Smart Agriculture System based on IoT

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ABSTRACT

The Internet of things (IOT) is remodelling the agribusiness empowering the agriculturists through the extensive range of strategies, for example, accuracy as well as practical farming to deal with challenges in the field. IOT modernization helps in assembly information on circumstances like climate, dampness, temperature and fruitfulness of soil, Crop web based examination empowers discovery of wild plant, level of water, bug location, creature interruption in to the field, trim development, horticulture. IOT utilize farmers to get related with his residence from wherever and at whatever point. Remote sensor structures are utilized for watching the homestead conditions and tinier scale controllers are utilized to control and mechanize the home shapes. To see remotely the conditions as picture and video, remote cameras have been used. IOT development can diminish the cost and update the productivity of standard developing.

ACKNOWLEDGEMENT

I wish to express my sincere thanks and deep sense of gratitude to SmartInternz platform for giving me an opportunity to learn how IoT can aid farmers in their day-to-day agricultural activity and enhance their productivity.

I would also like to my mentor for consistent encouragement and valuable guidance offered in a pleasant manner throughout the course of the internship.

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1. INTRODUCTION

In IoT-based smart farming, a system is built for monitoring the crop field with the help of sensors (light, humidity, temperature, soil moisture, etc.) and automating irrigation systems. The farmers can monitor the field conditions from anywhere. IoT-based smart farming is highly efficient when compared with the conventional approach. The applications of IoT-based smart farming not only target conventional, large farming operations, but could also be new levers to uplift other growing or common trends in agricultural like organic farming, family farming (complex or small spaces, particular cattle and/or cultures, preservation of particular or high-quality varieties, etc.), and enhance highly transparent farming. In terms of environmental issues, IoT-based smart farming can provide great benefits including more efficient water usage, or optimization of inputs and treatments.

1.1. OBJECTIVE AND GOALS

To design a working model through which farmer can monitor the environment conditions such as temperature, humidity and soil temperature in the field and can aid in irrigation activities by controlling the motor from anywhere at any point of time .

2. BLOCK DIAGRAM

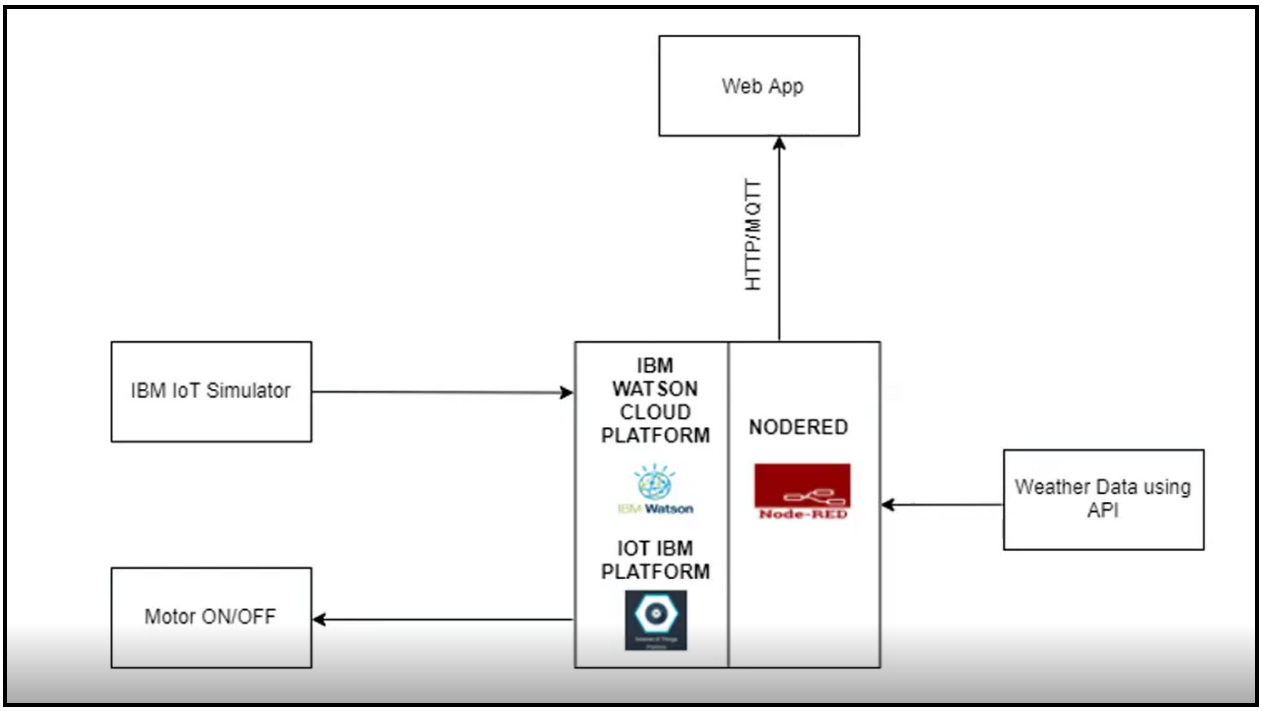

Fig. a

- **IBM Cloud** is a set of cloud computing services for business offered by the information technology company IBM. Here , IBM platform acts as an interface to control the electronic devices in real time through Watson IoT platform.
- **The Watson IoT platform** is used when the projects contain hardware such as sensors , electronic devices . It acts as an interface between devices and IBM Cloud by retrieving data from the devices and sending it to cloud and vice-versa.
- The simulated data is sent from **IBM IoT simulator** to IBM Watson cloud platform and then presented in **web interface using http/mqtt web protocols**.
- To know the real time data of any agricultural farm, we use **Open weather API** (Application Program Interface), which has some predefined APIs.
- Once the data is received , it is sent to the cloud via **Node-red platform** .
- The data is monitored continuously (here temperature , humidity and soil temperature) from a web interface .
- In case of watering crops **motor** can be turned on or off through the web interface controlled through internet .

3. SOFTWARE USED

3.1 IBM Cloud platform

The IBM cloud platform combines platform as a service (PaaS) with infrastructure as a service (IaaS) to provide an integrated experience. The platform scales and supports both small development teams and organizations, and large enterprise businesses. Globally deployed across data centres around the world, the solution you build on IBM Cloud™ spins up fast and performs reliably in a tested and supported environment you can trust.

The platform is built to support your needs whether it is working only in the public cloud or taking advantage of a multi cloud deployment model.

3.1.a. Node-RED

Node-RED is a flow-based development tool for visual programming developed originally by IBM for wiring together hardware devices, APIs and online services as part of the Internet of Things.

Node-RED provides a web browser-based flow editor, which can be used to create JavaScript functions. Elements of applications can be saved or shared for re-use. The runtime is built on Node.js. The flows created in Node-RED are stored using JSON. Since version 0.14, MQTT nodes can make properly configured TLS connections.

3.1.b. IBM Watson IoT Platform

Watson is the open, multi cloud platform that lets you automate the AI lifecycle. Build powerful models from scratch, or speed time-to-value with pre-built enterprise apps.

It allows secure, analyse and manage IoT data.

3.2 Python IDE

IDLE (short for Integrated DeveLopment Environment or Integrated Development and Learning Environment) is an integrated development environment for Python, which has been bundled with the default implementation of the language since 1.5.2b1. It is packaged as an optional part of the Python packaging with many Linux distributions. It is completely written in Python and the Tkinter GUI toolkit (wrapper functions for Tcl/Tk).

4. METHODOLOGY

1. Set up IBM cloud IBM academic account .
2. Install Node-RED locally in system, while installing Node.js as its prerequisite.
3. Create a set up as shown in figure b in node-RED by using the appropriate pallets.

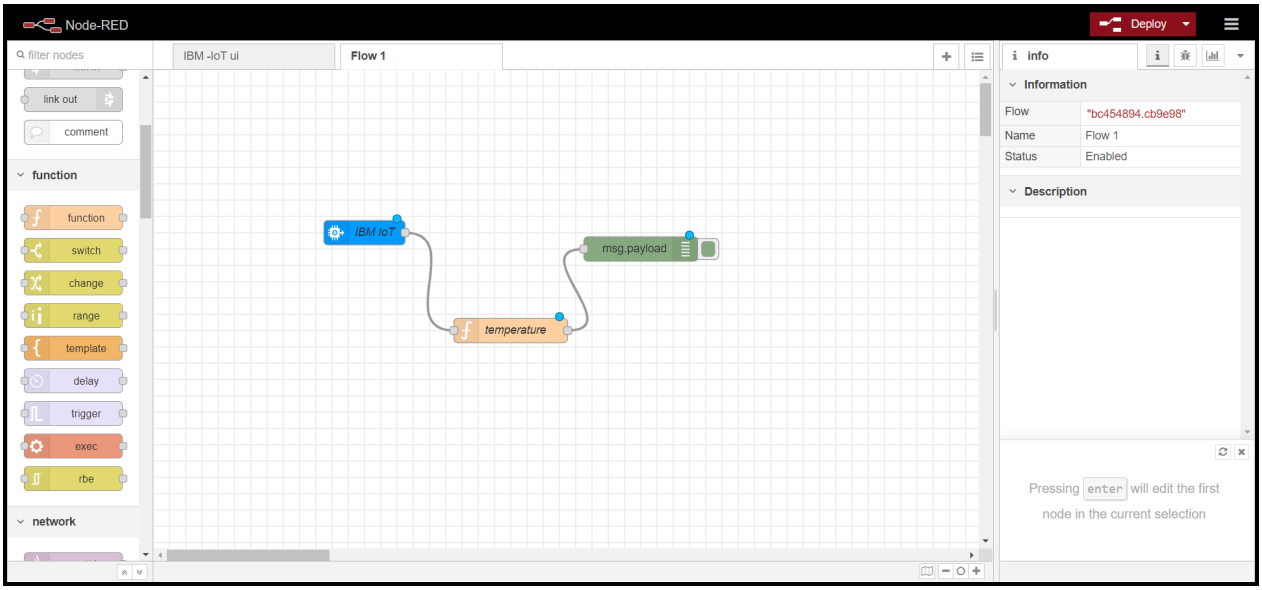

Fig. b

4. To retrieve data i.e temperature, humidity etc. , add a device in IBM Watson IoT platform as shown in Figure c.

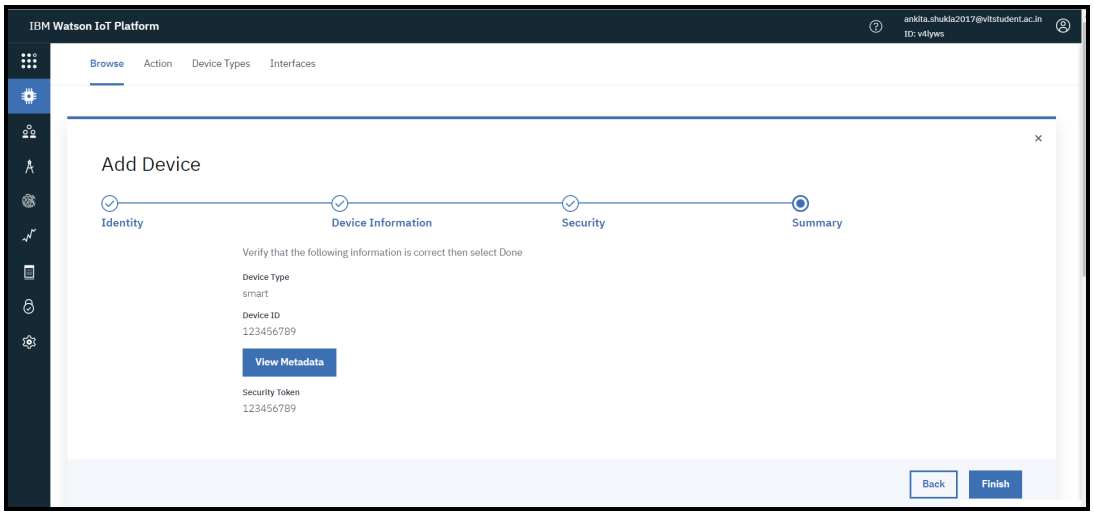

Fig. c

5. For connecting IBM cloud and node -RED we use API key which is generated in IBM Watson platform (Figure d).

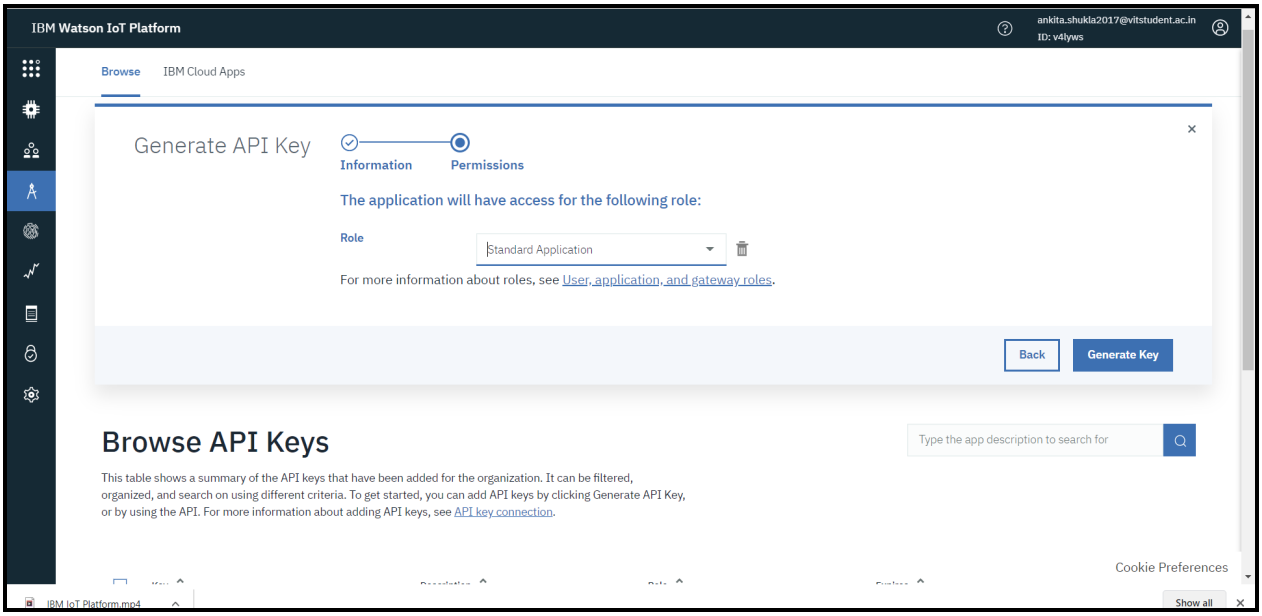

Fig. d

6. Connect the device to the simulator using the credentials such as device type, organization ID, authentication token etc. (Figure e, Figure f , & Figure g)

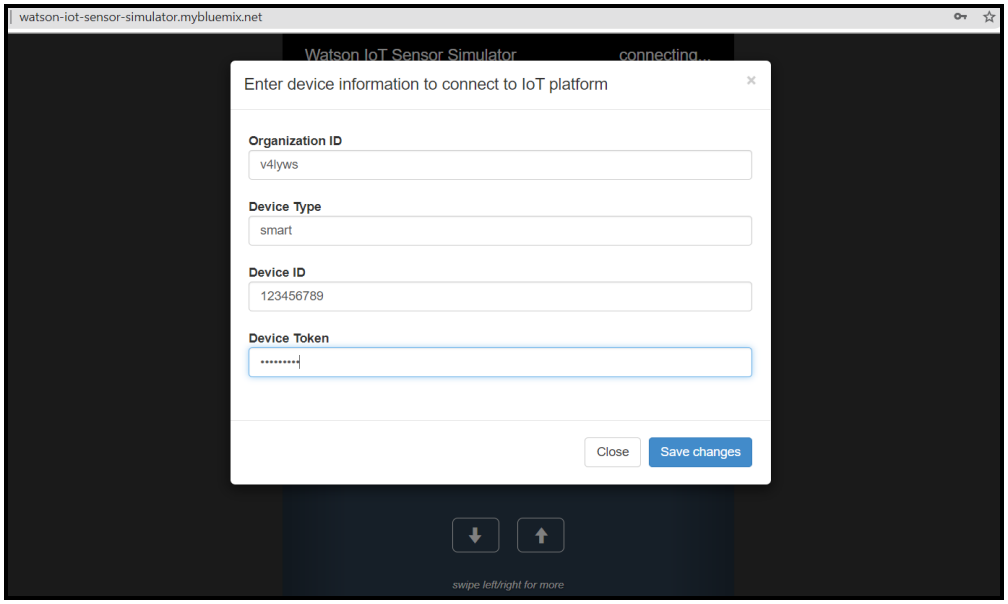

Fig. e

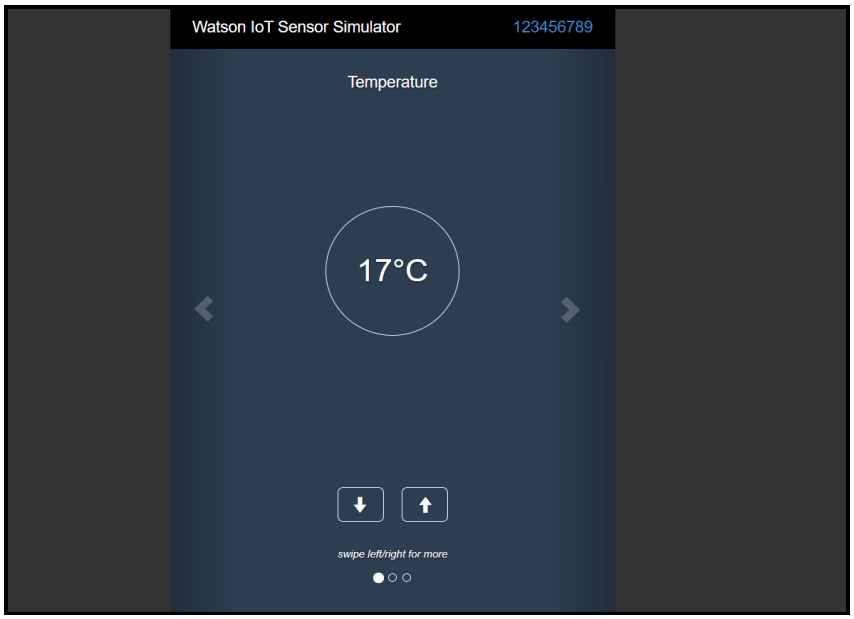
Watson IoT Sensor Simulator
123456789
Temperature
17°C
swipe left/right for more

Fig. f

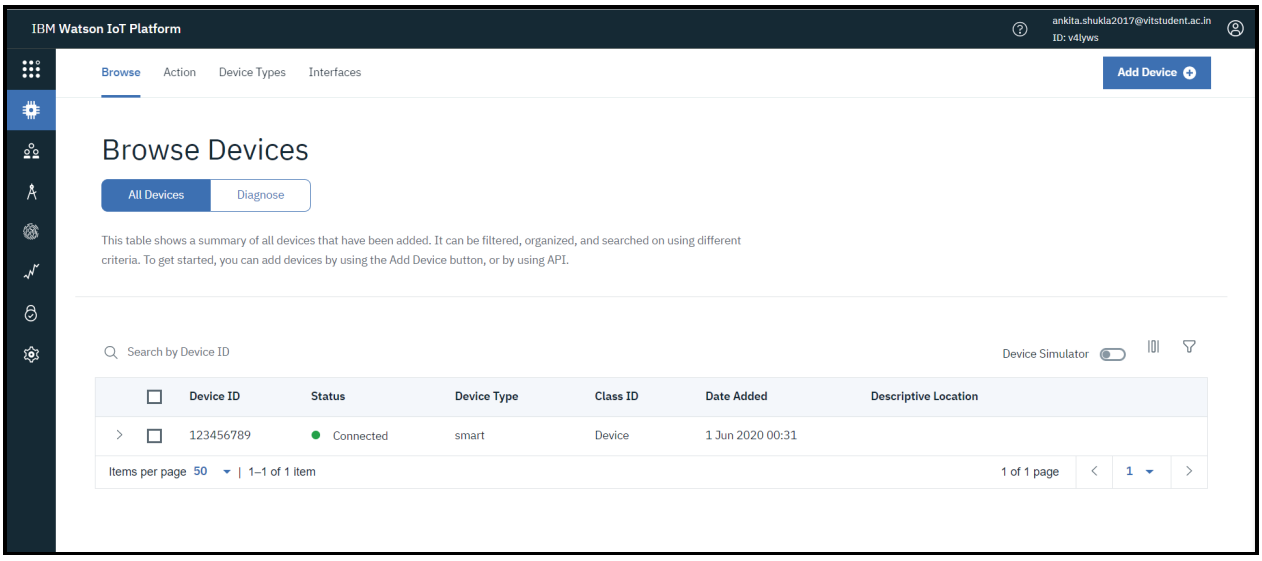
IBM Watson IoT Platform
ankita.shukla2017@vitstudent.ac.in
ID: v4lyws
Browse
Action
Device Types
Interfaces
Add Device
Browse Devices
All Devices
Diagnose
This table shows a summary of all devices that have been added. It can be filtered, organized, and searched on using different criteria. To get started, you can add devices by using the Add Device button, or by using API.
Search by Device ID
Device Simulator
Device ID
Status
Device Type
Class ID
Date Added
Descriptive Location
123456789
Connected
smart
Device
1 Jun 2020 00:31
Items per page 50
1–1 of 1 item
1 of 1 page
1

Fig. g

7. Add the API key in IBM IoT input node in nod -RED (Figure h)

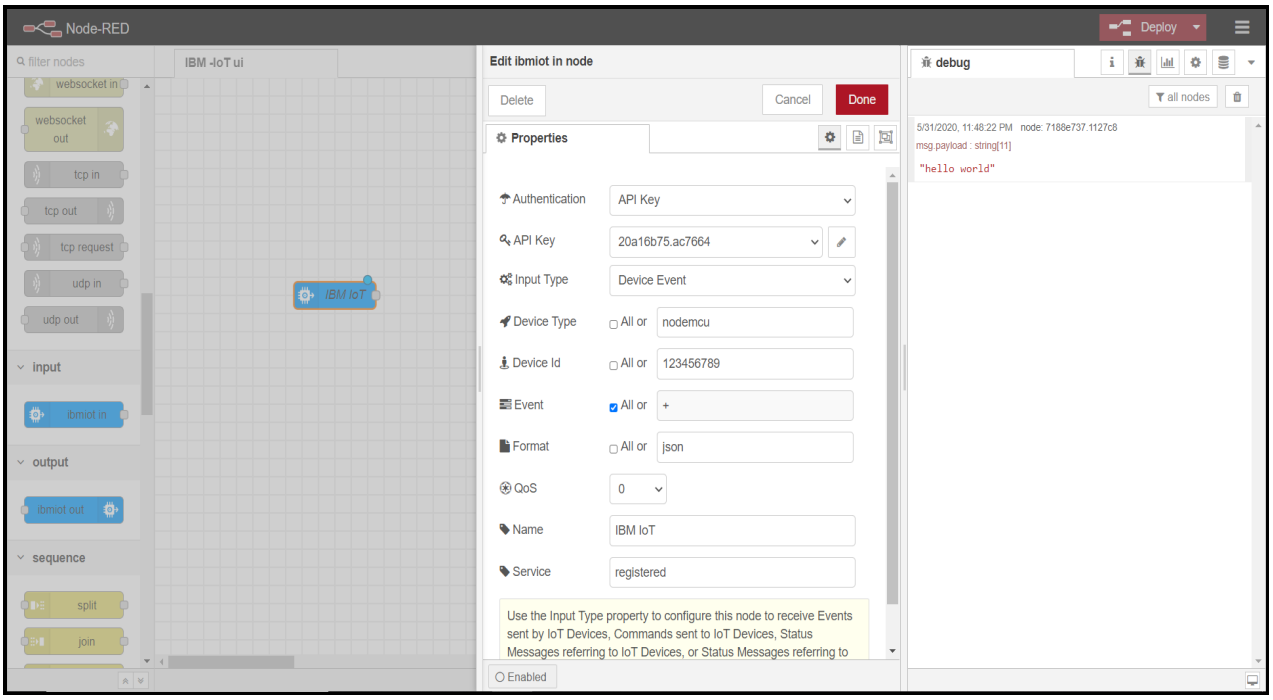

Fig. h

8. Use open weather API to get details of climatic conditions of any city . (Here Kanpur) and the deploy the whole flow.(Figure i)

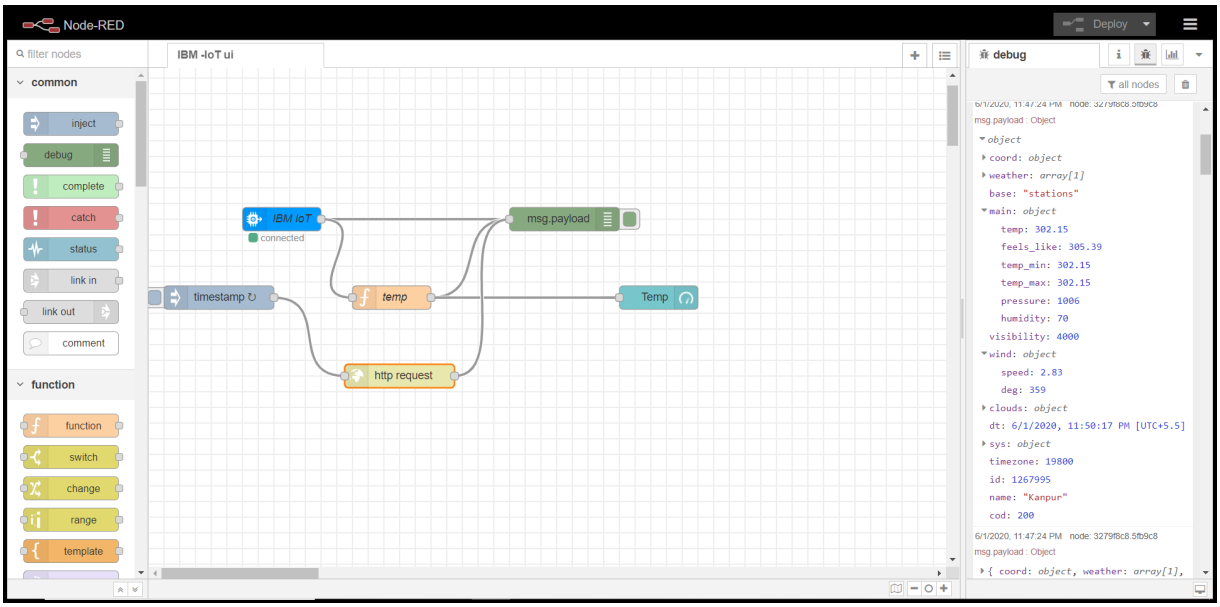

Fig. i

9. Add http request and a gauge to view the temperature using open weather API in a web interface. as shown in fig. j.

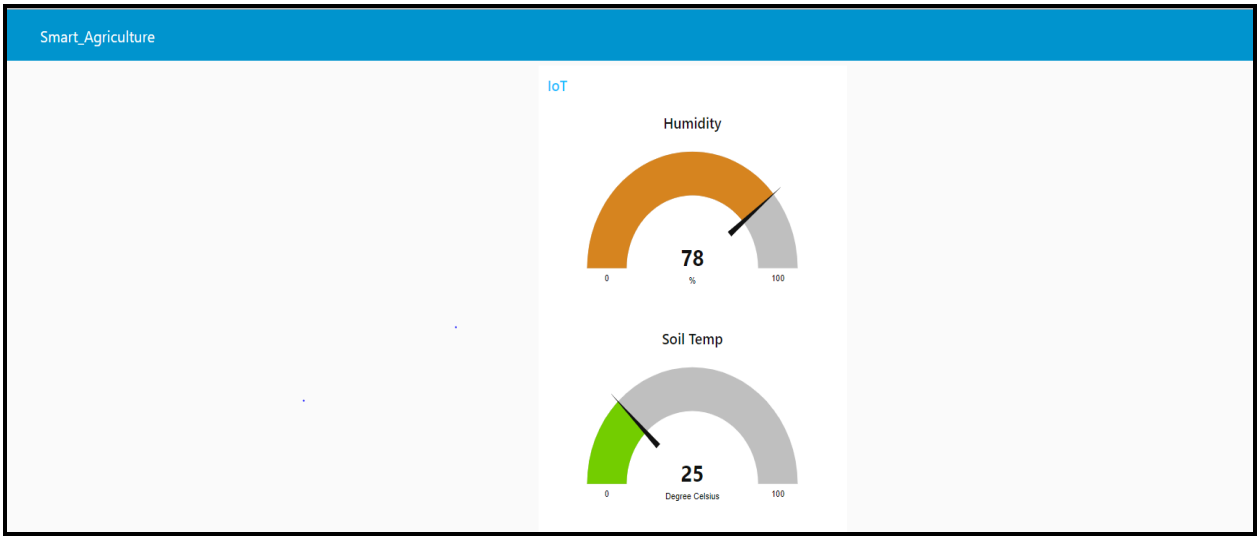

Fig. j

10 . Add motor on and motor off button to the flow including IBM output node configured with the same API key (Fig. k).

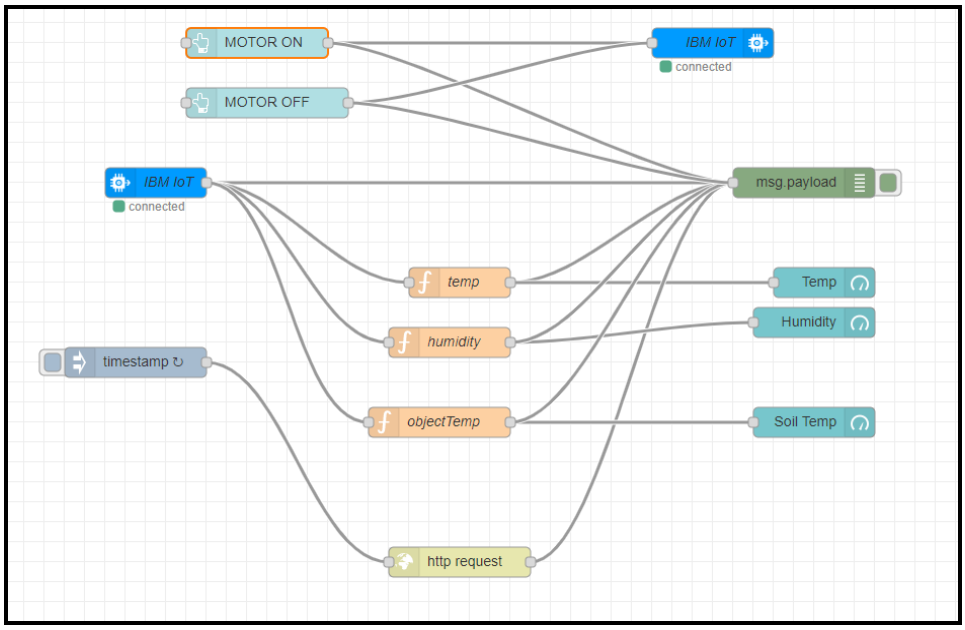

Fig. k

11. Write python code, import ibmiotf to python by installing it in system (pip install ibmiotf command in command prompt) and run the code.

5. RESULT

After running the python code , we can give command to control the motor (on/off) in the web interface and the result is shown in the debugger, as shown in fig. l.

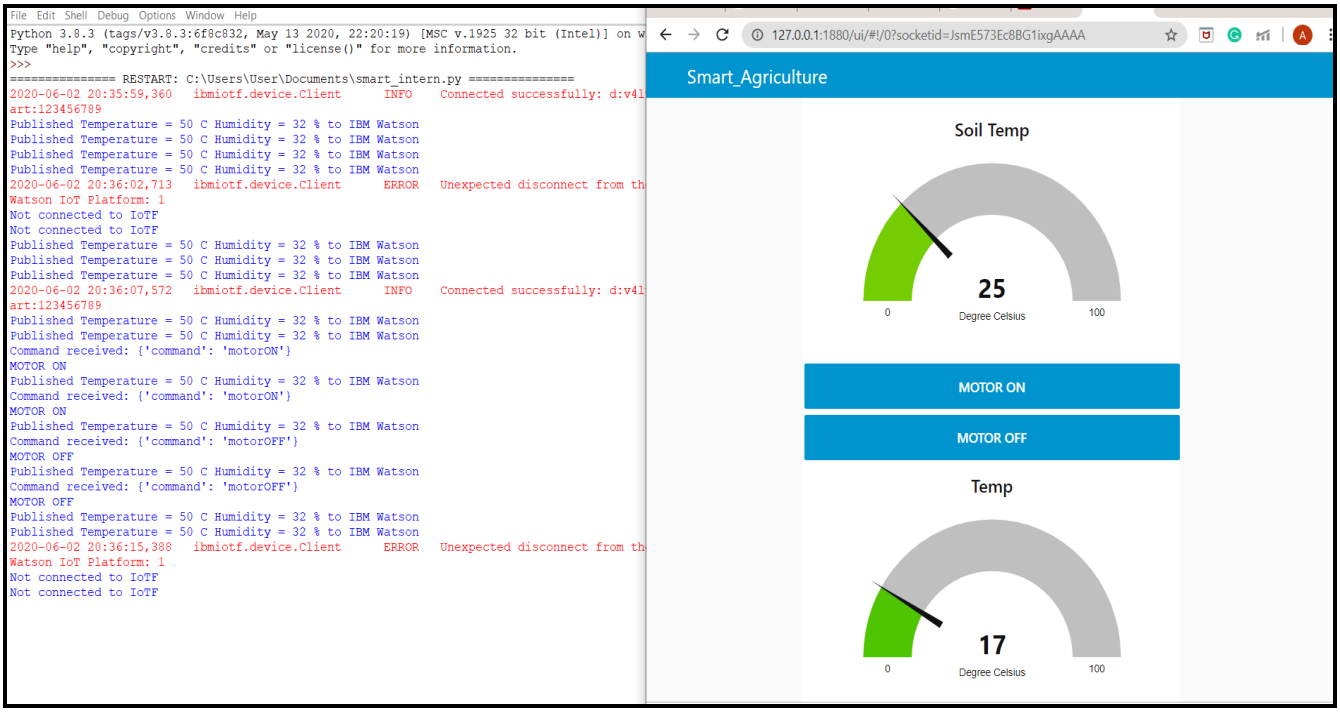

Fig. l

We can also analyse the obtained data using cards in IBM Watson IoT platform as shown in figure m.

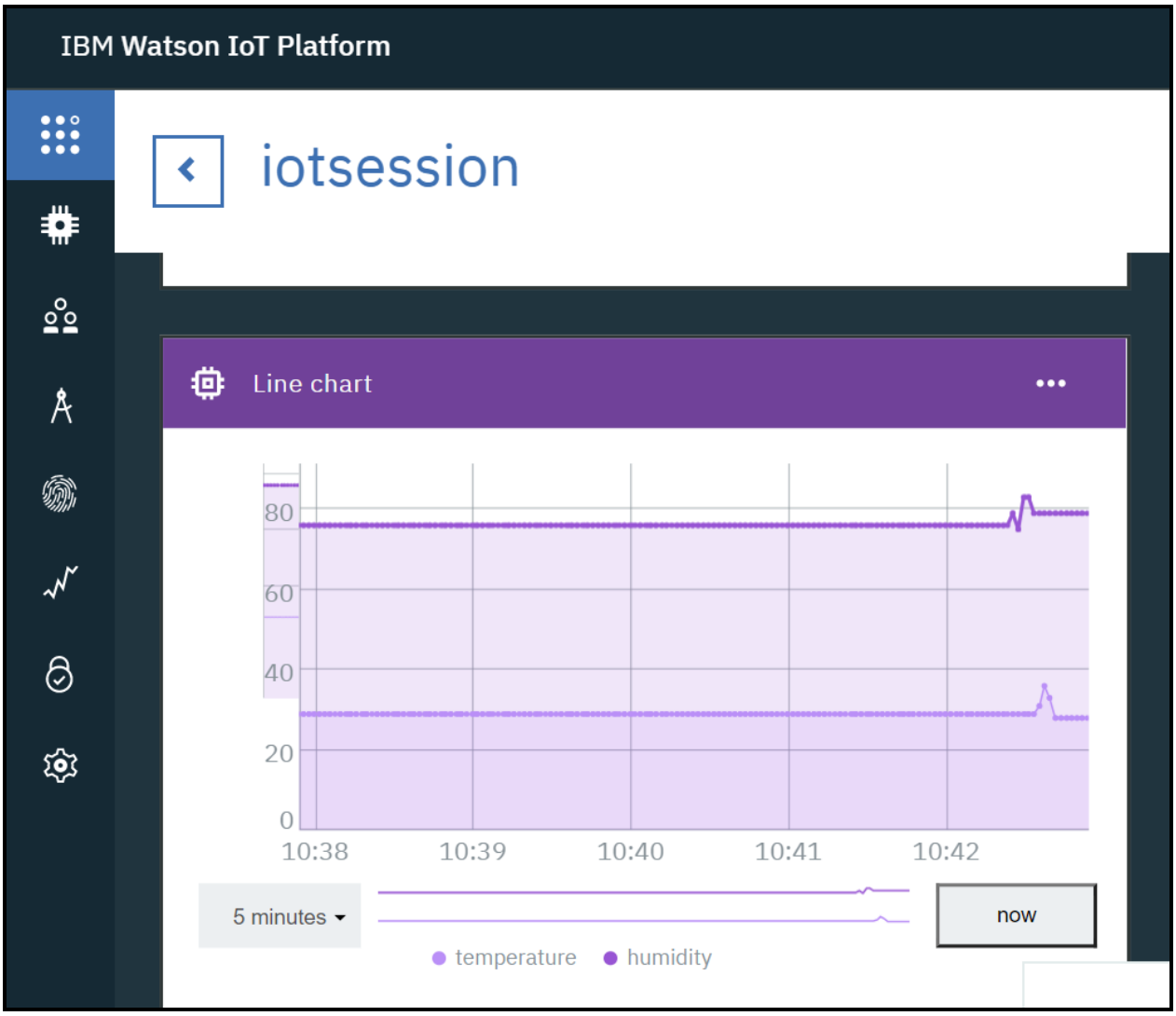

Fig. m

We can also analyse the data randomly (here distance and weight) by sending the simulated data into the device made as shown in figure n.

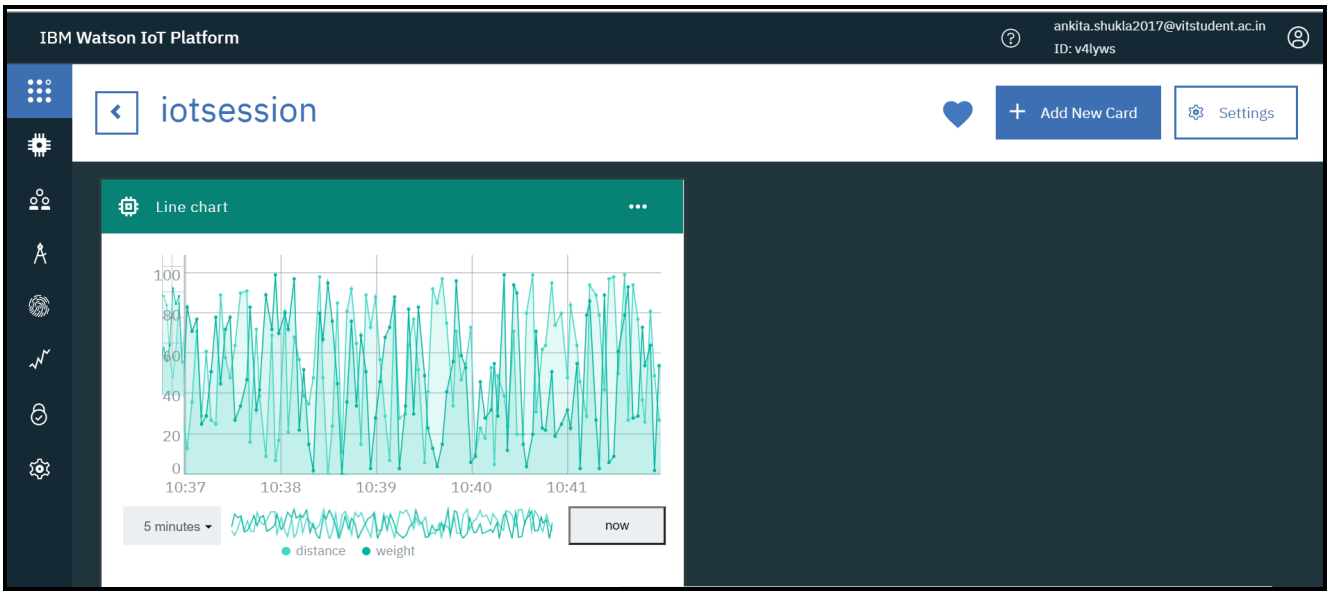

Fig. n

6. CONCLUSION

The IOT enables things selected recognized or potentially forced remotely crosswise over completed the process of existing configuration, manufacture open gateways for all the additional obvious merge of the substantial earth into PC based frameworks, in addition to acknowledging overhauled capacity, precision and cash interconnected favoured stance. Precisely when IOT is extended with sensors and actuators, the improvement modify into an occasion of the all the extra wide category of electronic physical structures, which in like manner incorporates headways, for instance, clever grids, splendid homes, canny moving and smart urban groups.