Functional Requirements:

• Taking sensor reading from the Sensor Circuit

• Pushing the data to a MySQL database.

• Retrieving information from database for Calculation garbage bin which fulfils the condition for garbage collection, example: Collect garbage from bins whose level is over 80% of bin.

• A client side script to get Garbage collection live Monitoring.

SYSTEM REQUIREMENET:

1. Arduino IDE

The open-source Arduino Software (IDE) makes it easy to write code and upload it to the board. It runs on Windows, Mac OS X, and Linux. The environment is written in Java and based on Processing and other open-source software. The Arduino IDE supports the languages C and C++ using special rules of code structuring. The Arduino IDE supplies a software library from the Wiring project, which provides many common input and output procedures. User-written code only requires two basic functions, for starting the sketch and the main program loop, that are compiled and linked with a program stub main() into an executable cyclic executive program with the GNU tool chain, also included with the IDE distribution. The Arduino IDE employs the program avrdude to convert the executable code into a text file in hexadecimal encoding that is loaded into the Arduino board by a loader program in the board's firmware.

2. XAMPP Local Server

XAMPP is an open source free software developed by Apache

friends. XAMPP software package contains Apache distributions for Apache server, MariaDB, PHP, and Perl. And it is basically a local host or a local server. This local server works on your own desktop or laptop computer. You can just install this software on your laptop or desktop and test the clients or your website before uploading it to the remote web server or computer. This XAMPP server software gives you suitable environment for testing MYSQL, PHP, Apache and Perl projects on the local computer.

The full form of XAMPP is X stands for Cross-platform, (A) Apache server, (M) MariaDB, (P) PHP and (P) Perl.

Cross-platform usually means that it can run on any computer with any operating system. Next MariaDB is the most famous database server and it is developed by MYSQL team. PHP usually provides a space for web development. PHP is a server-side scripting language. And the last Perl is a programming language and is used to develop a web application.

The XAMPP installation process is very simple and fast. Once XAMPP is installed on your local computer it acts as a local server or localhost. You can test the websites before uploading it to the remote web server. This XAMPP server software gives you suitable environment for testing MYSQL, PHP, Apache and Perl applications on a local computer.

3. MySQL Database

MySQL is an open source software. It is actually a relational database management system (RDBMS). This SQL stands for Structured Query Language. It is the most popular and best

RDBMS used for developing a variety of web-based software applications. With the help of MYSQL, it is possible to organize the information, manage, retrieve and update the data whenever you wish to do.

MySQL is very popular for Web-hosting applications because of its plethora of Web-optimized features like HTML data types, and because it's available for free. It is part of the Linux, Apache, MySQL, PHP (LAMP) architecture, a combination of platforms that is frequently used to deliver and support advanced Web applications. MySQL runs the back-end databases of some famous websites, including Wikipedia, Google and Facebook. Although MySQL is technically considered a competitor of Oracle DB, Oracle DB is mainly used by large enterprises, while MySQL is used by smaller, more Web-oriented databases. In addition, MySQL differs from Oracle's product because it's in the public domain.

4. Cloud Server Hosting

Cloud server hosting is when hosting services are made available to customers on demand via the Internet. Rather than being provided by a single server or virtual server, cloud server hosting services are provided by multiple connected servers that comprise a cloud. Cloud server hosting is also sometimes referred to as cluster server hosting or server on-demand hosting.

Cloud server hosting offers the advantages of increased accessibility and reliability, seamless scalability and potential cost savings, as customers are freed from having to invest in on-premises servers and hardware, and they pay

only for the resources they consume. On the other hand, security and lack of access and full control are potential concerns with cloud server hosting

2 HARDWARE REQUIREMENT

1. Node MCU

Node MCU is an open source IOT platform. It includes firmware which runs on the ESP8266WiFi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. Node MCU provides a way to connect different sensors to their controllers wirelessly via Wi-Fi. Since, it is an improved version of the ESP8266 it has better and easier programming, with better voltage stability and more reliability.

2. Ultrasonic Sensor

An optical sensor has a transmitter and receiver, whereas an ultrasonic sensor uses a single ultrasonic element for both emission and reception. In a reflective model ultrasonic sensor, a single oscillator emits and receives ultrasonic waves alternately. HC-SR04 is an ultrasonic sensor which is used for measuring the distance.

3. Jumper Wire

A jump wire is an electrical wire, or group of them in a cable, with a connector or pin at each end, which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering. Jumper wires are simply wires that have connector pins at each end, allowing them to be used to connect two points to each other without

soldering. Jumper wires are typically used with breadboards and other prototyping tools in order to make it easy to change a circuit as needed.

4. Breadboard

A thin plastic board used to hold electronic components such as transistors, resistors, chips, etc. that are wired together. Used to develop prototypes of electronic circuits, the boards can be reused for future jobs. Breadboards can also be used to create one-of-a-kind systems, although commercial products placed on printed circuit boards are typically much more robust and can handle greater frequencies.

5. USB Cable

USB cables are designed specifically to connect devices that use the universal serial bus (USB) protocol. They are used to connect personal computers (PCs) and peripherals such as mice, keyboards, printers, digital cameras, and mass storage devices. USB cables are also used in factory environments, sometimes with a locking mechanism, for connecting USB industrial I/O devices to computers.