

# SENDING DATA FROM RASPBERRY-PI TO IBM WATSON

<b>Date</b>	13 NOVEMBER 2022
<b>Team ID</b>	PNT2022TMID05347
<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

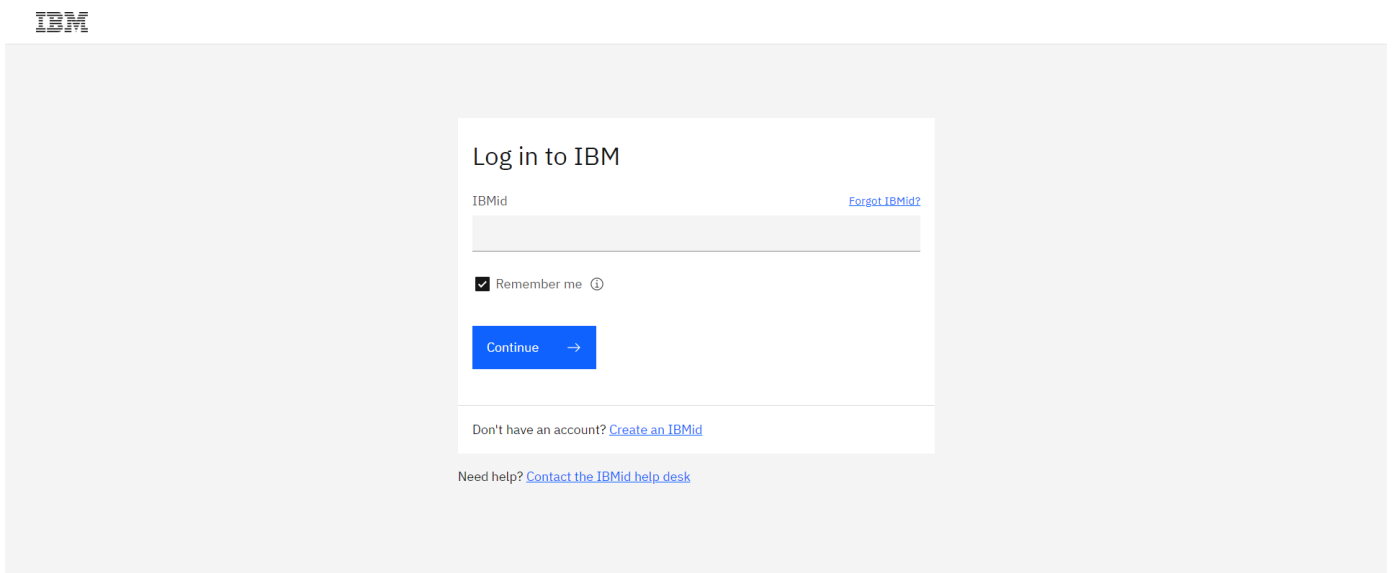
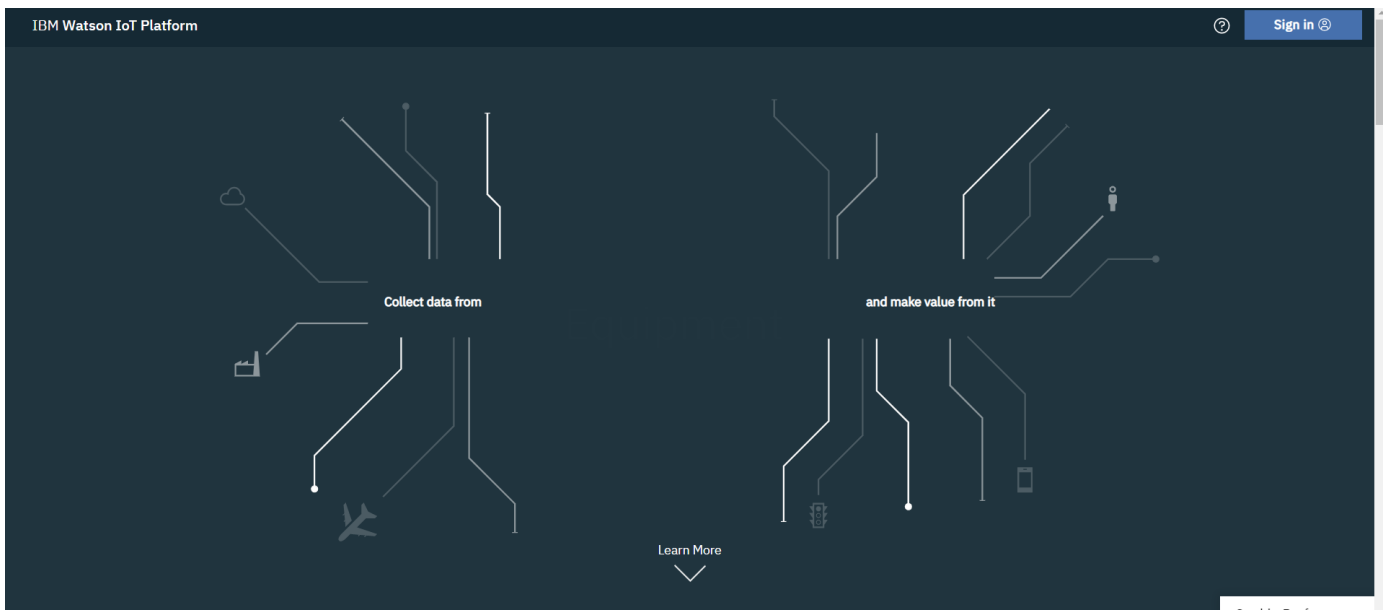
### SOFTWARE:

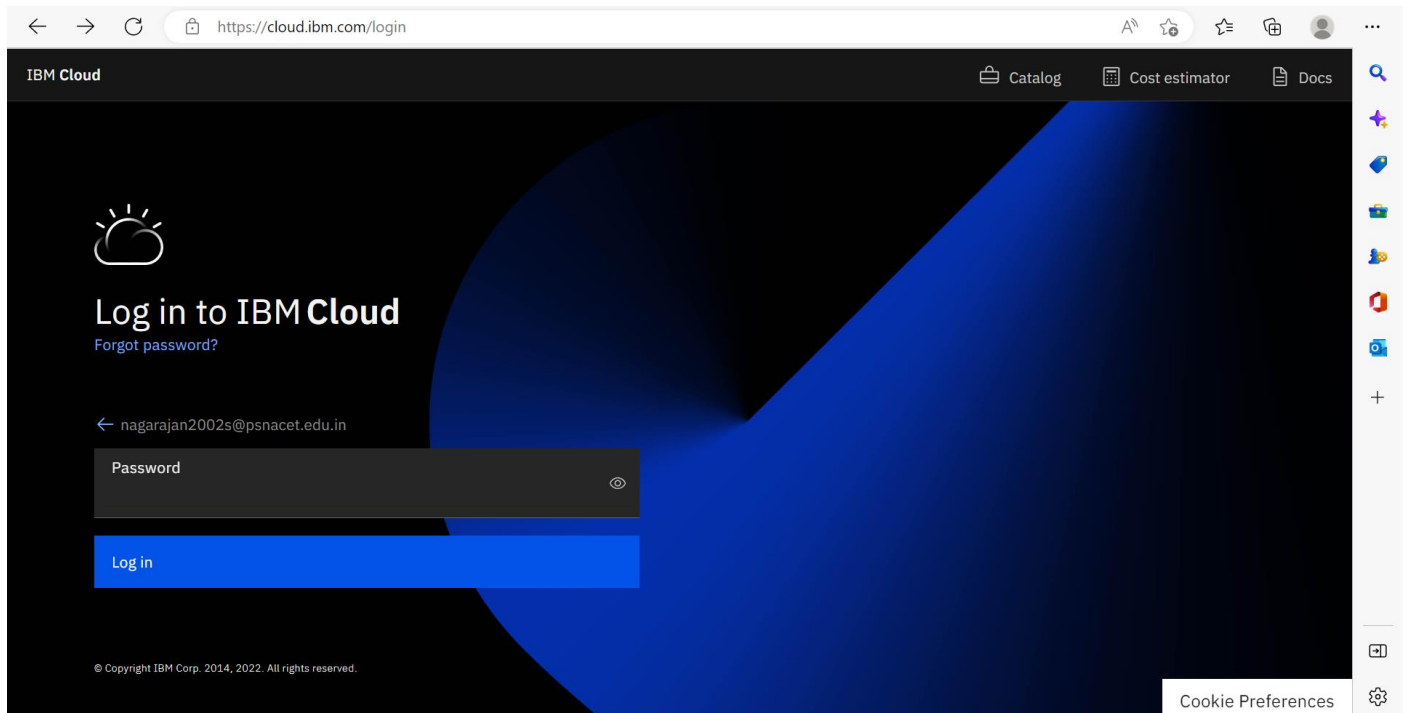
- IBM BLUEMIX ACCOUNT

## STEPS TO BE FOLLOWED

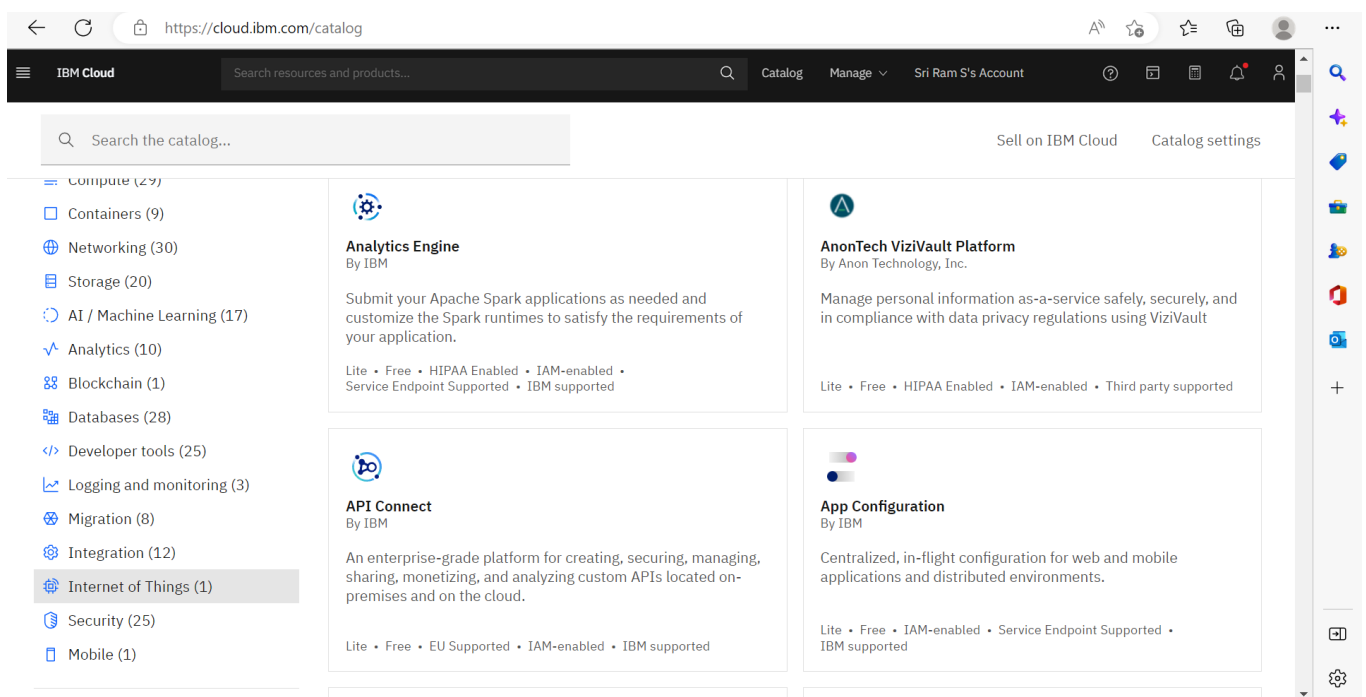
### Step-1: Create a device in IBM Watson:

- 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 header includes the IBM Cloud logo, a search bar, and navigation links for Catalog, Manage, and the user's account (Sri Ram S's Account). The main content area is divided into a left sidebar with metadata (Type: Service, Provider: IBM, Last updated: 08/15/2022, Category: Internet of Things, Compliance: IAM-enabled, Location: Frankfurt) and a main panel. The main panel has two tabs: 'Create' (active) and 'About'. Under the 'Create' tab, there are sections for 'Select a location' (Frankfurt (eu-de)) and 'Select a pricing plan'. A table lists the available plans:

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

On the right, a 'Summary' panel shows the service name, location, plan, and a checkbox for license agreement. A blue 'Create' button is prominently displayed.

- click on Launch

The screenshot shows the IBM Cloud 'Internet of Things Platform-0g' management page. The header is consistent with the previous screenshot. The main content area has a left sidebar with 'Manage' (active), 'Plan', and 'Connections'. The main panel features a large graphic of a central square with four 'U' shaped connectors. To the right of the graphic, the text reads 'Let's get started with IBM Watson IoT Platform' followed by a description: 'Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.' Below this text are 'Launch' and 'Docs' buttons. Further down, a section titled 'Ready for the next level?' shows a progress bar with 'Lite' (checked) and 'Non-Production' (unchecked) options. A blue chat bubble icon is in the bottom right corner.

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

IBM Watson IoT Platform

sriramagavan2002@psnacet.edu.in  
ID: a73pbpg

Browse Action Device Types Interfaces


Add Device +

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
 You don't have any devices. <a href="#">Create a device.</a>					

- After click on Add device this page will open

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Browse Action Device Types Interfaces

## Add Device

Identity Device Information Security Summary

Select a device type for the device that you are adding and give the device a unique ID.

Device Type

Device ID

Cancel Next

## Browse Devices

- Go to device type and fill the details.

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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

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ID: a73pbq

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

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

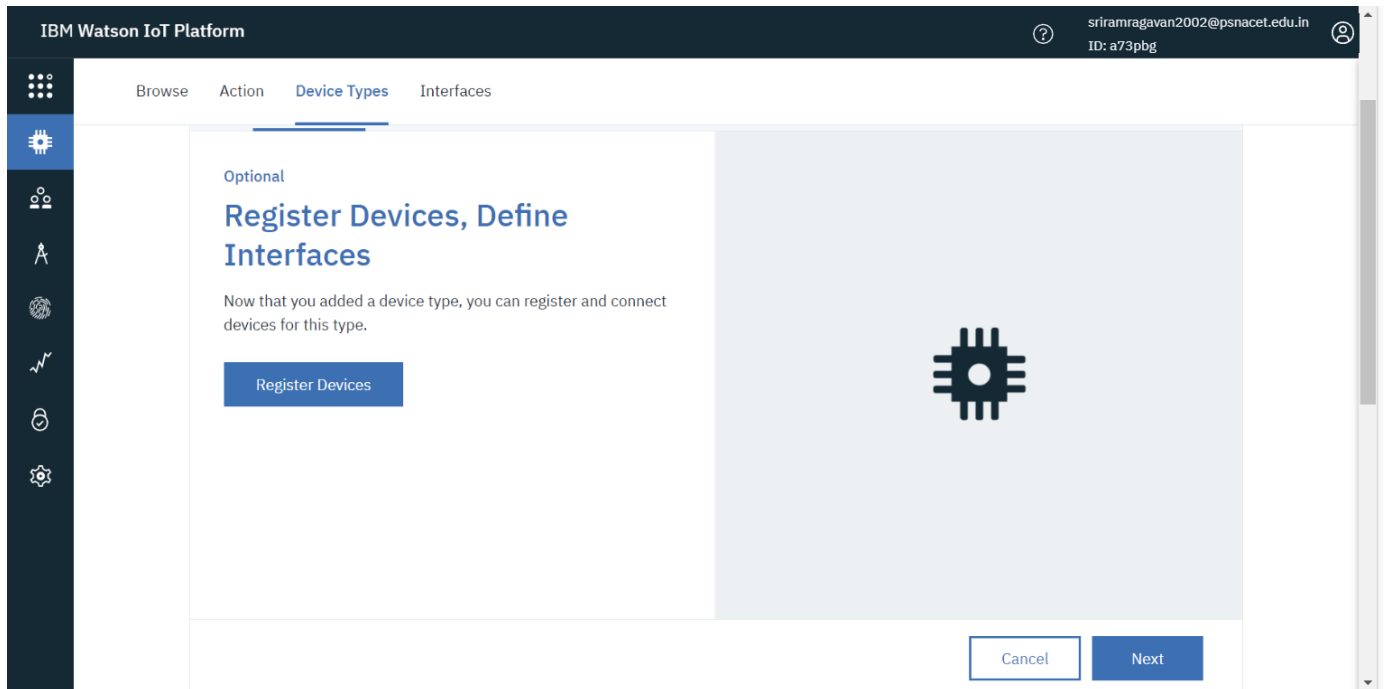
Enter Descriptive Location

Edit Metadata

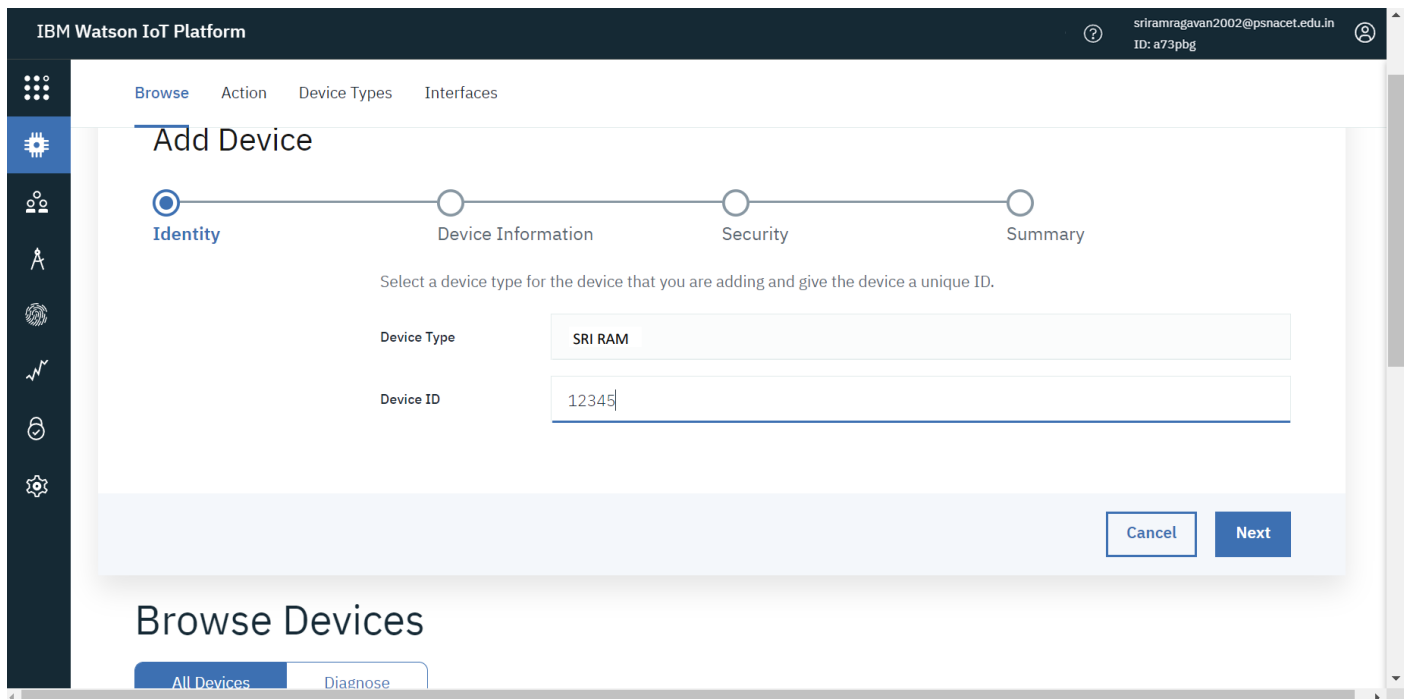
Back

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 icons for various IoT-related functions. 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; and '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 of the page shows the user's email 'sriramragavan2002@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 shows 'Identity' and 'Device Information' as completed steps, with 'Security' as the current step and 'Summary' as the next. The main content area is titled 'Security' and contains the following text: 'There are two options for selecting a device authentication token.' Below this, there are two columns of text. The left column is titled 'Auto-generated authentication token (default)' and describes the process: '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.' The right column is titled 'Self-provided authentication token' and describes the process: 'Provide your own authentication token for this device. The token must be between 8 and 36 characters and contain a mix 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 text, there is a form field labeled 'Authentication Token' with a placeholder 'Enter an optional token' and an information icon. At the bottom, 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

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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

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ID: a73pbg

Add Device

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

	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

>

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
--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                   0      0     0    0      0      0      0      0
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/acdc8f289011b7be7de71deebe642f683be0313dfff0493
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
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```

### 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
sriramgavan2002@psnacet.edu.in
ID: a73pbg
Add Device

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

	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
1

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'. A sidebar on the left contains various icons for navigation. The main content area shows a table of devices with columns: Device ID, Status, Device Type, Class ID, Date Added, and Descriptive Location. A device with ID 12345 is selected, showing its status as 'Disconnected' and type as 'Nagarajan'. Below the table, a panel titled 'Recent Events' shows a live stream of data. The events are listed in a table with columns: Event, Value, Format, and Last Received.

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

At the bottom right, there is a notification: '1 Simulation running' and a message to 'Activate Windows'.

#### 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 boards: 'USAGE OVERVIEW' with 3 cards and 'RISK AND SECURITY OVERVIEW' with 4 cards. A large dashed box with a plus sign indicates where to add a new board. Below the boards, there is a section for 'Boards shared with you'. The bottom right corner shows a notification: '1 Simulation running' and a message to 'Activate Windows'.

- 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.

IBM Watson IoT Platform

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ID: a73pbpg

+ Create New Board

Information

Members

USAGE OVERVIEW

3 Cards  
Owned by you

Boards shared with you

Create a new board

Provide a name and description for your new board.

Board name

Description

☒ Make this board my landing page.  
☐ Favorite (this also adds this board to your navbar)

Next

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

IBM Watson IoT Platform

sriramragavan2002@psnacet.edu.in  
ID: a73pbpg

+ Create New Board

Information

Members

USAGE OVERVIEW

3 Cards  
Owned by you

Boards shared with you

Create a new board

Adding viewers allows them to see your dashboard.

Owner  
sriramragavan2002@psnacet.edu.in

Members

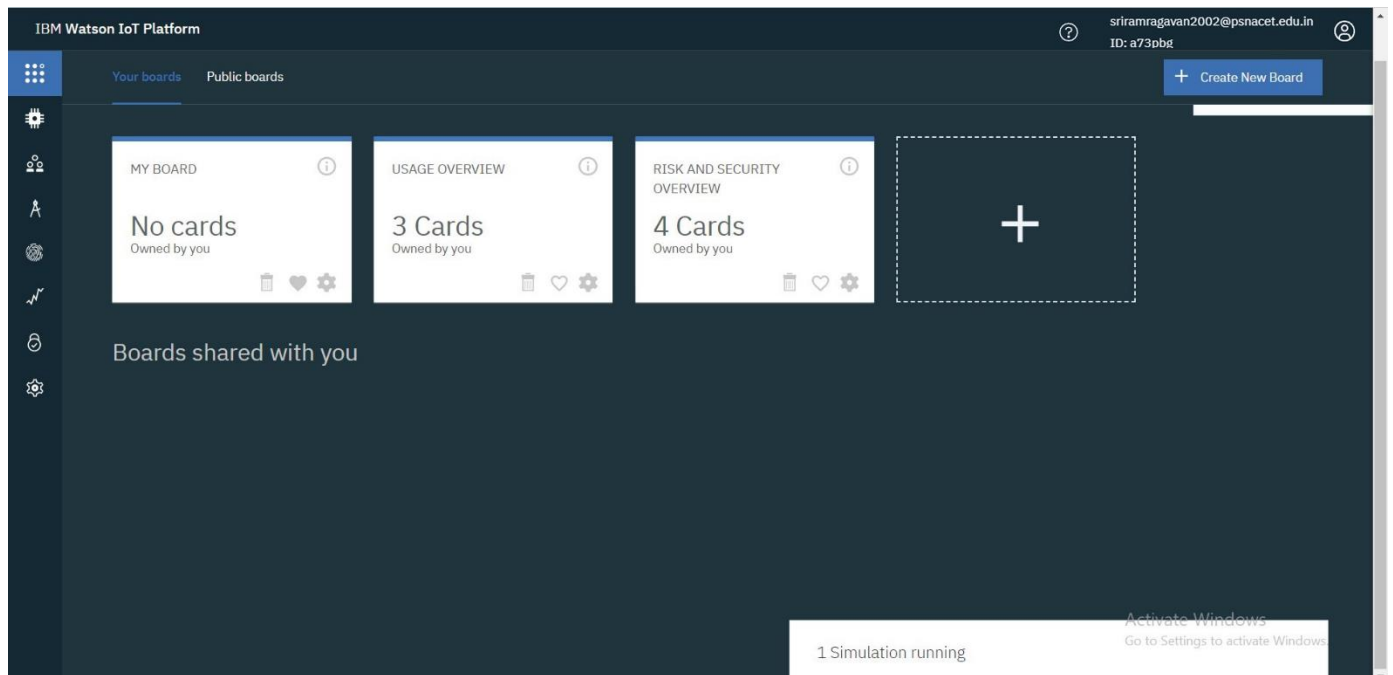
☐ Share as read-only with everyone?

+ add user ID

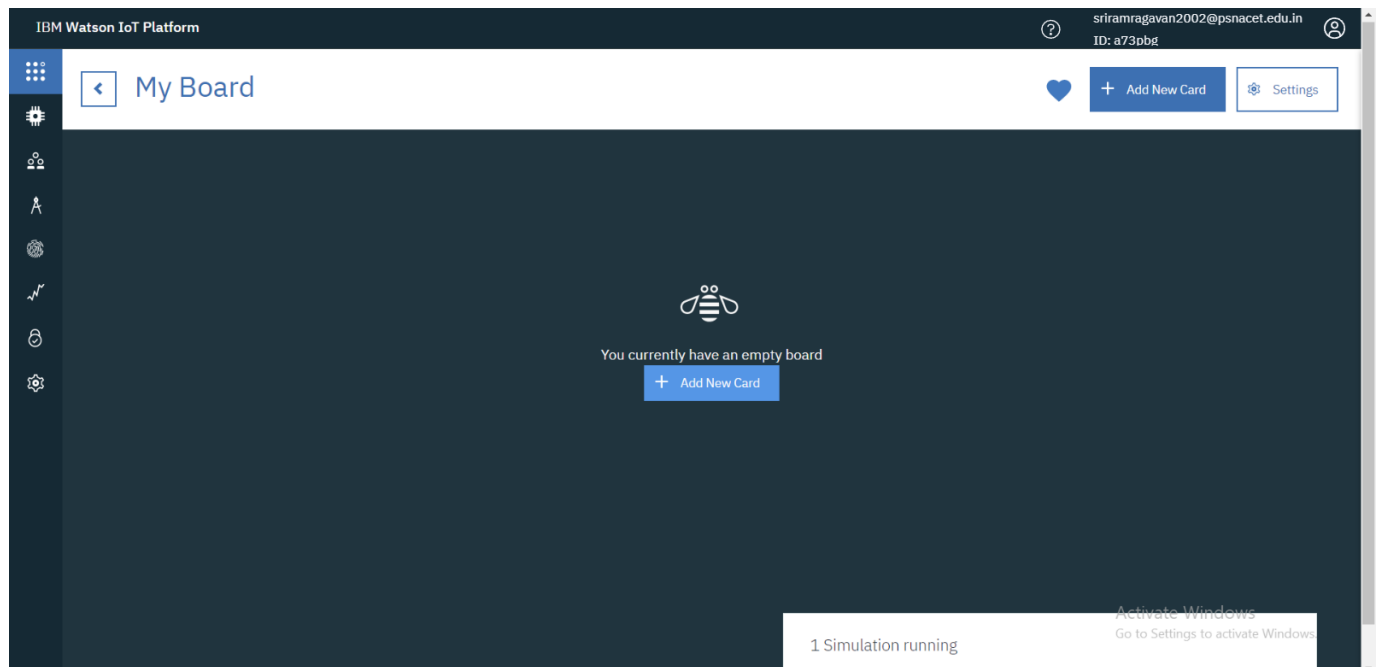
Name	Editor?

Back Submit

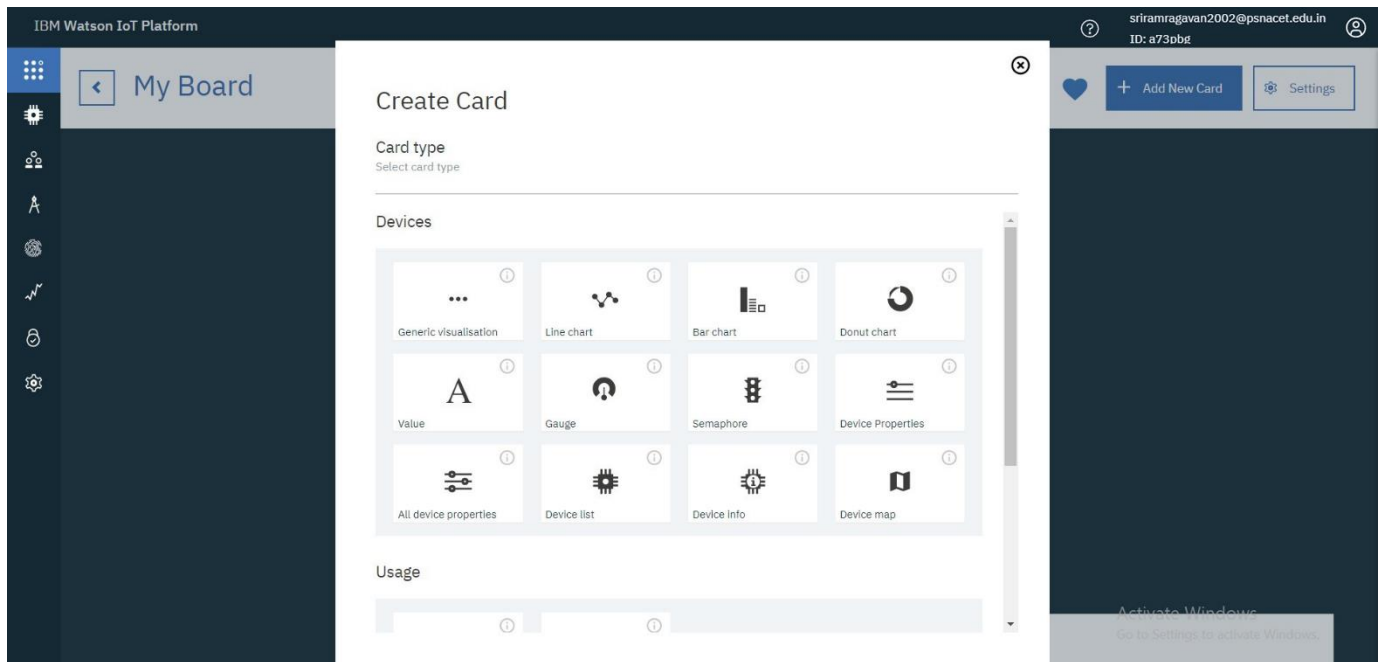
- Then double click on your boards name which you have created.



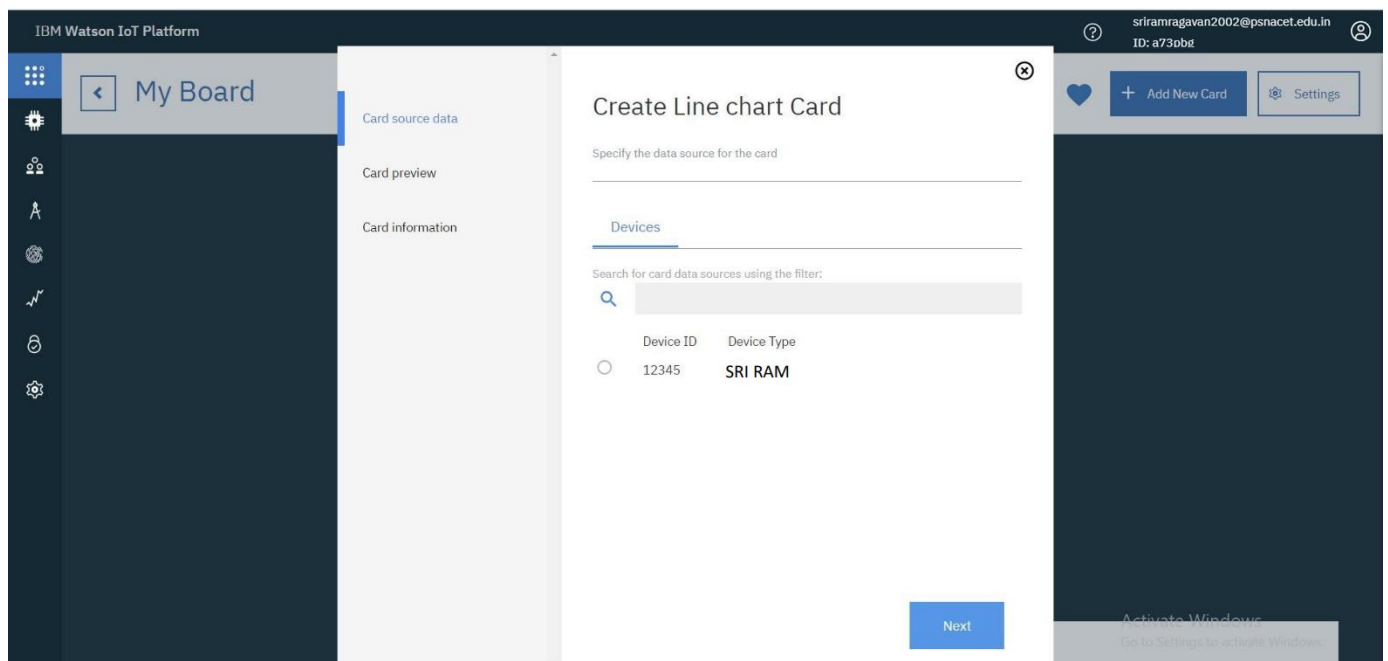
- Click on Add New Card



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



- 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

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

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

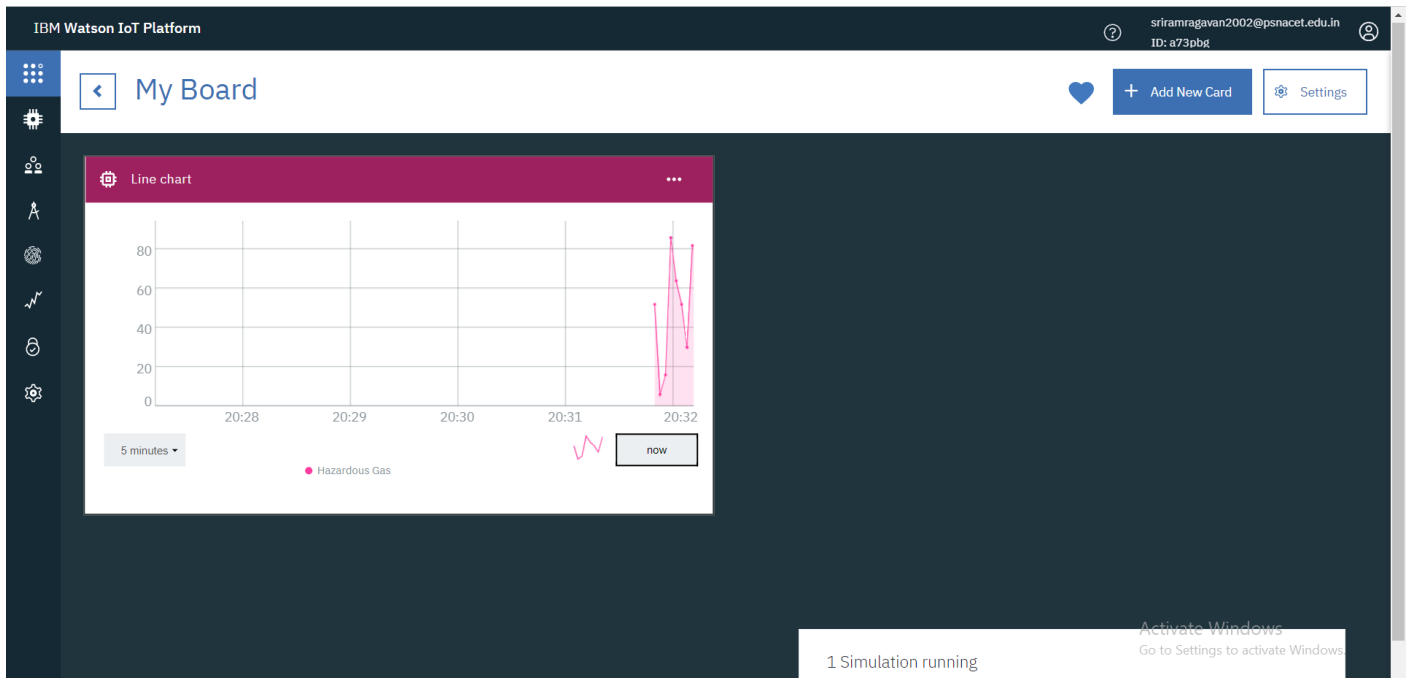
A line chart to display time series information with historic and live data

Back

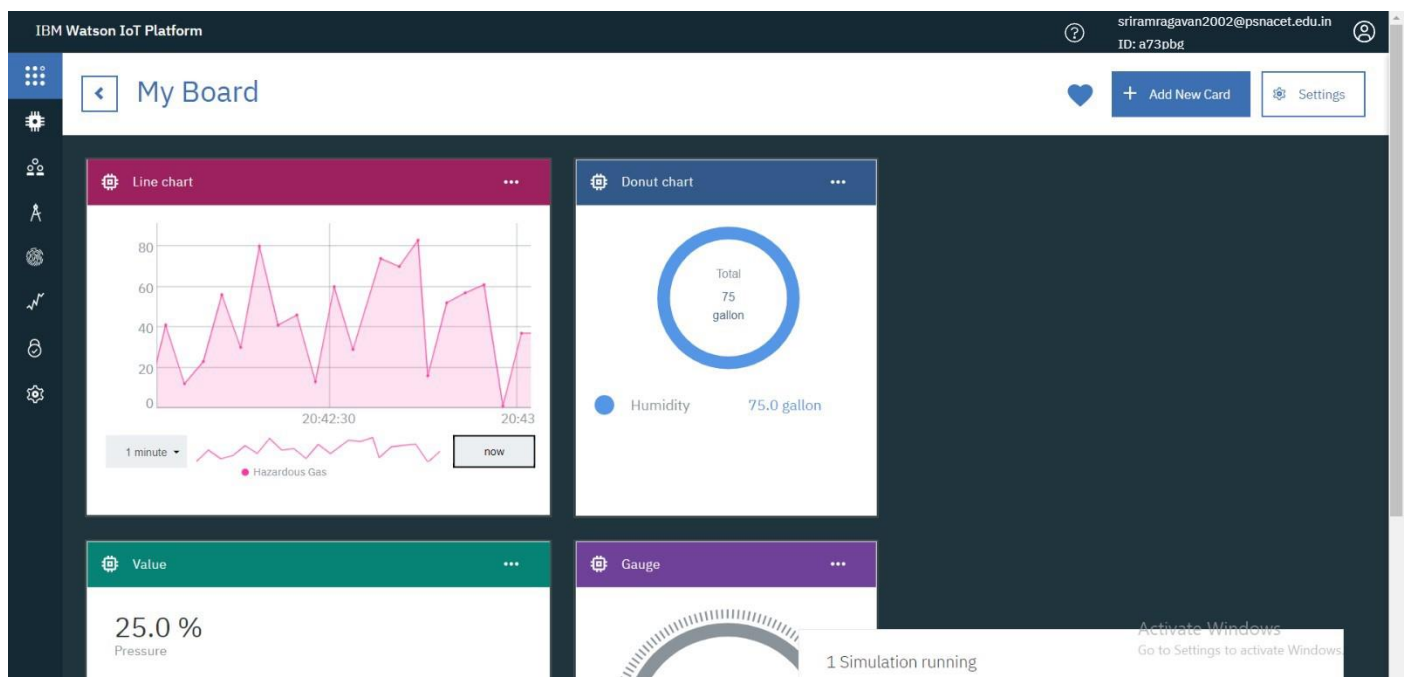
Submit

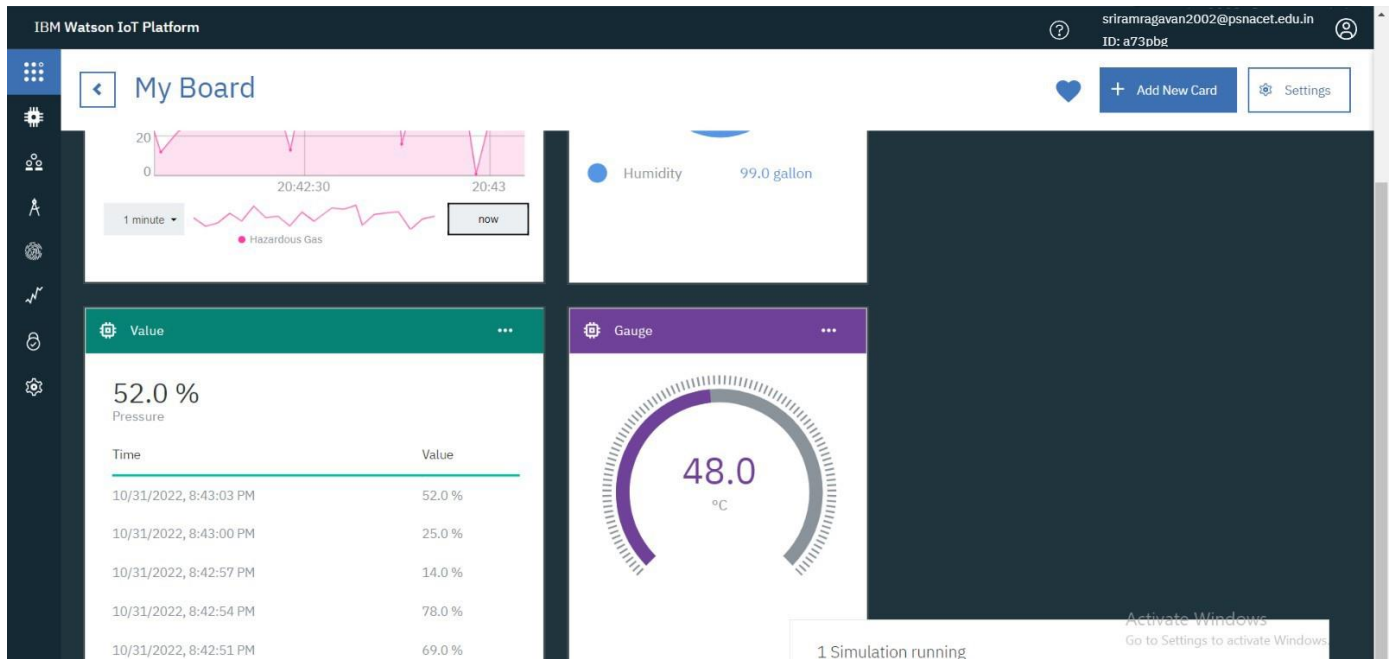


➤ Here is the graph



➤ 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.