# IoT Based River Water Quality Monitoring System Using IBM Watson

## 1.INTRODUCTION:

### a.Overview

Water is unique in its role as a life preserver. It is important to all members of a society.Water affects all stakeholders in a society due to its unique role as a life preserver. Apart from drinking, some of the other common activities that require water are domestic, agricultural, industrial and construction activites with different levels of acceptable water standards.So it is important for us to know the quality of water.

Current water quality monitoring system is a manual system with a monotonous process and is very time-consuming. This paper proposes a sensor-based water quality monitoring system. The main components of Wireless Sensor Network (WSN) include a microcontroller for processing the system, communication system for inter and intra node communication and several sensors. Real-time data access can be done by using remote monitoring and Internet of Things (IoT) technology. Here in this project Using IBM cloud,NODERED,MIT APP INVENTOR the following features are done:

***River water quality can be monitored by the web application.**

***Can be able to know if there are any dust particles present in the water.**

***The PH level of the water can be monitored.**

***Water temperature can be monitored.**

***Alerting the authorities if the water quality is not good so that they can go and announce the localities not to drink that water.**

### b.Purpose

Pollution of water in India's rivers is a cause of major concern. A case in point is the largest river in India, Ganga, which is about 2525 km long. Its basin has an area of approximately 861,404 square km making it roughly one-fourth the size of the country. The water of Ganga and its numerous tributaries is used by over 400 million people, which is roughly one-third of India's population and about that of the United States. Unfortunately, the state of Ganga is quite poor [2] despite years of efforts spent in monitoring water quality monitoring and its reporting.To overcome this problem and to update the technology in a smart way using IOT.

## 2.LITERATURE SURVEY:

### a.Existing problem

The environment around consists of five key elements e.g., soil, water, climate, natural vegetation, and landforms. Among these water is the utmost crucial element for human life. It is also vital for the persistence of other living habitats [1]. Whether it is used for drinking, domestic use, and food production or recreational purposes, safe and readily available water is the need for public health [2]. 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 [3]. Water pollution is a foremost global problem which needs ongoing evaluation and adaptation of water resource directorial principle at the levels of international down to individual wells. It has been studied that water pollution is the leading cause of mortalities and diseases worldwide. The records show that more than 14,000 people die daily worldwide due to water pollution. In many developing countries, dirty or contaminated water is being used for drinking without any proper prior treatment. One of the reasons for this happening is the ignorance of public and administration and the lack of water quality monitoring system which makes serious health .

### b.Proposed solution

The main aim is to develop a system for continuous monitoring of river water quality at remote places using wireless sensor networks with low power consumption, low-cost and high detection accuracy. pH, conductivity, turbidity level, etc. are the limits that are analyzed to improve the water quality. Following are the aims of idea implementation (a) To measure water parameters such as pH, dissolved oxygen, turbidity, conductivity, etc. using available sensors at a remote place. (b) To assemble data from various sensor nodes and send it to the base station by the wireless channel. (c) To simulate and evaluate quality parameters for quality control. (d) To send SMS to an authorized person routinely when water quality detected does not match the preset standards, so that, necessary actions can be taken.The following steps can be satisfied:

*River water quality can be monitored by the web application.

*Can be able to know if there are any dust particles present in the water.

*The PH level of the water can be monitored.

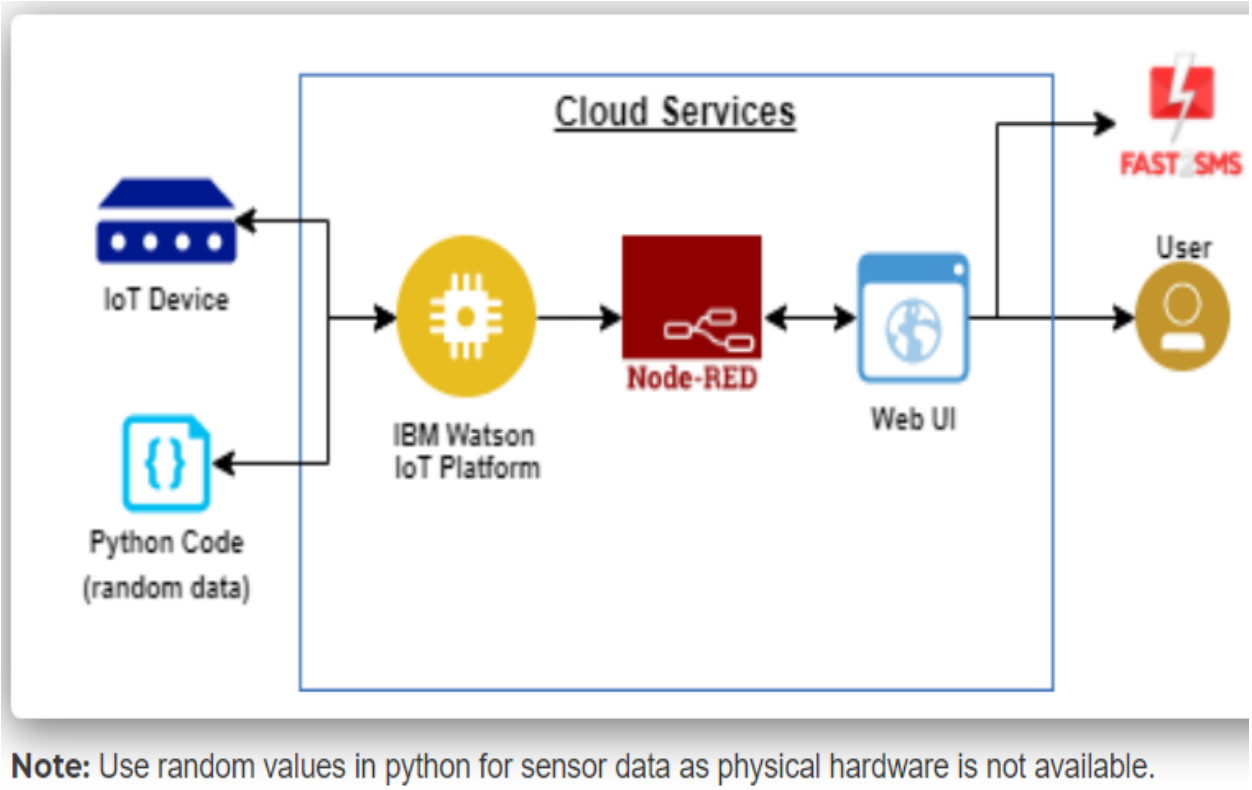
*Water temperature can be monitored.

*Alerting the authorities if the water quality is not good so that they can go and announce the

localities not to drink that water.

## 3.THEORITICAL ANALYSIS:

### a.Block Diagram




**Note:** Use random values in python for sensor data as physical hardware is not available.

### b.Hardware/Software Designing:

As **Hardware** is not available I have taken random values in python for sensor data as physical hardware is not available.

Coming to **Software,**The designed River water quality monitoring system can be divided into:

•IBM WATSON IOT PLATFORM
• NODERED
• MIT APP INVENTOR
• WEB UI AND HTTP REQUESTS
• FAST2SMS

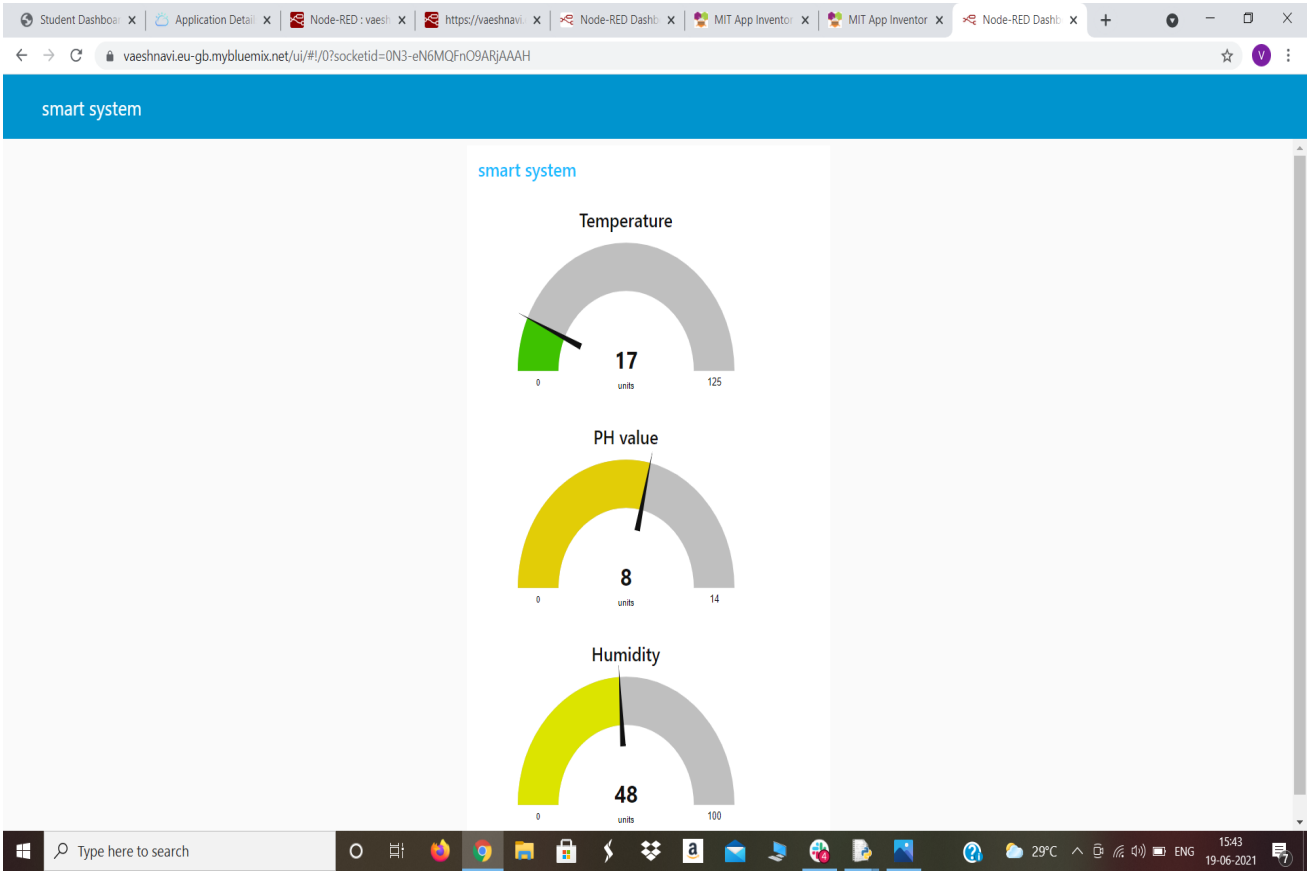
First we have to create an account in IBM cloud,then a device is to be created.using the device credentials in the python code we have take some random values as Hardware is not avaialble.Using different nodes in NODERED,a flow is created and connected to IBM platform.using the url we can get data and pictorial representation by appending /data and /ui

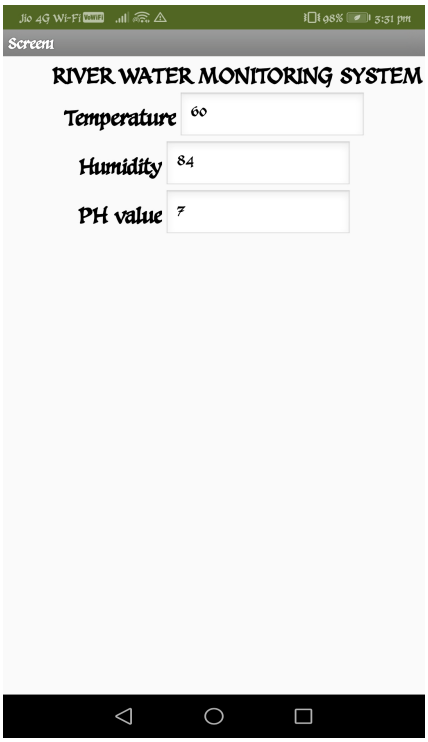
respectively to the url in new page.This is further extende to mobile application use by using MIT APP INVENTOR.A design and blocks are created according to the use.In order generste message to the agent FAST2SMS app is created.This completes the software along with hardware of the project.

**4.EXPERIMENTAL INVESTIGATION:**

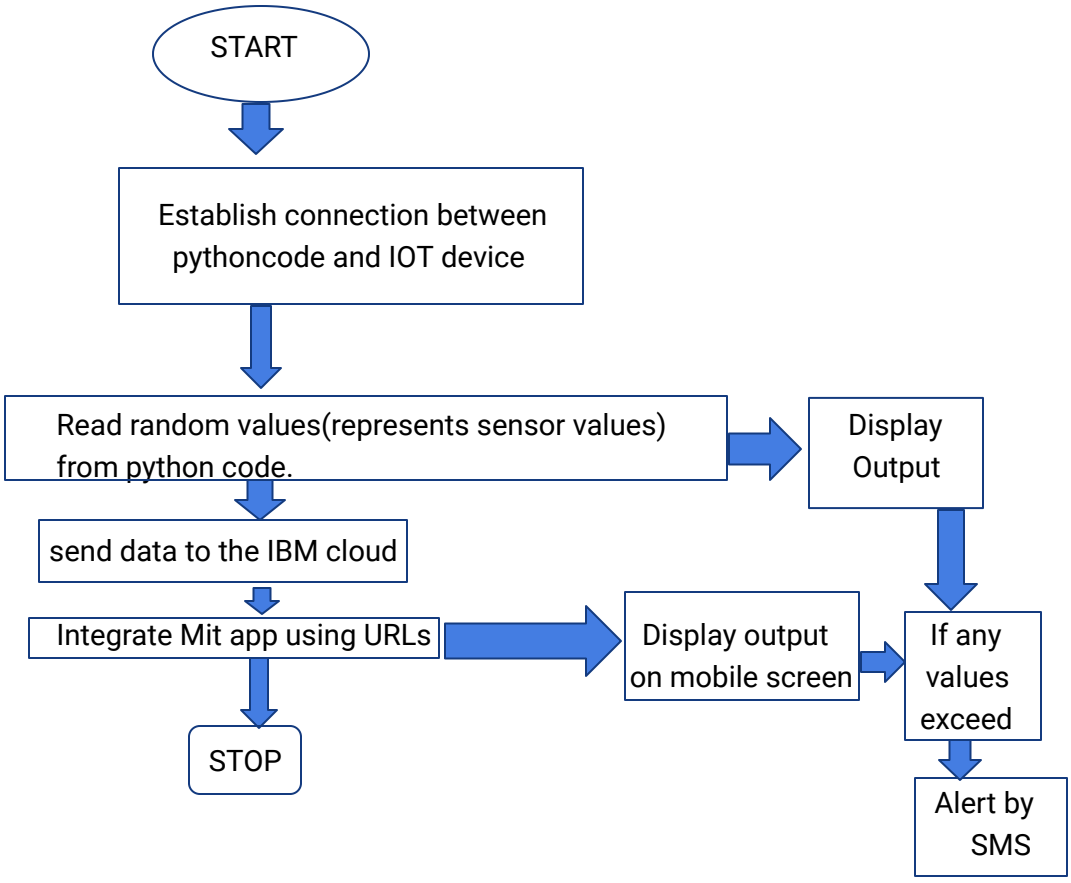
Three parameters namely pH, Humidity, Temperature and water level are measured using the experimental setup. The setup(Python code) is connected to the IBM watson Iot platform. The measured results are compared with drinking water quality standards.

The graphical representations and getting uoput in the mobile app are the main chalalnges in the experimental process.this can be done using url in the node red flow and blocks in the mit app.



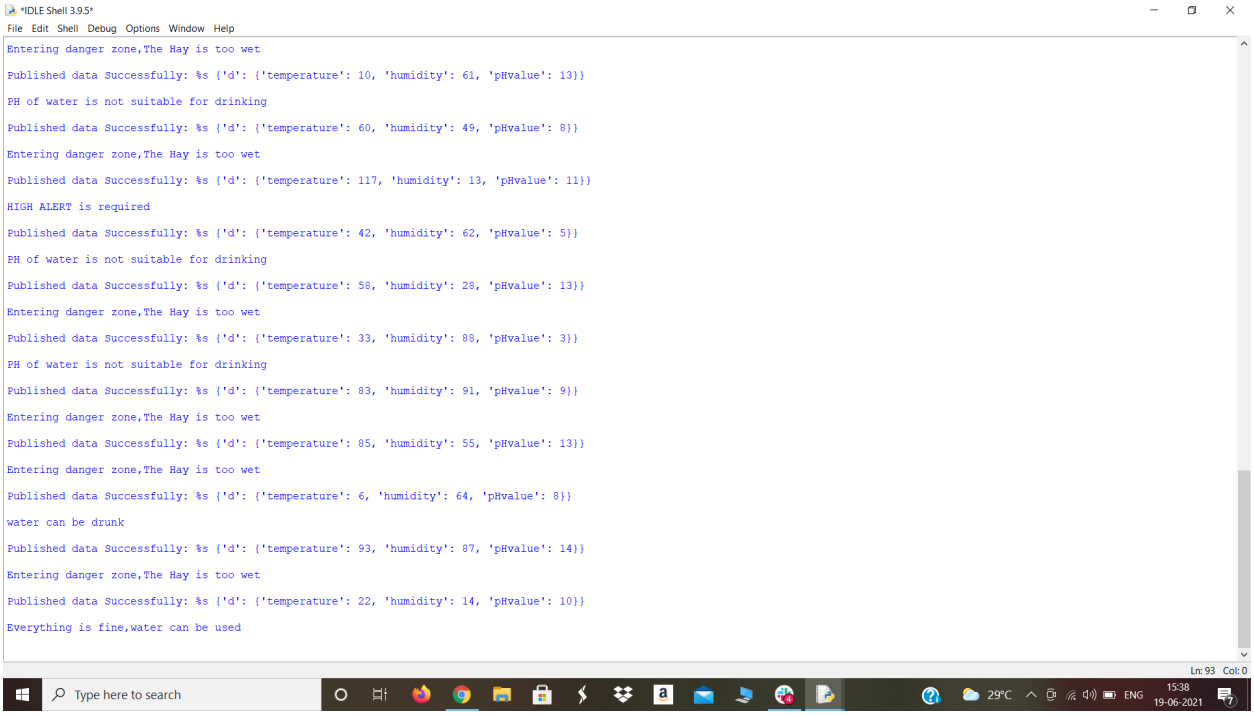

Screen
RIVER WATER MONITORING SYSTEM
Temperature
60
Humidity
84
PH value
7

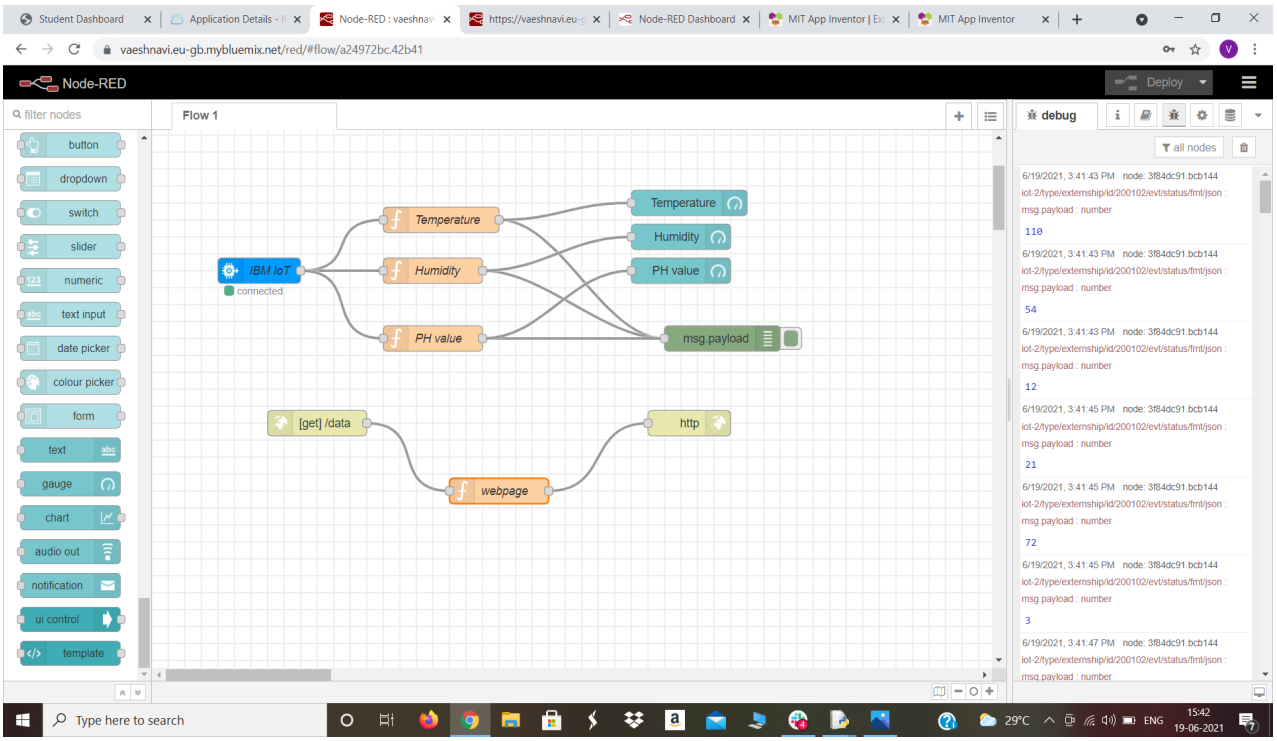
**5.FLOWCHART**:

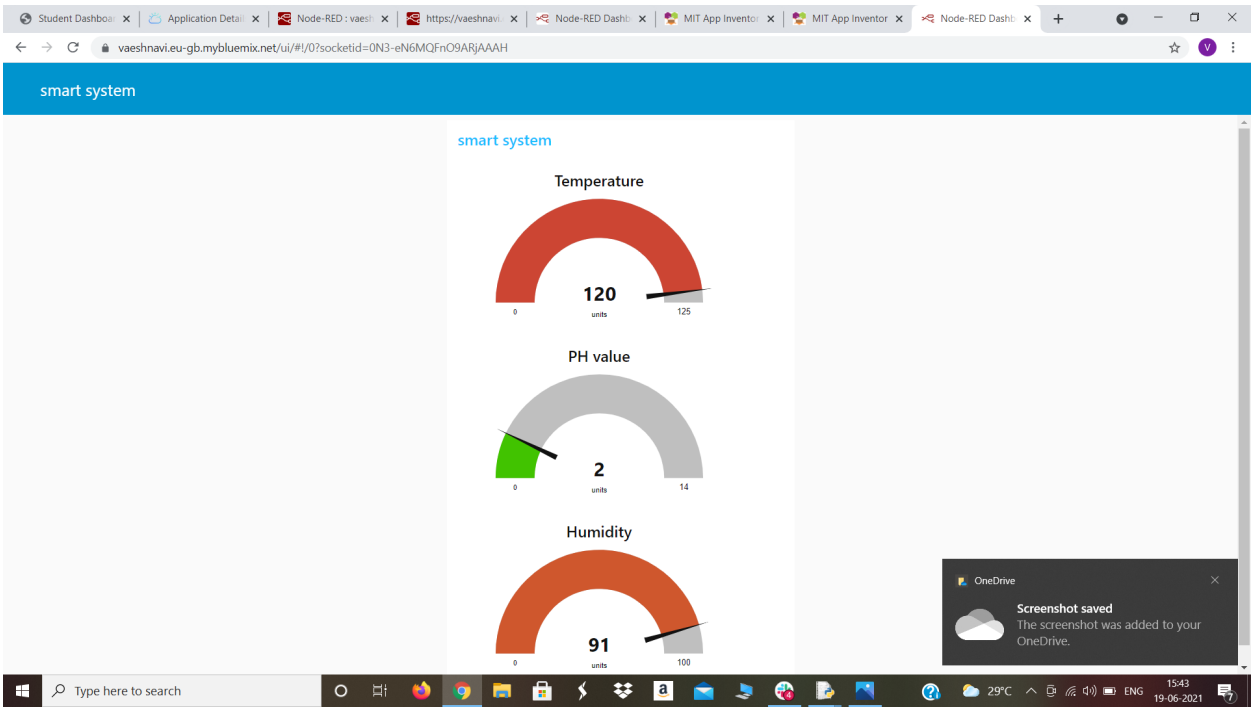

START
Establish connection between pythoncode and IOT device
Read random values(represents sensor values) from python code.
Display Output
send data to the IBM cloud
Integrate Mit app using URLs
Display output on mobile screen
If any values exceed
Alert by SMS
STOP

## 6.RESULT:

The following are the results of the project:




vaeshnavi.eu-gb.mybluemix.net/ui/#!/0?socketid=0N3-eN6MQFnO9ARjAAAH
smart system
smart system
Temperature
120
units
0
125
PH value
2
units
0
14
Humidity
91
units
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OneDrive
Screenshot saved
The screenshot was added to your OneDrive.
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29°C
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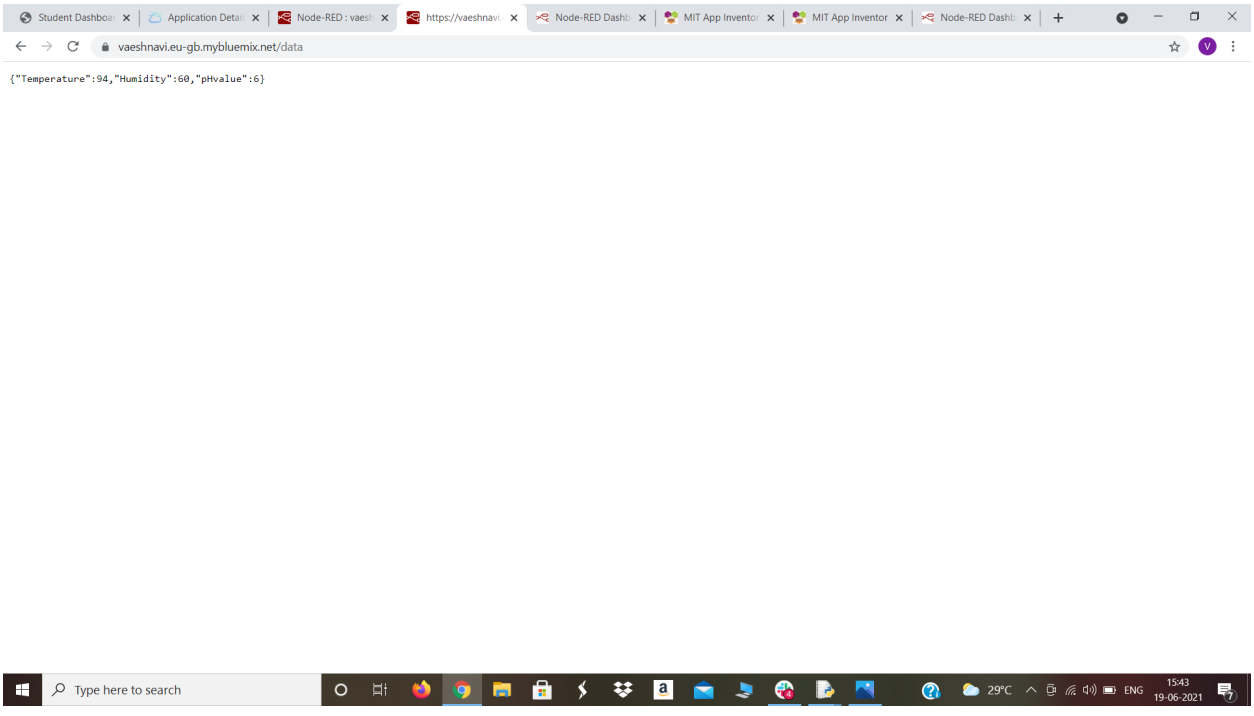
19-06-2021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ENG
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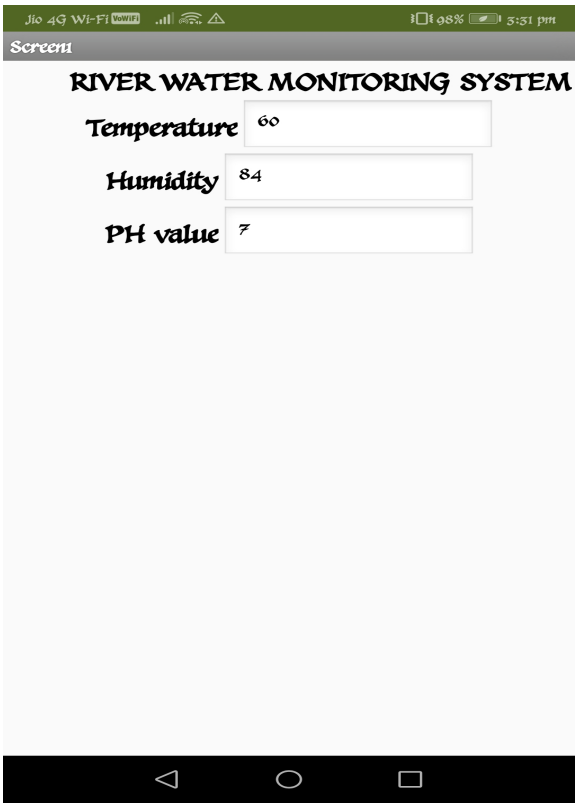
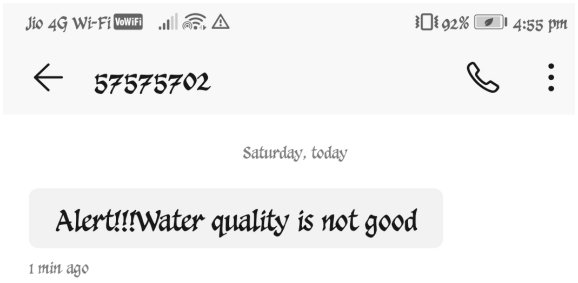



## 7.ADVANTAGES AND DISADVANTAGES:

Advantages:

- **Efficient resource utilization:** If we know the functionality and the way that how

each device work we definitely increase the efficient resource utilization as well as monitor natural resources.

- **Minimize human effort:** As the devices of IoT interact and communicate with each other and do lot of task for us, then they minimize the human effort.
- **Save time:** As it reduces the human effort then it definitely saves out time. Time is the primary factor which can save through IoT platform.
- **Enhance Data Collection:**
- **Improve security:** Now, if we have a system that all these things are interconnected then we can make the system more secure and efficient.

Disadvantages:

- **Security:** As the IoT systems are interconnected and communicate over networks. The system offers little control despite any security measures, and it can be lead the various kinds of network attacks.
- **Privacy:** Even without the active participation on the user, the IoT system provides substantial personal data in maximum detail.
- **Complexity:** The designing, developing, and maintaining and enabling the large technology to IoT system is quite complicated.

**8.APPLICATIONS:**

A. Domestic running water
B. Domestic stored water
C. Lake,River,Sea water,Environmental monitoring
D. Aquaculture centers
E. Drinking water distribution systems
F. Water and Air quality

**9.CONCLUSION:**

Real-time monitoring of water quality by using IoT platform will immensely help people to become conscious against using contaminated water as well as to stop polluting the water. The research is conducted focusing on monitoring river water quality in real-time. Due to the limitation, we only focus on measuring the quality of river water parameters.

**10.FUTURE SCOPE:**

This project can be extended into an efficient water management system of a local area. Moreover, other parameters which wasn't the scope of this project such as total dissolved solid, chemical oxygen demand and dissolved oxygen can also be quantified. So the additional parameters are required for further improvement of the overall system.

**11.BIBLIOGRAPHY:**


I. K. S. Adu-Manu, C. Tapparello, W. Heinzelman, F. A. Katsriku, and J.-D. Abdulai, "Water quality monitoring using wireless sensor networks: Current trends and future research directions," ACM Transactions on Sensor Networks (TOSN), vol. 13, p. 4, 2017.

II. N.Singh, Shambhu Shankar Bharti, R. Singh, and Dushyant KumarSingh. Remotely controlled home automation system.

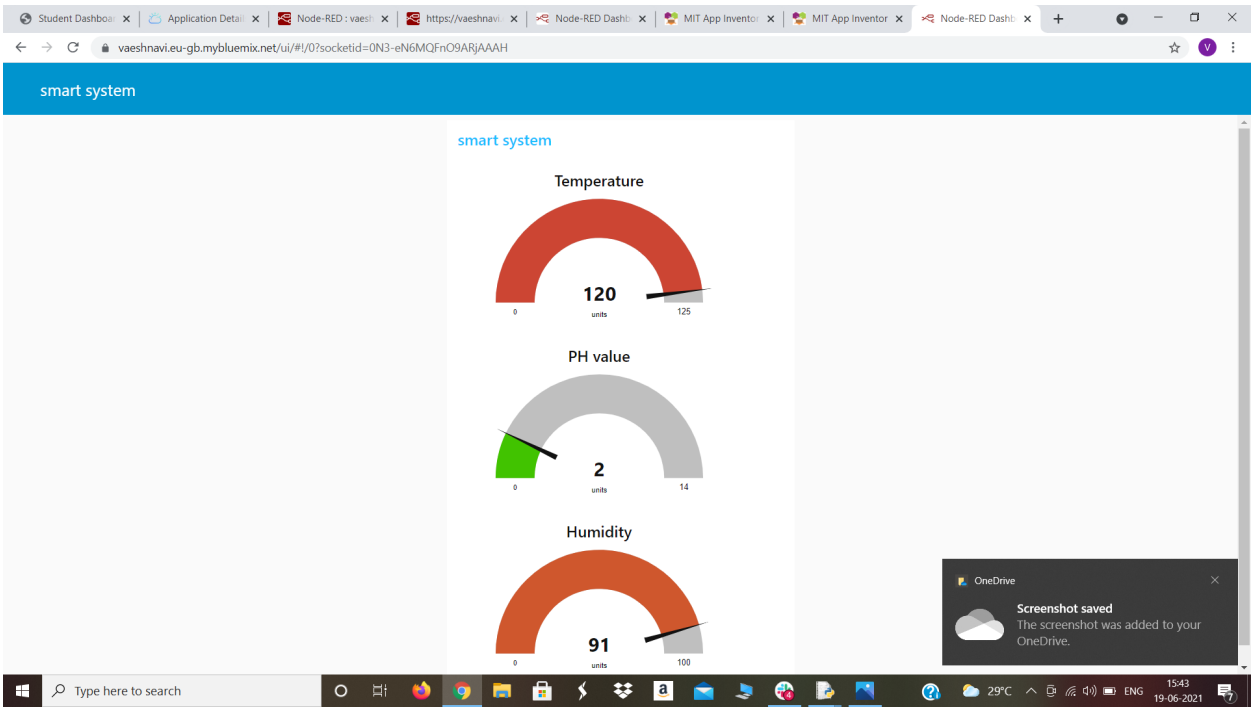

**12.APPENDIX:**

**A.Source Code:**

```
import wiotp.sdk.device
import time
import random
from pHcalc.pHcalc import Acid, Neutral, System
myConfig = {
    "identity": {
        "orgId": "kzz9wo",
        "typeId": "externship",
        "deviceId":"200102"
    },
    "auth": {
        "token": "23456789"
    }
}
```

```
15
16 def myCommandCallback(cmd):
17       print("Message received from IBM IoT Platform: %s" %
   cmd.data['command'])
18     m=cmd.data['command']
19     print()
20
21 client    =    wiotp.sdk.device.DeviceClient(config=myConfig,
   logHandlers=None)
22 client.connect()
23
24 while True:
25     temp=random.randint(0,125)
26     hum=random.randint(0,100)
27     PH=random.randint(0,14)
28             myData={'d':{'temperature':temp,   'humidity':hum,
   'pHvalue':PH}}
29       client.publishEvent(eventId="status", msgFormat="json",
   data=myData, qos=0, onPublish=None)
30     print("Published data Successfully: %s", myData)
31     print()
32     if temp<50 and hum<20:
33         print("Everything is fine,water can be used")
34     elif temp>50 and hum>20:
35         print("Entering danger zone,The Hay is too wet")
36     elif temp>75:
37         print("HIGH ALERT is required")
38     elif PH>6.5 and PH<8.5:
39         print("water can be drunk")
40     else:
41         print("PH of water is not suitable for drinking")
42     print()
43     client.commandCallback = myCommandCallback
44     time.sleep(2)
45 client.disconnect()
46
```

## B.UI output: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smart system
smart system
Temperature
120
units
0
125
PH value
2
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0
14
Humidity
91
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OneDrive
Screenshot saved
The screenshot was added to your OneDrive.
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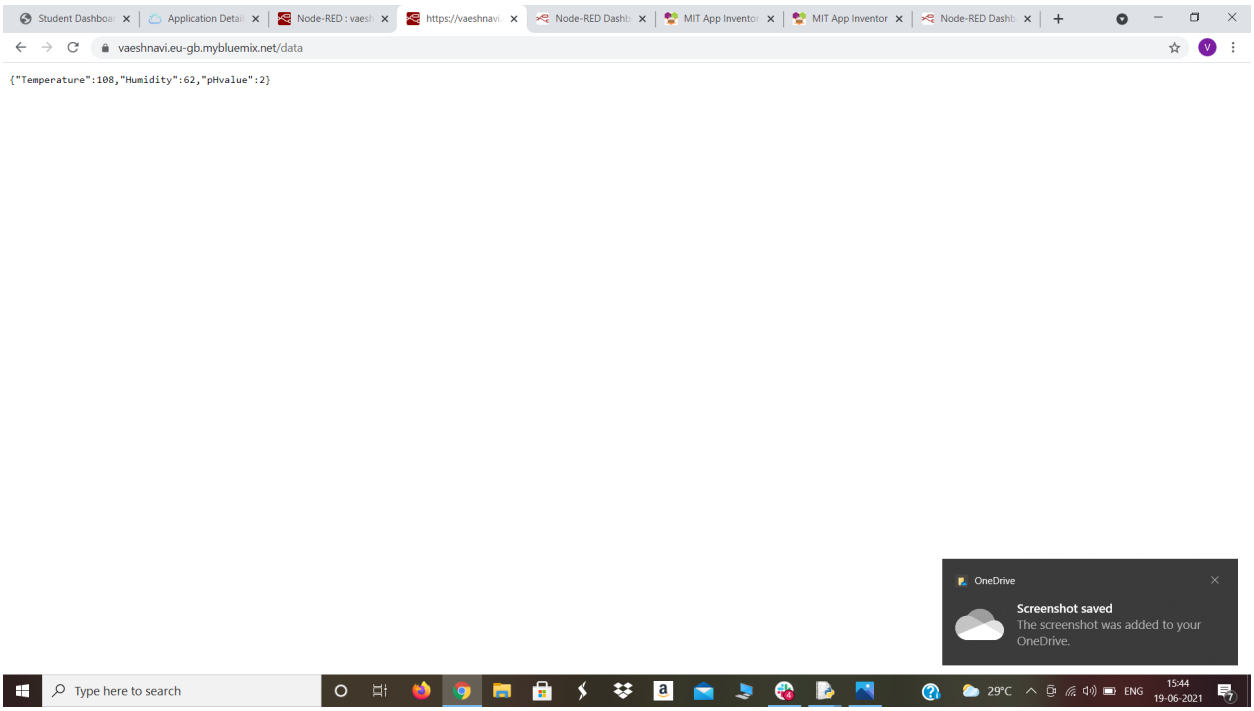
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{"Temperature":108,"Humidity":62,"pHvalue":2}
OneDrive
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