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Dr. Vitthalrao Vikhe Patil Foundation's

Dr. Vithalrao Vikhe Patil College of Engineering Ahmednagar

DTE College Code: EN-5161

DEPARTMENT OF IT ENGINEERING

"Blockchain-Based IOT Enabled E-waste Tracking and Tracing System for Smart Cities "

Project Guide

Prof. Mrs. P. S. Dolare
Associate Professor, Information Technology

A
PROJECT REVIEW
ON

Blockchain-Based IOT Enabled E-waste Tracking and Tracing System for Smart Cities

Sr. No.	Group Members	Roll No.
1.	Bhusare Vaishnavi Ashok	14
2.	Raut Vaibhavi vijay	53
3.	Shirsath Vaishnavi Babasaheb	61
4.	Vikhe Pratiksha Sunil	67

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INTRODUCTION

- Smart cities rely on multiple technologies to create, deploy and promote sustainable development strategies to meet the increasing demands of urbanization.

- This system covers the entire lifecycle of electronic devices, including manufacturing, use, and disposal. It also addresses security and privacy concerns related to electronic waste management.

- Smart cities are increasingly focusing on the design and development of waste management solutions that are based on advance technologies, such as Internet of Things (IoT) and blockchain.

PROBLEM STATEMENT

- The management of electronic waste (e-waste) in smart cities has become a significant challenge due to the proliferation of IoT devices and electronic gadgets.
- The lack of a transparent and efficient tracking and tracing system for e-waste disposal and recycling poses environmental, health, and logistical concerns.
- This system should provide a secure and immutable ledger for tracking the entire lifecycle of e-waste, from collection to recycling, while also enabling real-time monitoring and compliance enforcement to reduce the environmental impact of e-waste and promote sustainability in urban areas.

ABSTRACT

- Recycling of electronic waste is a rapidly growing global issue that requires proper monitoring and tracing of electronic devices and the business transactions between the stakeholders.

- The majority of current systems that manage electronic devices throughout their supply chain stages are centralized and lack data transparency, immutability, and security.

- Specifically, such systems are incapable of handling problems like comprehensive coverage of the life cycle of e-products, access control for maintaining data security, reputation-aware selection of stakeholders, and large amounts of data generated during various stages of the supply chain processes.

- we propose a blockchain-based IoT-enabled system for monitoring all post-production business processes, activities, and operations performed on an electronic device.

MOTIVATION

- To design and develop a blockchain-based Internet of Things (IOT) system designed to efficiently track and trace electronic waste (e-waste) within smart cities. This system seeks to enhance the management, recycling, and disposal of e-waste by leveraging the immutable and transparent nature of blockchain technology combined with the real-time data acquisition capabilities of IoT devices.
- Smart City Initiatives
- Challenges in E-Waste Management
- Technological Advancements

OBJECTIVE

- Implement a Blockchain Network: Establish a decentralized blockchain to securely record and verify all transactions and movements of e-waste.
- Develop a User Interface: Create a web application for stakeholders to interact with the system, including functionalities for reporting, tracking, and managing e-waste.
- Enhance E-Waste Management: Improve the sorting, recycling, and disposal of e-waste by accurate and timely information.
- Foster Public Awareness and Participation: Encourage responsible e-waste disposal practices among citizens through awareness campaigns and incentives.
- Integrate IoT Sensors: Deploy IoT devices to monitor the condition, location, and movement of e-waste in real-time.

SCOPE

SCOPE-

- E-Waste Monitoring
- Environmental Impact Assessment
- Resource Recovery

LITERATURE SURVEY

Sr. No.	TITLE OF THE PAPER & AUTHOR	REVIEW	RESEARCHGAP
1	Smart Garbage Monitoring System Using IOT Authors: Dr. Ihtiram Raza Khan Mehtab Alam Anuj Razdan Feb 2021	This research paper proposes an IoT based smart system based on clean waste management that assesses the level of waste on dustbins through sensory systems. In this system the microcontroller is used as a visual connector connecting the sensor and the IoT system.	The truck is called every time the garbage bin is full which can happen several times a day making the process time consuming and resource inefficient.
2.	Smart Garbage Management System for a Sustainable Urban Life: An IoT Based Application Authors: Minhaz Uddin Sohag Amit Kumer Podder June 2020	This system consists of an identification system, an automated lid system, a display system, and a communication system.	The system discussed in this report is Extortionate and revolves around human intervention in the functioning where there is clear lack in automation without human intervention

Sr. no	TITLE OF THE PAPER &AUTHOR	REVIEW	RESEARCH GAP
3	Garbage Management using Internet of Things. Authors: Mrs. Pallavi Nehete Dhanshri Jangam Nandini Barne Prajakta Bhoite Shalaka Jadhav	This system uses the smart dustbin in which a GSM board sends messages by detecting the level of garbage using an IR sensor. Water sensor is used to detect the wet garbage.	Uses GSM which is relatively old (can use GPRS)
4	Garbage Monitoring System Using IOT Authors: Ashima Bajaj Sumanth Reddy	This system makes use of a microcontroller, LCD screen, and Zigbee methodology for sending data. Ultrasonic sensors are used to detect the level of garbage collected in the bins. The LCD screen is used to display the level of garbage collected in the bins.	It suffers from the same drawbacks of being time consuming and resource inefficient as technology used is not practical with output and time parameters i.e., a garbage truck should only come in a periodical manner.
5	IoT E-Waste Monitoring System to Support Smart City Initiatives Author:Aznida Abu Bakar Sajak	This system is to design an IoT-based recycle e-waste monitoring system that will provide an efficient solution to electronics waste collection and generation data	This system only call the truck when dustbin is 100% full

PROPOSED SYSTEM

- The proposed system keeps track of the electronic devices from the time of its manufacturing and facilitates the consumers in depositing their used electronic devices through IOT-enable Smart Waste Bin.

- This proposed system is implemented on blockchain and uses multiple smart contracts to ensure proper handling of the e-waste. It uses reputation-centric criteria to minimize frauds in supply chain operations.

EXPECTED OUTCOMES

- Stakeholders can track the movement and status of e waste.
- Blockchain's cryptographic features enhance security.
- Increased transparency and traceability can lead to greater customer trust.

METHODOLOGY

•All Ultrasonic sensors will be interfaced to Arduino Mega and will be the input section of the system.

•Arduino Mega will be programmed to perform task to measure via sensor and give output.

• Arduino Mega will be connected to Internet and will be logged into a server through Ethernet Shield.

• Ultrasonic sensor will measure the waste quantity in the dustbins and will give readings for waste available in dustbins.

•We can continually monitor all the dustbins in our system through our website and also monitor all the events in the system. Ultrasonic sensor will measure the waste quantity in the dustbins and will give readings for waste available in dustbins.

SYSTEM ALGORITHMS/ TECHNIQUE USED

Algorithm 1 : Placing a Request to Buy Electronic Devices From Manufacturer

Input: Quantity, type, service time, device EA Output: Emit DataDestructionRequestPlaced Event Caller is not a registered user. Caller is Waste Recyling Plant AND Permit. GetPermitofDataDestructionUnit() is not Expired AND Reputation Score Minimum Value AND Device. Type = Storage Generate an identifier to uniquely identify the order. Update status of the order to 'Submitted'. Emit an event for the entities participating to let them know that the data destruction request was successfully placed using the waste recycling. Display an error and restore the smart contract to its initial state.

1. Input: Electronic device EA, shipment delivery due date, quantity, and type
2. Output: Emit PurchaseOrderPlaced Event.

SYSTEM ALGORITHMS/ TECHNIQUE USED

Algorithm 2 Submitting Bids to Confirm Delivering e-Waste in a Particular Region

This algorithm ensures that only verified and legitimate users can request and receive a data destruction certificate. It checks the order and payment status along with the reputation score to prevent fraudulent activities. The use of IPFS and blockchain ensures the integrity and transparency of the certificate issuance process, providing a secure and verifiable record of data destruction.

1. Input: Waste contractor EA, bid
2. Output: Emit ContractorsSelected Event

Algorithm 3 Placing a Request for Data Destruction Unit to Perform Data Erasing

1. Input: Quantity, type, service time, device EA
2. Output: Emit DataDestructionRequestPlaced Event

SYSTEM ALGORITHMS/ TECHNIQUE USED

Algorithm 4 Issuing Data Destruction Certificate of the Storage Devices

1. Input: Waste recycling unit EA, order ID, payment status.
2. Output: Emit DataDestructioncertificateIssued Event .

MODULES

Modules:

1.Manifacturer

2.Retailer

3.Consumer

4.Smart Waste Bins

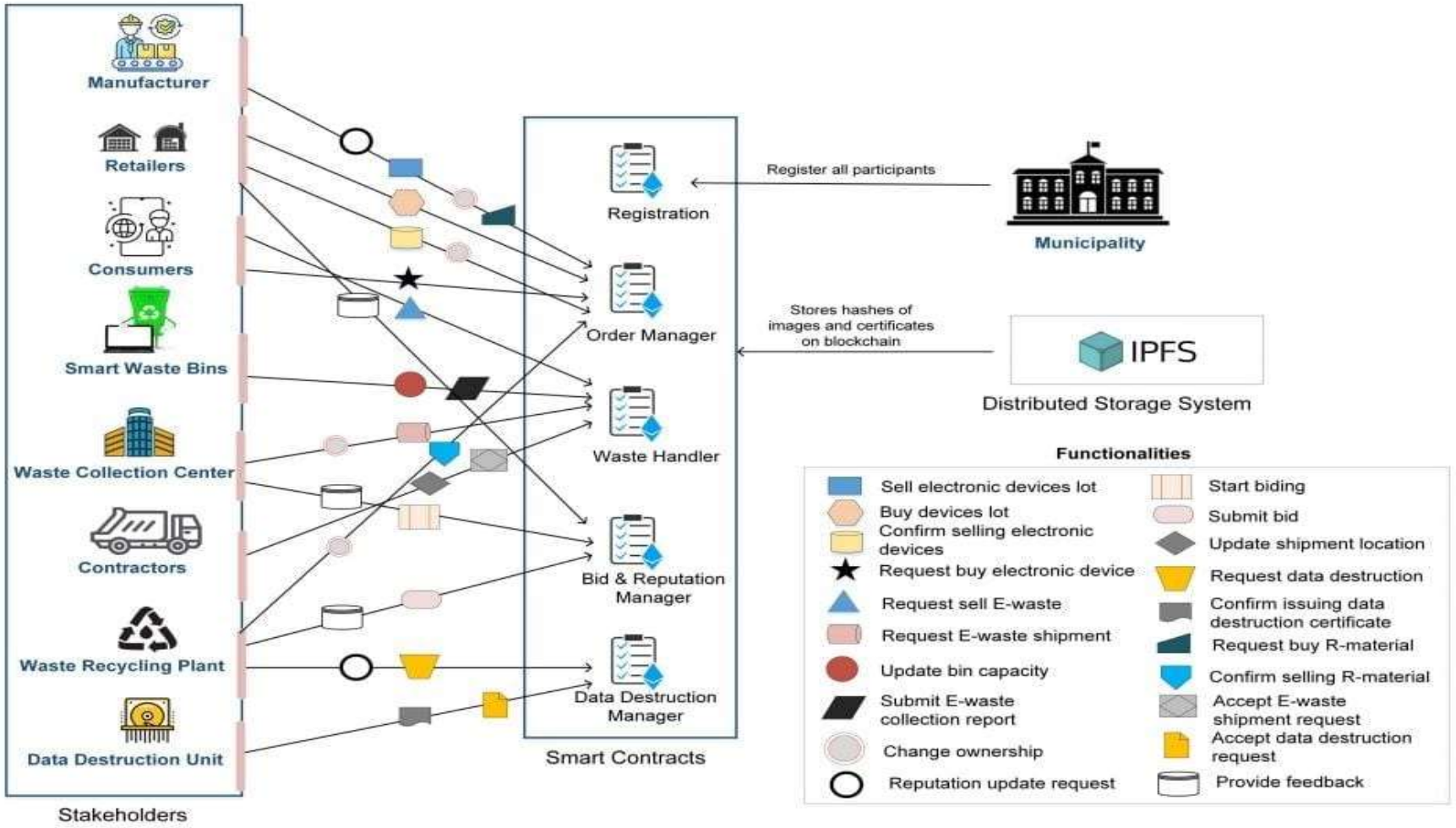
5.Waste Collection Center

6.Contractors

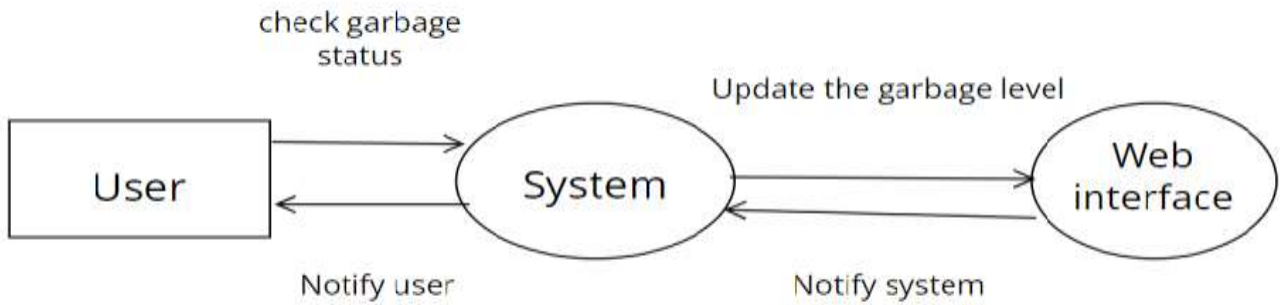
7.Waste Recycling Plant

8.Data Destruction unit

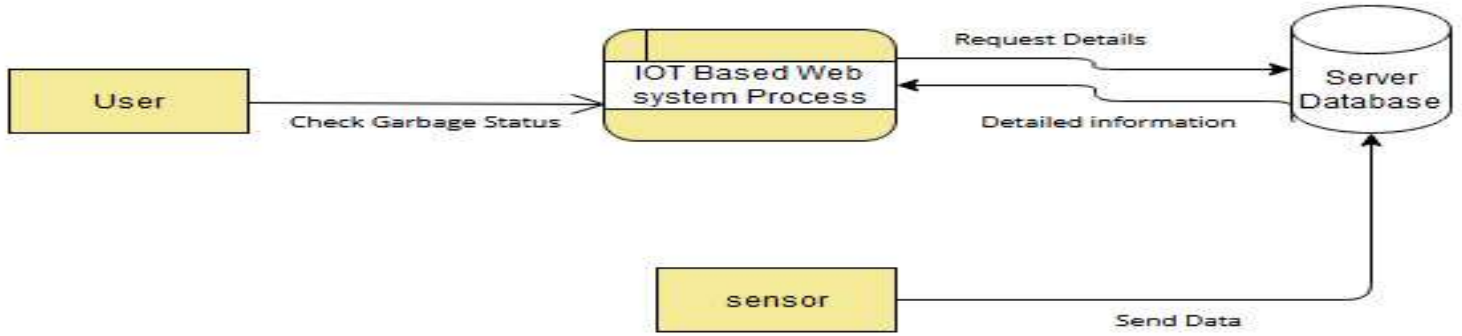
ARCHITECTURE DIAGRAM



DATA-FLOW DIAGRAM

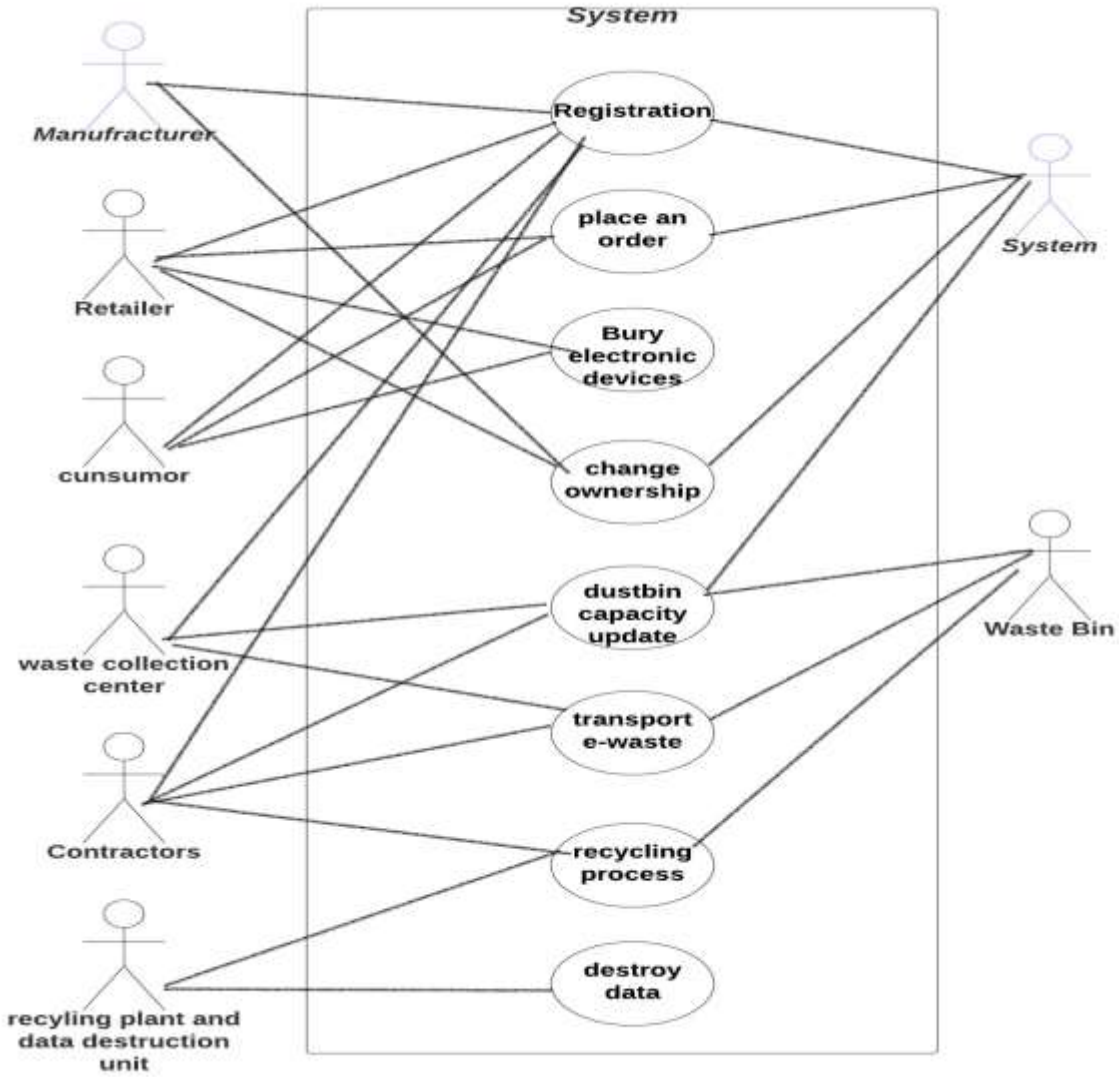


Level 0 Data Flow Diagram

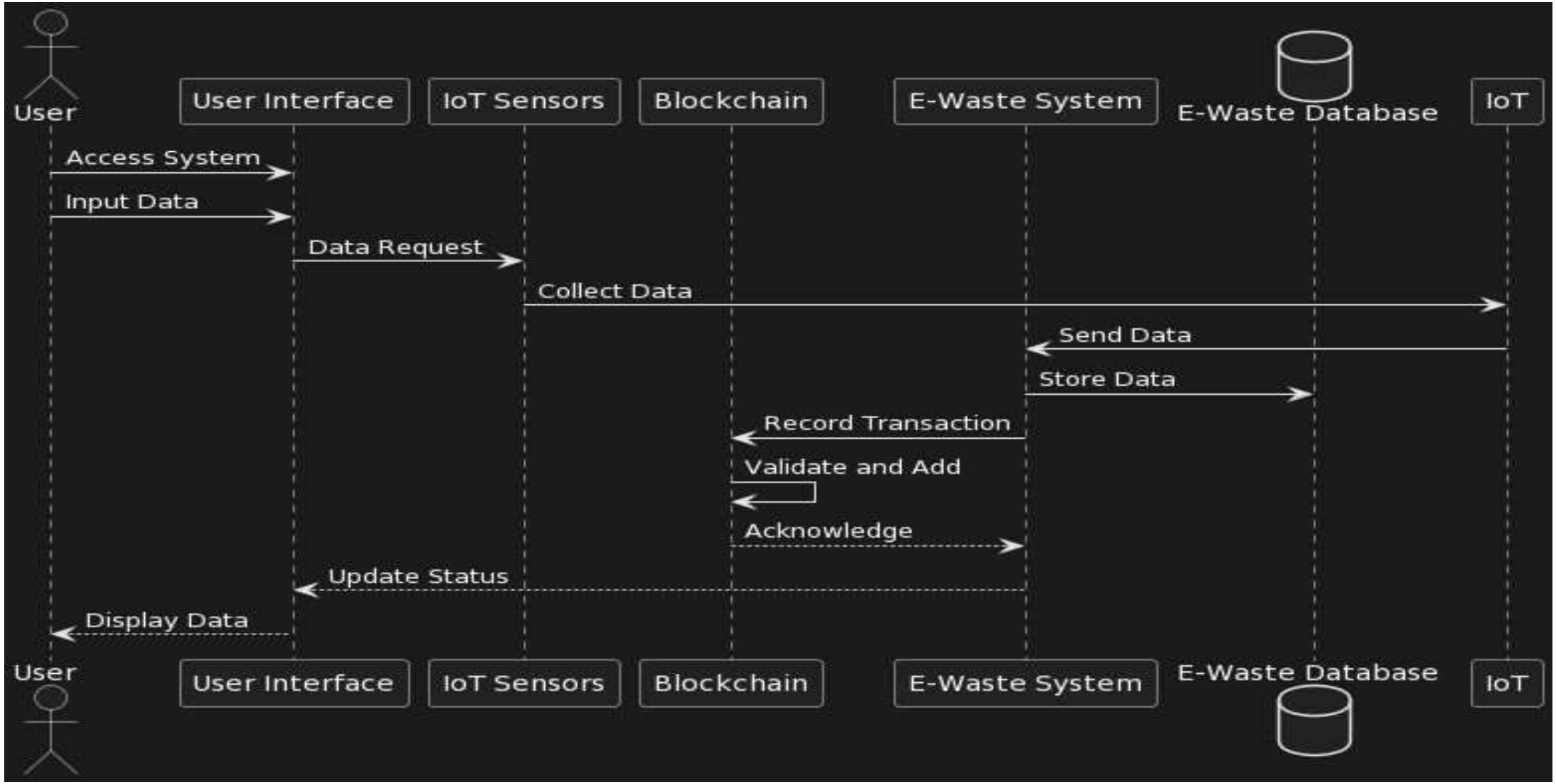


Level 1 Data Flow Diagram

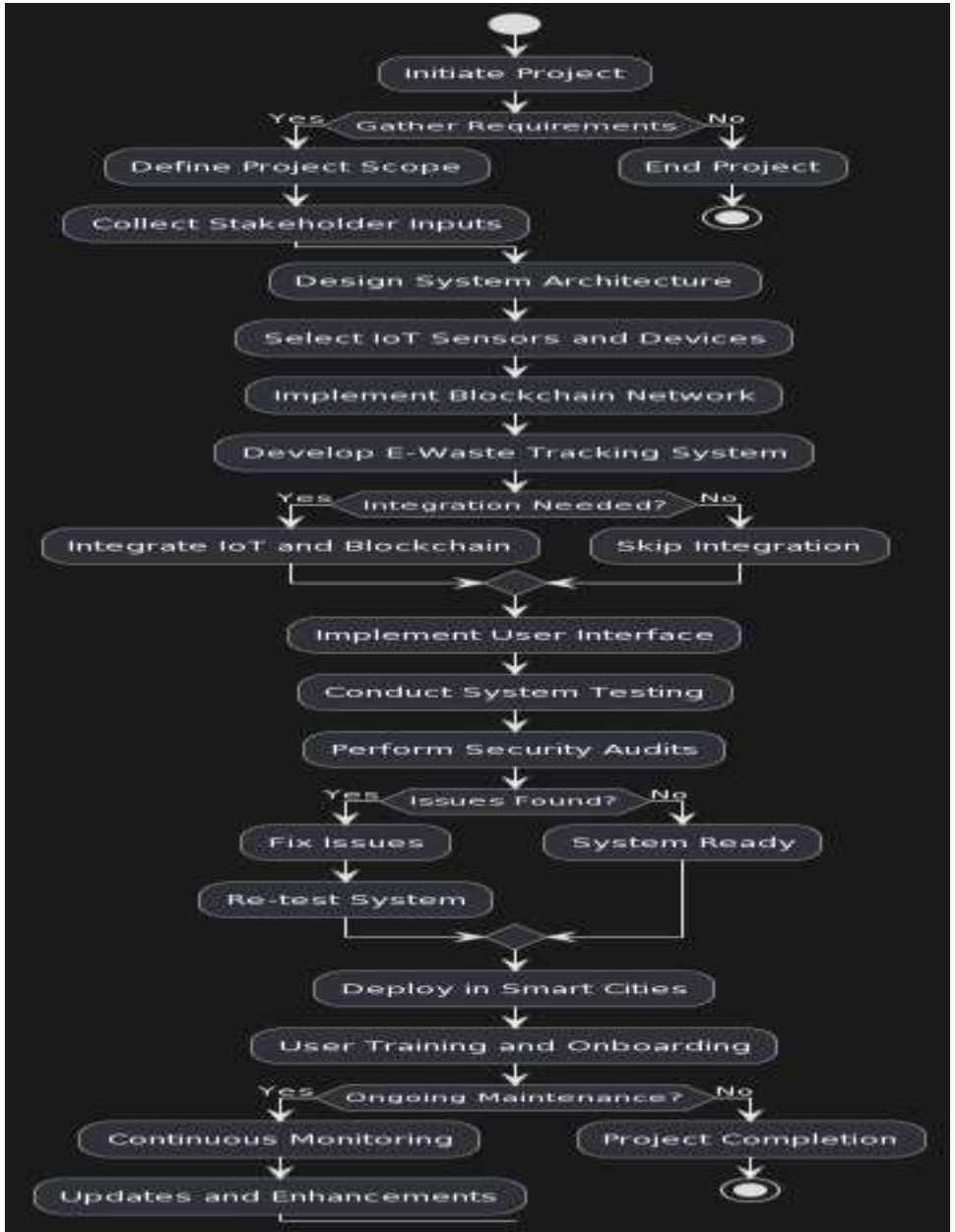
USECASE DIAGRAM



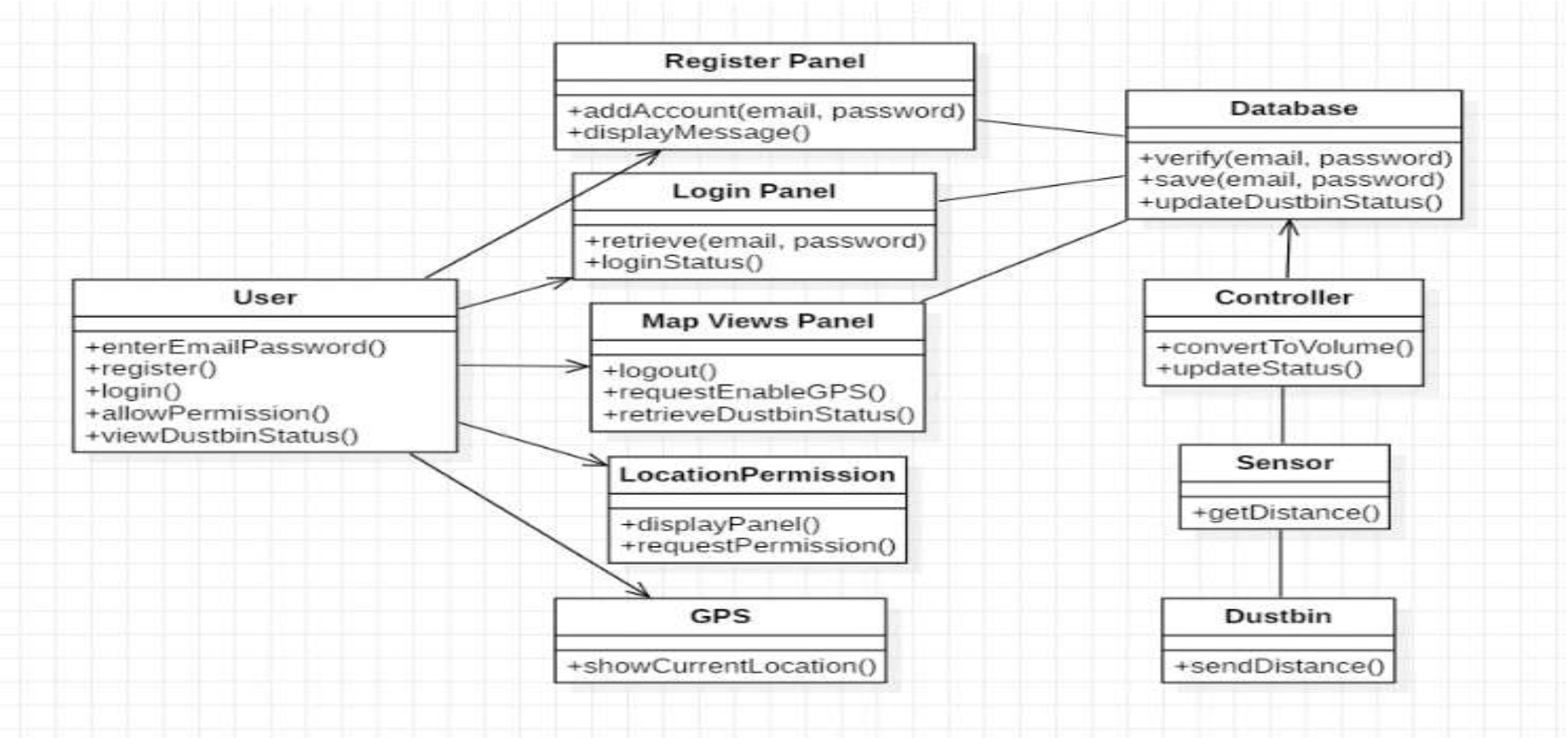
SEQUENCE DIAGRAM



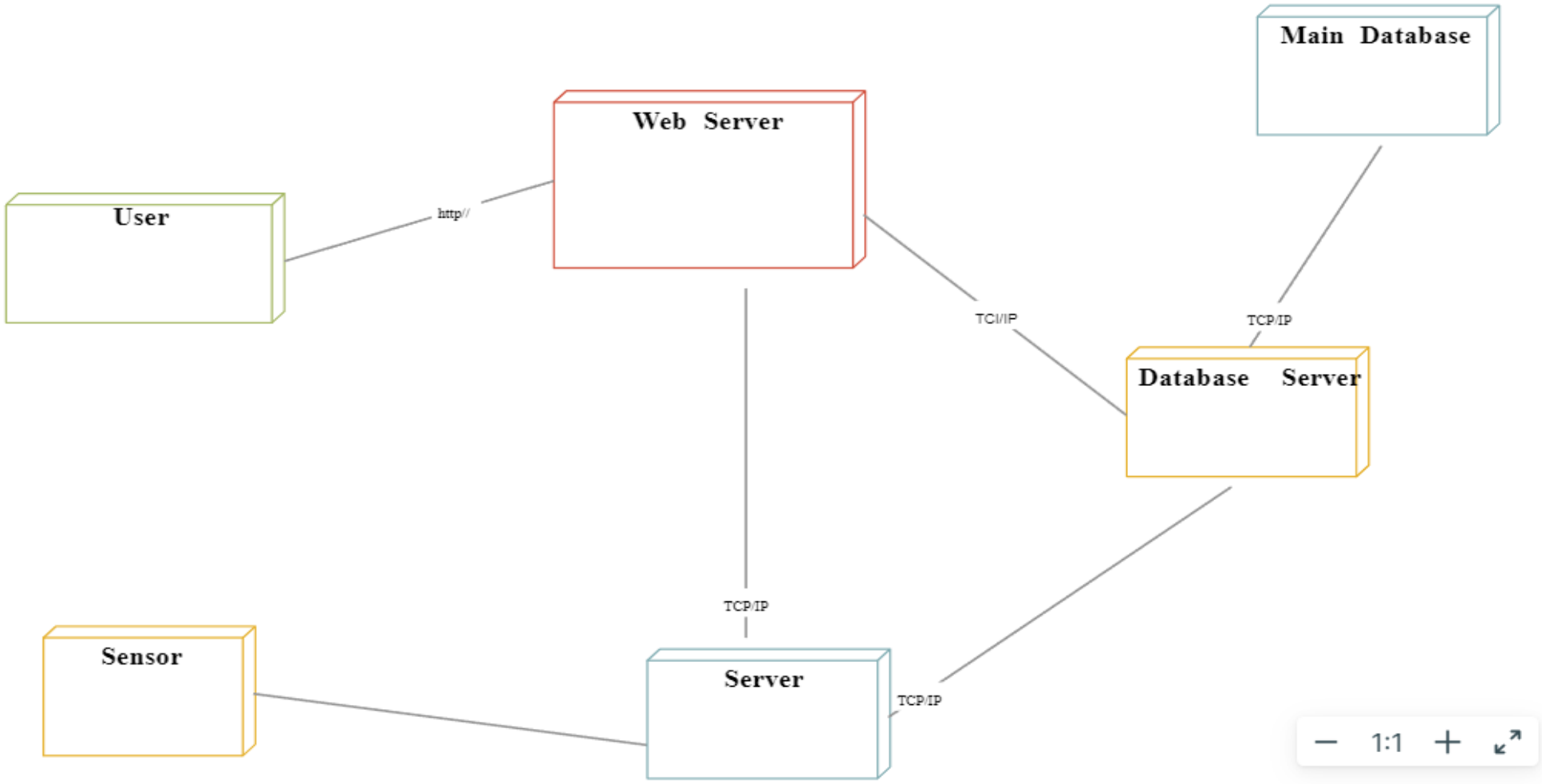
ACTIVITY DIAGRAM



CLASS DIAGRAM



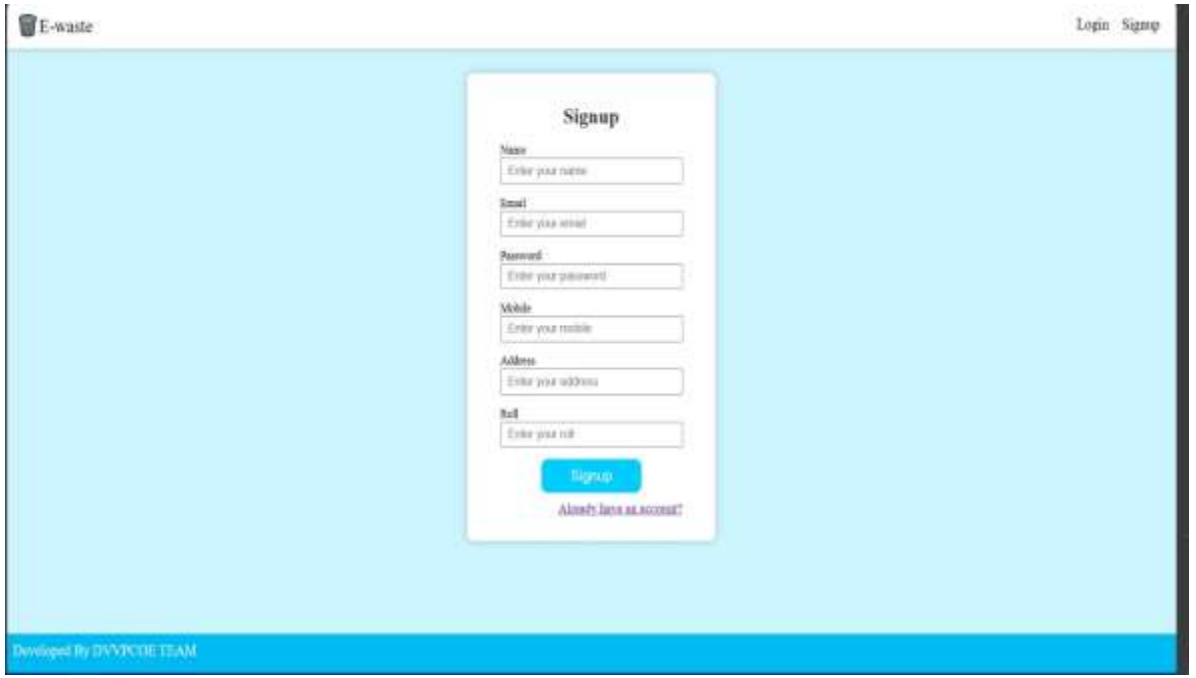
DEPLOYMENT DIAGRAM



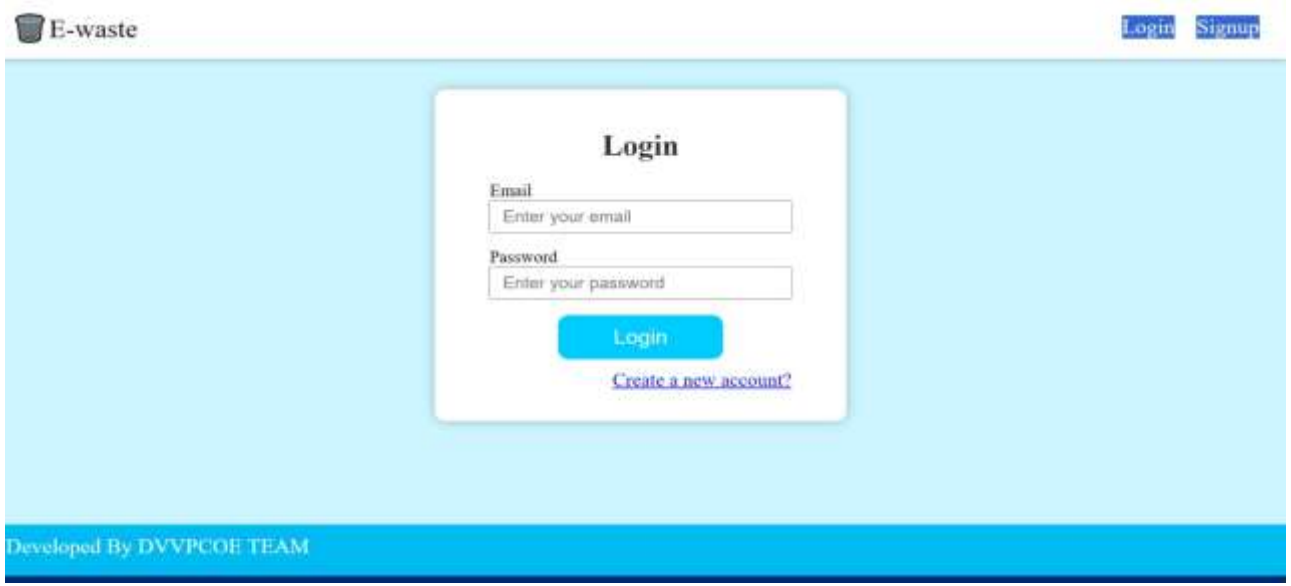
SCREENSHOTS OF MODULES

Home Page

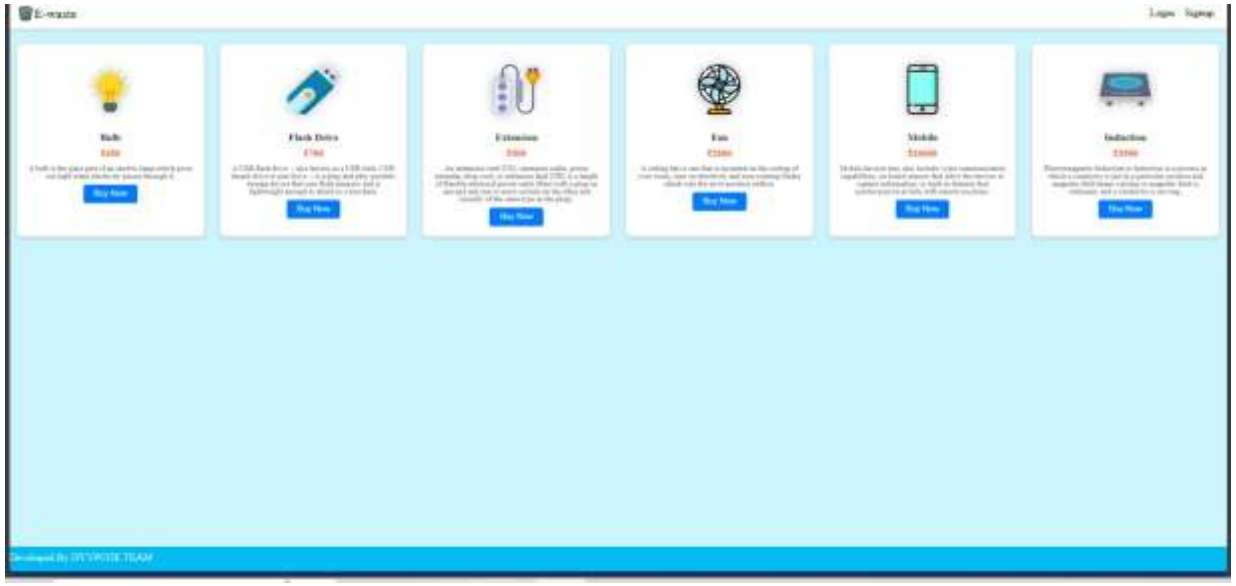
Signup



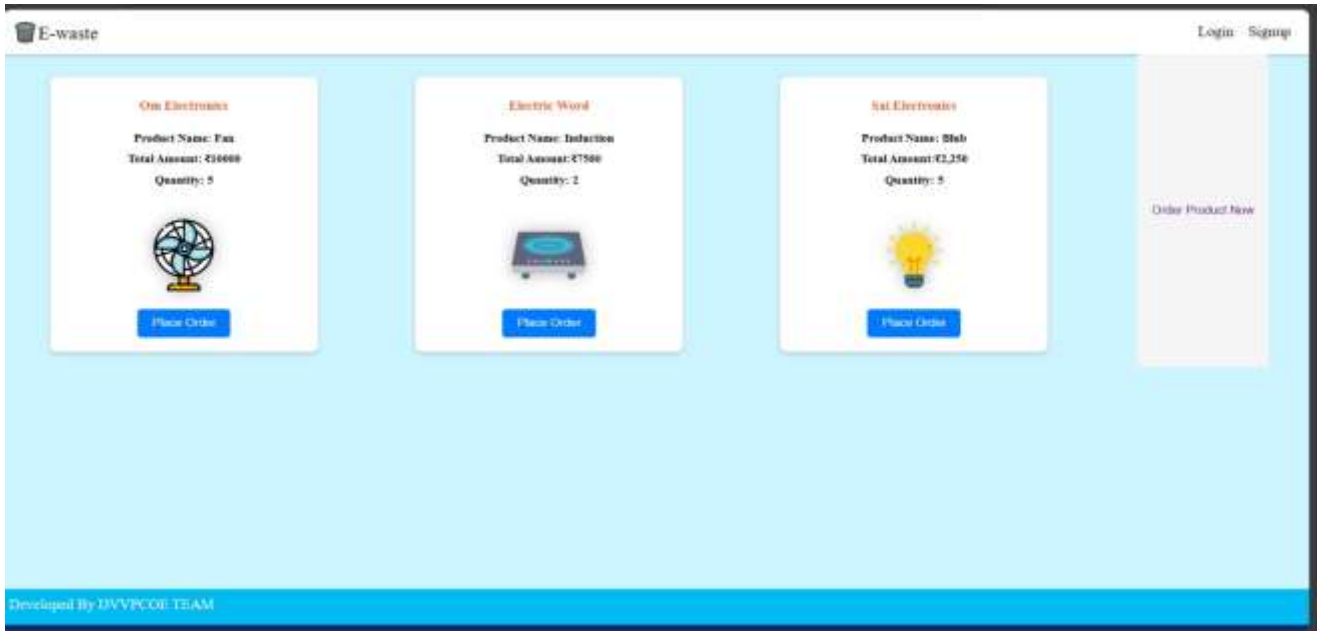
Login Page:-



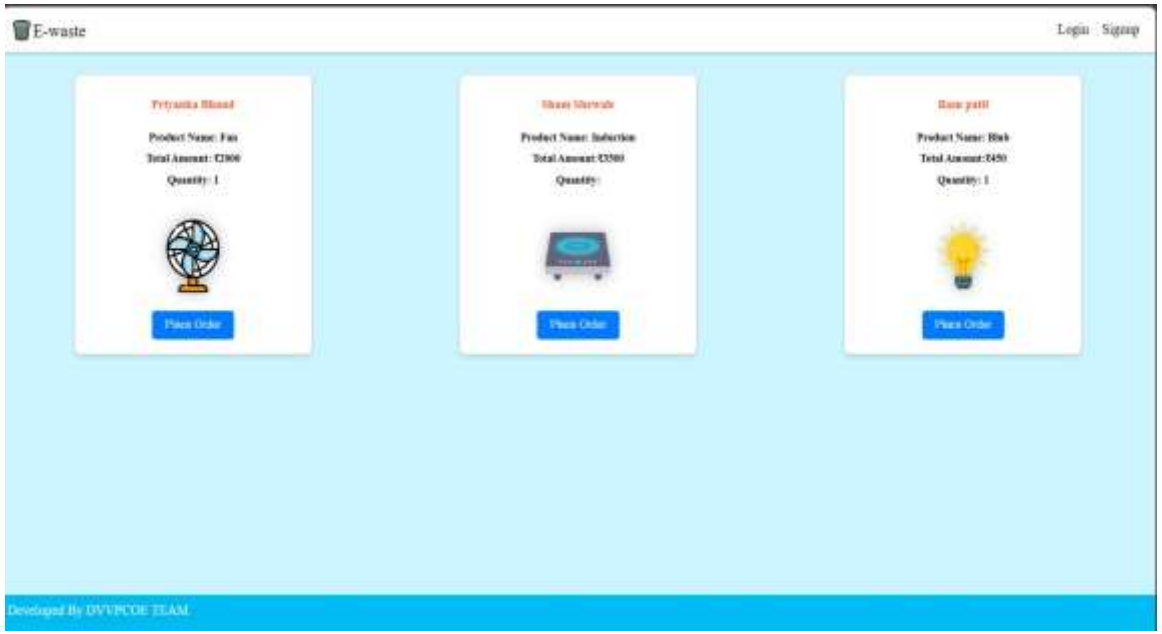
Manufacturer:



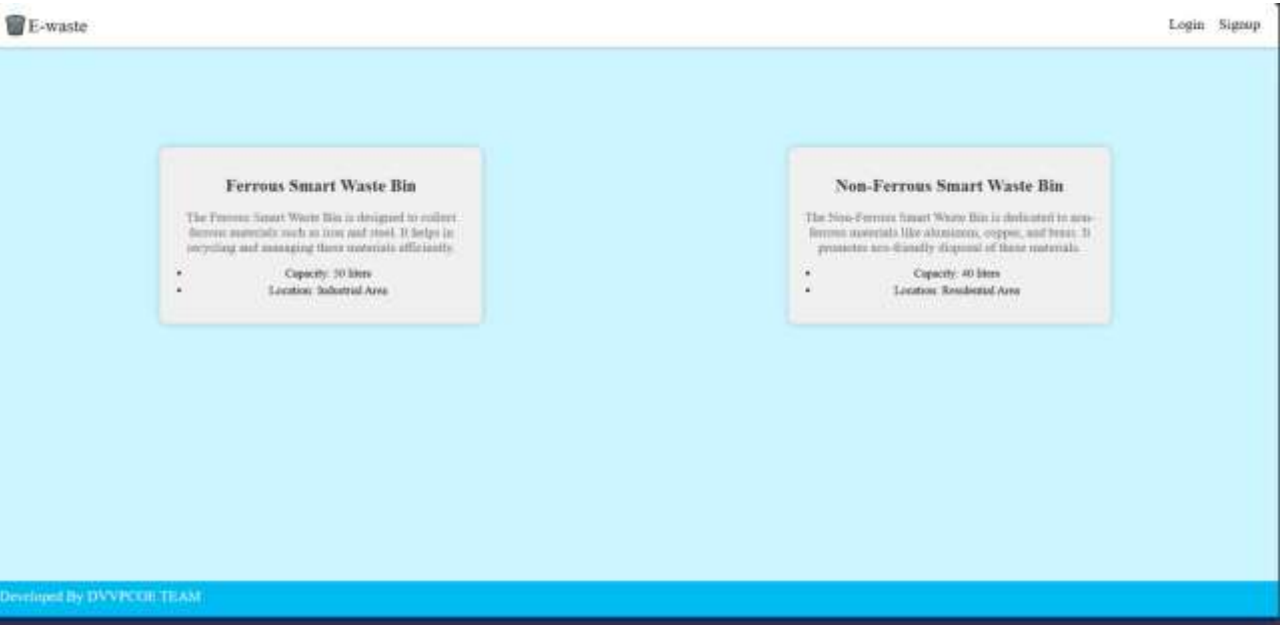
Retailer:



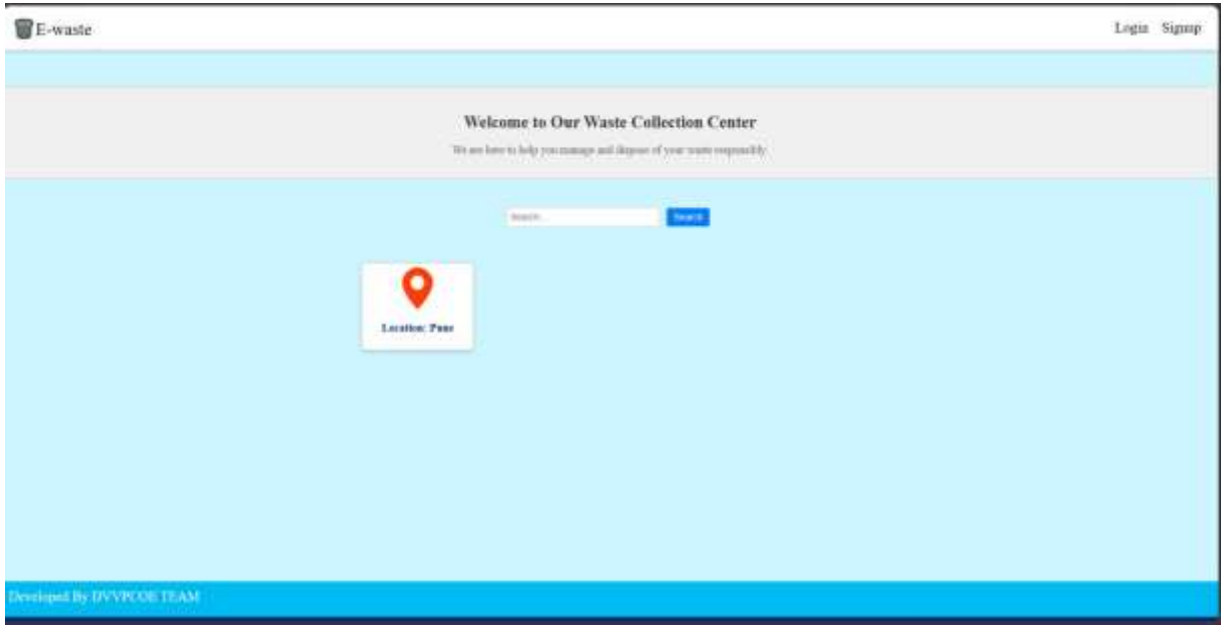
Consumer:



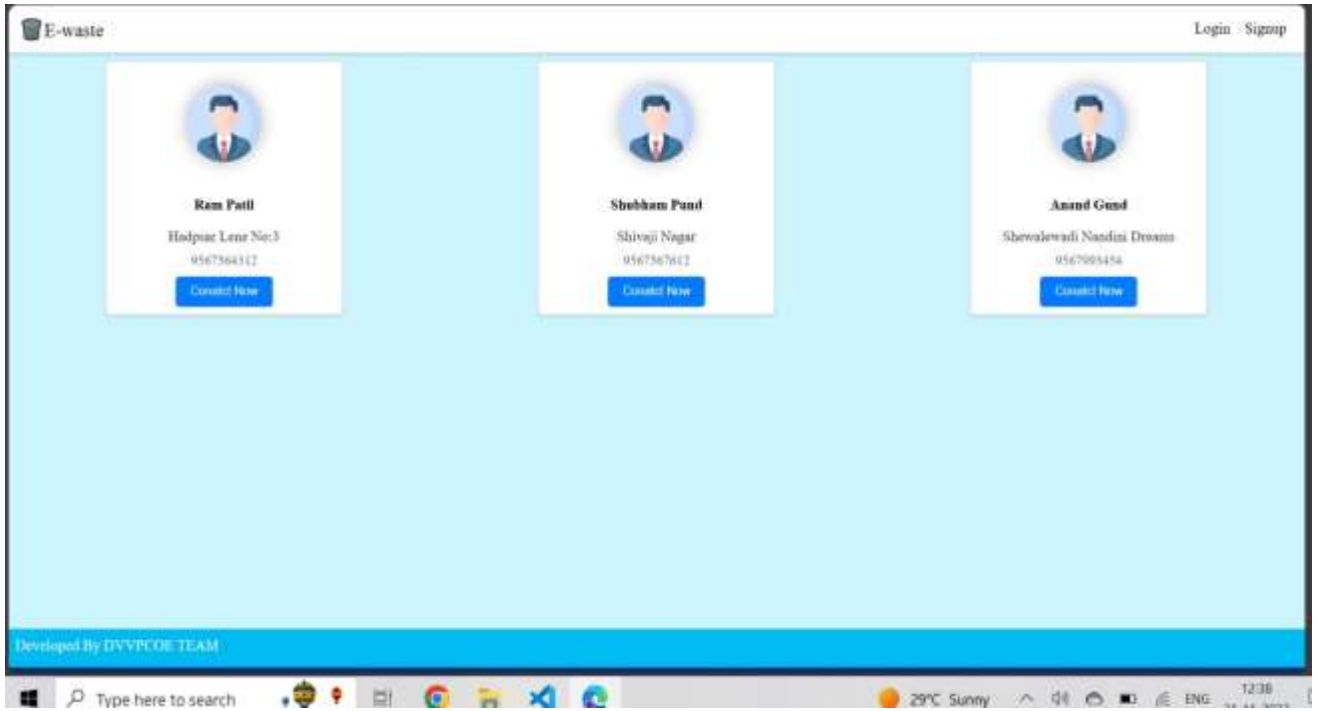
Smart Waste Bin:



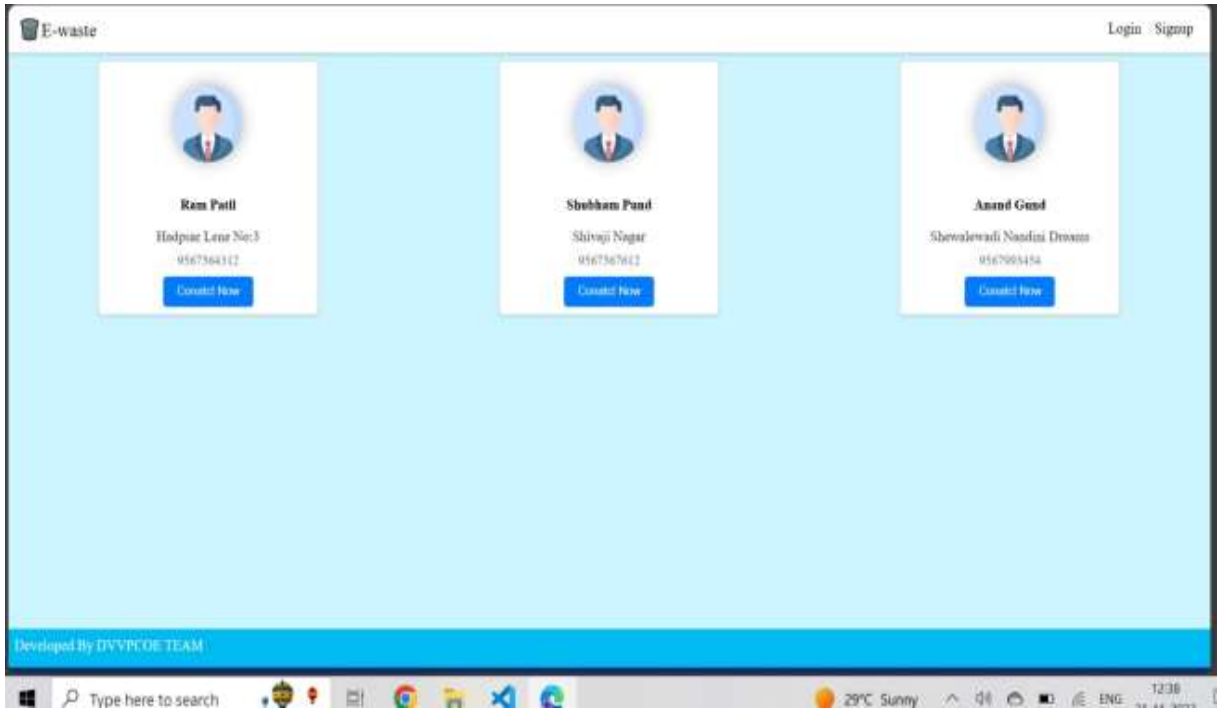
Waste Collection Center:



Contractor:



Recycling Plant:



CONCLUSION

- In this paper, we presented an IoT-enabled blockchain based system for tracking and tracing of electrical devices and their waste. Using the blockchain-platform, we designed a system that enables stakeholders to perform their business processes in a completely decentralized, secure, transparent, and auditable manner.
- The proposed system enables the authorities to ensure that electronic devices are purchased and supplied from licensed, reputed, and trustworthy users, disposed of appropriately, and managed by the participants in a safe and privacy-preserving manner. We resolved the scalability issues of the existing blockchain solutions by storing big data sets pertaining to electronic devices, e-waste. Moreover, we conducted the cost and security analysis of the proposed solution and found that our solution is practical, secure, viable, and highly dependable.
- The proposed system is generic and with small iterations it can be implemented for various other use case scenarios, such as domestic waste management, water waste management and other scenarios where traceability is required. In the future, we aim to incorporate additional types of waste into our system, such as wastewater, organic wastes, and food waste.

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