

# SENDING DATA FROM RASPBERRY-PI TO IBM WATSON

Date	7 <sup>th</sup> November 2022
Team ID	PNT2022TMID27037
Project Name	Smart Waste Management Using IOT in Metropolitan cities

## 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

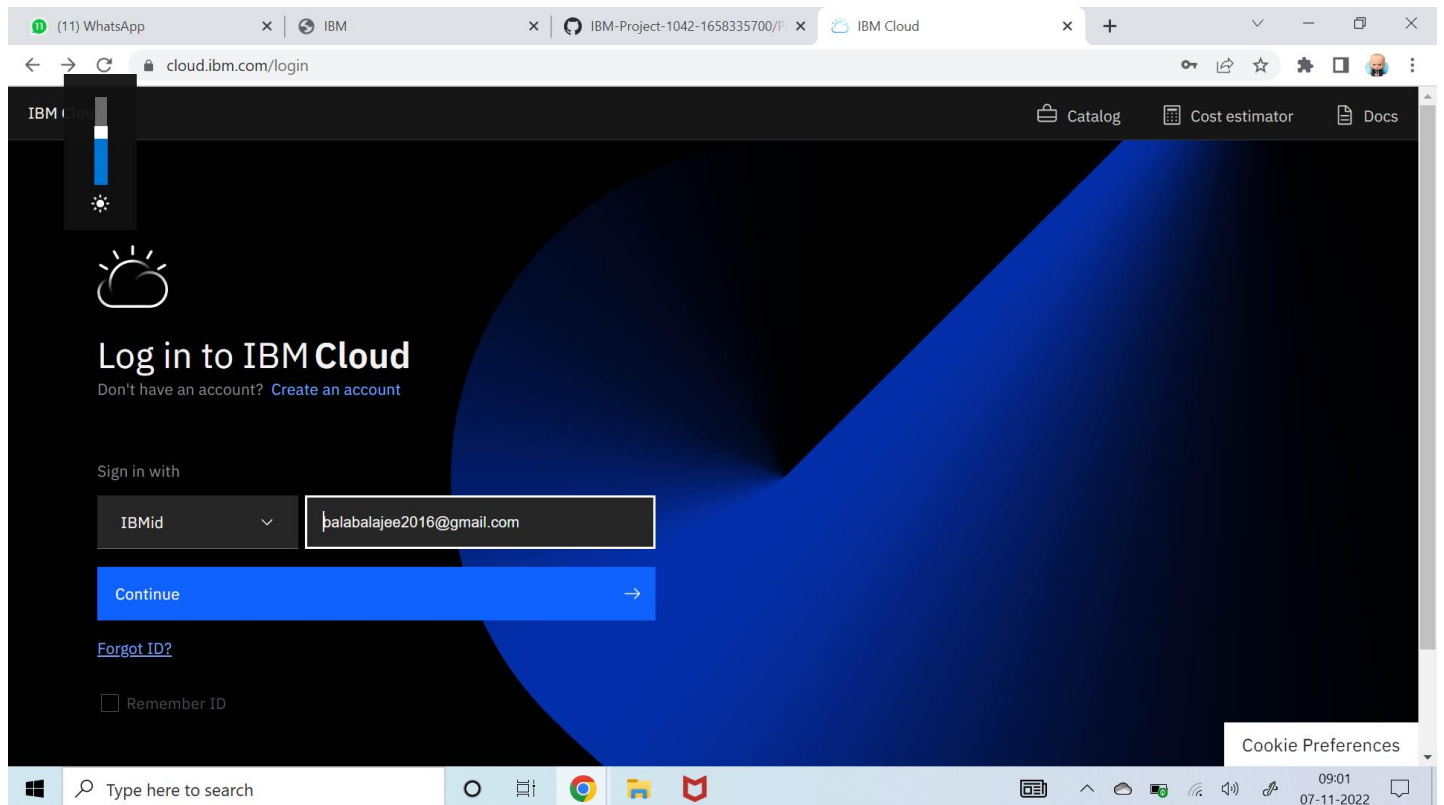
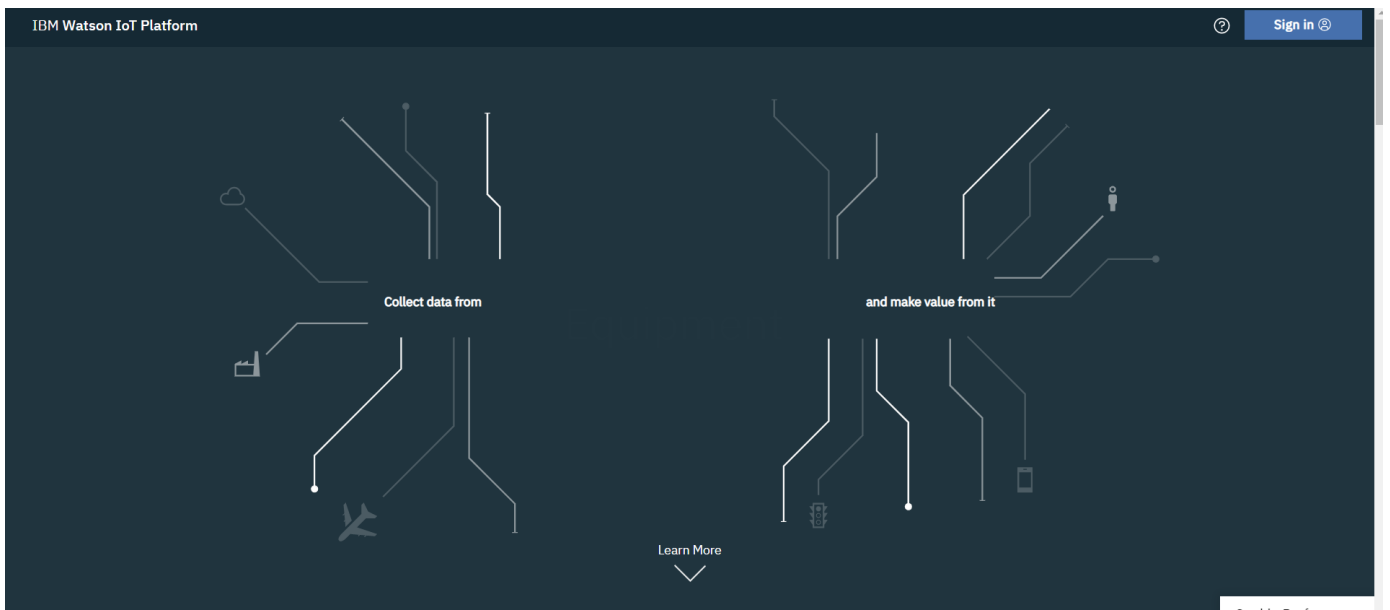
### SOFTWARE:

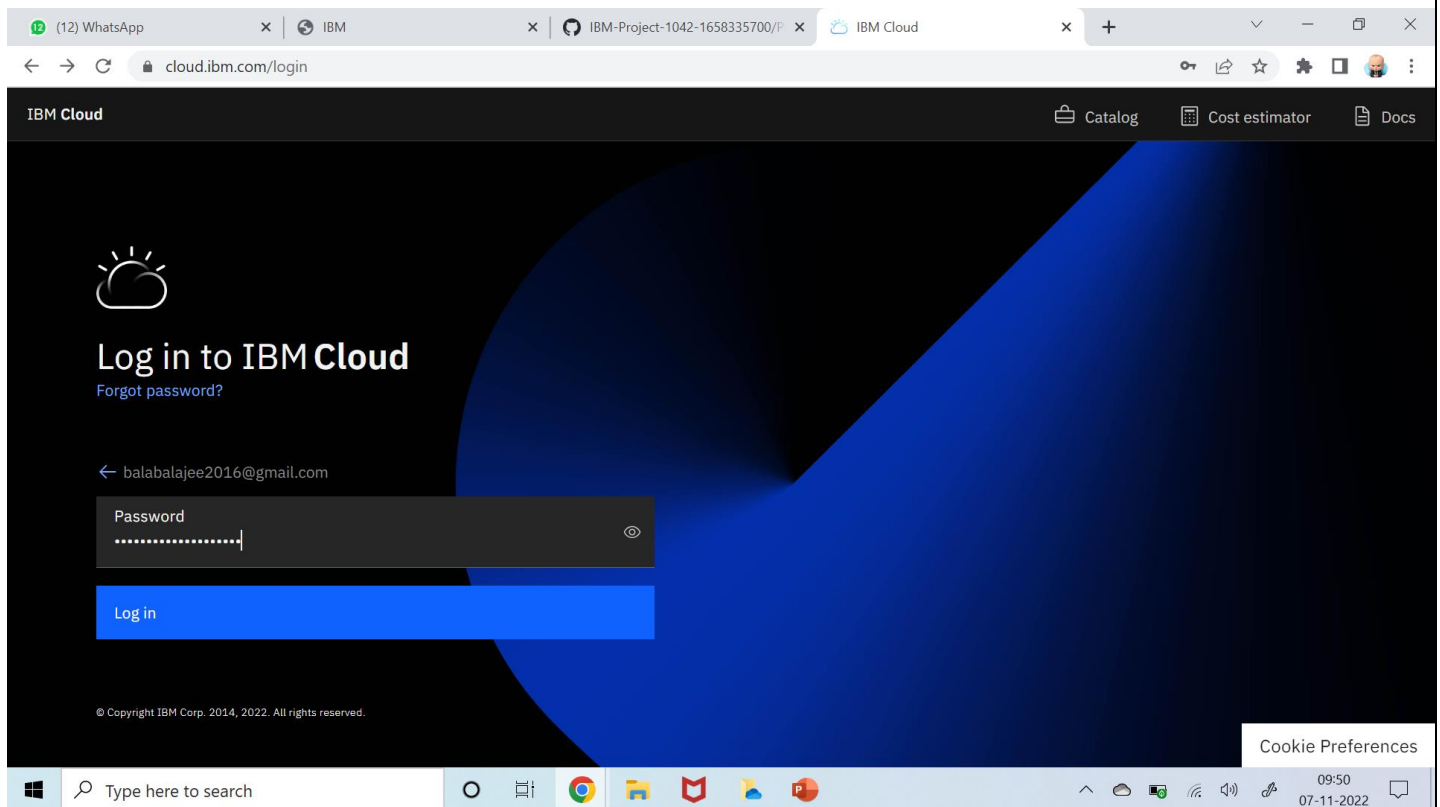
- IBM BLUEMIX ACCOUNT

## STEPS TO BE FOLLOWED

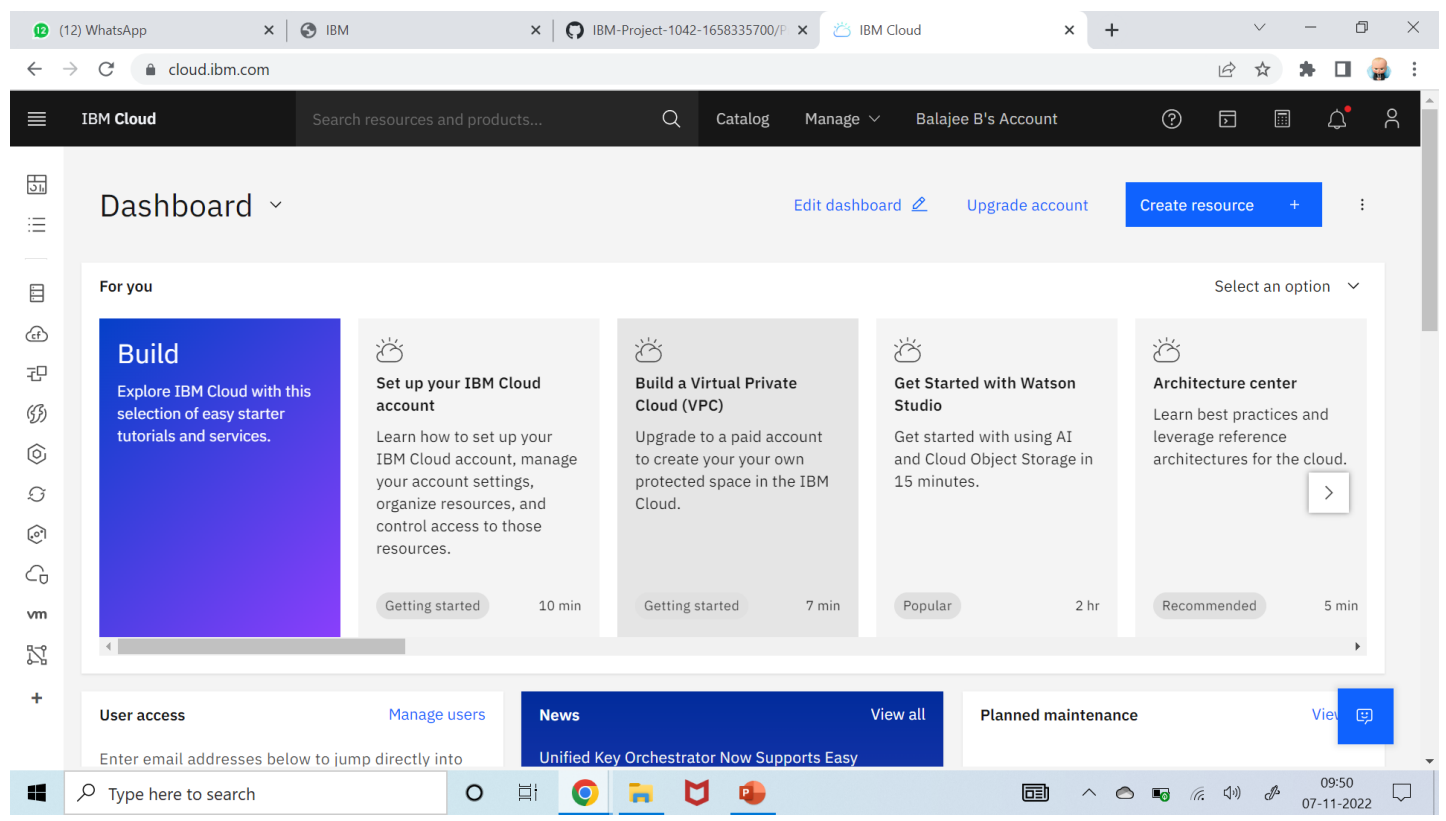
### Step-1: Create a device in IBM Watson:

- 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.

The screenshot shows the IBM Cloud Catalog page for the 'Internet of Things Platform' service. The page is titled 'Internet of Things Platform' and includes a description: 'This service is the hub of all things IBM IoT, it is where you can set up and manage your connected devices so that your apps can access their live and historical data.' The 'Create' tab is selected, showing a 'Select a location' dropdown menu with 'Frankfurt (eu-de)' selected. Below this is a 'Select a pricing plan' section with a table of plans. The 'Lite' plan is selected, which includes up to 500 registered devices and a maximum of 200 MB of each data metric. The pricing is 'Free'. On the right side, there is a 'Summary' section with details: 'Internet of Things Platform', 'Free', 'Location: Frankfurt', 'Plan: Lite', 'Service name: Internet of Things Platform-og', and 'Resource group: Default'. There is a checkbox for 'I have read and agree to the following license agreements:' and a 'Create' button.

IBM Cloud

Search resources and products...

Catalog Manage Balajee B's Account

Catalog /

## Internet of Things Platform

This service is the hub of all things IBM IoT, it is where you can set up and manage your connected devices so that your apps can access their live and historical data.

Create About

Type Service

Provider IBM

Last updated 08/15/2022

Category Internet of Things

Compliance IAM-enabled

Location

Select a location

Frankfurt (eu-de)

Select a pricing plan

Displayed prices do not include tax. Monthly prices shown are for country or location: [United States](#)

Plan	Features	Pricing
Lite	Includes up to 500 registered devices, and a maximum of 200 MB of each data metric Maximum of 500 registered devices	Free

Summary

**Internet of Things Platform** Free

Location: Frankfurt

Plan: Lite

Service name: Internet of Things Platform-og

Resource group: Default

☒ I have read and agree to the following license agreements:  
[Terms](#)

Create

Add to estimate

The screenshot shows the IBM Cloud Service Details page for the 'Internet of Things Platform-og' service. The page is titled 'Internet of Things Platform-og' and includes a status indicator 'Active' and an 'Add tags' link. The 'Manage' tab is selected, showing a 'Plan' section with 'Lite' and 'Non-Production' options. The 'Launch' button is highlighted. On the right side, there is a 'Let's get started with IBM Watson IoT Platform' section with a 'Launch' button and a 'Docs' button. Below this, there is a 'Ready for the next level?' section with a progress bar and a 'Launch' button.

IBM Cloud

Search resources and products...

Catalog Manage Balajee B's Account

Resource list /

## Internet of Things Platform-og

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

Lite Non-Production

click on Launch

- 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 'Add Device' button in the top right. Below the title, there are tabs for 'All Devices' and 'Diagnose'. A text block explains that the table shows a summary of all devices and can be filtered or searched. Below this is a search bar labeled 'Search by Device ID' and a 'Device Simulator' toggle. A table with the following headers is visible: Device ID, Status, Device Type, Class ID, and Date Added. The table is currently empty, showing only a device icon. The bottom of the browser window shows the Windows taskbar with the search bar and system tray.

- After click on Add device this page will open

The screenshot shows the 'Add Device' page in the IBM Watson IoT Platform. The page has a progress bar at the top with four steps: Identity, Device Information, Security, and Summary. The 'Identity' step is currently active. Below the progress bar, there is a text prompt: '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 containing 'Enter Device ID'. At the bottom right, there are 'Cancel' and 'Next' buttons. The browser window shows the URL 'qqu4hk.internetofthings.ibmcloud.com/dashboard/devices/browse/add' and the Windows taskbar.

➤ Go to device type and fill the details.

IBM Watson IoT Platform

balabalajee2016@gmail.com  
ID: qqu4hk

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 ☒ Device Or ☐ Gateway

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

Develop The Web....pdf Dashboard Nodes....pdf Show all

Type here to search

10:13 07-11-2022

➤ Click on Finish

IBM Watson IoT Platform

balabalajee2016@gmail.com  
ID: qqu4hk

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.

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Description

Develop The Web....pdf Dashboard Nodes....pdf Show all

Type here to search

10:13 07-11-2022

➤ Click on Register Device.

The screenshot shows the IBM Watson IoT Platform interface. The browser address bar displays the URL: `qqu4hk.internetofthings.ibmcloud.com/dashboard/devices/types/add`. The page title is "Register Devices, Define Interfaces". Below the title, there is a sub-header "Now that you added a device type, you can register and connect devices for this type." and a prominent blue button labeled "Register Devices". To the right of the text is a large grey area with a black gear icon. At the bottom right of the main content area are "Cancel" and "Next" buttons. The left sidebar contains various icons, and the top navigation bar shows "Browse", "Action", "Device Types", and "Interfaces". The user's email and ID are visible in the top right corner.

➤ 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: `qqu4hk.internetofthings.ibmcloud.com/dashboard/devices/browse/add?type=Fantastic-4`. The page title is "Browse Devices". Below the title, there are two buttons: "All Devices" and "Diagnose". A modal window is open, titled "Select a device type for the device that you are adding and give the device a unique ID." It contains two input fields: "Device Type" with the value "Fantastic-4" and "Device ID" with the value "12345". At the bottom right of the modal are "Cancel" and "Next" buttons. The left sidebar contains various icons, and the top navigation bar shows "Browse", "Action", "Device Types", and "Interfaces". The user's email and ID are visible in the top right corner.

➤ Click on Next

The screenshot shows the 'Add Metadata' form in the IBM Watson IoT Platform. The form is titled 'You can modify the default device information and enter more information about the device for identification purposes.' It contains several input fields for device information:

Field	Input
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

Below the input fields is an 'Add Metadata' button with a plus icon. At the bottom right of the form are 'Back' and 'Next' buttons. The browser's address bar shows the URL: `qqu4hk.internetofthings.ibmcloud.com/dashboard/devices/browse/add?type=Fantastic-4`. The user's email is `balabalajee2016@gmail.com` and their ID is `qqu4hk`.

➤ Click on Next

The screenshot shows the 'Authentication Token' form in the IBM Watson IoT Platform. The form is titled 'There are two options for selecting a device authentication token.' It contains two main sections:

- Auto-generated authentication token (default)**: This section explains that the service will generate an authentication token for the user. It states: '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**: This section explains that the user can provide their own authentication token. It states: '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 'Self-provided authentication token' section is an 'Authentication Token' input field with a placeholder text 'Enter an optional token' and an information icon. Below the input field 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.'

The browser's address bar shows the URL: `qqu4hk.internetofthings.ibmcloud.com/dashboard/devices/browse/add?type=Fantastic-4`. The user's email is `balabalajee2016@gmail.com` and their ID is `qqu4hk`.



## ➤ Click on Finish

IBM Watson IoT Platform

balabalajee2016@gmail.com  
ID: qqu4hk

Browse Action Device Types Interfaces

Verify that the following information is correct then select Finish

Device Type  
Fantastic-4

Device ID  
12345

View Metadata

Security Token  
To be generated

Back Finish

Browse Devices

Develop The Web....pdf Dashboard Nodes....pdf Show all

Type here to search

10:15  
07-11-2022

## ➤ Device is created

IBM Watson IoT Platform

balabalajee2016@gmail.com  
ID: qqu4hk

Browse Action Device Types Interfaces Add Device

Device ID	Status	Device Type	Device	Last Received
12345	Disconnected	Fantastic-4	Device	Nov 7, 2022 10:15 AM

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	{"type":"Buffer","data":[]}	json	a few seconds ago
event_1	{"#IBM Watson IOT Platform":"#pip install wiot..."}	json	5 minutes ago
event_1	{"randomNumber":24}	json	5 minutes ago

1 Simulation running

ibm.csv Show all

Type here to search

11:34  
07-11-2022

## 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]

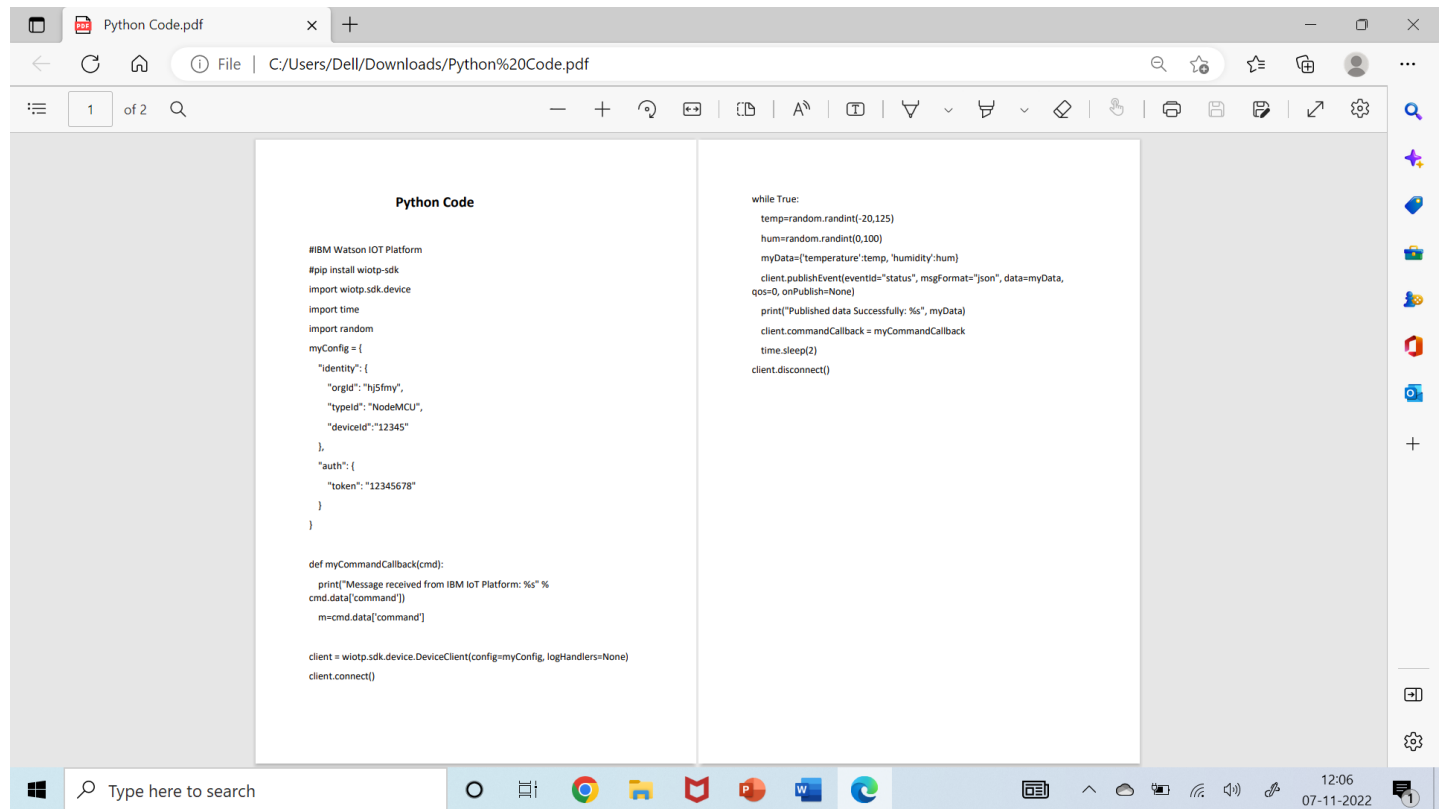
pi@raspberrypi:~$ sudo dpkg -i libssl1.0.0_1.0.1t-1-deb8u6_armhf.deb
Selecting previously unselected package libssl1.0.0:armhf.
(Reading database ... 115686 files and directories currently installed.)
Preparing to unpack libssl1.0.0_1.0.1t-1-deb8u6_armhf.deb ...
Unpacking libssl1.0.0:armhf (1.0.1t-1-deb8u6) ...
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
           % Done                   Dload  Upload   Total    Spent    Left  Speed
100 164 0 164 0 0 157 0 --:--: 0:00:01 --:--: 157
100 609 0 609 0 0 457 0 --:--: 0:00:01 --:--: 457
100 110k 100 110k 0 0 20117 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
            └─2562 /opt/iot/iot /dev/null

Oct 23 06:56:24 raspberrypi systemd[1]: Starting LSB: IoT service...
Oct 23 06:56:24 raspberrypi iot[2562]: 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 (58kB)
    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==0.10.2 (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 (122kB)
    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 1.6MB/s
Collecting certifi>=2017.4.17 (from requests==2.5.0->ibmiotf)
  Using cached certifi-2017.7.27.1-py2.py3-none-any.whl
Building wheels for collected packages: ibmiotf, dicttoxml, paho-mqtt
Running setup.py bdist_wheel for ibmiotf ... done
Stored in directory: /home/pi/.cache/pip/wheels/45/f9/45/bbc33ad957e82f7b71ba80e31d6d5a83d9d735a6d12e0c9418
Running setup.py bdist_wheel for dicttoxml ... done
Stored in directory: /home/pi/.cache/pip/wheels/20/d8/0d/acc8f289011b7be7de71deebe642f83be0313dfff0493
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:



### 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 iot platform Just look at the image below and if u see the same wifi kind of symbol on your created device then your dta is being received.

(11) WhatsApp x IBM-Project-40308 x IBM x IBM-Project-1042-1 x Service Details - IBM x IBM Watson IoT Platform x

qqu4hk.internetofthings.ibmcloud.com/dashboard/devices/browse

balabalajee2016@gmail.com ID: qqu4hk

IBM Watson IoT Platform

Browse Action Device Types Interfaces

Add Device +

12345 Disconnected Fantastic-4 Device Nov 7, 2022 10:15 AM

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	{"type":"Buffer","data":{}}	json	a few seconds ago
event_1	{"#IBM Watson IOT Platform":"#pip install wiot..."}	json	5 minutes ago
event_1	{"randomNumber":24}	json	5 minutes ago

1 Simulation running

ibm.csv

Show all

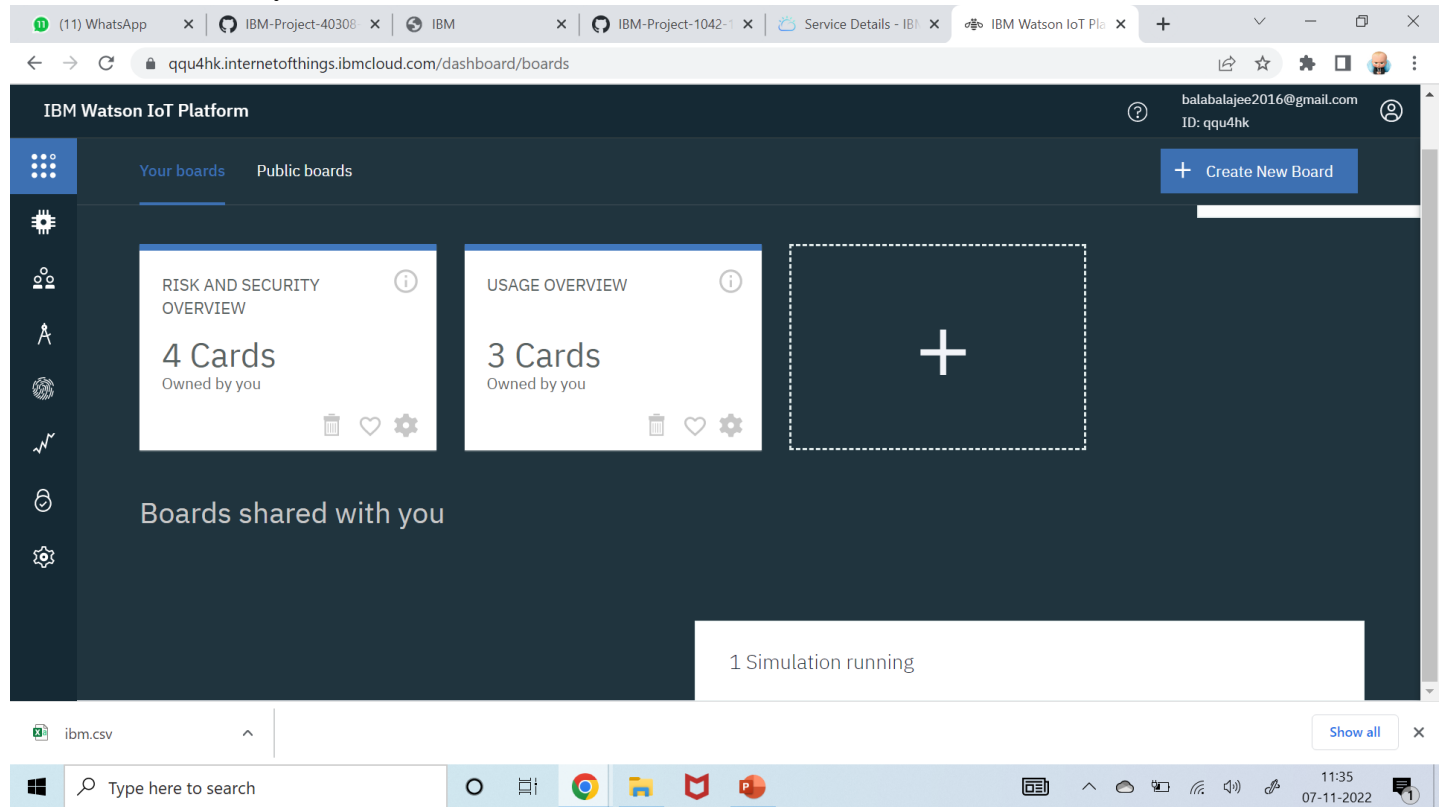
Type here to search

11:34 07-11-2022

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

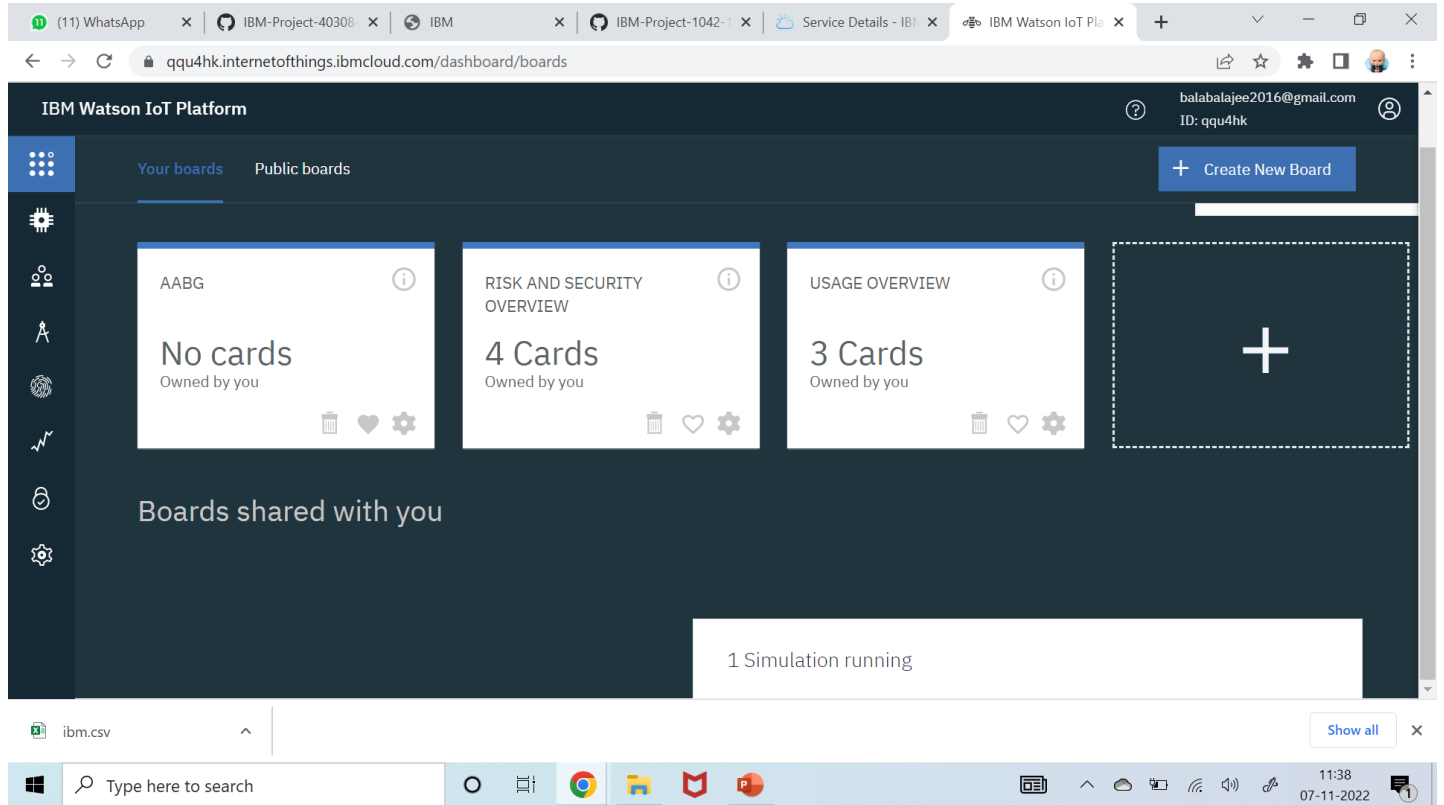
#### Step-4: Creating boards and cards for visualization of data:

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

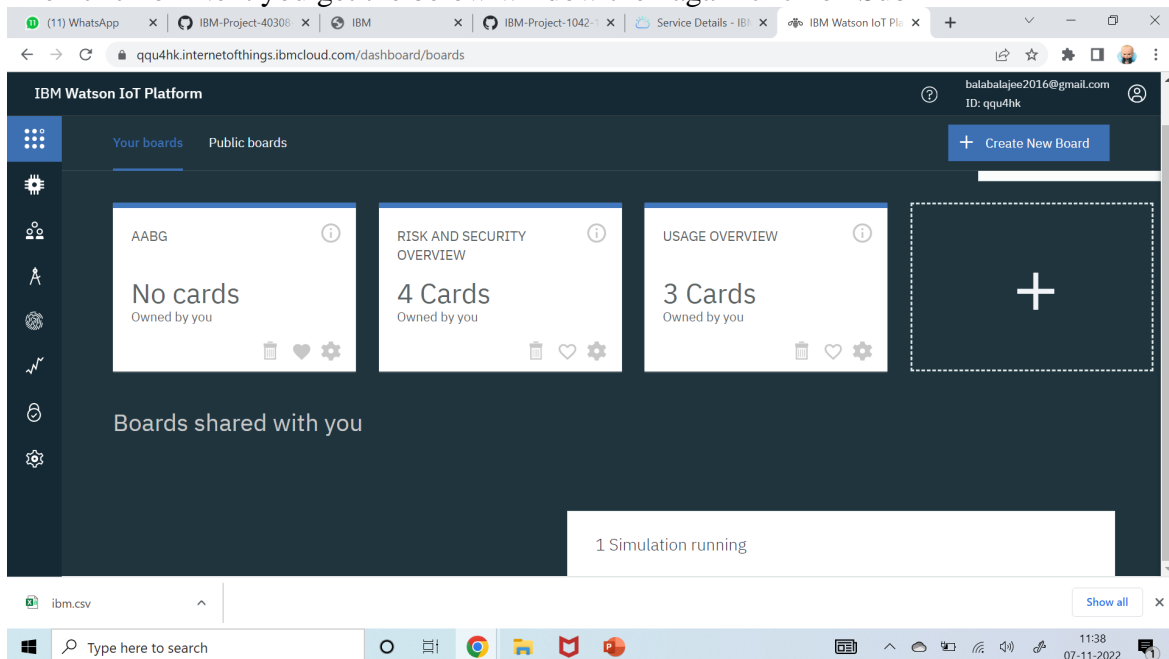


- Click on Create a new board to create a board .

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 Sub



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

➤ Click on Add New Card

The screenshot displays the IBM Watson IoT Platform interface. The browser's address bar shows the URL: `qqu4hk.internetofthings.ibmcloud.com/dashboard/boards/0e568c80-e51e-4d2c-bbde-400b58a5112b`. The page header includes the text "IBM Watson IoT Platform" and the user's email "balabalajee2016@gmail.com" with ID "qqu4hk". The main content area features a dark blue background with a white bee icon and the message "You currently have an empty board". A blue button labeled "+ Add New Card" is prominently displayed in the center. To the right of this button, a white box indicates "1 Simulation running". The left sidebar contains a vertical menu of icons for various platform functions. The bottom of the image shows a Windows taskbar with the search bar, task view button, and several open applications including Chrome, File Explorer, and PowerPoint. The system clock in the bottom right corner shows the time as 11:38 on 07-11-2022.

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

The screenshot shows the 'Create Card' interface in the IBM Watson IoT Platform. The left sidebar contains navigation icons. The main area is titled 'Create Card' and includes a 'Card type' section with the instruction 'Select card type'. Below this is a 'Devices' section displaying a grid of card templates: Generic visualisation, Line chart, Bar chart, Donut chart, Value, Gauge, Semaphore, and Device Properties. At the bottom, there is a 'Show all' button. The browser's address bar shows the URL: qqu4hk.internetofthings.ibmcloud.com/dashboard/boards/0e568c80-e51e-4d2c-bbde-400b58a5112b. The Windows taskbar at the bottom shows the search bar and various application icons.

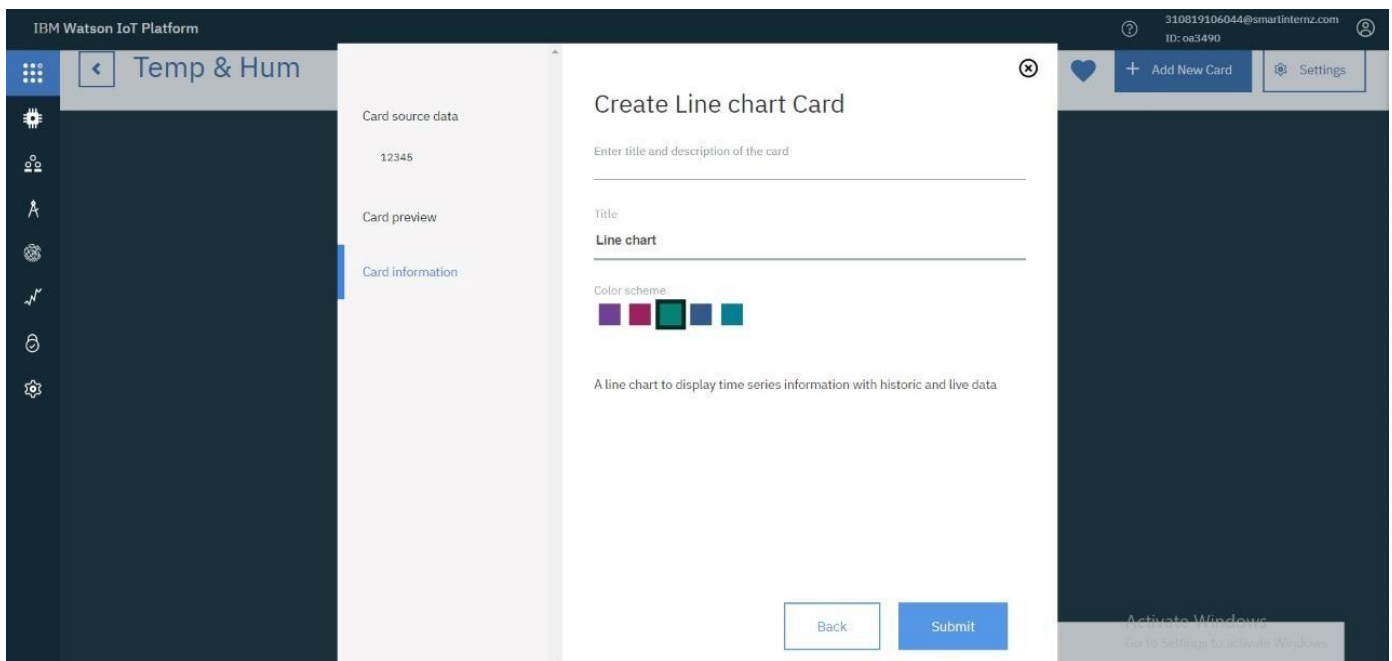
➤ You get the below window, choose the Device and click on Next.

The screenshot shows the 'Card information' interface in the IBM Watson IoT Platform. The left sidebar is the same as in the previous screenshot. The main area is titled 'Card information' and includes a 'Devices' section with a search bar and the instruction 'Search for card data sources using the filter:'. Below the search bar is a table with two columns: 'Device ID' and 'Device Type'. The table contains one entry: '12345' and 'Fantastic-4'. At the bottom right, there is a blue 'Next' button. The browser's address bar shows the same URL as in the previous screenshot. The Windows taskbar at the bottom shows the search bar and various application icons.

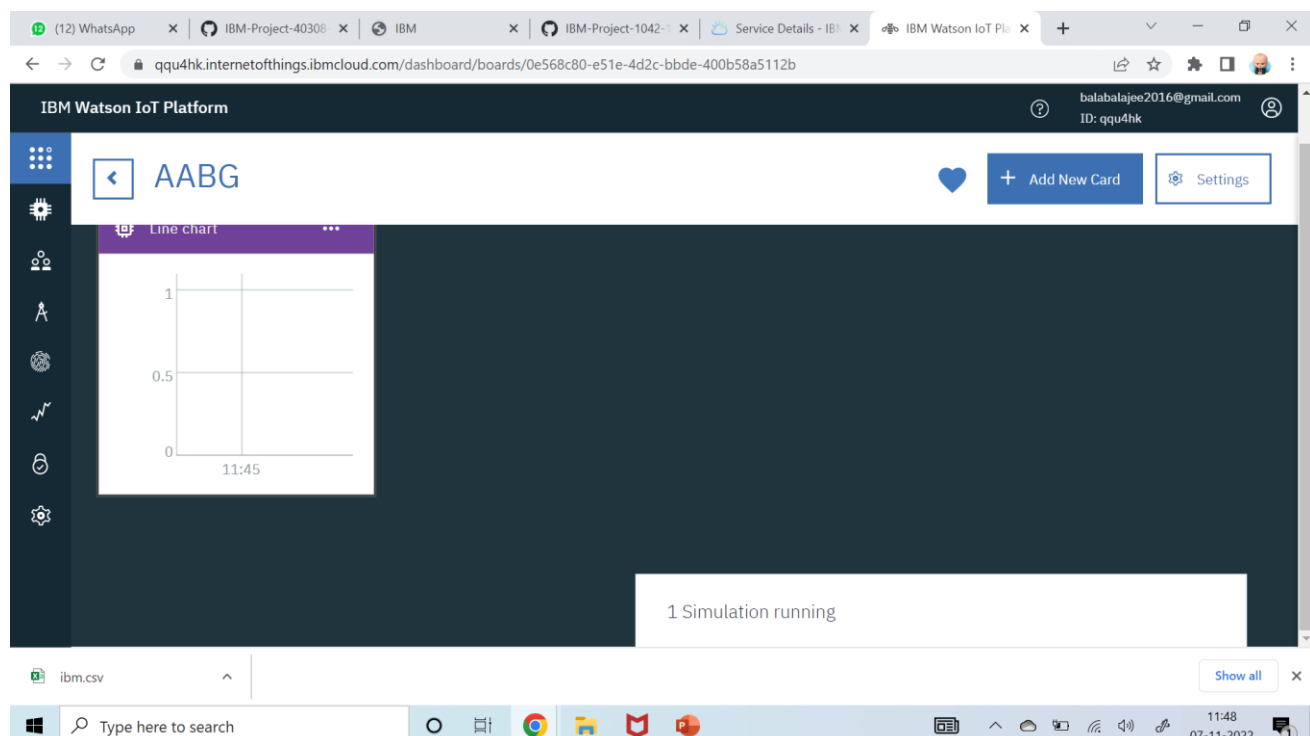


➤ Select the event, properly to be visualized on your graph and click next. In my case it is humidity

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



➤ 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.