

# **SENDING DATA FROM RASPBERRY-PI TO IBM WATSON**

|                     |   |
|---------------------|---|
| <b>Date</b>         | 13 NOVEMBER 2022  |
| <b>Team ID</b>      | PNT2022TMID05376  |
| <b>Project Name</b> | 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

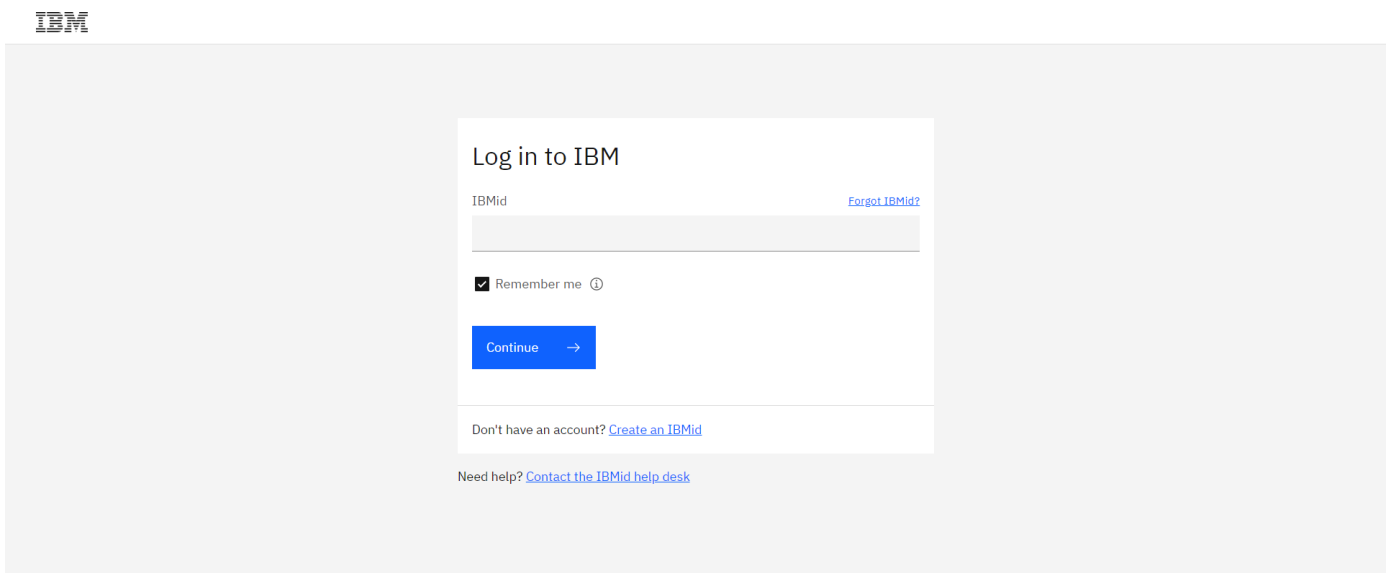
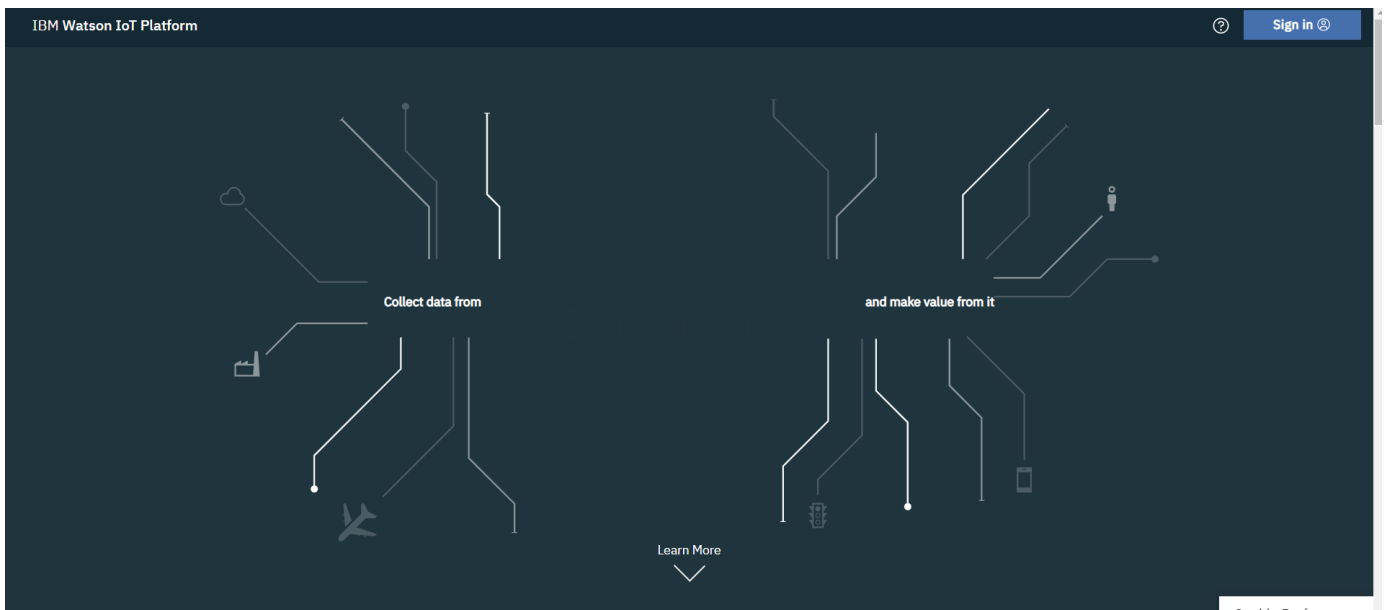
### **SOFTWARE:**

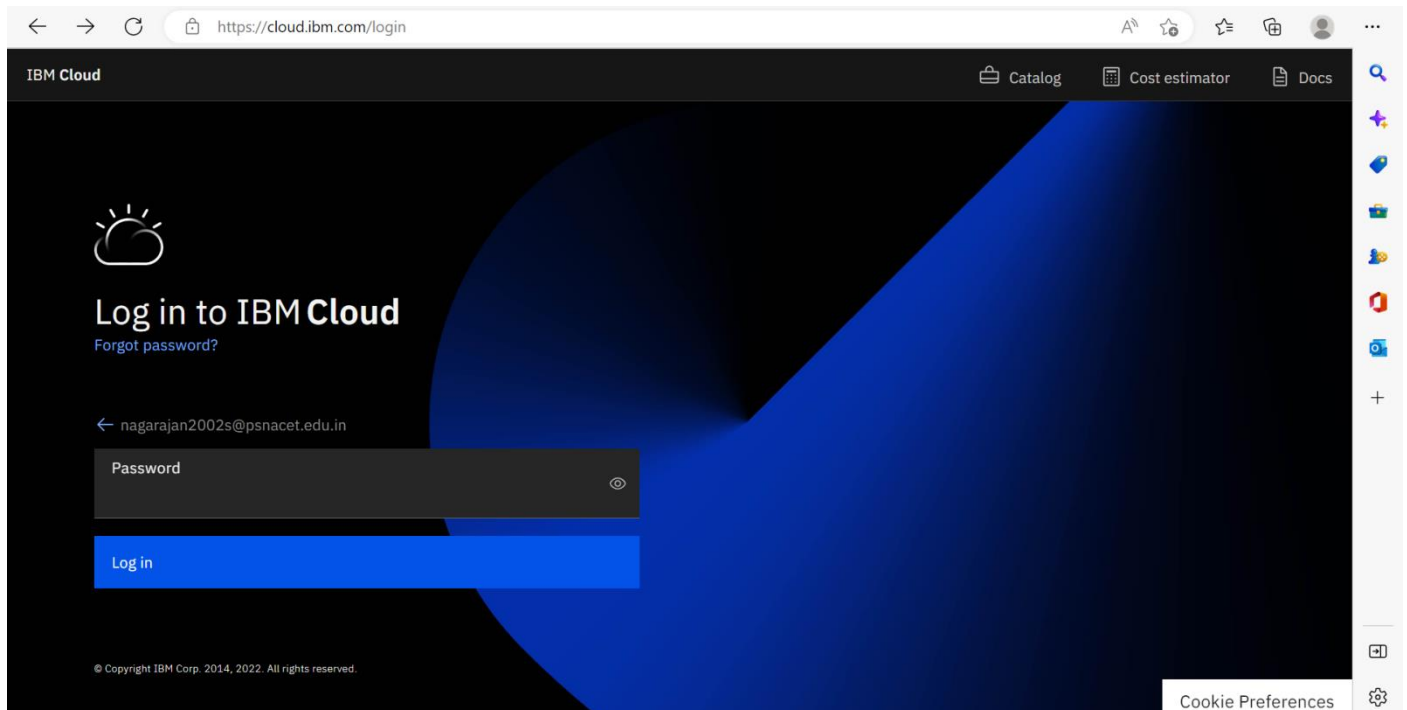
- IBM BLUEMIX ACCOUNT

## STEPS TO BE FOLLOWED

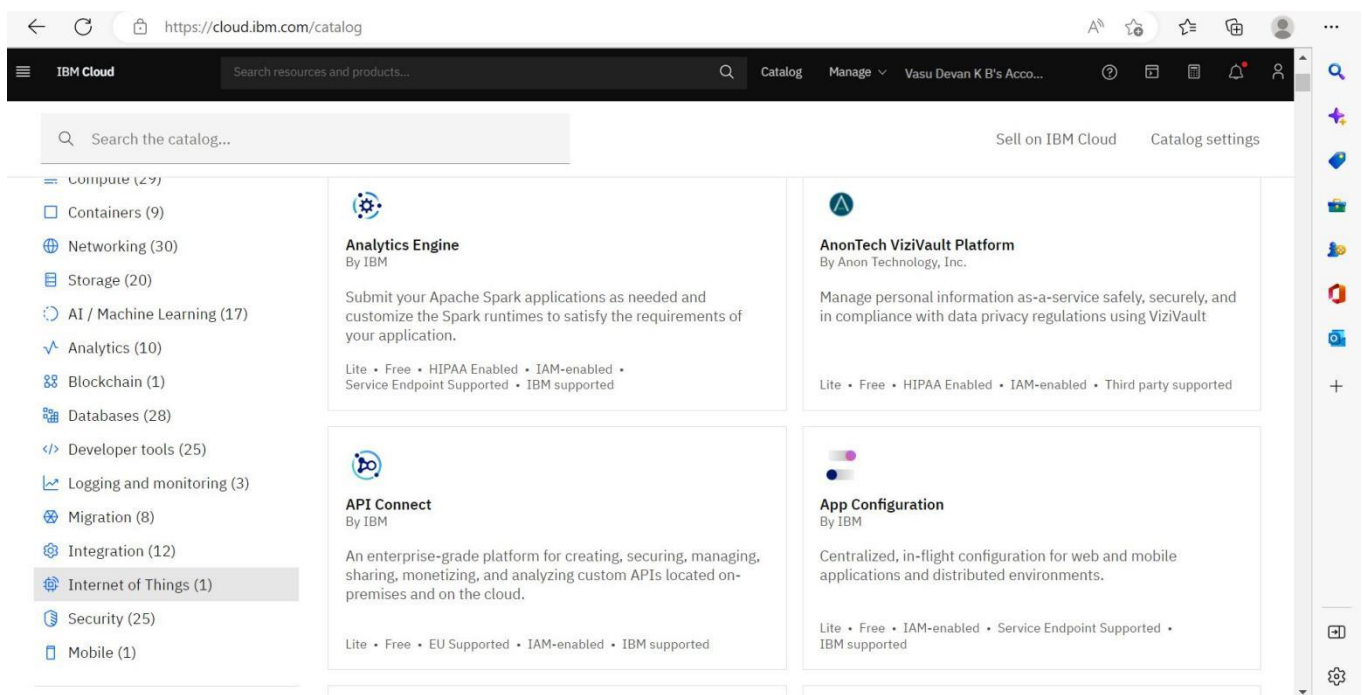
### Step-1: Create a device in IBM Watson:

- 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.

The screenshot shows the IBM Cloud 'Internet of Things Platform' creation page. The left sidebar contains metadata: Type Service, Provider IBM, Last updated 08/15/2022, Category Internet of Things, Compliance IAM-enabled, and Location Frankfurt. The main content area has two tabs: 'Create' (active) and 'About'. Under 'Create', there are sections for 'Select a location' (Frankfurt (eu-de)) and 'Select a pricing plan'. A table lists the pricing plans:

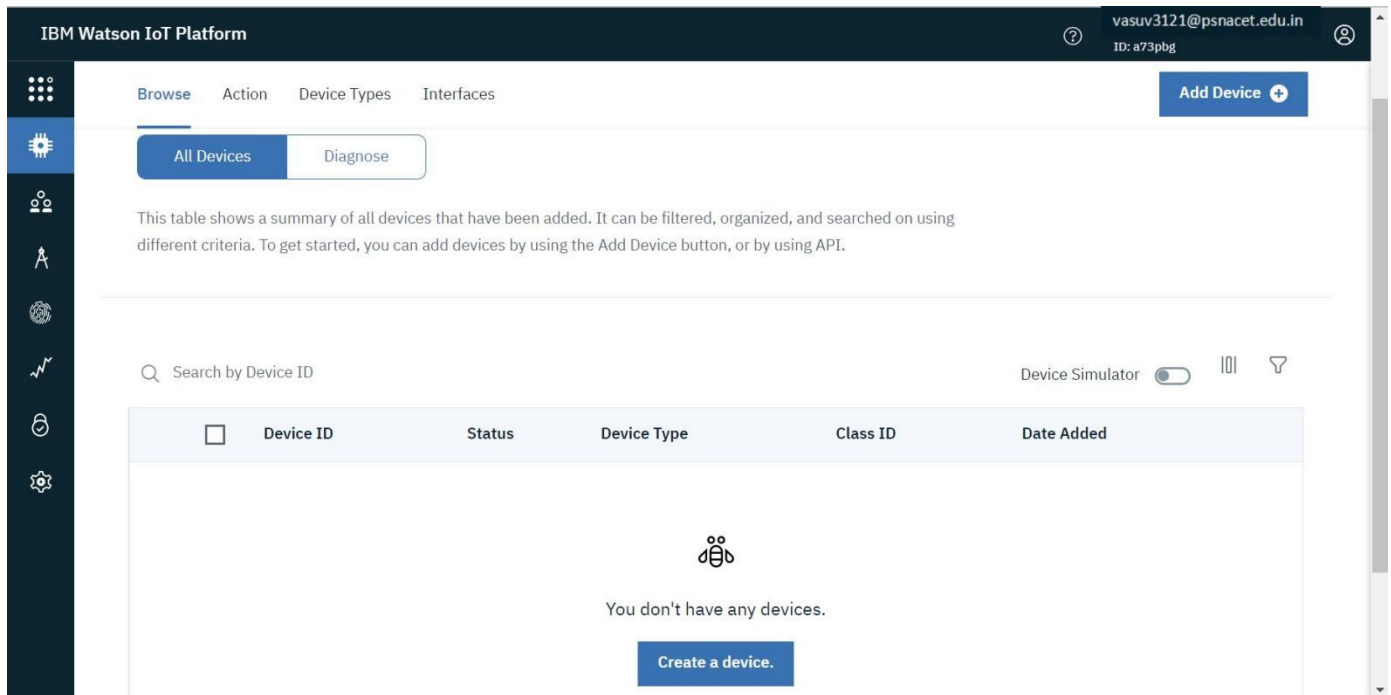
| Plan | Features  | Pricing |
|------|---|---------|
| Lite | Includes up to 500 registered devices, and a maximum of 200 MB of each data metric<br>Maximum of 500 registered devices | Free    |

The right sidebar shows a 'Summary' section with details: Internet of Things Platform, Location: Frankfurt, Plan: Lite, Service name: Internet of Things Platform-0g, and Resource group: Default. Below this is a checkbox for license agreements and a 'Create' button.

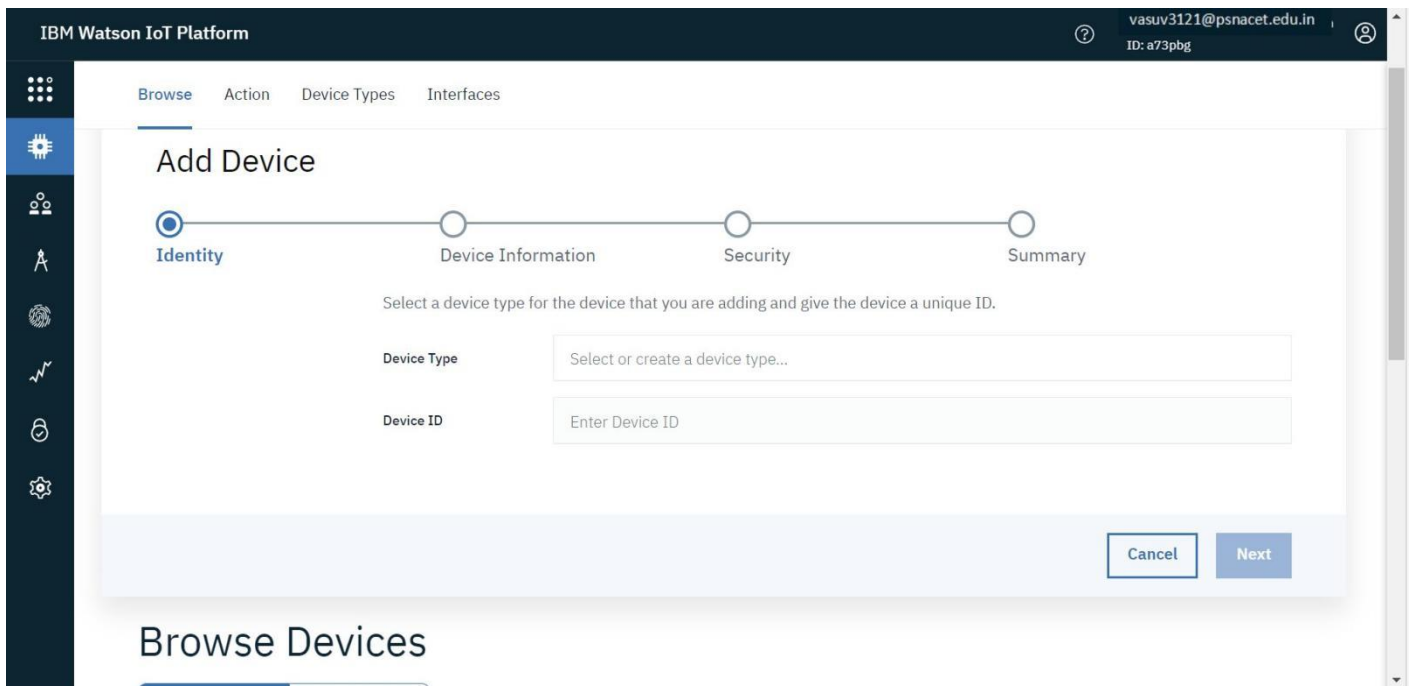
- click on Launch

The screenshot shows the IBM Cloud 'Internet of Things Platform-0g' management page. The left sidebar has 'Manage' selected, with sub-items 'Plan' and 'Connections'. The main content area features a large IoT icon and the heading 'Let's get started with IBM Watson IoT Platform'. Below this is a 'Launch' button and a 'Docs' button. A progress bar section titled 'Ready for the next level?' shows the 'IBM Watson IoT Platform Journey' with two steps: 'Lite' (completed) and 'Non-Production' (pending). A 'Launch' button is visible in the bottom right corner.

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



- After click on Add device this page will open



- Go to device type and fill the details.

The screenshot shows the 'Add type' form in the IBM Watson IoT Platform. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. The user is logged in as 'vasuv3121@psnacet.edu.in' with ID 'a73pbg'. The form is titled 'Add type' and has a progress indicator with two steps: 'Identity' (selected) and 'Device Information'. Below the progress indicator, a text box explains: '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.' The form has two tabs: 'Device' (selected) and 'Gateway'. The 'Name' field contains 'SRI RAM' with a note: '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.' The 'Description' field is empty. At the bottom right are 'Cancel' and 'Next' buttons.

IBM Watson IoT Platform

vasuv3121@psnacet.edu.in  
ID: a73pbg

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 **SRI RAM**  
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

Cancel Next

- Click on Finish

The screenshot shows the 'Add type' form in the IBM Watson IoT Platform, Step 2: Device Information. The top navigation bar and user information are the same as in the previous screenshot. The progress indicator shows 'Identity' as completed and 'Device Information' as the current step. A text box states: 'These attributes will be used as a template for new devices that are assigned this device type'. There is an 'Edit Metadata' button with a pencil icon. The form is divided into two columns of input fields. The left column contains: 'Serial Number' (Enter Serial Number), 'Model' (Enter Model), 'Description' (Enter Description), and 'Hardware Version' (Enter Hardware Version). The right column contains: 'Manufacturer' (Enter Manufacturer), 'Device Class' (Enter Device Class), 'Firmware Version' (Enter Firmware Version), and 'Descriptive Location' (Enter Descriptive Location). At the bottom right are 'Back' and 'Finish' buttons.

IBM Watson IoT Platform

vasuv3121@psnacet.edu.in  
ID: a73pbg

Browse Action Device Types Interfaces

## Add type

Identity Device Information

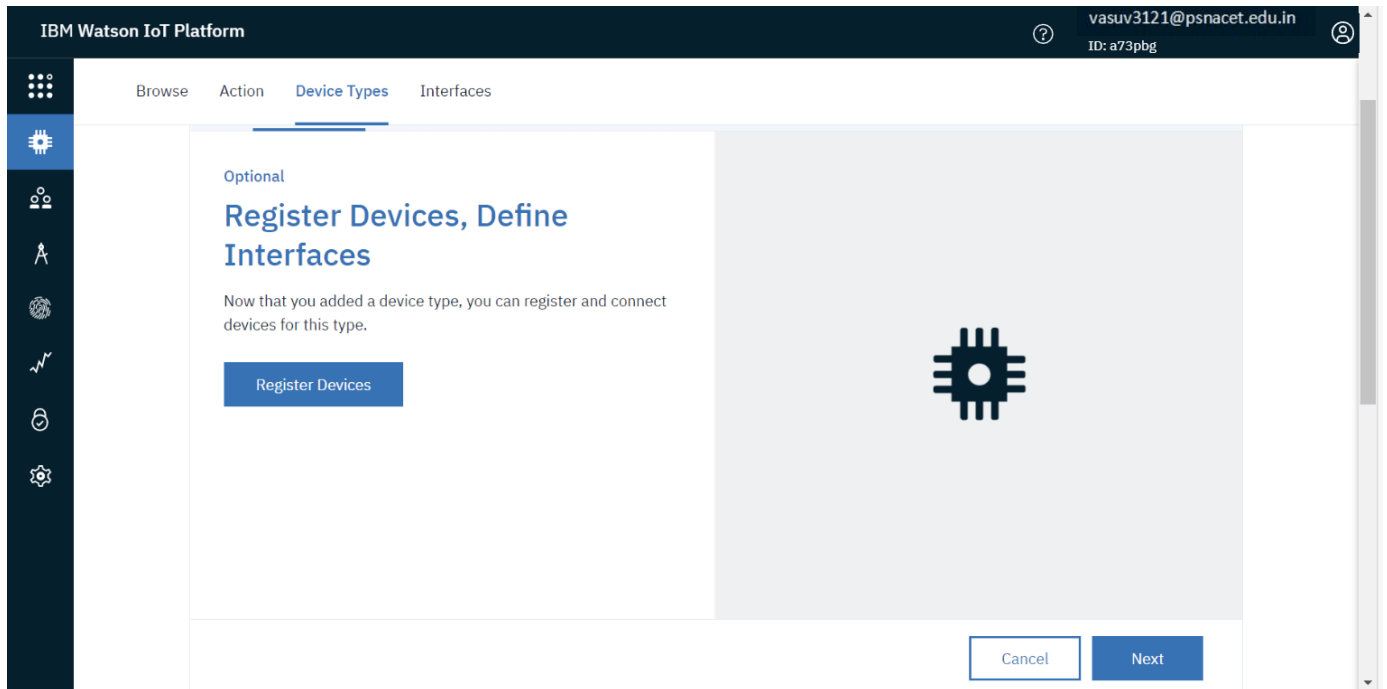
These attributes will be used as a template for new devices that are assigned this device type

Edit Metadata

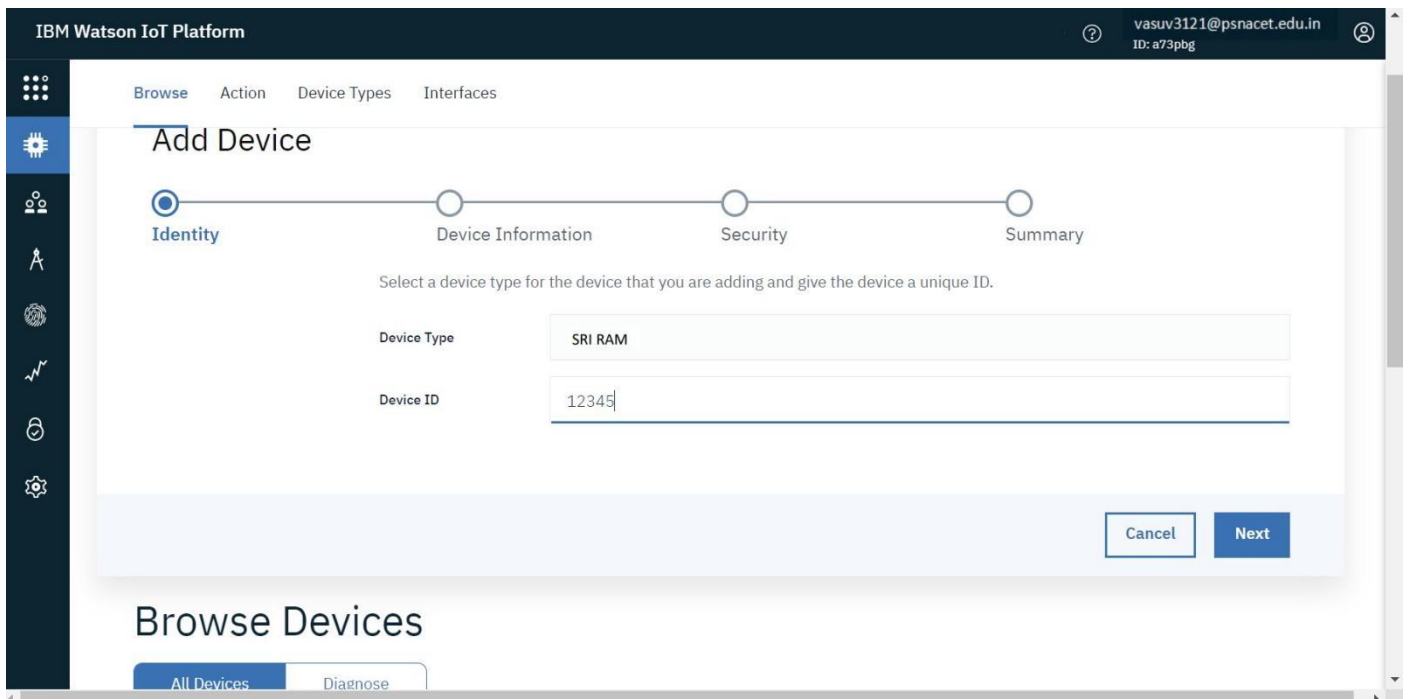
|                  |                        |                      |                            |
|------------------|------------------------|----------------------|----------------------------|
| Serial Number    | Enter Serial Number    | Manufacturer         | Enter Manufacturer         |
| Model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

Back Finish

- Click on Register Device.



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



➤ Click on Next

The screenshot shows the 'Add Device' page in the IBM Watson IoT Platform. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. The left sidebar contains various icons. The main content area is titled 'Add Device' and features a progress bar with four steps: Identity, Device Information (current), Security, and Summary. Below the progress bar, a message states: 'You can modify the default device information and enter more information about the device for identification purposes.' The form contains two columns of input fields: 'Serial Number', 'Model', 'Description', and 'Hardware Version' on the left; 'Manufacturer', 'Device Class', 'Firmware Version', and 'Descriptive Location' on the right. Each field has a placeholder text 'Enter [field name]'. At the bottom left of the form is a button labeled 'Add Metadata +'. The top right corner shows the user's email 'vasuv3121@psnacet.edu.in' and ID 'a73pbg'.

➤ Click on Next

The screenshot shows the 'Add Device' page in the IBM Watson IoT Platform, specifically the 'Security' step. The top navigation bar and left sidebar are consistent with the previous screenshot. The progress bar now highlights the 'Security' step. The main content area is titled 'Security' and features a message: 'There are two options for selecting a device authentication token.' Below this, there are two sections: 'Auto-generated authentication token (default)' and 'Self-provided authentication token'. The 'Auto-generated' section explains that the service will generate an 18-character alphanumeric token. The 'Self-provided' section explains that the user must provide their own 8-36 character token. At the bottom, there is an 'Authentication Token' label and a text input field with the placeholder 'Enter an optional token'. Below the input field, a note states: 'Make a note of the generated token. Lost authentication tokens cannot be recovered. Tokens are encrypted before being stored.' and a sub-note states: 'Authentication token are encrypted before we store them.' The top right corner shows the user's email 'vasuv3121@psnacet.edu.in' and ID 'a73obg'.



➤ Click on Finish

IBM Watson IoT Platform

vasuv3121@psnacet.edu.in  
ID: a73pbg

Browse

Action

Device Types

Interfaces

Add Device

Identity

Device Information

Security

Summary

Verify that the following information is correct then select Finish

Device Type

SRI RAM

Device ID

12345

View Metadata

Security Token

To be generated

Back

Finish

➤ Device is created

IBM Watson IoT Platform

vasuv3121@psnacet.edu.in  
ID: a73pbg

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 |
|---|-----------|--------------|-------------|----------|-----------------------|----------------------|
| > | 12345     | Disconnected | SRI RAM     | Device   | Oct 31, 2022 11:38 AM |                      |

Items per page 50

1-1 of 1 item

1 of 1 page

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>

1 Simulation running

Activate Windows  
Go to Settings to activate Windows.

## 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
pi@raspberrypi:~$ curl -LO https://github.com/ibm-messaging/iot-raspberrypi/releases/download/1.0.2.1/iot_1.0-2_armhf.deb
libssl1.0.0_1.0.1t-1-deb8u6_armhf.deb
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/rele
ases/download/1.0.2.1/iot_1.0-2_armhf.deb
% Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
           %             %             %             %             %
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 ... 115686 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[2]: 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 iso8601-0.1.10-py2.py3-none-any.whl (132kB)
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 1.0kB/s
Collecting requests-toolbelt<=0.7.0 (from ibmiotf)
  Downloading requests-toolbelt-0.8.0-py2.py3-none-any.whl (54kB)
    100% |#####| 61kB 1.0kB/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 (132kB)
    100% |#####| 133kB 1.4kB/s
Collecting idna<2.7,>=2.5 (from requests<=2.5.0->ibmiotf)
  Downloading idna-2.6-py2.py3-none-any.whl (56kB)
    100% |#####| 143kB 1.0kB/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 1.0kB/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/7e/f9/45/bbc33ad957e82f7b71ba80e31d665a83d9d735ad12e0c9418
Running setup.py bdist_wheel for dicttoxml ... done
Stored in directory: /home/pi/.cache/pip/wheels/20/d8/0d/acc8f289011b7be7de71deebe6f642f6b3be0313dfff0493
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 iso8601-0.1.10 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:gegt14: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 iot platform Just look at the image below and if u see the same wifi kind of symbol on your created device then your data is being received.

IBM Watson IoT Platform

vasuv3121@psnacet.edu.in ID: a73nbg

Browse Action Device Types Interfaces

## 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 ☒

| <input type="checkbox"/> | Device ID | Status       | Device Type | Class ID | Date Added            | Descriptive Location |
|--------------------------|-----------|--------------|-------------|----------|-----------------------|----------------------|
| <input type="checkbox"/> | 12345     | Disconnected | SRI RAM     | Device   | Oct 31, 2022 11:38 AM |                      |

Items per page 50 | 1-1 of 1 item

1 of 1 page

1 Simulation running

Activate Windows  
Go to Settings to activate Windows.

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

The screenshot displays the IBM Watson IoT Platform interface. The top navigation bar includes 'Browse', 'Action', 'Device Types', and 'Interfaces'. The main content area shows a table of devices with columns: Device ID, Status, Device Type, Class ID, Date Added, and Descriptive Location. The selected device (ID: 12345) is shown in a detailed view with tabs for Identity, Device Information, Recent Events, State, and Logs. The 'Recent Events' tab is active, showing a list of events with columns: Event, Value, Format, and Last Received. The events are JSON objects containing sensor data like 'Hazardous Gas', 'Temperature', and 'Humidity'.

| Event   | Value  | Format | Last Received     |
|---------|--|--------|-------------------|
| event_1 | {"Hazardous Gas":61,"Temperature":88,"Humidit..."} | json   | a few seconds ago |
| event_1 | {"Hazardous Gas":20,"Temperature":36,"Humidit..."} | json   | a few seconds ago |
| event_1 | {"Hazardous Gas":79,"Temperature":56,"Humidit..."} | json   | a few seconds ago |
| event_1 | {"Hazardous Gas":52,"Temperature":82,"Humidit..."} | json   | a few seconds ago |
| event_1 | {"Hazardous Gas":26,"Temperature":33,"Humidit..."} | json   | a few seconds ago |

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

The screenshot shows the 'Your boards' section of the IBM Watson IoT Platform. It features two cards: 'USAGE OVERVIEW' (3 Cards Owned by you) and 'RISK AND SECURITY OVERVIEW' (4 Cards Owned by you). A large dashed box with a plus sign indicates where to add new cards. The bottom section is titled 'Boards shared with you'. The interface includes a top navigation bar with 'Your boards' and 'Public boards' tabs, and a 'Create New Board' button.

1 Simulation running

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

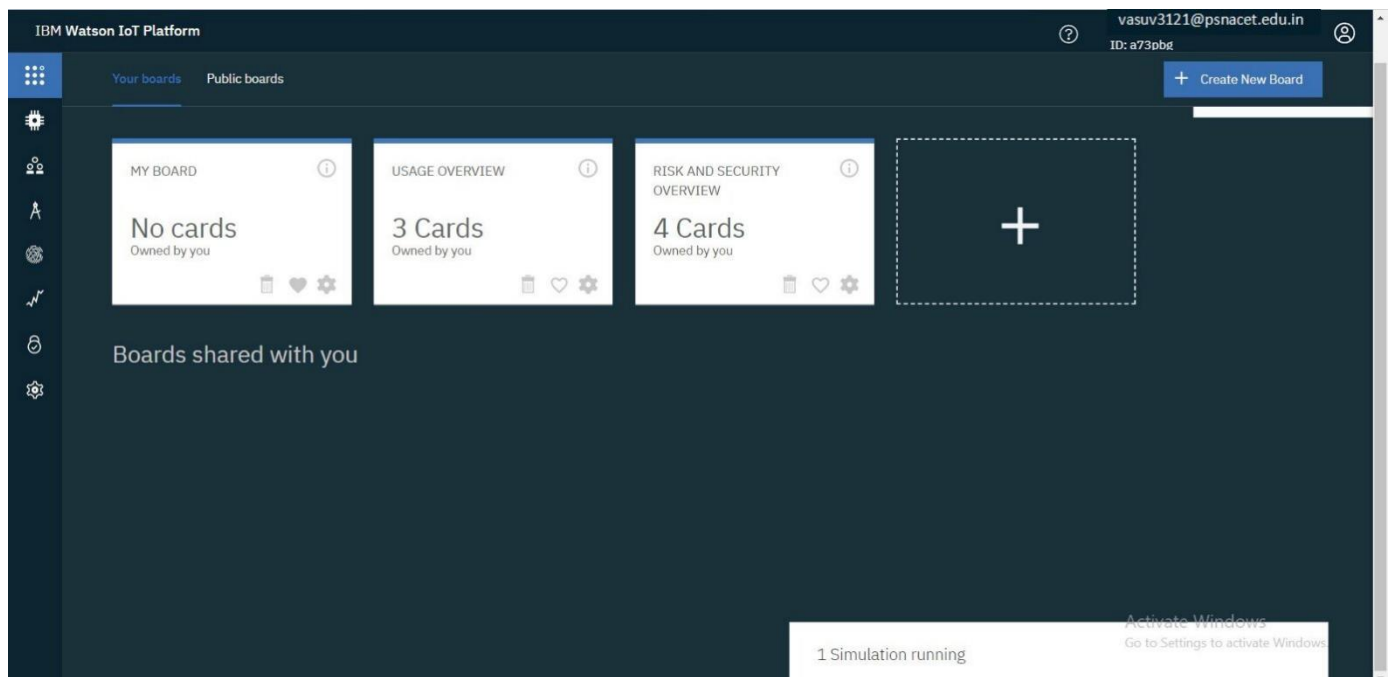
The given below window appears give a name and description to your board as shown in the window below.

The screenshot shows the IBM Watson IoT Platform interface. On the left, a sidebar contains navigation icons. The main area displays a 'Create a new board' dialog box. The dialog has a title bar with a close button. Below the title, it says 'Provide a name and description for your new board.' There are two input fields: 'Board name' and 'Description'. Below these fields, there are two radio button options: 'Make this board my landing page.' (which is selected) and 'Favorite (this also adds this board to your navbar)'. At the bottom right of the dialog is a 'Next' button. In the background, the platform's dashboard is visible, showing a 'USAGE OVERVIEW' card with '3 Cards Owned by you' and a 'Boards shared with you' section. The top right corner of the platform shows the user's email 'vasuv3121@psnacet.edu.in' and ID 'a73pbzg', along with a 'Create New Board' button. An 'Activate Windows' watermark is visible at the bottom right.

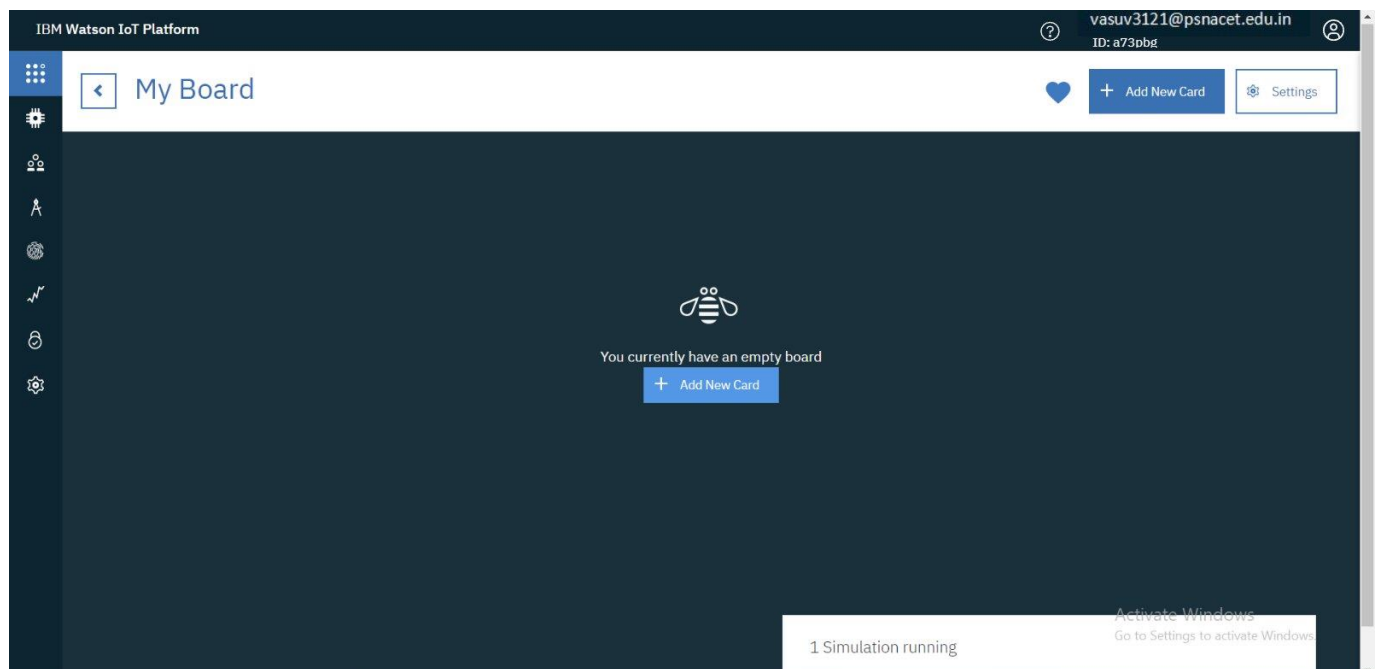
- Then click on Next you get the below window then again click on Submit

This screenshot shows the same 'Create a new board' dialog box, but after clicking the 'Next' button. The dialog now displays 'Adding viewers allows them to see your dashboard.' Below this, there is an 'Owner' field with the email 'sriramragavan2002@psnacet.edu.in'. There is a 'Members' field with a '+ add user ID' button. Below these fields, there is a radio button option 'Share as read-only with everyone?'. At the bottom of the dialog are 'Back' and 'Submit' buttons. The background interface remains the same as in the previous screenshot, showing the IBM Watson IoT Platform dashboard and user information.

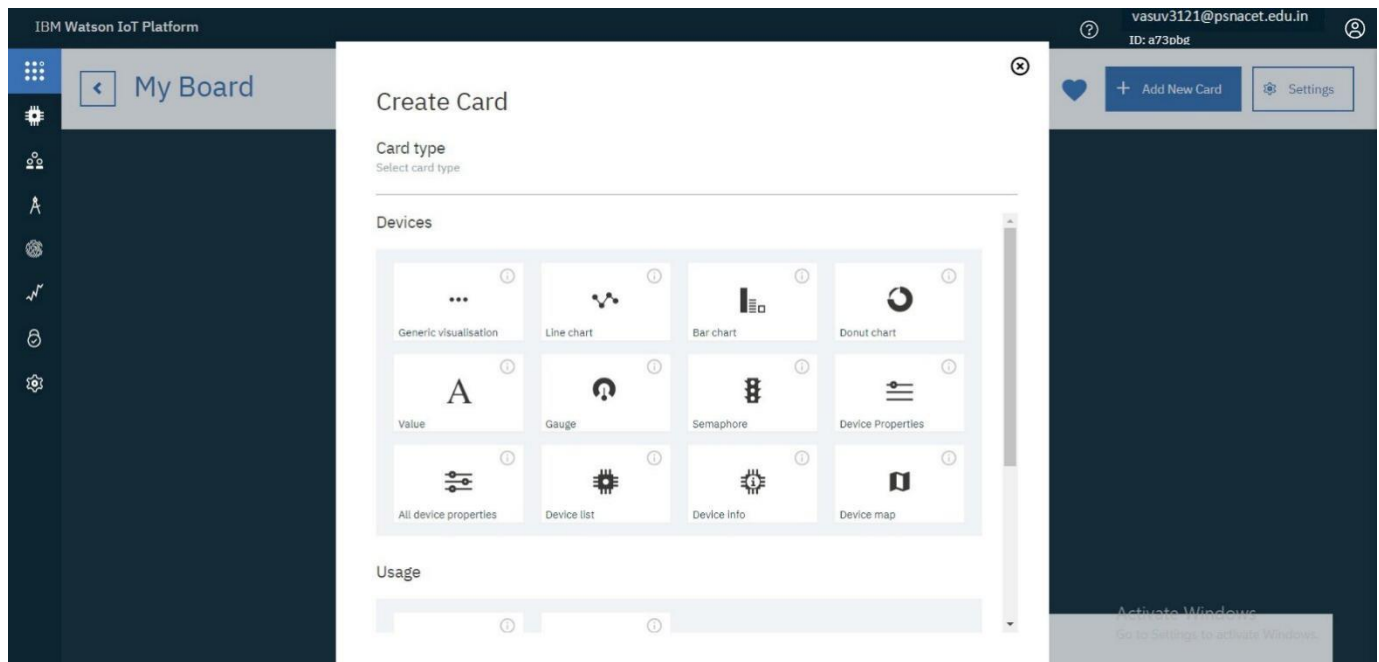
- Then double click on your boards name which you have created.



- Click on Add New Card



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



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

IBM Watson IoT Platform

Temp & Hum

Card source data

12345

Card preview

Card information

### Create Line chart Card

Connect data set

Temperature

Event

event\_1

Property

Temperature

Name

Temperature

Type

Number

Unit

Max

100

Back

Next

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

IBM Watson IoT Platform

Temp & Hum

Card source data

12345

Card preview

Card information

### Create Line chart Card

Enter title and description of the card

Title

Line chart

Color scheme

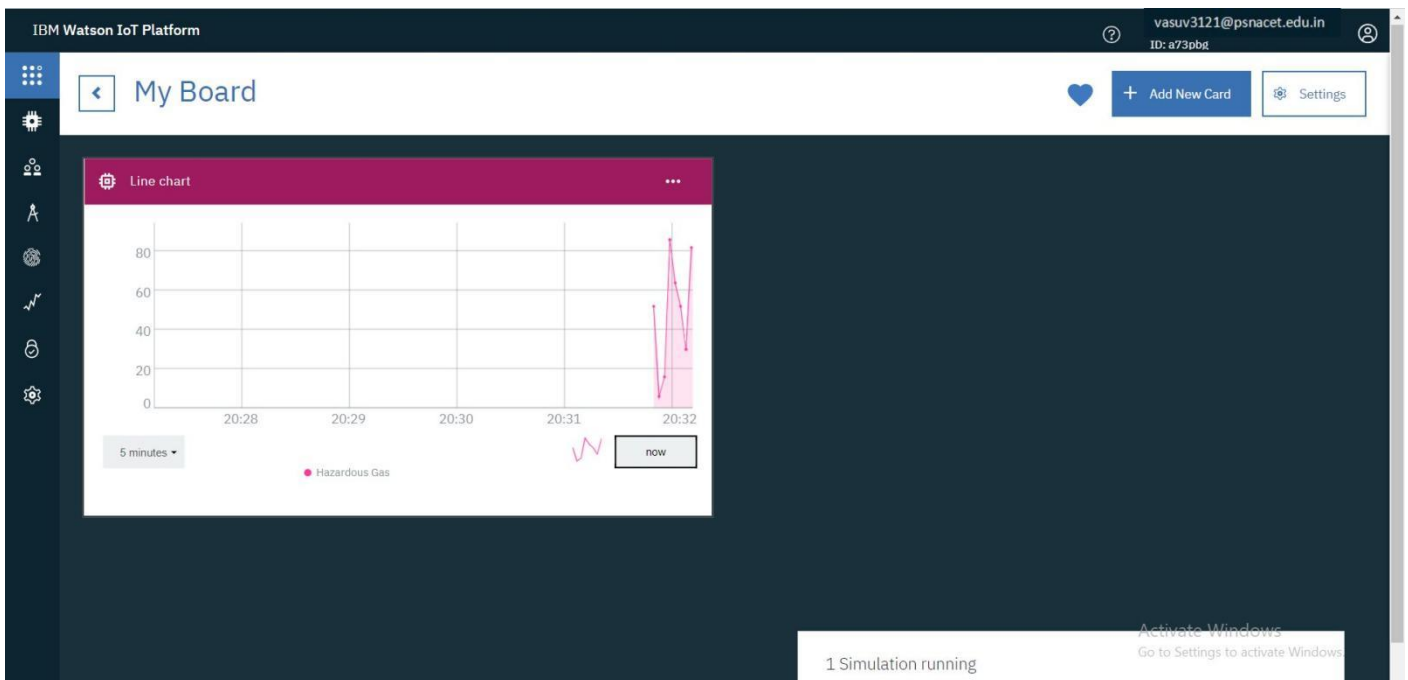
A line chart to display time series information with historic and live data

Back

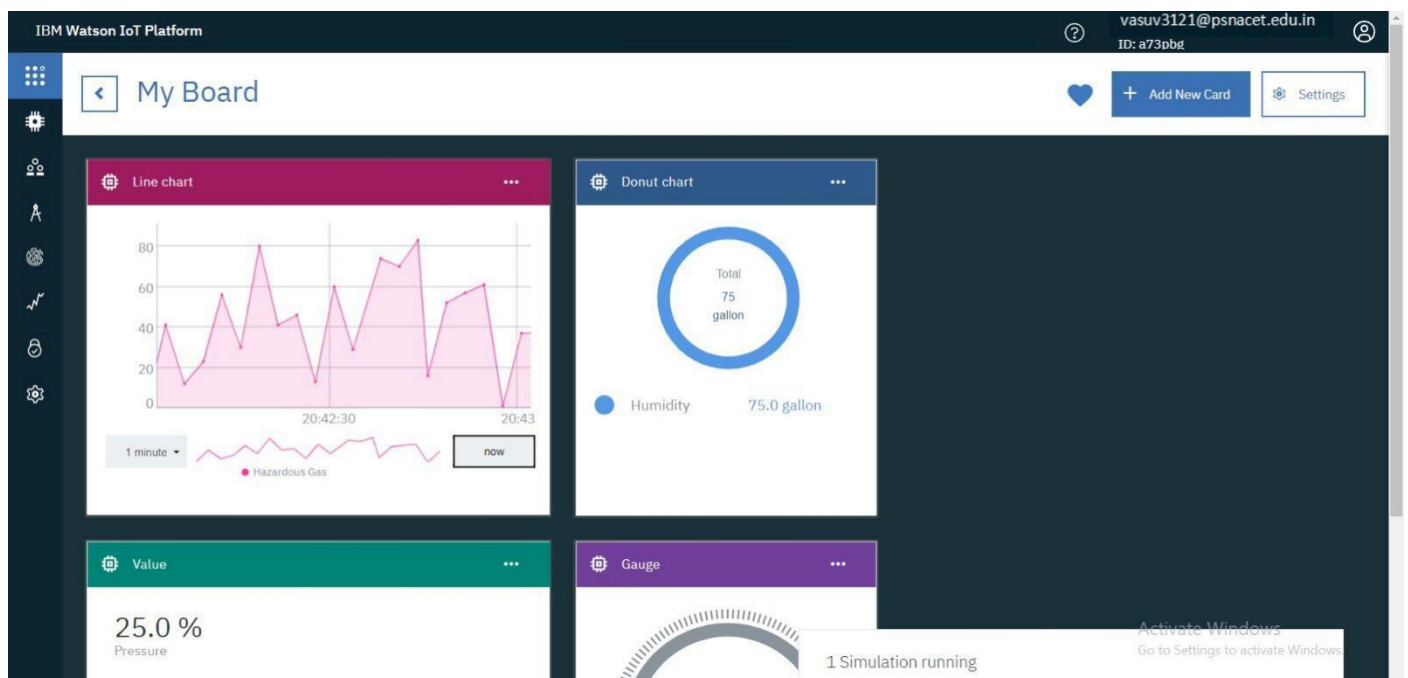
Submit



➤ 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.