PROJECT REPORT

PROJECT NAME : Smart waste management system for metropolitan cities

Team ID	PNT2022TMID05219
Project Name	Smart waste management system and metropolitan cities

Project Overview:

The solid waste is increasing in urban and rural areas as the population is increasing andwaste management has become a global concern. In implementing the smart cities the great challenge is how to manage waste with low cost and high performance. Waste has a negative impact on the quality of society which smart cities aim to improve. The process of collecting wastes, separating it, and transporting the containers daily and quickly to avoid any prospect ofa spread of diseases is a complex process. The Internet and its applications have become an integral part of today's human lifestyle. It has become an essential tool in every aspect. Due to the tremendous demand and necessity, researchers wentbeyond connecting just computers intothe web. With the help of IOT, garbage in the cities can be collected on monitoring the bin level, to prevent overflow of the garbage which negatively impacts the environment and to avoid or postpone garbage collection schedules in case of low garbage levels.

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 lowersthe chance of any bin being full for over aweek. 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 instigatethem whenever the bins reach the threshold level. They are sent with alert messages so that theycan 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. Thus, smart waste management provides us with the most optimal way of managing the waste in an efficient manner using technology.

IDEATION PHASE
LITERATURE SURVEY

Date	3 September 2022
Team ID	PNT2022TMID05219
Project Name	Smart Waste Management System For Metropolitan Cities
Maximum Marks	4 Marks

SI:NO	TITLE OF THE PAPERT	AUTHOR	METHODOLOGY	MERITS	YEAR OF PUBLICATION
1	Smart waste bin Management	Parthasarathi Manickaraja	Uses the Ultrasonic sensorto level the dustbin and also uses the GSM module	Provides an alert message once the level has reached to the authority	2022
2	Smart waste management using IOT	Tejashree Kadus	Technology used is a load cell and aWi-Fi module	Segregate thewaste in the dustbin and provides and alert message	2020
3	Smart waste management systems using machine learning	David Rutgvist	Uses automated machine learning for a real life smart waste management	It focuses on problems of detection of emptying of a recycling container using sensor measurements	2019

4	Real time solid waste bin monitoring system framework using wireless sensor network	Thiyaga priya dharshini	Smart bin based ona microcontroller based platform Arduino which is interfaced with GSM module	Waste management efficiency and itavoids lumping of wastes	2019
5	Smart waste collection system	Muhamd JavedRamzan	Technology based on sensor based collection and uses route algorithm	It identifies the status of waste bin levels along with the location to replace the bin	2018
6	Waste management and tracking	B Keerthana	Technology based on ZigBee.	Less expensive Lock based System with acknowledgmentalert system	2017
7	Smart Recycle Bin	Mohd Helmy Abd Wahab, Aeslina Abdul Kadir	A Conceptual Approach of Smart Waste Management with Integrated WebBased System	At the time of trash disposal, the material to be recycled could be identified using RFID technology	2015

SMART WASTE MANAGEMENT SYSTEM (WASTE PICKER)

DO

Empties waste containers manually or machanically

Make small decisions

Follow specific collection routes

Reports incidents found during the collection process

check the onboard vehicle computer

THINK

Balance between collection circuits are different

Sometimes collection routes are not efficient since some containers are empty

Want to complete the collection circuit the fastest way possible

Some containers and vehicles stops are not precise

SAY

Spend too much time in traffic, delaying collection time frames

There should be a better way to communicate with the command centre

There are several containers that are difficult to access

Some items are not being separated properly

FEEL

Pride for contributing to the reduction of waste

Over-whelmed with the amount of work and working schedule

Frustrated with some citizens that don't take waste collection seriously

Empowered when given new tools to work

PAINS

WCS system routes are time consuming

Not being sure about containers stops

People not understanding the importance of segregating waste

Not knowing what containers are empty or full

NEEDS

More efficient collection routes

More balanced work and personal life

Usage of new technologies and techniques to help the collection

Help reduce waste and pollution

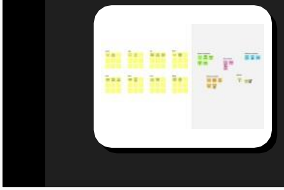
Template

Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

10 minutes to prepare
1 hour to collaborate
2-8 people recommended

Share template feedback



Need some inspiration?

See a finished version of this template to kickstart your work.

Open example →

Before you collaborate

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

10 minutes

TEAM ID : PNT2022TMID05219

A □ **Team gathering**
Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

B □ **Set the goal**
Think about the problem you'll be focusing on solving in the brainstorming session.

C □ **Learn how to use the facilitation tools**
Use the Facilitation Superpowers to run a happy and productive session.

Open article →

1 Define your problem statement

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

5 minutes

PROBLE M

How might we [your problem statement]?

Key rules of brainstorming

To run an smooth and productive session

- Stay in topic.
- Defer judgment.
- Go for volume.
- Encourage wild ideas.
- Listen to others.
- If possible, be visual.

2 Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

TIP

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

GEETHANJALI RAY

- lot platform to manage the waste management solution networks
- GPS enabled to track the location

PRADEEP V

- Using ultrasonic sensor and placing it at the top
- Solar panels that can power the trash function

KARKUVEL DEVI J

- Using IR sensor and placing it at the top
- Data analytics to understand the usage

KIRANTARA B

- A powerful network that manages the network and trash bins to transmit the data
- Weight sensor integrated with Arduino

Group ideas

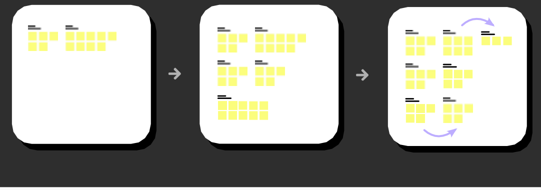
Take turns sharing your ideas while clustering similar or related notes as you go. Once all sticky notes have been grouped, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you and break it up into smaller sub-groups.

20 minutes

TIP

Add customizable tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.

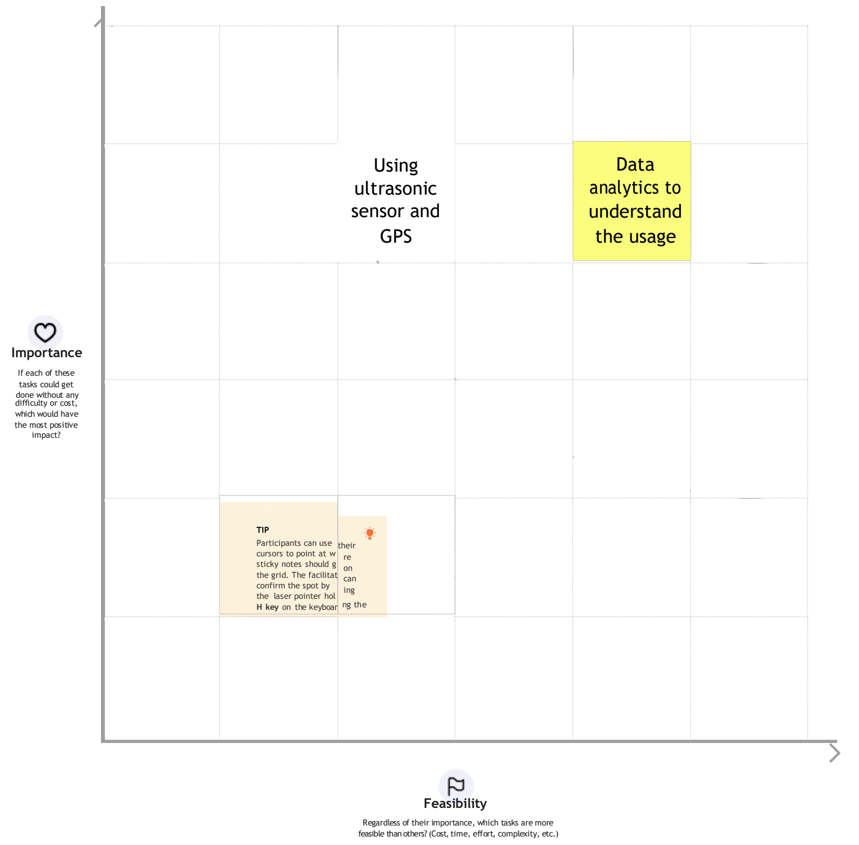
- Reduction in collection costs
- Iot solution uses the data& selects routes
- IOT helps to identify the empty trash bins
- Waste collection trucks, leads to pickup
- Transparency on waste situation increase efficiency over time
- Data analytics canhelp assess trends to better plan



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.

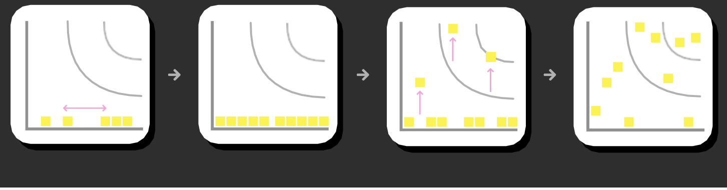
20 minutes



Using ultrasonic sensor and GPS
Data analytics to understand the usage
Importance
If each of these tasks could get done without any difficulty or cost, which would have the most positive impact?
Feasibility
Regardless of their importance, which tasks are more feasible than others? (Cost, time, effort, complexity, etc.)

TIP

Participants can use their cursors to point at w re sticky notes should g on the grid. The facilitat can confirm the spot by the laser pointer hol ing **H key** on the keyboar ng the



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

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

B □ **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 Proposal

TEAM ID	PNT2022TMID05219
PROJECT TITLE	SMART WASTE MANAGEMENT SYSTEM FOR METROPOLITAN CITIES
DATE	24 SEPT 2022

Problem Statement:

The collection and disposal of garbage waste is in unordered, inefficient way which leads to overfilling of bins, rottinggarbage smell and more fuel consumption of collecting trucks.

Purpose Statement (Goals):

The purpose of this project is to focus on problems of detection of emptying of a recycling container using sensormeasurements.

Solution description:

- Using sensors, weighing machine; real time monitoring the level of waste in bins.
- The information gets shared with appropriate authorities and fellow citizens through web application

Uniqueness/ Novelty:

Citizens & industries behaviors during specific festival, events at different seasons are monitored and are predicted for garbage overflowing. Also, to find the shortest path to reach the destiny for trucks in basis of fuel and time consumption.

Social Impact / Customer Satisfaction:

Informative, effective management of waste in big cities reduces waste impacts over environment pollution

Business Model (Revenue Model):

- Eco-friendly.
- Optimized route navigation system.
- Reduce fuel consumption.
- Alerts authority by real-time monitoring.
- Promote 3R’s (Reduce, Reuse, Recycle).

Scalability of the Solution:

- The need-driven waste collection eliminates unnecessary traffic blockage.
- Generate important statistical data for monitoring for waste collection.
- Recycling is promoted between residents, results in clean & sustainable environment.

Project Title: Smart Waste Management System

Project Design Phase-I - Solution Fit Template

Team ID: PNT2022TMID05219

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

1. Our target is Public.
2. Municipality and Local authorities of Metropolitan cities of India

5. CUSTOMER CONSTRAINTS CC

1. Recycling is expensive
2. Network issue
3. More energy
4. Cost
5. Size of the bin and separationof various wastes

6. AVAILABLE SOLUTIONS CC

1. Reduce running cost
2. Solar power
3. Increases the sustainabilityof waste services
4. Review compliance guidelines

Explore AS, differentiate

Focus on J&P, tap into BE, understand RC

2. JOBS-TO-BE-DONE / PROBLEMS J&P

1. Germ spreading
2. Avoid overflow bins & maintenance
3. Perform regular audits on waste management & disposal
4. Reduce number of bins & replace smart bins
5. Proper Segregating & Minimizing Waste.

9. PROBLEM ROOT CAUSE RC

2. Lack of waste disposal: If any network issues occurred then the message will not received by the workers, so the waste disposal get delayed.

3. Due to lack of proper systems for disposal and collections, wastes & garbage's end up in the roads and surrounding

7. BEHAVIOUR BE

1. Ai-based smart waste bin, designed for public places, enabling them to Monitor and Manage.
2. Sensor sense the amount of waste in trash can.
3. The device sends the notification to the agent and they collect the trash.

Focus on J&P, tap into BE, understand RC

3. TRIGGERS J&P

1. People want to make their environment cleaner and also prevent the spread of health hazards in their community -waste tend to decay faster, and if not carefully managed.

4. EMOTIONS: BEFORE / AFTER EM

BEFORE:

a. More negative emotion associated with increased intention to reduce waste management

AFTER:

a. People may feel good and comfortable once all project is set

10. YOUR SOLUTION RC

1. Network issue: Create an emergency readiness plan

2. Spending power: solar power usage

3. Waste disposal: Perform regular audit onwaste management & disposal

4. Shop Eco-Friendly with reusable bags and say know to disposable to water bottle

5. The solution mainly involves in collecting, sorting, recycling and when properly facilitated providing a source of energy andresources

8.CHANNELS OF BEHAVIOUR CH

ONLINE:

a. It reaches the customers quickly.

a. We can monitor in live

b. Information about the level of trashes filled isindicated and the data is transferred to the control room for each bin including its specifications (GSM module).

OFFLINE:

a. Placement of bins in the main hubs of the cities, taking necessary action of discharging wastes by the municipals

Project Design Phase-II
Solution Requirements (Functional & Non-functional)

Date	10 October 2022
Team ID	PNT2022TMID05219
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	**Fitting IoT device in the trashcans**	➢ The IoT device need to be fixed in the dustbin with Water proof safety. ➢ The IoT deviceconsists Ultrasonic sensor, IR sensor, Weightsensor. ➢ To send data to the cloud GPRS/GSM is used.
FR-2	**Detailed bin inventory**	➢ All monitored bins and stands can be seenon the map, and you can visit them at anytime via the Street View feature from Google. ➢ Bins or stands are visible on the map as green, orange or red circles. ➢ You can see bin details in the Dashboard – capacity, waste type, last measurement, GPS location and collection schedule or pick recognition.
FR-3	**Real Time Bin monitoring**	➢ The Dashboard displays real-time data on fill-levels of bins monitored by smart sensors. ➢ In addition to the % of fill-level, based on the historical data, the tool predicts when the bin will become full, one of the functionalities that are not included even in the best waste management software.

		➢ Sensors recognize picks as well; so you can check when the bin was last collected. ➢ With real-time data and predictions, you can eliminate the overflowing bins and stop collecting half-empty ones.
FR-4	**Expensive bins**	➢ We help you identify bins that drive up your collection costs. ➢ The tool calculates arating for each bin in terms of collection costs. ➢ The tool considers the average distance depo-bin-discharge in the area. ➢ The tool assigns bin a rating(1-10) and calculates distance from depo-bin discharge
FR-5	**Eliminate unefficient picks**	➢ Eliminate the collection of half-empty bins. ➢ The sensors recognize picks. ➢ By using real-time data on fill-levels and pick recognition, we can show you how fullthe bins you collect are.
FR-6	**Predictions for bin fullness**	➢ It is a 24×7 monitoring system is designed for monitoring the dumpster. ➢ If either of thecontainers is full then an alert message is sent from the dustbin to employees and the cloud. In turn, employees can clear the corresponding dumpster. ➢ The bin has Sensors that can recognize picks as well; so you can check when the bin was last collected. With real-time data and predictions, you can eliminate the ➢ overflowing bins and stop collecting half-empty ones.
FR-7	**Plan waste collection routes**	➢ Based on current bin fill-levels and predictions of reaching full capacity, you are ready to respond and schedule waste collection. ➢ You can compare planned vs. executed routes toidentify any inconsistencies.

Non-functional Requirements:

Following are the non-functional requirements of proposed solution

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	➢ A smart solution has been proposed to make the waste by sorting more simple and accurate and improve the user experience, usability, and satisfaction. ➢ It aims to optimize ease of use while offering maximum functionality.
NFR-2	**Security**	➢ Building and deploying IoT-based smart waste management in cities can be a complex, time consuming and resource-intensive process. ➢ Many municipal IT departments will not have the resources or in-house skills to support such a project internally.
NFR-3	**Reliability**	➢ Smart waste management is also about creating better working conditions for waste collectors and drivers. ➢ Operates in a defined environment without failure resulting in less manpower, emissions, fuel use and traffic congestion.
NFR-4	**Performance**	➢ The system will provide accurate reports, thus increasing the efficiency ofthe system. ➢ The real-time monitoring ofthe garbage level with the help of sensors and wireless communication will reduce the total number of trips required of Garbage collecting truck. ➢ This will reduce the total expenditure associated with the garbage collection.
NFR-5	**Availability**	➢ Another purpose of this project is to make the proposed waste management system ascheap as possible. ➢ By this we empowercities, businesses, and countries to manage waste smarter.

NFR-6	**Scalability**	➢ Using smart waste bins reduce the number of bins inside town , cities coz we able to monitor the garbage 24/7 more cost effect and scalability when we moves to smarter.

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Project Design Phase-II
Data Flow Diagram & User Stories

Date	14 October 2022
Team ID	PNT2022TMID05219
Project Name	Project – Smart Waste Management
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 theright amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

Flow Diagram:

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 sustainabilityis the best way out of this problem. It is done in the following manner:

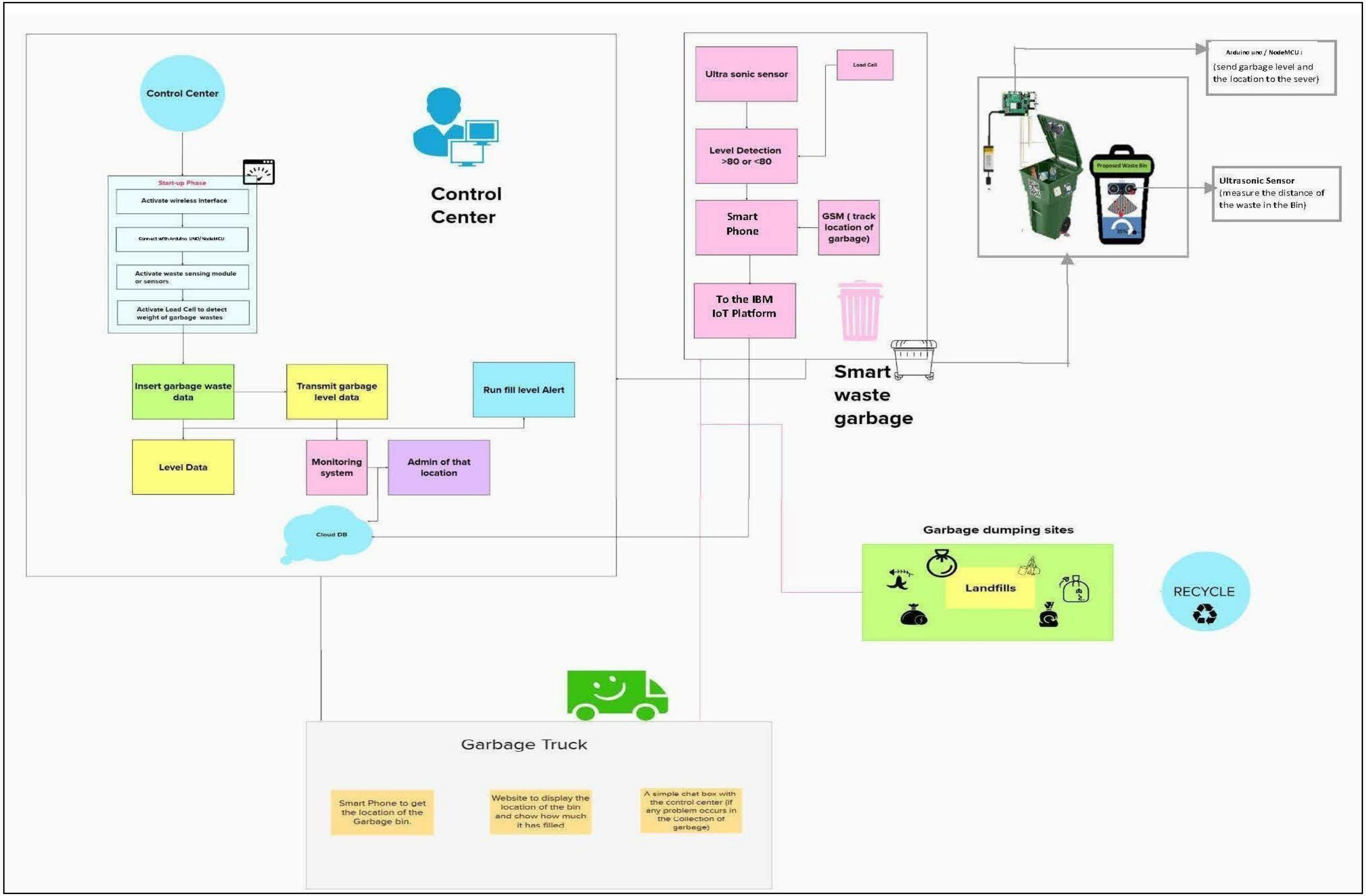
1. The smart bin system undergoes a thorough system check in order to function efficiently.

2. 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 tothe garbage collectors as well as to the municipality or area administration.

3. The area in which garbage is found to overflow is allocated to respective garbage collectors in the form of messages through GSM system.

4. 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.



Control Center

Start-up Phase

Activate wireless interface

Connect with Arduino UNO/ NodeMCU

Activate waste sensing module or sensors

Activate Load Cell to detect weight of garbage wastes

Control Center

Insert garbage waste data

Transmit garbage level data

Run fill level Alert

Level Data

Monitoring system

Admin of that location

Cloud DB

Ultra sonic sensor

Load Cell

Level Detection >80 or <80

Smart Phone

GSM (track location of garbage)

To the IBM IoT Platform

Smart waste garbage

Arduino uno / NodeMCU :

(send garbage level and the location to the sever)

Ultrasonic Sensor

(measure the distance of the waste in the Bin)

Garbage dumping sites

Landfills

RECYCLE

Garbage Truck

Smart Phone to get the location of the Garbage bin.

Website to display the location of the bin and show how much it has filled

A simple chat box with the control center (if any problem occurs in the Collection of garbage)

User Stories:

User Type	**Functional Requirement (Epic)**	**User Story Number**	**User Story / Task**	**Acceptance criteria**	**Priority**	**Release**
Admin (Corporate Authority)	Login	USN-1	As an administrator, I have assigned user names and passwords to each employee and add new dustbins and their location and send mail to Truck Driver when the location is filled	I can manage my online account and dashboard.	Medium	Sprint-2
Truck Driver	Login	USN-2	As a Truck Driver, I'll follow Admin's instruction and the route assigned to reach the filled garbage.	I can take the shortest path assigned to me and reach the waste filled land.	Medium	Sprint-2
Local Garbage Collector	Login	USN-3	As a Local Garbage Collector, I'II gather all the waste collected from the garbage and house and load it onto a garbage truck.	I can collect the trach, pull it to the truck, and send it out.	Medium	Sprint-2
Municipality officer	Login	USN-4	As a Municipality officer, I'll make sure everything is sticked to plan and without any issues.	All of these processes are under my control.	High	Sprint-1

Project Design Phase-II

Technology Stack (Architecture & Stack)

Date	15 October 2022
Team ID	PNT2022TMID05219
Project Name	Smart waste management system and metropolitan cities
Maximum Marks	4 Marks

Technical Architecture:

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web Portal	HTML,CSS,NodeRed, Javascript.or on
2.	Application Logic-1	To calculate the distance of dreck and show the real time level in web portal , information getting via ultra sonic sensor andthe alert message activate with python script to web portal.	Ultrasonic sensor/ Python.
3.	Application Logic-2	To calculate the weight of the garbage and show the real time weight in web portal, this info getting via load cell and the alert message activate with python to web portal.	Load cell/Python.
4.	Application Logic-3	Getting location of the Garbage.	GSM / GPS.
5.	Cloud Database.	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
6.	File Storage	File storage requirements	Github,Local file system.
7.	External API-1.	Firebase is a set of hosting services for any type of	Firebase.

		application. It offers NoSQL and real-time hosting of databases, content, social authentication, and notifications, or services, such as a real-time communication server.	
8.	Ultrasonic Sensor.	To throw alert message when garbage is getting full.	Distance Recognition Model.
9.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: localhost Cloud Server Configuration:localhost,Firebase.	Localhost, Web portal.

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	NodeRed,Python,IBM Simulator.	IoT
2.	Security Implementations	Raspberry Pi is connected to the internet and for example used to broadcast live data, further security measures are recommended and use the UFW(uncomplicated Firewall).	IoT
3.	Scalable Architecture	Raspberry pi:Specifications Soc: rspi ZERO W CPU: 32-bit computer with a 1 GHz ARMv6 RAM: 512MB Networking: Wi-Fi Bluetooth: Bluetooth 5.0, Bluetooth Low Energy (BLE). Storage: MicroSD GPIO: 40-pin GPIO header, populated	IoT

S.No	Characteristics	Description	Technology
		Ports: micro HDMI 2.0, 3.5mm analogue audio-video jack, 2x USB 2.0, 2x USB 3.0, Ethernet Dimensions: 88mm x 58mm x 19.5mm, 46g	
4.	Availability	These smart bins use sensors like ultrasonic andload cell to send alert message about the trash level recognition technology, and artificial intelligence, enabling them to automatically sort and categorize recycling litter into one of itssmaller bin.	IoT.
5.	Performance	Number of request:RPI manages to execute 129-139 read requests per second. Use of Cache:512mb Use of CDN's:Real time	IoT/Web portal.

Project Planning Phase Milestone and Activity List

Date	21 October 2022
Team ID	PNT2022TMID05219
Project Name	Smart Waste Management System forMetropolitan Cities

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers, research publications etc.	3 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	10 SEPTEMBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	17 SEPTEMBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	24 SEPTEMBER 2022
Problem Solution Fit	Prepare problem - solution fit document.	30 SEPTEMBER 2022
Solution Architecture	Prepare solution architecture document.	24 SEPTEMBER 2022

Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	8 OCTOBER 2022
Functional Requirement	Prepare the functional requirement document.	10 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	14 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram.	15 OCTOBER 2022
Prepare Milestone & ActivityList	Prepare the milestones & activity list of the project.	21 OCTOBER 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.	IN PROGRESS..

Project Planning Phase

Project Planning (Sprint delivery Plan)

Date	22 October 2022
Team ID	PNT2022TMID05219
Project Name	Project – 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	Login	USN-1	As an Administrator, I can have total access to all the Co-Admin and Truck driver and monitor the waste.	20	High	Karkuvel Devi . J
Sprint-2	Login In	USN-2	As a Co-Admin, I'll control the waste level by monitoring them via IBM Iot. Once the filling happens, I'll notify trash truck with location of bin with bin ID.	20	High	Kirantara . B
Sprint-3	Dashboard	USN-3	As a Co-Admin, I will set the Notification process and other management are done.	20	High	Geetanjali Ray
Sprint-4	Dashboard	USN-4	As a Truck Driver, I can able to see the filled dustbin in my Dashboard and empty them.	10	Medium	Pradeep . V
Sprint-4	Dashboard	USN-5	As a Municipality officer I can view all the process is proceeding without any problems.	10	High	Pradeep . V

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	

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 - 1

Date	29 October 2022
Team ID	PNT2022TMID05219
Project	Smart Waste Management system for metropolitan cities

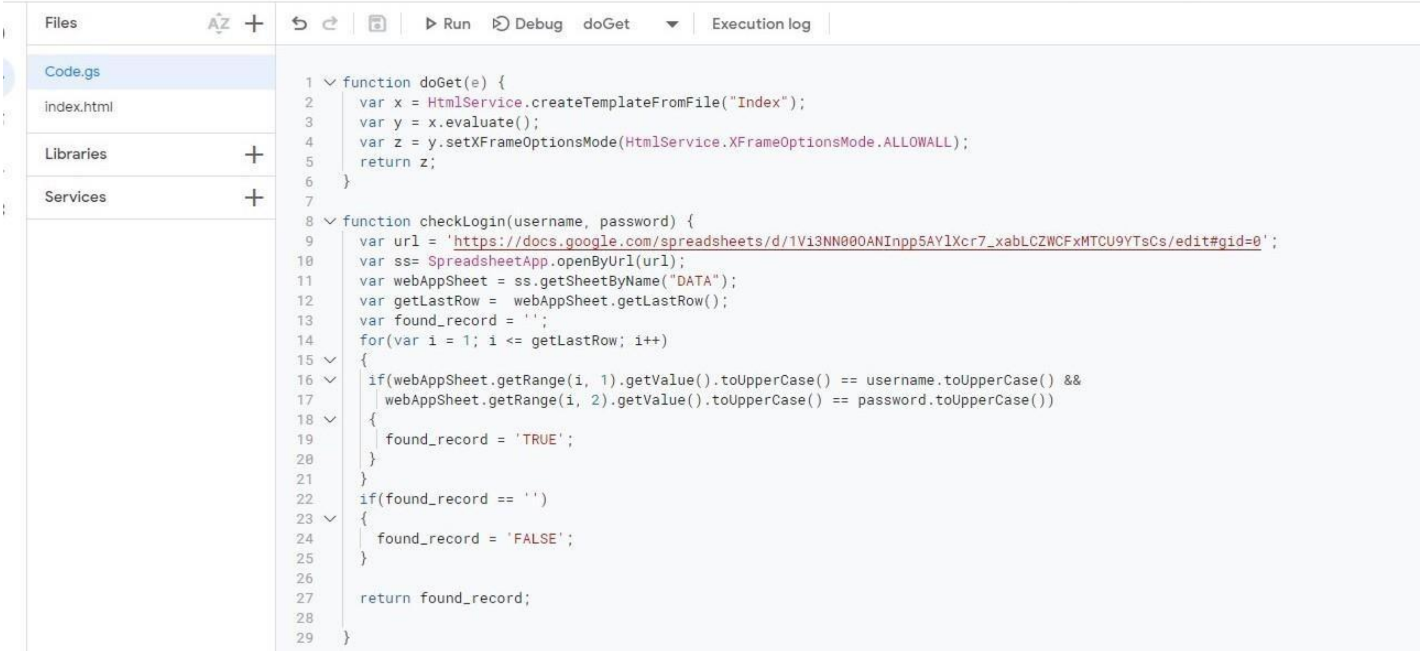
OBJECTIVE:

A 24×7 monitoring system is designed for monitoring dumpsters. The ultrasonic sensor is used for measuring the level of waste in the dustbin. The DC motor powered platform is used for segregating wet and dry waste. The IR sensor and moisture sensor is used for separating wet and dry waste. If either of the containers is full then an alert message is sent from the dustbin to garbage collector and the cloud. In turn, based on the allotment garbage collector can clear the corresponding dumpster.

CODE FOR REGISTRATION AND LOGIN CREDENTIALS:

Code.gs:

```
function doGet(e) {
  var x = HtmlService.createTemplateFromFile("Index");var y =
  x.evaluate();
  var z = y.setXFrameOptionsMode(HtmlService.XFrameOptionsMode.ALLOWALL);return z;
}

function checkLogin(username, password) {
  var url = 'https://docs.google.com/spreadsheets/d/1Vi3NN00OANInpp5AYlXcr7_xabLCZWCFxMTCU9YTsCs/edit#gid=0';
  var ss= SpreadsheetApp.openByUrl(url);
  var webAppSheet = ss.getSheetByName("DATA");var
  getLastRow = webAppSheet.getLastRow(); var
  found_record = '';
  for(var i = 1; i <= getLastRow; i++)
  {
   if(webAppSheet.getRange(i, 1).getValue().toUpperCase() == username.toUpperCase() &&
      webAppSheet.getRange(i, 2).getValue().toUpperCase() == password.toUpperCase())
   {
      found_record = 'TRUE';
   }
  }
  if(found_record == '')
  {
     found_record = 'FALSE';
  }

  return found_record;
}

function AddRecord(usernamee, passwordd, email, phone) {
    var url = 'https://docs.google.com/spreadsheets/d/1Vi3NN00OANInpp5AYlXcr7_xabLCZWCFxMTCU9YTsCs/edit#gid=0';
    var ss= SpreadsheetApp.openByUrl(url);
    var webAppSheet = ss.getSheetByName("DATA"); webAppSheet.appendRow([usernamee,passwordd,email,phone]);

}
```



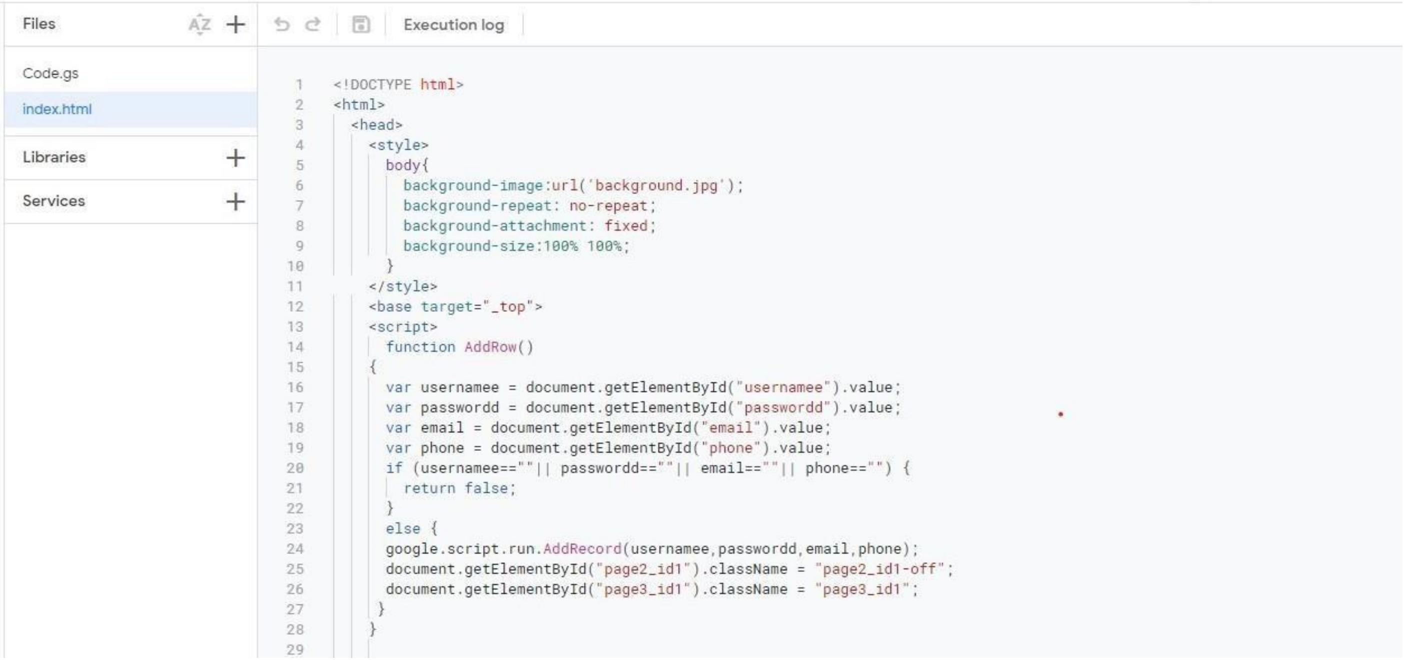
```
function doGet(e) {
  var x = HtmlService.createTemplateFromFile("Index");
  var y = x.evaluate();
  var z = y.setXFrameOptionsMode(HtmlService.XFrameOptionsMode.ALLOWALL);
  return z;
}

function checkLogin(username, password) {
  var url = 'https://docs.google.com/spreadsheets/d/1Vi3NN00OANInpp5AYlXcr7_xabLCZWCFxMTCU9YTsCs/edit#gid=0';
  var ss= SpreadsheetApp.openByUrl(url);
  var webAppSheet = ss.getSheetByName("DATA");
  var getLastRow =  webAppSheet.getLastRow();
  var found_record = '';
  for(var i = 1; i <= getLastRow; i++)
  {
   if(webAppSheet.getRange(i, 1).getValue().toUpperCase() == username.toUpperCase() &&
     webAppSheet.getRange(i, 2).getValue().toUpperCase() == password.toUpperCase())
   {
     found_record = 'TRUE';
   }
  }
  if(found_record == '')
  {
    found_record = 'FALSE';
  }

  return found_record;

}
```

index.html:

```
<!DOCTYPE html>
<html>
    <head>
        <style>
            body{
                background-image:url('background.jpg');background-
                repeat: no-repeat; background-attachment: fixed;
                background-size:100% 100%;
            }
        </style>
        <base target="_top">
        <script>
            function AddRow()
        {
            var usernamee = document.getElementById("usernamee").value; var passwordd
            = document.getElementById("passwordd").value; var email =
            document.getElementById("email").value;
            var phone = document.getElementById("phone").value;
            if (usernamee==""|| passwordd==""|| email==""|| phone=="") {return false;
            }
            else { google.script.run.AddRecord(usernamee,passwordd,email,phone);
            document.getElementById("page2_id1").className = "page2_id1-off";
            document.getElementById("page3_id1").className = "page3_id1";
          }
        }

          function LoginUser()
        {
        var username = document.getElementById("username").value;var password =
        document.getElementById("password").value;
        google.script.run.withSuccessHandler(function(output)
        {
            if(output == 'TRUE')
            {
                  var url1 ='https://node-red-jrfhu-2022-10-06.eu-
gb.mybluemix.net/ui/#!/0?socketid=kVaDwxl44Sp25mOZAAAX';
                  var winRef = window.open(url1);
                  winRef ? google.script.host.close() : window.onload=function(){document.getElementById('url').href = url1;}
            }
            else if(output == 'FALSE')
            {
                document.getElementById("errorMessage").innerHTML = "Invalid data";
            }
        }).checkLogin(username, password);
        }

function function1(){
        document.getElementById("page1_id1").className = "page1_class1-off";
        document.getElementById("page2_id1").className = "page2_id1";
}

function function3(){ document.getElementById("page3_id1").className = "page3_id1-
    off";document.getElementById("page1_id1").className = "page1_id1";
}

    </script>
    <style>

/*page1*/
.page1_class1-off{
        display: none;
    }


/*page2*/
.page2_class1{ display:
        none;
    }

.page2_id1-off{
        display:none;
}

/*page3*/
.page3_class1{
        display:none;
```

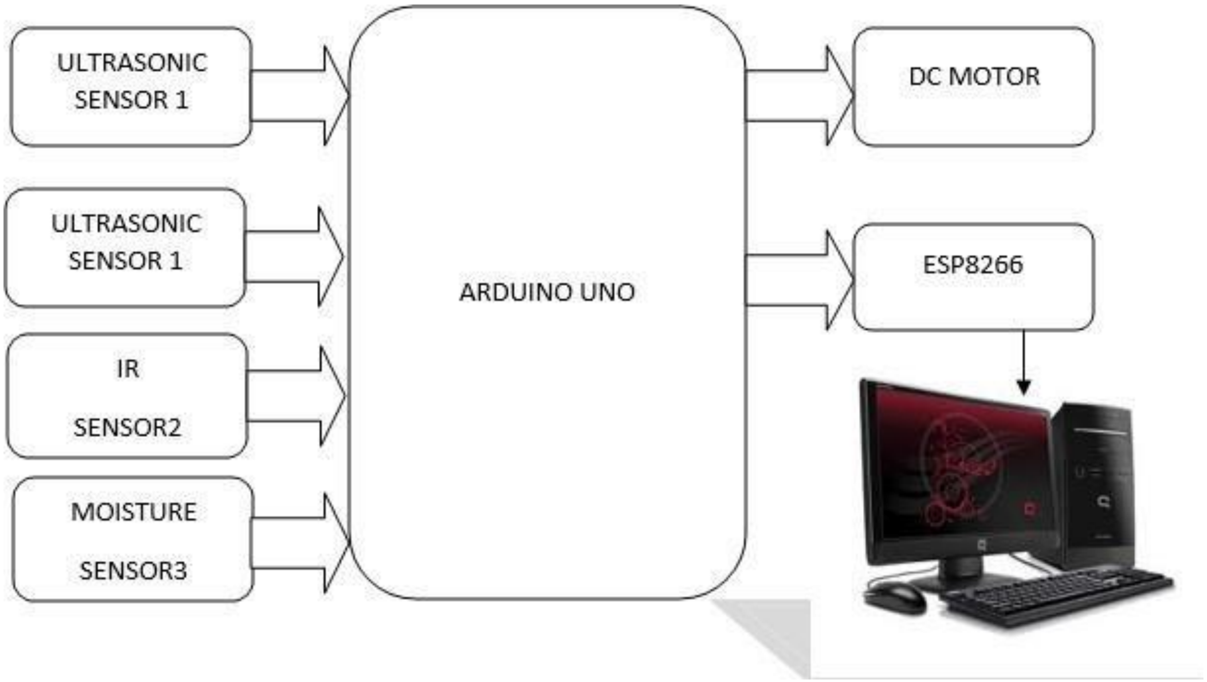
```
}
.page3_id1-off{
        display:none;
}


input[type=text]:hover{
                border-bottom:2px solid black;
            }
input[type=number]:hover{
                border-bottom:2px solid black;
            }
input[type=password]:hover{
                border-bottom:2px solid black;
            }


</style>
<meta name="viewport" content="width=device-width, initial-scale=1.0">
    </head>
    <body>
          <br><br>
     <!--page1-->
<center>
  <div class="page1_class1" id="page1_id1" style="background-
color:rgb(135, 207, 235);border:2px solid gray;border-radius: 20px;width: 250px;padding-top: 10px;padding-bottom: 
20px;padding-left: 20px;padding-right: 20px;">
        <h1>Login Here</h1>
        <br>
        <p>Username</p>
        <input type="text" id="username" placeholder=" Enter Username" style=";outline: none; text-align: center;font-size:0.9em 
;width: 50%;font-weight:bold;"/><br>
        <br>
        <p>Password</p>
        <input type="password" id="password" placeholder=" Enter Password" style="border- top: none;border-right: 
none;border-left: none;outline: none; text-align: center;font-size:0.9em ;width: 50%;font-weight:bold;"/>
        <br><span id="errorMessage" style="color: red" ></span><br>
        <br>
        <input type="submit" value="Login" onclick="LoginUser()" style="float: centre;padding-top: 1px;padding-bottom: 
1px;padding-left: 10px;padding-right: 10px;font-size: 0.9em;font- weight:bold;" /><br>
        <br><br>
        <b>If you don't have an account,</b><input type="button" onClick="function1()" value="Create New" style="margin-top: 
5px;font-weight:bold;" />
  </div>

<!--page2-->
<div class="page2_class1" id="page2_id1" style="background-
color:rgb(135, 207, 235);border:2px solid gray;border-radius: 20px;width: 250px;padding-top: 10px;padding-bottom: 
20px;padding-left: 20px;padding-right: 20px;">
  <h1>Register Here</h1>
  <p>Name</p>
        <input type="text" id="usernamee" placeholder=" Enter Name" style="border-top: none;border-right: none;border-left: 
none;outline: none; text-align: center;font-
size:0.9em ;width: 50%;font-weight:bold;"/><br>
```

```
        <br>
  <p>Password</p>
        <input type="password" id="passwordd" placeholder="Create password" style="border-top: none;border-right: 
none;border-left: none;outline: none; text-align: center;font-size: 0.9;width: 50%;font-weight:bold;" /><br>
                <br>
  <p>Email</p>
        <input type="text" id="email" placeholder=" Enter Email" style="border-top: none;border-right: none;border-left: 
none;outline: none; text-align: center;font-
size:0.9em ;width: 50%;font-weight:bold;"/><br>
        <br>
  <p>Phone Number</p>
        <input type="number" id="phone" placeholder="Enter number" style="border-top: none;border-right: none;border-left: 
none;outline: none; text-align: center;font-
size:0.9em ;width: 50%;font-weight:bold;" /><br><br>
        <br><br>
        <input type="submit" value="Create" onclick="AddRow()" style="float: centre;padding- top: 1px;padding-bottom: 
1px;padding-left: 10px;padding-right: 10px;font-size: 0.9em;font-weight:bold;" />
        <br>
</div>

<!--page3-->
  <div class="page3_class1" id="page3_id1" style="background:none;border:2px solid gray;border-radius: 20px;width: 
250px;padding-top: 10px;padding-bottom: 20px;padding-left: 20px;padding- right: 20px;"><center>
        <h2> REGISTRATION SUCCESSFUL! Login to your account</h2>
        <input type="submit"  onClick="function3()" value="Login" style="font-weight:bold;"><br>
  </div>


  </center>
   </body>
 </html>
```



```
<!DOCTYPE html>
<html>
  <head>
    <style>
      body{
        background-image:url('background.jpg');
        background-repeat: no-repeat;
        background-attachment: fixed;
        background-size:100% 100%;
      }
    </style>
    <base target="_top">
    <script>
      function AddRow()
    {
      var usernamee = document.getElementById("usernamee").value;
      var passwordd = document.getElementById("passwordd").value;
      var email = document.getElementById("email").value;
      var phone = document.getElementById("phone").value;
      if (usernamee==""|| passwordd==""|| email==""|| phone=="") {
        return false;
      }
      else {
      google.script.run.AddRecord(usernamee,passwordd,email,phone);
      document.getElementById("page2_id1").className = "page2_id1-off";
      document.getElementById("page3_id1").className = "page3_id1";
     }
    }

```

CIRCUIT DIAGRAM:



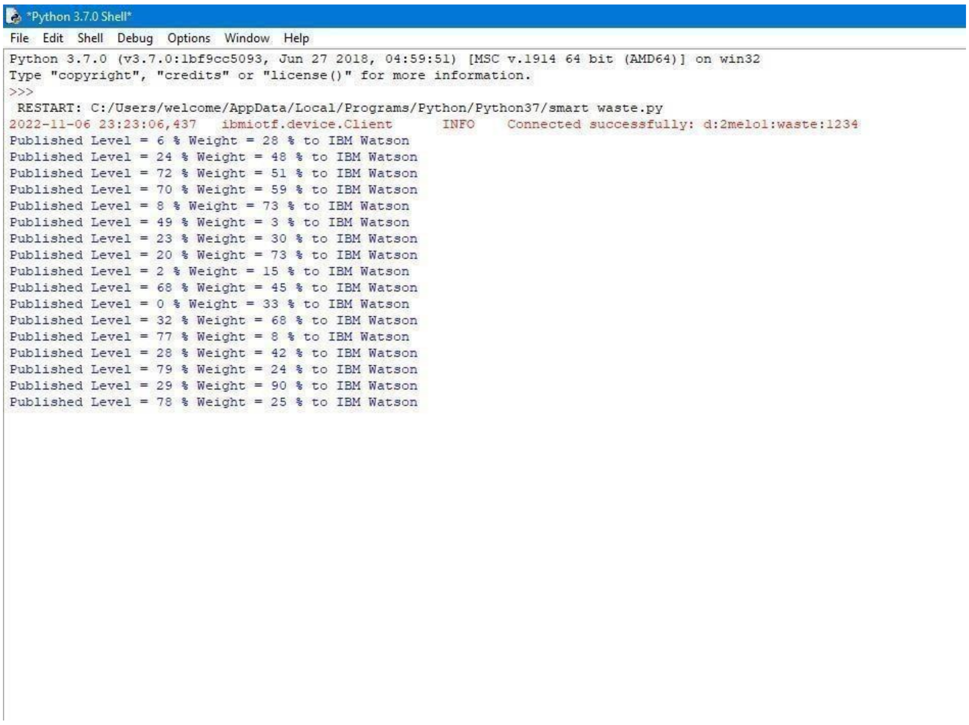
SPRINT – 2

Date	17 October 2022
Team ID	PNT2022TMID05219
Project Name	Project – Smart Waste Management system for metropolitan cities

Python Code

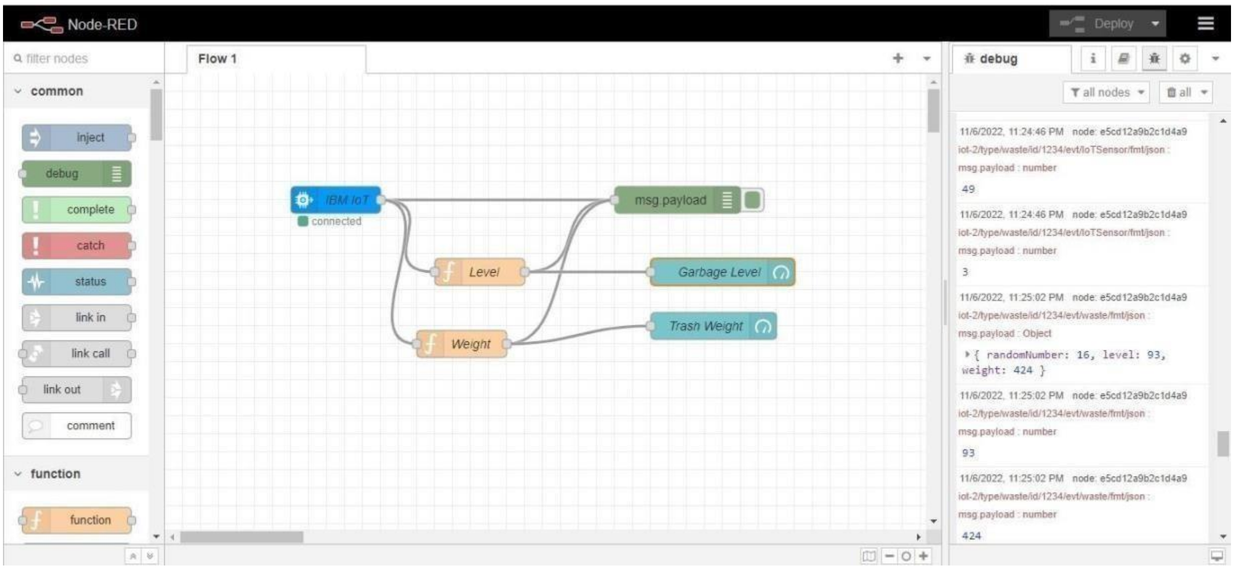
```
import time import sys
import ibmiotf.application
import ibmiotf.device import
random
#Provide your IBM Watson
Device Credentials
organization

= "2melo1" deviceType =
"waste" deviceId = "1234" authMethod =
"token" authToken = "12345678"
# Initialize GPIO
def myCommandCallback(cmd):
print("Commandreceived: %s" % cmd.data['command'])
status=cmd.data['command']
if status=="waste level":
    print ("waste level monitored")
  else :
    print ("weight level monitored")
    #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

      level=random.randint(0,100) weight=random.randint(0,100)


      data = { 'level' : level, 'weight': weight }

      #print data

      def myOnPublishCallback():

        print ("Published Level = %s %%" % level, "Weight = %s %%" % weight, "to IBM Watson")
        success = deviceCli.publishEvent("IoTSensor", "json", data, qos=0,
    on_publish=myOnPublishCallback)
        if not success:

        print("Not connected to IOTF")

  time.sleep(20)



deviceCli.commandCallback = myCommandCallback



  # Disconnect the device and application from the cloud deviceCli.disconnect()
```

OUTPUT:

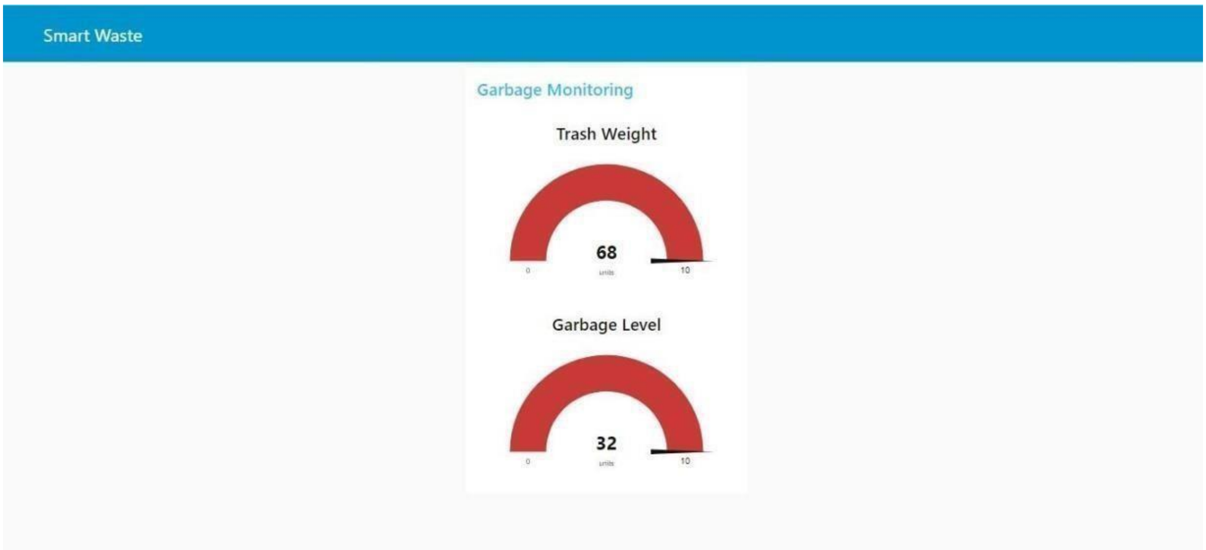


```
Python 3.7.0 (v3.7.0:1bf9cc5093, Jun 27 2018, 04:59:51) [MSC v.1914 64 bit (AMD64)] on win32
Type "copyright", "credits" or "license()" for more information.
>>>
 RESTART: C:/Users/welcome/AppData/Local/Programs/Python/Python37/smart waste.py
2022-11-06 23:23:06,437   ibmiotf.device.Client      INFO    Connected successfully: d:2melol:waste:1234
Published Level = 6 % Weight = 28 % to IBM Watson
Published Level = 24 % Weight = 48 % to IBM Watson
Published Level = 72 % Weight = 51 % to IBM Watson
Published Level = 70 % Weight = 59 % to IBM Watson
Published Level = 8 % Weight = 73 % to IBM Watson
Published Level = 49 % Weight = 3 % to IBM Watson
Published Level = 23 % Weight = 30 % to IBM Watson
Published Level = 20 % Weight = 73 % to IBM Watson
Published Level = 2 % Weight = 15 % to IBM Watson
Published Level = 68 % Weight = 45 % to IBM Watson
Published Level = 0 % Weight = 33 % to IBM Watson
Published Level = 32 % Weight = 68 % to IBM Watson
Published Level = 77 % Weight = 8 % to IBM Watson
Published Level = 28 % Weight = 42 % to IBM Watson
Published Level = 79 % Weight = 24 % to IBM Watson
Published Level = 29 % Weight = 90 % to IBM Watson
Published Level = 78 % Weight = 25 % to IBM Watson
```

NODE RED INPUT AND OUPUT:



```
11/6/2022, 11:24:46 PM   node: e5cd12a9b2c1d4a9
iot-2/type/waste/id/1234/evt/IoTSensor/fmt/json :
msg.payload : number
49
11/6/2022, 11:24:46 PM   node: e5cd12a9b2c1d4a9
iot-2/type/waste/id/1234/evt/IoTSensor/fmt/json :
msg.payload : number
3
11/6/2022, 11:25:02 PM   node: e5cd12a9b2c1d4a9
iot-2/type/waste/id/1234/evt/waste/fmt/json :
msg.payload : Object
▸{ randomNumber: 16, level: 93,
weight: 424 }
11/6/2022, 11:25:02 PM   node: e5cd12a9b2c1d4a9
iot-2/type/waste/id/1234/evt/waste/fmt/json :
msg.payload : number
93
11/6/2022, 11:25:02 PM   node: e5cd12a9b2c1d4a9
iot-2/type/waste/id/1234/evt/waste/fmt/json :
msg.payload : number
424
```

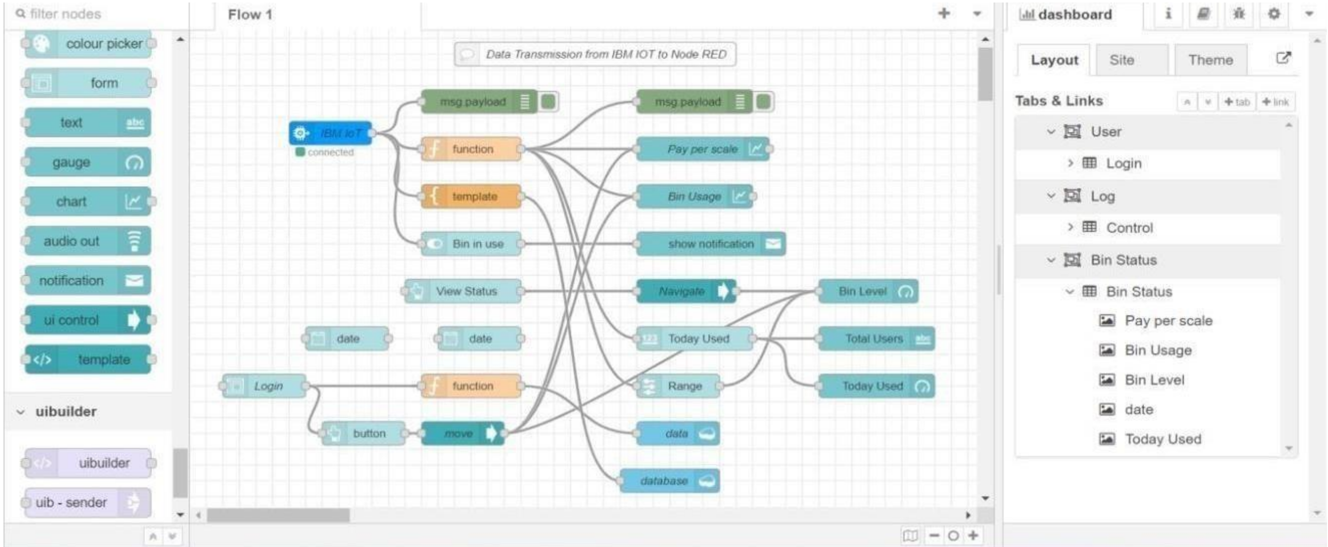


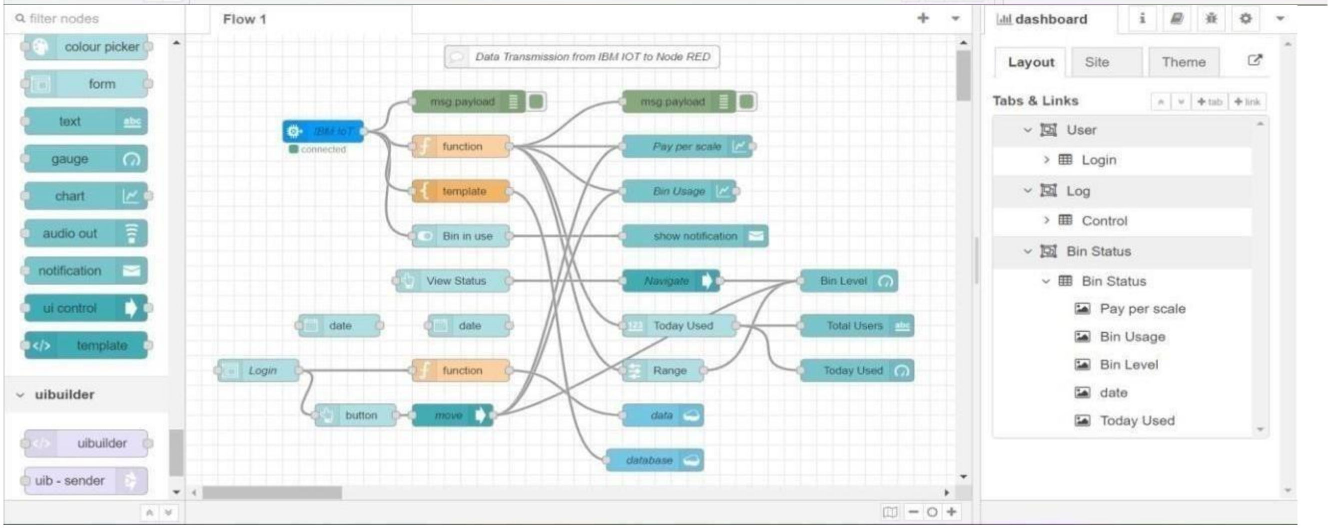
Delivery of Sprint – 3

Node Red Connection to IBM Cloudant

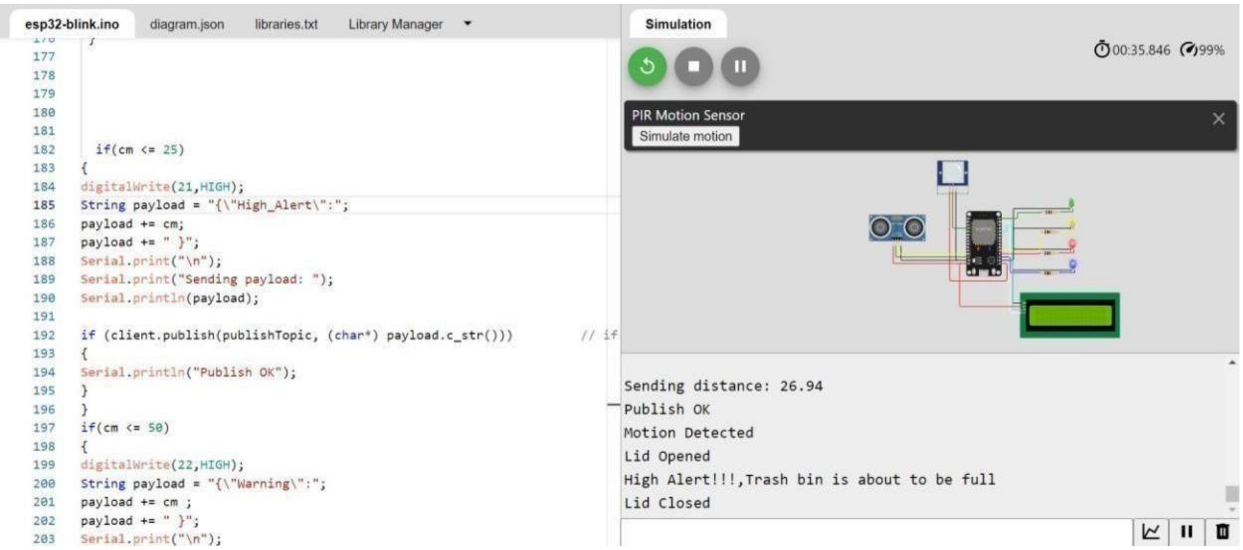
Date	17 October 2022
Team ID	PNT2022TMID05219
Project Name	Smart Waste Management system for metropolitan cities
Maximum Marks	4 Marks

1. Node-RED Connection setup for data transmission from IBM Watson IOT platform to Node-REDdashboard.





2.Simulate Wokwi connection to transmit data from wokwi account to IBM Watson IOT platform and then toNode Red dashboard.

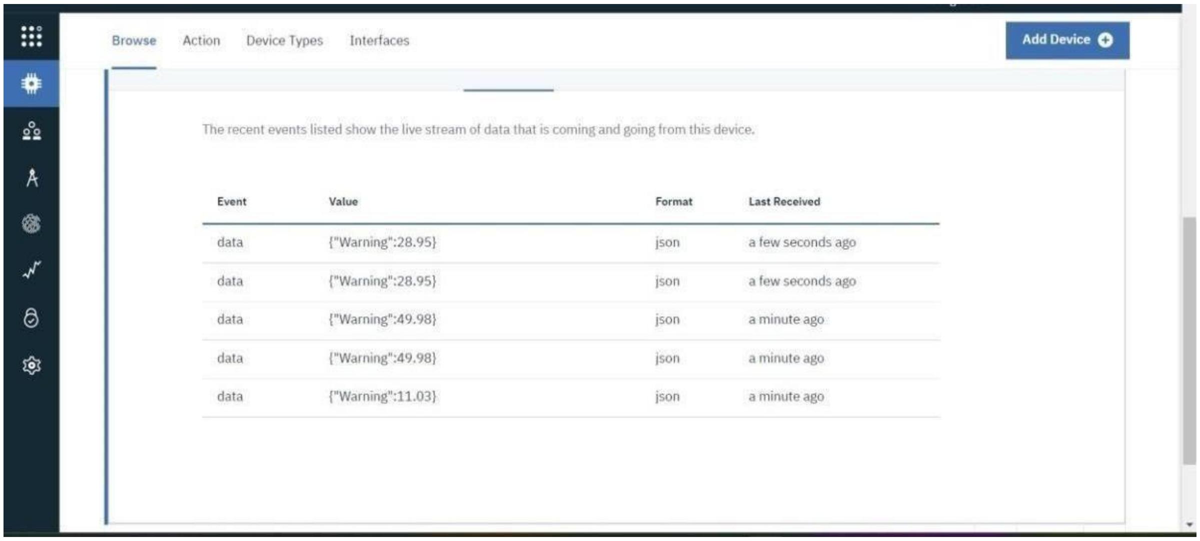


```
}




  if(cm <= 25)
{
digitalWrite(21,HIGH);
String payload = "{\"High_Alert\":";
payload += cm;
payload += " }";
Serial.print("\n");
Serial.print("Sending payload: ");
Serial.println(payload);

if (client.publish(publishTopic, (char*) payload.c_str()))          // if
{
Serial.println("Publish OK");
}
}
if(cm <= 50)
{
digitalWrite(22,HIGH);
String payload = "{\"Warning\":";
payload += cm ;
payload += " }";
Serial.print("\n");
```

```
Sending distance: 26.94
Publish OK
Motion Detected
Lid Opened
High Alert!!!,Trash bin is about to be full
Lid Closed
```

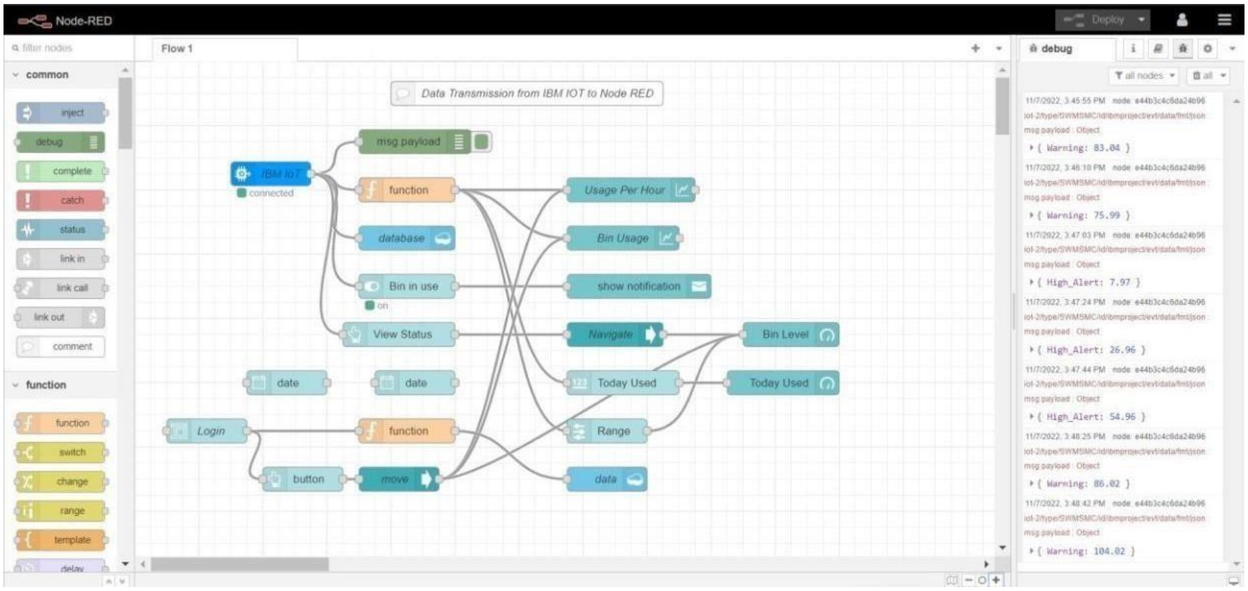
3.Data transfer to Watson IOT platform.

4.Data transfer from IBM Watson IOT platform and wokwi to Node red.



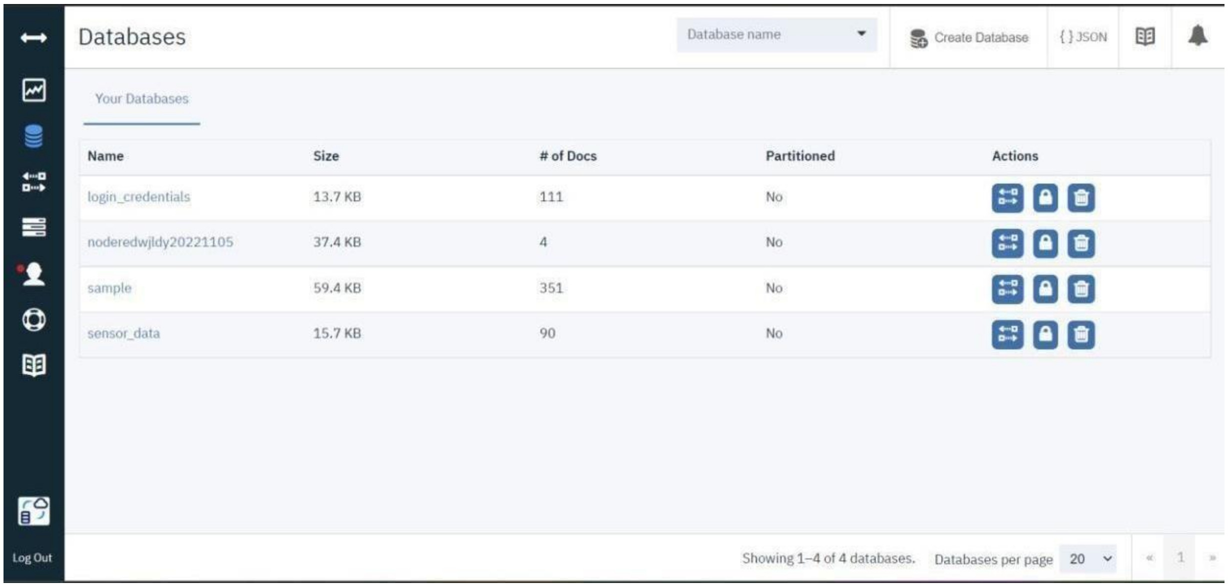
The recent events listed show the live stream of data that is coming and going from this device.

Event	Value	Format	Last Received
data	{"Warning":28.95}	json	a few seconds ago
data	{"Warning":28.95}	json	a few seconds ago
data	{"Warning":49.98}	json	a minute ago
data	{"Warning":49.98}	json	a minute ago
data	{"Warning":11.03}	json	a minute ago



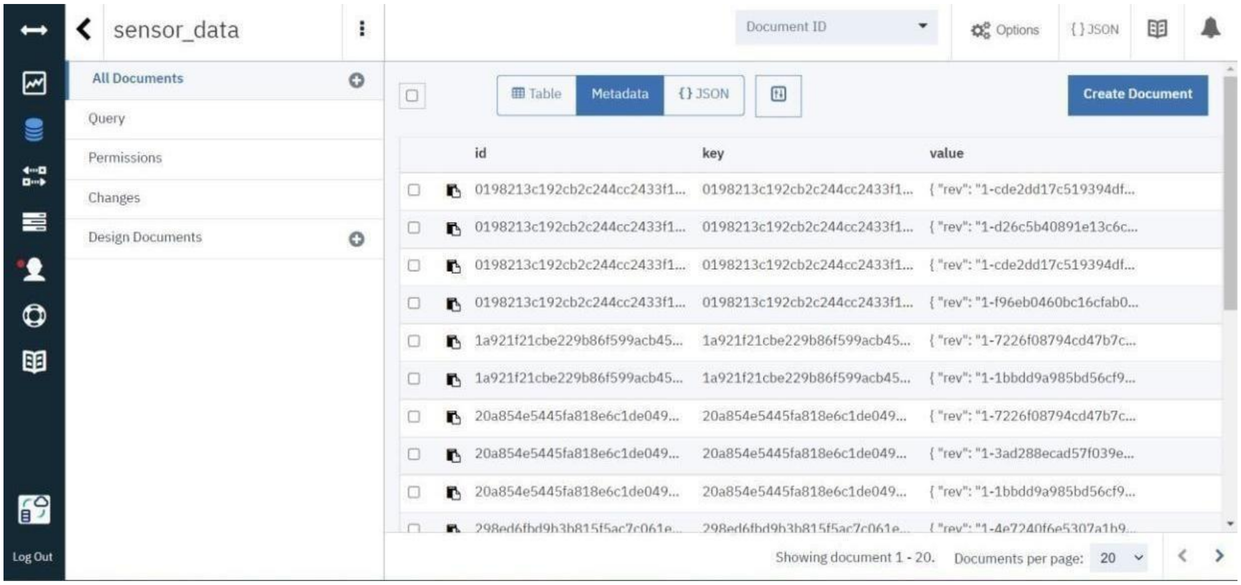
```
11/7/2022, 3:45:55 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json
msg.payload : Object
▸{ Warning: 83.04 }
11/7/2022, 3:46:10 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json
msg.payload : Object
▸{ Warning: 75.99 }
11/7/2022, 3:47:03 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json
msg.payload : Object
▸{ High_Alert: 7.97 }
11/7/2022, 3:47:24 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json
msg.payload : Object
▸{ High_Alert: 26.96 }
11/7/2022, 3:47:44 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json
msg.payload : Object
▸{ High_Alert: 54.96 }
11/7/2022, 3:48:25 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json
msg.payload : Object
▸{ Warning: 86.02 }
11/7/2022, 3:48:42 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json
msg.payload : Object
▸{ Warning: 104.02 }
```

5.Storing database in IBM cloudant DB.



Name	Size	# of Docs	Partitioned	Actions
login_credentials	13.7 KB	111	No	
noderedwjldy20221105	37.4 KB	4	No	
sample	59.4 KB	351	No	
sensor_data	15.7 KB	90	No	

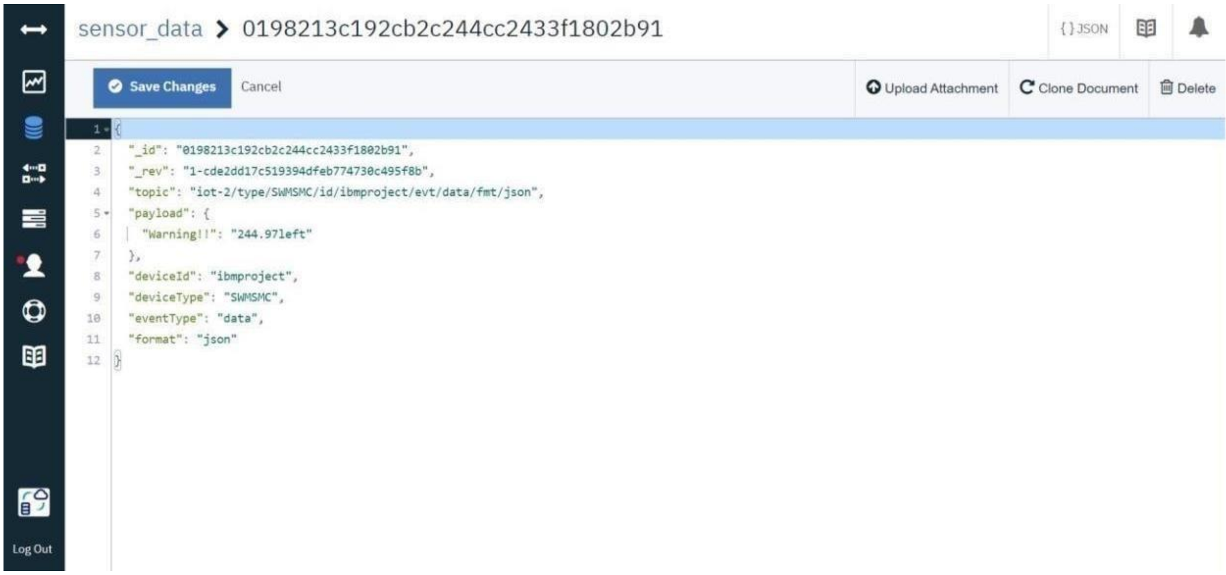
Showing 1–4 of 4 databases. Databases per page 20 « 1 »



		id	key	value
□		0198213c192cb2c244cc2433f1...	0198213c192cb2c244cc2433f1...	{ "rev": "1-cde2dd17c519394df...
□		0198213c192cb2c244cc2433f1...	0198213c192cb2c244cc2433f1...	{ "rev": "1-d26c5b40891e13c6c...
□		0198213c192cb2c244cc2433f1...	0198213c192cb2c244cc2433f1...	{ "rev": "1-cde2dd17c519394df...
□		0198213c192cb2c244cc2433f1...	0198213c192cb2c244cc2433f1...	{ "rev": "1-f96eb0460bc16cfab0...
□		1a921f21cbe229b86f599acb45...	1a921f21cbe229b86f599acb45...	{ "rev": "1-7226f08794cd47b7c...
□		1a921f21cbe229b86f599acb45...	1a921f21cbe229b86f599acb45...	{ "rev": "1-1bbdd9a985bd56cf9...
□		20a854e5445fa818e6c1de049...	20a854e5445fa818e6c1de049...	{ "rev": "1-7226f08794cd47b7c...
□		20a854e5445fa818e6c1de049...	20a854e5445fa818e6c1de049...	{ "rev": "1-3ad288ecad57f039e...
□		20a854e5445fa818e6c1de049...	20a854e5445fa818e6c1de049...	{ "rev": "1-1bbdd9a985bd56cf9...
□		298ed6fbd9b3b815f5ac7c061e...	298ed6fbd9b3b815f5ac7c061e...	{ "rev": "1-4e7240f6e5307a1b9...

Showing document 1 - 20. Documents per page: 20

6.Data is stored in JSON format



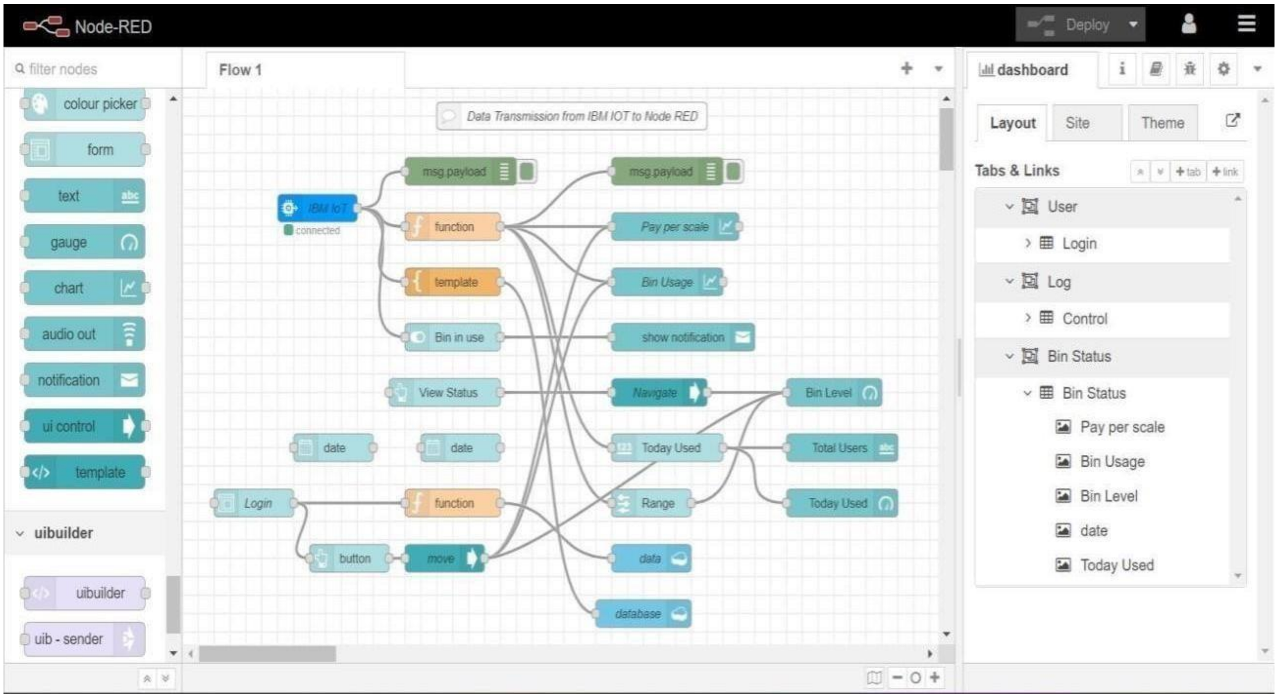
```
{
  "_id": "0198213c192cb2c244cc2433f1802b91",
  "_rev": "1-cde2dd17c519394dfeb774730c495f8b",
  "topic": "iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json",
  "payload": {
    "Warning!!": "244.97left"
  },
  "deviceId": "ibmproject",
  "deviceType": "SWMSMC",
  "eventType": "data",
  "format": "json"
}
```

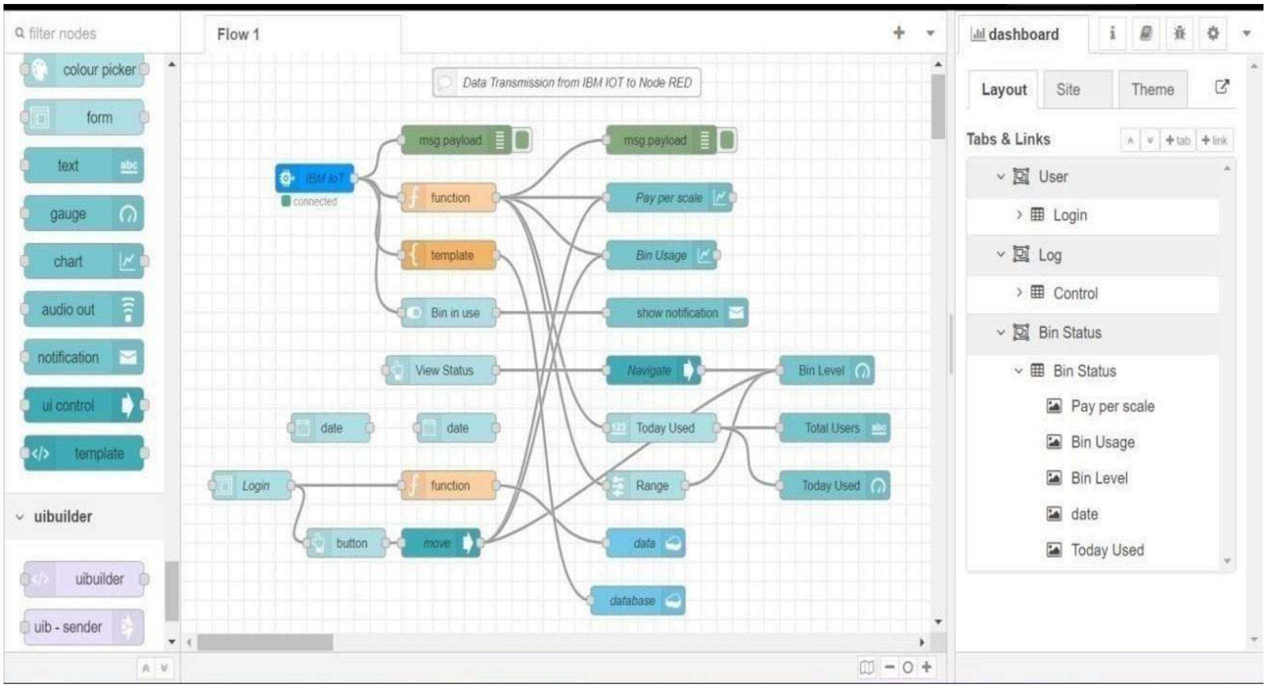
Delivery of Sprint – 4

Web UI Design and Deploy

Date	17 November 2022
Team ID	PNT2022TMID05219
Project Name	Smart Waste Management for Metropolitan Cities - IOT

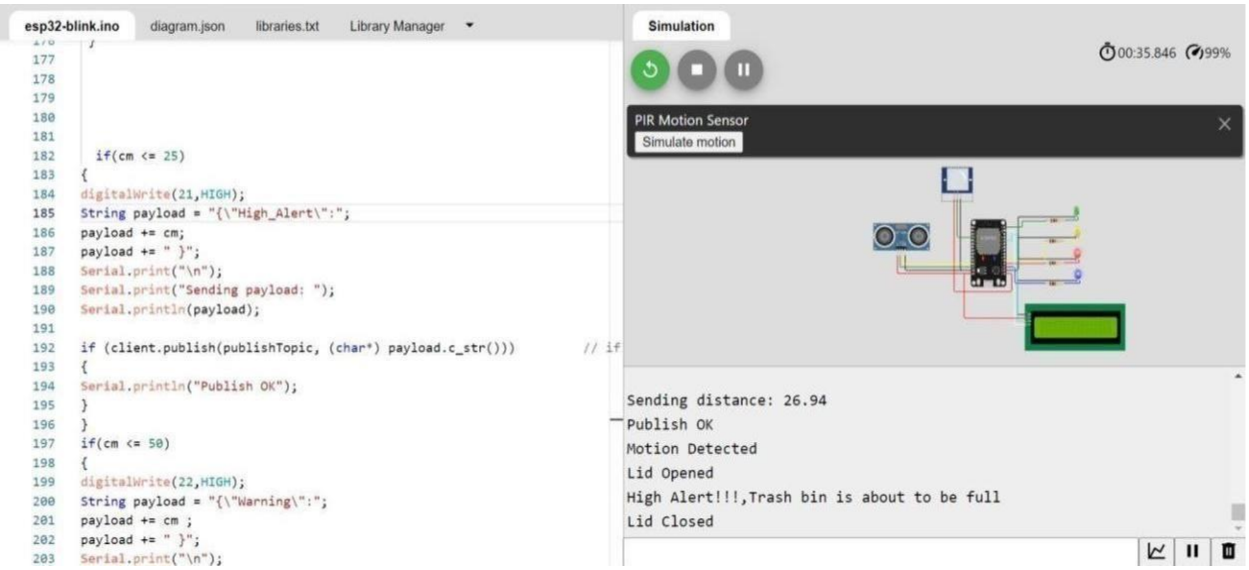
1. Node-RED Connection setup for data transmission from IBM Watson IOT platformto Node-RED dashboard.





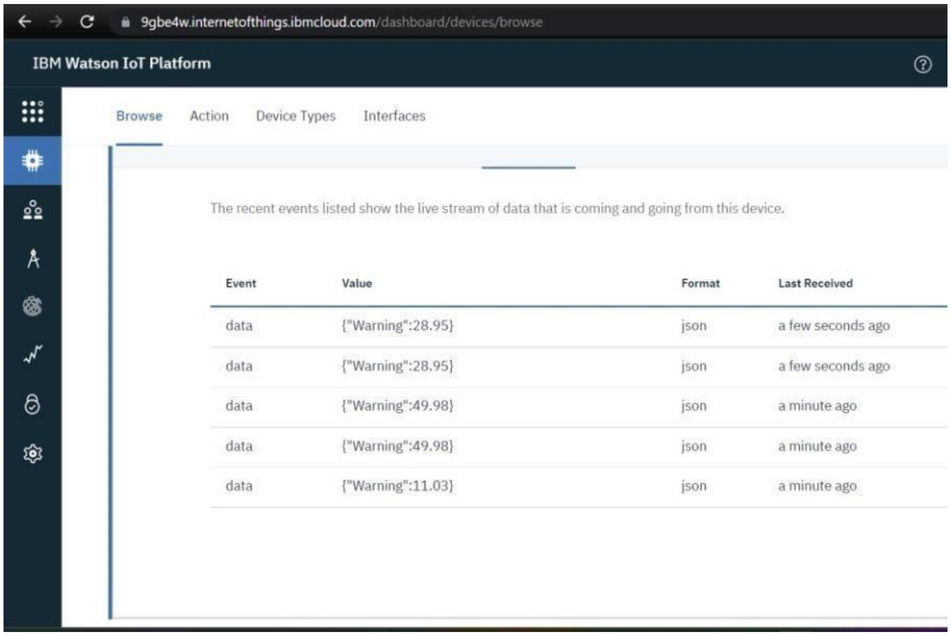
1. Simulate Wokwi connection to transmit data from wokwi account to IBM Watson IOTplatform and then to Node Red dashboard.

2. Data transfer to Watson IOT platform.



```
 if(cm <= 25)
{
digitalWrite(21,HIGH);
String payload = "{\"High_Alert\":";
payload += cm;
payload += " }";
Serial.print("\n");
Serial.print("Sending payload: ");
Serial.println(payload);

if (client.publish(publishTopic, (char*) payload.c_str()))          // if
{
Serial.println("Publish OK");
}
}
if(cm <= 50)
{
digitalWrite(22,HIGH);
String payload = "{\"Warning\":";
payload += cm ;
payload += " }";
Serial.print("\n");
```

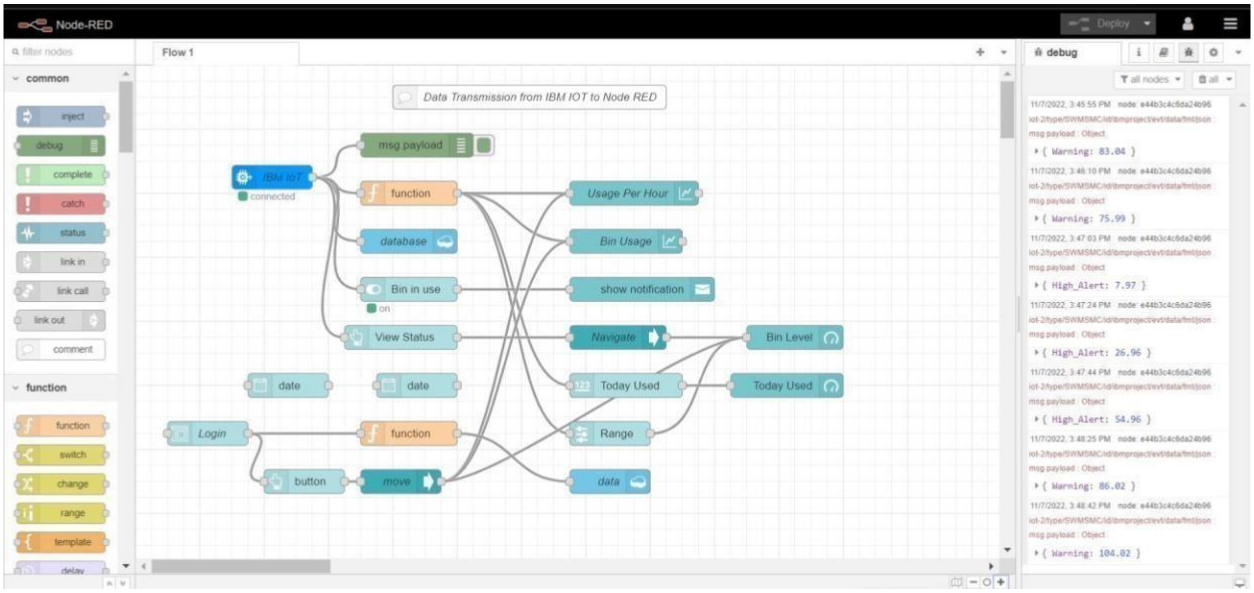
```
Sending distance: 26.94
Publish OK
Motion Detected
Lid Opened
High Alert!!!,Trash bin is about to be full
Lid Closed
```


9gbe4w.internetofthings.ibmcloud.com/dashboard/devices/browse
IBM Watson IoT Platform
Browse
Action
Device Types
Interfaces

The recent events listed show the live stream of data that is coming and going from this device.

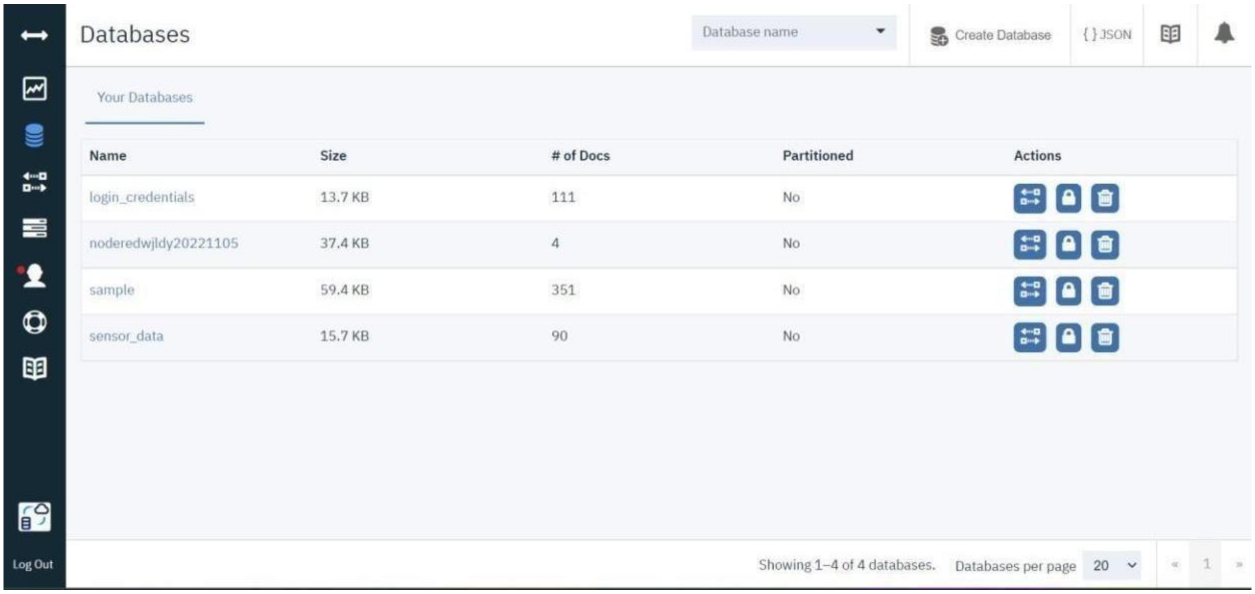
Event	Value	Format	Last Received
data	{"Warning":28.95}	json	a few seconds ago
data	{"Warning":28.95}	json	a few seconds ago
data	{"Warning":49.98}	json	a minute ago
data	{"Warning":49.98}	json	a minute ago
data	{"Warning":11.03}	json	a minute ago

3. Data transfer from IBM Watson IOT platform and wokwi to Node red.



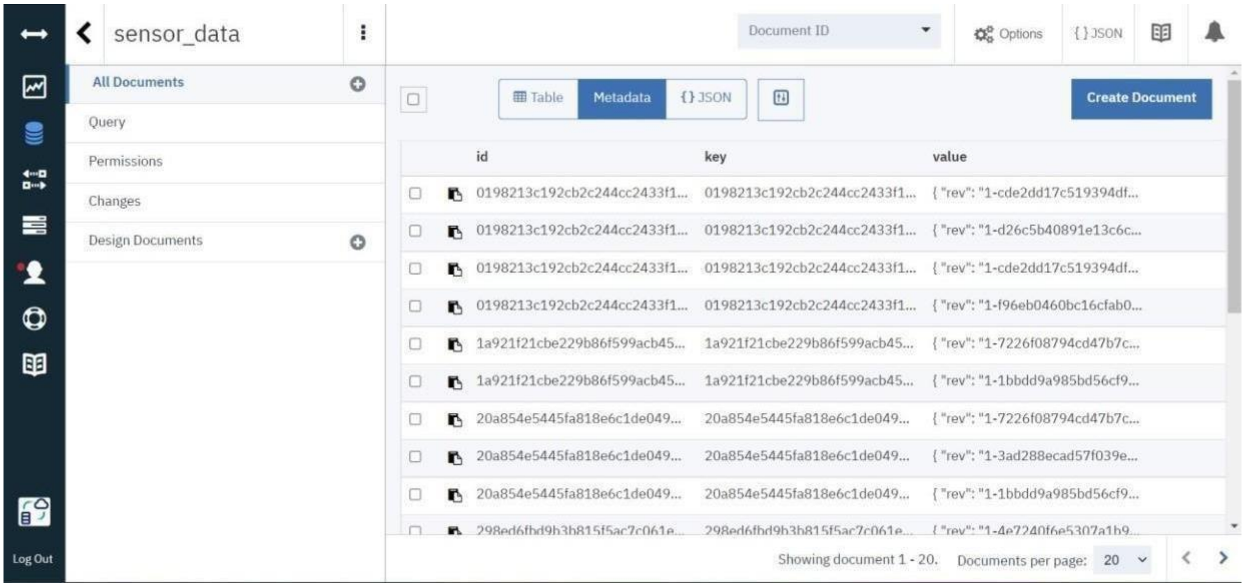
```
11/7/2022, 3:45:55 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json :
msg.payload : Object
▸{ Warning: 83.04 }
11/7/2022, 3:46:10 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json :
msg.payload : Object
▸{ Warning: 75.99 }
11/7/2022, 3:47:03 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json :
msg.payload : Object
▸{ High_Alert: 7.97 }
11/7/2022, 3:47:24 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json :
msg.payload : Object
▸{ High_Alert: 26.96 }
11/7/2022, 3:47:44 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json :
msg.payload : Object
▸{ High_Alert: 54.96 }
11/7/2022, 3:48:25 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json :
msg.payload : Object
▸{ Warning: 86.02 }
11/7/2022, 3:48:42 PM  node: e44b3c4c6da24b96
iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json :
msg.payload : Object
▸{ Warning: 104.02 }
```

5 . Storing database in IBM cloudant DB.



Name	Size	# of Docs	Partitioned	Actions
login_credentials	13.7 KB	111	No	
noderedwjldy20221105	37.4 KB	4	No	
sample	59.4 KB	351	No	
sensor_data	15.7 KB	90	No	

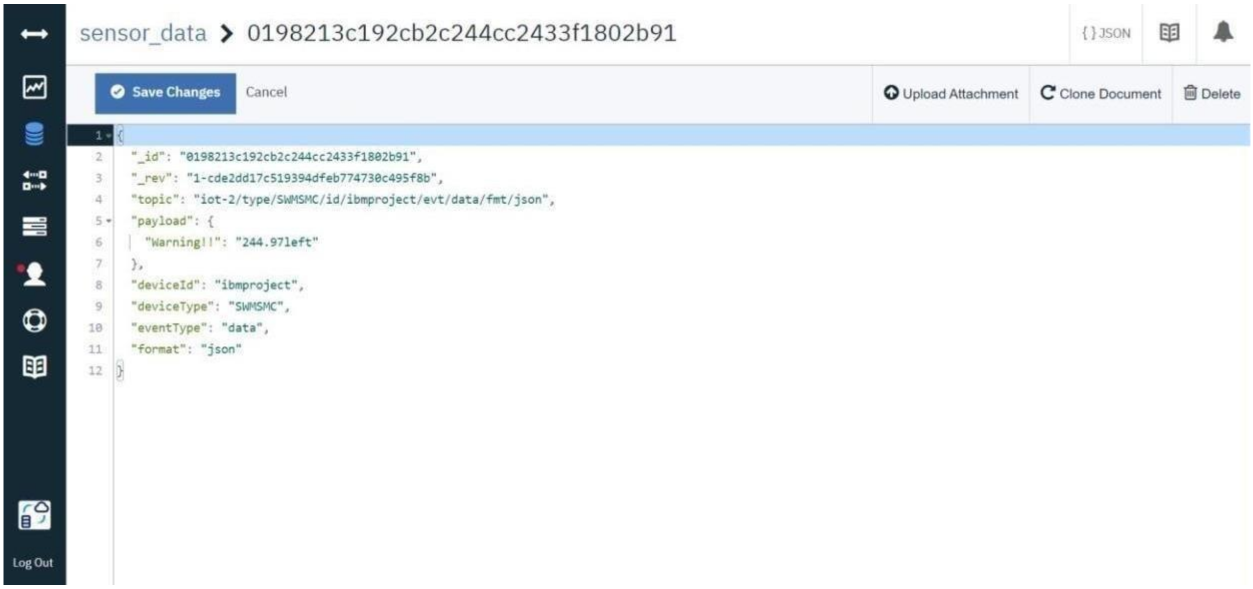
Showing 1–4 of 4 databases. Databases per page 20



id	key	value
0198213c192cb2c244cc2433f1...	0198213c192cb2c244cc2433f1...	{ "rev": "1-cde2dd17c519394df...
0198213c192cb2c244cc2433f1...	0198213c192cb2c244cc2433f1...	{ "rev": "1-d26c5b40891e13c6c...
0198213c192cb2c244cc2433f1...	0198213c192cb2c244cc2433f1...	{ "rev": "1-cde2dd17c519394df...
0198213c192cb2c244cc2433f1...	0198213c192cb2c244cc2433f1...	{ "rev": "1-f96eb0460bc16cfab0...
1a921f21cbe229b86f599acb45...	1a921f21cbe229b86f599acb45...	{ "rev": "1-7226f08794cd47b7c...
1a921f21cbe229b86f599acb45...	1a921f21cbe229b86f599acb45...	{ "rev": "1-1bbdd9a985bd56cf9...
20a854e5445fa818e6c1de049...	20a854e5445fa818e6c1de049...	{ "rev": "1-7226f08794cd47b7c...
20a854e5445fa818e6c1de049...	20a854e5445fa818e6c1de049...	{ "rev": "1-3ad288ecad57f039e...
20a854e5445fa818e6c1de049...	20a854e5445fa818e6c1de049...	{ "rev": "1-1bbdd9a985bd56cf9...
298ed6fbd9b3b815f5ac7c061e...	298ed6fbd9b3b815f5ac7c061e...	{ "rev": "1-4e7240f6e5307a1b9...

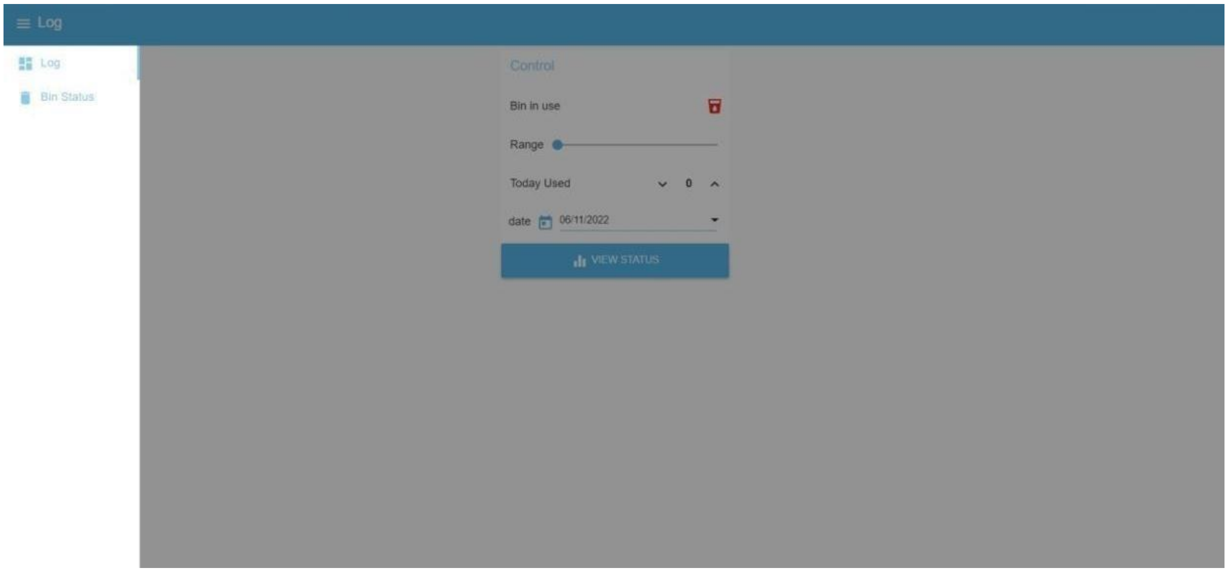
Showing document 1 - 20. Documents per page: 20

6. Data is stored in JSON format



```
{
  "_id": "0198213c192cb2c244cc2433f1802b91",
  "_rev": "1-cde2dd17c519394dfeb774730c495f8b",
  "topic": "iot-2/type/SWMSMC/id/ibmproject/evt/data/fmt/json",
  "payload": {
    "Warning!!": "244.97left"
  },
  "deviceId": "ibmproject",
  "deviceType": "SWMSMC",
  "eventType": "data",
  "format": "json"
}
```

7. Web UI

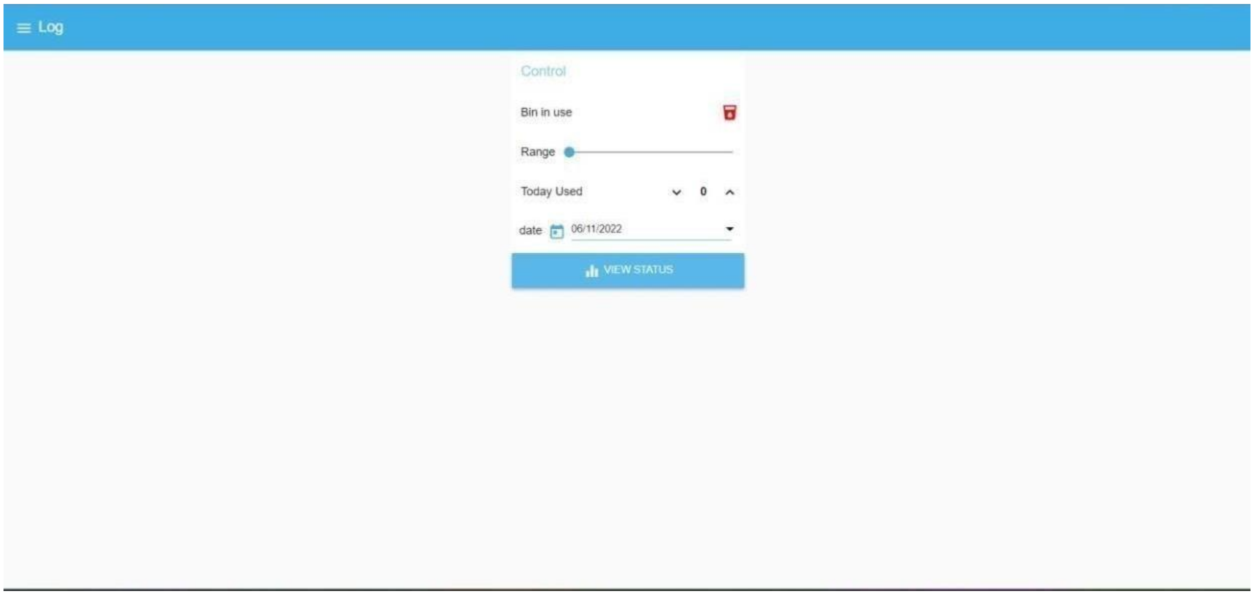


Bin in use

Range

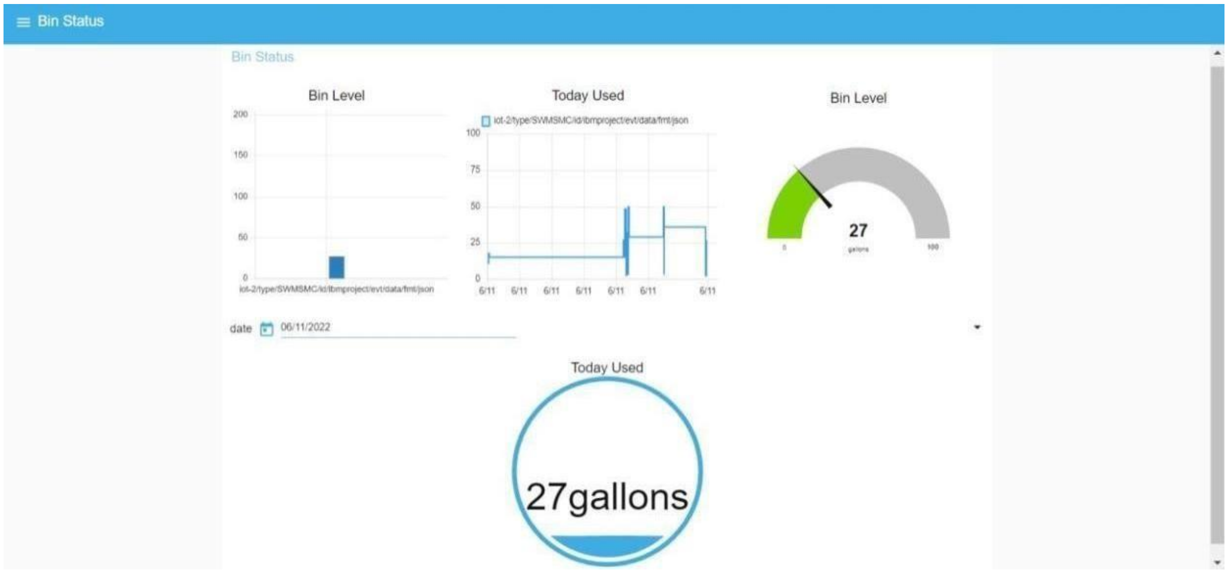
Today Used 0

date 06/11/2022



Today Used 0

date 06/11/2022



date 06/11/2022