A Project Report On

Virtual Classroom

Submitted in Partial Fulfilment of
The Degree of

Bachelor of Engineering
In
Computer Engineering

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CERTIFICATE

This is to certify that this work of Industrial Defined Project entitled **Virtual Classroom** represents the bonafide work of **Sharma Darshan A. (110583107009)** and **Patel Kaushal B. (090584107201)** for the partial fulfilment of the degree of **Bachelor of Engineering** in **Computer Engineering** at the Department of Computer Engineering, **Faculty of Engineering, Shree Saraswati Education Sansthan's Group of Institutions**, during the academic year 2013-14 and their work is satisfactory.

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ABSTRACT

Virtual Classroom is the online platform bringing together the learners either local or distant and the teachers within one class through the help of web based system. It is referred as a web based system as it requires computer and internet connection. Virtual Classroom has the features of chatting as well as video and audio conferencing between the tutors and the students. The participants can have the flair of raising hands if they have any questions or for ending the sessions. Similarly, whiteboard is provided for the sharing of ideas or any important messages among the tutors and students. As virtual classroom is the representation of real classroom virtually, participants are fully benefited as per in the real classroom. They can share the ideas, knowledge, subject matters with the tutors and among the participants.

ACKNOWLEDGEMENT

At this point of time when we are writing this documentation we got a chance to look few months back when we were yet to take up any project on hand. Considering this slice of time and status now, we strongly feel a sense of difference, a sense of having grown. We consider us fortunate to be served this grand feast of knowledge and experience for the last precious months we spent for developing this project documentation.

I owe a great many thanks to a great many people who helped and supported me during the writing of this documentation.

Our deepest thanks to Assistant Professor, **Mr. Pragnesh Patel**, the Guide of the project, for guiding us. He has taken pain to go through the documentation and make necessary correction as and when needed.

I express my thanks to **Mr. Bimal Kumar**, Head of the Computer Engineering Department, for extending his support.

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1. Introduction

1.1 Organization Profile

PCube Softech is an Indian based service provider programming association. It can provide creative web design, web development solutions along with web hosting like Domain Registration, Domain transfer, web site hosting and numerous more. It also provides the Search Engine Optimization (SEO) services.

1.1.1 Mission

One-Stop Internet Solutions Provider: To accomplish objective by giving recognized programming aids in the worldwide business sectors by consistent innovation in technology. Illuminating the surroundings by offering learning and receiving an Integral methodology towards work.

1.1.2 Vision

We confer to make the term offshore synonymous with quality. We are unvaryingly refining our outsourcing model to accord preferred bargains to our clients. Our growing portfolio of utilities empowers us to convey close-to-close fixes, while our developing specialized finesse makes it plausible for us to handle even profoundly intricate ventures. By constructing our presence in distinctive parts of the world, nurturing talent, streamlining our administration courses of action, and staying bound to ceaseless upgrade, we find routes in which to convey value answers at competitive rates.

1.2 Project Detail

1.2.1 Project Definition

A virtual classroom is an online learning environment. It is a desktop based network application through which a presenter and participant can communicate with each other using a computer with internet/LAN connection.

1.2.2 Project Profile

1.2.2.1 Aim

Developing a virtual classroom system to promote a greater count of students to splurge into the field of education. It integrates the benefits of a physical classroom with the convenience of a virtual learning environment, minus the commuting hazards and

expenses. It will show the immense flexibility and sophistication in the existing learning platform structures, with the perfect blend of synchronous and asynchronous interaction. It provides a means of collaborative learning for the students.

1.2.2.2 The Concept of E-learning

At present, internet and computer has more roles in everybody's life and way of living. All educational institutes are interested in information technology. Application of technology in education, therefore, is important. Current instruction has changed quite dramatically. Students and instructors use network in their classroom. Information technology is the cause of the age of information in which there are a lot of contents to learn without end. Connecting information through the largest network can be done on the internet. People can broaden their learning and knowledge at all levels because internet collects all bodies of knowledge in the form of hypertext documents, normally it is called WWW or World Wide Web. This can be considered as virtual library of the world. Moreover, internet is a tool to communicate easily to every person from all parts of the world. As a result, internet is used in instruction and learning to supplement classroom and it can be used as a tool for online teaching/learning. This is a form of distance learning for a whole course or a whole curriculum. Trends in internet technology are also progressing rapidly. That is to say, learning via electronic media or e-Learning is becoming more and more important. Students have a role to search for and share knowledge. They will learn to communicate in a fast manner, learn to choose the content to enhance their understanding, and learn according to their demands because they can access to all information in the world. It is widely known that web is an important service on the internet which drives e-Learning and makes it gain more attention from the general public.

Web has an important role in education and learning in an open system and decentralization. This makes a new dimension of learning with no limit in time and place. Learning can be made both in classroom and external world. In developed countries, e-Learning has spread inside conventional education, human development in organizations and individual learning. However, in India, learning via electronic media is very new and it has not gained much application. In the course of this changing world, the impact of globalization, free trade in economics along with development in science and technology will push India to make sure that the population is ready for the changes in the future.

Therefore, e-Learning is an alternative which is suitable for the development of human resource in order to compete in the modern world.

E-Learning is a kind of distance learning which applies electronic media through World Wide Web where learners and instructors can communicate. Learners can access many resources of information without boundaries. Learners can participate in activities and trainings online by facilities in WWW. Online learning, therefore, is widely popular at present because there is no limit in distance, time and place. Moreover, it supports the potentials and the capabilities of learners.

1.2.2.3 Definition of Virtual Classroom

Just as the term virtual means a simulation of the real thing, Virtual Classroom is a simulated classroom via Internet, which provides a convenient communication environment for distance learners just like traditional face-to-face classroom. A virtual classroom allows learners to attend a class from anywhere in the world and aims to provide a learning experience that is similar to a real classroom.

In a college setup, lectures are scheduled, students arrive on time; find their teachers, fellow learners, a blackboard or whiteboard, LCD projector, optionally a television screen with videos. Likewise, a Virtual Classroom is a scheduled, online, teacher-led training session where teachers and learners interact together using computers linked to a network such as the Internet.

A virtual classroom enables to bring learners from around the world together online in highly interactive virtual classes while greatly reducing the travel, time, and expense of on-site teaching/training programs. It can be used as a solution for live delivery and interaction that addresses the entire process of creating and managing the teaching-learning process. It facilitates instructor and student in teaching-learning events, such as a seminar, online discussion or a live training for employees in company. In a traditional classroom, professor, students and fellow learners are present, similarly, the same set of participants are present in a virtual classroom. They can talk with each other alike the traditional classroom via chat. Similarly presenter uses whiteboard, gives notes/resources, gives presentation as given in traditional one.

Thus, virtual classroom can be visualized as a classroom where a lecture or session is conducted using Internet.

1.2.2.4 Features of Virtual Classroom

The various features of Virtual Classroom that make learning interesting as well as interactive have been elaborated below:-

- **Synchronous Learning:** In this type of learning process, students and professors connect and interact with each other in real time. This is indeed a very significant process where students get answers to their queries & questions then and there. Interaction with professors and peers makes the learning process interesting and enriching for students.

- **Live Audio-Video Support:** Audio and video support both contribute towards the e-learning process in virtual classroom. Various tools are available for text-based chat- verbal interaction through audio conferencing and sharing of ones own video through web-camera. Professors can share their audio and video, thus establishing one-to-one relation with students. This builds confidence in students about the teaching methods and allows professors to communicate effectively with the students. Moreover, the students asking questions can share their videos with the fellow students as well.

- **Session Recording:** The entire classroom session can be recorded in video format and stored in library for future reference. This feature is extremely useful, especially for absent students, who can review the recordings later and understand the concepts elaborated by the professors. Moreover, the students can also refer to the recordings for revision purpose, at their convenience.

- **White Board:** White Board is an alternative to the traditional blackboard method, used as a tool for drawing graphics or diagrams in virtual classroom. It comes handy when professor wants to visually explain any abstract concept. If any student has a query, which needs some graphical explanation and the professor does not

have an apt graphic for it, then even a crude diagram can be extremely beneficial for emphasizing on the concepts.

- **Sharing of Learning Resources and/or Desktop Screen:** The resource sharing feature in virtual classroom allows professors to share varied content in different formats with the students in real time while delivering lectures on various course topics. This resource sharing feature supports sharing of various file formats - MS Word, MS Excel, PowerPoint Presentations, PDF files, flash presentations, flash videos etc. While teaching, the professors can exhibit all the operations from the desk, by sharing a particular application or the entire desktop. This resource sharing feature is extremely useful for sharing various course materials like topic notes, subject diagrams or graphs, explanatory videos etc. With this type of supportive and informative course material, learning becomes interesting and gives an interactive experience.

- **Classroom Control by Professors & Active Student Participation:** In virtual classroom when professors deliver lectures to the students while explaining or elaborating concepts, ideally one sided process of communication is followed, and students are not permitted to talk/ express themselves at the same time in order to avoid chaotic situations. Though all the participants from the virtual classroom are connected through audio and/or video conference, the participation rights are controlled by the professors. During the lectures, in case the students come across a particular doubt or query, while the professors are explaining, the students can set their status to “raise hand” which indicates that the student has a question which needs to be addressed by the professor. However, only 1 student can ask question at a time, in order to avoid confusion as well as disturbance and to maintain focus and clarity on queries asked. Since the professors have the control rights, they can respond to the question or else disable the status of “raise hand” and take the question at the end of the session.

1.2.2.5 Advantages of Virtual Classroom

Following are some of the advantages of Virtual classroom over traditional classroom model:

- **Removal of geographical barriers (Anywhere learning):** A virtual classroom allows learners and teachers to attend a single live training session from any place in the world, provided they have a computer and Internet connection.

- **Sessions can be recorded:** If learners miss a traditional classroom-based training session, they have very little opportunity to engage in the learning experience that took place. A virtual classroom has a facility to record the session, so learners or teachers can replay it afterward. Teachers too, get an opportunity to review their own or their colleagues performance.

- **Quicker to organize:** Training can be organized more quickly than traditional classroom-based training. Classrooms and projectors do not need to be reserved, materials do not need to be distributed. The sessions are easier to schedule or reschedule since attendees will not be traveling to the venue of the session.

- **One to one communication:** In a virtual classroom environment, learners can talk to the teacher and to each other, and although this communication is not as rich in a traditional classroom, it still can help learners, since it is one to one.

Due to these advantages, concept of virtual classroom is getting very popular. Since it allows learners to attend sessions from anywhere in world, it is very useful for distant learners and for people who cannot meet face to face because of lack of time.

1.2.2.6 Limitations of Virtual Classroom

Following are the limitations of Virtual Classroom over Traditional classroom:

- **Teachers and students need to become familiar with the tools**

  Teachers and students are familiar with the workings of a traditional classroom, that is, they understand the concepts of hand raising, the whiteboard, assignments, and

so forth. With a virtual classroom, all attendees must become familiar with the way the virtual classroom works before virtual classroom based training starts.

- **Time dependency for Live Sessions**
  Attending virtual classroom training is restricted to a certain scheduled time.
- **Infrastructure for the participants PC needs to be prepared**
  Virtual classroom sessions need to be scheduled, teachers need to be invited, and participants' PCs need to be prepared.
- **Technical Limitations**
  Technical issues such as bandwidth, speed of the connection or power failure may create problem while presentation is going on.

1.3 Purpose

- To **support live on-line classes** for distance learning and remote education.
- To **pool academic resources** thereby improving access to advanced educational experiences.
- To **improve the quality and effectiveness of education** by collaborative learning and teaching process.
- To **hold and participate** in the meetings, webinars, conferences/Workshop, interviews, etc. through video conferencing.
- To **increase and improve** the accessibility of educational resources to the **persons with disabilities**.

1.4 Scope

The scope of this project is

- To support live on-line classes for distance learning education.
- To allow multiple remote users to communicate in real time.
- To create the connection between the presenter and the participant's computer without the help of a mediator server.

1.5 Objective

The main objective of developing the virtual classroom is to allow multiple remote users to communicate in real time using minimum available resources and having lower response time.

1.6 Technology and Literature Review

Before deciding scope for our project, we have studied many existing virtual classrooms. This study helped us lot for knowing the various features of virtual classroom.

We analyzed following currently existing virtual classrooms and e-learning software to identify their various features and limitations:

- Cisco Webex
- Adobe Connect
- Wiziq
- A-view Classroom
- Citrix gotoMeeting & Citrix gotoAssist
- Blackboard Inc. platforms like Blackboard connect, Blackboard learn

1.6.1 Features

- **Directing Messaging** among participants or between presenter and participants is possible using chat feature in virtual classroom.
- **Resource sharing** is possible between presenter and participants. Presenter uploads files (notes) to the session. Participants at their end can download these resources.
- Let other participants share and present documents from their computers and **assign privileges** to individual participants.
- **Shared whiteboards** are used by professor to visually explain any abstract concept. If any student has a query, which needs some graphical explanation and the professor does not have an apt graphic for it, then even a crude diagram can be extremely beneficial for emphasizing on the concepts.
- Presenter can create **polls** are useful for presenter to get feedback from participants.
- Virtual **hands up**, to indicate that participant has questions to ask. When participant does his hands up, presenter can chat with him to solve his/her queries.

- **Lectures can be recorded** so that the participants can watch the lecture at a later time or send to other colleagues who could not attend the lecture.
- **Participants can be invited** to an online lecture that has already been started via email or send **reminders** about the upcoming lectures.
- By **audio and video lecture** feature presenter can deliver voice based lectures. Presenter can share his/her audio and video, thus establishing one-to-one relation with participants.
- Presenter can access the participant's desktop screen or vice verse using the **remote desktop sharing** feature.

1.6.2 Limitations

- All the virtual classrooms listed above are not free to use. We need to pay a reasonable amount to use their features.
- Only a limited number of participants can attend the lectures.
- There is no facility of audio to text conversion for deaf participants or to facilitate participants to attend lecture in unfamiliar languages.
- All the virtual classrooms listed above can only be accessed through the Internet, but not through Local Area Network(LAN).

2. About the System

2.1 System Requirement Specification

2.1.1 Purpose

This Software Requirement Specification provides a complete description of all the functions and constraints of the Virtual Classroom System. The purpose of this software requirements specification is to verify that all the specifications are correct and are verified. This document also serves to ensure that the software is traceable throughout its software development life cycle.

2.1.2 Intended Audience

This SRS would be used by the following people

- **Developers:** The developers would use this document to implement the functionalities and to ensure traceability of the software.
- **Testers**: The testers would use this document to know the interfaces and to test the software accordingly.
- **Users:** The users would use this document to verify if the requirements specified satisfy their needs.

2.1.3 User Characteristics

There are different classes of users of virtual classroom based on the roles that they play. Depending on the user type, virtual classroom takes different form for each user. These forms can be categorized depending on the user's role. These roles are as follows:

1. Presenter(or Administrator)

Facilities provided to the Presenter are:

- User Registration
- Create/Deletes Courses and Lectures
- Deletes Participants
- Edits Personal Profile
- Views/Deletes saved files
- Conduct Presentation
- Conduct Poll
- Explain concepts using Whiteboard

- Public/Private Chat

2. Participant

Facilities provided to Participant are:

- User Registration
- Edit participant profile
- Views/Deletes saved files
- View Presentation
- Public/Private Chat
- Give response to polls

2.1.4 General Constraints, Assumptions and Dependencies

- **General Constraints:** This software will need presentation slides, videos and images as inputs. The users need to generate all these inputs using other mediums.

- **Assumptions:** We have made the following assumptions:
  - The user has presentation slides (say .ppt, .pdf etc), video and images for making the multimedia presentation.
  - The user has some previous knowledge of using similar software's.

- **Dependency:** This software would need Java Runtime Environment(JRE) and some additional packages for working.

2.1.5 External Interface Requirements

2.1.5.1 Hardware Interfaces

- **Processor:** Intel Pentium-4 or above
- **Hard disk:** 20GB or above
- **RAM:** 512 MB or above
- **Pointing Device:** Mouse or Writing Pad
- **Input Devices:** Head phone or speakers, Microphone , Webcam(optional)

2.1.5.2 Software Interfaces

- **Operating System:** Any
- **Front End:** Java Runtime Environment (JRE 7)
- **Back End:** Oracle 12c

2.1.5.3 Communications Interfaces

- Internet/LAN Connection

2.1.6 Functional Requirements

The Functional Requirements of Virtual Classroom are as follows:

- **User Registration:** The user - presenter/participant need to be register themselves when they use this software for the first time.
- **Course and Lecture creation:** If the presenter wants to create a course consisting of multiple lectures he can create the course and define multiple lectures.
- **Connecting people:** The main function of this software is that it lets multiple remotely located users to communicate through live audio and video communication, remote desktop sharing, polling system, and raise hand facility through which the students can ask queries to professors.
- **Sharing Resources:** During the presentation the presenter and the participant can share resources like files(.ppt, .pdf, .xsl etc), lecture videos, etc.

2.1.7 Non-Functional Requirements

- **Performance:** This software should perform the same way irrespective to its Operating System environments. Time taken for importing files and publishing the multimedia presentation should be minimum.

  The main performance issue that will be faced in this software will be of **load balancing** when large number of participants will be participated in the multimedia presentation. Great efforts will be taken to handle this problem.

  Also great efforts would be taken to keep the response time as minimum as possible.
- **Reliability:** Efforts will be taken to make this software reliable, so that the presenter and the participants can use it to communicate effectively.

- **Availability:** We would like to make this software open source so that the software is available at anytime to everyone.
- **Security:** We will take care that no unintended users can participate in the presentation.
- **Portability:** As this software is to work on multiple platforms, portability is an essential attribute and we ensure this by using JAVA as our programming language.

2.2 Feasibility Study

The main aim of the feasibility study activity is to determine whether it would be financially or technically possible to develop the product. The feasibility study activity involves analysis of the problem and collection of all relevant information relating to the product such as the different data items which would be input to the system, the processing to be carried out on these data, the output data required to be produced by the system, as well as various constraints on the behavior of the system. There are basically 4 types of feasibility analysis:

2.2.1 Operational Feasibility

The operational feasibility is always a totally people-oriented approach. During this phase of feasibility analysis, the singular point-of-view are the people, the main users of the system. The problems that are likely to be faced by the users while operating on the system are thoroughly discussed during this phase.

Many difficulties like geographical barriers, not getting professional guidance, etc. that the end-user faces while attending the traditional-classroom based training sessions can be solved by using virtual classrooms. Hence, the problem is of course worth solving because of several limitations of traditional classrooms and also the present virtual classrooms are paid and supports only limited number of participants.

2.2.2 Technical Feasibility

This phase of the feasibility analysis deals with the computer-oriented feasibility of the system. As the name suggests, this phase tackles the technical problems of the system. The platform, the language and various kind of software that we are going to use to develop the system are beneficial in terms of the long use and that supports object oriented

programming concept etc. Also, the technology and software that we are going to use are available.

We also, do have necessary technical expertise with us as a mentor, technical leader and project guide so that, the development will be compatible with the schedule. Certain kind of training is required for particular technology but it will not make adverse effect on the development schedule.

2.2.3 Schedule Feasibility

This is again a very important phase of the feasibility analysis. This phase explains the importance of time-limits in the organization. It tells whether we can complete the assigned task under proposed time-durations or not. According to the current scenario, we have completed the Requirements analysis, Requirements gathering, Software Requirements Specification, and Design phases. So, as far as current scenario is concerned the project is scheduled feasible with prescribed format.

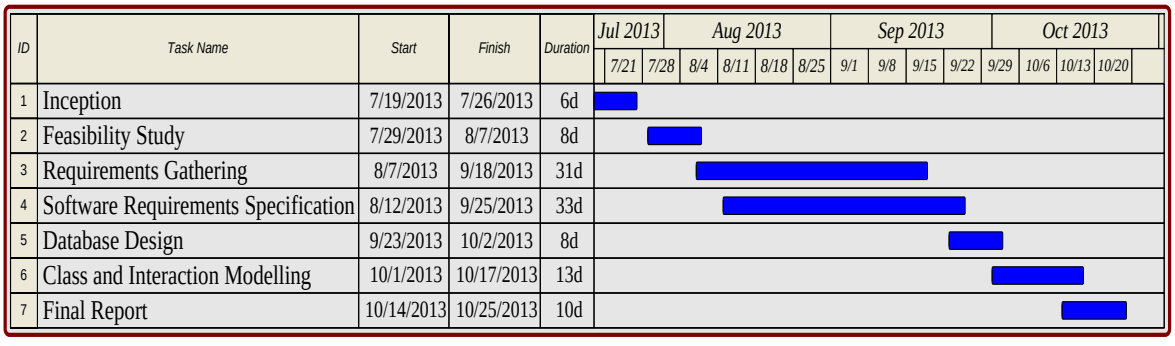
2.2.4 Economic Feasibility

It is a measurement of cost-effectiveness of project or solution. This is often called Cost Benefit analysis. Economic feasibility deals with the cost and benefits of the system. This system is economically feasible.

2.3 Project Planning

The plan of our project is according to the following Gantt chart:

ID	Task Name	Start	Finish	Duration
1	Inception	7/19/2013	7/26/2013	6d
2	Feasibility Study	7/29/2013	8/7/2013	8d
3	Requirements Gathering	8/7/2013	9/18/2013	31d
4	Software Requirements Specification	8/12/2013	9/25/2013	33d
5	Database Design	9/23/2013	10/2/2013	8d
6	Class and Interaction Modelling	10/1/2013	10/17/2013	13d
7	Final Report	10/14/2013	10/25/2013	10d



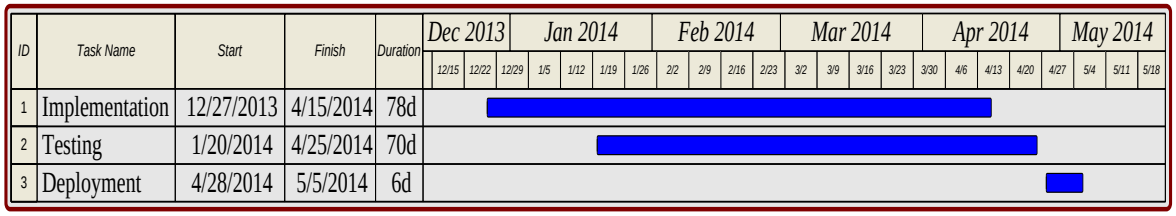


Fig. 2.1 Gantt chart

3. Analysis

3.1 E-R Diagram

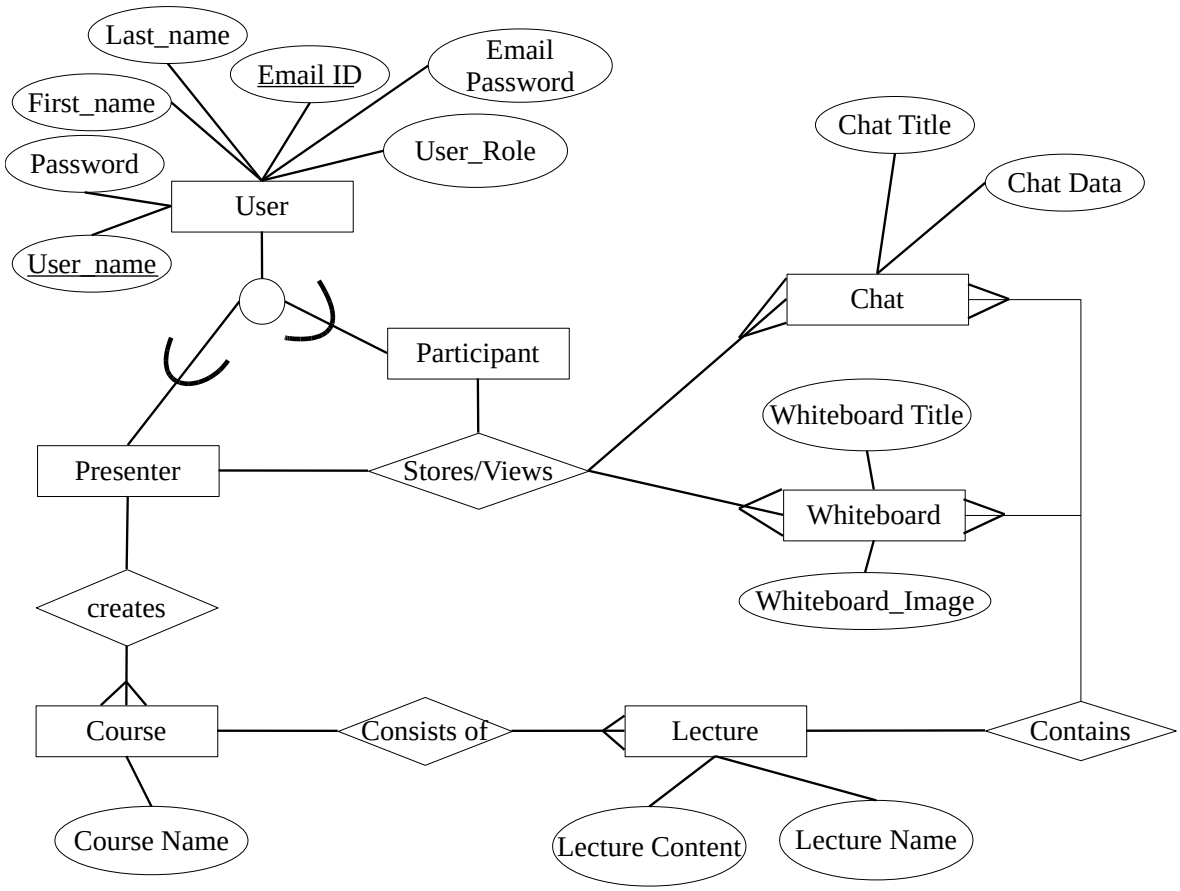


Fig. 3.1 E-R Diagram

3.2 Data Flow Diagram

3.2.1 Context Diagram (Level 0)

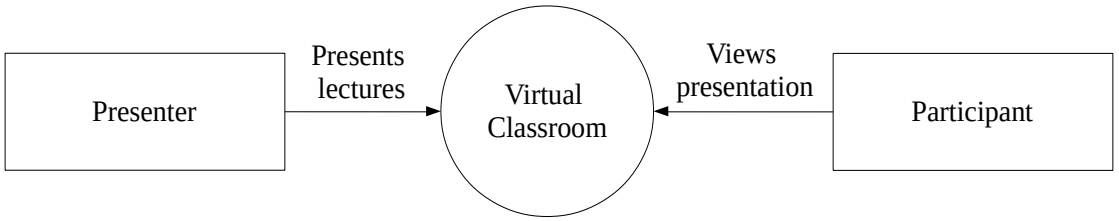


Fig. 3.2 Context Diagram

3.2.2 DFD - Level 1

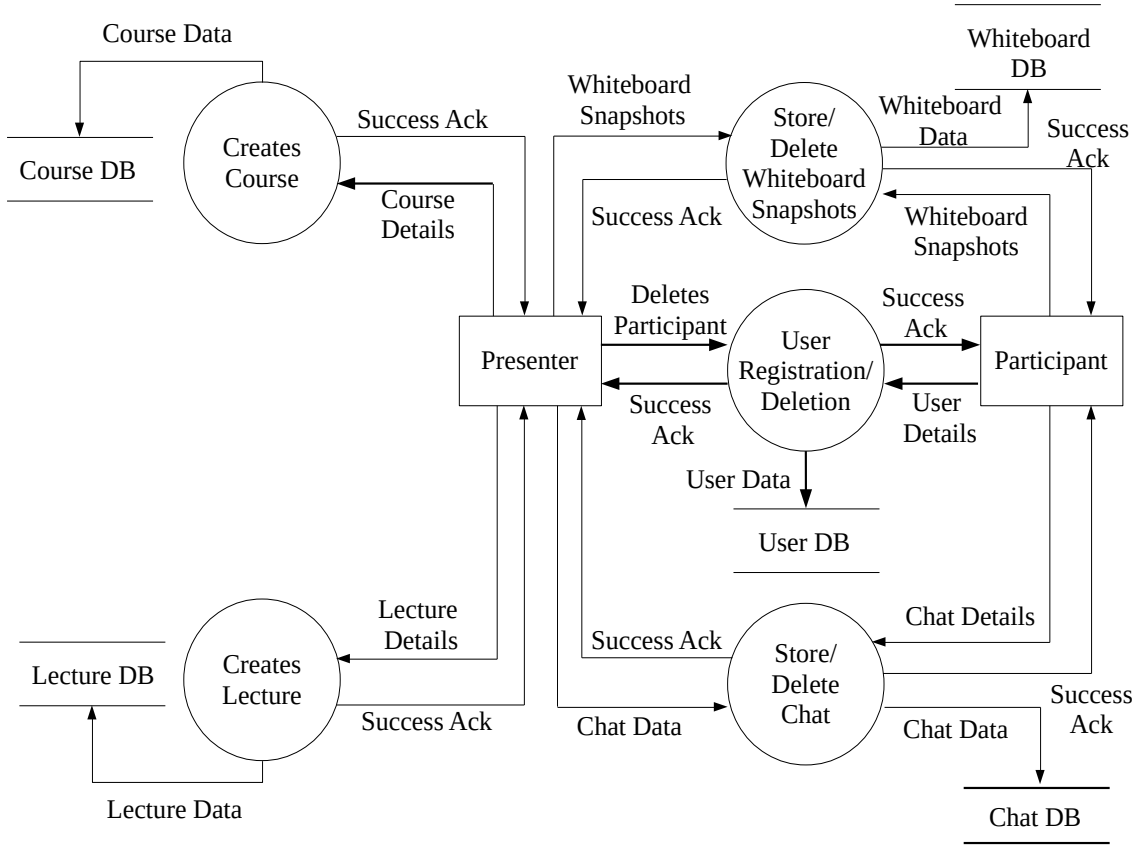


Fig. 3.3 DFD-Level 1

3.3 Use Case Diagram

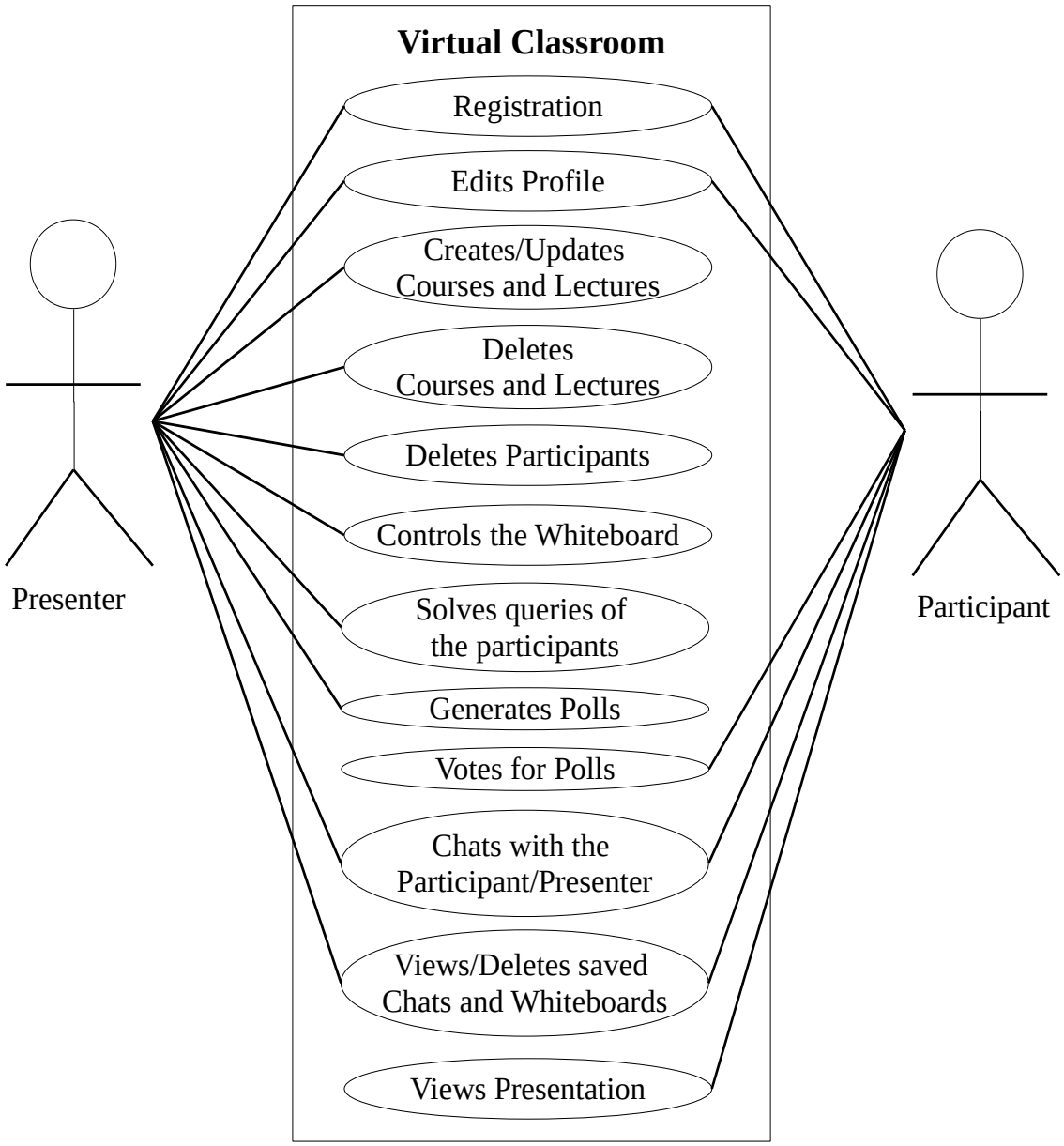


Fig. 3.4 Use Case Diagram

3.4 Sequence Diagram

3.4.1 Sequence Diagram for User Registration

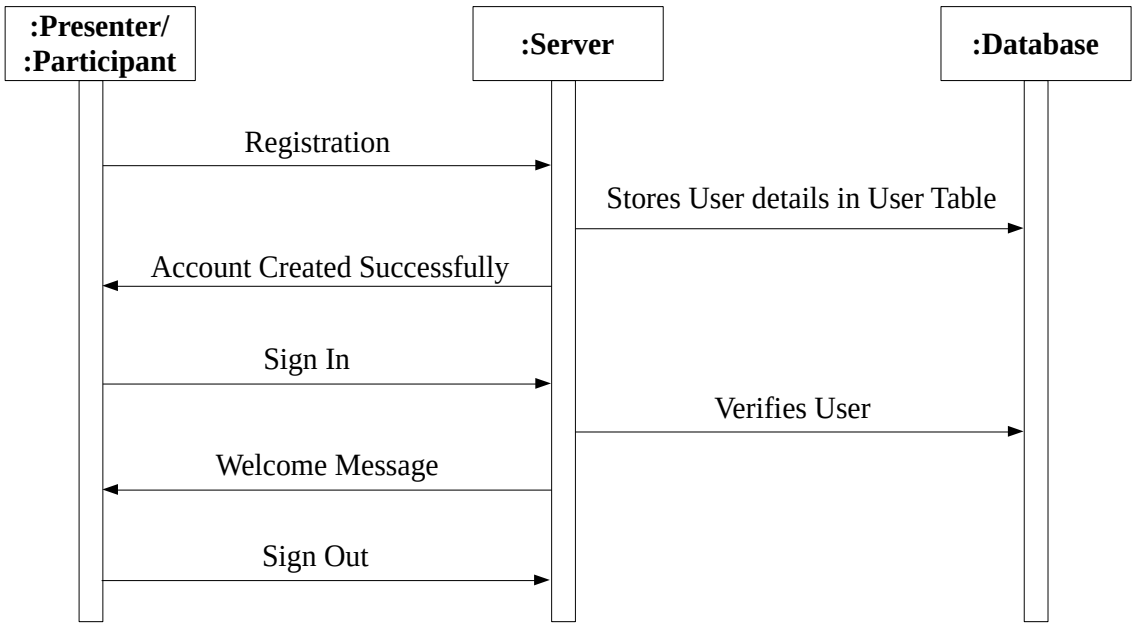


Fig. 3.5 Sequence Diagram - User Registration

3.4.2 Sequence Diagram for Course and Lecture Creation

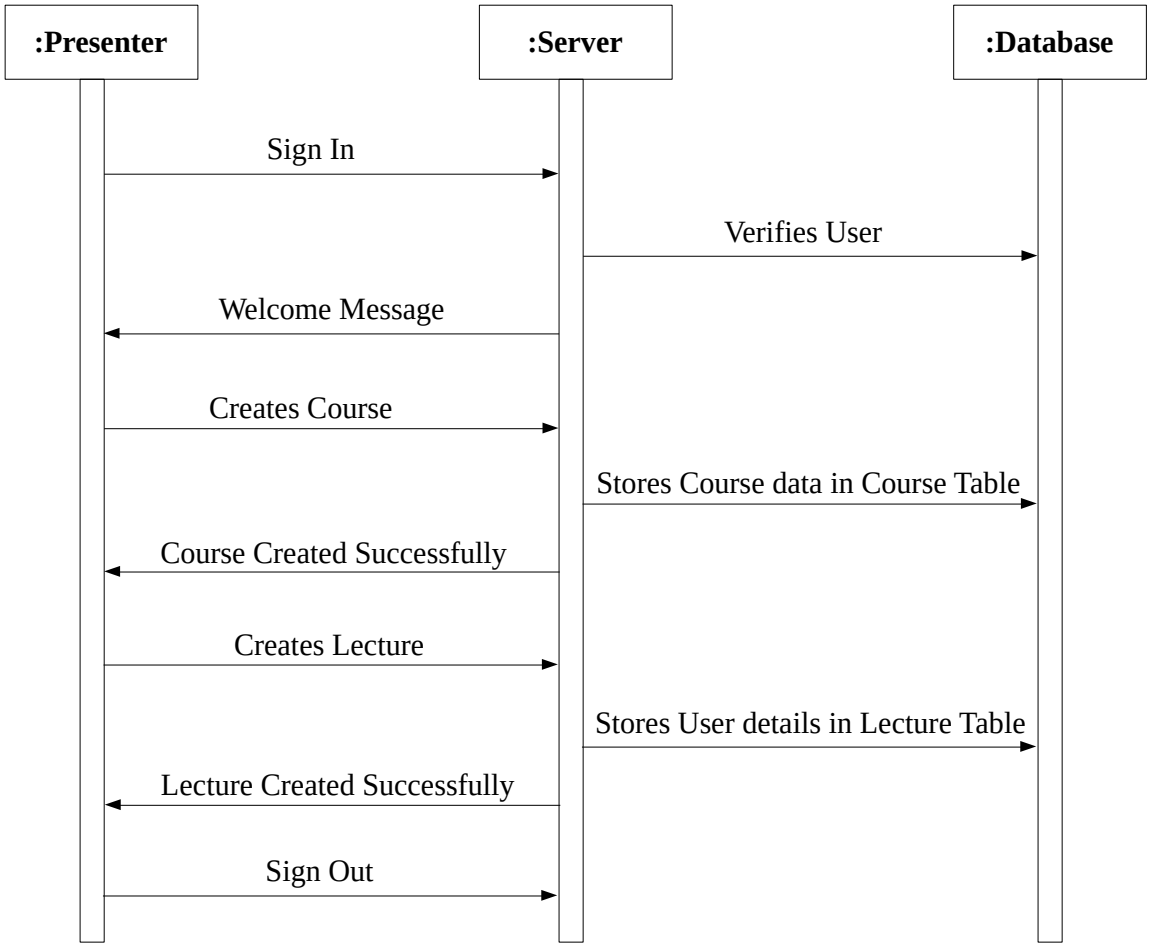
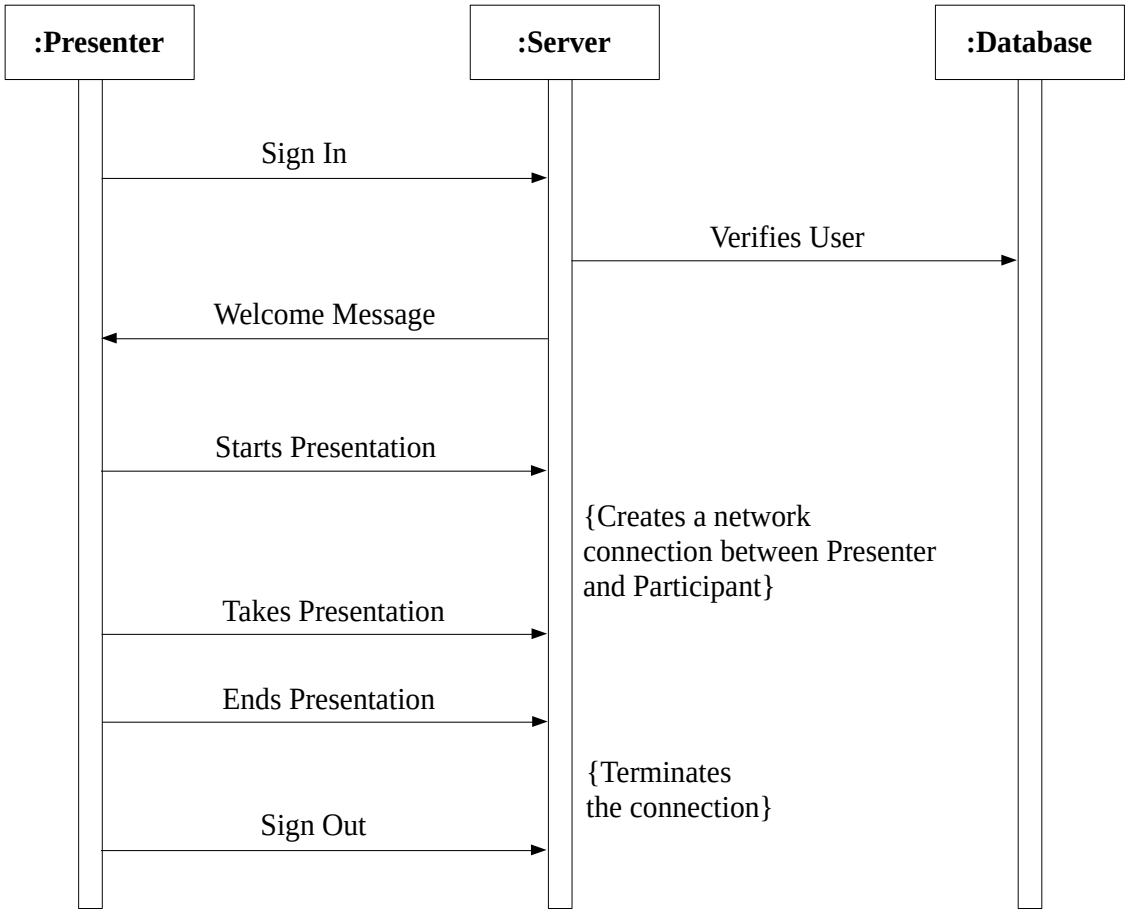


Fig. 3.6 Sequence Diagram - Course and Lecture Creation

3.4.3 Sequence Diagram for Starting Presentation



3.7 Sequence Diagram - Starting Presentation

3.4.4 Sequence Diagram for Joining Presentation

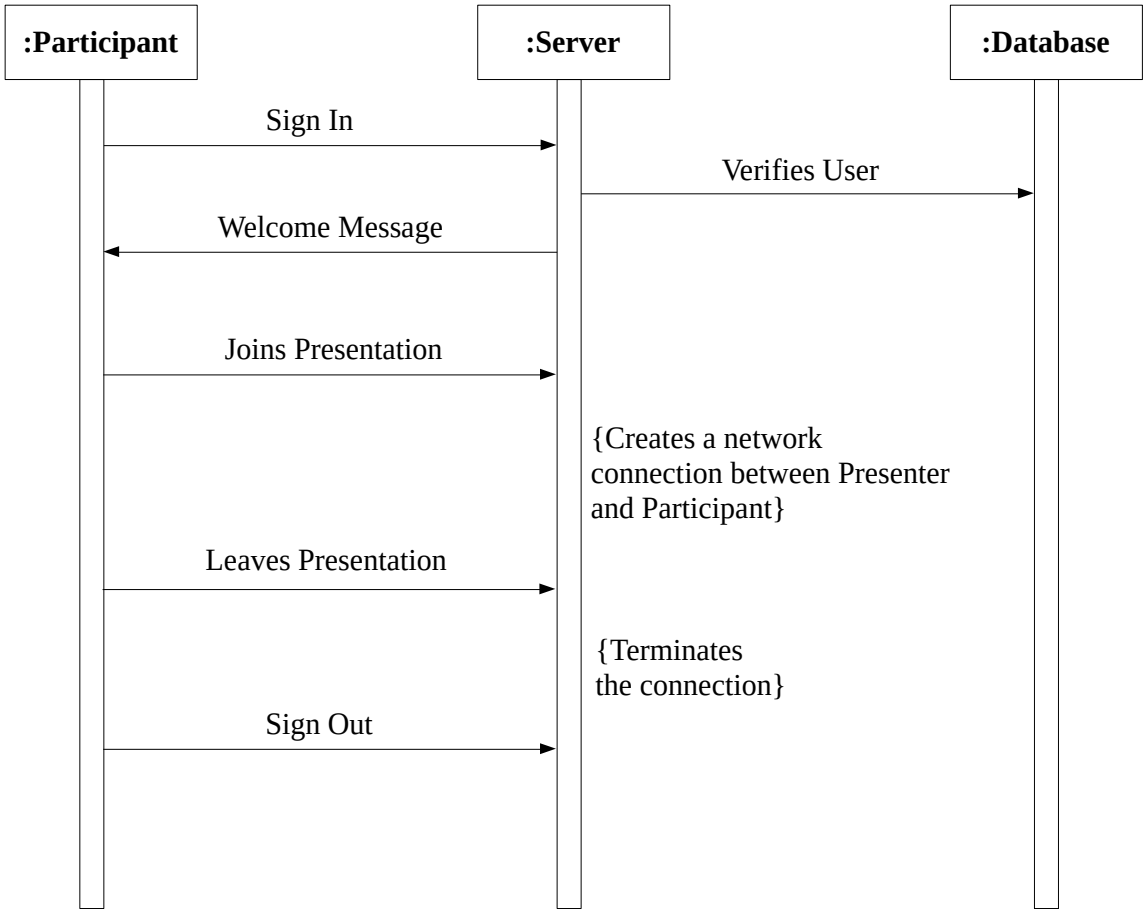


Fig. 3.8 Sequence Diagram - Joining Presentation

3.4.5 Sequence Diagram for Storing Chat and Whiteboard Snapshots

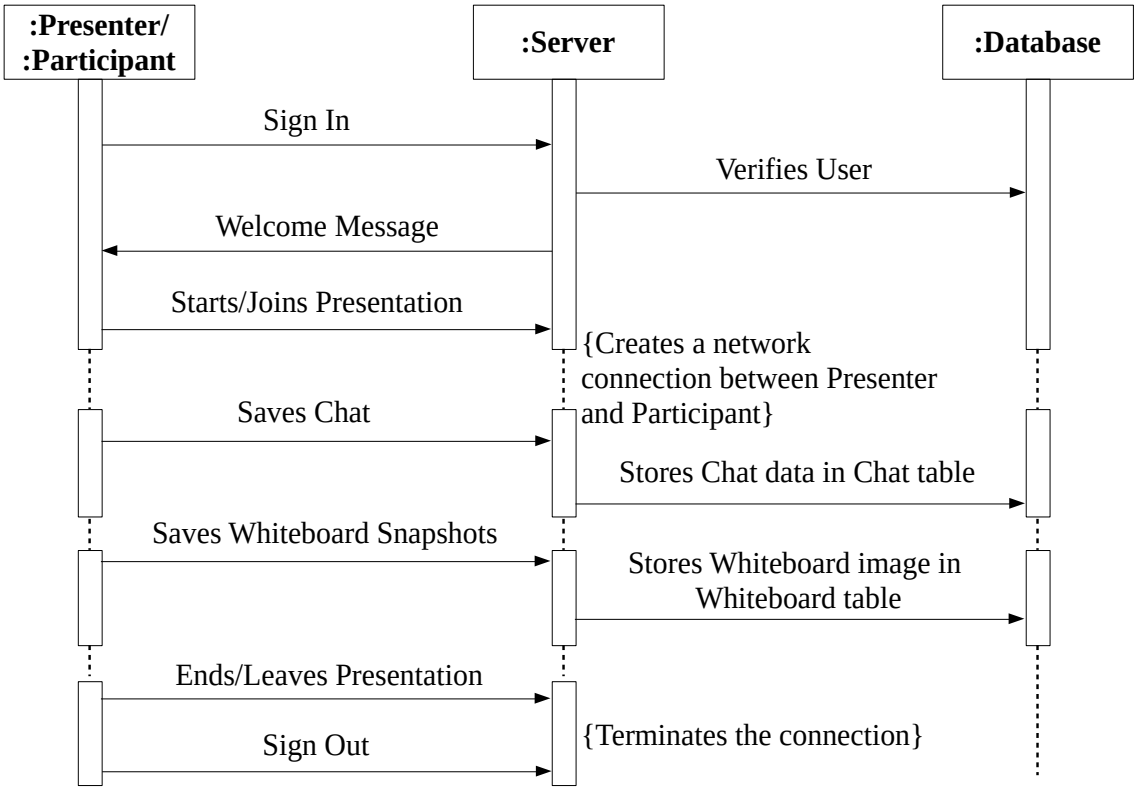


Fig. 3.9 Sequence Diagram - Storing Chat, Whiteboard Snapshots or Lecture Video

3.5 Activity Diagram

3.5.1 Activity Diagram for Presenter

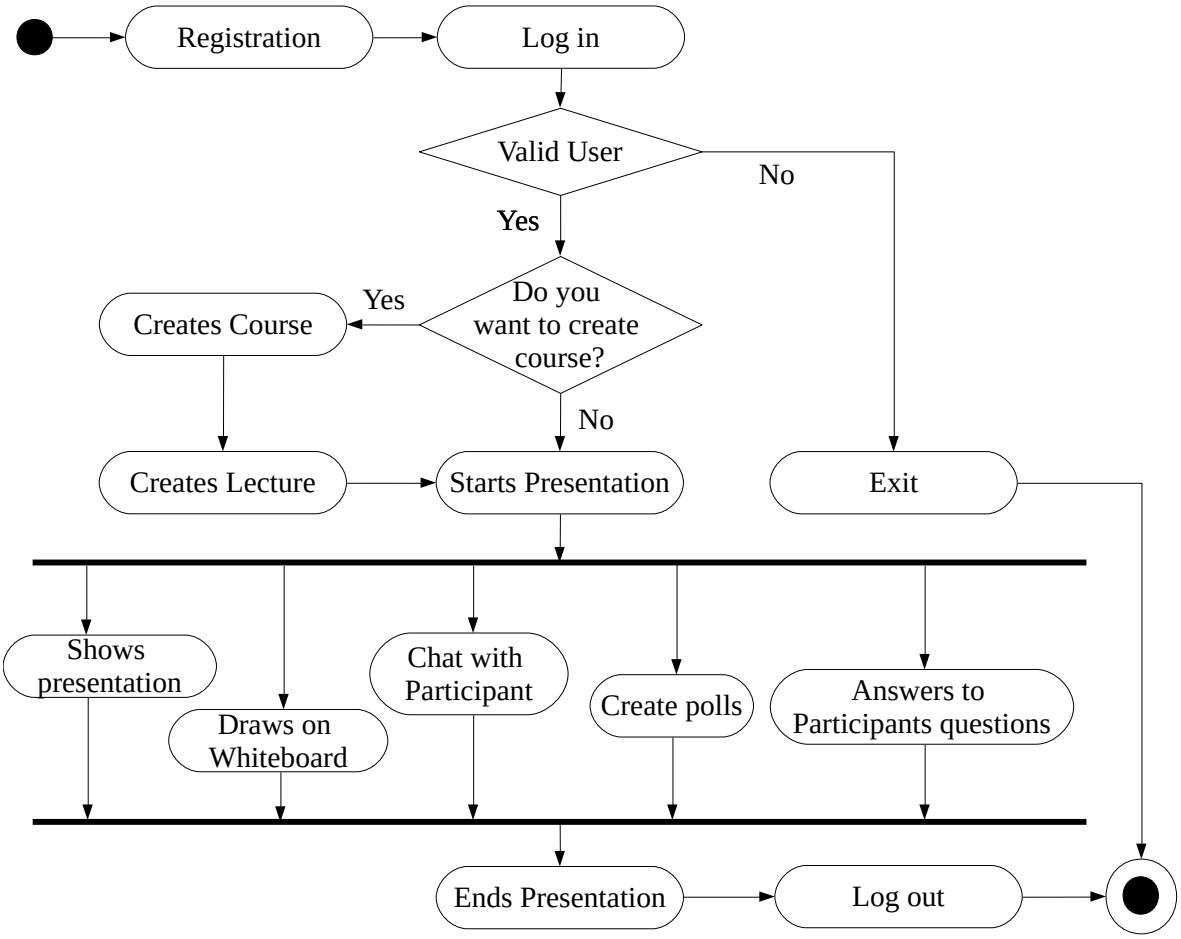


Fig. 3.10 Activity Diagram - Presenter

3.5.2 Activity Diagram for Participant

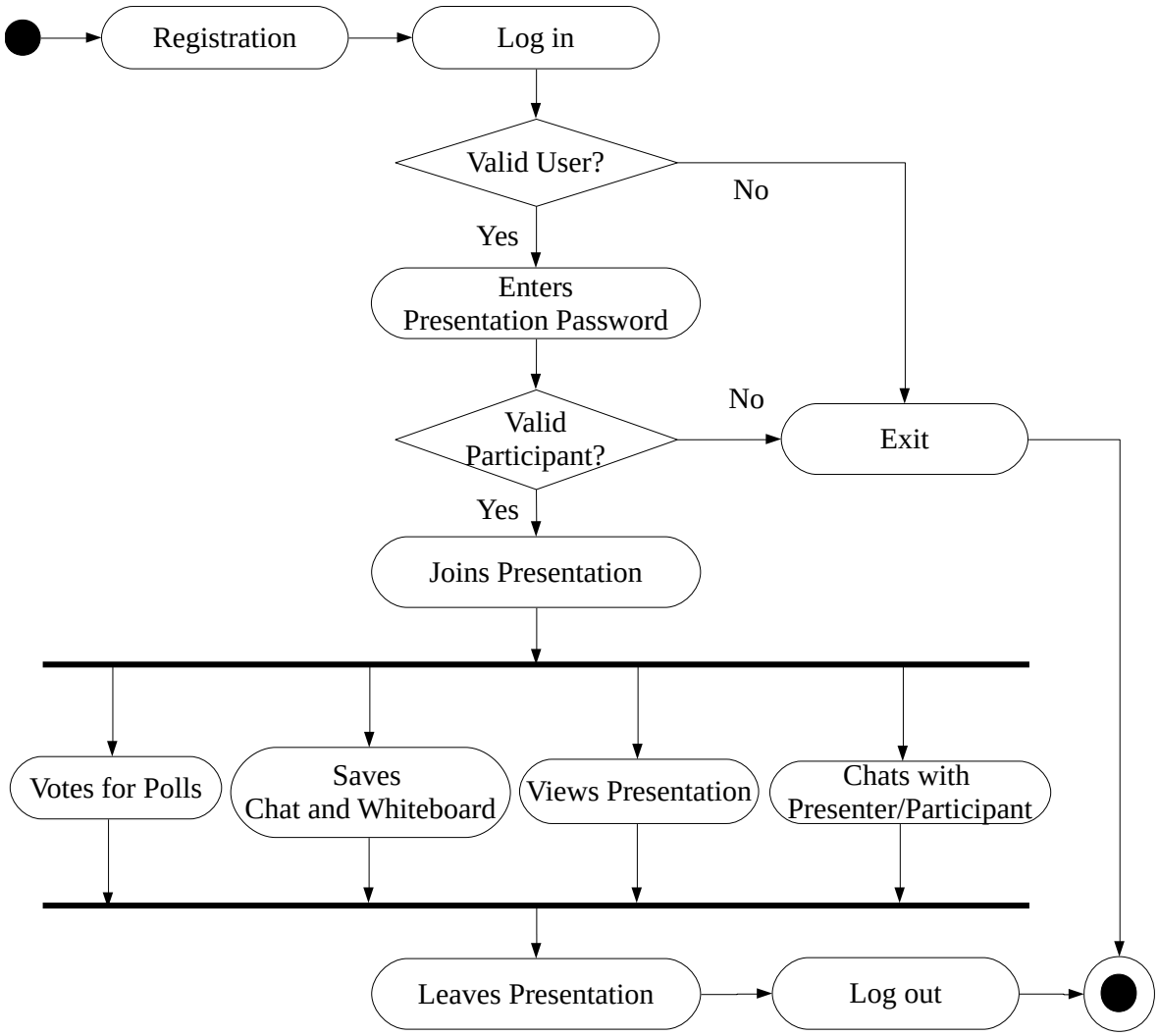


Fig. 3.11 Activity Diagram - Participant

3.6 Class Diagram

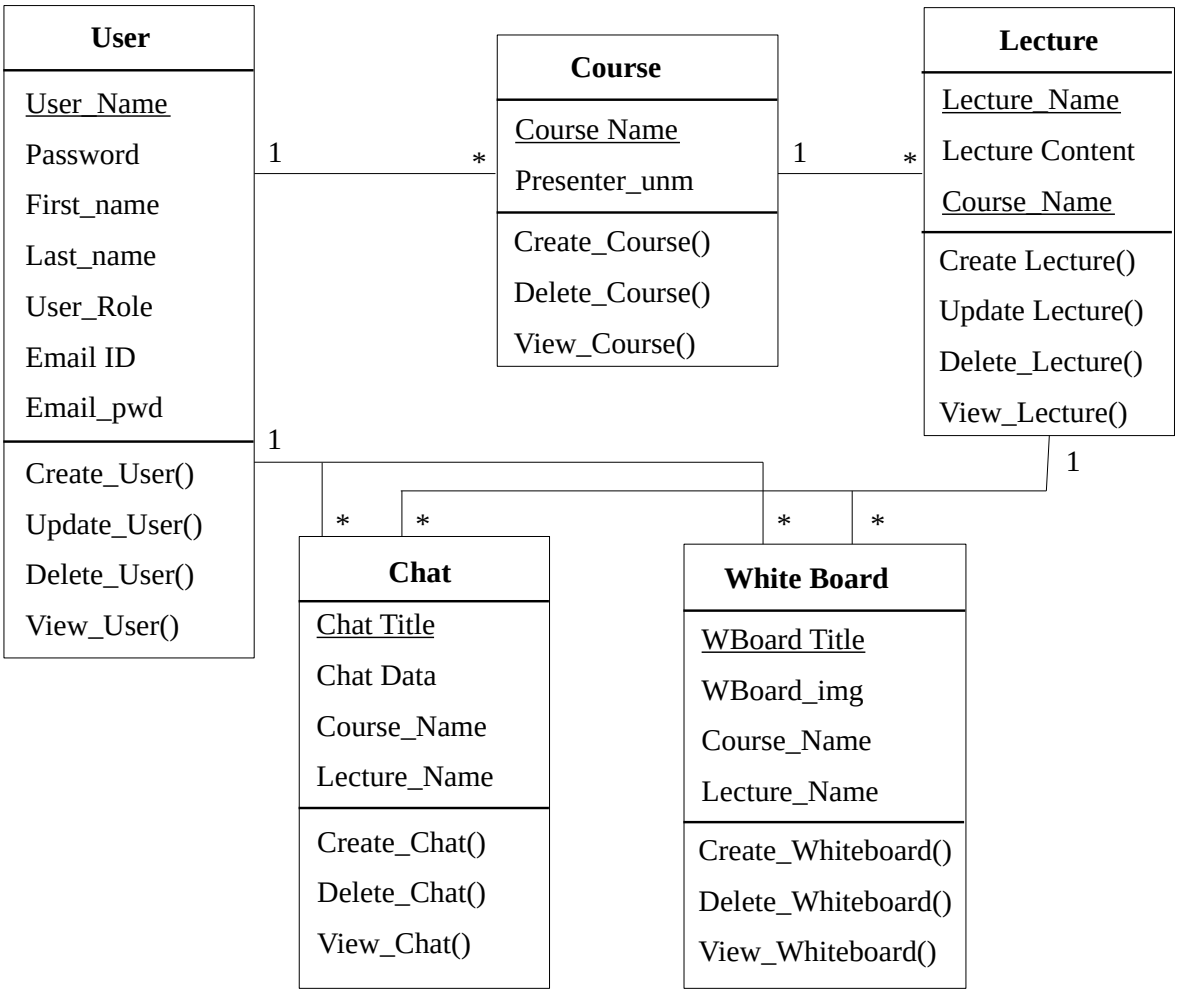


Fig. 3.12 Class Diagram

4. Design

4.1 System Flow Diagram

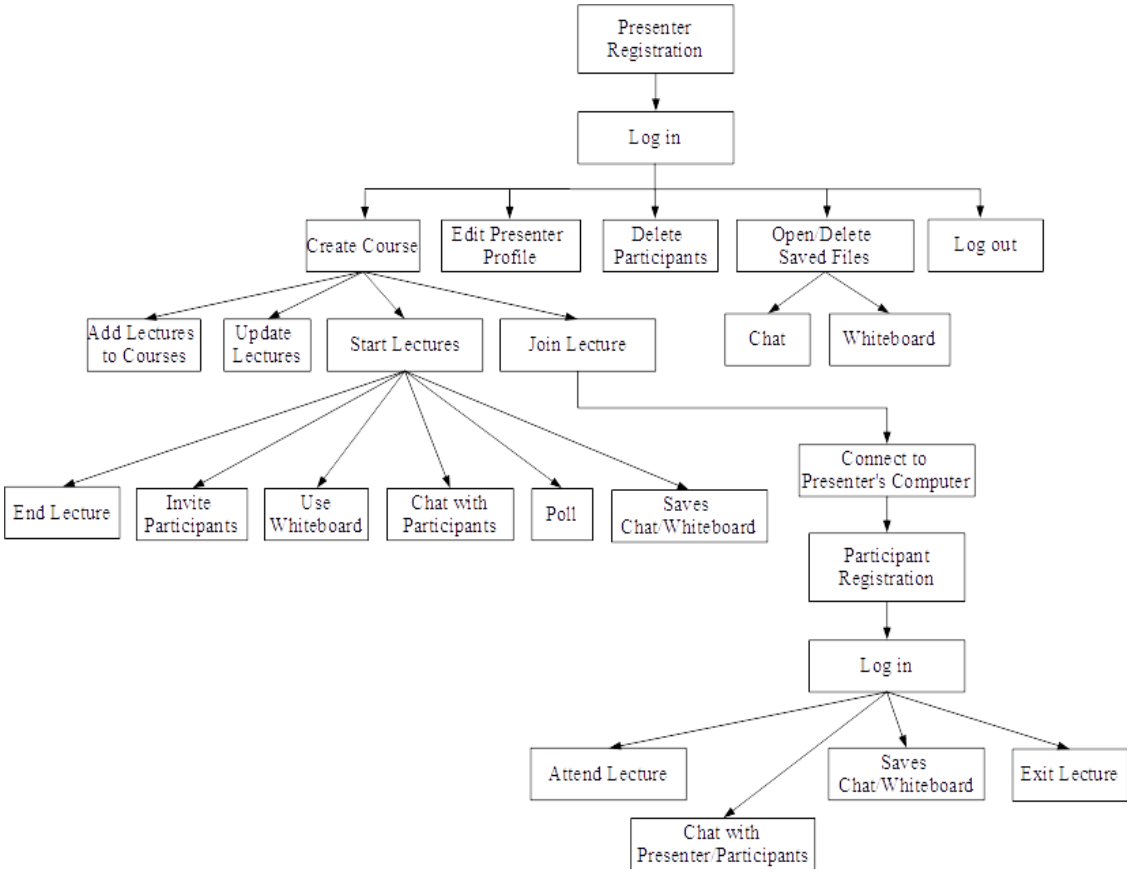


Fig. 4.1 System Flow Diagram

4.2 Data Dictionary

Table 4.1: Course

Course				
Column No.	**Column Name**	**Datatype**	**Constraints**	**Allow Null**
1	Course_Name	Varchar2(30)	Primary Key	No
2	Presenter_unm	Varchar2(30)	Foreign Key	No

Table 4.2: Lecture

Lecture				
Column No.	**Column Name**	**Datatype**	**Constraints**	**Allow Null**
1	Lecture_Name	Varchar2(30)	Primary Key	No
2	Lecture_Content	Varchar2(200)		Yes
3	Course_Name	Varchar2(30)	Primary Key, Foreign Key	No

Table 4.3: Course_Viewer_Info

Course_Viewer_Info				
Column No.	**Column Name**	**Datatype**	**Constraints**	**Allow Null**
1	Course_name	Varchar2(30)	Foreign Key	No
2	Lecture_name	Varchar2(30)		No
3	Viewer_unm	Varchar2(30)	Foreign Key	No

Table 4.4: UserInfo

UserInfo				
Column No.	**Column Name**	**Datatype**	**Constraints**	**Allow Null**
1	User_Name	Varchar2(30)	Primary Key	No
2	First_name	Varchar2(25)		No
3	Last_name	Varchar2(25)		No
4	Password	Varchar2(30)		No
5	User_Role	Varchar2(30)		No
6	Email_ID	Varchar2(50)		No
7	Email_pwd	Varchar2(30)		Yes

Table 4.5: Chat

Chat				
Column No.	**Column Name**	**Datatype**	**Constraints**	**Allow Null**
1	Chat_Title	Varchar2(30)	Primary Key	No
2	Chat_Data	Blob		No
3	Course_Name	Varchar2(30)	Foreign Key	Yes
4	Lecture_Name	Varchar2(30)		Yes

Table 4.6: Whiteboard

Whiteboard				
Column No.	**Column Name**	**Datatype**	**Constraints**	**Allow Null**
1	WBoard_Title	varchar2(30)	Primary Key	No
2	WBoard_img	Blob		No
3	Course_Name	varchar2(30)	Foreign Key	Yes
4	Lecture_Name	varchar2(30)		Yes

4.2 Relationship between Tables

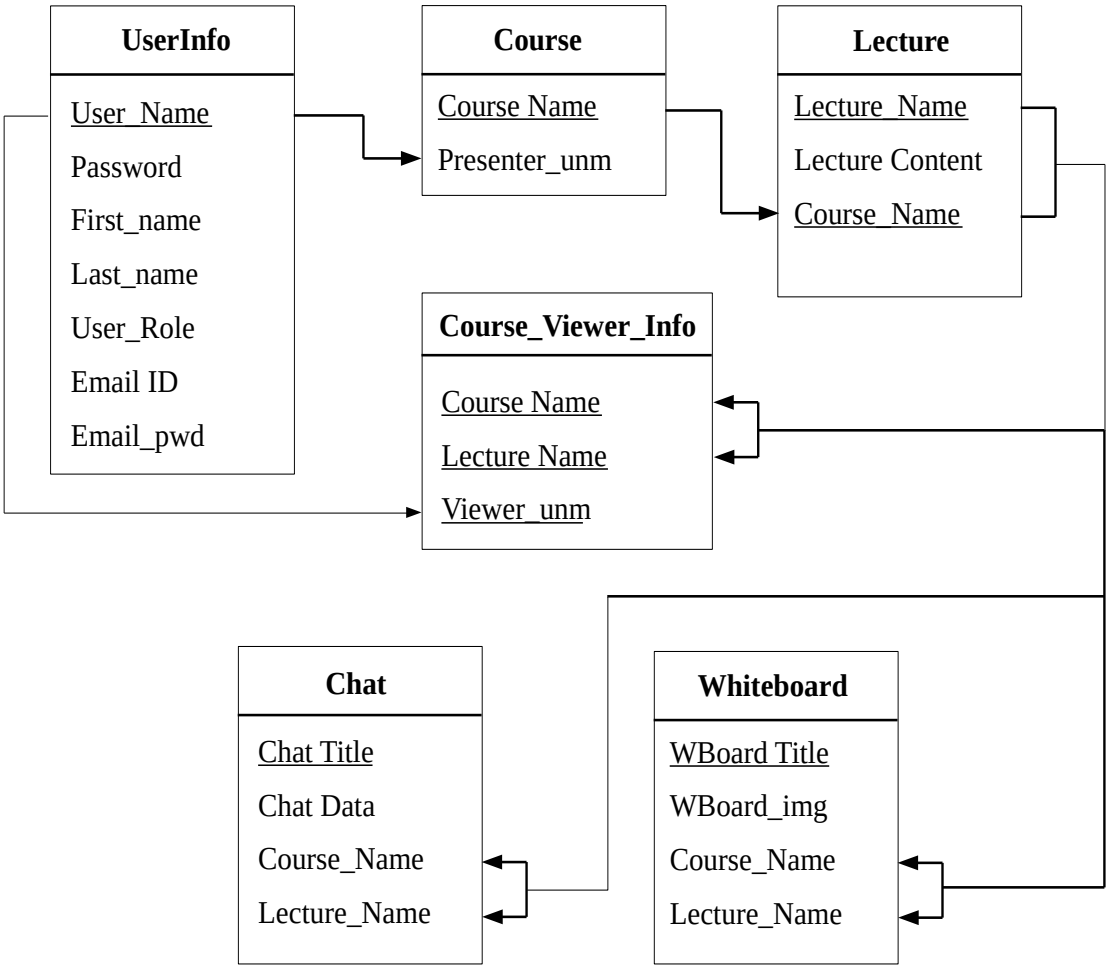


Fig. 4.2 Relationship between tables

4.4 User Interface

4.4.1 Presenter Registration

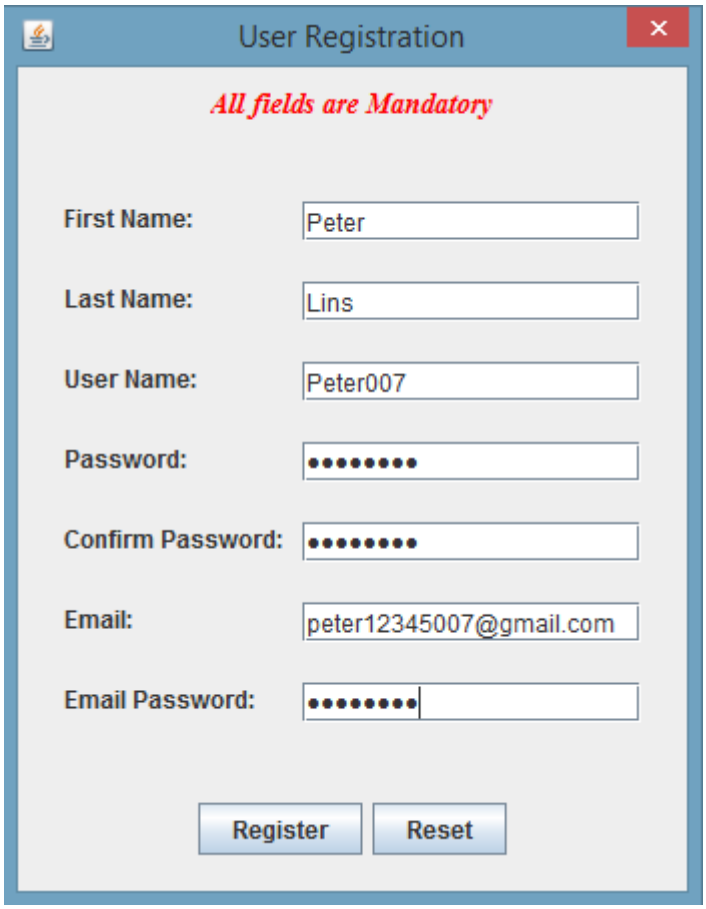


Fig. 4.3 User Registration

- Presenter registers using this form.

4.4.2 Login Form

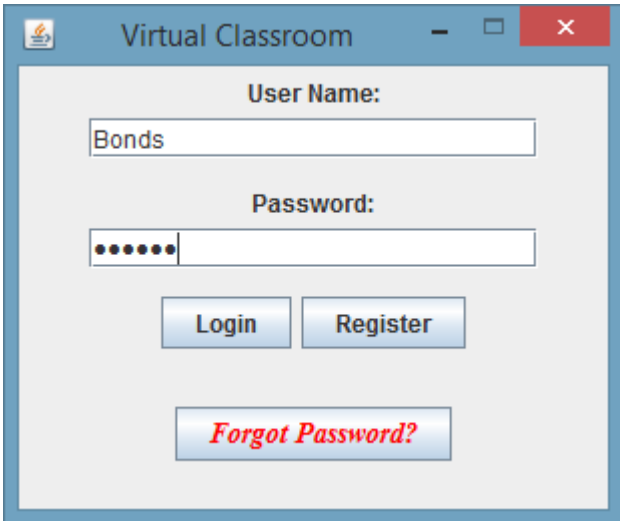


Fig. 4.4 User Login

- User Logs in using this form.

4.4.3 Meeting Menu

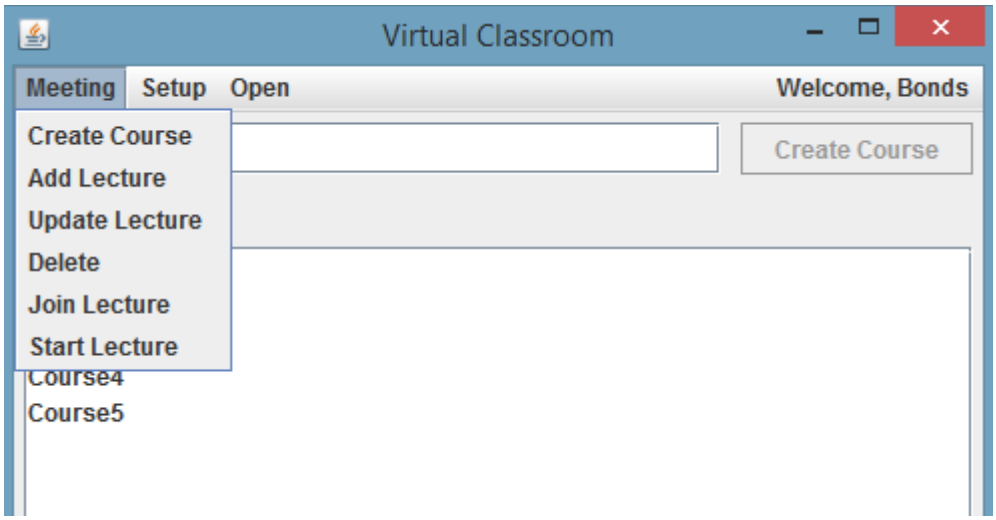


Fig. 4.5 Meeting Menu

- Meeting menu contains menus for creating course, adding, updating and deleting lectures and for starting and joining lectures.

- **4.4.4 Setup Menu**

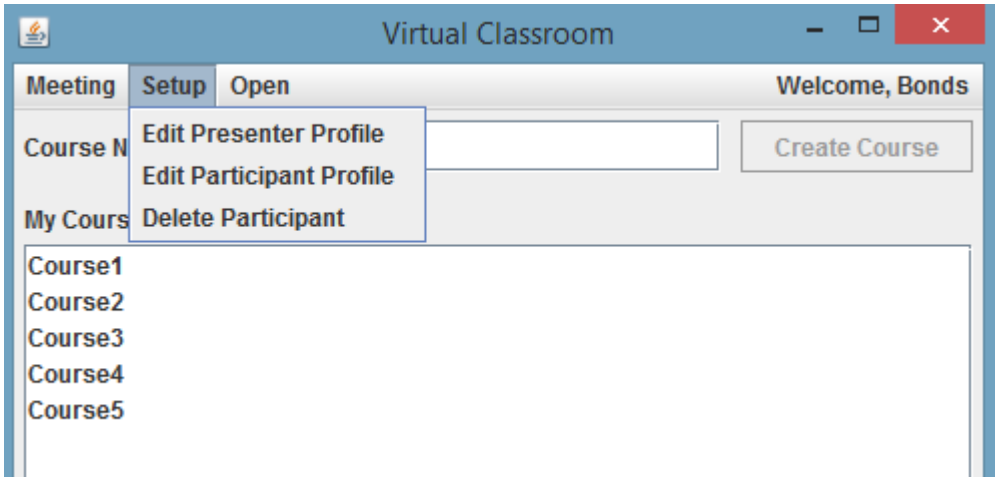


Fig. 4.6 Setup Menu

- Setup menu contains menus for editing presenter or participant profile and for deleting participants.

4.4.5 Open Menu

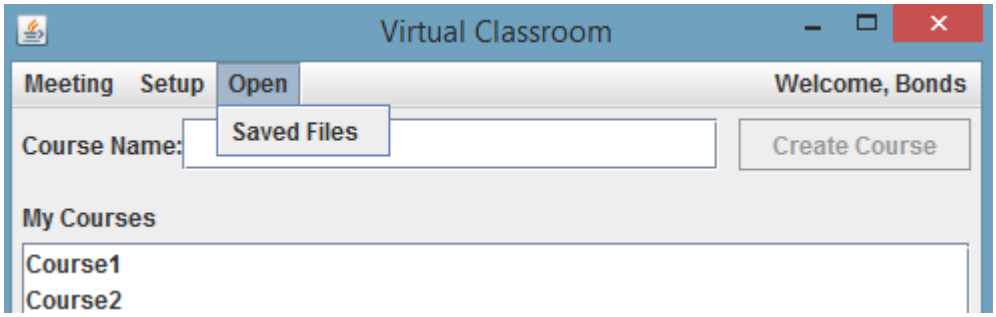


Fig. 4.7 Open Menu

- Open menu is used for opening and deleting saved files.

4.4.6 Logout Menu

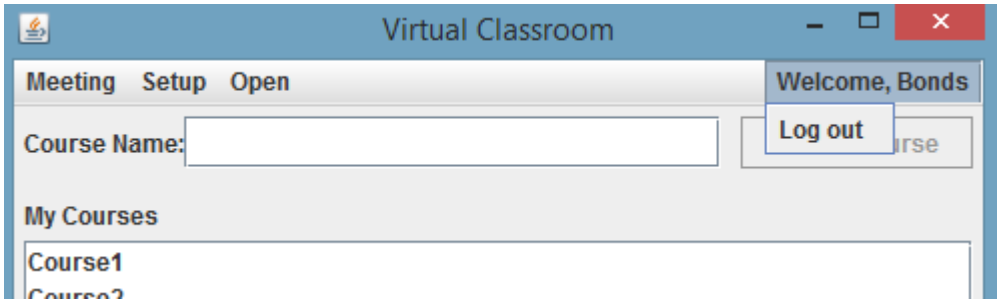


Fig. 4.8 Logout Menu

- Logout menu is used for signing out from the virtual classroom.

4.4.7 Create Course

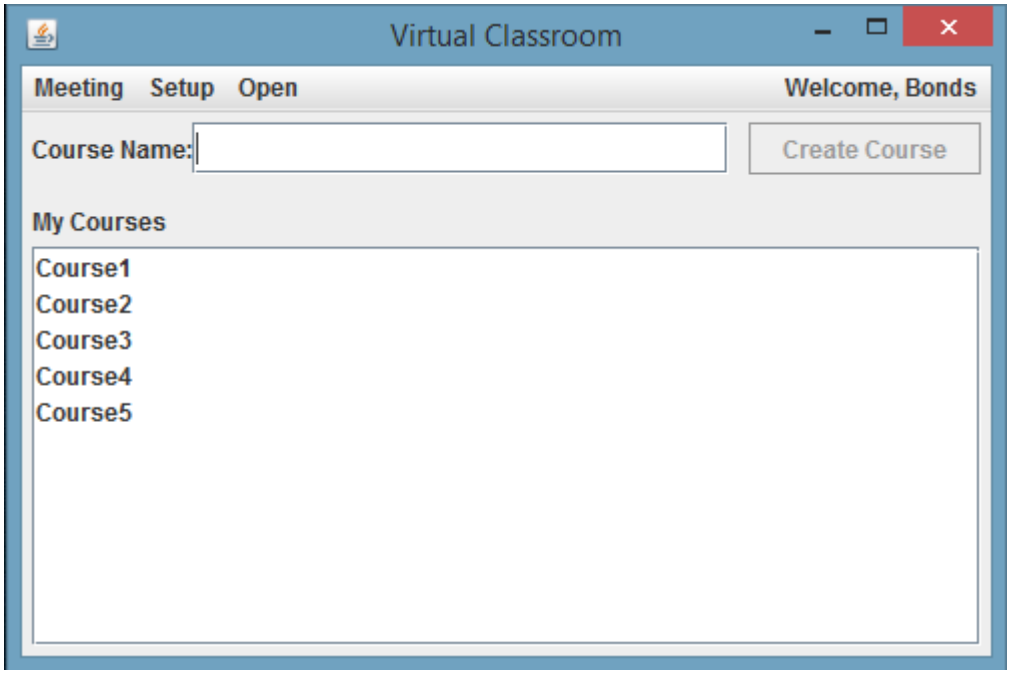


Fig. 4.9 Create Course

- Presenter can create new course from this form.

4.4.8 Add Lecture

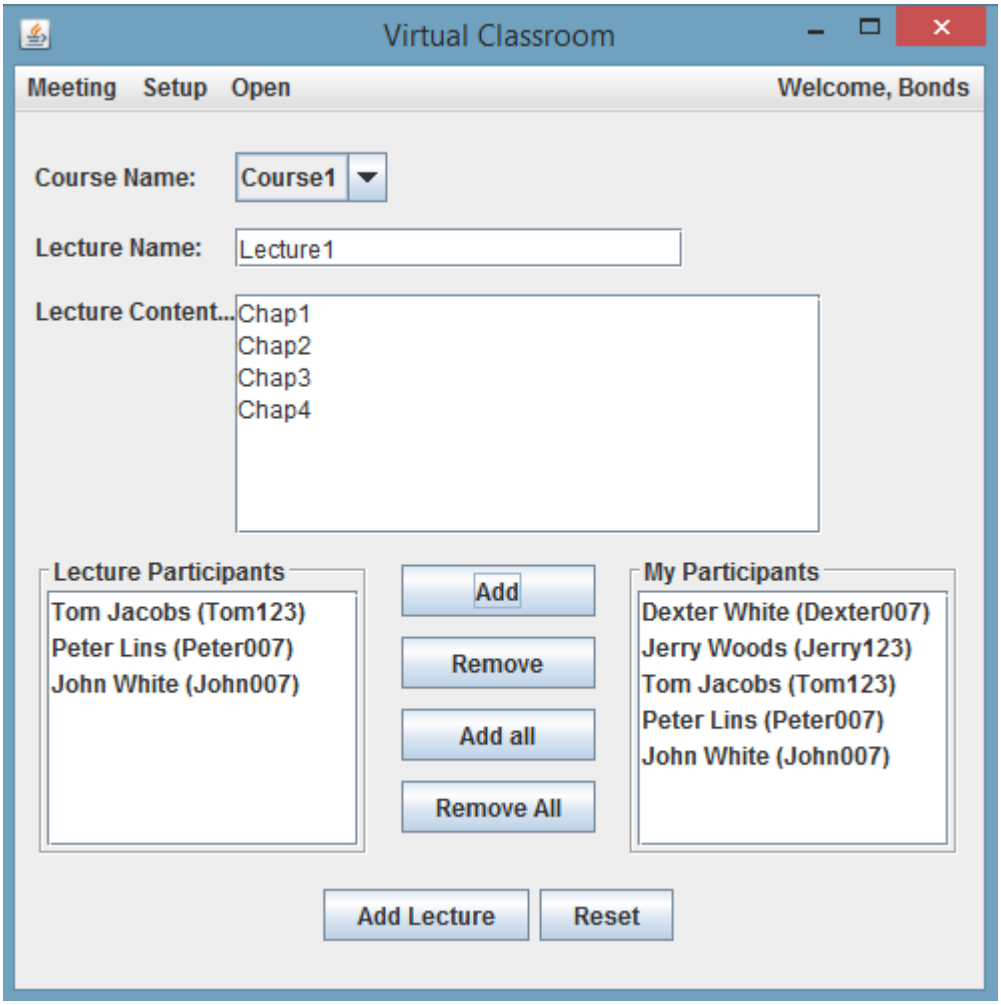


Fig. 4.10 Add Lecture

- Presenter can add new lectures to particular courses using this form.
- He can add or remove participants to the new lecture using Add, Remove, Add all, and Remove all button.

4.4.9 Update Lecture

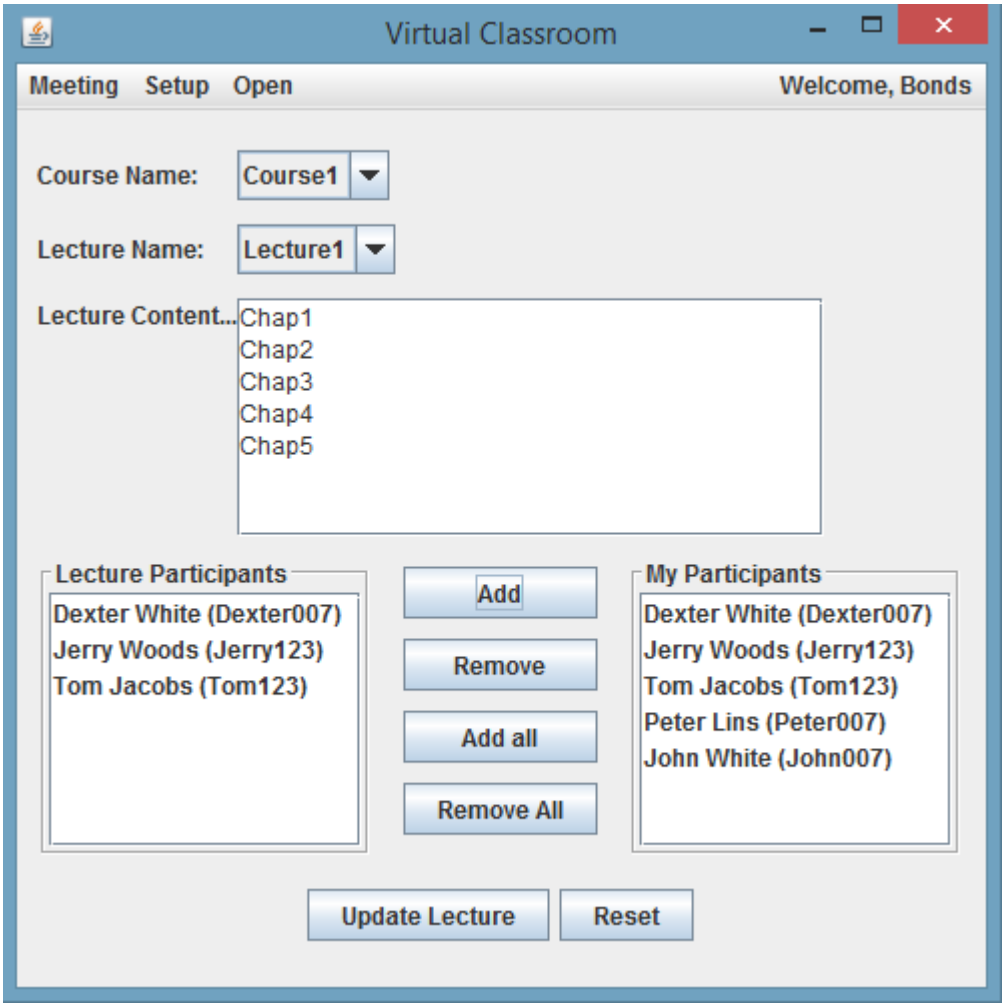


Fig. 4.11 Update Lecture

- Presenter can update existing lectures of particular courses using this form.

4.4.10 Delete Courses and Lectures

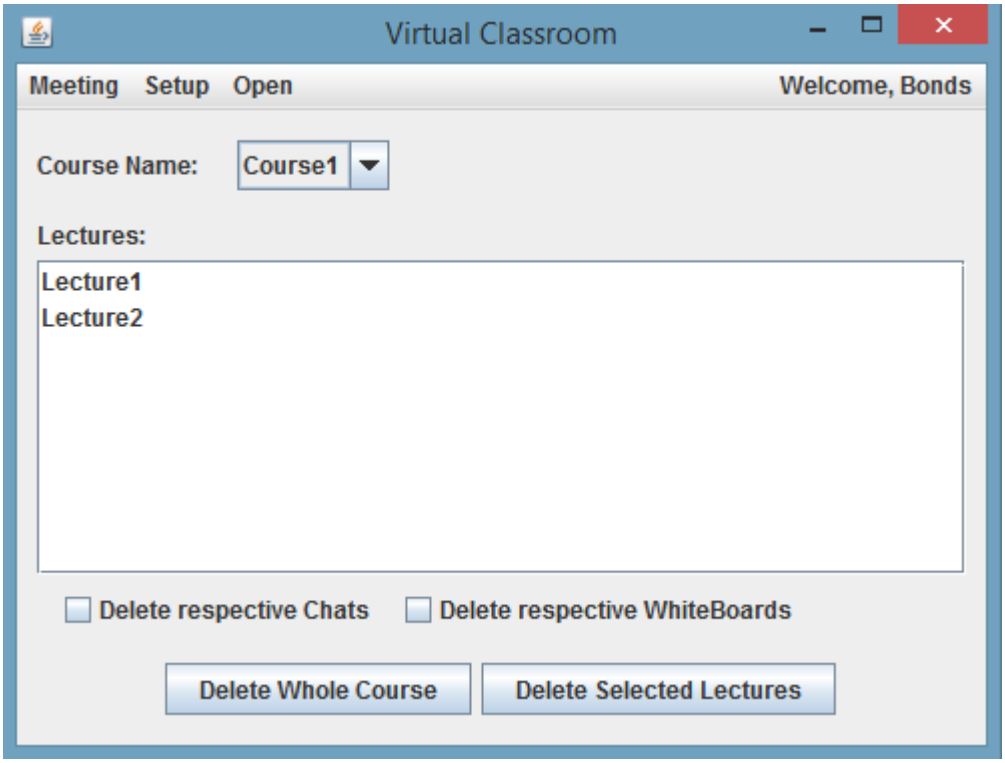


Fig. 4.12 Delete Courses and Lectures

- Presenter can delete whole course or a lecture in a particular course using this form.
- He can also delete respective Chats and Whiteboards of respective lectures using this form.

4.4.11 Start Lecture

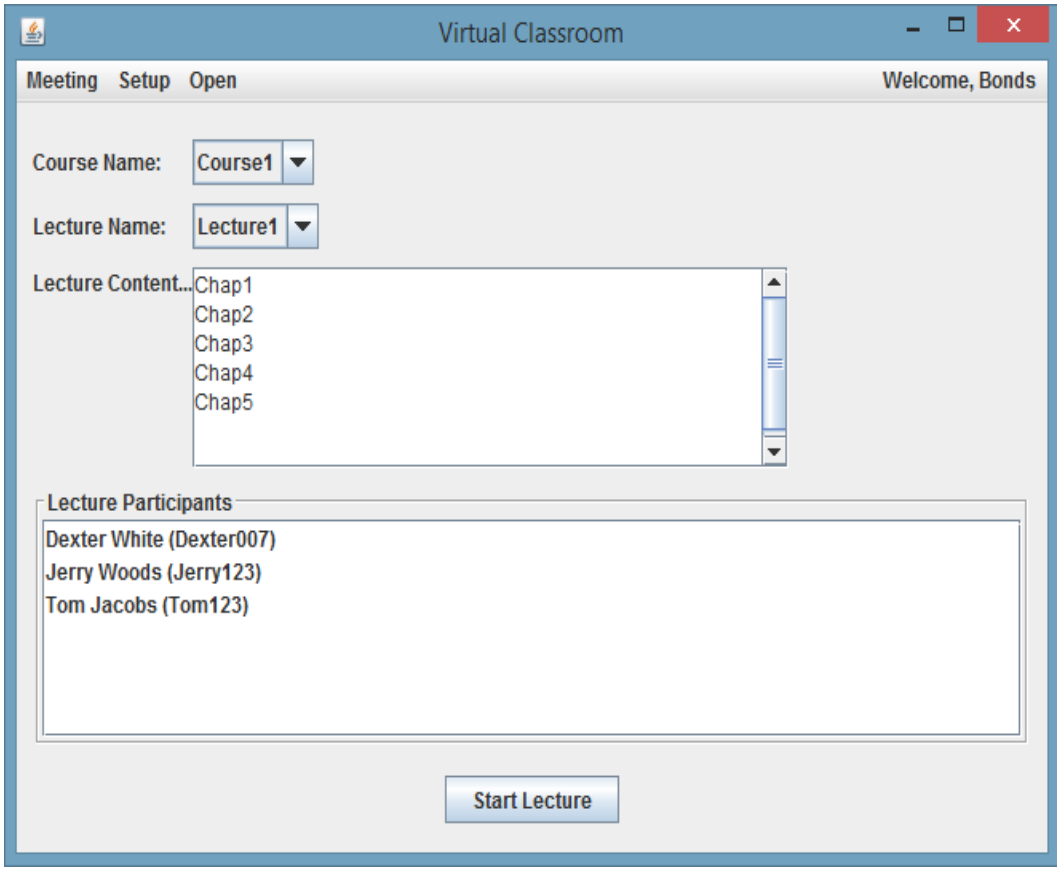


Fig. 4.13 Start Lecture

- Presenter starts the lecture from this form.

4.4.12 Edit Presenter Profile

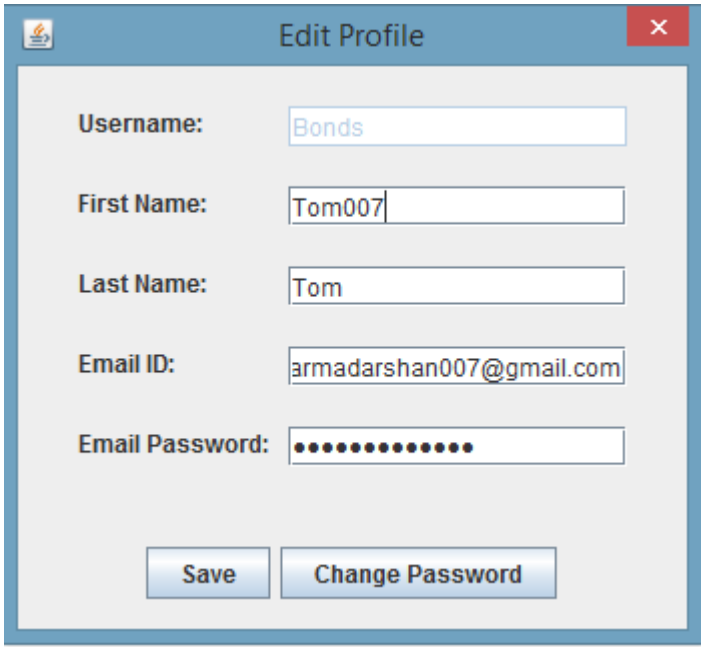


Fig. 4.14 Edit Presenter Profile

4.4.13 Delete Participants

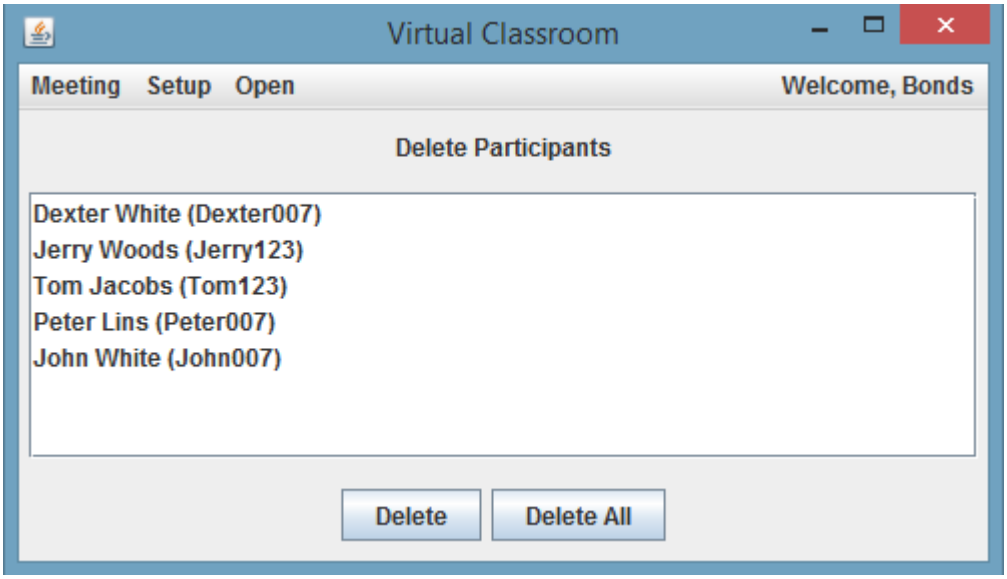


Fig. 4.15 Delete Participants

- Presenter can delete his participants from this form.

4.4.14 Open/ Delete Saved Files

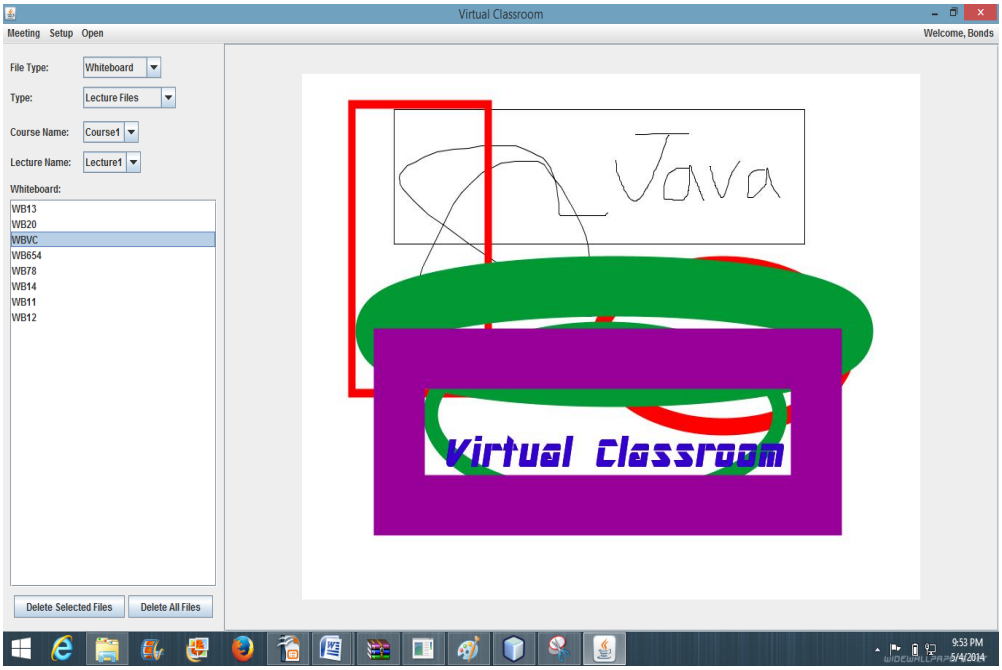


Fig. 4.16 Open/ Delete Saved Files

- Presenter can open or delete saved files: Chats or Whiteboards from this form.
- There are to types of files:
    - **Non Lecture Files**: Files which does not belong to particular lecture.
    - **Lecture Files**: Files which belongs to a particular lecture of a course.
- He can filter through the course and lecture names to open required files.
- He can also delete the files from this from.

4.4.15 Lecture: Start up Page

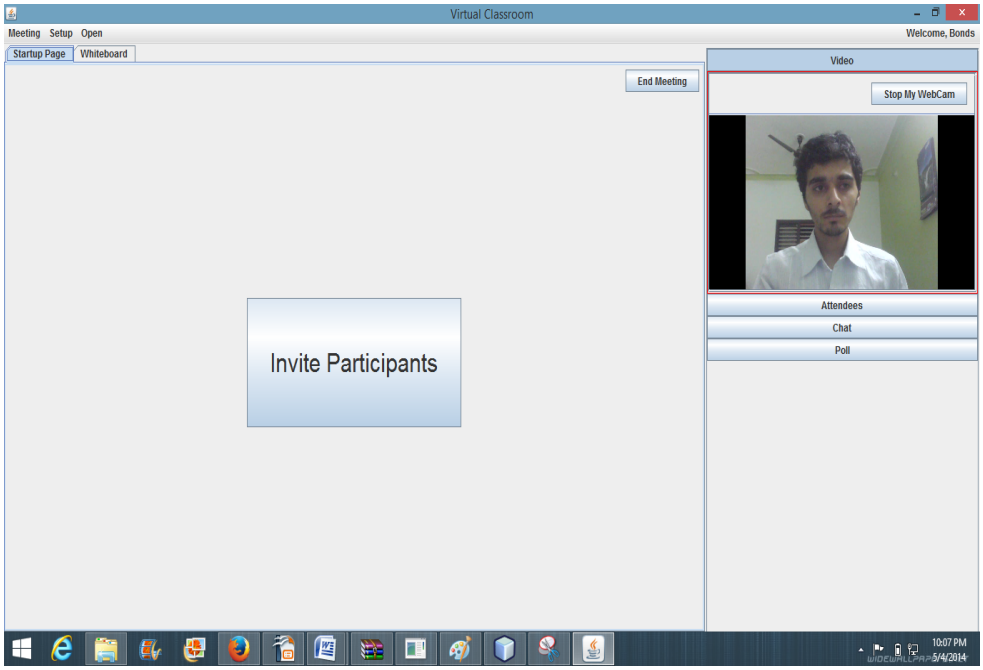


Fig. 4.17 Lecture: Start up Page

- This is the lecture start up page.
- The presenter can invite new participants using the "Invite Participants" button.
- The presenter can end the meeting using "End Meeting" button.

4.4.16 Invite Participants

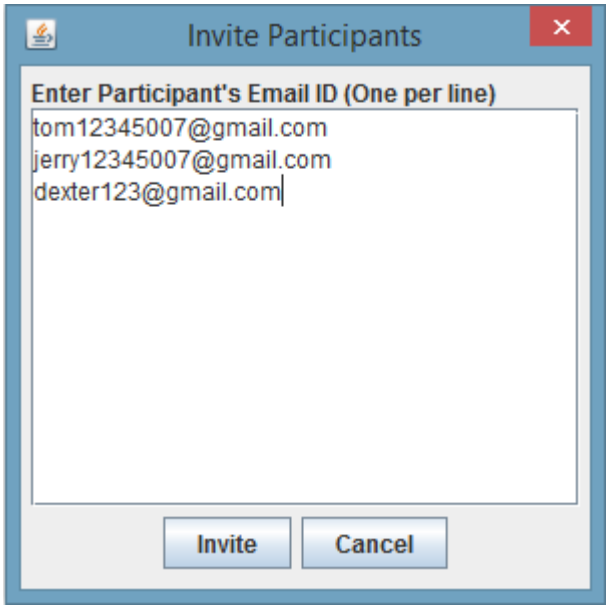
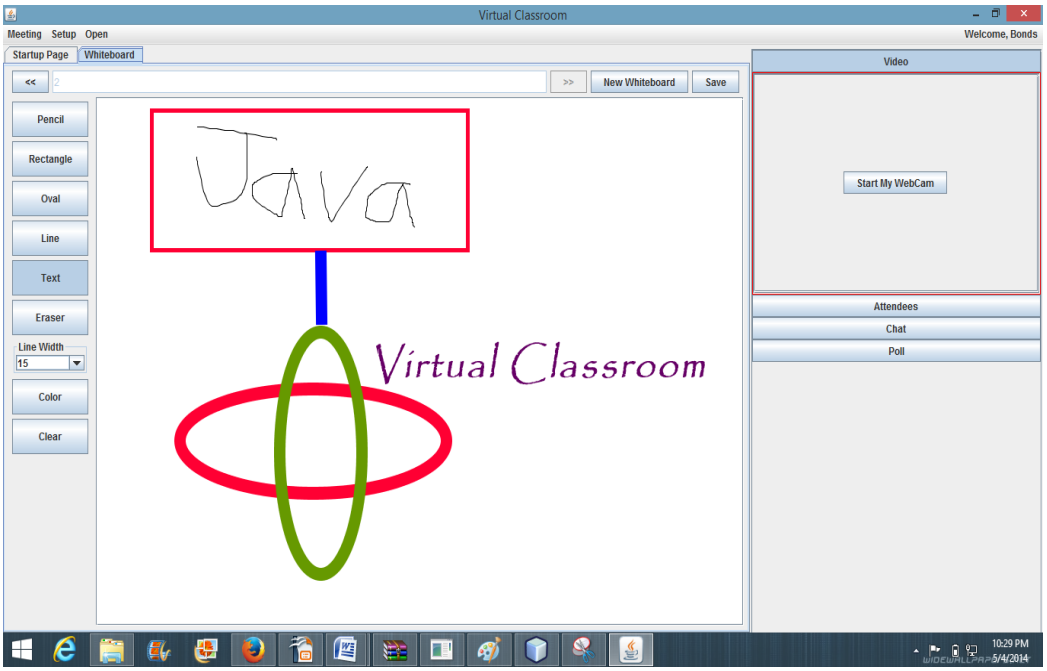


Fig. 4.18 Invite Participants

4.4.17 Lecture: Whiteboard

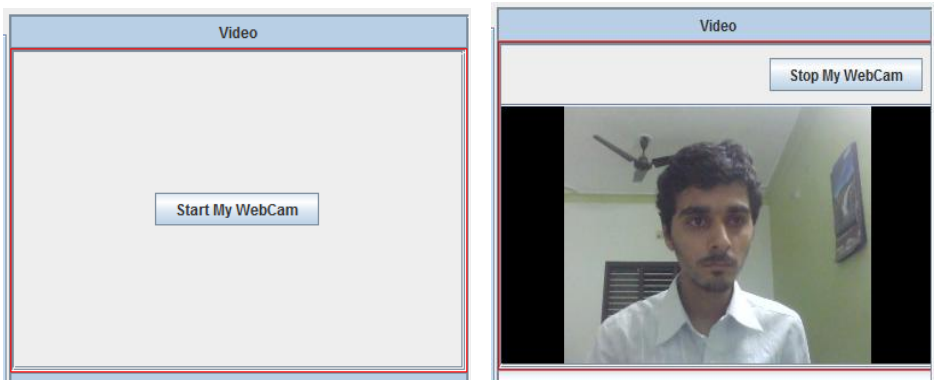


4.19 Lecture: Whiteboard

- This is the Whiteboard of the presenter.

- He can draw different shapes and write text using the various whiteboard tools to explain course contents to his participants.
- He can open multiple whiteboards and save whiteboards.

4.4.18 Lecture: Presenter's Video



4.20 Lecture Presenter's Video

- Presenter can start and stop his webcam using this accordion menu.

4.4.19 Lecture: Chat

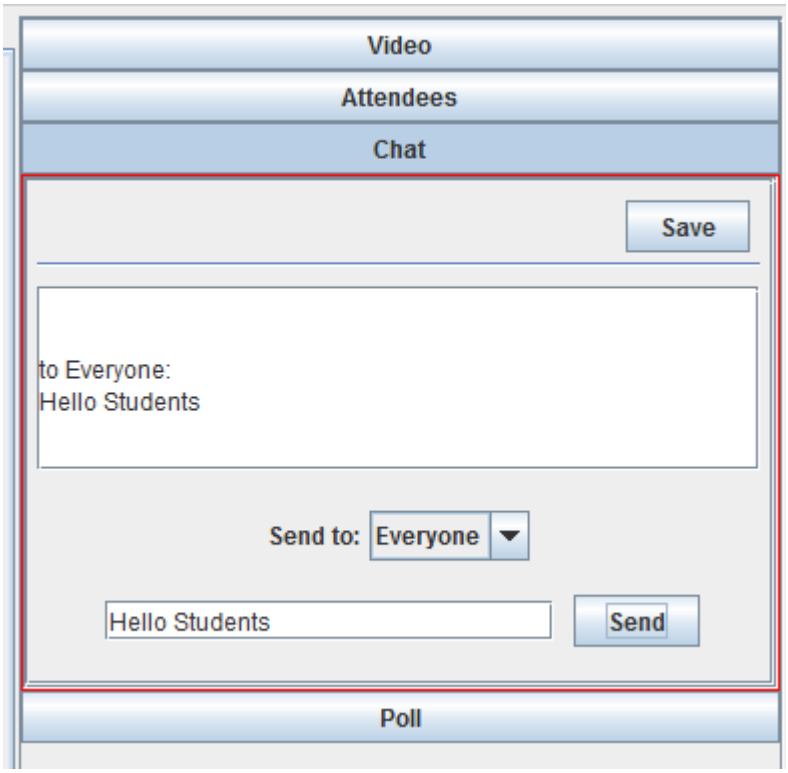


Fig. 4.21 Lecture: Chat

- User can send message to all or a particular user using this the Chat accordion menu.

4.4.20 Lecture: Logged In Attendees

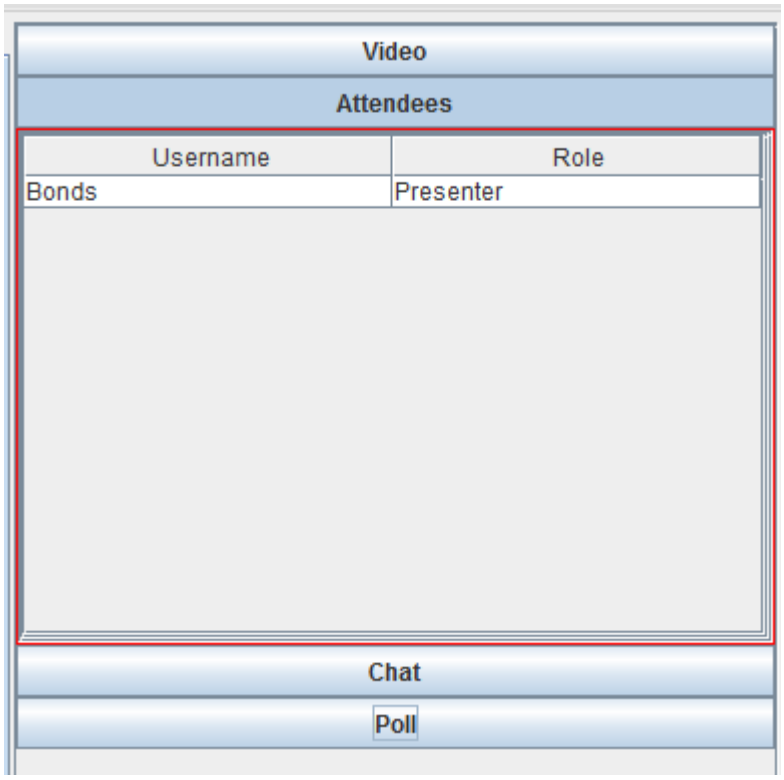


Fig. 4.22 Lecture: Logged In Attendees

- This accordion menu displays the logged in attendees and their roles: Presenter or Participant.

4.4.21 Lecture: Poll

- **Poll: Question Generation**

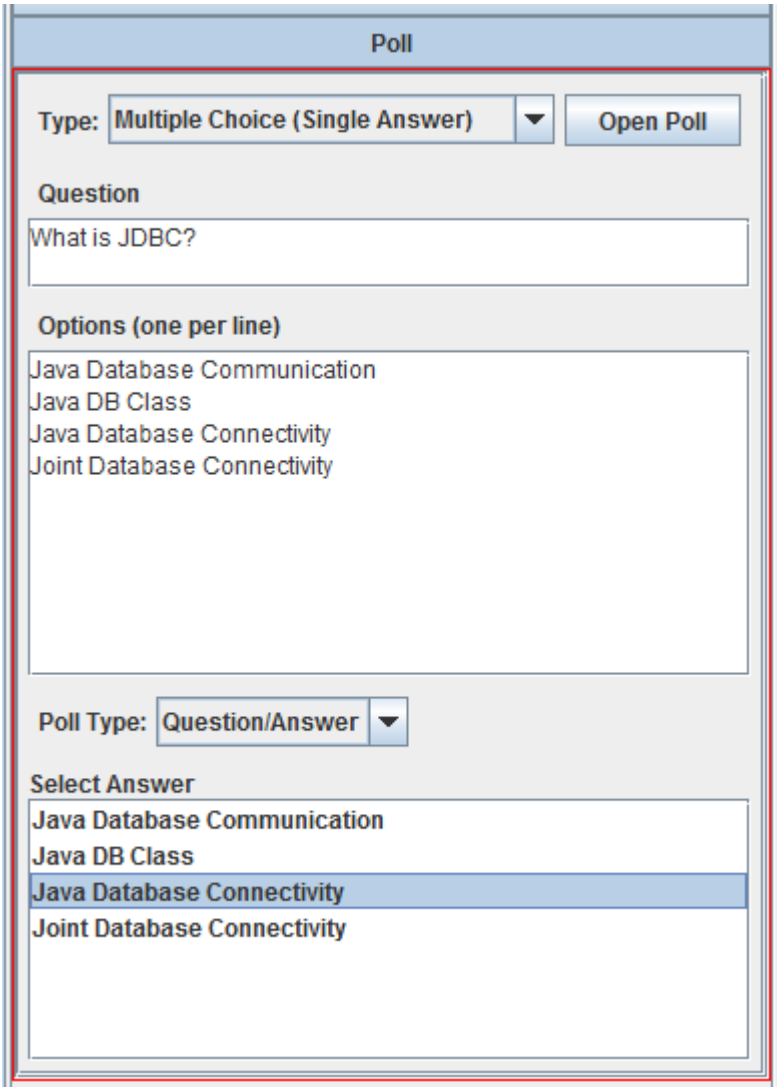


Fig. 4.23 Poll: Question Generation

- Presenter can create polls using this accordion menu.
- He can create different types of poll:
  - Single Choice
  - Multiple Choice
  - Short Answer
- He opens the poll using the open poll button.

- **Poll: Opened Poll**

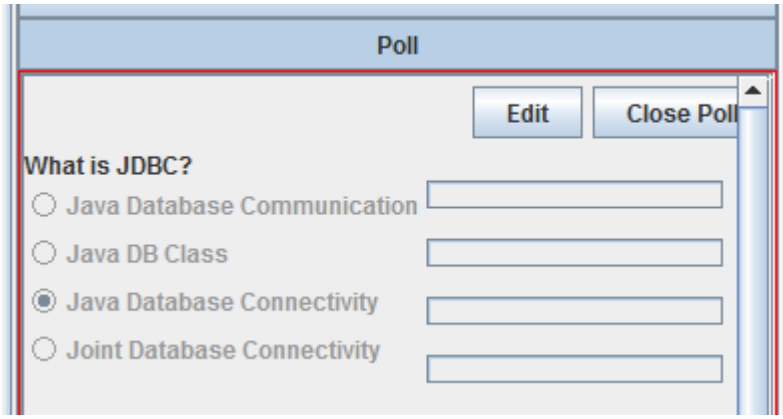


Fig. 4.24 Poll: Opened Poll

- When the poll is opened, the above form opens which displays the participants responses.

4.4.22 Join Lecture

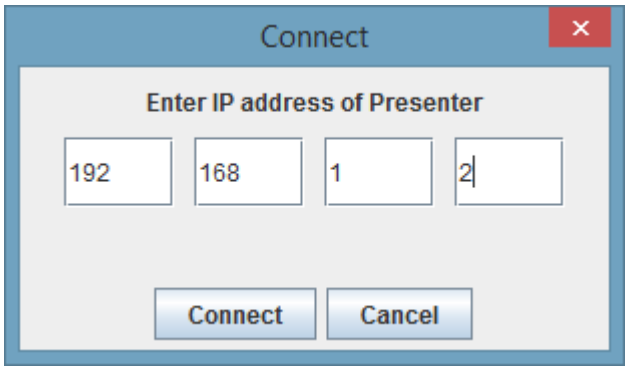


Fig.4.25 Connect to Server (Presenter's Computer)

- The participant has to enter the ip address of the presenter's computer and after pressing the "Connect" button the participant's computer creates a socket connection with the presenter's computer.
- After successful connection, the participant can login and join the lecture.

5. Implementation

The system implementation is the next phase after completion of design phase. The purpose of the implementation phase is to transfer the design into executable computer software. In the implementation phase the system is built to meet the design specification. Implementation phase include some additional issues that must be taken care of hardware devices, software, utilities or tools that aid in development and the problems faced during their installation.

5.1 Implementation Environment

The technologies used to implement virtual classroom is as follows:

- **Front End: Java**

Java is an object-oriented programming language developed by James Gosling and his colleagues at Sun Microsystems in the early 1990s. The language, which was designed to be platform independent, is a derivative of early 1990's-style C++ with a simpler syntax, a robust runtime environment and simplified memory management.

Java is a computer programming language that is concurrent, class-based, object-oriented, and specifically designed to have as few implementation dependencies as possible. It is intended to let application developers "write once, run anywhere" (WORA), meaning that code that runs on one platform does not need to be recompiled to run on another. Java applications are typically compiled to bytecode (class file) that can run on any Java virtual machine (JVM) regardless of computer architecture.

- **Back End: Oracle**

Oracle database (Oracle DB) is a relational database management system (RDBMS) from the Oracle Corporation. Originally developed in 1977 by Lawrence Ellison and other developers, Oracle DB is one of the most trusted and widely-used relational database engines. The system is built around a relational database framework in which data objects may be directly accessed by users (or an application front end) through structured query language (SQL). Oracle is a fully scalable relational database architecture and is often used by global enterprises, which manage and process data across wide and local area networks. The Oracle database has its own network component to allow communications across networks. Oracle DB is also known as Oracle RDBMS and, sometimes, just Oracle.

- **IDE: NetBeans**

NetBeans is an integrated development environment (IDE) for developing primarily with Java, but also with other languages. It is also an application platform framework for Java desktop applications and others. The NetBeans IDE is written in Java and can run on Windows, OS X, Linux, Solaris and other platforms supporting a compatible JVM.

5.2 Security Feature

- Only those participants who receives the presenter's invitation can join the live lecture.
- **JVM**

The binary form of programs running on the Java platform is not native machine code but an intermediate byte code. The JVM performs verification on this byte code before running it to prevent the program from performing unsafe operations such as branching to incorrect locations, which may contain data rather than instructions. It also allows the JVM to enforce runtime constraints such as array bounds checking. This means that Java programs are significantly less likely to suffer from memory safety flaws such as buffer overflow than programs written in languages such as C which do not provide such

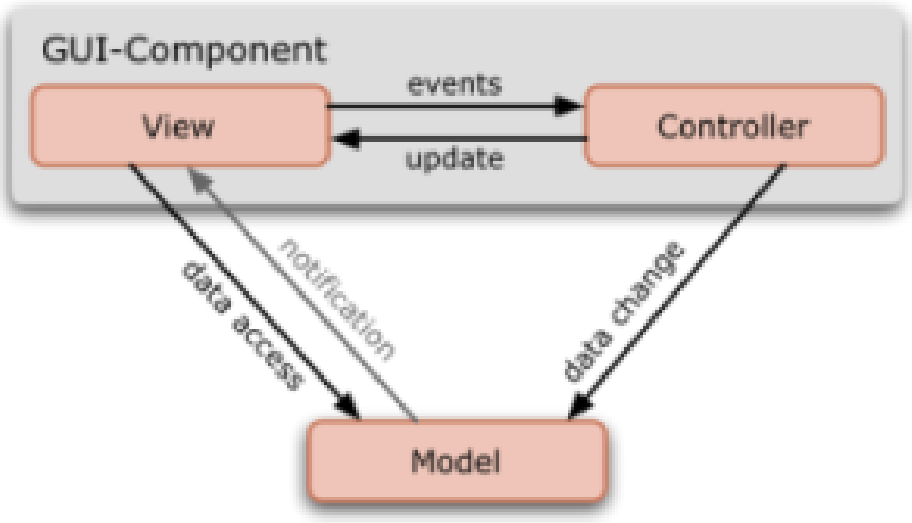
memory safety guarantees. The platform does not allow programs to perform certain potentially unsafe operations such as pointer arithmetic or unchecked type casts. It also does not allow manual control over memory allocation and deallocation; users are required to rely on the automatic garbage collection provided by the platform. This also contributes to type safety and memory safety.

5.3 Coding Standard

- **MVC Architecture:**

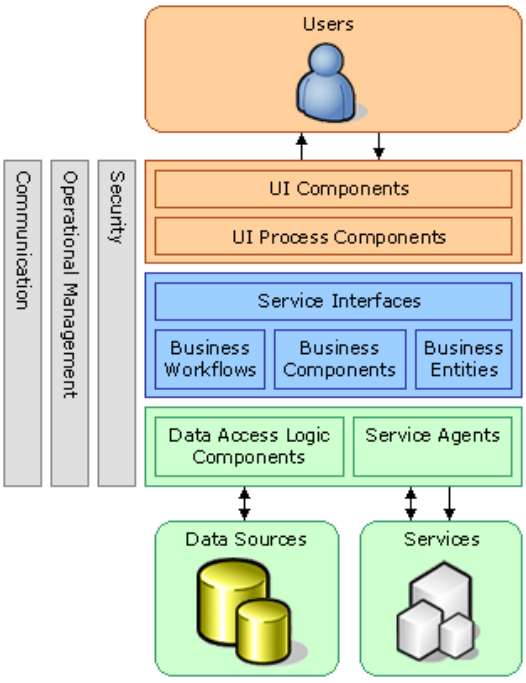
  MVC Pattern stands for Model-View-Controller Pattern. This pattern is used to separate application's concerns.

  - **Model:** A model notifies its associated views and controllers when there has been a change in its state. This notification allows the views to produce updated output, and the controllers to change the available set of commands. In some cases an MVC implementation might instead be "passive," so that other components must poll the model for updates rather than being notified.
  - **View:** A view requests information from the model that it needs for generating an output representation to the user.
  - **Controller:** A controller can send commands to the model to update the model's state (e.g., editing a document). It can also send commands to its associated view to change the view's presentation of the model.



5.4 Data Access Layer

Data access layer can be an important part of a software application. Business applications almost always need access to data from relational or object databases and the Java platform offers many techniques for accessing this data, regardless of whether a data access layer is used. The oldest, and most mature and reliable technique, is to use the Java Database Connectivity – JDBC API, which provides the capability to execute SQL queries against a database and then fetch the results, one column at a time.



6. TESTING

6.1 Testing Plan

Testing is the last stage of the system before we release the product online. During the testing we try to make sure that software does exactly what it is supposed to. Our system is completed and modules developed and ready to be deployed on-line are tested successfully.

6.2 Testing Strategy

- Testing a program with intension of finding errors, using a good test case that has high probability of finding a yet undiscovered error.
- To use testing to demonstrate that software functions appear to be working according to specification and that the requirements about the performance of the system have been met.
- Testing Information Flow.
- It will generate specific Error message while invalid transaction occur.

6.3 Testing Methods

Testing has dual function, it is used to establish the presence of defects in a program and it is used to judge whether or not the program is usable in practice. Thus testing is useful for validation and verification, which ensure that software conforms to its specification and meets the needs of the software customer.

We resorted Alpha testing, usually comes in after the basic design of the program has been completed. The project manager will look over the program and make suggestion or give ideas to us to improve or to correct the design. They also report and give ideas to help get rid of our work around any major problems. There is bound to be a number of bugs after a program is created and they are most likely to get known to the developers the alpha testing.

We carried out testing process in using following testing methods:

- Unit testing
- System testing

In another method called Black Box or Functional testing we are concerned about the output of the module and software i.e. whether the software gives proper output as per our requirements or not. In another words these testing aims to test a given program's behavior against its specification without making any reference to the internal structures of the program or the algorithms used. Therefore the source code is not needed, and so even purchased modules can be tested. The program just gets a certain input, and its functionality is examined by observing the output.

This can be done in the following way

- Input
- Interface
- Processing
- Output

The tested program gets a certain input or the input is observed. Then the product does its job & generates a certain output, which is collected by a second interface. This is then compared to the expected output, which has been determined before the test.

We used code testing too, which is a method in which we examined the logic of program that is to execute each and every instruction of module. During the testing of the module as well as during the testing phase of system, we tried to execute most of the instruction of various modules.

As a “Special System Case” we employed Performance Time Testing. During the development of our system we had to be too much conscious about the performance time along with memory utilization.

Unit Testing

The purpose of the coding and unit testing of software development is to translate the software design into source code. Each component of the design is implemented as a program module. The end-product of this testing is a set of program modules that have been individually tested. During this testing, each module is unit tested to determine the correct working of all the individual modules. It involves testing each module in isolation as this is the most efficient way to debug the errors identified at this stage.

System Testing

Last of all, system is tested to find whether the system and its original objectives tally, whether the current specification and system documentations matches. The primary objective is testing of compatibility of individual modules.

Testing Strategies

Mainly two types of methods are applied for testing.

- Black Box Testing
- White Box Testing

Black Box Testing

- Black Box Testing are used to demonstrate that the software function are operational that input is Properly accepted & output is correctly produced and that the integrity information is maintained.
- This testing is performed for the system by checking firstly the dummy data & then by the original data that any constraints are violated or not & then it resulted into Success that no violation was occurred.
- Validation for Inputs are already given so only proper inputs will be there for the system & hence gives the desired Output.

White Box Testing

- White Box Testing is predicted on close examination of procedural detail. Providing test cases that exercise specific sets of conditions or loops tests logical Path through the software. The Status of program may be examined at various points to determine if the expected status corresponds to actual Status.

6.4 Test Cases

Test cases would be prepared for the transactions and reports and any other items. Test cases and sample test data would be used for carrying out the unit testing. The result of the testing would be documented against the test data used. On completion of unit testing of transactions and reports, integrated testing would be initiated and performed.

A document called test procedure would be prepared for each unit being tested, which would contain the test conditions, test data and test results. S unit may be tested multiple times, every time the same document would be updated with the test activities.

7. Conclusion and Future Work

7.1 Conclusion

As given in system specification, we have implemented most of the functionalities of the proposed virtual classroom. Our virtual classroom will be used for conducting web seminars. It has mainly two users, presenter and participant. A presenter will conduct a session for participants, which will attend the session from anywhere in the world.

When the presenter starts the session, he can teach various contents of the lecture using the whiteboard. He can ask questions or polls to the participant and the participant can answer the questions using the polling feature of this software. The presenter and participants of a session can chat with each other using the live chat feature. The participant can attend the lecture from any corner of the world.

This virtual classroom software is totally free to use, since it does not need a mediator server. The presenter's computer becomes the server for the session.

7.2 Future Enhancement

There are many future works are pending for making our software a full-fledged virtual classroom. They are:

- Document sharing
- Live audio and video sharing
- Lecture video recording
- Desktop sharing
- Allowing participants to interact in the classroom by assigning various privileges

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