Smart Agriculture System Based on IoT

REPORT

CONTENT

1. INTRODUCTION

1.1 Overview

In India, agriculture plays an important role for development in food production. In our country, agriculture depends on the monsoons which are not a sufficient source of water. So irrigation is used in agriculture field. Internet of Things (IoT) is a milestone in the evolution of technology. IOT plays an important role in many fields, one of that is Agriculture by which it can feed billions of people on Earth in future.

1.2 Purpose

The objective of this project is to overcome the challenges in the irrigation system of agricultural activities. The system can be operated from remote location through wireless transmission so there is no need to concern about irrigation timing as per crop or soil condition. The farmer is notified with the information regarding field condition through mobile periodically. This system will be more useful in areas where there is scarcity of water and will be worth efficient with satisfying its requirements. The objective of the system is to

a) conserve energy & water resources

b) handle the system manually and automatically.

2. LITERATURE SURVEY

2. 1 Existing problem

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. Nowadays, water shortage is becoming one of the biggest problems in the world. We need water in each and every field. In our day to day life also water is essential. Agriculture is one of fields where water is required in tremendous quantity. Wastage of water is the major problem in agriculture. Every time excess of water is give to the fields. There are many techniques to save or to control wastage of water in agriculture. If the field is a far away land, the farmer needs to travel along distance daily to monitor and irrigate his crops. This brings in the dire need of a system that proposes effective usage of water, without wasting even a drop and also a system that helps a farmer in controlling his crops even if he is away.

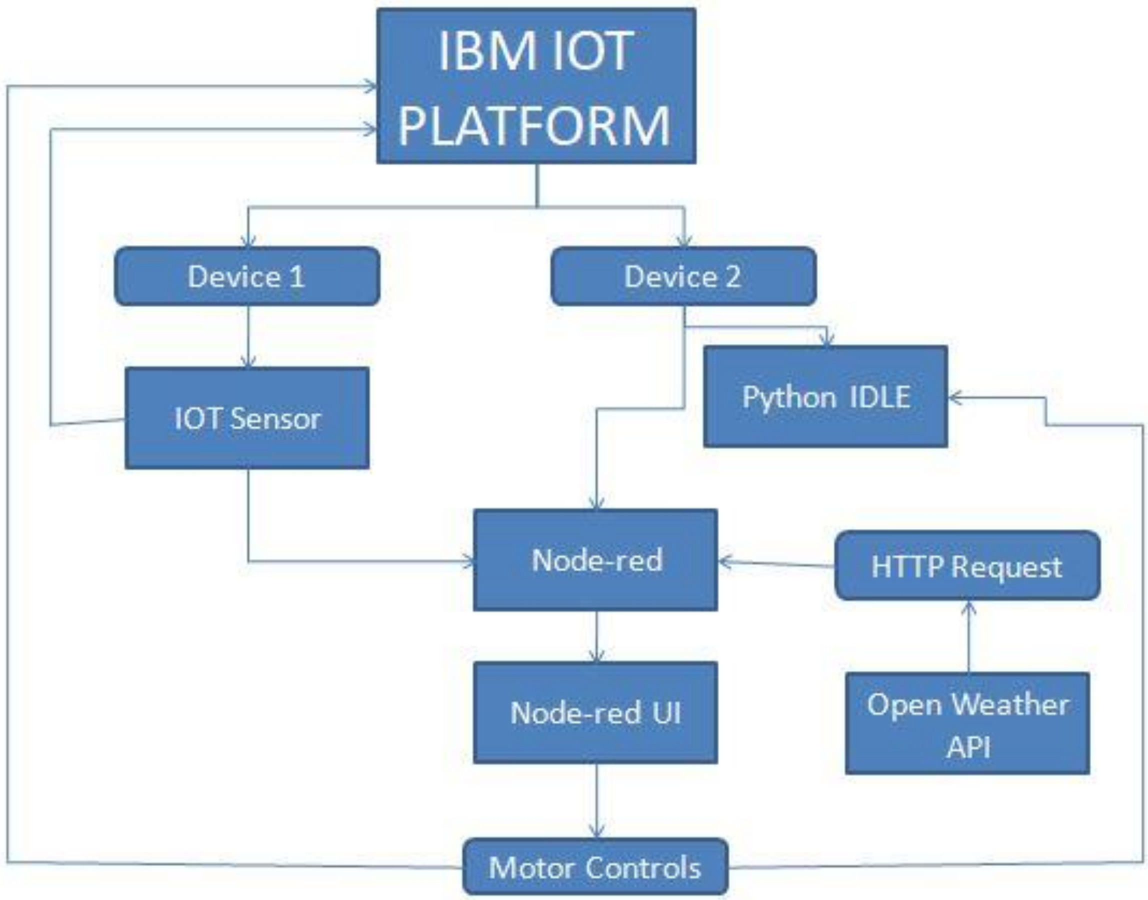
2.2 Proposed solution

Smart Agriculture System based on IoT helps a farmer yeild a good crop. The objective of the system is to a) conserve energy & water resources b) handles the system manually and automatically.

The farmer can watch his crops from anywhere using the mobile application. The app provides him details about soil moisture, climatic conditions, temperature, humidity and weather forecasting and other parameters with which the farmer can decide when and how much amount of water to be irrigated to his crops. He can irrigate the crops by controlling the motor using the application even when he is not near the field.

3. THEORETICAL ANALYSIS

3.1 Block diagram



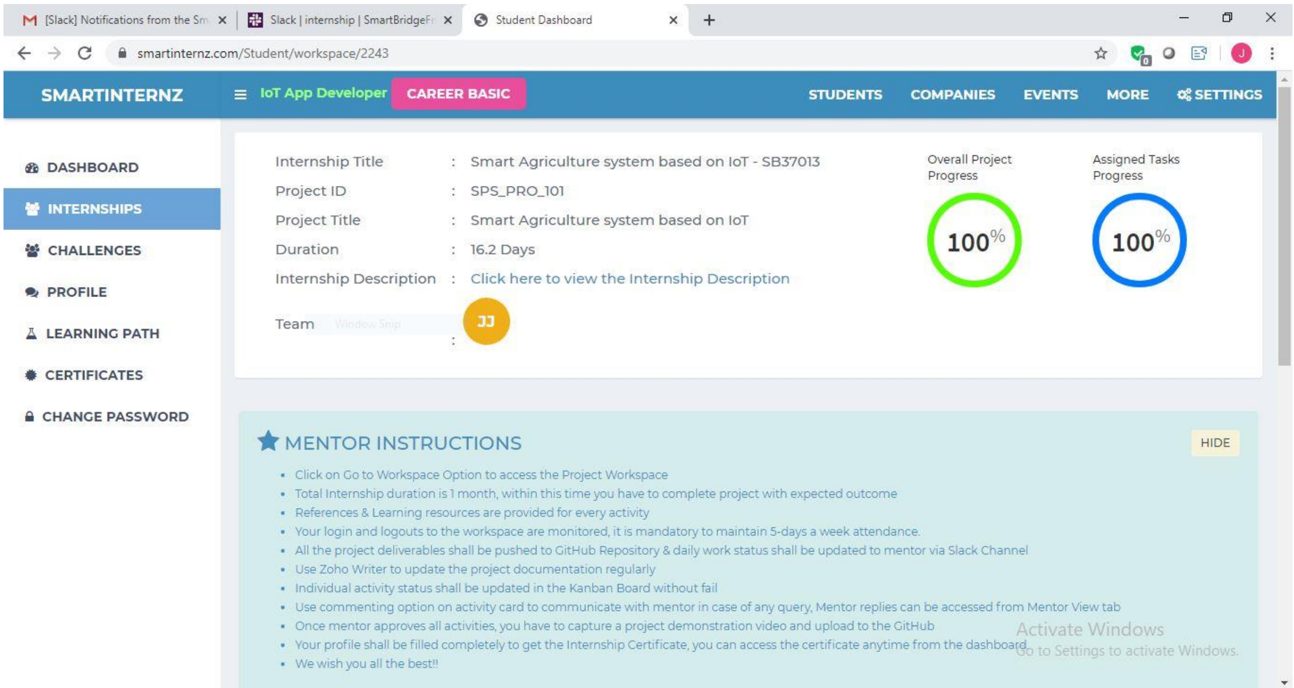
3.2 Hardware/Software analysis

The main softwares used in this project are:

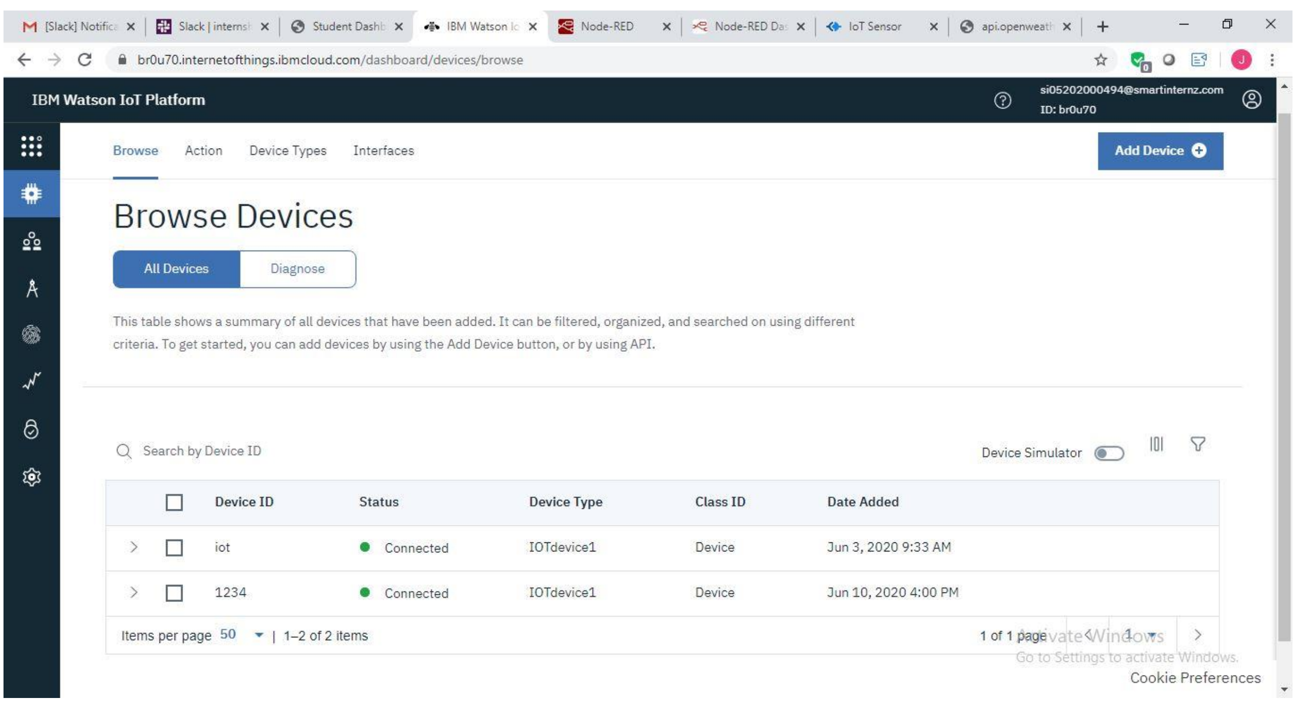
- IBM IOT Watson Platform
  An IOT platform is created where all the sensor data and device data is displayed.2 separate devices are created for IOT sensor and Control Panel.
- Node-Red
  A work flow based virtual programming tool that is relying more on input-output with json as a data exchange format.
- Node-Red UI
  An 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 IDLE
  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

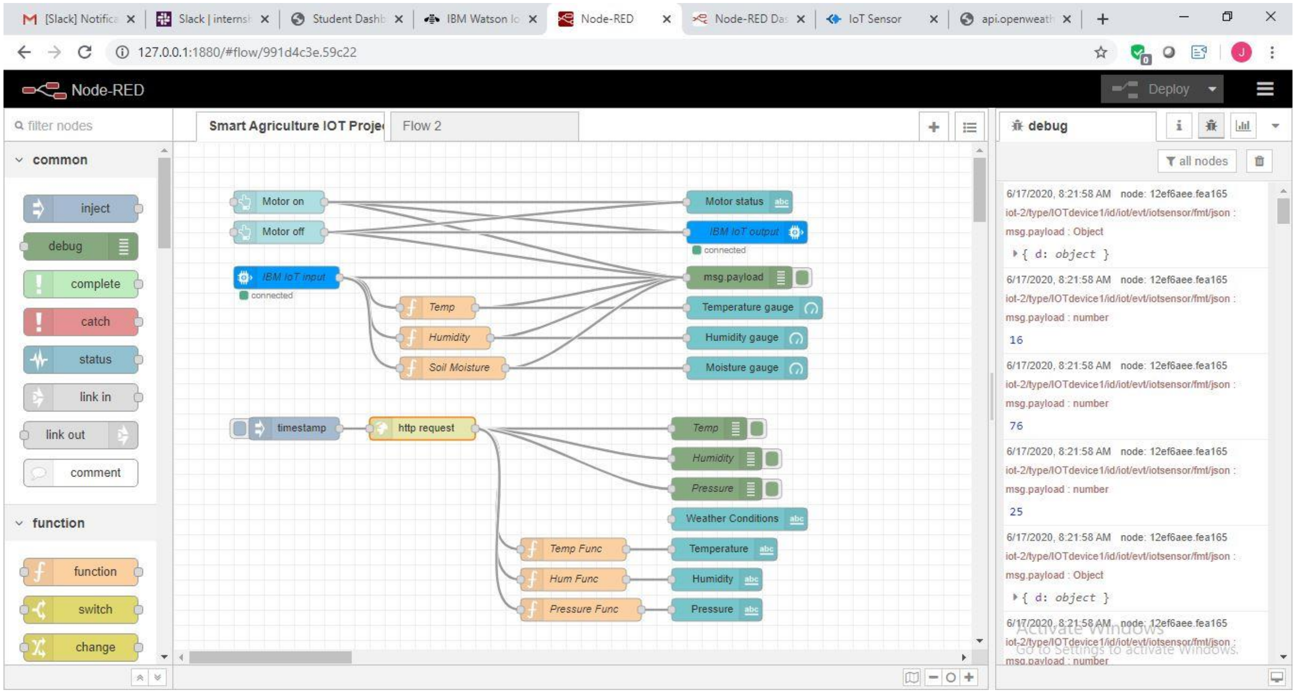
- **SmartInternz Dashboard**



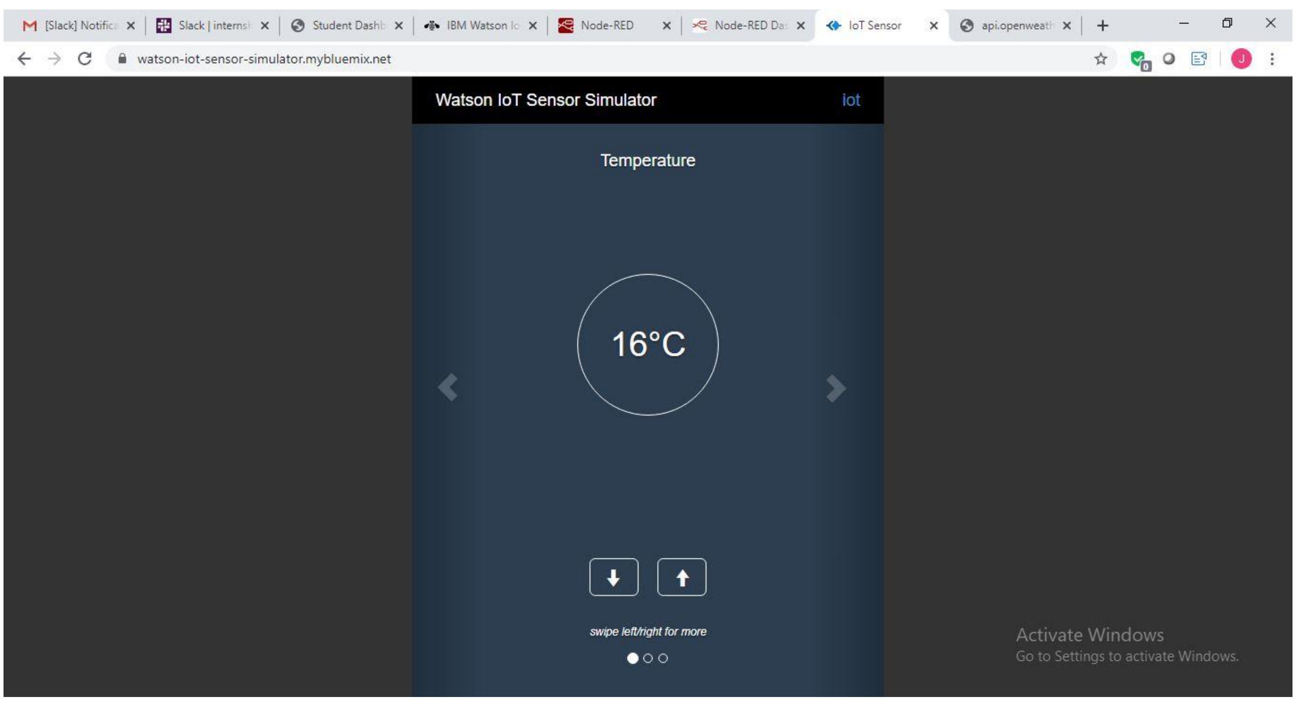
- **IBM IOT Watson Platform showing the connected status of devices**



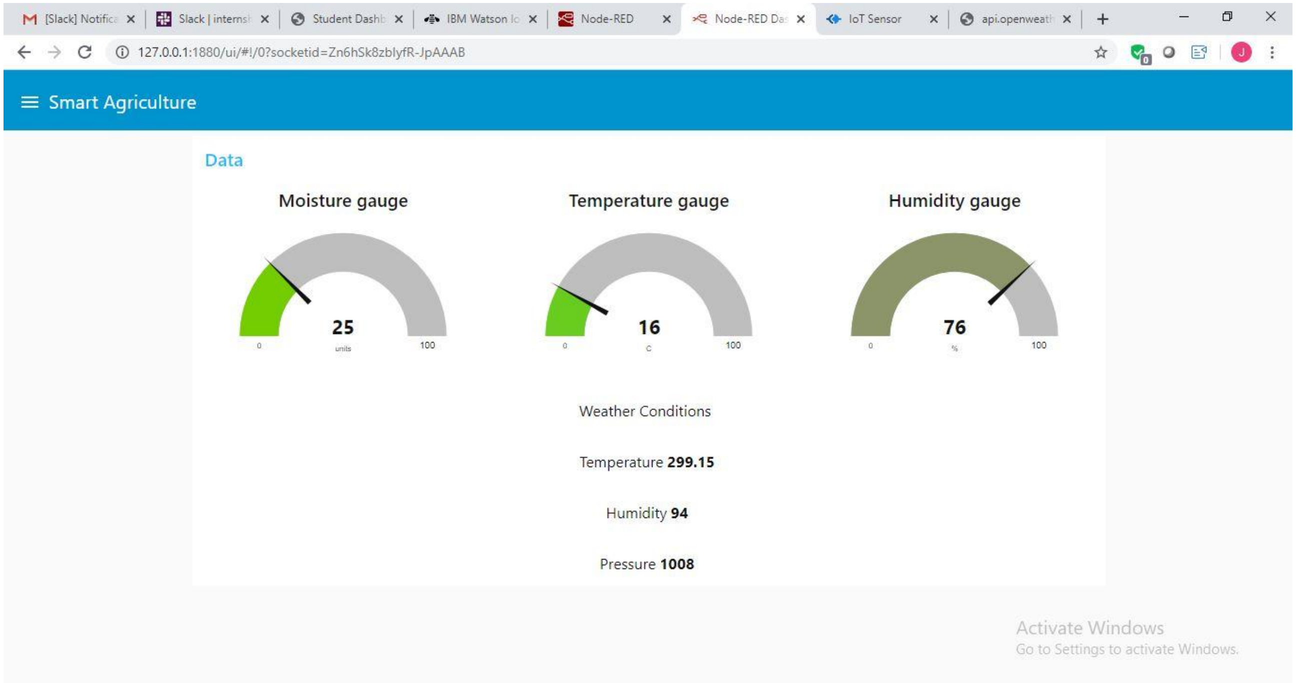
- **Node-RED Flow**

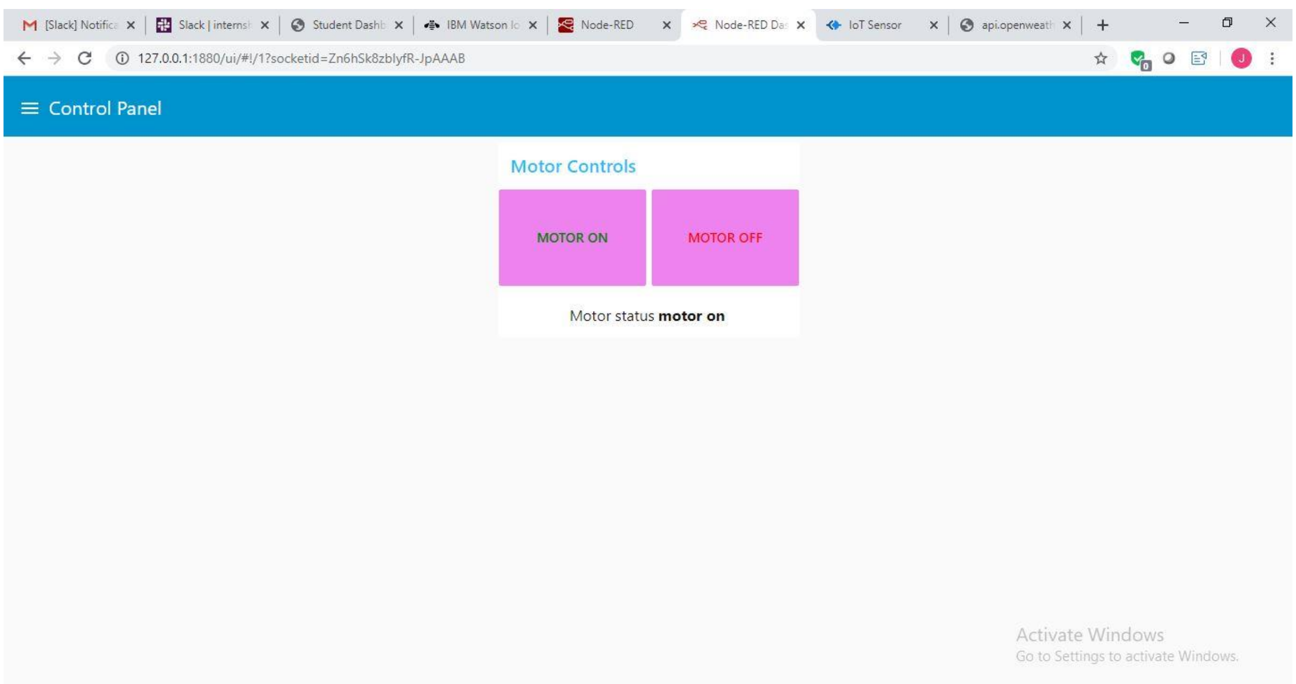


- **IOT Sensor**

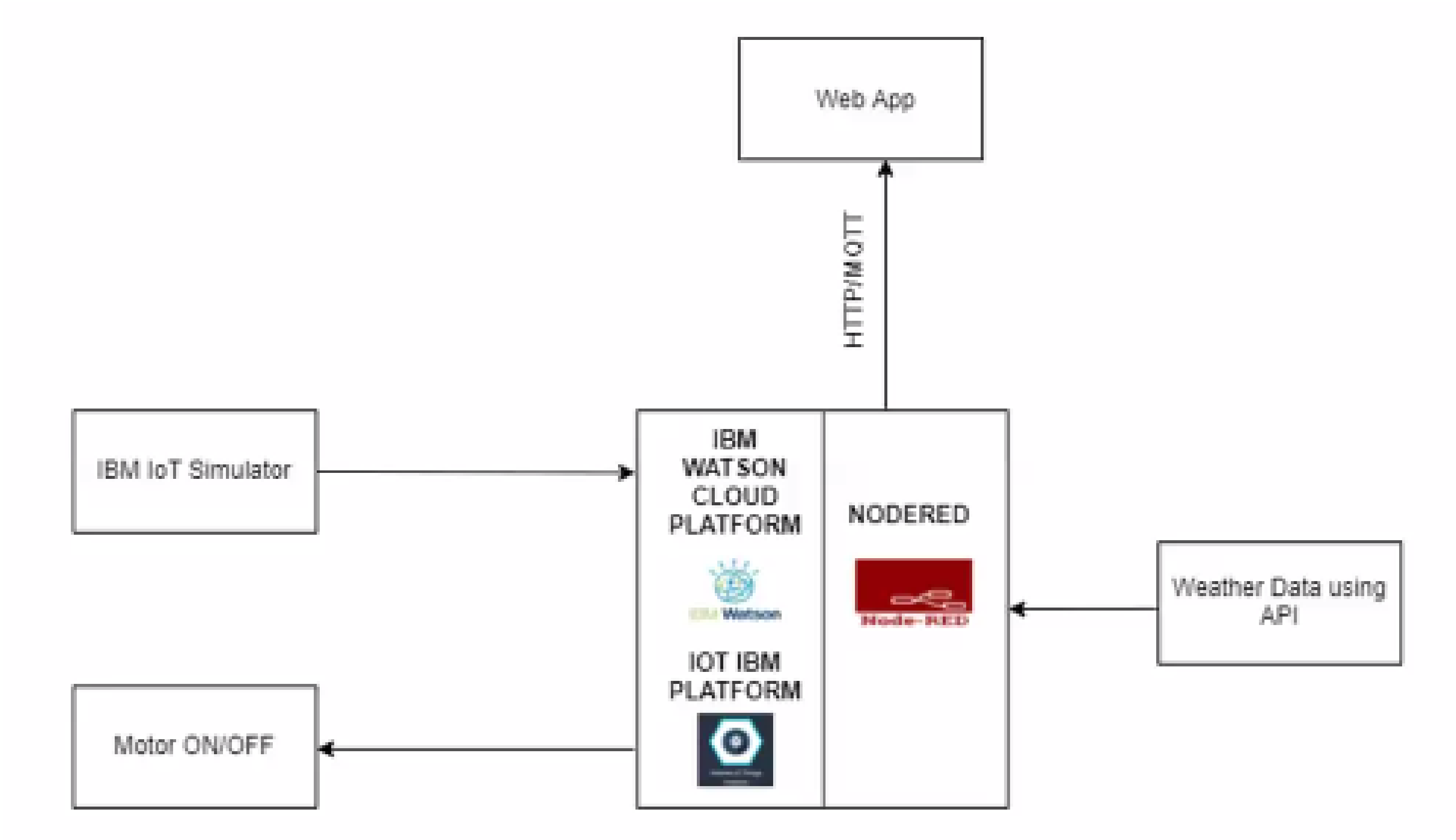


- **Node-RED UI**


127.0.0.1:1880/ui/#!/0?socketid=Zn6hSk8zblyfR-JpAAAB
Smart Agriculture
Data
Moisture gauge
25
units
0
100
Temperature gauge
16
C
0
100
Humidity gauge
76
%
0
100
Weather Conditions
Temperature 299.15
Humidity 94
Pressure 1008
Activate Windows
Go to Settings to activate Windows.


127.0.0.1:1880/ui/#!/1?socketid=Zn6hSk8zblyfR-JpAAAB
Control Panel
Motor Controls
MOTOR ON
MOTOR OFF
Motor status motor on
Activate Windows
Go to Settings to activate Windows.

5 FLOWCHART



Web App
HTTP/MQTT
IBM IoT Simulator
IBM WATSON CLOUD PLATFORM
IBM Watson
NODERED
Node-RED
IOT IBM PLATFORM
Weather Data using API
Motor ON/OFF

6 RESULT

Developed a web application that displays weather conditions of a particular area (the area selected by the user) and also temperature, humidity and soil moisture of the crops. User can control the motor operations and irrigate the crops after analyzing the environmental conditions of his crops.

7 ADVANTAGES AND DISADVANTAGES

Advantages:

- Conserve energy & water resources
- System can be handled manually and automatically
- System can be operated from a distance

Disadvantages:

- Over irrigation can occur if the farmer forgets to turn off the motor which will badly affect the crops. Therefore a timer mechanism should be implemented so as to turn off the motor after a specified interval of time if he forgets to turn off it.

8 APPLICATIONS

The application has found its base on agricultural field but can be extended to other areas too like constructional activities. It currently helps in:

- Displaying environmental conditions of the crops
- Controlling the motor operation
- Monitoring the crops even far away from the place

The application can be modified to meet new requirements and expectations.

9 CONCLUSION

The automated irrigation system implemented was found to be feasible and cost effective for optimizing water resources for agriculture production. This irrigation system allows cultivation in places with water scarcity thereby improving sustainability. The irrigation system helps the farmer by making his work smarter. As the demand for water increases, along with the need to protect aquatic habitats, water conservation practices for irrigation need to be effective and affordable. As multiple sensors are used, water can be provided only to the required area of land. This system reduces the water consumption to greater extent. It needs minimal maintenance. The power consumption has been reduced very much. The crop productivity increases and the wastage of crops are very much reduced.

10 FUTURE WORK

The extension work is to make user interface much simpler by just using SMS messages for notifications and to operate the switches.

Since different regions have different weather conditions, another feature that can be added to the system is displaying or providing information on which crop is suitable for which weather conditions.

Different crops need different amount of water.The amount of water required by each crop should also be made available so that the farmer can turn on the motor for the required moisture content.

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 = "br0u70" #replace the ORG ID

deviceType = "IOTdevice1"#replace the Device type wi

deviceId = "1234"#replace Device ID

authMethod = "token"

authToken = "12345678" #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()
```