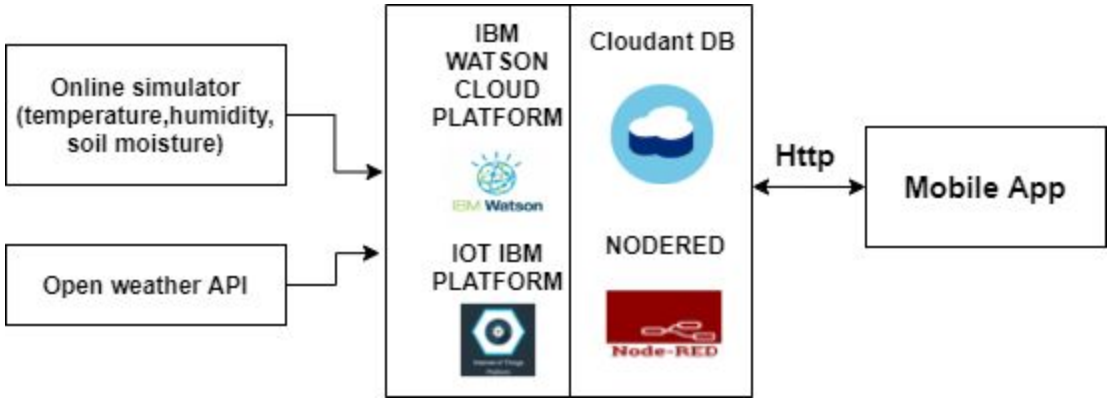
Campus Green Automation Using IBM Cloud

Abstract:
Campus Green project aims at developing and maintaining a greening project in Sreepathy Institute of Management and Technology, Vavanoor, Palakkad. In this project, we propose a **Real-Time Weather Based Smart Sprinkler System** to maintain the greenery of the campus. The main objective of the system is real-time monitoring of the proposed area over which the campus green project is set up. The system monitors the soil and environment conditions in realtime and also gets weather forecast data from OpenWeather API. Based on the sensor data and the weather forecast data, automated sprinklers will be operated which maintains a healthy environment for plants and trees. The data are stored in the IBM cloud and visual analysis is provided with the help of a web application and android application. Manual operation of motors is possible through the web and mobile UIs. Also, the system provides real-time notification over user mail about the present conditions of weather and sprinkler systems.

Introduction:
Currently, the campus green project is realized using manual effort. A person in charge needs to visit the place and manually inspect whether the plants and trees are having a healthy environment. If there is high temperature and less soil moisture then the person needs to manually operate the watering system or motors to provide healthy growing conditions for the trees. The watering system needs to be monitored as long as it is turned ON which increases the human load. If not monitored correctly, it may result in loss of water. To avoid these drawbacks, a **Real-Time Weather Based Smart Sprinkler System** is proposed. The IoT based system makes the watering process more efficient and reduces a lot of human load.

Proposed Solution:
In the proposed project the soil moisture, temperature and humidity levels at Sreepathy are continuously monitored with the help of sensors. These values are updated to the IBM IoT platform and the data is stored in Cloudant DB. The system also fetches data from open weather APIs and automatically controls the sprinkler system. The data can be visualized with the help of web and android application interfaces.



Features of the Proposed Solution:

- Real-time weather data (Sensor & API Data)
- Automated operation of sprinklers

- Alert notifications based on weather conditions
- Web/App interface to visualize weather conditions
- Cloud storage to keep track of weather conditions.
- Remote operation of Sprinklers using Android application

Project Flow:

- Configure and connect the online simulator to publish temperature, humidity, and soil moisture values to the IBM IoT Platform.
- Create a Node-RED flow to get the data from the IBM IoT platform and store it in Cloudant DB.
- Create HTTP APIs in Node-RED to send the sensor data to the mobile app and also to get the commands from the mobile applications.
- Create a mobile app to visualize the sensor parameters and also to get the open weather data.
- Configure the mobile app to send commands to the IBM IoT Platform to control the sprinklers based on the sensor values and weather details.
- Send notifications to users based on weather conditions.

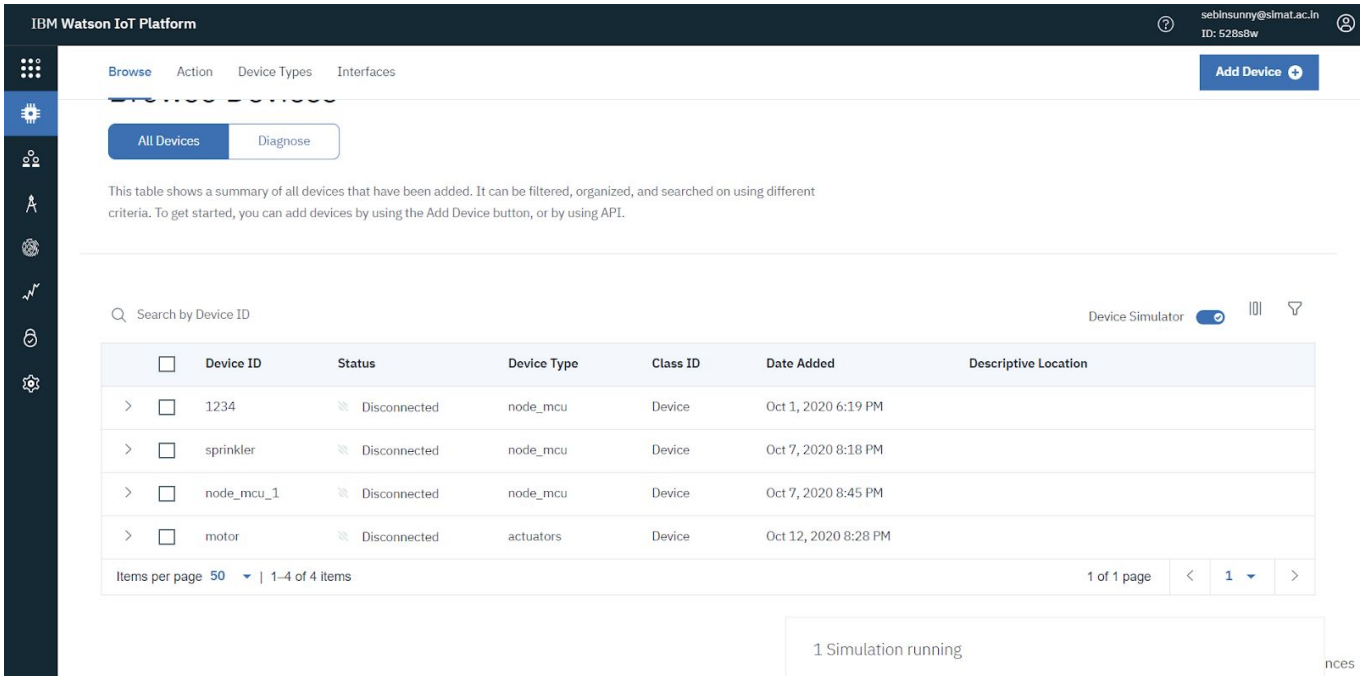


Fig 1: IBM Watson IoT Platform

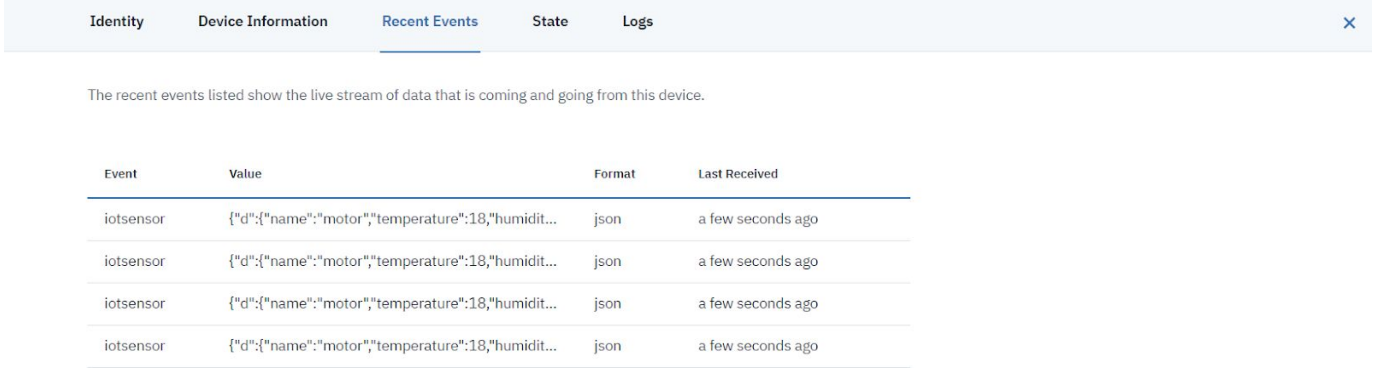


Fig 2: Values obtained from IBM online simulator

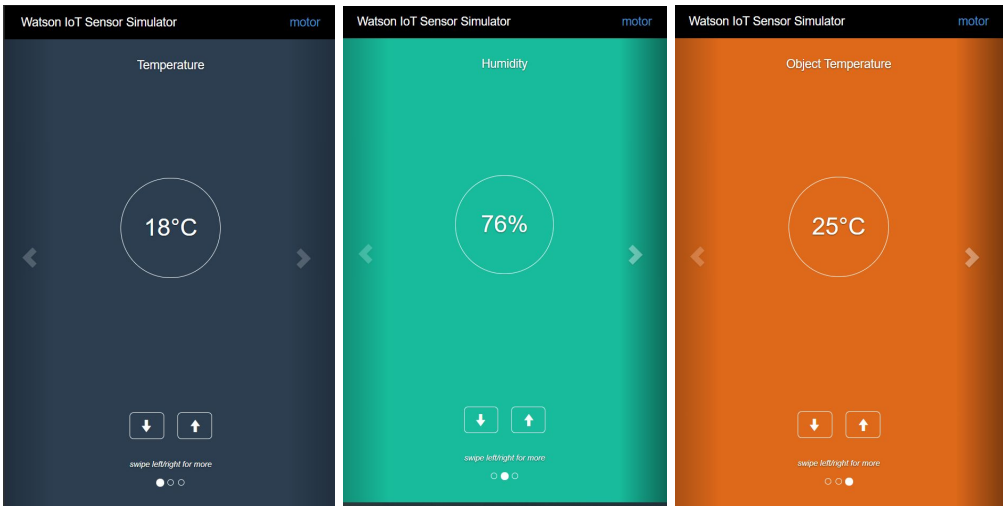


Fig 3: IBM Watson IoT Sensor Simulation

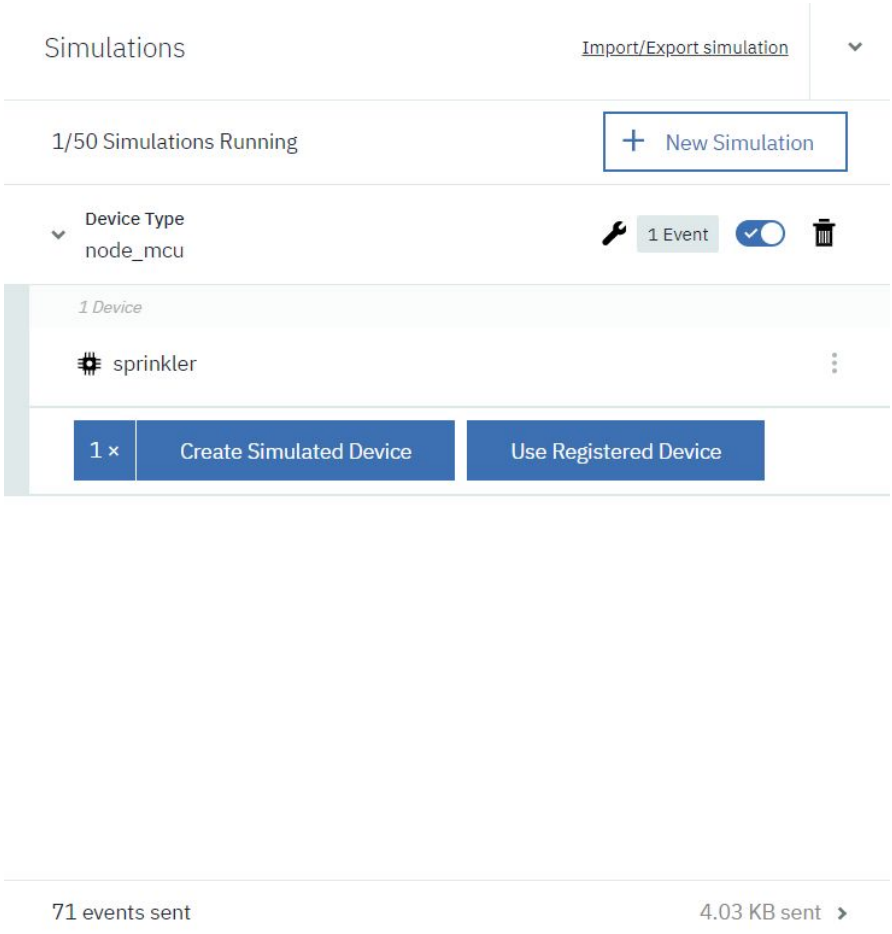


Fig 4: IBM Watson IoT Platform Sensor Simulation

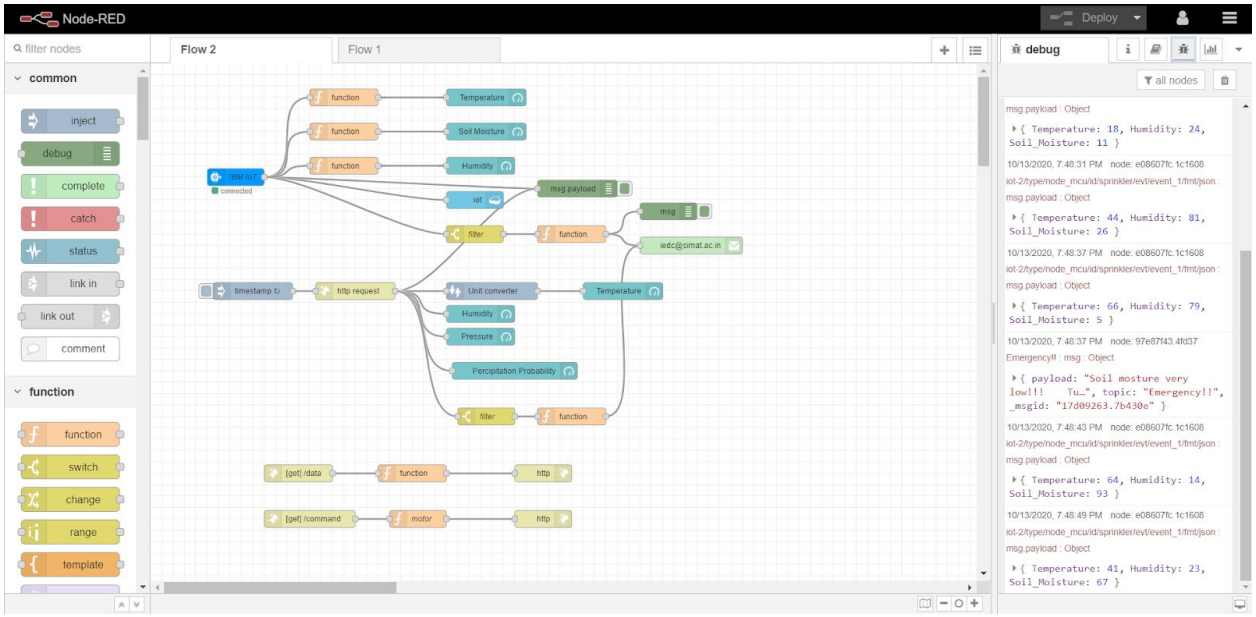


Fig 5: Node-Red Flow

Weather Data Obtained from OpenWeathe API at Sreepathy Institute of Management And Technology.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  "timezone":"Asia/Kolkata",
  "timezone_offset":19800,
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    "sunset":1602592733,
    "temp":297.15,
    "feels_like":300.91,
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    "dew_point":296.12,
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    "visibility":3000,
    "wind_speed":2.1,
    "wind_deg":360,
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}

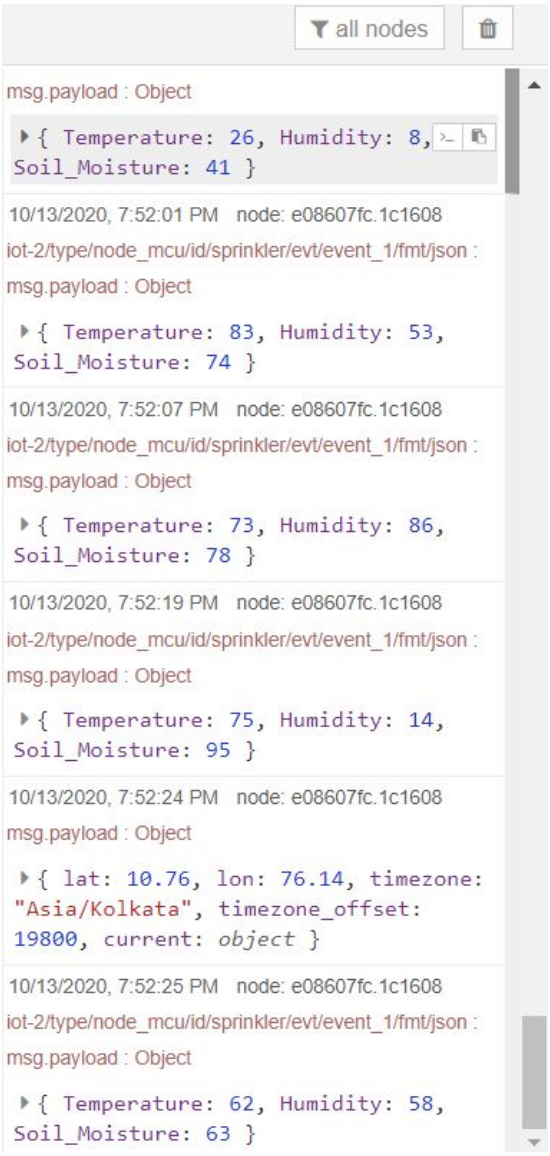

Fig 6: Values obtained from IBM IoT Platform & Weather API

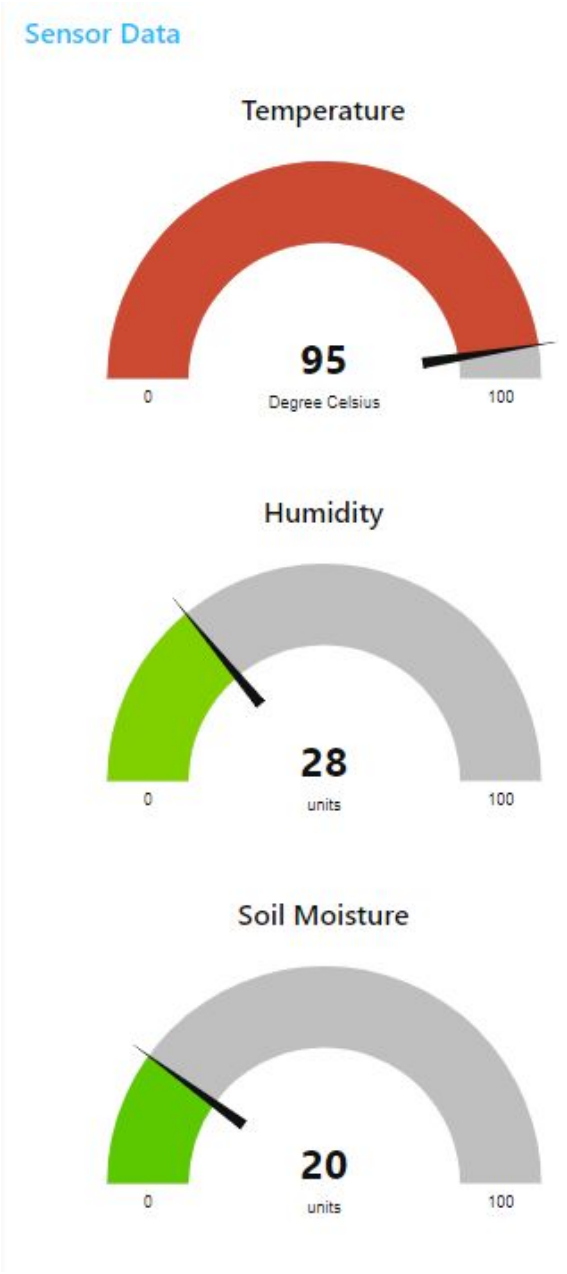

Fig 7a: Web Interface - Simulated Sensor Data

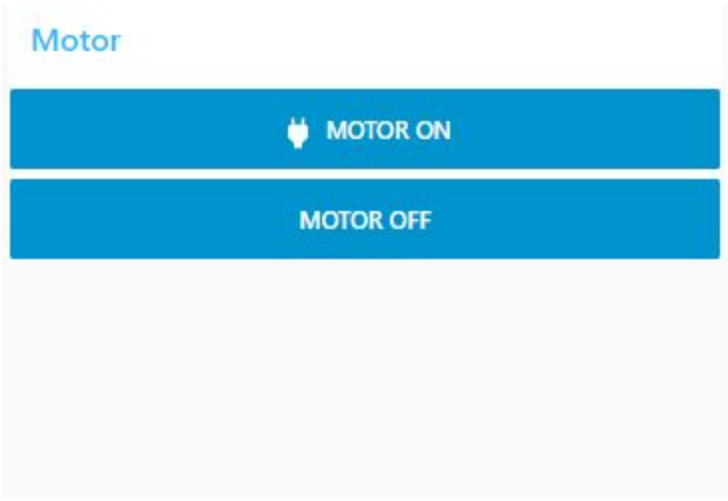

Fig 7b: Web Interface - Motor ON/OFF Control

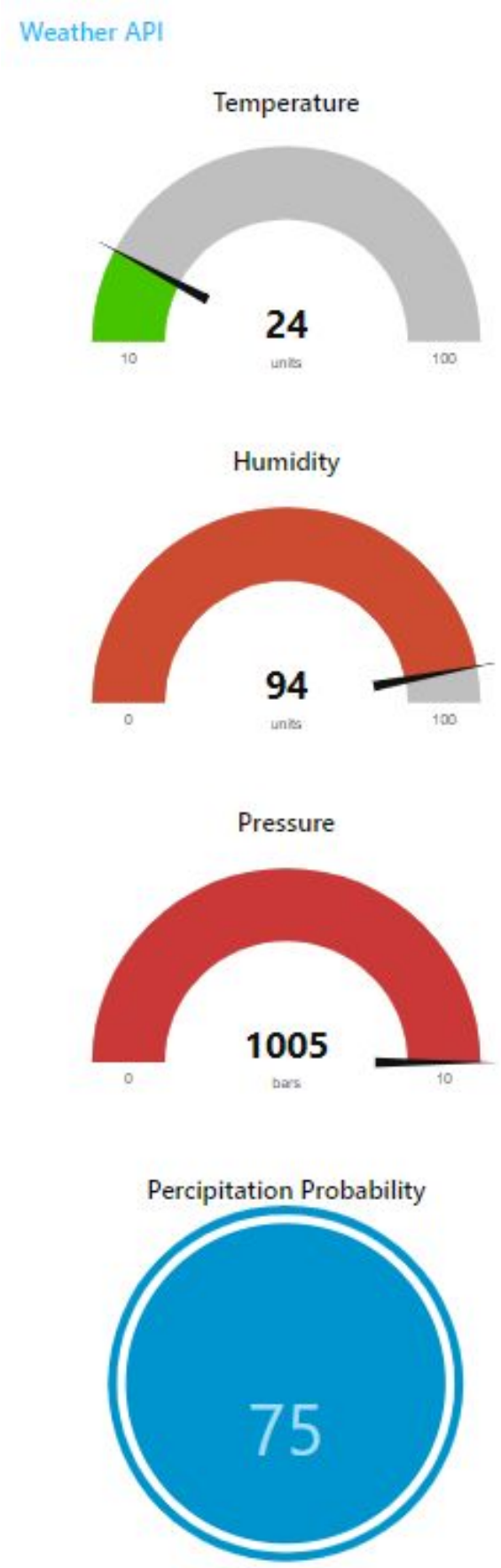

Fig 7c: Web Interface - API Weather Data

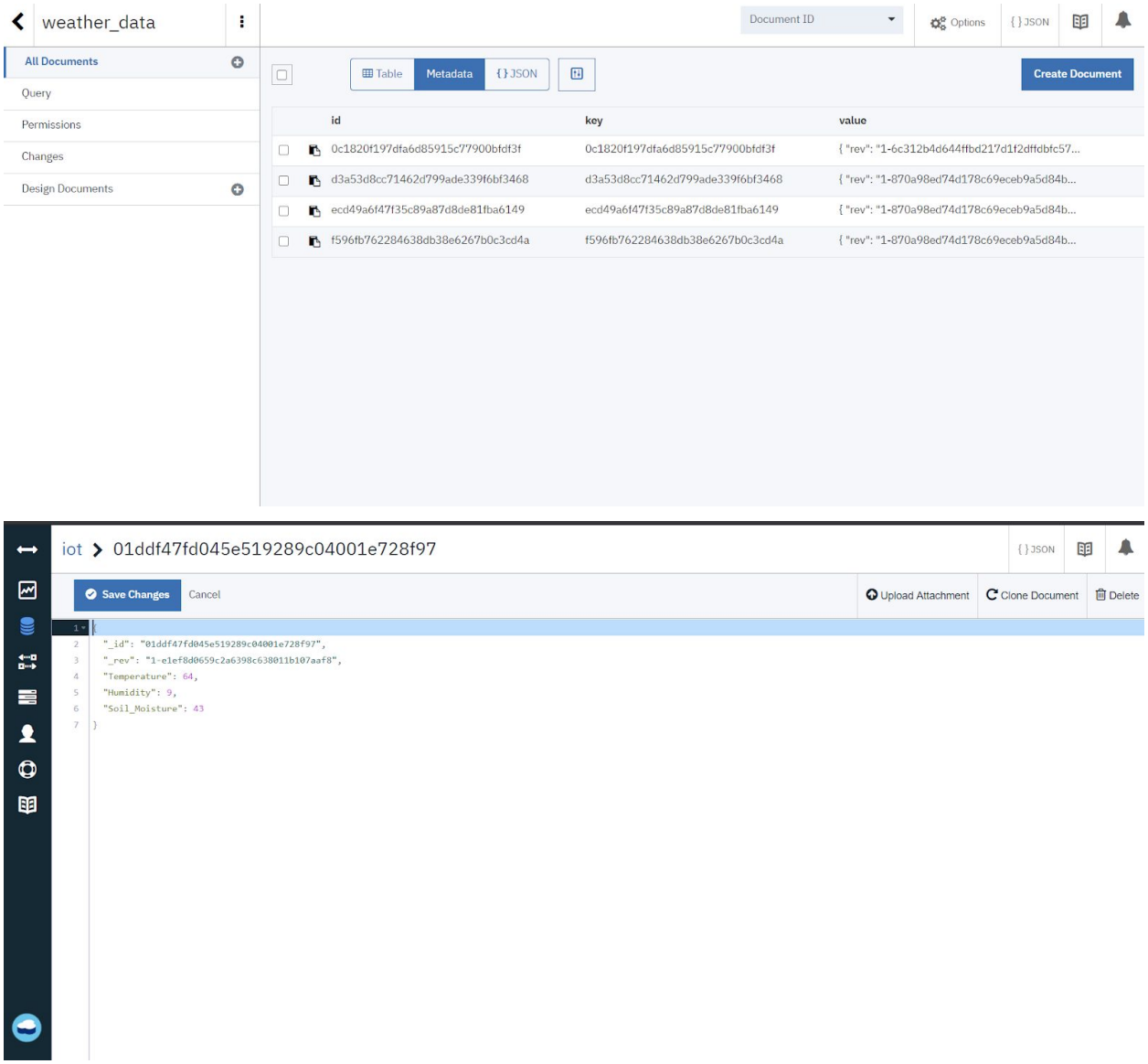

Fig 8: Data Stored in IBM Cloud

Fig 9: e-mail Notification on Low Soil Moisture Levels

Android Application Interface