

Location Based Garbage Management System for Smart City

ABSTRACT:

This paper introduces the garbage management system for maintaining hygienic conditions in a smart city. Our system is designed to solve this issue and will provide complete details of the vehicle located in the different areas throughout the city. The concerned public can access the information from anywhere and anytime to get the details. Accordingly they can take the decision on this immediately. The key aspect of this system is to collect garbage from the public. An Android application will act as GUI to supervise the garbage status. GPS system employed will pinpoint the exact location of the vehicle.

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I. INTRODUCTION

With increasing population in our country, urbanization has increased which has led to the generation of waste. Tonnes of trash are generated every year. Ten million tonnes of garbage is generated in the cities. This leads to deterioration of public health, environmental pollution, impact on quality of life of the citizens. Thus, waste management has been a crucial issue. The previous research in the area of technology related to Smart Garbage Management involves the use of Zigbee and GSM technology for connectivity. Earlier technology include RFID technology to identify tags attached to objects. A combination of above technologies have been used for connectivity purpose. There is shortfall in research to efficiently alert the authorities in an optimized way to maintain clean environment. The system introduced uses more advanced wireless technology and handy applications for further improvements. The garbage full condition is automatically detected with the help of threshold value set and the information is transmitted to the concerned authorities to initiate the cleaning operations. The mechanism used to locate the bin helps in minimizing the time required for performing the cleaning process.

CLOUD COMPUTING

1.1 GENERAL:

Cloud Computing is a new delivery model for IT services based on Internet protocols. It typically involves provisioning of dynamically scalable and often virtualized resources at the infrastructure, platform and software levels. It addresses different fundamentals like virtualization, scalability, interoperability, quality of service and failover mechanism. Cloud environment differs from traditional environments on the fact that it (1) is massively scalable, (2) can be encapsulated as an abstract entity that delivers different levels of services to customers outside the Cloud, (3) is driven by economies of scale, (4) can be dynamically configured (via virtualization or other approaches) and (5) can be delivered on demand [2]. Among other models, cloud environments can be public, private or hybrid. A public cloud (a.k.a. external cloud) is a cloud that provides cloud resources and services to the public. A private cloud (a.k.a. internal cloud) is an enterprise owned or leased cloud. In general, a hybrid cloud is a composition of two or more clouds of different models. Nevertheless, we define, in this paper, a hybrid cloud as a composition of one public cloud and one private cloud. Such a cloud is an environment in which an enterprise has its own private cloud that provides and manages some internal resources and only uses external resources provided by the public cloud when needed.

1.2 OBJECTIVE:

In this paper we propose a new and more efficient algorithm that produces solutions which are very close to the optimal ones. Our contribution is efficient not only for the bursting of behavior-based compositions but also for architecture-based compositions of services.

EXISTING SYSTEM

The waste collection process is a critical aspect for the service providers. The traditional way of manually monitoring the wastes in waste bins is a complex, cumbersome process and utilizes more human effort, time and cost which is not compatible with the present day technologies. Irregular management of waste

typically domestic waste, industrial waste and environmental waste is a root cause for many of the human problems such as pollution, diseases and has adverse effects on the hygiene of living beings.

DISADVANTAGES

- ❖ Time consuming and less effective: trucks go and empty containers whether they are full or not.
- ❖ Unhygienic Environment and look of the city.
- ❖ Bad smell spreads and may cause illness to human beings.
- ❖ Existing system requires high manpower and high costs .

PROPOSED SYSTEM

The concept of smart waste management is implementable in cities where waste production is domestically high but the effort put to control it is relatively very low. This idea is compatible mainly with the concept of smart cities. The smart waste management mainly avoids the congested collection of waste generated domestically which creates difficulty to manage its disposal. The proposed idea can be implemented for smart cities where the residents would dispose their garbage by using the garbage collection vehicles. When the public want dispose their garbage then they put a message public can track their vehicles . The cost could be distributed among the residents leading to cheaper service provision.

ADVANTAGES

- This system will avoid the garbage overflow the bins
- The proposed system will reduce the operational time required
- Intelligent management of the services in the city.
- Deployment of garbage collection vehicles based on the actual needs.
- Cost Reduction and resource optimization.
- Improves Environment quality
 - Fewer smells
 - Cleaner cities
- Effective usage of dustbins.

II. LITERATURE REVIEW

TITLE: Smart Garbage Collection System In Residential Area

YEAR: 2015

AUTHOR: GaikwadPrajakta, JadhavKalyani, and MachaleSnehal

ABSTRACT:

As the name suggests we are developing an Automatic garbage collection and information gathering system which is based on Image processing as well as on GSM module. The main concept is that a Camera will be placed at every garbage collection point along with load cell sensor at bottom of the garbage can. The camera will take continuous snapshots of the garbage can. A threshold level is set which compares the output of camera and load sensor .The comparison is done with help of microcontroller. After analysing the image we get an idea about level of garbage in the can and from the load cell sensor we get to know weight of garbage. Accordingly information is processed that is controller checks if the threshold level is exceeded or not. The controller sends a message with the help of GSM module to Garbage collection local central office to notify that garbage can is exceeded its capacity and disposal of waste is required. Accordingly the authority sends the garbage can collecting vehicle to collect the garbage, which is done with the help of robot mechanism.

TITLE: Smart Bin Implementation for Smart Cities

YEAR: 2015

AUTHOR: Narayan Sharma, NirmanSingha and TanmoyDutta,

ABSTRACT:

This work introduces the design and development of smart green environment of garbage monitoring system by measuring the garbage level in real time and to alert the municipality where ever the bin is full based on the types of garbage. The proposed system consisted the ultrasonic sensors which measure the garbage level, an ARM microcontroller which controls system operation whereas everything will be connected to ThingSpeak. This work demonstrates a system that allows the waste management to monitor based on the level of the garbage depth inside the dustbin. The system shows the status of different four types of garbage; domestic waste, paper, glass and plastic through LCD and ThingSpeak in a real time to store the data for future use and analysis, such as prediction of peak level of garbage bin fullness. It is expected that this system can create

greener environment by monitoring and controlling the collection of garbage smartly through Internet-of-Things.

TITLE: Concept, Design and Implementation of Automatic Waste Management System

YEAR: 2013

AUTHOR: Adil Bashir, Shoaib Amin Banday, Ab. Rouf Khan and Mohammad Shafi

ABSTRACT:

One of the main concerns with our environment has been solid waste management which in addition to disturbing the balance of the environment also has adverse effects on the health of the society. The detection, monitoring and management of wastes is one of the primary problems of the present era. The traditional way of manually monitoring the wastes in waste bins is a complex, cumbersome process and utilizes more human effort, time and cost which is not compatible with the present day technologies in any way. This paper proposes an advanced method in which waste management is automated. Radio frequency identification (RFID) is one of the most promising and anticipated technologies in recent years. The system makes use of radio frequency (RF) tags and web support. This work presented here certainly provides a novel approach in handling and disposing off the day to day solid wastes in an efficient and easy way. The system consists of four main subsystems namely Smart Trash System (STS), Local Base Station (LBS), Smart Vehicle System (SVS) and Smart Monitoring and Controlling Hut (SMCH). The proposed system would be able to automate the solid waste monitoring process and management of the overall collection process. The technologies that would be used in the proposed system are good enough to ensure the practical and perfect for solid waste collection process monitoring and management for green environment.

TITLE: A Smart Waste Management with Self-Describing objects

YEAR: 2013

AUTHOR: YannGlouche and Paul Couderc

ABSTRACT:

Radio Frequency Identification (RFID) is a pervasive computing technology that can be used to improve waste management by providing early automatic identification of waste at bin level. In this paper, we propose a smart bin application based on information self-contained in tags associated to each waste item. The wastes are tracked by smart bins using a RFID-based system without requiring the support of an external information system. Two crucial features of the selective sorting process can be improved using this approach. First, the user is helped in the application of selective sorting. Second, the smart bin knows its content and can report back to the rest of the recycling chain.

TITLE: Zig-Bee Based Waste Bin Monitoring System

YEAR: 2014

AUTHOR: Mrs.KanchanMahajan and Prof.J.S.Chitode

ABSTRACT:

There are many technologies which are used for waste collection as well as for well managed recycling. In this project, we have introduced an integrated system combined with an integrated system of Zigbee and Global System for Mobile Communication (GSM). The sensors would be placed in the common garbage bins placed on the public places. When the garbage reaches the level of the sensor, then that indication will be given to ARM 7 Controller. The controller will give indication to the driver of garbage collection truck as to which garbage bin is completely filled and needs urgent attention. ARM 7 will give indication by sending SMS using GSM technology.

TITLE: Smart Trash system: An Application using ZigBee

YEAR: 2014

AUTHOR: Pavithra,

ABSTRACT:

Pollution is the introduction of contaminants into an environment that causes instability, disorder, harm or discomfort to the ecosystem i.e., physical system or living organisms. Especially growing countries and most populated cities are severely affected by the pollution. Ignorance of cleanliness is spoiling our environment. The aim of this paper is to mainly concentrate on eradicating this issue and then reduce it. The smart trash consists of two sensors namely IR and gas sensors. The IR sensor placed inside the trash sense the level of trash and gas sensor will sense the toxic gases. Once the trash is filled, alarm rings. The RFID placed inside the trash will intimate about the overflowing of trash to the corporation office. The RFID placed at the corporation office is serial interfaced with PC. The visual display is coded with VB. The information regarding the removal of trash is sent to the respective area truck driver about the location of the field trash can. The complaint report contains

the exact location of the trash can. If the trash can is not replaced at a right time, the microcontroller placed at the trash can intimate the information to the corporation office once again. The intimation will be displayed in corporation office LCD continuously until the trash is removed. Once the truck driver removes the trash the alarm stops and continuous intimation to corporation office and truck also ends. Database of every trash bin can be maintained by municipality. Due to immediate disposal of bin, spread of disease can be reduced.

TITLE: Dust Bin Monitoring System

YEAR: 2016

AUTHOR: Ann Mary Thomas, Annu Reji Philip, Tessy Elsa Peter and Er.Nishanth P. **ABSTRACT:**

This paper presents IoT innovation project of a smart waste bin with real time monitoring system which integrates multiple technologies such as solar system, sensors and wireless communication technologies. The aim of this project is to provide an efficient and cost-effective waste collection management system hence providing clean, healthy and green environment. This study proposed a new framework that enables remote monitoring of solid waste bin in real-time via Wi-Fi connection, to assist the waste management activity. The system framework is based on wireless sensor network [WSN] contains three segments: renewable energy source, WSN and control station. Within this framework there are four developed subsystems: solar power system, smart waste bin, short messaging service [SMS] notification system and real-time monitoring system that are interrelated to each other to perform as an efficient, cost-effective waste management system that yield to a green and healthy living environment.

2.2.1 MODULES

MODULES:

Admin

- Bin list
- Driver information

User

- Bin list with action
- Location about the garbage to collect

ADMIN

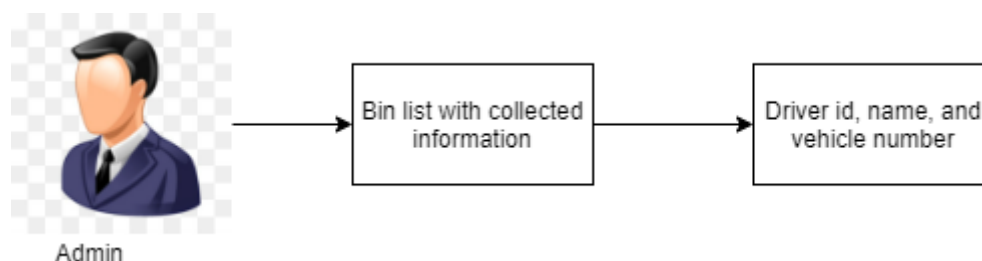
Admin Login and view the bin list with collected information and also contains Driver information with id, name, and vehicle number.

- **BIN LIST**

Bin list contains collected information

- **DRIVER INFORMATION**

Driver information contains driver id, name and vehicle number.



USER

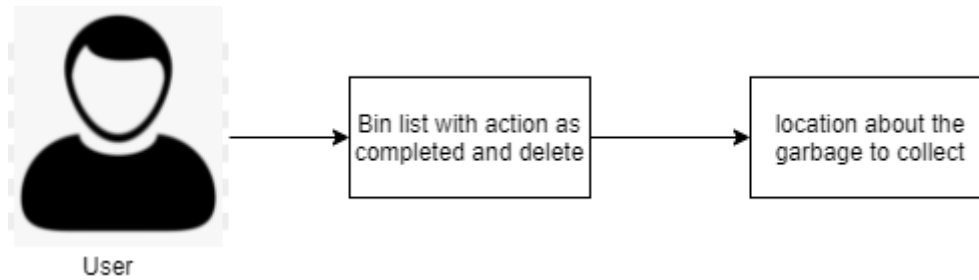
User register and login then view the bin list with action as completed and delete then can view location about the garbage to collect

- **BIN LIST WITH ACTION**

Bin list contains action of the user as to complete the request to collect garbage and also to delete the request.

- **LOCATION ABOUT THE GARBAGE TO COLLECT**

In this module user can view the location which garbage to collect



III. REQUIREMENTS ENGINEERING

3.1 GENERAL

These are the requirements for doing the project. Without using these tools and software's we can't do the project. So we have two requirements to do the project. They are

1. Hardware Requirements.
2. Software Requirements.

3.2 HARDWARE REQUIREMENTS

The hardware requirements may serve as the basis for a contract for the implementation of the system and should therefore be a complete and consistent specification of the whole system. They are used by software engineers as the starting point for the system design. It shows what the system does and not how it should be implemented.

Operating System : Windows 07
PROCESSOR : Intel Core i3.
RAM : 4 GB DDR2 RAM

3.3 SOFTWARE REQUIREMENTS

The software requirements document is the specification of the system. It should include both a definition and a specification of requirements. It is a set of what the system should do rather than how it should do it. The software requirements provide a basis for creating the software requirements specification. It is useful in estimating cost, planning team activities, performing tasks and tracking the team's and tracking the team's progress throughout the development activity.

IDE : ANDROID STUDIO
Programming Language : Java
Database : Fire based

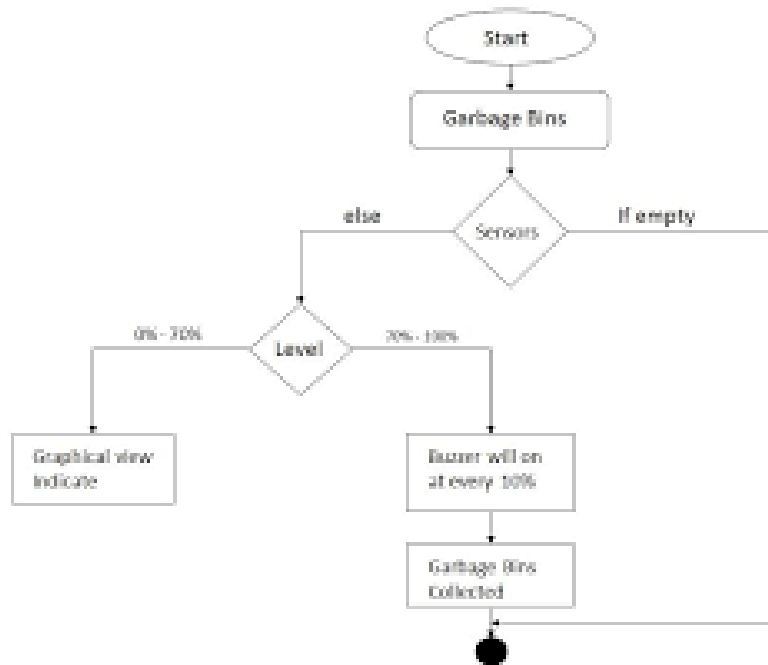
IV. DESIGN ENGINEERING

4.1 GENERAL

Design Engineering deals with the various UML [Unified Modeling language] diagrams for the implementation of project. Design is a meaningful engineering representation of a thing that is to be built. Software design is a process through which the requirements are translated into representation of the software. Design is the place where quality is rendered in software engineering. Design is the means to accurately translate customer requirements into finished product.

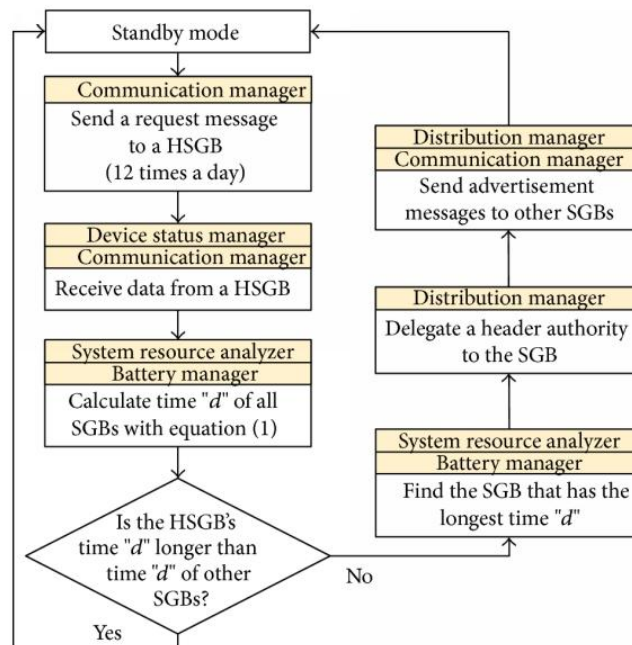
DATA FLOW DIAGRAM

Data flow diagrams are used to graphically represent the flow of data in a business information system. DFD describes the processes that are involved in a system to transfer data from the input to the file storage and reports generation. Data flow diagrams can be divided into logical and physical. The logical data flow diagram describes flow of data through a system to perform certain functionality of a business. The physical data flow diagram describes the implementation of the logical data flow.



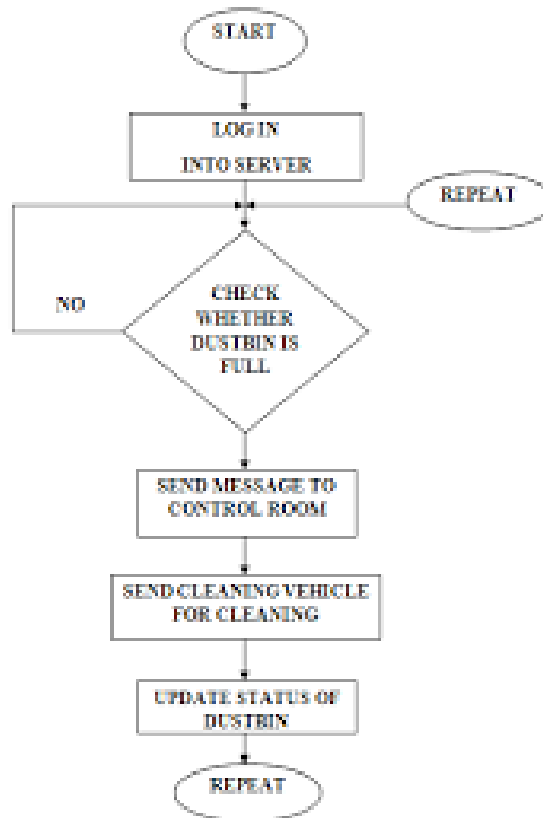
CLASS DIAGRAM:

Class diagrams are the main building block in object-oriented modeling. They are used to show the different objects in a system, their attributes, their operations and the relationships among them. The different object's are Data owner, Cloud user, Cloud admin these are the objects in this uml relationships and their properties are uploading the documents, generating key for securing the data, maintaining the cloud data s then downloading using the key and accessing the cloud data.



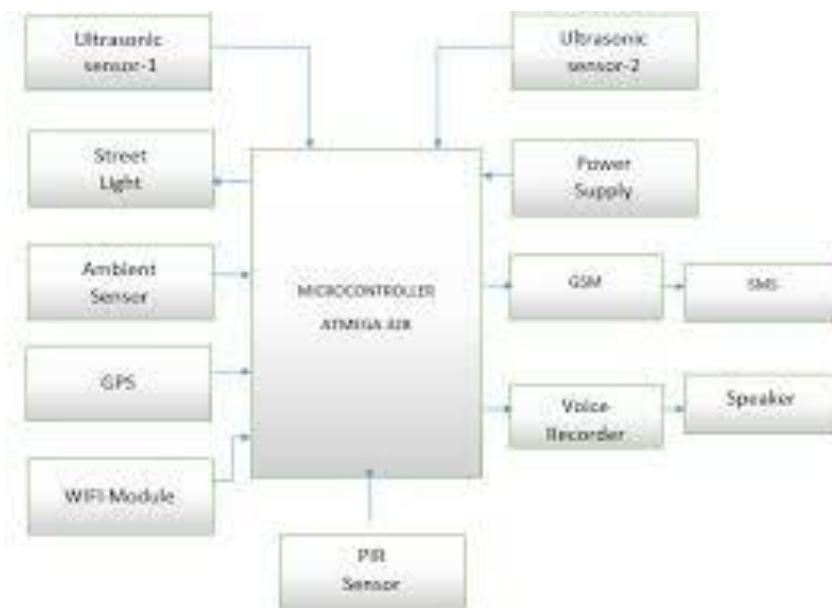
STATE DIAGRAM:

A state diagram, also known as a state machine diagram or state chart diagram, is an illustration of the states an object can attain as well as the transitions between those states in the Unified Modeling Language. Then, all of the possible existing states are placed in relation to the beginning and the end.



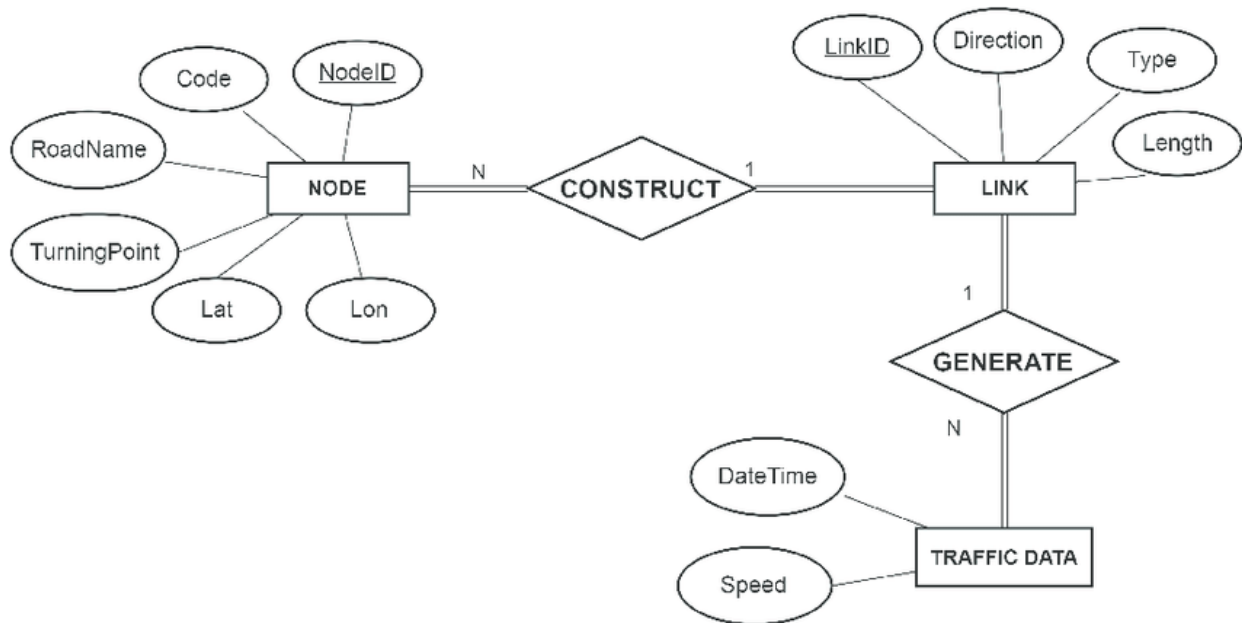
COMPONENT DIAGRAM:

The Component diagrams are special type of UML diagrams used for different purposes. These diagrams show the physical components of a system. To clarify it, we can say that component diagrams describe the organization of the components in a system.

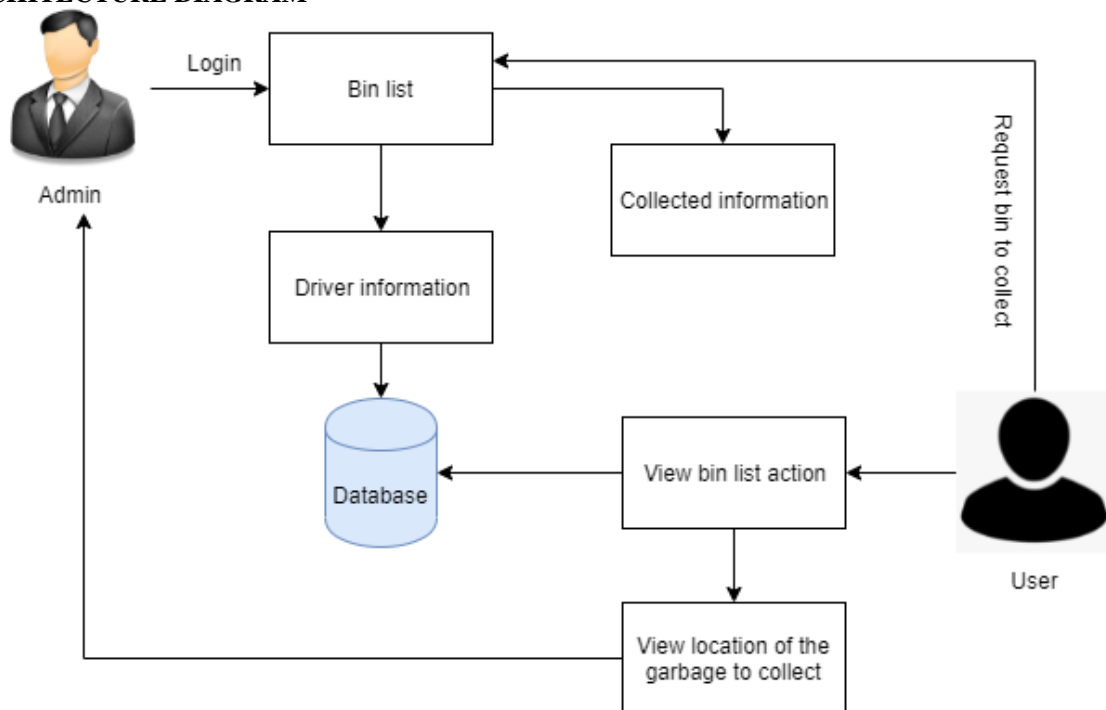


E-R DIAGRAM

E-R Diagram stands for Entity Relationship Diagram, also known as ERD is a diagram that displays the relationship of entity sets stored in a database. In other words, ER diagrams help to explain the logical structure of databases. ER diagrams are created based on three basic concepts: entities, attributes and relationships. ER Diagrams contain different symbols that use rectangles to represent entities, ovals to define attributes and diamond shapes to represent relationships



ARCHITECTURE DIAGRAM



V. DEVELOPMENT TOOLS

5.1 GENERAL

This chapter is about the software language and the tools used in the development of the project. The platform used here is JAVA.

5.2 FEATURES OF JAVA

5.2.1 THE JAVA FRAMEWORK

Java is a programming language originally developed by James Gosling at Sun Microsystems and released in 1995 as a core component of Sun Microsystems' Java platform. The language derives much of its syntax from C and C++ but has a simpler object model and fewer low-level facilities. Java applications are typically compiled to bytecode that can run on any Java Virtual Machine (JVM) regardless of computer architecture. Java is general-purpose, concurrent, class-based, and object-oriented, and is specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere".

Java is considered by many as one of the most influential programming languages of the 20th century, and is widely used from application software to web applications. The Java framework is a new platform independent that simplifies application development. Internet Java technology's versatility, efficiency, platform portability, and security make it the ideal technology for network computing. From laptops to datacenters, game consoles to scientific supercomputers, cell phones to the Internet, Java is everywhere!

5.2.2 OBJECTIVES OF JAVA

To see places of Java in Action in our daily life, explore java.com.

Why Software Developers Choose Java

Java has been tested, refined, extended, and proven by a dedicated community. And numbering more than 6.5 million developers, it's the largest and most active on the planet. With its versatility, efficiency, and portability, Java has become invaluable to developers by enabling them to:

- Write software on one platform and run it on virtually any other platform
- Create programs to run within a Web browser and Web services
- Develop server-side applications for online forums, stores, polls, HTML forms processing, and more
- Combine applications or services using the Java language to create highly customized applications or services
- Write powerful and efficient applications for mobile phones, remote processors, low-cost consumer products, and practically any other device with a digital heartbeat

Some Ways Software Developers Learn Java

- Today, many colleges and universities offer courses in programming for the Java platform. In addition, developers can also enhance their Java programming skills by reading Sun's java.sun.com Web site, subscribing to Java technology-focused newsletters, using the Java Tutorial and the New to Java Programming Center, and signing up for Web, virtual, or instructor-led courses.

Object Oriented

To be an Object Oriented language, any language must follow at least the four characteristics.

1. **Inheritance** : It is the process of creating the new classes and using the behavior of the existing classes by extending them just to reuse the existing code and adding additional features as needed.
2. **Encapsulation**: It is the mechanism of combining the information and providing the abstraction.
3. **Polymorphism**: As the name suggests one name multiple form, Polymorphism is the way of providing the different functionality by the functions having the same name based on the signatures of the methods.
4. **Dynamic binding** : Sometimes we don't have the knowledge of objects about their specific types while writing our code. It is the way of providing the maximum functionality to a program about the specific type at runtime.

5.2.3 COLLECTIONS:

The Java Collections API's provide Java developers with a set of classes and interfaces that makes it easier to handle collections of objects. In a sense Collection's works a bit like arrays, except their size can change dynamically, and they have more advanced behavior than arrays. In this project we are using Array List for collecting the user input and saving values.

5.2.4 THREAD:

In this project threading concept is very important. A thread is a sequential path of code execution within a program. And each thread has its own local variables, program counter and lifetime. Like creation of a single thread, we can also create more than one thread (multithreads) in a program using class Thread or implementing interface Runnable to make our project efficient and dynamic. In our project we are using request process with the help of multi threading concepts.

5.2.5 SWINGS:

Swing, which is an extension library to the AWT, includes new and improved components that enhance the look and functionality of GUIs. Swing can be used to build Standalone swing gui apps as well as Servlets and Applets. It employs a model/view design architecture. Swing is more portable and more flexible than AWT.

VI. IMPLEMENTATION

6.1 GENERAL

In this we implement the coding part using eclipse. Below are the coding's that are used to generate the domain module for Cloud Computing. Here the proposed techniques are used in the coding

VII. SOFTWARE TESTING

7.1 GENERAL

In this paper, we develop achievability protocols and outer bounds for the secure network coding setting, where the edges are subject to packet erasures, and public feedback of the channel state is available to both Eve and the legitimate network nodes. Secure network coding assumes that the underlying network channels are error-free; thus, if our channels introduce errors, we need to first apply a channel code to correct them, and then build security on top of the resulting error-free network. We show that by leveraging erasures and feedback, we can achieve secrecy rates that are in some cases multiple times higher than the alternative of separate channel-error-correction followed by secure network coding; moreover, we develop outer bounds and prove optimality of our proposed schemes in some special cases.

7.2 DEVELOPING METHODOLOGIES

The test process is initiated by developing a comprehensive plan to test the general functionality and special features on a variety of platform combinations. Strict quality control procedures are used.

The process verifies that the application meets the requirements specified in the system requirements document and is bug free. The following are the considerations used to develop the framework from developing the testing methodologies.

7.3 Types of Tests

7.3.1 Unit testing

Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program input produce valid outputs. All decision branches and internal code flow should be validated. It is the testing of individual software units of the application .it is done after the completion of an individual unit before integration. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

7.3.2 Functional test

Functional tests provide systematic demonstrations that functions tested are available as specified by the business and technical requirements, system documentation, and user manuals.

Functional testing is centered on the following items:

- Valid Input : identified classes of valid input must be accepted.
- Invalid Input : identified classes of invalid input must be rejected.
- Functions : identified functions must be exercised.
- Output : identified classes of application outputs must be exercised.
- Systems/ Procedures: interfacing systems or procedures must be invoked.

7.3.3 System Test

System testing ensures that the entire integrated software system meets requirements. It tests a configuration to ensure known and predictable results. An example of system testing is the configuration oriented system integration test. System testing is based on process descriptions and flows, emphasizing pre-driven process links and integration points.

7.3.4 Performance Test

The Performance test ensures that the output be produced within the time limits, and the time taken by the system for compiling, giving response to the users and request being send to the system for to retrieve the results.

7.3.5 Integration Testing

Software integration testing is the incremental integration testing of two or more integrated software components on a single platform to produce failures caused by interface defects.

The task of the integration test is to check that components or software applications, e.g. components in a software system or – one step up – software applications at the company level – interact without error.

7.3.6 Acceptance Testing

User Acceptance Testing is a critical phase of any project and requires significant participation by the end user. It also ensures that the system meets the functional requirements.

Acceptance testing for Data Synchronization:

- The Acknowledgements will be received by the Sender Node after the Packets are received by the Destination Node
- The Route add operation is done only when there is a Route request in need
- The Status of Nodes information is done automatically in the Cache Updation process

7.2.7 Build the test plan

Any project can be divided into units that can be further performed for detailed processing. Then a testing strategy for each of this unit is carried out. Unit testing helps to identify the possible bugs in the individual component, so the component that has bugs can be identified and can be rectified from errors.

VIII. APPLICATION

8.1 GENERAL

In this paper, we develop achievability protocols and outer bounds for the secure network coding setting, where the edges are subject to packet erasures, and public feedback of the channel state is available to both Eve and the legitimate network nodes. Secure network coding assumes that the underlying network channels are error-free; thus, if our channels introduce errors, we need to first apply a channel code to correct them, and then build security on top of the resulting error-free network. We show that by leveraging erasures and feedback, we can achieve secrecy rates that are in some cases multiple times higher than the alternative of separate channel-error-correction followed by secure network coding;

8.2 APPLICATION

Semantic Web applications:

LDO is the cornerstone of The Semantic Web, yet there still very few commercial LDO apps. In the latest issue of Nodalities, a magazine about the Semantic Web by UK Company Talis, there is an article by Talis CTO Ian Davis about the state of Semantic Web applications.

LDO application development for IBM data servers

An LDO store in the DB2 database server is a set of user tables within a database schema that stores an LDO data set. A unique store name is associated with each set of these tables. Each LDO store has a table that contains metadata for the store. This table has the same name as the store.

8.3 FUTURE ENHANCEMENTS

In the future, we plan to research on applying the principles of secure semantic searching to design secure cross-language searching schemes.

SCREENSHOTS:

IX. CONCLUSION:

This paper proposes a system that makes sure that cleaning of garbage bins is done when level of garbage reaches its level. The system uses admin and user module. This further reduces operational time by alerting the concerned authorities via an Android application. This system also makes use of GPS technology in the Android application to alert the nearest employee and hence reducing the time for the dustbin cleaning process.

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