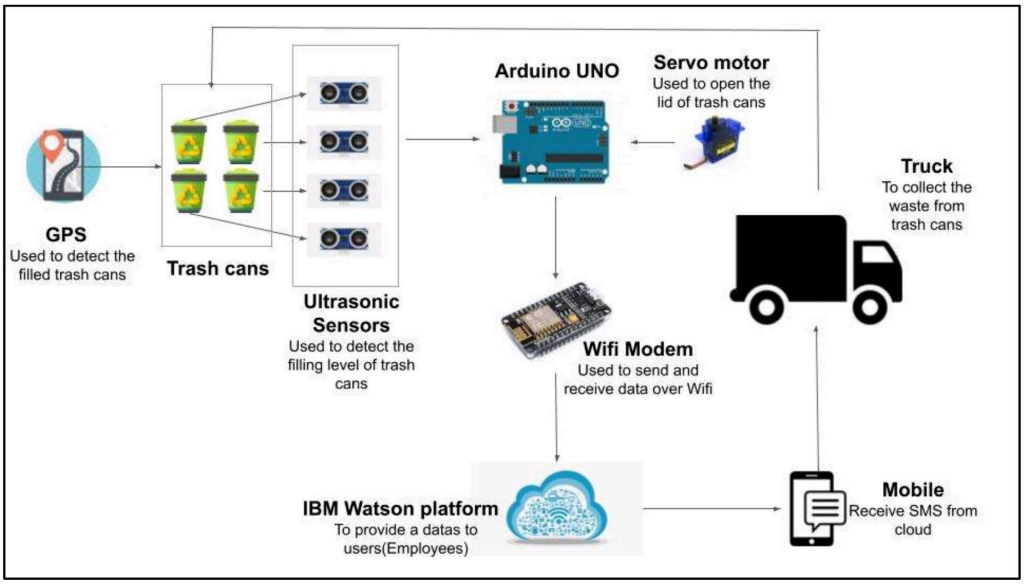
Project Design Phase-II
Technology Stack (Architecture & Stack)

Date	12 May 2023
Team ID	NM2023TMID01588
Project Name	SMART CITY WASTE MANAGEMENT SYSTEM WITH CONNECTED TRASHCANS

Technical Architecture



Guidelines:

- Include all the processes (As an application logic / Technology Block)
- Provide infrastructural demarcation (Local / Cloud)
- Indicate external interfaces (third party API's etc.)
- Indicate Data Storage components / services
- Indicate interface to machine learning models (if applicable)

Table-1:Components & Technologies

S.No	Component	Description	Technology
1.	User Interface	How user interacts with application	NodeRed,Python
2.	Application Logic-1	To show the distance and real time level of the smartbin in web portal,information getting via ultrasonic sensor and alert message activate with python script to web portal	Ultrasonic sensor,Python
3.	Application Logic-2	Getting location of the Garbage	GPS
4.	Application Logic-3	The IBM Watson Assistant service combines machine learning, natural language understanding, and an integrated dialog editor to create conversation flows between apps and users.	IBM Watson Assistant
5.	Database	Data Type, Configurations etc.	MySQL, NoSQL, etc.
6.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
7.	File Storage	File storage requirements	GitHub, Local Filesystem
8.	External API-1	The Google Maps API can be used to display the location of trash cans on a map, as well as provide directions to the nearest trash can.	Google map API
9.	External API-2	A transportation API can be used to integrate waste collection schedules with public transportation routes, ensuring that trash cans are emptied efficiently and on time	Transportation API
10.	Machine Learning Model	To send alert message when garbage is full	Distance Recognition Model
11.	Infrastructure (Server / Cloud)	The sensor data is transmitted to a cloud or central server, which processes the data and analyzes it to optimize waste collection schedules.	Cloud or Central server

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	1.Open source platforms like GPS helps to identify the most efficient routes for waste collection vehicles, minimizing fuel consumption and reducing collection time. 2. IoT-based smart bins equipped with sensors can monitor their fill levels in real-time	1.Waste collection and Routing 2.Smartbin monitoring
2.	Security Implementations	1. Implement strong encryption techniques to secure the communication between the trash cans and the central management system. 2. Regularly update the firmware and software of the trash cans to patch any security vulnerabilities. This includes both the embedded software running on the trash cans and the central management system software.	1.Data Encryption 2.Firmware and software updates.
3.	Scalable Architecture	Implement load balancing mechanisms to distribute incoming requests or data across multiple servers or instances. Load balancers ensure that the workload is evenly distributed, optimizing resource utilization. Additionally, employ auto-scaling techniques that automatically adjust the number of resources based on workload patterns and predefined thresholds.	Load balancing and auto scaling
4.	Availability	1.Establish effective communication channels to keep users informed about any planned maintenance activities, service disruptions, or alternative arrangements. Utilize notifications through mobile apps, emails, or other channels to provide timely updates and manage user expectations.	1.User Communication
5.	Performance	Reliable communication and connectivity infrastructure are vital for transmitting data from smart bins to the central management system. The performance of the system depends on stable and high-speed connections, minimizing data transfer delays or interruptions. Utilizing robust network technologies and ensuring sufficient bandwidth can help maintain optimal performance.	Communication and Connectivity