SRI LANKA INSTITUTE OF INFORMATION TECHNOLOGY

Distributed Lecturing and Examination System (DLES)

PROJECT MEMBERS

M.F.F. Faraj	- DCN/07/C3/0619
Y.L.A Weerasinghe	- DCN/07/C3/0642
T.I. Senevirathna	- DCN/07/C4/0816
R.M.A.I.K. Amunugama	- DCN/07/C4/0752
Udari Edirisooriya	- DCN/07/C3/0582

Supervised by:

.....

Dr. Malitha Wijesundara

01.03.2010

Project Title : Distributed Lecturing and Examination System (DLES)

Project ID: PDCN-27

Group Members:

Student ID	Student Name	Signature
DCN/07/C3/0619	**M.F.F. Faraj**	
DCN/07/C3/0642	**Y.L.A Weerasinghe**	
DCN/07/C4/0816	**T.I. Senevirathna**	
DCN/07/C4/0752	**R.M.A.I.K. Amunugama**	
DCN/07/C3/0582	**Udari Edirisooriya**	

Date of Submission: 01.03.2009

Project Sponsor: Not Applicable.

Supervised by:

. . . . . .

Dr. Malitha Wijesundara

Abstract

As a result of the extensive research that we carried out on the field of modern education systrem, it was realized by us that a system with all the online education features built in one single module is difficult to find. inorder to satisfy this neccesity we decided to build an online Destributed Learning and Examination System as our 4th year project.

As the name implies, the fetures like Real time lecture conducting/viewing, Downloading lecture materials, Real time white board viewing, Previewing lecture slides, Recording and storing lecture videos, Viewing the lecturer/student, Lecturer and student interaction and Online examination center with real time monitoring will be embeded with this system.

In order to achieve these objectives, open source softwares such as php, javascript, MySQL, Action Script and flash with Real Time Messaging Protocol will be in use.

By this project our consern is to turn a new leaf in online education culture.

Contents

List of figures:

Chapter 1

Introduction

As we continue on completing our academic studies with relation to IT we tend to seek for methods which can make life more convenient and smooth. Because of that eventually we are driven to seek innovative methods to make our higher studies a convenient one. Since modern days most of our students are equipped with internet, laptops, web cams and various inventions thanks to the technology, we thought about compiling these inventions to create a virtual environment which could be helpful to create a new era of comfortable learning culture. The bloom of the concept "Distributed Lecturing and Examination System" was coupled up with the existing concepts like virtual class room, e-learning, educational networking and e-safe examination systems.

The concept of Virtual classroom and Educational networking systems, not been a stranger for the international market has been occupied to various cultures of learning among the world due to the convenience it provides to the education system. As a matter of fact the challenge for us is to create a system which has all the existing features in a more advanced manner and its own unique features as well. The core objective of this project is to inspire students a new perception of a learning culture which is more convenient to them in engaging day to day learning activities without facing any hazard involved in learning by traveling to a certain destination, wasting time and travel cost which are involved in current educational system.

In this project we hope to accomplish this target by creating a web based application which enables users to easily login to the site and get all the required services. Once the Distributed Lecturing and Examination System is created, from the lecturer's point of view they can conduct a lecture easily from anywhere in the world by distributing the live video stream of the lecture among the students. All the students who are allocated to that particular class can watch that lecture and they can view any shared lecture material as lecture presentations, documents etc., at the same time as well. In this system both the lecturer and the student can see the other participants in their virtual class room. Due to this effective feature, this system can be used for video conferencing by group of people too. As we are using the concept of educational networking, you can enjoy all the features available in a social networking web site but only for the educational purposes. Students may ask questions from the lecturer and they can also discuss them with their friends in the classroom too.

The unique feature of this system is its own whiteboard system which enables the lecturer to use his computer terminal as a writing surface. All the students can see the content and it will be updated at the same time. This system is also capable of providing e-safe, more reliable examination system which can randomly select questions from a pool of questions and generate exams as required by the lecturer. In order to provide high security to the system, lot of modern tools and techniques like sequentially monitor capturing methods will be in use. To develop this system we are going to use open source software to reduce the cost factor. To design web interface we will use PHP and Javascript, for the client side application development we will use Flash with Action Script which uses Real Time Messaging Protocol (RTMP) to interact with the RED5 media server. For the development of the database MySQl will be in use.

We think this is where the future of learning lies. There's nothing to install or manage, everything is hosted on secure web servers that lecturers and students can access from anywhere using only a standard Web browser. So now we can get ready to extend traditional classroom learning with this new and innovative "Distributed Lecturing and Examination System".

Chapter 2

Objectives of the Project

Main objective of our project is to implement a user friendly web based Distributed Lecturing and Examination System. In order to achieve this we expect to successfully complete the following objectives;

- Real time lecture conducting/viewing

  If a logged user needs to conduct a lecture he can advertise about his lecture in the web site and users who are interested in the subject can participate the lecture by sending a request to the lecturer. The lecturer can conduct the lecture in real time and the students can view it simultaneously.

- Downloading lecture materials

  If the lecturer is using lecture materials such as presentations, tutorials, demo diagrams to support his lecture, these recourses can be uploaded to the site so that the students can download them.

- Real time whiteboard viewing

  Lecturer can use a whiteboard to demonstrate the lecture. And this software whiteboard can be viewed by the students simultaneously.

- Previewing lecture slides

  If the lecturer is using presentation slides, these can be viewed through the site. When the lecturer moves from slide to slide, student can view the current viewed slide by the lecturer.

- Recording and storing lecture videos

  Lectures held in the past are recorded and provided though the site for the students in future use.

- Viewing the lecturer/student

  Students can view the lecturer conducting the lecture and lecturer can view students as well as student can view the other students enrolled in the class under some restrictions.

- Lecturer and student interaction

  Students can ask questions by typing the questions in a chat box and the lecturer receive them as pop up messages.

- Online examination center with real time monitoring

  Lecturer can enter questions to our database and a question paper is generated from them under lecturer's instructions.

Chapter 3

Methodology

Distributed Lecturing and Examination System is a web based, one of the most users friendly, all in one complete virtual classroom package. The system will be a solution to bridge the physical gap between lecturers and students around the world. At the same time, the system can be utilized for video broadcasting, conferencing and online examinations.

Distributed Lecturing and Examination System will be a web service which is going to be hosted on a server which contains 3 servers namely Web Server, Database Server and Java Server. Web service will be run on Apache and it would contain the PHP web applications of the system. MySQL will be used as the database server and Tomcat will be used as the Java server which runs RED5 media server, which would be used for media streaming. This structure could be distributed in between several different physical server computers depending on the growth of the system. The development of the system will basically lie on open source technologies. Client end will run Flash, HTML/JavaScript and would use web browser to access the system. Client will need a web camera, microphone and speakers (or a headset) in order to use the Online Lecturing System.

3.1 System Processes

There are 3 main types of users in the system. They are lecturers who conduct classes, students who attend the classes and the administrators of the system who perform system related tasks. Administrators have full access to the entire system while lecturers have medium level of privileges. Online students will have low level access.

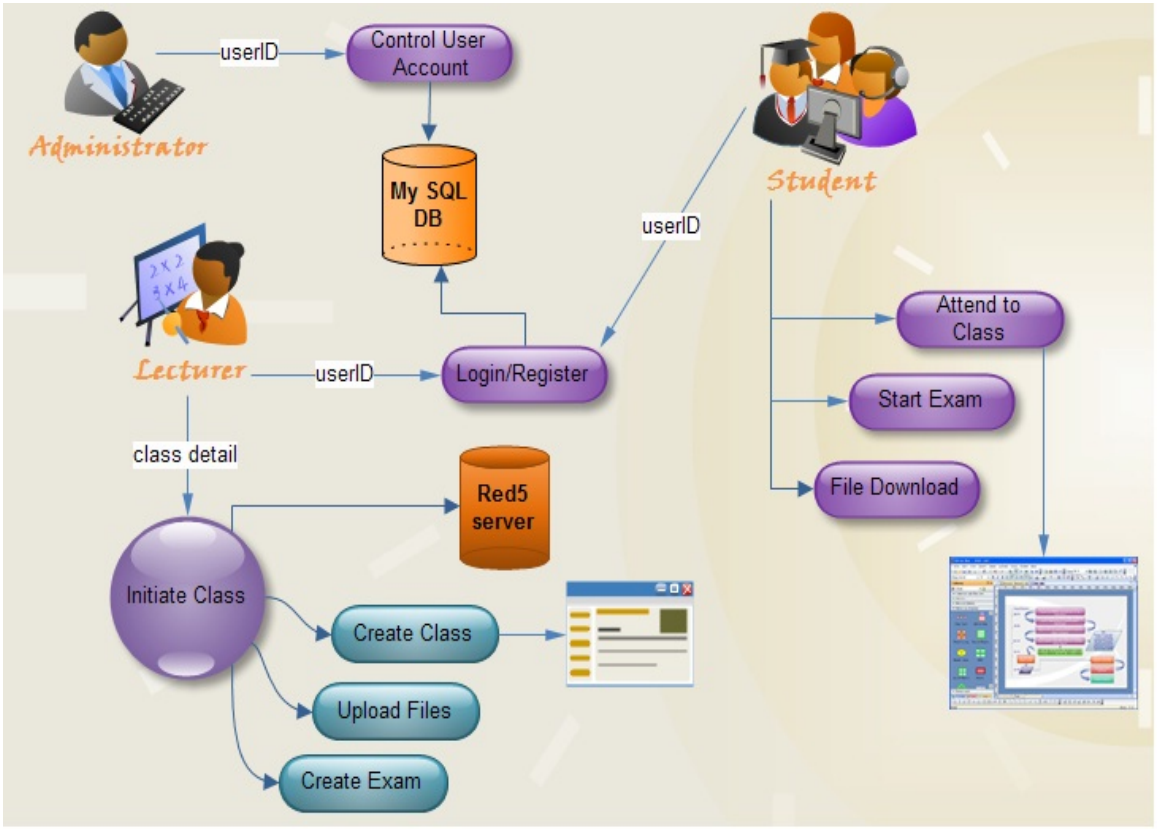

Fig 1: System Flow Diagram

All the users need to register with DLES Website first. Lecturer can create a class and students can send requests to join a class. All the users can view all the available classes on the system. Once the lecturer approves the student request, student is added to the class. Students can then view the online classroom. Lecturer can create session times and start the classes on time. Once the lecturer logs in during the session interval, he could start the class and students can view the lecturer and whiteboard real time. Each student can see other users in the class via webcams and access control would be designed appropriately.

Online chatting, real time video, real time whiteboard will be some of the main features of the system along with real time sharing of lecture materials. At the same time the current lecture slides screen would show the current slide of the current lecture. Lecture materials can also be published in the course web that will be integrated to the class. So any student can download the materials from the class course web at any time. At the same time, based on the server hard disk space the video and audio records of each class session will be stored for a certain period of time so that the students who missed the class can retrieve the class video and go through it.

Security implementation by means of Access Control Lists will be one of the key security features of the system. Each user will be provided with personal home page and the classes will include wikis and blogs. Examination Center will be one of the core products of the system which would ensure secure examinations. Exam Center will be integrated to the class room component so that lecturer can conduct exams.

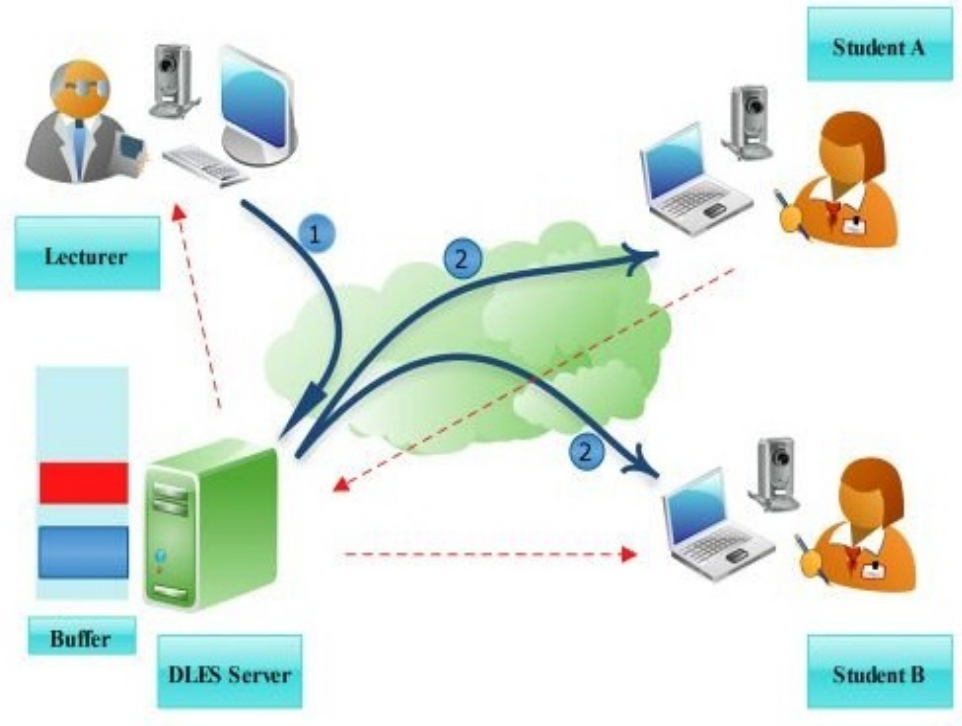

Fig 2: Network Diagram

3.1.1 Streaming and Storage

In order to achieve real time video and audio streaming, the contents transferred will be kept in the memory on the server. The server memory will process all the real time data obtained using RTMP (Real Time Messaging Protocol) and multicast those to appropriate agents other than the sender. The receivers include all the other members of the class. The recording of the audio and video would be performed and it would be stored on the DLES server storage. DLES server consists of several servers running but it could be distributed among many physical servers depending on the future demands. The permanent lecture materials will be stored on DLES server storage and the files can be shared during a classroom session. Real time whiteboard and lecture slides screen will also be transmitted using RTMP in no time. Students from one class can't peep into another without lecturer's authorization.

3.1.2 Examination Center

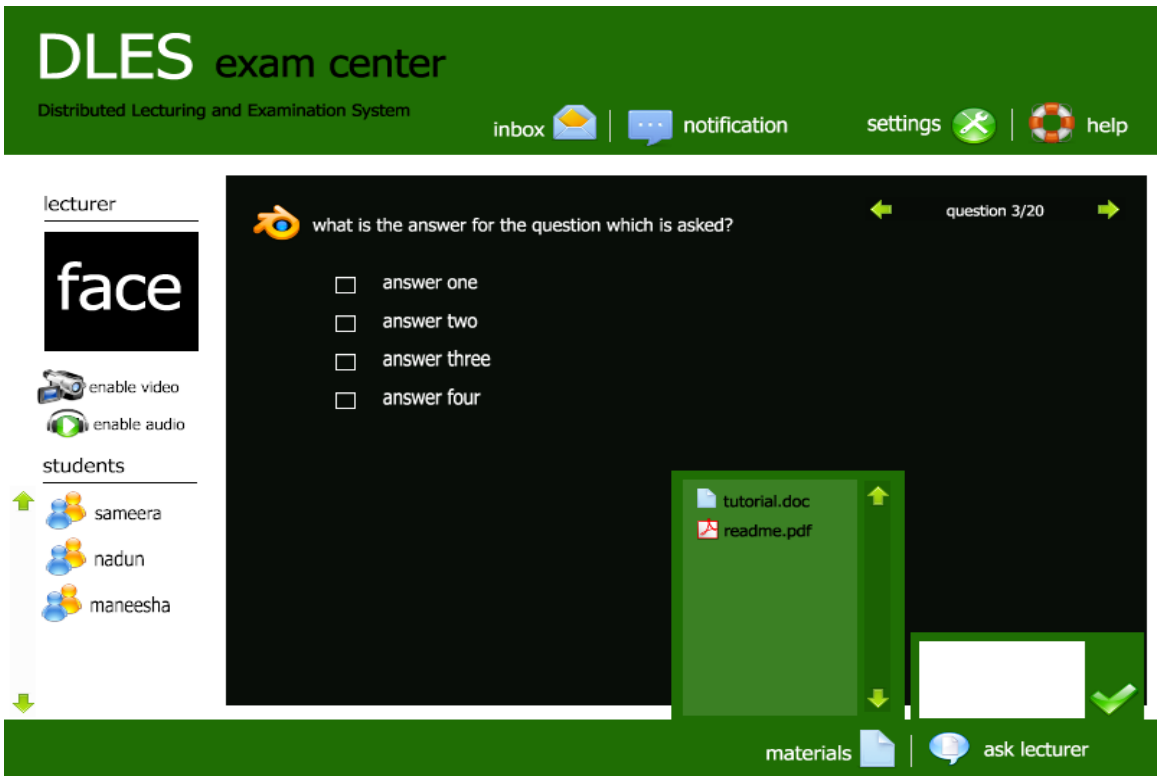

Fig 2: Examination Center Interface

Examination Center is one of the main components of the system. The examination center solution would ensure secure exam restricting ways to cheat in online exams. The exam would be multiple choice or structured. Multiple choice answers can be evaluated automatically by the system. The structured questions should be manually checked by the lecturer. Exam papers will be set by the lecturer which he can easily create using the advanced exam creator system we provide. The examination system will be mainly coded in PHP along with Java. We would be using security mechanisms in order to protect the exam. Questions can be picked randomly from a pool of categorized questions which would be useful in standard papers for all students. We would be monitoring the session while they write the exams. Exam expiration would also be enabled so that students must take the exam during the allocated time. Periodic user activity record will be stored on the server.

3.2 System Implementation

3.2.1 Database

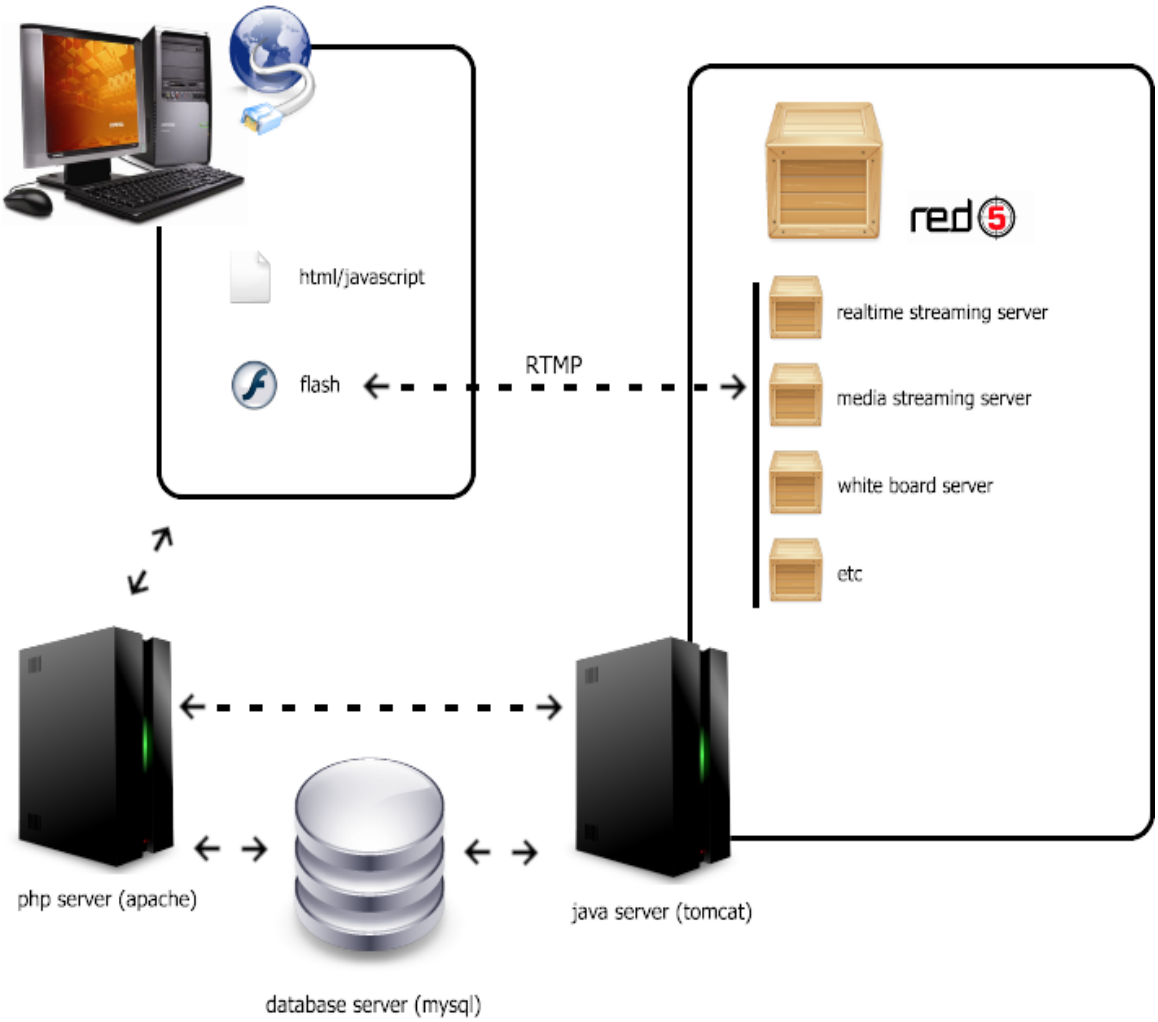

Fig 3: Database Architecture

The server machine consists of 3 main services:

- Database Server

  The database server contains all the application data. MySQL is used as the database server. MySQL as the best open solution for the database, it gives the low memory consumption and resource usage while in production.

- Web server

  Apache HTTP server along with PHP is used as the web server which contains the server side database handling and the client implementation to view the html and flash content. HTML is produced by the execution of the PHP codes deployed in the Apache server. The flash client interacts with the Red5 multimedia server application. Flash contents are used to develop cutting edge interactive applications such as real time video streaming, publishing, whiteboard content transferring, etc...

- Java Server

  Open source apache tomcat server as the java server, serves the need of multimedia server which runs as an application deployed in the Tomcat. Red5 which was originally coded in java as a J2EE web application is the API and the RTMP server which is used to write our own server applications for multimedia handling.

  Flash and RED5 uses RTMP as the media transmission protocol. The red5 applications written in order to work with the flash applications will be deployed in the java tomcat server along with the RED5 server.

3.2.2 Real time streaming / publishing application.

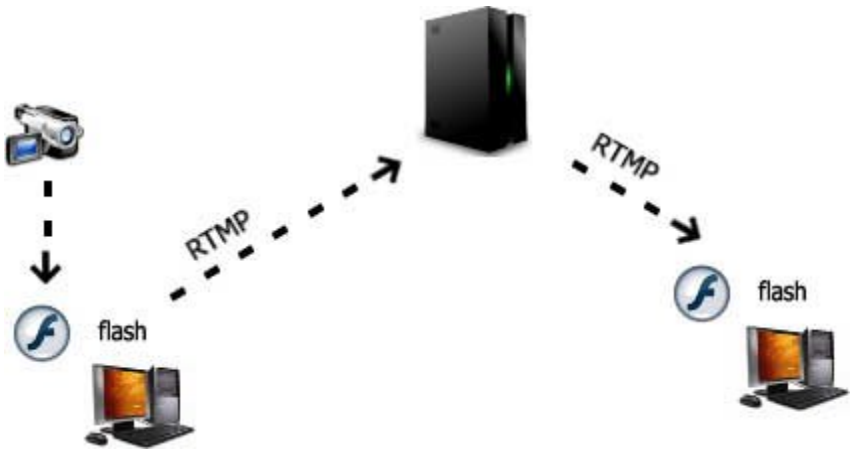

Fig 4: Real time streaming / publishing application

This application is used to transfer the content of the webcam directly to another host via the web browser's flash client, without any desktop application running in the client end.

The client which has the multimedia equipment such as Web Cam and microphone can transmit the real time data captured using flash. This content is buffered in the server and when another client subscribes, server sends that client the real-time multimedia content to be viewed. Likewise the real-time conference or video transmission is achieved easily and conveniently.

3.2.3 Multimedia streaming application.

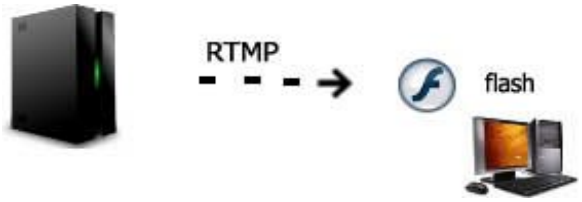

Fig 5: Multimedia streaming application.

The stored audio video content can be accessed by the client using a specific flash player which interacts with the RED5 server application and retrieves the stored multimedia content.

3.2.4 Whiteboard content transmission application.

Virtual online flash whiteboard known as the DLES smart board is the client side transmission application use to create the whiteboard content.

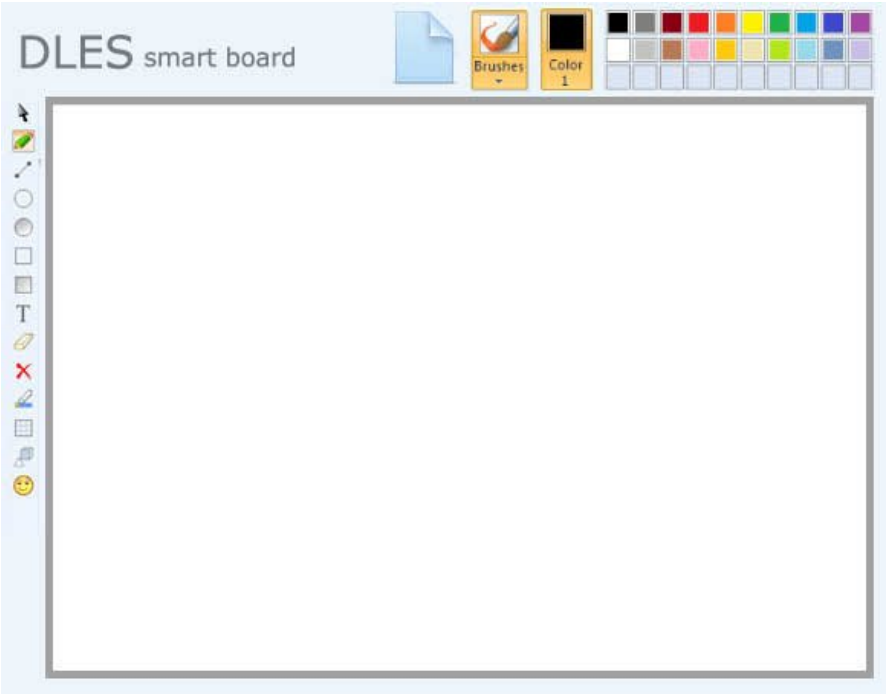

Fig 6: whiteboard application.

This flash application fetches the images periodically and transmits the whiteboard content to the server application written in RED5 API. This is same as the video transmission which was discussed earlier. But there the frame rate is much lower than the video transmission.

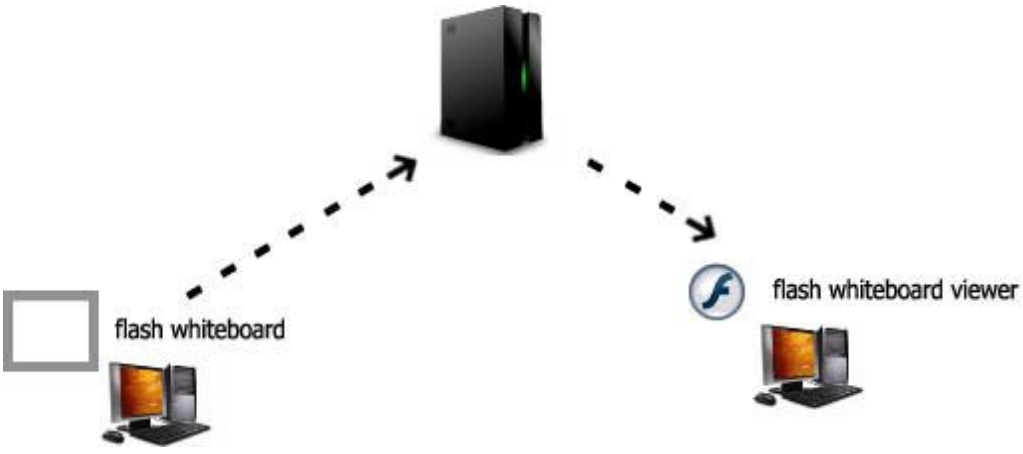

Fig 7: whiteboard content distribution.

The client using the flash whiteboard content creator, which is the smart board application, can create the content of the white board, and on real-time, the content is published

to the server, from which the content is distributed to the flash whiteboard viewer clients connected.

3.2.5 File Server (Java Based Bunchi Server)

The data files in need of storing in the server are kept securely in the Java Based Bunchi Server (J2BS). This File server was fully coded from the scratch on behalf of the project DLES, and will be available to download as an open source project.

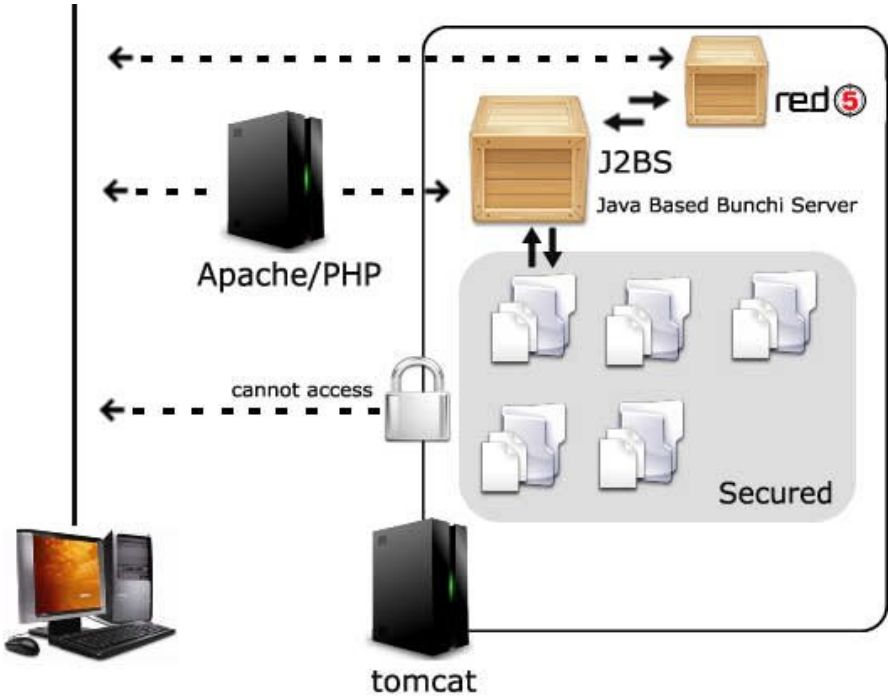

Fig 8: File Server Architecture.

J2BS runs in the Tomcat server as a servlet. The servlet interface enables the outsiders to download or upload a file to the server. Authentication can be enabled for securing the files.

3.3 Work break down structure.

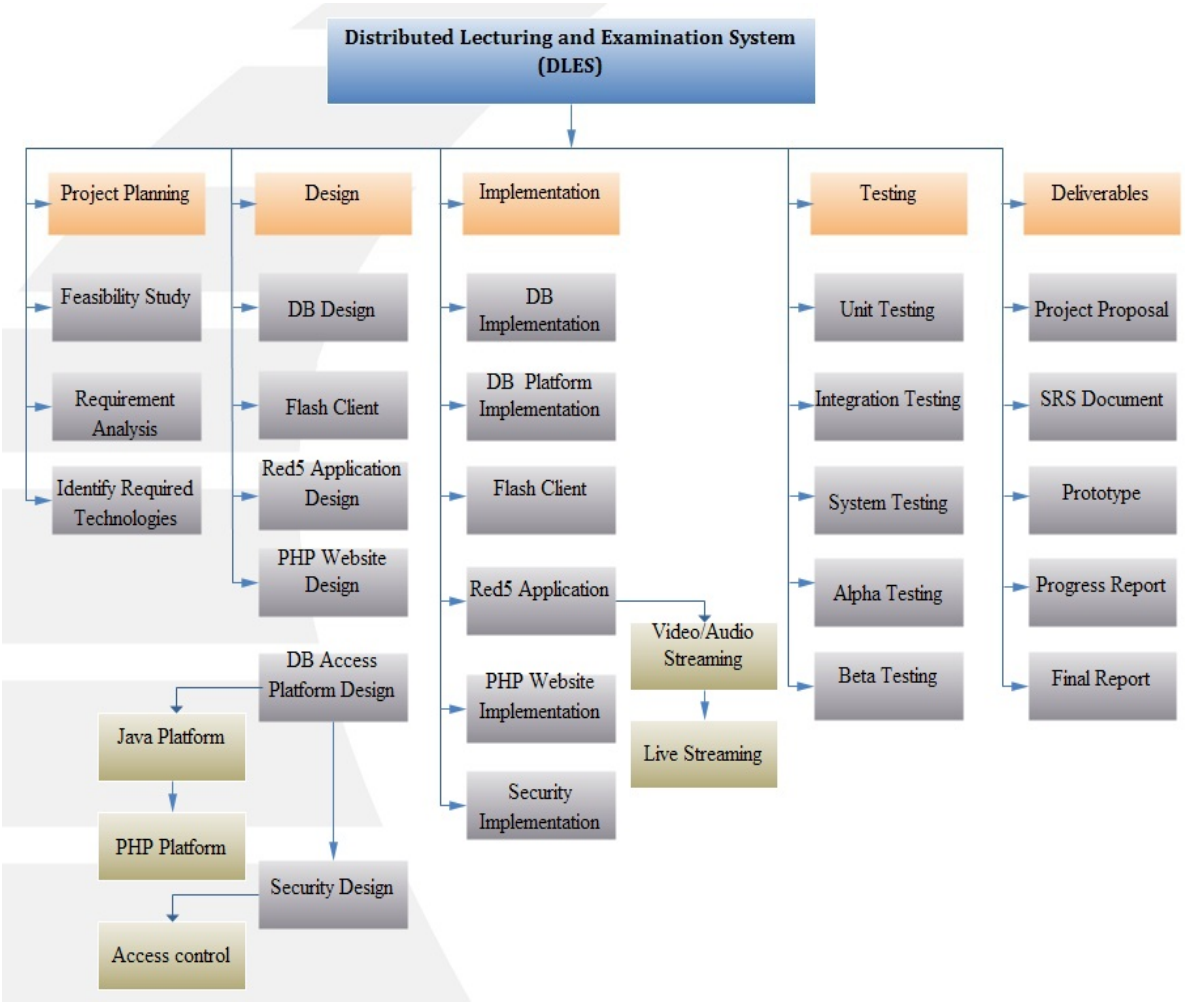

Fig 9: Work break down structure.

3.4 Gant Chart.

Chapter 4

Description of Personal and Facilities

Group Member	Assigned Task
M.F.F. Faraj	• Media server and client design and coding • System design • JavaScript Ajax module for the application interfaces • Online multimedia chat • Multimedia streaming
Y.L.A. Weerasinghe	• Develop the database platform in PHP • Webpage Authentication module in PHP • Access control List module in PHP • Webpage new user registration in PHP. • PHP module for reading the documents uploaded. • Flash module for showing the documents.
T.I. Senevirathna	• Develop the database platform in Java • Authentication and validate user module in Java • Examination security module in Java • Access control List module in Java • Examination Interface in PHP • Document Upload module in PHP / AJAX or Flash
R.M.A.I.K. Amunugama	• Develop the database • Examination paper creator • Module for handling doubt sent to the lecturer • Doubt sending AJAX module • Ajax enabled interactive Help Desk.
U. Edirisuriya	• Examination Desktop application • Database management • File storing and retrieving module. • System integration and testing • Documentation Integration

Chapter 5

Conclusion

Distributed Lecturing and Examination System is the first web based online virtual classroom system fulfilling all the classroom requirements. The activity of the system is no different to a real classroom setup. Real-time videos enable lecturers and students see each other. Students can see other students in the class and can interact with them in various forms. Students can share files among all users or specific users. Students can chat while the lectures go on without impeding the lecture. But lecturer has the ability to control the student conversations and he can restrict the conversation from his end. The real time whiteboard will be used to explain things more clearly and lecture slides screen will also be used so that student can read the slides while listening to the lecturer. The classroom environment is introduced as "Smart Class". Additionally the site would contain a course web in order to store files along with video and audio recordings of the lecturer's lecture. The "Exam Center" will be an integrated product to the Smart Class which can be used by the lecturers to set up exams.

DLES will be the next generation classroom style. The need to travel long distances will be solved and it will spare money and time. DLES will be more education based but it can also be used for other commercial applications as desired with the growth of the web site. This fully featured classroom package will bridge the gap between students and lecturers. This will bring a new era to social networking world.

Chapter 6

References

[1] Adobe Systems Inc, "RTMP Specification License" April 2009.

[2] N. Ansari, H. Liu, Y. Q. Shi and H. Zhao, "Dynamic Bandwidth Allocation for VBR Video Transmission", in Journal of Computing and Information Technology - CIT 11, Advanced Networking Laboratory, Department of Electrical and Computer Engineering, New Jersey Institute of Technology, Newark, USA , 2003

[3] Paul Gregoire , "Deploying Red5 to Tomcat", September 2007

[4] Steven Gong, Paul Gregoire, Daniel Rossi, "Red 5-Open Source Flash Documentation-Reference book" , Version 0.7.1

[5] Simon Ting, Instructional Developer, NTID, Cathy Clarke, Digital Media Specialist, NTID, Zach Szafran, Student Programmer, NTID, Regina Kiperman-Kiselgof, Employment Counselor, NTID, "Videoconferencing Using Open-Source Software:Building a Proof-of-Concept Platform for Communications and Distance Learning"

[6] Clark, Ruth /Kwinn, "Ann The New Virtual Classroom: Evidence-based Guidelines for Synchronous e-Learning", Pfeiffer, March 2007

[7] Julie C. Meloni, "PHP 5 Fast Easy Web Development"

[8] Paul DuBois, "MySQL", Fourth Edition, Addison-Wesley, September, 2008

[9] Vivek choptra, Ben Galirath, Chanoch Wigger, "Professional Apache Tomcat" , John Wiley sons, Inc., 2005