

SENDING DATA FROM RASPBERRY-PI TO IBM WATSON

Date	7 th November 2022
Team ID	PNT2022TMID27134
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

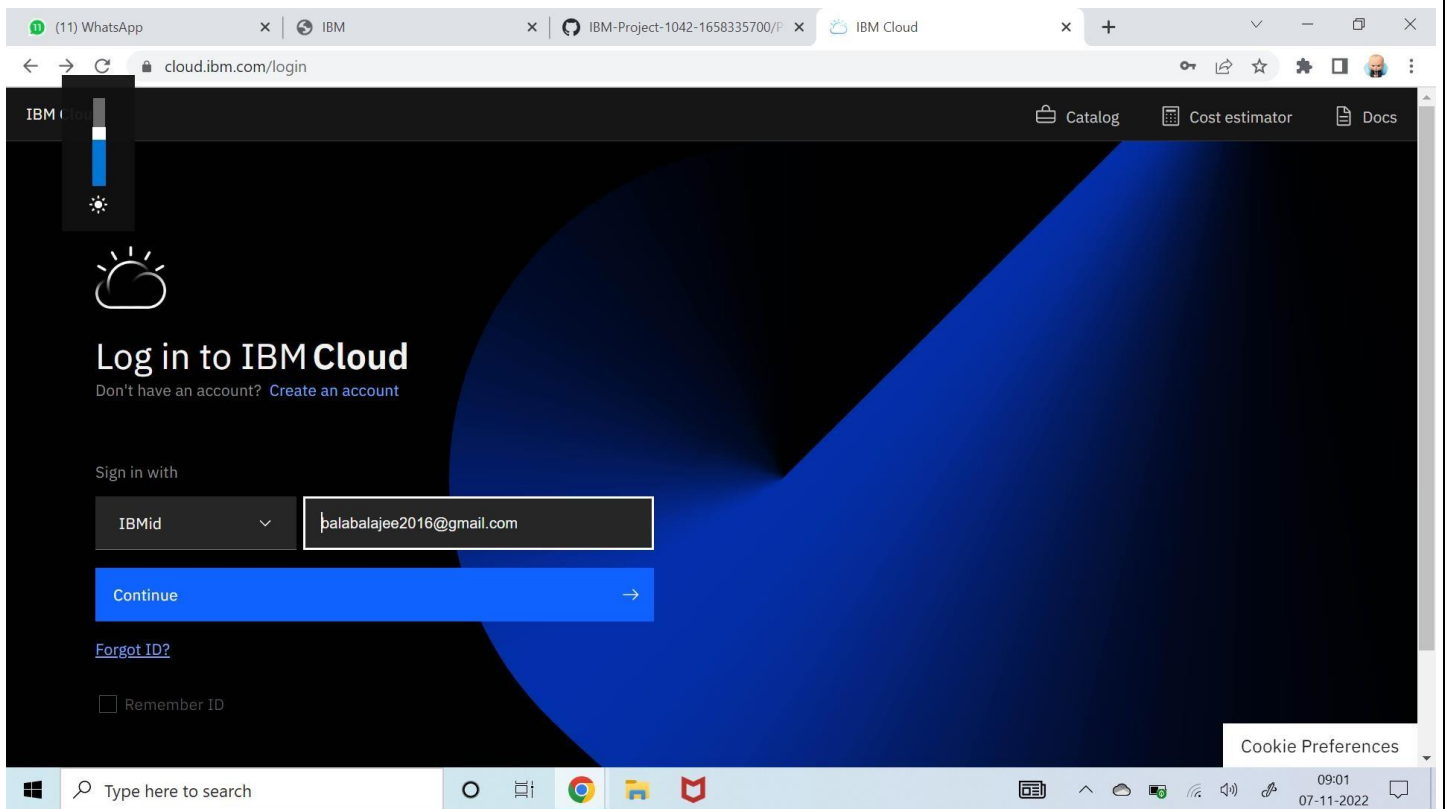
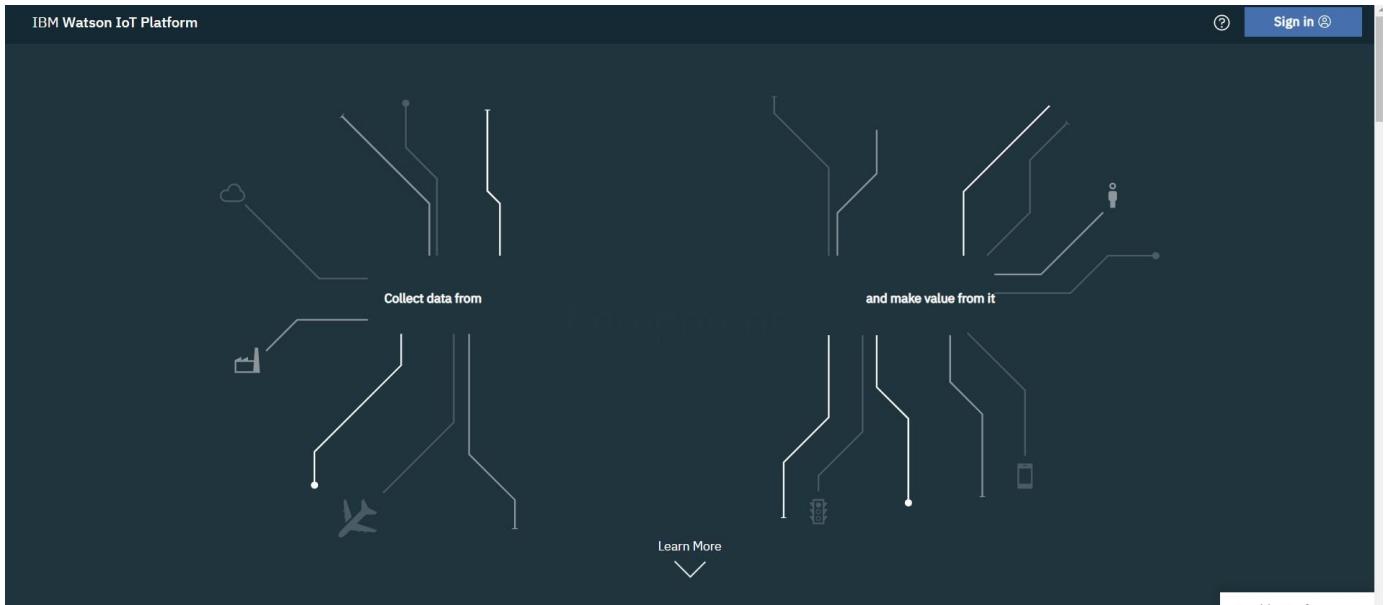
SOFTWARE:

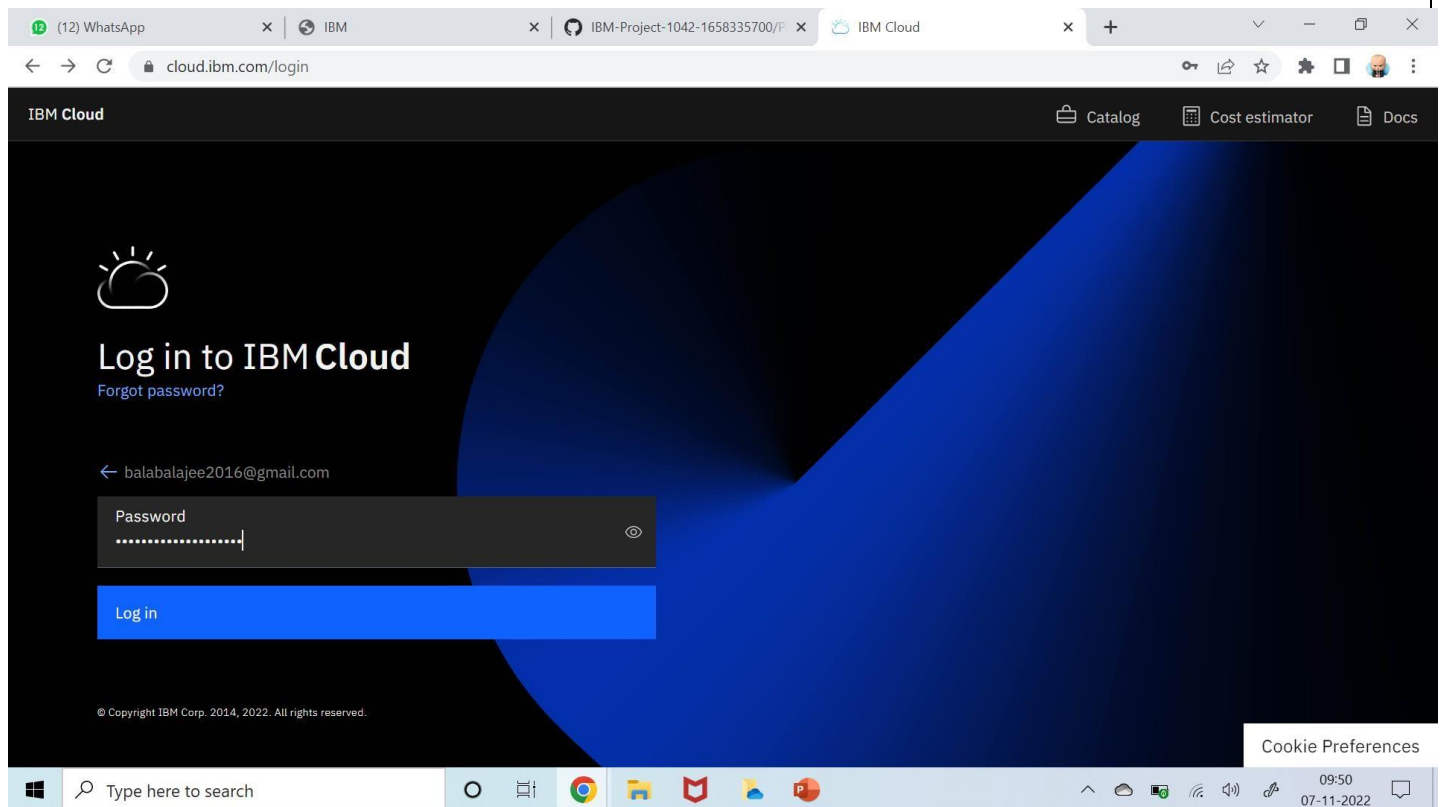
- IBM BLUEMIX ACCOUNT

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', '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.

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

The screenshot shows the IBM Watson IoT Platform dashboard. The page is titled 'Internet of Things Platform-og' and includes a status indicator 'Active'. The 'Manage' tab is selected, showing a 'Plan' section with a 'Launch' button. Below this is a 'Connections' section. The main content area features a large graphic of a central node connected to several peripheral nodes, with the text 'Let's get started with IBM Watson IoT Platform' and 'Securely connect, control, and manage devices. Quickly build IoT applications that analyze data from the physical world.' Below this is a 'Ready for the next level?' section with the 'IBM Watson IoT Platform Journey' progress bar. The progress bar shows 'Lite' as the current stage and 'Non-Production' as the next stage. There is a 'Launch' button and a 'Docs' button.

click on Launch
Dashboard of IBM Watson IoT platform,

○ Click on Add device

The screenshot shows the IBM Watson IoT Platform interface. The browser address bar displays the URL `qqu4hk.internetofthings.ibmcloud.com/dashboard/devices/browse`. The page header includes the IBM Watson IoT Platform logo and the user's email `balabalajee2016@gmail.com` with ID `qqu4hk`. The main navigation bar has tabs for `Browse`, `Action`, `Device Types`, and `Interfaces`. The `Browse` tab is active, showing the `BROWSE DEVICES` section. Below this, there are two buttons: `All Devices` (selected) and `Diagnose`. A text block explains that the table shows a summary of all devices and can be filtered, organized, and searched. Below this is a search bar labeled `Search by Device ID` and a `Device Simulator` toggle switch. The main content area features a table with the following columns: `Device ID`, `Status`, `Device Type`, `Class ID`, and `Date Added`. The table is currently empty, displaying only a header row and a large empty space with a small icon at the bottom. The bottom of the screenshot shows a Windows taskbar with a search bar and several application icons, including Chrome, File Explorer, and PowerPoint. The system clock indicates the time is 10:03 on 07-11-2022.

○ After click on Add device this page will open

IBM Watson IoT Platform

balabalajee2016@gmail.com
ID: qqu4hk

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 Select or create a device type...

Device ID Enter Device ID

Cancel Next

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

Type here to search

10:04 07-11-2022

Go to device type and fill the details.

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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 Fantastic-4

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

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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

Fantastic-4

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

The screenshot shows a web browser window with multiple tabs. The active tab is 'IBM Watson IoT Platform' with the URL 'qqu4hk.internetofthings.ibmcloud.com/dashboard/devices/types/add'. The page header includes the user's email 'balabalajee2016@gmail.com' and ID 'qqu4hk'. The main content area is titled 'Register Devices, Define Interfaces' and contains a 'Register Devices' button. A large grey box with a microchip icon is on the right. 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 open applications including Chrome, File Explorer, and PowerPoint. The system clock indicates 10:13 on 07-11-2022.

Register Device.

○ Click on

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

IBM Watson IoT Platform

balabalajee2016@gmail.com
ID: qqu4hk

Browse Action Device Types Interfaces

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

Device Type Fantastic-4

Device ID 12345

Cancel Next

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

Next

IBM Watson IoT Platform

balabalajee2016@gmail.com
ID: qqu4hk

Browse Action Device Types Interfaces

You can modify the default device information and enter more information about the device for identification purposes.

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

Add Metadata +

Back Next

○ Click on

○ Click on Next

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balabalajee2016@gmail.com
ID: qqu4hk

Browse Action Device Types Interfaces

There are 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.

Authentication Token

Enter an optional token

Make a note of the generated token. Lost authentication tokens cannot be recovered. Tokens are encrypted before being stored.

Authentication token are encrypted before we store them.

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

Type here to search

10:14
07-11-2022

Finish

Click on

The screenshot shows the IBM Watson IoT Platform dashboard. The user is logged in as 'balabalajee2016@gmail.com' with ID 'qqu4hk'. The dashboard is displaying the 'Browse' tab for a device named 'Fantastic-4'. The device ID is '12345'. A 'View Metadata' button is visible. The security token is 'To be generated'. At the bottom, there are 'Back' and 'Finish' buttons.

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

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

Type here to search

10:15
07-11-2022

Device is created

The screenshot shows the IBM Watson IoT Platform dashboard. The user is logged in as 'balabalajee2016@gmail.com' with ID 'qqu4hk'. The dashboard is displaying the 'Browse' tab for a device named 'Fantastic-4'. The device ID is '12345'. The device status is 'Disconnected'. The device type is 'Fantastic-4'. The device is a 'Device'. The device was created on 'Nov 7, 2022 10:15 AM'. A 'Add Device' button is visible. The 'Recent Events' tab is selected, showing a table of events. The table has columns: Event, Value, Format, and Last Received. The events are:

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 Watson IoT Platform

balabalajee2016@gmail.com
ID: qqu4hk

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

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/lib
s11.0.0_1.0.1t-1-deb8u6_armhf.deb
Resolving ftp.nl.debian.org (ftp.nl.debian.org)... 130.89.149.21, 2901:67c: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 ... 11566 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 --:--:--  0:00:01 --:--:--  157
100 609    0 609    0    0  457    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)
    Group: /system.slice/iot.service
    MainPID: 2562 /opt/iot/iot /dev/null

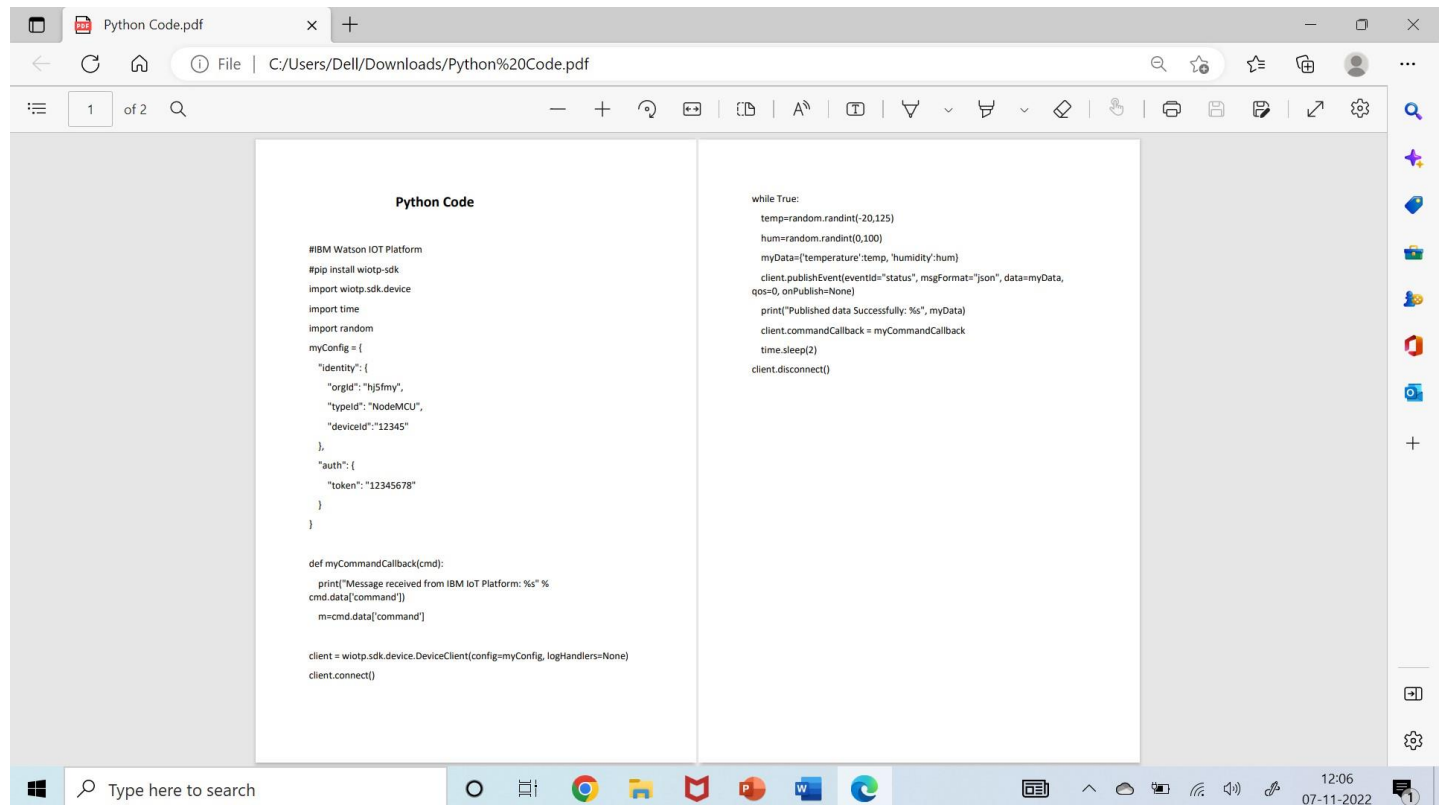
Oct 23 06:56:24 raspberrypi systemd[1]: Starting LSB: Iot service...
Oct 23 06:56:24 raspberrypi iot[2557]: Starting the iot program
Oct 23 06:56:25 raspberrypi iot[2562]: **** Iot Raspberry Pi Sample has started ****
Oct 23 06:56:25 raspberrypi iot[2562]: Config file not found. Going to Quickstart mode
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/7e/f9/45/bbc33ad957e82f7b71ba80e31d6d5a83d9d735a6d12e6c9418
Running setup.py bdist_wheel for dicttoxml ... done
Stored in directory: /home/pi/.cache/pip/wheels/20/d8/0d/acdc8f289011b7be7de71deebe6f642f83be0313dfff0493
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

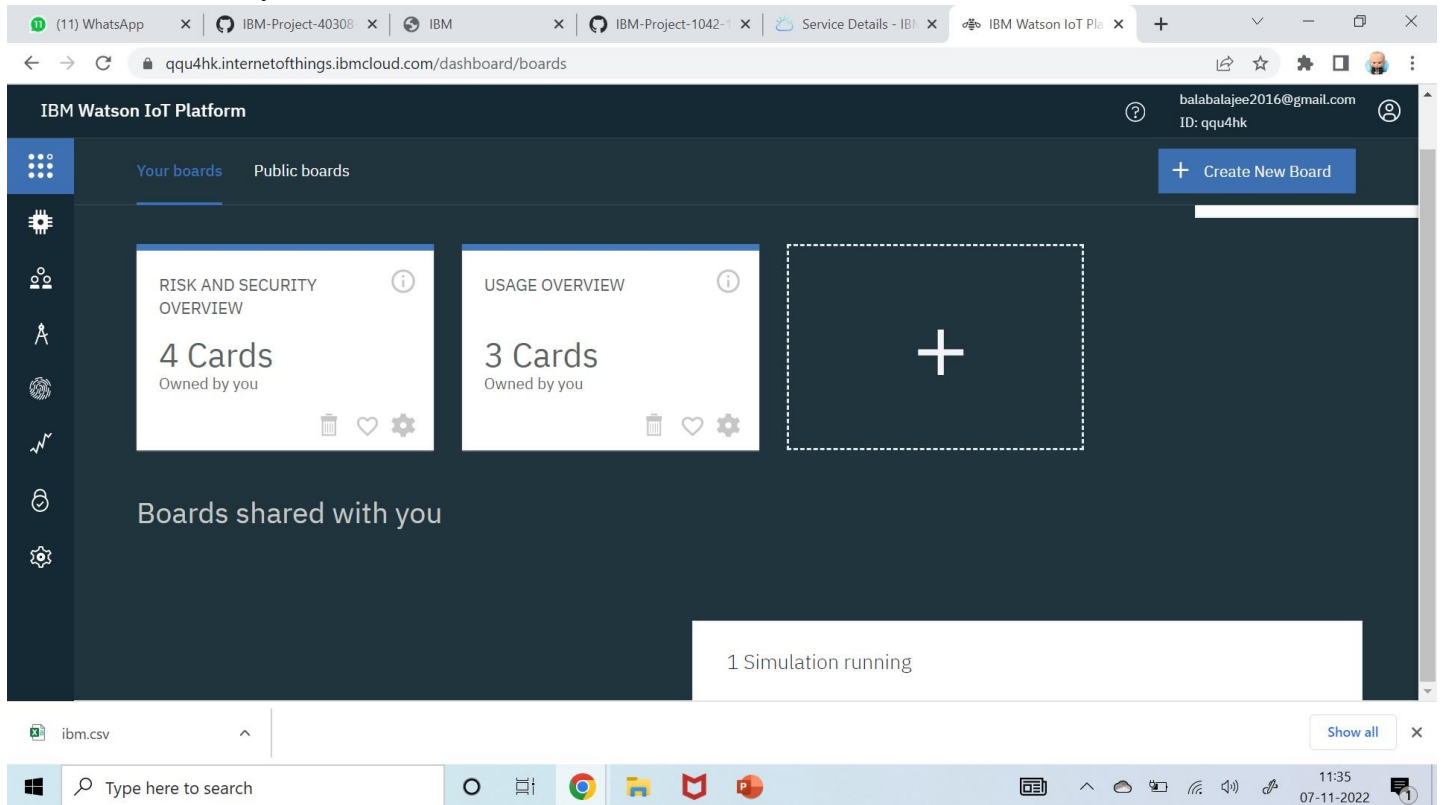
Type here to search

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.

IBM Watson IoT Platform

balabalajee2016@gmail.com
ID: qqu4hk

Your boards Public boards

+ Create New Board

AABG
No cards
Owned by you

RISK AND SECURITY OVERVIEW
4 Cards
Owned by you

USAGE OVERVIEW
3 Cards
Owned by you

+

Boards shared with you

1 Simulation running

ibm.csv

Show all

Type here to search

11:38 07-11-2022

Then click on Next you get the below window then again click on Sub

IBM Watson IoT Platform

balabalajee2016@gmail.com
ID: qqu4hk

Your boards Public boards

+ Create New Board

AABG
No cards
Owned by you

RISK AND SECURITY OVERVIEW
4 Cards
Owned by you

USAGE OVERVIEW
3 Cards
Owned by you

+

Boards shared with you

1 Simulation running

ibm.csv

Show all

Type here to search

11:38 07-11-2022

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

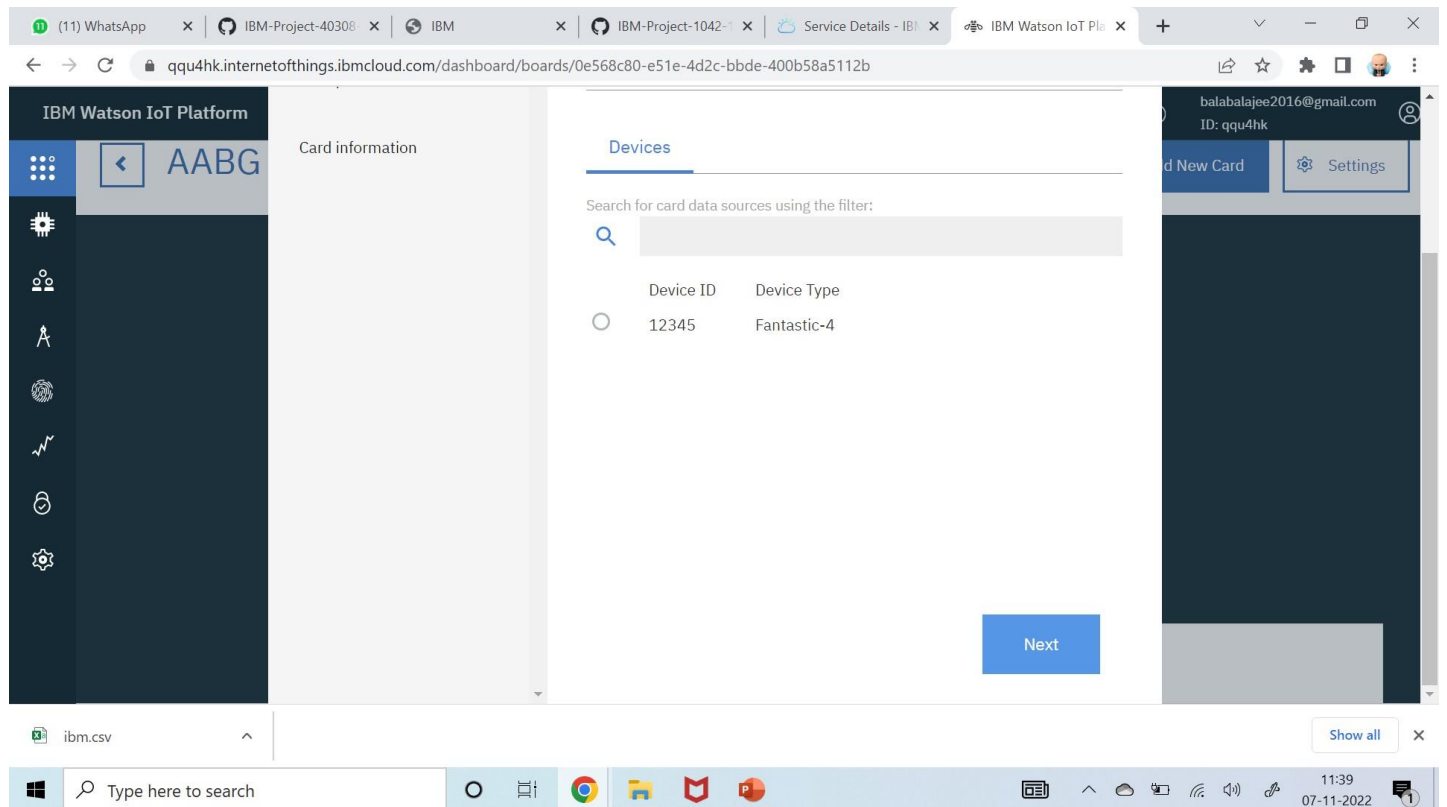
○ Click on Add New Card

The screenshot shows the IBM Watson IoT Platform dashboard. The browser's address bar displays the URL: `qqu4hk.internetofthings.ibmcloud.com/dashboard/boards/0e568c80-e51e-4d2c-bbde-400b58a5112b`. The dashboard header includes the user's email `balabalajee2016@gmail.com` and ID `qqu4hk`. A sidebar on the left contains various icons for navigation. The main area shows a board named "AABG" with a message: "You currently have an empty board" and a button labeled "+ Add New Card". At the bottom right of the board area, it says "1 Simulation running". Below the dashboard, a file explorer shows a file named `ibm.csv`. The Windows taskbar at the bottom includes a search bar and several application icons.

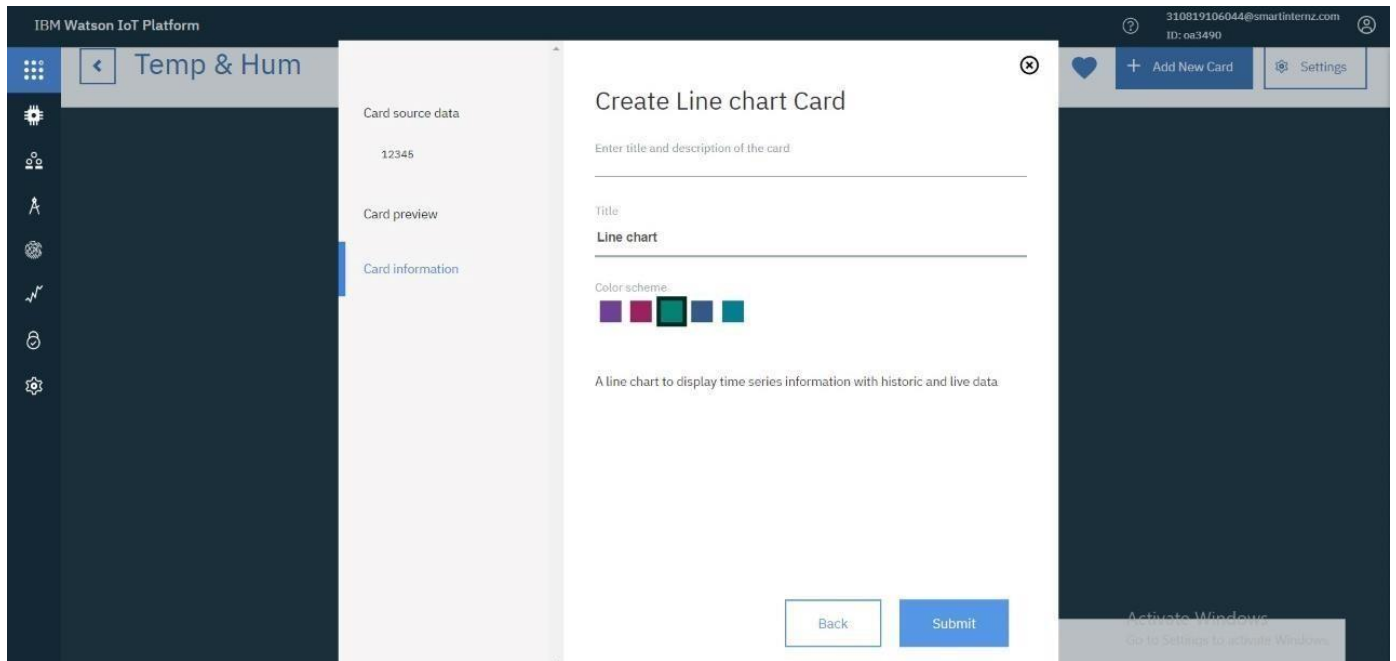
○ Select the type of Graph u want accordingly and click next

This screenshot shows the same IBM Watson IoT Platform dashboard as before, but with a "Create Card" dialog box open in the center. The dialog has a title "Create Card" and a section "Card type" with the instruction "Select card type". Below this, there is a "Devices" section displaying a grid of card templates. The templates include: "Generic visualisation", "Line chart", "Bar chart", "Donut chart", "Value", "Gauge", "Semaphore", "Device Properties", and three other icons without text labels. Each template has a small information icon in the top right corner. The background dashboard is dimmed, and the "Add New Card" button is visible in the top right corner of the main area.

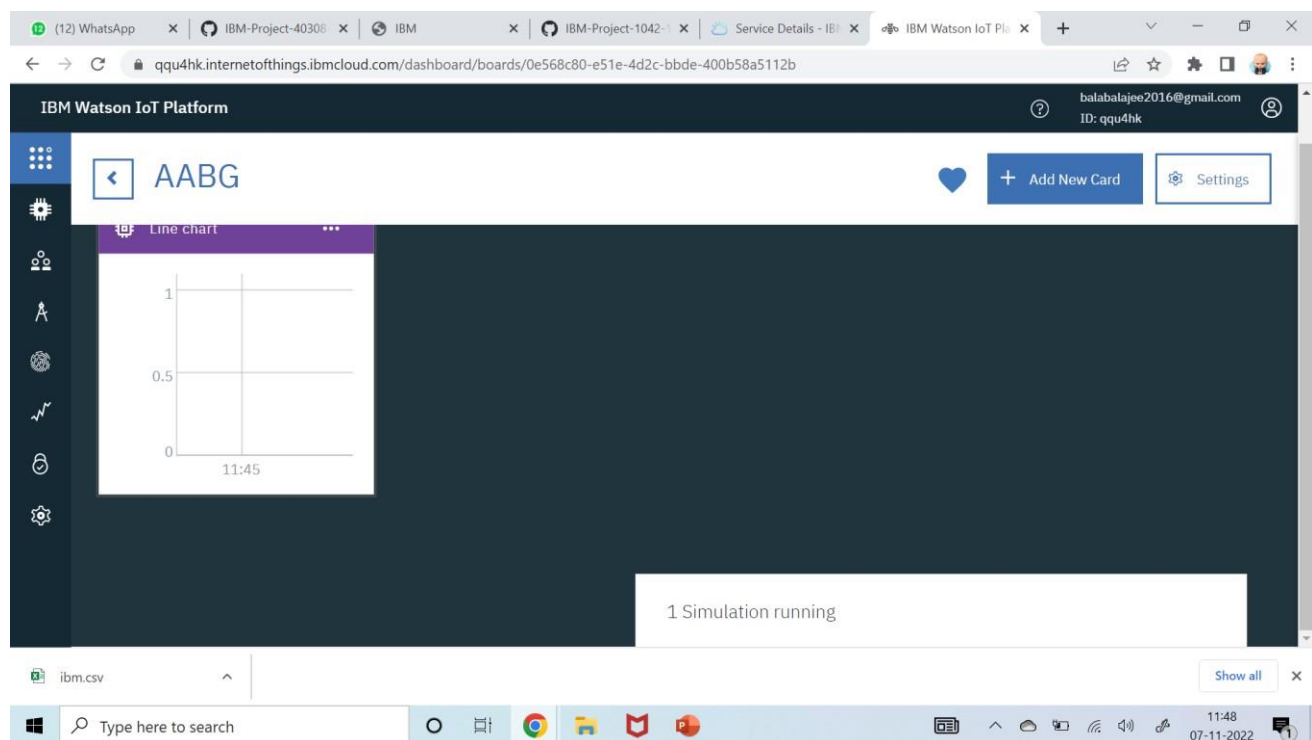
- You get the below window, choose the Device and click on Next.



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