UNIVERSITY OF NAIROBI
SCHOOL OF COMPUTING AND INFORMATICS

Distributed Group Management Solution

[DGMS]
For
Distributed Enterprises

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MSC INFORMATION SYSTEMS

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Declaration

I, the undersigned hereby do declare that this project is my original work and has not been submitted to any other University for academic credit or any other use.

Name……

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Data……..

Signature…….

Dedication

To my wife Margaret, you endured it all as I did this project. You stood up with me by your prayers and love during the course of this project.

To my son Walter, my daughters Viola and Abigail. I owe it all unto you.

Acknowledgement

I would take this opportunity to give my thanks to my GOD who gave me all it takes to finish this project. My supervisor Dr Okelo Odongo for his guidance and encouragement throughout the period project. All the Lectures at ICS who taught me in the course work. I would not have done the project if it were not for the knowledge in different field that you imparted to me. My friend and colleague Boniface Masila for his encouragement.

To my wife and children for their prayers support and understanding. Lastly, to my friend Gitao, and his wife Mary, for their prayers and encouragement.

Abstract

It a foregone conclusion that information systems has dramatically changed not only the way we do things but even they way we think.

The advance of computer and especially the PC in the 1980s and data networks has heralded a new chapter in regard to information processing, storage, exchange and transfer.

Organisations, Governments and individuals have injected huge sums of money in installing computers in the offices and networking them. This has effectively greatly improved on information processing and managements from the traditional methods.

Data networks form LANs; to the Internet have provided a vehicle of data transfer that has not been known before. This has propelled organisation to become distributed by having multiple branches spread out within a campus, a city, between cities and all over the world the Internet- a change in the mode of doing business.

Examples of such organisations include Retail business enterprises such as supermarkets, Banks, Governments departments, Educational institutions such as colleges and universities, Hospitals, Police stations, Pharmacy outlets etc.

One of the challenges to this development is the fact that people have not changed from being themselves. Ideally people are social beings and need to interact whether they are in different locations or not. The interaction range from the usual formal meetings to the informal chat over a cup of tea or when people bump on each other along the hall way and corridors.

However in distributed scenario the interaction becomes more complicated due to the distances involved. There are a host of technologies out there that attempt to address different interaction needs between people within organisations.

There is a great need to carefully look into the market for existing interaction technologies, the interaction supported for workers and other players in an organisation. A substantial piece of work is designing and implementing a model that can support key interaction areas such as formal meetings within an organisation.

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Introduction

Distributed enterprises.

Distribution of services and product is of great achievement to organisation. Today organisations owe their growth (success) to the fact that they are able to get the product and services near to the customer and therefore widening their customer base. This means that there will be several branches spread out in a given area under the control of a central hub office. This distribution will require the transfer of control/request information between branches.

Central to this development is the growth of information and Communications technologies especially the emergence of PCs, Local Area networks, and advance in Internet and backbone networks.

Collaboration

The people factor plays a major role in the well being of organisations. There is no organisation today designed to run free of the involvement of people. The very nature and business role of any organisation originate from people cognitive abilities. The interaction within the people system may have a positive or negative effect on the success of any organisation. In addition, a healthy people component means well for the organisation. This “good health” can only be realized when the social characteristic of the people is taken into account.

Within an organisation, people interaction at different levels and for different reasons. It may be informal or formal depending on the desired goal.

Managers will need to interact on a regular basis to exchange ideas and info. The info collected can therefore be used make decisions on issues that need management attention. The decisions arising thereof are the headlights that if implemented may lead to the growth of the organisation or may help to solve a given problem that could be hampering the organisation operations.

People need to chat over, even on serous issues during break sessions or over some activities. The chat can be between two people or a group.

Collaboration Techniques.

People interact using a variety of techniques which includes: conversations (chatting) over the telephone system, Memos on notice boards, Diaries for scheduling and acting as reminders, Informal discussions (chatting) during work breaks sessions, feedback forms, suggestion boxes which are physically located in position to encourage people to give ideas without fear of intimidation, pigeon holes, questionnaires, interviews, brainstorming, discussion groups, debates, presentations (academic, product based etc.) and regular meetings.

Other techniques that may apply depending on the target audience and the objective include:

- Press conferences: Where one or a group of people wishes to address the press (Both print and broadcast media personnel) on issues meant for the public.
- Cross-examination debate: This is an interaction technique that is applied in criminal law, civil law and political debates.
- Rallies (political, religious).
- Public Address (Using the broadcasting media). As when the president may address the nations using the broadcast media.
- Voting during elections (National, institutional)

Role of ICT in Distributed Interaction

Information and communication technologies have single handedly reconfigured the ever conceived “a large world” to what now is regarded “Global Village”. Today the technology is there for any one to get connected and interact with other people any where in the word. People can meet while in different countries, exchange ideas and make critical decisions in regard to any specific topic.

WORLD+ICT=Global Village

The Internet and related technologies to such as file transfer, web etc have made it possible to have any information at our desktops.

The ever-increasing processing power of PCs has incredibly enhanced information processing. Software Engineering practices and techniques have improved greatly the quality of processed work to a level that would not have been fathomed few years ago.

Networks today can scale up to Gb/s speeds. They have made it possible to transfer data and info in deferent media beyond boarders.

What this means is that with the right IT technology one can have the info as desired and transfer it to any desired point on the globe.

Inherently there is no part of any organisation that does not feel the positive impact of ICT. This includes the most important component-The people.

Truly ICT has not only affected the way people work but also the way they interact. Interaction or collaboration is one of the dynamics that play key roles in driving organisations forward or backward and therefore it is every body's interest to know how ICT is and can enhance this important people characteristic.

Problem definition

Of all the interaction techniques discussed above formal meeting stand out among the rest because of the role it plays in making organisations forge a head in their business.

Meetings provide an opportunity and an environment for organisations stakeholders gather information that could be crucial to making important decisions. Meeting resolutions which is actually, "The power of the people" gives the managers the required strength and confidence to move ahead and implement even hard policies with certainty the all will be ok -hence the importance of meetings".

Distribution of services and products closer to market points brings great economic rewards but also introduces some complications in regard to meeting in view of the fact that people are dispersed geographically. The wonder is that, the same technology can be used to address the anomaly.

There are many technologies in the market that address meeting as a way of interaction. There is a need than to evaluate these technologies and how they address the critical characteristics of a meeting.

Project Aim

The aim of this project was to establish the level of use of ICTs in supporting formal meetings in distributed enterprises with a view to designing and developing a prototype meeting model that embraces critical virtues of a formal meeting.

Project Objectives.

1. Examine and evaluate existing technologies that support group collaboration with emphasis on meeting in distributed organisations such as institutions, retail enterprises etc.
2. Design a collaborative LAN based demonstrative meeting model that is closely modelled on the physical meeting.
3. Develop the prototype model.

Project Methodology.

In order to accomplish the stated project objectives the following methodologies were used.

1. **Examine the Physical meeting model**

I needed to fully understand the critical elements of a meeting, its organisation and the actual processes involved including the required outputs.

In addition I looked at other interaction modes such as a suggestion box, query tools and the chatting component and their role in an organisation.

2. **Evaluate Existing Meeting Technologies**

There is so much meeting technologies out there. However there is the need to evaluate the suitability of the technology in meeting an organisation's meeting needs.

3. **System Prototype Design**

It is a required software engineering practices to design any software products. The design here focuses on an integrated prototype meeting system composed of a suggestion box, meeting component, query utility and a chatting utility. This will and entails the use of:

- Structure charts showing the interconnection between the prototype modules.
- DFDs showing the processes involved and their data requirements and
- User interface design.

4. **Prototype Implementation**

Lastly a prototype system has been implemented illustrating how technology can be used to model a meeting scene and also incorporate other features such as suggestion box, a query utility and chatting.

Research Findings

The research done is based examining the requirements for a formal meeting and evaluating the technologies that supporting meetings.

The Physical Meeting Model

Meeting is one of the popular and formalised techniques of collecting info and making decisions. In some cases it is a must for organisations to conduct several meetings within a given duration.

In most cases a specified action must be accompanied by a copy of the meeting minutes that sanctioned the action.

A typical example is the cooperatives organisations in Kenya (A success case study even for other countries). Disbursement of loans can only be sanctioned through a meeting. There are designated days when meetings are held.

In other cases the meeting minutes are so crucial that they are legally binding and act as contract documents. An example is an agreement document between any two people or group of people.

In most organisations the minutes act not only as a reference point in future but also as a means of evaluating the progress in policy implementations. Past minutes help to bring to focus critical issues that may easily be forgotten or overlooked.

All these, point to the important of meetings to organisation and even individuals and specifically the output of the meeting-minutes.

Characteristics of a meeting

Before a meeting takes place, it must be planned an advance and the people concerned notified. Most important aspect to the participants is the agenda, the venue for offsite meeting, the start time and date of meeting.

In a typical meeting scenario, participants meet in a room under the guidance of a chairperson. One of the members is appointed to note down members deliberations. The deliberations are then used to compose minutes, which are an account of what took place during the meeting. The minutes also include the action to be carried out, by whom and by when.

Types of meetings

Meetings fall into three main categories:

1) **Status Meetings**: generally Leader-led, which are about reporting by one-way communication. This the type of a meeting appropriate for informing people about developments or breakthroughs.
2) **Work Meetings**: which produce a product or intangible result such as a decision. Work meetings are most effective when facilitated by a neutral facilitator who brings meeting design, processes and expertise in producing work collaboratively
3) Meetings which never should have happened, such as the Monday morning staff meeting which is on the calendar "just in case".

Many meeting will be either of the subtypes below:

- **Staff meeting** -typically a meeting between a manager and those that report to the manager (possibly indirectly).
- **Team meeting** - a meeting among colleagues working on a common team project.
- **Ad-hoc meeting** - a meeting called together for a special purpose. Either to announce discus new developments or to discus urgent matters.
- **Management meeting** - a meeting among managers normally to discuss strategic issues.
- **Board meeting** - a meeting of the Board of directors of an organization
- **One to one meeting** - a meeting between two individuals

Issues Arising From Meetings

According to a 2004 survey commissioned by IMS (Interactive Meeting Solutions, Inc.):

1. 55% of meetings are dominated by one or two people
2. 32% of people feel they could get fired for speaking the truth in a meeting
3. 39% of decisions are made once the meeting is over
4. 80% of the discussion is about things people already agree on

The survey is a clears reflection of exactly what happens in a meeting. Most of problems mainly people based. Also the traditional meeting structure may contribute a significant proportion to this problem. This includes:

1. The minutes in many cases takes long time before they are compiled and distributed to members. This greatly affects the decision-making process and

implementation of decisions which further affect desired growth targets and predictions

2. Normally people are not motivated to attend meetings. There is a general feeling that meetings just waste time. This is due to the fact that in most cases people do not see any change. I.e. their contributions do not get the desired attention.
3. Members do not take that attending meetings is apart of their duties especially in government organizations and therefore they send apologies to replace them in meetings.
4. No immediate action to those who miss meetings. This is due to any of following reasons: No defined administrative specified action for those missing meetings, Minutes take long and therefore the immediate effect of any desired action is lost, Lack of commitment on those mandated to take actions (the “Saving my brother from trouble attitude”).
5. Some people feel intimated to express their ideas. This is may be due to the presence of especially their bosses or because they have inherent fear of being heard yet they may have great ideas that may help.
6. Meetings are always held under time constraints. Therefore not every body has time to air their views. There will therefore be the “I’ve not been heard feeling among participants”.

It will be quite important for any meeting technology to address the above problems. That is it should be able to automatically generate minutes of a meeting, create a report of those who do not attend meetings, provide a feature that users can use to giver their opinion on any issue after the meeting. This will encourage those who have fear and also those that could not because there was no time.

Distributed organization

For distributed organizations the problems becomes even more complicated:

7. Participants need to travel long distances to attend to meetings, and later get back to workstations to get work done. This brings with itself more lost time, more lost business growth, Increased Operational cost (Transport costs and allowances).
8. Some people may not attend the meetings due to genuine concerns. E.g. Family matters, health conditions (when one is restricted by health issue). This may deny the meeting quality contribution and therefore quality decision.

Currently organization is trying to put into place some mechanism to address some of these problems. On top is the use of suggestion boxes.

Suggestion box.

Suggestion boxes are a common place information bins today in many organizations. This shows that there is an understanding that people may not be ready to contribute in meetings because of fear of victimization (not unfounded). Its main aim is to encourage everybody in the organization to contribute towards the well being of the organization.

The suggestion box is a tool that should bring TQM in organizations in the sense that not every body may be part of a management meeting. Also in addition to victimization there might not be enough time for everybody to give his or her opinion. Such people will find their comfort in using the suggestion bin.

Issues with Physical Suggestion Box

Despite the fact that suggestion boxes can play great role in gathering information, it is far from being achieved. This is because of the following reasons:

1. No positioning of the box may provide the anonymous and fear proof conditions that people requires. Therefore it fails to encourage people to constantly give ideas.
2. There is no defined structure to give feedback to the suggestions. The management fear that they may be the target of such suggestions and therefore are not willing to give them the attention they deserve.
3. There is no requirement that suggestions dropped will be acted upon. Due to the **sorting** and **compiling** time overhead and lack of **dedicated personnel** to deal with the issues. Ideally the suggestion should be sorted and compiled into reports by top management. The report should list down issues that need attention and further discussion. Such issues should be in the agendas list in future meetings.
4. If some of the suggestions touched on issues that have already been implemented even if partially, a brief report should compiled detailing what has been done, and when, and then posted on web site for public perusal. This will encourage people not only to give more but also to work hard as they feel appreciated.

To enhance decision-making and ensure that everybody within an organization is motivated a meeting system should incorporate a suggestion bin. The meeting system should automatically generate a report for all the suggestion on a regular basis for

action. This will eliminate the time and exhausting task of going through the manual suggestions. There will be no need for any personnel to filter through the suggestions.

Chatting.

Much of the collaboration the take place between people within organization is informal. Telephone conversations, chatting between people as they bump on each other along the corridors, the customary morning and afternoon greetings etc, are just but view examples. Informal meetings enable people within organizations to socialize.

Chatting do play important role in getting work done faster and even to high quality levels. Very serious decisions have been made between two or more people while chatting over a cup of tea within an organization during break time. Traditionally chatting decisions are based on human trust, which may not last long to hold such discussions valid.

Chatting Issues
It should be emphasized that, chatting within organizations is important. However, there are some problems, which may need some attention and includes:

- Some informal discussion has far reaching agreements and also far reaching effect if any of the parties involved violate the agreement. This is because there is no documentation to show for such agreements.
- On of the main cause of disagreements among workers and which may affect the growth index negatively is failure to honor agreement reached in a chat among them.

I have been involved in some discussions where the word of the mouth is taken as good as a check. However this is challenge to many of us and may not work all the time.

The meeting system should incorporate chatting feature and should give a means of chatting peers to save their dialogs. This will provide some fallback positions in case of peers dishonoring or forgetting other’s claims.

In some specific case the chatting can be digitally signed to ensure non-repudiations.

ICT In Collaboration

Incidentally the development of IT and ICTs focuses on human needs. There is therefore a whole range of technologies in the market that are designed to support different areas of collaboration among different people within an organisation. This include:

- **Telephone** (Analogue). This is a traditional over the time technology that allows people any where in the world to converse over the analogue telephone wires.
- **VOIP**. Voice over the Internet Protocol.
- **E-mails**: An Internet/Intranet based messaging service that enables people with e-mail account to communicate with each other any time. E-mail service will require an e-mail server to be running for it to work.
- **Office applications** for processing information. There are a host of applications in the market that help with office information processing needs such as Ms-office suite, Lotus office suite etc. They help to design and create documents that can be used for communication such as attachments, reports, memos, notices, questionnaires, feedback forms, presentation slides etc.
- **Electronic schedulers** such as Microsoft outlook, which reminds us of, scheduled activities after a preset time.
- **Web browsers**: which enable an Internet or intranet user to access web documents form any server in the world. Web document are documents (pages) created using html that has links to each other. The link can be between documents that are in deferent location in the world or within the boundaries of an organisation. The linking is made possible by the http protocol in the TCP/IP protocol suite. With http one can create a complex Web of documents. The documents can be accessed by clicking on a hyperlink, which could be a text, graphics or an object that has an event handler associated with it.
- Chat for informal communication between two people.
- Collaborative writing and drawing (whiteboard)."

Most collaboration products do integrate several tools that support various interaction modes.

This integrated product when deployed over the Internet and then integrated with Internet other associated technologies makes " Bill Davidow coined term "virtual corporation"" a reality.

Virtual Corporation is concept that promises "*free access to a much broader array of utilizable resources, gained through acts of partnership, empowerment, and trust."* From a white paper by - Geoff Moore.

By going beyond these limits, businesses are divesting themselves of low-value-added tasks and breaking free from market-restricting constraints, thereby allowing them to maximize the return on their highest-value-added assets.

Such companies with more decentralized, partner-oriented cultures include HP, Sun, Microsoft, and Compaq. They definitely have the edge over their centralized companies such as IBM.

Leveraging the Infrastructure

What has made this dramatic shift in strategic advantage possible is almost entirely a function of the proliferation of a newly emergent web of computing and communications infrastructure. Laptop computers have grown in popularity and are becoming cheaper. They are an "instant Internet enabled" gadgets that can be hooked to the Internet instantly. Therefore virtually every public site has the ability of becoming a surrogate office, be it a hotel room, a visitors/clients waiting room, the public park, or even a private bedroom.

With video conferencing facilities having matured, it is clear that the traditional rules of interaction will have to undergo a transformation.

Some of the products include:

- **Aroundme** :Open source product that combines social networking tools with collaborative work features, such as, document libraries, and calendars.
  Developer: Tom Calthrop and others and run on UNIX, and Windows (written in PHP)
- **BSCW Shared Workspace System** :A Web-based environment for collaborative document editing and other shared work.
  Developer: Fraunhofer FIT and OrbiTeam Software GmbH
  Platforms: UNIX, Windows

- **BRANE :**Enterprise collaborative work platform. BRANE embeds discussion throughout the team workspace so that discussions take place in the context of relevant documents and project management information. Developer: Brane Space LLC, Platform: Windows
- **BrightSuite** :Features both asynchronous collaborative tools (forums, calendars, scheduling, etc.) and real-time tools (conferencing and instant messaging). Source code is available for complete customisability. Requires Microsoft Access, SQL Server, or MySQL. Developer: DCASoft, Platform: Windows
- **Convea :** Intranet platform for collaborative work, featuring threaded discussions, real-time chat, instant messaging, group scheduling, file management, and more. Requires Internet Explorer. Developer: Convea Ltd. Platform: Windows.
- **Deme :**Free, open source platform for small to medium-size groups who make decisions democratically. Features discussion forums with integrated email capabilities, collaborative document authoring, and polling. Requires PHP and MySQL. Developer: Groupspace.org (Stanford University and East Palo Alto Community Network). Platform: Linux.
- **EPMAC:** Project management and team collaboration software enabling task management, resource management, issue tracking, messaging, document sharing and versioning. Also available as a hosted service. Developer: American eBusiness Solutions. Platform: Windows 2000.
- **Exchange Server :** :Email server software that facilitates exchange of data among Microsoft Outlook users. Developer: Microsoft. Platform: Windows.
- **IntraSmart** :Intranet software featuring message boards, group calendars, company directory, document library, and more. Developer: Mindbridge Platforms: UNIX, Windows, Macintosh .
- **IsoSpace :** Workspaces featuring real-time web and video conferencing, instant messaging, and persistent message boards, document management, etc. Built on a J2EE platform so no client download is required; works on mobile devices as well as PCs. Available both as licensed software and as a hosted service.**Developer:** IsoSpace, Inc. **Platforms:** Windows, Unix, Macintosh

- **Projistics:** Project management and collaboration system featuring task, resource and time management, calendar and status reports, opportunity management, resource management and knowledge management using a document center and knowledge base, customizable workflow engine, issue and bug tracking, change management system, and risk management system. **Developer:** Nagarro. **Platform**: Windows.
- **TeamCenter:** A suite of groupware tools, including a "collaborative outliner" that functions similarly to a tree-structured discussion forum. Implemented entirely in Java.
  Developer: Inovie Software, Inc.
  Platforms: Windows 95 & NT, UNIX
- **teamspace**: Virtual team rooms including message boards, chats, calendar, team administration, file sharing, project management, idea generation and evaluation. Also available as a hosted service.
  Developer: 5 POINT AG, Germany
  Platforms: UNIX, Windows.
- **eStudio** by Same-Page: Free for the first 30 days. A "virtual office suite" with 15 collaboration tools, including message boards, real-time chat, group calendars & scheduling, project tracking, presentations, contact management, project time logging, document management, and more.
- **WebEx WebOffice** (formerly Intranets.com): Features document management, calendars, task management, discussions, contact lists, expense reports, polls, and databases. Optionally integrates WebEx live web conferencing at extra cost.
- **TeamTalk (TT).** TT Version 2.0, developed by Trax Softworks, Inc., TT allows users to conduct meetings at either the same time or at different times. TT permits anonymous and known comments, but does not have a semi anonymous capability. TT meetings are conducted in topics which authorized users create
- **The Meeting Room (TMR).** By Eden Systems Corporation. TMR is a full-featured EMS that permits group discussions and also has a variety of voting tools. The system administrator has the ability to set up users on the system, and each user can be designated as either a leader or a participant. Only designated leaders can call meetings; other users are restricted to participating in meetings to which they are invited

Videoconferencing online deliberations Systems

Other products have inbuilt Videoconferencing for online deliberations. They add into the general meeting, the videoconferencing facilities such as Video, Telephone, speech capturing interface etc.

Examples include:

The Voxwire MeetingRoom

The Voxwire MeetingRoom is an unlimited PC-to-PC web conferencing application that allows people to communicate & see the same website or presentation on their screens.

GoToMeeting: Web Conferencing Made Easy

It allow one to easily organize a meeting on the fly or scheduled meetings, perform live demonstrations and collaborate on documents.

InterCall

InterCall offers conferencing services from a standard audio teleconference, to interactive a video conferencing services.

Cata Web Conferencing

Cata Technologies is an online application service provider (ASP) that provides web conferencing solutions that are easy to set up and affordable.

Team space - collaboration

Flexible groupware and web portal for teamwork and project work.

Meeting Technologies

Microsoft Net Meeting

Microsoft based meeting solution. Latest version comes embedded in windows XP and 2000 and 2003 operating software.

Def: Net Meeting

This is a program that allows real time "over the Internet" or “network” meetings to take place between one or two computers in different locations. It incorporated a "chat" facility and both video and audio connections.

Mostly it allows users in different locations to share files and applications as if they were both sitting in front of the same computer

Evaluating Microsoft Net Meeting

The program provides several features that attempt to model several meeting categories at the same time. The feature include:

- Telephone to talk to others
- Video to see others as they participate.
- Share applications and documents.
- Collaborate with others using shared applications
- Send files to others.
- Draw with others in a shared Whiteboard.
- Chat facility for informal conversation.

Shortcomings of Net Meeting

Microsoft NetMeeting system is one of the technologies in the market that attempt to meet the needs of a meeting in distributed organizations. It is a meeting technology for distributed organization that attempt to eliminate the need for people to travel for long distances for the meeting to take place.

However on a closer analysis based on a real physical meeting model, NetMeeting has some shortcomings:

1. Does not Model a real meeting environment where participants have control of the meeting. There is no allowance to setup meeting details. Consider a University meeting for example, typical details required would be the meeting category (e.g. Academic Board Meeting, Exam Board, Faculty etc). Also there should be a provision for the agenda to be discussed.

2. Does not have a facility that can automatically generate minutes. (Only feature that is provided is shared program ability that is locked when one user is using it).
3. Minutes once generated should be automatically posted to a web server where they can be accessed publicly.
4. Does not cater for people weaknesses and fears. It should provide away of people to give their contributions on topical issues in the form of suggestion a box.
5. NetMeeting can only run on windows platform. This means that a version has to be written for every other operating system.

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Distributed Group Management Solution

DGMS

For
Distributed Enterprises

Distributed Group Management Solution

DGMS Overview

A lot of effort has been put into the research and development of systems that support collaborative group working and especially those that support meeting. Still there is a lot to be done in this field. There is need to design an integrated product that meets interaction needs of different groups of people and individuals in organisations.

According to ***Uday S. Murthy*** *and* ***L. Murphy Smith*** in their paper "Electronic Meeting Systems at Work" described an electronic meeting system as one having the following features:

1. "PCs networked on the LAN in the same room or at different locations,
2. An administrator who determines the meeting type, sets the agenda, and invites participants.
3. Participants view a common meeting blackboard with all participants' comments displayed together on each of their screens,
4. Input to the meeting occurs by participants typing in new ideas or comments or their reaction to existing ideas and comments, and posting their input.
5. The common screen is updated so that all participants can view the additions
6. In contrast with face-to-face meetings, electronic meetings permit simultaneous input. Participants do not have to wait their turn before entering a comment, allowing for an uninhibited generation of ideas and suggestions
7. Meetings do not have to be attended at the same time and place. Some EMS tools should even allow for users to dial in and participate in a meeting from remote locations.

DGMS is a demonstrative meeting prototype model that attempts to address some of critical features that every formal meeting should embrace. At the same time it addresses some of the problems that characterises most meetings such as delay in compiling and distribution of the minutes.

DGMS has incorporated a suggestion bin that encourages more people in any organisation to offer their contributions.

DGMS Aim

The aim is to design and implement a DGMS prototype illustrative model that incorporates some of the strong features of the physical meeting environment and also seeks to address some of it problems. It attempts to model a LAN based real meeting environment by giving the administrator total control of the meeting.

Objectives

At the end of the project I wish to design and implement a DGMS system that will model a real physical meeting environment which:

1. Enabling users to see each other's contributions.
2. Providing facilities that enable the meeting administrator to set-up meeting particular before start time and inform the participants automatically.
3. Generate the minutes automatically.
4. Publish the minutes to a webs server.
5. Generate a report on workers who miss meetings. (Can be used for evaluation purposes)
6. Provide an anonymous suggestion box.
7. Generate and publish suggestions report
8. Provide a chatting facility for use by any two people
9. Should run on any platform and in addition

Development Tools

DGMS is a distributed (network based) application system. As such the development and implementation had to be done successfully in a network environment using a network-programming platform.

Hardware and Software Tools

The tools used include:

- At least two PCs (I used one PC and a laptop) in a network. I did set up a simple network using a lap link cat 5 cable.
- Java Programming Language: Java was adopted because of its suitability as a network programming language. It is full fledged with well-built network programming features such as Sockets, Datagram sockets, Multicast socket URL manipulation etc. The implementation requires the sending of objects and therefore objects serialization is required. This is well addressed in java objectstream class.

Also java has a well-established inbuilt file handling classes, which makes it very easy to create and manipulate files and directories. Working data and generated information including are stored in files. The fact that java was ordinary designed for the web made the designers give a lot attention to security. Therefore using java makes it easy to guarantee security of data/info not only for data in storage but also during transfer and for application.

- Web Development tools: Basically the reports are web based. This means that they will be created using mainly HTML, ASP for web databases, JavaScript for client, and CSS for dynamic content manipulation. I used java to write this reports automatically.
- Java network programming Textbooks and Internet.

Design Tools

To Design the system I used:

- Structure Charts for module design
- DFDs for process design
- The Microsoft word draw tools for design of user interface.

System Features

DGMS should have then following features:

Authentication

Description

Verifies that the user using the system is valid and is carrying out the appropriate task. The authentication details are stored in a server.

The authentication component makes use of several functions both at the client side and the server side.

At the client side the login class provides a user interface for users to enter their credentials. These include: username, password, and login type (A choice of either admin or user). The details are encapsulated into a serializable object and then sent out to the server trough an objectOutPutStream. If login is successful the client then is switched to the user options or admin options window depending on the user type.

If login fails the client alerts the user accordingly. If the next subsequent five trials are unsuccessful the client process is closed and the socket connection is disconnected.

At the server side the userAuthentication function receives the object through an objcetInputStream object and extract the record values. The values are checked for authenticity. If username, password and user type are valid the function send back to the client a successful login flag. If any of the values fails the user is alerted and if this persist for next five more times the socket is closed.

Suggestion Box:

Description

The suggestion component is also a client/server tier, which enables users to drop comments and suggestions on any topic to the server. It should be accessible publicly without any authentication.

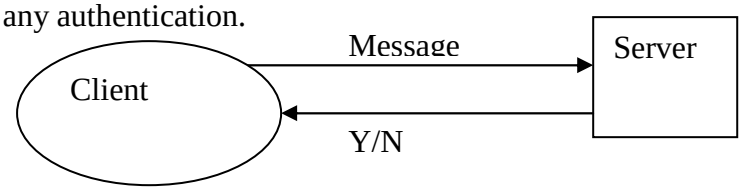


Figure 1: Suggestion Box

The client side provides a user interface for users to enter their suggestion and the drop them. Dropping the message takes them to the server where they are saved in a

suggestion text file. Suggestions are logged on monthly bases. This therefore means that suggestion reports are also generated on monthly bases.

Suggestions are anonymous. This gives some confidence to the user by removing the effect of fear of victimization. This is coupled by the fact that the suggestion can be dropped from user's desktop with any moving effort.

Also by the fact that suggestion reports are automatically generated removes the sorting and compiling administrative overheads. This makes it possible for management to attend to the content of suggestions, which in turn encourages people to continue giving suggestions.

Query Utility:

Description

The query component is also a client/server tier, which enables users to post queries on any topic to a server. One must be authenticated to post or view query results.

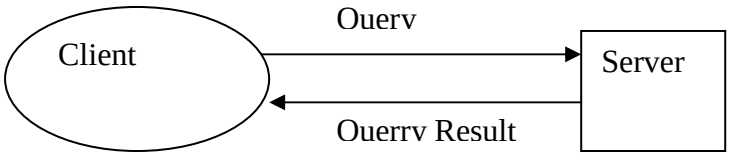


Figure 2: Query utility

The client side provides a user interface for users to post their queries. The queries are taken to the server where they are saved in a queries text file. The interface also provide a means for the user to view all the queries posted by who and when and their solutions.

Chat utility:

Description

The chat utility allows users to dialog within the enterprise. The chatting component is also a client/server configuration where the two chatting peers communicate through a server.

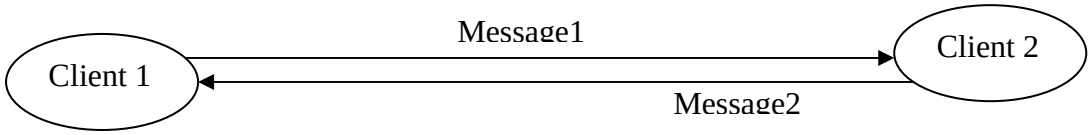


Figure 3: chat utility

The client component provides an interface to register, connect to the person intending to chat to and to send and receive messages. The user must first request the

chatting list from the server. Any user intending to chat must first register. The chat does not allow a person to register more than once.

If the person is not in the chatting list the user can send a probing request to the server, which alerts the required user to register for chatting. This is only possible if the requested user is online (has login in successfully at least).

Once a connection is successful any user can initiate chatting by sending a message. The server does not get involved while chatting progresses.

Meeting Organizer

Description

The organizer component is also a client/server configuration, which is used by the meeting coordinator to setup the details required for a meeting. These include meeting category, participants of the meeting and the agenda. It should then broadcast the details to all the participants.

Operation:

The coordinator uses the client interface to request from the server the users, who can log into the system and the meeting categories that can be allowed into a meeting. He/she uses these lists to choose the meeting participants and select the meeting category.

Once selected he/she sends the participants list back to the server. This is to enable the server to filter out deliberations from other intruders.

The meeting details are then broadcasted to all the participants.

The coordinator can set-up these details from any client machine so long as she has the administrators right.

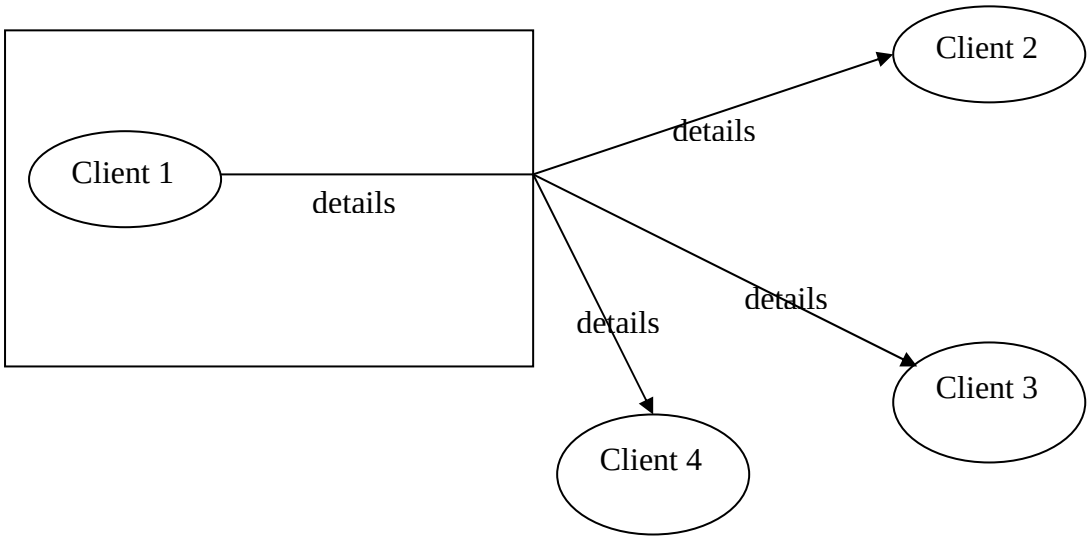


Figure 4: Broadcasting meeting details.

Net Meeting.

Description

Enable participants to send their contributions to others and view other's contributions. This is the core of DGMS. It is also a client/server configuration where like the chatting component except that the server in this case is involved. Messages fist go to the server from wher they are broadcasted.

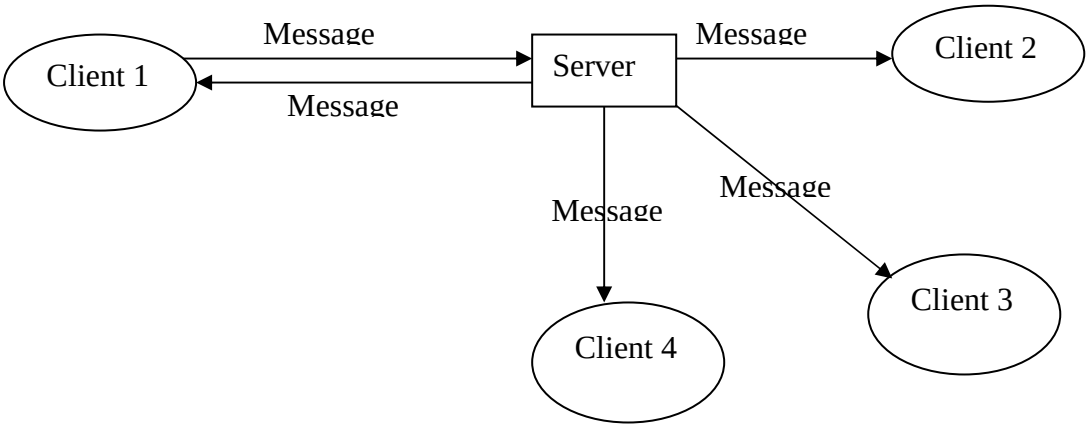


Figure 5: Meeting-message broadcasting.

Operation:

For a meeting to take place the participants must first setup the meeting details using the broadcasted information. This is accomplished through the meeting user interface features.

A participant sends his/her contribution and the server broadcast them to rest. The server also appends the massages to a temporary file to be used later to generate meeting reports.

The server also generates a list of absentee participants to be used to generate absentee report for use by managers.

Minute generator

One of the exciting ability of the DGMS is the ability to generate minutes and the report as web pages automatically. The report that are can be generated include:

i. User accounts and the access rights
ii. Monthly Successful login
iii. Monthly failed login
iv. Suggestions report
v. Chatting Report
vi. Minutes Report

vii. Meeting Statistics

Description

The report generator component is a client/server configuration. It can only be activated by a user with administrative rights.

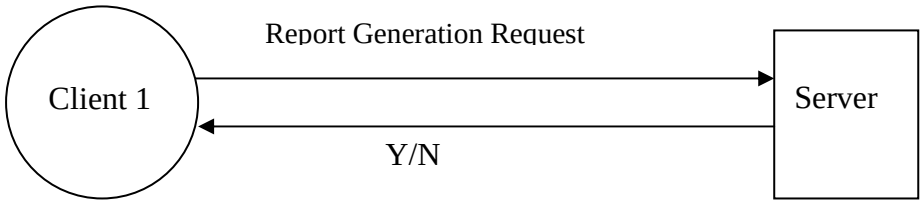


Figure 6: Report generation request

Operation:

The coordinator uses the admin options user interface to sends report generation request from the server. Once the server receives the request it finds the required report data according to the list above and then generate a report in html format. The server then sends a successful flag to the client.

Report Publisher.

Description

The report-publishing component is a client/server configuration. It can only be activated by a user with administrative rights.

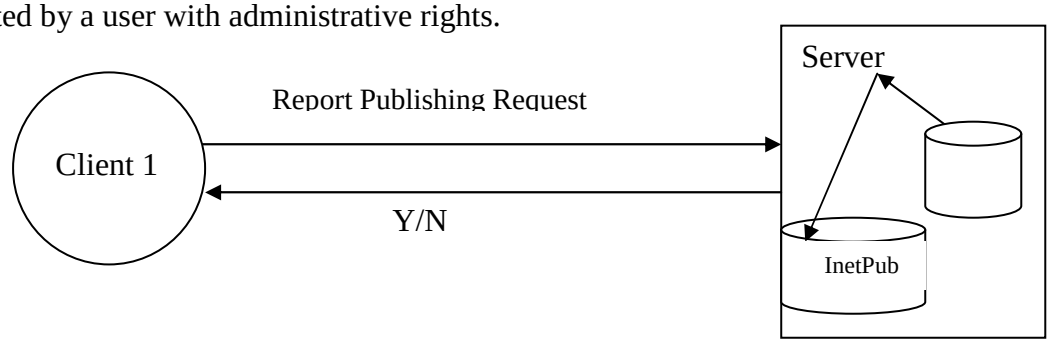


Figure 7: Report publishing request

Operation:

The coordinator uses the admin options user interface to sends a report-publishing request to the server. Once the server receives the request it finds the required report web page and creates a copy of it in the Inetpub folder for publishing thus becoming a web document.

User Activity tracker (UAT):

Description

DGMS is designed to have a feature that tracks everything a user does within the system. This does no include the suggestions activity requires complete anonymity.

Whenever a client successfully logs into the system, or activities he engages in are captured and stored into a temporary file. When he/she logs out the file content is emptied and the content sent to the server for storage. The server sends back to the client a confirmation alert to client. The stored data will then be used later to generate activities report.

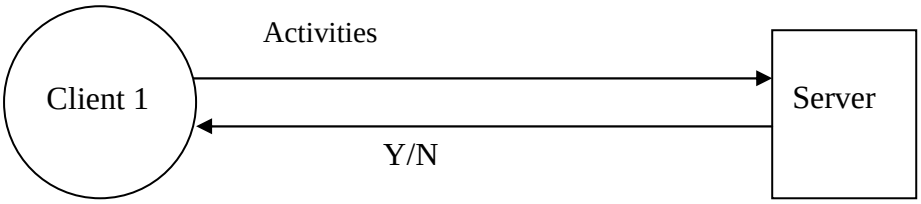


Figure 8: User Activity tracker

This information is for auditing purposes. It can be used to:

- Identify the most used feature of the system. For example if chatting is used a lot and expected target cannot be achieved then the UAT can provide information to address the problem.

Additional Future Improvements

In addition the following components can be considered for future improvements.

Voting component:

Description

Where voters can select their candidates of choice. The system should at the end of the voting event declare the winner. The voting component can be designed to meet the needs of different groups of people. Examples include: Student leaders election, Lecturers Union election etc.

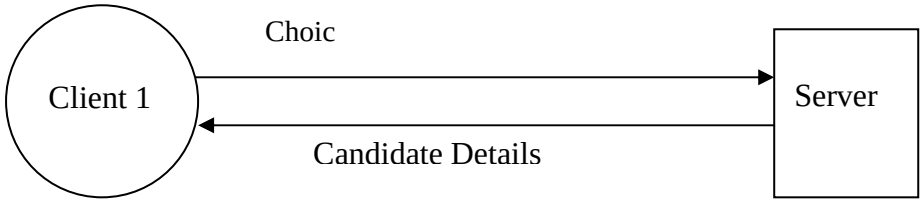


Figure 9: Voting component

The client interface should provide a way for the user to see the photos of each candidate and their profile on request. The make a choice and send it to the server for processing. The server should ensure that only bonfide members participate in voting and that a member can only vote once.

Once the voting period is over it should automatically declare the winner to the users with the accompanying details.

Pigeonholes

The pigeonhole component can be customized for diverse uses, such as:

i. A storage location for lecture slide and other materials based on topics or Lecture sessions.

ii. A storage location for memos for a group of people or an individual (This is physical implementation of the physical model).

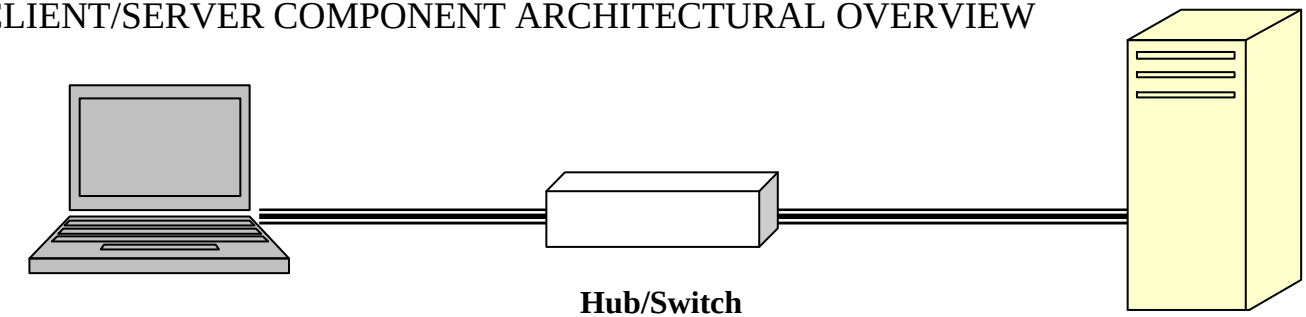
iii. A medium of document transfer between people within an organization.

iv. A storage location for examination results for students.

DGMS Design

1. Module Design Structure Chat
2. Process Design DFDs
3. User Interface Design

DGMS: CLIENT/SERVER COMPONENT ARCHITECTURAL OVERVIEW



CLIENT: ROLE

- **Provides login interface.**
- **Provides User interface for**
  - Dropping suggestions
  - Meeting
  - Chatting
  - Creating users
  - Setting Group categories
  - Displays SENT chats and meeting messages.
  - Generating Minutes and other report
  - Publishing the minutes to a web server

SERVER :ROLE

- Authenticates Users
- Coordinate chatting
- Creates logs
- Creates reports and post them to a web site
- Receive meeting messages and broadcasts to others.
- Receives suggestions and saves them.

Figure 10: CLIENT/SERVER ARCHITECTURE

DGMS: Design

The DGMS design is divided into two main parts. The server side design and the client side components design.
For each side there are two approaches to the process design

- ✓ Use of Structure chat
- ✓ Use of DFDs

Server Side: Components Design

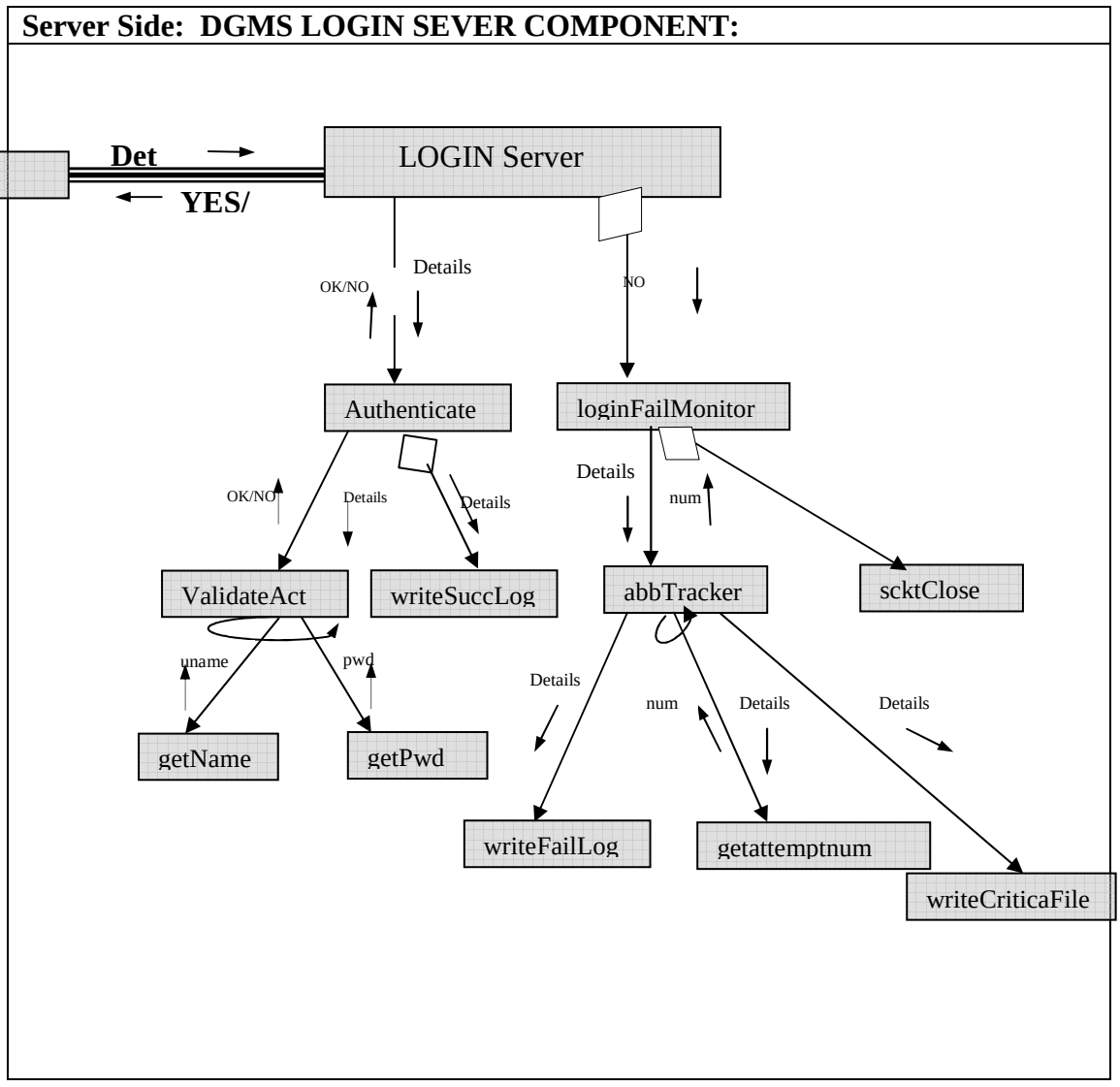


Figure 11: Login server/side Component

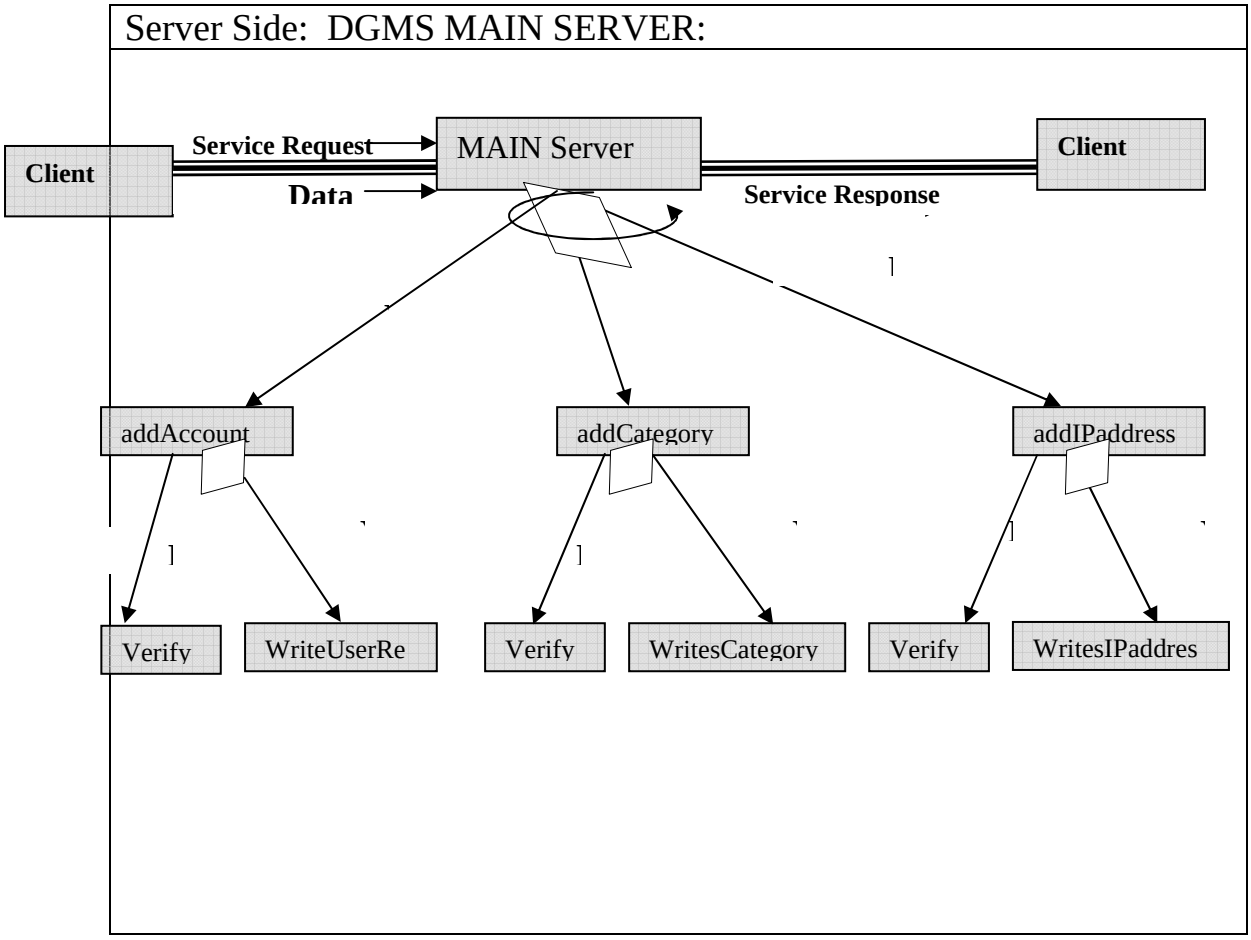
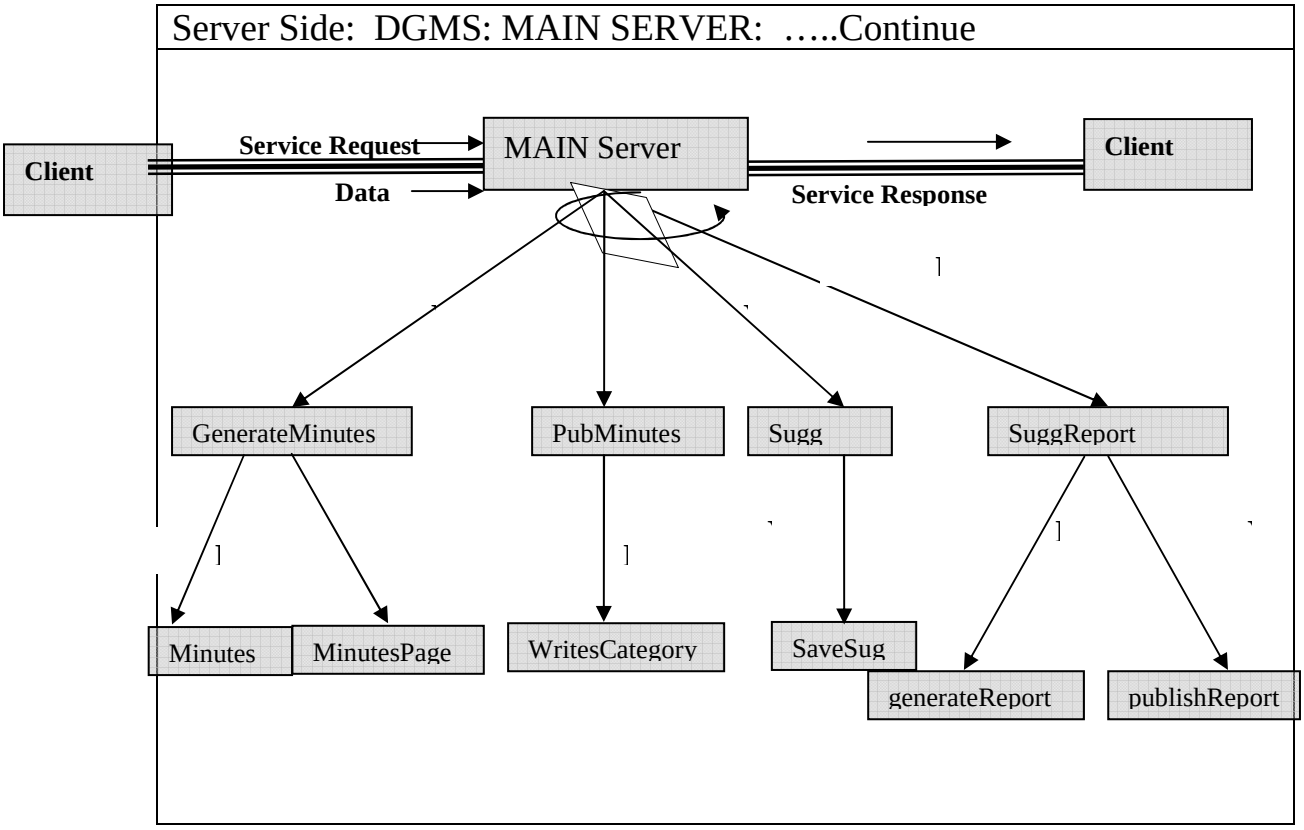
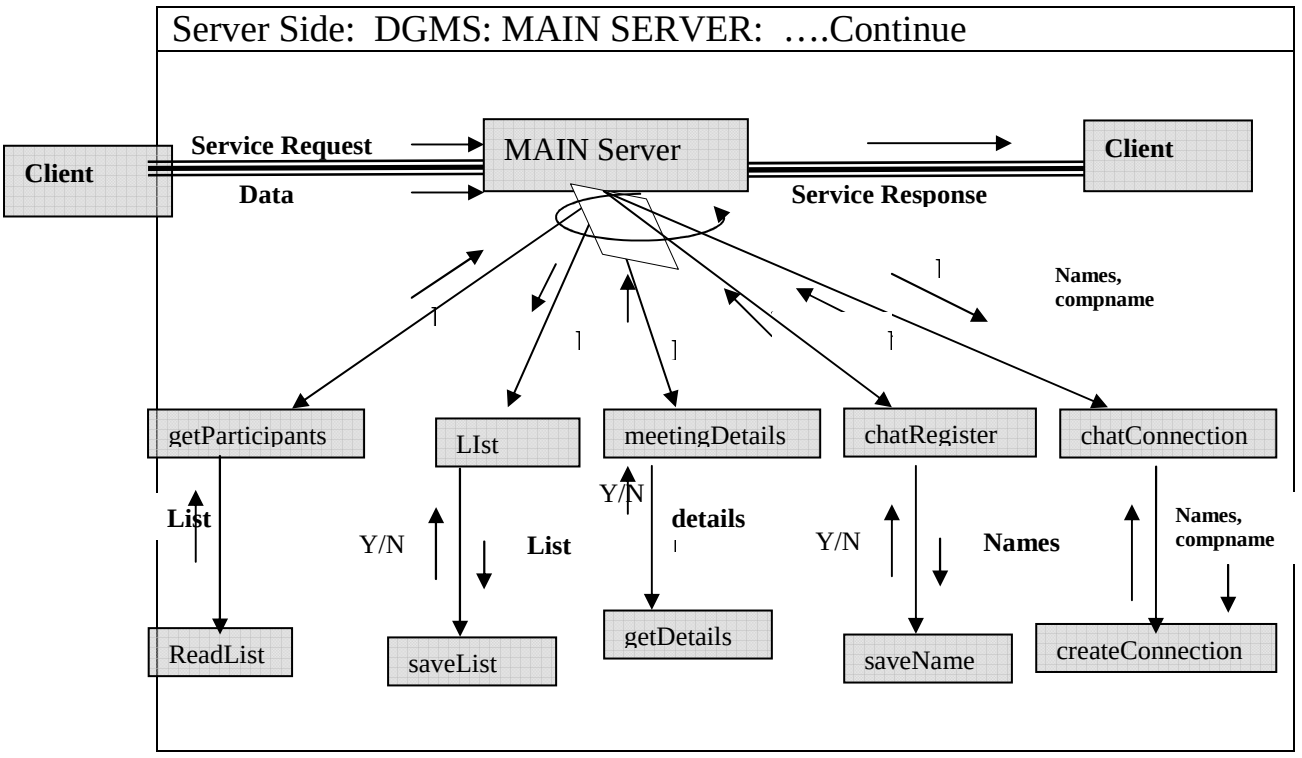


Figure 12: Main server


Server Side: DGMS: MAIN SERVER: …..Continue
Client
Service Request
Data
MAIN Server
Client
Service Response
GenerateMinutes
PubMinutes
Sugg
SuggReport
Minutes
MinutesPage
WritesCategory
SaveSug
generateReport
publishReport


Server Side: DGMS: MAIN SERVER: ….Continue
Client
Service Request
Data
MAIN Server
Client
Service Response
Names,
compname
getParticipants
LIst
meetingDetails
chatRegister
chatConnection
List
Y/N
List
Y/N
details
Y/N
Names
Names,
compname
ReadList
saveList
getDetails
saveName
createConnection

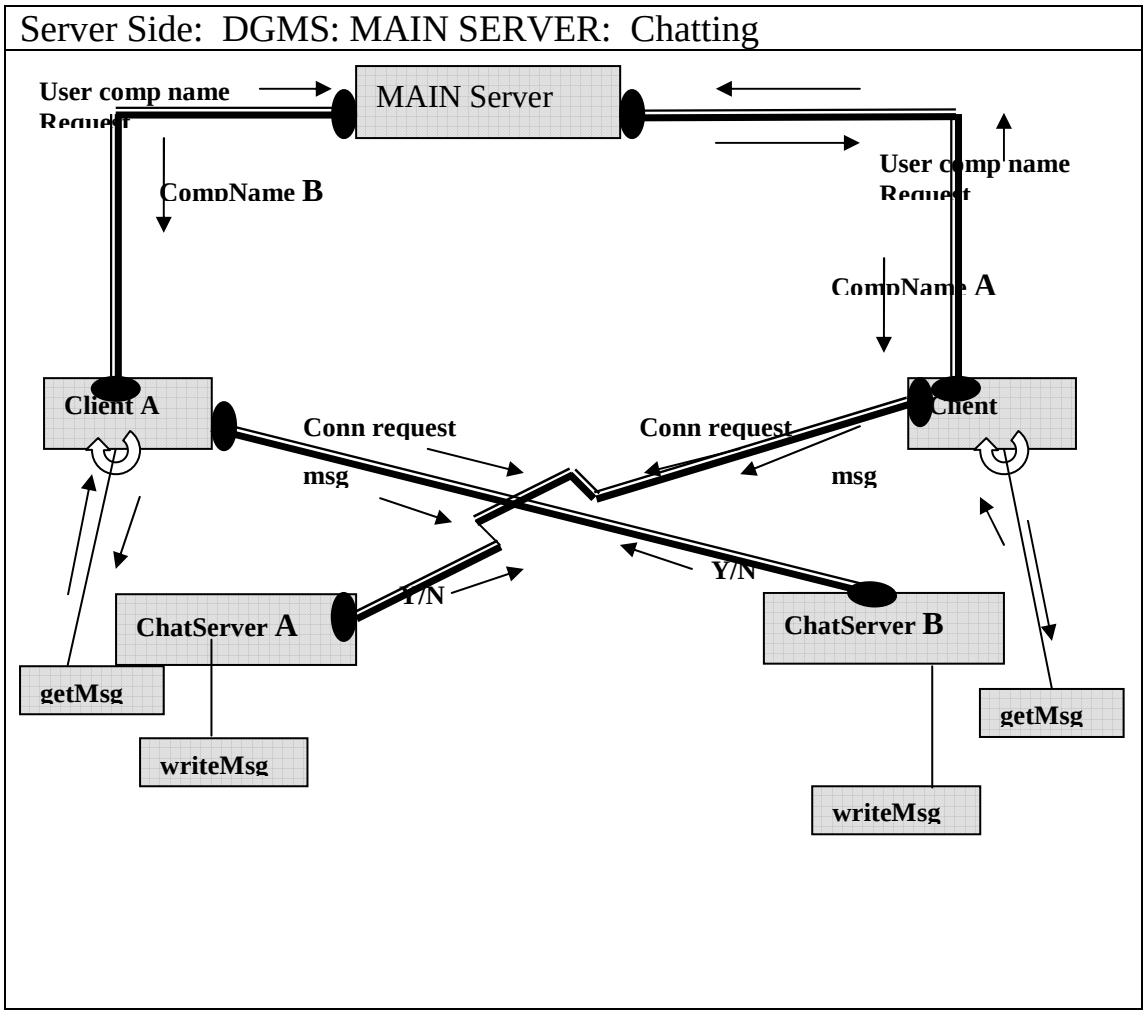


Figure 13 : Chat utility design

Server Side: DGMS: Meeting Component:

A. MessageReciever Server (A datagram process):

It receives the message from the client. Then:

1. It removes the meeting category from the datagram for creating message directory.
2. It also accesses the name to verify whether he is among the participants
3. It calls the write message function to save it in a temporary buffer waiting to be read by the multicast process.

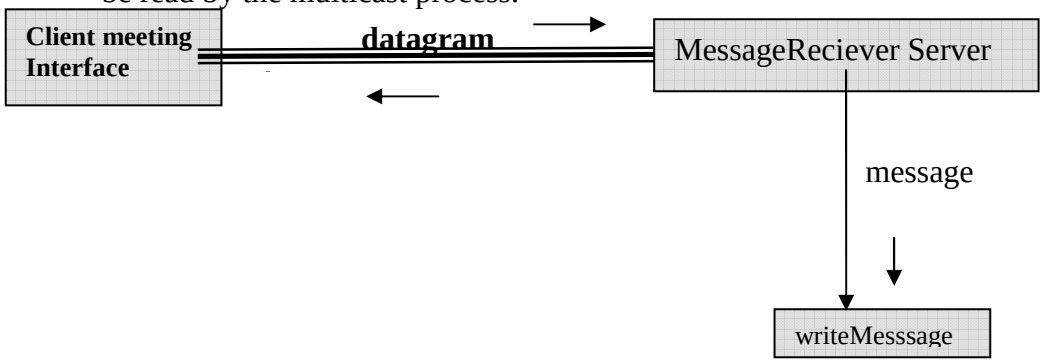


Figure 14: online Meeting structure chart design

C. Datagram Message Format

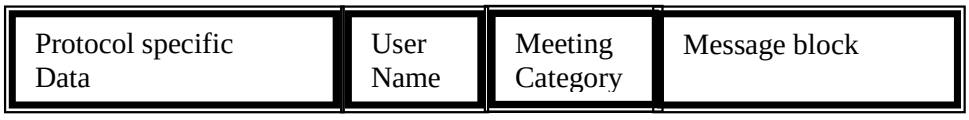


Figure 15: online Meeting message structure

A. MessageMulticastor Server (A multicast process):

It receives the datagramMessage from the buffer by calling the getMessage function to and then multicasts it to the participating clients

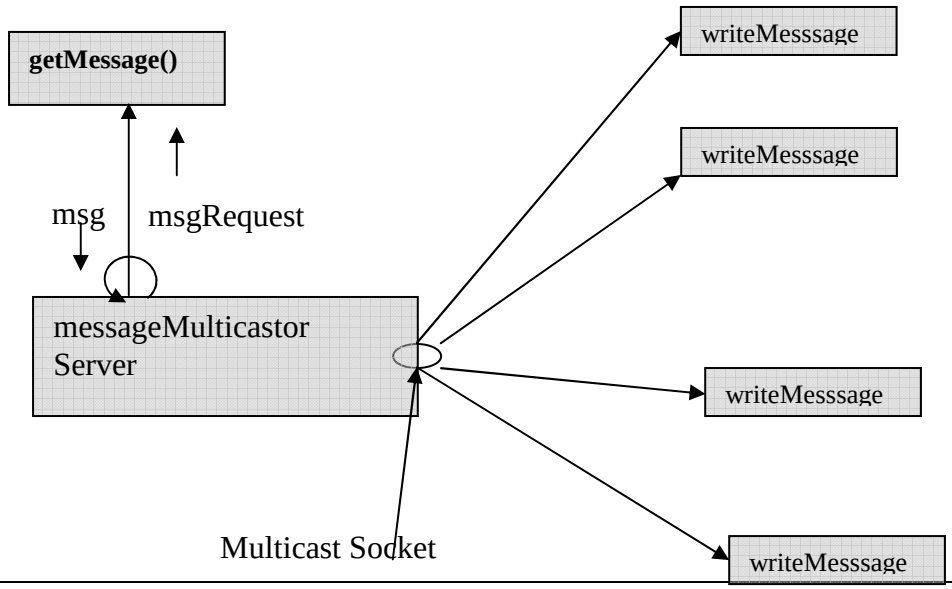


Figure 16 : online meetingMessage multicast or structure chat

Client Side Design

A. Meeting Client: getMeetingDetails (A datagram process)

It receives the message from the multicastor and then writes it in a temporary location to be read by the user interface getMessage process, which displays to the user via the interface.

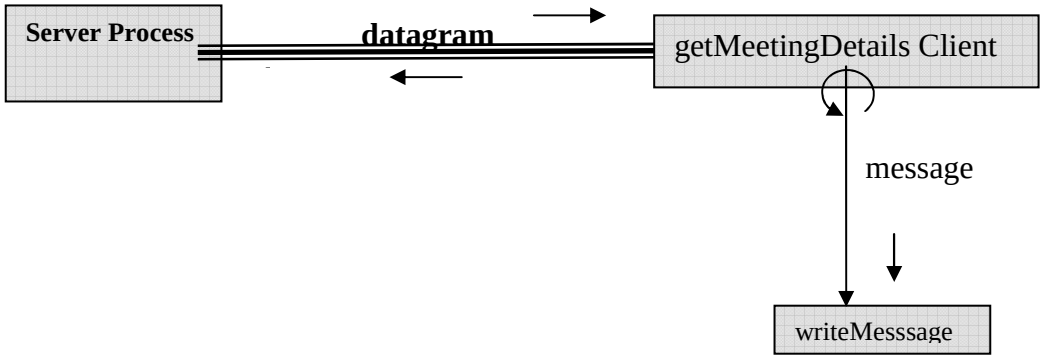


Figure 17: getMeetingDetails

B. displayMessage Client: Structure Chart

It reads the message from the temporary location and then:

1. Separate the name and the message
2. Displays to the name first and then the message to the user via the interface.

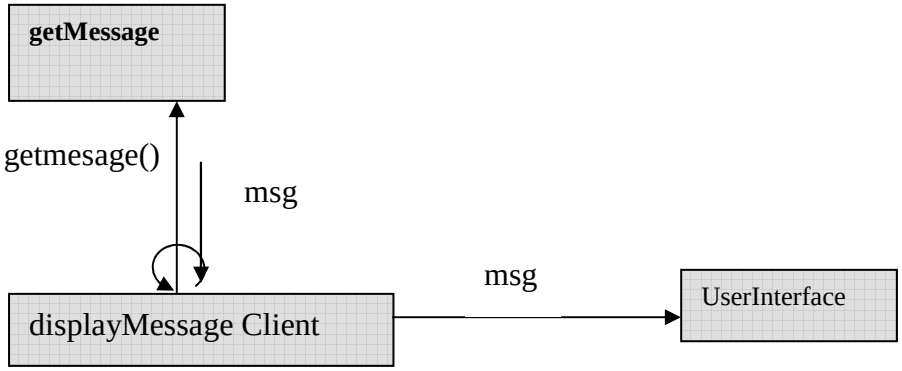


Figure 18; displayMessage module

C. Stored Message Format

The message is tripped all other accompanying information except the user name

Figure 19: Display message structure

DGMS PROCESS DESIGN

Process Design: DFDs

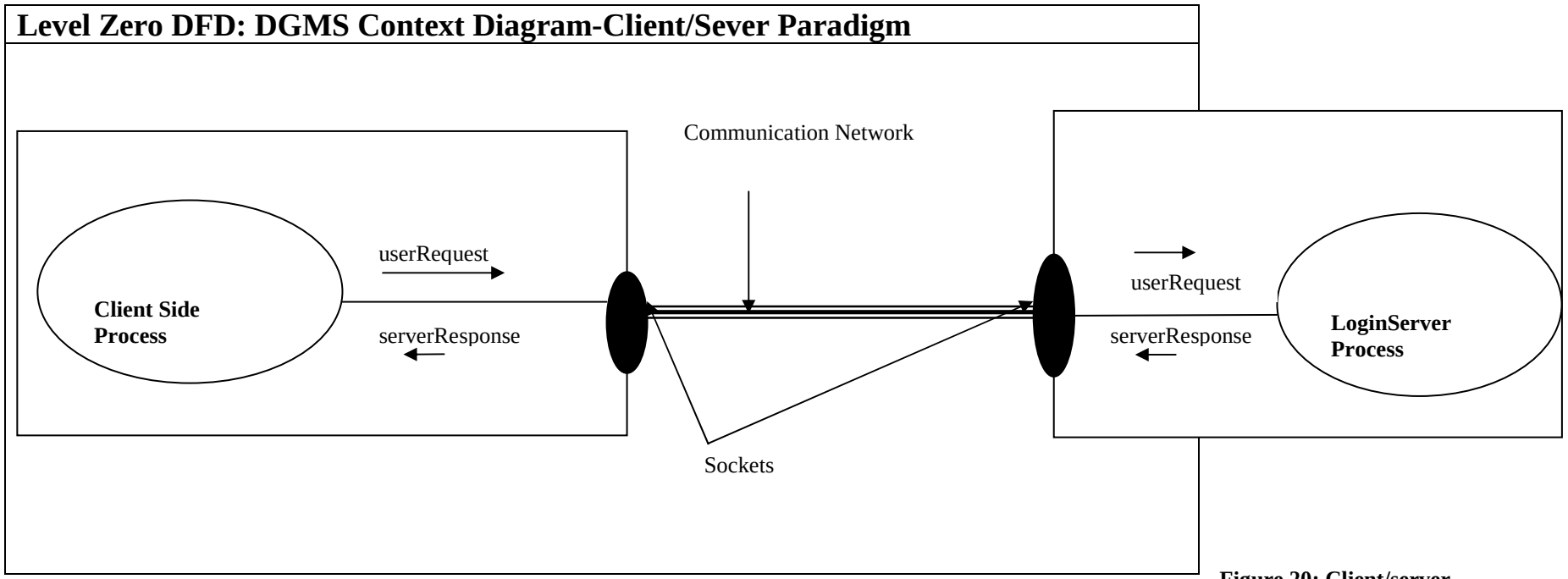


Figure 20: Client/server architecture : Level 0 DFD

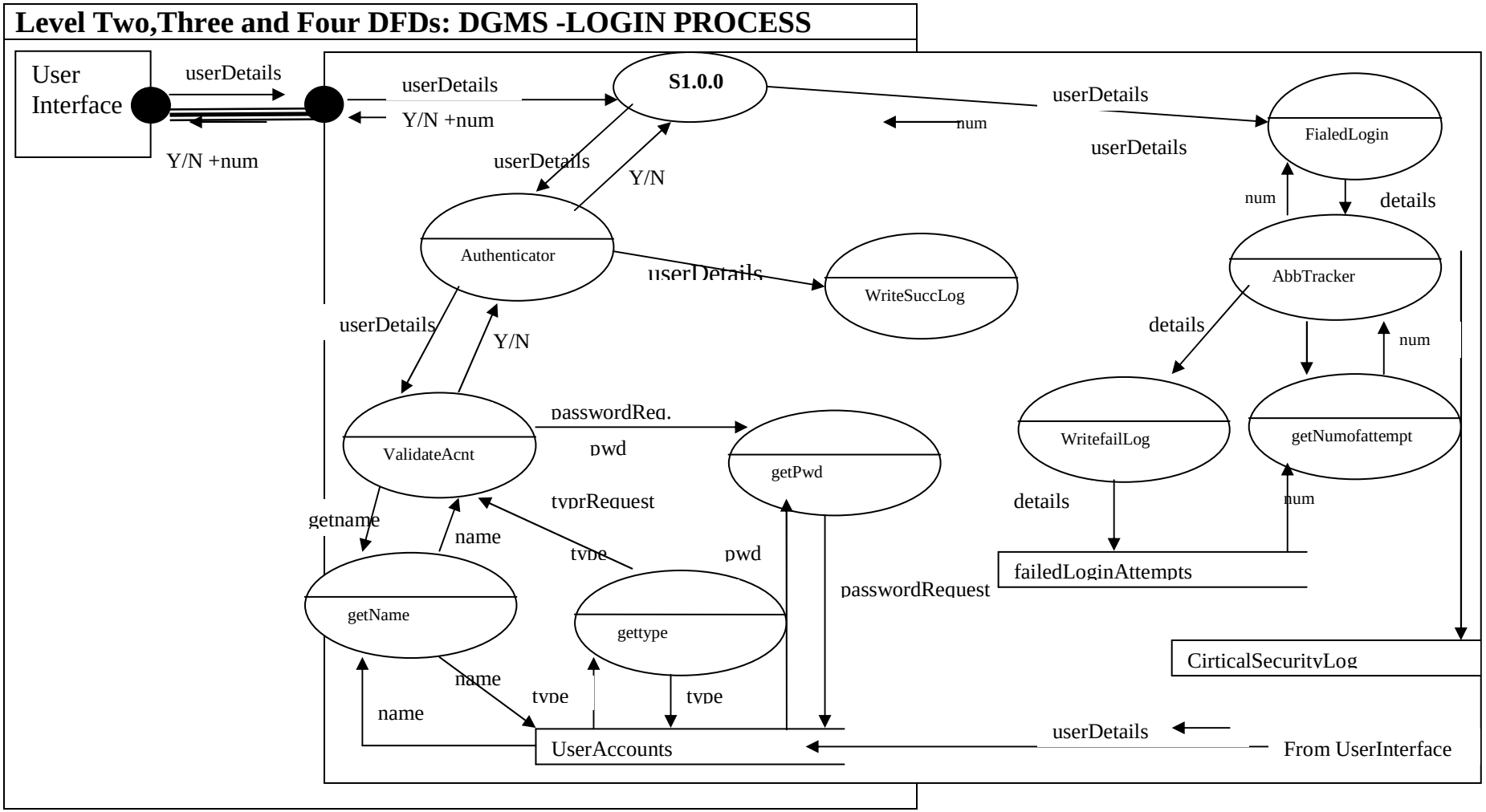


Figure 21:Login Process Level 1-3 DFDs

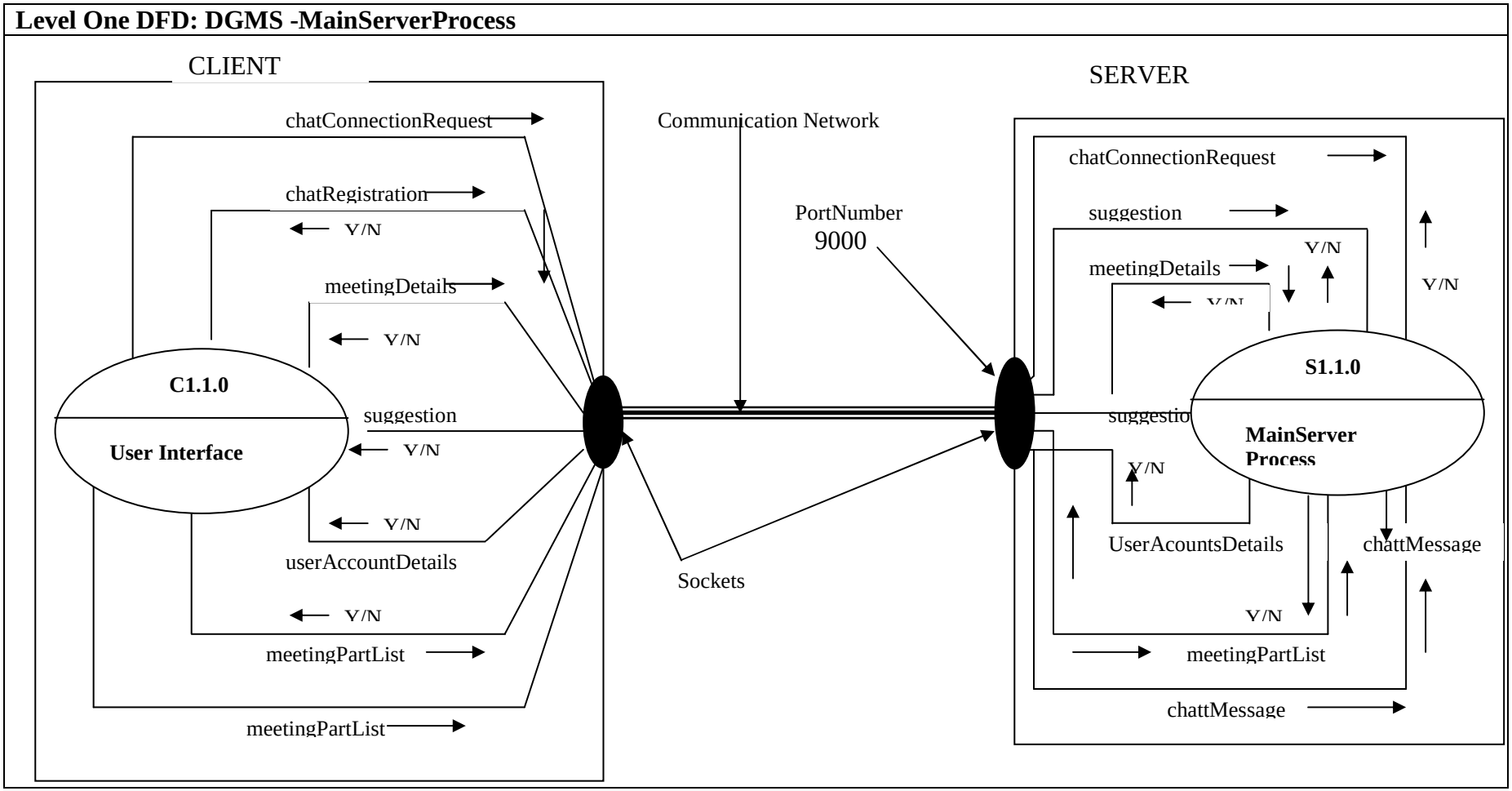
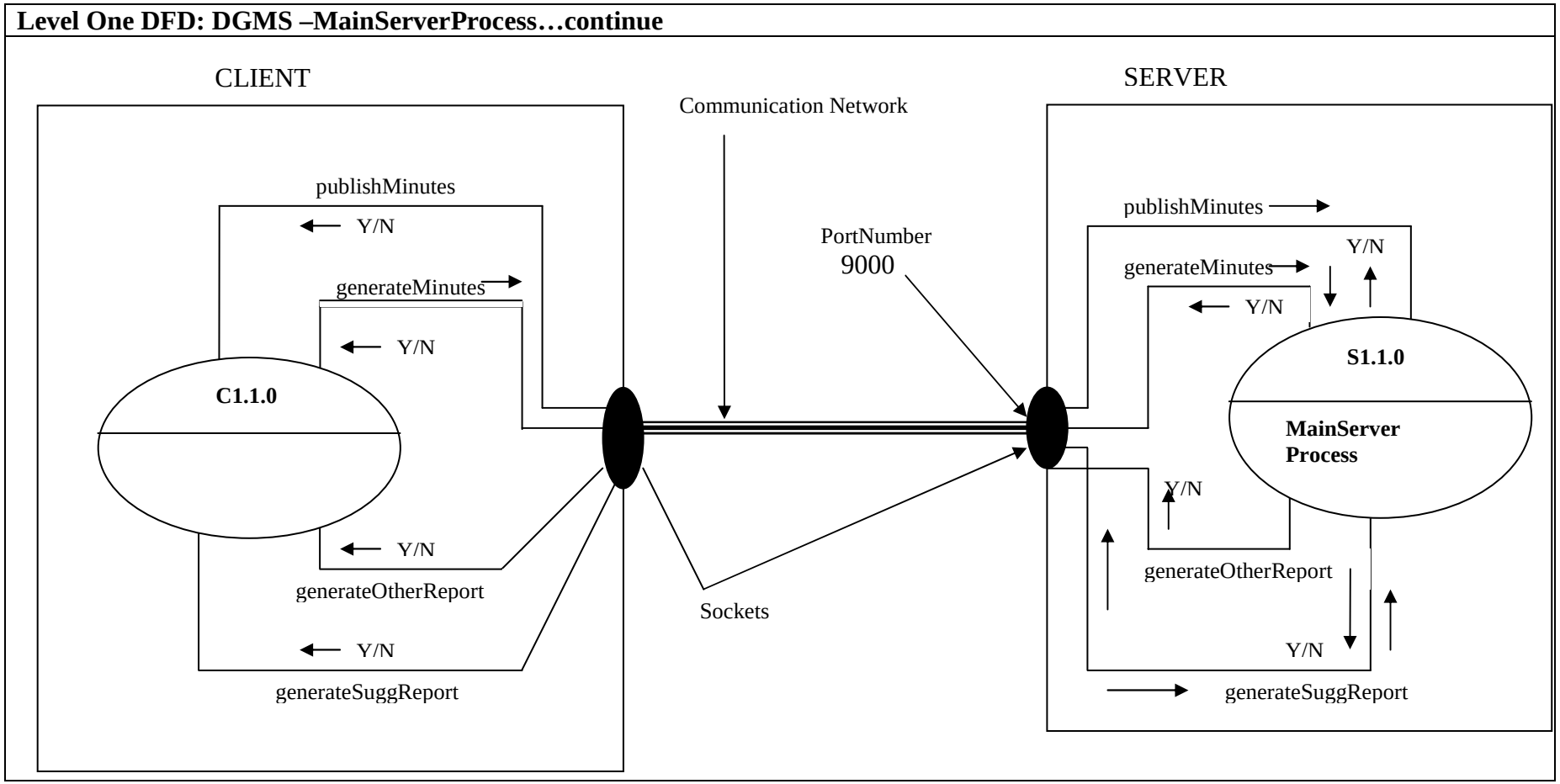


Figure 22 DGMS: MainServer Component - Level One DFD:

Level One DFD: DGMS –MainServerProcess…continue



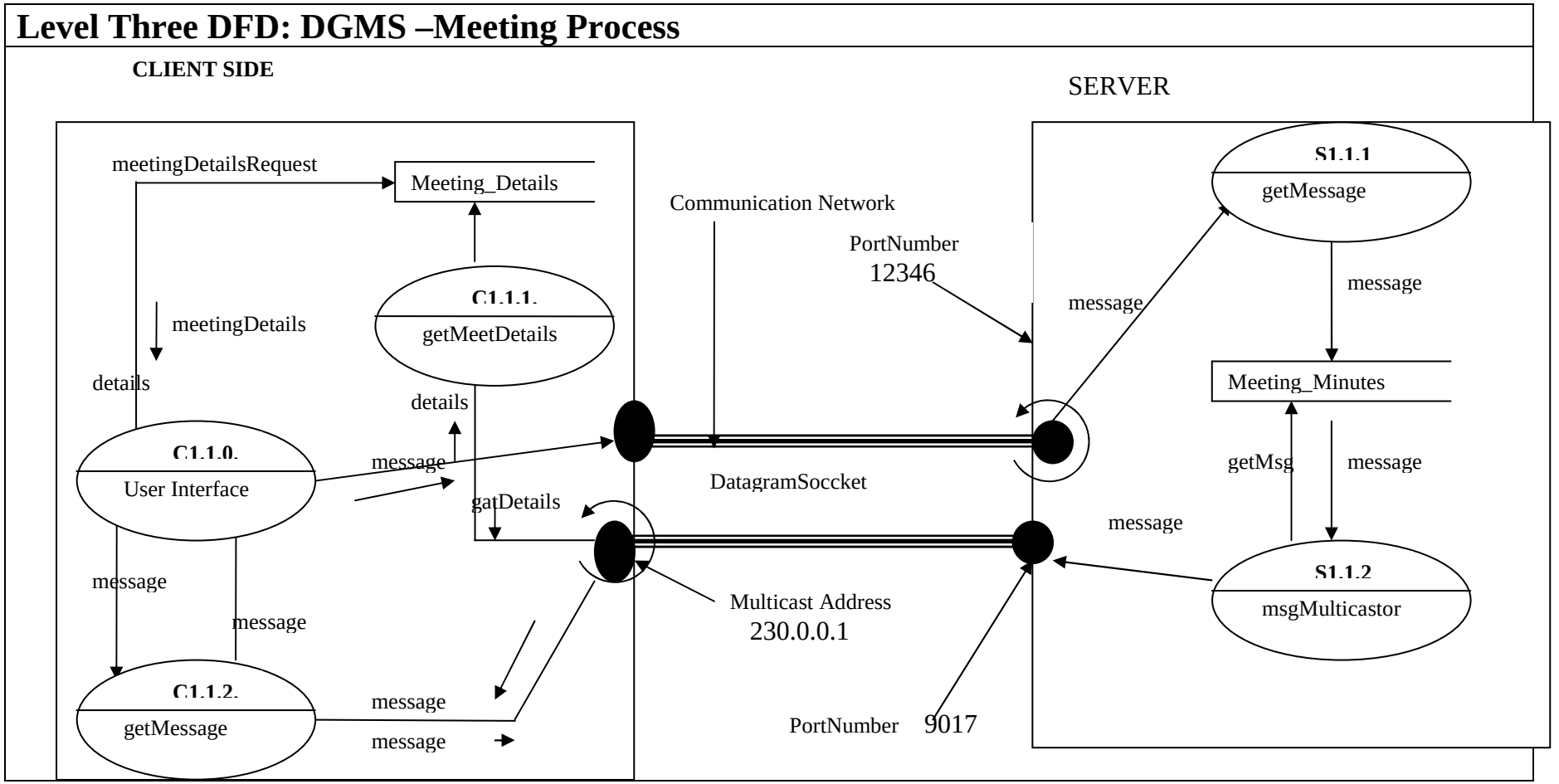


Figure 23 meeting Component Level 3 DFD

DGMS: Meeting Component

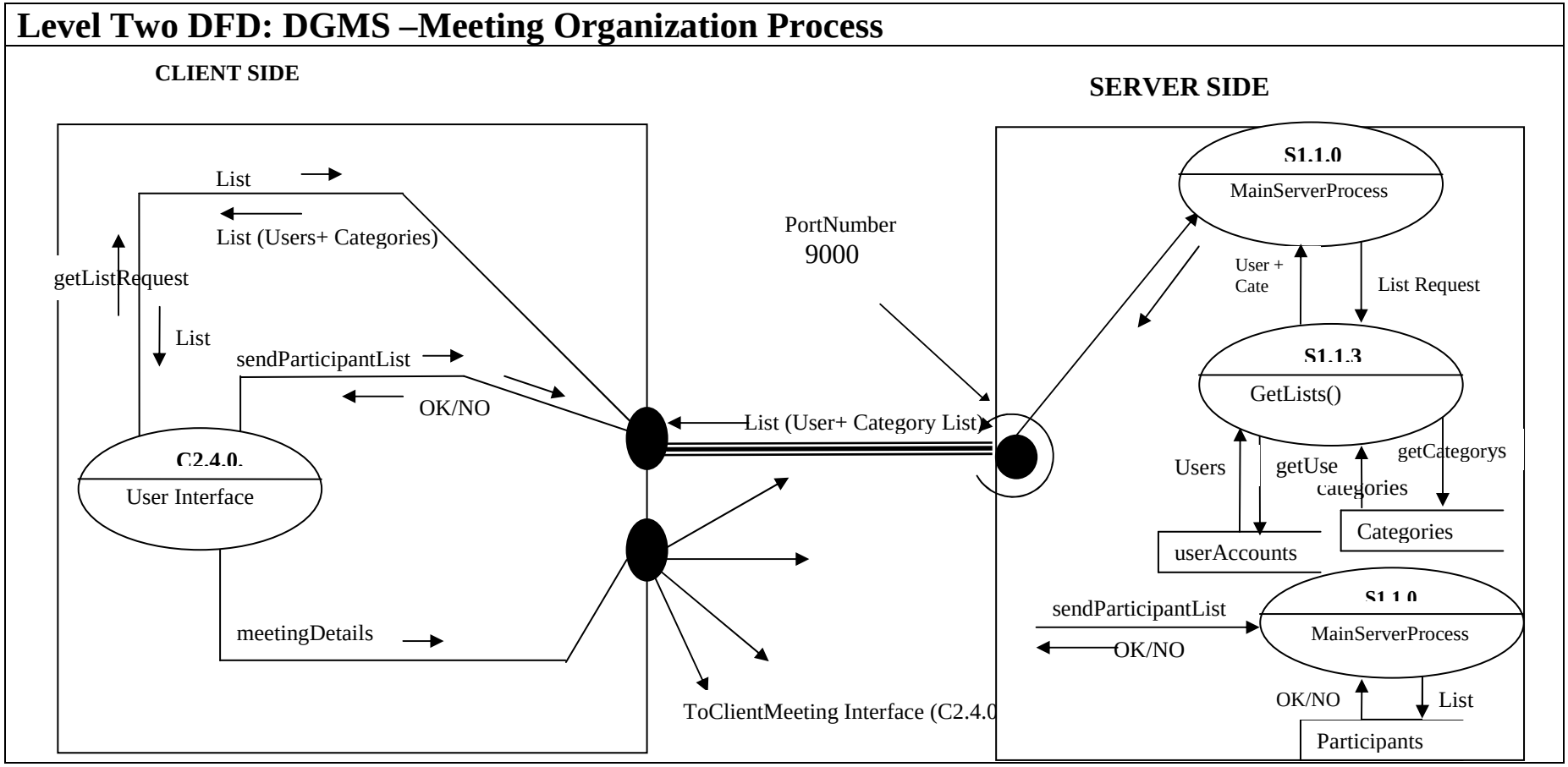


Figure 24: Meeting Organization- Level 2 DFD

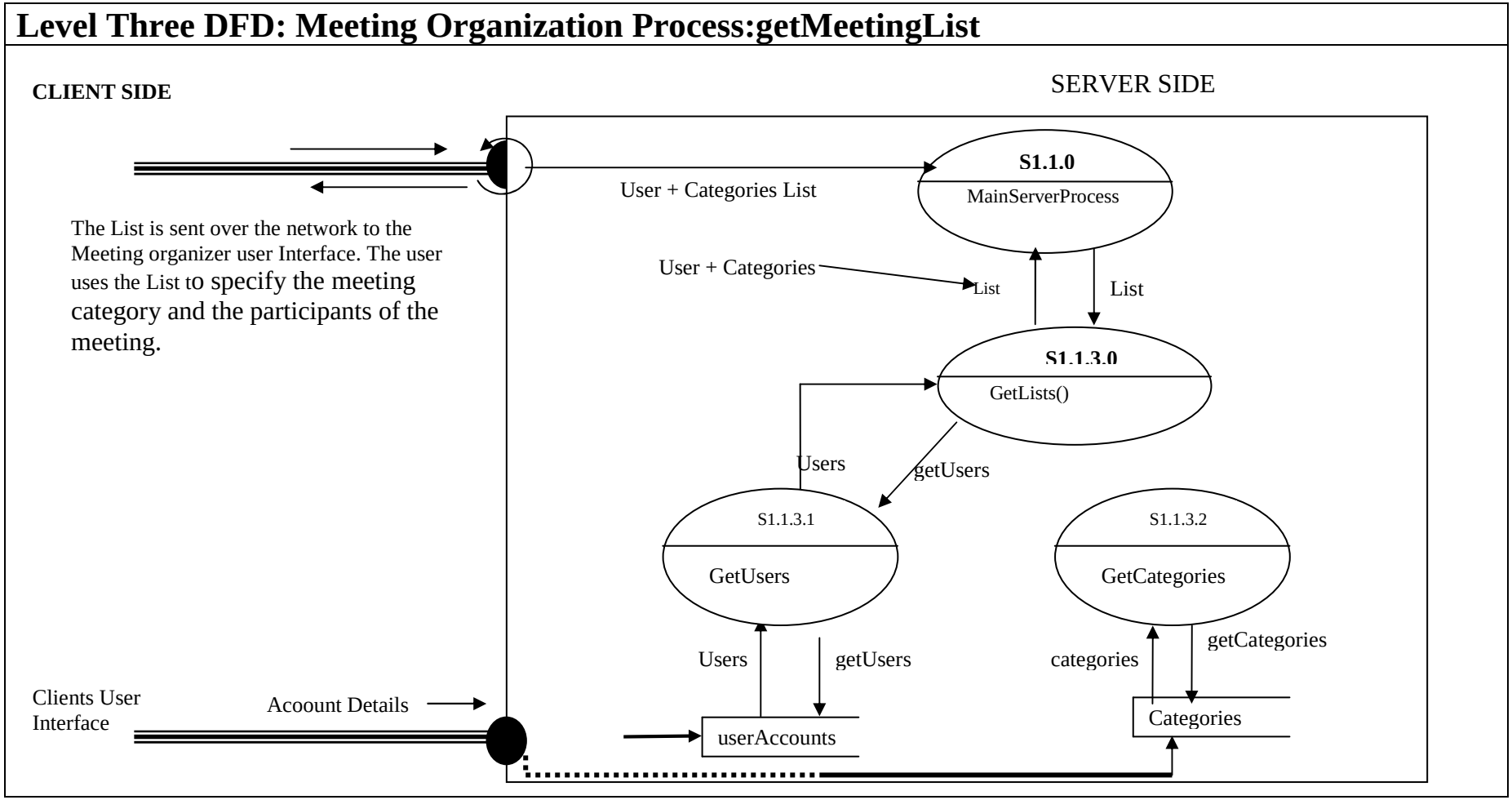


Figure 25: meeting Organisation-Level 3 DFS

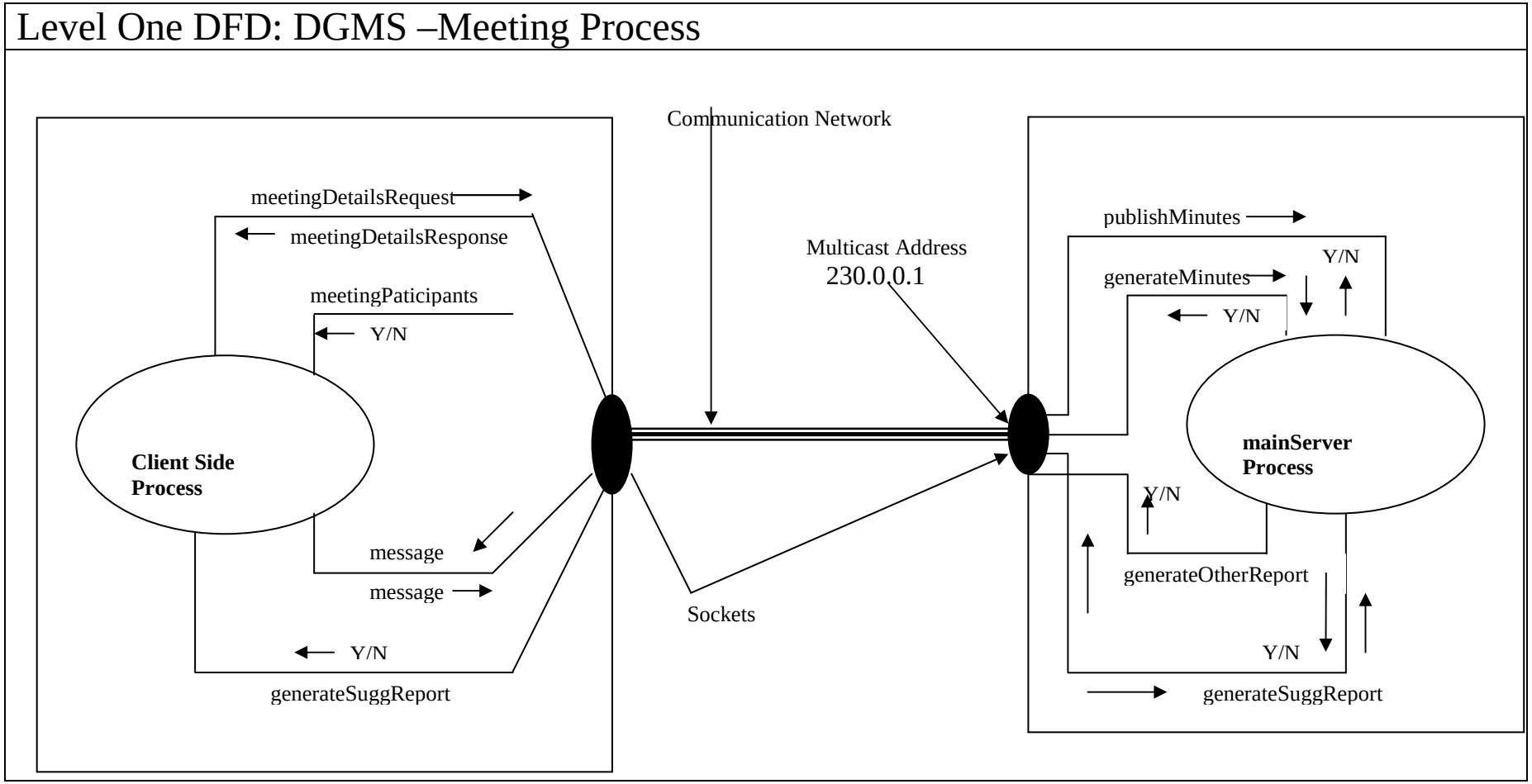


Figure 26: Meeting Process Level 1 DFD

User Interface Design

Reliability, security and other attributes are everyone's desired qualities of a program. However whether a system will be rejected or accepted by users depends larghely on the UI. A good user Interface should have the following feature among others:

- ✓ Easy to use
- ✓ Help the user to recover from errors
- ✓ Communicate with the user on success or failure of an operation
- ✓ Have uniform design in theme hue and color.

It is with this view in that I have given DGMS user interface Design the attention it deserves. I have put in place dialogues to communicate with users and client side input validation. This avoids unnecessary network traffic to and from the server over the network. It also gives the user instant alert messages in order to make the appropriate decision.

Common Design Features

There are some settings that apply to all the components. These are:

1. Background color of the component- **grey**.
2. Title bar color-**dark blue**
3. Highlighted item- **light blue**
4. Background color of textAreas and textFileds- **white**
5. Font size-**12**
6. Font style-**Times New Roman**
7. Font color-**black**

Main Window.

It provides the main entry point to all users and has the following features.

Feature:

1. Login button: Once clicked it should open a login dialog for users.
2. Exit Button for exiting the system
3. Suggestion Button. To be used by users to drop in suggestion on any topic. The suggestion facility is available to all. One does not need to login to send a suggestion.
4. Resize disabled
5. setTitle("DGMS");
6. setSize(400,300);
7. setLocation(200,150);
8. setVisible(true)

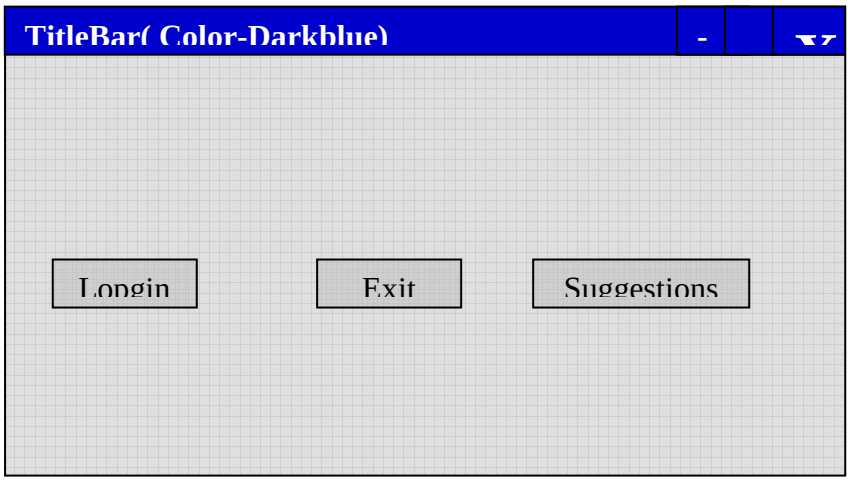


Figure 27: Entry window UI

Suggestion Box.

Enable users to send suggestion to the server. The suggestion should be anonymous.

Feature:

1. Drop button: Once clicked it should establish a connection with the server and then sends the message.
2. Close Button for closing the suggestion window.
3. Text area for typing in text. To be used by users to drop in suggestion on any topic. The text area should be reset to empty once the typed message is sent .The suggestion facility is available without necessarily login in.

Other include:

4. setTitle ("DGMS Suggestion");
5. setBounds(50,50,450,350);
6. setResizable(false);
7. reshape(50,50,450,350);
8. setLocation(50,50);

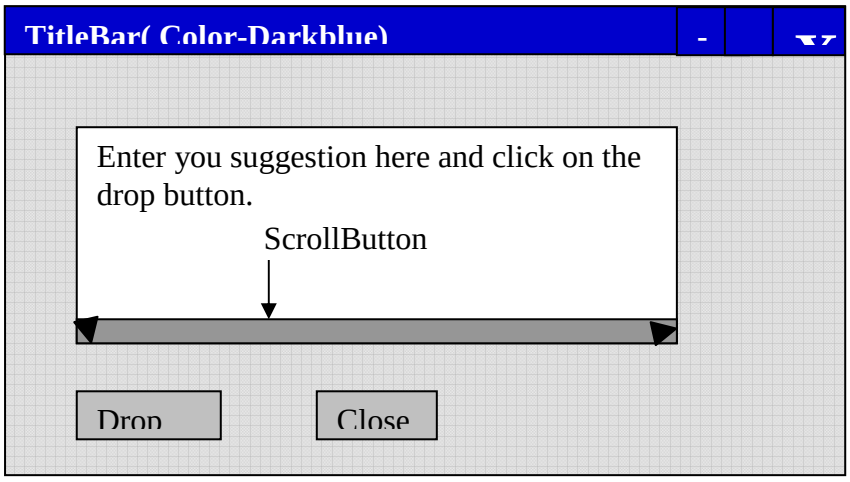


Figure 28: Suggestion box UI

Login Window.

Enables users to log into the system and therefore gain access to the entire services offered by the system.

Feature:

1. OK button: Once clicked it should establish a connection with the server and then sends the user details.
2. Cancel Button for closing the window.
3. Three Text Fields for entering the required input.
4. A list box with only admin and user options
5. setTitle("Login");
6. setSize(250,200);
7. setLocation(250,200);
8. setVisible(true);
9. setVisible(false);

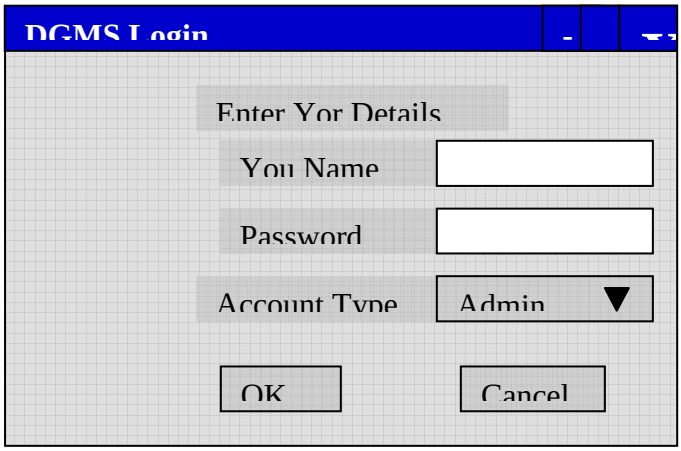


Figure 29 Login Window UI

Login Characteristics

1. All the fields must be filled. If not a dialog box should be displayed alerting the user of omissions.
2. The user name, password and account type must match with what is in the file. Any violation will make a dialog box to be displayed alerting the user.

3. Invalid consecutive logins are allowed for only five times after which the connection is disconnected automatically. This is a security measure to minimize hacking by users.

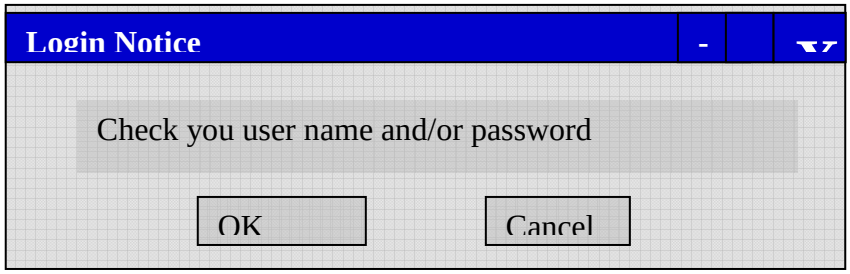


Figure 30 Login dialog window UI

User Options Window.

It provides all the features that a user needs to interact with the system. From the user options an administrator can:

- Setup meeting
- Add a meeting Category
- Add A user account
- Add an IP address
- Chat
- Engage in a meeting
- Generate reports and publish reports to a web server

Feature:

1. The menu bar: Contains the Action, Reports, and Help menus that provide various submenus.
2. Exit Button for closing the window.
3. setTitle("DGMS Admin Options");
4. setSize(400,300);
5. setLocation(200,150);
6. setVisible(false);

User Options Window-Showing the menu bar.

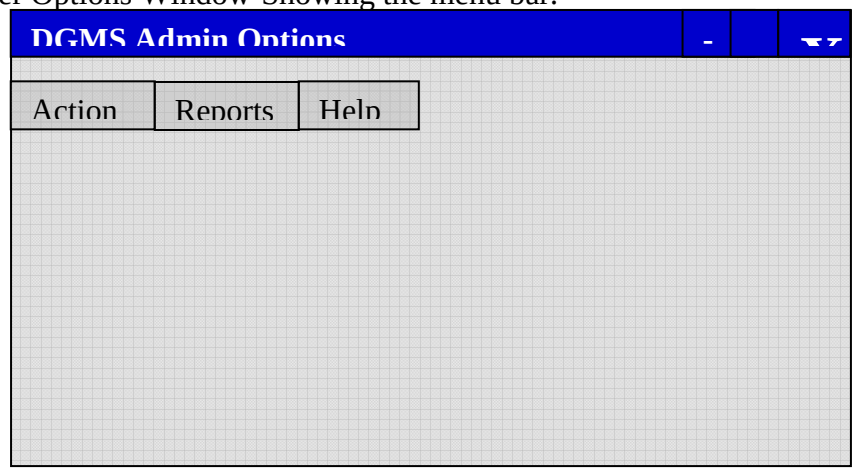
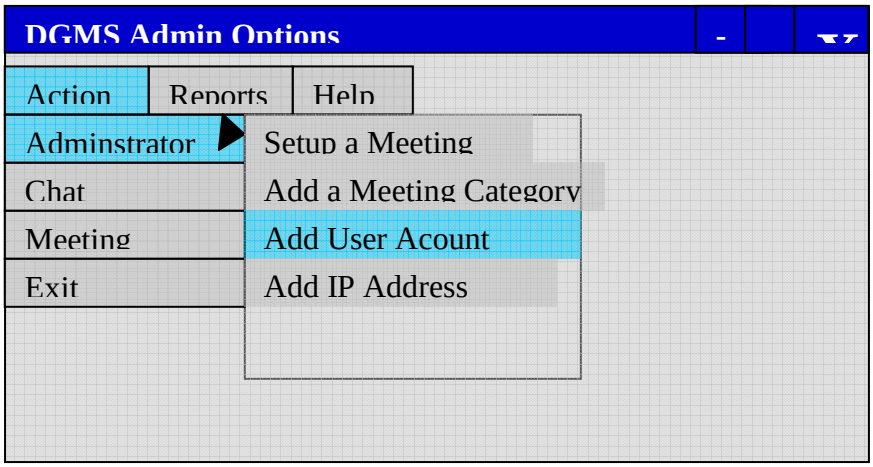
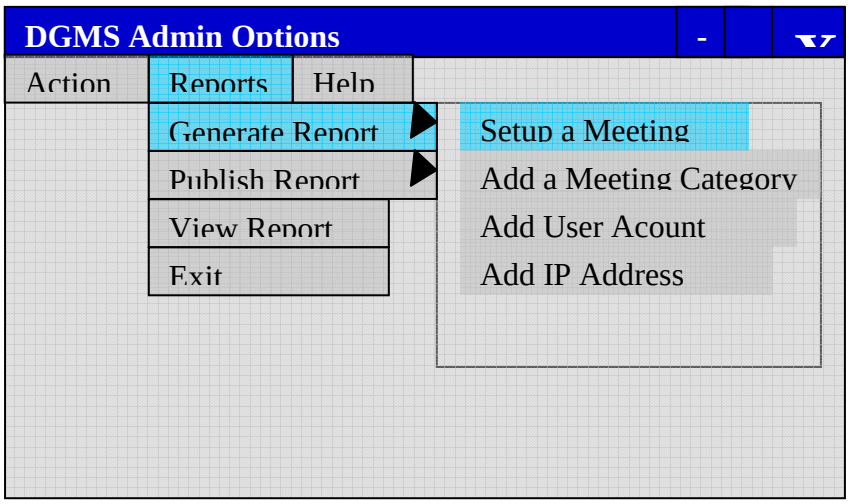


Figure 31: User Options Window UI

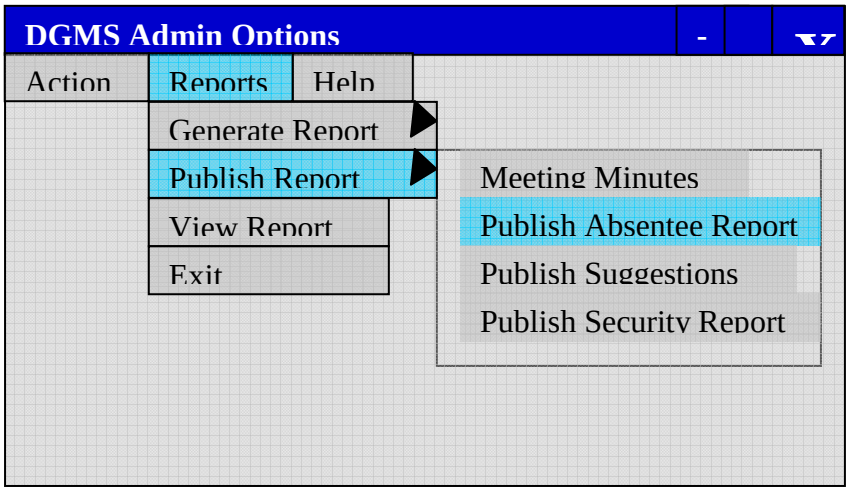
User Options Window-Showing the **Action Menu**. and the Administrators Submenu. The highlight color is for every selected item.



User Options Window-Showing the **Report Menu** and **Generate Report** Submenu.



User Options Window-Showing the Report **Menu,** and **Publish Report** Submenu.



Create User Account Window.

Enables users to add more user accounts.

Feature:

1. OK button: Once clicked it should establish a connection with the server and then sends the user details.
2. Cancel Button for closing the window.
3. Three Text Fields for typing in entering the required input.
4. A list box with only admin and user options
5. Other Properties include:
6. Window size (300 by 300)
7. Screen location (250,200)
8. Window should not be resizable

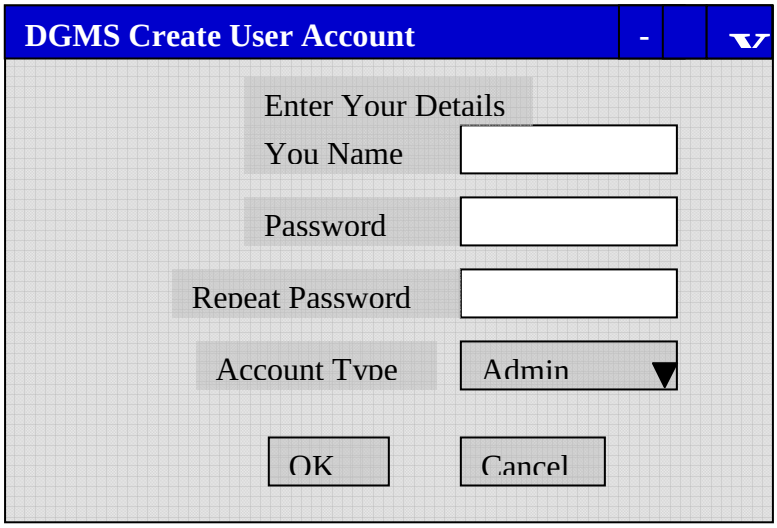


Figure 32: User Account Dialogue

Add New Meeting Category Window.

Enables users to add new meeting category.

Feature:

1. OK button: Once clicked it should establish a connection with the server and then sends the user details.
2. Cancel Button for closing the window.
3. Other Properties include:
4. Window size (250 by 150)
5. Screen location (250,200)
6. Window should not be resizable

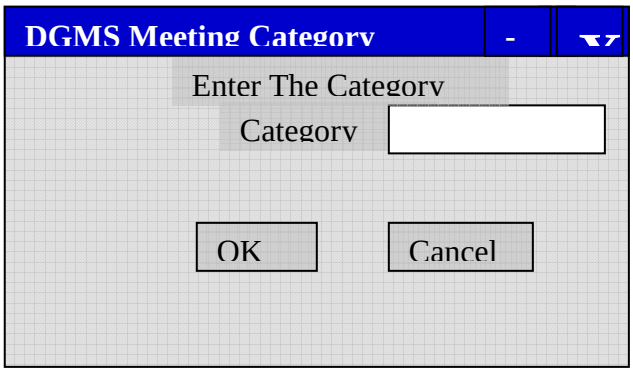


Figure 33: Category dialogue

Chatting System Window

It provides all the necessary features that a user require to be able to chat effectively

Features

The feature include:

1. Send button: Once clicked it should and then sends the user message through the established connection.
2. Close Button for closing the window.
3. A Register button to register for chatting. Only people who have registered can chat.
4. Getting List button to initiate the downloading of the already registered members. The user selects one of the registered members to establish a connection with.
5. Connect Button for initiating a connection to the other chat guy. creating.
6. Save button to enable the user to save the dialogs. In html format only.
7. View All/Resume button. When the label is "View All" the sender can send message and can also see all the past messages he had typed. When the label is "Resume" the sender cannot send any message. Click to change to View All to resume chatting.
8. Two TextAreas each in its own scroll pane for typing in and viewing the chat message from the other partner. .

9. A list box to display the registered members
10. A text field s to show the current chatting partner.

Other Properties include

11. Boundary Settings (50,50,700,500)
12. Screen Location (50,50).
13. setResizable(false);
14. Color settings remain the same for all components in the window.

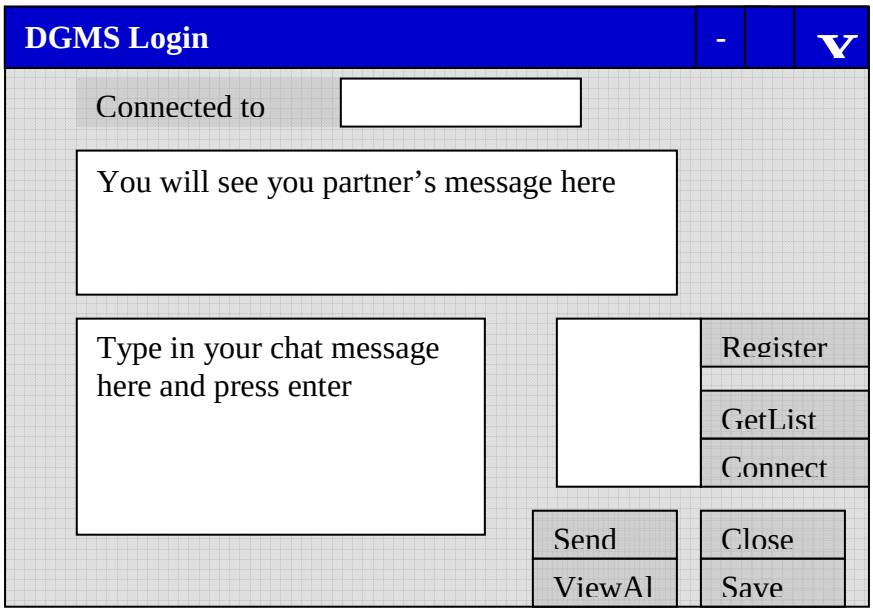


Figure 34: Chatting Systems window UI

Meeting Organizer

It provides all the necessary features that a meeting coordinator requires to setup a meeting. It is designed in view of the needs of a meeting

Features

The feature include:

1. Send button: Once clicked it should and then broadcasts the meeting details to all the participants. They should be online and opened the meeting interface.
2. Close Button for closing the window.

3. A Register button to register for chatting.
4. Get all List button: Downloading the meeting categories, and list of all users in the system. This information enables the coordinator to pick participants and meeting category easily.
5. LoadDefaults Button for getting most common meeting settings.
6. Save button to enable the user to save the dialogs. In html format only.
7. Clear All button. It is used to reset all setting to empty
8. Three List boxes. One to list all the users in the userAccount database, another to list user picked for a meeting and another one to list agendas of the meeting.
9. One Combo box to list all the meeting categories in the categories database
10. Two add Buttons for adding new participants to the participants list and adding an agenda from the agenda textfield.
11. Two del Buttons for removing participants from the participants list and agenda from the agenda textfield.

Other Properties include:

12. Boundary Settings (150,80,600,300)
13. Screen Location (150,80).
14. setResizable(false);
15. Color settings remain the same for all components in the window.

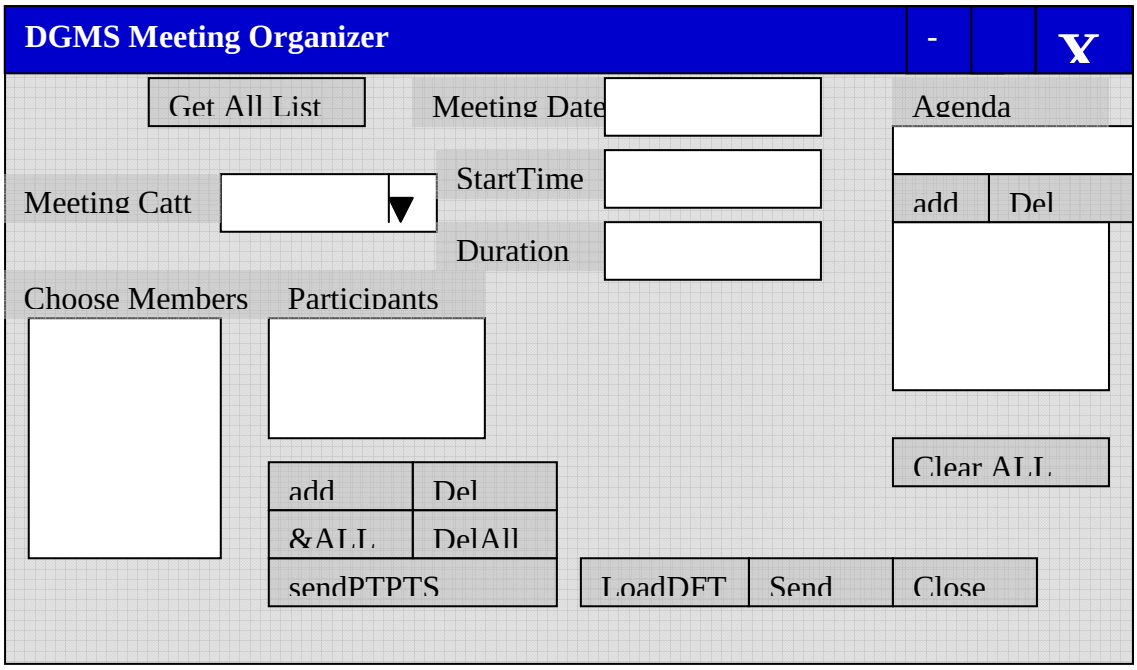


Figure 35: Meeting organiser UI

Meeting System

It provides all the necessary features that a meeting a meeting participants requires to engage in meeting effectively. The meting system is supported by behind the scene processes that capture any incoming messages from other users and displays it in the user interface with out any prompt by the user. The user is therefore able to capture all the deliberations taking place in the meeting on any agenda.

Engaging in a meeting is two way process.

1. Loading the meeting details. Loading the details gives the member crucial info that is required for any meeting. Top on this list is the agenda. Followed by meeting category and participants. This is accomplished by pressing on the **meeting Details** button. It picks the downloaded meeting details process them and the set the two list boxes with the appropriate list values.
2. Sending you contributions after typing.

Features

The feature include:

1. Send button: Once clicked it should the meeting massage to the server where it is then broadcasted to other members. They should be online and opened the meeting interface.
2. Close Button for closing the window.
3. Get all List button to initiate the downloading of the list, which is composed of the meeting categories, and list of all users in the system. This information enables the coordinator to pick participants and meeting category easily.
4. Save button to enable the user to save the meeting deliberation in case the minutes nay delay. In html format only.
5. Two List boxes. One to list all the participants, another to list agendas of the meeting.
6. Boundary Settings (50,50,750,600)
7. Screen Location (50,50).
8. setResizable(false);
9. Color settings remain the same for all components in the window.

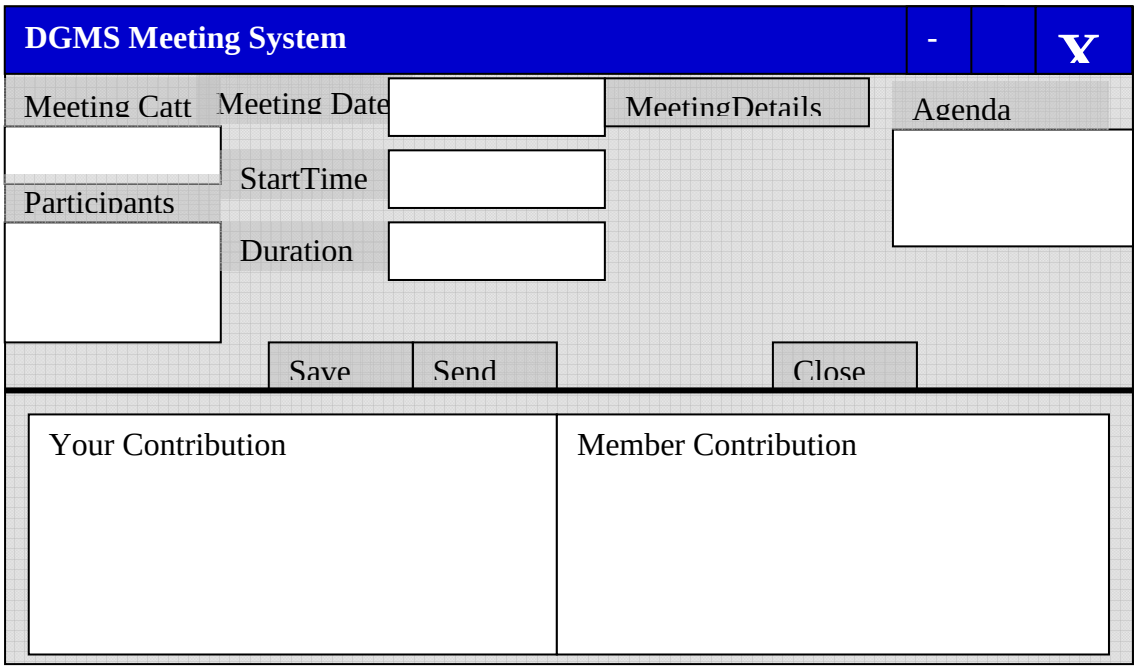


Figure 36: Meeting in session UI

Out Put Design

Meeting Minutes

This section looks at the design of the output format for the report. All report are web based and are automatically generated by java.

Basically the meeting report should be molded based on a standard meeting format.

The report should have the following components.

- Meeting Category
- Agenda
- Participants
- Absetee
- Meeting dates
- Deliberations

Meeting Minutes

Meeting Held on ……..

Participants
1……
2……
3. ……
..
.

Agenda
1. .
2.

Participants	**Contribution**

Meeting generation activated by ……on ……..at ……

Figure 37: minutes design

SUGGESTION REPORT

Suggestions Report	
Created on……..at…….by……	
Date Of Posting	**Suggestion**

Figure 38: Suggestion report design

DGMS Security Design

In the project I designed security as an incremental component that can be added into the system. However there are default security mechanisms that have been incorporated. This include:

Password Authentication

Every user of the system must be authenticated. The authentication is based on the username, user password and user type.

Login fail lockout

If user login fails for five consecutive attempts the system locks him out and disconnect the socket connection.

Security Reports

DGMS generates report on security violation. The report include:

- ✓ **Login failed report**: log of all login attempts that failed.
- ✓ **Critical Security report**: For users who failed to login for five consecutive attempt and were locked out.

Add-on Security

The default security mechanisms incorporated into the system does not safe guard the integrity of data.
The greatest concern over the transfer of information over the networks and Internet is information's confidentiality and integrity. In serious transactions non-repudiation is required.

Java Security API
DGMS is designed and developed using java programming language. Java has matured to provide support for security for data during storage and transfer.

Java Security API contains several APIs that one can use to secure data and even the applications against any form of attack. It contains the following APIs:

- Java Cryptography Extensions (JCE)which support both encryption and decryption.
- Java secure socket Extensions (JSSE)
- Java Authentication and Authorization Services (JAAS)

- Java GSS-API (Generic Security Service) for Kerberos v5 support.
- Java certificate Path API.

Currently DGMS security design focuses on the use of JCE in generating single key for encryption and decryption. This is a low-level security design and can be extended to include more comprehensive security mechanisms for varying operation environment.

In this design the data is encrypted using a secret key. The key and the data are transferred wrapped together to the server, which unwraps to access the key and then use it to decrypt the data. The data could be users authentication details, the meeting deliberations etc.

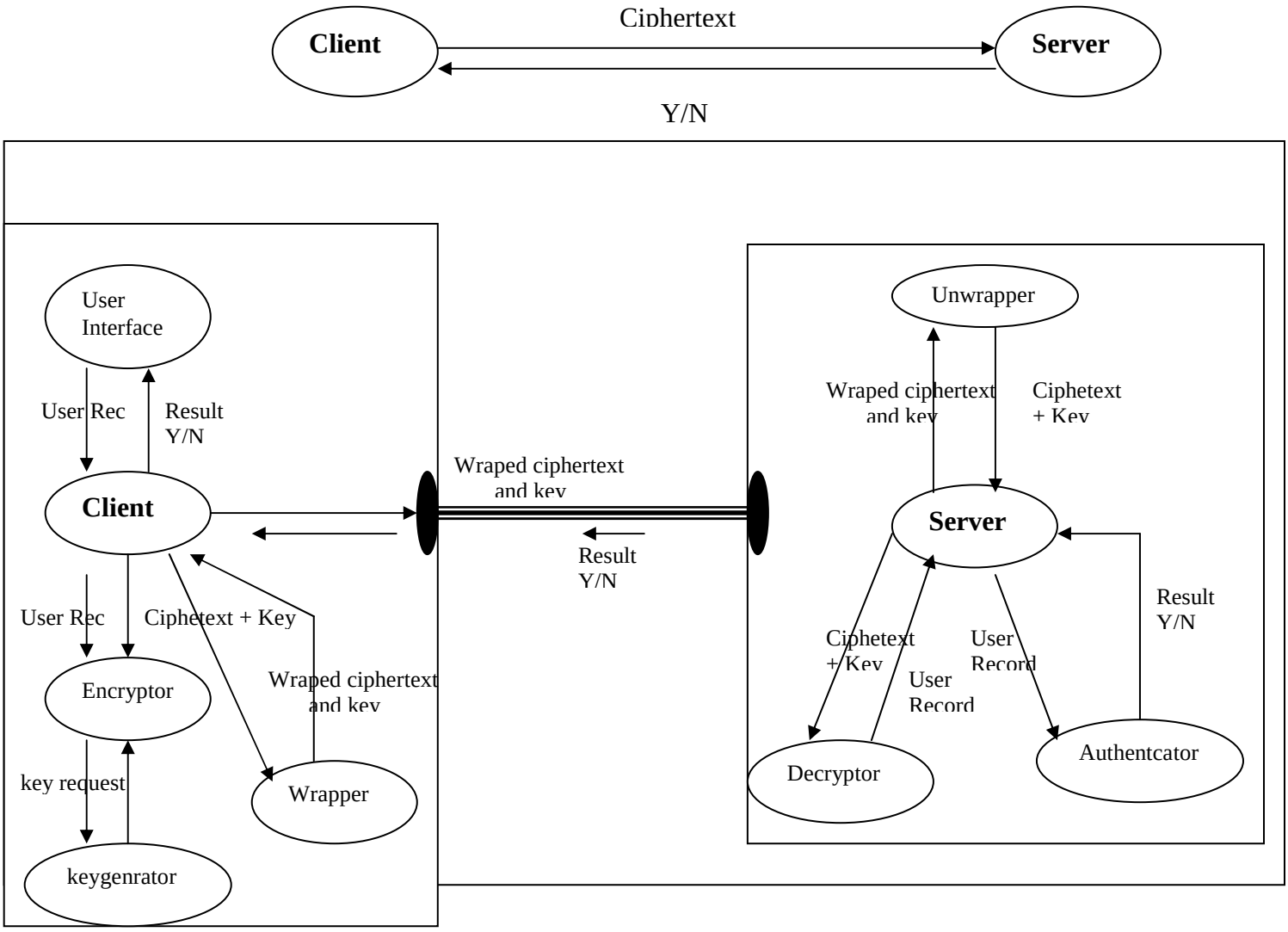


Figure 39: user record encryption design

DGMS security can be extended to cater for different security needs. This may need the use of:

Digital Signatures
Digital signature algorithms such as DSA provides adequate security functionalities which includes generating public/private key pairs as well as signing and verifying arbitrary digital data. A digital signature has many useful characteristics:

- Its authenticity can be verified, via a computation that uses the public key corresponding to the private key used to generate the signature.
- It cannot be forged, assuming the private key is kept secret.
- It is a function of the data signed and thus can't be claimed to belong to other data as well.
- The signed data cannot be changed; if it is, the signature will no longer verify as being authentic

Message Digests
Cryptographically secure message digests, such as MD5 and SHA-1. These algorithms, also called one-way hash algorithms, are useful for producing "digital fingerprints" of data, which are frequently used in digital signatures and other applications that need unique and not forgeable identifiers for digital data.

A digest has the following properties:

- It should be computationally infeasible to find another input string that will generate the same digest.
- The digest does not reveal anything about the input that was used to generate it.

Message digest algorithms are used to produce unique and reliable identifiers of data. The digests are sometimes called the "digital fingerprints" of data.

Some digital signature systems compute the digest of a message and digitally sign the digest rather than signing the message itself. This can save a lot of time, since digitally signing a long message can be time-consuming.

Discussion and Conclusion

Conclusion

A lot of effort has been put into the research and development of systems that support collaborative group working and especially meeting systems. Some have well developed video conferencing facilities that will amaze any one. However most of this endeavour has ignored some important aspect of the physical meeting scenario.

DGMS as an attempt to model physical meeting ha addresses some of these issues such as taking care of those who cannot contribute because of fear or because of time limitations. In deed this model fair very well in the market because of its limited width of coverage. However it will acts as a demonstration of how much technology can achieve especially in our local universities.

Challenges encountered

The main challenge that I encountered is the design and implementation of some of the feature such as chat and the online meeting. Not every good idea that resulted to a good impenetrable designs.

I also had to study seriously on java and especially network programming and web report generation using java.

Nevertheless I know it has taken long to accomplish this far but I think the experience and in-depth knowledge I have obtained is of great worth.

DGMS Challenge

DGMS and it fully developed matured product face an enormous challenge. The main challenge that is encountered is acceptability. People are used to traditionally acceptable ways of interacting. Consequently structures have been built around this traditionally modes. There is therefore in making people adapt to new ways interacting. “ Change No Mater Its Worth Will Be Always Opposed”. One feature of DGMS and its father products is their claim to eliminate transport and allowance cost. From peoples perspective meeting time and venues especially outside working places is away of earning more income.

It may then be necessary to consider a motivation token for people to participate in meetings and concentrate on other benefits that arise from the use of such technologies.

Another major problem is standards. The success of any new products and more so for distributed software products depends on its interoperability across heterogeneous platforms be they computers, operating systems, networks, or applications. DGMS may be required to inter-operate with other technologies. But not all products (just like DGMS) are based on legislated, dejure standards. Currently there are no regulated de-jure standards to regulate the design and development of integrated interacting solutions.

Suggestions for Further Work

Workers in an organisation do interact in a variety of ways and various reasons. A lot of work in study and system developments has been done but still there are more to be accomplished. There is no technology today that can claim 100% achievement in meeting collaboration needs.

DGMS is an effort to model various ways that user can interact in work places using text as the media of interaction.

DGMS can expand to incorporate more and more collaboration features and support all available media types. Further development should look at the possibility of flexible system that can adapt to deferent organisations mode of working with minimal effort as possible.

Specifically additional work that can be done on DGMS includes:

1. Designing more efficient chat algorithms than is currently being used.
2. Add a **gruopChat** component to allow for group chatting. The members of the group need to register and a member cannot register twice. Massages are broadcasted to the group.
3. Designing and developing a pigeon hole component that models the physical system. Users will just need to drag a document with the mouse to specific hole or click an TOAL button to drop to all holes. Further development can make the hole to be flexible to meet deferent user needs such as:
    - ✓ Acting as a storage location for student result slips in a college or university.
    - ✓ Act a storage location for training materials may be by courses, sessions etc.
    - ✓ Act as an account balance storage location for banks customers.
4. Designing and developing a procurement component for goods required within the organisation. This is an elaborate component that will require adequate security on transaction and payments and appropriate well-designed transaction reports.
5. Designing and developing a voting component that can be used during voting events such as student and staff unions elections within the organisation. The

component should provide all the necessary information for a particular candidate, monitor voting progress and announce the winner when the elections are over.

6. Designing and developing an opinion poll component that can be used to gather and analyse people's opinion on an event or item of concerns. The component should after analysing publish the poll result immediately.
7. Adopt the system to run on the Internet for wider reach.
8. Design and implement intelligence into the system by incorporating distributed artificial intelligence technology.
9. Design and implement data security component that is flexible to meets the needs of different business environments.
10. Design an integrated interaction component that can be bought or installed incrementally. This will help to meet the economic needs of different communities especially in Southern Sahara.

Appendices

Specifies other useful information for understanding the requirements. All SRS documents should include at least the following two appendices:

Acronyms, Abbreviations

1. **TQM** - Total Quality Management
2. **Total Quality Management**. An organisation management practice that brings ownership and therefore management of organisation to everybody within.
3. **Wikipedia**-An Internet website for definitions of terms-http
4. **ICT**-Information and Communication Technology
5. **WWW**-World-Wide Web
6. **CSCW**-Computer-Supported Cooperative Work
7. **UAT-** User Activity tracker:
8. **HTTP:** Hypertext Transfer Protocol
9. **TCP/IP:** Transmission control Protocol/ Internet Protocol
10. **API-** Application programming Interface
11. **MAC**-Message Authentication Code" algorithm
12. **DSA** -Digital Signature Algorithm.
13. **JCE** -Java Cryptography Extension
14. **PBE**- Password Passed Encryption

Definitions

Total Quality Management- Management practice that makes everybody within an organisation feel they are part of the management.

Public Key -A number associated with a particular entity (for example, an individual or an organization). A public key is intended to be known to everyone who needs to have trusted interactions with that entity.

Private Key -A number that is supposed to be known only to a particular entity. That is, private keys are always meant to be kept secret. A private key is always associated with a single public key.

Digital Signature -A string of bits that is computed from some data (the data being "signed") and the private key of an entity. The signature can be used to verify that the data came from the entity.

Cryptography Algorithm -An algorithm used to help ensure one or more of the the confidentiality of data, authentication of the data sender, integrity of the data sent , and nonrepudiation;:

Encryption -The process of taking data (called *cleartext*) and a short string (a *key*) to producing a *ciphertext*, which is meaningless to a third-party who does not know the key.

Decryption - The inverse of encryption; the process of taking ciphertext and a short key string, and producing cleartext.

Certificate -A digitally signed statement from one entity, saying that the public key of some other entity has some particular value. If you trust the entity that signed a certificate, you trust that the association in the certificate between the specified public key and another particular entity is authentic**.**

Password-Based Encryption

Password-Based Encryption (PBE) derives an encryption key from a password. In order to make the task of getting from password to key very time-consuming for an attacker, most PBE implementations will mix in a random number, known as a salt, to create the key.

Key Agreement

Key agreement is a protocol by which 2 or more parties can establish the same cryptographic keys, without having to exchange any secret information.

Cipher
Encryption and decryption are done using a cipher. A cipher is an object capable of carrying out encryption and decryption according to an encryption scheme (algorithm).

Message Authentication Code" (MAC) algorithm

A MAC provides a way to check the integrity of information transmitted over or stored in an unreliable medium, based on a secret key. Typically, message authentication codes are used between two parties that share a secret key in order to validate information transmitted between these parties.

Message Digest Algorithm (or One-Way Hash Function)

A function that takes arbitrary-sized input data (referred to as a *message*) and generates a fixed-size output, called a *digest* (or hash).

Engine Class
The term engine class is used in the Java Security API to refer to a class that provides the functionality of a type of cryptography algorithm. The Security API defines a Java class for each engine class. For example, there is a MessageDigest class, a Signature class, and a KeyPairGenerator class.

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