trust to validity of stored data without the need for a centralized authority became possible. Also, the data in Blockchain is publicly accessible.As Block chains can be publicly accessible, anyone will be able to check the information from the website and the data once stored into it cannot be altered.

Advantages of proposed system

• Accelerated Data Exchange
• Lower cost
• Improved security
• Streamlines Accounting

II. LITERATURE SURVEY

A. “Water Auditing Using IoT”[1][2][3][4]

Internet of things (IoT) [12] becomes a very useful tool in order to connect the things and save the data in the Cloud so that the data can be viewed anytime, anyplace with the help of an internet. IoT can be used in almost in any field whether it is medical or in some other field also. Water is the most important element on the earth. The concept of IoT can be extended in order to find out the amount of water usage. All Water systems lose some amount of Water for a variety of reasons. Water auditing is an emerging method of increasing accountability for water utility systems. It is a tool to overcome drought related problem, shortage, leakage and losses. In this paper we present an application of IoT in order to measure the amount of water used. Our system will provide a breakdown of how, when and where the water is used. This will help to reduce the wastage of the water and also to avoid the unnecessary usage of the water. The system will lead to Proper

Management of Water distribution so that the water wastage must be restricted.

B. “ Water Level Indicator With Alarm” [7][10]

Here is a simple, versatile circuit which indicates the level of water in a tank. This circuit produces alarm when water level is below the lowest levelL1 and also when water just touches the highest level L12. The circuit is designed to display 12 different levels. However, these display levels can be increased or decreased depending upon the level resolution required. This can be done by increasing or decreasing the number of level detector metal strips (L1 to L12) and their associated components. In the circuit, diodesD1, D2 and D13 form half-wave rectifiers. The rectified output is filtered using capacitors C1 through C3 respectively. Initially, when water level is below strip L1, the mains supply frequency oscillations are not transferred to diode D1. Thus its output is low and LED1 does not glow. Also, since base voltage of transistor T1 is low, it is in cut-off state and its collector voltage is high, which enables tone generating IC1 (UM66) and alarm is sounded. When water just touches level detector strip L1, the supply frequency oscillations are transferred to diode D1. It rectifies the supply voltage and a positive DC voltage develops across capacitor C1, which lights up LED1. At the same time base voltage for transistor T1 becomes high, which makes it forward biased and its collector voltage falls to near-ground potential. This disables 5
IC1 (UM66) and alarm cannot be sounded. Depending upon quantity of water present in the tank,

corresponding level indicating LEDs glow. It thus displays intermediate water levels in the tank in bar-graph style. When water in the tank just touches the highest level detector stripL12, the DC voltage is developed across capacitor C2. This enables tone generating IC1 (UM66) and alarm is again sounded.

C. "Design and Implementation of an Automated and Decentralized Pollution Monitoring System with Blockchains, Smart Contracts, and LoRaWAN" [6][11]

This work proposes an IoT- and Blockchain-based, distributed system, for automated measuring, storing, and monitoring of water and air quality in environments such as lakes, mountains, urban areas, or factories. Comparable state-of-the-art solutions, require human interaction to access the data or require high power consumption or space requirements, or they are based on centralized architectures. The proposed pollution monitoring system here, on one hand, employs LoRa[11] to address the high power consumption and long-range transmission challenges of IoT protocols. On the other hand, it is designed to be fully decentralized by using the EthereumBlockchain to store and retrieve the data recorded by IoT sensors. Thus, data integrity is provided without the need for a Trusted Third Party (TTP) and data is collected and captured automatically without any manual operations needed. Observations on the four different types of sensors for measuring Potential Hydrogen (PH), Turbidity, Carbon monoxide (CO), and Carbon dioxide (CO_2), revealed a high accuracy with the expected time-lines of measurements, non-falsified experimental values collected and can be used as reliable evidence of presence of pollution.

III. SYSTEM ARCHITECTURE

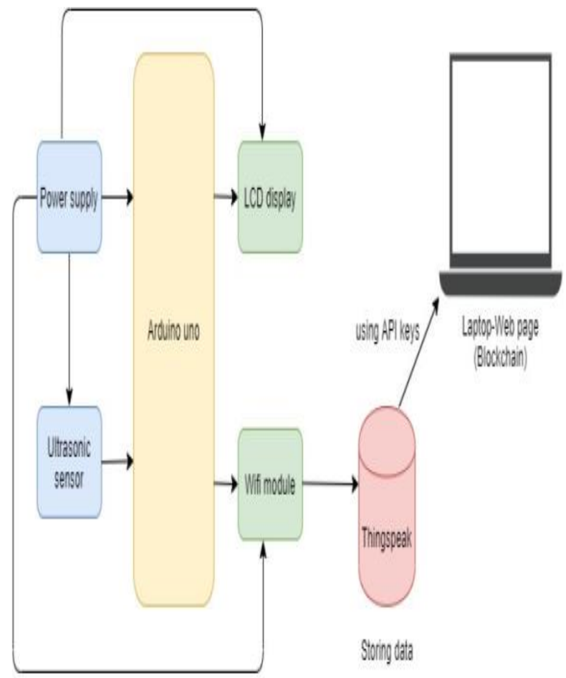

Fig. 3.1 Architecture Diagram

By seeing the implementation of the system we can explain the step of sending the data to the cloud. We consider the water tank filled with water, on the top of the tank we place the pressure sensor which measures the pressure present in the tank or the level of the tank. In the outlet of the tank water flow sensor is present which measures the flow rate of the water. The two sensors are connected to the microcontroller i.e. arduino board which carries out the processing task. In order to send the sensor data to the cloud we require a Wi-Fi module without which we are not able to send the data to the cloud. Once the data is send to the cloud we are able to see the water flow from anywhere no need to present physically near the system. We are monitoring the water flow with the help of a laptop. In this way we are able to see how much water is present in the tank and from that how much is flow to the other tank remotely.

IV IMPLEMENTATION

The main objective of our project is to measure water level in dams and rivers using sensors, which will store data using WIFI module in thingspeak, and we retrieve information of water level and store that information in the Ethereumblockchain[13][14] using API keys

We will create a website where anyone can know the information about water storage levels in the rivers and dams and by this people will know how much water they are using day-by-day.

By storing information in Ethereumblockchain no can modify the information and there is no need of central authority(Trusted third party).

Working of water audit system:

1) Initially, the ultrasonic sensor is fixed to any dams as it difficult for us we will use a water filled bottle.

2) The kit is powered up when connected to electricity.

3) When the sensor senses the distance from sensor to water it notes the distance and that distance is considered as input and the process starts.

4) Then the input is sent Arduino [17][18] where the it displays the data.

5) Through the WIFI module the data is sent to thingspeak.

6) Here we use API keys and sent the information present in thingspeak to Ethereumblockchain.

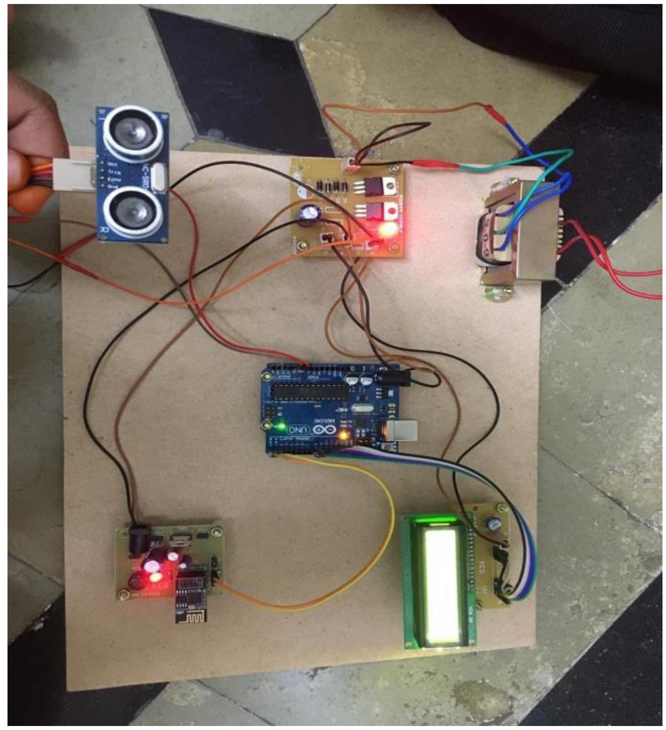

Fig: 4.1 water level audit kit

Fig: 4.2 Displaying water level in LCD

Fig 4.3 Sending data to thingspeak

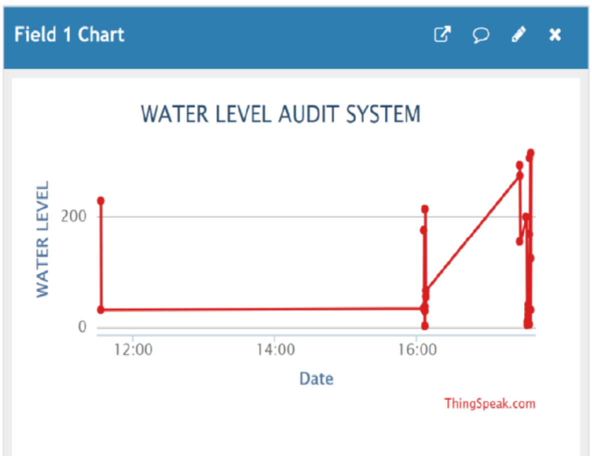

Fig 4.4 Water level graph in thingspeak

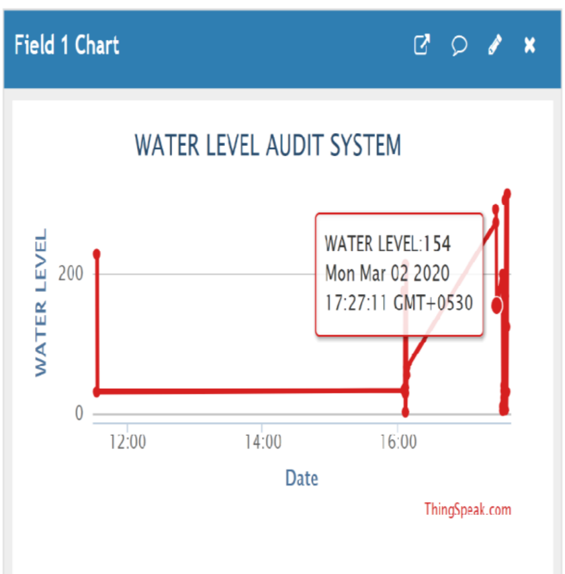

Fig 4.5 Displaying details of water level and time

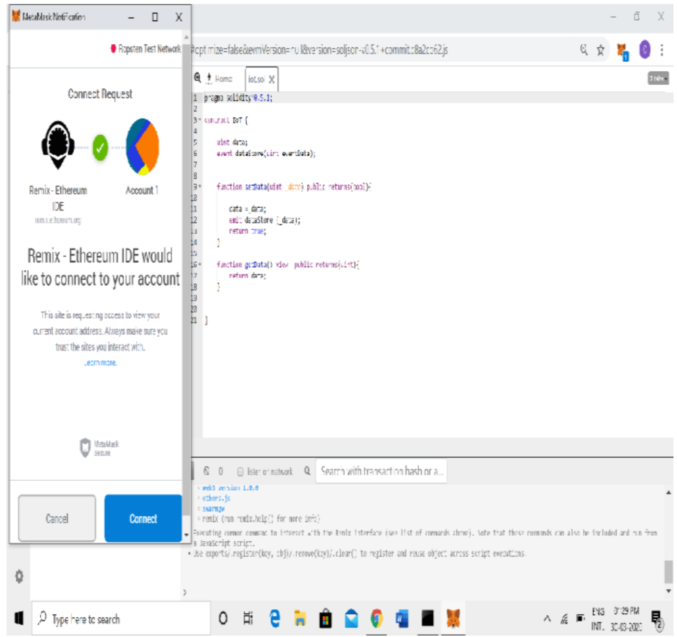

Fig 4.6 Connecting to metamask

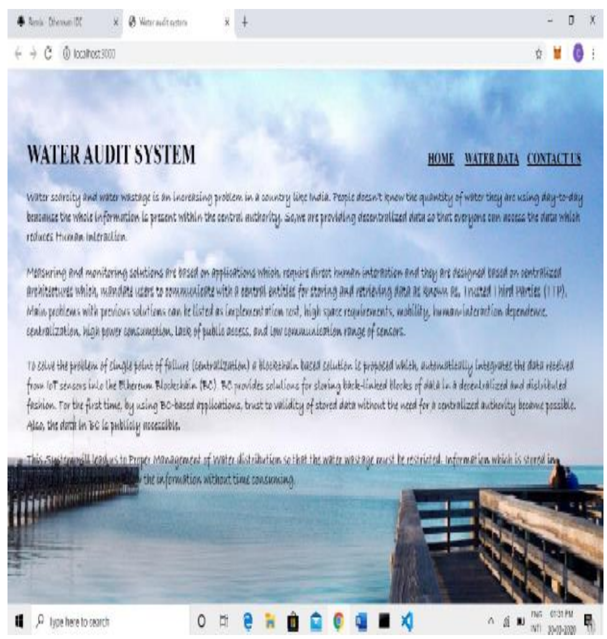

Fig 4.7 Webpage

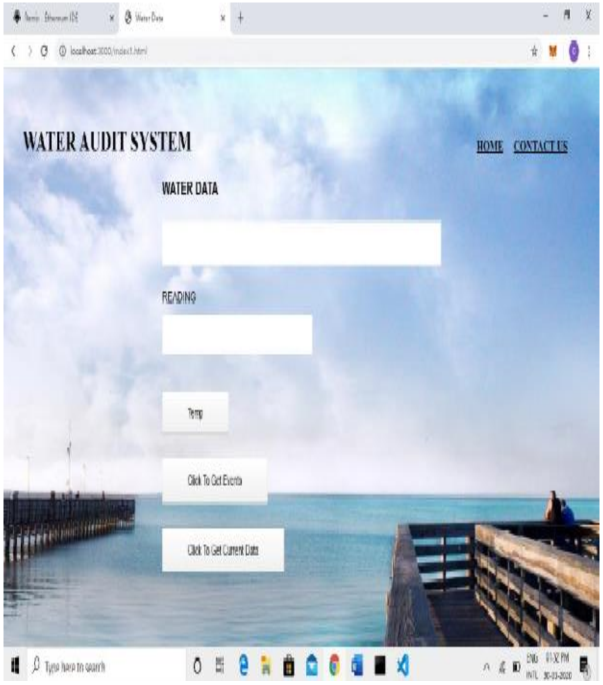

Fig 4.8 . Water data page

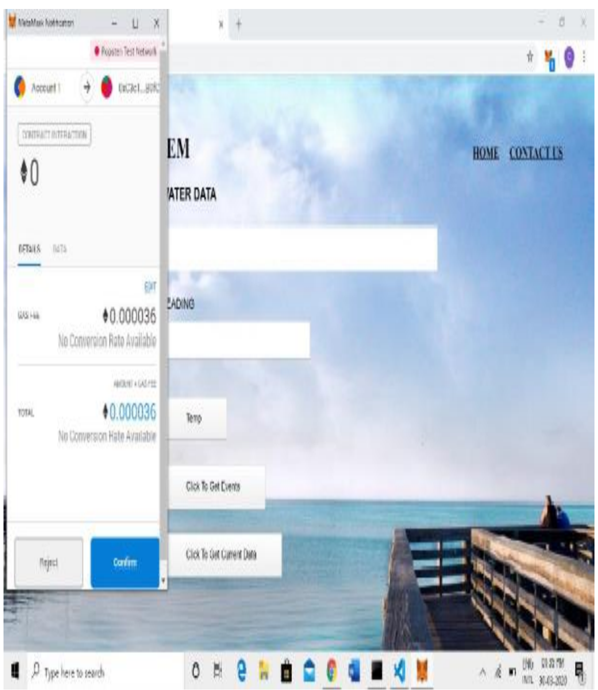

Fig 4.9 Transaction to connect and receive data from thingspeak

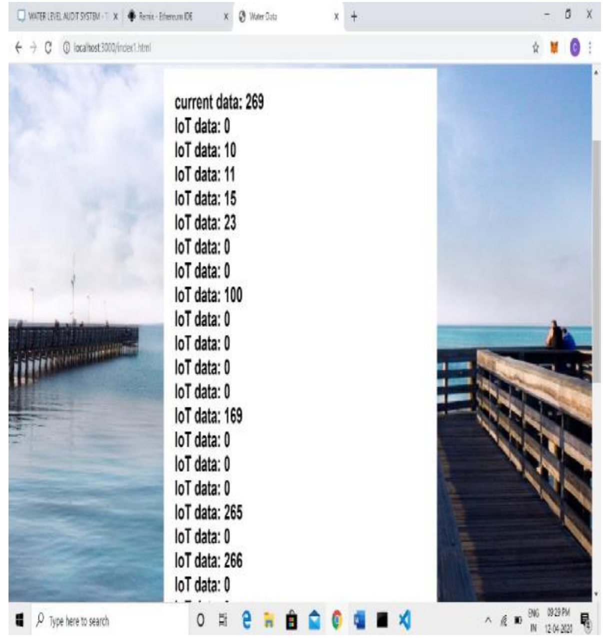

Fig 4.10 Displaying Water level distance

V. CONCLUSION

In this Paper, a power-efficient, automated, and decentralized IoT and Blockchain-based water monitoring system is introduced, which on the one hand, leverages the unique nature of Blockchain by providing tamper resistant decentralized and trustable distributed systems and there is no requirement of human labourer for monitoring the level.As water plays a vital role in the life of every human being so it is also necessary to conserve the water.

It will lead to Proper Management of Water distribution so that the water wastage must be restricted and generates more precise and accurate results. So in future the calculation can be upgraded to increase the number of water tanks, it can be extended to keep the record of water use in the society. Also, operation execution time is less. Because of its cost efficiency this system can be installed in various rural areas where the water problems are on a rise. Therefore, for these purposes our proposed system is very important.

VI.REFERENCES

1. Rathi Dinesh (2005), " Water audit in National scenario " National conference on water management conservation and R.A. Ganorkara* et al.

/ (IJAEST) INTERNATIONAL JOURNAL OF ADVANCED ENGINEERING SCIENCES AND TECHNOLOGIES Vol No. 8, Issue No. 1, 039 -048

2. Amola.Kulkarni, Avinash A. Patil, Balasaheb b. Patil (2014), "Water audit: a case study of water suppy scheme of Shrivardhan", Journal of computing technologies (2278 – 3814), vol. 3, issue 6, pp-5-11.

3. R. A. Ganorkar and Isha.P. Khedikar (2011), "Water audit", International journal of advanced engineering sciences and technologies, vol. No. 8, issue no.1

4. R.A.Ganorkar, P.I.Rode, S.A Deshmukh, Dr.R.M.Dhoble, (2013), "Water Audit- A Tool for Assessment Of Water Losses", International Journal Of Computational Engineering Research, Vol. 3 Issue.3, pp-252-256.

5. R. R. Dighade, M. S. Kadu, A.M.Pande, (2014), "Challenges in Water Loss Management of Water Distribution Systems in Developing Countries", International Journal of Innovative Research in Science, Engineering and Technology, Vol. 3, Issue 6, pp-13838-13846.

6. Design and Implementation of an Automated and Decentralized Pollution Monitoring System with Blockchains, Smart Contracts, and LoRaWANSinaRafatiNiya, Sanjiv S. Jha, Thomas Bocek, Burkhard Stiller Communication Systems Group CSG@IfI, University of Zurich Binzmuhlestrasse 14, CH-8050 Zurich, Switzerland.

7. S.M.Khaled Reza, Shah Ahsanuzzaman, S.M. Mohsin Reza, "Microcontroller Based Automated Water Level Sensing and Controlling: Design and Implementation Issue", WCECS 2010, October 20-22, 2010, pp 220-224.

8. George Suciu, Adela Vintea, Stefan CiprianArseni, Cristina Burca, Victor "Challenges and Solutions for Advanced Sensing of Water Infrastructures in Urban Environments", 2015 IEEE SIITME , 22-25 Oct 2015, pp 349-352.

9. Samarth Viswanath, Marco Belcastro, John Barton, Brendan O'Flynn, Nicholas Holmes, Paul Dixon, "Low-power wireless liquid monitoring system using ultrasonic sensors", IJSSIS, Vol 8, NO.1, March 2015, pp 28-44.

10. Asaad Ahmed Mohammed ahmed Eltaieb1, Zhang Jian Min2 . "Automatic Water Level Control System", International Journal of Science and Research (IJSR) ISSN (Online): 2319-7064.

11. lora-alliance. (2017). lora-alliance. [online] Available at: https://www.lora-alliance.org/technology [Accessed 1 Dec. 2017].

12. En.wikipedia.org. (2017). NarrowBand IOT. [online] Available at: https://en.wikipedia.org/wiki/NarrowBand_IOT [Accessed 1 Dec. 2017]. 67

13. https://www.ethereum.org/

14.https://en.wikipedia.org/wiki/Ethereum

15.https://remix.readthedocs.io/en/latest/

16.https://solidity.readthedocs.io/en/v0.5.6/

17. Arduino: The Complete Beginner's Guide, CreateSpace Independent Publishing Platform.

18.Getting Started with Arduino UNO, https://www.arduino.cc/en/Guide/ArduinoUno