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Enhanced Learning Management System (LMSs)

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ABSTRACT

SAQ is Web-based software you use over the internet with a web browser. You don't have to install any CDs, download any software, or worry about upgrades. If you use an online bank or web-based email program like Gmail, Hotmail, or Yahoo Mail then you've already used web-based software before.

In this thesis, we had got the code of the program DimDim and made some modifications and additions, but based on conversion of this program from a special program for private transactions, banking, politician and business to new program that is more comprehensive and wider, it is not limited to banking and private transactions, but in order to be more prevalent and comprehensive to include educational transactions, e-learning, social media, political and business in addition to solve the existing program's problems in the above mentioned.

Then we enhanced "DimDim" and made some modifications to be a new software called "SAQ" which has differences that one more efficient than "DimDim", beginning firstly; the new name "SAQ" related to simulation answer and questions but "DimDim" we didn't find any meaning for it, secondly; "SAQ" had been more secure by creating a database tables that have a user name and password for each subscriber, it prevents anyone to enter the chat room which hasn't user name and password, thirdly; adding scalability for subscriber number which was limited by two, but in "SAQ" had been reached to one hundred, besides that; made availability to use cameras and microphones for each subscribers controlling of the number of users, subscribers using cameras and microphones, finally; the frame size of the camera which was fixed but in "SAQ" had been variable due to the number of subscribers using cameras and appear on the user interface.

ملخص

يعتبر البرنامج "SAQ" احد برامج المحاكاة بين السؤال والجواب وهو برنامج على شبكة الإنترنت يستخدم من خلال متصفح ويب, وللتعامل مع هذا البرنامج فأنت لست بحاجة لتحميله سواء من الانترنت أو من خلال اسطوانة مضغوطة, إذا كنت تستخدم احد التطبيقات عبر الإنترنت أو برنامج البريد الإلكتروني على شبكة الإنترنت مثل Google أو Yahoo أو Hotmail أو Gmail فإنه من السهل عليك استخدام البرنامج "SAQ" مثله كأي تطبيق علي أي متصفح لشبكة الانترنت.

في هذه الأطروحة، فقد حصلنا على الكودالخاص بالبرنامج "DimDim" وأجرينا بعض التعديلات والإضافات، ولكن على أساس تحويل هذا البرنامج من برنامج خاص بالمعاملات السرية والمصرفية الخاصة بالسياسيين و رجال الأعمال لبرنامج جديد أكثر شمولية وأوسع نطاقا لا يقتصر علي المعاملات المصرفية والسرية فقط، ولكن ليشمل المعاملات الخاصة بالتعليم، كالتعلم الإلكتروني، ووسائل الإعلام الاجتماعية والسياسية ورجال الأعمال لتسهيل المهام علي المدرسيين والطلبة.

وعليه فقط تم التعديل علي البرنامج "DimDim" ليكون برنامج جديد يخدم التعليم الالكتروني يختلف عن القديم بداية بالاسم الجديد "SAQ" والذي يعني المحاكاة بالسؤال والجواب, ومن ثم زيادة الحماية والأمان لمستخدميي البرنامج من خلال إنشاء قاعدة بيانات تحتوي علي اسم المرور وكلمة السر لكل مستخدم للبرنامج ويريد الدخول لغرف المحادثة, ويزداد اختلافا بالتغيير الرئيسي علي البرنامج ألا وهو زيادة عدد المشتركين المستخدميين للبرنامج في نفس اللحظة وفي نفس غرفة المحادثة من عدد اثنيين الي عدد يصل الي مائة مشترك, بالإضافة الي ذلك السماح للمشتركين بالتحكم بعدد الكاميرات ولواقط الصوت المستخدمة من خلال مدير غرفة المحادثة وليس من خلال مدير الخادم, وأخر التعديلات هو التحكم في حجم برواز الصورة الخاص بالكاميرات فزيادة عدد الكاميرات علي واجهة البرنامج يتطلب مساحة كبيرة أو من خلال التحكم بحجم الكاميرات والذي يعطي الامكانية لرؤية أكبر عدد ممكن من صور الكاميرات علي الواجهة الرئيسية للبرنامج.

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Introduction

Chapter One: Introduction

Traditional education, also known as back-to-basics, conventional education or customary education, refers to long-established customs found in schools that society has traditionally deemed appropriate. Some forms of education reform promote the adoption of progressive education practices, a more holistic approach which focuses on individual students' needs and self-expression. In the eyes of reformers, traditional teacher-centered methods focused on rote learning and memorization must be abandoned in favor of student-centered and task-based approaches to learning. However, many parents and conservative citizens are concerned with the maintenance of objective educational standards based on testing, which favors a more traditional approach [1], see Figure 1.1.

As students and teachers, we all have had the experience of being in a traditional classroom. You can see and interact with your classmates. Every movement or sound around you is visible or audible to distract you. The usual scene of flying aeroplanes, caricatures, jokes etc behind teachers' back especially when they are writing on the board, punishments, getting grounded and what not. You are getting bored but dare not leave the lecture in between. Or else maybe as a teacher you want to extend your lecture but the schedule holds you. Now the scene has changed. In the Virtual Classroom, a teacher can address a strength of about 200 without having to shout, without getting distracted and everything is under control. Imagine how much time is saved! As a teacher, you can upload Power Points, Excel sheets, Word documents and PDFs. Just a click away! Not to forget using as many boards as you want to, getting connected to the Internet, loading videos-- probably everything that a teacher requires is a click away. You are constantly facing the students. There is no din and noise to be borne. No disturbance and yet you can interact with the taught! It is for you to decide whether a student can talk

or not. Sounds like a wow science fiction! No it is no Teaching Story 2050; it is a reality in 2008. And that too without any investment! As a teacher you have the right to select your pay package and you can teach globally. What else would a teacher desiring to take up online teaching as a profession want! [2].

Figure 1.1: Traditional Class Room

1.1 Distance Learning Definition

Distance learning, an option different from the traditional classroom (TCR), takes place when space, time or both separate the teacher and the learner. Whether online through the Internet or through videoconferencing, distance learning offers educational opportunities that meet students' changing needs and grant them the flexibility of learning anytime, anyplace and at a pace that meets their individual learning styles [3]. Distance education is well regarded as a better way to bring education to those who are unable to attend classes at traditional schools and universities. In recent years, new Web technologies and systems such as Ajax,

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RSS, Wikis, blogs, social networks, online image and video sharing, online whiteboard and mind maps have made distance education more efficient and effective. However, in today's distance education practice, distance learners still cannot get some of the benefits that traditional classrooms have offered [4].

These days, there are many different ways to access higher education. You can enroll in a traditional program, attending classes and accessing educational resources on campus. You can also enroll in an all-online program, in which the majority of your school work and communications are completed via the Internet. Or there's the in-between option: Blended learning environments that combine on campus and online coursework "Virtual Class Room" (VCR) [5].

1.2 The Difference between Distance Learning and Traditional Learning VCR and TCR

How do you know which option is right for you? The following guide covers some of the major differences between online and on-campus courses to help you decide what method will best meet your needs [43].

1.2.1 Flexibility

Online courses typically allow students to work asynchronously, which means that they can complete their coursework at the time and place of their choosing. This is often ideal for working students or single parents who need a flexible schedule. However, students who struggle to be self-motivated may find that they quickly fall behind.

1.2.2 Communication

Gone are the days when distance learning meant that you had to correspond with your instructor via snail mail, or even email. Today's Internet-based courses

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typically include opportunities for instant communication such as message boards, online chatting and even videoconferencing.

But even a video conversation can't replace the experience of face to face interaction. Students who thrive on the quick exchange of ideas between professor and students may find that they prefer the classroom environment to online courses. On the other hand, students who experience anxiety when they're called on to speak during class will enjoy the time to reflect on their responses offered by online courses.

1.2.3 Interaction

For many students, social interactions are a key aspect of the college experience. If you're planning to meet new people and expand your social and professional networks, it's important to take at least a few classes on campus.

However, online courses aren't entirely devoid of interaction. As noted above, some include message boards and videoconferences that link classmates to each other as well as to their instructors. Furthermore, many online classes are taken by people from all over the world at the same time, offering an opportunity to make digital connections with people who you would never meet on campus.

1.2.4 Learning and Skills Development

Of course, the primary reason you're in class is to learn and develop new skills. For some students, this can be very difficult without the direct, face to face input of an instructor. If you don't learn well from books and other written material you may find that you struggle with online coursework, particularly when you don't receive swift feedback.

However, online courses offer some unique opportunities for skills development. It's important to be somewhat comfortable with computers before

you embark on an online class, but most students find that the experience helps them develop a whole new set of useful technical skills. Online courses also typically involve a lot more writing practice since there are few opportunities for answering questions verbally [5].

1.3 Problem statement

The growing popularity of E-Learning has introduced new terms to education, such as Virtual Classroom, where the students and the teacher meet in a virtual classroom. In virtual classrooms students are not present physically in the classroom but connected to the classroom via the Internet. Just as the term virtual means a simulation of the real thing, Virtual Classroom is a simulated classroom via the 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 [6]. Tools and technology that can be implemented to enhance teaching and learning from a distance continue to evolve. With this rapid evolution, continuous assessment is necessary to ensure optimal connections take place among students, instructors, and educational content in an effective, and online learning communities [7]. The Virtual Classroom is a network system to provide a distributed, near real-time electronic collaborative environment that allows video, audio, data and sensor participation by a worldwide set of participants in experiments undertaken in physically remote locations [8]. Walls or specific time slots cannot contain the current classroom experience. Through transparent and virtual accessibility, Internet-based systems enrich virtual classrooms through multiple avenues of communication. Virtual classroom implementers use these new avenues to transcend the former, passive student experience where the instructor was the

mentor and the students were the learners. Ideally, virtual classrooms include multiple representations of the classroom knowledge, learning, and assessment. For example, a professor or student giving a presentation can combine static power point slides of the lecture with an oral presentation of those slides, further augmented by annotations in the slides, and including multiple assessment instruments for the audience's confirmation of learned outcomes. Traditionally, professors relied on textbooks, lectures, and a board/overhead to convey the dense, hard-to-grasp information they were communicating, i.e. static representation. The current academic climate and the needs of its different types of learners demand the advantage of dynamic representation- an advantage that is a challenge to accomplish. This is radically different from a mere reconfiguration, repurpose, or redirection of existing curricula. The virtual classroom is nothing like the traditional classroom. Primary differences are geography, increased class size, and time benefits. Students and professor can choose geographically where their virtual classroom will exist from one class to another, i.e. the "anyplace classroom". The idea of infinite limit for student enrollment to the virtual classroom is good for the academic institution but a nightmare for the instructor. The dynamics of the classroom experience change from traditional specific time slot of classes, i.e. Monday and Wednesday, 1 pm to 3 pm, versus the 24/7 availability of a proposed web classroom. The virtual classroom communicates clear realistic availability of each component. Yes, the web site is 24/7 available. The instructor is available during office hours, i.e. Monday and Wednesday, 1pm to 3pm [9].

1.4 Thesis Motivation

The motivation of the thesis is that current LMSs are a hot education science research. They need a lot of development and enhancements to provide Quality of

Services (QoS), capabilities and additional tools to make them easier to use. So, there are some real factors motivate me. There are including the following:

a) The lack of virtual classrooms in current LMSs;

b) The poor QoS functionality in current LMSs that support these virtual classroom systems.

c) The limited number of users that are currently supported in existing virtual classrooms (e.g. Skype, DimDim, OpenMeeting, etc.). This limitation is necessary due to the degraded performance when this number increases.

1.5 Thesis Objectives

The objectives of this MS thesis research are to:

- Enhance Learning Management Systems (LMSs) with virtual classroom tool, video streaming technologies, video sharing, other Web 2.0 technologies and interactive tools. The architecture of the virtual classroom will be integrated with the LMS systems.

- Develop the virtual classroom system to be modular and component-based. This modular design enables us to test each component separately and independently.

- Make the developed virtual classroom user-scalable by developing an enhancement software package to some example LMSs that currently support a limited number of participants by upgrading them into supporting as many users as the instructor using them desires (the support will be practically to an infinite number of users). The scalability of the developed virtual classroom is in number of users. Increasing the number of students leads to an increase in the interaction between students and the instructor. This objective is stated since existing virtual classroom tools (Skype,

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DimDim, etc.) put a limit on the number of users who could participate in the virtual classroom due to performance limitation issues.

▪ Improve developed virtual classroom Quality of Service (QoS) and performance compared to existing virtual classrooms. The performance metrics to be optimized include delay, Round Trip Time (RTT), Bandwidth, number of users, and throughput.

▪ The developed virtual classroom will have the following technical features: increasing the possibility of interaction between students and the instructor, improving performance in students sharing, increasing the permissions of the instructor, and increasing the permissions of the students (users).

1.6 E-Learning Literature Review

In this section we present some of recent work that has been done in the field of virtual classrooms.

In reference [8] authors present the design and current status of an interactive Virtual Classroom project. A prototype has been developed at San Jose State University SJSU to implement and test equipment, software and processes for extending the classroom and experimental teams to remote sites via wireless Internet. The intent of the center is to demonstrate and develop systems that can be implemented for outreach programs to provide the students immersed education by taking the classroom to the experimental site. The interactive IP network supports experiments such as, robot tele-presence, multi-sensor observatories, real time computational fluid dynamic, structural and thermal analyses for vehicles and payloads such as microsatellites, high altitude balloons and rockets. The deployed system allows for worldwide collaboration and virtual access to remote experimental facilities and modeling laboratories. The collaborative services provided include video/audio, links between experiment areas and experimenters,

archive capabilities and broadcast of two-way video and audio, and instant messaging. The Virtual Classroom demonstrates that modern wireless communications systems can be integrated to provide seamless, high performance communications even to remote locations. It provides a platform for extending to the entire Internet.

In reference [10] authors discuss salient features of a virtual classroom model that can take advantage of a worldwide networking infrastructure of WWW to conduct education electronically. A conceptual overview of this model, called VCOIN "Virtual Classroom Over the Internet", is presented in detail. VCOIN provides a platform for a student-oriented learning approach as opposed to the conventional teacher-centered classroom system. The paper discusses how a student can exploit the flexibility of the VCOIN system to determine his /her plan for learning. However, VCOIN provides several unique features for retaining the instructor's ability to oversee student activities, which is a major advantage in a conventional classroom. Algorithmic details are provided for a combination of centralized and FCFS (Fist-Come First-Serve) floor control for regulation of audio/video communications of student groups and centralized Mouse Detect feature for monitoring and controlling student activities at a remote place.

In Cork Institute of Technology "ICT" [11] in April 2005, the authors managed a project which is sponsored under the Socrates/Minerva action plan for ICT in Education. The main stated purpose of their project is to analyze, evaluate and document the use of synchronous e-learning systems (virtual classroom systems) in academic and corporate institutions in Europe. The project is coordinated by the Ericsson Competence Solutions in Dun Laoghaire, Ireland and runs until October 2005. Their work includes the production of portfolio of ten demonstration courses which have to do with the production, delivery and evaluation of a number of real virtual classroom sessions.

A virtual extension of the classroom was been designed, implemented, and deployed in [12], a distance education system based on integrating the remote students in a unified, highly-interactive virtual environment. Most classrooms already have a front facing projector driven by a PC—the main piece of additional equipment is a projector facing towards the back of the classroom. The projector paints a virtual hole into the back wall which reveals a virtual extension of the classroom that hosts remotely located students. Preliminary tests indicate that the configuration is effective. The remote students feel and are perceived as being present in the classroom.

In reference [13] authors proposed to inspire creativity in e-learning using a tool called the virtual interactive classroom by using RTMP (Real- Time Messaging Protocol) which is a sophisticated TCP-based real-time networking protocol that supports the efficient exchange of messages, synchronized data, audio, and video. Teachers and students can publish streaming audio, video and other data messages to present streaming media with interaction or navigation. Using this virtual classroom on the Internet, students can immediately interact with teachers as though they were studying in a real classroom. In addition to the virtual interactive classroom, the authors also propose using web-based collaborative work as an add-on feature to the learning system. Both teacher and students can use the web-based collaborative work for sharing resources and exchanging ideas after the class. The integration of the two concepts of the virtual interactive classroom and web-based collaborative work in order to enhance teaching and learning performance has been created.

In reference [14] authors proposed an LAMS (Learning Activity Management System) sequence template which is expected to lead them to a pedagogical planner for implementing effective synchronous virtual classroom, and they share the lessons learnt about using LAMS to facilitate open education in

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their university. Organizing synchronous e-learning opportunities for their students is an effective way to increase self-learning with less guidance and support. By using LAMS they can properly prepare and monitor their students to enhance their participation in effective Tutoring Tele-Meetings (TTM) with which they complement teaching of algorithms to undergraduate students. They identified the characteristics of LAMS from the perspective of process support in order to facilitate an effective synchronous virtual classroom which is used in teaching of Algorithms to undergraduate students. LAMS is capable to support the educational blended learning approach but entail an increased workload for instructors and tutors. Fortunately, with time consuming and undertaken experience this load could be expected to diminish. LAMS appears to have compromised learning outcomes in comparison with the previous learning environment in increasing learners' motivation and in encouraging participation. By using LAMS instructors can properly prepare and monitor their students to enhance their participation in effective TTM.

In reference [15] authors discuss the architectural design of an integrated system for the delivery of lectures in a virtual environment. The architecture and description of the system components are presented with the techniques and recommendations for the implementation of the designed system. The system architecture is multi-tier, modular, scalable, and built for adaptability to database middleware suite. All functionalities within the application are delivered using Web services, communicate via industry standard XML messaging and access is purely via a Web browser. The architecture for an integrated virtual classroom for delivering lectures, issuing and controlling assignments, with chatting, choices and forums is proposed. The proposed architecture takes advantage of e-learning features such as the White board, Audio and Video features. The Video feature

enables one to transmit and receive video broadcasts with others in a classroom session.

Chronobot/Virtual Classroom (CVC) system is designed and implemented in [16]; CVC system is a novel time/knowledge exchange platform. The system is based on a flexible, component based architecture. The messages used by the distributed components are formulated in XML, and every component can be tested separately. The communication server is built on the basis of the Java Messaging Service (JMS) engine. Message archiving techniques are described to support unlimited message retrieving. Verified in practice, the system can provide an operational, robust platform for time/knowledge exchange in e-Learning and distance education.

In reference [17] authors discussed that the appearance of powerful portable communications devices, resulting in the need for future LMS (Learning Management System) aims to accessibility, independent of the dominant or pre-defined platform for access to educational content and educational activities. The increasing spread of virtual social interaction gets a significant role in creating applications that are supported by the LMS. In social interaction, consumers are increasingly sharing resources for learning, as well as their ideas and opinions through discussions, presentations, blogs, comments, etc… tools for this purpose. In this way, learning moves from the corporate model to the global, and therefore the organization LMS need the same adjustment. Accordingly, authors conclude that any existing LMS needs to be developed and improved. Flexibility and adaptability LMS individual and social community, whether real or virtual, individually or through collaborative learning, accompanied by educational standards, is one of the main objectives which determines LMS future. Accessible to large repositories of learning objects, monitoring of standards for the creation of compatible content (for example SCORM), an increase of structural, as opposed to

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instructional content, forcing non linear ways of learning, follow-up of new IT is the default.

In reference [18] authors outline techniques for an active learning environment in a virtual MIS (Management Information Systems) classroom, as well as a comparison of outcomes in that distance learning class with a regular, live, MIS class. These techniques included discussions, small group projects and cooperative work supported by technology such as chat sessions, e-mail and bulletin boards. Feedback to students was improved through the use of an online grade book and e-mail. Outcomes were measured in terms of grades for participation, exercises, assignments, tests and the overall grade. There were no significant differences in outcomes. They also present the results of a survey measuring students' experiences with the virtual class. Students were generally very positive about the quality of the learning experience. Teaching a distance learning class using active learning techniques is a difficult and time-consuming enterprise.

In reference [19],[20] authors highlighted how technology adds value to the academic learning experience/environment for business communication with a focus upon televised courses, streaming videos, instant messaging and Web-based resources. Implications for the learning experience are that oral and written language use becomes more dynamic, an that learner outcomes are audience- and message centered; and that content instruction is analytical.

Shubhangi K. Jadhav and Archana Rane Sterling from the Institute of Technology and Management through the Center for Development of Advanced Computing (CDAC) organization [20], carried out research and development in the area of computer software technology and computer science and Conducting educational programs and training activities such as Vasistha which is an Instruction Delivery Framework for Online Learning which aims to provide a

framework for course designers to structure an online course for effective online learning. The focus of this framework is on learning rather than just information gathering. Authors also develope Veda which is an online testing and question banking system. The system allows a teacher to create tests in any domain. These tests can be administered on-line to a large number of students. The system enables frequent and effective evaluation of students, and also provides feedback about the test to the staff in terms of a statistical analysis of questions. In adition, the authors develop Sandesh which is query responding simplified. In many large-scale e-learning scenarios, one of the major concerns is handling the queries coming from the participants. Unlike in a classroom, one student does not know what questions other student's pose. Thus repetitive queries are very common. However, since different students pose the queries they may not be identical, for simple string matching to detect similarity and combine responses. Thus, query handling tends to demand substantial time investment from the faculty. Sandesh is an attempt to answer this problem, automating the process of replying to such e-mails. (Chaatra) A Student Monitoring and learner modeling system produce very basic statistics about students such as page hits and number of posts on forums, which do not really convey any information to the teacher about the actual learning that is taking place. For example, although the page visits, quiz results and forum entries are recorded in the system, no correlation is established between these. And (Acharya) Intelligent Tutoring System for SQL brings artificial intelligence techniques to the field of computer-based instruction. ITS uses elaborate internal representation of the subject to be taught, enabling it to reason with student's level of understanding of the subject.

The Cisco Virtual Classroom solution allows institutions to address all of these issues in a flexible [21][22], cost-effective, and ultimately successful manner. Based on the Cisco Meeting Place conferencing platform used by enterprises

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around the world for the last decade, Cisco Virtual Classroom blends audio, video, Web collaboration, white-boarding, and instant messaging (IM) capabilities into a single, comprehensive distance learning solution. [22] Existing video conferencing systems allow participants to see and hear each other; the design is not based on the way people naturally interact. There is no sense of being in the same room with other participants due to poor audio quality, poor image resolution, and the small size of the picture. Eye-to-eye contact is commonly absent due to misplaced cameras. At best, video conferencing achieves "situational awareness" of what is happening in a remote location, but cannot convey facial expressions. Furthermore, video conferencing is limited by its difficulty of use and spotty connectivity success, particularly for some faculty who are not technically savvy. Cisco create a Tele-Presence system which significantly different from existing video conferencing systems. Cisco Tele-Presence enables eye-to-eye contact between participants as well as allowing participants to observe nonverbal cues. Through the use of multiple video cameras and screens, students and educators are able to see one another at the same time they are viewing shared video, and are able to conduct an electronic dialogue without the constraints of time and place. Such group brainstorming can be the most rewarding and productive educational experiences of all and provide the essential teamwork skills required by today's business world. Additionally, research teams on cross institution and transnational projects can save traveling time and money for brainstorming and development meetings.

In reference [23] J. Stefan Institute and University of Ljubljana, Slovenia developed expertise and knowledge that is focused on workplace learning. they offer high quality programs in workplace learning and expertise on a range of issues related to workplace learning, that will help work organizations gain sustainable competitive advantage. Computer literacy programs for learning

industry-standard computing skills and programs for education for quality standardization process are most frequently wanted by Slovene enterprises these days. Their workplace learning environment is implemented through virtual textbook and virtual classroom. They allow students to access learning materials and other supporting tools, and to communicate and collaborate with their colleagues as well as with the tutors by means of standardized Web browsers and other services based on client-server model. The results achieved in their first few implemented environments are encouraging. Students expressed high degree of interest for participation in the existing courses and proposed many new topics for new courses. The efficiency of learning measured through the results of formal examinations showed excellent degree of proficiency in subjects studied.

In [4] Distance education is well regarded as a better way to bring education to those who are unable to attend classes at traditional schools and universities. In recent years, new Web technologies and systems such as Ajax, RSS, Wikis, blogs, social networks, online image and video sharing, online whiteboard and mind maps have made distance education more efficient and effective. However, in today's distance education practice, distance learners still cannot get some of the benefits that traditional classrooms have offered. In this paper, we present the design of a Web-based course delivery system that is intended to provide a classroom like environment to learners distributed across the Web. Within such a system, learners are more closely connected, and helps can come more timely from their peers or the instructor and tutors. We discuss the design and architecture of the system, as well as the implementation. They presented the design and implementation of online course delivery system intended to provide distance learners with a better virtual classroom or virtual learning environment. They first talked about some special considerations for the design, and then presented the architecture of the system on the server side. also discussed about how the system can be

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implemented using publicly available Web technologies including PHP, MySQL, JavaScript with Ajax and others, though we didn't show the details of coding.

1.7 Thesis Contributions

In order to effectively and efficiently implement the objectives of the thesis we intend to apply the following methodology and procedures:

- Study and analyze different existing virtual classroom systems such as Skype, DimDim, OpenMeeting, Illuminate, etc. The analysis of these tools will include technologies used, weaknesses, technical problems, limitations, Quality of Service (QoS), and maximum number of users supported.

- The developed virtual classroom system will fix the problem in existing virtual classrooms and will be:
    - flexible
    - component-based and modular, and
    - scalable

We will use video and audio streaming technologies, state-of-art real-time transmission protocols, and Web 2.0 technologies. A main concern in the design will be the focus on improving QoS.

- Compare the results with many different systems from different aspects like possibilities, the number of users, capabilities, functionality, efficiency, connections modes, use camera and microphone etc.

- Evaluate the enhanced virtual classroom through the conduct of several lectures using the system by different communities including universities, corporations, and industry. In addition, the virtual classroom will be tested in different communication technologies such as wired and wireless Internet (e.g. WiFi,).

- Testing each module (component) of the enhanced system separately.

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- Testing the whole system in an integrated fashion.
- Present the results of a survey measuring students' experiences with the developed virtual classroom.
- Measuring the QoS metrics of the developed system including delay, Round Trip Time (RTT), Bandwidth, number of users, and throughput.
- Compare the results with results obtained from existing equivalent systems (Skype, DimDim, Illumuinate, etc.).

1.8 Thesis Organization

The rest of the thesis report is organized as follows: Chapter 2 presents the virtual classrooms techniques in learning management systems. Chapter 3 presents the related work in virtual classrooms. Chapter 4 presents thesis enhancements to virtual classrooms. In addition, Chapter 4 presents validation of the developed enhancements. Chapter 5 represents the validating proposed enhancements. Chapter six summarizes and concludes the thesis with future work.

Chapter Two

Virtual Class Room Architecture

Chapter Two: Virtual Class Room Architecture

2.1 Introduction

E-Learning has become one of the most popular teaching and learning methods by stretching the spatial and temporal barriers. Various e-learning systems have been developed in the past decade. Learning Management Systems are able to support online training with different levels of granularity and formalization, which focus on automation of some aspects of the design process, execution and assessment. Learning Content Management System expects to provide standard-based content repositories that allow learners to capture, store, deliver, and manage learning resources. Furthermore, ubiquitous learning environment gains more and more attention in recent years, which aims to provide an interoperable, pervasive, and seamless learning architecture to connect, integrate, and share three major dimensions of learning resources: learning collaborators, learning contents, and learning services. However, almost the e-learning systems are self-independent and the learning resources are disordered, isolated, and heterogeneous, and there is no common overarching context for the available resources.

Virtual learning communities are cyberspaces in which individual and collaborative learning is implemented by groups of geographically dispersed learners and providers of knowledge to accomplish their goals of learning. Though there are no agreements on what constitutes a virtual learning community, it has gained widespread acceptance that virtual learning communities are knowledge based social entities where knowledge is the key to their success. An important activity in a virtual learning community is the collaboration. Many virtual learning communities strive to attract new members or encourage members to learn and to contribute knowledge. Nevertheless, such collaboration environment is generally not supported by conventional learning environments [41] [45].

E-learning 2.0 emerges inspired by the popularity of Web 2.0, which places increased emphasis on social learning and use of social software such as blogs, wikis, and etc., . Conventional e-learning systems were based on instructional packets that were delivered to students using Internet technologies. The role of students consisted in learning from the reading and preparing assignments. By contrast, E-learning 2.0 is built around collaboration, which assumes that knowledge is socially constructed. Learning takes place through conversations about content and grounded interaction about problems and actions. It focuses on promoting communication, social interaction and participation to scaffold learning. Therefore, it is desirable to design and develop a sophisticated learning environment to achieve e-learning 2.0, encouraging learners' active involvement of resource contribution, enabling convenient resources accessing and utilization, and facilitating better interaction and collaboration [3].

2.2 E-learning Approaches

There are two general approaches to e-learning: self-paced and facilitated/instructor-led. Self-paced learners are alone and completely independent, while facilitated and instructor-led e-learning courses provide different levels of support from tutors and instructors and collaboration among learners. Often, e-learning courses combine both approaches, but for simplicity it is easy to consider the two separately.

2.2.1 Self-paced e-learning

Learners are offered e-learning courseware (also called Web-based training (WBT)), which can be complemented by supplemental resources and assessments. Courseware is usually housed on a Web server, and learners can access it from an online learning platform or on CD-ROM. Learners are free to learn at their own

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pace and to define personal learning paths based on their individual needs and interests. E-learning providers do not have to schedule, manage or track learners through a process. E-learning content is developed according to a set of learning objectives and is delivered using different media elements, such as text, graphics, audio and video. It must provide as much learning support as possible (through explanations, examples, interactivity, feedback, glossaries, etc.), in order to make learners self-sufficient. However, some kind of support, such as e-mail-based technical support or e-tutoring, is normally offered to learners. When self-paced e-learning is offered through an Internet connection, there is the potential to track learners' actions in a central database.

2.2.2 Instructor-led and facilitated e-learning

In this model, a linear curriculum is developed that integrates several content elements and activities into a chronological course or syllabus. The course is scheduled and led by an instructor and/ or facilitator through an online learning platform. E-learning content for individual study can be integrated with instructor's lectures, individual assignments and collaborative activities among learners. Learners, facilitators and instructors can use communication tools such as e-mails, discussion forums, chats, polls, whiteboards, application sharing, and audio and video conferencing to communicate and work together. At the end, a final step typically includes an exercise or assessment to measure learning [24] [44].

2.3 E-learning Components

E-learning approaches can combine different types of e-learning components, including:

(a) E-learning content;

(b) E-tutoring, e-coaching, e-mentoring;

(c) Collaborative learning;

(d) Virtual classroom.

2.3.1 E-learning content

E-learning content can include:

2.3.1.1 Simple learning resources

Simple learning resources are non-interactive resources such as documents, PowerPoint presentations, videos or audio files as shown in Figure 2.1. These materials are non-interactive in the sense that learners can only read or watch content without performing any other action. These resources can be quickly developed and, when they match defined learning objectives and are designed in a structured way, they can be a valuable learning resource even though they don't provide any interactivity [47].
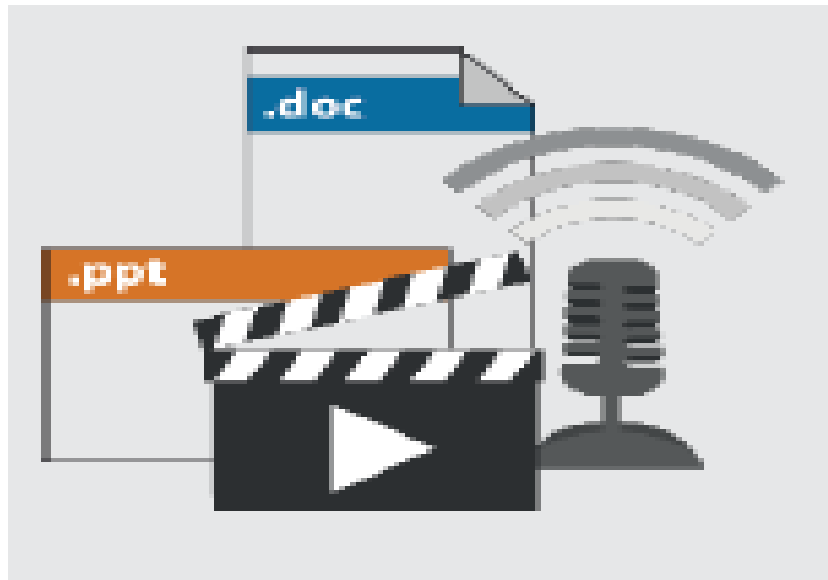
Figure 2.1: Simple learning resources

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2.3.1.2 Interactive e-lessons

The most common approach for self-paced e-learning is Web-based training consisting of a set of interactive e-lessons. An e-lesson is a linear sequence of screens which can include text, graphics, animations, audio, video and interactivity in the form of questions and feedback as shown in Figure 2.2. E-lessons can also include recommended reading and links to online resources, as well as additional information on specific topics [37].

Figure 2.2: Interactive e-lessons

2.3.1.3 Electronic simulations

Simulations are highly interactive forms of e-learning. The term "simulation" basically means creating a learning environment that "simulates" the real world, allowing the learner to learn by doing. Simulations are a specific form of Web-based training that immerse the learner in a real world situation and respond in a dynamic way to his/her behavior, see Figure 2.3. [24][36].

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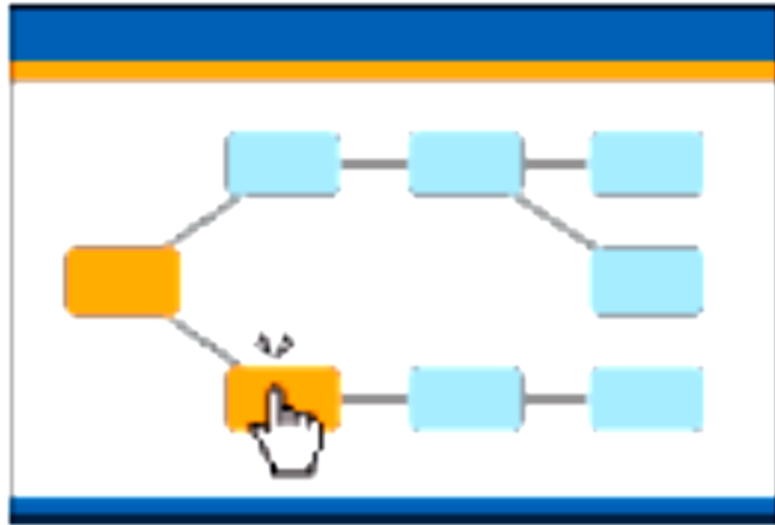
Figure 2.3: Electronic simulations

2.3.1.4 Job aids.

Job aids provide just-in-time knowledge. They can take several forms and be delivered on different platforms (e.g. computer, printed document, mobile phone). They usually provide immediate answers to specific questions, thus helping users accomplish job tasks. Technical glossaries and checklists are a few examples of simple job aids as shown in Figure 2.4, but sophisticated expert systems can also be developed to assist workers in complex decision-making.
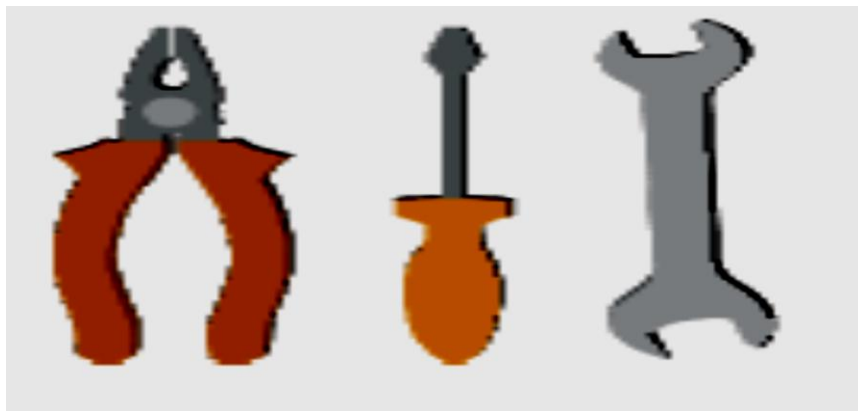
Figure 2.4: Job aids

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2.3.2 E-tutoring, e-coaching, e-mentoring

Services which provide human and social dimensions can be offered to learners to support them through the learning experience.

E-tutoring, e-coaching and e-mentoring as in Figure 2.5, provide individual support and feedback to learners through online tools and facilitation techniques.

Figure 2.5: E-tutoring, e-coaching, e-mentoring

2.3.3 Collaborative learning

Collaborative activities range from discussions and knowledge-sharing to working together on a common project. Social software, such as chats, discussion forums and blogs, are used for online collaboration among learners.

Synchronous and asynchronous online discussions as shown in Figure 2.6, are designed to facilitate communication and knowledge-sharing among learners. Learners can comment and exchange ideas about course activities or contribute to group learning by sharing their knowledge.

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Figure 2.6: Online discussions

Collaborative project work implies collaboration among learners to perform a task. Collaborative activities as shown in Figure 2.7, can include project work and scenario-based assignments.

Figure 2.7: Collaboration activity

2.3.3.1 Synchronous communication

Synchronous events take place in real time as shown in Figure 2.8. Synchronous communication between two people requires them to both be present at a given time. Examples of synchronous activities are chat conversations and audio/video conferencing.
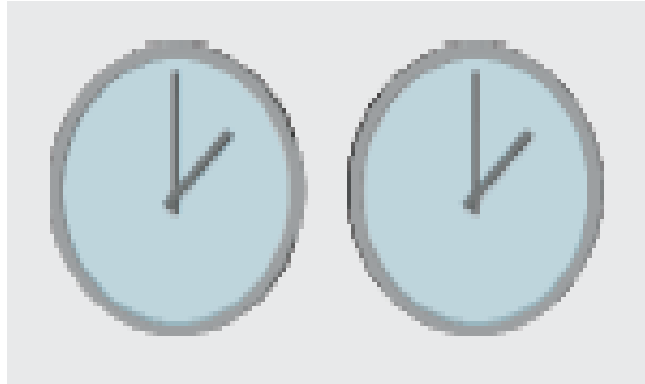
Figure 2.8: Synchronous system

2.3.3.2 Asynchronous communication

Asynchronous events are time-independent. A self-paced course is an example of asynchronous e-learning because online learning takes place at any time. E-mail or discussion forums are examples of asynchronous communication tools, see Figure 2.9. [38].
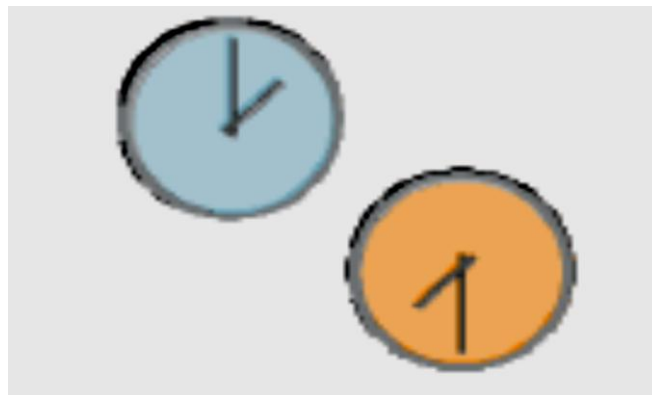
Figure 2.9: Asynchronous system

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The flexibility of Internet technology creates gray areas around the concepts of synchronous and asynchronous see Figure 2.10.

Synchronous	Asynchronous
> Chat and IM > Video and audio conference > Live webcasting > Application sharing > Whiteboard > Polling	> E-mail > Discussion forum > Wiki > Blog > Webcasting

Figure 2.10: Examples for Synchronous and Asynchronous Systems

For example, video and audio sessions can be recorded and made available for learners who cannot attend a live event.

2.3.4 Virtual class room (VCR)

A virtual classroom is the instructional method most similar to traditional classroom training, as it is led completely by an instructor as shown in Figure 2.11.

Figure 2.11: Virtual Class Room (VCR)

A virtual classroom is an e-learning event where an instructor teaches remotely and in real time to a group of learners using a combination of materials (e.g. PowerPoint slides, audio or video materials). It is also called synchronous learning.

This method requires the least amount of effort to convert materials (but instructors still have to prepare them). Appropriate technology must be in place for both the learners and providers (e.g. software for the virtual classroom and good connectivity) [24].

2.3.4.1 Virtual Class Room (VCR) Integration

Remote students are integrated into a virtual extension of the classroom, which is projected onto the back wall of the classroom. A remote student is acquired with a webcam and is modeled as a real-time video sprite. The sprite is inserted into the geometric model of the classroom extension. Even though each remote student can potentially be located at a different site, the remote students are integrated into a unified virtual environment, which is displayed at a natural location within the field of view of the instructor. The instructor gets a sense of the body language and facial expression of remote students and sees if a remote student raises his/her hand in real time [12].

2.3.4.2 What is a virtual classroom?

A virtual classroom is an instrument for conducting live classroom-like sessions over the internet. In it, students and tutor(s) can communicate using voice, video, chat and whiteboard tools. They also have facilities like application sharing, polling, breakout sessions and quizzes. It allows the tutor and students to participate in real time lessons and discussions. Students can ask questions, draw on the whiteboard, and participate in breakout sessions. (Almost) everything that

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can be done in a real classroom can be done in a virtual classroom. Moreover, the whole classroom session can be recorded and made available for review afterwards. In Figure 2.12, we present a screen shot of the virtual classroom instrument Illuminate Live [25].
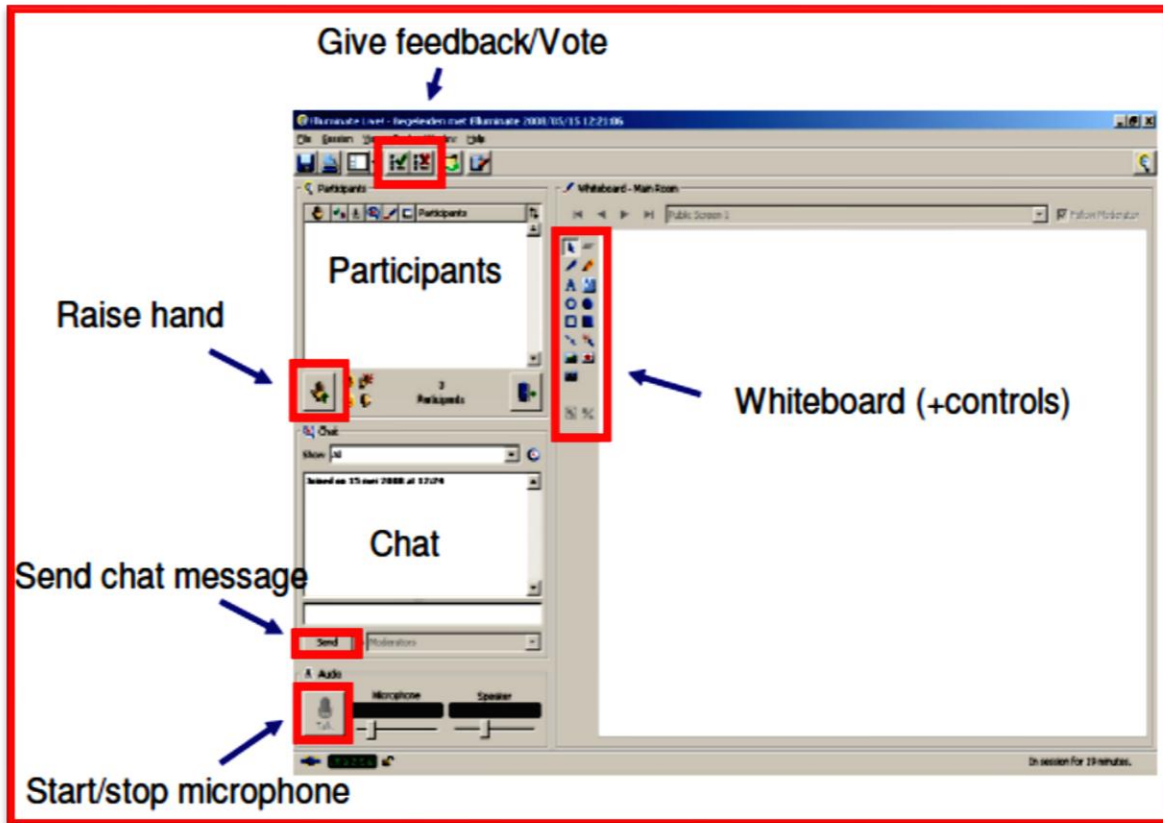
Figure 2.12: screenshot of an empty virtual classroom in Illuminate Live! (Student view), indicating some interaction functions.

2.4 Virtual Class Room System Architecture

The system has two main components: a Classroom System that is deployed at the on-campus classroom and a Remote Student System that is deployed for each remotely located student. Figure 2.13, presents a deployment with n remote students.

The Classroom System extends the classroom to accommodate remote students in a way transparent to the instructor and local students. The image of a

virtual 3D room is projected onto the back wall of the classroom to provide additional seats for the remote students. The instructor interacts with the remote students naturally, much the same way she/he interacts with students physically present in the classroom. The Classroom System communicates with each of the sites where remote students are located to send audio and video from the classroom and to receive audio and video from each remote site.

Figure 2.13: Virtual Class Room System Architecture

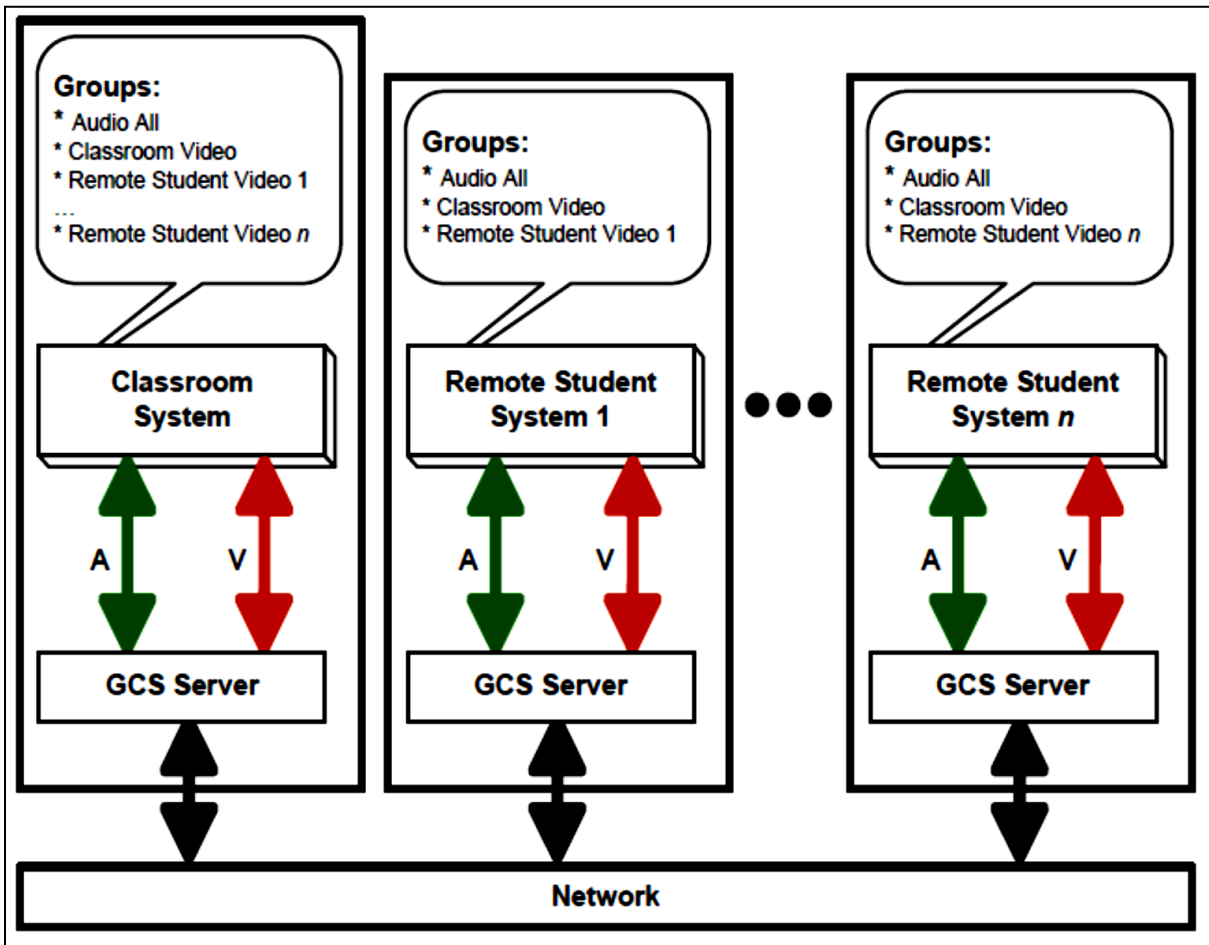The Remote Student System simulates the classroom environment for a remote student by displaying video of the classroom, and by rendering audio from the classroom and the other remote students in real time. The Remote Student

www.manaraa.com

System captures the student with a video sprite which it sends to the classroom in real time. The Remote Student System also captures the student audio which it sends to each of the other remote students and to the classroom in real-time. The audio communication between remote students and the instructor is always on.

The Classroom System and the Remote Student System use a common communication infrastructure for the audio and video transmission. The communication infrastructure is based on a group communication system (GCS). A GCS is a distributed messaging system that enables efficient communication between a set of processes logically organized in groups and communicating via multicast in an asynchronous environment where failures can occur. Services provided by a GCS include group membership as well as reliable and ordered message delivery (e.g. FIFO, causal, or total ordering). The membership service informs all members of a group about the list of currently connected and alive group members, and notifies group members about every group change. A group can change for several reasons. In an idealized fault-free setting, a change can only be caused by members voluntarily joining or leaving the group. In a more realistic environment faults such as processes becoming disconnected or network partitions can prevent members from communicating. When faults are healed, group members can communicate again. These events can also trigger corresponding changes in group membership [42].

A typical GCS follows an architecture where the major functionality is provided by a set of GCS servers, while applications interact with a server through a GCS client library. An application can be a member of many groups and can act both as a sender and a receiver. Many GCS implement customized group communication protocols relying on UDP unicast and multicast services.

The GCS abstraction provides a modular design and an organization of the communication based on topics of interest to the participants in the system. Groups

are just pre-defined names and not reserved IP addresses as in IP multicast. In our case, a single group, Audio All, is used for all audio communication since all participants need to receive all audio. All participants subscribe to this group. A participant sends the audio it captures and receives the audio captured by all other participants. Video communication is handled using $n + 1$ groups, where n is the number of remote students. We assign one group, Classroom Video, for the video captured from the classroom. All Remote Student Systems and the Classroom System are members of this group. Finally, one group is assigned for the video captured from each remote student site. The members of group Remote Student Video i are the Remote Student System i and the Classroom System, which send and receive the remote student i video, respectively [12].

2.4.1 Classroom system

The primary task of the Classroom System is to provide support for hosting remote students within a campus classroom, in a manner that interferes minimally with normal lecture activities. We target small to medium classrooms that seat 40 or fewer on campus students. Such classrooms allow interactive lectures, which most benefit students. Large classrooms preclude all interaction between instructor and students, so augmenting such a classroom with an interactive distance education system are futile. When the lecture is a mere monologue, asynchronous distance education systems do not place remote students at much of a disadvantage compared to on campus students who can physically attend lecture.

The Classroom System implements the interface between the instructor and remote students. Providing the remote students with instructor audio and video does not pose unusual challenges. However, simulating the presence of the remote students for the instructor is complicated by the fact that each remote student can potentially be located at a different site. Whereas audio contact is straightforwardly

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enabled by mixing and rendering real-time audio feeds, enabling visual contact is more challenging. A naïve approach would be to display the n video feeds of the n remote students in n separate windows. Such visualization is ineffectual. The instructor cannot maintain visual contact simultaneously with all remote students and is forced to scan each window sequentially, spending considerable effort to adapt cognitively to each one of the multitude of contexts.
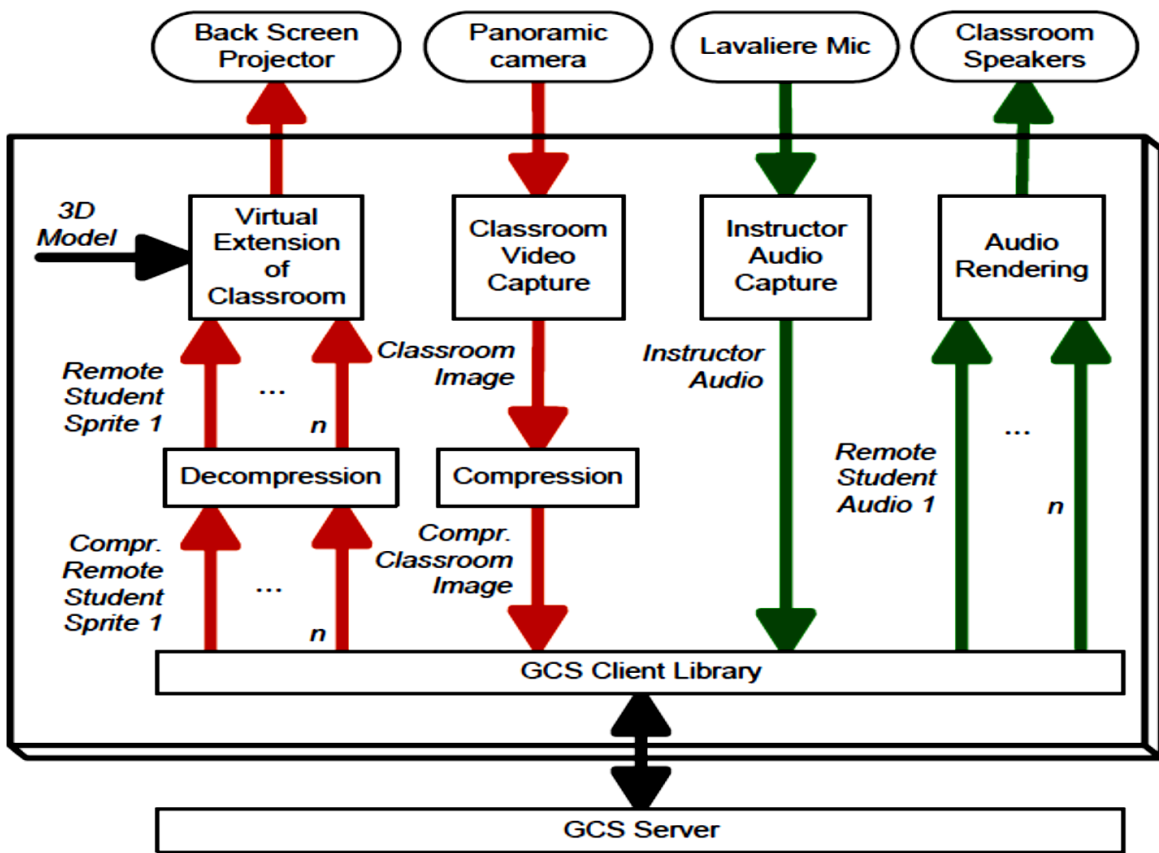

Figure 2.14: Class Room System Architecture

We have developed a method that allows the instructor to maintain visual contact with the remote students in parallel. The students are extracted from their individual video feeds and inserted into a unified virtual environment, which is displayed at a natural location within the field of view of the instructor (Figure

2.15). The virtual environment extends the classroom at the back to provide additional seats, which are used by the remote students. The 3D model of the virtual extension is integrated with the images of the remote students and is rendered from a viewpoint that matches the default instructor position. The resulting image is projected onto the back wall of the classroom. The instructor easily monitors the local students and the back wall simultaneously, as if the classroom were larger. The body language, facial expression, and events such as a remote student raising her/his arm are immediately apparent to the instructor, which enables effective interaction. The penalty of hosting the remote students is essentially limited to the inherent disadvantage of a slightly larger class [39].

Figure 2.15: Distance education system deployed in first classroom (top), and photographs of the back-wall screen showing remote students integrated into a virtual extension of the classroom (bottom).

Such an approach has only recently become practical, enabled by advances in video technology (e.g. high resolution high-frame rate webcams with standard high-bandwidth interfaces, high-resolution high brightness projectors), in general purpose computing (e.g. PCs that can execute non-trivial per-pixel operations on high-resolution images at interactive rates), and in graphics computing (e.g. add-in graphics cards that can render 3D scenes described with millions of triangles at interactive rates). The classroom system consists of four main modules as in Figure 2.14: Virtual Extension of Classroom, Classroom Video Capture, Instructor Audio Capture, and Audio Rendering, each described in detail below [45].

2.4.1.1 Classroom video capture

The Classroom Video Capture module acquires the view of the classroom that includes the instructor and sends it to the remote student sites. A camera with a fisheye lens is used because its large field of view allows keeping the instructor in the frame without having to track the instructor or to move the camera.

Figure 2.16: Classroom image delivered to remote students.

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Although cameras that automatically track the instructor are available commercially we have decided against using them because of lack of robustness. Such cameras periodically lose the instructor, which we found to be more disturbing than the lower resolution on the instructor provided by the current solution. The classroom image is down sampled, compressed, and sent to the remote student sites. Figure 2.16, shows a typical classroom image as seen by a remote student.

2.4.1.2 Audio capture and rendering

The task of the Audio Capture module is to acquire audio at the classroom and remote sites. Instructor audio is acquired with a wireless Lavaliere microphone and sent to the remote student sites. The Audio Rendering module receives and mixes audio from each remote student. The mixed sound is rendered on the speakers of the classroom. The same software module is used to render audio for the classroom and the remote students. The software at a location L discards audio packets received from the group that originated from location L.

2.4.2 Remote student system

A Remote Student System (i) has two tasks. The first task is to simulate the classroom environment for remote student (i) by receiving and rendering video of the classroom, and by receiving and rendering audio of the classroom and the other remote students. The second task is to capture audio and video of remote student (I) and to send them to the classroom for integration into the virtual extension. The Remote Student System consists of several modules as shown in Figure 2.17. The Remote Student Capture module acquires remote student (i) and builds an effective yet compact visual representation. The Classroom Display module provides remote student (i) with a view of the classroom through the panoramic images received

from the classroom. The Audio Capture module acquires remote student (i) audio through a headset microphone and sends it to the classroom and the other remote students. Finally, Audio Rendering combines the audio received from the other remote students and from the instructor to provide audio feedback to remote student (I) via a headset
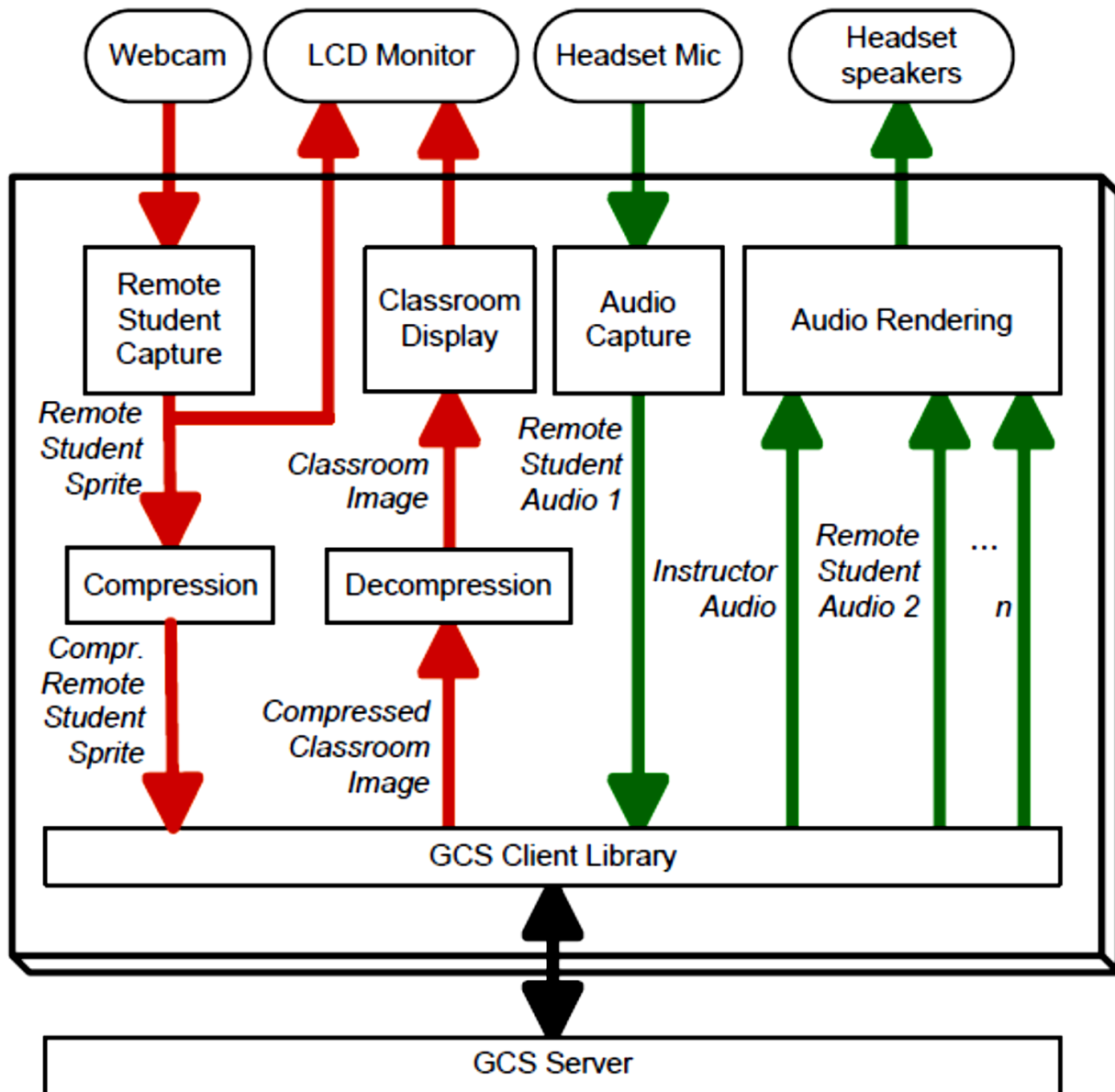
Figure 2.17: Remote Student System.

2.4.2.1 Remote student capture

The Remote Student Capture module is a critical component of the Remote Student System providing the instructor with a quality visual depiction of the remote student, in real time. One option is to acquire a 3D model of the student. Compared to modeling the virtual extension of the classroom, modeling the student is complicated by the fact that the scene is dynamic. However, a good approximation of the appearance of the remote student that works well within the virtual extension of the classroom can be obtained if the student is modeled with a real-time video sprite. A video sprite is a video where the background pixels are transparent at all times. The video sprite is a good approximation in our context because the remote student is displayed far away from the instructor (beyond the back wall of the classroom), so the flatness of the sprite is not a concern [46].

2.4.2.2 Background subtraction

The challenge is to find the foreground pixels in each frame, in real-time. We took the approach of background subtraction. First the remote student moves outside of the field of view of the webcam and a background frame is acquired. Then the background frame is used to determine which pixels changed, which are labeled as foreground. Since the camera adjusts exposure in real time, background pixels will not match exactly the pre-recorded background frame.

Background subtraction has been studied extensively in image and video processing. Early work in background subtraction algorithms assumed a relatively static scene and used a simple adaptive filter to update the background pixel colors. More recent work utilizes elaborate models of the background to accommodate for changes.

In our context, performance is critical in order to achieve the desired frame rate of 5fps. We developed a simple and efficient background subtraction

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algorithm that assumes that the background is static. The assumption can be easily satisfied by a student that joins the lecture from a private room. Joining from a large active environment requires the student to choose a location with a static background, as it is the case, for example, when the background is provided by a wall.

The frame is corrected efficiently using a safety region at the periphery of the frame which is known to be background. In Figure 2.18, the middle image shows the safety region in magenta. The currently acquired sprite with the magenta safety region is displayed to provide feedback to the student. The student is asked to keep out of the magenta region, and to reacquire the background frame when changes in the background create persistent mismatches visible as misclassified foreground pixels. The sprite is compressed and sent to the classroom [12].

Figure 2.18: Frame, background, and video sprite compute by background subtraction.

Chapter Three

Literature Review of VCR

Chapter Three: Literature Review of VCR

The creation of a new online distance learning system was funded by an NSF grant in 2004. Key contributions of this work are to produce a prototype system that will have a better sense of presence and a higher degree of interactivity than existing systems. The technical goal was for remote students to be integrated into a virtual extension of the classroom, which is projected onto the back wall of the classroom, see Figure 3.1,.

Figure 3.1: Distance education system deployed in first classroom

A remote student is acquired with a webcam and is modeled as a real-time video avatar, thereby removing the background of remote students. Even though each remote student can potentially be located at a different site, the remote students are integrated into a unified virtual environment, which is displayed at a natural location within the field of view of the instructor. The instructor gets a

sense of the body language and facial expression of remote students and sees if a remote student raises his/her hand in real time. See Figure 3.2, [26].

Figure 3.2: Photographs of the Back-Wall screen showing remote students integrated of the classroom

3.1 Web Based Software

Web-based software is software you use over the internet with a web browser. You don't have to install any CDs, download any software, or worry about upgrades. If you use an online bank or web-based email program like Gmail, Hotmail, or Yahoo Mail then you've already used web-based software before.

When you use web-based software you don't have to worry about anything technical, you can just do your work. We handle all the security and uptime and backups and upgrades and "IT guy" stuff. You can stay focused on what you're good at and we'll handle the rest.

With traditional software, employees save data on their laptops, USB drives, or portable hard drives. It's not as safe as it sounds. Laptops are stolen, computers are rarely backed up properly, and it's unlikely everyone's machines are up to date with the latest security patches and updates. When you use our web-based software, your data is stored on secure, always-updated, backed-up daily enterprise-class servers in a state-of-the-art, highly-secure data center.

A key advantage to web-based software is that all your data is centralized and accessible over the web from any computer at any time. You can't leave something on the wrong computer since everything is stored in one place on the web. You can get to it from anywhere. Safe, secure, and password protected, of course. Your data is automatically backed up daily and stored in multiple locations for additional redundancy.

Software used to only be available for certain platforms. There was Windows software, Mac software, etc. any Web based software works on any platform with a web browser and internet connection. Mac, Windows, Linux are all supported. Since everyone you work with logs into the same centralized account, you have a single database with everything in one place. No more worrying about who has the latest information: Everyone has it.

When you use web-based software your office is everywhere. At work, at home, a hotel, at a client's office, even on your mobile phone. You data are accessible anywhere with internet access [27].

3.2 Web Based Software Application

Here a list of existing virtual classroom systems which is considered as an application to the web based software;

- BigBlueButton (BBB), is an open source web conferencing system.
- Skype, a VoIP application

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- Bricolage, content management system.
- Collabtive, web-based project management software.
- Dimdim, based web conferencing service.
- DotNetNuke, also called DNN: module based, evolved from ASP 1.0 demo applicsations.
- eGroupWare, a free open source groupware software intended for businesses from small to enterprises.
- EtherPad, collaborative drafting with chat.
- Feng Office Community Edition.
- Group-Office.
- Horde.
- Jumper 2.0, collaborative search engine and knowledge management platform.
- Kolab, integrated Horde web frontend.
- Ourproject.org, has wiki, forums, mailing lists, FTP, SSH, sub-domains, hosting, ddbb, email alias, backups, CVS/SVN, task management.
- phpGroupWare.
- Simple Groupware.
- SOGo, integrated email, calendaring with Apple iCal, Mozilla Thunderbird and native Outlook compatibility.
- Tiki Wiki CMS Groupware, has wiki, forums, calendar, ticket system, workflow engine.
- Tine 2.0.
- Tonido, free collaborative software with workspace synchronizing, Web access from personal desktop; cross-platform.
- Zarafa, full MAPI MS Exchange replacement for Linux, GPL
- Zimbra.

After that I will review samples of virtual classrooms with some details as ways of work, the existing services and some available facilities:

3.2.1 BigBlueButton (BBB):

BigBlueButton is an open source web conferencing system built on over fourteen open source components to create an integrated solution that runs on mac, unix, or PC computers. Its vision is that starting a web conference should be as easy as clicking a single metaphorical big blue button. As an open source project, it should be easy for others to embrace and extend. And while web conferencing means many things to many people, their focus is to make the best web conferencing system for distance education. Enter BigBlueButton, a phenomenal open-source web conferencing system that lets presenters engage with our teams through real-time sharing of audio, video, chat, presentations, and desktops. We've been using it from the start and have been mightily impressed with how easy to use and effective it's been for our teams. In Figure 3.3, BBB main interface with usability like real classroom [28].

There are some features that a teacher will enjoy in BBB, such as present, draw, record and audio.

3.2.1.1 Presentation control:

A presenter can easily upload multiple PDF's or Office documents. Once uploaded, the participants are able to see the current slide as the presenter moves through their presentation. See Figure 3.4.
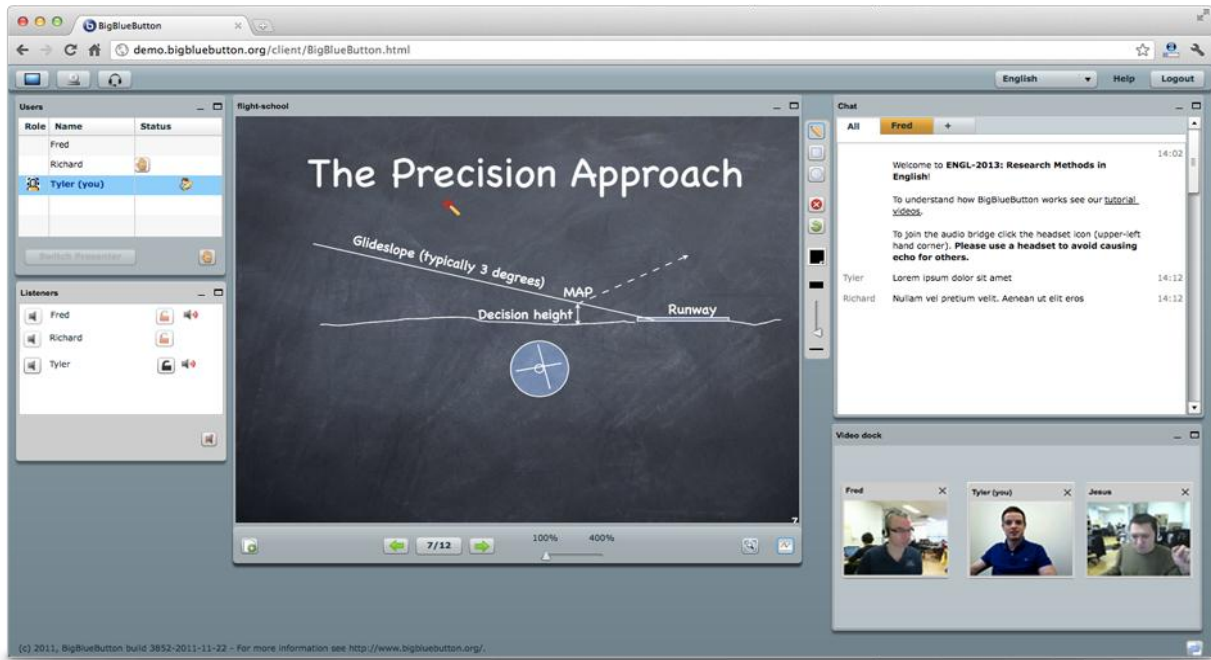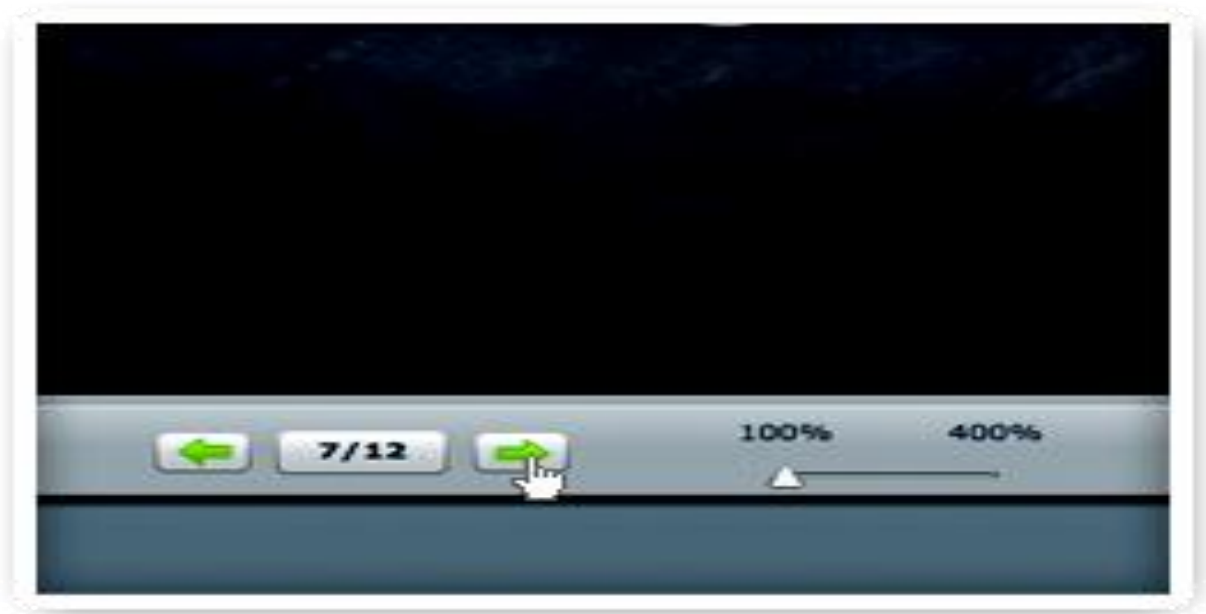
Figure 3.3: BigBlueButton Main Interface

Figure 3.4: BigBlueButton Presentation Control

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3.2.1.2 Audio engagement:

The presenter has complete control over all the audio engagement within the conference. They are able to mute, un-mute and eject any of the participants by simply click on the necessary icon within the listener's module. As Figure 3.5.

Figure 3.5: BigBlueButton Audio Engagement

3.2.1.3 See your students:

When logged into the conference users have the option of sharing their video over the web using a built or external webcam. Multiple participants and a presenter can be sharing their video simultaneously. Figure 3.6, shows three users for webcam simultaneously [21].
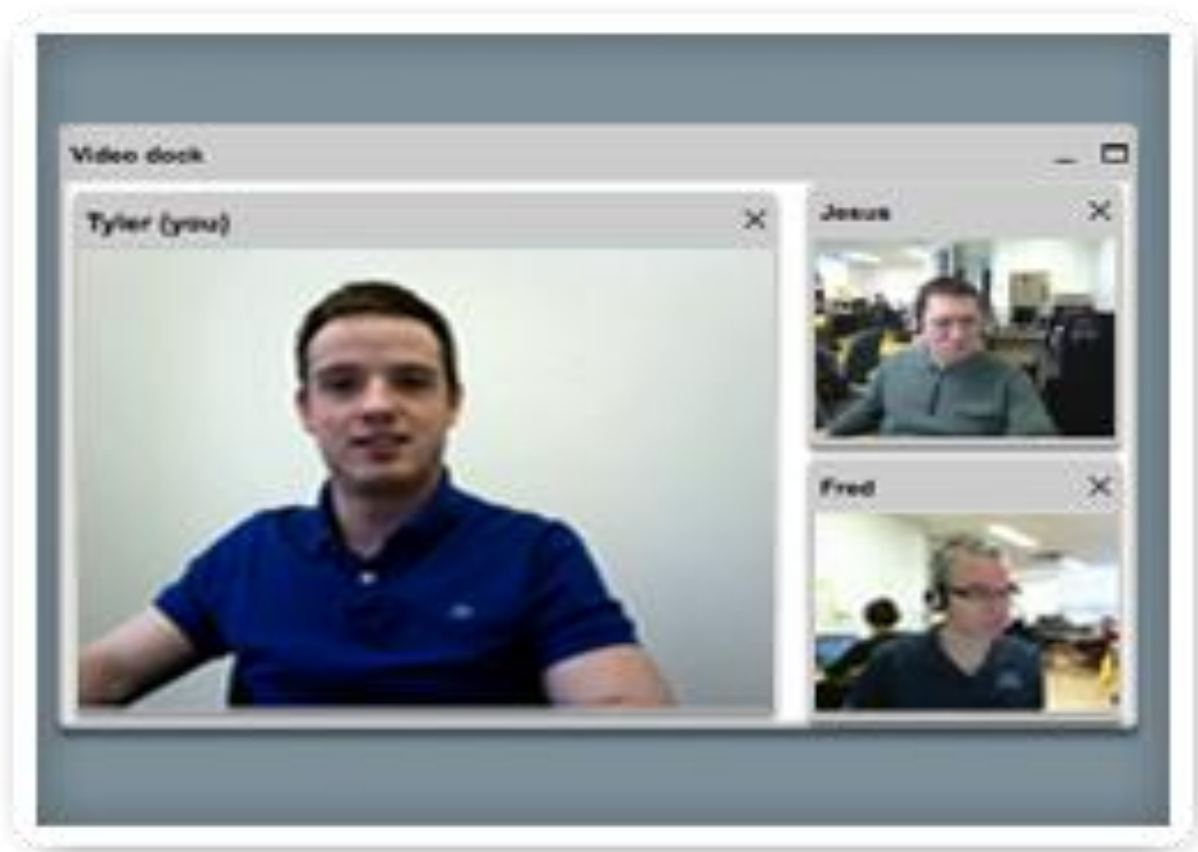
Figure 3.6: BigBlueButton Webcam

3.2.2 Skype:

Skype is a computer program that can be used to make free voice calls over the Internet to anyone else who is also using Skype. It's free and considered easy to download and use, and works with most computers. Once you download, register and install the software, you'll need to plug in a headset, speakers or USB phone to start using Skype. On September 12, 2005 Skype was acquired by eBay [29].

Skype is a VoIP application, available in both free and paid versions for Mac OS X and Windows. VoIP, which stands for "voice over Internet protocol," is a type of technology that refers to any communication taking place over a network, such as the Internet. VoIP can include instant messages, video conferencing and

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even fax messages sent online instead of through a telephone line. You can use Skype to communicate with friends and family or hold business conferences [30]. Figure 3.7, shows the Skype virtual classroom.

There are some features for Skype, such as Skype Name, Instant Messaging, Audio and Video Conferencing and Skype Premium and Business.

3.2.2.1 Skype name

Regardless of whether you are using the free or paid version of Skype, you must register for a Skype name. Your Skype name is your identity on Skype and is how people will contact you through the application. To create your Skype name, click the link that appears when you open the application on your computer. Skype gives you the option to fill out your full name, location and other information in your profile so people can find you on Skype.
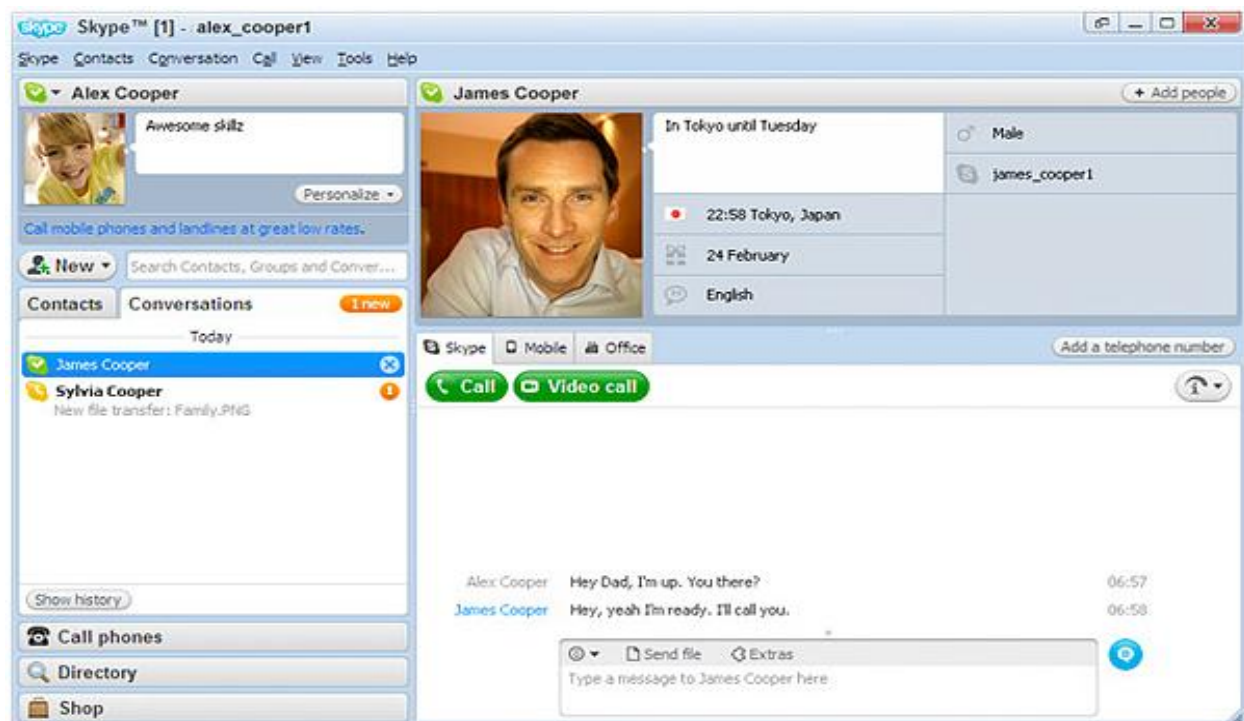

Figure 3.7: Skype Virtual Classroom

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3.2.2.2 Instant messaging

One of the most basic features of Skype is instant messaging and chat rooms. You can initiate free instant messages to have conversations with multiple contacts online, or invite contacts to join a chat room. Skype allows you to send and receive files to contacts directly through the instant messaging window. Skype even provides a selection of emoticons to express your feelings in your instant message. Emoticons are located in the bottom-right corner of the application window.

3.2.2.3 Audio and video conferencing

Skype offers free audio calls between Skype users and reduced rates on calls from your computer to regular telephone numbers anywhere in the world. To call regular telephone numbers, you must purchase Skype credit, which is available through the application. Skype also provides free one-on-one video conferencing between Skype users. A broadband Internet connection is recommended when using the audio conferencing feature and required to use the video conferencing feature.

3.2.2.4 Skype premium and business

Although Skype is available for free download, paid versions of Skype offer extra features. Skype Premium includes group video conferences with up to six contacts and live chat customer support, and is available for Mac and Windows. Skype Premium is available for a monthly subscription of $8.99 or a day pass for $4.99. Skype Business offer a variety of solutions for small businesses, medium business and large enterprises. As of February 2011, Skype Business is only available for Windows [30].

3.2.3 DimDim Software

Dimdim offers a browser based web conferencing service based on the open source platform. Users can download the open source code and install it to their servers. Attendees are not required to download any software to host or attend a meeting. Dimdim allows presenters to share their desktops, show slides, as well as talk, listen, chat, and broadcast via webcam [31].

Figure 3.8: DimDim Main Interface

Dimdim was made available primarily as an enterprise edition and as a Virtual Machine appliance, but an open source community edition has also been made available to developers under the GNU General Public License (GPL),

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giving them the option to install and host Dimdim in their own networks. The most recent open source version released in December 2008 and hosted at sourceforge.net, is V4.5 "Liberty". However, no installation instructions were provided, and the software had several arbitrary limitations, leading some to describe it as "crippled". Distributions of the system for the installation to several OSes, Virtual Machines and the corresponding documentation are available in several archives on the SourceForge.net Dimdim site. Figure 3.8, display the DimDim main interface. Dimdim can be integrated with the e-learning platforms Moodle, Claroline and Docebo, the collaborative suite Zimbra and the CRM software SugarCRM. Unlike DimDim's web-hosted services, the Dimdim open source server does not restrict the number of attendees or simultaneous meetings allowed [32].

After studying a variety of virtual class room systems on the Web Based, this thesis selects "DimDim" program for enhancements due to several reasons, including:

1. The presence of some of the problems that the company did not find her producing solutions.

2. Closure of this product after its purchase by a competing company.

3. The limited number of subscribers of the system does not exceed 6 users at the same time.

4. The lack of protection for user's entrance, where anyone can enter without a user name or password.

5. a lot of advertisements that affect the performance of the program efficiency and the basic function as an educational program.

Chapter Four

Proposed VCR
Enhancements

Chapter Four: Proposed VCR Enhancements

4.1 Introduction:

DimDim is the free web conferencing service where you can share your desktop, show slides, collaborate, chat, talk and broadcast via webcam with absolutely no download required for attendees. DimDim is 100% browser-based and is easy to open and free web meeting alternative.

4.2 DimDim Architecture:

The DimDim Web Meeting Infrastructure (WMI) aims for a synergy of multiple components that are responsible for various unit functions using two levels of interaction protocols. The first set is called the End User Protocol Suite (EUPS) which run over HTTP/S and is designed for communication between End Users (Web Console, DimDim Plug in) and the DimDim Web Meeting Infrastructure. The only member of the EUPS which does not run over HTTP is RTMP used for live Audio Video streaming and white-boarding (in case of clients who can access the TCP 1935 port directly. A fallback to this running over HTTP/S also is included in the EUPS. The second set is the Inter Component Protocol Suite (ICoPS) that are used for communication between the backend components which constitute the Web Meeting Infrastructure. The DimDim WMI is reverse proxy by an nginx front server that provides transparent access for the EUPS end points. The major components of DimDim WMI are [33]:

- DimDim Conference Server (DCS)
- DimDim Media Server (DMS)
- DimDim Screen share Server (Reflector)
- DimDim Streaming Server (DSS)

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These components are accessed via an nginx based reverse proxy and thus from an external perspective all of them are available at a single HTTP port end point with the URL patterns serving as the differentiator. This reduces the complexity of the port architecture and also allows for easier firewall management policies when deploying DimDim Web Meeting Infrastructure [33]. The following picture shows the Web meeting infrastructure in detail. See Figure 4.1.
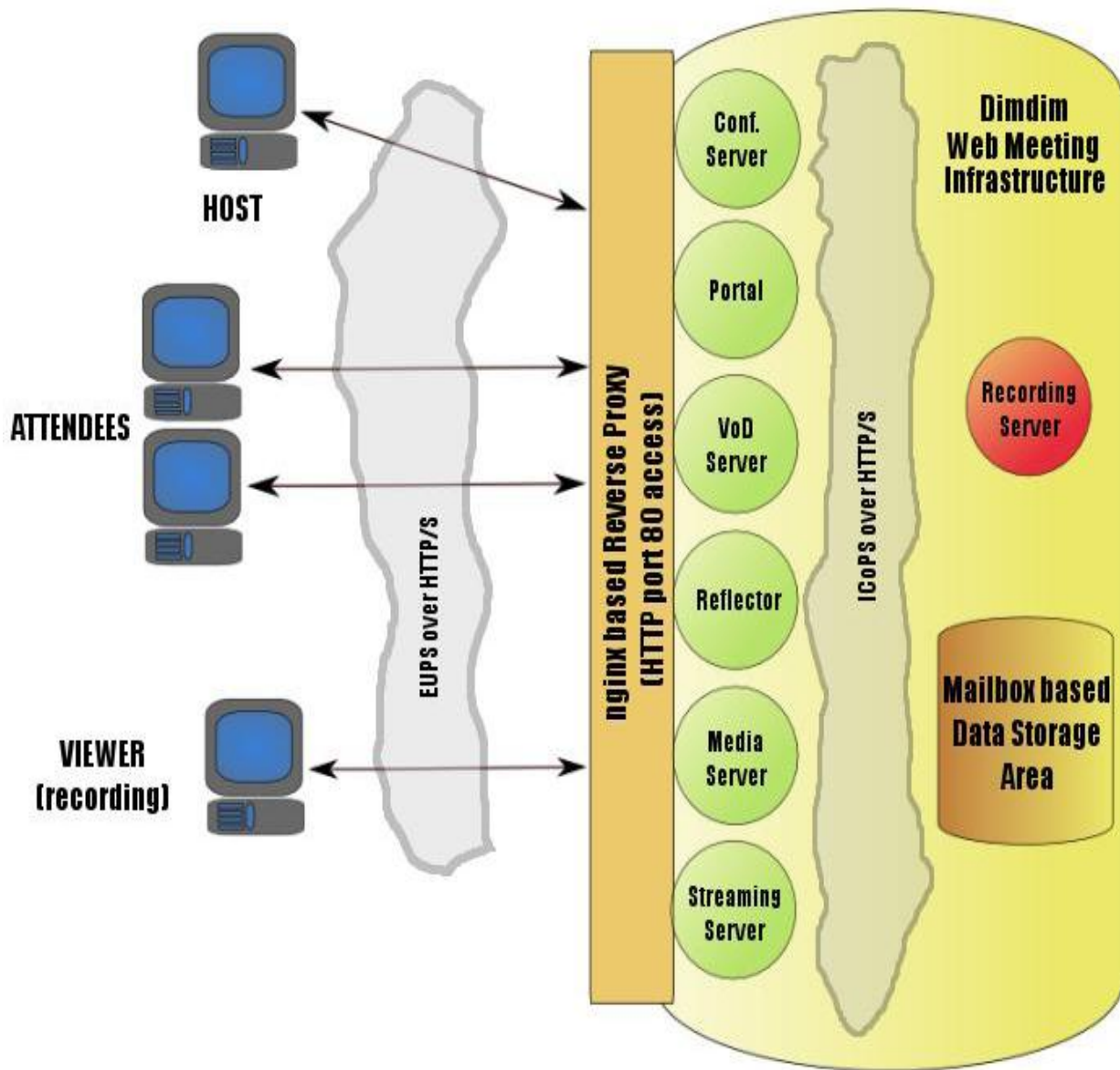

Figure 4.1: DimDim Web meeting infrastructure

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4.2.1 Component description

4.2.1.1 Dimdim conference server (DCS)

Is majorly a pub-sub system that provides the infrastructure for conferences (along with attendees and hosts) to interact using a messaging infrastructure that is responsible for state management of the conference itself along with its participants. The EUPS part of DCS is a JSON over HTTP/S based system that leverages Web 2.0 messaging and interaction paradigm to the fullest.

4.2.1.2 Dimdim Media Server (DMS)

Is responsible for handling varied media resources like power point presentations, pdf files etc. and also handles pre-uploaded content for conferences in future. In conjunction with portal it also provides a mailbox system name spaced by DimDim user id and meeting id to provide dynamic as well as static content required for personalization / branding of DimDim Web Meeting.

4.2.1.3 Dimdim screen share server (Reflector)

Provides a robust scalable screen share protocol server that runs a modified VNC protocol over HTTP/S by leveraging the FastCGI protocol. It can support multiple screens each with one presenter and multiple viewers.

4.2.1.4 Dimdim streaming server (DSS)

Provides live streaming capabilities for Audio and Video using RTMP or RTMPT (RTMP over HTTP/S) and whiteboard features. It is usually commoditized by using either Flash Media Server (FMS) or Wowza Media Server (WMS) or Red5 Open source media server.

4.3 What Happen to DimDim "History"

An alpha version of Dimdim was released in fall 2006, followed by a private beta launch in fall 2007. The company's first public beta was in April 2008. Version 4.0 beta was released in July 2008. Dimdim formally exited beta in December 2008 with the launch of version 4.5.

Dimdim was a software company that provided a web-based platform for realtime, rich-media collaboration and meetings. Dimdim provided free web conferencing service where users could share desktops, show slides, collaborate, chat, talk and broadcast via webcam. It has been compared to the WebEx 2.0 web conferencing application. Dimdim was acquired by Salesforce for USD $31M on January 6, 2011 [34].

The company was founded in March 1999 by former Oracle executive Marc Benioff, Parker Harris, Dave Moellenhoff, and Frank Dominguez as a company specializing in software as a service (SaaS). Harris, Moellenhoff and Dominguez, three software developers previously at Clarify, wrote the initial sales automation software.

In June 2004, the company went public on the New York Stock Exchange under the stock symbol CRM, raising US$110 million. Marc Benioff and Magdalena Yesil were the initial basic connection investors and board members. Other early investors include Larry Ellison, Halsey Minor, Stewart Henderson, Mark Iscaro, and Igor Sill of Geneva Venture Partners.

The Service Cloud provides companies with a call center-like view that enables them to create and track cases coming in, and automatically route and escalates what's important. The Salesforce CRM-powered customer portal provides customers the ability to track their own cases, includes a social networking plug-in that enables the user to join the conversation about their company on social networking websites, provides analytical tools and other

services including email, chat, Google search, and access to customers' entitlement and contracts [35].

Salesforce company in the software's industry based on presenting facilities to customers especially business, bankers and politicians etc…, and to facilitate tasks for them to save both time and money, the movement and participate in seminars, conferences and meetings of different and varied places across the world, It uses technologies such as REST, UDDI and other Web-based to meet the needs of customers. They also work closely on the confidential customer information to their importance and sometimes dangerous, the company is working to strengthen the security aspect of information about customers. It has been keen on providing connection software between customers, which should be ease of contact, comfortable work, good speed connection and a high degree of secrecy to be used in the open channel of communication between customers and each other on the basis of privacy and non-penetration or eavesdropping. So, the company has purchased the product DimDim and worked on the development, strengthen and privacy for customers, they run DimDim through the company and controlled by the server's administrator, who open contacts and give the communication channel for customers through prior reservation and select a certain number of channels for participation to ensure quality and maintain the confidentiality of customers.

All this is happening across the Internet browser by giving URL of the DimDim from the server administrator followed by the counter parties' title on our server, and then they can access the chat room through the internet via exclusive server.

But there are many problems in the program which was facing the company to manage the program "DimDim", such as but not limited to:

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1. Does not allow for more than two customers to enter into one chat room for ensuring confidentiality, which does not allow the way for third parties have no License or registered before.

2. There are no database to control the user's membership, it was through server's manager in order to preserve the program from any penetrate through the loss or theft of your user name and password.

3. Not allowed to add a new customer to the interview by anyone of the parties, but the administrator of the server is the only one who can add a new customer.

4. Posts of microphones and cameras are specified by not more than two.

5. The size of the resulting image from the camera is steady by 2 cm x 2 cm, and no one of the interview can zoom in or out.

Salesforce.com's platform as a service product is known as Force.com. The Force.com platform allows external developers to create add-on applications that integrate into the main salesforce.com application and are hosted on salesforce.com's infrastructure [35].

So, in our approach we had got the code of the program DimDim and made some modifications and additions, but based on conversion of this program from a special program private transactions, banking, politically and business to a new program more comprehensive and wider is not limited to banking private transactions, but in order to be more prevalent and comprehensive to include transactions education, e-learning, social media, political and business in addition to solve the existing program's problems in the above mentioned. And now will introduce our approach that has done through amendments, enhancement, modifications and additions to the DimDim program.

4.4 DimDim Enhancements

Before starting to mention the amendments, this approach mentioned that had studied the DimDim program a comprehensive and complete study, it had stated previously that got on the open source code for the program which design by the Java programming Language. Then studied the problems mentioned above which began in optional for the things that have decided to modify the program DimDim. And now this thesis will mention the modifications that have made to the program DimDim with explanations and show them in the following paragraphs that each paragraph includes one of the amendments are as follows:

4.4.1 The program name

After searching for the name of the program "DimDim" to get the source for explaining the shortcut name, we did not find any evidence to show the shortcut which contains three letters refined twice "Dim". Besides, we decided to give the program a new name after adding amendments and improvements to the program "DimDim" to become the new name of the program is the SAQ which expresses abbreviation for the words of Simulation Question and Answer.

Figure 4.2, which shows the old name of the program "DimDim" and followed by Figure 4.3, which carries the new name for the program "SAQ", this name was changed by the addition of the amendment to the main interface of the program.

Also, some changes in colors and the overall shape of the main interface to make some of the differences from the old program.
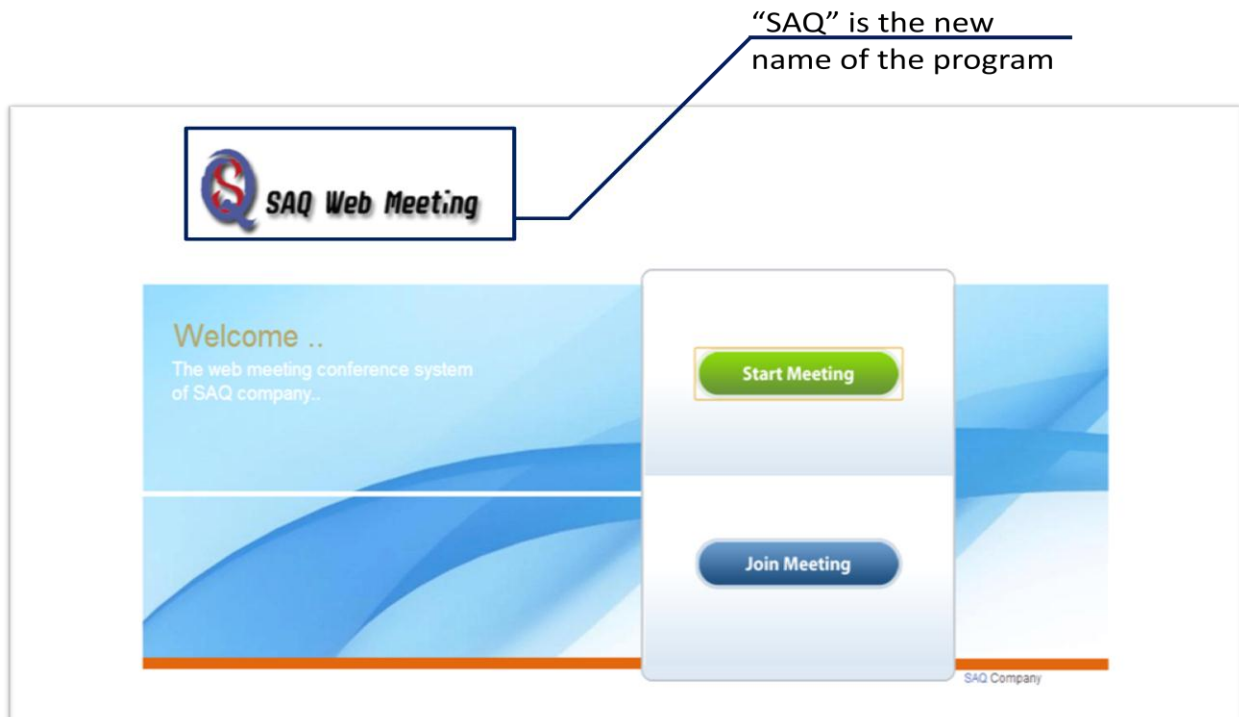
Figure 4.2: The old name "DimDim"

Figure 4.3: The new name "SAQ"

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4.4.2 Enhancing security in DimDim

The program "DimDim" has high property protection secret, but was based on the server's administrator who controls of the program and allow the required number of users in advance to enter to the chat room and participate with others. It was not allowed for anyone of control to add person or prevent him from participating or not, because all of this was through the administrator of the server, Where the server administrator opens the chat room and give some powers to the members of the room, but if the number was more than two, the server administrator gives these powers to one of the members to manage the room.

These powers director of the chat room were not complete so he was not able to control the number of subscribers, times of entry, registration or increase the number of subscribers. And here lies the problem where it was not allowed to director of chat room for increasing the number of participants in the room, but prior to reporting to the server administrator to add the person sought and allow him to participate. Also, most posts were no more than bilateral, that's why two parties were considered the two directors of the room. Also, most posts were no more than bilateral that's why two parties were considered the two directors of the room. So, Each participant can talk and use the microphone at the time he wish, but it needs to inform the other party the desiring for talking to the other party who will stop talking and allow the requester to use the microphone to talk.

The new program "SAQ" has been changed and allows a number of participants greater than two, "our approach will talk about this topic later" and therefore need to be a director for the chat room, the person who created this room can have control for all actions inside the room, not through the server administrator as the old program. For instance, the control room manager can give the chance to talk through the microphone or add a new number of subscribers who will know the possible number of participations later. Therefore this approach did

some modifications for dispensing of the server administrator and keep the administration room exists and effective continuously but through the director of the room. So, this thesis focused on the amendment here firstly in the creation of a special database for the managers of the rooms, and secondly in the login for the room by giving the room a name to enter it by the others who have this name.

4.4.2.1 Creating database

In the beginning when we operated the old program "DimDim" as we reported before that pre-access control and set up rooms only through the server administrator who has all the powers especially the establishment of the rooms, identify members and open the way for them to talk, not for any member of any possibility to control things. But in our approach we canceled this system which hasn't any database related to the members to give them accessibility to the program. So, in this thesis we added some amendments to develop this program through creating a database using a special programming language in database MySQL as shown in the Figure 4.4, below which illustrates the databases beside MySQL database [40].

Then this approach created a single table called "users" as shown in Figure 4.5, that contains two fields, one of them for the user name and the other for the password as shown in Figure 4.6, which shows the names of the subscribers. Each one of them owns a user name and password are independent of the others; they can through this name and password access to the new program "SAQ". Just through online access to the site of the program through the link "URL" as the program registered on the server. So, each user can create new chat room and use the full authority to control the room, and by using the own powers for each chat room creator they can add new members, delete a member, give a microphone to a member who wants to talk, and control all events and actions inside this chat room.
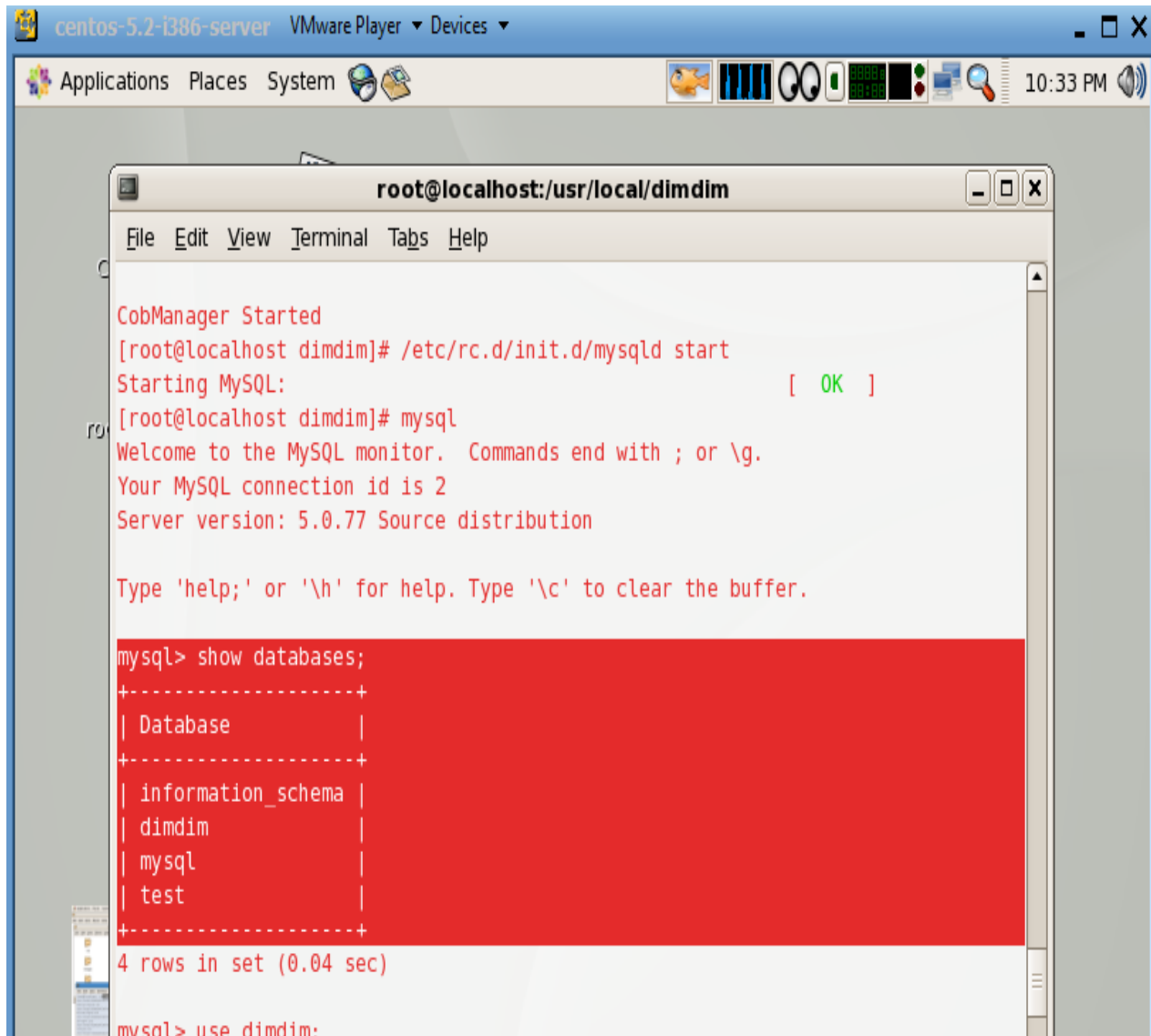
Figure 4.4: Database tables creating by MySql

To operate the data base and to make availability to accessed by users or by administrator, our approach connect all created tables by MySQL Connector/J official JDBC driver. The server administrator can add members for the first time, as shown in Figure 4.7, where we added the name of Mr. Mohammed Mikki, the supervisor of my Master. Then for each subscriber can use all the powers and do all the actions within the chat room now independently of the server administrator.

Figure 4.5: The database table "users"

Figure 4.6: The database table "users" fields

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Figure 4.7: Adding new member as first time.

4.4.2.2 The chat room security

After speaking earlier about the establishment of the database and the independence of work for each user and chat rooms builders, established a system for accessing to all users and verification of registration or not, the new program "SAQ" has a new interface as shown in Figure 4.8, the logon process with linking the database table by "users" During the code added to the original code of the program that verifies the presence of a user name and validate the password.
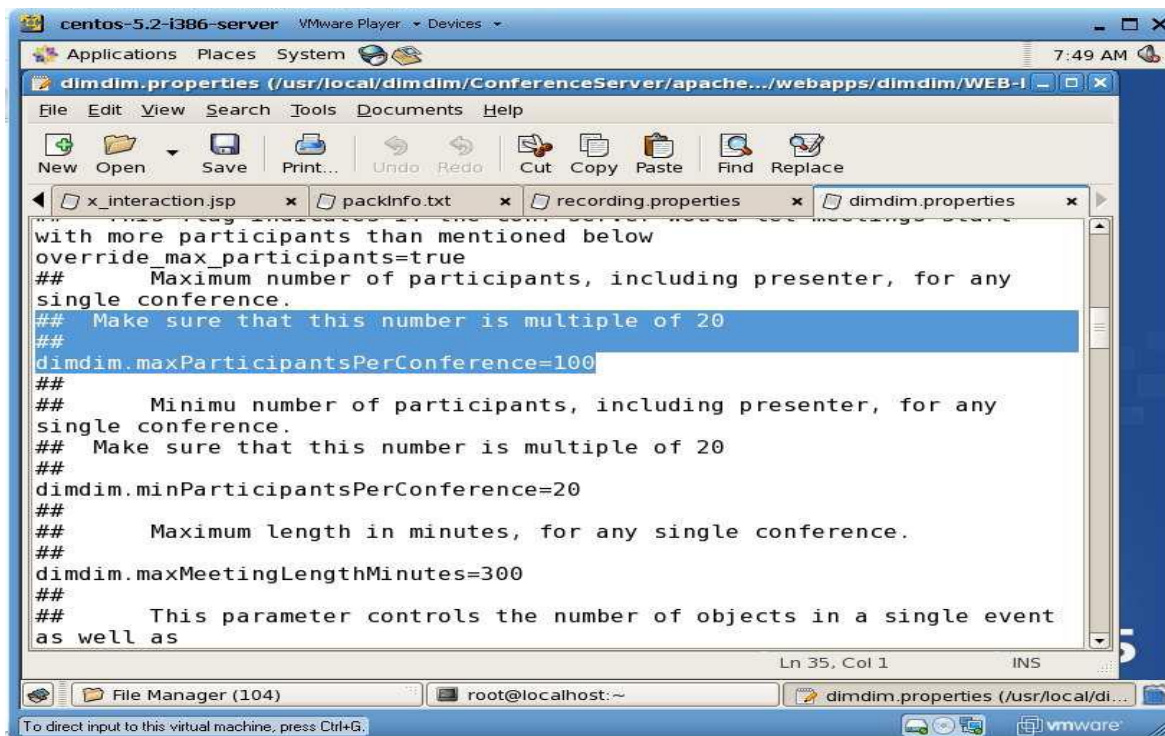
Figure 4.8: The logon process

Note: If the server is public, may be anyone join "SAQ" without permission.

4.4.3 Adding scalability to DimDim

The core part namely the number of members and users of the program especially at the same moment, as we know that this program "SAQ" works through a synchronous system and hence the number of users is very important because they are working at the same moment as they hear and see each other at the same moment, this was not allowed only for a specific number to be determined by the participants and allows them for sharing through the administrator as mentioned before. But all this was as previously reported for meetings businessmen, politicians and special events that require advance notice to the administrator to be able to open the way for the required number of subscribers, but this number ranges from two to six subscribers is consider not enough, also the code of the original program "DimDim" which was developed did not allow for more than two.

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But to implement the program for a large number to use it in the field of education, especially in the virtual classroom we need to allow it for large number of subscribers up to more than twenty subscribers who need to register and working together at the same moment, but this may need to be modified and developed of the program code, to get a larger number of two and allow large number in virtual classrooms. So, it was need to examine the code to reach a mechanism for control increasing the number of subscribers and users of the program through changes in the program's code. The amendments were as follows:

The number of participations were permitted did not exceed six and sometimes up to twenty. But this happens according to the request from customers to the administrator to increase participations number through registration of the additional subscribers in the databases of the program, but it is so costly, it needs to increase the band width, bit rate, operating costs and the cost of participates subscriber.

Figure 4.8: dimdim.properties file

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So the properties of the program "DimDim" is modified to increase the number from 20 to 1000 subscribers can participate at the same moment with synchronize time besides considering the band width and bit rate to allow for a greater number possible of subscribers, It has been edited by modifying the file "dimdim.properties" as shown in Figure 4.8, in which may explain the possibility of adjustment in the number of subscribers from 6 to 1000 as we'll see results in the participation of a number of participants and the comparison between them in chapter 5 for validating proposed enhancements and results. This amendment was request a full study for the code file "dimdim.properties" through the code file has been modified which contains the properties of the "DimDim" program to be run the required number.

4.4.4 Enhancing tools in DimDim

After the completion of basic amendments which took considerable effort to finish them, there are other concerns need to be amended which serve the basic amendments mentioned before, in inertia especially in the general shape of the program which serve the applications traditionally without interaction with this interface because it was aim to fulfill the purpose away from Interestingness and controls the available media tools, for example, the camera frame containing the image of the camera as Figure 4.9, where it was fixed without changing interaction whether to increase or decrease the frame size, and will turn now to the amendments that have been serviced on the secondary services on program with amendments core.
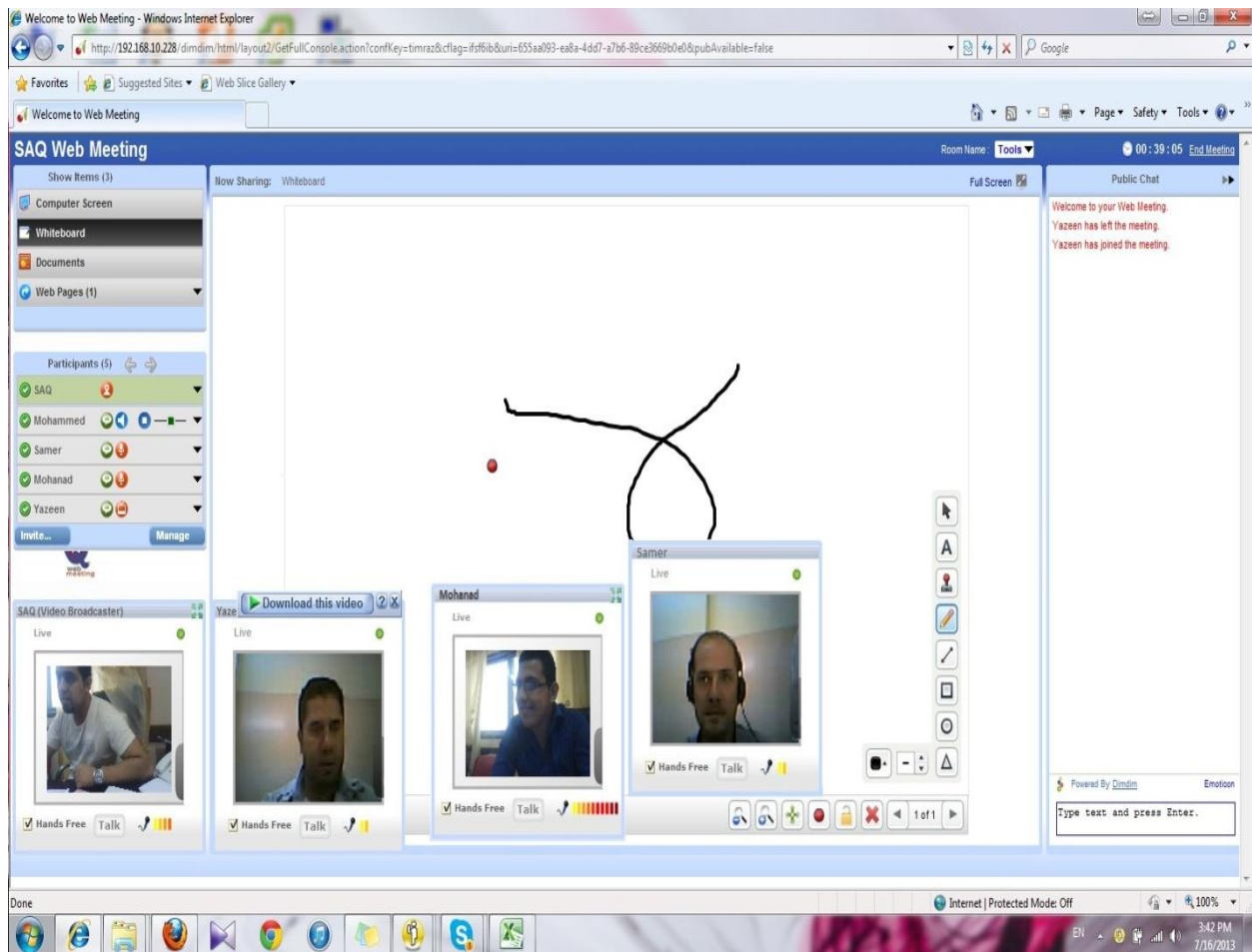
Figure 4.9: Camera frame containing the image of the camera

4.4.4.1 Camera's frame

Due to the limited number of users and the overall interface of the program which allows only for one person can appear through the camera in a constant frame which was fixed and can't be controlled in both enlarged or minimized, So, it was need to modify the program's code to control the size of frame and the emergence of a photo cameras number to be more than one where it was previously can only appear for one camera with constant frame size, but after modifications in the file "dimdim.maxAttendeeVideos" the number of cameras frames were increase up to 100 cameras frame with controlling the size of all

frame for each camera as shown in Figure 4.10. So, the sharing cameras depend on the band width and bit rate.
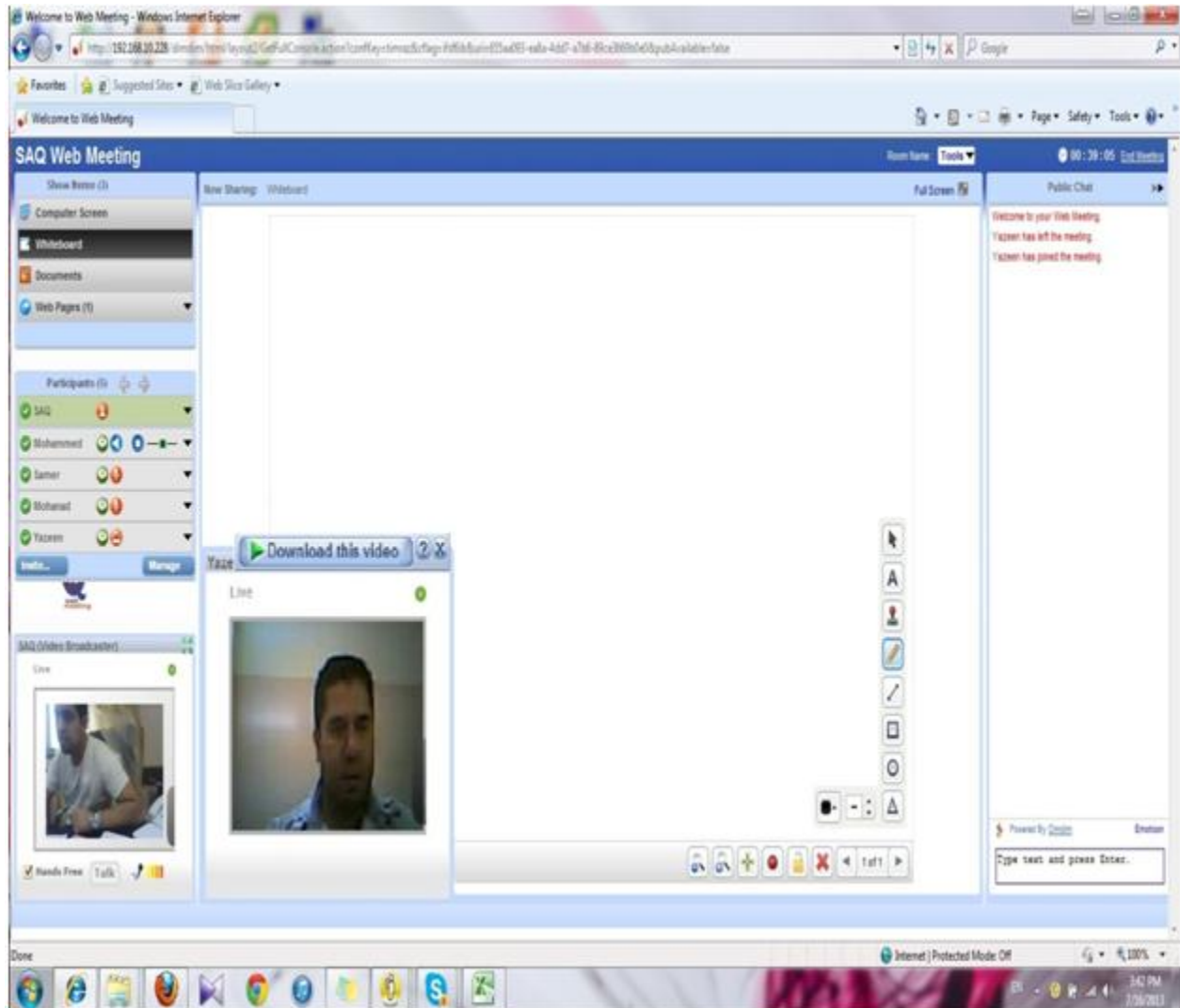
Figure 4.10: multi-cameras variable frame size

4.4.4.2 Microphone's sharing

Also, in this case it was necessary amendment in the number of microphones because it needed through using cameras which increased its number before; we know if anyone wants to share in a chat-room by using a camera, they should to use the microphone. So, microphone and camera were using together at the same time with synchronize system and they are linked together. It was a problem when

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anyone using a camera because he need to use a microphone which using only from the chat room manager and only he allow to other for using it interchangeably with the member who shows his image on the camera but the number of microphones sharing are related to number of sharing cameras, so when this approach modified the cameras sharing and increased its sharing up to 100 frame camera may use in one chat room, it must increase the number of sharing microphones to allow for each subscriber to use it with camera at the same time while the manager just give to him the chance for talking, these amendment has been modified through the file "dimdim.maxAttendeeAudios".

4.4.5 User Interface

In this thesis as mentioned previously that it had changed the program name from the "DimDim" to "SAQ" and this had to be some changes to suit the new name of the program and there were amendments to be suitable with changes such colors used in interface "GUI" and logo for program as shown below where it displays in Figure 4.11, the new name and logo, but Figure 4.12, shown the name and logo for the old program.

Figure 4.11: New Logo   Figure 4.12: Old logo

Also, the following images displayed in Figure 4.13, and Figure 4.14, which are shown the differences between the old and new "GUI" interface for the old and modified program.
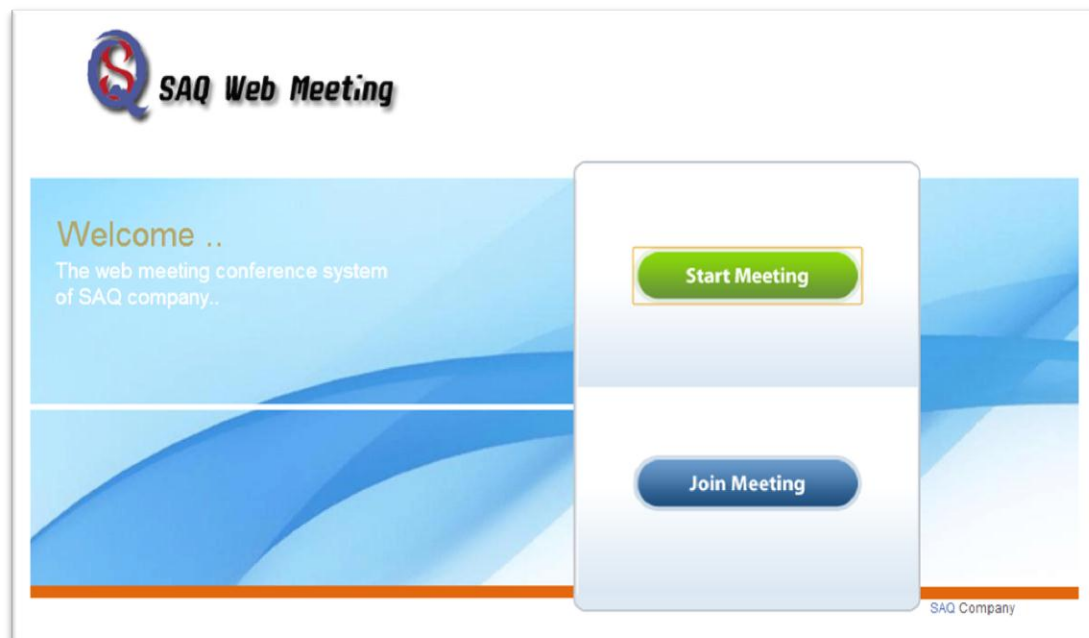

Figure 4.13: The old interface

Figure 4.14: The new interface

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4.4.6 Company's logo and advertising

Among the amendments that made in this approach is canceling the advertisements and logos for companies on the core interface which was occupied a large part from the load of the server where they are registered each company, its name and logo on it and each time the program is run for any chat room must sure for all the logos and the names of companies, but this takes a large space of bandwidth and reduces the bit rate. Also the old program was connecting these ads to Google engine for further dissemination but this is also down from the performance of the program in both bit rate and band width. So, it was canceled of all these processes to reach a good band width and high bit rate.

Chapter Five

Validating Proposed Enhancements

Chapter Five: Validating Proposed Enhancements

5.1 Introduction

This chapter for validating proposed enhancements of the modifications done and improvements to the old program "DimDim" and present it in new form with better potential and more beneficial than before which summed up a set of amendments. Firstly, change the name of the program from "DimDim" to "SAQ". Secondly, to increase secrecy in dealing with the program in process of entering and access the program through the creation of a database kept username and its password. Thirdly, reaching to the most important part of the topic, namely to increase the number of subscribers and shares in the each chat room away from the administrator's server control, These requirements of increasing the subscribers and there shares have led to the need for increasing the number of photo camera and microphones users to nearly 100 subscribers and users at the same moment.

Previously in chapter 4, we demonstrated that the occurred modifications and showed all the amendments with its new image compared with the old images in old program "DimDim", but now we will do some comparisons between the old program and the new version to study some effects on the band width, bit rate and response time through following comparisons:

5.2 Band Width Validation

This study for the comparison between the new program and the old program by running the two programs in the computer laboratory of the University of Palestine, where the programs run on one of the devices as a server and then been reached through the web page and the number of subscribers were 17 users at the same moment. They can see the instructor in the frame of the camera and listen to him, without the possibility to participate camera or microphone due to lack of

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presence on devices lab and the instructor's device only has camera and microphone. After examination of the programs through band width there was no change or influence, because in both cases there is a single source is a lecturer and the rest spectators and therefore will not change the use of band width.

5.3 Bit Rate Validation

The first case at the University of Palestine was not enough. So, this approach protested to another place to test program and used a server located in the public aid society hospital, It was tried with some of the staff there to use the program and connect to it and try to use the camera and microphones at the same moment. The users for the program at the same time was 5 participants with using cameras and microphones without any problems or disconnections, So it was a successful experiment without congestion or dropping down for any subscriber, tested by PRGT Network Monitor (IT-UNIT-DSK) with URL address 192.168.10.202/index.htm. Each one of the five cameras can see his image and the other four images as shown in Figure 5.1.
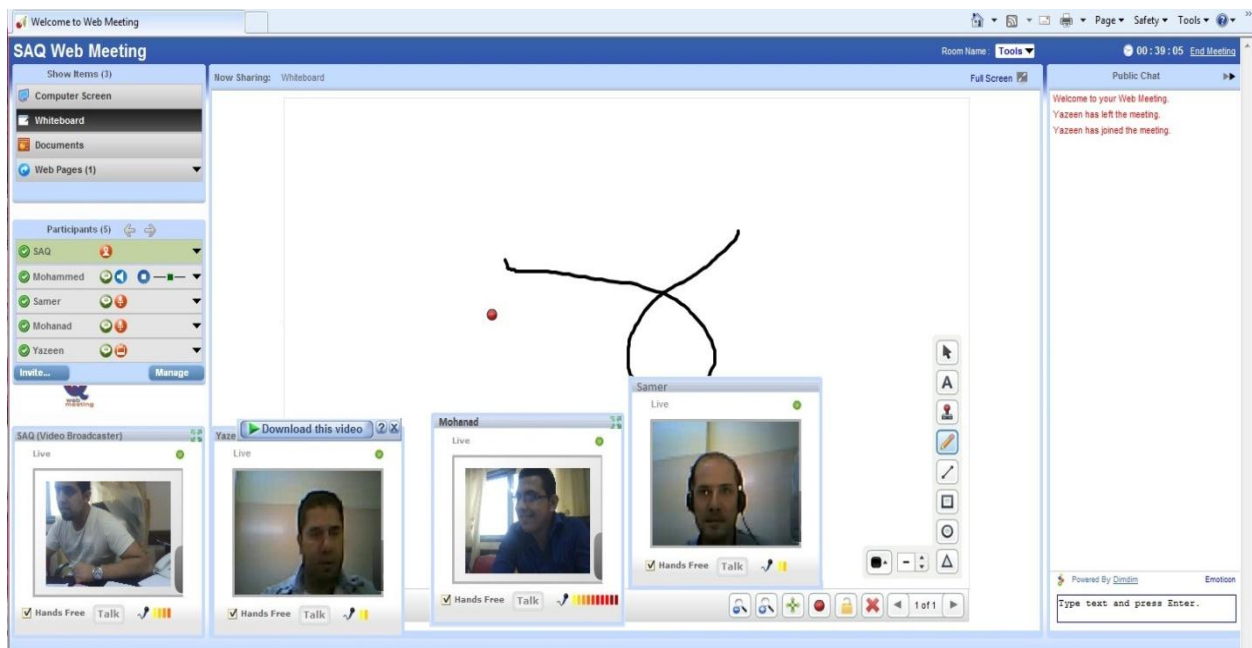

Figure 5.1: Multi-subscribers at the same time

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The main experiment was to test the bandwidth and the bit rate through running the new program "SAQ" related to compare it to the old program "DimDim" as follows:

5.3.1 Bit rate validation for more subscribers

The bit rate was increasing with using the new program "SAQ" because there are 5 subscribers were using the cameras and microphones at the same time, before, the old program "DimDim" was tested with operating only two subscribers. Then, by increasing the bit rate, the bandwidth occupation will be increase. Besides, if we increase the number of subscribers we need to increase the bandwidth or bit rate.
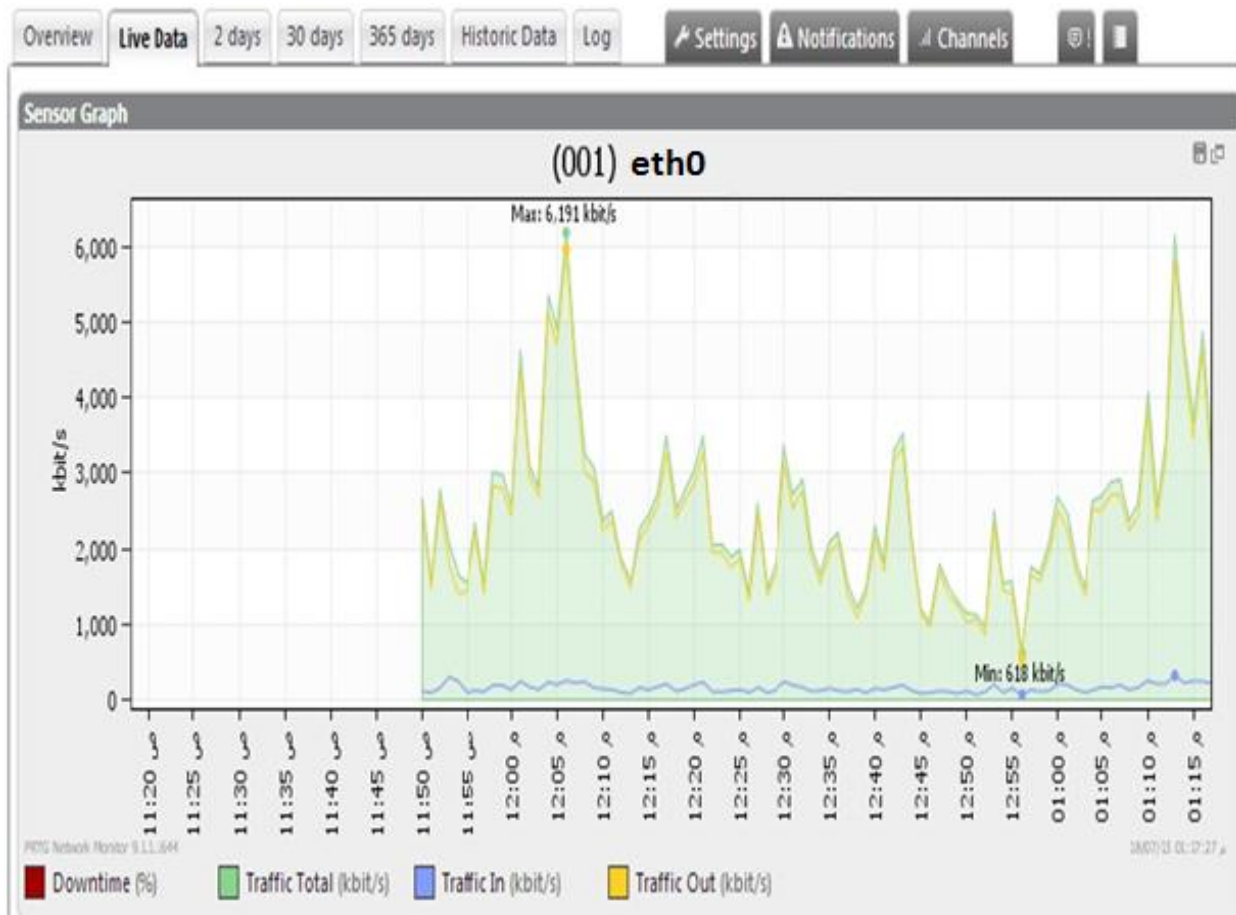

Figure 5.2: The bit rat capacity using SAQ.
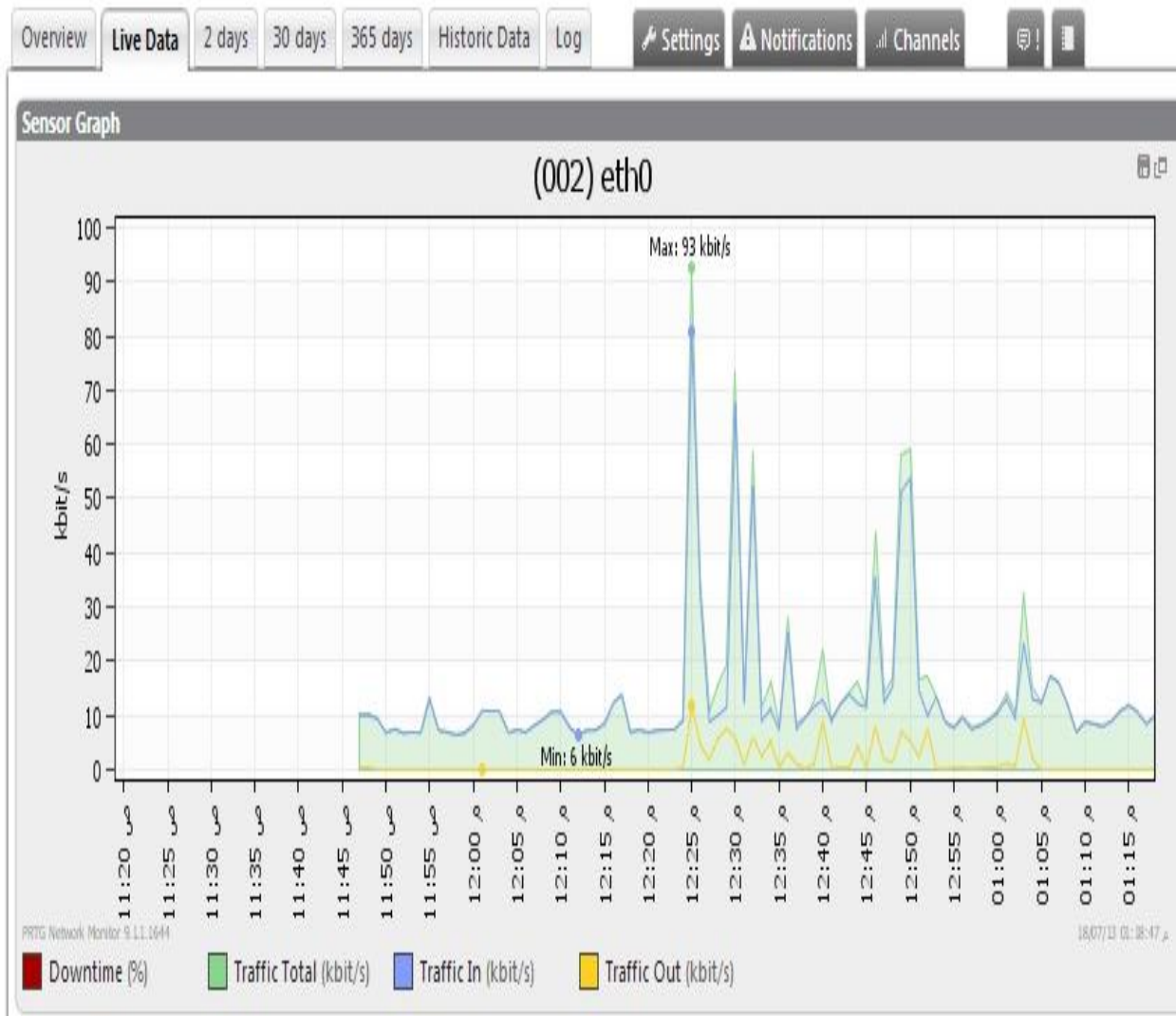
Figure 5.3: The bit rat capacity using DimDim.

The above Figures 5.2, and 5.3, has shown the bit rate capacity with running the new program "SAQ" and the old program "DimDim" sequence. In figure 5.3 will find increasing the bit rate capacity more than in figure 5.3 which indicates that bandwidth occupation will be increase. So, this increasing in capacity using of the bandwidth was related to the increasing number of subscribers.

5.3.2 Bit rate validation without advertisement & logos

The new comparison between the new program "SAQ" and the old program "DimDim" in bit rate by operate the new program without logos and advertisement related to the firms and companies published its own logos and ads on DimDim web page. Then, by operating the old program "SAQ" and testing the bit rate we found a huge bit rate capacity was occupied in bandwidth as shown in Figure 5.4. But, when testing the bit rate on the new program "SAQ" without logos and ads, it decreased in using the bit rate with less than bandwidth occupation as shown in Figure 5.5.
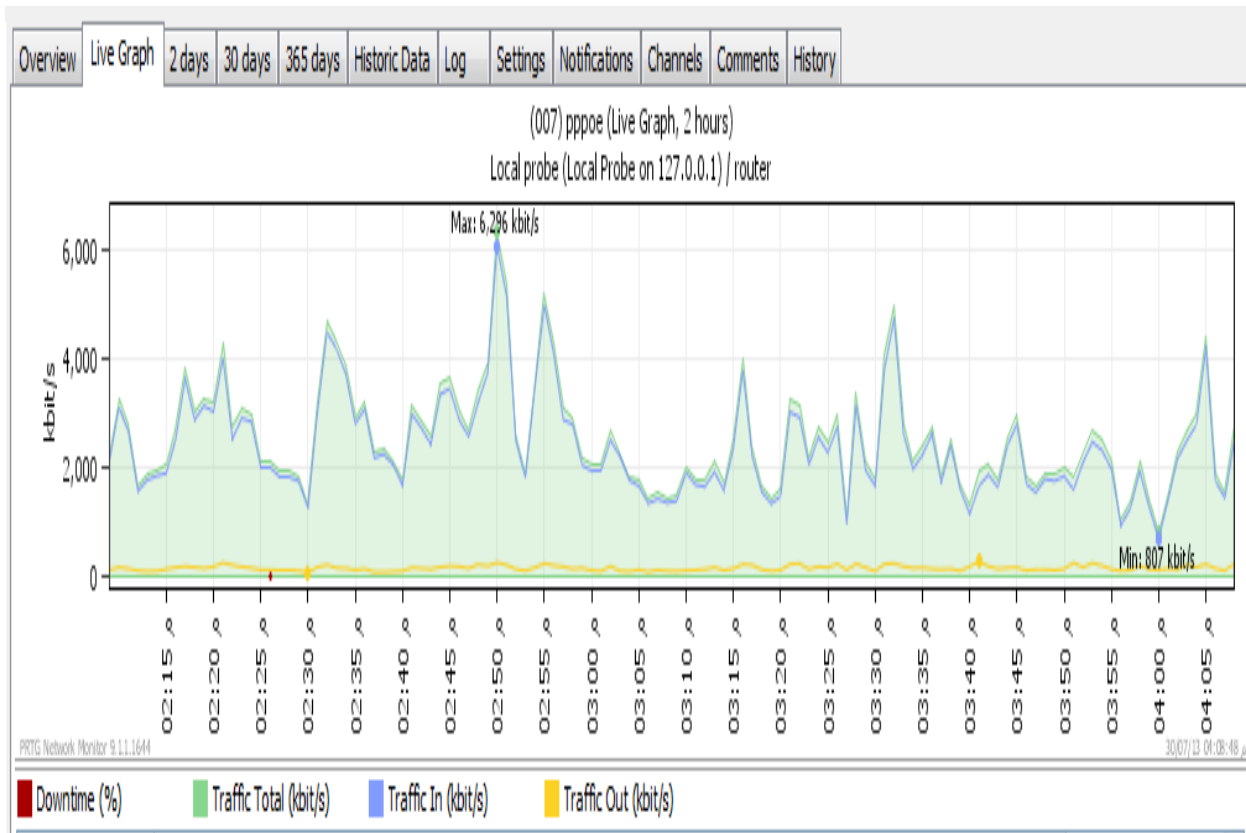

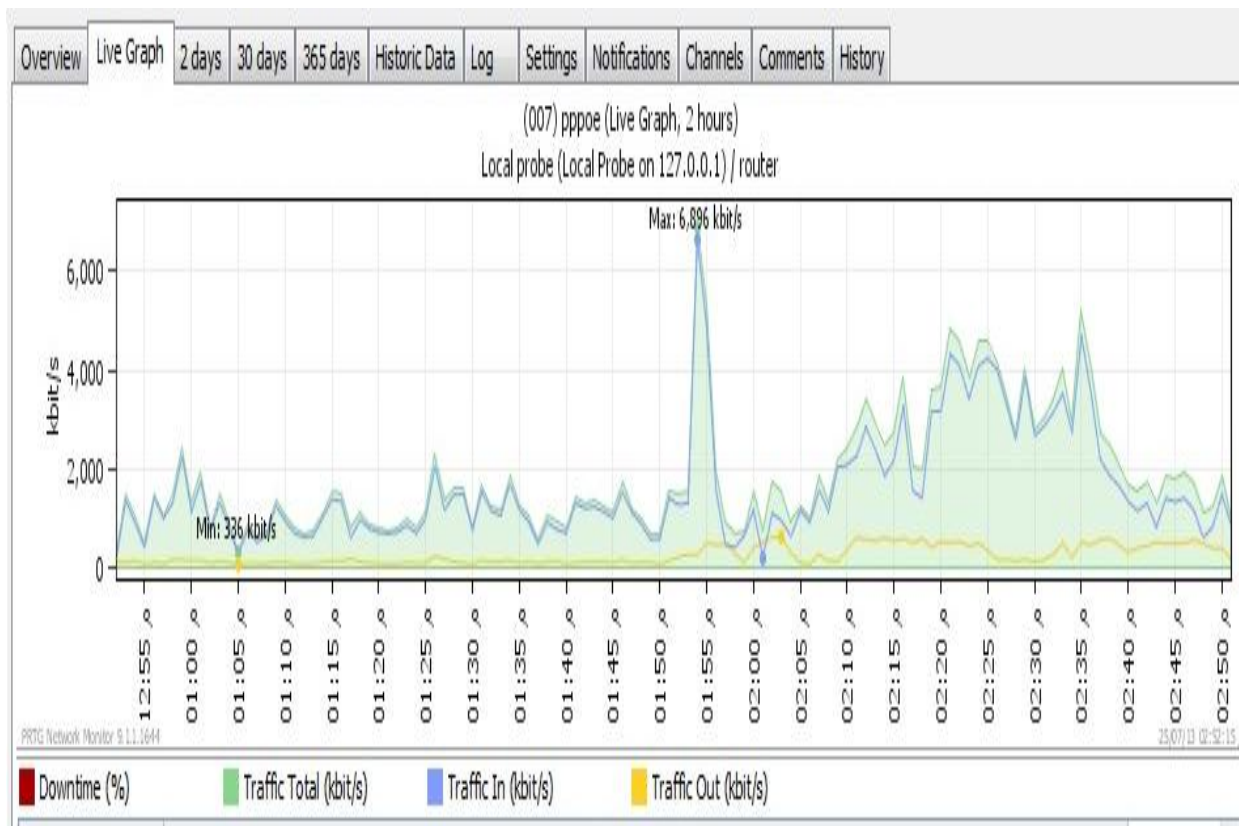Figure 5.4: The bit rat capacity using DimDim with logos & ads.

Figure 5.5: The bit rat capacity using SAQ without logos & ads.

5.3.3 Bit rate validation without Google search engine

The new approach stooped the registration in Google search engine, and then tested it through the capacity of bit rate and the occupied capacity in bandwidth with compare to the old program "DimDim" which already operate with registration in Google search engine as we mentioned before at section 4.4.6.

The Figure 5.6, shows the bit rate capacity while operate the old program "DimDim" which display the bit rate is very high or more than the bit rate capacity related to operate the new program "SAQ" as shown in Figure 5.7, without registration to Google research engine. So, there is more efficiency in bet rate and bandwidth while operate the program "SAQ" without Google engine search registration than the old program "DimDim".
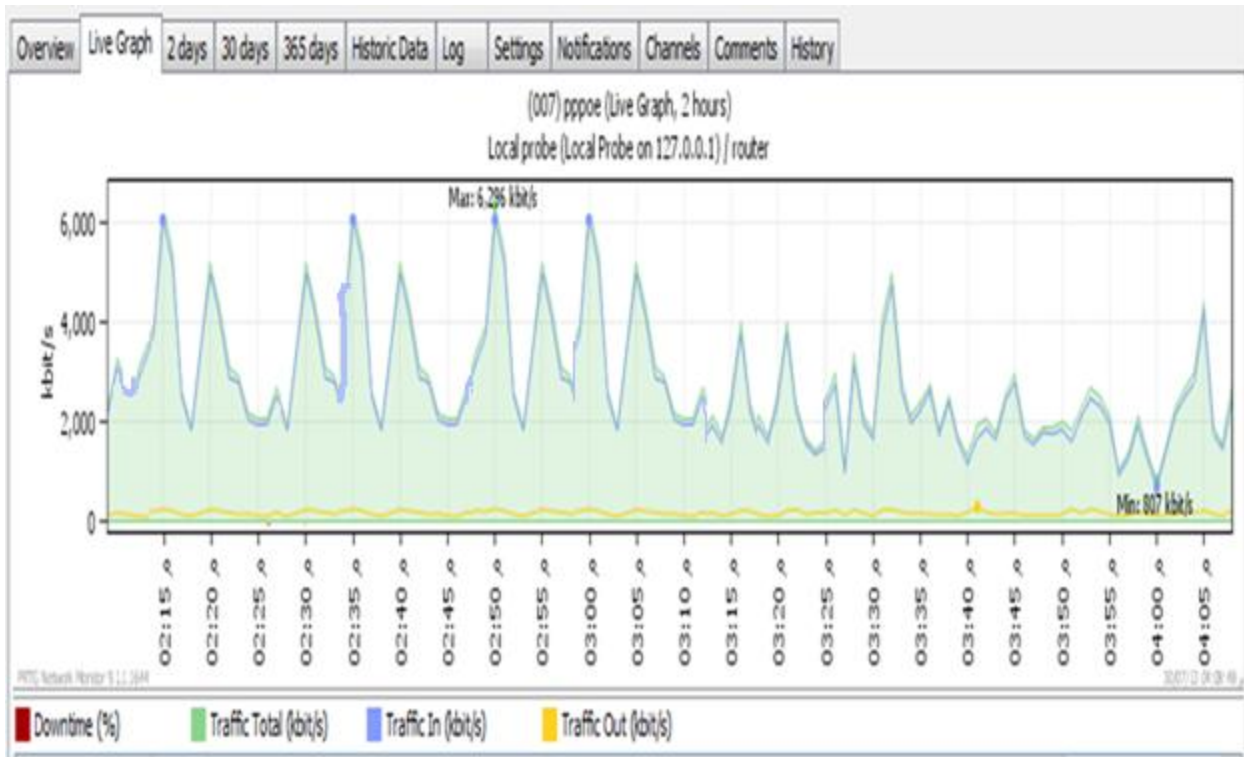
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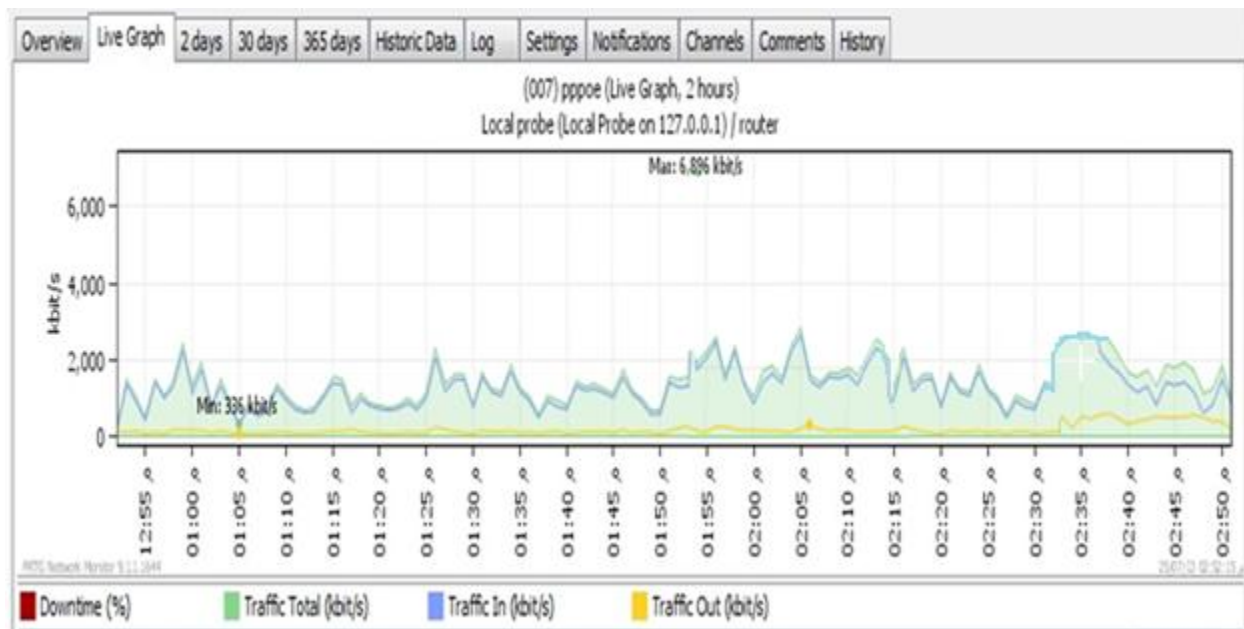Figure 5.6: The bit rat capacity using DimDim with Google engine.

Figure 5.7: The bit rat capacity using SAQ without Google engine.

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Chapter Six

Conclusion and Future Work

Chapter Six: Conclusion and Future Work

6.1 Conclusion

Simulation Question and Answer "SAQ" is a virtual classroom "VCR" which consider as an instrument for conducting live classroom-like sessions over the internet. In it, students and tutor(s) can communicate using voice, video, chat and whiteboard tools. They also have facilities like application sharing, polling, breakout sessions and quizzes. It allows the tutor and students to participate in real time lessons and discussions. Students can ask questions, draw on the whiteboard, and participate in breakout sessions. Almost, everything that can be done in a real classroom can be done in a virtual classroom. Moreover, the whole classroom session can be recorded and made available for review afterwards.

SAQ is Web-based software you use over the internet with a web browser. You don't have to install any CDs, download any software, or worry about upgrades. If you use an online bank or web-based email program like Gmail, Hotmail, or Yahoo Mail then you've already used web-based software before.

When you use web-based software you don't have to worry about anything technical, you can just do your work. We handle all the security and uptime and backups and upgrades and "IT guy" stuff. You can stay focused on what you're good at and we'll handle the rest.

In this thesis, we have enhanced web conferencing software "DimDim" which offers a browser based web conferencing service based on the open source platform. Users can download the open source code and install it to their servers. Attendees are not required to download any software to host or attend a meeting. DimDim allows presenters to share their desktops, show slides, as well as talk, listen, chat, and broadcast via webcam.

But there are many problems in DimDim software which recorded firstly, does not allow for more than two customers to enter into one chat room, Secondly;

no database to control the user's membership, thirdly; not allowed adding a new customer to the interview by anyone of the parties, fourthly; posts of microphones and cameras are specified by not more than two, finaly; The size of the resulting image from the camera is steady by 2 cm x 2 cm, and no one of the interview can zoom in or out.

So, in our approach had got the code of the program DimDim and make some modifications and additions, but based on conversion this program from a special program transactions confidentiality, banking, politically and business to a new program more comprehensive and wider is not limited to banking transactions and confidentiality, but in order to be more prevalent and comprehensive to include transactions education, e-learning, social media, political and business in addition to solve the existing program's problems in the above mentioned.

Then we enhanced "DimDim" and made some modifications to be a new software "SAQ" which has differences more efficient than "DimDim", beginning firstly; the new name "SAQ" related to simulation answer and questions but "DimDim" we didn't find any meaning, secondly; "SAQ" had been more secure by creating a database tables have a user name and password for each subscriber, it prevents anyone to enter the chat room that hasn't a user name and a password, thirdly; adding scalability for subscriber number which was limited by two, but in "SAQ" had been reached to one hundred, besides that; made availability to use cameras and microphones for each subscribers controlling of the number of users, subscribers using cameras and microphones, finally; the frame size of the camera which was fixed but in "SAQ" had been variable due to the number of subscribers using cameras and appear on the interface.

6.2 Future Work

The proposed software "SAQ" is based on the web-based conferencing platform for real time as a synchronies system, it using the media tools like cameras and microphones for each subscriber. Also, we can transfer files besides all functions used by "SAQ" but it need a large bit rate and it occupied a large capacity in bandwidth.

In the future, we would like to enhance the "SAQ" software to be used as mobile application, and to be an asynchronies system to store data to let anyone left the class can show it again. In addition, we would like to make the "SAQ" software to be use peer to peer techniques for transferring files, documents, and videos to decrease using bit rate and bandwidth. Also, may use it as a desktop application.

References

[1] Traditional education,

   Available at: http://en.wikipedia.org/wiki/Traditional_education

[2] Traditional Class Room,

   Available at: http://wiziq.typepad.com/wiziqcom/2008/06/virtual-classro.html

[3] Li, Y., "Designing Collaborative E-Learning Environments based upon Semantic Wiki", sponsored by Knowledge Science & Engineering Institute, 2011.

[4] Namahn, "e-learning into an organization, management support is necessary", electronic magazine, sponsored by ASTD (American Society for Training & Development), 2009.

[5] Virtual Class Room (VCR),

   Available at: http://education portal.com/articles/The_Differences_Between_Online_and_Traditional_Classroom_Educations.html

[6] Shubhangi K. Jadhav, "Virtual Classroom. The Center for Development of Advanced Computing", Sterling Institute of Technology and Management, Nerul, Navi, Mumbai, 2010.

[7] Shauna Schullo, "Selecting a Virtual Classroom System: Elluminate Live vs. Macromedia Breeze", MERLOT Journal of Online Learning and Teaching Vol. 3, No. 4, December 2007.

[8] Max Butin and Benoit Belley, "The Virtual Classroom: a Worldwide Wireless Internet Collaborative Experimental Environment", American Institute of Aeronautics and Astronautics, 2007.

[9] Barbara Victoria Berna, "Challenges in the Pedagogy of Virtual Classrooms", ASEE Southeast Section Conference, 2011.

[10] Sam Hsu and Abhi Pandya, "Yet Another Virtual Classroom over the Internet", Motorola, Inc., Plantation, Florida, 2001.

[11] Gearóid Ó Súilleabháin MScEcon MA, "Virtual Classrooms in Educational Provision – DEIS", Development, Cork Institute of Technology, April 2005.

[12] Radu Dondera, Chun Jia, Voicu Popescu, Cristina Nita-Rotaru, Melissa Dark, and Cynthia York,"Virtual Classroom Extension for Effective Distance Education", Purdue University, 2007.

[13] Anucha Tungkasthan and Nipat Jongsawat, "Enhancing Learning Systems by using Virtual Interactive Classrooms and Web-based Collaborative Work", Graduate School of Information Technology in Business, Siam University, Bangkok, Thailand, 2010.

[14] Eleni Rossiou and Constantinos Paparrizos, "Using LAMS to facilitate an effective synchronous virtual classroom in the teaching of algorithms to undergraduate students", European LAMS & Learing Design Conference, 2009.

[15] A.I. Obasa, A.A. Eludire and Mbing Isaac, "The Architectural Design of an Integrated Virtual Classroom System", Research Journal of Information Technology 3(1): 43-48, 2011.

[16] S. K. Chang, Xin Li, Ricardo Villamarin and Dan Lyker, Chris Bryant, " The Design and Implementation of the Chronobot/Virtual Classroom (CVC) System", Department of Computer Science, University of Pittsburgh, USA, 2007.

[17] Muzafer Saračević, Esad Međedović, Sead Mašović, Faruk Selimović and Hamza Kamberović, "Application Learning Content Management Systems, Virtual Classroom and M-Learning in Enterprices", ICT for SME, 2011.

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[18] Thomas Abraham, "Evaluating the Virtual Management Information Systems (MIS) Classroom", Journal of Information Systems Education, Vol. 13(2), 2007.

[19] Mary F. Fortune and John J. Staczek, "Merging Business Communication with Technology: Developing Successful Multimedia Modes for Distance Delivery", Association for Business Communication Annual Convention, 2004.

[20] Cisco Systems, Inc., "Cisco Virtual Classroom Solutions for Colleges and Universities", 2005.

[21] Cisco Systems, Inc., "Tele-Presence in Education", 2005.

[22] Harris Wang, "Towards a Real Virtual Classroom", Athabasca University, Alberta, Canada, 2010.

[23] Jože Rugelj, "Some Experiences With Virtual Classroom for Workplace Learning", J. Stefan Institute and University of Ljubljana Ljubljana, Slovenia, 2002.

[24] FAO (Food and Agriculture Organization), E-learning_methodologies, A_guide_for_designing_and_developing_e-learning_courses, 2011.

[25] Kathleen Schlusmans, "The introduction of a virtual classroom instrument at the open university of the Netherlands", Open University of the Netherlands, 2009.

[26] Melissa J. Dark, "Evaluating Interactivity and Presence in an Online Distance Learning System", IEEE, 2007.

[27] Web Based Software,

   Available at: http://37signals.com/webbased

[28] BigBlueButton virtual classroom software,

   Available at: http://www.bigbluebutton.org/.

[29] Skype software,

Available at: http://www.webopedia.com/TERM/S/Skype.html.

[30] Skype software,

Available at: http://techtips.salon.com/description-skype-3004.html.

[31] DimDim software,

Available at: http://www.crunchbase.com/company/dimdim.

[32] DimDim software,

Available at: http://en.wikipedia.org/wiki/Dimdim.

[33] B. Farter, "Dimdim Web Meeting Server API Documentation", ASEE Southeast Section Conference, 2011.

[34] Salesforce company,

Available at: http://en.wikipedia.org/wiki/Salesforce.com

[35] Shi, Y., Xie, W., Xu, G. 2002. Smart remote classroom: Creating a revolutionary real-time interactive distance learning system. In International Conference on Web-Based Learning.

[36] Adobe Systems Incorporated. (2007). Solutions for higher education. Retrieved November 10, 2007,

Available at://www.adobe.com/education/hed/

[37] Blocher, J. M., (2005). Increasing learner interaction: Using jigsaw online. Educational Media International.

[38] Ng, K. C., (2007). Replacing facetoface tutorials by synchronous online technologies: Challenges and pedagogical implications. International Review of Research in Open and Distance Learning.

[39] Software Engineering – A Practitioner's Approach [5/e (2001) – Pressman].

[40] PostgreMySQL: Manuals: MySQL Commands:
Available at: http://www.postgresql.org/docs/7.3/interactive/sqlcommands. Html.

[41] Virtual Teaching in Higher Education

Available at: http://www.csun.edu/sociology/virexp.htm

[42] Virtual Classroom—Instructor-led web-based training

Available at: http://www.cadence.com/support/virtual-classroom.aspx

[43] Virtual and traditional classroom – a comparison

Availableat:http://www.google.ps/url?sa=t&rct=j&q=why+virtual+classroom +not+traditional+classroom

[44] Jochems, W., Koper, R. & Merrienboer, J. V. (Eds) (2003). Integrated e-Learning: Implications for pedagogy, technology and organization. London, UK: Routledge Falmer.

[45] Koppelman, H. & Vranken, H. (2008). Experiences with a synchronous virtual classroom in distance education. SIGCSE Bulletin.

[46] Pena-Shaff, J. & Nicholls, C. (2004). Analyzing student interactions and meaning construction in computer bulletin board (BBS) discussions. Computers & Education, 42(3), 243-265.

Available at: http://dx.doi.org/10.1016/j.compedu.2003.08.003

[47] Blanchette, J. (2001). Questions in the online learning environment. Journal of Distance Education, 16(2), 37-57.

Available at: http://www.jofde.ca/index.php/jde/article/view/175/121