PROJECT REPORT

SMART WASTE MANAGEMENT SYSTEM FOR METROPOLITAN CITIES

TEAM ID:PNT2022TMID46746

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Team member : GANGA L
Team member : KABISHENA P
Team member : SARASWATHI K

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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. Thisaffects 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 ofcontaminants 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 trashcans 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,

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:

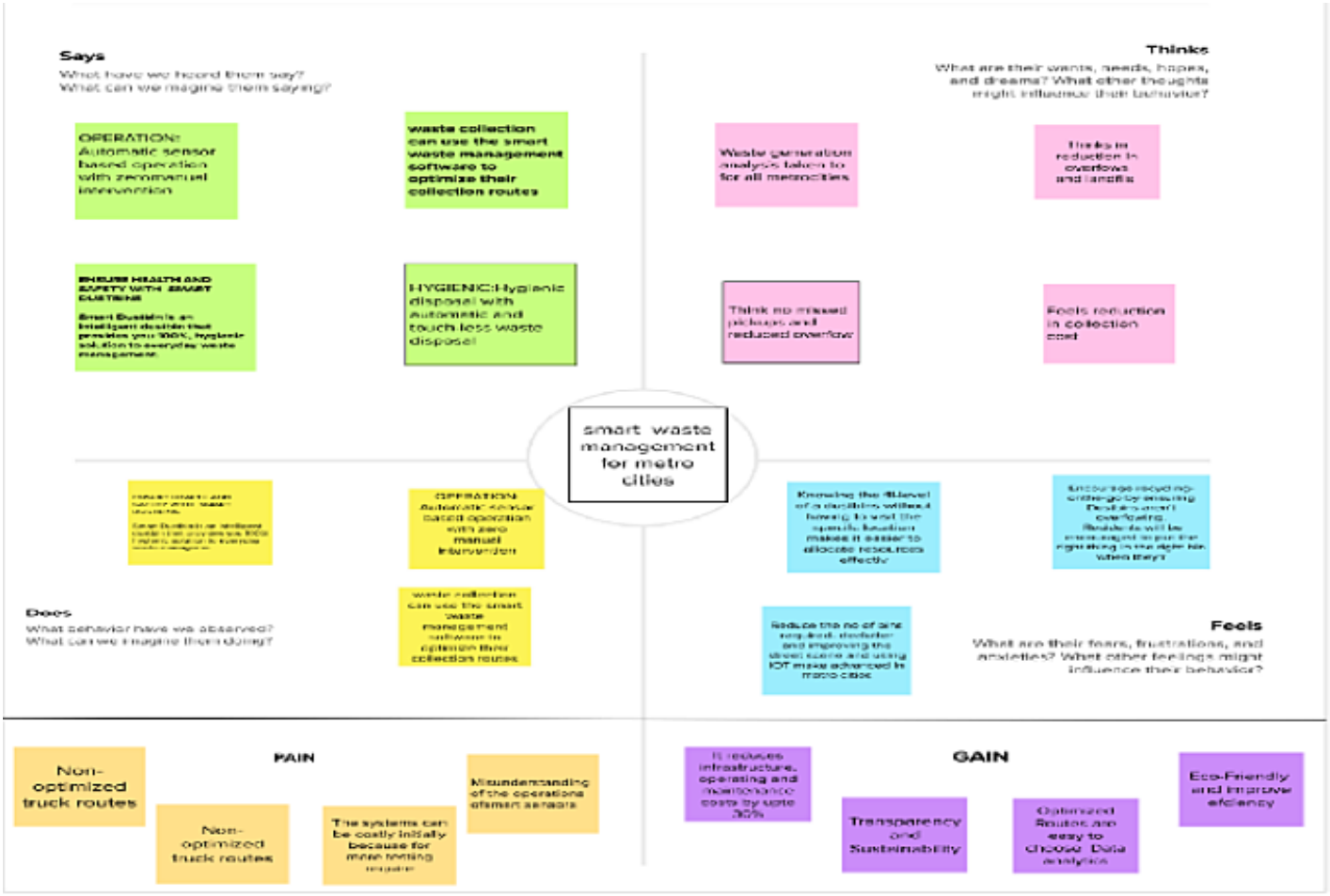
Proposed a smart recycle bin that can handle the recycling of plastic, glass, paper, andaluminium cans. It generates a 3R card after automatically determining the value of the trashthrown away. The recycle system makes it possible to accumulate points for placing waste intodesignated recycle bins. By 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. To usethe recycle bin, the user must tap his card to the designated RFID reader. Doors to recycling bins are opened, and rubbish is placed one by one.

2.3 PROBLEM STATEMENT DEFINITION:

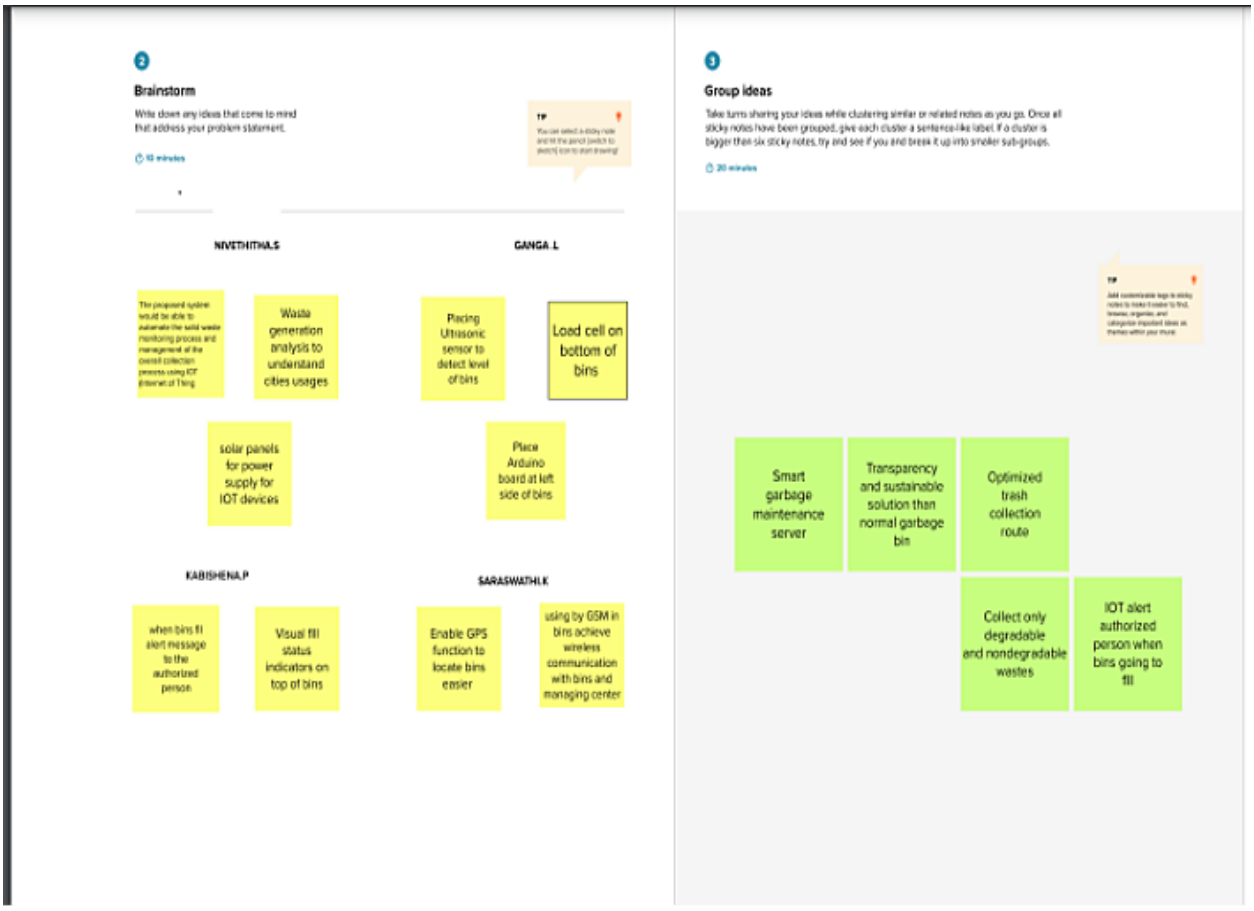
Problem Statement (PS)	I am (Customer)	I am trying to	But	Because	Which makes me feel
PS-1	Householder	Dispose the vegetable waste and other householder waste	It increases the land pollution and contaminate ground water	To keep the surroundings clean and healthy.	Difficult
PS-2	industrialist	Dispose the chemical waste and recycle for future use.	It contaminates wildlife's habitats and endangers the life of people at large.	To avoid risk for both environment and human health.	Unpleasant.

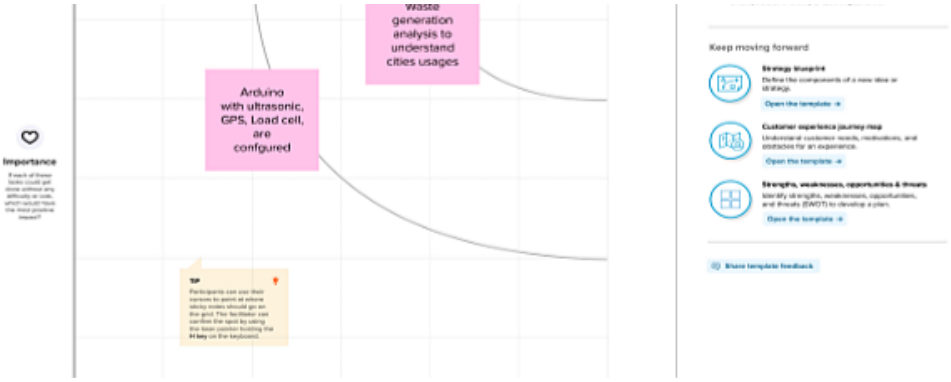
3. IDEATION & PROPOSED SOLUTION:

3.1 Empathy map canvas:



3.2Ideation & Brainstorming

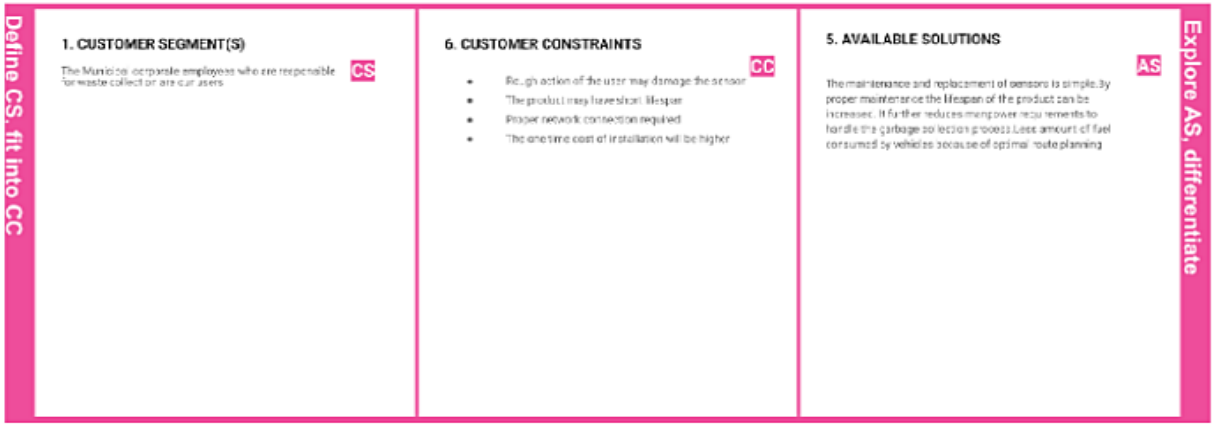


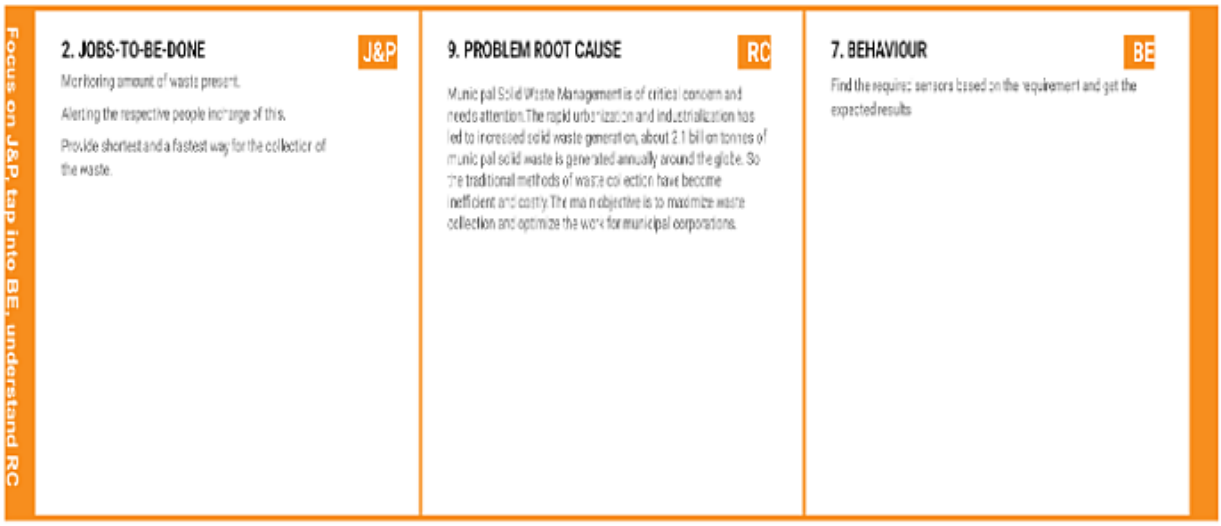


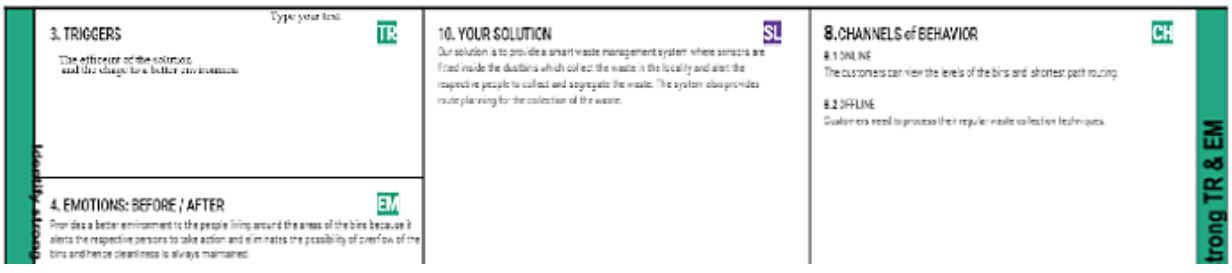
3.3 Proposed Solution:

S.NO	PARAMETER	DESCRIPTION
1.	Problem statement(problem to be solved).	1.To manage the waste to metropolitan cities using smart technique.
2.	Ideal/solution description.	1.To implement a smart bin built on a microcontroller based platform Arduino Unoboard. 2.Which is interfaced with GSM modemand Ultrasonic sensor,which can given the status of the waste present in the dustbin to the municipal autvority.
3.	Novelty/ uniqueness.	1.Immunity transferring of data about each bin to the control room. 2.Accurate indication. 3.Weight of the trashes are indicated
4.	Social impact/ customer satisfaction.	1.It reduces the overflow of trases in the bin. 2.It reduces the pollution. 3.It provides vibrant environment 4.Reduces the breeding of diseases vectors(mosquito, housefly, cockroach, microbes,etc...) 5.Easy collection and discharing of waste by the concern authority at regular intervals.
5.	Business model (revenue model).	1.The waste areut in the bin by the public. 2.The bins sence the LED. 3.It provides the indication of each stage of the waste dumped by usinh the LED. 4.Once the trash completely fills the bin 5.Information is provided to the control room. 6.The trash collected and the bin will be emptied by the corporation.
6.	Scalability of the solution.	1.Well monitoring system with accurate indication. 2.Reduce the waste efficiency. 3.easy maintanance. 4.Reasonable cost.

3.4 Problem solution fit:







4. REQUIREMENT ANALYSIS

4.1 Functional requirement:

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through LinkedIN
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User waste categories.	User decay User non-decay
FR-4	User dustbin	User size User capacity
FR-5	Eliminate unefficient picks.	Eliminate the collection of half-empty bins. The sensors recognize picks
FR-6	Plan waste collection routes.	The tool semi-automates waste collection route planning

4.2 NON-FUNCTIONAL REQUIREMENT:

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	1.IoT device verifies that usability is a special and important perspective to analyze user requirements,which can further improve the design quality. 2. In the design process with user experience as the core, the analysis of users' product usability can indeed help designers better understand users' potential needs in waste management.
NFR-2	Security	1.Use a reusable bottles 2. Use reusable grocery bags 3. Purchase wisely and recycle
NFR-3	Reliability	1.Smart waste management is also about creating better working conditions for waste collectors and drivers. 2. Instead of driving the same collection routes and servicing empty bins, waste collectors will spend their time more efficiently, taking care of bins that need servicing
NFR-4	Performance	1.The Smart Sensors use ultrasound technology to measure the fill levels (along with other data) in bin several times a day. 2. Using a variety of IoT networks(NB IoT,GPRS), the sensors send the data to Smart Waste Management Software System, a powerful cloud-based platform, for data-driven daily operations, available also as a waste management app. 3. Customers are hence provided data-driven decision making, and optimization of waste collection routes,frequencies, and vehicle loads resulting in route reduction by at least 30%.

NFR-5	Availability	1.By developing & deploying resilient hardware and beautiful software we empower cities, businesses,and countries to manage waste smarter.
NFR-6	Scalability	1.Using smart waste bins reduce the number of bins inside town , cities bacause we able to monitor the garbage 24/7 more cost effect and scalability when we moves to smarter.

5. PROJECT DESIGN:

5.1 Data Flow Diagrams:

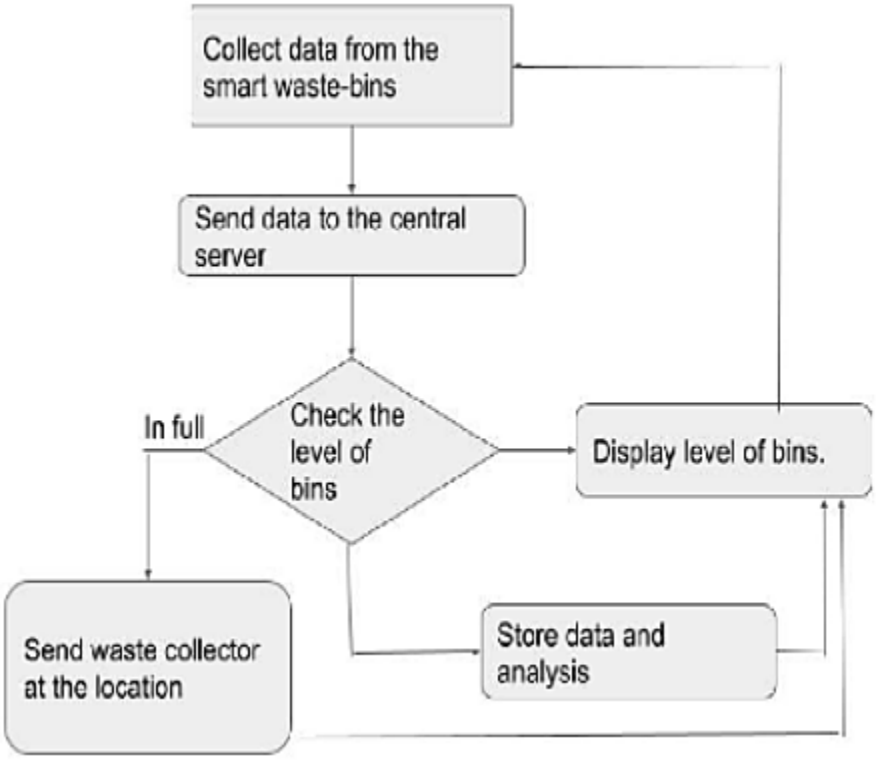
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored A smart waste management platform uses analytics totranslate the data gather in your **bins into actionable insights to help you improve your waste services.** You can receive data on metric such as:

1. The first test conducted is the situation where the garbage bin is empty or its garbagelevel is very low

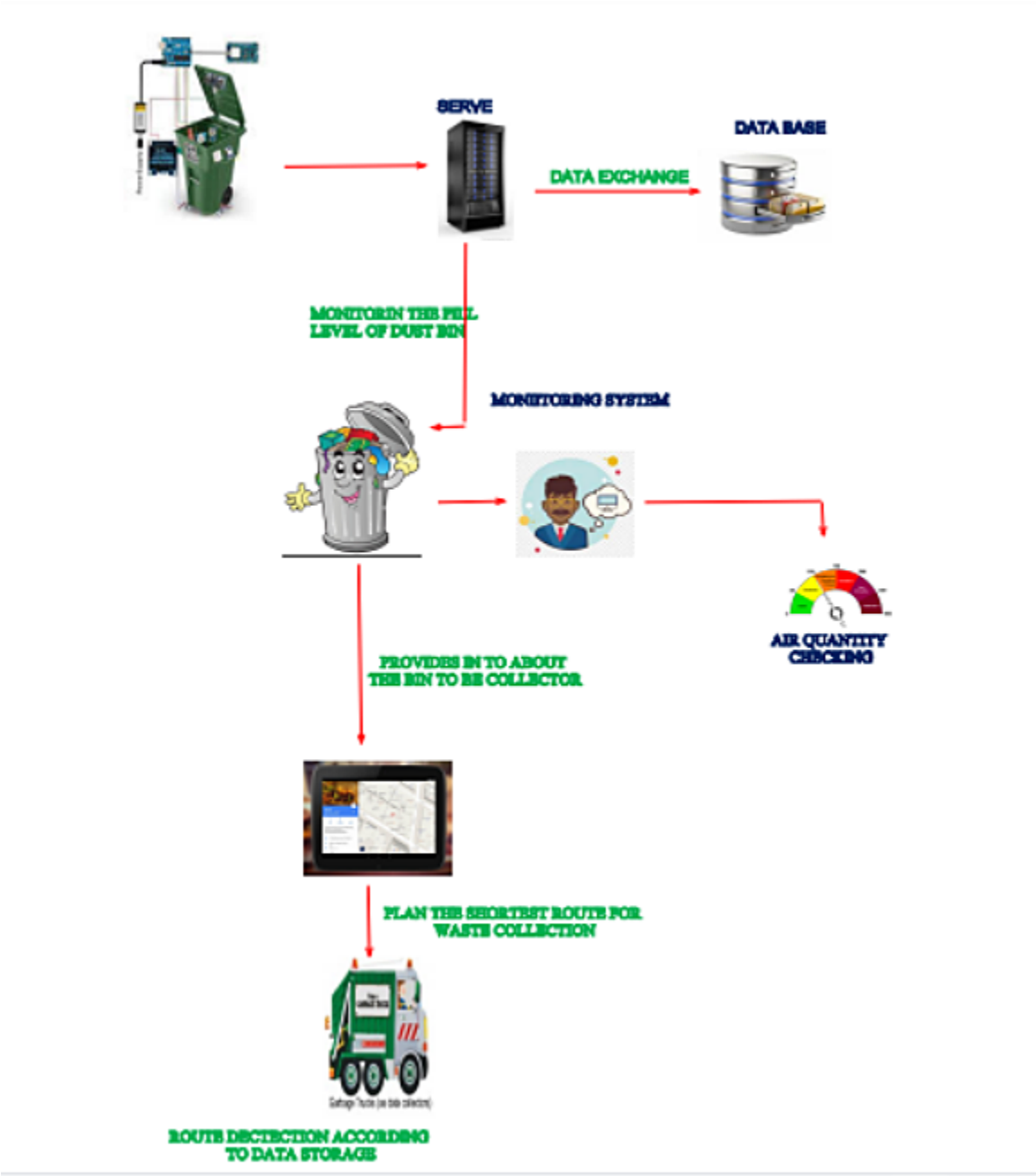
2. Then, the bin is filled with more garbage until its level has surpassed the first threshold **value, which is set to 80% then the first warning SMS is being sent, as depicted**
3. The first notification SMS sent by the system, once the waste reaches the level of 85% full
4. The second notification SMS sent by the system, indicating that bin is at least 95% full and **the garbage needs to be collected immediately**

5. Locations prone to overflow
6. The number of bins needed to avoid overflowing waste
7. The number of collection services that could be saved
8. The amount of fuel that could be saved
9. The driving distance that could be saved

Data flow diagram:



5.2 Solution & Technical Architecture:



5.3Userstories:

USER TYPR	FUNCTIONAL REQUIREMW NT (EPIC)	USER STORY NUMB ER	USER STORY/TASK	ACCEPTANCE CRITERIA	PRIORITY	RELEASE
Admin (who manage web	Logic	USN-1	Ass an admin,I gave user id and pass word for ever workers and manage them	I can manage web account/ dashboard	Medium	Sprint-2
CO ADMIN	Logic	USN-2	Asa co admin,I an manage garbageget filling alert i will post	I can manage garbage monitoring	High	Sprint-1
Truck driver	Logic	USN-3	A struck drive,I am follow the rout sebd by co admin to reach the filling garbage	I can vdrive to reach the garbage filled route in pulled to	Medium	Sprint-2
Local garbage collector	Logic	USN-4	As a waste collector, I am collect all there trash from garbage and local into garbage truck and send them to landfill it	I can collect trash and pulled to truck and send off	High	Sprint-2
Municipality	Logic	USN-5	As municipality Iam check the process are happening in disciplinemanner without any any issuse	I can manage all these process goi ng good	High	Sprint-2

6.PROJECT PLANNING & SCHEDULING:

6.1Sprint Planning & Estimation:

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gatheringinformation by referring the,technical papers,research publications etc.	28 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvasto capture the user Pains & Gains, Prepare list of problemstatements	24 SEPTEMBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	25 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	23 SEPTEMBER 2022
Problem Solution Fit	Prepare problem - solution fit document.	30 SEPTEMBER 2022
Solution Architecture	Prepare solution architecture document.	28 SEPTEMBER 2022
Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	20 OCTOBER 2022
Functional Requirement	Prepare the functional	8 OCTOBER 2022

	requirement document.	
Data Flow Diagrams	Draw the data flow diagrams and submit for review	9 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram	10 OCTOBER 2022
Prepare Milestone & ActivityList	Prepare the milestones & activity list of the project.	22 OCTOBER 2022
Prepare Milestone & ActivityList	Develop & submit the developed code by testing it.	IN PROGRESS.

6.2 Sprint Delivery Schedule:

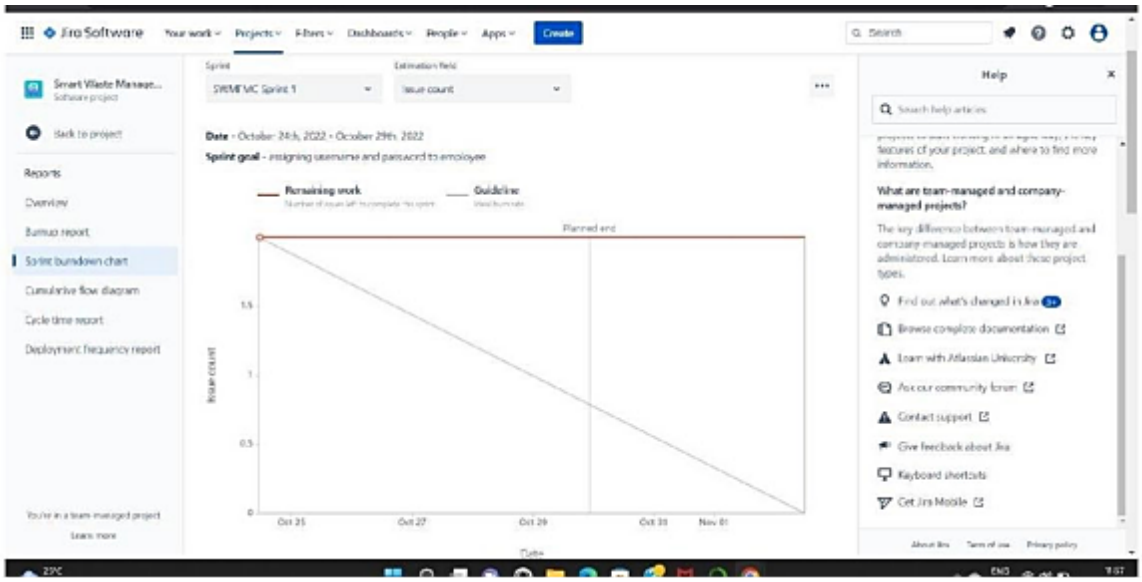
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Login	USN-1	1.As a Administrator, I need to give user id and passcode for ever workers over there in municipality. 2.As a Co-Admin, I'll control the waste level by monitoring them vai real time web portal. Once the filling happens, I'll notify trash truck with location of bin with bin ID	20	HIGH	GANGA
Sprint-2	Dashboard	USN-2	As a Truck Driver, I'll follow Co-Admin's Instruction to reach the filling bin in short roots and save time	20	LOW	NIVETHITHA
Sprint-3	Dashboard	USN-3	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	SARASWATHI
Sprint-4	Dashboard	USN-4	As a Municipality officer, I'll make sure everything is proceeding as planned and without any problems	20	HIGH	KABISHENA

Project Tracker, Velocity & Burndown Chart:

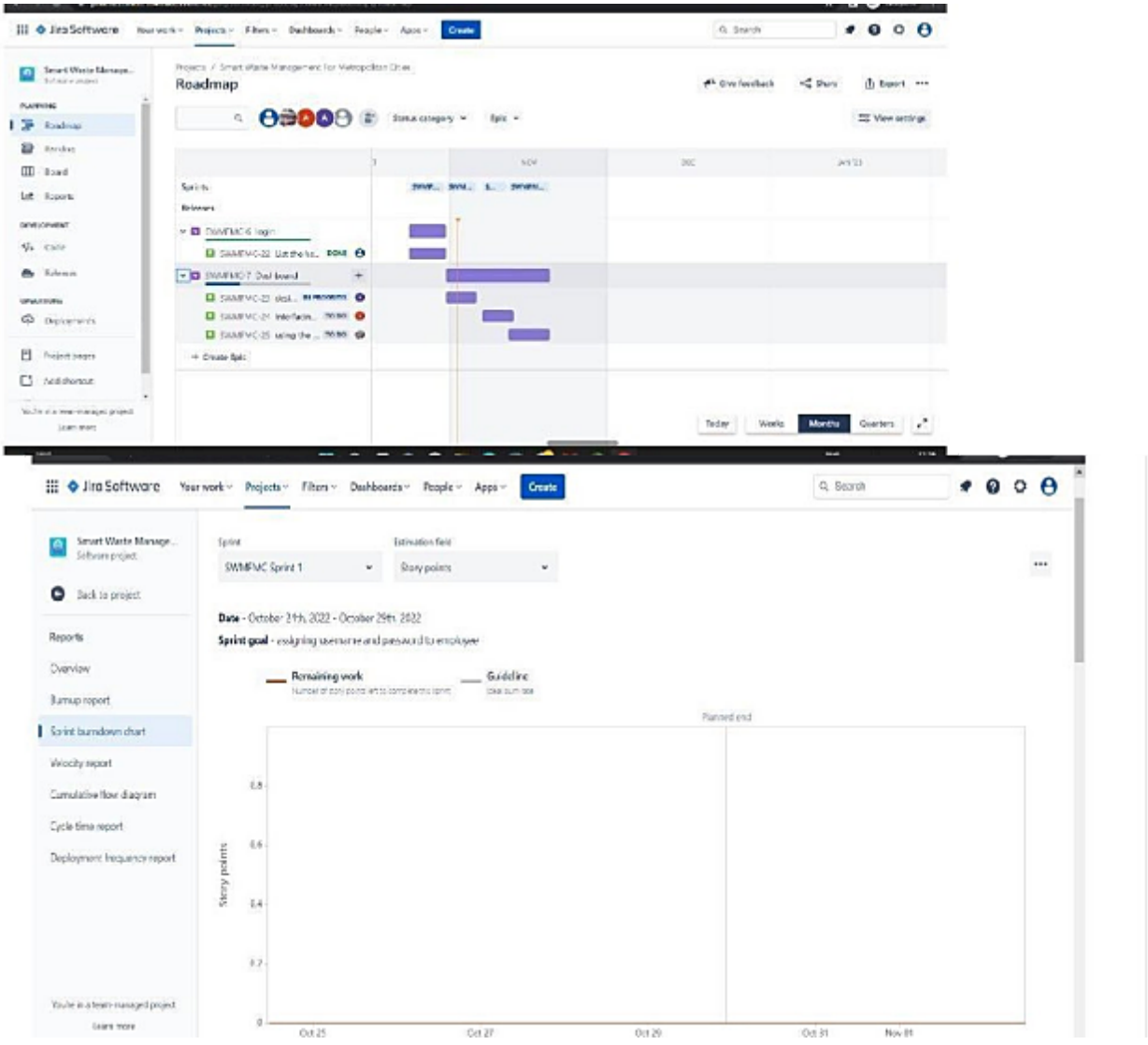
Sprint	Total Story Points	Duration	Sprint StartDate	Sprint End Date (Planned)	Story Points Completed (Planned EndDate	SprintReleaseDate (Actual)
Sprint-1	20	6 days	22 Oct 2022	27 Oct 2022	20	06 Nov 2022
Sprint-2	20	6 days	31 Oct 2022	05 Oct 2022	30	07 Nov 2022
Sprint-3	20	6 days	07 Oct 2022	12 Oct 2022	40	08 Nov 2022
Sprint-4	20	6 days	14 Oct 2022	19 Oct 2022	50	09 Nov 2022

6.3 Reports from JIRA:

Burnout Chart:

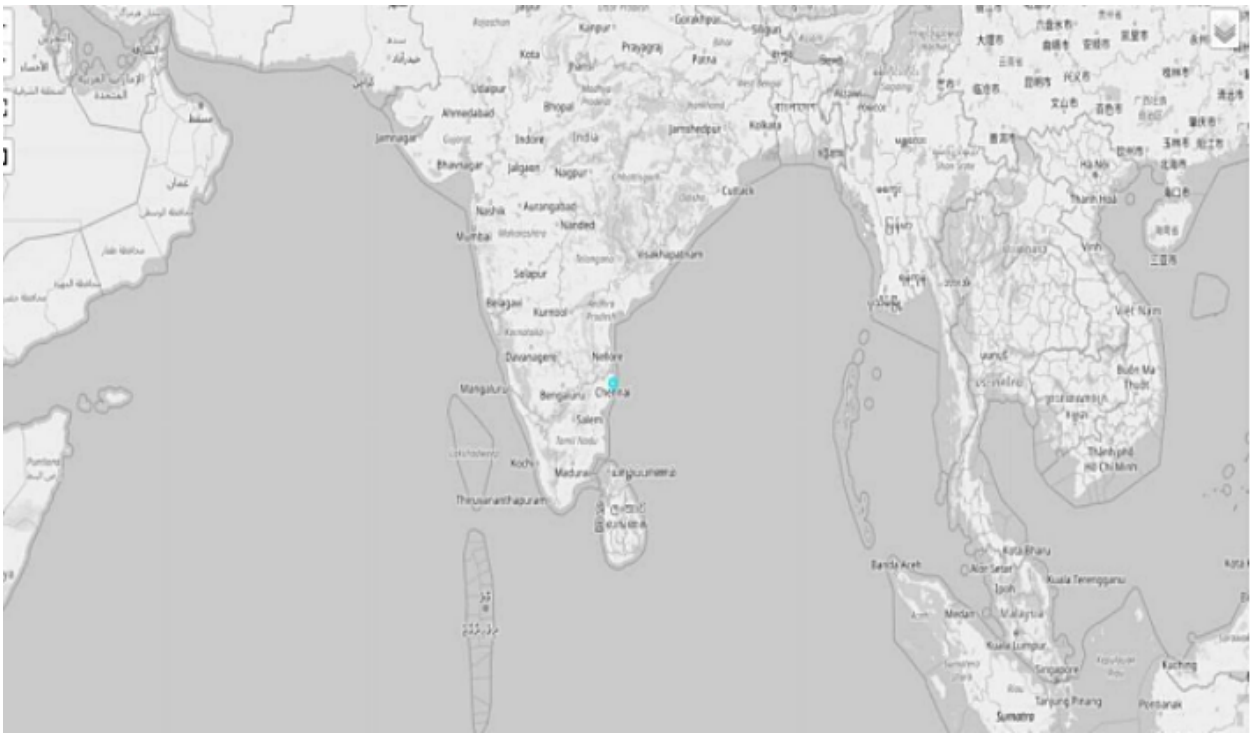


Road map:

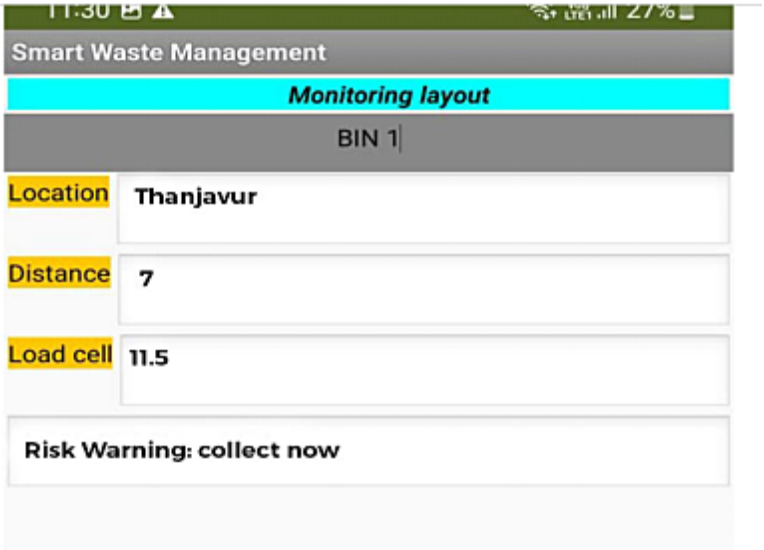

Jira Software
Roadmap
Today
Weeks
Months
Quarters
Jira Software
Your work
Projects
Filters
Dashboards
People
Apps
Create
Search
Sprint
SWMFMC Sprint 1
Estimation field
Story points
Date - October 21th, 2022 - October 25th, 2022
Sprint goal - assigning username and password to employee
Remaining work
Guideline
Planned end
Back to project
Reports
Overview
Burnup report
Sprint burndown chart
Velocity report
Cumulative flow diagram
Cycle time report
Deployment frequency report
Story points
Oct 25
Oct 27
Oct 29
Oct 31
Nov 01

7. CODING & SOLUTIONING:

Feature 1- LOCATION TRACKER:



Feature 2- LIVE UPDATE ON COLLECTED DATA



8. Testing:

8.1 Testcases:

Date					11-Nov-22						
Team ID					PNT2022TMID46746						
Project Name					PROJECT-Smart Waste Management System for Metropolitan Cities - IOT						
Maximum Marks					4 marks						
Test case ID	**Feature Type-Bin Level**	**Component**	**Test Case Scenario**	**Pre-Requisite**	**Availability**	**Test Condition**	**Expected Result**	**Actual Result**	**Status**	**Comments**	**Accessed By**
Test case 1	Empty	Ultrasonic Sensor	When Bin is empty	Ultrasoncic sensor PIR	Bin is accessible to users	Bin Level == 0	Displays Bin level and space	Working as expected	Pass		User
Test case 1	Accessible	Ultrasonic Sensor	When bin level is below 50 %	Ultrasoncic sensor , PIR	Bin is accessible to users	Bin Level < 50	Displays Bin level and space	Working as expected	Pass		User
Test case 3	Accessible	Ultrasonic Sensor	When bin level is above 50	Ultrasoncic sensor , PIR	Bin is accessible to users and the	Bin Level > 50	Displays Bin level and space	Working as expected	Pass		User
Test case 4	Accessible	Ultrasonic Sensor	When bin level is below 75 %	Ultrasoncic sensor , PIR	Bin is accessible to users and the	Bin Level < 75	Displays Bin level and space	Working as expected	Pass		User
Test case 5	Limit exceeded	Ultrasonic Sensor	When bin level is above 75 %	Ultrasoncic sensor , PIR Motion sensor	Bin is not accessible to the users, the admin	Bin Level > 75	Displays Bin is FULL and Seals the bin.	Working as expected	Pass	The system starts to sense the	User/Admin

	Test Scenarios
1	Garbage Bin Does not have waste in it
2	The garbage bin is filled to its intermidiate level
3	The Garbage bin is filled above the intermidiate level
4	Garbage bin is filled to its maximum level
5	The Garbage level is exceded the specified threshold level

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	78

Test Case Analysis:

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

Section	Total Cases	Not Tested	Fail	Pass
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:

			NFT - Risk Assessment						
S.No	Project Name	Scope/feature	unctional Change	Hardware Changes	Software Changes	Impact of Downtime	Load/Volume Changes	Risk Score	Justification
1	Smart Waste m	New	Low	No Changes	Moderate	nil	>5 to 10%	ORANGE	
2	Smart Waste m	Existing	Moderate	No Changes	Moderate	moderate	>5 to 10%	GREEN	
3	Smart Waste m	Existing	No Changes	No Changes	Moderate	nil	>5 to 10%	GREEN	

NFT - Detailed Test Plan				
S.No	Project Overview	NFT Test approac	ptions/Dependencies	Approvals/SignOff
1	Smart Waste managemer	The test was done	It is assumed that the	Completed

End Of Test Report								
S.No	roject Overvie	FT Test approac	NFR - Met	Test Outcome	O/NO-GO decisio	Recommendations	Identified Defects (Detected/Closed/Open)	Approvals/SignOff
1	Smart Waste	The Load Test	Green	The test result was positi	Approved	None	The identified defects have b	Completed

	A	B	C	D	E	F
1	NFT Test approach					
2		The Load Test was done by sending massive amounts of data from the IoT kit. Since we have leveraged the IBM WATSON IoT platform, the load test passed successfully.				
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						

10. ADVANTAGES & DISADVANTAGES

ADVANTAGES:

1. Reduction in Collection Cost
2. No Missed Pickups
3. Reduced Overflows
4. Waste Generation Analysis
5. CO_2 Emission Reduction

DISADVANTAGES:

1. System requires a greater number of waste bins for separate waste collection as perpopulation in the city.
2. This results into high initial cost due to expensive smart dustbins compare to othermethods. 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

PROGRAM: (python script)

```
 import ibmiotf.application
 import ibmiotf.device
 import time
import random
 import sys
# watson device details
organization ="7tbblb"
devicType ="IBM1"
 deviceId ="IBM1ID"
authMethod="use-token-auth"
 authToken="123456789"
 #generate random values for randomo variables (temperature&humidity) def
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,"authmethod":authMethod,"authtoken":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 %"
 else:
 load = "0 %"
 if distance < 15:
dist = 'Risk warning:' 'Dumpster poundage getting high, Time to collect :) 90 %'
elif distance < 40 and distance >16:
 dist = 'Risk warning:' 'dumpster 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 :' ' Dumpster poundage getting high, Time to collect :)'
 elif load == "60 %" or distance == "60 %":
warn = 'alert :''dumpster is above 60%'
else :
 warn = 'alert :' 'No need to collect right now '
 def myOnPublishCallback(lat=10.678991,long=78.177731):
print("Gandigramam, Karur")
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)

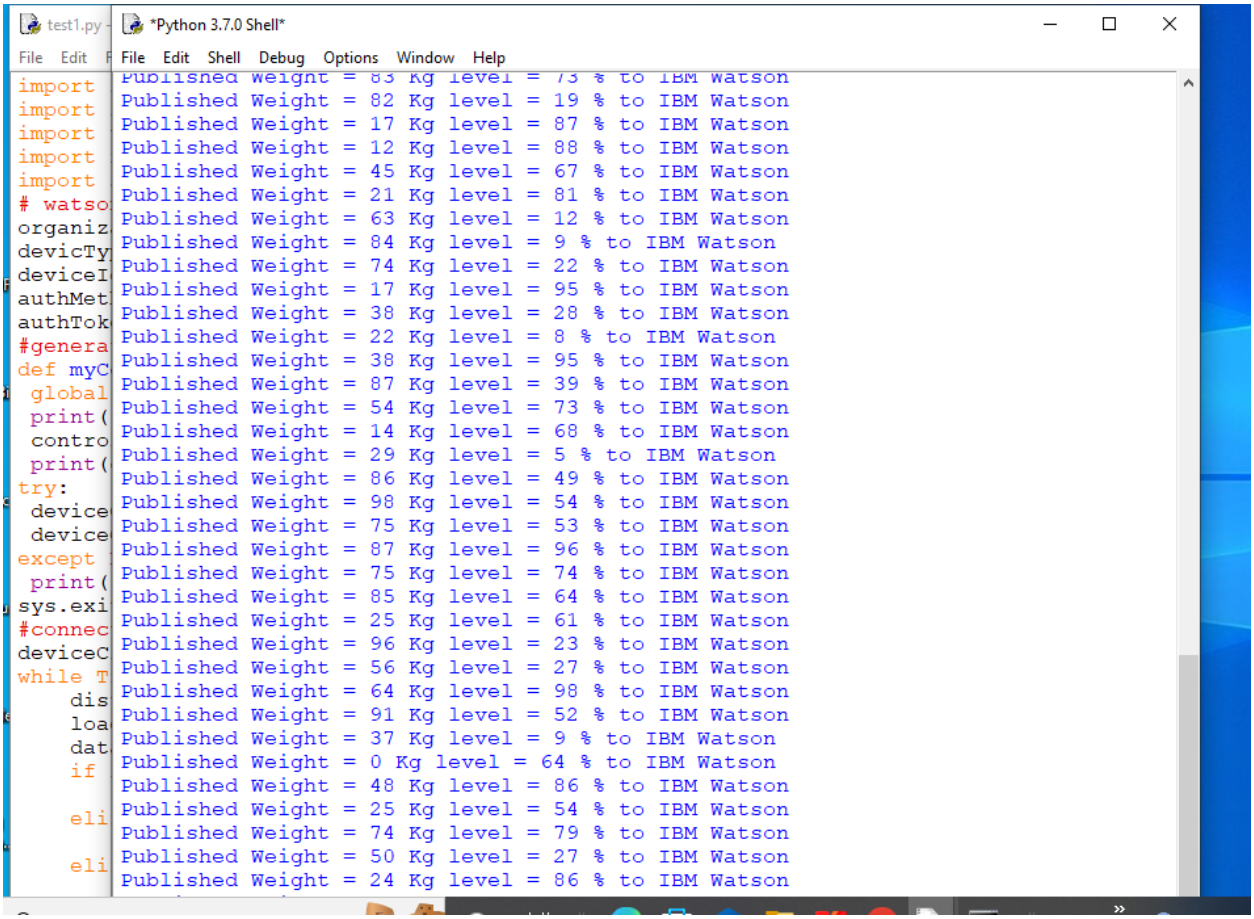
if not success:

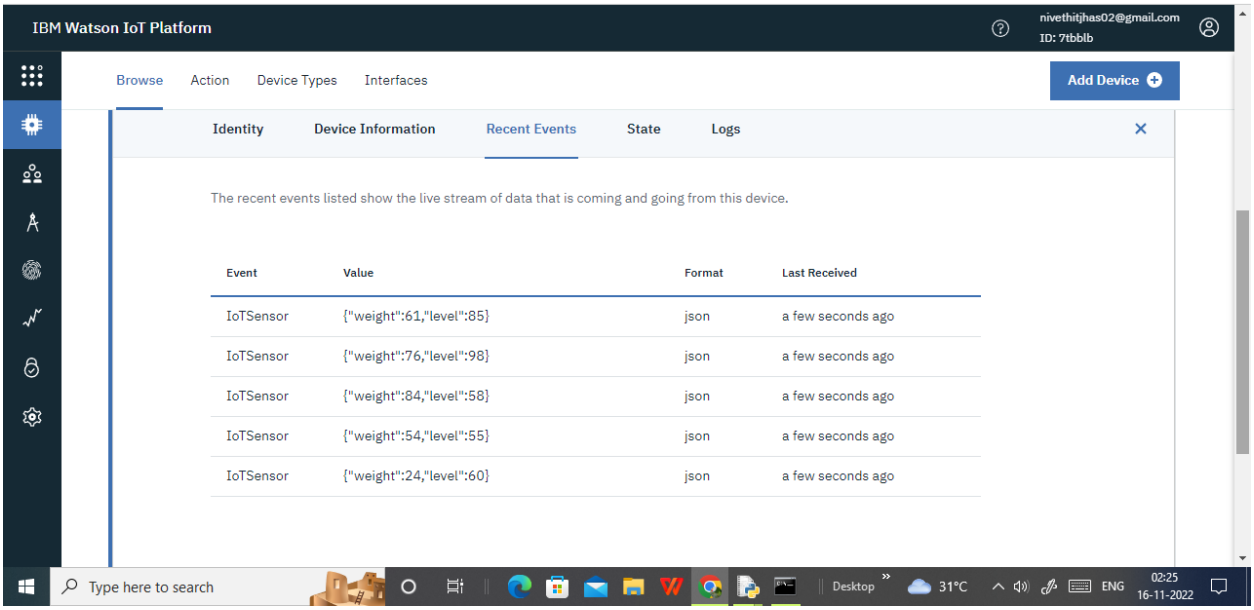
print("not connected to ibmiot")

time.sleep(30)

deviceCli.commandCallback=myCommandCallback

#disconnect the device deviceCli.disconnect





13.Appendix:

```
    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:' 'Dumpster poundage getting high, Time to
collect :) 90 %'

                    elif distance < 40
and distance >16:
          dist = 'Risk warning:' 'dumpster 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: Dumpster poundage getting high,
Time to collect :)'                    elif
load == "60 %" or distance == "60 %":
                         warn = 'alert :'
```

GitHub Link:

https://github.com/IBM-EPBL/IBM-Project-44357-1660724321

Demo Link:

https://drive.google.com/file/d/1lYi-PlbFpMrd2gtpuSwMdV0GzpXCl-n5/view?usp=sharing