INTERNSHIP PROJECT REPORT

ON

INTERNET OF THINGS

Project Name

SMART AGRICULTURE SYSTEM BASED ON IOT

Submitted by

Mohamed Nazeem Thameemul Ansari

TABLE OF CONTENT

1 .INTRODUCTION

1.1 OVERVIEW

Agriculture is an important part of the country's economy and provides a large-scale employment to the people. However, agriculture is highly dependent upon weather and climate. But, changes in temperature, soil moisture, carbon dioxide may result in low yield of crops. So we have to monitor the environmental parameters in order to manage crop growth and increase the agricultural production yield.

In order to monitor the conditions at ease, Cloud connected, wireless system aid in this crop yield maximization, which automates day-to-day agricultural tasks and real time monitoring for smart decision-making.

1.2 PURPOSE

- Need for technology to monitor important parameters like soil moisture, temperature, Humidity etc. to improve the cultivation process.
- Need for technology to monitor weather of particular area with reliable source to save the crops at the time of natural calamities like flood, cyclone etc.
- Development of certain techniques to reduce the workforce, energy and time for cultivation.
- Development of a feasible method to control the electrical equipment in the farm from any part of the world.

2. LITERATURE SURVEY

2.1 EXISTING PROBLEM

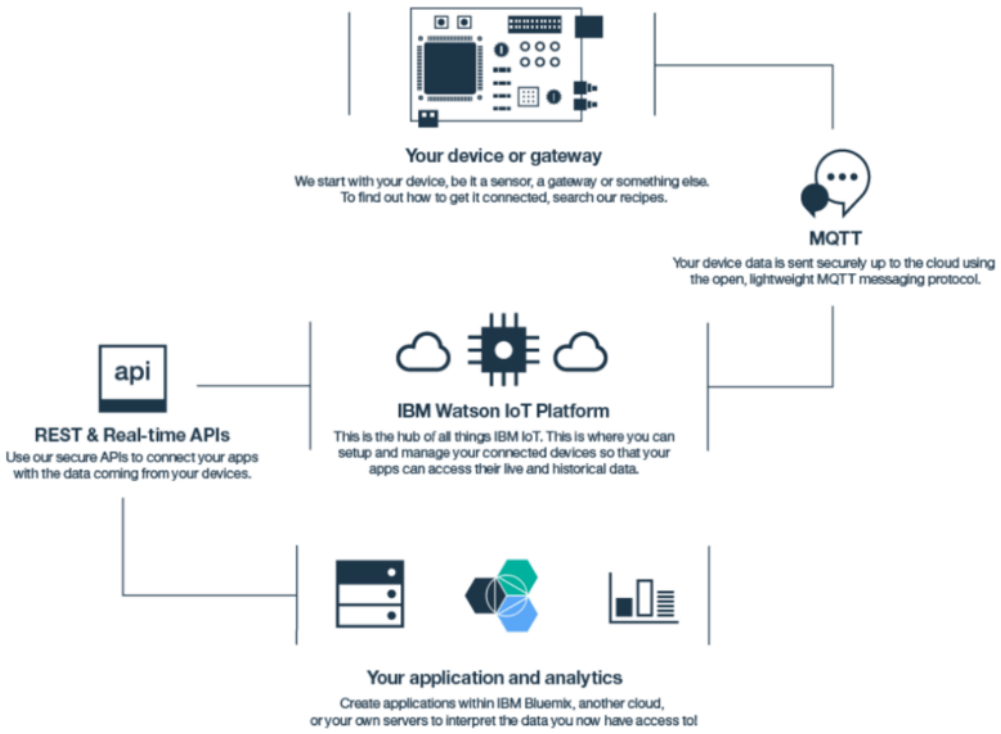
1. Controlling the device from longer distance.
2. Getting the weather data from weather station.
3. Transfer of node data to the gateway at faster rate.
4. Unavailability of data's such as PH level, potassium, Nitrogen etc related to the soil.

2.2 PROPOSED SOLUTION

1. To control a device from longer distance from web application.
2. To get the weather details like wind speed, temperature, humidity from weather station through weather API.
3. To display the data in the web application.

3. THEORITICAL ANALYSIS

3.1 BLOCK DIAGRAM



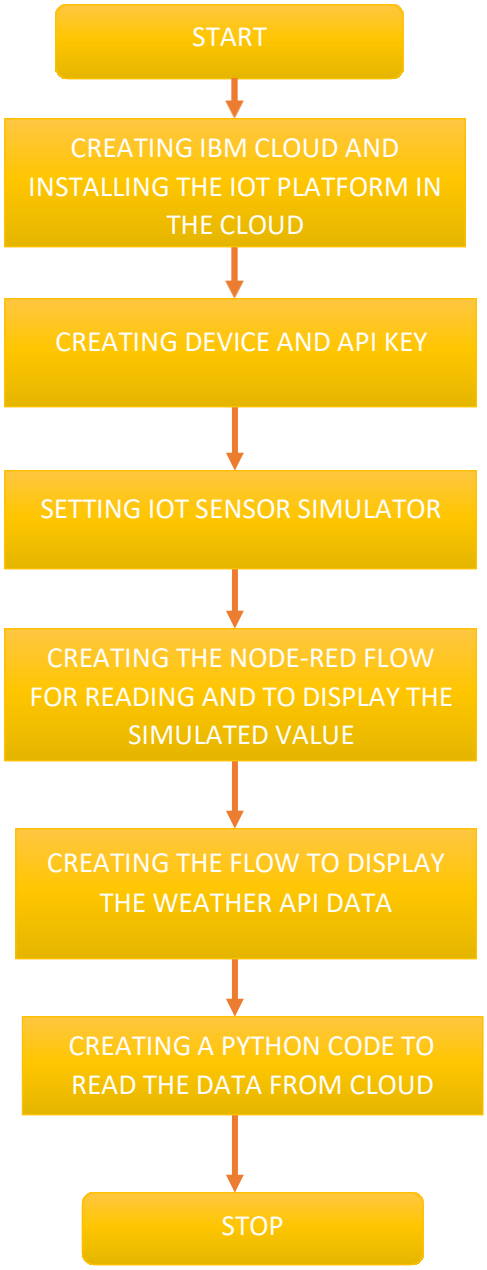
3.2 SOFTWARE DESIGNING

This app requires NodeRED to design the user interface for the web application and python code to control the motor from anywhere in the world. The user interface must display the environmental conditions, based on which the user must be able to control the motor from anywhere using IoT.

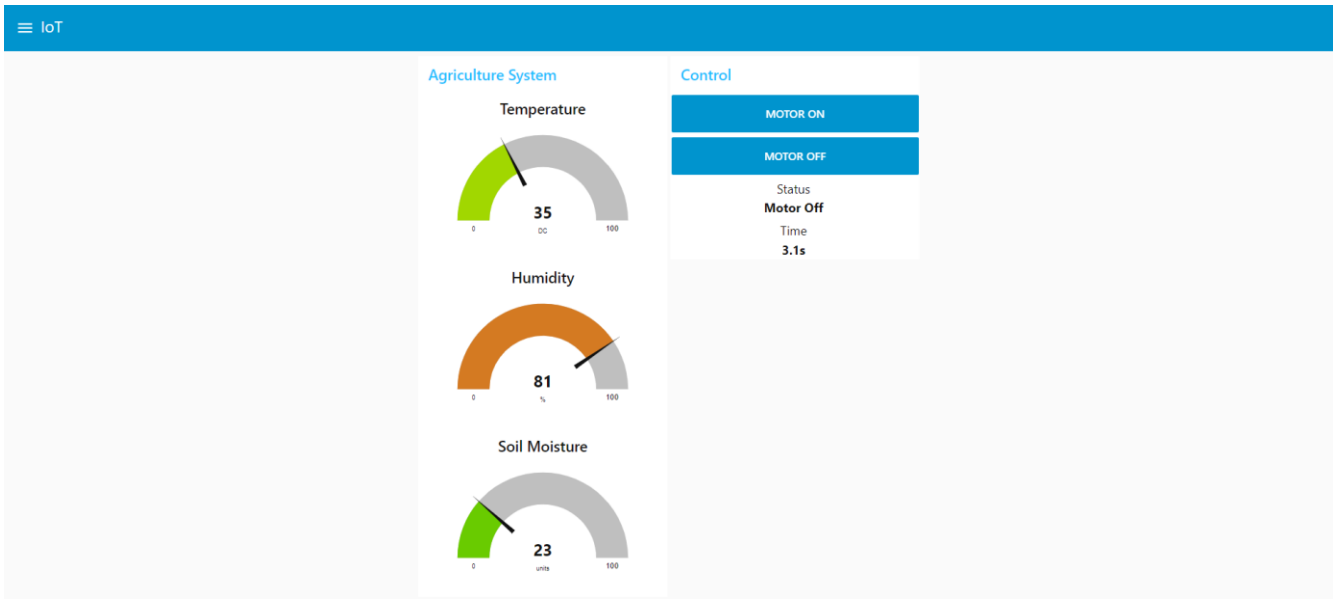
4. EXPERIMENTAL ANALYSIS

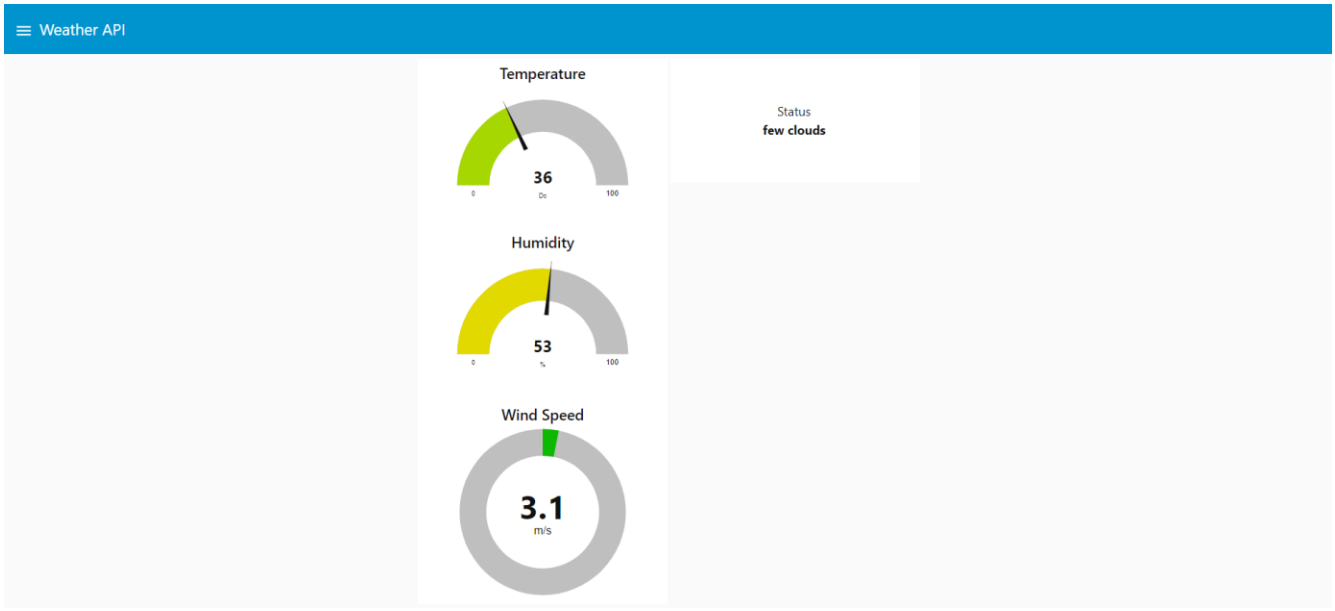
1. A device is created and simulated using the device simulator in Internet of Things platform of IBM cloud.
2. The device is then simulated using an online IoT simulator.
3. The user interface is created using NodeRED and integrated to the devices.
4. The webapp should display the simulated values.
5. Open weather API is integrated to the NodeRED and the values are displayed in the webapp
6. The output device must be integrated to the Python code.
7. The Python code should reflect the output depending upon the button pressed in the webapp.

5. FLOW CHART


START
CREATING IBM CLOUD AND INSTALLING THE IOT PLATFORM IN THE CLOUD
CREATING DEVICE AND API KEY
SETTING IOT SENSOR SIMULATOR
CREATING THE NODE-RED FLOW FOR READING AND TO DISPLAY THE SIMULATED VALUE
CREATING THE FLOW TO DISPLAY THE WEATHER API DATA
CREATING A PYTHON CODE TO READ THE DATA FROM CLOUD
STOP

6. RESULT


IoT
Agriculture System
Temperature
35
Humidity
81
Soil Moisture
23
Control
MOTOR ON
MOTOR OFF
Status
Motor Off
Time
3.1s


Weather API
Temperature
36
Humidity
53
Wind Speed
3.1
m/s
Status
few clouds

7. ADVANTAGE AND DISADVANTAGE

7.1 ADVANTAGE

1. Communicating using the device at longer distance through web application. It will play an important role in reducing the man power and travelling expenses of a farmer.
2. Monitoring the parameter like temperature, humidity etc will play an important role in improving the growth of the plant.
3. Integrating the weather station to the web browser will provide the details of status of the cloud, wind speed etc. It will allow the farmer to prevent their plants from natural calamities.

7.2 DISADVANTAGE

1. Since the real time sensor will be connected to the controller, the controller requires continuous supply of internet to transfer the data.
2. Non availability of weather prediction for long period of time. Since the long weather prediction require additional payment to open weather.

8.APPLICATIONS

1. This technique can be used to in the field of home automation.
2. It can also in the field where maintaining the process parameters are essential.
3. It can also be used in controlling the wheel chair for physically challenged people.
4. It can be used in hospital to monitor the patient temperature, heart rate etc. During this COVID- 19 situation, it will play a huge role.
5. It can also be used in material handling equipment in hospitals.

9. CONCLUSION

Thus the various parameters like temperature, humidity etc were monitored using web application. The data from weather station like wind speed, temperature, humidity etc were displayed in the web browser. The device like motor, light etc can also controlled by the web application.

10. FUTURE SCOPE

- The various data's of soil nutrients is not added in the web browser, that can be added to the web application.
- Long range forecast is not available in the web application, it can also be added to provide accurate information about weather.
- Controlling the device through mobile application and voice will play important role in enhancing this project.
- Providing the GPS and GIS information will also improve productivity of the farmer.

11. BIBLIOGRAPHY

1. google.com

2. cloud.ibm.com

3. Wikipedia

4. internetofthingsagenda.techtarget.com

5. iotforall.com

6. github.com

12. APPENDIX

A. PYTHON CODE

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

#Provide your IBM Watson Device Credentials
organization = "4j41xg" #replace the ORG ID
deviceType = "IoTDevice"#replace the Device type wi
deviceId = "Actuator"#replace Device ID
authMethod = "token"
authToken = "123456789" #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()
```

B. NODE RED FLOW

[{"id":"b23ab862.8945e8","type":"tab","label":"Flow
1","disabled":false,"info":""},{"id":"e969faaf.d0e088","type":"ibmiot
in","z":"b23ab862.8945e8","authentication":"apiKey","apiKey":"cfd30fd8.f39c3","input
Type":"evt","logicalInterface":"","ruleId":"","deviceId":"AgricultureSmartSystem","app
licationId":"","deviceType":"IoTDevice","eventType":"Data","commandType":"Data","
format":"json","name":"IBM
IoT","service":"registered","allDevices":false,"allApplications":"","allDeviceTypes":fal
se,"allLogicalInterfaces":"","allEvents":true,"allCommands":"","allFormats":"","qos":0,
"x":170,"y":140,"wires":[["9eeef05d.e5839","cf1590da.62e5a","edf1a38f.9fa7","c110c8
f7.ab68b8"]]},{"id":"9eeef05d.e5839","type":"debug","z":"b23ab862.8945e8","name":"
","active":true,"tosidebar":true,"console":false,"tostatus":false,"complete":"payload","tar
getType":"msg","x":460,"y":140,"wires":[]},{"id":"cf1590da.62e5a","type":"function","
z":"b23ab862.8945e8","name":"Soil Moisture","func":"
msg.payload=msg.payload.d.objectTemp\nreturn
msg;","outputs":1,"noerr":0,"x":290,"y":240,"wires":[["9eeef05d.e5839","9eccab21.e95
688"]]},{"id":"edf1a38f.9fa7","type":"function","z":"b23ab862.8945e8","name":"Humi
dity","func":" msg.payload=msg.payload.d.humidity\nreturn
msg;","outputs":1,"noerr":0,"x":290,"y":180,"wires":[["9eeef05d.e5839","caac7c4a.68c
87"]]},{"id":"c110c8f7.ab68b8","type":"function","z":"b23ab862.8945e8","name":"Te
mperature","func":"msg.payload=msg.payload.d.temperature\nreturn
msg;","outputs":1,"noerr":0,"x":300,"y":100,"wires":[["9eeef05d.e5839","704ef03f.fee2
a"]]},{"id":"caac7c4a.68c87","type":"ui_gauge","z":"b23ab862.8945e8","name":"","gro
up":"bd1d1ce8.db71b","order":2,"width":0,"height":0,"gtype":"gage","title":"Humidity"
,"label":"%","format":"{{value}}","min":0,"max":"100","colors":["#00b500","#e6e600"
,"#ca3838"],"seg1":"","seg2":"","x":510,"y":200,"wires":[]},{"id":"704ef03f.fee2a","typ
e":"ui_gauge","z":"b23ab862.8945e8","name":"","group":"bd1d1ce8.db71b","order":1,"
width":0,"height":0,"gtype":"gage","title":"Temperature","label":"DC","format":"{{valu

e}}","min":0,"max":"100","colors":["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":520,"y":80,"wires":[]},{"id":"9eccab21.e95688","type":"ui_gauge","z":"b23ab862.8945e8","name":"","group":"bd1d1ce8.db71b","order":3,"width":0,"height":0,"gtype":"gage","title":"Soil
Moisture","label":"units","format":"{{value}}","min":0,"max":"100","colors":["#00b500","#e6e600","#ca3838"],"seg1":"","seg2":"","x":490,"y":260,"wires":[]},{"id":"c91b72b1.d5fa1","type":"ibmiot
out","z":"b23ab862.8945e8","authentication":"apiKey","apiKey":"cfd30fd8.f39c3","outputType":"cmd","deviceId":"Actuator","deviceType":"IoTDevice","eventCommandType":"home","format":"json","data":"data","qos":0,"name":"IBM
IoT","service":"registered","x":700,"y":420,"wires":[]},{"id":"64b5bce4.f58bf4","type":"ui_button","z":"b23ab862.8945e8","name":"","group":"8c21506c.9bba7","order":1,"width":0,"height":0,"passthru":false,"label":"Motor
On","tooltip":"","color":"","bgcolor":"","icon":"","payload":"{\"command\":\"motoron\"}","payloadType":"json","topic":"","x":430,"y":440,"wires":[["c91b72b1.d5fa1","72e691ed.8cd89","e078d8ec.9b5078","9127490a.e681e8"]]},{"id":"560fa3f7.ec672c","type":"ui_button","z":"b23ab862.8945e8","name":"","group":"8c21506c.9bba7","order":2,"width":0,"height":0,"passthru":false,"label":"Motor
Off","tooltip":"","color":"","bgcolor":"","icon":"","payload":"{\"command\":\"motoroff\"}","payloadType":"json","topic":"","x":430,"y":580,"wires":[["c91b72b1.d5fa1","72e691ed.8cd89","105ae85a.264648","9127490a.e681e8"]]},{"id":"72e691ed.8cd89","type":"debug","z":"b23ab862.8945e8","name":"","active":true,"tosidebar":true,"console":false,"tostatus":false,"complete":"payload","targetType":"msg","x":710,"y":360,"wires":[]},{"id":"95ca3fdc.e52d8","type":"ui_text","z":"b23ab862.8945e8","group":"8c21506c.9bba7","order":3,"width":0,"height":0,"name":"","label":"Status","format":"{{msg.payload}}","layout":"col-
center","x":930,"y":560,"wires":[]},{"id":"e078d8ec.9b5078","type":"change","z":"b23ab862.8945e8","name":"","rules":[{"t":"set","p":"payload","pt":"msg","to":"Motor
On","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":700,"y":520,"wires":[["95ca3fdc.e52d8"]]},{"id":"105ae85a.264648","type":"change","z":"b23ab862.8945e8","name":"","rules":[{"t":"set","p":"payload","pt":"msg","to":"Motor
Off","tot":"str"}],"action":"","property":"","from":"","to":"","reg":false,"x":700,"y":580,"wires":[["95ca3fdc.e52d8"]]},{"id":"9127490a.e681e8","type":"interval-
length","z":"b23ab862.8945e8","format":"human","bytopic":false,"minimum":"","maximum":"","window":"","timeout":false,"msgTimeout":"","minimumunit":"msecs","maximumunit":"msecs","windowunit":"msecs","msgTimeoutUnit":"msecs","reset":false,"startup":false,"msgField":"payload","timestampField":"timestamp","repeatTimeout":false,"name":"","x":720,"y":480,"wires":[["aa8effd3.4899"],[]]},{"id":"aa8effd3.4899","type":"ui_text","z":"b23ab862.8945e8","group":"8c21506c.9bba7","order":4,"width":0,"height":0,"name":"","label":"Time","format":"{{msg.payload}}","layout":"col-
center","x":920,"y":480,"wires":[]},{"id":"651256f3.e7b7d8","type":"tab","label":"Weat

her
API","disabled":false,"info":""},{"id":"ed4938be.e1cc78","type":"inject","z":"651256f3
.e7b7d8","name":"","topic":"","payload":"","payloadType":"date","repeat":"","crontab":
"","once":false,"onceDelay":"1","x":160,"y":320,"wires":[["8a8311e3.798b6"]]},{"id":"
8a8311e3.798b6","type":"http
request","z":"651256f3.e7b7d8","name":"api","method":"GET","ret":"obj","paytoqs":fa
lse,"url":"http://api.openweathermap.org/data/2.5/weather?q=Chennai,%20IN&appid=a
7c2f6db7663395799fd94aaba9aed1b","tls":"","persist":false,"proxy":"","authType":"","
x":350,"y":320,"wires":[["884113df.8dd17","5ed1b0b8.c895d","b9c1aef7.38299","d13f
d0aa.b71ce","66c1a8f1.86bb98"]]},{"id":"884113df.8dd17","type":"debug","z":"65125
6f3.e7b7d8","name":"","active":true,"tosidebar":true,"console":false,"tostatus":false,"co
mplete":"false","x":580,"y":320,"wires":[]},{"id":"5ed1b0b8.c895d","type":"change","z
":"651256f3.e7b7d8","name":"Temperature","rules":[{"t":"set","p":"payload","pt":"msg
","to":"payload.main.temp","tot":"msg"}],"action":"","property":"","from":"","to":"","re
g":false,"x":390,"y":140,"wires":[["da9284d1.1bb458"]]},{"id":"9c688a96.541cc8","typ
e":"ui_gauge","z":"651256f3.e7b7d8","name":"","group":"5d9a04d3.9d32bc","order":1,
"width":0,"height":0,"gtype":"gage","title":"Temperature","label":"Dc","format":"{{val
ue}}","min":"0","max":"100","colors":["#0cb300","#e2e600","#f01414"],"seg1":"","seg
2":"","x":710,"y":100,"wires":[]},{"id":"b9c1aef7.38299","type":"change","z":"651256f
3.e7b7d8","name":"Humidity","rules":[{"t":"set","p":"payload","pt":"msg","to":"payloa
d.main.humidity","tot":"msg"}],"action":"","property":"","from":"","to":"","reg":false,"
x":480,"y":440,"wires":[["3dba1230.e88f3e"]]},{"id":"3dba1230.e88f3e","type":"ui_ga
uge","z":"651256f3.e7b7d8","name":"","group":"5d9a04d3.9d32bc","order":2,"width":0
,"height":0,"gtype":"gage","title":"Humidity","label":"%","format":"{{value}}","min":0
,"max":"100","colors":["#00b500","#e2e600","#ee1111"],"seg1":"","seg2":"","x":710,"y
":440,"wires":[]},{"id":"d13fd0aa.b71ce","type":"change","z":"651256f3.e7b7d8","nam
e":"Wind
Speed","rules":[{"t":"set","p":"payload","pt":"msg","to":"payload.wind.speed","tot":"ms
g"}],"action":"","property":"","from":"","to":"","reg":false,"x":550,"y":220,"wires":[["6
cc33f01.20549"]]},{"id":"6cc33f01.20549","type":"ui_gauge","z":"651256f3.e7b7d8","
name":"","group":"5d9a04d3.9d32bc","order":4,"width":0,"height":0,"gtype":"donut","t
itle":"Wind
Speed","label":"m/s","format":"{{value}}","min":0,"max":"100","colors":["#00b500","
#d6e600","#e7230d"],"seg1":"","seg2":"","x":770,"y":220,"wires":[]},{"id":"66c1a8f1.8
6bb98","type":"change","z":"651256f3.e7b7d8","name":"type of
weather","rules":[{"t":"set","p":"payload","pt":"msg","to":"payload.weather[0].descripti
on","tot":"msg"}],"action":"","property":"","from":"","to":"","reg":false,"x":220,"y":560
,"wires":[["bdee25b4.387878"]]},{"id":"bdee25b4.387878","type":"ui_text","z":"65125
6f3.e7b7d8","group":"2a49e944.7c54d6","order":4,"width":6,"height":3,"name":"","lab
el":"Status","format":"{{msg.payload}}","layout":"col-
center","x":410,"y":560,"wires":[]},{"id":"da9284d1.1bb458","type":"function","z":"65

1256f3.e7b7d8","name":"","func":"msg.payload = msg.payload - 273.15\nreturn msg;","outputs":1,"noerr":0,"x":540,"y":80,"wires":[["9c688a96.541cc8"]]},{"id":"cfd30fd8.f39c3","type":"ibmiot","z":"","name":"","keepalive":"60","serverName":"4j41xg.messaging.internetofthings.ibmcloud.com","cleansession":true,"appId":"","shared":false},{"id":"bd1d1ce8.db71b","type":"ui_group","z":"","name":"Agriculture System","tab":"d75c8eb6.dafe7","order":1,"disp":true,"width":"6","collapse":false},{"id":"8c21506c.9bba7","type":"ui_group","z":"","name":"Control","tab":"d75c8eb6.dafe7","order":2,"disp":true,"width":"6","collapse":false},{"id":"5d9a04d3.9d32bc","type":"ui_group","z":"","name":"station","tab":"e2e79fdd.7f085","order":1,"disp":false,"width":"6","collapse":false},{"id":"2a49e944.7c54d6","type":"ui_group","z":"","name":"Daily Chart","tab":"e2e79fdd.7f085","order":2,"disp":false,"width":"6","collapse":false},{"id":"d75c8eb6.dafe7","type":"ui_tab","z":"","name":"IoT","icon":"dashboard","order":1,"disabled":false,"hidden":false},{"id":"e2e79fdd.7f085","type":"ui_tab","z":"","name":"Weather API","icon":"dashboard","order":2,"disabled":false,"hidden":false}]