

SMART WIRELESS INFORMATION DISSEMINATION SYSTEM



BY

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ABSTRACT

Fast communication and immediate information dissemination is a prime factor in today’s modern world. Administration staff/ teachers need to communicate with students and their parents on regular basis. Pakistan Telecommunication Authority (PTA) developed software to meet the above mentioned requirement. Using this software text messages can be sent to any cell phone device. But this software posed a few problems, just to name a couple; log maintenance was not available and search criteria were very limited. Immense need was felt to upgrade the existing software. This syndicate accepted the challenge to remove the shortcoming and add some new functionality.

New software “Smart Wireless Information Dissemination System” (SWIDS) had to be developed from scratch as no source code was available for the existing software.. SWIDS has solved the problems of previous version and some new features have been added which makes it very easy software to use at all levels. A deliberate effort has been done to make GUI attractive and user friendly. Selection of recipients can be made on different search criteria. A detailed log is maintained for every out going message, which can be seen by authorized persons/ administrator. USB SIM Module is installed on only one computer (server). All other clients can

send messages to this server using existing LAN resources and message is delivered to recipients through the USB SIM Module attached to server. Moreover SWIDS is linked with the mail server and email alerts are generated to the participants over their respective mobile sets. This software provides a GUI for database maintenance. Design and architecture standards are followed at all levels to develop this software. SWIDS is a successful software meeting all the requirements.

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Above all, we are sincerely thankful to our beloved parents for their love, support and prayers that have made us who we are today.

CHAPTER 1

INTRODUCTION

1.1 Introduction

Fast communication and immediate information dissemination is a prime factor in today's modern world. The cheaper and faster the communication channel is, the more advantage an organization is at. It has been noted that usually teachers/ management of educational

institutions need to communicate to students and their parents/ guardians regularly for better working and results. Institutions mostly rely on paper mail correspondence which is slow and costly. Keeping fore going in view Pakistan Telecommunication Authorities developed software.

Software developed by Pakistan Telecommunication Authorities (PTA) had certain limitations. It was only distributed to selected institutions. Real time usage showed that it had some major issues. It was not user friendly at all. Moreover maximum character length of message was restricted to 160 characters. There was no provision for the log maintenance. Searching and selecting students/ parents to send messages is a hectic job as the Graphical User Interface (GUI) does not support it well. A need was felt by all the institutions using this software that it should be enhanced in functionality and features. So, it was not very successful. It did assist in information dissemination, but traffic is normally large in universities so an immense need was felt for a better version.

1.2 Problem Statement

Information dissemination to particular persons in large organization needs to be very cheap, efficient and reliable. There should be a swift and fast mechanism of passing information.

1.3 Solution

The solution is to design and develop **SMART WIRELESS INFORMATION DISSIMINATION SYSTEM (SWIDS)**. The proposed solution consists of client desktop application, server desktop application, database and GSM Modem. System will provide facility to compose messages for all employees of an organization and transmit them with just a single

click of button. Information will be delivered through Short Messaging Service (SMS) over the mobile phones of the employees.

1.4 Objectives

The main goals of the project are:

1. Important information should be disseminated using very cheap and effective mode of communication.
2. Important information should be disseminated very quickly and efficiently.
3. All Staff members should have facility to send SMS.
4. Registered users should be informed about email received.

1.5 Goals

The main goals of the project are:

1. SWIDS should disseminate important information on user's mobiles.
2. System should allow all clients to send messages from their personal computers.
3. A very user friendly GUI is provided which makes DB management very easy for a person with basic computer knowledge.
4. SMS alert is generated whenever a mail is received for the registered users on mail server. Alert message is sent on the users mobile, containing the subject line of email and sender email id.
5. SWIDS provides facility of log maintenance of sent messages as well as the mail alerts. Log can be seen and printed by administrator only.

6. SWIDS provides enhanced searching capability to users. A user can find on different search criteria. E.g. students living in a particular city or students of a particular class etc.

1.6 Domain of Project

Computer Networks & Pervasive Computing

1.7 Intended Audience:

This document is intended for

Project Supervisor: In order to be sure they are development of the project fulfills requirements provided in this document.

Project Team: In order to be sure they are developing the right project that fulfills requirements provided in this document.

Project Panel: In order to analyze and evaluate the progress of the project.

Users: In order to get familiar with the idea of the project and suggest other features that would make it even more functional.

System administrators: In order to know exactly what they have to expect from the system, right inputs and outputs and response in error situations.

1.8 Organization of Report:

Chapter1: Introduction of the project and an overall functionality of the project.

Chapter2: Describes the literature review done for this project.

Chapter3: Describes the requirement specifications of this project.

Chapter4: Describes the overall design and architecture of this project

Chapter5: Describes the system development with all the details of the system functions and explains the way they have been implemented.

Chapter6: Presents the results and analyze it with other techniques and methodologies available in market.

Chapter7: Includes the future work and the conclusion.

1.9 Conclusion

This was a brief description of SWIDS. Software is very easy to use and requires no maintenance. No special qualification is required to use or install it. It can be used in various institutions/ offices for fast information dissemination

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

It is important to know about the equipment and technology used. This chapter provides the details about the technology, its working principles and limitations. It introduces GSM Modems available and software available to use them. Chapter gives the overview of this new trend in communication.

2.2 Short Messaging

SMS (Short Message Service), commonly referred to as "text messaging," is a service for sending short messages of up to 160 characters (224 characters if using a 5-bit mode) to mobile

devices, including cellular phones, smartphones and PDAs. SMS is similar to paging. However, SMS messages do not require the mobile phone to be active and within range and will be held for a number of days until the phone is active and within range. SMS messages are transmitted within the same cell or to anyone with roaming service capability. They can also be sent to digital phones in a number of other ways, including:

1. From one digital phone to another
2. From Web-based applications within a Web browser
3. From instant messaging clients like ICQ
4. From VoIP applications like Skype
5. From some unified communications applications.

Users can send messages from a computer via an SMS gateway. SMS gateways are Web sites that allow users to send messages to people within the cell served by that gateway. They also serve as international gateways for users with roaming capability.

2.2.1 Benefits of using SMS

1. Discretion

An SMS message is less of an intrusion in a union environment as well as demonstrating sensitivity towards privacy when communicating with your members.

2. Accuracy

Your message is there in black and white so there are fewer distractions compared to other channels, like background noise disrupting phone calls. This is particularly important when disseminating important information.

3. Succinct messaging

Why use 10 words when five will do? Most messages can be articulated in one 160-character message.

4. Mass communication

The same message can be broadcast to thousands of handsets at a touch of a button.

5. Cost savings

The standard rate of a text message is only a few pence. When you send out thousands of messages the cost

2.3 Bulk Short Messaging

In Bulk short messaging, sms can be sent to numerous recipients by just a touch of button. This is done by using a list of recipient's numbers. The same message is sent to all of them by using a GSM Modem, a cell phone or a web service. Every message is dealt independently. Even if some numbers are switched off or incorrect, the messages to other numbers are delivered.

2.4 Methods of sending SMS

Various methods are available to send bulk messages. These methods rely on different techniques. A mobile handset or a GSM Modem can be used. but they need support of software program. However web based solutions do not use handset/modems neither a software, they directly communicate with SMS Gateways. The used methods are listed here:

1. Using mobile handsets
2. Using a web based sms solution
3. Using software / instant messengers like ICQ. Skype etc.

2.4.1 SMS sent by mobile handset

SMS as used on modern handsets was originally defined as part of the GSM series of standards in 1985 as a means of sending messages of up to 160 characters, to and from GSM mobile handsets. Since then, support for the service has expanded to include alternative mobile standards such as ANSI CDMA networks and Digital AMPS, as well as satellite and landline networks. Most SMS messages are mobile-to-mobile text messages, though the standard supports other types of broadcast messaging as well. The benefits of SMS to subscribers center around convenience, flexibility, and seamless integration of messaging services and data access. From this perspective, the primary benefit is the ability to use the handset as an extension of the computer. SMS also eliminates the need for separate devices for messaging because services can be integrated into a single wireless device—the mobile terminal. These benefits normally depend on the applications that the service provider offers.

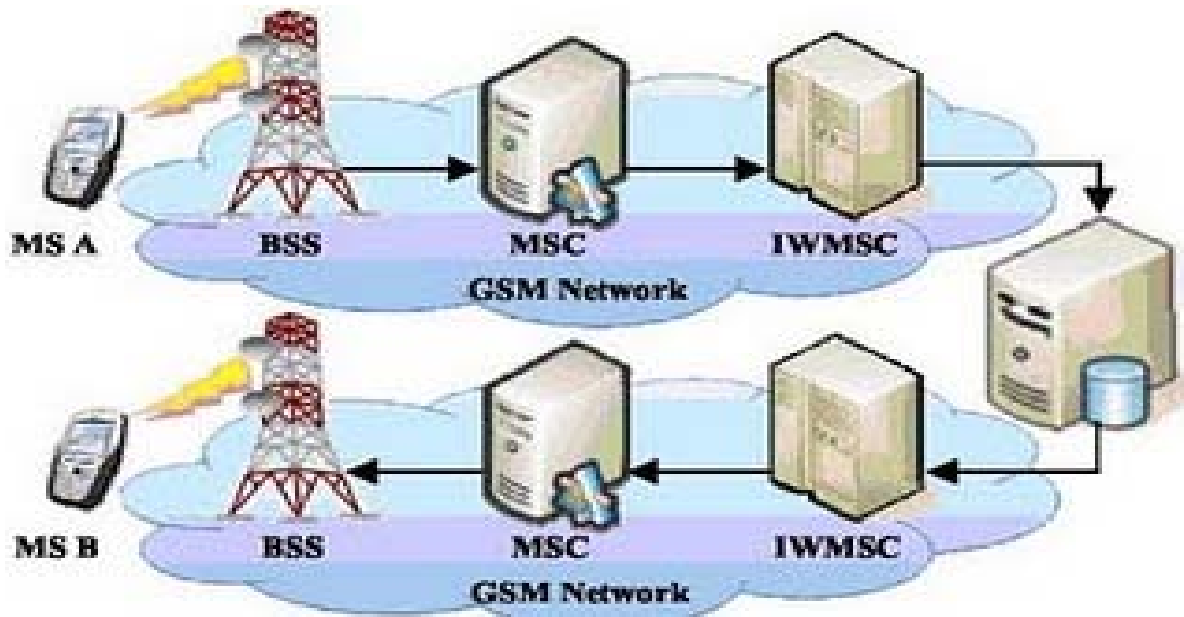


Figure 2.1 SMS sent by mobile network

2.4.2 SMS using a web based account

Web based SMS account can be used to send bulk SMS from anywhere using internet. SMS can be sent to any phone with a personalized id. SMS credit is purchased from the web site/ service provider to use the account. These sites let members reply via SMS from mobile phone and the replies drop straight back to desktop. Moreover no hardware or software is to be purchased. This account can be used from anywhere in the world where internet facility is available.

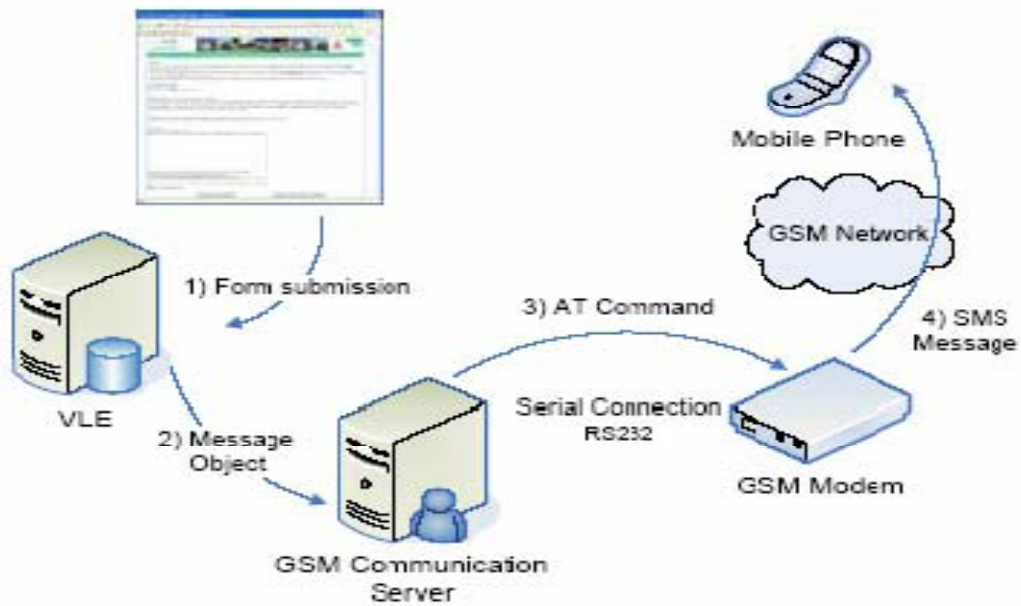


Figure 2.2 SMS sent through web network

2.4.3 SMS using a software and GSM Modem

SMS can be sent to multiple numbers using software and a GSM Modem. A SIM of any cellular network is used with GSM Modem, which is connected to the server. List of number is selected from database or entered manually, message is sent to all numbers from modem attached to server. Replies can also be received at the server through modem.

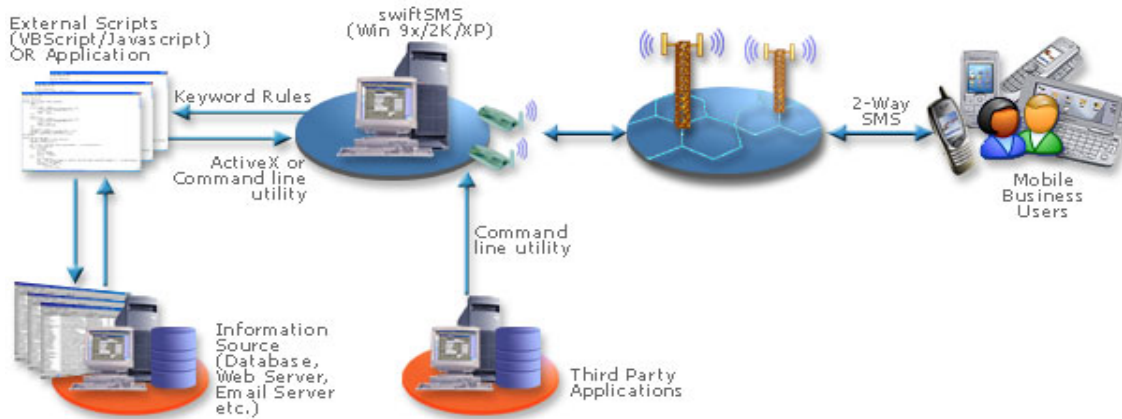


Fig 2.3 SMS sent using a GSM Modem network

2.5 GSM Modem

A GSM modem is a specialized type of modem which accepts a SIM card, and operates over a subscription to a mobile operator, just like a mobile phone. From the mobile operator perspective, a GSM modem looks just like a mobile phone. A GSM modem can be a dedicated modem device with a serial, USB or Bluetooth connection, or it may be a mobile phone that provides GSM modem capabilities. A GSM modem exposes an interface that allows applications such as SWIDS to send and receive messages over the modem interface. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. To perform these tasks, a GSM modem must support an "extended AT command set" for sending/receiving SMS messages. GSM modems can be a quick and efficient way to get started with SMS, because a special subscription to an SMS service provider is not required. The mobile operator charges for this message sending and receiving as if it was performed directly on a mobile phone. In most parts of the world, GSM modems are a cost effective solution for receiving SMS messages, because the sender is paying for the message delivery.



Figure 2.4 GSM Modems

2.6 Existing System

Existing system was provided by PTA but it has certain short comings. It is not very user friendly. Database management is a time consuming process. Facility of log maintenance is not available. In short existing system does not fulfil the need. Detailed comparison is given in result and analysis chapter.

2.7 Chapter Summary

The software available in the market do not provide all the required functionality. The features offered by them are limited so it is an immense need to develop software that fulfils all the requirements and provide required features.

REQUIREMENT ANALYSIS

3.1 Introduction

This chapter deals with software requirement specifications. It explains the requirements given by the user. This chapter explains what our system needs to perform. Functional and non functional requirements are given in this chapter. Requirements given in this chapter dictates if the system developed is in accordance with the intentions or not.

This chapter includes the functional requirements that were inferred from the scope and the objectives of the project. It also discusses the non-functional requirements that must be achieved for better performance of the system.

3.2 Specific Requirements

Detailed requirements were gathered by the stake holders. They are divided in two parts, functional and non functional. System is designed and developed keeping these requirements in focus.

3.2.1 Functional Requirement:

1. The system should have a graphical user interface that should provide it with the options to update database, give option to enter various search criteria and user friendly GUI to write and send messages.
 - a. Description: Graphical user interface must make the job easier and time saving. It will make the system user friendly.
 - b. Criticality: Good GUI is important for the system to be successful.
 - c. Technical-Issues: Interface is being made by graduate level student no HCI expert has been consulted for aesthetics.

4. Users have options to enter multiple search criteria and further refine the result by selecting or deselecting the result of the search added.

- a. Description: if a search gives list of 20 students and users wants to send message to only 8 students, system should provide the option .
- b. Criticality: This requirement is critical and system must offer this facility.
- c. Technical-Issues: user cannot give direct queries to database, only available queries can be used.
- d. Risks: If this functionality is not available then user will have to send message to the complete list.

5. Once the system is installed on server and client side following features should be available.

Log Maintenance: This feature should offer user to see the record of sent messages and their status. Users must be able to get a print of the log

- a. Priority: the priority of this feature is high and it is must to achieve it.
- b. Precondition: Users are able to send messages to server and server forwards them to GSM Modem for transmission.
- c. Functional Requirements:
 - i. The system should monitor every sent message and maintain a detailed log for it.
 - ii. Log should show the sender, sent date and time group, recipients, message contents, delivery status and error details if any.
 - iii. Administrator should be able to control the rights of accessing log.
 - iv. Authorized user should have an option to take a print of the log of messages

- d. Constraint/Assumption:
 - i. Printers on LAN are available.

Multiple Clients: This feature should offer users to use the system and send messages simultaneously.

- a. Priority: Priority of this feature is high and it is must to achieve it.
- b. Precondition: Device is connected and available to users.
- c. Functional Requirements:
 - i. When multiple users send messages, no one should be made to wait.
 - ii. If the device is busy with sending message from one user, the messages from other users should be delivered to server and put in queue for onward submission to Modem.
 - iii. Multiple clients should be able to access the database at the same time.
- d. Constraint/Assumption:
 - i. Assuming the server is working and device is functional.
 - ii. Even if GSM device is not functional or network is temporarily unavailable system must keep adding messages in queue on server side and users must be informed when messages are transmitted later.

Database Maintenance: This feature should offer administrator to add, delete or update database entries even when the system is working.

- a. Priority: Priority of this feature is low and it is an optional feature if time permits.
- b. Precondition: System is working fine.
- c. Functional Requirements:
 - i. The system should offer concurrency and integrity of the data.

- ii. When user deletes an entry he must be warned before executing the command.
 - iii. Log the deleted user must be maintained and deleted after confirmation from the administrator.
- d. Constraint/Assumption:**
- i. Administrative rights are required to perform these actions.

3.2.2 Non-Functional Requirements:

1. Performance:

The system should perform at reasonable speed, to handle traffic from multiple users. Clients must be provided with acknowledgement messages.

2. Usability:

It is a desktop application so client end users must be able to use it with ease possessing basic knowledge of computer. Administrator should be able to use the system efficiently with simple understanding of the SWIDS back end functionality.

3. Efficiency:

Search capability must be efficient and provide clients to give multiple search criteria. System must be able to deal multiple requests at the same time. This is a real time interactive application so it must be efficient.

4. Compatibility:

The system should be compatible with different versions of windows (XP, VISTA).

5. Reliability:

The system should have a low failure rate and a high level of service availability. Critical messages should be sent twice to ensure delivery.

6. Maintainability:

The system should be easy to be maintained by administrator. However developers or users with adequate knowledge are able to edit, add or delete given functionality.

3.3 Chapter Summary:

Chapter described the requirements of SWIDS. To conclude, system should be able to work efficiently in real time environment and provide reliable information dissemination. Multiple clients should be able to use it as if they are working on a dedicated information dissemination system. Functional and non functional requirements are organized according to the scope of the project.

CHAPTER 4

SYSTEM DESIGN AND ARCHITECTURE

4.1 Introduction

Chapter gives an account of the system design of SWIDS. Here high level design is briefly explained to give an over of the system. Decomposition of system in modules is also given for better understanding. Working and relationship between modules helps in better conceptualizing of implemented system. Chapter is kept simple so that a reader with minimum background knowledge can fairly understand the working of SWIDS. Fig 4.1 gives a pictorial view of the system.

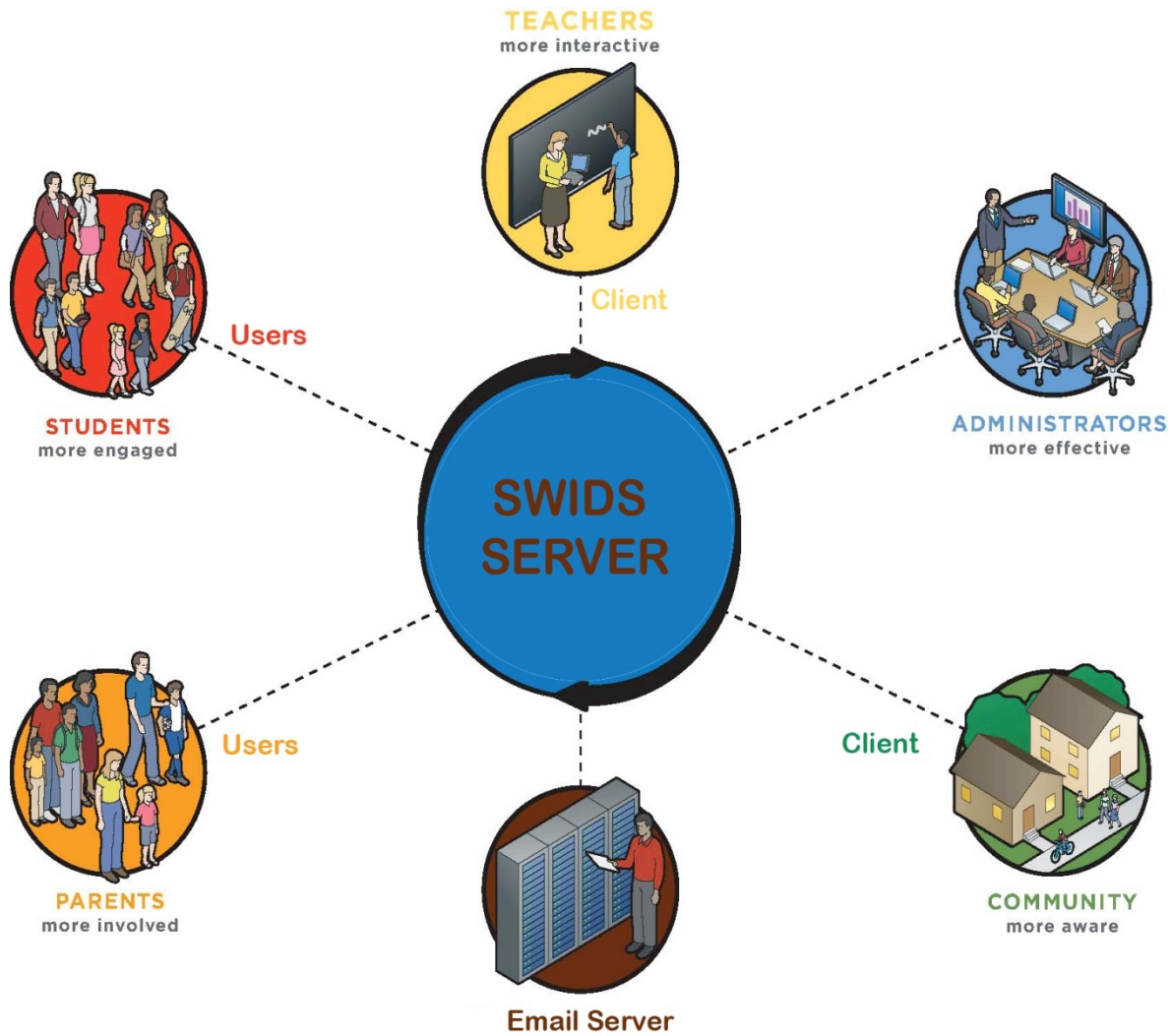


Figure 4.1 View of the system

4.2 High Level Design

SWIDS design is kept very simple. Client server architecture is used. For communication between client and server existing LAN resources are utilized. it is a desktop application. Major functionality is kept with server end. Client end is used as an interface to authenticate clients, enter search criteria, select users and compose message. Fig 4.2.1 shows that client end perform minimum essential functions. Logic and processing rest with server end. This design encourages even users with basic computer knowledge to use the system efficiently.

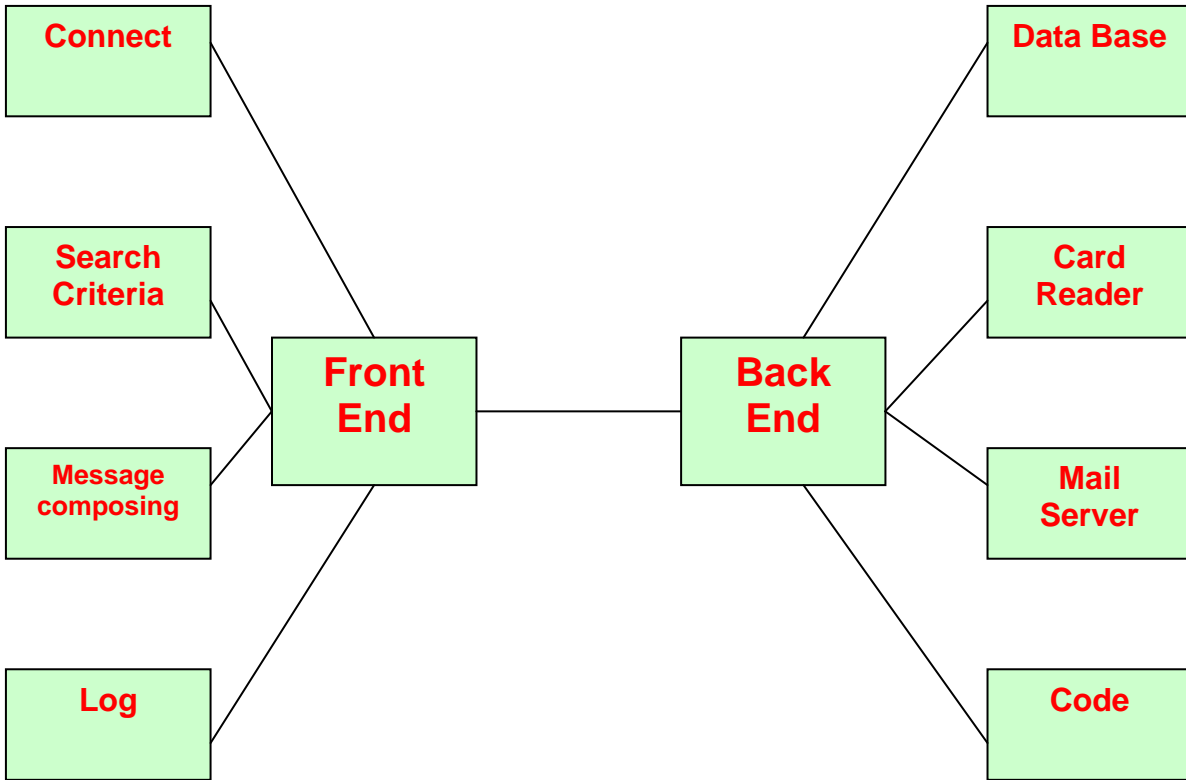


Figure 4.2 High level design

4.3 Modular Decomposition of SWIDS

SWIDS was developed in different modules. These modules provide independent functionality. They are loosely coupled and highly cohesive. Users directly interact with client module and server module only. Interaction with server module is to set up the configurations and manage database. Modules used in SWIDS are

1. Client Module
2. Server Module
3. Database Module
4. GSM Module

5. Mail Server Module

Mail Server Module is developed at the last and help is seek because only single function is added to the already working module of mail server. Fig 4.3 shows the 5 modules of SWIDS and sub modules for client, server and database are also shown.

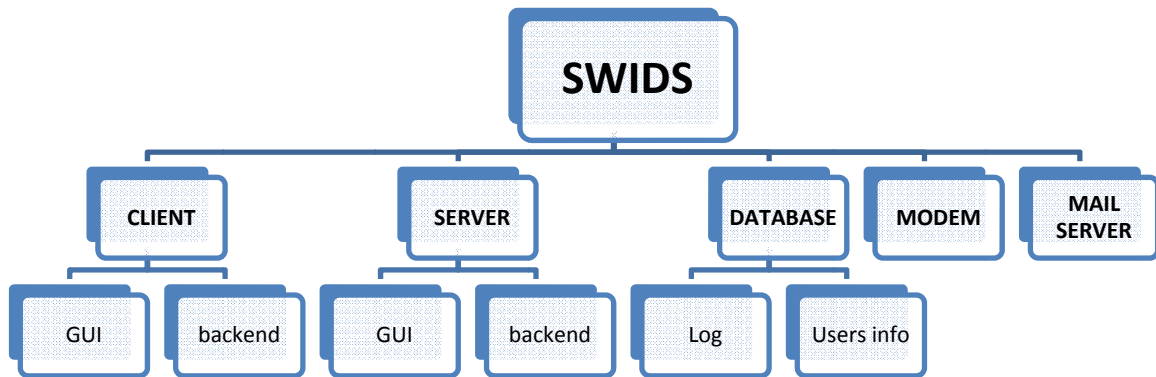


Figure 4.3 Modular decomposition of SWIDS

4.3.1 Client Module

Client module is installed at desktop application on computers of all the clients. During run time multiple client modules run and communicate with the server. Client uses this desktop application to sign in with the server. After authentication client can search database, compose message and send it to server for onward transmission to GSM Modem.

Client Module Description

Type	A module that runs on the client end of the system. It provides all the required functionality to clients.
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<p>Purpose</p>	<p>It interacts with server for client's authentication. This module provides the facility to search the database using different criteria. Client uses this module to compose the message and send it to server.</p>
<p>Dependencies</p>	<p>It correlates with Server module.</p>
<p>Resources</p>	<p>The Module Uses all the Resources as allocated by Operating System.</p>
<p>Processing</p>	<p>Client module does not process any data. It only gives option to select names from the list send by server in response of a search query</p>
<p>Data</p>	<p>The data used by this module is the resultant data sent by server in response to different search queries. This module also deals with the actual message body.</p>

Table 4.1 Client Module description

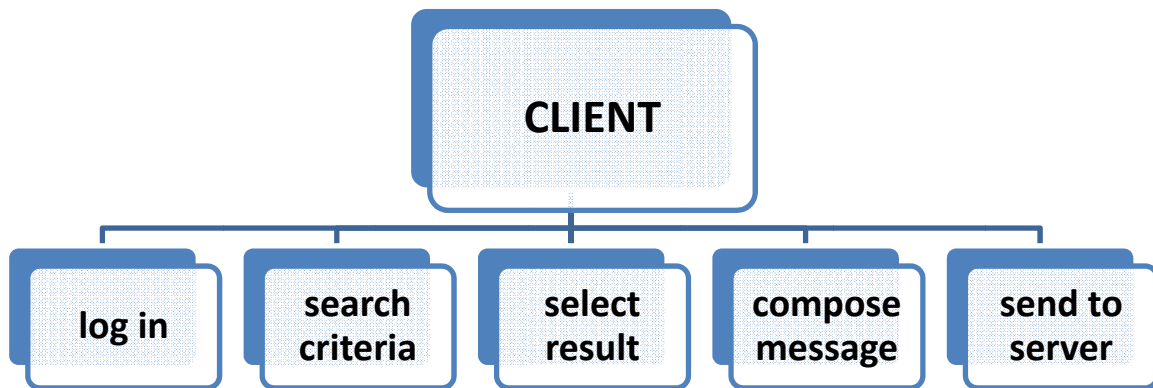


Figure 4.4 Sub modules of Client

4.3.2 Server Module

Server module is installed on the server only. It is the most important module of SWIDS. It correlates with client, database, mail server and GSM Modem. It is responsible for all the processing and logic in SWIDS. This module interacts with client to authenticate them and takes search criteria from clients, forwards it to database and send back the result given by database to client. It also accepts messages from client and mail server and forwards them to GSM Modem for transmission. It is the only module which interacts with GSM Modem.

Server Module Description

<p>Type</p>	<p>A core Module which is installed on server side of the system. It interacts with the clients , System Database, mail server module and USB SIM card reader</p>
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Purpose	It authenticates the clients. After that it provides searching capability to clients, it receives messages from client and mail server transmits them from USB SIM device and sends them in log. This module is also used to enter/ update client's information.
Dependencies	It correlates with the Database Module in order to provide searching capability to clients and maintain log.
Resources	The Module Uses all the Resources as allocated by Operating System.
Processing	The Module uses the data obtained from database to send messages to recipient's cell numbers. It sends the messages received from clients to USB SIM card reader for transmission
Data	The data handled by this module is Message

	body, recipient's numbers and details, clients details
--	--

Table 4.2 Server Module description

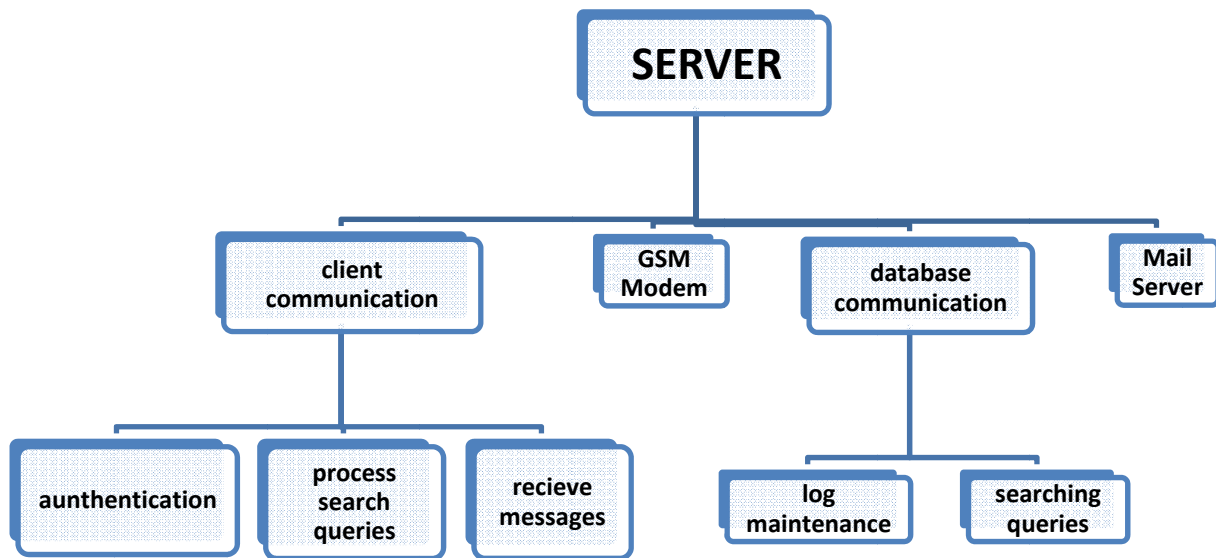


Figure 4.5 Sub modules of server

4.3.3 Database Module

Data base module holds all the data of students and staff members. It is also responsible to maintain a log of all the sent messages. When a client send s query with a certain search criteria, server forwards it to database module and a list as result is sent back to client via server. When a user wants to see message log or wants to take print out, server interacts with database to make that log available. Database also holds all the registered users and their rights details to use the system.

Database Module Description

Type	A core module that deals with the data of clients, participants and log.
Purpose	It maintains the information of the registered clients. It has all the information of the students. This information is used to process different queries using different search criteria. The module maintains the complete log of the messages.
Dependencies	It can interact with server module only.
Resources	The Module Uses all the Resources as allocated by Operating System.
Processing	This module uses all the data regarding clients, participants and messages
Data	The data handled by this module is participants numbers and details, clients details and passwords, Messages etc