Virtual Classroom Tool

SOFTWARE REQUIREMENTS REPORT

CENG 491 Fall 2004

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1. INTRODUCTION

The purpose of the project is to develop a tool for synchronous distance learning with multimedia facilities. The tool should provide network broadcasting of a multimedia lecture given by a trainer to multiple clients, interaction with the students, preparation, online editing and offline replay of the courses.

1.1. Background Information

1.1.1. What is Distance Education?

Within a context of rapid technological change and shifting market conditions, the education system all over the world is challenged with providing increased educational opportunities without increased budgets. Many educational institutions are answering this challenge by developing distance education programs. At its most basic level, distance education takes place when a teacher and student(s) are separated by physical distance, and technology (i.e., voice, video, data, and print), often in concert with face-to-face communication, is used to bridge the instructional gap. These types of programs can provide adults with a second chance at a college education, reach those disadvantaged by limited time, distance or physical disability, and update the knowledge base of workers at their places of employment.

1.1.2. Is Distance Education Effective?

Many educators ask if distant students learn as much as students receiving traditional face-to-face instruction. Research comparing distance education to traditional face-to-face instruction indicates that teaching and studying at a distance can be as effective as traditional instruction, when the method and technologies used are appropriate to the instructional tasks, there is student-to-student interaction, and when there is timely teacher-to- student feedback [1; 2].

1.1.3. How is Distance Education Delivered?

A wide range of technological options are available to the distance educator. They fall into four major categories:

- **Voice** - Instructional audio tools include the interactive technologies of telephone, audioconferencing, and short-wave radio. Passive (i.e., one-way) audio tools include tapes and radio.
- **Video** - Instructional video tools include stil images such as slides, pre-produced moving images (e.g., film, videotape), and real-time moving images combined with audioconferencing (one-way or two-way video with two-way audio).
- **Data** - Computers send and receive information electronically. For this reason, the term "data" is used to describe this broad category of instructional tools.
- **Print** - This is a foundational element of distance education programs and the basis from which all other delivery systems have evolved. Various print formats are available including: textbooks, study guides, workbooks, course syllabi, and case studies.

1.2. Definition of Current Systems

As we have stated in “Proposal Report”, our project subject is “Virtual Classroom Tool”. We have examined many virtual classroom tools and learning management tools’ web sites on the internet. The reason for examining these web sites was making specifications more clear. As a result of our research, we observed that there are three leading solutions for the virtual classroom project:

IBM Lotus Virtual Classroom

- Creating assesments and surveys
- Delivering presentation
- Demonstrating software
- Using audio-video to add more interactivity to virtual sessions
- Sending additional reading materials to students before and after a classroom session
- Registering the participants online
- Catalog learning materials, presentations and content
- Track attendence and assessment results
- Assigning participants to break-out sessions for small groupwork
- Initiating the breakout sessions to divide the students into virtual groups and monitoring their progress using instant messaging
- Sharing any application running on either instructor’s desktop and student’s desktop
- Sharing agenda items with all users and speaker notes with other instructors

HP Virtual Classroom

- Voice-over-IP available to hear the audio content through your PC
- Recording and archiving for later viewing of events
- Multi-formats, snapshots and live demos
- Hand raising / Queues
- Online survey and polling mechanisms
- Online course evaluations
- Private chats
- Question manager
- Slide review
- Message board
- Scalable, up to 250 concurrent users (with full interactivity features)
- Works through firewalls
- Works on 28.8 or above modem connection

Microsoft Live Meeting

- Rich Multimedia Content
- Video, Images, Streaming Video and Animations
- White Boarding
- PowerPoint Animated Slides
- Application sharing
- Web Touring

- Snapshots
- Integrated VOIP and Telephony
- Polling and Quizzing
- Instant Learner Feedback
- Question & Answer manager
- Threaded Discussions
- Group Chat, Private Chat & Subgroup Chat
- Hand Raising
- Multiple Instructors
- Ejector Button
- Network Performance Indicator
- Break Out Capabilities
- Configurable Learning Environment
- Automatic Slide Shows
- Count down timer
- Session Clock
- Learner Note Taking on Presentation Slides
- Learner Downloading of Session Resources
- Passing Controls to Learner
- Save, Review, and Download Chat and Q&A Interactions
- Tracking and Reporting Information

1.3. Our Goals

We have specified our goals accordig to our research discussed in the previous section. The scope of our project is as follows:

- The students and the instructor will have user IDs and passwords for authenthication.
- The instructor gives the lecture online.
- The students follow the current lecture online or previous lectures offline.

In order to achieve our goal, we chose the features of the systems mentioned previously that matches our expectations. In addition, we will create a WAP site as a plugin for the newsgroup of the courses so that the clients will have the opportunity to get the information about the course via mobile phones.

2. CUSTOMER MEETING REPORT

Since the virtual classroom tool serves for students and instructors directly, we have met students and instructors from our university. We are satisfied with the profiles of the participants since all of them were aware of the project content.

We have divided the participants into two groups according to their department: engineering and social sciences.

The students and instructors from the engineering departments were mostly interested in the material content of the lectures. For instance, they indicated that animations or experiment demonstrations are the most important parts of their lectures. Therefore, they requested a wide range of multimedia content.

On the other hand, the students and the instructors from the social sciences were mostly interested in the visual content of the lectures, that is, the video image quality should be as good as the video image in a teleconferencing system because they want to participate in the lectures interactively (like in a real classroom).

According to the feedback from the people who participated to our research, they want a virtual classroom tool with the following features:

- User friendly interface,
- Easiness for updates,
- Usable for long periods of time,
- Providing safety, that is, the program should not be visible to irrelevant people.
- The program should be safe from being changed by irrelevant people.
- Real classroom effect.
- High quality in the audiovisual and multimedia content.

3. PROJECT SCHEDULE

3.1. Detailed Plan

Phase 1: Requirement Analysis

- Interaction with users to understand their requirements
- Understanding needs and constarints
- Information gathering
- Research on current systems
- Preparation of requirement analysis report

Phase 2: Design and Analysis

- Database design
  - Design tables and entities of database
- Architectural design for client – server system
  - Designing client interface
  - Designing server interface
- Preparation of the design report

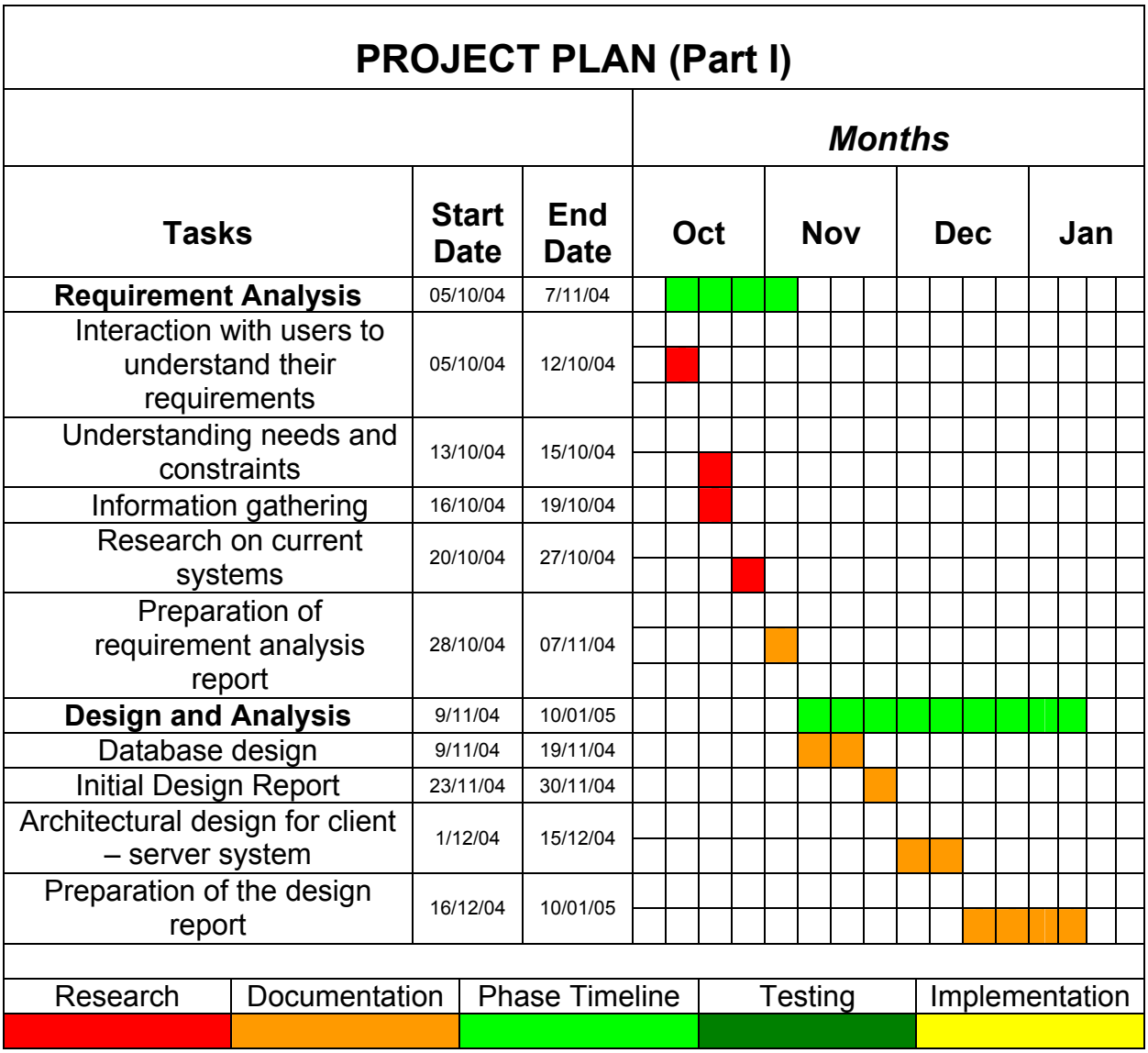
Phase 3: Implementation

- Configuration and testing of the required software
- Creating database
  - Population of the database with sample data
- Development of network connection among the applications
- Implementation
  - Implementation of the chat service
  - Implementation of the whiteboard
  - Implementation of the multimedia board
  - Implementation of video and audio streaming
  - Implementation of user interface
  - Implementation of help service
  - Implementation of newsgroup on the web and WAP
- Preparation of implementation document

Phase 4: Testing

- Integration of all modules and testing of integrated system
- Testing of all features
- Preparation test document

3.2. Gannt Chart



PROJECT PLAN (Part II)

Tasks	Start Date	End Date	*Months* Feb	Mar	Apr	May
Implementation	14/02/05	22/05/05				
Configuration and testing of the required software	14/02/05	18/02/05				
Creating Database	19/02/05	21/02/05				
Development of network connection among the applications	22/02/05	23/02/05				
Implementation of the chat service	24/02/05	28/02/05				
Implementation of the whiteboard	1/03/05	14/03/05				
Implementation of the multimedia board	15/03/05	28/03/05				
Implementation of video and audio streaming	29/03/05	18/04/05				
Implementation of user interface	19/04/05	2/05/05				
Implementation of help service	3/05/05	9/05/05				
Implementation of newsgroup on the web and WAP	10/05/05	16/05/05				
Preparation of implementation document	17/05/05	22/05/05				
Testing	23/05/05	30/05/05				
Integration of all modules and testing of integrated system	23/05/05	26/05/05				
Testing of all features	27/05/05	28/05/05				
Preparation of test document	29/05/04	30/05/05				

Research	Documentation	Phase Timeline	Testing	Implementation

4. REQUIREMENT SPECIFICATION

4.1. Functional Requirements

4.1.1. Desktop Application properties

4.1.1.1. “INSTALL” Function

After the application is developed and released, it should be installed on the server computer, instructor’s computer and the students’ computers. The installation processes are performed by INSTALL function.

4.1.1.2. “CONNECT DATABASE” Function

When the student and the instructor login the system or when a student wants to follow a previous lecture that is saved on the server or the dynamic help property works, the system should interact with the database. This connection is performed by CONNECT DATABASE function.

4.1.1.3. “CONNECT NETWORK” Function

For almost all of the processes, the server connects to the instructor’s computer and the students’ computers via local area network. The network connections of the applications are performed by CONNECT NETWORK function.

4.1.2. Authentication

4.1.2.1. “LOGIN” Function

The instructor and the students should login in order to use the system. Whenever the instructor or the the student wants to login the system, the username and the password are checked by the system and the permission is given to the user if the user name and the password are valid. This process is performed by LOGIN function.

4.1.3. Video and Audio Streaming

4.1.3.1. “GET VIDEO AND AUDIO” Function

While the instructor is giving the lecture, the realtime physical audiovisual data is converted to the digital form by the camera. This audiovisual data is saved as files in the system. This saving operation is performed by the GET VIDEO AND AUDIO function.

4.1.3.2. “ENCODE VIDEO AND AUDIO” Function

The audiovisual data saved as files in the system is encoded and converted into transportable form. This process is performed by the ENCODE VIDEO AND AUDIO function.

4.1.3.3. “SEND VIDEO AND AUDIO” Function

The audiovisual data converted into transportable form is sent to the clients by the server. This process is performed by the SEND VIDEO AND AUDIO function.

4.1.3.4. “DISPLAY VIDEO AND AUDIO” Function

The audiovisual data transferred from the server in the transportable form is saved as files in the system. Then this data is displayed by a player in the computer. This process is performed by the DISPLAY VIDEO AND AUDIO function.

4.1.4. Chat

4.1.4.1. “CHAT” Function

The students ask questions to the instructor via chatting. Moreover, the students can communicate each other by chatting. In the chat process, the text written by the students is sent to the server. Then this message is sent to the target computer by the server. Then, the target computer takes the message. All of these processes are performed by the CHAT function.

4.1.5. Whiteboard

4.1.5.1. “WHITEBOARD” Function

Like a blackboard in a real classroom, there is a whiteboard in the virtual classroom tool. The instructor writes or draws on this whiteboard and the image of the whiteboard can be seen by all the students that are online. This process is performed by the WHITEBOARD function.

4.1.6. Application Sharing

4.1.6.1. “SHARE” Function

While the instructor gives lectures, he/she shows some multimedia content. These materials are sent by the instructor, transferred to the students’ computers and displayed in the multimedia board. This process is performed by the SHARE function.

4.1.7. Offline Lecture

4.1.7.1. “RECORD VIDEO AND AUDIO” Function

All the lectures and the materials given by the instructor are saved on the server. Then a student can follow those lectures offline. The recording operation is

done while the instructor is giving the lecture. This operation is performed by the RECORD VIDEO AND AUDIO function.

4.1.7.2. “REPLAY VIDEO AND AUDIO“ Function

If a student wants to follow a lecture offline, all the audiovisual data and materials are presented as same as the online lecture. For instance, if the instructor shows a slide while giving the lecture, that material is presented at the same time period of the lecture with the online lecture. This process is performed by the REPLAY VIDEO AND AUDIO function.

4.1.8. Dynamic Help

4.1.8.1. “HELP” Function

While the students and the instructor are using the system, there will be an embedded help window. The content of this window changes according to the usage area. For instance, if the user clicks on an area on the application window, the help window will show the help topics about that area. This process is performed by the HELP function.

4.1.9. Newsgroup

4.1.9.1. “WEB SERVER” Function

There will be newsgroup for each course. The students discuss about the course topics. They can access the newsgroup using web browsers. The newsgroup functionality is performed by the WEB SERVER function.

4.1.9.2. “WAP SERVER” Function (Plugin)

The newsgroup will be accessible via WAP. This means that, the students or the instructor can access all the messages written in the newsgroup with mobile phones. The accessibility to the newsgroup using WAP technology is performed by the WAP SERVER function.

4.2. Other Requirements

4.2.1. Hardware Requirements

To construct the system, the hardware requirements are as follows:

- Server computer
- At least 2 PCs (1 for the instructor and 1 for the student)
- Video camera or wabcam
- Microphone

4.2.2. Software Requirements

4.2.2.1. Operating System

Our Project needs extensive usage of multimedia content. Microsoft Windows Operating Systems serves wide variety of multimedia applications (Windows Media Player, Microsoft Office, Internet Explorer, etc). Therefore, our project will only operate on Microsoft Windows Operating Systems.

4.2.2.2. Development Environment

After determining the opreating system, we have decided to use Microsoft Visual Studio .Net as the development environment. It is the most suitable development environment for Windows Operating Systems, because the .Net platform can easily integrate with many Windows components. We will use “Microsoft Media Technologies” library for the audiovisual processing.

4.2.2.3. Database Server

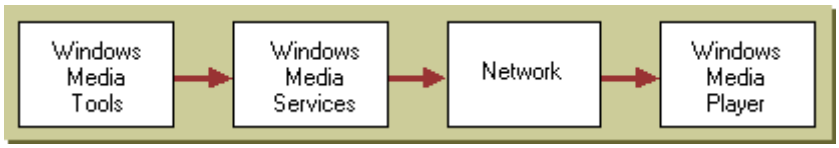
Since we will use Microsoft Visual Studio .Net as the development environment and the Windows Operating Systems as the operating system, we will use Microsoft SQL Server as the database server.

4.2.2.4. Web and WAP Servers

We will use Microsoft Internet Information Service (ISS).

4.2.2.5. Other Software

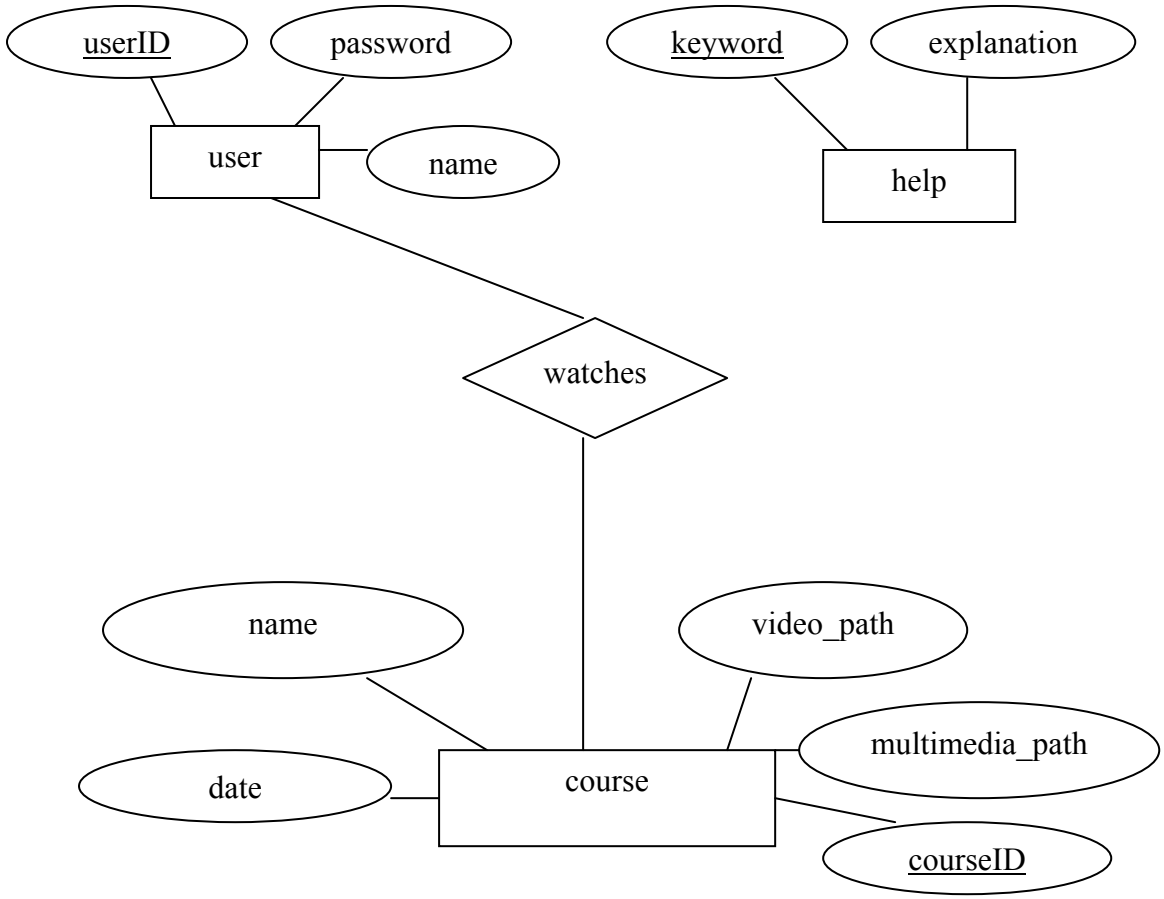
Windows Media Player, Windows Media Encoder, Windwos Media SDK. The usage of these applications are represented in the figure below:



5. MODELLING

5.1. Data Model

5.1.1. ER Diagram



5.1.2. Data Description

User

1. **userID:** This number that is a primary key for user so any two members are not confused.
2. **password:** The string field that is used fort the authentication.
3. **name:** The realname of the user.

Help

1. **keyword:** The string field that is the primary key for help search.
2. **explanation:** The string field that contains the explanations of the keywords.

Course

1. **courseID:** The number that is the primary key for each lecture that is saved on the system.

2. **name:** The name of the course.
3. **date:** The date of the given lecture.
4. **video_path:** The path that the video files are saved.
5. **multimedia_path:** The path that multimedia files are saved.

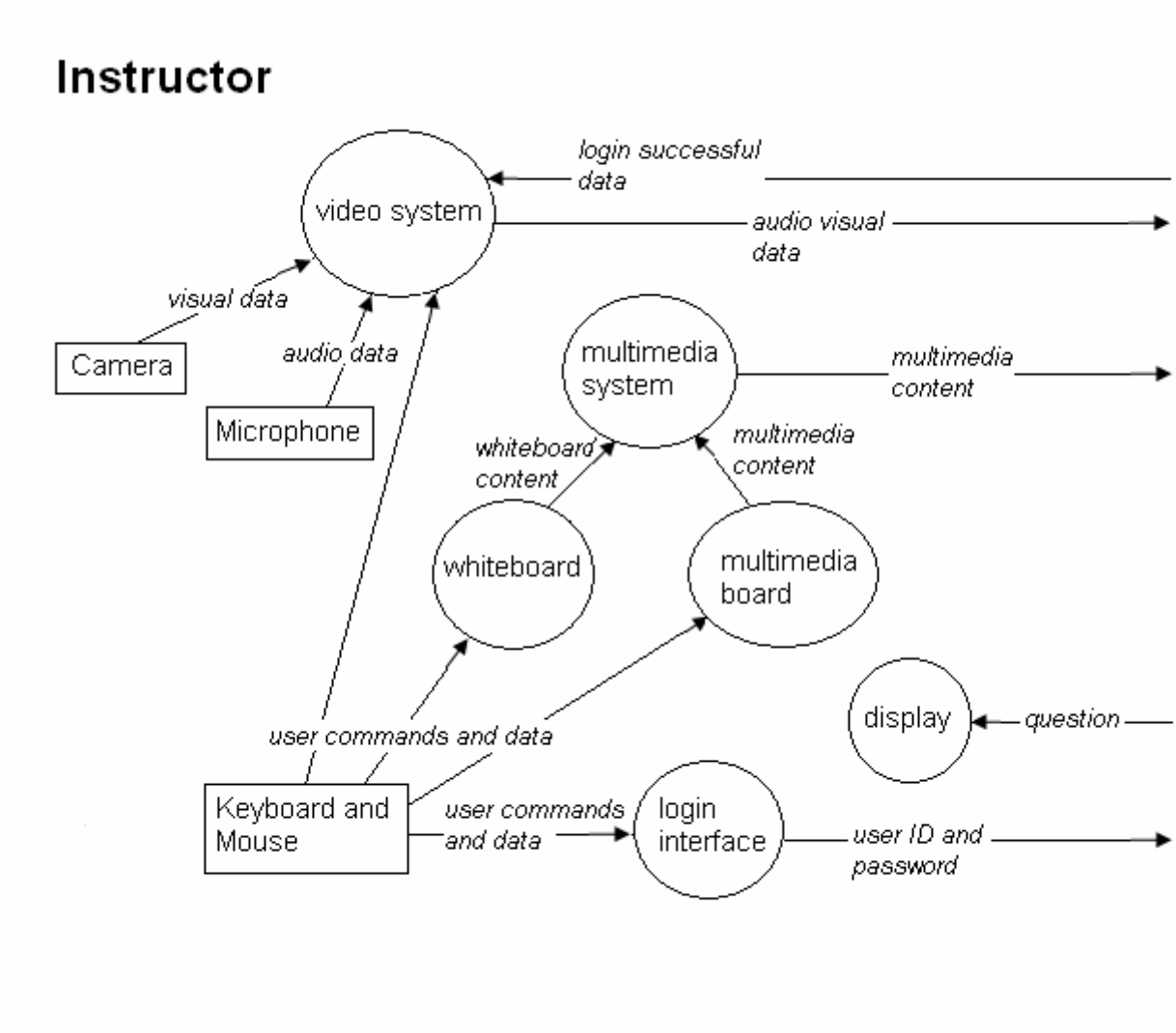
5.1.3. Explantion of Relations

“Watches” relation between the User and the Course entities

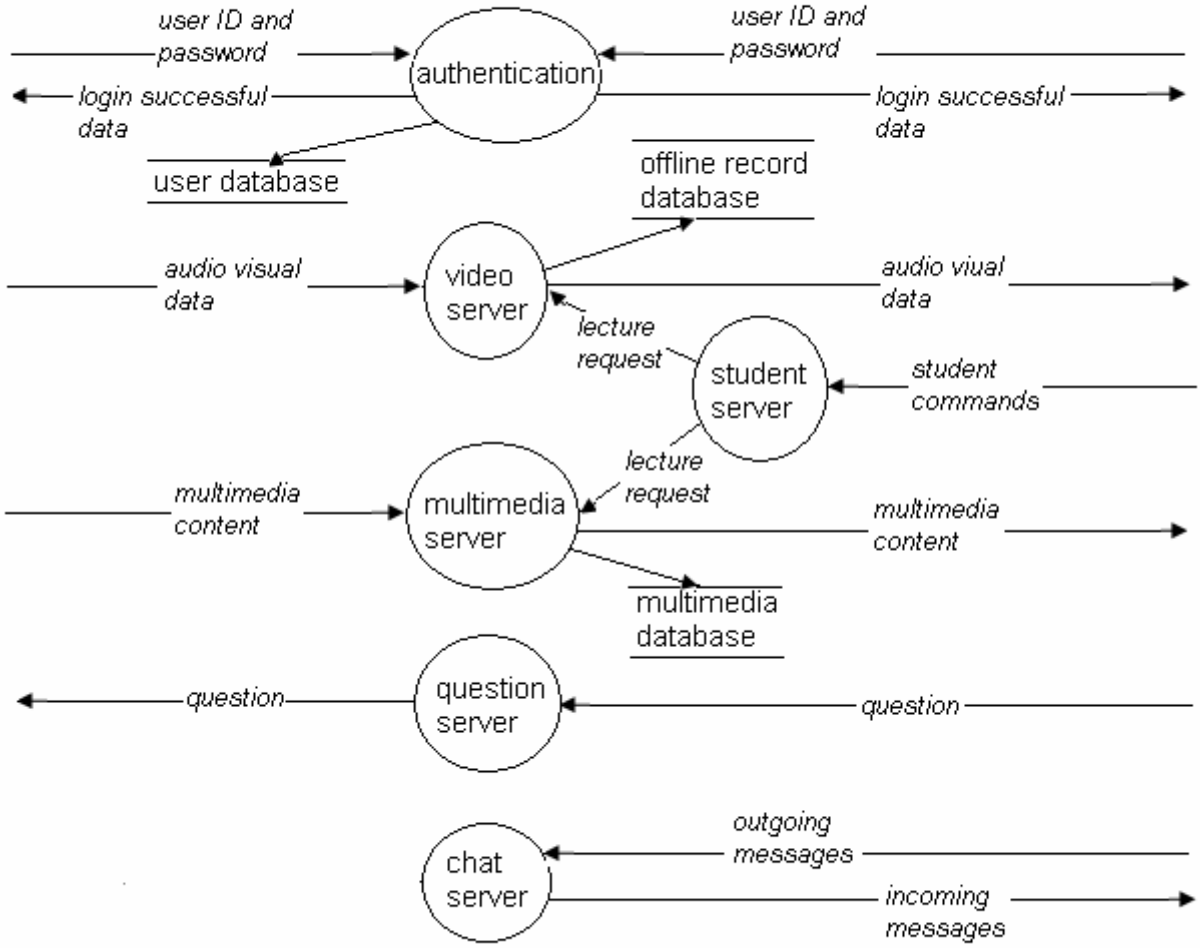
This relation keeps the information of the lectures that are watched by the users. The user can follow the offline lectures that he/she missed.

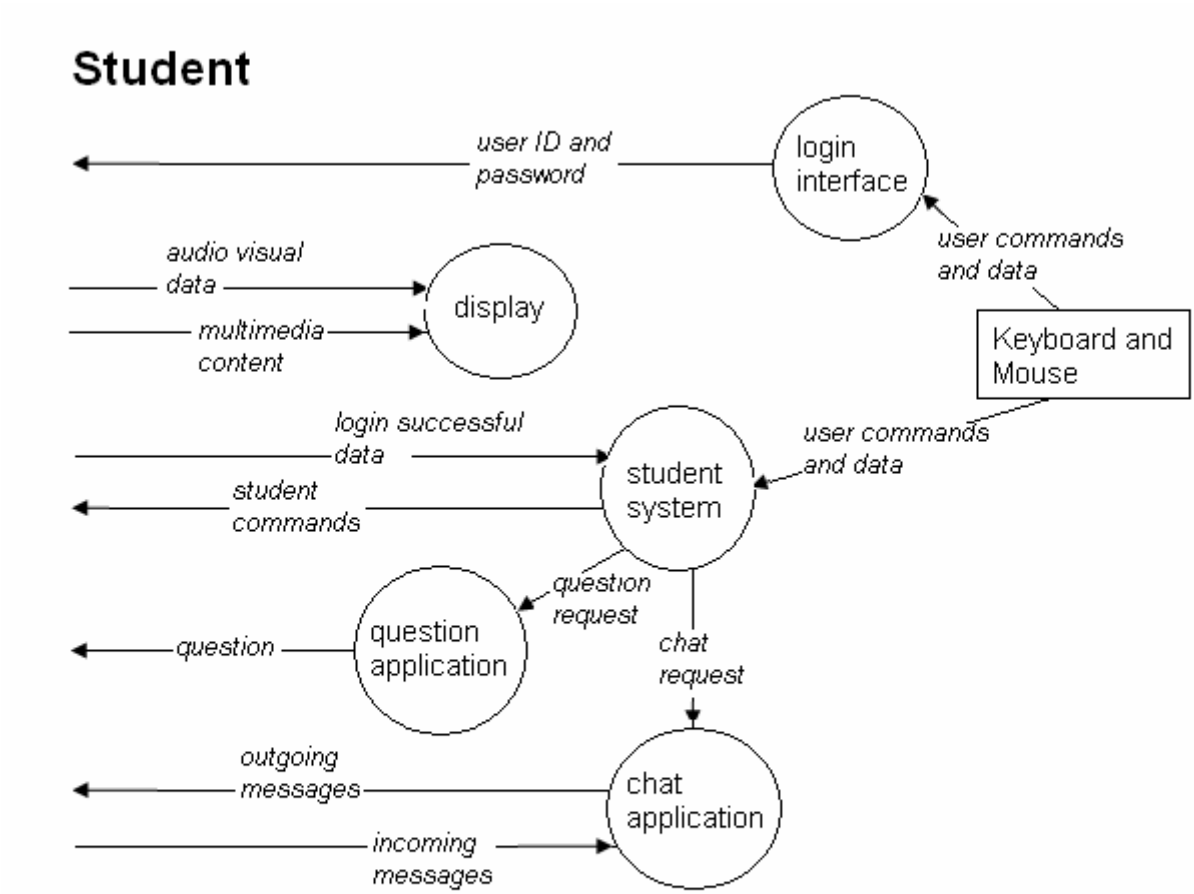
5.2. Functional Model

5.2.1. Data Flow Diagram at Level 2



Server


user ID and password
authentication
user ID and password
login successful data
login successful data
user database
offline record database
audio visual data
video server
audio viual data
lecture request
student server
student commands
lecture request
multimedia content
multimedia server
multimedia content
multimedia database
question
question server
question
outgoing messages
chat server
incoming messages


Student
user ID and password
login interface
user commands and data
audio visual data
display
multimedia content
Keyboard and Mouse
login successful data
user commands and data
student system
student commands
question request
question
question application
chat request
outgoing messages
chat application
incoming messages

5.2.2. Data Dictionary

Name	userID
Aliases	None
Where used/How used	Authentication
Description	userID = string userID is an input which comes from user to get into the system.

Name	password
Aliases	None
Where used/How used	Authentication
Description	password = string (at least 6 characters long) password id is an input which comes from user to get into the system.

Name	login successful data
Aliases	None
Where used/How used	Authentication is valid
Description	Login successful data is the input which comes from the server to the user when the login is successful

Name	visual data
Aliases	None
Where used/How used	Video system uses this data as the input
Description	Visual data is the digital data that comes from the video camera

Name	audio data
Aliases	None
Where used/How used	Video system uses this data as the input
Description	audio data is the digital data that comes from the microphone

Name	command (the instructor)
Aliases	None
Where used/How used	Input for the ➢ video system ➢ whiteboard ➢ multimedia board
Description	The instructor uses commands in order to control his/her application

Name	multimedia content
Aliases	None
Where used/How used	The output of the multimedia board and the input for the multimedia system
Description	The multimedia content (slides, animations,etc)

Name	whiteboard content
Aliases	None
Where used/How used	The output of the white board and the input for the multimedia system
Description	whiteboard content (the data that is created by using the white board tools)

Name	audiovisual data
Aliases	None
Where used/How used	the output of the video system and input for the video server
Description	audiovisual data is the combination of visual and audio data

Name	question
Aliases	None
Where used/How used	the output of the question application and the input for the question server
Description	The question asked by the students to the instructor

Name	chat request
Aliases	None
Where used/How used	the output of student system and the input for the chat application
Description	The request sent from one student to another in order to chat

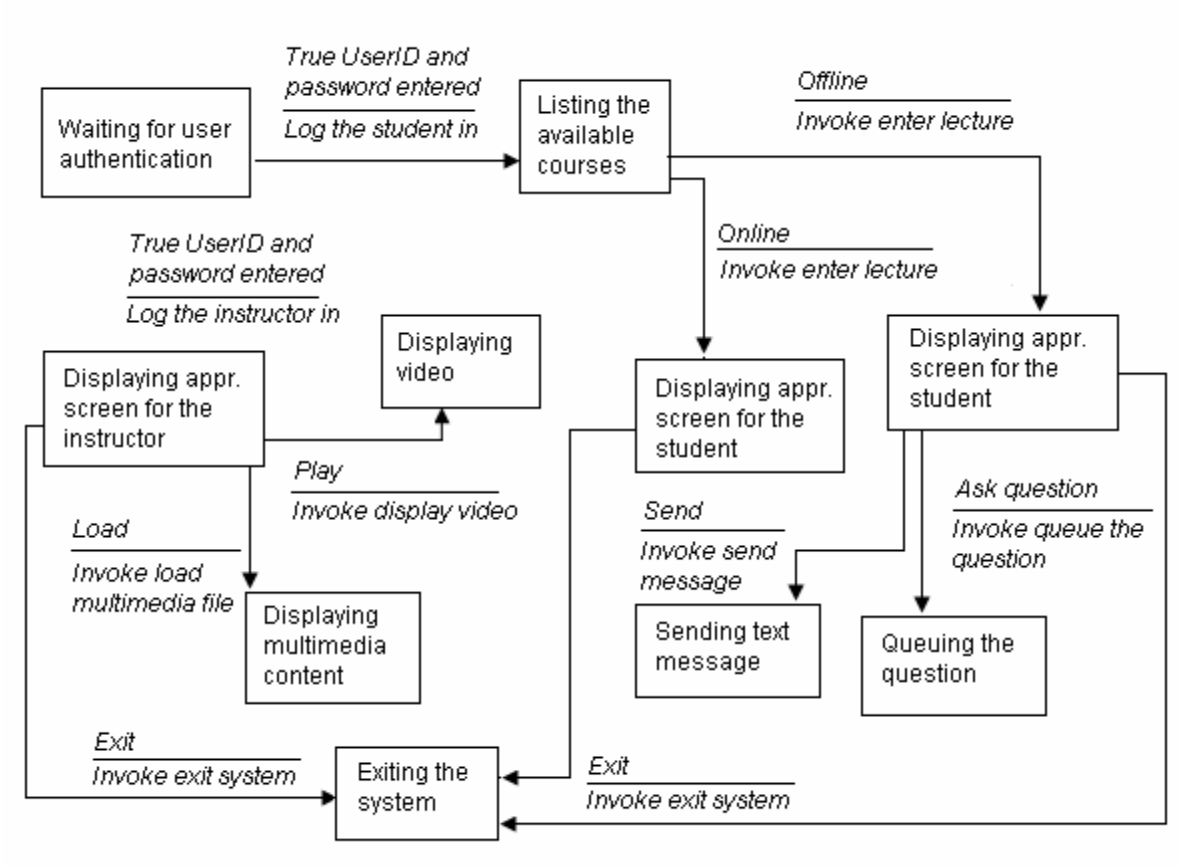
Name	incoming message
Aliases	None
Where used/How used	The output of the chat application and the input for the chat server
Description	The message that is to be sent to the specified student

Name	outcoming message
Aliases	None
Where used/How used	The output of the chat server and the input for the chat application
Description	The message that is to be taken by the target student

Name	lecture request
Aliases	None
Where used/How used	The output of the student server and the input for the video server and the multimedia server
Description	The request for online or offline lecture

5.3. Behavioral Model

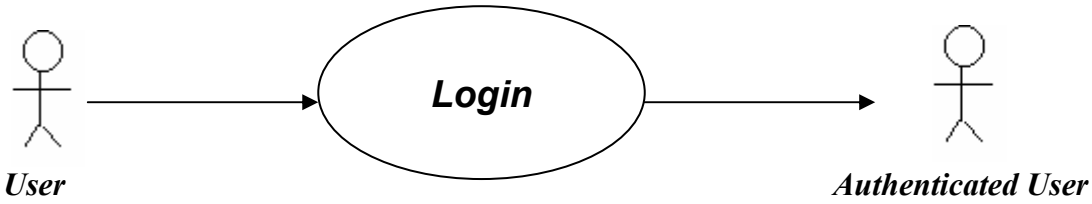
5.3.1. State Transition Diagram



5.4. Use Case Analysis

5.4.1. Login

Initiating Actor: Any user (student, or instructor)
Preconditions: None, this is the starting point of the system.



Flow of Events:

Starts the system.

System:

- Presents login screen to the user.

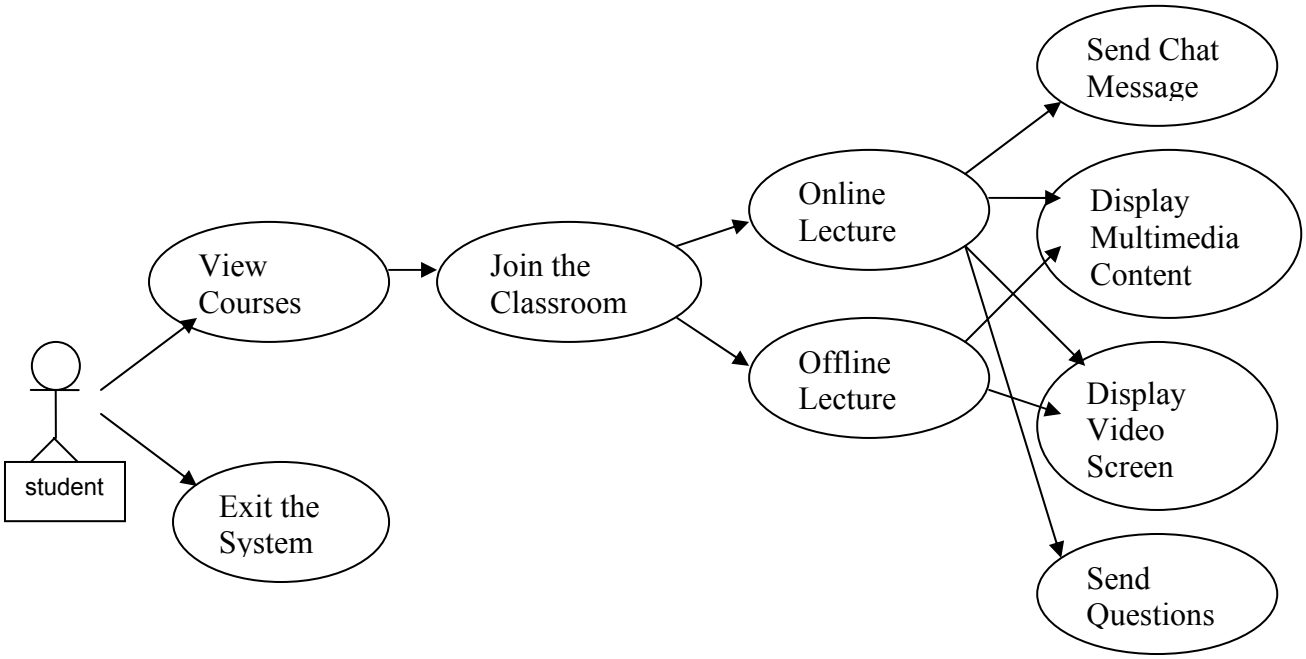
Enters ID, password and type (student /instructor) and clicks the login button.

System:

- Compare the User ID and password with minimum 6-key in the appropriate file.
- If the User ID and password are valid, the user is logged on, and an appropriate screen is presented specifying the services available for this type of user.
- If the ID and/or password are invalid, the system displays a message which notifies user .Then the login screen is presented again.
- Two distinct users with same User ID and password can not log on the system if one is already in the system.

5.4.2. Student Actions

Initiating Actor: Student
Preconditions: The user must be logged in as a student, and must have a menu with available services.



Flow of Events:

Views Courses

Selects “View Courses” option from the menu

System:

- Displays the courses student already enrolled
- Displays the saved lectures for each course to let the student select and enter offline.
- If the course is online at this moment, let the student select and enter online.

Joins the classroom

Selects the course which he/she want to participate in.

System:

- Enters the selected lecture
- Displays the approprite screen for the student

Online lecture

Chats with other students.

- If the student wants to chat with other students, first he/she presses “private”, or “public” button button to determine if he wants to send text message to selected ones, or all the participants.
- If the chat option is “private”, selects the students to send message
- Enters the text to “enter the text” field in the chat tool.

- Presses the “send” button.
- The student who gets the text message is warned by the system audio bell and message appears in the “view messages” field in the chat tool following the previous messages.
- System saves the log files of the public and private text messages.

Video and audio data is loaded.

- Increases or decreases the volume.
- Can not change the size of the video screen.

Multimedia content is loaded into the multimedia board.

Configures the whiteboard by using the whiteboard tool.

- Presses the “snapshot” button to take snapshot of the whiteboard. System copies it to the clip board.
- Changes the background color by pressing “background” button and selecting the color from the color palette.

Asks a question.

- Student types the question in the “enter question” field.
- Presses the “send” button to send it to the instructor.

Displaying content of the course to users.

- Selects the “course map” from the menu**.** The Course Map tool will not directly display files that have been added as attachments, tests, or assignments. Student can use the tool to display the folder or area these things are in, but instructor must ask students to click on the link from that folder.

Offline lecture

Video and audio data is loaded.

- Increases or decreases the volume
- Cannot change the size of the video screen.

Multimedia content is loaded into the multimedia board.

Configures the whiteboard by using the whiteboard tool.

- Presses the “Snapshot” button to take snapshot of the whiteboard. System copies it to the clipboard.
- Changes the background color by pressing “background” button and selecting the color from the color palette.

Displaying content of the course to users.

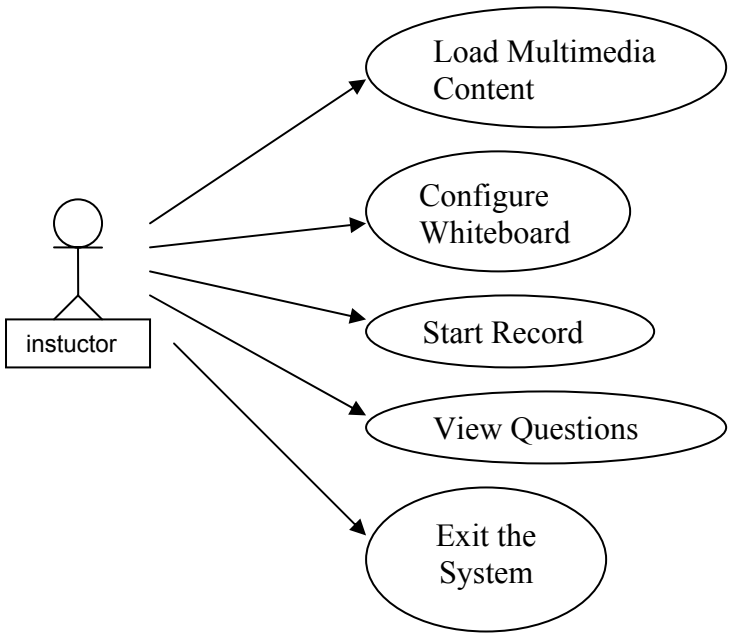
- Selects the “course map” from the menu**.** The Course Map tool will not directly display files that have been added as attachments, tests, or assignments. Student can use the tool to display the folder or area these things are in, but instructor must ask students to click on the link from that folder.

Exits the System

- When student attempts to exit the system by pressing the “log off the system” button,the system gives a warning message for confirming the user’s decision. Then, the user exits the system.

5.4.3. Instructor Actions

Initiating Actor: Instructor
Preconditions: The user must be logged in as a instructor, and must have a menu with available services for instructor.



Flow of actions:

Joins the classroom

- Enters the lecture
- Displays the approprite screen for the student

Online lecture

Loads multimedia content on the multimedia board.

- Instructor uploads supplementary course material from the appropriate file into multimedia board by using “Load File” from menu bar.
- When instructor presses “Share” button ,then multimedia content will be shared by all students present in the system.

Configures video screen.

- When instructor presses “Play” button , data comes from external device (etc.video, webcam) is transferred to student video screen. Morever,the system authomatically start to save this data in the server .

Configures whiteboard.

- Instructor selects necessary drawing tools from toolbar so as to configure the whiteboard.
- Instructor selects necessary edit tools from toolbar so as to configure the whiteboard.

Displays the questions from the students in the queue.

- When the student sends a question, it is queued by the system. At the same time,the sistem give an audio bell warning to the instructor that new question came from the student. Checking the “question queue” field, instructor replies them anytime he wants.

Exits the System

- When the instructor attempts to exit the system by pressing the “log off the system” button, the system gives a warning message for confirming the user’s decision. Then, the user exits the system.

6. GLOSSARY

American Standard Code for Information Interexchange (ASCII)	A computer language used to convert letters, numbers, and control codes into a digital code understood by most computers.
Application Service Provider (ASP)	A specialized form of an Internet service provider (ISP) that allows a company to have a software application hosted via a rental fee. An ASP sells access to a “packaged application” on a fee basis. ASPs provide IT operations expertise (offering the necessary application functionality, hardware, database and networking services, etc.) and frequently also business operation expertise in a particular market niche or in a particular functional area (such as HR or logistics management).
Asynchronous	Communication in which interaction between parties does not take place simultaneously.
Asynchronous Transfer Mode (ATM)	A high bandwidth,low delay, packet-like switching and multi-plexing technique.
Audio Bridge	A device used in audioconferencing that connects multiple telephone lines.
Audioconferencing	Voice only connection of more than two sites using standard telephone lines.
Backbone	A primary communication path connecting multiple users.
Band	A range of frequencies.
Bandwidth	Information carrying capacity of a communication channel.
Browser	Software that allows you to find and see information on the Internet.
Codec (COder/DECoder)	Device used to convert analog signals to digital signals for transmission and reconvert signals upon reception at the remote site while allowing for the signal to be compressed for less expensive transmission.
Collaborative Tools	Allow learners to work with others via e-mail,

	threaded discussions or chat. In some cases, collaboration is used to facilitate team-based projects. Collaborative tools can sometimes provide the ability to host moderated discussion groups, where students and instructors can collaborate on course-related materials or assignments in an asynchronous environment. In addition, real-time synchronous chat allows learners to communicate with their peers and instructors, emulating a physical classroom setting.
Compressed Video	Television signals transmitted with much less than the usual bit rate. The lower bit rates typically involve some compromise in picture quality, particularly when there is rapid motion on the screen.
Computer-Based Training (CBT)	Course or educational material presented on a computer, primarily via CDROM or floppy disk. Unlike Web-based training, computer-based training does not require a computer connected to a network and does typically not provide links to learning resources outside of the course.
Desktop Videoconferencing	Videoconferencing on a personal computer.
Dial-Up Teleconference	Using public telephone lines for communication links among various locations.
Distance Education	The process of providing instruction when students and instructors are separated by physical distance, and technology, often in tandem with face-toface communication, is used to bridge the gap.
Distance Learning	The desired outcome of distance education.
Echo Cancellation	The process of eliminating the acoustic echo in a videoconferencing room.
E-Learning/Technology-Based Learning	Covers a wide set of applications and processes such as Web-based learning, computer-based learning, virtual classrooms, and digital collaboration. It includes the delivery of content via Internet, intranet/extranet (LAN/WAN), audio/video tape, satellite broadcast, interactive TV, and CD-ROM.
Fiber Optic Cable	Glass fiber that is used for laser transmission of video, audio, and/or data.
File Transfer Protocol	A protocol that allows you to move files from a

(FTP)	distant computer to a local computer using a network like the Internet.
Full Motion Video	Signal which allows transmission of complete action taking place at the origination site.
Fully Interactive Video	(Two way interactive video) Two sites interact with audio and video as if they were colocated.
Host	A network computer that can receive information from other computers.
Instructional Television Fixed Service (ITFS)	Microwave-based, high-frequency television used in educational program delivery.
Integrated Services Digital Network (ISDN)	A telecommunications standard allowing communications channels to carry voice, video, and data simultaneously.
Interactive Media	Frequency assignment that allows for a two-way interaction or exchange of information.
Internet-Based Training/Web-Based Training (WBT)/Online Training	Delivery of educational content via a web browser over the public Internet, a private intranet, or an extranet (LAN/WAN). Internet-based training provides links to learning resources outside of the course, such as references, e-mail, bulletin boards, and discussion groups. It provides the advantages of computer-based training (CBT) while retaining advantages of instructor-led training. The term Internet-based training is used synonymously with Web-based training and online training.
Internet Protocol (IP):	The international standard for addressing and sending data via the Internet.
Local Area Network (LAN)	Two or more local computers that are physically connected.
Learning Management System (LMS):	Internet-based software that deploys, manages, tracks and reports on interaction between a) the learner and the content, and b) the learner and the instructor. In particular, training management systems perform student registration, track learner progress, record test scores, and indicate course completions, and finally allow instructors/trainers to assess the performance of their students. Learning management systems administer and track both online and classroom-based learning events, as well as other training processes.

Learning Portal	A Web site that offers learners or organizations consolidated access to learning and training resources from multiple sources. Learning portals can be grouped into content consolidation portals, embedded technology portals, internal portals, community & collaboration portals, and affiliation portals. Operators of learning portals are also called content aggregators, distributors or hosts.
Learning Service Provider (LSP)	An LSP is a specialized type of ASP offering learning management and training delivery software on a hosted/rental basis via diverse business models. There are four different types of LSPs: 1) full service LSPs (customizing, implementing, and hosting a complete software solution via a private network); 2)content specific LSPs (licensing content to an organization and providing a level of learning management services to the buyer); 3) tool specific LSPs (licensing and hosting their specific system to an organization); and 4) portal LSPs (hosting a portal site and bundle the learning system in the background). LSPs also include value-added resellers (VAR) and companies providing certification and testing services, online collaboration services, media production and delivery services, and online tutoring.
Multimedia	Any document which uses multiple forms of communication, such as text, audio, and/or video.
Multi-Point Control Unit (MCU)	Computerized switching system which allows point-to-multipoint videoconferencing.
Network	A series of points connected by communication channels in different locations.
Protocol	A formal set of standards, rules, or formats for exchanging data that assures uniformity between computers and applications.
Server	A computer with a special service function on a network, generally receiving and connecting incoming information traffic.
Slow Scan Converter	Transmitter/receiver of still video over narrow band channels. In real time, camera subjects must remain still for highest resolution.

Synchronous	Communication in which interaction between participants is simultaneous.
Teleconferencing	Two way electronic communication between two or more groups in separate locations via audio, video, and/or computer systems.
Technology-Based Training	Includes the delivery of content via Internet, intranet/extranet (LAN/WAN), satellite broadcast, audio/video tape, interactive TV, and CD-ROM. Technology-based training includes computer-based training (CBT) and Web-based training (WBT).
Training Management Systems	See Learning Management Systems.
Transmission Control Protocol (TCP)	A protocol which makes sure that packets of data are shipped and received in the intended order.
Video Teleconferencing	A teleconference including two way video.
Web-Based Training (WBT)	See Internet-Based Training

Note
The following resources were reviewed and consulted in the preparation of this publication:

- Glossary: http://152.30.11.86/DEER/Houghton/Committees/distancelearn/GlossaryDistEd.html
- Glossary of Terms. http://www.ctcnet.com/tips/glossary.htm
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- Willis, B. (Ed.) (1994). Distance education: Strategies and tools. Educational Technology Publications, Inc.: Englewood Cliffs, N. J.

7. REFERENCES

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2. Verduin, J.R. & Clark, T.A. (1991). *Distance education:The foundations of effective practice*. San Francisco, CA: Jossey-Bass Publishers.