

INTRANET MAIL SERVER



PROJECT WORK DONE AT
ADVANCE ECOM SOLUTIONS

PROJECT REPORT

SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE AWARD OF THE DEGREE OF
M.Sc Applied Science (Computer Technology)
OF BHARATHI UNIVERSITY, COIMBATORE.

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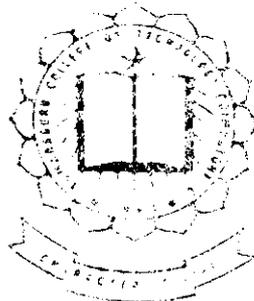
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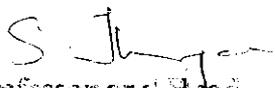
INTRANET MAIL SERVER

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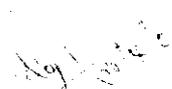
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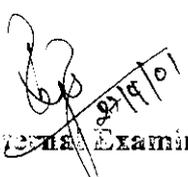
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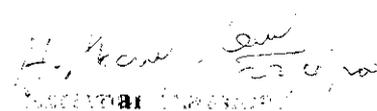

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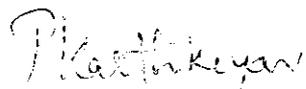

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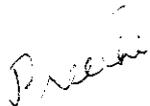

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DECLARATION

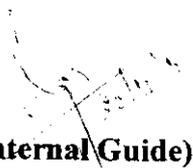
I hereby declare that the project entitled INTRANET MAIL SEVER, submitted to Bharathiar University as the project work of M.Sc Applied Science (Computer Technology) Degree, is a record of original work done by me under the supervision and guidance of Mr.Karthikeyan, M.C.A, P.M, Advance Ecom Solutions, Coimbatore and Mrs. L.S. Jayashree, M.E, MISTE Lecturer, Department of computer science and Engineering, Kumaraguru College of Technology, Coimbatore. And this project work has not found the basis for the award of any Degree/Diploma/ Associateship/Fellowship or similar title to any candidate of any university.

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DEDICATED TO

MY

BELOVED PARENTS

Acknowledgements

Synopsis

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INTRANET MAIL SERVER is a scalable, reliable and secure SMTP/POP3 Email server. With the powerful features of AES MAIL SERVER, network's Email can be collected from a single, ISP provided, POP3 account and/or host an entire domain with AES Mails full-fledged server.

INTRANET MAIL SERVER is designed to meet all LAN and Internet Email needs using a single POP3 account. It has the features of POP3 User Settings, Local User Settings, Internet Dial Up Settings, and SMTP/POP3 Settings. It also provides the Auto dial up facility in specified time intervals. The Auto response feature available in the mail server responds to the incoming mail automatically by sending back an acknowledgment mail. There are facilities for Dialing & checking mails or checking mails when the Internet is already on. The Send alone, receive alone and Send & Receive options are provided.

The incoming and outgoing mails are compressed and stored in the server in an encrypted form. The mails are decrypted and decompressed before forwarding them to the local users or to the ISP's Mail Server. It also has the option of deleting the message immediately or after every fifth message.

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Introduction

1. INTRODUCTION

1.1 Project Overview

The primary objective of Intranet Mail Server is to provide multiple mail ids from a single Internet account or a POP3 account. The Mail server incorporates within it, a POP3 server, a POP3 client, a SMTP server, a SMTP client and a Auto dialup facility. The POP3 server holds the mails downloaded from the Internet accounts, to the respective users in their respective areas. The POP3 client downloads the mails from the ISP's Mail server. The SMTP server receives and holds the mails from various users within an organization, which are to be sent to the external world. The SMTP client sends the mails that are received and stored by smtp server to the ISP's Mail server. The Auto dialup facility establishes the Internet connection in specified intervals of time and terminates the connection after posting the outgoing mails and retrieving the incoming mails.

The protocols - SMTP and POP3 supported by the Mail Server allows any e-mail client (SMTP and POP3 compliant) such as Outlook Express, Netscape Communicator etc., to receive and send mails from

the Mail Server. When a user sends a mail from his e-mail client, the mail client contacts the SMTP server, which accepts the mail. If the mail is for a local user, it is instantly transferred to that user's mailbox. If the mail is not for a local user, then the mail is kept in the outbox of the server, which will be sent to the external world once the Internet connection is established. When the Mail Server makes a connection to the Internet (using the account name and password supplied to it), it sends out all the out-bound mails lying in its outbox and then downloads mails from the POP3 accounts. The downloaded mails are stored in the user's mailbox. The user can log into the Mail Server to view his mails.

Some of the features of the Mail Server include:

- ✧ Unlimited personal e-mail ids over one Internet account
- ✧ Ability to pick mails from multiple POP3 accounts
- ✧ High-speed data transfer
- ✧ Usage of any SMTP/POP3 compatible clients (Eudora, Outlook Express...)
- ✧ Storing mails in encrypted and compressed form.
- ✧ Limiting the size of the mails that are to be sent or received

- ↗ Auto-dialup facility
- ↗ Auto response capability
- ↗ Requires a single machine (not dedicated) and a single modem
- ↗ Can be installed and run on Windows 95, Windows 98 and Windows NT

The Administrator is the sole authority to activate the Mail Server. When new users are added, the Mail Server adds them to the list of users. The Inbox will contain all the mails received for the users. The Outbox holds all the mails sent by the users. The user can use his mail client to delete his mail from the Inbox.

The Internet account or the POP3 account of the company must be configured during the installation of the Mail Server. The Mail Server has a facility to add the POP3 account. The size of the mails that are to be downloaded/posted can be specified. Based on the Administrator's choice, the mails with size greater/lesser than the specified size are considered. This feature helps an organization to minimize the network traffic over the Internet.

1.2 Organization Profile

Advance e-com Solutions,
98, Sree Lakshmi Towers,
MTP Road,
Coimbatore – 641043.
Phone - 447474
E-Mail : ecom@quickwebsolutions.com
Website: www.Quickwebsolutions.com

AES is a U.S based MNC with it's head quarters located at Leslin, New Jersey, U.S.A. which was established in the year 1998, with it's branch office in Coimbatore, India. The server is at Baltimore, U.S.A. Successfully completing a year of service in the Ecom Industry, now it has more than 300 domains in the server. They have a strong technical team at the branch office at Coimbatore with more than 25 Software Engineers. They 'the E-com People' have developed sites for categories that include B-to-B, B-to-C and C-to-C and portal sites also.

Message:

Ever since it's inception, AES has laid emphasis on contributing to the development of the IT Industry in its own unique way, by maintaining high caliber, technology and consistency in upgrading the technology. The confidence of our customers and employees has given us their

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System Study and Analysis

2. System Study And Analysis

System study is the phase in which the problems are identified, the existing system, if any are studied, various alternate solutions to the problem are defined and the most feasible solution is recommended considering the cost factors, hardware, software and human resources. During the study phase a preliminary analysis is carried out in sufficient depth to permit a technical and economical evaluation of the proposed system. At the conclusion of the study phase, a decision is made whether or not to proceed with the design phase.

2.1 Existing System

Electronic communication, because of its speed, turnaround time and broadcasting ability, is exploding the world much faster than expected by industry experts. Email is cheaper and faster than a letter, less intrusive than a phone call, less hassle than a FAX. Using email, differences in location and time zone are less of an obstacle to communication. The above said advantages clearly state that email is exploding.

Let us examine how an organization can provide with the facility of email to its employees.

If an organization is able to provide individual accounts to all its employees then there is no doubt that any of these facilities will be denied. We speak of an organization, which really cannot afford to get individual mail account to all its employees. There are two possible ways through which an organization can provide the facility of email to its employees.

Case 1:Single Internet Account and One POP3 Account

Consider the case where an organization has a single Internet account. As ISPs (Internet Service Providers) provide the facility of POP3, this organization can have the facility of email. All employees working in that organization may use the same email address for receiving and sending emails. Here again only a single Computer in the organization may have the facility of connecting to the Internet. So, obviously all the users who are given with the facility of email should send and receive mails from the system, which has the facility of connecting to Internet. Evidently, this method of giving email access to all employees has quite a lot of

The primary disadvantages of this method are

- ✦ The organization cannot provide enough system time to all its employees.
- ✦ As different users use the facility of email at different times, the connection to Internet has to be made quite frequently which again increases the cost of the organization.
- ✦ There is no way to ensure that the mail has reached the desired person or not.
- ✦ Simultaneous access to mail by two different users is not possible.
- ✦ There is no way to keep the mail secured in the mailbox.

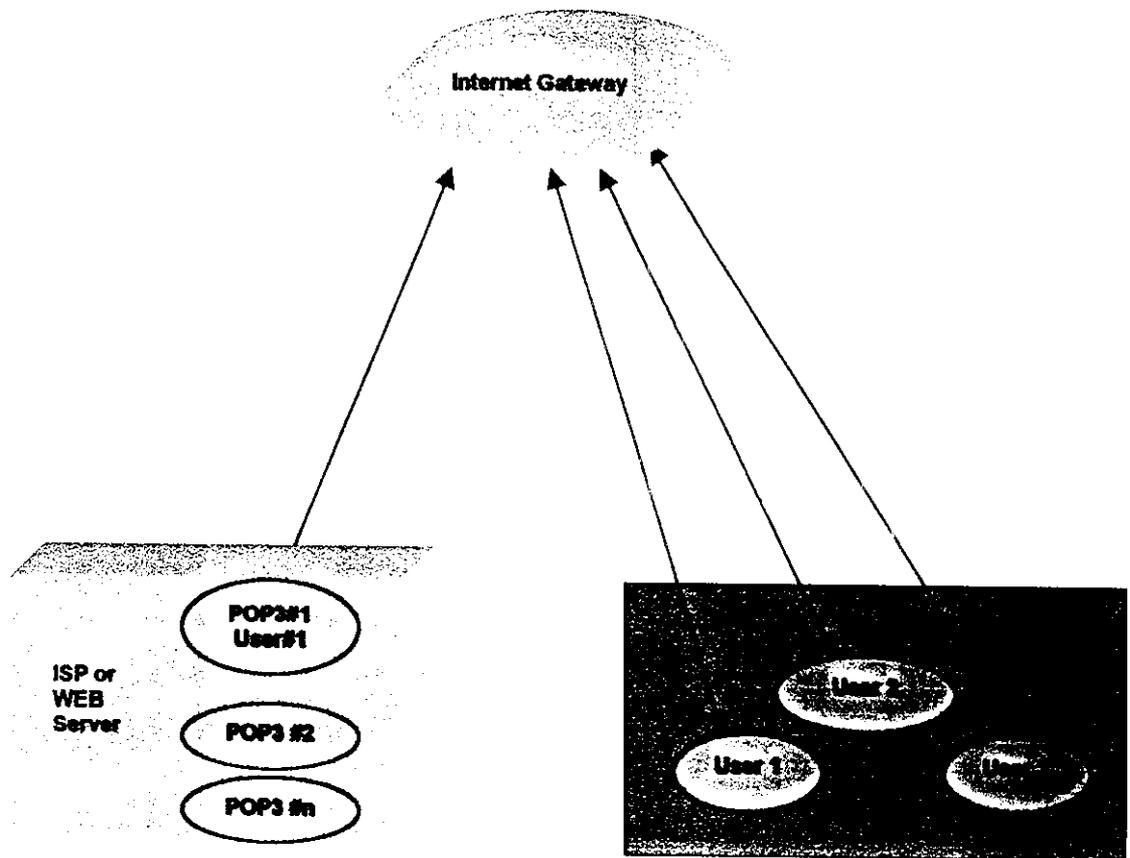
Case 2: Multiple POP3 Accounts.

Now let us consider the case of an organization having a single Internet Account and multiple (limited) POP3 accounts. Some ISP's provide multiple POP3 accounts at an extra cost (you may also get some POP3 accounts from your web server). Organizations having multiple POP3 accounts can configure each POP3 account to a separate department. The problem faced in the above case of giving a same email address to the whole organization has now reduced to give an email address to each department. Employees of a particular department can use the same email address for sending and receiving mails.

Now let us see some advantage of this case over the previous case.

- ⇒ Each department can configure separate mail client to their respective POP3 account. Mails exposed to the whole organization are now only exposed to a particular department. So, in a way, mails pertaining to a particular department are secured.
- ⇒ The mail access, which was previously restricted to a particular computer resource, is now spread across the various departments within an organization.
- ⇒ One can ensure that mails pertaining to a particular department have reached that department which is not at all possible in the previous case.

The following diagram shows the System with a single Internet account.



But however this method also has some limitations, as faced in the previous case. Some limitations are

- ✦ Mails pertaining to an individual are not secured.
- ✦ Though the mail access is distributed among the departments, the departments cannot provide email access to all its employees.

- ⇒ All departments cannot connect to Internet at the same time due to the limited connections (for a single account) restriction by the service provider.
- ⇒ Users of the department have to wait for the resource to be freed before they can send and receive emails.
- ⇒ Each individual cannot configure the mail client according to his own wish.
- ⇒ Two or more users within a department cannot send mails at the same time.

Limitations

The limitations of above two cases are summarized below.

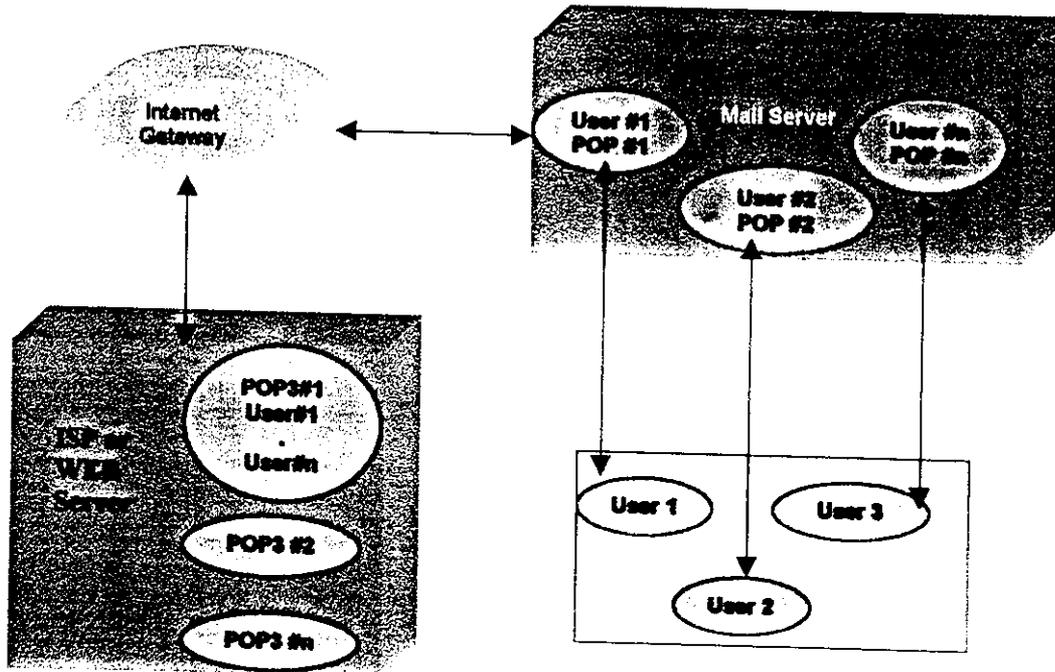
- ⇒ No privacy of individual mails. No user, within a department or within an Organization can feel that his privacy is maintained.
- ⇒ Requires a machine that is dedicated for mailing purpose. No doubt that all the users within a department or within an organization will use the facility of email. So it is absolutely necessary to dedicate a system so that an organization can ensure it provides mailing facility to all its employees.

- ⇨ All users have to use the same mail client. If two users use two different mail clients, then again there is a problem for the third user to know, in which mail client his mail is.
- ⇨ All the users must use the same email address. (Even though there is a chance of aliasing, still there is no way a user can feel his mails are secured).
- ⇨ Two users cannot use the mail client simultaneously (i.e. two users cannot send mail simultaneously).
- ⇨ Each individual user has to dial out to check his mail.
- ⇨ The organization may not have any control over the mail transfer. If the organization wishes to enforce some restrictions to all its employees, then with the above existing cases it is almost impossible.
- ⇨ Above all, the mails are not secured. None of the personal and official mails are secured.

These are the serious limitations that are faced when an organization is not able to provide individual account to all its users. Both the organization and the employees have their own reason to comment on the limitations.

2.2 Proposed System

The following diagram helps in understanding the system that is proposed.



The proposed system acts as an intermediate between the ISP or WEB Server and the users. The system has both the SMTP server and the POP server built into it. The default port in which the POP server will be waiting is 110 and the default port of SMTP server is 25. When the users

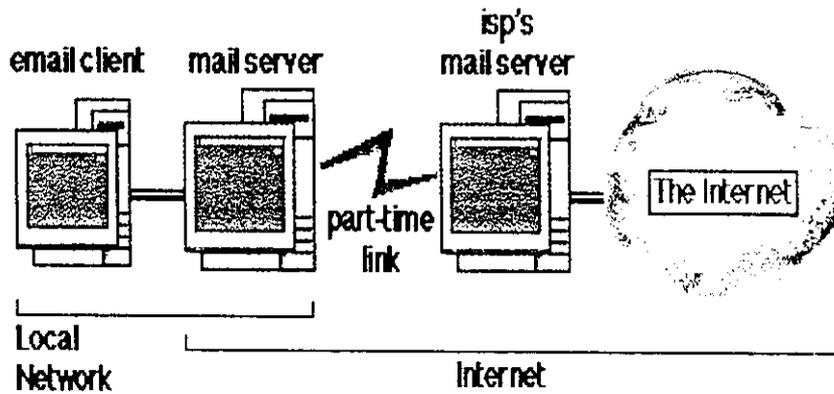
send mail, the mail client opens a connection to the SMTP server and sends the mails. To receive a mail, the mail client opens a connection to the POP server and checks whether there is any mail for that particular user. It is not necessary for a user to be aware of all these facts. These things will be taken care by the mail client. But the system must be able to respond to the client's requests. When the system receives the mail, it should store all the mails in a local storage, so that, when a connection is made, the system can send all the mails to the ISP server. The SMTP client carries out sending the mails that are collected from the local users to the ISP Server. The proposed system must collect all the mails from the ISP Server and store it in the respective user's mailbox. The POP client carries out this function. POP client establishes a connection to the ISP Server by using the account name and password supplied to it and checks whether there is any new mail for that domain. If there is any new mail, then the client receives all the mails, and places it in the inbox. The Auto dialup facility dials and establishes connection with the Internet.

The proposed system comply with the protocol standards

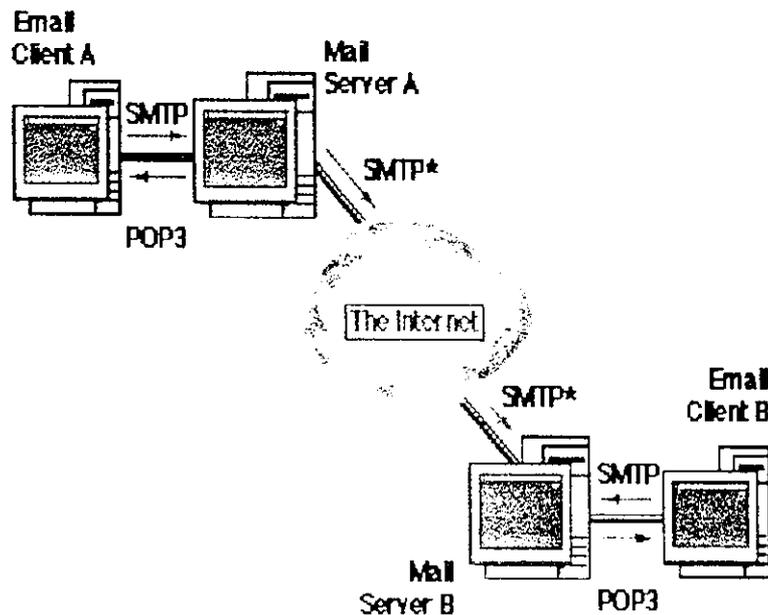
- RFC 822 known as SMTP (Simple Mail Transfer Protocol)
- RFC 1959 known as POP3 (Post Office Protocol)

SMTP and POP3 are the commonly used protocols in all Mail servers for sending and receiving mails.

Connecting the Mail server with the ISP's Mail server



How do POP3 & SMTP relate to each other?



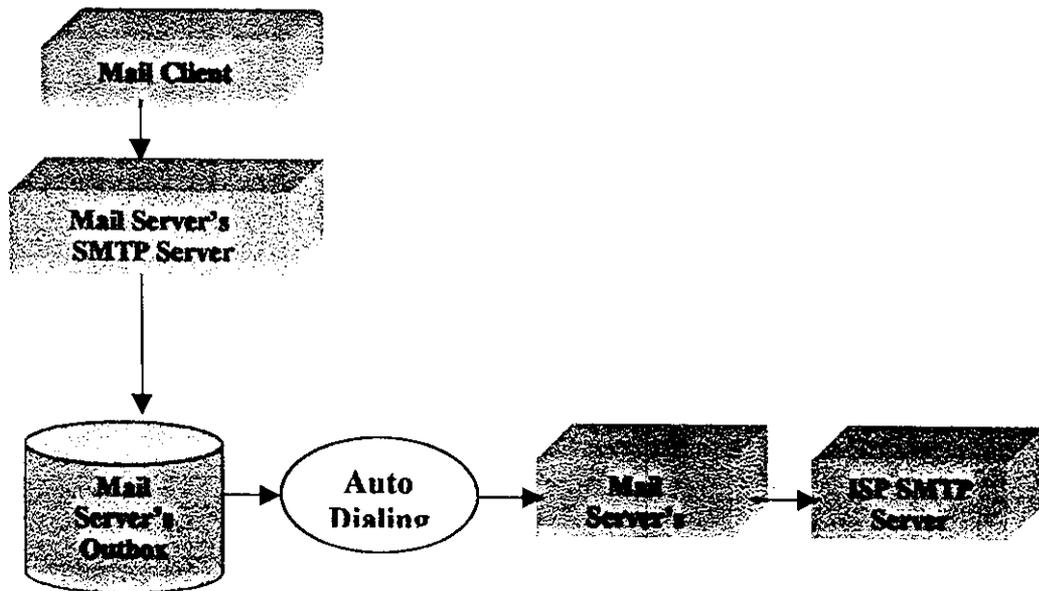
Modules in the Proposed System

There are five modules in the Mail Server. They are

- 1) **SMTP Server:** Waits at port 25 and accepts connections from the mail client and collects the mails sent by the users.
- 2) **SMTP Client:** Sends the mails that are collected from the users to the ISP Server.
- 3) **POP Server:** Waits at port 110 and accepts connections from the mail client to respond with the respective user's mailbox.
- 4) **POP Client:** Collects the mails from the ISP Server and places them in the Inbox.
- 5) **Auto dialup:** Automatically dials and establishes connection with the Internet in specified time intervals and then terminates the connection after uploading or downloading of mails.

The following diagram helps in understanding the process involved in sending and receiving mails:

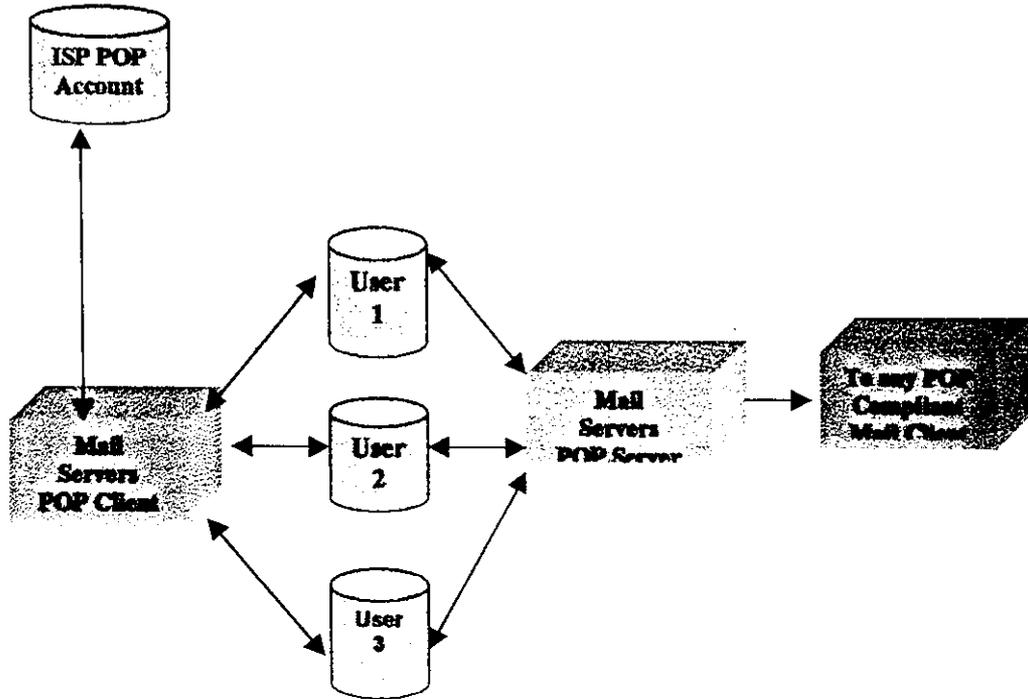
Sending Mails



When a user composes a mail and clicks the send button, the mail client configured to the Mail Server's SMTP Server, opens a connection at port 25 and requests for sending a mail. The Mail Server's SMTP server receives mails and places all the mails in its outbox. This is done only after validating the user who is sending the mail. Similarly, there may be many users sending their mails. The Mail Server collects all the mails and stores it in its outbox. Then, when the system is connected to the net, the SMTP client built into the Mail Server collects all the mails from the outbox and sends it to the ISP Server. SMTP client must be configured with the ISP Server address so that it could establish a connection to that

server and send the mails that are collected from the users within an organization. This is the basic operation involved in sending mails.

Receiving Mails



When connected to the Internet, Mail Server's pop client is configured with the address of the ISP Server (to establish connection) and provided with the account name and password it collects mails from all the pop accounts. Based on the recipient's name the client program filters all the mails and places it in the respective user's mailbox. If the mail is for an

unknown user then the client program places that mail in the Administrator's mailbox. When a user connects to the Mail Server to check for mail, the POP server checks the user's mailbox to see whether there is any mail. If there is any mail then the server gives a positive response on the status of the mailbox and based on the request, it sends all the mails to the user. If there is no mail for that particular user, then the POP server gives a negative response on the user's mailbox status.

2.3 Requirements of the new system

Because software is always a part of a larger system, work begins by establishing the requirements for all the system elements. The requirements gathering process in case of Mail Server is intensified and focused on the programs to be built, required function, behavior, performance and the various interfaces with the external system, the Mail Server has to meet.

The primary objective of the system to be developed is defined after studying the initial requirements that the system has to meet. The objective of the system is "to provide multiple individual e-mail accounts over a single Internet account". The normal requirements of the system can be stated as:

⇒ The system should have a well-defined user interface. Even though there will only be one user, Administrator, using the system, the system should be able to guide him to configure with the necessary details.

⇒ Since the system will be connected to the Internet to transfer all the mails received from the users and to collect all the mails for the users from the POP3, performance play a key role. It is an absolute necessity for the system to ensure that mails are sent and received in a faster manner.

Expected requirements are implicit to the product or system and may be so fundamental that the customer does not explicitly state them. Their absence will be a cause for significant dissatisfaction. But however, the requirements of Mail Server can be stated as:

⇒ Each user must be provided with a separate POP account to make sure that individual mails are secured.

⇒ Any user who wishes to check his mail must be validated before he is given with his mailbox status, i.e. only after user authentication is done, the system should provide the user with his mailbox status.

- ⇒ The system must be able to accept any number of connections simultaneously. There may be a number of users within a department or within an organization connecting to the system to send or receive the mails. The system should provide the mechanism to handle all these facilities.
- ⇒ The system should have the provision to enforce restrictions on mails that are sent and received. Eg. Suppose the organization decides not to retrieve mails above 20k, then system must have the facility of enforcing that restriction.
- ⇒ The system should be able to collect those mails from multiple pop accounts. If the organization has only one POP account from where the mails are to be collected, then there is no problem. If the organization has multiple POP accounts then the system must have a provision where it can collect mails from different POP accounts.
- ⇒ The system should accept connections from any POP and SMTP compliant clients. Eudora, Outlook Express is some among them. The system must be able to accept connections from any email client that is POP and SMTP compliant.
- ⇒ The Administrator must be the sole authority that must be given with all the resources of the system.

- ⇒ The mails should be stored in an encrypted and compressed form in the mail server to protect the mails from hacking and to reduce the usage of memory.
- ⇒ The mails should be decompressed and decrypted before posting them to ISP or before forwarding them to the clients.
- ⇒ Automatic dialup facility should be available to establish connection to the Internet in specified time intervals.
- ⇒ The system must be provided with an Auto-response facility.

2.4 User characteristics

The mail server requires an Administrator to configure the system. He is the sole authority who is responsible for adding new users and deleting the existing users. Once the Mail Server has been installed, the Administrator must be the first person to log on and must configure the necessary settings like adding the users, specifying the accounts where he wants the Mail Server to pick up the mails.

There is nothing the end user has to learn except to compose a message and send through his mail client software. He is supposed to use only the POP compliant mail client. Two of the popular mail clients in the market are Internet Explorer and Outlook Express. Every mail client should be

Programming Environment

3. Programming Environment

3.1 Hardware configuration

The proposed system is being implemented on the following hardware configuration:

Minimum Configuration

Processor	- Pentium I
Speed	- 600 MHz
Main Memory	- 333 MB
Hard Disk	- 12 GB

Recommended Configuration

Processor	- Pentium III
Speed	- 750 MHz
Main Memory	- 512 MB
Hard Disk	- 30 GB

3.2 Descriptions of Software

Never before has any new programming language attracted so much attention and become so popular so quickly. In the first year of its

existence, Java took the Web by storm and became its adopted programming language. Since then, Java has become the language of choice for developing both Internet and Intranet applications, and is used for both business and consumer software development. The Java phenomenon has captivated the imaginations of programmers around the world and is leading the way towards the next era of distributed application development. Java's appeal lies in its simplicity, its familiarity, and the careful selection of features that it includes and excludes. A government committee or a clique of academics did not design Java. It shares the spirit with C more than any syntactical similarities. It is a programming language that was designed by programmers for programmers.

The reason that so much attention has been paid to Java is summarized in the following list. Java allows the developer to do

- ⇒ Write robust and reliable programs
- ⇒ Build an application on almost any platform and run that application on any other supported platform without recompiling the code.
- ⇒ Distribute the application over a network in a secure fashion.

- ✧ Java is Simple
- ✧ Java is Object Oriented
- ✧ Java is Platform Independent
- ✧ Java is Safe
- ✧ Java is Reliable

Networking

A network socket is like an electrical socket. Network sockets are TCP/IP packets and IP addresses. Internet Protocol (IP) is a low-level routing protocol that breaks data into small packets and sends them to an address across a network. Transport Control Protocol (TCP) is a higher level Protocol that manages robustly string together these packets, sorting and retransmitting them as necessary.

TCP/IP Client Sockets:

TCP/IP sockets are used to implement reliable, bi-directional, persistent, point-to-point, stream based connections between hosts on the Internet. A socket can be used to connect Java's I/O system to other programs that may reside either on the local machine or any other machine on the Internet.

Servlets:

Servlets are small programs that execute on the server side of a web connection. Servlets offer several advantages:

- ⇒ Servlets execute within the address space of a web server.
- ⇒ Servlets are Platform Independent, because they are written in Java.
- ⇒ The full functionality of the java class libraries is available to a servlet.

JDBC Characteristics:

JDBC is a “call – level” SQL interface for Java. This interface is totally independent of the available database management systems.

SQL conformance: JDBC does not restrict the type of queries passed to an underlying DBMS driver. JDBC may be implemented on top of common SQL level API's, in particular on top of ODBC. JDBC provides a Java interface that stays consistent with the rest of the Java system.

There are no conflicts. The JDBC mechanisms are simple to understand and use. This simplicity does not mean that functionality suffers.

JDBC Components:

- ⇒ Application
- ⇒ Driver Manager
- ⇒ Driver
- ⇒ Bridge drivers

System Design and Development

4. System Design And Development

4.1 Introduction

Software design is an interactive process through which requirements are translated into a “Blue-print” for the software. The following three characteristics will serve as a guide for the evaluation of a good design.

- ↻ The design must implement all the explicit requirements contained in the analysis model, and it must accommodate all of the implicit requirements desired by the customer.
- ↻ The design must be readable, understandable guide for those who generate code and for those who test and subsequently maintain the software.
- ↻ The design should provide a complete picture of the software, addressing the data, functional and behavioral domains from an implementation perspective.

4.2 Design Phase Activities

Following the guidelines, the various activities that were done during the design phase of the Mail Server are:

4.2.1 Input Design

4.2.2 Output Design

4.2.3 Database Design

4.2.4 Process design

4.2.5 Screen Design

4.2.1 Input Design

The objective of the input design is to create an input layout that is easy to follow. In many applications, Keyboard remains the primary input medium. But this is not the case in Mail Server. It requires a very minimal input from the administrator to begin its operation. To avoid errors made by the operators, all the input made to the system are validated properly and is made in such a way that the user is given with the option of minimal typing work. The data validations are done by making the screen design in such a way that user commits little or no errors. Defined privilege levels govern access to application ranging from input screens to file access and updating. The input to the system is more oriented towards configuring the system. The system must be provided with the details of the server from where it should download the mails, details of the users from whom the system should accept mails and

distribute the mails. The following section helps in understanding the Inputs to the system.

Configuring the Mail Server:

The following configurations are of absolute necessity to make the Mail Server begin its operation:

User Configuration:

This is the area where we will add a new user to the Mail Server system. On entering the configuration – User’s area, the Administrator will be presented with a scroll-box showing the list of registered users on the system, with the options Add, Delete and Edit.

When we start the Mail server for the first time, there will only be one user seen, namely the Administrator. As we add users, the list gets displayed in the scroll box.

Internet Configuration:

Mail Server requires the details of the connection with the Internet Service Provider.

↗ Domain name

↗ Dialup number

⇒ Username: login-id to the ISP.

⇒ Password

⇒ Auto dial (minutes)

We would have used the above information when we configured our web browser or email client for use with the Internet account. In case we change the password for the ISP access, we have to change the password here too.

More Than One POP Account

The Mail Server can also collect mail from multiple e-mail hosts to be routed to one or more persons. To do this, the Mail Server must be provided with the names of all the POP accounts and the password, so that, it can collect the mails from all POP accounts. The details include

⇒ Code

⇒ POP3 Username

⇒ POP3 Password

⇒ POP3IP/Domain name

⇒ UserCode

Server Settings:

The Mail Server requires the details of the SMTP and POP3 servers of the ISP. They include the following:

- ⇒ SMTP IP Address
- ⇒ SMTP Port (default 25)
- ⇒ POP3 IP Address
- ⇒ POP3 Port (default 110)

Configuring The Mail Client:

In order to access mails from the Mail Server, users have to configure their POP3 compliant mail client. The SMTP and POP server address configured in the mail client must be the address of the computer where Mail Server is running. Only when this configuration is done, the mail clients know where to receive the messages. There are many email clients in the market now.

4.2.2 Output Design

The output from the system will be

- ⇒ Sending mails collected from the users to the ISP Server.

⇒ Serving the users with their mails collected from the ISP Server.

Sending the mails:

There may be many users within an organization sending the mails. The Mail Server receives all the mails and stores it in its outbox. If the system is connected online to the Internet, then it will immediately send all the mails to the ISP server. If the system is not connected, then the Mail Server stores all the mails in its outbox till it is connected. Once the connection is established, the Mail Server sends all the mail lying in its outbox. Sending the messages in a format that could be understood by any ISP server is an important aspect. There is a standard format that has been established and followed all over the world by the Internet Committee which all the mail clients and servers are expected to follow. It is necessary that Mail Server compose the messages in a predefined specified format so that it can deal with any server over the net.

Serving With Mails:

After sending all the mails lying in its outbox, the Mail Server downloads all the mails from the organization's POP account. All the mails received will be stored in the inbox of the Mail Server. Then it is

the duty of the Mail Server to serve the mails when a user connects to check for his mails. The user will be first authenticated based on the username and password. If the authentication succeeds, then the Mail Server responds with the status of that particular user's mailbox. If there is any mail for the user, based on the request from the mail client, the Mail Server serves all the mails to that user. If the authentication fails, then the Mail Server does nothing except returning an error message to the user.

Here again, composing of messages plays a vital role. There may be many kinds of files like bitmap files, text files, html files, gif files and so on that are to be received and sent. The Mail Server must compose the messages containing these kinds of files and attachments in the standard format defined for the mails and must be able to serve the mail clients in such a way that any mail client should be able to understand the format. This is the basic requirement of the output design and the system is designed to handle all types of messages.

4.2.3 Database Design

As such the system needs considerably a good amount of storage space to store the mails collected from the users and from the ISP server, the

database design plays a vital role in the development of the system. The system creates and maintains files for each incoming and outgoing mail. The filenames of all incoming mails are stored in a table “INBOX” which acts as the Inbox of the Mail Server. The filenames of all outgoing mails are stored in a table “OUTBOX” which acts as the Outbox of the Mail Server. The details of the incoming and outgoing mails can be maintained or deleted by the Administrator.

Apart from maintaining two tables for the users, the Mail Server has to maintain some other details to do its function. Every time the system cannot and must not ask from the user the server address and the POP accounts. So it is necessary to maintain details about the server in a separate file so that when the send instruction is received, it can make use of the details about the server to establish the connection. Also the system must maintain the details of the POP accounts, the user name and password, which it uses to connect to the ISP server to check for the mails and to send the mails after connecting to the Internet. The system should also maintain the details about the local users and their password. Without this, Mail Server will not be able to authenticate the users when they connect to the system to check for the mails. Basically when a new user is added the system prompts for the user name and password.

The table structure for each of the tables used in Mail Server is as follows:

INBOX:

This table is used to store the details of the incoming mails. The fields included in this table are as follows:

- ↗ Code :Sequence Number – **AutoNumber**.
- ↗ User Code :Unique code of the User – **Number**.
- ↗ Data :Name of the file where the mail is stored – **Memo**.
- ↗ Status :This holds '0' for unread messages and '1' for the messages that are opened for reading – **Number**.
- ↗ Dor : Date of receipt of the mail – **Date/Time**.
- ↗ Dore : Date of read by the client - **Date/Time**.
- ↗ Size : Size of the mail – **Number**.
- ↗ Message ID :The unique message identifier extracted from the mail – **Text**.

OUTBOX:

This table is used to store the details of the outgoing mails. The fields included in this table are as follows:

- ↗ Code :Sequence Number - **AutoNumber**.

- ✉ Mfrom :The Sender's Mail ID - **Text**.
- ✉ Mto :The Receiver's Mail ID - **Memo**.
- ✉ Mdate : Date of mails sent – **Date/Time**.
- ✉ Status : This holds '1' for messages that are not yet sent to the ISP and '2' for the messages that are sent to the ISP – **Memo**.
- ✉ Authorized :This indicates whether the outgoing message is authorized by the Administrator or not – **Text**.
- ✉ Size :Size of the mail – **Number**.

LOCAL USER DETAILS:

This table is used to store the details of the users. The fields included in this table are as follows:

- ✉ User Code : Sequential Code generated for the users - **AutoNumber**.
- ✉ User Name :Account Name for the user – **Text**.
- ✉ Password :The password set for the Account – **Text**.
- ✉ Department :The Department in which the user is working – **Text**.
- ✉ Details :Other Details of the user – **Memo**.

↻ AutoReply : Administrators choice of sending the reply message – **Number**.

↻ AutoReplymessage : Acknowledgement that the mails have been received – **Memo**.

LOG DETAILS:

This table is used to store the current connection status and the status of mails that are being downloaded. The fields included in this table are as follows:

↻ LogCode :The sequence number – **AutoNumber**.

↻ LogDetails :The details showing the current status of the mail server – **Text**.

↻ Date/Time :The current time/date – **Date/Time**.

POP3 USER DETAILS:

This table is used to store the details of all POP3 accounts. The fields included in this table are as follows:

↻ Code :The Sequence Number – **AutoNumber**.

↻ PopUserName :POP3 Account Name – **Text**.

↻ PopPassword :Password for the POP3 Account – **Text**.

↻ Pop3IP :The IP Address of the POP3 Account - **Text**.

↻ UserCode : Unique Code for the user - **Number** .

INTERNET SETTINGS:

This table is used to store details regarding the Internet connectivity. The fields included in this table are as follows:

- ↻ InternetConnection :The name of the Internet Service Provider(Ex. BPL, VSNL) – **Text**.
- ↻ ServerName :The Name of the server - **Text**.
- ↻ MailServerIP :The IP Address of the ISP's Mail Server - **Text**.
- ↻ TimeOut : The time within which the next dialup should occur - **Number**.
- ↻ PhoneNumber :The phone number used for establishing the Internet connection - **Text**.
- ↻ UserName :The Account name used for establishing the Internet Connection - **Text**.
- ↻ Pass : The Password used for establishing the connection to Internet - **Text**.

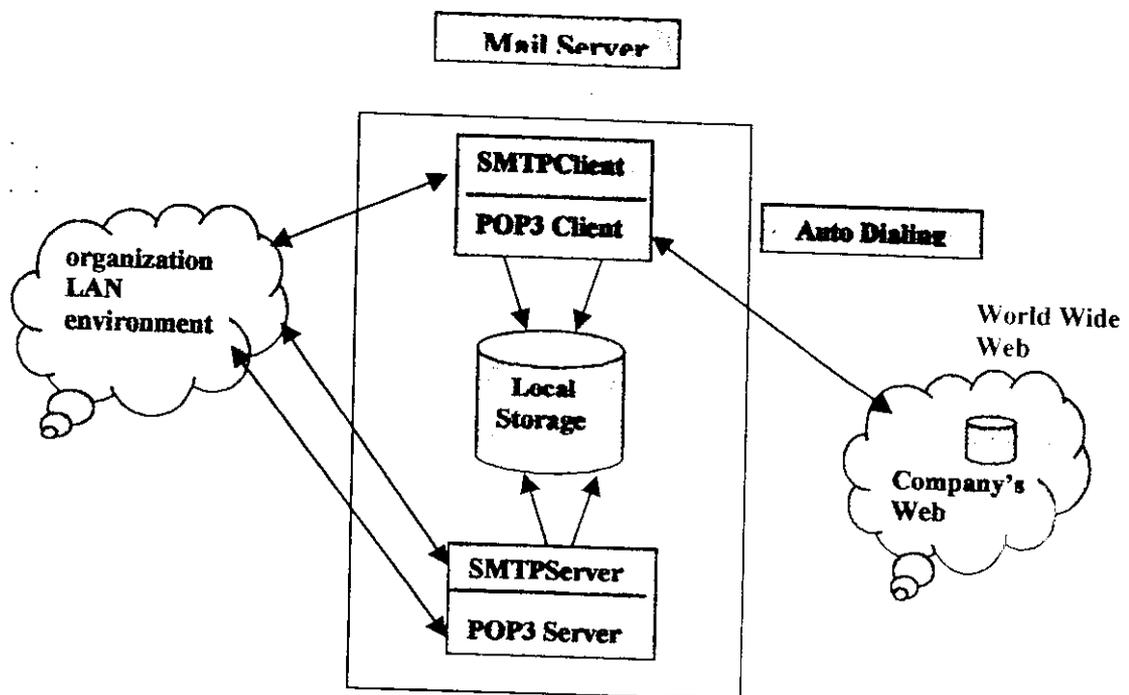
4.2.4 Process Design

Introduction

Software Engineering process is the glue that holds the technology layers together and enables rational and timely development of the computer software. Process defines a framework for a set of key process areas that must be established for effective delivery of the software. The key process areas form the basis for management control of software projects.

Process Involved:

The following diagram helps in understanding the system.



The Mail Server has both the SMTP and POP server built into it. Both the servers interact with the organization's local LAN environment and accept connections from the mail clients. The client programs built into the Mail Server interact with the ISP or WEB server in the process of sending and receiving mails. The Auto dial up facility carries out the process of establishing connection with the ISP.

Modules:

The whole system consists of five modules:

- SMTP Server
- SMTP Client
- POP Server
- POP Client
- Auto Dialup

SMTP Server:

This server waiting at port 25 listens for the connection from the mail client. Any mail client that is SMTP compliant can be used to send the mails. When the server recognizes a connection from the mail client it creates a separate thread to process the request and continues to wait for any other connection. The thread created by the server will do the entire

operation of servicing the mail client. First, when a connection is sensed, the Mail Server sends a positive response to the client. The client receives the following message:

220 SMTP Server - Client IP: <IP Address of the client>

Only when the server issues positive response, the client engages in further transaction. After receiving the positive response, the client starts sending the mails composed by the users. For convenience, the server will be called as receiver smtp and the client will be called as sender. There are three steps to SMTP Mail transactions. The transaction is started with a '**mail from**' command, followed by the sender identification. A series of one or more '**rcpt to**' command follows, giving the receiver information. Then a '**data**' command gives the Mail data. And finally, the end of mail data indicator <crLf>. <crLf> confirms the transaction. A unique file is created for every outgoing mail. The mails are stored in an encrypted and compressed form in their respective files. The details of the outgoing mail from the client are stored in the outbox of the Mail Server. By default, the status for all outgoing mails is set to '1' in the outbox. The first step in the procedure is the '**mail from**' command. This command is followed by the address of the sender.

```
mail <SP> from:<sender@server name> <crLf>
```

This command tells the SMTP-receiver that a new mail transaction is starting and to reset all its state tables and buffers, including any recipients or mail data. If accepted, the receiver-smtp returns a '250 mail from < sender@server name >' reply.

The second step in the procedure is the 'rcpt' command.

```
rcpt <SP> to:<receiver@server name> <crLf>
```

This command identifies one recipient. If accepted, the receiver-SMTP returns a '250 mail from < sender@server name >' reply and stores the receiver's mail-id. If the recipient is unknown the receiver-smtp returns a '550 Invalid Syntax'. This second step of the procedure can be repeated any number of times.

The third step in the procedure is the '**data**' command.

```
data <crLf>
```

If accepted, the receiver-SMTP returns a '354 send data with crLf.crLf ' intermediate reply and considers all succeeding lines to be the message text. When the end of text is received and stored, the SMTP-receiver sends a '250 Message Queued' reply. Since the mail data is sent on the

transmission channel, the end of the mail data must be indicated so that the command and reply dialog can be resumed. SMTP indicates the end of the mail data by sending a line containing only a period. The end of mail data indicator also confirms the mail transaction data. If accepted, the receiver-SMTP returns a '250 Message Queued' reply. The 'data' command should fail only if the mail transaction was incomplete, or if resources are not available. The above procedure is an example of a mail transaction. These commands must be used only in the order discussed above. Example (below) illustrates the use of these commands in a mail transaction. This SMTP example shows mail sent by Sachin at host Quickwebsolutions.com to prithii, uday and jack.

Here S is Mail client, R is Mail Server

S: mail from: sachin@quickwebsolutions.com

R: 250 mail from sachin@quickwebsolutions.com

S: rcpt to: prithii@yahoo.com

R: 250 rcpt to prithii@yahoo.com

S: rcpt to: uday@hotmail.com

R: 250 rcpt to uday@hotmail.com

S: rcpt to: jack@usa.net

R: 250 rcpt to jack@usa.net

S: data

R: 354 send data with <crLf>.<crLf>

S: hello, welcome to mail server

S:.....etc. etc. etc.

S: <crLf>. <crLf>

R: 250 message queued

The smtp server after receiving the mails, stores it in the user's outbox.

SMTP Client:

The mails are collected from the users and are stored in the mail server's outbox by the SMTP server in an compressed/encrypted form. The mails that are stored must now be sent to the ISP's Mail Server, so that it can reach the external world. The SMTP client carries out this function.

When the Mail Server is connected to the Internet, it checks the outbox. If the client program finds that there are unsent mails in the outbox, i.e. mails with status set to '1', then the system sends the mails to the ISP's Mail Server. Once the mails are sent to the ISP, the status is set to '2'.

While accepting the mails from the mail clients (users), Mail Server acts as an smtp server. But in case of sending the mails to the ISP server, the situation reverses. Here Mail Server acts as a client and sends all the messages to the ISP after decrypting and decompressing. The SMTP

client built into the Mail Server now does all the functions that are done by the mail client.

POP Client:

POP client opens a connection to the ISP server with the help of account name and password supplied to it. When the POP client establishes a connection to the ISP server, the server should reply with a positive response. Only then the Mail Server can engage in further transactions to collect the mails. If there is no positive response from the ISP server, Mail Server returns a message informing about the negative response of the ISP server and closes the connection. When the response from the ISP server is positive, Mail Server first sends the user name (i.e. account name). If the user name is validated, then the POP client sends the password. Only after validating the password, the ISP server lists the details of the mails in the mailbox. POP client checks to see whether there are any unread messages in the mailbox. If there are no unread messages in the server, POP client simply issues a 'quit' command and terminates the session. If there are unread messages, then the POP client retrieves the messages, first that are below the specified size limit, then followed by the mails beyond the size limit and terminates the connection from the ISP server by issuing the 'quit' command. The mail

downloading status is, by default, set to 'N' (i.e. not completed downloading). Once the mails are downloaded, the status is set to 'C'. The mail server has the facility to send an acknowledgement to the received mails. This feature is incorporated using Auto Response capability of the mail server. The Administrator sanctions the User's list as to who should send an acknowledgement message. Now that the POP client has received all the mails, it has to place it in the server's inbox.

POP Server:

Initially, the server host starts the POP3 service by listening on TCP port 110. When a client host wishes to make use of the service, it establishes a TCP connection with the server host. When the connection is established, the POP3 server sends a greeting. The client and POP3 server then exchanges commands and responses until the connection is closed or aborted. Commands in the POP3 consist of case-insensitive keyword, possibly followed by one or more arguments.

Keywords and arguments are each separated by a single SPACE character. Keywords are three or four characters long. Each argument may be up to 40 characters long. Responses in the POP3 consist of a status indicator and a keyword possibly followed by additional

information. A CRLF pair terminates all responses. Responses may be up to 512 characters long, including the terminating CRLF. There are currently two status indicators: positive (“+OK”) and negative (“-ERR”). Servers must send the “+OK” and “-ERR” in uppercase. Responses to certain commands are multi-line.

When examining a multi-line response, the client checks to see if the line begins with the termination octet. If so and if octets other than CRLF follow, the first octet of the line (the termination octet) is stripped away. If so and if CRLF immediately follows the termination character, then the response from the POP3 server is ended and the line containing “.CRLF” is not considered part of the multi-line response. A POP3 session progresses through a number of states during its lifetime. Once the TCP connection has been opened and the POP3 server has sent the greeting, the session enters the AUTHORIZATION state. In this state, the client must identify itself to the POP3 server. Once the client has successfully done this, the server acquires resources associated with the client’s mail drop, and the session enters the TRANSACTION state. In this state, the client requests actions on the part of the POP3 server. When the client has issued the QUIT command, the session enters the UPDATE state. In this state, the POP3 server releases any resources acquired during the TRANSACTION

state and says goodbye. The TCP connection is then closed. A server must respond to an unrecognized, unimplemented, or syntactically invalid command by responding with a negative status indicator. A server must respond to a command issued when the session is in an incorrect state by responding with a negative status indicator.

The **AUTHORIZATION** state:

Once the TCP connection has been opened by a POP3 client, the POP3 server issues a one-line greeting. This can be any positive response. An example might be:

S:+OK POP3 Server Client IP: <IP Address of the client>

The POP3 session is now in the **AUTHORIZATION** state. The client must now identify and authenticate itself to the POP3 server. The possible mechanism for doing this is, the **USER** and **PASS** command combination. If the user name and password is valid, the POP3 server responds with a positive status indicator. The POP3 session now enters the **TRANSACTION** state, with no messages marked as deleted. After the POP3 server has opened the mail drop, it assigns a message-number to each message, and notes the size of each message in octets. The first message in the mail drop is assigned a message number of "1", the second is assigned "2", and so on. In POP3 commands and responses, all

message numbers and message sizes are expressed in base-10 (i.e. decimal).

S: User <user name>

R: +ok Send the password for username

S: Pass<password>

R: +ok Successfully logged in

The TRANSACTION State

Once the client has successfully identified itself to the POP3 server and the POP3 server has locked and opened the appropriate mail drop, the POP3 session is now in the TRANSACTION state. The client may now issue any of the following POP3 command repeatedly. After each command, the POP3 server issues a response. Eventually, the client issues the QUIT command and the POP3 session enters the UPDATE state. Here are the POP3 commands valid in the TRANSACTION state:

STAT

Arguments : none

Restrictions : may only be given in the TRANSACTION state

Discussion :The POP3 server issues a positive response with a line containing information for the mail drop. This line is called a “drop listing” for that mail drop. In order to simplify parsing, all POP3 servers are required to use a certain format for drop listings. The positive response consists of “+OK” followed by a single space, the number of messages in the mail drop, a single space, and the size of the mail drop in octets. This memo makes no requirement on what follows the mail drop size. Minimal implementations should just end that line of the response with a CRLF pair. More advanced implementations may include other information.

Possible Responses:

+OK <no of messages> <total bytes>

Examples:

C:STAT

S:+OK 3 36760

LIST [msg]

Arguments : A message number (optional), which, if present, may not refer to a marked as deleted.

Restrictions : may only be given in the TRANSACTION state.

Discussion : If an argument was given and the POP3 server issues a positive response with a line containing information for that message. This line is called a “scan listing” for that message. If no argument was given and the POP3 server issues a positive response, then the response given is multiline. After the initial +OK, for each message in the mail drop, the POP3 server responds with a line containing information for that message. This line is also called a “Scan Listing” for that message. If there are no messages in the mail drop, the POP3 server responds with no scan listings-it issues a positive response followed by a line containing a termination octet and a CTRL F pair. In order to simplify parsing, all POP3 servers are required to use a certain format for scan listings. A scan listing consists of the message number of the message followed by a single space and the exact size of the message in octets.

Possible Responses:

+OK scan listing follows

-Err no such message

RETR msg

Arguments : A message-number, which may not refer to a message, marked as deleted.

Restrictions : May only be given in the TRANSACTION state.

Discussion : If the POP3 server issues a positive response, then the response given is multi-line. After the initial +OK, the POP3 server sends the message corresponding to the given message number, being careful to byte-stuff the termination character.

Possible Responses:

+OK message follows

-ERR no such message

DELE msg

Arguments : A message number which may not refer to a message marked as deleted .

Restrictions : May only be given in the TRANSACTION state.

Discussion : The POP3 server marks the message as deleted. Any future reference to the message number associated with the message in a POP3 command generates an error. The POP3 server does not actually delete the message until the POP3 session ends with QUIT state.

Possible Responses:

+OK message deleted

ERR no such message

QUIT

Arguments : none

Restrictions : none

Discussion : The POP3 server removes all messages marked as deleted from the mail drop and replies as to the status of this operation. If there is an error, such as a resource shortage, encountered while removing messages, the mail drop may result in having some or none of the messages marked as deleted be removed. In no case may the server remove any messages not marked as deleted. Whether the removal was successful or not, the server then releases any exclusive access lock on the mail drop and closes the TCP connection.

Possible Responses:

+OK

-ERR Invalid Message number

Examples:

C: QUIT

S:+OK Thank You For Using POP3 server.

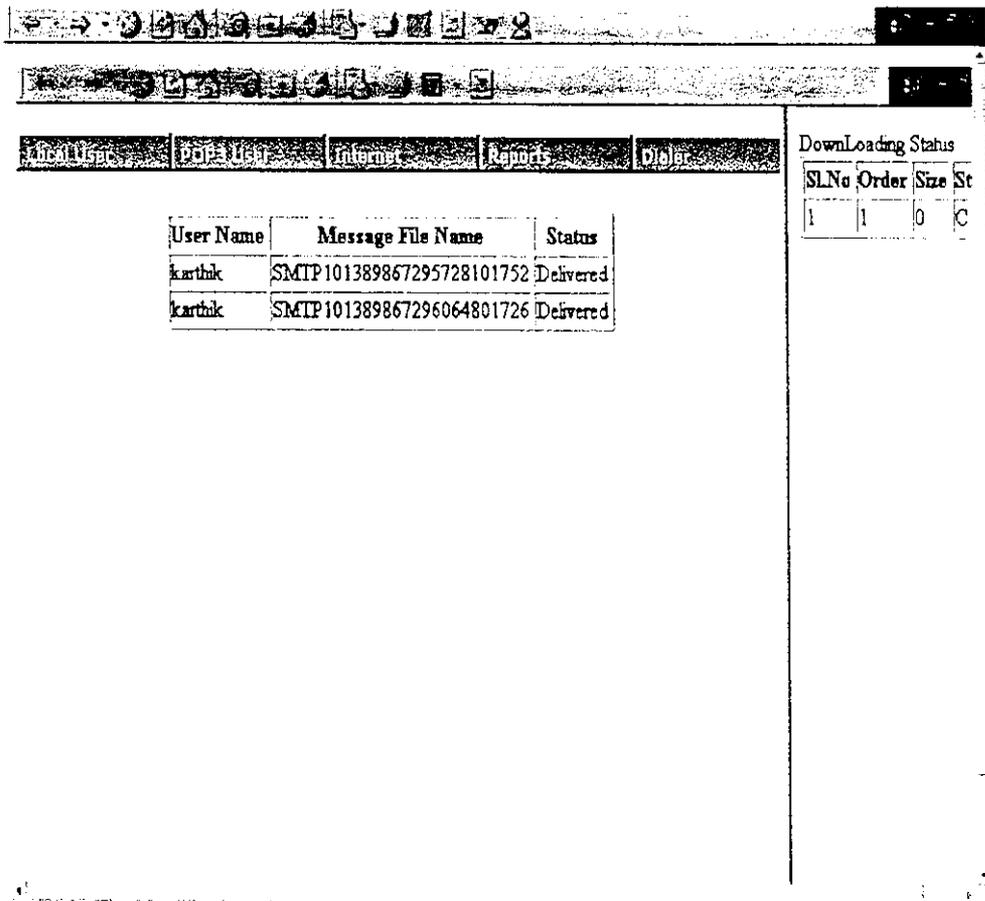
These are the basic commands that the POP server has to implement in order to service the mail clients connecting to the system to check for mails.

Auto Dialup

Auto dialup refers to automatic connection to the Internet at specified intervals of time. When the connection is established, the mails which are in the outbox will be automatically sent and the mails are retrieved in the inbox. When the server is not responding or if there is any other error, then it is disconnected. After certain period, it will again establish connection. Once all the mails are sent or received it automatically disconnects.

4.2.5 Screen Design

In this process the format of inputs, i.e., the screens are designed. The objective of the screen design is to create screen layouts that are easy to follow and use. To avoid errors made by the operators, all the screens to the system in case of adding new users, configuring pop3 and smtp server etc are made in such a way that the user is given with the option of minimal typing work. The detailed explanation of each of the screens is given below:



This is the main window of the application. This is the only screen that pops out when the application is started. This screen indicates the messages received with the user name, encrypted filename and the status showing 'delivered' or 'undelivered'. This screen also shows the Downloading status with its size and the status. A Menubar appears on the screen with the following menus.

☞ Local User Details

⇨ Pop User Details

⇨ Internet settings

⇨ Reports

⇨ Dialer

1. Local User Details

The User Configuration like adding users is done using this screen.

SLNo	Order	Size	St
1	1	0	C

NAME:

PASSWORD:

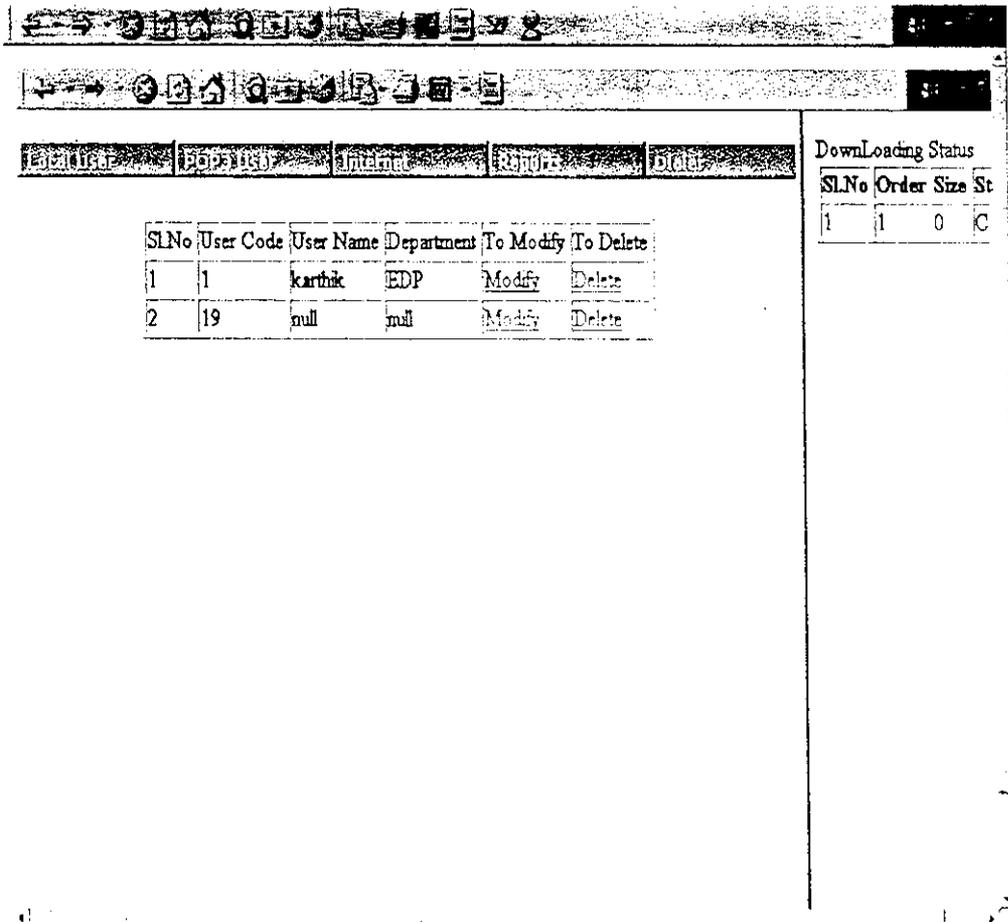
DEPARTMENT:

NOTES:

AUTO REPLY: YES NO

AUTO REPLY MESSAGE:

To add a user, fill in appropriate data and then click on the “Add User” button. A window will popup showing the updated record. Here the user can ‘modify’ or ‘delete’ records.



Now once the “Modify” link is chosen a window pops out to modify the data. After necessary changes are made click on the “Modify User” button, a message pops out as ‘Successfully updated’.

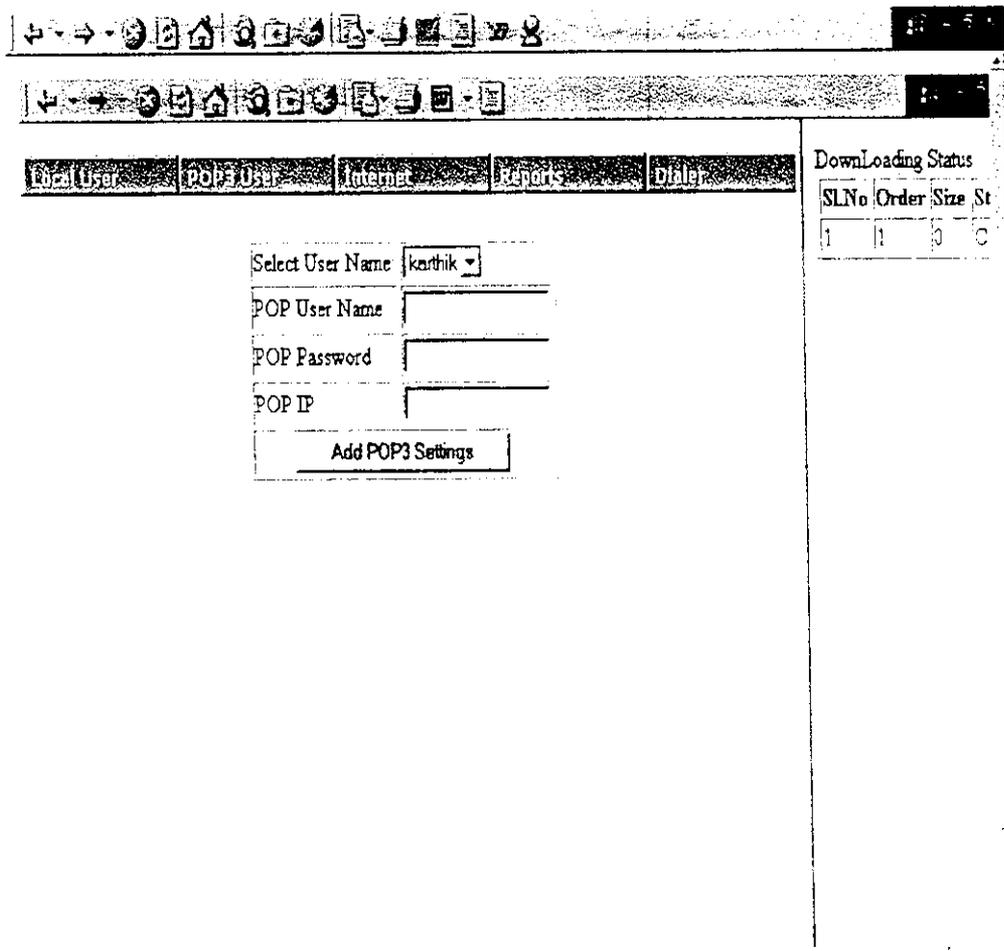
SLNo	Order	Size	St
1	1	C	C

NAME	karthik
PASSWORD	*****
DEPARTMENT	EDP
NOTES	Programmer
AUTO REPLY	<input checked="" type="radio"/> YES <input type="radio"/> NO
AUTO REPLY MESSAGE	Your Message Has Been Received. sss Regards Karthik
Modify User	

To delete a user, the administrator just needs to click on the “Delete” link and a message pops out as ‘Record Deleted Successfully’.

2. POP3 User details

The POP account from where the mail server is to collect the mails is specified using this screen. There can be more than one POP account where the mail server can collect mails.



After adding the pop account click on the “Add Pop3 Settings” button.

A window pops out showing the updated record. Here the user can ‘modify’ or ‘delete’ records.

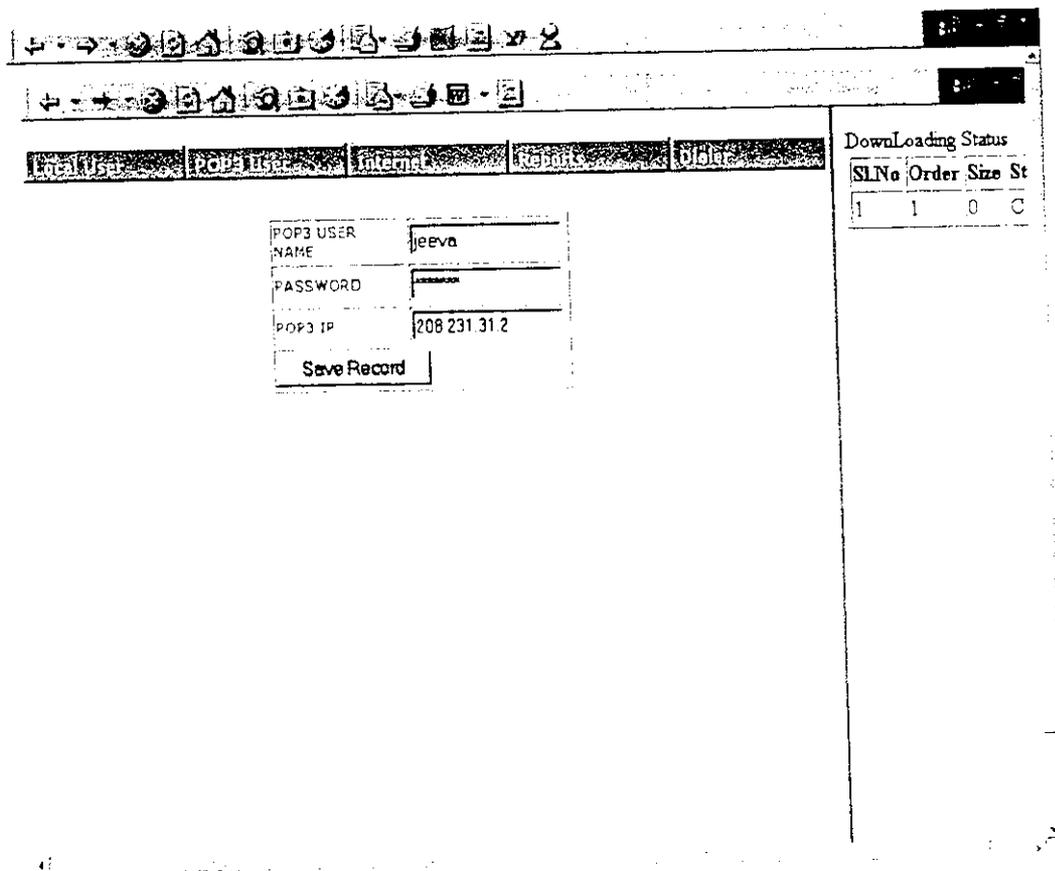
The screenshot shows a web application interface with a navigation menu at the top containing 'Local User', 'POP User', 'Internet', 'Reports', and 'Dialer'. Below the menu is a table with the following data:

SLNo	User Code	POP User Name	POP IP	To Modify	To Delete
1	1	jeeva	208.231.31.2	Modify	Delete

To the right of the main table is a 'Downloading Status' table:

SLNo	Order	Size	St
1	1	0	C

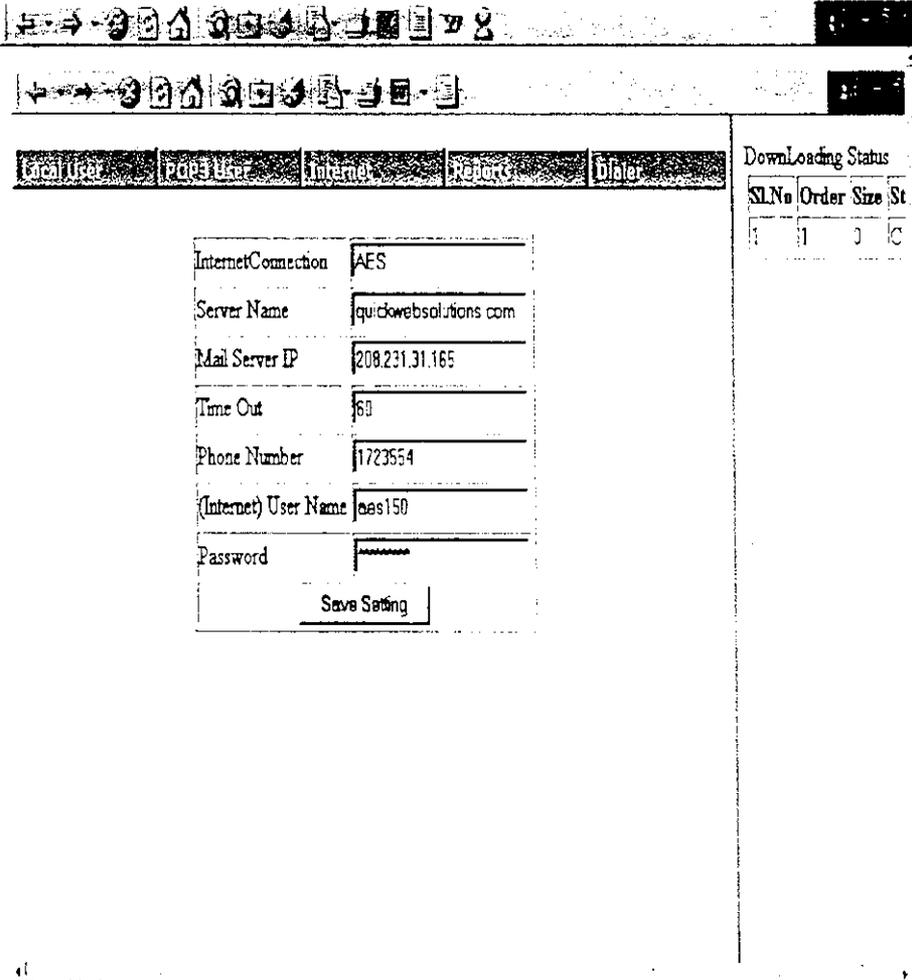
Now once the 'Modify' a window pops out where the data can be modified. Once the changes are made click on the "Save Record" button, a message pops out as ' Successfully Updated'.



To delete a record, the administrator just needs to click on the "Delete" link and a message pops out as 'Record Deleted Successfully'.

3. Internet Settings

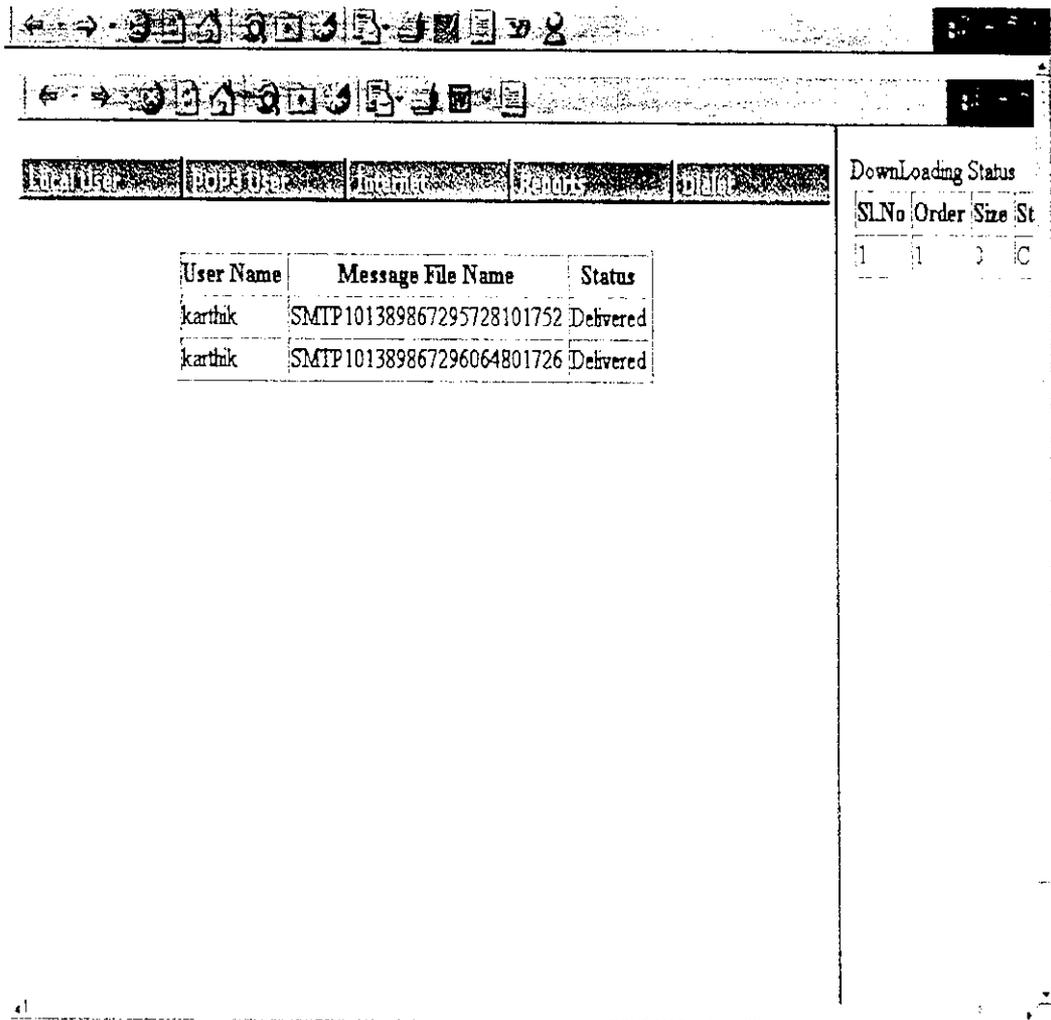
This screen shows the 'Internet Connection', 'Server Name', 'Mail Server IP', 'User Name', 'Password', etc. Once the changes are made in



this screen click on the "Save Setting" button, a message pops out as 'Successfully Added'.

4. Reports

This 'receive' option shows the startup screen where messages with the username, encrypted filename, and the status showing 'delivered' or 'undelivered' are displayed. This screen shows the received messages.



User Name	Message File Name	Status
karthik	SMTP101389867295728101752	Delivered
karthik	SMTP101389867296064801726	Delivered

DownLoading Status			
SLNo	Order	Size	St
1	1	3	C

The 'sent' option gives the details of the Sender, Recipient, Status and the size. This screen also shows the Downloading status with its size and the status.

The screenshot displays a web application interface with a navigation bar at the top containing icons for home, search, and other functions. Below the navigation bar, there are several tabs: 'Available', 'Downloaded', 'Incoming', 'Reports', and 'Outgoing'. The 'Available' tab is currently selected.

The main content area is divided into two sections. On the left, there is a table with the following data:

From	To	Status	Size
karthik@quickwebsolutions.com	karthik@quickwebsolutions.com	Delivered	1482
karthik@quickwebsolutions.com	karthik@quickwebsolutions.com	Delivered	523
karthik@quickwebsolutions.com	k@quickwebsolutions.com	Not Delivered	1431

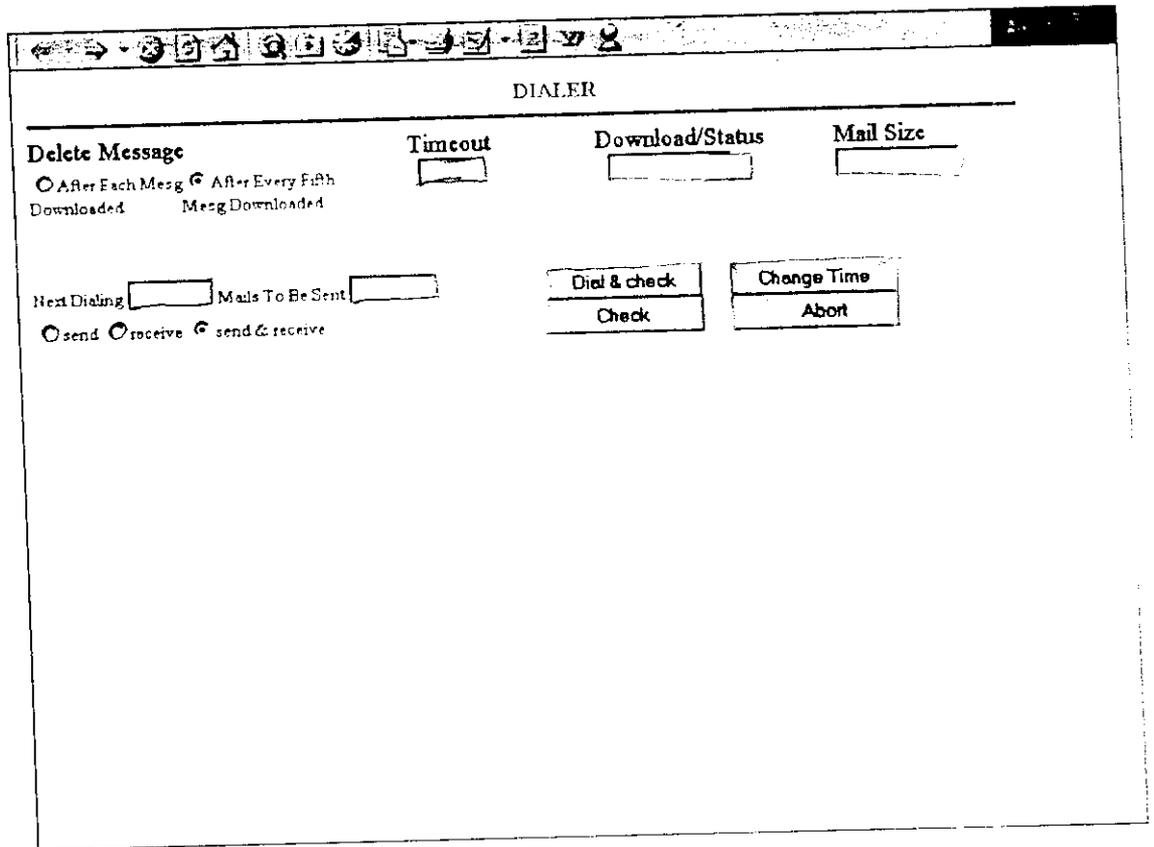
On the right side, there is a section titled 'DownLoading Status' with a table containing the following data:

SLNo	Order	Size	St
1	1	0	C

5. Dialer

This dialer dials automatically to the Internet according to the specification.

The dialer contains options "Delete Message" which while downloading the message from the POP3 server deletes message 'immediately' or after downloading every 'fifth' message.



System Implementation and Testing

↻ A good test case is one that has a high probability of finding an undiscovered error.

↻ A successful test is one that uncovers an as-yet undiscovered error.

Test Cases

The testing of software is a means of assessing or measuring the software to determine its quality. The area of testing is one of the key process areas in ensuring the quality of the software.

The testing of software is a means of accessing or measuring the software to determine its quality. The area is one of the key process areas ensuring the quality of the software.

A detailed test case was designed after requirement stage with 100% conditions coverage, boundary conditions (below, at, above), stress conditions [huge data, abnormal conditions].

Testing is done to ensure

- ↻ Each instruction is executed at least once.
- ↻ All paths and branches are executed at least once.
- ↻ Identify critical paths and execute at east once.

⇒ Intermediate and temporary files are updated properly.

⇒ Check for expected output.

Each component of the system is tested individually. The testing is done by the programmer and is verified by the project leader. The system is tested under all invalid conditions and all the errors were recorded. On completion of the individual component testing, all the components were integrated and testing on integration was also done under all valid and invalid conditions.

Errors Encountered

During the testing phase of the software, following errors were noted:

⇒ Mail size in octet count was not properly calculated.

⇒ A Mail addressed to multiple users was not filtered properly.

⇒ Mails that were considerably larger in size were not sent quickly.

⇒ System was not able to recover when a client disconnects the connection abruptly.

All the possible errors were listed out and the alternatives were framed and the bugs were corrected after a thorough study of all the possible causes.

Conclusion

scope for future Development

Appendix

Books:

1. Crocker, H. David, “ Standard For The Format Of Arpa Internet Text Messages”, RFC 822, August 1999.
2. Myers. J, “Post Office Protocol”, RFC 1359, May 1999.
3. Naughton, Patrick and Schildt Herbert “ The complete Reference – Java 2.0”. Tata McGraw-Hill Publishing Company, 2000.
4. Weber. L. Joseph “Special Edition Using Java 1.2”. Prentice Hall of India Private Limited, 2000.
5. Goodwill, James “Developing Java Servlets”. Techmedia, 1999.

Websites:

[http:// netman.lit.buffalo.edu/index.html](http://netman.lit.buffalo.edu/index.html)

Information about network management system, download vendors.

www.java.sun.com/printing/jdk1.2./printing/

Java Tutorial printing lesson.

www.googlee.com

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