# Smart Agriculture System Based On IoT

## REPORT

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# 1. INTRODUCTION

## 1.1 Overview

India is an agricultural country, and it's really essential sector and it's a sector which demands more innovation at this time. Agricultural industry faces a lot of threats like droughts, non-availability of nutrients and many other issues due to lack of knowledge on climatic and soil conditions. Conventional agricultural methods depends on monsoon rains, but due to climatic changes monsoon rains now is insufficient and better irrigation facilities are at demand. In this situation IoT have become a major milestone in the field of Agriculture.

## 1.2 Purpose

The objective of this project is to overcome this challenge. The system consist of real time monitoring of soil conditions like Soil Temperature and soil humidity and atmospheric temperature using sensors. The system also collect and inform the local weather conditions from weather reports in Open weather report, enabling them to know about the temperature, humidity and whether it will rain. These data can be viewed by the farmer from any part of the world using an app and it also let him control the motors in his field using the app by analyzing the weather and soil conditions shown in the app. These monitoring proves highly useful in areas of water scarcity. The objective of the system is to conserve energy and water resources and to handle the system manually and automatically.

# 2. LITERATURE SURVEY

## 2.1 Existing problem

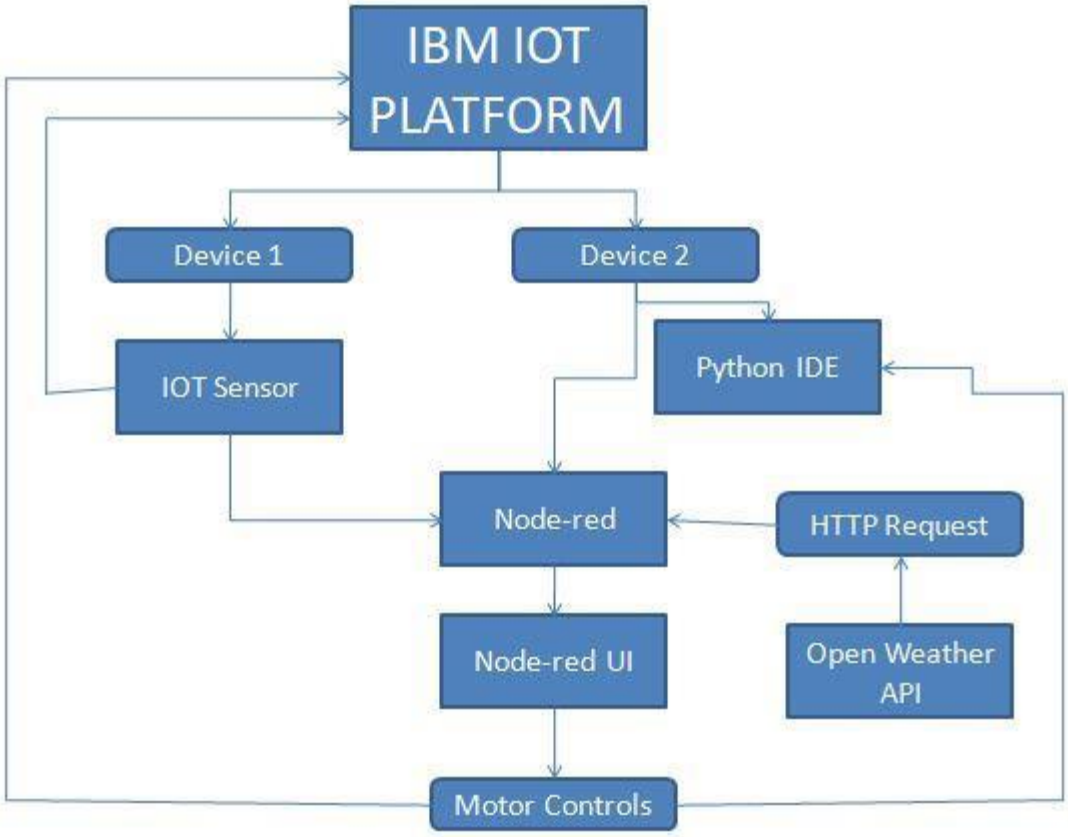
Water shortage is becoming one of the biggest problems in the world. Agricultural is one of the fields which consume tremendous quantity of water. Wastage of water is the major problem in agriculture and due to unplanned use of water the ground water level is decreasing day by day. Lack of rains and scarcity of land water also results in decrement in volume of water on earth. Even crop yield is also a current issue since farmers suffers huge lose in crops due lack of data on the real time soil conditions. Thus monitoring the soil conditions including soil humidity, temperature and weather reports help reduce wastage of the water. And the IoT system gives the full control of the irrigation to the farmer and the farmer don't have to manually monitor each and every region of the field.

## 2.2 Proposed solution

The Smart Agriculture System based on IoT helps a farmer yield a good crop. The objective of the system is to enable the farmer control the irrigation very easily and monitor the condition of his field using simple web application and to help conserve energy and water. The application provides details on soil moisture, soil temperature, climatic conditions and weather forecast. This data help the farmer control irrigation of his field by controlling the motor using his web application.

# 3. THEORETICAL ANALYSIS

## 3.1 Block diagram



### 3.2 Hardware/Software analysis

The main softwares used in this project are:

• IBM IOT Watson Platform

An IOT platform is created where all the sensor data and device data is displayed.2 separate devices are created for IOT sensor and Control Panel.

• Node-Red

A work flow based virtual programming tool that is relying more on input-output with json as a data exchange format.

• Node-Red UI

A user interface where we are given the motor control options and the data on filed parameters, weather conditions etc.

• Open Weather API

Open Weather provides current weather forecasting data locally. Weather conditions are accessed using the API Key issued after logging in.

• IBM IOT Sensor

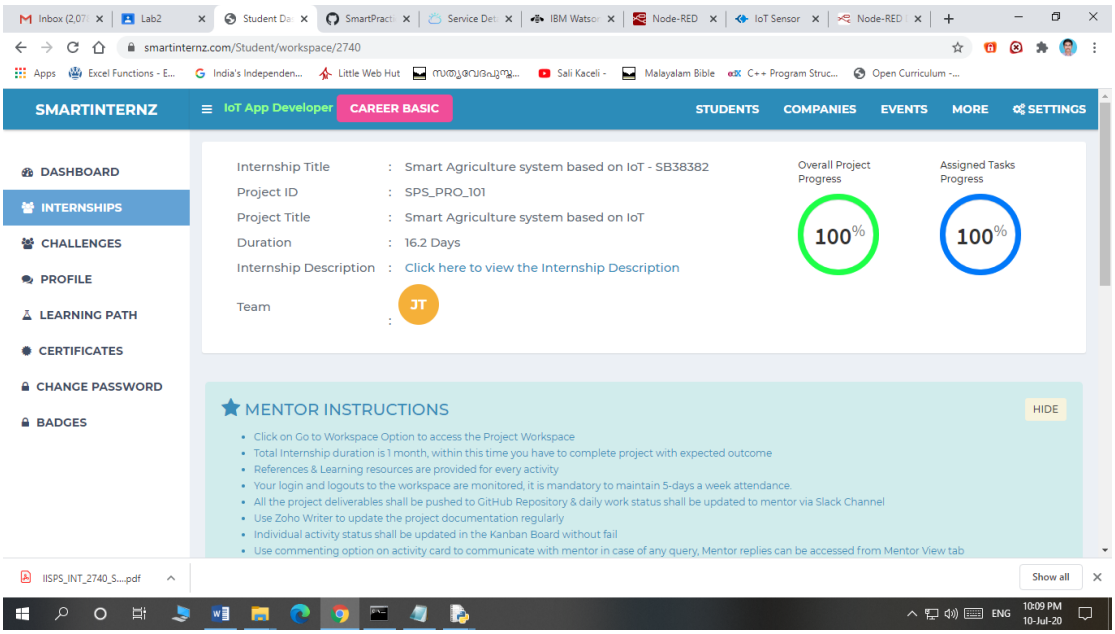
Used to connect and simulate the devices created from IBM IOT Platform to generate necessary data.

• Python IDE

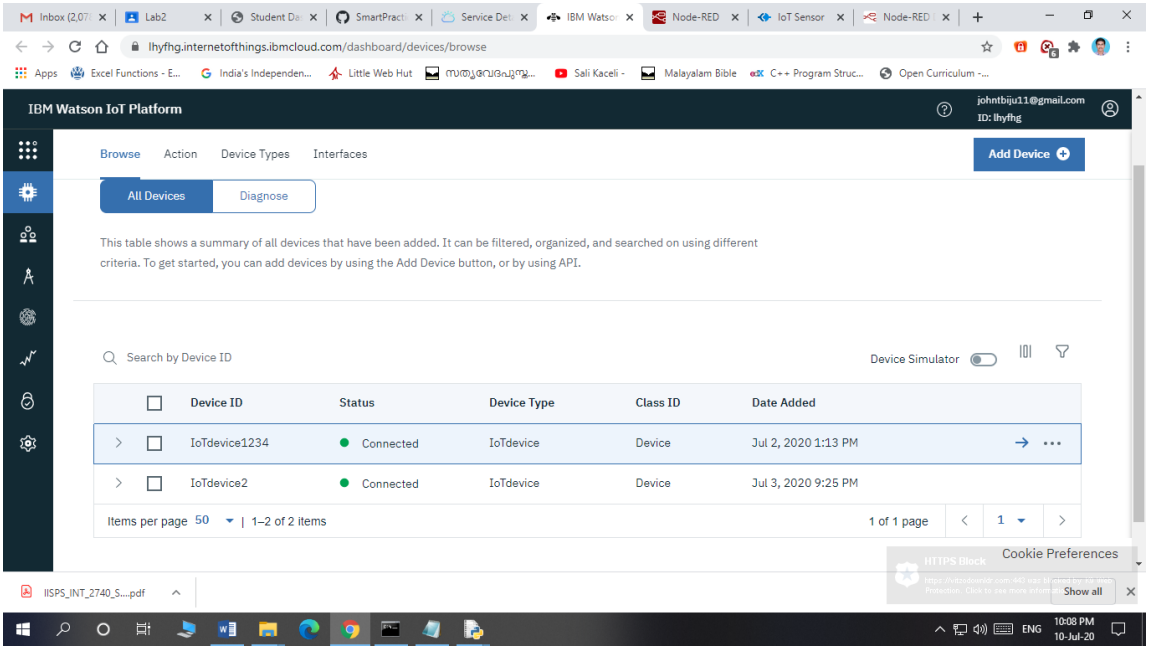
The source code is written in python. The device credentials are provided in the python program so as to connect it to IOT Platform.

# 4 EXPERIMENTAL INVESTIGATIONS

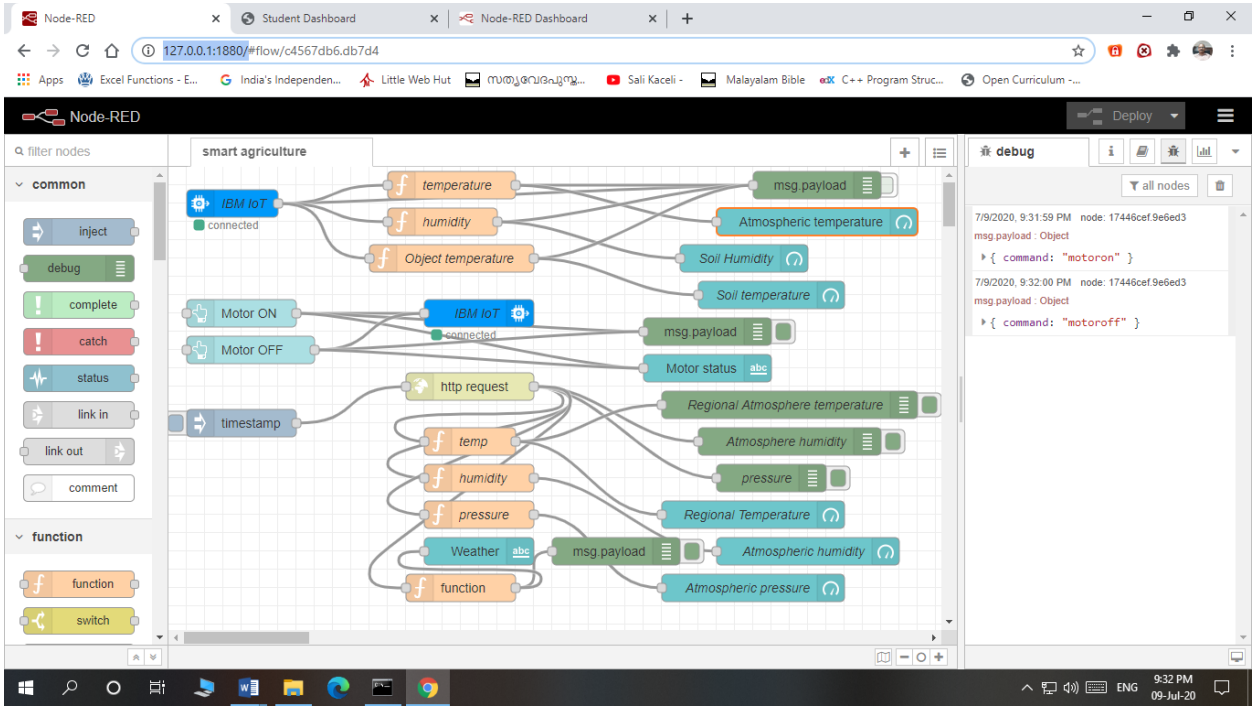
• Smart Internz Dashboard



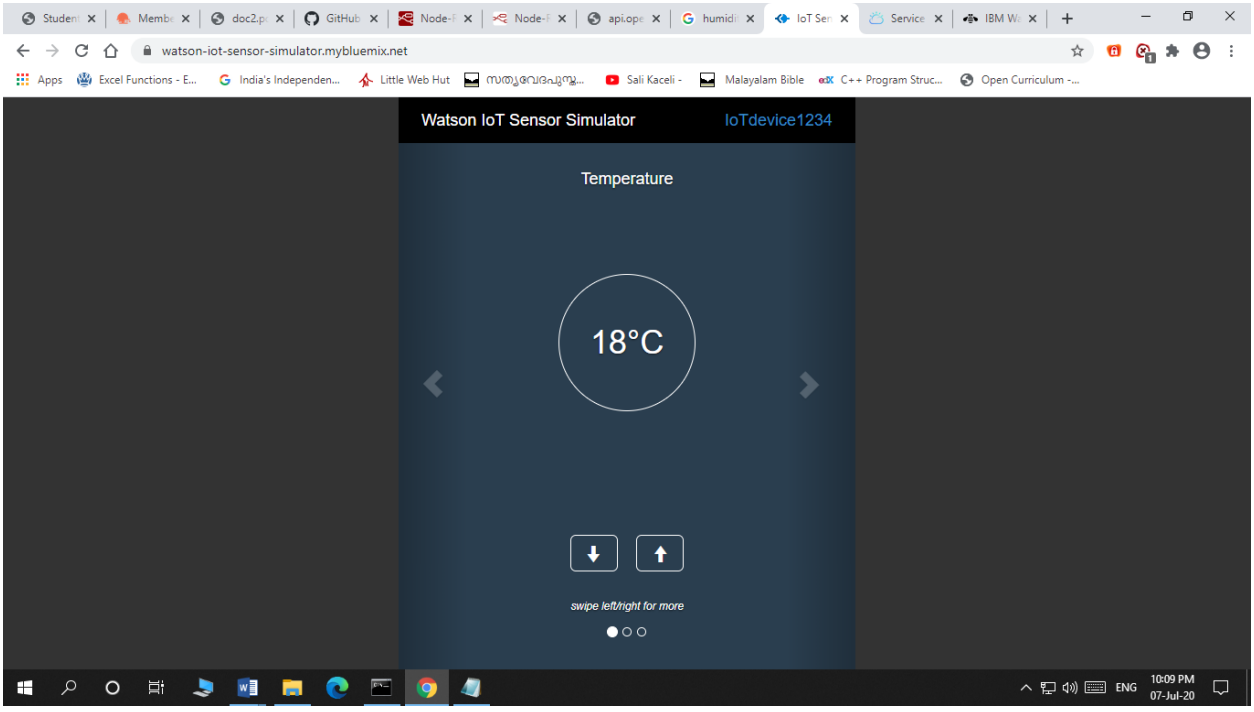

- **IBM IOT Watson Platform showing the connected status of devices**



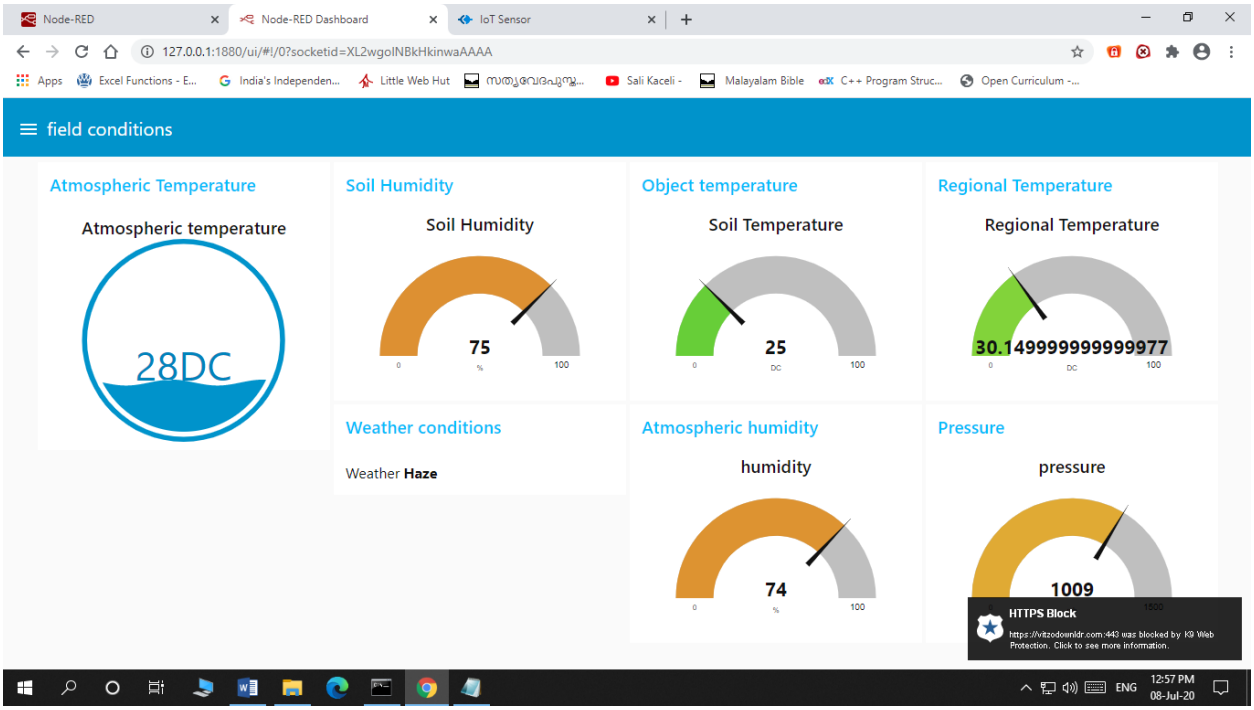
- **Node-RED Flow**

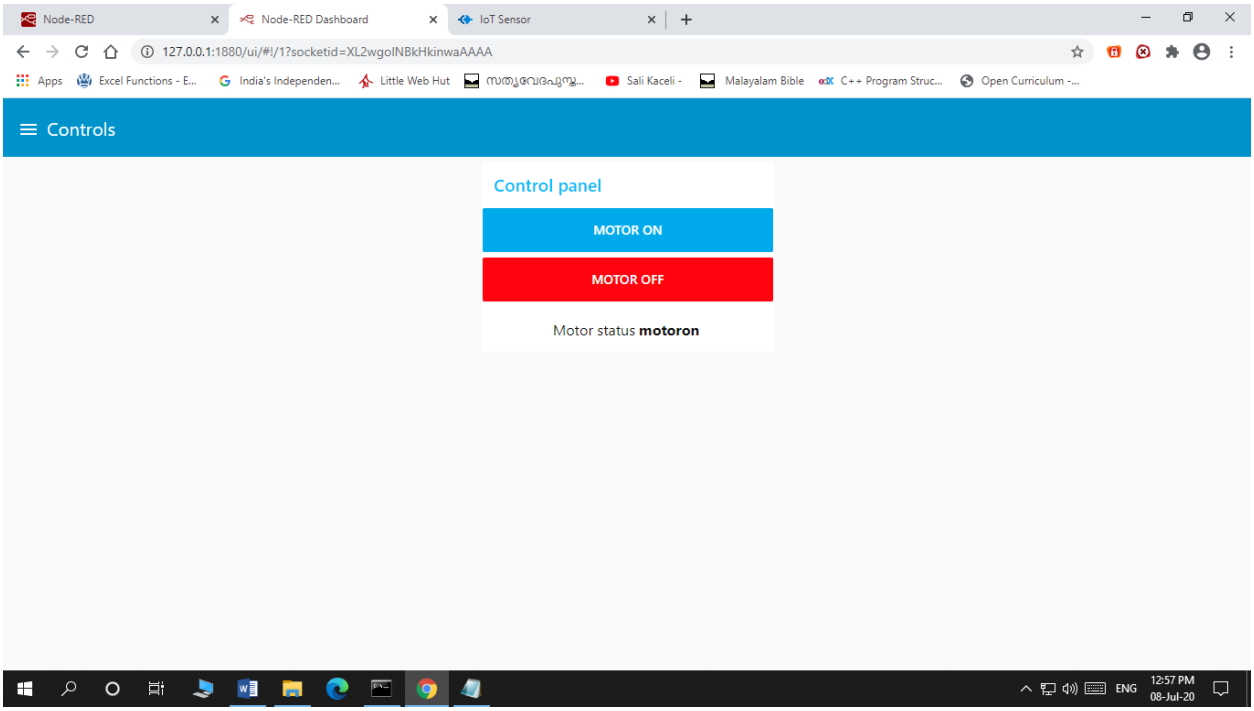



- IoT Sensor

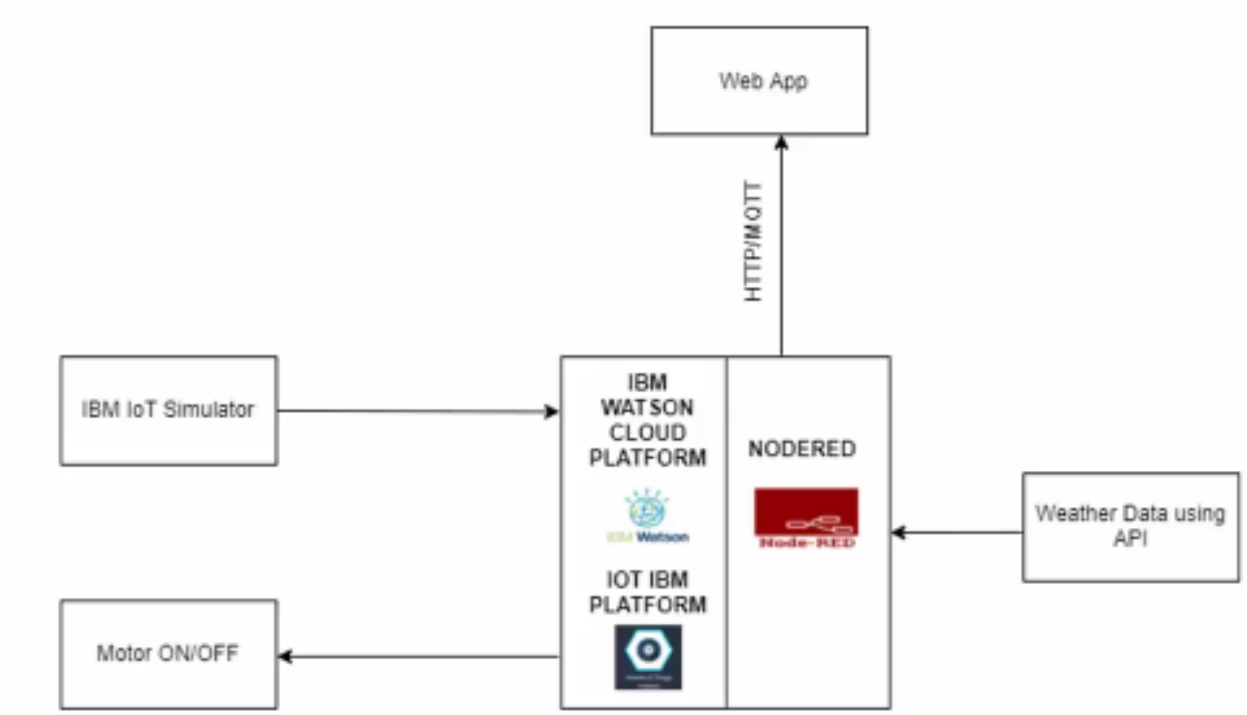


- NodeRed UI


Node-RED
Node-RED Dashboard
IoT Sensor
127.0.0.1:1880/ui/#!/0?socketid=XL2wgoINBkHkinwaAAAA
field conditions
Atmospheric Temperature
Atmospheric temperature
28DC
Soil Humidity
Soil Humidity
75
Object temperature
Soil Temperature
25
Regional Temperature
Regional Temperature
30.149999999999977
Weather conditions
Weather Haze
Atmospheric humidity
humidity
74
Pressure
pressure
1009
HTTPS Block
ENG
12:57 PM
08-Jul-20


Node-RED
Node-RED Dashboard
IoT Sensor
127.0.0.1:1880/ui/#!/1?socketid=XL2wgoINBkHkinwaAAAA
Controls
Control panel
MOTOR ON
MOTOR OFF
Motor status motoron
ENG
12:57 PM
08-Jul-20

# 5 FLOWCHART




# 6 RESULT

Developed a web application that displays temperature and humidity of soil and atmospheric conditions and weather forecast of a particular area. User can control the motor to irrigate the fields by analyzing the data from the application.

# 7 ADVANTAGES AND DISADVANTAGES

**Advantages:**

- Conserves water
- Helps user control the system from anywhere
- Can be controlled by web application hence no need to visit field frequently.
- Fully automated data collection

**Disadvantages:**

- Over irrigation may occur if farmer forgets to turn off the motor and results in damage of crop and wastage of water. Therefore a fixed timing mechanism should be implemented to turn off the motor.
- Illiteracy of farmer
- Since it is an web application there is threats of hacking

# 8 APPLICATIONS

It can be applied on large fields, or even at our house gardens ( so that we can irrigate it when we are away from house).
It helps in:

- Displaying real time data of soil conditions and weather conditions.
- Thus helps monitor crops from anywhere.
- Control motor using web application to irrigate the fields.

## 9 CONCLUSION

The Smart Agricultural System using IoT implemented and was found to be feasible and cost effective for optimizing water resources for agricultural production and to ensure better yield of crops. The system help farmer work smarter and more efficient, it has considerably decreased the work of farmer as the farmer can control irrigation just by a web application without actually going to the field, it also helps him monitor the soil conditions and even decide what crop to plant next depending on the weather conditions provided in the web application. The system reduces wastage of resources and ensures that proper and timely care is able to be given to the crops.

## 10 FUTURE WORK

The system can be made better by including sensing and collecting of data including pH and amount of soil nutrients. Adding intelligence to the system can also include features of suggesting farmer which crop to plant by analyzing the soil nutrients and weather conditions.
It can also include automatic notification to the farmer when soil moisture reduces to a considerable amount indicating the farmer to switch ON the motor. Automatic switching OFF of the motor help avoid water wastage and over irrigation. The system can also have the feature of providing the farmer data bases and needs of each crop that’s feasible to be grown in the field.

# 11 BIBILOGRAPHY

1. Joaquín Gutiérrez, Juan Francisco Villa-Medina, Alejandra NietoGaribay, and Miguel Ángel Porta- Gándara" Automated Irrigation System Using a Wireless Sensor Network and GPRS module" , Ieee Transactions OnInstrumentation And Measurement, Vol. 63, No. 1, January 2014.

2. "An Automatic Irrigation System using ZigBee in Wireless Sensor Network" 2015 International Conference on Pervasive Computing (ICPC)- IEEE 2015 by Pravina B. Chikankar, Deepak Mehetre , Soumitra Das Computer Engineering Department K J College of Engineering Management Research, Pune, India.

# APPENDIX

## A. Source Code

```
import time
import sys
import ibmiotf.application # to install pip install ibmiotf
import ibmiotf.device

#Provide your IBM Watson Device Credentials
organization = "lhyfhg" #replace the ORG ID
deviceType = "IoTdevice"#replace the Device type wi
deviceId = "IoTdevice2"#replace Device ID
authMethod = "token"
authToken = "iot123456789" #Replace the authtoken

def myCommandCallback(cmd): # function for Callback
        print("Command received: %s" % cmd.data)
        if cmd.data['command']=='motoron':
```

```
            print("MOTOR ON IS RECEIVED")

        elif cmd.data['command']=='motoroff':
            print("MOTOR OFF IS RECEIVED")

        if cmd.command == "setInterval":

            if 'interval' not in cmd.data:
                print("Error - command is missing required information:
'interval'")
            else:
                interval = cmd.data['interval']
        elif cmd.command == "print":
            if 'message' not in cmd.data:
                print("Error - command is missing required information:
'message'")
            else:
                output=cmd.data['message']
                print(output)

try:
        deviceOptions = {"org": organization, "type": deviceType, "id":
deviceId, "auth-method": authMethod, "auth-token": authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
        #.....................................

except Exception as e:
        print("Caught exception connecting device: %s" % str(e))
        sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud
as an event of type "greeting" 10 times
deviceCli.connect()

while True:
```

```
        deviceCli.commandCallback = myCommandCallback

# Disconnect the device and application from the cloud
deviceCli.disconnect()
```