Report Document

Project Title

SMART WASTE MANAGEMENT SYSTEM FOR METEROPOLITAN CITIES

CATEGORY: IOT

BY

SRI VENKATESWARAA COLLEGE TECHNOLOGY, SRIPERAMBDUR, VADAKAL.

DEPARTMENT OF

ELECTRONICS AND COMMUNICATION ENGINEERING

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BALA AMUTHA D - 412619106003

Project Report

INTRODUCTION

Project Overview:

One of the major problems in metropolitan cities is collection, Manage and disposal of waste. The trash we generate which Produce more emission that affects us for long term.

The purposes of using IOT in waste management are route Optimization, collection and recycling of waste.

The advent of Internet of Things (IOT) technologies facilitates the progress of clean atmosphere and to lead a healthy life style

Work flow of the project:

Project Description:

- Garbage level detection in bins.
- Getting the weight of the garbage in the bin.
- Alerts the authorized person to empty the bin whenever the bins are full.
- Garbage level of the bins can be monitored through a web App.
- We can view the location of every bin in the web application by sending GPS location from the device.

Software Required:

Python, IOT Cloud Platform , IBM Cloud,Node- RED, IBM IoT Platform, IBM Nodered, IBM Cloudant DB

System Required:

8 GB RAM, Intel Core i3, OS Windows/Linus/MAC,Laptop or Desktop

Purpose:

- One of the objectives was to improve trash management in order to cut expenses, lower CO2 emissions, and generally promote a greener and more sustainable city.
- A waste management system is a technique used by an organization to dispose of, reduce, reuse, and prevent waste.
- Enables workers to empty bins before they fill up with waste or recyclables and before an infestation becomes a problem.
- Every government has a responsibility to safeguard citizens' health and save resources.

LITERATURE SURVEY

1. Adapting food supply chains in Smart Cities to address the impacts of COVID19 a case study from Guadalajara metropolitan area

B. Baena *et al.,*"Adapting food supply chains in Smart Cities to address the impacts of COVID19 a case study from Guadalajara metropolitan area," *2020 IEEE International Smart Cities Conference (ISC2).*This article focuses on the food supply chain and aligns with the United Nations Sustainable Development Goal of Zero Hunger. They are looking to avoid food waste where Smart Cities must work. Food waste requires innovation with technology to change consumer's behaviors, efficient supply chain management, and innovative food production systems not to harm the environment. Among the economic impact, water and carbon footprint affects vital performance indicators into a Smart City. Hence, this work considers water and carbon footprint, as well as economic impact. We contribute to the Smart Cities, providing a multi-Agent simulation able to be scaled with an ontology with the purpose to plot different scenarios to stakeholders in a Smart City and help to avoid food waste situations. To simplify the simulation, as

preliminary work, we used a typical food in Guadalajara Metropolitan Area, which is a Taco. The model covers a community in the Zapopan Municipality, where a developed urban study is the first proof of the system's concept. Furthermore, based on the simulation scenarios fed with real, local data, we discussed how we can integrate this multi-agent platform to face COVID-19. Finally, we want to help family businesses on the food supply chain using information technologies and applying digital processes to better adapt to new operation rules since COVID-19 to fight food waste since COVID-19.

2. Deep Learning based Smart Garbage Classifier for Effective Waste Management

S. R., R. P., V. S., K. R. and G. M., "Deep Learning based Smart Garbagem Classifier for Effective Waste Management," *2020 5th International Conference on Communication and Electronics Systems (ICCES).*India is the second most populated country in the world and it is still facing hindrances to its development on waste management. It is believed that 10 million tons of waste is produced just by the metropolitan cities in India. In this work, a way to classify the waste and find the category of it is proposed with a well-defined and labelled data set of images consisting of categories (plastic, paper, cardboard, metals) using Convolutional Neural Network (CNN). Images are categorized based on their properties by the help of a self-learning neural network. The designed classifier learns from the image data provided for training purpose. The classifier uses the method of supervised learning where the algorithm learns from a labelled data set. With this method a testing accuracy of 76% is achieved.

3. Smart waste management using Internet of Things: A survey

K. N. Fallavi, V. R. Kumar and B. M. Chaithra, "Smart waste management using Internet of Things: A survey," *2017 International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud) (I-SMAC).* At present solid waste management is a major concern in the metropolitan cities of the developing and developed countries. As the population is growing, the garbage is also increasing. This huge unmanaged accumulation of garbage is polluting the environment, spoiling the beauty of the area and also leading to the health hazard. In this era of Internet, IOT (Internet of Things) can be used effectively to manage this solid waste. In this paper, we have discussed the definition of Internet of Things and its elements, testing and prototyping tool cooja simulator and finally the study of various literatures available on smart waste management system using IOT.

4. Internet of Things based Intelligent Waste Segregation and Management System for Smart Home Application

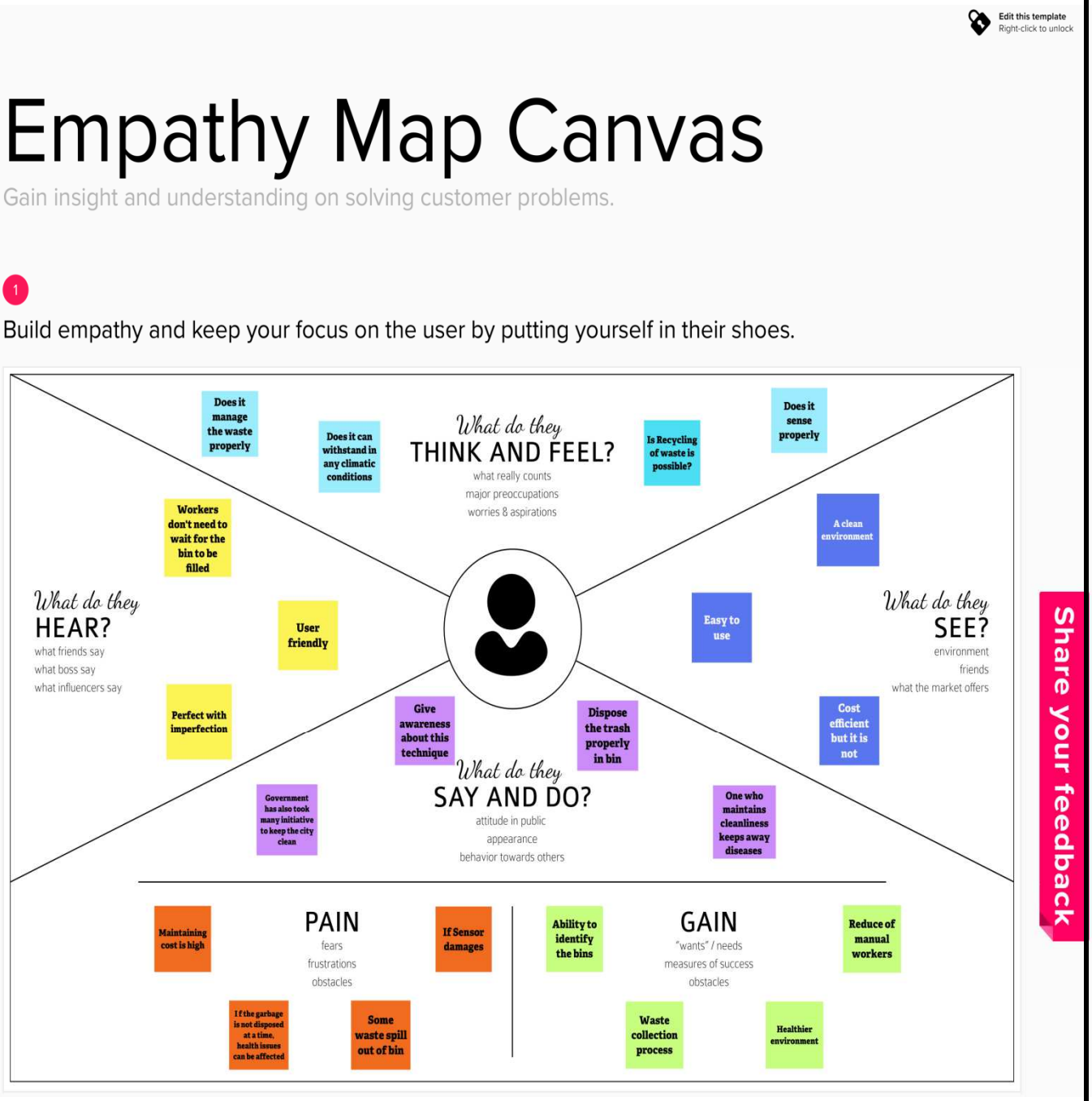
M. Bhuvaneswari, K. Tansin, S. T. Ahamed, N. T. Sri Ram and S. V. Prasath, "Internet of Things based Intelligent Waste Segregation and Management System for Smart Home Application," *2022 7th International Conference on Communication and Electronics Systems (ICCES).*The Internet of Things (IoT) has a significant impact on research for real time data monitoring. Waste segregation and control based on IoT is a significant task in metropolitan cities and municipal corporations. The advancement of key enabling technologies dependent on IoT enabled devices. Waste segregation and disposal mechanisms are among the severe problems associated with smart cities, which have a negative impact on our society and health. The trash bin monitoring and control is carried out through a microcontroller is proposed in this work. An IoT enabled smart bin utilizes a microcontroller with multiple sensors will control the process. In this paper, use inductive proximity sensors to detect metal trash, while temperature and humidity sensors are used to segregate as wet and organic wastes. The bin filling level is monitored using Infrared sensors. IoT with sensor communication module allows remote control of real-time data collection at each home. While Bluetooth allows for short-range waste monitoring via a mobile app. Waste is piled at various levels in the trash bins. The centralized controller is enabled and the filled bins are managed effectively with the deep learning technique. The waste collection is monitored by setting up a training model based on Deep Learning (DL). The intelligent GUI will track the unfilled levels of each trash bin as proposed.

5. Solid Waste Management Models: Literature Review

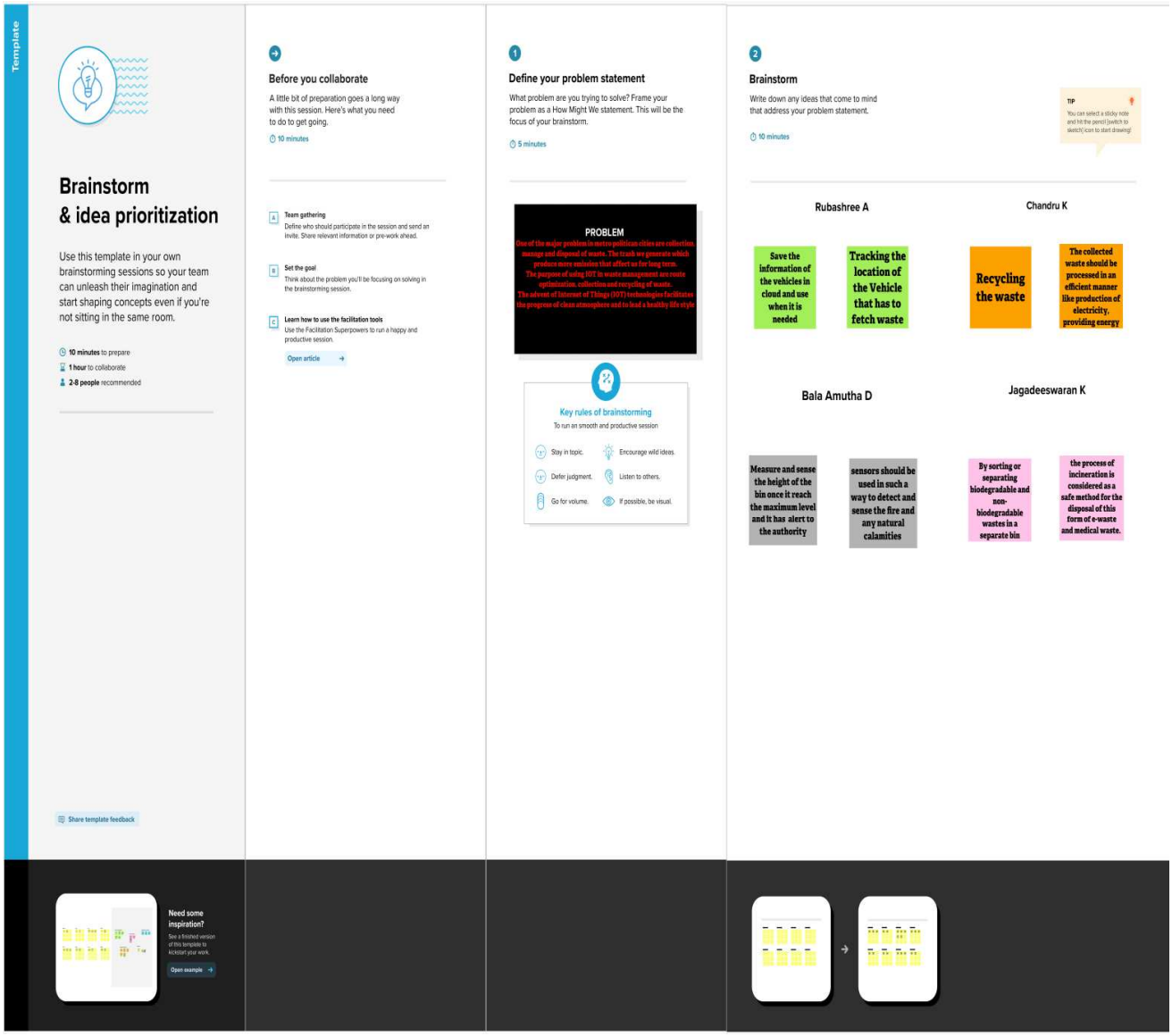
N. P. Adriyanti, A. Gamal and O. C. Dewi, "Solid Waste Management Models: Literature Review," *2018 2nd International Conference on Smart Grid and Smart Cities (ICSGSC).*Waste has always been a serious problem, not only to the environment but also to the economic and social aspect. Solid waste management models are created to solve waste problems in different aspects and areas. Many models were made to tackle waste problems in cities or metropolitan areas. Yet, there are no specific solid waste management models that are made specifically for villages that undergo a transition to a city and it is affecting both natural and social environment in the area. A literature study was done to see which existing model could be applied to Indonesia's transitioning villages through the lenses of sustainable urban planning by reviewing ten existing models. The conclusion from the literature study is that solid waste management model needs to emphasize (1) the participation of local communities, (2) the pattern of waste transport and the type of waste management that does not require a large financial burden, (3) management infrastructure that can be made / held by the community / local organizations.

IDEATION & PROPOSED SOLUTION:

Empathy Map Canvas:



Ideation & Brainstorming:

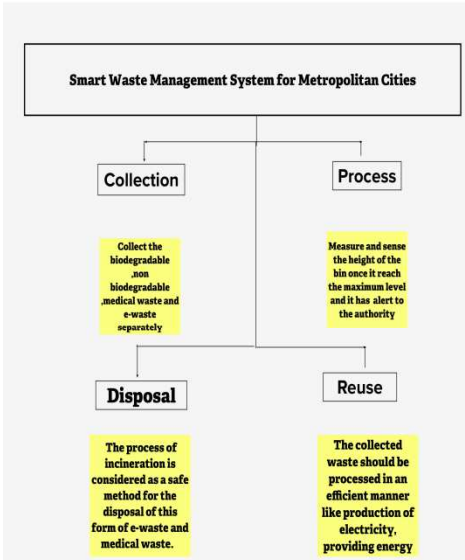


3

Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

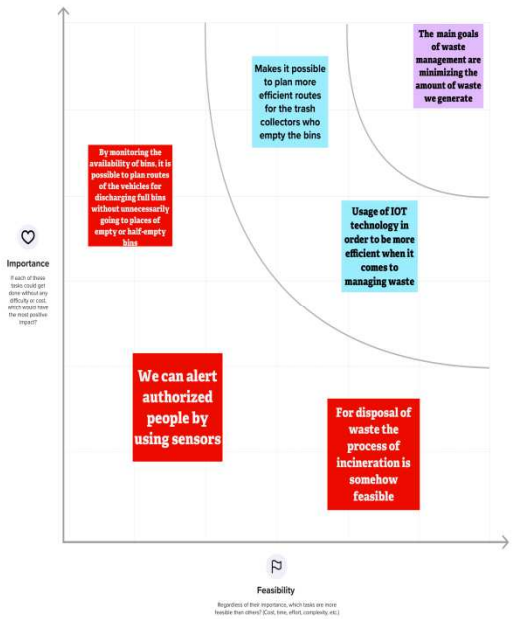


4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

20 minutes



After you collaborate

You can export the mural as an image or pdf to share with members of your company who might find it helpful.

Quick add-ons

Share the mural
Share a view link to the mural with stakeholders to keep them in the loop about the outcomes of the session.

Export the mural
Export a copy of the mural as a PNG or PDF to attach to emails, include in slides, or save in your drive.

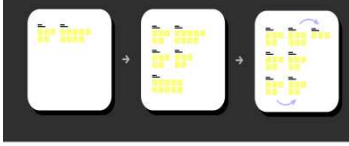
Keep moving forward

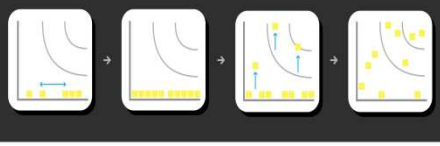
Strategy blueprint
Define the components of a new idea or strategy.
Open the template →

Customer experience journey map
Understand customer needs, motivations, and obstacles for an experience.
Open the template →

Strengths, weaknesses, opportunities & threats
Identify strengths, weaknesses, opportunities, and threats (SWOT) to develop a plan.
Open the template →

Share template feedback





PROJECT DESIGN PHASE 1

PROPOSED SOLUTION TEMPLATE

Date	October 2022
Team ID	PNT2022TMID38320
Project Name	Smart Waste Management System For Metropolitan Cities
Maximum Marks	2 Marks

PROPOSED SOLUTION TEMPLATE:

S.NO	PARAMETER	DESCRIPTION
1.	Problem statement	One of the major problem in metropolitan cities are collection, manage and disposal of waste. The trash we generate which produce more emission that affect us for long term. The purposes of using IOT in waste management are route optimization, collection and recycling of waste. The advent of Internet of Things (IOT) technologies facilitates the progress of clean atmosphere and to lead a healthy life style
2.	Idea / solution description	If the bins which reach the maximum level, then sensors sense and alert the authority. The trash collectors collect the waste and dispose waste properly.

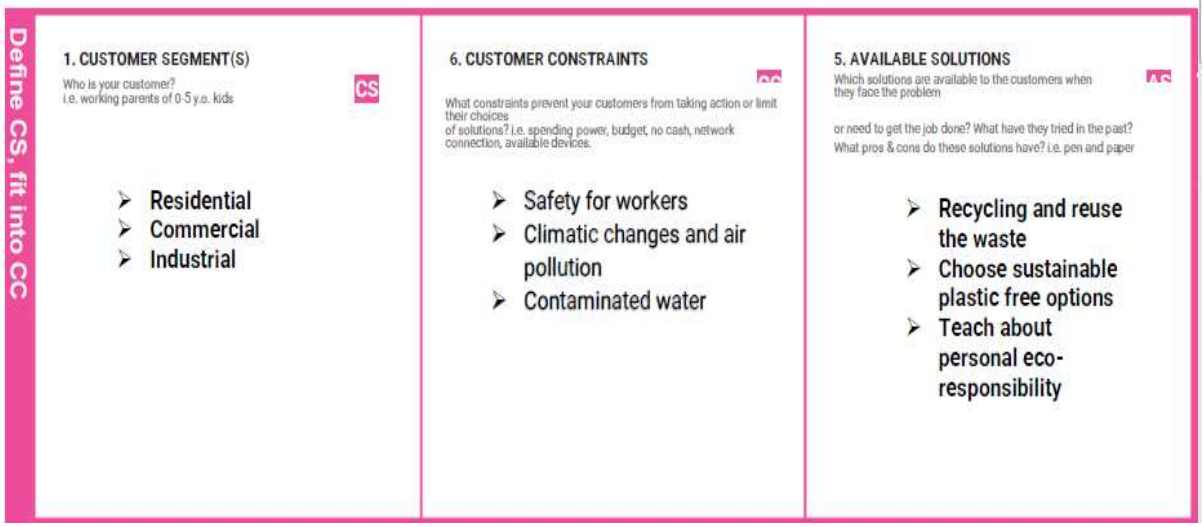
3.	Novelty / Uniqueness	Separate bins should be kept to collect bio-degradable and non bio-degradable waste in the metropolitan cities. The trash collecting vehicles can be tracked where it coming and notify the location to the civilians Eliminating unnecessary garbage truck trips lower carbon emission and reduces the transportation cost. Smart waste container minimize overflow, creating a cleaner and safer environment.
4.	Social Impact / Customer Satisfaction	➢ Real-time waste monitoring. ➢ Predictions for bin fullness. ➢ Detailed database of bins and stands. ➢ Interactive bin map including Street view. ➢ Route planning for waste collection. ➢ Overview of scheduled and executed routes. ➢ Database of citizen reports. ➢ Fire and tilt alarm
5.	Business Model	Waste Management generates revenue by providing residential, commercial, industrial, and municipal clients with a variety of disposal services and recycling solutions.

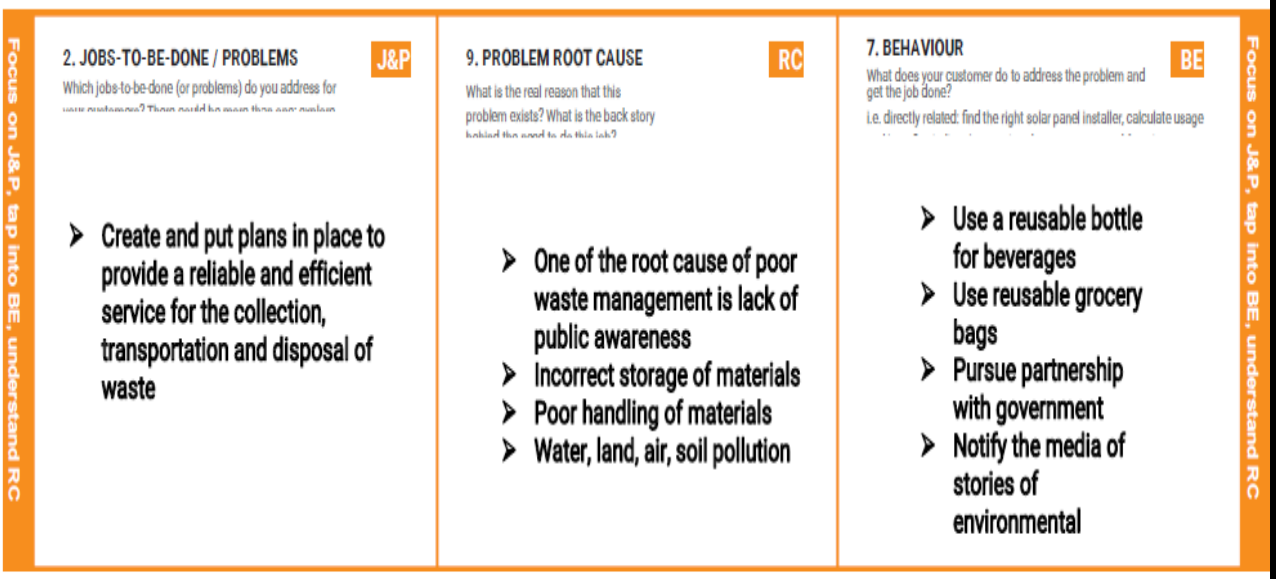
Problem Solution fit:

Project Title: Smart Waster Management System for Metropolitan Cities

Project Design Phase-I - Solution Fit Ter

Team ID: PNT2022TMID38320





3. TRIGGERS

TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

Strict rules and self-consciousness, it help the people to lead the clean atmosphere.

4. EMOTIONS: BEFORE / AFTER

EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

Before: People get panic to diseases and discomfort of their lifestyle

After: Peaceful lifestyle

10. YOUR SOLUTION

SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

Sensors sense and notify the authority. Trash collectors collect the waste and dispose in the appropriate places

8. CHANNELS of BEHAVIOUR

CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.

Online: Their report to the social media a bad impact how their faced the problem

Offline: Their complaint to the proper authorities

REQUIREMENT ANALYSIS:

Project Design Phase-II

Solution Requirements (Functional & Non-functional)

Date	October 2022
Team ID	PNT2022TMID38320
Project Name	Smart Waste Management System For Metropolitan Cities
Maximum Marks	4 Marks

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Employee ID
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	Design smart bins	Bins should be fitted with sensors to measure the weight, level, and placement of waste. cloud storage for data.
FR-4	Cloud computing	Obtain data from the sensors.act as a storage container. Calculate when the bin level and weight cross the threshold.

FR-5	Dashboard view	Display bin information in the Dashboard with an aesthetically pleasing UI. Give the proper pop-up warnings when the trash cansare full. Real-time bin surveillance.
FR-6	Alert system	Users of web applications should receive notifications.truck drivers with precise bin locations for waste collection through GSM module.

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	easy-to-use UI that is straightforward. Utilize single-page applications to improve user experience and reduce page load interruptions.
NFR-2	**Security**	Use password and OTP two-factor authentication for access from authorised users, and add captchas for extra protection.
NFR-3	**Reliability**	Use captcha for added security and password and OTP two-factor authentication for access from authorised users.

NFR-4	**Performance**	The web application should load quite quickly, and since the sensor data is gathered and processed remotely in the cloud, good performance is guaranteed.
NFR-5	**Availability**	This intelligent waste management system continuously monitors intelligent bins around the clock. Any upcoming module deployments for the web application can also happen without interferingwith the functionality of other pages. When a new module is deployed and the system is unavailable, acountdown is displayed to show when the system will be operational once more.
NFR-6	**Scalability**	In addition, the sensor technology in smart bins can be updated for greater accuracy, ensuring both vertical and horizontal scalability, if the municipality wishes to increase the number of trash cans in any location.

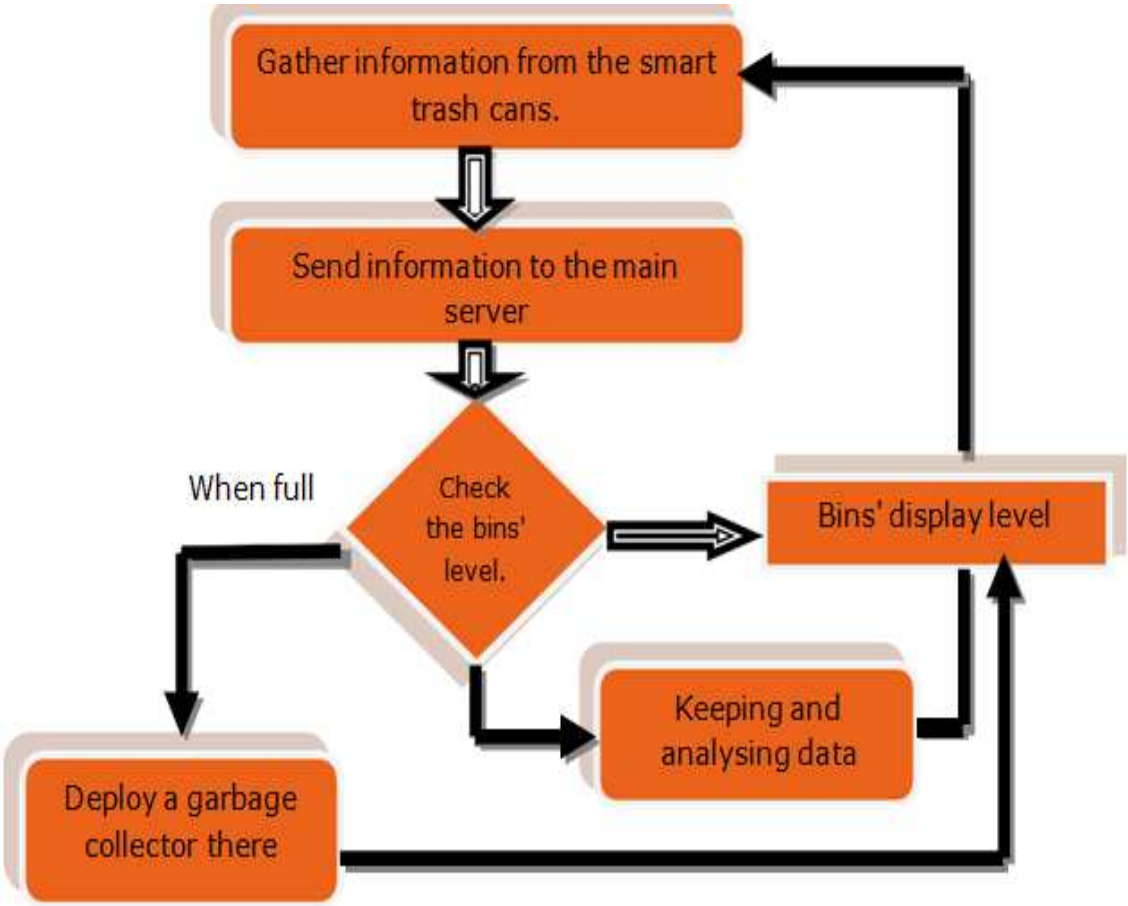
PROJECT DESIGN:

Data Flow Diagram

Date	October 2022
Team ID	PNT2022TMID38320
Project Name	Smart Waste Management System for Metropolitan Cities
Maximum Marks	4 Marks

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 wheredata is stored.

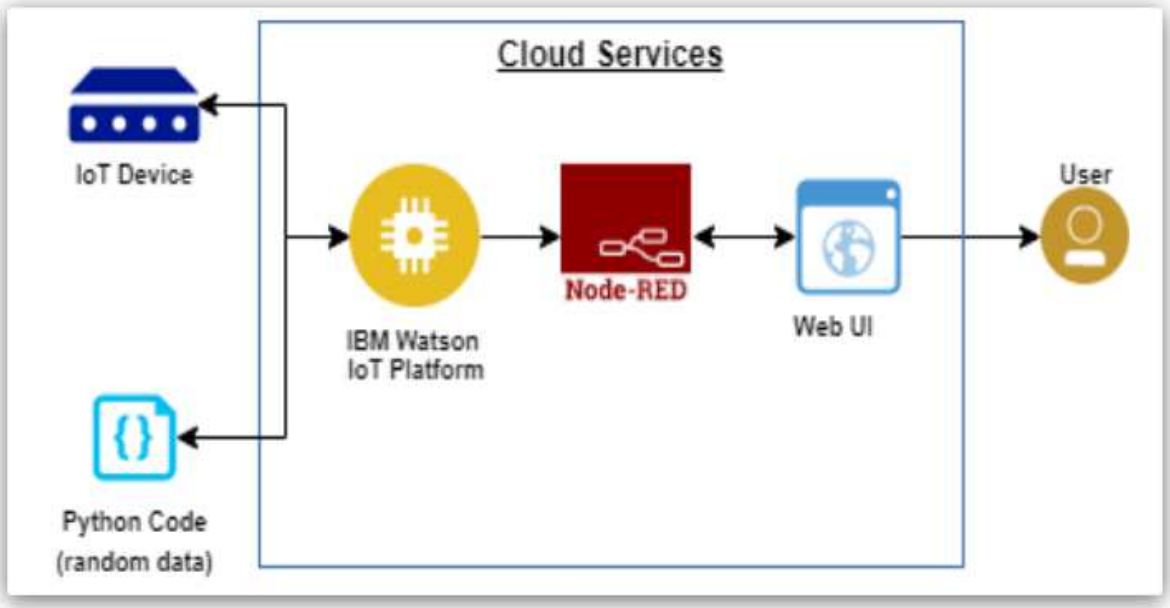


User Stories:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Web application user) – Municipality employee	Registration	USN-1	As a user, I can register for the application by entering my employee ID, email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
	Confirmation	USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
	Login	USN-3	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard	USN-4	As a user, I can access all resources inthe dashboard.	I can have access to all the features.	High	Sprint-2
	Monitoring	USN-5	As a user, I can monitor the status of the smart bins.	Now I can see the amount of trash in the bin, its weight,and where it is.	High	Sprint-2
	Alerting	USN-6	As a user, By providing the position of the bin via an SMS, I can remind the truck drivers to empty the trash.	Truck drivers can receive alert notifications from me.	High	Sprint-2
Customer (General Public)	Viewing	USN-7	As a user, I have access to several sites' smart bin statuses.	Without registering, I can view information on smart bins.	Medium	Sprint-3
Administrator	Creates and maintains	USN-8	As an admin, I am able to produce and update all bin-related data.	Without a permit, I have full access to the application.	High	Sprint-3
	Provide credentials	USN-9	As an admin, I have the ability to give or withdraw the municipality's login information.	I have access to their login and logout status.	Medium	Sprint-3

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
			employees.			
	Update smart bins in a locality	USN-10	As an admin, Any bins in that area can be added, deleted, or updated in the system by me.	I have complete access to the system and am allowed to add or remove bins as I see fit.	High	Sprint-3

Technical Architecture:



Technology Stack (Architecture & Stack):

Date	**October 2022**
Team ID	**PNT2022TMID38320**
Project Name	**Smart Waste Management System For Metropolitan Cities**
Maximum Marks	**4 Marks**

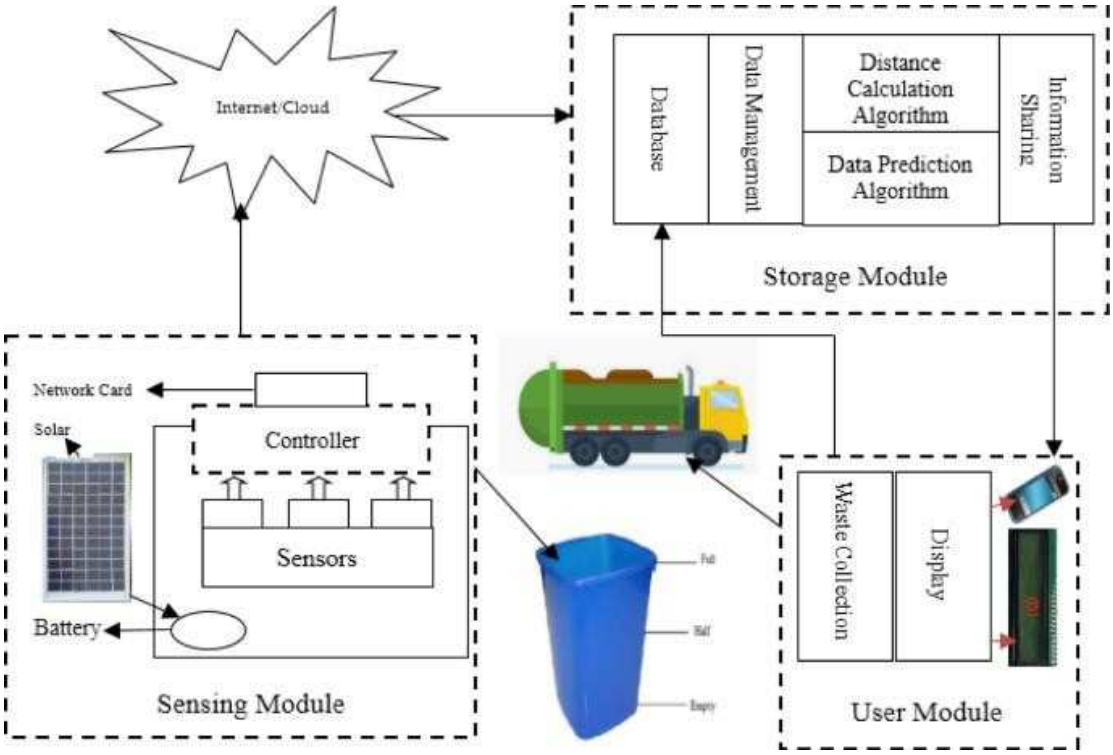


Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web Application	HTML, CSS, JavaScript, React Js
2.	Application Logic-1	Python is used to calculate the real-time weight of the bins, show it on the web site, and notify the authorities using data from the load cell and weight sensor.	Weight sensor /Load cell Python
3.	Application Logic-2	Python is used to calculate the real-time weight of the bins, show it on the web site, and notify the authorities using data from the load cell and weight sensor.	Level Sensor Python
4.	Application Logic-3	To find the trash cans	GPS module
5.	Cloud Database	Cloud database service	IBM DB2 IBM Cloudant
6.	File Storage	requirements for file storage	Git Hub Repository
7.	External API-1	When the bins are filled, load cell and level sensors are employed to monitor and send out alerts.	Sensor Technology
8.	External API-2	Give verification id	Aadhar API, etc.
9.	Infrastructure (Cloud)	Application Deployment on Local System / Cloud Configuration Local Server: localhost Cloud Server: IBM Configuration	Local, Web application

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	List the open-source frameworks used	Technology of Opensource framework
2.	Security Implementations	List all the security / access controls implemented, use of firewalls etc.	Technology used
3.	Scalable Architecture	Justify the scalability of architecture (3 –tier, Micro-services)	Technology used
4.	Availability	Justify the availability of application (e.g. use of load balancers, distributed serversetc.)	Technology used
5.	Performance	Design consideration for the performance of the application (number of requests per sec, use of Cache, use of CDN's) etc.	Technology used

Date: October 2022
Team ID: PNT2022TMID38320
Project Name: Smart Waste Management System For Metropolitan Cities

Document an existing experience

Narrow your focus to a specific scenario or process within an existing product or service. In the **Steps** row, document the step-by-step process someone typically experiences, then add detail to each of the other rows.

PROJECT PLANNING & SCHEDULING:

Milestone and Activity List

Date	22 October 2022
Team ID	PNT2022TMID38320
Project Name	Project - **Smart Waste Management System For Metropolitan Cities**

Milestone and Activity list for- Smart Waste ManagementSystem For Metropolitan Cities

S.NO	TITLE	DESCRIPTION	DATE
1.	**Literature Survey & Information Gathering**	Literature survey on the selected project & gathering information by referring to technical papers,research publications etc.	28 SEPTEMBER 2022
2.	**Prepare Empathy Map**	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	24 SEPTEMBER 2022
3.	**Ideation**	List them by organizing the brainstorming session and prioritizethe top 3 ideas based on feasibility & importance.	25 SEPTEMBER 2022
4.	**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
5.	**Problem Solution Fit**	Prepare problem - solution fitdocument.	30 SEPTEMBER 2022

6.	**Solution Architecture**	Prepare a solution architecture document.	28 SEPTEMBER 2022
7.	**Customer Journey**	Prepare the customer journey maps to understand the user interactions &experiences with the application (entry to exit).	16 OCTOBER 2022
8.	**Functional Requirement**	Prepare the functional requirement document.	16 OCTOBER 2022
9.	**Data Flow Diagrams**	Draw the data flow diagrams and submit for review.	15 OCTOBER 2022
10.	**Technology Architecture**	Prepare the technology architecture diagram.	14 OCTOBER 2022
11.	**Prepare Milestone & Activity List**	Prepare the milestones & activitylist of the project.	22 OCTOBER 2022
12.	**Project Development - Delivery of Sprint-1, 2, 3 & 4**	Develop & submit the developed code by testing it.	IN PROGRESS…

Project Planning Phase

Date	21 October 2022
Team ID	PNT2022TMID38320
Project Name	**SMART WASTE MANAGEMENT SYSTEM For Metropolitan Cities**
Maximum Marks	8 Marks

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

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1		US-1	Develop the IBM Cloud services required for this project.	6	High	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint-1		US-2	The IBM Cloud services necessary for this project should be developed.	4	Medium	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint-1		US-3	The creation of the IBM Watson IoT platform serves as the intermediary between web applications and IoT devices.	5	Medium	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint-1		US-4	Create a device in the IBM Watson IoT platform and obtain the device credentials to connect the IoT device to the IBM cloud.	5	High	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A

Sprint-2		US-1	Set up the connection security and generate the API keys needed by the Node-RED service to connect to the IBM IoT Platform.	10	High	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint-2		US-2	Establish a Node-RED service.	10	High	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint-3		US-1	Create a Python script to publish arbitrary sensor data to the IBM IoT platform, including Load cell, IR sensor, and GSM/GPS data.	7	High	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Story Points**	**Priority**	**Team Members**
Sprint-3		US-2	Following the development of Python code, commands simply output the statements that describe device control.	5	Medium	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint-3		US-3	Send information to the IBM Cloud	8	High	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint-4		US-1	In Node-Red, create a web user interface.	10	High	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A
Sprint-4		US-2	Set up the Cloudant DB nodes to store the incoming sensor data in the Cloudant DB and the Node-RED flow to receive data from the IBM IoT platform.	10	High	Chandru K Bala Amutha D Jagadeeswaran K Rubashree A

Project Tracker, Velocity & Burn down Chart: (4 Marks)

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

CODING & SOLUTIONING

Feature 1

- REMOTE WASTE LEVEL MONITORING
- ENERGY EFFICIENT

Feature 2

- HYGIENIC
- DURABLE & LONG LIFE

Result:

The project of Smart Waste Management System for Metropolitan Cities application was executed successfully

Advantages:

- ❖ Make your city smart.
- ❖ Increase Productivity and Performance.
- ❖ Control of every individual waste issues.

Disadvantages:

- ❖ The procedure is not always economically
- ❖ Non-uniform waste distribution in bins
- ❖ The practices are not followed consistently

Conclusion:

The practice of producing rubbish is too dangerous not only for the current generation, but also for future generations. It is vital to educate and encourage people to practice Recycle, Reuse, and Reduce rather than producing waste. Municipalities and governments should prioritize waste removal.

Future Scope:

- ❖ This application helps the waste collector to save their time efficiently.
- ❖ In this the user can also be able to check the bins values with the application

APPENDIX:

Source Code:

```
import requests
import json
import ibmiotf.application
import ibmiotf.device
import time
import random
import sys
# watson device details
organization = "4yi0vc"
devicType = "BIN1"
deviceId = "BIN1ID"
authMethod= "token"
authToken= "123456789"
#generate random values for randomo variables (temperature&humidity)
def myCommandCallback(cmd):
global a
```

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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:
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```
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,q
```

```
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
```

GitHub: https://github.com/IBM-EPBL/IBM-Project-3494-1658570510