]

Project Report Format

1. **INTRODUCTION**
    1. Project Overview
    2. Purpose
2. **LITERATURE SURVEY**
    1. Existing problem
    2. References
    3. Problem Statement Definition
3. **IDEATION & PROPOSED SOLUTION**
    1. Empathy Map Canvas
    2. Ideation & Brainstorming
    3. Proposed Solution
    4. Problem Solution fit
4. **REQUIREMENT ANALYSIS**
    1. Functional requirement
    2. Non-Functional requirements
5. **PROJECT DESIGN**
    1. Data Flow Diagrams
    2. Solution & Technical Architecture
    3. User Stories
6. **PROJECT PLANNING & SCHEDULING**
    1. Sprint Planning & Estimation
    2. Sprint Delivery Schedule
7. **TESTING**
    1. Test Cases
    2. User Acceptance Testing
8. **RESULTS**
    1. Performance Metrics
9. **ADVANTAGES & DISADVANTAGES**
10. **CONCLUSION**
11. **FUTURE SCOPE**
12. **APPENDIX**

Source Code
GitHub & Project Demo Link

Project Report

Team ID	PNT2022TMID47771
Project Name	Smart waste management system for metropolitan cities

1. INTRODUCTION

1.1 Project Overview:

With the increasing population and industrialization of nations throughout the globe, waste has become a great concern for all of us. Over years, researchers figured that only waste management is not enough for its proper treatment and disposal techniques to preserve our environment and keeping it clean in this era of globalization. With the help of technology researchers have, introduced IoT based Smart Waste Management solutions and initiatives that ensures reduced amount of time and energy required to provide waste management services and reduce the amount of waste generated. Unfortunately, developing countries are not being able to implement those existing solutions due to many factors like socio-economic environment. Therefore, in this research we have concentrated our thought on developing a smart IoT based waste management system for developing countries like INDIA that will ensure proper disposal, collection, transportation and recycling of household waste with the minimum amount of resources being available

1.2 Purpose:

We amalgamate technology along with waste management in order to effectively create a safe and a hygienic environment. Smart waste management is about using technology and data to create a more efficient waste industry. Based on IoT (Internet of Things) technology, smart waste management aims to optimize resource allocation, reduce running costs, and increase the sustainability of waste services. This makes it possible to plan more efficient routes for the trash collectors who empty the bins, but also lowers the chance of any bin being full for over a week. A good level of coordination exists between the garbage collectors and the information supplied via technology. This makes them well aware of the existing garbage level and instigate them whenever the bins reach the threshold level. They are sent with alert messages so that they can collect the garbage on time without littering the surrounding area. The fill patterns of specific containers can be identified by historical data and managed accordingly in the long term. In addition to hardware solutions, mobile applications are used to overcome the challenges in the regular waste management system, such as keeping track of the drivers while they are operating on the field. Thus, smart waste management provides us with the most optimal way of managing the waste in an efficient manner using technology.

2. LITERATURE SURVEY:

2.1 Existing problem:

Waste management has become an alarming challenge in local towns and cities across the world. Often the local area bins are overflowing and the municipalities are not aware of it. This affects the residents of that particular area in numerous ways starting from bad odour to unhygienic and unsafe surroundings. Poor waste management - ranging from non-existing collection systems to ineffective disposal -causes air pollution, water and soil contamination. Open and unsanitary areas contribute to contamination of drinking water and can cause infection and transmit diseases. Toxic components such as Persistent Organic Pollutants (POPs) pose particularly significant risks to human health and the environment as they accumulate through the food chain. Animals eating contaminated plants have higher doses of contaminants than if they were directly exposed. Precipitation or surface water seeping through waste will absorb hazardous components from landfills, agricultural areas, feedlots, etc. and carry them into surface and groundwater. Contaminated groundwater also poses a great health risk, as it is often used for drinking, bathing and recreation, as well as in agricultural and industrial activities. Landfills and waste transfer stations can attract various pests (insects, rodents, gulls, etc.) that look for food from waste. These pests can spread diseases through viruses and bacteria (i.e., salmonella and e- coli), which are a risk to human health.

2.2 References:

PAPER 1:

TITLE: IoT Based Waste Management for Smart City

AUTHOR NAME: Parkash Tambare, Prabu Venkatachalam

PUBLICATION YEAR: 2016

DESCRIPTION:

In the current situation, we frequently observe that the trash cans or dust cans that are located in public spaces in cities are overflowing due to an increase in the amount of waste produced each day. We are planning to construct "IoT Based Waste Management for Smart Cities" to prevent this from happening because it makes living conditions for people unsanitary and causes unpleasant odours in the surrounding area. There are numerous trash cans scattered throughout the city or on the campus that are part of the proposed system. Each trash can is equipped with a low-cost embedded device that tracks the level of the trash cans and an individual ID that will enable it to be tracked and identified.

PAPER 2:

AUTHOR NAME: Mohammad Aazam, Marc St-Hilaire, Chung-Horng Lung, Ioannis Lambadaris

PUBLICATION YEAR: 2016

DESCRIPTION:

Each bin in the Cloud SWAM system that Mohammad Aazam et al suggested has sensors that can detect the amount of waste inside. There are separate bins for organic, plastic/paper/bottle/glass, and metal waste. This way, each form of waste is already divided, and it is known how much and what kind of waste is collected thanks to the status. Different entities and stakeholders may benefit from the accessibility of cloud-stored data in different ways. Analysis and planning can begin as soon as garbage is collected and continue through recycling and import/export-related activities. Timely garbage collection is provided via the Cloud SWAM system. A timely and effective method of waste collection improves health, hygiene, and disposal.

PAPER 3:

TITLE: Arduino Microcontroller Based Smart Dustbins for Smart

Cities **AUTHOR NAME:** K. Suresh, S. Bhuvanesh and B. Krishna

Devan **PUBLICATION YEAR:** 2019

DESCRIPTION:

In this paper, a technique for cleaning up our surroundings and environment is described. The Indian government just began work on a smart city initiative, and in order for these towns to be smarter than they already are, the garbage collection and disposal system must be improved upon. Self-Monitoring Automated Route Trash (SMART) dustbins are intended for use in smart buildings such as colleges, hospitals, and bus stops, among other places. In this study, we have employed the PIR and Ultrasonic sensors to detect human presence, the Servomotor to open the dustbin lid, and the Ultrasonic sensor to detect the level of rubbish. Signals between two trash cans are transmitted using a communication module, and the GSM module sends the message to the operator.

PAPER 4:

AUTHOR NAME: Mohd Helmy Abd Wahab, Aeslina Abdul Kadir, Mohd Razali Tomari and Mohamad Hairol Jabbar

PUBLICATION YEAR: 2014

DESCRIPTION:

Proposed a smart recycle bin that can handle the recycling of plastic, glass, paper, and aluminium cans. It generates a 3R card after automatically determining the value of the trash thrown away. The recycle system makes it possible to accumulate points for placing waste into designated recycle bins. By allowing the points to be redeemed for goods or services, such a system promotes recycling activities. The system keeps track of information on disposal procedures, materials disposed of, user identification, and points accrued by the user.

PAPER 5:

TITLE: Waste Management Initiatives in India For Human Wellbeing

AUTHOR NAME: Dr. Raveesh Agarwal, Mona Chaudhary and Jayveer Singh

PUBLICATION YEAR: 2015

DESCRIPTION:

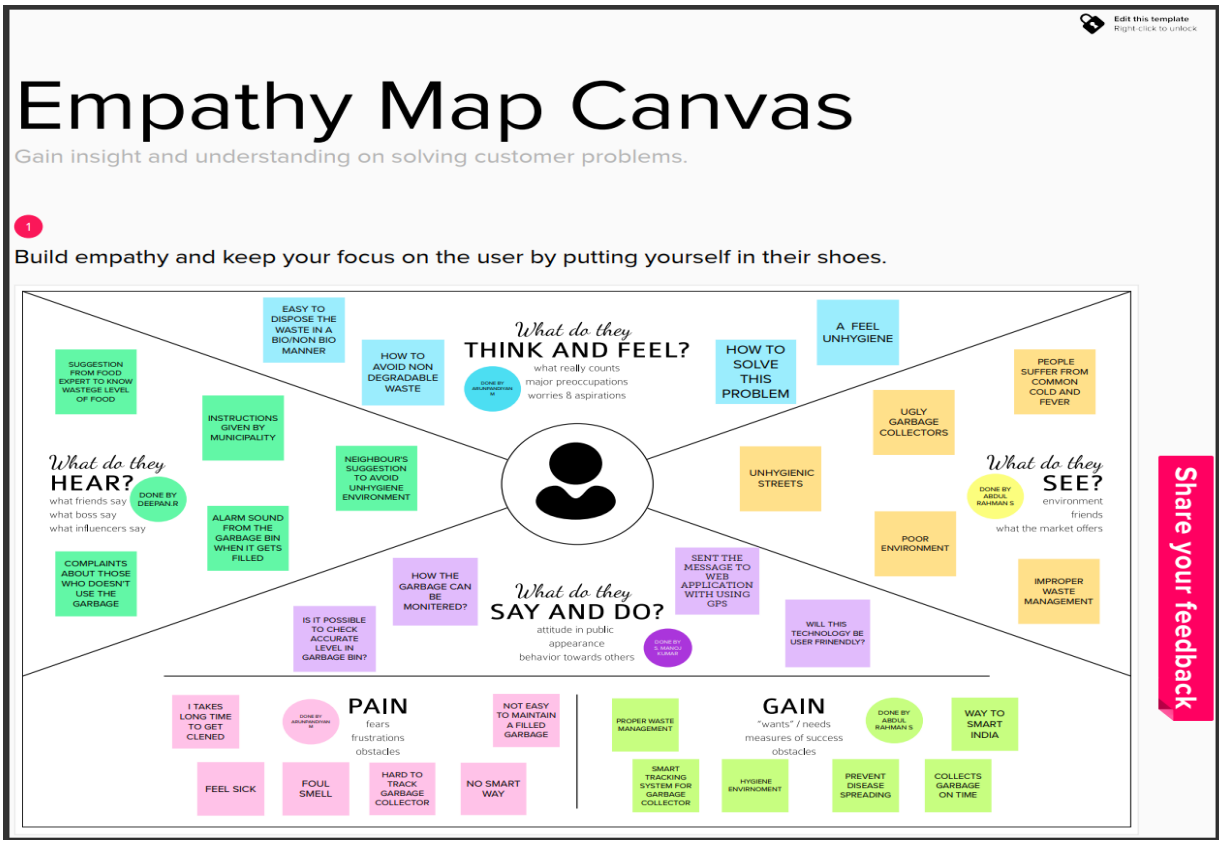
The objective of this paper is to examine the present methods used in India for the welfare of its people in different waste management efforts. The other goal is to offer advice on how to make Indian municipalities' trash disposal procedures better. On secondary research, this essay is founded. The system is improved by looking at the reports that have already been written about waste management and the suggestions made for improvement by planners, NGOs, consultants, government accountability organisations, and important business leaders. It provides in-depth understanding of the various waste management programmes in India and identifies areas where waste management might be improved for societal benefit. The essay makes an effort to comprehend the crucial part that our nation's official waste management sector plays in the waste management process.

2.3 Problem Statement Definition:

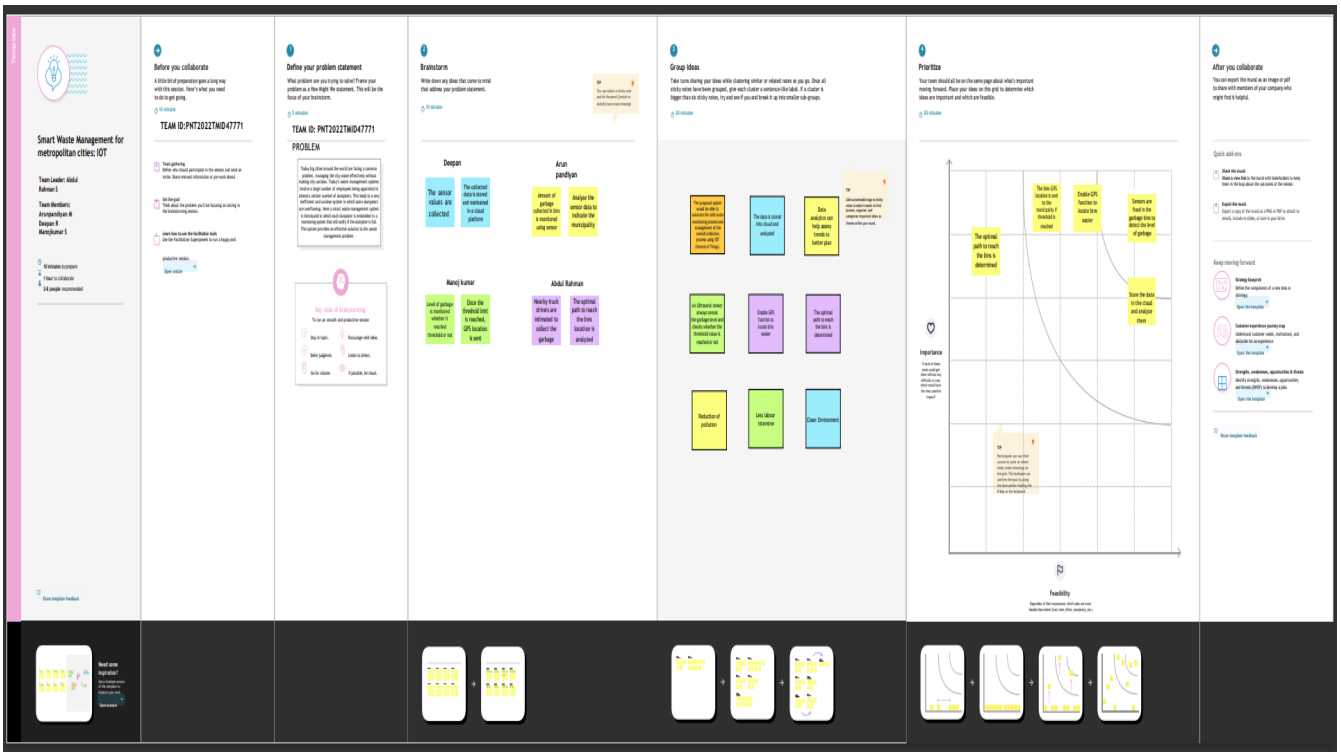
Problem Statement (PS)	**I am (Customer)**	**I'm trying to**	**But**	**Because**	**Which makes mefeel**
PS-1	Municipal corporation authority	Get notified when the trash cans are full and be made aware of where the full cans are located.	Don't havethe facilities atthe moment	There is no toolavailable to determine the level of bins.	Frustrated
PS-2	Individual working for a private limited corporation	Get rid of the example of a surplus of waste	The trash cans are always filled	I occupy a metropolitan where there is acity is invariably crowd.	Worried

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Ideation & Brainstorming



3.3 Proposed Solution

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	This project addresses the issue of waste management in smart cities with underperforming garbage collection systems. With the help of this project, businesses may get the intelligent garbage management solutions they require. This technology enables the authorized person to provide truck drivers with a time- and cost-efficient route by always knowing the level of fill in each garbage can in a neighborhood or city.
2.	Idea / Solution description	The following are the main research goals: • The proposed system would be able to use IOT to control the complete collection process and automate the solid waste monitoring procedure (Internet of Things). • The Smart Trash System (STS) and the Smart Monitoring and Controlling Hut are the two key components of the proposed system (SMCH). • The circuit at the garbage bin, which communicates it to the receiver at the desired location in the area or spot, is placed at the waste bin in the proposed system to acknowledge whenever the waste bin is filled. • In the suggested system, the waste bin status at the monitoring and regulating system is shown by the signal that is received.
3.	Novelty / Uniqueness	We intend to implement SWM in our college, but the hardest part is that janitors (cleaners) don't know how to use it practically. To solve this problem, our team decided to create a wristband for them that flashes a light to let them know when the trash bin is full. This is something unique that we were able to do here despite the limitations of the project.
4.	Social Impact / Customer Satisfaction	According to popular perception, the direct social effects of current solid waste disposal practices— such as the proximity of landfills to neighborhoods, the development of pests, and a decline in property values—are the worst effects.
5.	Business Model (Revenue Model)	The operations of Waste Management are divided into two reportable business segments: Solid Waste, which consists of the company's waste transfer, recycling, resource recovery, and disposal services, which are run and managed locally by its various subsidiaries, each of which focuses on a specific geographic area; Corporate and Other, which consists of the company's other activities.
6.	Scalability of the Solution	In order to address this issue, smart city design is being researched and discussed more and more globally.The proposed method makes use of sensor and communication technologies, collecting garbage information from the smart bin in real-time and sending it to an internet site that city residents may access to see whether the compartments are still available.

3.4 Problem Solution fit

Smart waste management system

Team ID : ***PNT2022TMID47771***

STEP 1

Problem Solving Cards

-Basic question

#Problem Statement

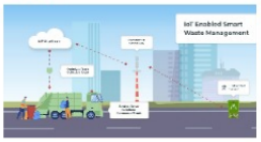
1. *What's most valuable to the customer?*
2. *What are we the best at?*
3. *Where are we looking to improve?*

STEP 2

Framing Statements

Smart waste management system framing

How can we use our Optimization skills to increase the customer's value of Saving Time in order to improve the waste management?



The biggest issue with waste management in underdeveloped nations starts right at the beginning of the process. Waste and garbage wind up in the streets and adjacent areas because there are insufficient measures in place for their collection and disposal.
According to a Google study report, garbage creation peaked in 2010 at about 20,000 tonnes per day, and by 2025, it's predicted to reach at least 47,000 tonnes per day.
Around 30% of waste ends up on the highways and in public places due to inefficient collection and disposal procedures, making it nearly difficult to handle this quantity of waste using current methods.
Additionally, as there is no organised system for handling and recycling the collected trash, the majority of it ends up in landfills and river water, further polluting the environment.
The social and economic infrastructure of the nation itself is the main barrier to deploying smart waste management systems based on IoT.
The major issue in the initial stage of this system is correct disposal and collecting.
Additionally, it's critical to inspire and persuade individuals to use proper garbage disposal techniques.

STEP 3

Ideas

Problem Solution

Example ideas:

Ai-based smart waste bin, designed for public places, enabling them to Monitor and Manage

Reduce the number of bins required & DE-cluttering and improving the street scene

We have identified the potential areas for development after a number of previous projects on waste management and teaching people how to dispose of waste properly failed to produce noticeable effects. We have created a procedure that ensures proper disposal and effective waste collection in order to address this issue.
The procedures we created include new methods by employing Decreasing Time Algorithms (DTA) to monitor garbage generation and collection of the garbage's, as well as inventive effort to encourage people to dump in designated areas or containers.

4.REQUIREMENT ANALYSIS

4.1 Functional requirement

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Real time bin monitoring.	The Dashboard shows statistics on the amount of fill in bins as it is being tracked by smart sensors. The application also forecasts when the bin will fill up based on past data in addition to the percentage of fill level, which is one of the features that even the finest waste management software lacks. As picks are also recognized by the sensors, you can determine when thebin was last emptied. You can get rid of the overflowing bins and cease collecting half-empty ones using real-time data and forecasts.
FR-2	Eliminate inefficient picks.	Get rid of the collection of half-empty trash cans. Picks are recognized by sensors. We can demonstrate to you how full the bins you collect are using real-time data on fill-levels and pick recognition.
FR-3	Plan waste collection routes.	Route planning for rubbish pickup is semi-automated using the tool. You are prepared to act and arrange for garbage collection based on the levels of bin fill that are now present and forecasts of approaching capacity. To find any discrepancies, compare the planned and actual paths.
FR-4	Adjust bin distribution.	Ensure the best possible bin distribution. Determine which regions have a dense or sparse distribution of bins. Ensure that each form of waste has a representative stand. You can make any required adjustments to bin position or capacity based on past data.
FR-5	Expensive bins.	We assist you in locating containers that increase collection prices. The tool determines a collection cost rating for each bin. The tool takes local average depo- bin discharge into account. The tool determines the distance from depo-bin discharge and rates bins (1–10).
FR-6	Detailed bin inventory.	On the map, you can see every monitored bin and stand, and you can use Google Street View at any timeto visit them. On the map, bins or stands appear as green, orange, or red circles. The Dashboard displays information about each bin, including its capacity, trash kind, most recent measurement, GPS position, andpick- up schedule.

4.2 Non-Functional requirements

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Usability is a unique and significant perspective to examine user needs, which may further enhance the design quality, according to IoT devices. Analyzing how well people interact with a product may help designers better understand customers' prospective demands for waste management, behavior, and experience in the design process when userexperience is at the Centre.
NFR-2	**Security**	Utilize recyclable bottles. Utilize reusable shopping bags. Spend responsibly and recycle Eat and drink in limited-use containers.
NFR-3	**Reliability**	Creating improved working conditions for garbage collectors and drivers is another aspect of smart waste management. Waste collectors will use their time more effectively by attending to bins that require service rather than travelling the same collection routes and servicing empty bins.
NFR-4	**Performance**	The Smart Sensors assess the fill levels in bins (alongwith other data) numerous times each day using ultrasonic technology. The sensors feed data to Senone's Smart Waste Management Software System, a robust cloud-based platform with data-driven daily operations and a waste management app, using a variety of IoT networks (NB-IoT, GPRS). As a consequence, customers receive data-driven decision-making services, and garbage collection routes, frequency, and truck loads are optimized resulting in at least a 30% decrease in route length.
NFR-5	**Availability**	By creating and implementing robust hardware and gorgeous software, we enable cities, companies, and nations to manage garbage more intelligently.
NFR-6	**Scalability**	Using smart trash bins allows us to scale up and monitor the rubbish more efficiently while also reducing the number of bins needed in towns and cities.

5. PROJECT DESIGN

5.1 Data Flow Diagrams

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirements graphically.

It shows how data enters and leaves the system, what changes the information, and where data is stored.

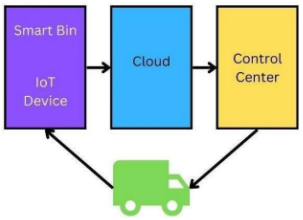
A smart waste management platform uses analytics to translate the data gather in your

bins into actionable insights to help you improve your waste services.
You can receive data on metric such as:

- The first test conducted is the situation where the garbage bin is empty or its garbage level is very low
- Then, the bin is filled with more garbage until its level has surpassed the first threshold **value, which is set to 80% then the first warning SMS is being sent, as depicted**
- The first notification SMS sent by the system, once the waste reaches the level of 85% full
- The second notification SMS sent by the system, indicating that bin is at least 95% full and **the garbage needs to be collected immediately**
- Locations prone to overflow
- The number of bins needed to avoid overflowing waste
- The number of collection services that could be saved
- The amount of fuel that could be saved
- The driving distance that could be saved.

5.2 Data flow diagram:

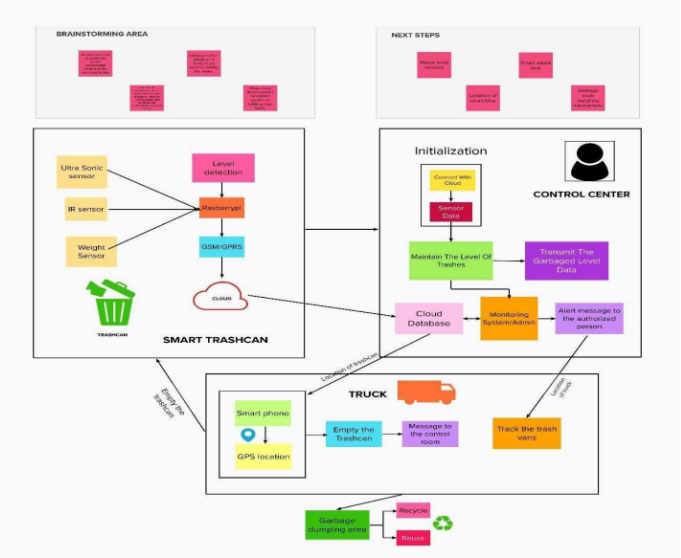
Data Flow Diagram:



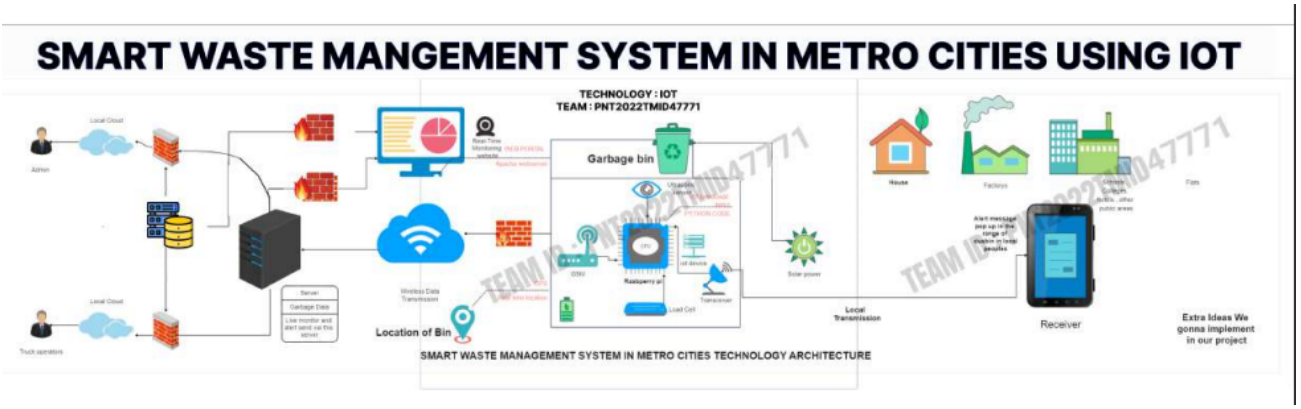
Simplified Diagram

The IoT device is fitted in the trashcans.

- The sensors in the device sense the garbagelevel.
- The GSM/GPRS will send the information aboutthe garbage level to the cloud.
- The admin in the control center notifies the authorized person to collect the garbage.



5.2 Solution & Technical Architecture:



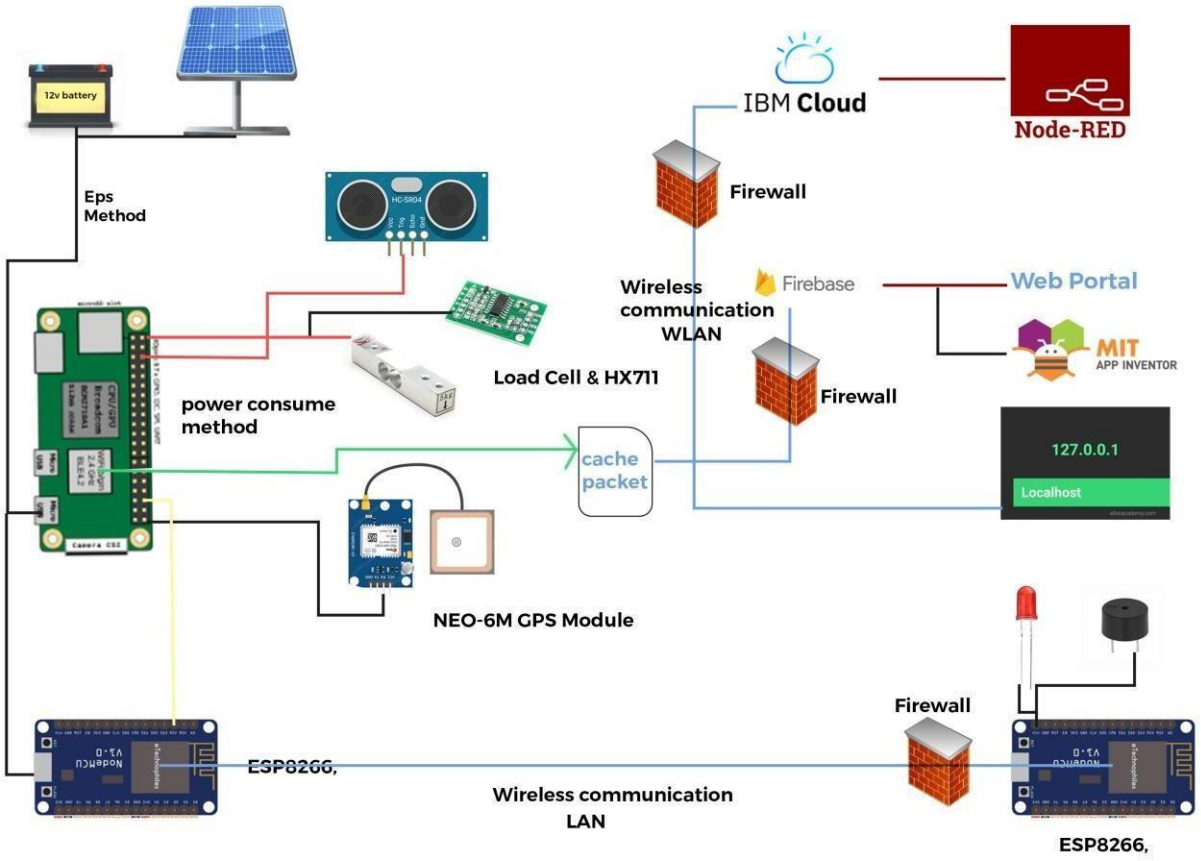


Table-1: Components & Technologies:

S.no	Component	Description	Technology
1.	User Interface	Mobile Application	HTML, CSS, JavaScript.
2.	Application Logic	Logic for a process in the application	Javascript
3.	Database	Data Type, Configurations etc.	Firebase, ibm cloud
4.	Cloud Database	Database Service on Cloud	IBM Cloud
5.	File Storage	File storage requirements	Local Filesystem and IBM cloud
6.	Infrastructure (Server / Cloud)	Application Deployment on CloudLocal Server Configuration	Local and Cloud Foundry

Table-2:Application Characteristics:

S.no	Characteristics	Description	Technology
1.	Open-Source Frameworks	GitHub	Internet hosting service
2.	Security Implementations	Application security: Veracode.	Network automation
3.	Scalable Architecture	It provides the room for expansion more databaseof smart bins added additionally can be updated.	Cloud storage
4.	Availability	As the system control is connected to web server itis available 24*7 and can be accessed whenever needed.	Server, Appleixe, reple
5.	Performance	Performance is high it uses 5mb caches	Wireless Sensor Network

TEAM ID : PNT2022TMID47771

5.3 User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Admin	Login	USN-1	As an administrator, I assigned user names and passwords to each employee and managed them.	I can control my online account and dashboard.	Medium	Sprint-1
Co-Admin	Login	USN-2	As a Co-Admin, I'll control the waste level monitor. If a garbage filling alert occurs, I will notify the trash truck of the location and rubbish ID.	I can handle the waste collection.	High	Sprint-1
Truck Driver	Login	USN-3	As a Truck Driver, I'll follow Co Admin's instruction to reach the filled garbage.	I can take the shortest path to reach the waste filled route specified.	Medium	Sprint-2
Local Garbage Collector	Login	USN-4	As a Local Garbage Collector, I’II gather all the waste from the garbage, load it onto a garbage truck, and deliver it to Landfills	I can collect the trach, pullit to the truck, and send it out.	Medium	Sprint-3
Municipalit yofficer	Login	USN-5	As a Municipality officer, I'll make sure everything is proceeding as planned and without any problems.	All of these processes areunder my control.	High	Sprint-4

TEAM ID : PNT2022TMID47771

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers, research publications etc.	15 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	15 SEPTEMBER 2022
Brainstorming	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	15 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	24 SEPETMBER 2022
Problem Solution Fit	Prepare problem - solution fit document.	24 SEPETMBER 2022
Solution Architecture	Prepare solution architecture document.	24 SEPETMBER 2022

Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	11 OCTOBER 2022
Functional Requirement	Prepare the functional requirement document.	11 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	11 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram.	11 OCTOBER 2022
Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	27 OCTOBER 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.	IN PROGRESS

TEAM ID : PNT2022TMID47771

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

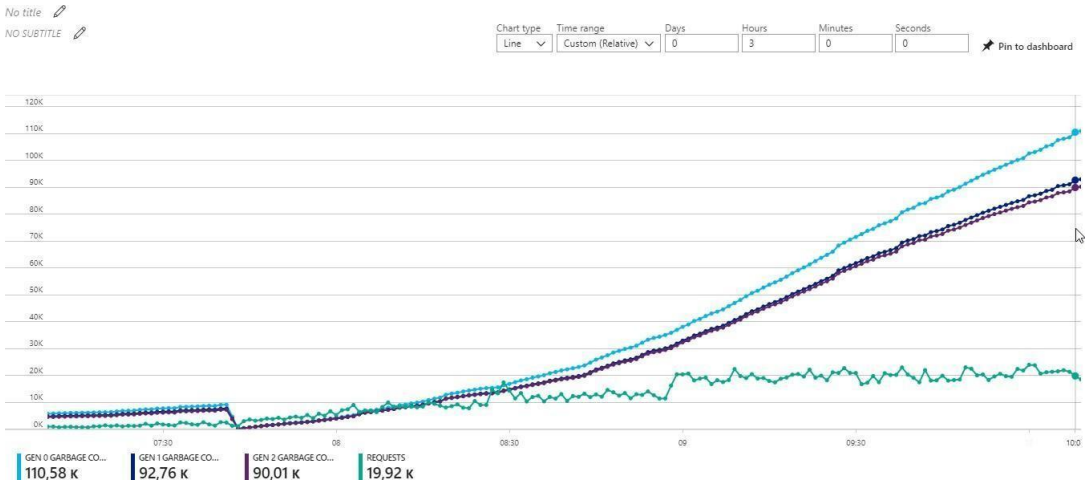
Use the below template to create a product backlog and sprint schedule

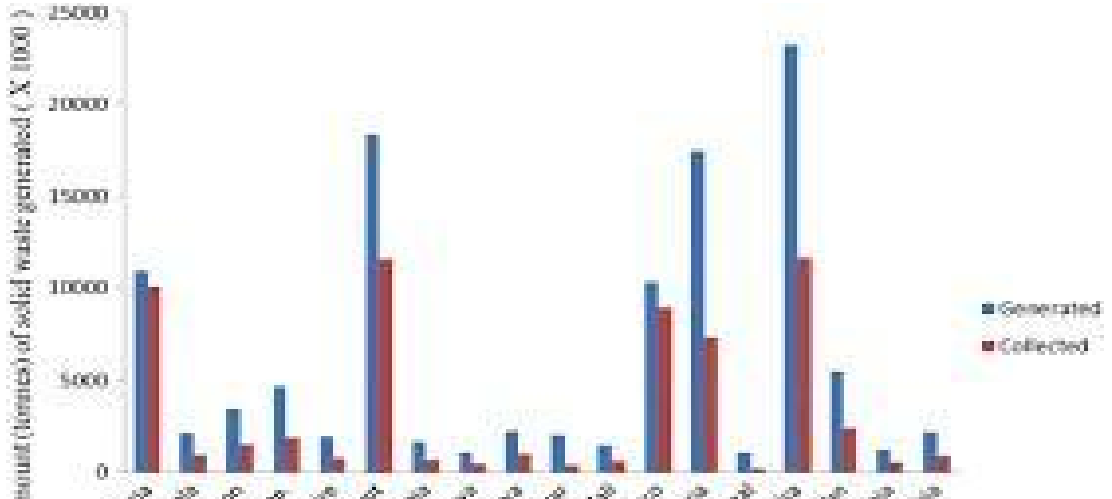
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	As a Administrator, I need to give user id and passcode for ever workers over there in municipality	10	High	Arunpandiyan
Sprint-1	Login	USN-2	As a Co-Admin, I'll control the waste level by monitoring them vai real time web portal. Once the filling happens, I'll notify trash truck with location of bin with bin ID	10	High	Manoj Kumar
Sprint-2	Dashboard	USN-3	As a Truck Driver, I'll follow Co-Admin's Instruction to reach the filling bin in short roots and save time	20	Low	Abdul Rahman
Sprint-3	Dashboard	USN-4	As a Local Garbage Collector, I'll gather all the waste from the garbage, load it onto a garbage truck, and deliver it to Landfills	20	Medium	Deepan
Sprint-4	Dashboard	USN-5	As a Municipality officer, I'll make sure everything is proceeding as planned and without any problems	20	High	Abdul Rahman

6.2. Sprint Delivery Schedule

7. RESULTS & TESTING

7.1 Performance Metrics





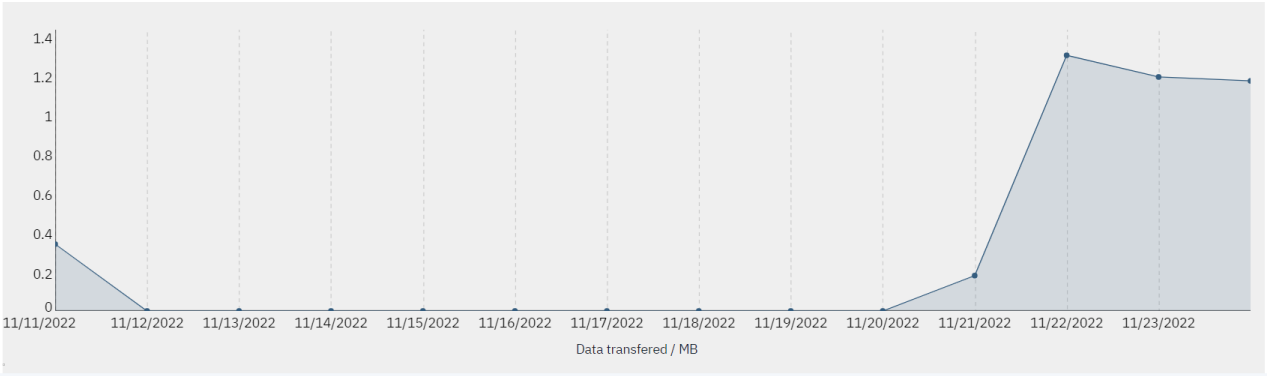
TEAM ID : PNT2022TMID47771

Data Transferred

Date Period (months)

1 | 3 | 6 | Max

from 11/11/2022 to 11/24/2022



8. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

- Reduction in Collection Cost
- No Missed Pickups
- Reduced Overflows
- Waste Generation Analysis
- CO2 Emission Reduction

DISADVANTAGES:

- System requires a greater number of waste bins for separate waste collection as per population in the city.
- This results into high initial cost due to expensive smart dustbins compare to other methods.
- Sensor nodes used in the dustbins have limited memory size.

9. CONCLUSION

A Smart Waste Management system that is more effective than the one in use now is achievable by using sensors to monitor the filling of bins. Our conception of a "smart waste management system" focuses on monitoring waste management, offering intelligent technology for waste systems, eliminating human intervention, minimizing human time and effort, and producing a healthy and trash- free environment. The suggested approach can be implemented in smart cities where residents have busy schedules that provide little time for garbage management. If desired, the bins might be put into place in a metropolis where a sizable container would be able to hold enough solid trash for a single unit. The price might be high.

10. FUTURE SCOPE

There are several future works and improvements for the proposed system, including the following:

1. Change the system of user authentication and atomic lock of bins, which would aid in protecting the bin from damage or theft.

2. The concept of green points would encourage the involvement of residents or end users, making the idea successful and aiding in the achievement of collaborative waste management efforts, thus fulfilling the idea of Swachh Bharath.

3. Having case study or data analytics on the type and times waste is collected on different days or seasons, making bin filling predictable and removing the reliance on electronic components, and fixing the coordinates.

4. Improving the Server's and Android's graphical interfaces

TEAM ID : PNT2022TMID47771

12) APPENDIX

Source Code

For simulator python code

FIZBIN (1).PY

```
import requests
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys

# watson device details

organization = "1qvr56"
devicType =  "MZ"
deviceId = "SMARTBINZID1"
authMethod= "token"
authToken= "123456789"

#generate random values for randomo variables (temperature&humidity)



def myCommandCallback(cmd):
    global a
    print("command recieved:%s" %cmd.data['command'])
    control=cmd.data['command']
    print(control)

try:
        deviceOptions={"org": organization, "type": devicType,"id":
deviceId,"auth-method":authMethod,"auth-token":authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
        print("caught exception connecting device %s" %str(e))
        sys.exit()

#connect and send a datapoint "temp" with value integer value into the cloud as
a type of event for every 10 seconds
deviceCli.connect()

while True:
```

TEAM ID : PNT2022TMID47771

```
    distance= random.randint(10,70)
    loadcell= random.randint(5,15)
    data= {'dist':distance,'load':loadcell}


    if loadcell < 13 and loadcell > 15:
        load = "90 %"

    elif loadcell < 8 and loadcell > 12:
          load = "60 %"

    elif loadcell < 4 and loadcell > 7:
          load = "40 %"
    else:
          load = "0 %"

    if distance < 15:
          dist = 'Risk warning:' 'MZ Smart Bin poundage getting high, Time to
collect :) 90 %'


    elif distance < 40 and distance >16:
          dist = 'Risk warning:' 'MZ Smart Bin is above 60%'

    elif distance < 60 and distance > 41:
          dist = 'Risk warning:' '40 %'
    else:
          dist = 'Risk warning:' '17 %'



    if load == "90 %" or distance == "90 %":
          warn  = 'alert :' 'Risk Warning: MZ Smart Bin poundage getting high,
Time to collect :)'

    elif load == "60 %" or distance == "60 %":

          warn = 'alert :' 'MZ Smart Bin is above 60%'
    else :
          warn = 'alert :' 'PUSHED SUCCESSFULLY IBM '

    def myOnPublishCallback(lat=10.294847 ,long= 78.763668):
        print("Mz Car Main Gate")
        print("published distance = %s " %distance,"loadcell:%s "
%loadcell,"lon = %s " %long,"lat = %s" %lat)
        print(load)
```

```
        print(dist)
        print(warn)

    time.sleep(5)


    success=deviceCli.publishEvent ("IoTSensor","json",warn,qos=0,on_publish=
myOnPublishCallback)

    success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish=
myOnPublishCallback)



    if not success:
        print("not connected to ibmiot")
    time.sleep(5)




    deviceCli.commandCallback=myCommandCallback
#disconnect the device
deviceCli.disconnect()
```

FIZBIN (2).PY

```
import requests
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys

# watson device details

organization = "1qvr56"
devicType =  "MZ2"
deviceId = "SAMRTBINID2"
authMethod= "token"
authToken= "123456789"
```

TEAM ID : PNT2022TMID47771

```
#generate random values for randomo variables (temperature&humidity)



def myCommandCallback(cmd):
    global a
    print("command recieved:%s" %cmd.data['command'])
    control=cmd.data['command']
    print(control)


try:
        deviceOptions={"org": organization, "type": devicType,"id":
deviceId,"auth-method":authMethod,"auth-token":authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
        print("caught exception connecting device %s" %str(e))
        sys.exit()

#connect and send a datapoint "temp" with value integer value into the cloud as
a type of event for every 10 seconds
deviceCli.connect()

while True:

    distance= random.randint(10,70)
    loadcell= random.randint(5,15)
    data= {'dist':distance,'load':loadcell}



    if loadcell < 13 and loadcell > 15:
        load = "90 %"

    elif loadcell < 8 and loadcell > 12:
          load = "60 %"

    elif loadcell < 4 and loadcell > 7:
          load = "40 %"
```

TEAM ID : PNT2022TMID47771

```
    else:
          load = "0 %"


    if distance < 15:
          dist = 'Risk warning:' 'Mz Smart Bin poundage getting high, Time to
collect :) 90 %'



    elif distance < 40 and distance >16:
          dist = 'Risk warning:' 'Mz Smart Bin is above 60%'


    elif distance < 60 and distance > 41:
          dist = 'Risk warning:' '40 %'
    else:
          dist = 'Risk warning:' '17 %'




    if load == "90 %" or distance == "90 %":
          warn  = 'alert :' ' Mz Smart Bin poundage getting high, Time to
collect :)'


    elif load == "60 %" or distance == "60 %":


          warn = 'alert :' 'Mz Smart Bin is above 60%'
    else :
          warn = 'alert :' 'No need to collect right now '
    def myOnPublishCallback(lat=10.294847 ,long= 78.763668):
        print("Mz Car Main Gate")
        print("published distance = %s " %distance,"loadcell:%s "
%loadcell,"lon = %s " %long,"lat = %s" %lat)
        print(load)
        print(dist)
        print(warn)


    time.sleep(10)
```

```
    success=deviceCli.publishEvent ("IoTSensor","json",warn,qos=0,on_publish=
myOnPublishCallback)

    success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish=
myOnPublishCallback)




    if not success:
        print("not connected to ibmiot")
    time.sleep(30)




    deviceCli.commandCallback=myCommandCallback
#disconnect the device
deviceCli.disconnect()
```

FIZBIN (3).PY

```
import requests
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys

# watson device details

organization = "1qvr56"
devicType =  "MZ"
deviceId = "SMARTBINZID3"
authMethod= "token"
authToken= "123456789"
```

TEAM ID : PNT2022TMID47771

```
#generate random values for randomo variables (temperature&humidity)



def myCommandCallback(cmd):
    global a
    print("command recieved:%s" %cmd.data['command'])
    control=cmd.data['command']
    print(control)


try:
        deviceOptions={"org": organization, "type": devicType,"id":
deviceId,"auth-method":authMethod,"auth-token":authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
        print("caught exception connecting device %s" %str(e))
        sys.exit()


#connect and send a datapoint "temp" with value integer value into the cloud as
a type of event for every 10 seconds
deviceCli.connect()


while True:


    distance= random.randint(10,70)
    loadcell= random.randint(5,15)
    data= {'dist':distance,'load':loadcell}



    if loadcell < 13 and loadcell > 15:
        load = "90 %"


    elif loadcell < 8 and loadcell > 12:
          load = "60 %"


    elif loadcell < 4 and loadcell > 7:
```

TEAM ID : PNT2022TMID47771

```
            load = "40 %"
    else:
            load = "0 %"

    if distance < 15:
            dist = 'Risk warning:' 'Mz Smart Bin poundage getting high, Time to
collect :) 90 %'


    elif distance < 40 and distance >16:
            dist = 'Risk warning:' 'Mz Smart Bin is above 60%'

    elif distance < 60 and distance > 41:
            dist = 'Risk warning:' '40 %'
    else:
            dist = 'Risk warning:' '17 %'



    if load == "90 %" or distance == "90 %":
            warn  = 'alert :' ' Mz Smart Bin poundage getting high, Time to
collect :)'

    elif load == "60 %" or distance == "60 %":

            warn = 'alert :' 'Mz Smart Bin is above 60%'
    else :
            warn = 'alert :' 'No need to collect right now '
    def myOnPublishCallback(lat=10.294847 ,long= 78.763668):
        print("Mz Canteen")
        print("published distance = %s " %distance,"loadcell:%s "
%loadcell,"lon = %s " %long,"lat = %s" %lat)

        print(load)
        print(dist)
        print(warn)
```

```
    time.sleep(10)



    success=deviceCli.publishEvent ("IoTSensor","json",warn,qos=0,on_publish=
myOnPublishCallback)

    success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish=
myOnPublishCallback)




    if not success:
        print("not connected to ibmiot")
    time.sleep(30)







    deviceCli.commandCallback=myCommandCallback
#disconnect the device
deviceCli.disconnect()
```

FIZBIN (4).PY

```
import requests
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys

# watson device details

organization = "1qvr56"
devicType =  "MZ4"
deviceId = "SAMRTBINZID4"
```

TEAM ID : PNT2022TMID47771

```
authMethod= "token"
authToken= "123456789"

#generate random values for randomo variables (temperature&humidity)




def myCommandCallback(cmd):
    global a
    print("command recieved:%s" %cmd.data['command'])
    control=cmd.data['command']
    print(control)


try:
        deviceOptions={"org": organization, "type": devicType,"id":
deviceId,"auth-method":authMethod,"auth-token":authToken}
        deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
        print("caught exception connecting device %s" %str(e))
        sys.exit()


#connect and send a datapoint "temp" with value integer value into the cloud as
a type of event for every 10 seconds
deviceCli.connect()


while True:


    distance= random.randint(10,70)
    loadcell= random.randint(5,15)
    data= {'dist':distance,'load':loadcell}



    if loadcell < 13 and loadcell > 15:
        load = "90 %"


    elif loadcell < 8 and loadcell > 12:
          load = "60 %"
```

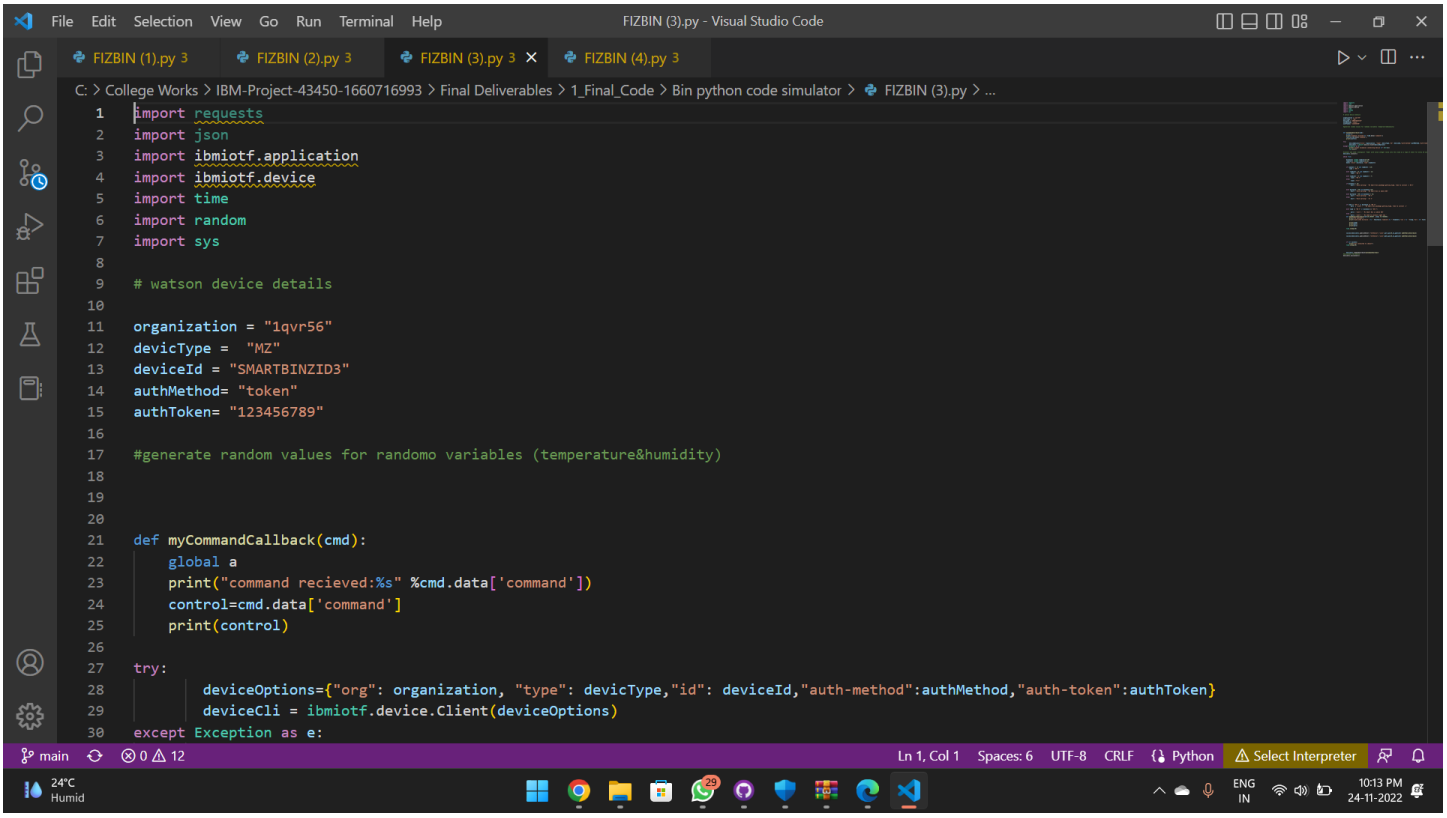
TEAM ID : PNT2022TMID47771

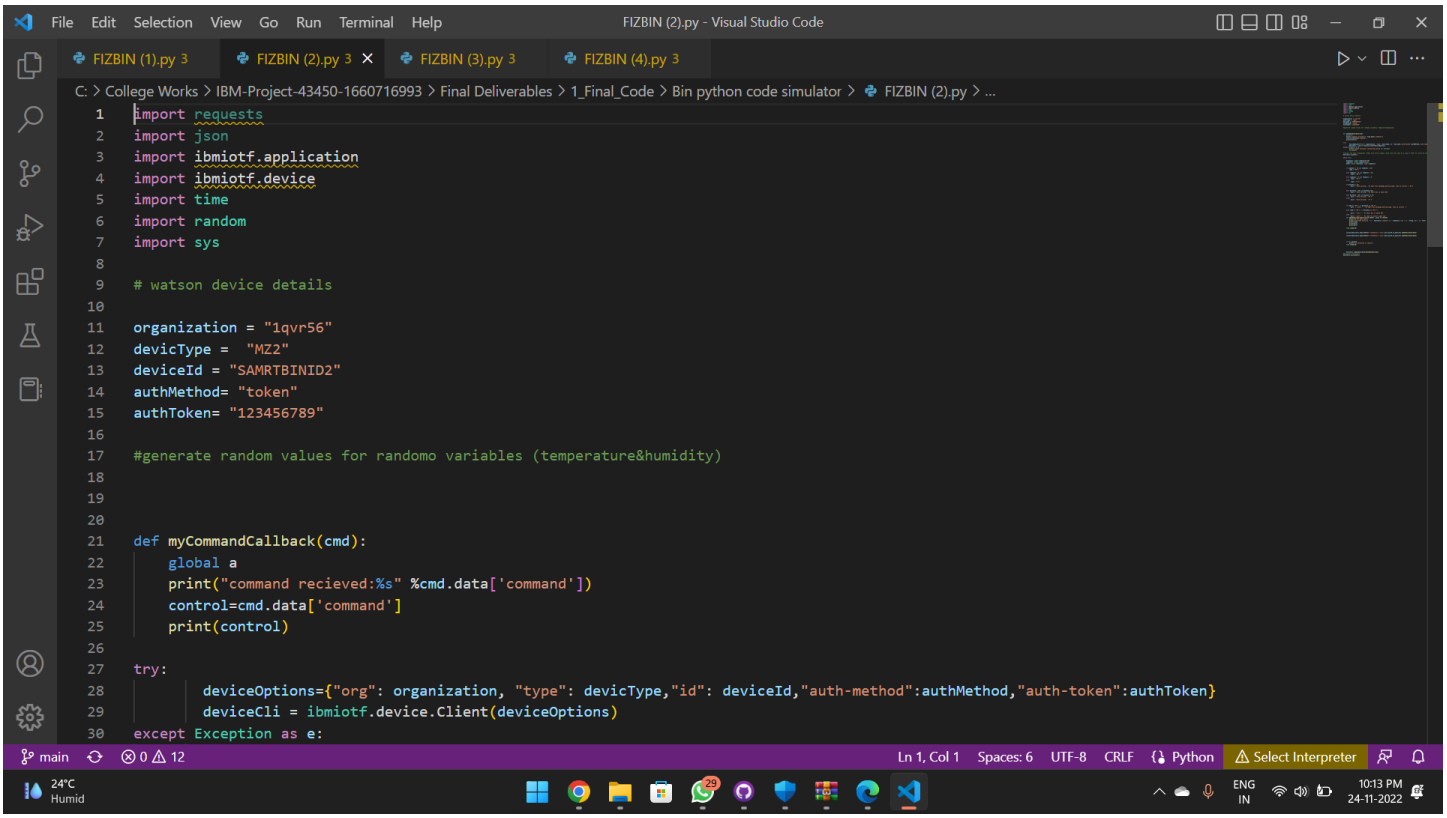
```
    elif loadcell < 4 and loadcell > 7:
          load = "40 %"
    else:
          load = "0 %"

    if distance < 15:
          dist = 'Risk warning:' 'Mz Smart Bin poundage getting high, Time to
collect :) 90 %'


    elif distance < 40 and distance >16:
          dist = 'Risk warning:' 'Mz Smart Bin is above 60%'

    elif distance < 60 and distance > 41:
          dist = 'Risk warning:' '40 %'
    else:
          dist = 'Risk warning:' '17 %'



    if load == "90 %" or distance == "90 %":
          warn  = 'alert :' 'Risk Warning: Mz Smart Bin poundage getting high,
Time to collect :)'

    elif load == "60 %" or distance == "60 %":

          warn = 'alert :' 'Mz Smart Bin is above 60%'
    else :
          warn = 'alert :' 'PUSHED SUCCESSFULLY IBM '

    def myOnPublishCallback(lat=1,long=1):
        print("")
        print("published distance = %s " %distance,"loadcell:%s "
%loadcell,"lon = %s " %long,"lat = %s" %lat)
        print(load)
        print(dist)
```

```
        print(warn)


    time.sleep(5)



    success=deviceCli.publishEvent ("IoTSensor","json",warn,qos=0,on_publish=
myOnPublishCallback)

    success=deviceCli.publishEvent ("IoTSensor","json",data,qos=0,on_publish=
myOnPublishCallback)




    if not success:
        print("not connected to ibmiot")
    time.sleep(5)




    deviceCli.commandCallback=myCommandCallback
#disconnect the device
deviceCli.disconnect()
```

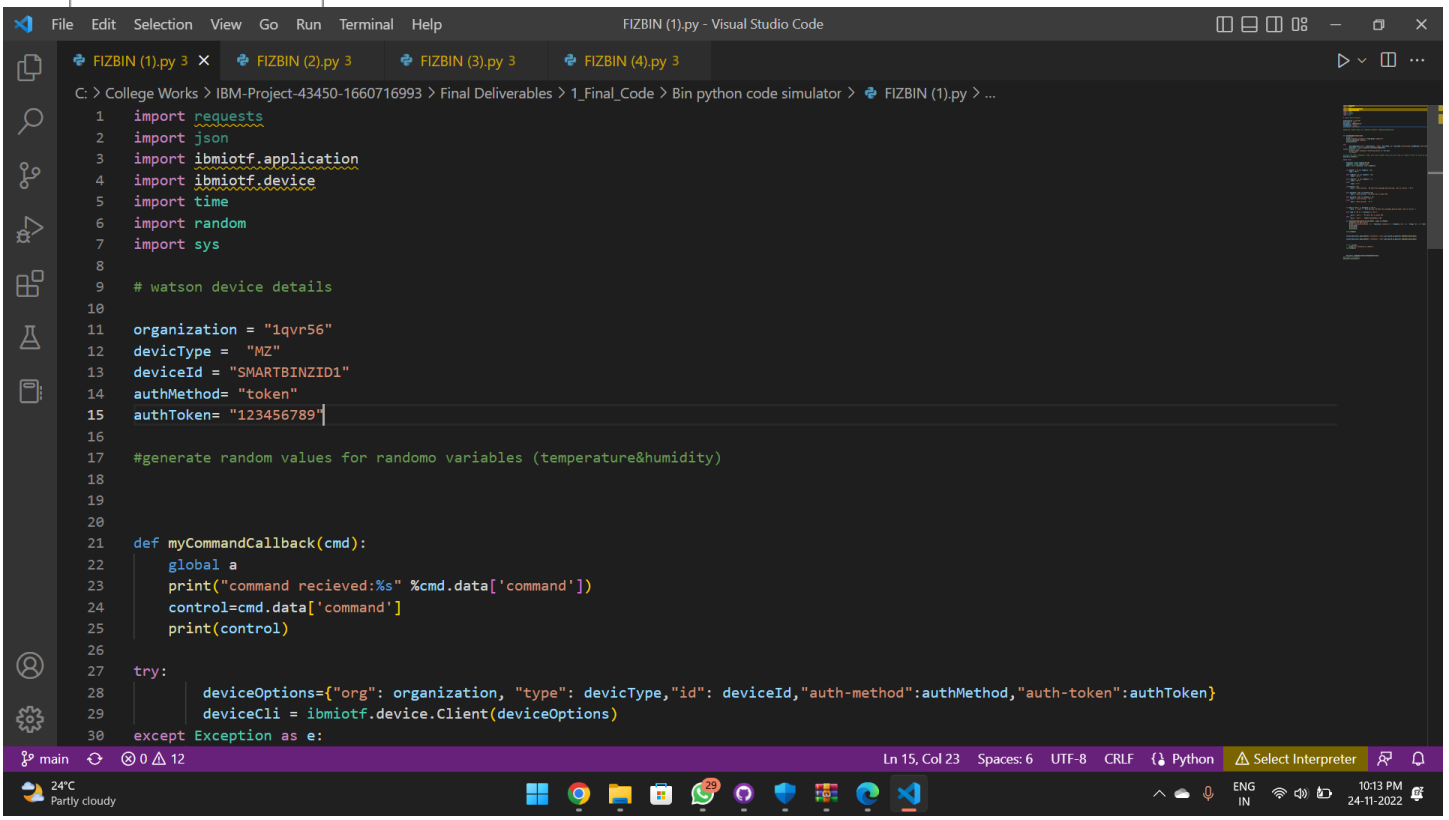
TEAM ID : PNT2022TMID47771

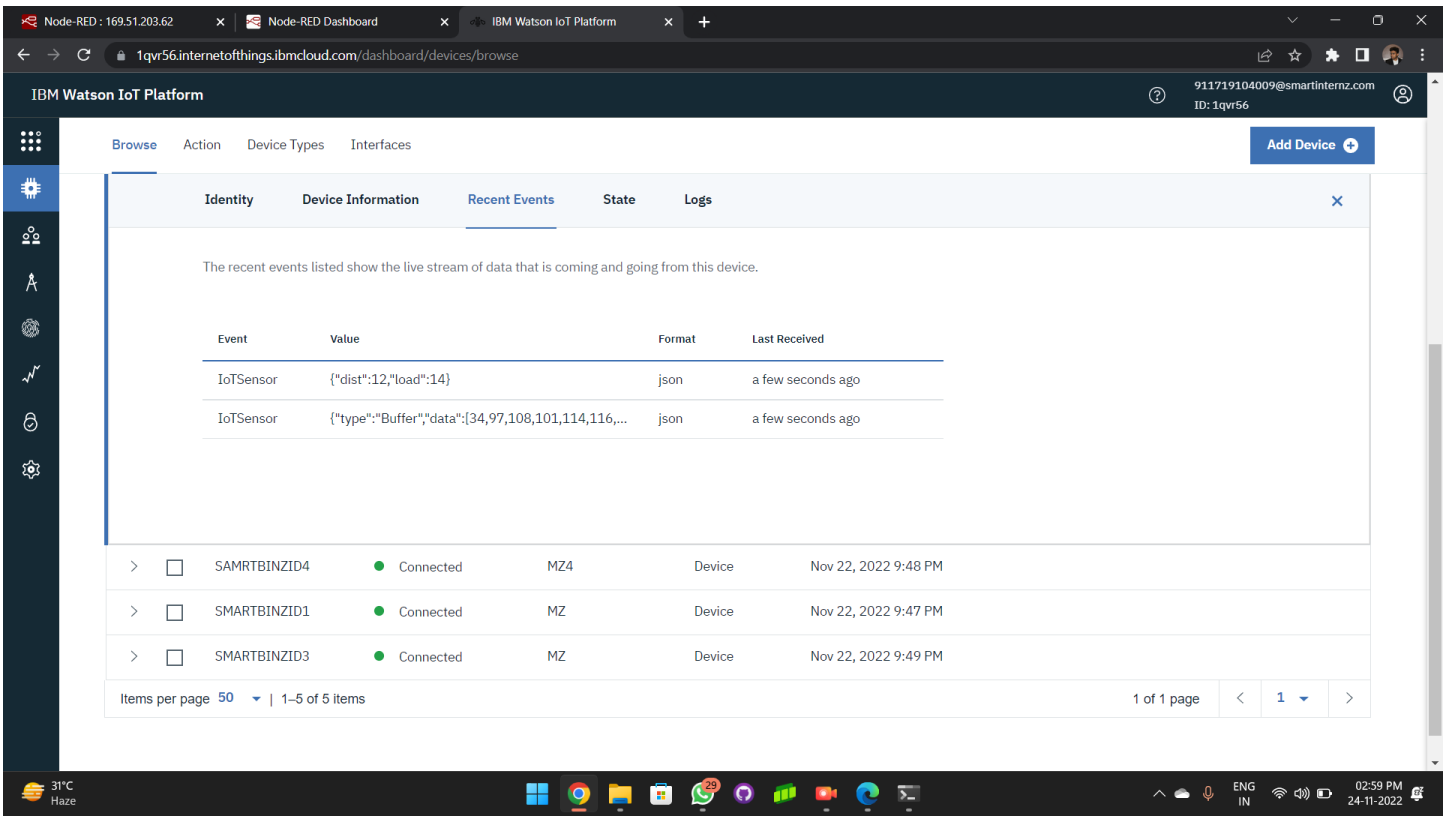
13.2 OUTPUT PICTURE



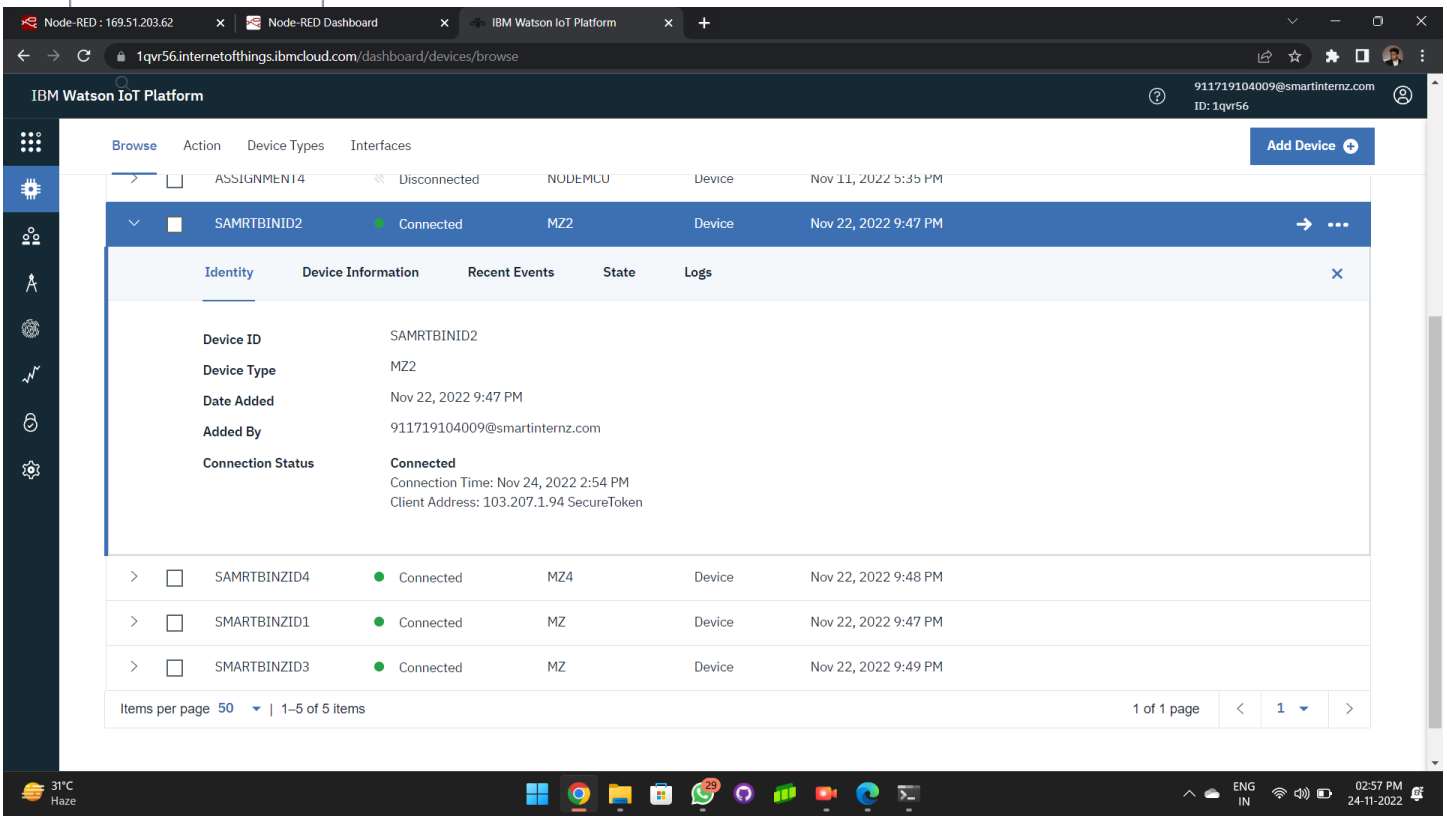


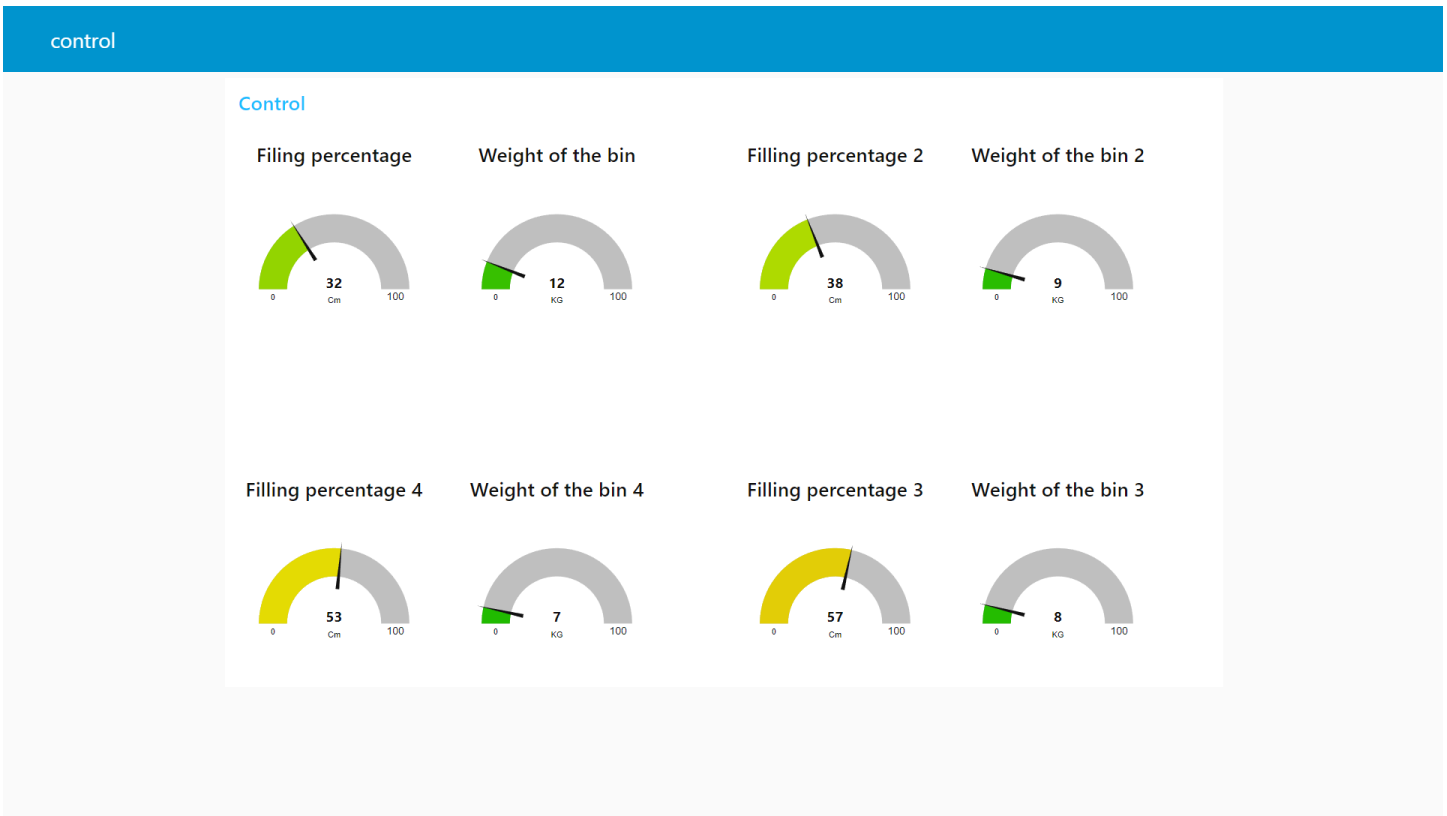
TEAM ID : PNT2022TMID47771



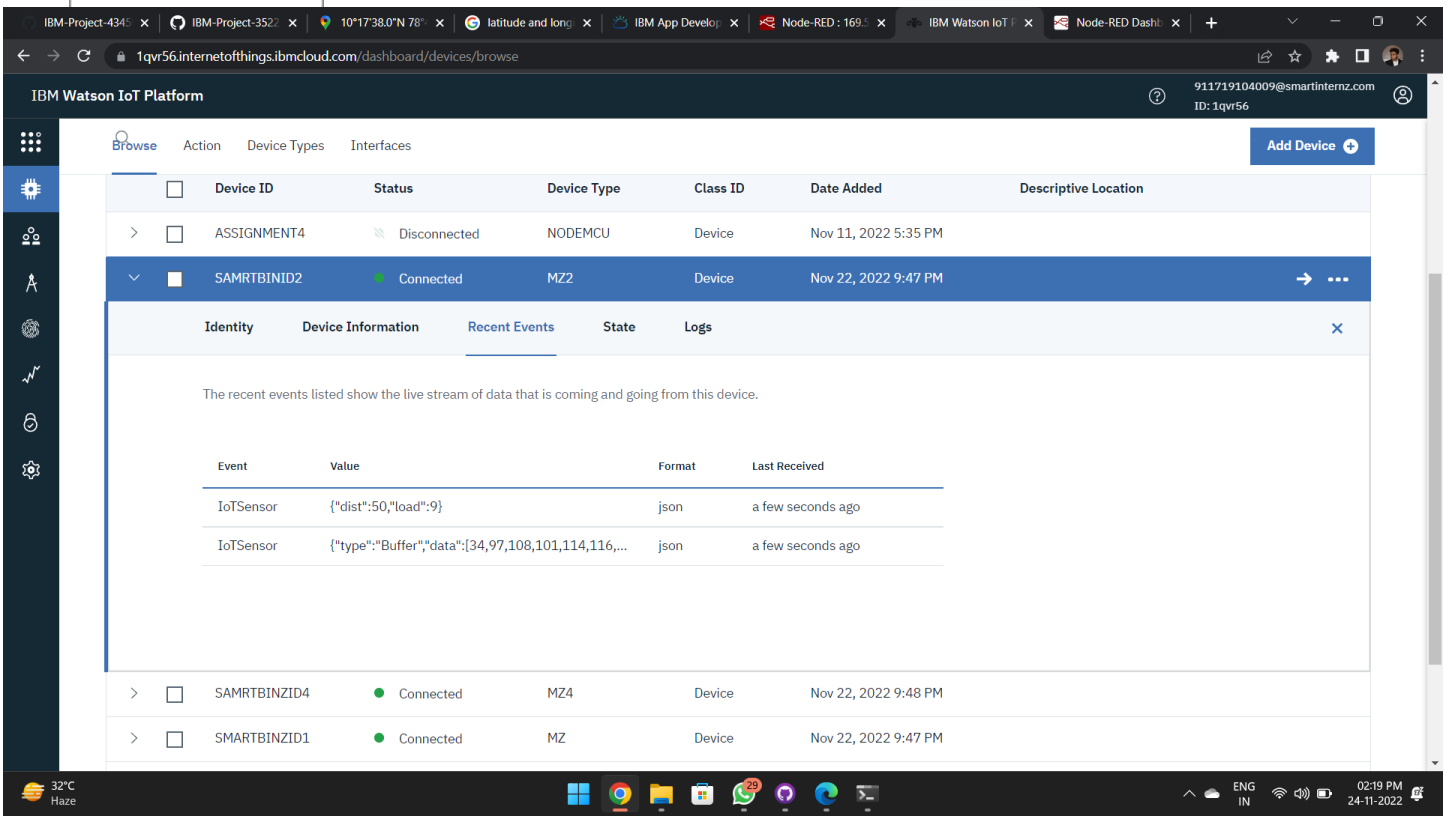


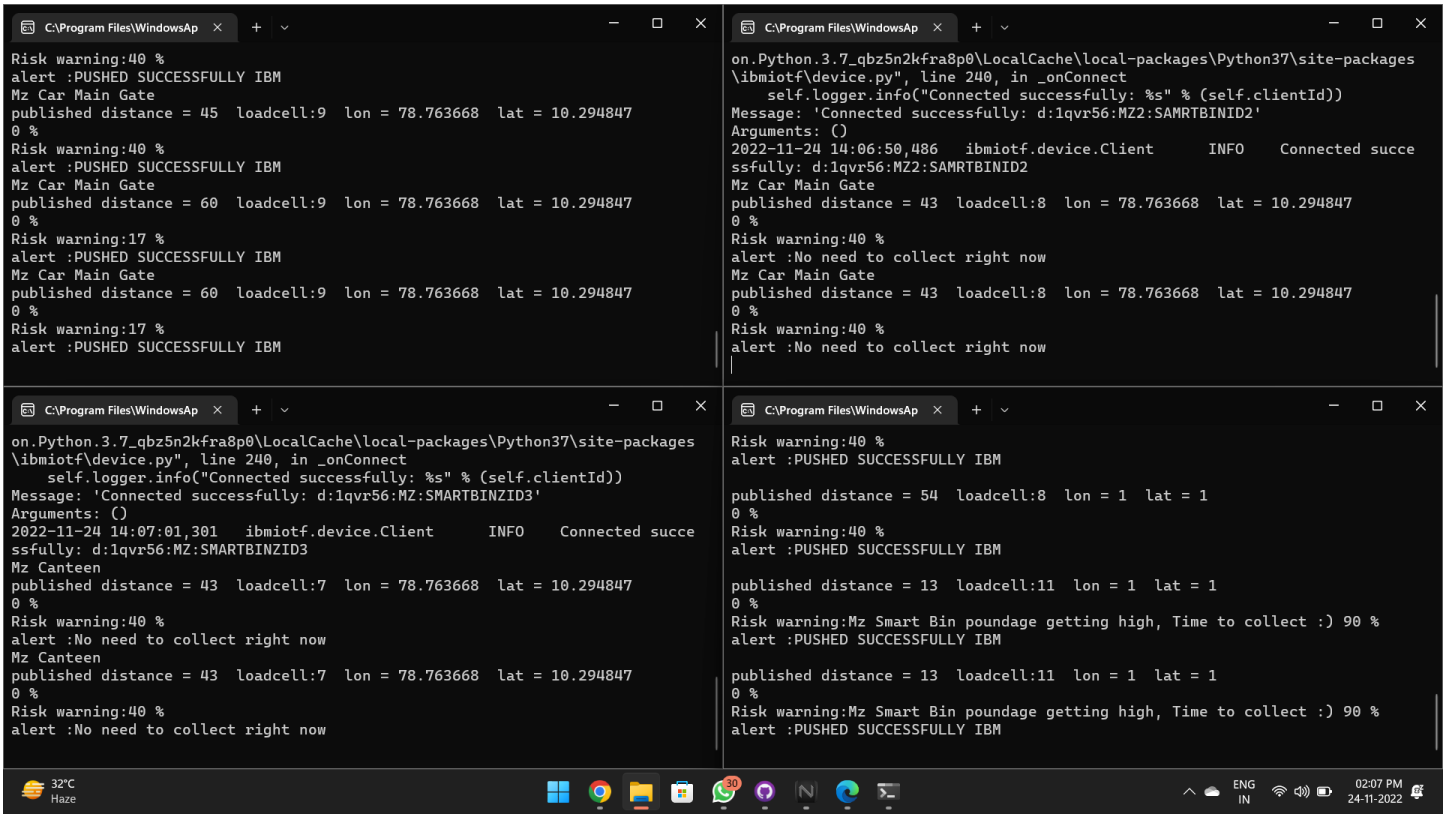
TEAM ID : PNT2022TMID47771



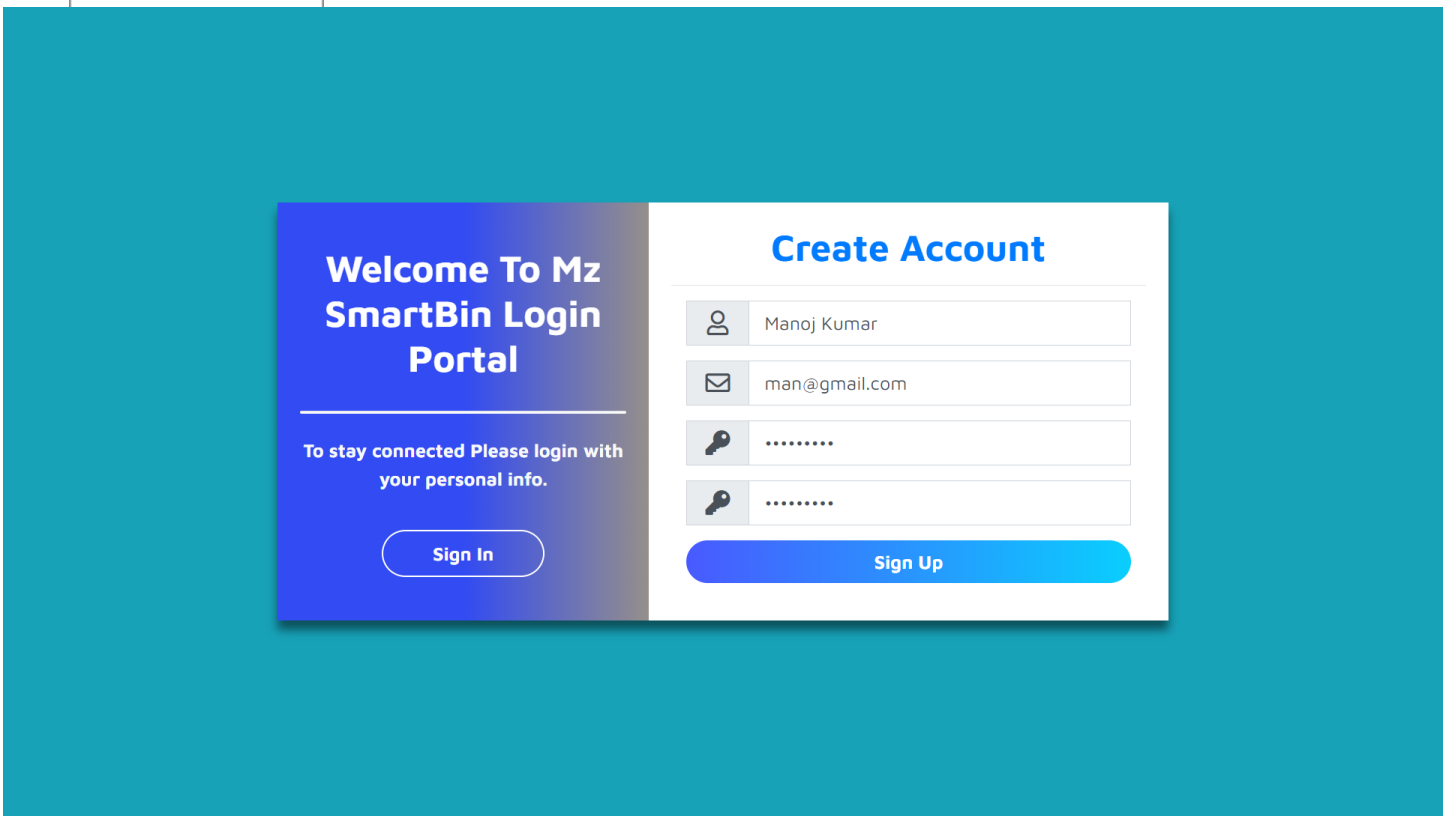


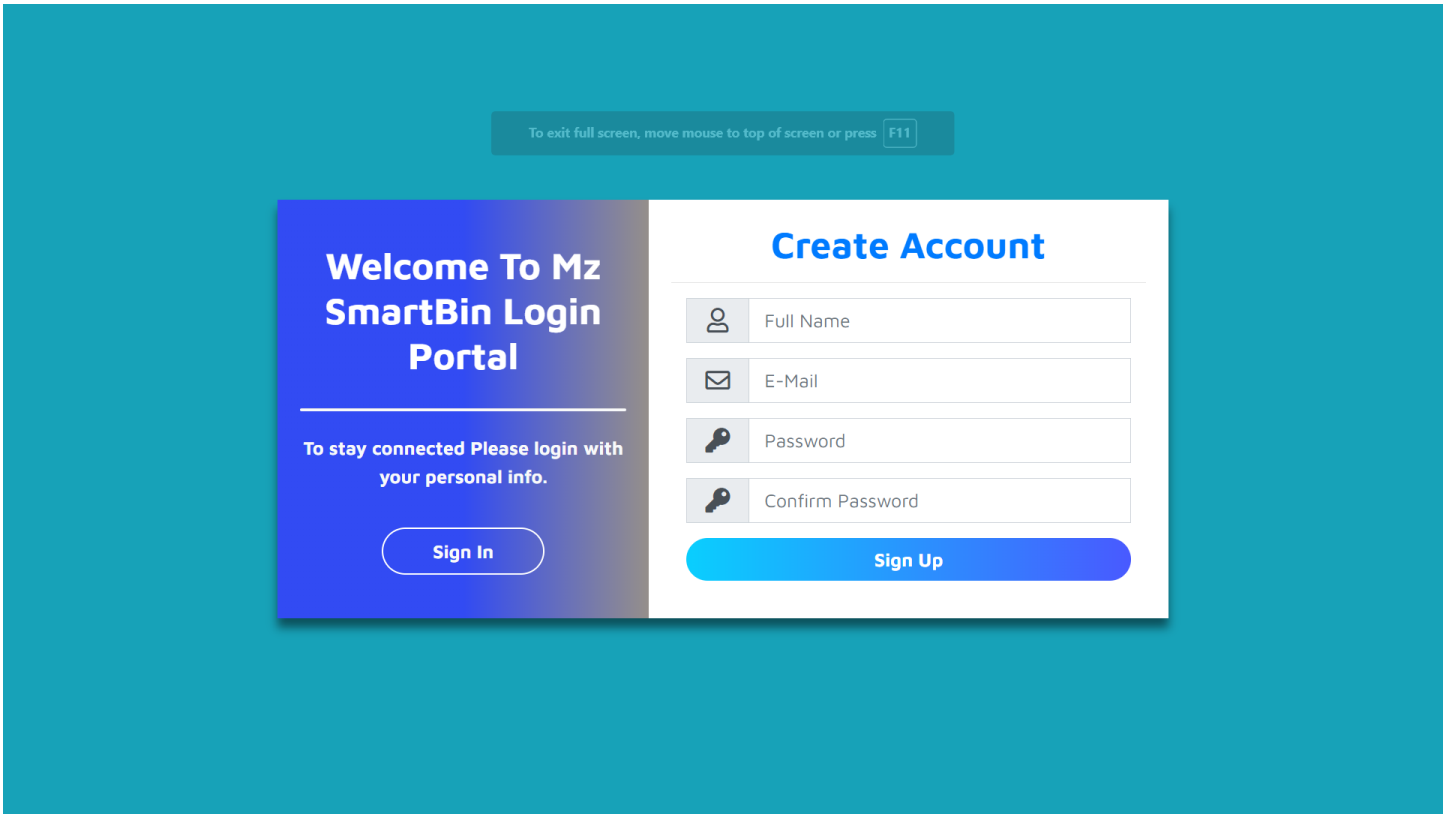
TEAM ID : PNT2022TMID47771



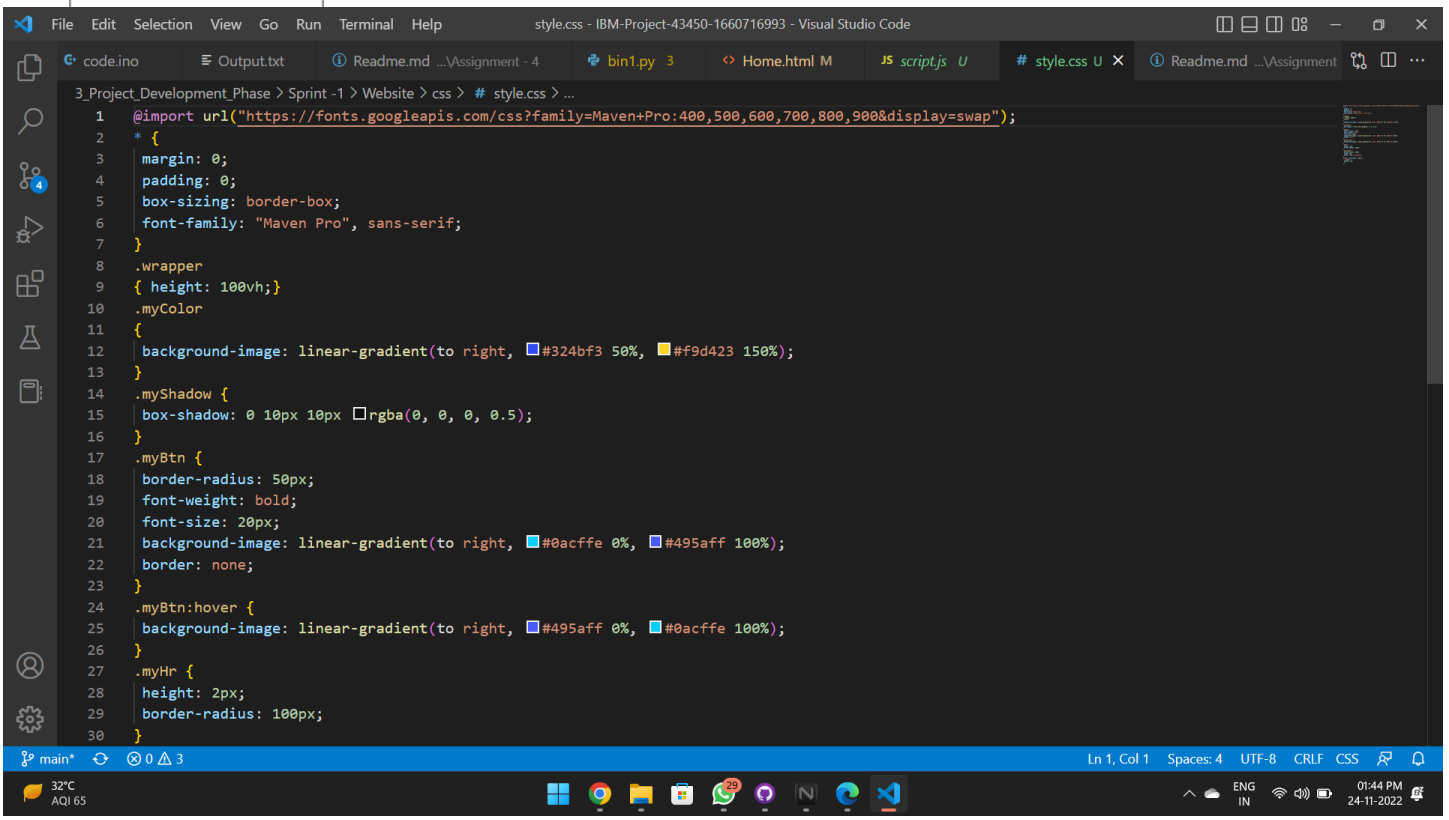


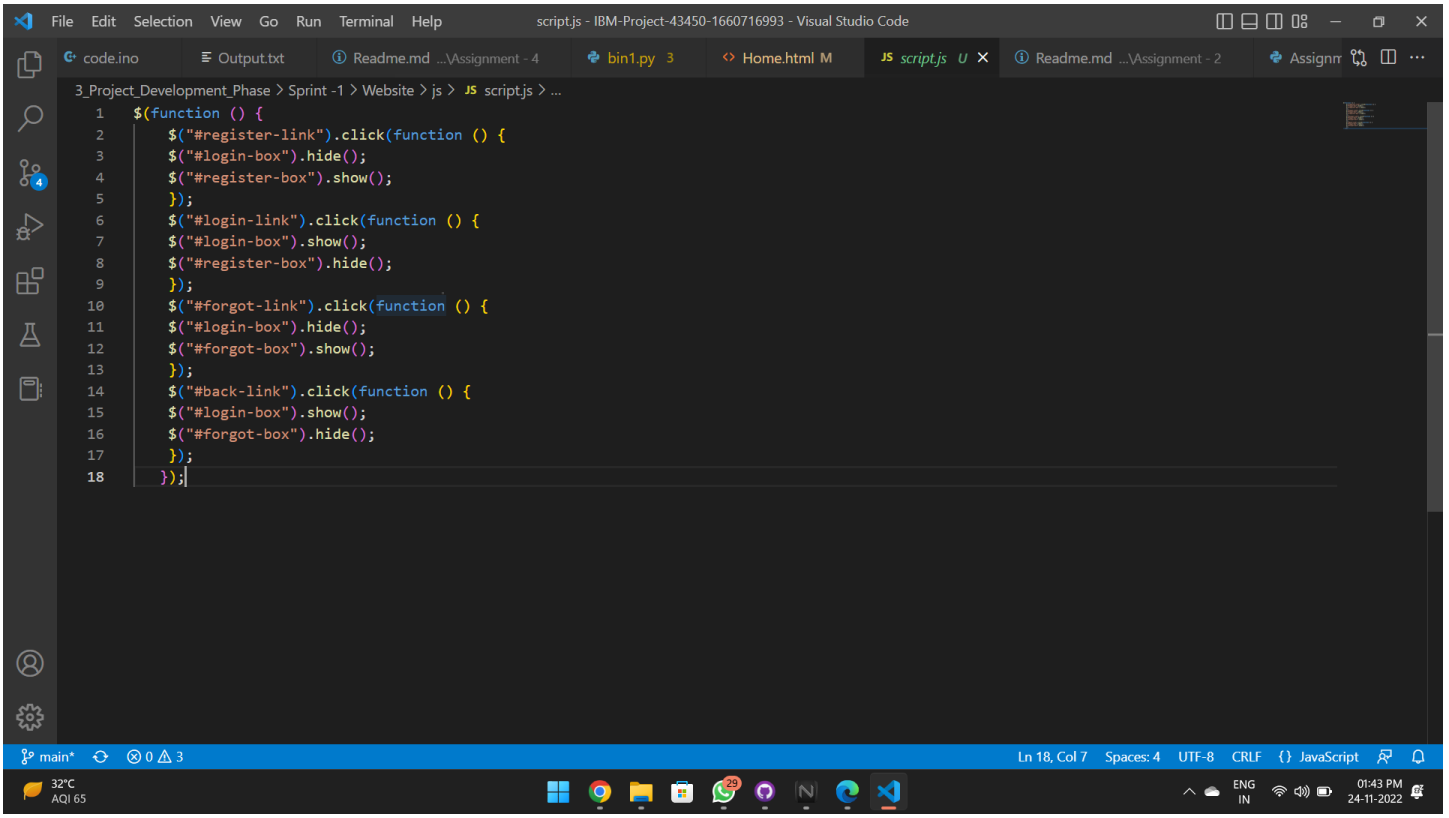
TEAM ID : PNT2022TMID47771



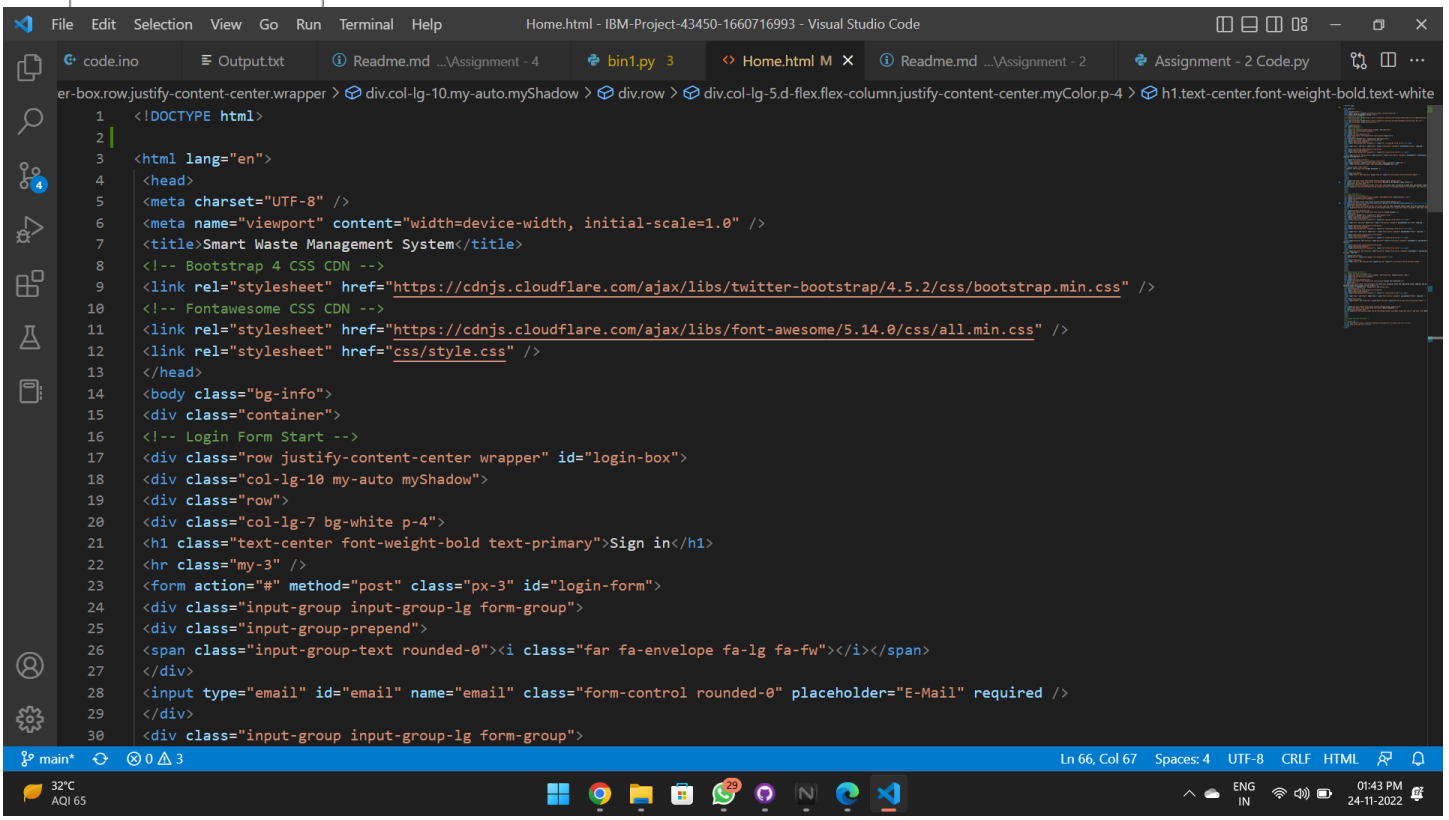


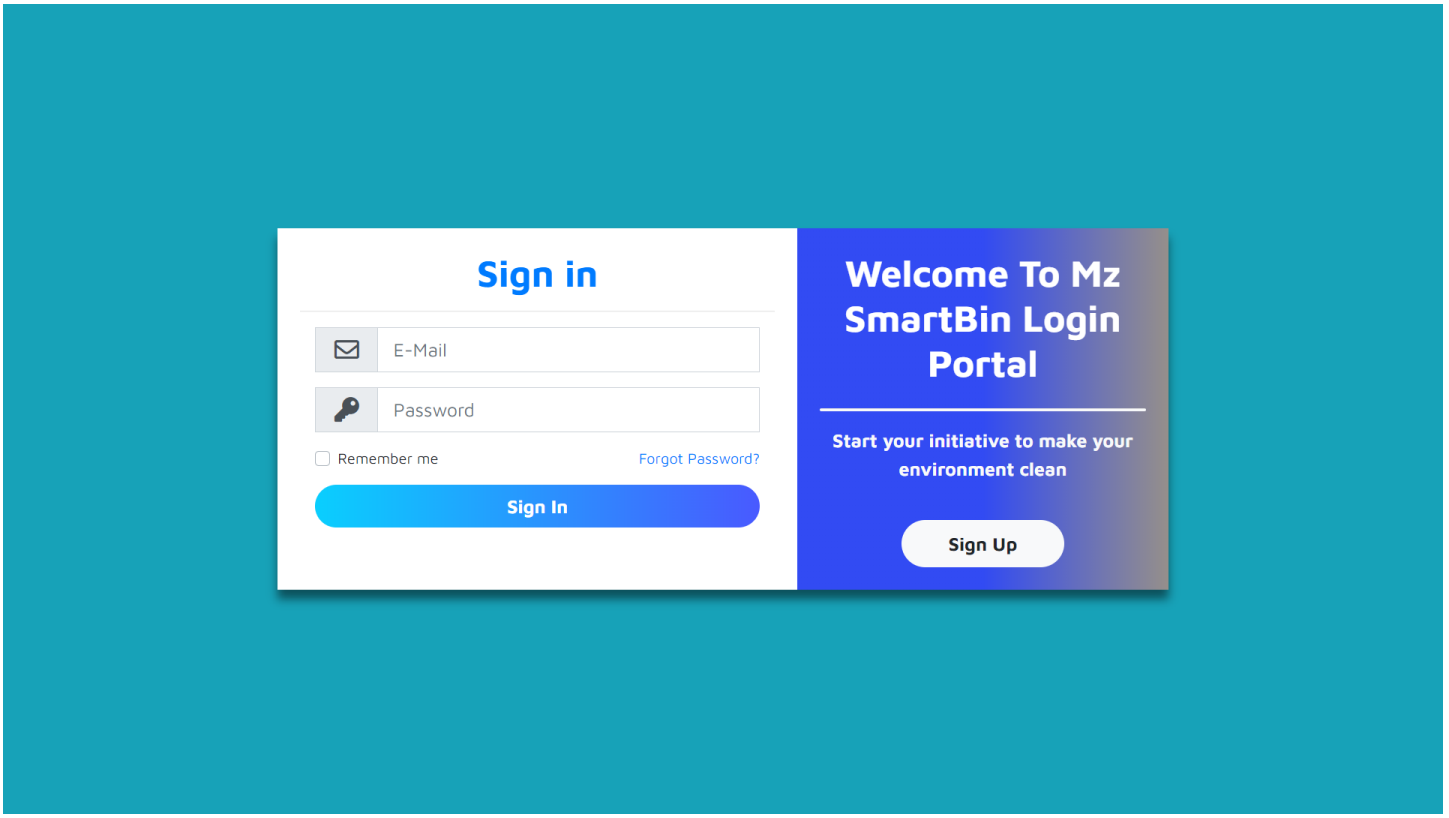
TEAM ID : PNT2022TMID47771



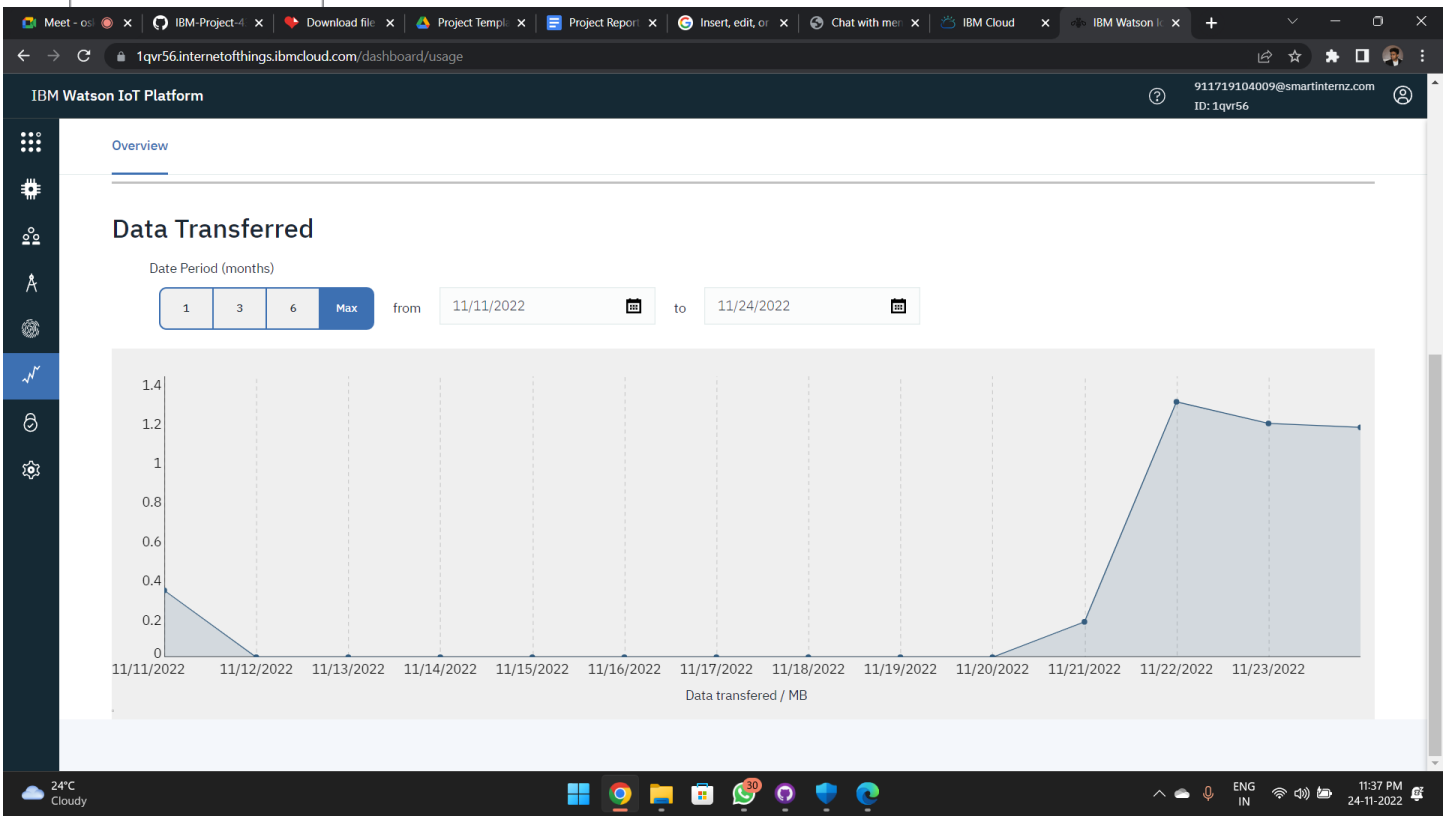


TEAM ID : PNT2022TMID47771





TEAM ID : PNT2022TMID47771



13.3 LINK

S GitHub

Link:

https://github.com/IBM-EPBL/IBM-Project-43450-1660716993

website Link:

http://169.51.203.62:30317/red/#flow/54ba2d7691a78b33

Video Demo Link:

https://drive.google.com/drive/folders/1FzMRA4ZXVB3xrDtGUMBc1cDR2dqyUvHk?usp=sharing