Project Report

Team ID	**PNT2022TMID41897**
Project Name	**Smart waste management system for metropolitan cities**
Team Lead	**Arunadevi S**
Team Member 1	**Nandhakumar P**
Team Member 2	**Shivani P**
Team Member 3	**Azahagupandi M**

1. INTRODUCTION

1.1 Project Overview:

Our waste generation is constantly growing to form a global garbage crisis. Even though we indulge in creating a more sustainable and greener, we still fail to handle our waste generation and management. Combining technology support with a vision of social, economic and environmental sustainability is the best way out of this problem. It is done in the following manner. The smart bin system undergoes a thorough system check and battery level monitoring in order to function efficiently. If the battery level is found to be low, it has to be recharged immediately, else it can proceed to the next step. The threshold level levels of the bin are indicated my multiple sensors attached to bin. If the garbage exceeds the level, then an alert message is sent to the garbage collectors as well as to the municipality or area administration. The area in which garbage is found to overflow is allocated to respective garbage collectors in the form of messages through GSM system. Once the waste bin is emptied, an information update is sent to the municipality and server is updated. This is how the waste from bins can be efficiently handled and managed using technology which in turn keeps the environment clean and healthy.

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

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.

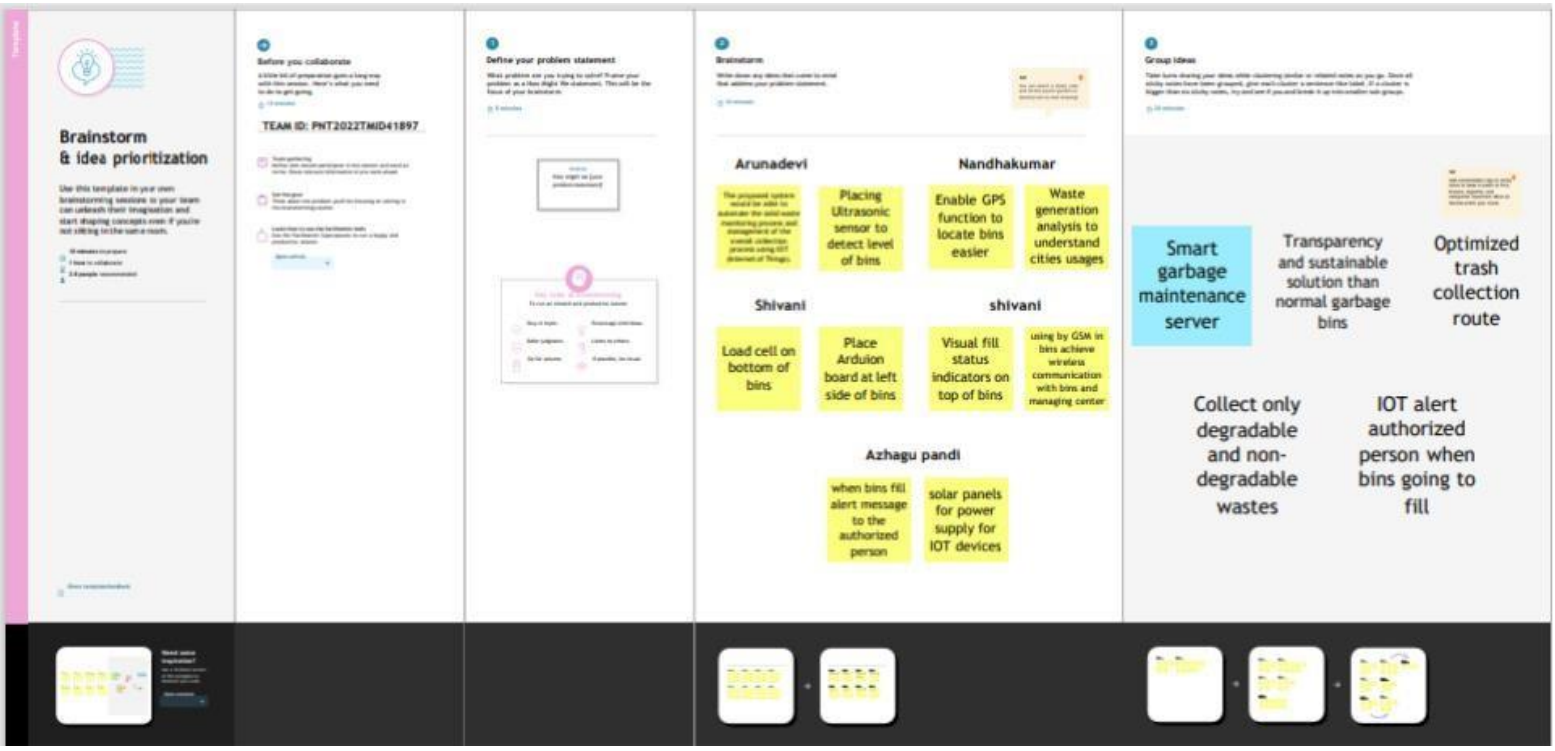
2.3 problem statement definition:

Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me feel
PS-1	Council	Monitor the waste in my city	I have not much effective system for monitoring	Because of high cost	unhygienic
PS-2	Council	Manage the waste in my city	I have not much effective system for managing	Because of more time consuming	unsafe

3.IDEATION & PROPOSED SOLUTION:

3.1 Empathy map canvas:

3.2 Ideation & Brainstorming:



3.3 Proposed Solution:

SI No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Detecting the level of garbage and informing the garbage collectors through a proper communication channel about the garbage level and alerts them to collect it at a specified time efficiently.
2.	Idea / Solution description	By using fill level sensors we can detect the garbage level. Improving the communication channel using proper technology like WiMAX. Using GPS for tracking the location of bin and sorting out the short routes. Using cloud service for the storage purpose.

3.	Novelty / Uniqueness	By using IoT, GPS and GSM like technologies which if properly used in the establishment of this project helps to detect the garbage level and intimating about it to the authority and initiating them to collect the garbage on time.
4.	Social Impact / Customer Satisfaction	It keeps our surroundings clean and green and free from bad odour of wastes, emphasizes on healthy environment. Reduces air pollution
5.	Business Model (Revenue Model)	Smart waste management system is an innovative and effective step to analyze the production of waste annually and it helps to find the ways to reduce the factors which increases the waste produced.
6.	Scalability of the Solution	Smart waste management can attain its scalability by still more advancement in IoT and using many sensors to detect its accurate level accurately. Its implementation can be enhanced by using 5G type of technology for faster communication. AI recycling robots can be used in the nearer future.

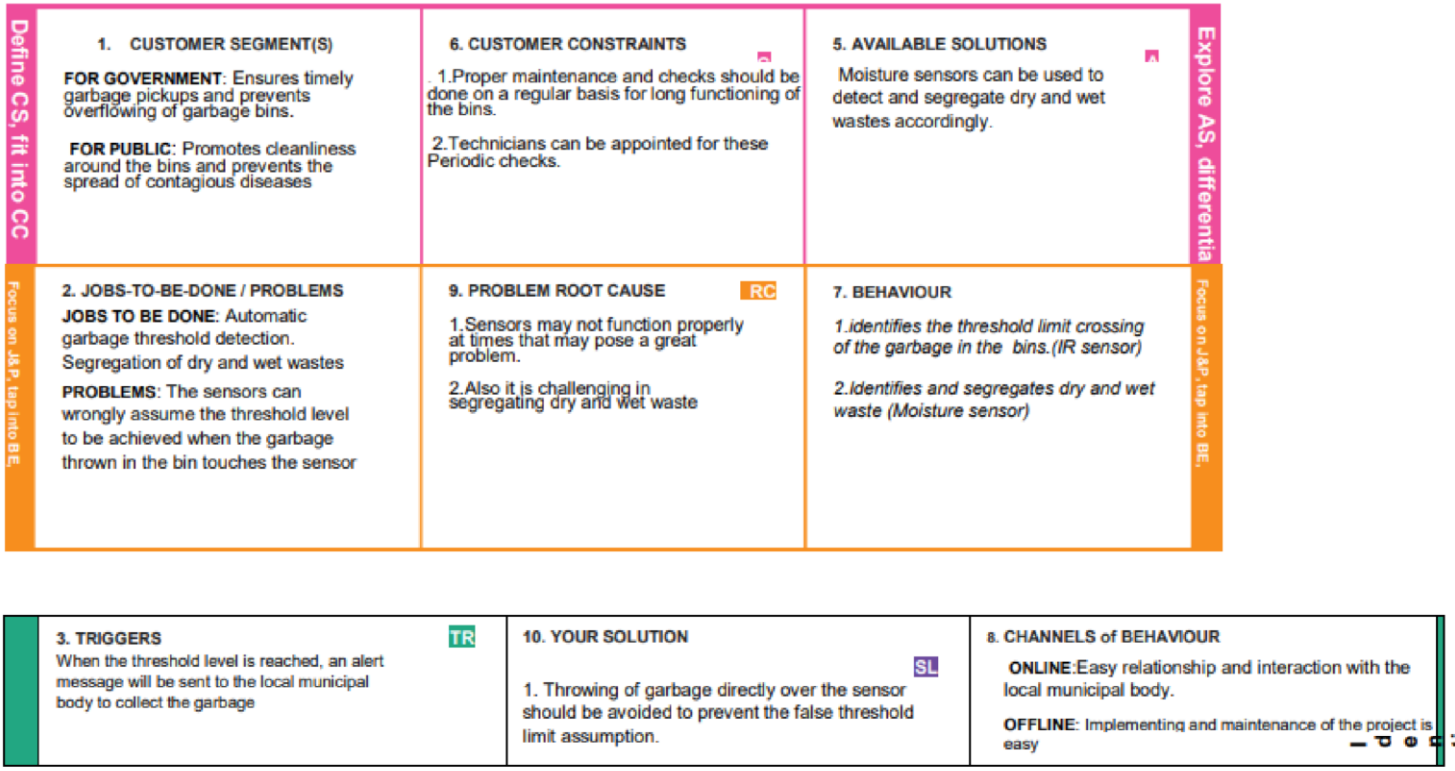
3.4 Problem solution fit:

4. REQUIREMENT ANALYSIS

Project Title: smart waste management system for metropolitan cities

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMID41897



4.1 Functional requirement

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 the bin 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 semiautomated 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 time to 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, and pick-up schedule.

4.2 Non-Functional requirements:

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. Analysing how well people interac with a product may help designers better understand customers' prospective demands for waste managemen behaviour, and experience in the design process when use experience is at the Centre.
NFR-4	**Performance**	The Smart Sensors assess the fill levels in bins (along with othe 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 datadriven daily operations and a waste management app using a variety of IoT networks (NB-IoT, GPRS). As 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 gorgeou 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.
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.

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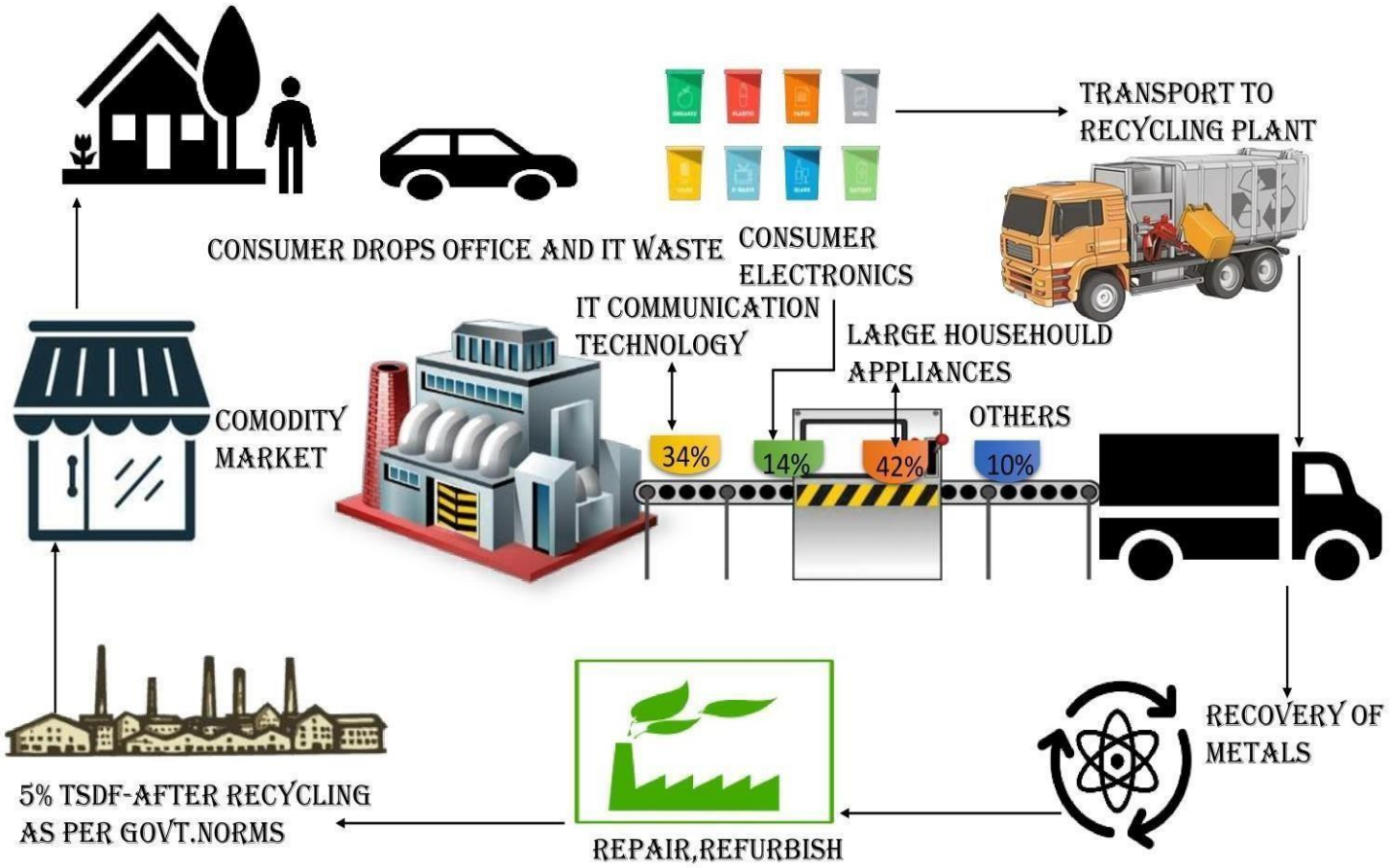
5. PROJECT DESIGN:

5.1 Data Flow Diagrams:

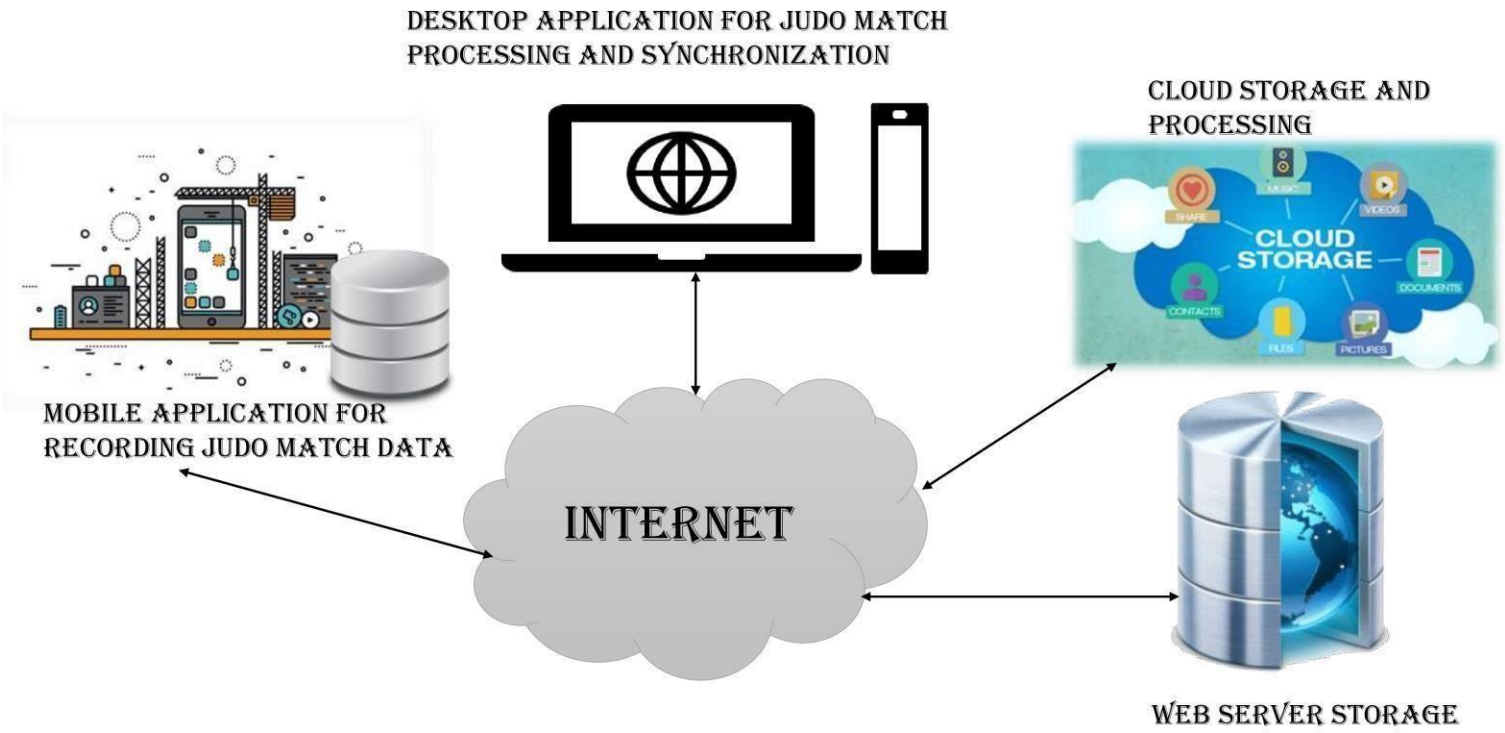
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored A smart 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

Data flow diagram:



5.2 Solution & Technical Architecture:



5.3 User stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Admin(who manages server)	Web server login	USN-1	As a admin, I can able to track the truck driver name, id, contact number, location, and also the location of the dustbin.	I can Manage and direct workers through web server	High	Sprint-1

Co-Admin	Login	USN-2	As a co-admin I'll monitor the workers, whether the work has been done properly, checking the availability of workers and also monitor the waste collected by the truck driver within the scheduled time	I can monitor the garbage bin activity	High	Sprint-1
Customer (Web user)	User	USN-3	As a user , I can able to raise queries to higher authorities about the maintenance and disposal of waste	I can raise queries	Medium	Sprint-2
Customer Care Executive	Worker	USN-4	As a customer care executive I will try to rectify the queries from customers by contacting coadmin. In case of emergency situation query can be reported to Admin.	I can attend calls and respond people and solve their problems	High	Sprint-1

Truck driver	Worker	USN-5	The truck driver is a worker who has been assigned to collect the garbage and he have to report to admin about when and where and also the timings , the garbage has been picked up according the daily schedule.	I will do the work properly and report the data at the scheduled time	High	Sprint1

6. PROJECT PLANNING & SCHEDULING:

6.1 Sprint Planning & Estimation:

PHASE	TITLE	DESCRIPTION
Ideation Phase	Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers, research publications etc.
	Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements

	Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.
Phase-1	Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.
	Problem Solution Fit	Prepare problem - solution fit document.
	Solution Architecture	Prepare solution architecture document.
Phase-2	Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).
	Functional Requirement	Prepare the functional and Nonfunctional requirement document.
	Data Flow Diagrams	Draw the data flow diagrams and submit for review.
	Technology Architecture	Prepare the technology architecture diagram.
Project planning phase	Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.

Project development phase	Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.

6.2 Sprint Delivery Schedule:

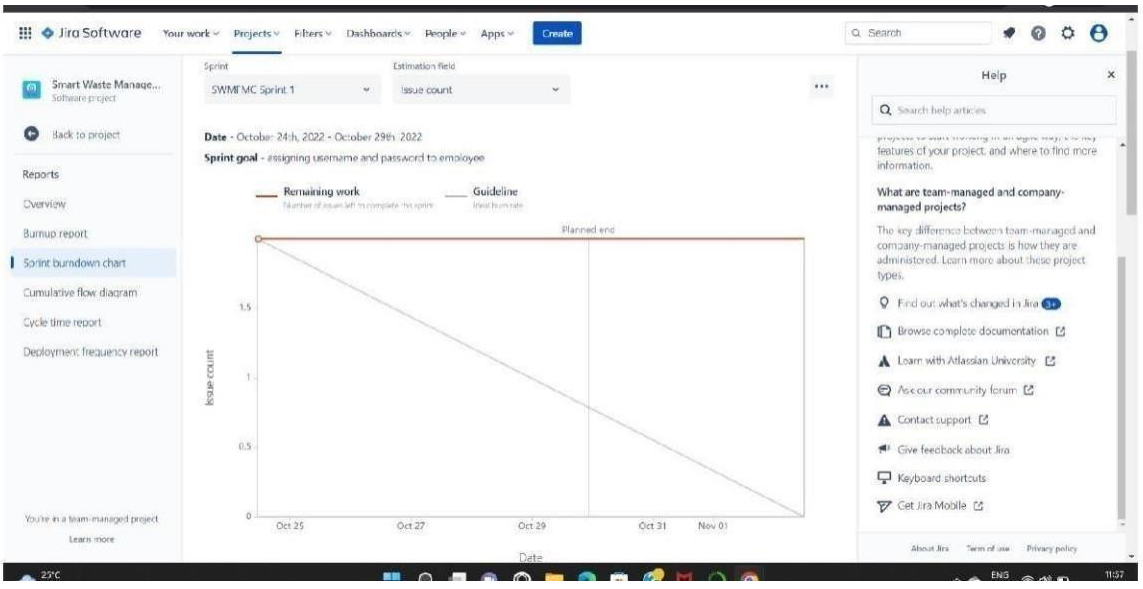
Sprint	Functional Requirement (Epic)	User Story Number	User Story/Task	Story Points	Priority	Team Members
Sprint-1	Cloud	USN-1	Cloud web server is created which connects the bin and the authority who is responsible for the disposal of waste from its bin	10	High	Arunadevi S
Sprint-1	Software	USN-2	Design the circuit which is to be integrated within the garbage bin using sensors.	10	High	Arunadevi S
Sprint-2	Cloud Server	USN-3	Upload the details of truck driver and location of bin using GPS	5	Medium	Nandhakumar P
Sprint-2	Technology	USN-4	Connect cloud server and bins	5	High	Nandhakumar P
Sprint-2	Sensor	USN-5	Detect the level of garbage using sensor and stores it in the server for specific interval of time.	10	High	Nandhakumar P
Sprint -3	Python, GPS	USN-6	Write the python code for intimating to the authority about alerting message regarding	10	High	Shivani P
			collection of garbage and where to collect			Shivani P
Sprint-3	Cloud	USN-7	Authority should allocate which truck driver should collect the waste at particular area	10	Medium	Shivani P
Sprint-4	Communicating Medium	USN-8	Truck driver receives the message from the authority and goes to collect the garbage	10	Medium	Azhagupandi M
Sprint-4	Communicating Medium	USN-9	After collecting the garbage, truck driver intimates that the garbage has collected	10	Low	Azhagupandi M

Project Tracker, Velocity & Burndown Chart:

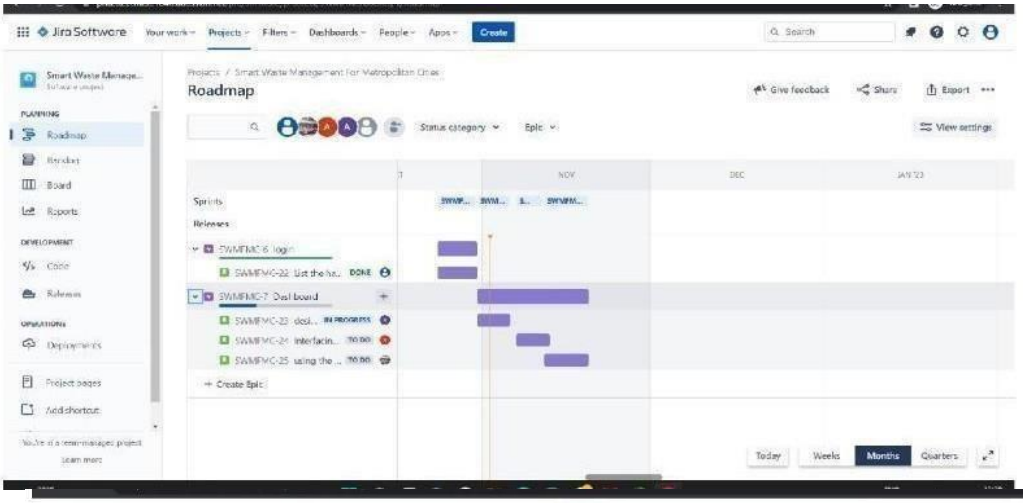
Sprint	Total Story Points	Duration	Sprint StartDate	Sprint End Date (Planned)	Story Points Completed (Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	22 Oct 2022	27 Oct 2022	20	06 Nov 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	30	07 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	49	08 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	50	09 Nov 2022

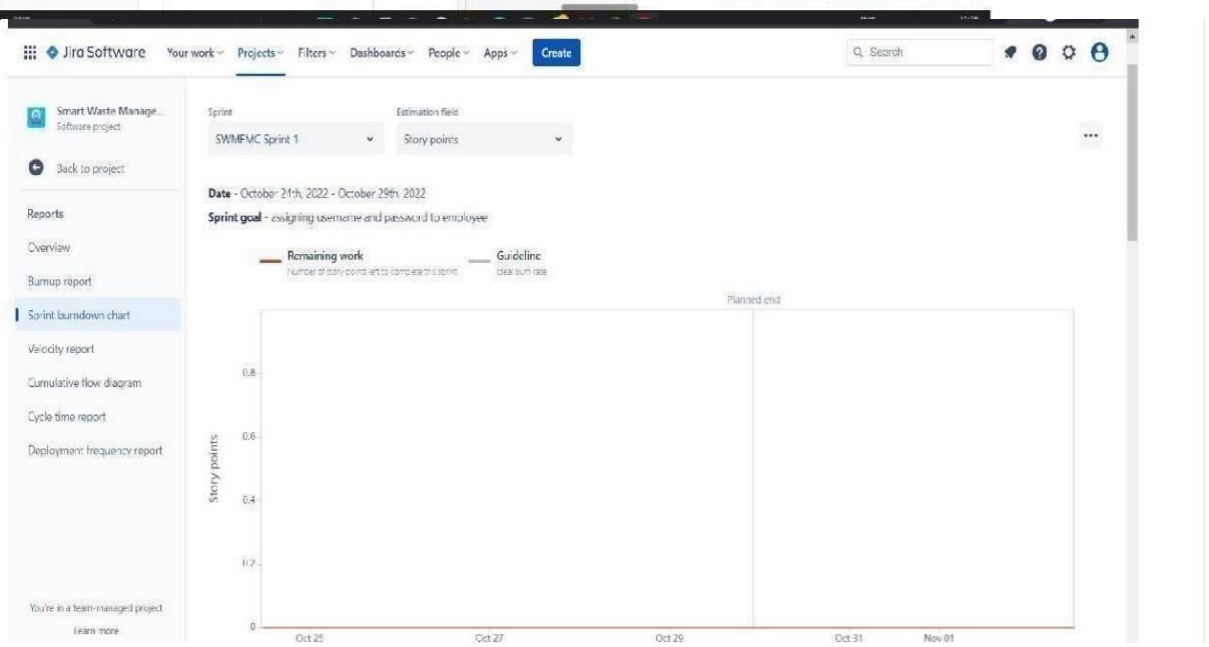
6.3 Reports from JIRA:

Burnout Chart:



Road map:





7.CODING & SOLUTIONING:

7.1 Feature 1- TRANSMIT DATA FROM WORKWI ACCOUNT TO IBM WATSOON IOT PLATFORM

kumar.py - C:\Users\nandh\Downloads\kumar.py (3.6.5)

File Edit Format Run Options Window Help

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

#Provide your IBM Watson Device Credentials
organization = "1086aa"
deviceType = "device"
deviceId = "12345"
authMethod = "token"
authToken = "123456789"
# Initialize GPIO

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="lighton":
        print ("led is on")
    else :
        print ("led is off")
    #print(cmd)

try:

    deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth

    deviceCli = ibmiotf.device.Client(deviceOptions)
#.....................................
except Exception as e:
    print("Caught exception connecting device: %s" % str(e))
    sys.exit()

# Connect and send a datapoint "hello" with value "world" into the cloud as an even
deviceCli.connect()
while True:
#Get Sensor Data from DHT11
    weight=random.randint(0,100)
    level=random.randint(0,100)
    data = { 'weight' : weight, 'level':level }
    #print data
```

Python 3.6.5 Shell

File Edit Shell Debug Options Window Help

```
Published Weight = 64 Kg level = 63 % to IBM Watson
Published Weight = 41 Kg level = 97 % to IBM Watson
Published Weight = 37 Kg level = 66 % to IBM Watson
Published Weight = 33 Kg level = 16 % to IBM Watson
Published Weight = 8 Kg level = 44 % to IBM Watson
Published Weight = 89 Kg level = 9 % to IBM Watson
Published Weight = 22 Kg level = 85 % to IBM Watson
Published Weight = 6 Kg level = 7 % to IBM Watson
Published Weight = 72 Kg level = 12 % to IBM Watson
Published Weight = 14 Kg level = 33 % to IBM Watson
Published Weight = 12 Kg level = 40 % to IBM Watson
Published Weight = 43 Kg level = 54 % to IBM Watson
Published Weight = 95 Kg level = 40 % to IBM Watson
Published Weight = 84 Kg level = 19 % to IBM Watson
Published Weight = 12 Kg level = 13 % to IBM Watson
Published Weight = 15 Kg level = 49 % to IBM Watson
Published Weight = 54 Kg level = 12 % to IBM Watson
Published Weight = 51 Kg level = 100 % to IBM Watson
Published Weight = 10 Kg level = 31 % to IBM Watson
Published Weight = 93 Kg level = 23 % to IBM Watson
Published Weight = 66 Kg level = 63 % to IBM Watson
Published Weight = 87 Kg level = 52 % to IBM Watson
Published Weight = 83 Kg level = 94 % to IBM Watson
Published Weight = 17 Kg level = 73 % to IBM Watson
Published Weight = 61 Kg level = 13 % to IBM Watson
Published Weight = 38 Kg level = 63 % to IBM Watson
Published Weight = 17 Kg level = 93 % to IBM Watson
Published Weight = 70 Kg level = 69 % to IBM Watson
Published Weight = 63 Kg level = 82 % to IBM Watson
Published Weight = 83 Kg level = 97 % to IBM Watson
Published Weight = 43 Kg level = 95 % to IBM Watson
Published Weight = 73 Kg level = 83 % to IBM Watson
Published Weight = 73 Kg level = 22 % to IBM Watson
Published Weight = 94 Kg level = 13 % to IBM Watson
Published Weight = 0 Kg level = 5 % to IBM Watson
Published Weight = 63 Kg level = 65 % to IBM Watson
Published Weight = 31 Kg level = 6 % to IBM Watson
Published Weight = 42 Kg level = 18 % to IBM Watson
Published Weight = 32 Kg level = 84 % to IBM Watson
```

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7.2 Feature 2- LIVE UPDATE ON COLLECTED DATA:

IBM-Project-45096-1660728218 | IBM Watson IoT Platform | Node-RED : node-red-tsakl-2022 | Node-RED Dashboard

1086aa.internetofthings.ibmcloud.com/dashboard/devices/browse

Gmail YouTube ibm page My Dashboard - Te... GeeksforGeeks Practice | Geeksfor... Node-RED : node-r... IBM-Project-19203-... IBM-Project-27802-... IBM Cloud

IBM Watson IoT Platform

622519104005@smartinternz.com
ID: 1086aa

Browse Action Device Types Interfaces

Add Device

12345 Connected device Device Nov 24, 2022 4:02 PM

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
IoTSensor	{"weight":33,"level":16}	json	a few seconds ago
IoTSensor	{"weight":37,"level":66}	json	a few seconds ago
IoTSensor	{"weight":41,"level":97}	json	a few seconds ago
IoTSensor	{"weight":64,"level":63}	json	a few seconds ago
IoTSensor	{"weight":73,"level":100}	json	a few seconds ago

0 Simulations running

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8.Testing:

8.1 Testcases:

TEST CASE ID	FEATURE TYPE	COMPONENT	TEST SCENARIO	PREREQUISITE	STEPS TO EXECUTE	TEST DATA	EXPECTED RESULT	ACTUAL RESULT	STATUS	COMMENTS	TC FOR AUTOMATION(Y/N)	BUG ID	EXECUTED BY
LOGIN PAGE_TC_001	FUNCTIONAL	HOME PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIG N UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.ENTER URL AND CLICK GO 2.VERIFY LOGIN/SIGN UP	https://169.51.20.4.219.30106	L0gin page is visible	Working as expected	PASS	**Successful**			**ARUNADEVI**

LOGIN PAGE_TC_002	UI	HOME PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIG N UP WEN USER CLICK ON MY ACCOUNT BUTTON		1. ENTER URL AND CLICK GO 2.VERIFY LOGIN/SIGN UP Elements a.ID textb o x B. password textbox c..login button D.new user E.already have an account	https://169.51.204.219.30106	Application should show below UI element	Working as expected	PASS	Successfull			**NANDHAKUMAR**

LOGIN PAGE_TC_003	FUNCTIONAL	LOGIN PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIG N UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.enter url and click go 2.click on my account 3.Enter valid ID 4.Enter valid password 5.click on login		User should navigate your home page.	Working as expectd	PASS	Successful			**SHIVANI**
					button								
LOGIN	FUNCTIONAL	LOGIN PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIG N UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.enter url	Id:1111 password:5678	Confirmation message sent	Working as expected	PASS	Successful			**SHIVANI**
PAGE_TC_004						butvton							

LOGIN PAGE_TC_005	UI	LOGIN PAGE	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIGN UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.enter url and click go 2.click on my account 3.Enter valid ID 4.Enter valid password 5.click on login button	Id:1111 password:5678	Confirmation message sent	Working as expected	PASS	Successful	**SHIVANI**
LOGIN PAGE_TC_006	FUNCTIONAL	LOGIN PAGE FOR ADMIN	VERIFY THE USER IS ABLE TO SEE THE LOGIN/SIGN UP WEN USER CLICK ON MY ACCOUNT BUTTON		1.enter url and click go 2.click on my account 3.Enter valid ID 4.Enter valid password 5.click on login button	Id:1111 password:5678	Customer database is visible	Working as expected	PASS	Successful	**AZAHAGUPANDI**

8.2 User acceptance Testing:

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	7

1. Test Case Analysis:

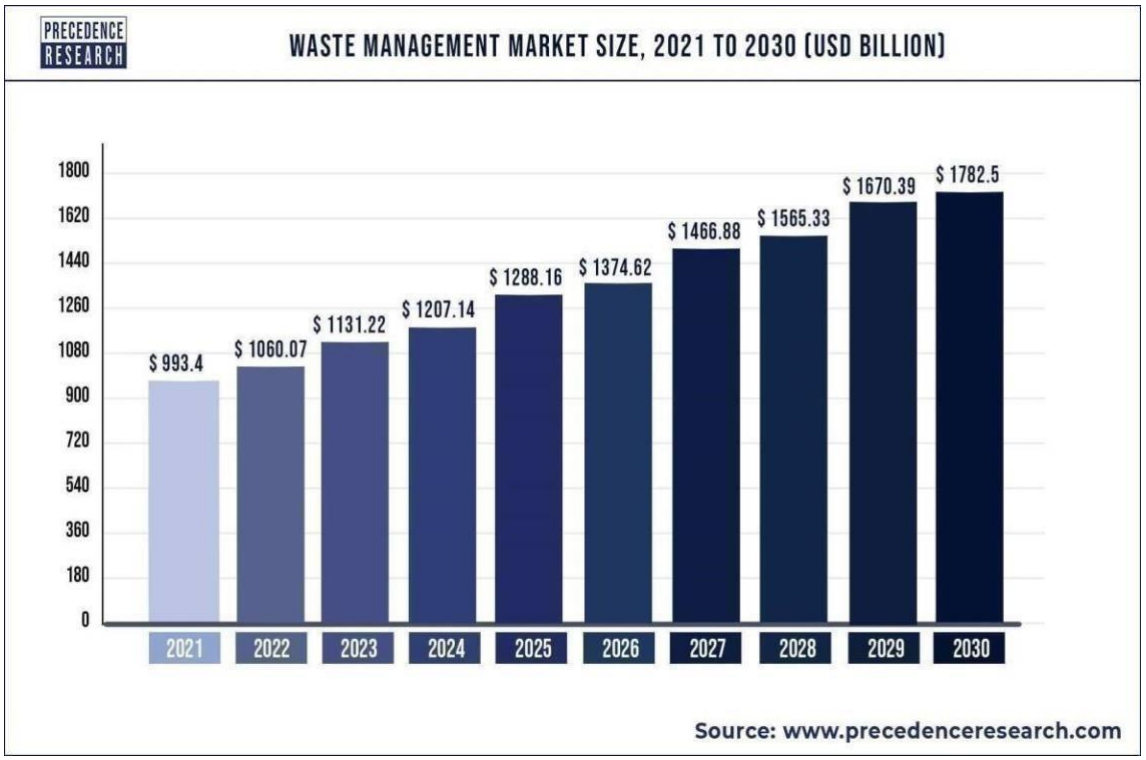
This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fai l	Pas s
Print Engine	7	0	0	7
Client Application	51	0	0	51

Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS:

9.1 Performance Metrics:



10. 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.

11. 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.

12. 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

13. Appendix:

CODING:

CODE FOR USER INTERFACE:

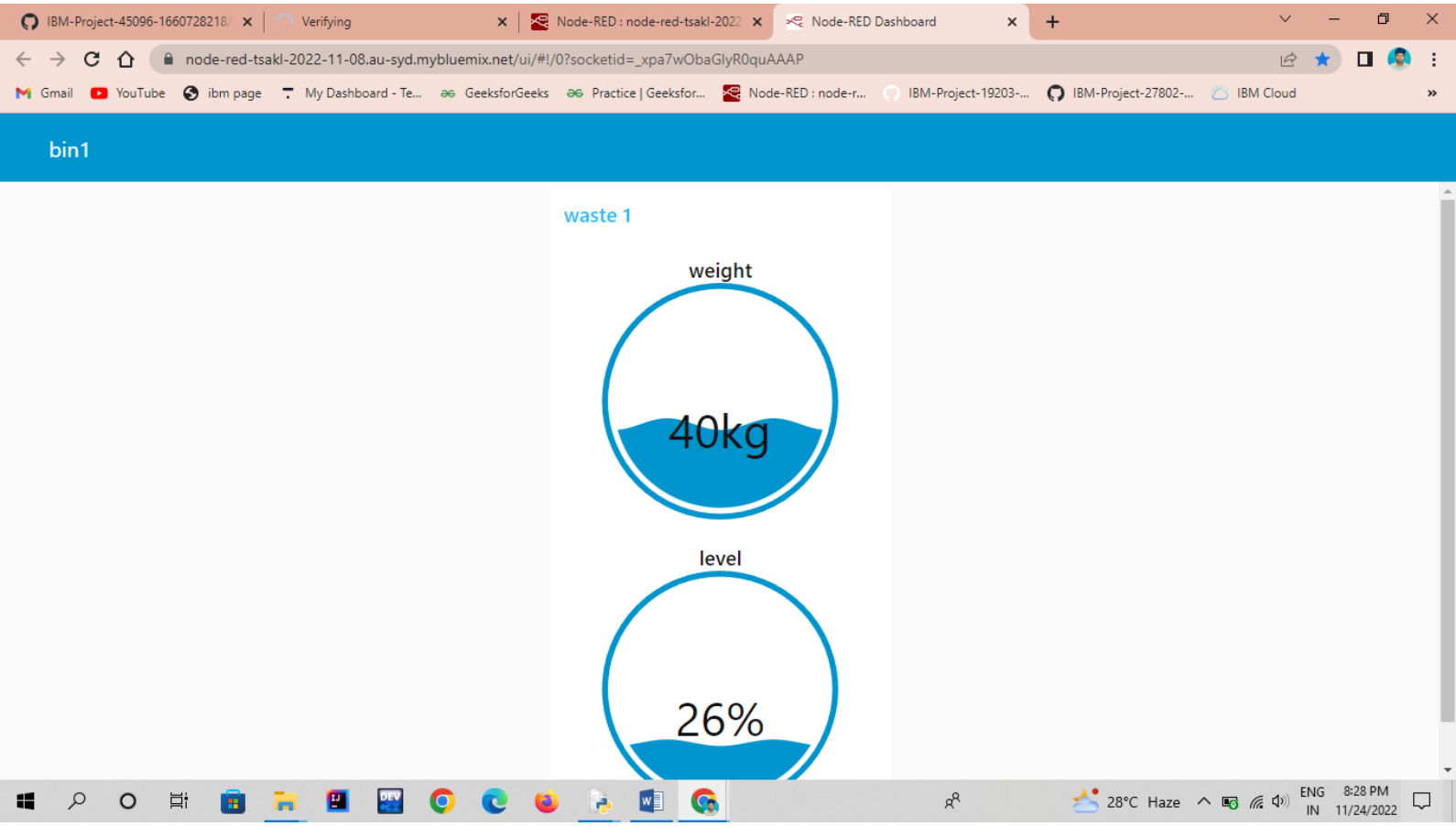
PYTHON CODE :

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

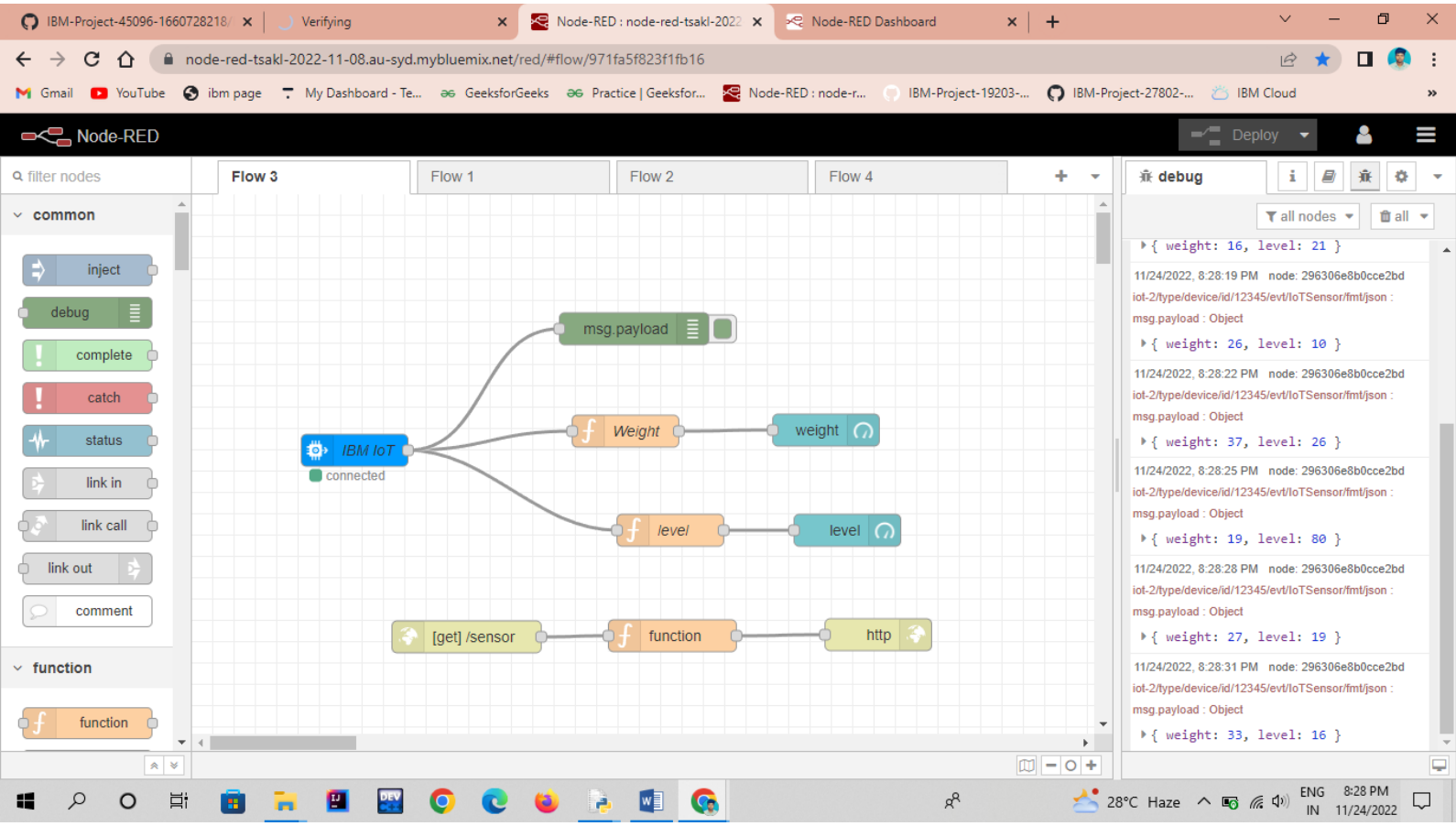
```
#Provide your IBM Watson Device Credentials
organization = "1086aa"
deviceType = "device"
deviceId = "12345"
authMethod = "token"
authToken = "123456789"
# Initialize GPIO

def myCommandCallback(cmd):
    print("Command received: %s" % cmd.data['command'])
    status=cmd.data['command']
    if status=="lighton":
        print ("led is on")
    else :
        print ("led is off")
    #print(cmd)

try:

    deviceOptions = {"org": organization, "type": deviceType, "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 "hello" with value "world" into the cloud as an
event of type "greeting" 10 times
deviceCli.connect()
while True:
#Get Sensor Data from DHT11
```

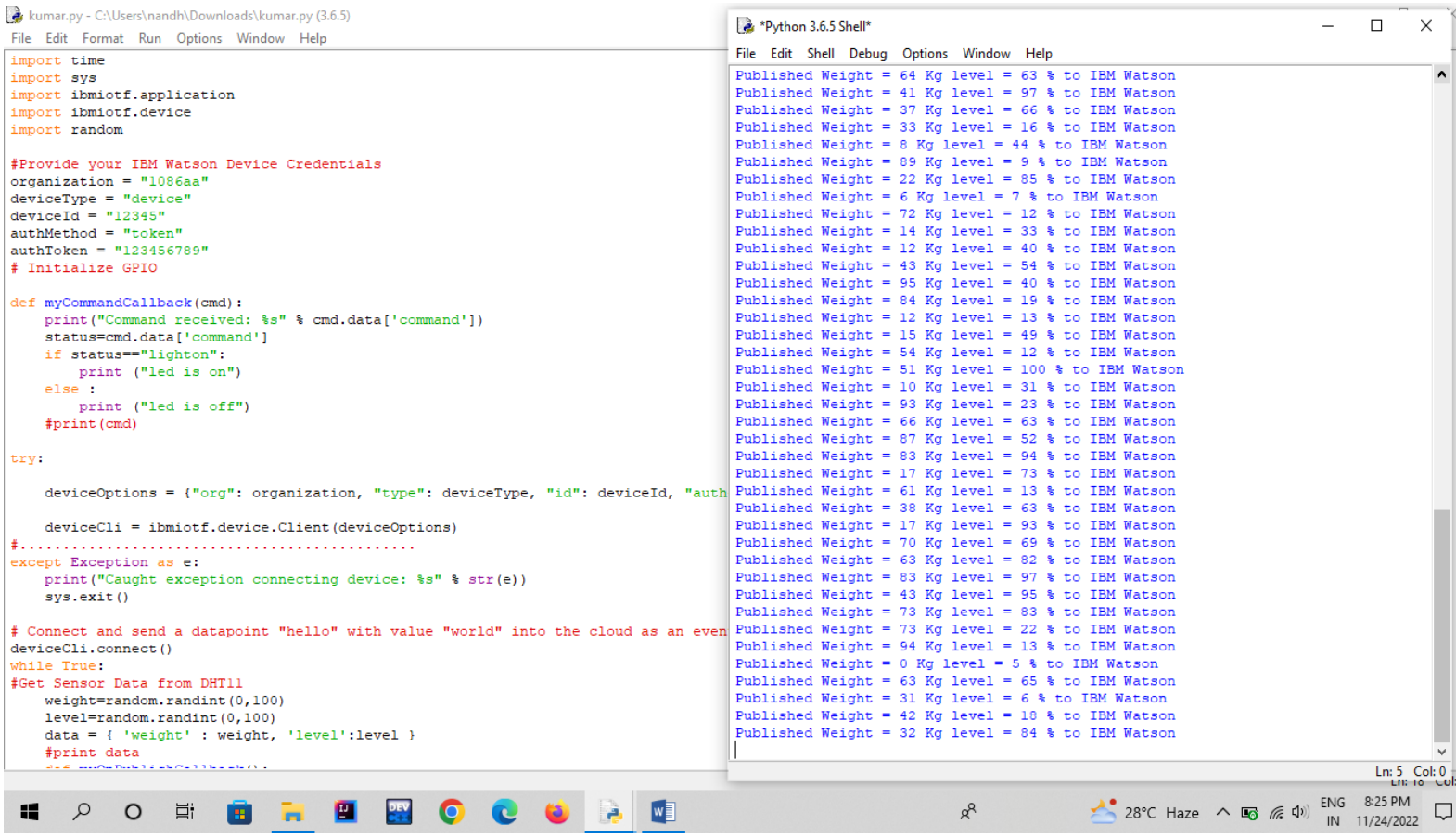
```
    weight=random.randint(0,100)
    level=random.randint(0,100)
    data = { 'weight' : weight, 'level':level }
    #print data
    def myOnPublishCallback():
        print ("Published Weight = %s Kg" % weight, "level = %s %%" % level, "to
IBM Watson")
    success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
on_publish=myOnPublishCallback)
    if not success:
        print("Not connected to IoTF")
    time.sleep(3)
    deviceCli.commandCallback = myCommandCallback
# Disconnect the device and application from the cloud
deviceCli.disconnect()
```

OUTPUT SCREENSHOTS:



SENSOR WORKUP CONNECTION SCREENSHOT




kumar.py - C:\Users\nandh\Downloads\kumar.py (3.6.5)
File Edit Format Run Options Window Help
import time
import sys
import ibmiotf.application
import ibmiotf.device
import random
#Provide your IBM Watson Device Credentials
organization = "1086aa"
deviceType = "device"
deviceId = "12345"
authMethod = "token"
authToken = "123456789"
# Initialize GPIO
def myCommandCallback(cmd):
print("Command received: %s" % cmd.data['command'])
status=cmd.data['command']
if status=="lighton":
print ("led is on")
else :
print ("led is off")
#print(cmd)
try:
deviceOptions = {"org": organization, "type": deviceType, "id": deviceId, "auth
deviceCli = ibmiotf.device.Client(deviceOptions)
except Exception as e:
print("Caught exception connecting device: %s" % str(e))
sys.exit()
# Connect and send a datapoint "hello" with value "world" into the cloud as an even
deviceCli.connect()
while True:
#Get Sensor Data from DHT11
weight=random.randint(0,100)
level=random.randint(0,100)
data = { 'weight' : weight, 'level':level }
#print data
Python 3.6.5 Shell
File Edit Shell Debug Options Window Help
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Published Weight = 37 Kg level = 66 % to IBM Watson
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Published Weight = 32 Kg level = 84 % to IBM Watson
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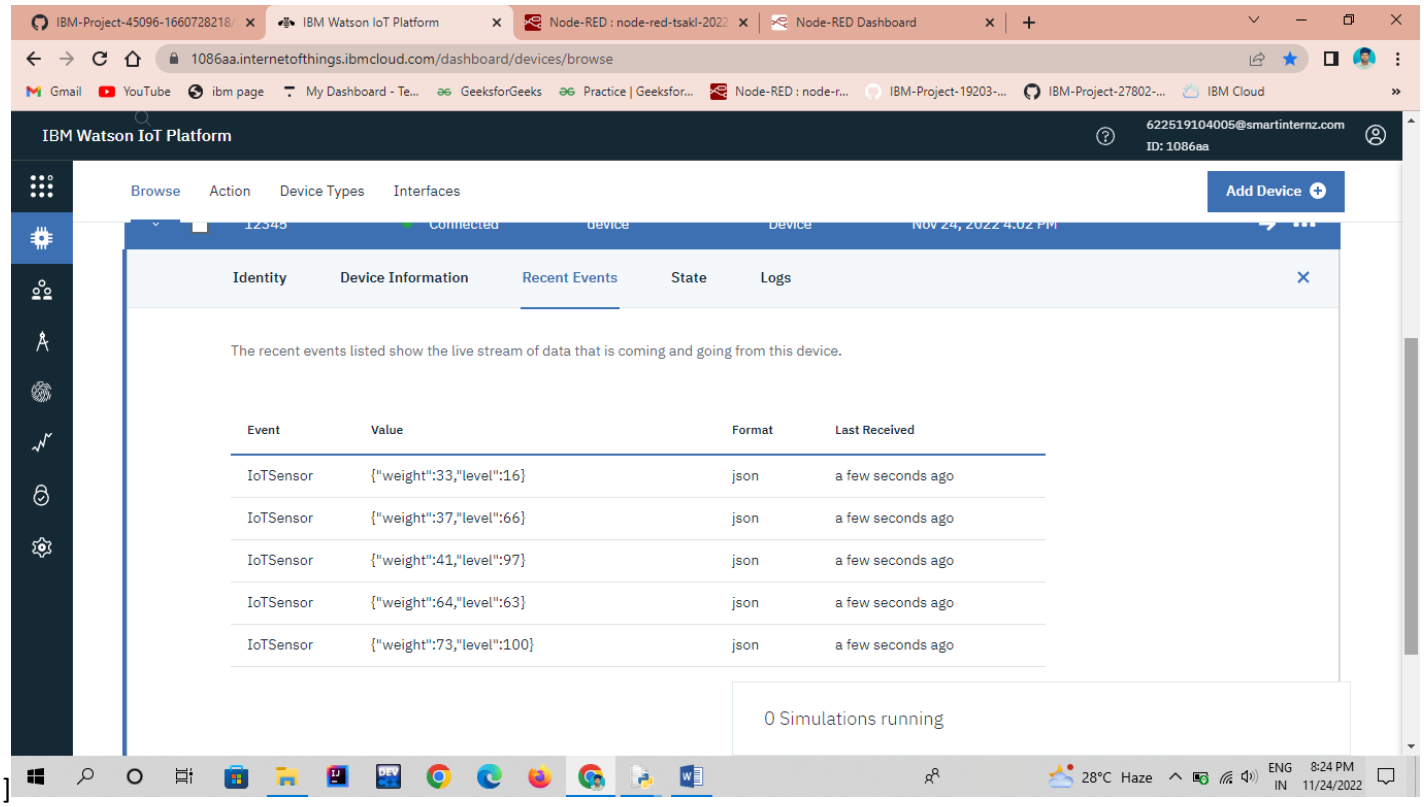
IBM-Project-45096-1660728218/
IBM Watson IoT Platform
Node-RED : node-red-tsakl-2022
Node-RED Dashboard
1086aa.internetofthings.ibmcloud.com/dashboard/devices/browse
Gmail YouTube ibm page My Dashboard - Te... GeeksforGeeks Practice | Geeksfor... Node-RED : node-r... IBM-Project-19203-... IBM-Project-27802-... IBM Cloud
IBM Watson IoT Platform
622519104005@smartinternz.com
ID: 1086aa
Browse Action Device Types Interfaces
Add Device
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
IoTSensor {"weight":33,"level":16} json a few seconds ago
IoTSensor {"weight":37,"level":66} json a few seconds ago
IoTSensor {"weight":41,"level":97} json a few seconds ago
IoTSensor {"weight":64,"level":63} json a few seconds ago
IoTSensor {"weight":73,"level":100} json a few seconds ago
0 Simulations running
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VIDEO LINK: https://www.youtube.com/watch?v=0XKlG9Or6Is