

SENDING DATA FROM RASPBERRY-PI TO IBM WATSON

Date	15 NOVEMBER 2022
Team ID	PNT2022TMID38324
Project Name	GAS LEAKAGE MONITORING AND ALERTING SYSTEM FOR INDUSTRIES

AIM:

To send sensor data (or any dummy data) from Raspberry –Pi to IBM Watson .In our case it is DHT sensors Data.

REQUIREMENTS:

HARDWARE:

- RASPBERRY-PI (3B)(WITH ETHERNET CABLE OR WIFI CONNECTED)
- USB MOUSE
- USB KEYBOARD
- VGA TO HDMI CABLE
- A MONITOR
- RASPBERRY'S POWER SUPPLY
- DHT-11 Sensor
- Connecting Wires

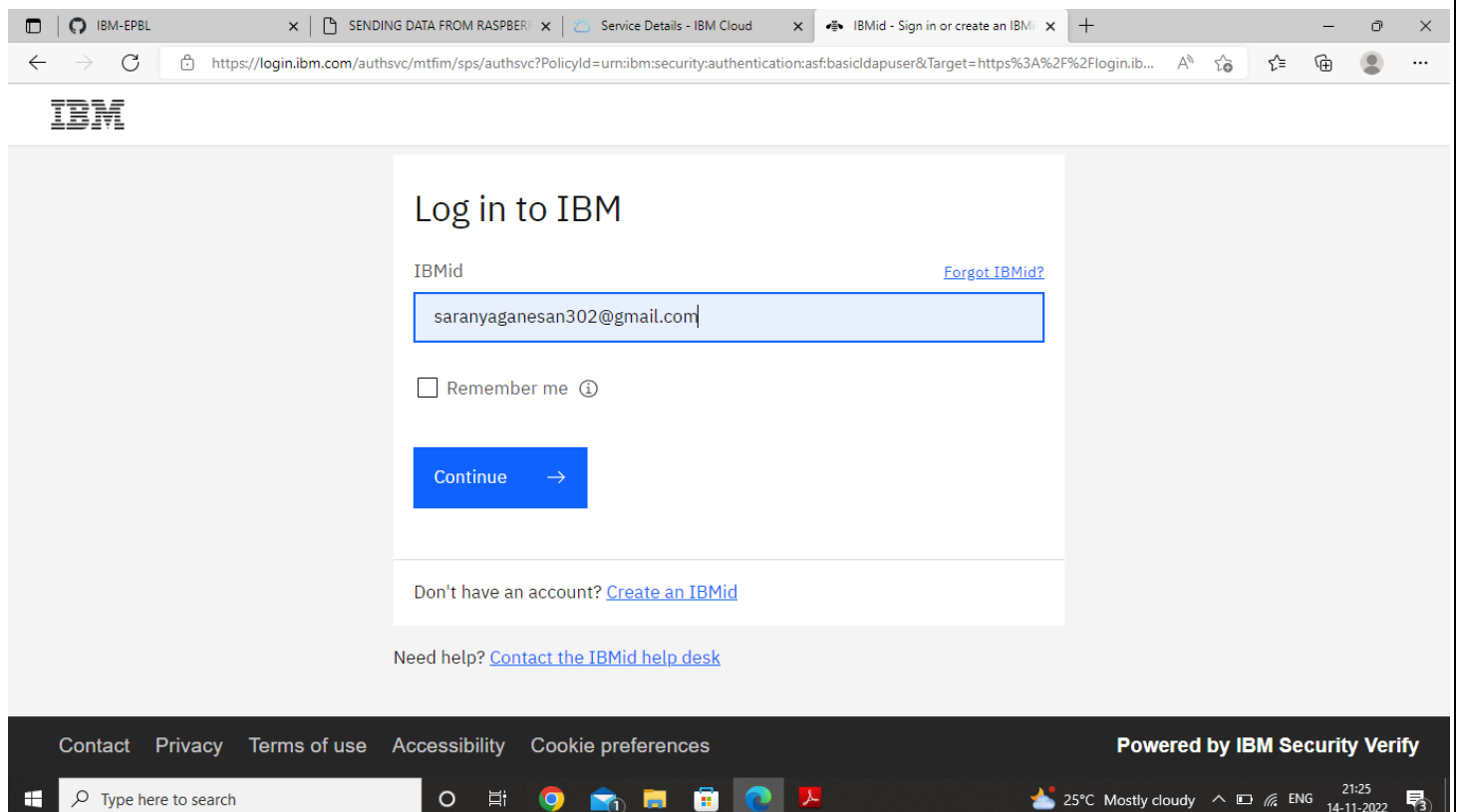
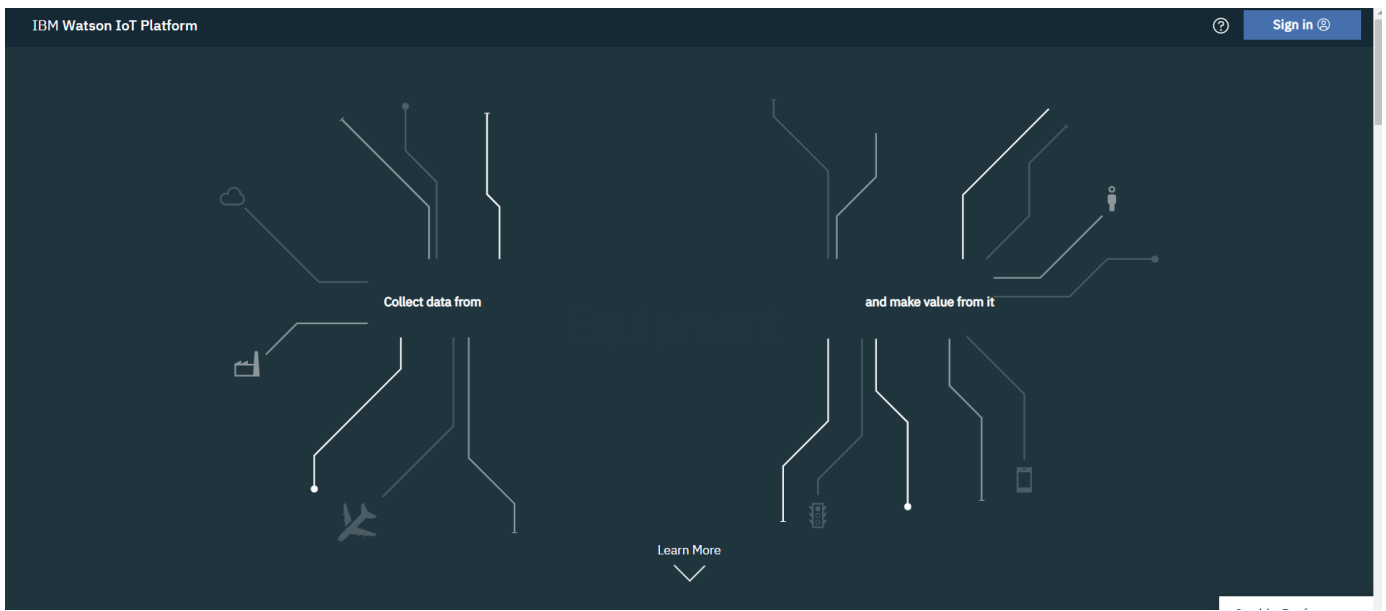
SOFTWARE:

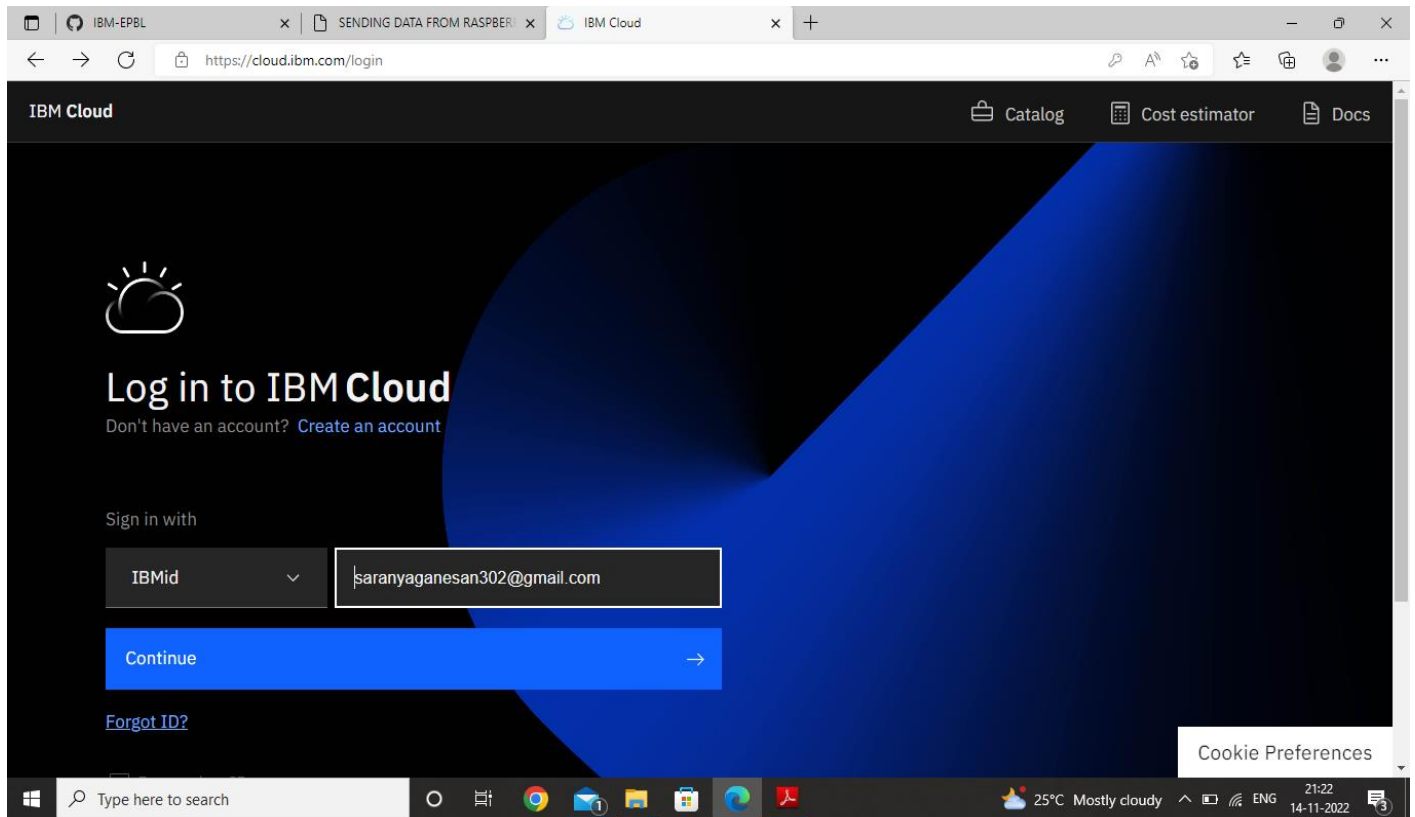
- IBM BLUEMIX ACCOUNT

STEPS TO BE FOLLOWED

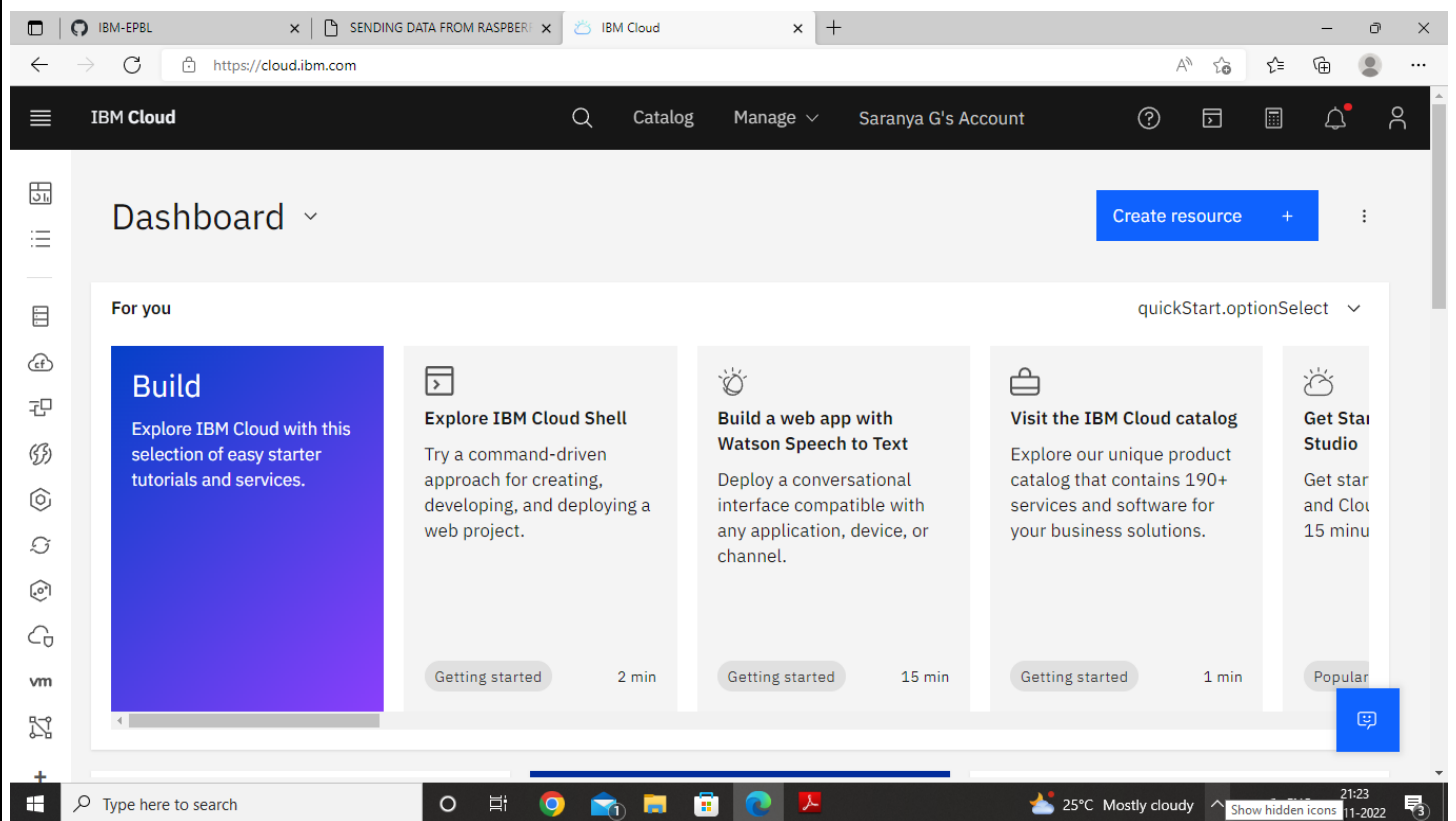
Step-1: Create a device in IBM Watson:

- Firstly, login into your IBM-Bluemix account with your e-mail ID and Password.





➤ Click on catalog on your dashboard screen, then under platform go IoT.



➤ Check all details and click on create.

IBM Cloud

Resource list

Create resource +

Name	Group	Location	Product	Status	Tags
Internet of Things Platform-kq	Default	London	Internet of Things Platform-kq	Active	

25°C Mostly cloudy 21:23 14-11-2022

➤ click on Launch

IBM Cloud

Internet of Things Platform-kq

Active Add tags

Details Actions...

Manage

Plan

Connections

Let's get started with IBM Watson IoT Platform

Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.

Launch Docs

Ready for the next level?

IBM Watson IoT Platform Journey

25°C Mostly cloudy 21:23 14-11-2022

- Dashboard of IBM Watson IoT platform,
- Click on Add device

The screenshot shows the IBM Watson IoT Platform interface. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. A sidebar on the left contains various icons. The main content area is titled 'Browse Devices' and features a table of devices. The table has columns for 'Device ID', 'Status', 'Device Type', and 'Class ID'. A single device is listed with ID '12345', status 'Disconnected', and type 'NodeMCU'. A search bar and a 'Device Simulator' toggle are also visible.

Device ID	Status	Device Type	Class ID
12345	Disconnected	NodeMCU	Device

- After click on Add device this page will open

The screenshot shows the 'Add Device' page in the IBM Watson IoT Platform. It features a progress bar with four steps: 'Identity', 'Device Information', 'Security', and 'Summary'. The 'Identity' step is currently active. Below the progress bar, there are two input fields: 'Device Type' and 'Device ID'. The 'Device Type' field has a dropdown menu with the option 'Select or create a device type...'. The 'Device ID' field has a placeholder text 'Enter Device ID'.

➤ Go to device type and fill the details.

The screenshot shows the 'Add Type' form in the IBM Watson IoT Platform. The form is titled 'Add Type' and has a progress bar with two steps: 'Identity' (selected) and 'Device Information'. The 'Identity' step includes a 'Type' dropdown menu with 'Device' and 'Gateway' options, a 'Name' text field with the value 'Saranya', and a 'Description' text field with the value 'Device'. A 'Next' button is visible at the bottom right of the form.

IBM Watson IoT Platform

Browse Action **Device Types** Interfaces

Add Type

Identity Device Information

Device types group devices that have similar characteristics, such as model number, firmware version, or location. Give the device type a unique name and a description that identifies characteristics that are shared by devices of this type.

Type Or

Name

The device type name is used to identify the device type uniquely and uses a restricted set of characters to make it suitable for API use.

Description

➤ Click on Finish

The screenshot shows the 'Add Type' form in the IBM Watson IoT Platform, Step 2: Device Information. The form is titled 'Add Type' and has a progress bar with two steps: 'Identity' (completed) and 'Device Information' (selected). The 'Device Information' step includes a table with fields for 'Serial Number', 'Model', 'Description', 'Hardware Version', 'Manufacturer', 'Device Class', 'Firmware Version', and 'Descriptive Location'. Each field has a corresponding input box. A 'Finish' button is visible at the bottom right of the form.

IBM Watson IoT Platform

Browse Action **Device Types** Interfaces

Add Type

Identity Device Information

These attributes will be used as a template for new devices that are assigned this device type

Serial Number	<input type="text" value="Enter Serial Number"/>	Manufacturer	<input type="text" value="Enter Manufacturer"/>
Model	<input type="text" value="Enter Model"/>	Device Class	<input type="text" value="Enter Device Class"/>
Description	<input type="text" value="Enter Description"/>	Firmware Version	<input type="text" value="Enter Firmware Version"/>
Hardware Version	<input type="text" value="Enter Hardware Version"/>	Descriptive Location	<input type="text" value="Enter Descriptive Location"/>

➤ Click on Register Device.

The screenshot shows the IBM Watson IoT Platform interface. The browser address bar displays the URL: <https://e06cdh.internetofthings.ibmcloud.com/dashboard/devices/types/add>. The page title is "IBM Watson IoT Platform". The user is logged in as "saranyaganesan302@gmail.com" with ID "e06cdh". The navigation menu includes "Browse", "Action", "Device Types", and "Interfaces". The "Device Types" tab is active, showing the "Register Device" screen. The screen has two tabs: "Register Device" (selected) and "Advanced Flow". The "Register Device" tab contains the heading "Optional Register Devices, Define Interfaces" and a subheading "Now that you added a device type, you can register and connect devices for this type." Below this is a blue button labeled "Register Devices". To the right of the text is a large grey area with a blue microchip icon. At the bottom right of the main content area are "Cancel" and "Next" buttons. The Windows taskbar at the bottom shows the search bar, task view, and several application icons. The system tray shows "Good air", network status, and the date/time "21:48 14-11-2022".

➤ Choose the device and give device ID and then click on next.

The screenshot shows the IBM Watson IoT Platform interface. The browser address bar displays the URL: <https://e06cdh.internetofthings.ibmcloud.com/dashboard/devices/browse/add>. The page title is "IBM Watson IoT Platform". The user is logged in as "saranyaganesan302@gmail.com" with ID "e06cdh". The navigation menu includes "Browse", "Action", "Device Types", and "Interfaces". The "Browse" tab is active, showing the "Add Device" screen. The screen has a progress bar with four steps: "Identity" (selected), "Device Information", "Security", and "Summary". Below the progress bar is the heading "Add Device". The instructions state: "Select a device type for the device that you are adding and give the device a unique ID." There are two input fields: "Device Type" with a dropdown menu showing "Select or create a device type..." and "Device ID" with a text input field showing "Enter Device ID". The Windows taskbar at the bottom shows the search bar, task view, and several application icons. The system tray shows "25°C Mostly cloudy", network status, and the date/time "21:28 14-11-2022".

➤ Click on Next

The screenshot shows the 'Add Device' wizard in the IBM Watson IoT Platform. The user is at the 'Device Information' step, which is the second of four steps: Identity, Device Information, Security, and Summary. The 'Identity' step is completed. The 'Device Information' step contains several input fields for device details:

- Serial Number: Enter Serial Number
- Model: Enter Model
- Description: Enter Description
- Hardware Version: Enter Hardware Version
- Manufacturer: Enter Manufacturer
- Device Class: Enter Device Class
- Firmware Version: Enter Firmware Version
- Descriptive Location: Enter Descriptive Location

There is an 'Add Metadata' button with a plus icon. At the bottom right, there are 'Back' and 'Next' buttons. The 'Next' button is highlighted in blue, indicating it is the next step in the process.

Browse Devices

➤ Click on Next

The screenshot shows the 'Add Device' wizard in the IBM Watson IoT Platform. The user is at the 'Security' step, which is the third of four steps: Identity, Device Information, Security, and Summary. The 'Identity' and 'Device Information' steps are completed. The 'Security' step contains two options for selecting a device authentication token:

- Auto-generated authentication token (default)**: Allow the service to generate an authentication token for you. Tokens are 18 characters and contain a mix of alphanumeric characters and symbols. The token is returned to you at the end of the device registration process.
- Self-provided authentication token**: Provide your own authentication token for this device. The token must be between 8 and 36 characters and contain a mix of lowercase and uppercase letters, numbers, and symbols, which can include hyphens, underscores, and periods. Do not use repeated characters, dictionary words, user names, or other predefined sequences.

Below the options, there is an 'Authentication Token' input field with a placeholder 'Enter an optional token' and an information icon. Below the input field, there is a note: 'Make a note of the generated token. Lost authentication tokens cannot be recovered. Tokens are encrypted before being stored.' and a statement: 'Authentication token are encrypted before we store them.'

➤ Click on Finish

IBM Watson IoT Platform

Identity Device Information Security Summary

Verify that the following information is correct then select Finish

Device Type
Saranya
Device ID
Device

View Metadata

Security Token
To be generated

Back Finish

➤ Device is created

IBM Watson IoT Platform

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
12345	Disconnected	NodeMCU	Device
12345	Disconnected	Saranya	Device

Items per page 50 | 1-2 of 2 items

1 of 1 page 1

STEP-2: INSTALLING NECESSARY PACKAGES ON YOUR PI:

- Now we are going to install necessary packages on your pi.
- Open your terminal in your pi and type the following commands
- `curl -LO https://github.com/ibm-messaging/iot-raspberrypi/releases/download/1.0.2.1/iot_1.0-2_armhf.deb`
- `sudo dpkg -i iot_1.0-2_armhf.deb`
- `service iot status`

Following are the images as to what appears on your pi's terminal when u type these commands

```
File Edit Tabs Help
--2017-10-23 06:55:22-- http://ftp.nl.debian.org/debian/pool/main/o/openssl/libssl1.0.0_1.0.1t-1-deb8u6_armhf.deb
Resolving ftp.nl.debian.org (ftp.nl.debian.org)... 130.89.149.21, 2001:67c:2564:a120::21
Connecting to ftp.nl.debian.org (ftp.nl.debian.org)[130.89.149.21]:80... connect
ed.
HTTP request sent, awaiting response... 200 OK
Length: 867950 (848K) [application/x-debian-package]
Saving to: 'libssl1.0.0_1.0.1t-1-deb8u6_armhf.deb'

libssl1.0.0_1.0.1t- 100%[=====] 847.61K  358KB/s   in 2.4s

2017-10-23 06:55:25 (358 KB/s) - 'libssl1.0.0_1.0.1t-1-deb8u6_armhf.deb' saved [
867950/867950]

pi@raspberrypi:~$ sudo dpkg -i libssl1.0.0_1.0.1t-1-deb8u6_armhf.deb
Selecting previously unselected package libssl1.0.0:armhf.
(Reading database ... 115608 files and directories currently installed.)
Preparing to unpack libssl1.0.0_1.0.1t-1-deb8u6_armhf.deb ...
Unpacking libssl1.0.0:armhf (1.0.1t-1-deb8u6) ...
Setting up libssl1.0.0:armhf (1.0.1t-1-deb8u6) ...
pi@raspberrypi:~$ curl -LO https://github.com/ibm-messaging/iot-raspberrypi/rel
eases/download/1.0.2.1/iot_1.0-2_armhf.deb
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           Dload  Upload   Total   Spent    Left  Speed
100 164  0 164  0  0 157  0 --:--:0  0:00:01 --:--:-- 157
100 609  0 609  0  0 457  0 --:--:0  0:00:01 --:--:-- 457
100 110k 100 110k  0  0 29117  0 0:00:03  0:00:03 --:--:-- 48190
pi@raspberrypi:~$ sudo dpkg -i iot_1.0-2_armhf.deb
(Reading database ... 115626 files and directories currently installed.)
Preparing to unpack iot_1.0-2_armhf.deb ...
Unpacking iot (1.0-1) over (1.0-1) ...
Setting up iot (1.0-1) ...
Processing triggers for systemd (232-25+deb9u1) ...
pi@raspberrypi:~$ service iot status
* iot.service - LSB: iot service
   Loaded: loaded (/etc/init.d/iot; generated; vendor preset: enabled)
   Active: active (running) since Mon 2017-10-23 06:56:25 UTC; 17s ago
   Docs: man:systemd-sysv-generator(8)
   CGroup: /system.slice/iot.service
           └─562 /opt/iot/iot /dev/null

Oct 23 06:56:24 raspberrypi systemd[1]: Starting LSB: iot service...
Oct 23 06:56:24 raspberrypi iot[2567]: Starting the iot program
Oct 23 06:56:25 raspberrypi iot[2562]: **** IoT Raspberry Pi Sample has started ****
Oct 23 06:56:25 raspberrypi iot[2562]: Config file not found. Going to Quickstart mode
Oct 23 06:56:25 raspberrypi iot[2562]: Running in Quickstart mode
Oct 23 06:56:25 raspberrypi systemd[1]: Started LSB: iot service
```

- Then open your terminal and type `pip install ibmiotf`

```
File Edit Tabs Help
pi@raspberrypi:~$ pip install ibmiotf
Collecting ibmiotf
  Downloading ibmiotf-0.3.0.tar.gz (59kB)
    100% |#####| 61kB 510kB/s
Collecting dicttoxml>=1.7.4 (from ibmiotf)
  Downloading dicttoxml-1.7.4.tar.gz
Collecting iso8601>=0.1.10 (from ibmiotf)
  Downloading iso8601-0.1.12-py2.py3-none-any.whl
Collecting paho-mqtt>=1.2 (from ibmiotf)
  Downloading paho-mqtt-1.3.1.tar.gz (80kB)
    100% |#####| 81kB 916kB/s
Collecting pytz>=2014.7 (from ibmiotf)
  Using cached pytz-2017.2-py2.py3-none-any.whl
Collecting requests>=2.5.0 (from ibmiotf)
  Downloading requests-2.18.4-py2.py3-none-any.whl (88kB)
    100% |#####| 92kB 1.6MB/s
Collecting requests-toolbelt>=0.7.0 (from ibmiotf)
  Downloading requests-toolbelt-0.8.0-py2.py3-none-any.whl (54kB)
    100% |#####| 61kB 1.6MB/s
Collecting xmldict>=0.18.2 (from ibmiotf)
  Downloading xmldict-0.11.0-py2.py3-none-any.whl
Collecting urllib3<1.23, >=1.21.1 (from requests>=2.5.0->ibmiotf)
  Downloading urllib3-1.22-py2.py3-none-any.whl (132kB)
    100% |#####| 133kB 1.4MB/s
Collecting idna<2.7, >=2.5 (from requests>=2.5.0->ibmiotf)
  Downloading idna-2.6-py2.py3-none-any.whl (56kB)
    100% |#####| 61kB 1.7MB/s
Collecting chardet<3.1.0, >=3.0.2 (from requests>=2.5.0->ibmiotf)
  Downloading chardet-3.0.4-py2.py3-none-any.whl (133kB)
    100% |#####| 143kB 1.9MB/s
Collecting certifi>=2017.4.17 (from requests>=2.5.0->ibmiotf)
  Using cached certifi-2017.7.27-py2.py3-none-any.whl
Building wheels for collected packages: ibmiotf, dicttoxml, paho-mqtt
Running setup.py bdist_wheel for ibmiotf
  Stored in directory: /home/pi/.cache/pip/wheels/7e/f9/45/bbc33ad957e02f7b71ba80e316d65a83d9d735a0d12e0c0418
Running setup.py bdist_wheel for dicttoxml
  Stored in directory: /home/pi/.cache/pip/wheels/45/62/59/96910b33ec6a7b2ae66a13765491b50def5468024078e12cce
Running setup.py bdist_wheel for paho-mqtt
  Stored in directory: /home/pi/.cache/pip/wheels/28/d8/0d/acdc8f289011b7be7de71deebef6642fb3be9313dfff0493
Successfully built ibmiotf dicttoxml paho-mqtt
Installing collected packages: dicttoxml, iso8601, paho-mqtt, pytz, urllib3, idna, chardet, certifi, requests, requests-toolbelt, xmldict, ibmiotf
Successfully installed certifi-2017.7.27.1 chardet-3.0.4 dicttoxml-1.7.4 ibmiotf-0.3.0 idna-2.6 iso8601-0.1.12 paho-mqtt-1.3.1 pytz-2017.2 requests-2.18.4 requests-toolbelt-0.8.0 urllib3-1.22 xmldict-0.11.0
pi@raspberrypi:~$
```

- I have sent DHT-11 Sensors data to ibm bluemix .To get the code u need to login into IOT GYAN.
- Then I get the image as follows in my pi's shell:

```

File Edit Shell Debug Options Window Help
Python 2.7.13 (default, Jan 19 2017, 14:48:08)
[GCC 6.3.0 20170124] on linux2
Type "copyright", "credits" or "license()" for more information.
>>>
===== RESTART: /home/pi/Downloads/dht11toibmiot.py =====
2017-10-23 07:10:37,768 ibmiotf.device.Client INFO Connected successfully: d:gegtl4:mydevice:mydevice
Published Temperature = 28 C Humidity = 50 % to IBM Watson
SensorData Invalid
Published Temperature = 28 C Humidity = 50 % to IBM Watson
SensorData Invalid
Published Temperature = 28 C Humidity = 50 % to IBM Watson
SensorData Invalid
Published Temperature = 28 C Humidity = 50 % to IBM Watson
Published Temperature = 28 C Humidity = 50 % to IBM Watson
Published Temperature = 28 C Humidity = 50 % to IBM Watson

```

Step-3: checking your data sent on IBM Bluemix:

- After you have sent your sensors data you can check whether it is received at your IOTplatform Just look at the image below and if u see the same wi-fi kind of symbol on your created device thenyour data is being received.

The screenshot shows the IBM Watson IoT Platform dashboard. The main heading is 'Browse Devices'. Below it, there are tabs for 'All Devices' and 'Diagnose'. A message states: '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.' Below this is a search bar labeled 'Search by Device ID'. To the right of the search bar is a 'Device Simulator' toggle switch. The table below has the following data:

Device ID	Status	Device Type	Class ID
12345	Disconnected	NodeMCU	Device
12345	Disconnected	Saranya	Device

At the bottom of the table, it says 'Items per page 50' and '1-2 of 2 items'. On the right side of the table, it says '1 of 1 page'.

➤ After double clicking on your created device you can see the received data as shown in image

IBM Watson IoT Platform

Identity Device Information **Recent Events** State Logs

The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
event_1	{"randomNumber":80,"temp":94,"hum":74}	json	4 minutes ago
event_1	{"randomNumber":76,"temp":103,"hum":65}	json	5 minutes ago
event_1	{"randomNumber":9,"temp":91,"hum":69}	json	6 minutes ago
event_1	{"randomNumber":53,"temp":106,"hum":89}	json	7 minutes ago

Items per page 50 | 1-2 of 2 items

1 of 1 page

1 Simulation running

Step-4: Creating boards and cards for visualization of data:

➤ In your Watson platform you have an option called board .Click on it and you get the following window on your screen

IBM Watson IoT Platform

Your boards Public boards

Sort By Recently changed

SARANYA 4 Cards Owned by you

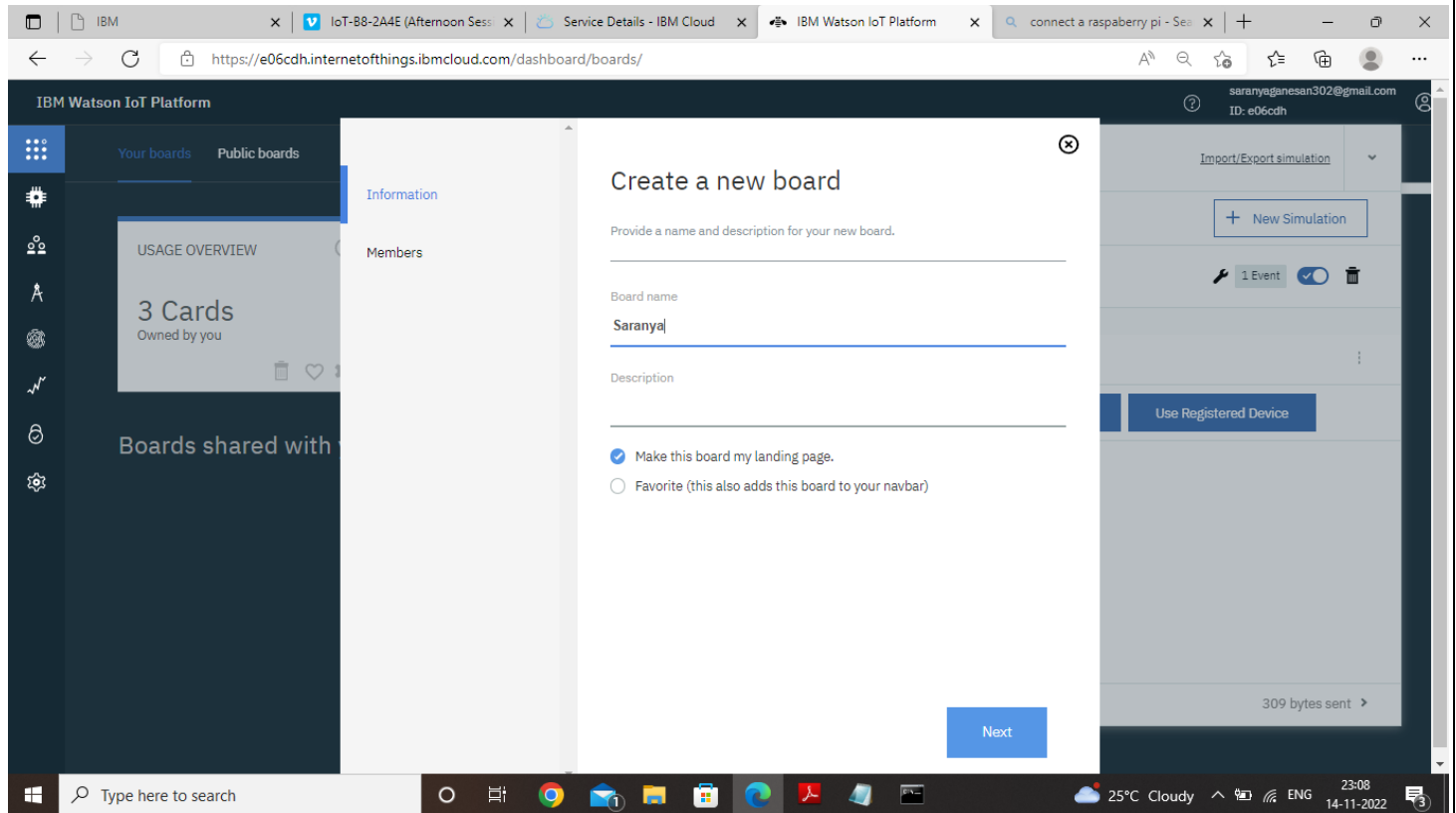
USAGE OVERVIEW 3 Cards Owned by you

RISK AND SECURITY OVERVIEW 4 Cards Owned by you

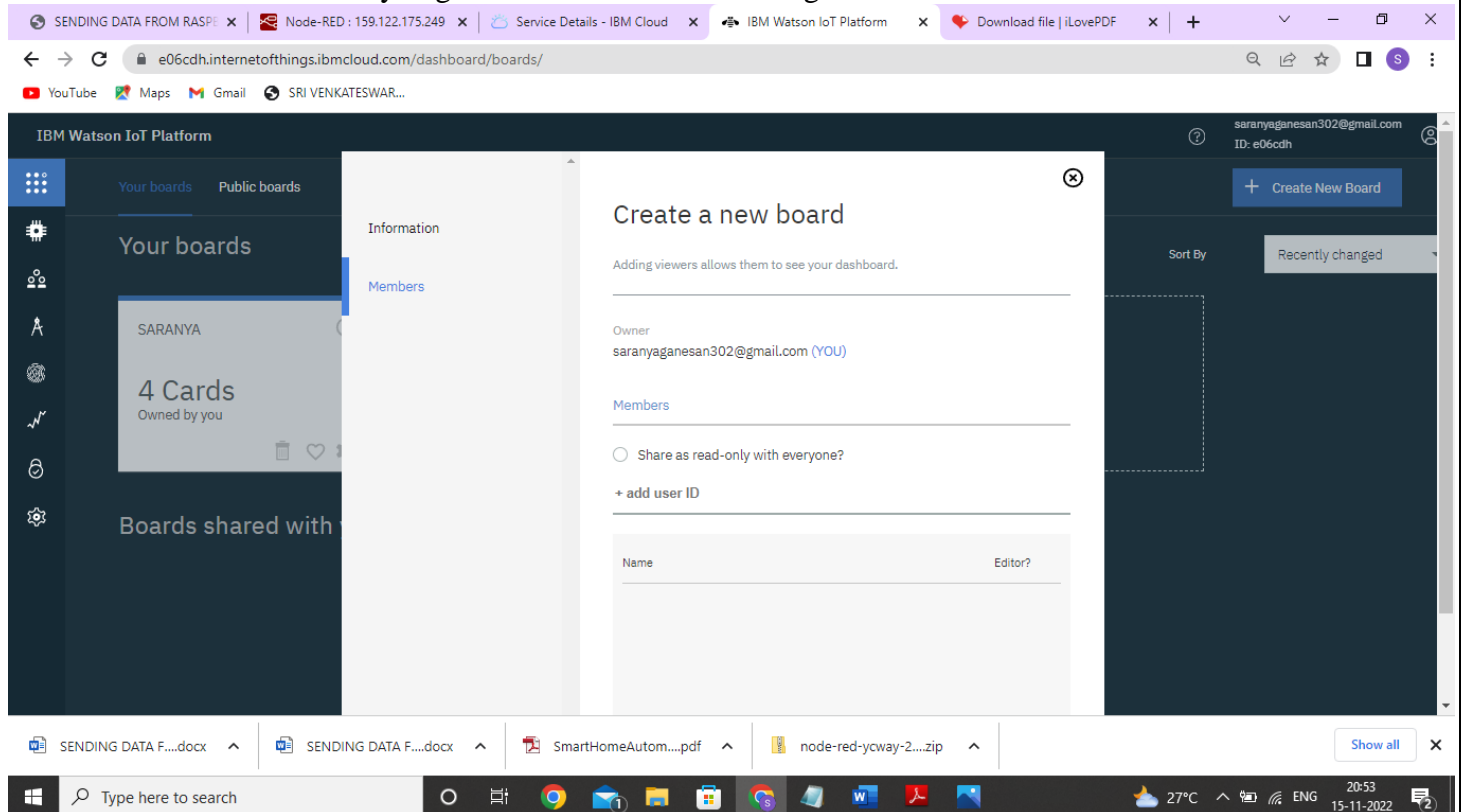
Boards shared with you

- Click on Create a new board to create a board .

The given below window appears give a name and description to your board as shown in the window below.



- Then click on Next you get the below window then again click on Submit



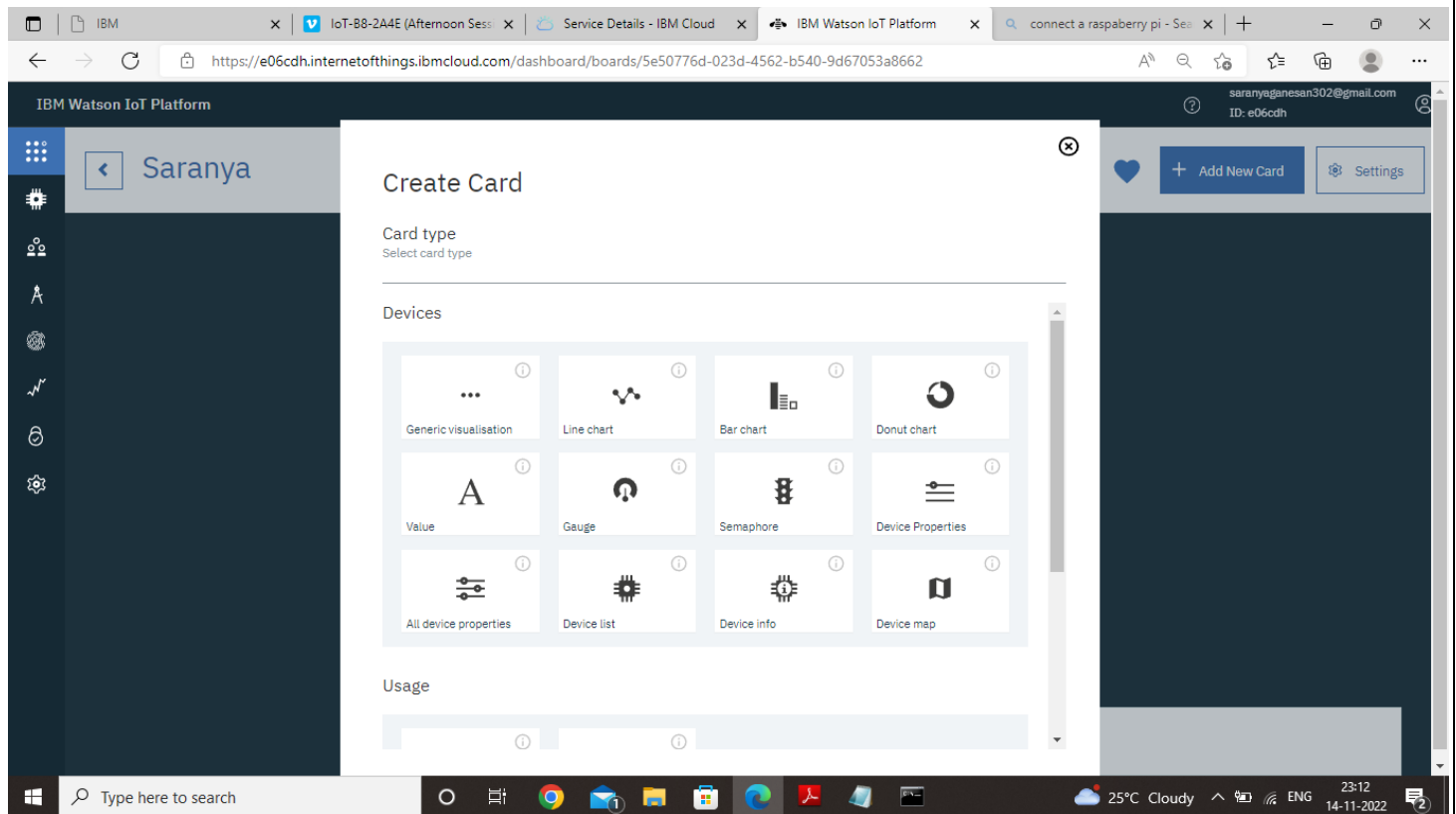
➤ Then double click on your boards name which you have created.

The screenshot shows the IBM Watson IoT Platform dashboard. The top navigation bar includes the user profile 'saranyaganesan302@gmail.com' and 'ID: e06cdh'. The main section is titled 'Your boards' and displays three boards: 'SARANYA' (4 Cards), 'USAGE OVERVIEW' (3 Cards), and 'RISK AND SECURITY OVERVIEW' (4 Cards). A '+ Create New Board' button is visible in the top right. The bottom of the dashboard shows a taskbar with various applications and a system tray with weather and time information.

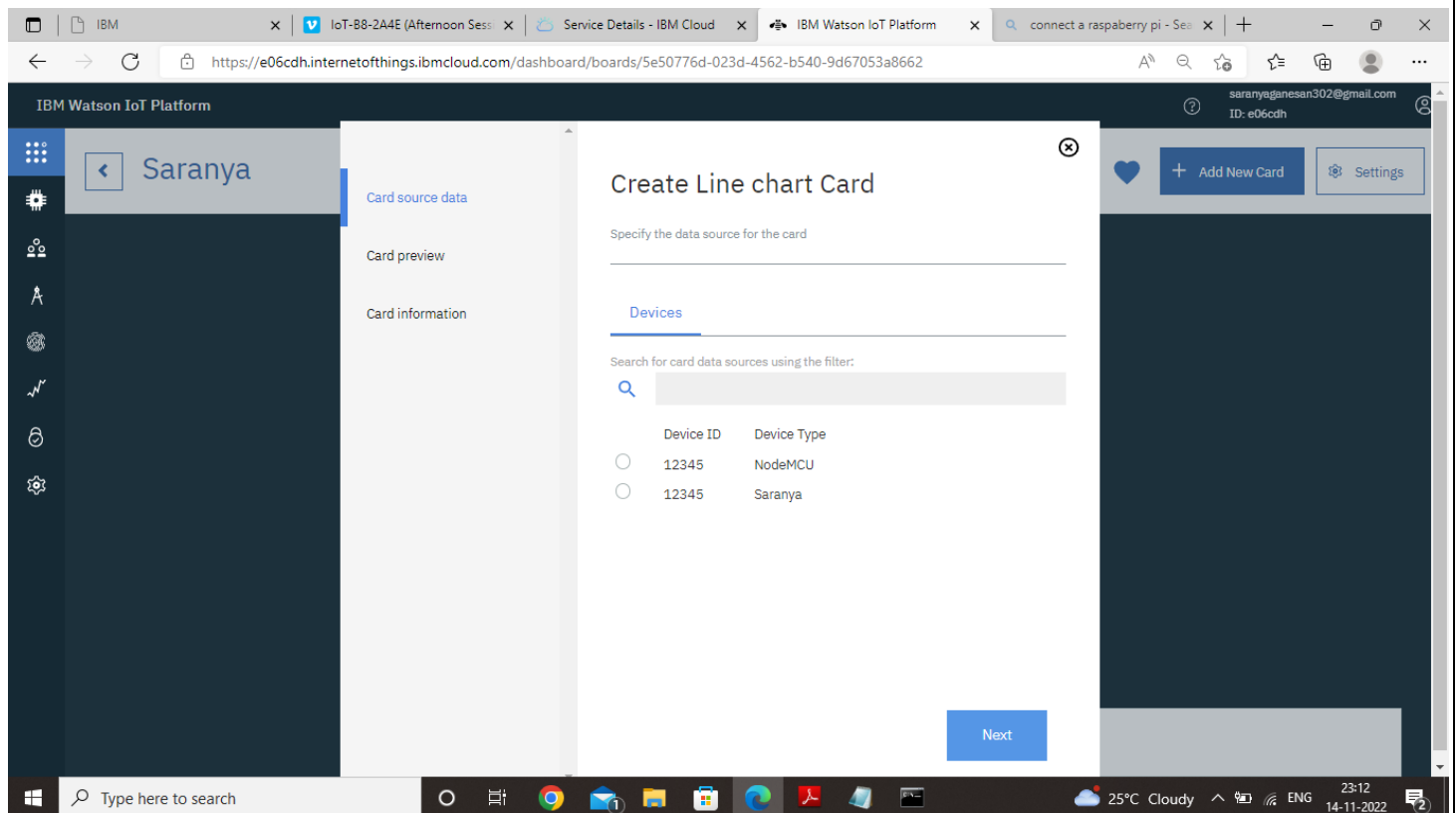
➤ Click on Add New Card

The screenshot shows the IBM Watson IoT Platform dashboard with the 'Saranya' board selected. The main area displays a message: 'You currently have an empty board' with a '+ Add New Card' button. The top navigation bar includes the user profile 'saranyaganesan302@gmail.com' and 'ID: e06cdh'. The bottom of the dashboard shows a taskbar with various applications and a system tray with weather and time information.

➤ Select the type of Graph u want accordingly and click next



➤ You get the below window, choose the Device and click on Next.



➤ Select the event, properly to be visualized on your graph and click next. In my case it is humidity

The screenshot shows the IBM Watson IoT Platform interface. On the left, there's a sidebar with navigation icons. The main area displays a 'Create Line chart Card' dialog. The 'Connect data set' section has the following fields: 'Event' (event_1), 'Property' (temp), 'Name' (temp), 'Type' (Number), and 'Unit' (empty). Below these, 'Min' is 0 and 'Max' is 100. The 'Next' button is highlighted in blue.

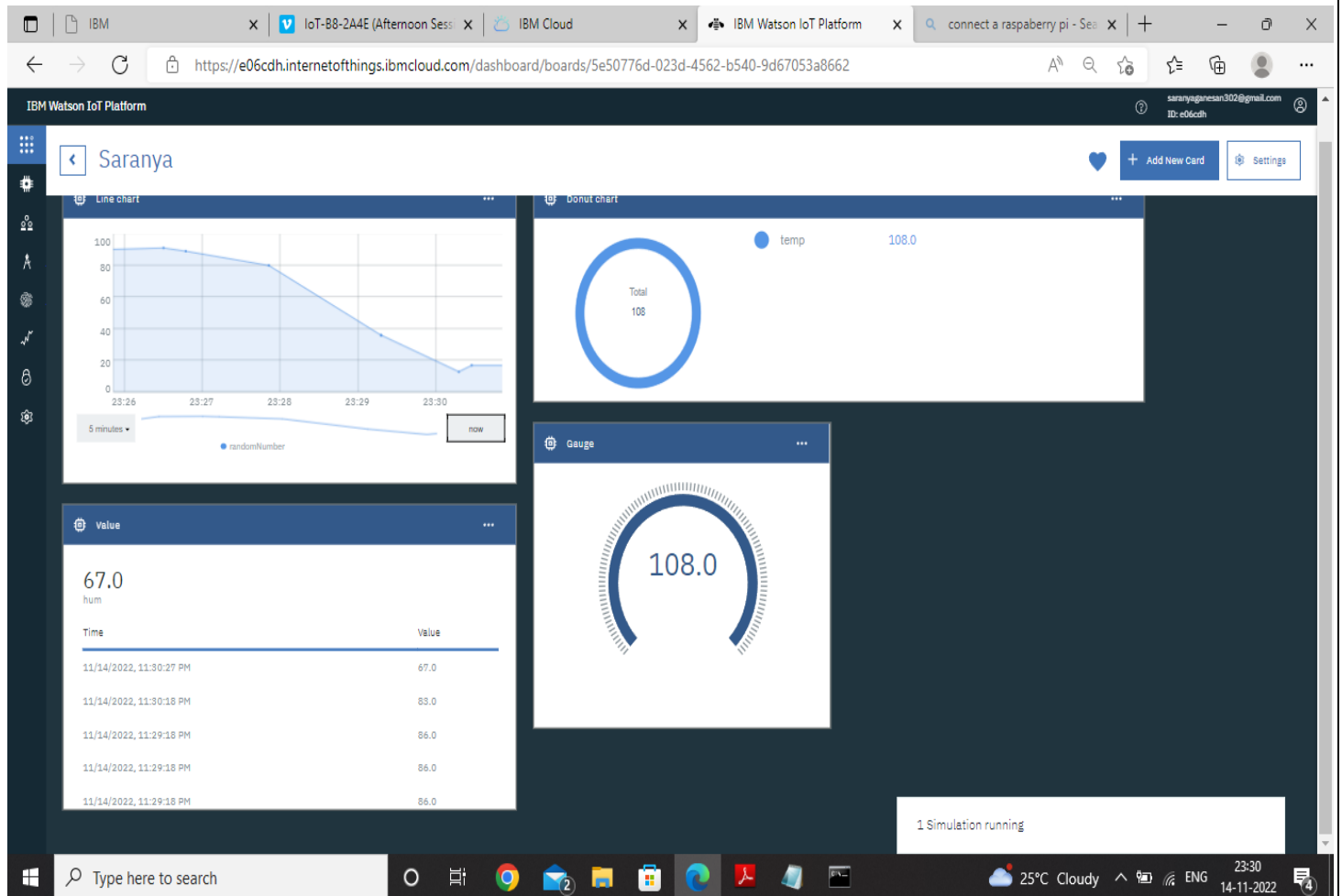
➤ Then select the size of the graph and color of the graph board you want and click next

The screenshot shows the same IBM Watson IoT Platform interface. The 'Create Line chart Card' dialog is now at the 'Enter title and description of the card' step. The 'Title' field is set to 'Line chart'. Below it, there's a 'Color scheme' section with five color swatches (purple, pink, green, blue, teal). The 'Submit' button is highlighted in blue.

➤ Here is the graph



➤ Repeat the process to get different graphs.



RESULT:

Hence, we were able to send data from our pi to IBM Watson and visualize it on a graph.