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

Date	15 October 2022
Team ID	PNT2022TMID33002
Project Name	Project – Smart Waste Management For Metropolitan Cities
Maximum Marks	4 Marks

Technical Architecture:

The Deliverable shall include the architectural diagram as below and the information as per the table1 & table 2

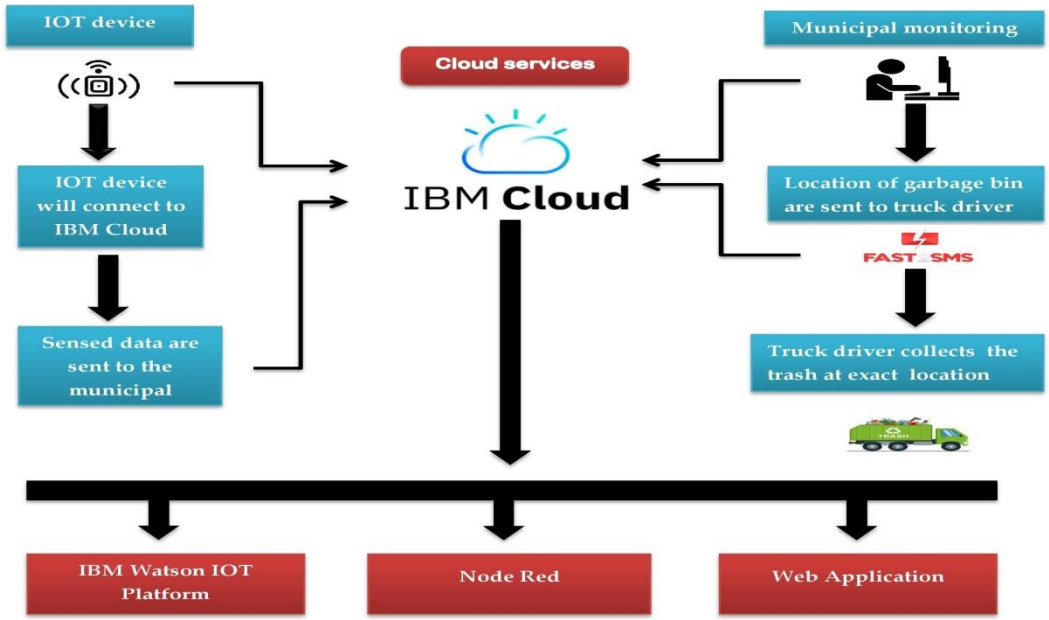

Table-1 : Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	○ Web UI, Mobile App, Chatbot , MIT inventor etc.	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Application Logic-1	○ IoT applications stores connected sensor data in the cloud. ○ Using real-time IoT dashboards and alerts, you gain visibility into key performance indicators, ○ statistics for mean time between failures, and otherinformation.	Java / Python
3.	Application Logic-2	○ The internet of things, or IoT, is a system of interrelated computing devices, mechanical and digital machines, objects, animals or people that are provided with unique identifiers (UIDs) and theability to transfer data over a network without requiring human- to-human or human-to-computer interaction.	IBM Watson STT service
4.	Application Logic-3	○ Watson Assistant lets you build conversational interfaces into any application, device, or channel.Add a natural language interface to your application to automate interactions with your endusers. ○ Common applications include virtual agents and chat bots that can integrate and communicate onany channel or device.	IBM Watson Assistant
5.	Database	IoT data comes in three different types, based on the device generating it and the use case. ○ Status data: Status data is basic, raw data that communicates the status of a device or system.	MySQL, NoSQL, etc.

		○ Automation data: This type of data is created byautomated devices and systems such as smart thermostats and automated lighting. ○ Location data: Location data communicates the geographical location of the device or system.	
6.	Cloud Database	○ Cloudant handles software and hardware provisioning, management and scaling, and support	IBM DB2, IBM Cloudant etc.
7.	File Storage	○ IBM Cloud® Block Storage is persistent, high-performance iSCSI storage thatis provisioned and managed independently of compute instances. ○ iSCSI-based Block Storage LUNs are connected toauthorized devices through redundant multi-path I/O (MPIO) connections.	IBM Block Storage or Other Storage Service or Local Filesystem
8.	External API-1	Runtime APIs Admin HTTP API ○ This HTTP-based API can be used to remotely administer the runtime. It is used by the Node- RED Editor and command-line admin tool. Hooks ○ The Hooks API provides a way to insert customcode into certain key points of the runtime operation. Storage ○ This API provides a pluggable way to configurewhere the Node- RED runtime stores data.	IBM Weather API, etc.

		Logging ○ A custom logger can be used to send log events toalternative locations, such as a database. Context Store ○ This API provides a pluggable way to store contextdata outside of the runtime.	
9.	External API-2	Editor APIs ○ The APIs available in the editor for nodes and plugins to use. This includes a set of standardUI widgets that can be used within a node's edit template. Module APIs ○ The APIs provided by npm modules that Node- RED is built from. These can be used to embed Node-RED into existing Node.js applications.	Aadhar API, etc.
10.	Infrastructure (Server / Cloud)	○ Application Deployment on Local System / CloudLocal Server Configuration: Cloud Server Configuration	Local, Cloud Foundry, Kubernetes, etc

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	○ It is an open-source IoT framework. The main purpose of the framework is data collection and device management. ○ Further, it uses IoT protocols like HTTP, MQTT and CoAP for device connectivity. ○ It is also highly scalable as every type of device easily integrated	Technology of Opensource framework
2.	Security Implementations	Safety ○ The IoT platform should never do something it isn't supposed to do. The principal game changer regarding software in the domain of IoT is safety coupled with accountability and responsibility. Any applied automation through an IoT solution meansthat we have faith in the system and trust that it will never do harm in the environment. Security ○ The IoT platform must ensure proper device management (via authentication and authorization mechanisms), data privacy, integrity, and confidentiality via secure communication and encryption of data. ○ Security is especially crucial for an IoT platform, as it will rely more on automated security.	e.g. SHA-256, Encryptions, IAM Controls, OWASP etc.
3.	Scalable Architecture	Portability	Technology used

S.No	Characteristics	Description	Technology
		○ The IoT platform must be portable if it is destinedto heterogeneous nodes. ○ This may be achieved by leveraging virtualization technologies (for example, by using the Java Virtual Machine), or packing the deliverable into host operating system oblivious form (like the Docker image). Adaptability ○ To support an extensive list of devices, andprovide more service APIs for integration purposes, it is mandatory ○ to have an adaptable IoT platform. The possible usage scenarios are vast, and cannot be predetermined in advance. Usability ○ To reduce the deployment hassle, and quickly get users up and running with an IoT platform, it must be in a user- friendly form in multiple aspects. This includes the management, supervision, and reporting facilities. Efficiency ○ The IoT platform should ideally have a small footprint, employ advanced data storage technologies, and require adequate hardware resources to be usable in both real time and regular contexts. To move the computation neardevices it should run on less capable hardware (for example, inside a smart meter or smartphone).	

S.No	Characteristics	Description	Technology
4.	Availability	○ Load balancing is a core networking solution usedto distribute traffic across multiple servers in a server farm. Load balancers improve application availability and responsiveness and prevent server overload.	Technology used
5.	Performance	○ Fog Computing is a new paradigm and an extension of Cloud Computing. This better performance results justifies the suitability of IoTapplications using Fog-Based Cloud Network approach. ○ Imperva and other CDNs can be used to reduceyour website's latency, improving overall site performance and UX. ○ Among other methods, this is done through: Content caching – CDNs cache and compress mirror versions of your web pages, which are thenstored in strategically placed data centers	Technology used