

**OPTIMIZATION OF COMPUTER LABS USAGE IN
SCHOOLS:
A CASE STUDY OF SMART-SCHOOL**

**UPP FINAL REPORT
VOT 71660
FEBRUARY 15TH. 2007**

PROJECT LEADER : ASSOC PROF DR MOHD AIZAINI MAAROF

ABSTRACT

The explosion of computer-based multimedia instructional has led to the adoption of general applications, such as word-processors and spreadsheets as an efficient way of learning. Furthermore, with the explosion of Internet Communication Technology (ICT) and a catalyst program like Multimedia Super Corridor (MSC), where smart school is one of the agenda, conventional classrooms nationwide are being transformed to a PC-based laboratory. With the future stakes of children nationwide, the matter of controlling and providing the best environment for study cannot be taken lightly. This project developed a Smart Laboratory Real-Time Management System (SLRTMS), to further increase the efficiency of learning, management and student monitoring by using client-server approach. This system will benefit both the instructor and the student, as it simplifies common tasks in a normal PC-based classroom. The server, which is used by the instructor as a control device for teaching and communicating, provides several functions: automating class attendance; broadcasting laboratory work and announcement; providing discussion channel between instructor and students; viewing and locking computer screens; and generating database reports. SLRTMS is a LAN-based system using Windows 98 as the platform and it's development exploited the functionality of COM and DCOM while using Microsoft Access as its database.

ABSTRAK

Perkembangan arahan multimedia berdasarkan komputer telah menghala kepada penggunaan aplikasi umum seperti pemrosesan perkataan sebagai satu kaedah yang berkesan dalam pembelajaran. Selain daripada itu, perkembangan Teknologi Komunikasi Internet (*Internet Communication Technology – ICT*) dan program pemangkin seperti Koridor Raya Multimedia (MSC) di mana sekolah pintar (*smart school*) sebagai salah satu agenda akan menjadikan bilik darjah sedia ada akan ditukar kepada makmal berdasarkan komputer peribadi. Bagi masa depan pelajar sekolah kaedah kawalan dan menyediakan persekitaran pembelajaran yang terbaik tidak boleh diambil ringan. Projek ini mebangunakan *Smart Laboratory Real-Time Management System* (SLRTMS) untuk meningkatkan keberkesanan dalam pembelajaran, pengurusan dan pengawasan pelajar dengan menggunakan pendekatan pelayan-pelanggan. Sistem yang dihasilkan akan meberikan faedah kepada pelajar dan juga pengendali (guru) kerana ia mempermudah tugas biasa dalam bilik darjah biasa berdasarkan komputer peribadi. Pelayan yang digunakan oleh pengendali (guru) sebagai peranti kawalan untuk pengajaran dan berkomunikasi menyediakan beberapa fungsi berikut: mengotomasikan kehadiran kelas; penyebaran kerja makmal dan pengumuman; melihat dan mengunci skrin komputer dan menghasilkan laporan pangkalan data. SLRTMS ialah sistem berdasarkan rangkaian setempat (*Local Area Network – LAN*) dan menggunakan Windows 98 sebagai plantar dan pembangunannya menggunakan fungsian COM dan DCOM manakala *Microsoft Access* sebagai pangkalan datanya.

Acknowledgements

The research leader would like to acknowledge the contribution of the early programmer Beh Phaik Siew. This software is the result of a research supported by a seed grant from the Research Management Center of Universiti Teknologi Malaysia.

Great support from research members has enabled this project to be completed and delivered. The team members are :

1. Assoc. Prof Dr. Abd Samad Hj Ismail
2. Assoc Prof Mazleena Salleh
3. Cik Rashidah Kadir
4. Pn. Anazida Zainal

Table of Contents

Abstract

Abstrak

Acknowledgements

CHAPTER 1 : INTRODUCTION

- 1.0 Introduction
- 1.1 Objective
- 1.2 Scope
- 1.3 Importance of the Project
- 1.4 Summary

CHAPTER 2 : LITERATURE REVIEW

- 2.0 Introduction
- 2.1 School Lab Management System Available Technologies
 - 2.1.1 SynchronEyes
 - 2.1.2 NetSupport School
 - 2.1.3 NetOp
- 2.2 Summary

CHAPTER 3 : METHODOLOGY

- 3.0 Introduction
- 3.1 Overview of the System
- 3.2 System Development
 - 3.2.1 Conceptual Design
 - 3.2.2 Logical Design
 - 3.2.3 Physical Design
 - 3.2.4 Functional Design
- 3.3 Summary

CHAPTER 4 : RESULTS AND DISCUSSION

- 4.0 Introduction
- 4.1 Discussion

CHAPTER 5 : CONCLUSION

- 5.0 Introduction
- 5.1 Future Work

CHAPTER 1

INTRODUCTION

1.0 Introduction

In education, the value of electronic delivery systems has long been recognized by teachers and lecturers worldwide. With the explosion of Information and Communication Technology (ICT) and a catalyst program like Multimedia Super Corridor (MSC) where smart school is one of the agenda, conventional classroom has been transformed to a PC-based laboratory. Integrated control systems can simplify the teaching delivery in a computer laboratory.

There has been a virtual explosion of computer-based multimedia instructional applications for diverse subjects and interests. General-purpose applications, like word-processing and spreadsheet, have been adopted extensively in classroom environment as effective and efficient teaching and learning tools. To better adopting and managing the usage of these instructional applications and to impose some degree of supervision so that the students are not side tracked [5], the “traditional classrooms” are transforming to computer-based laboratories. ICT continues to enhance the classroom experience and empower teachers and students. The collaborative interaction and the flexibility in catering different learning abilities and paces of students are among the many benefits that ICT brings along into education.

The project delivers Smart Laboratory Real-time Management System (SLRTMS) that is beneficial to the instructor as well as to the students. This system uses client-server approach. The server is used by the instructor as a control device for teaching and communicating provides several functions: automating class attendance; broadcasting laboratory work and announcement; providing discussion channel between instructor and students; viewing and locking students’ computer screens; and generating database

reports. SLRTMS is a LAN-based system using Windows 98 as the platform and its development exploited the functionality of COM and DCOM and Microsoft Access as its database. This system provides a better interactive information environment and promotes a higher educational effectiveness.

1.1 Background to the Problem

Computers and content based software are mushrooming the schools. This is due to the education vision which is to utilize computers and IT in general to facilitate the learning and teaching in schools. Grants were given to selected schools to buy computers and its necessary infrastructure. The pilot run was done on smart schools where computers were intensively used in learning and teaching. This will later be adopted by all government sponsored schools. Teachers and school personnel start to that to manage a computer based classroom is not the same as to manage a conventional classroom. And to manually checked on the students and their activities on the computers by walking from one student to another is strenuous. Computers bring with them uninvited problems that can divert students attention and focus on the materials being delivered in the class. They may surf Internet and chat with someone from the other side of the globe. Thus, there is a need to develop an application which is targeted to address the management aspect of it. The application developed in this project not only allows the teachers to use the computers as a teaching medium, but it also allows them to monitor students' behavior in a computer lab.

1.2 Project Purpose

The project was aimed at producing an application that can optimize the usage of a computer lab in a school. Several misbehavior patterns of students in this type of classrooms were identified, an effective delivery management style to be in place and has proposed an effective tool for the management of IT-based classrooms. The tool is called

“Smart Laboratory Real-time Management System” (SLRTMS). A case study of smartschool was chosen due to its sufficient infrastructure and education content that exploit the use of computers and IT.

1.3 Objective

The following are the objectives of the project :

- i) To produce an application where the instructor is able to control and monitor the computer usage of the student
- ii) Enable discussion between lecturer and student
- iii) Enable instructor to take attendance of the students effectively.

1.2 Scope

The project will adopt the following as the scope:

- i) The system employs client-server approach.
- ii) The system was developed using .NET technology.
- iii) Features are grouped into package. The packages are :
 - a. Management
 - b. Monitoring
 - c. E-learning

1.3 Importance of the Project

It is essential to develop a smart lab management system as the mode of learning is gradually change to computer-based. Traditional teacher-to-students relationship and monitoring are longer applicable. Thus, there is a need to have an application that can

manage the computer-based classroom so that teaching and learning can be made more efficient.

1.4 Summary

This chapter has outlined the objectives and scope of the project. It also has justified the need to develop a smart lab management system.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This section reviews some of the available software related to computer lab management systems. Their technology and features were studied.

2.1 School Lab Management System Available Technologies

Three School Lab Management System products have been studied. They are *NetSupport School v.6*, *SynchronEyes 3.0* and *NetOp School v2.5 Software* [3]. In general, they share some common features as shown in Table 1. All the three studied software have an ability to allow an instructor to lock student workstations during instructional moments and share a single computer screen with everyone in the lab.

Table 1.1 : Common features in school lab management system

| Product Feature | NetSupport School v.6 | SynchronEyes 3.0 Software | NetOp School v2.5 |
|--------------------|---|--|--|
| Monitoring | Displaying up to 16 student PCs' simultaneously | View all student screen | Remote control students for one-on-one instruction |
| Locking | Screen, keyboard and mouse | Screen, keyboard and mouse | Screen, keyboard and mouse |
| Chatting/Message | Group (chat room) | 1-to-many (<i>Instructor to student</i>) Group (chat room) | 1-to-1 (<i>Student to instructor</i>) 1-to-many (<i>Instructor to student</i>) Group (chat room) |
| Broadcast screen | Instructor to students | Instructor and student (both) | Instructor to students |
| File transfer | Instructor to students | Not available | Instructor to students |
| Generate report | Not available | Not available | Not available |
| Attendance | Not available | Not available | Not available |
| Operating System | Windows | Windows & Macintosh | Windows |
| Place | Same place | Same place | Different places |

2.1.1 SynchronEyes

SynchronEyes create a focused learning environment with *SynchronEyes* computer-lab instruction software [9]. It has an intuitive interface that helps instructor provide one-to-one instruction in a computer lab.

2.1.2 NetSupport School

Meanwhile, *NetSupport School* is an interactive software solution that enables instructor to demonstrate, monitor and interact with their students [6]. This can be done on a whole class basis or to a selected group of students or even to individual students.

2.1.3 NetOp

NetOp includes a file transfer feature that is very useful when an instructor needs to distribute a file or even to collect assignments (in a form of files) from the students [4]. It can also open up a program file simultaneously on all the clients (students) workstations from a single instructor workstation.

In Malaysia school environment, attendance is compulsory. This is due to the fact that few important exams are scheduled throughout their primary and secondary educations. A continuous absenteeism may result in school drop-outs. SLRTMS provides an automatic attendance recording. This will help the teacher to monitor the students who regularly missed their classes. Locking in SLRTMS was designed with twofold purposes. First, to ensure that the students can concentrate during the instructional moments and second is to block them from misusing the computers. The former is helpful in helping the students to concentrate. Concentration during instructional moments are quite critical because the students have to listen to the instructions carefully. Listening skill is acknowledged as one of the basic skills that can actually influence the students academic performance [7]. So, this locking mechanism is actually a useful aid in helping the students to concentrate on their listening to the instructions. The later purpose is for misuse detection. If misuse is detected, a report will be generated. This report generation is a feature included in SLRTMS with an intention to help an instructor to analyze students behavior in lab. As a result, more attention can be given to these unfocused students.

2.2 Summary

This chapter has presented the findings on common features that most of the computer lab management systems have. They are locking, monitoring, chatting, file transfer and broadcast screen. A study of the Malaysian traditional classroom has also been performed. The lacking feature identified is the report on the class attendance.

CHAPTER 3

METHODOLOGY

3.0 Introduction

This chapter will describe the approach that we have taken to develop the system. It also describes the design and components of the system. The components included are the common features found in any School Lab Management Systems. We also implemented attendance system into SLRTMS.

3.1 Overview of the system

This Smart Laboratory Real-time Management System (SLRTMS) can be beneficial to the instructor as well as to the students. This system uses client-server approach. The server is used by the instructor as a control device for teaching and communicating. SLRTMS is a LAN-based system using Windows 98 as the platform and it's development exploited the functionality of COM and DCOM and Microsoft Access as its database. This system also provides a better interactive information environment and promotes a higher educational effectiveness.

There are two applications involved in the development of SLRTMS. The Client Application (or the students) only has a discussion module. This is 1-to-1 discussion. It enables the students to communicate or post a query to the instructor.

Meanwhile the other application is called Server. The server module has several functions and can be grouped into three broad categories. They are Usage, Management and Monitoring. In Usage category, the discussion module allows the instructor to respond to query posted by a student or the instructor may choose to broadcast the

response to all the students in the lab. Besides this, the instructor may choose to use this facility to broadcast a class assignment or announce any information related to the activities needed to be performed. It provides an alternative channel for discussion apart from the conventional discussion between instructor and students that normally being carried out in the event of teaching. Components enable an automatic class attendance, viewing and locking students' computer screens, students and instructors record management as well as generating database reports. A special module called Registration will register new students into the system. Upon registration, the student will be assigned a user id and a password.

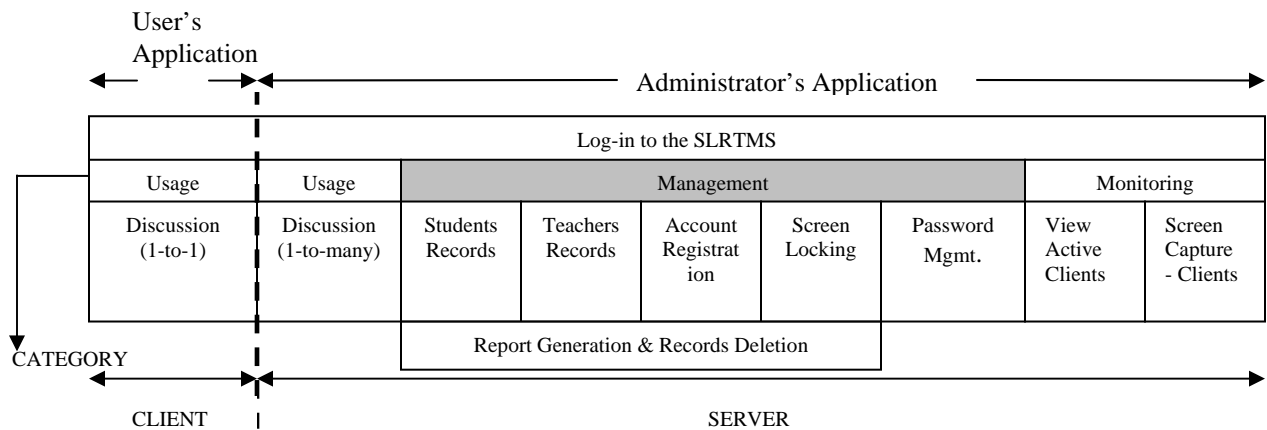


Figure 3.1: SLRTMS Components

3.2 System Development

SLRTMS is a client-server system that exploits RAD (Rapid Development Application) methodology during its development

The Smart Lab Real Time Management System (SLRTMS) uses Object Oriented Analysis and Design (OOAD) as its development methodology. The primary reason to use OOAD is to prolong the software's life and extends its functionality. This is made possible by reusing the already available classes in this current system and, for future extensibility:

1. add new modules to the current system

2. to communicate with other applications with little/no change to the current code.

Another motivation for using this methodology is to explore and implement OOAD into the newly improved feature of true Object Oriented Programming in Visual Basic .NET. Visual Basic has always been referred to as a 'mediocre' language by some programmers.

The main modeling language to express the system will be the Unified Modeling Language (UML) as a primary notation. UML is being used because of its flexibility and simplicity in addressing the system in design.

The system is broken into modules for simplicity during development and testing phases. Besides, it will also ensure modularity which means new module can be developed and added to the system without affecting the existing modules. This technique is suitable when used together with object-oriented concept as it will minimize the dependency between each module and make them reusable for further extension on the system.

The tools and technologies used to design and implement SLRTMS are;

1. Rational Rose
 - a. Rational Rose is a popular design tool used to model systems using UML. The current version auto-generates classes for C++ and Java only.
2. Visual Basic .NET
 - a. Visual Basic is an exciting tool currently used by a majority group of programmers. The latest edition named Visual Basic .NET has lots of new features that is currently being used in developing the SLRTMS.
3. .NET Remoting
 - a. Because the SLRTMS is a client-server application that relies heavily on network resources, .NET Remoting via Httpchannel is used for communication means. .NET Remoting doesn't encapsulate data in SOAP format, and transferring data in binaries is more faster.

3.2.1 Conceptual Design

The conceptual design of SLRTMS is as shown in Figure 3.1. It comprises of three actors that are administrator, instructor and student. The role of the administrator manages the system such as students' records and instructors' records that include passwords.

All the three actors need to register their accounts with the system before proceeding to other functions. The access capability of functions by each user is specified during registration. The system itself or the administrator can set the user password at the time of the registration. For security reason users must modify the password once they are login to the system.

Student and instructor interact with each other through discussion and students can download files such as notes and assign through the FTP function. Beside this, students are also capable of submitting their assignment with the FTP function. On the other hand, instructor has a wider scope of functions. They can view the class attendance

for the session, broadcast instructions or assignments, view students' screen, lock students' screen and update students report.

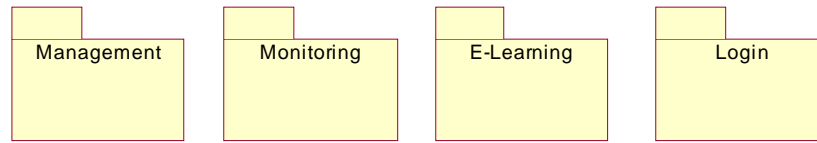


Figure 3.2: Basic package design of SLRTMS

SLRTMS is divided into separate packages to simplify the system's functional development. This abstract view of the system gives the users and developers an overall view of what the system can do.

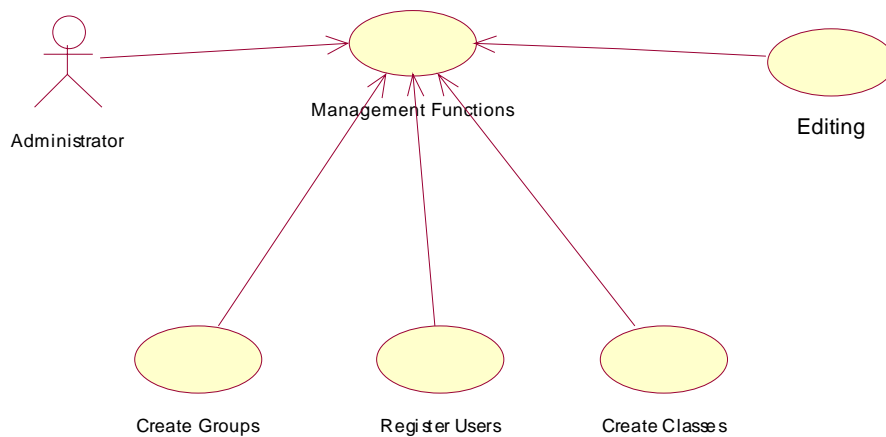


Figure 3.3: Use-case of the Management package

The management package serves four main functions. Create Groups as an administrator exclusive function to create groups for students. Register Users to register new students/lecturers/administrators. Create Classes to add new classes for new or existing lecturers.

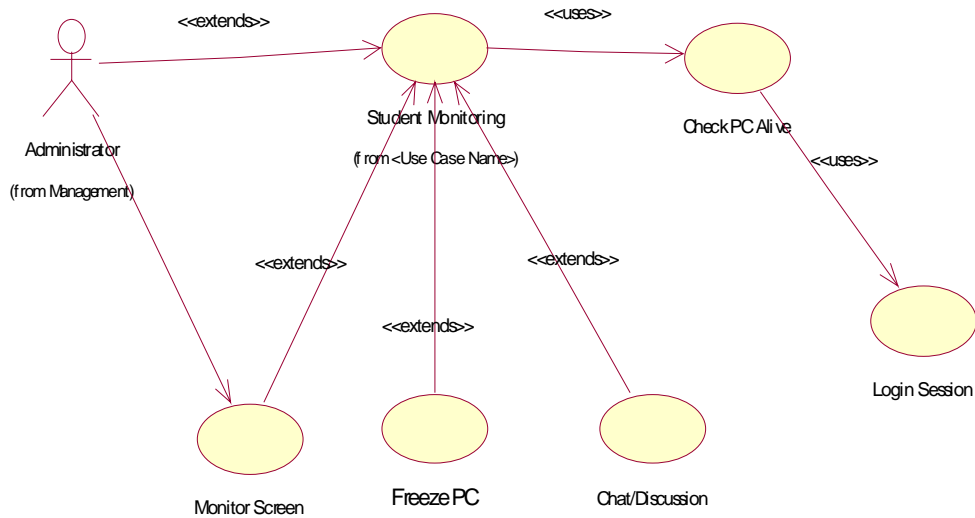


Figure 3.4: Monitoring Use-Case

Check PC Alive checks the PC corresponding to the student using it for network activity by an ICMP call (ping) for every 5 minutes (relative to the time the student is logged on to reduce network traffic). The Monitor Screen function is a general function for the Student and Lecturer group to monitor each other's screen (with the latter true provided that permission is given). Freeze PC allows the Admins group to freeze student's PC for Class Demonstration purpose or as a simple 'punishment' for misusing their PCs. The Chat/Discussion serves as a channel for students and lecturers to communicate with each other; either in private or public discussion.

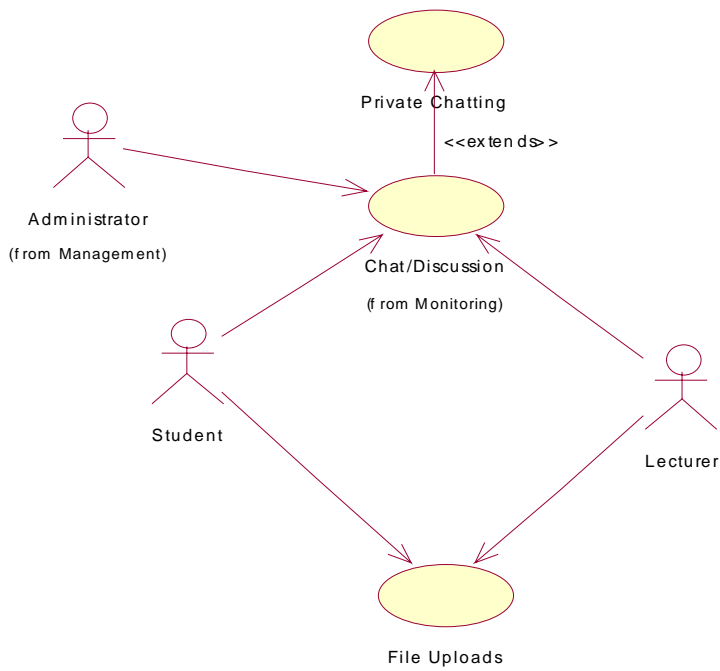


Figure 3.5: E-learning Use-Case

The E-learning aspect of the system consists of Chat/Discussion Use-Case (from the Monitoring Use-Case Diagram), and File Uploads.

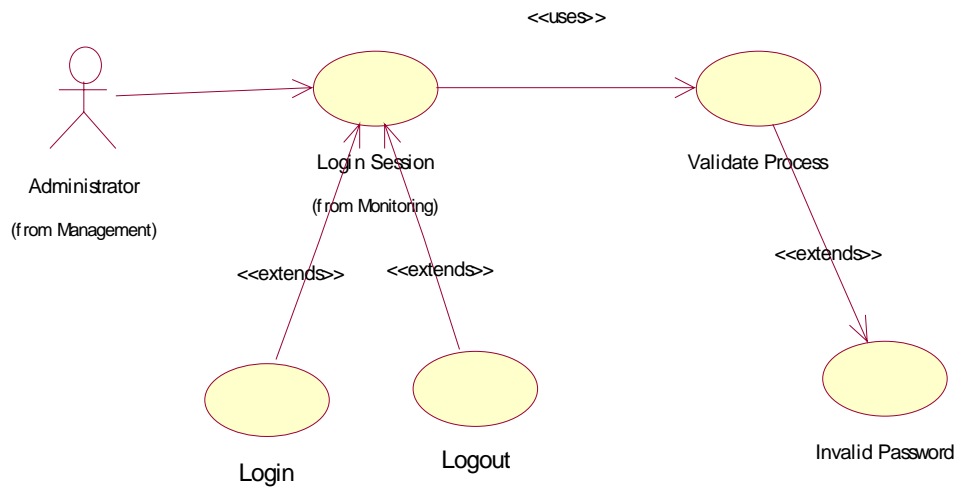


Figure 3.6: Login Use-Case

3.2.2 Logical Design

The logical design of SLRTMS comprises of possible scenarios using Sequence Diagrams and Collaboration Diagrams as notation.

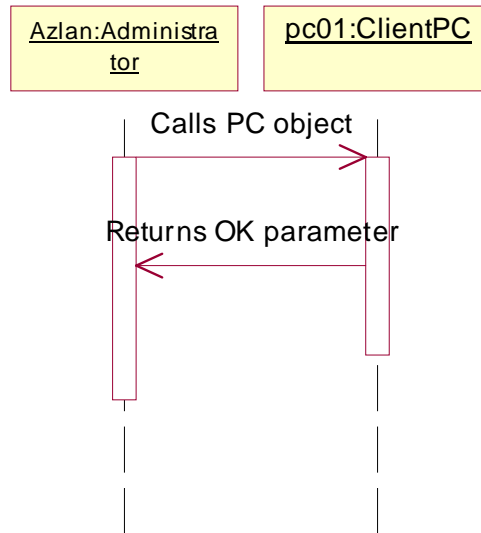


Figure 3.7: Check PC Alive Sequence Diagram

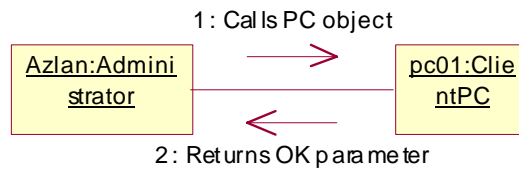


Figure 3.8: Check PC Alive Collaboration Diagram

Simply put, the Check PC Alive function pings the client's PC every 5 minutes and logs them off if no connection is available.

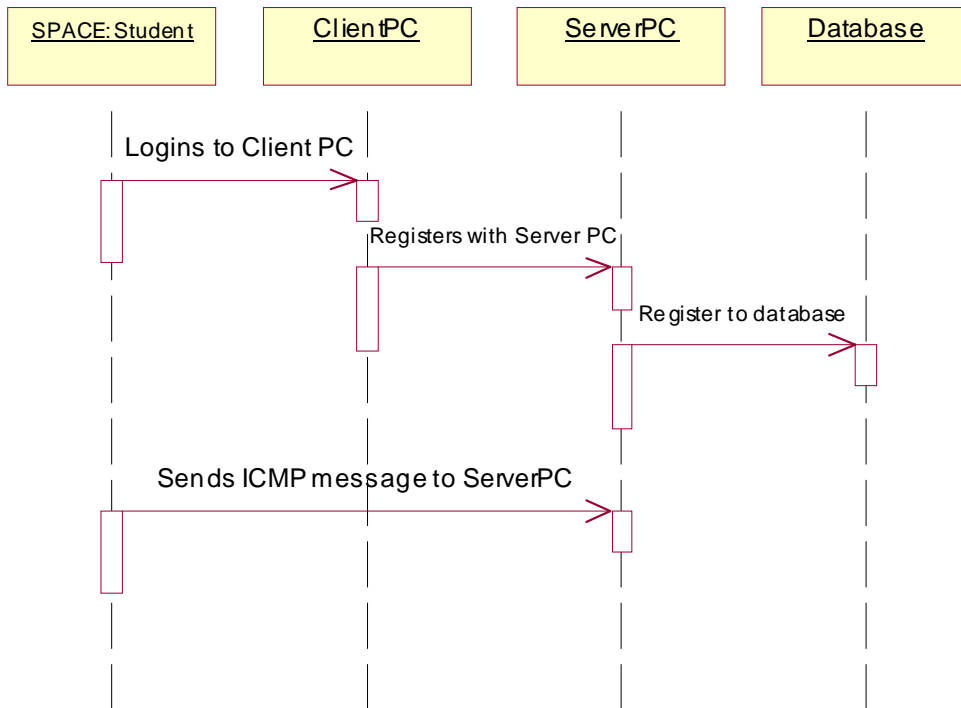


Figure 3.9: Login Session Sequence Diagram

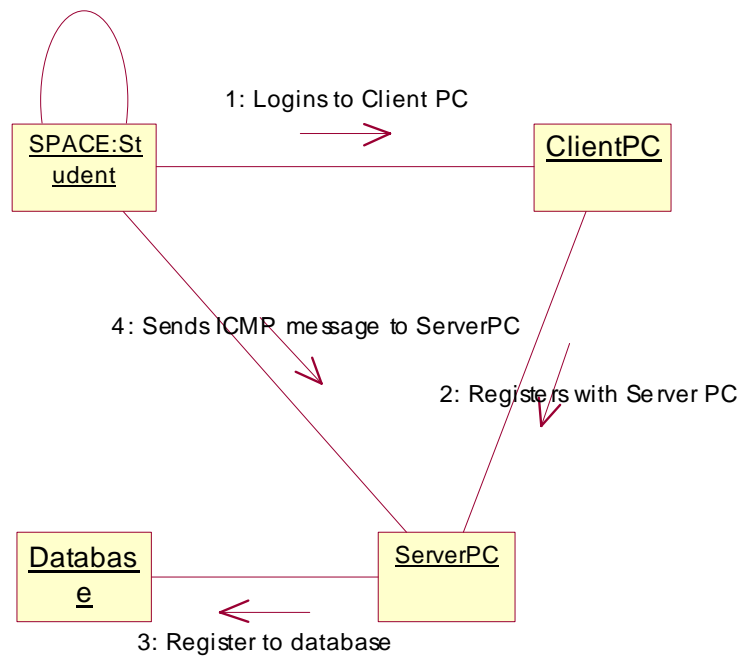


Figure 3.10: Login Session Collaboration Diagram

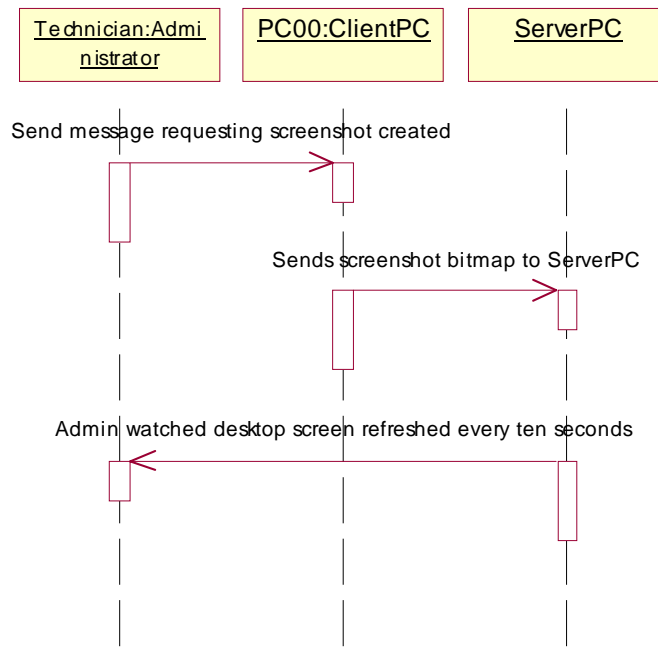


Figure 3.11: Monitor Screen Sequence Diagram

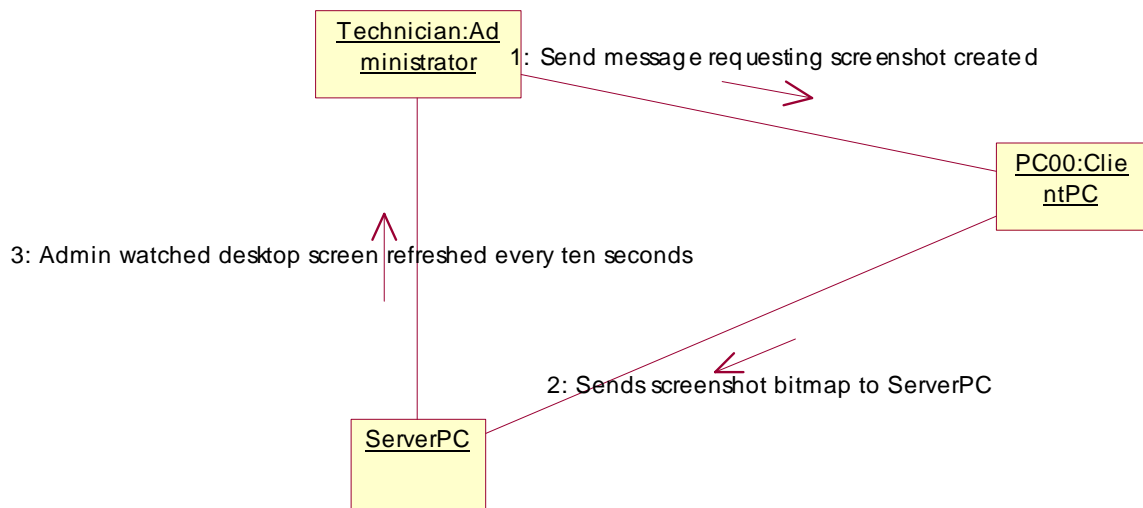


Figure 3.12: Monitor Screen Collaboration Diagram

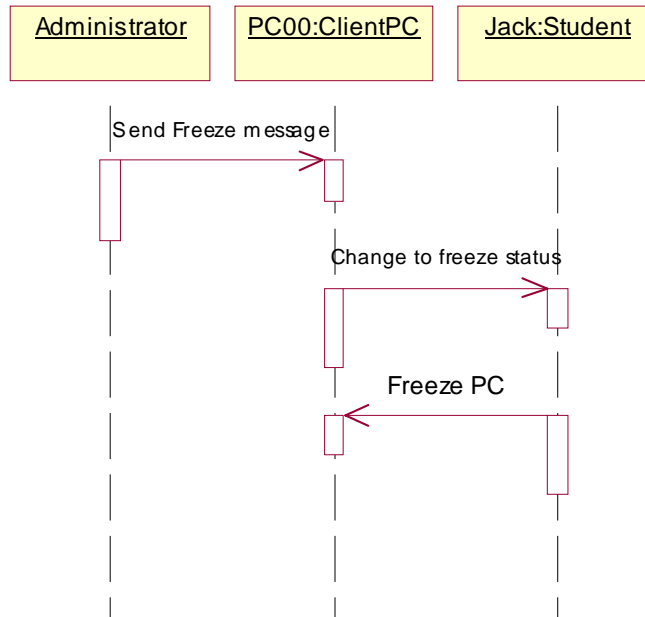


Figure 3.13: Freeze PC Sequence Diagram

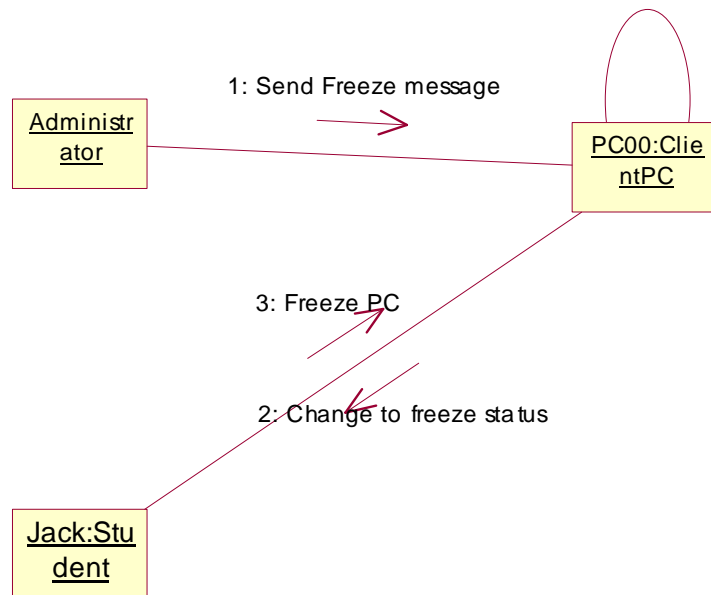


Figure 3.14: Freeze PC Collaboration Diagram

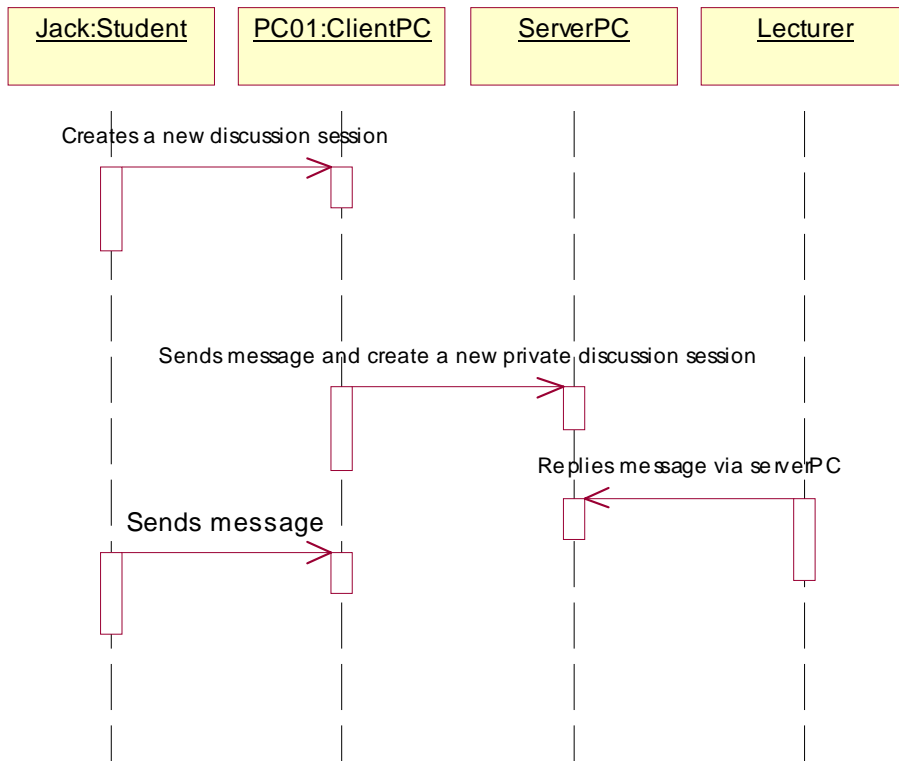


Figure 3.15: Private Chat Sequence Diagram

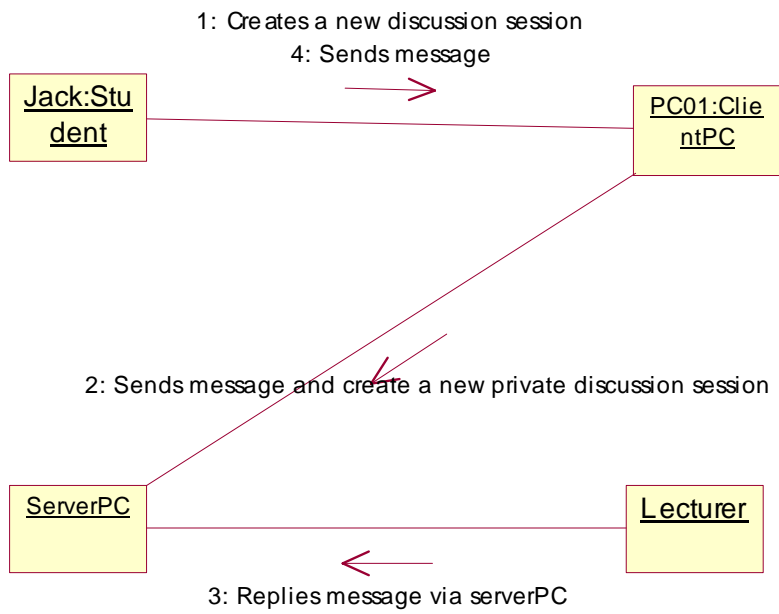


Figure 3.16: Private Chat Collaboration Diagram

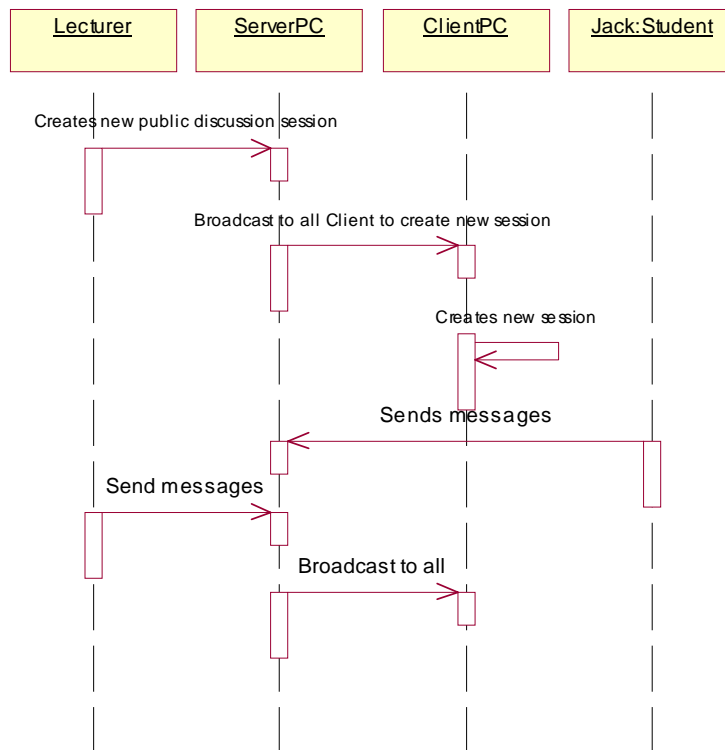


Figure 3.17: Public Discussion Sequence Diagram

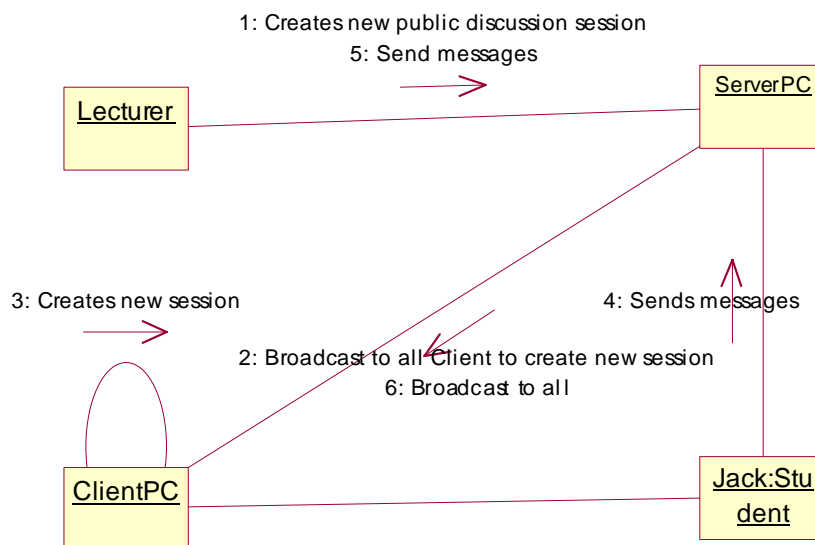


Figure 3.18: Public Discussion Collaboration Diagram

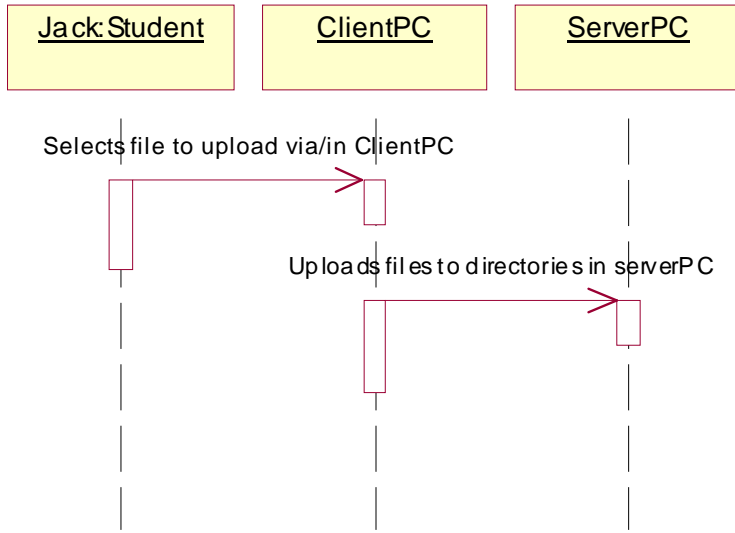


Figure 3.19: Uploads Sequence Diagram

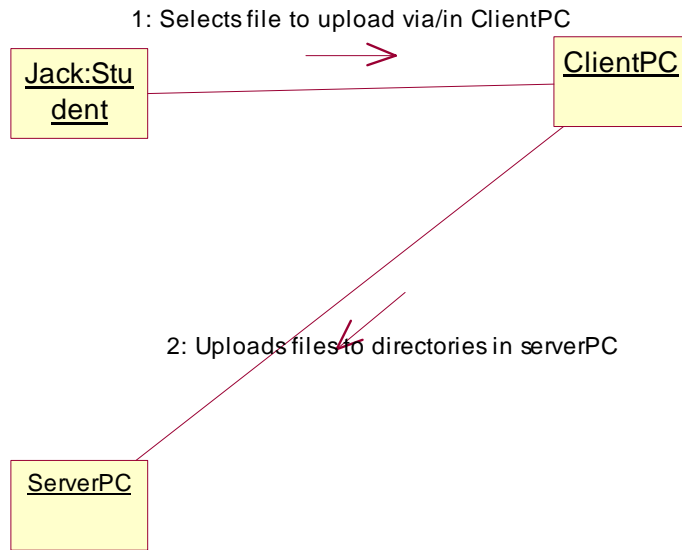


Figure 3.20: Uploads Collaboration Diagram

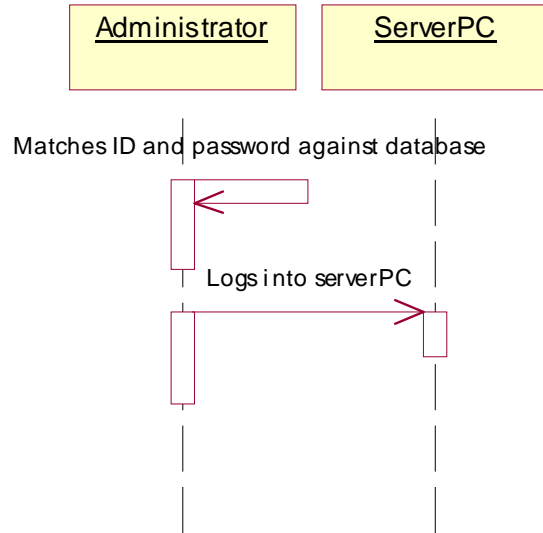


Figure 3.21: Validate Password Sequence Diagram

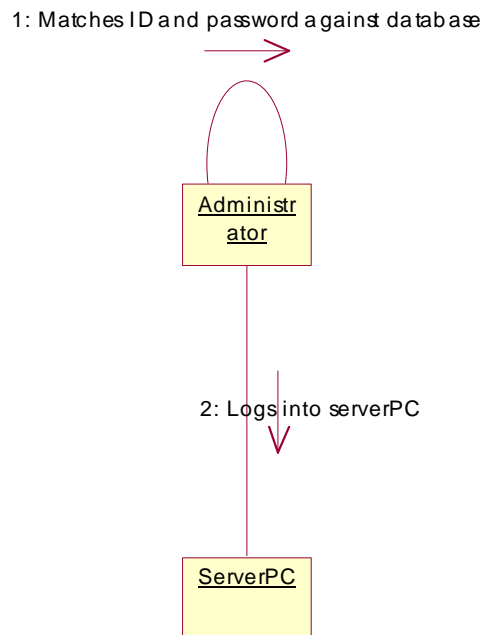


Figure 3.22: Validate Password Collaboration Diagram

3.2.3 Physical Design

Below is the physical design of the system, SLRTMS.

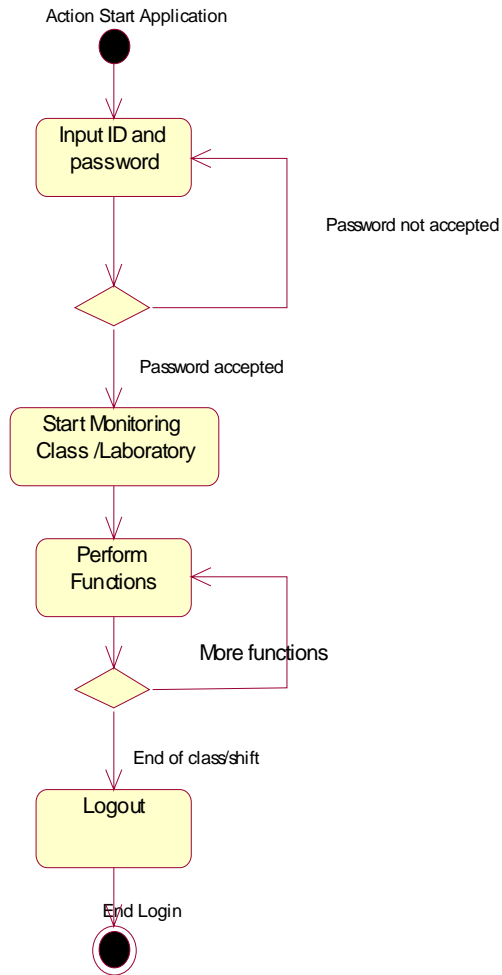


Figure 3.23: SLRTMS basic Activity Diagram

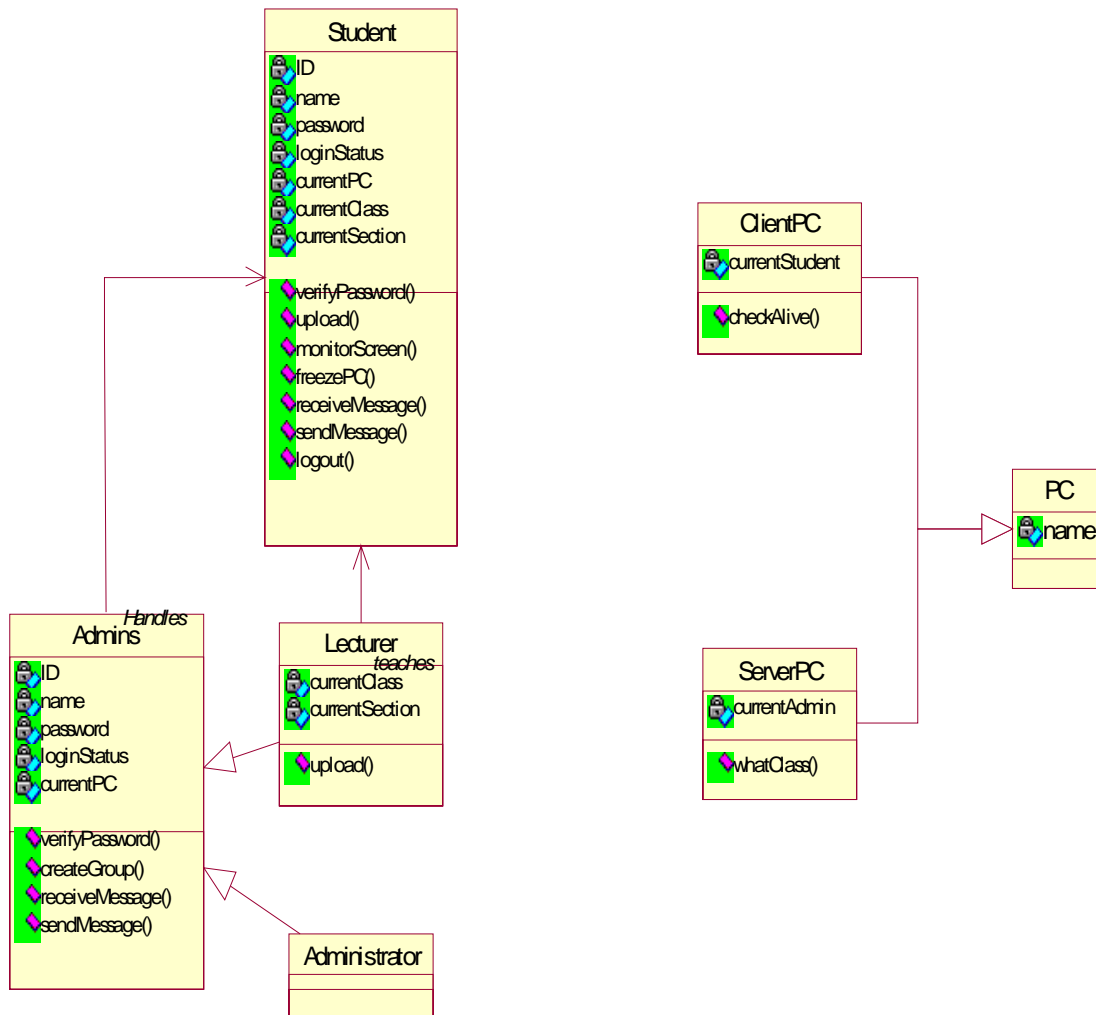


Figure 3.24: SLRTMS Class Diagram

3.2.4 Functional Design

System's main functional specification:

1. Screen Monitor

- 1.1 The administrator group should be able to view student's screen from his/her workstation.
- 1.2 Students may view the lecturer's/admin's screen provided that permission is given

2. Chat/Discussion

- 2.1 The admin group may initiate a discussion room for all students.
- 2.2 The admin group may start a private chat session with a student.
- 2.3 Students may chat with one another privately provided that permission is given from the admin group.

3. File Transfer

- 3.1 Lecturer's may upload files to students PC.
- 3.2 Student's may upload files to lecturers workstation.
- 3.3 Directories are automatically created for each lecturer and each class.

4. Create Group

- 4.1 Lecturers may create groups for students.
- 4.2 Students not belonging to any group will have 'NOGROUP as default.
- 4.3 Actions such as Discussions may be directed to specific groups.

5. Freeze PC

- 5.1 Admin group may freeze student's PC.
- 5.2 Admin group may freeze all student's PC.
- 5.3 Admin group may restore student's PC.

6. Create Class

- 6.1 Class may be created for every registered lecturer.
- 6.2 Registered lecturer may create more than one class.

7. Register User

- 7.1 Admin group may register for new Administrator/Lecturer.

3.3 Summary

In this chapter, we have discussed the design and the development of the system. In developing SLRTMS we have implemented the Object Oriented Analysis and Design (OOAD) approach. OOAD methodology can prolong the software's life and extends its functionality. This can be obtained by reusing the already available classes in this current system and, for future extension.

CHAPTER 4

RESULTS AND DISCUSSION

4.0 Introduction

In short, the SLRTMS system's workflow is as follows:

1. The instructor logs into the server.
2. Students log into the client workstation(at this time, the system automatically logs the student's attendance). The client program will run in the system tray.
3. Student's are allowed to;
 - a. Change their current password
 - b. Join a class discussion
4. While in control of the server, instructors are able to;
 - a. Monitors the student's screen via the *Monitor Student* function
 - b. Freeze the student's PC
 - c. Take part in a class discussion with the students.
 - d. View/print out the attendance sheet (automatically generated by the system)
5. Instructors are also able to add new students, subjects, and instructors using this system.

The above steps are summarized in the figure below.

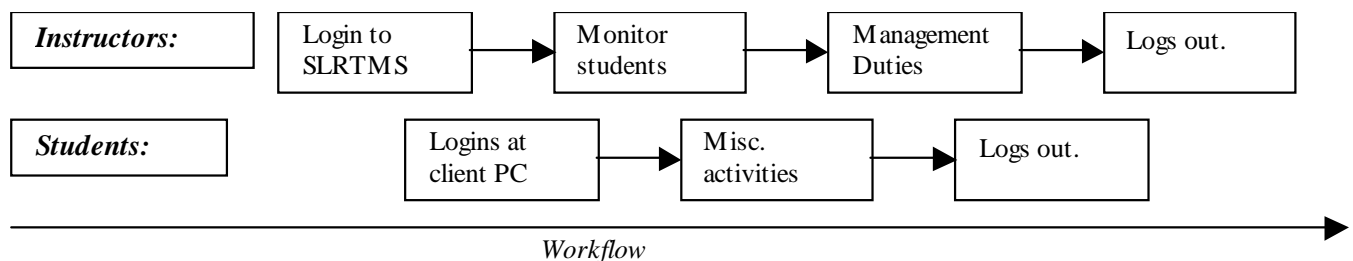


Figure 4.1 : The SLRTMS workflow

The overview of the system is illustrated in Figure 3.1. When a student logon into the system at the beginning of the laboratory session, the student's attendance record in the server will be updated. The instructor can broadcast laboratory assignment as well as other teaching information electronically. Each student can communicate with the instructor to propose his/her ideas or ask questions without interrupting other students in the laboratory. However, reply from instructor can be selectively done, either to an individual or broadcast to all the students in the laboratory. If the instructor think that his/her response may benefit other students, he/she may choose to broadcast to all the students in the lab. Instructor can view each of the student's computer screen to browse or inspect his/her activities. If there is any misbehavior or misuse of the computer in the laboratory session detected, the instructor can take control of the computer by freezing it from execution. This action is called locking and it will be recorded in the database. This recorded event will help the instructor to analyze students' behaviors in the lab. Besides, this facility is handy to the instructor so that the students can give full attention to the instructor during the class-wide instructional session. The instructor is allowed to manipulate student's data whether to add, edit or delete the data. Information on class attendance and computer misuse in the database can be generated and printed into a report format. The interfaces were designed with an aim to make it user-friendly. For example, a color coding scheme was used to highlight the names of the students who are present in the lab, whereas the absentees will be denoted by gray color. Figure 4.2 shows an instructor's attendance screen. This attendance information can also be produced in a report format as shown in Figure 4.5.

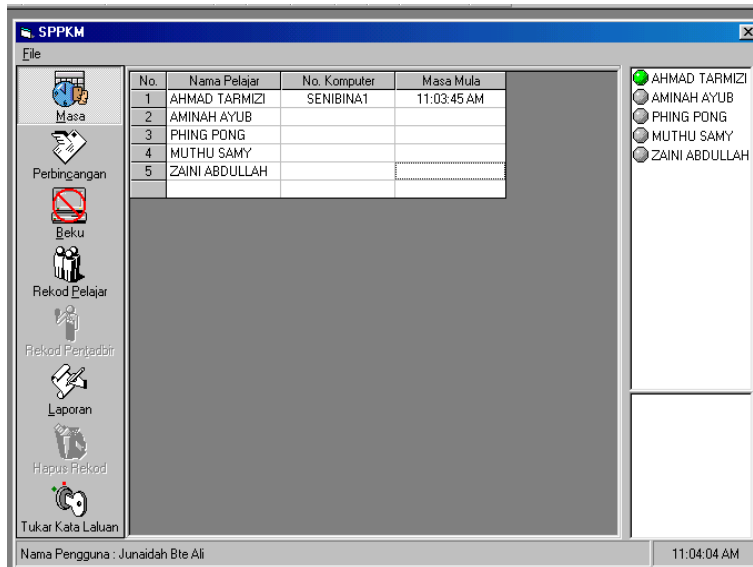


Figure 4.2 : System Interface for Attendance

A teacher can also list all the students who registered for a particular class or course. The screenshot for listing the registered students is shown in Figure 4.3 below.

Display all the students registered for subject DCP1023

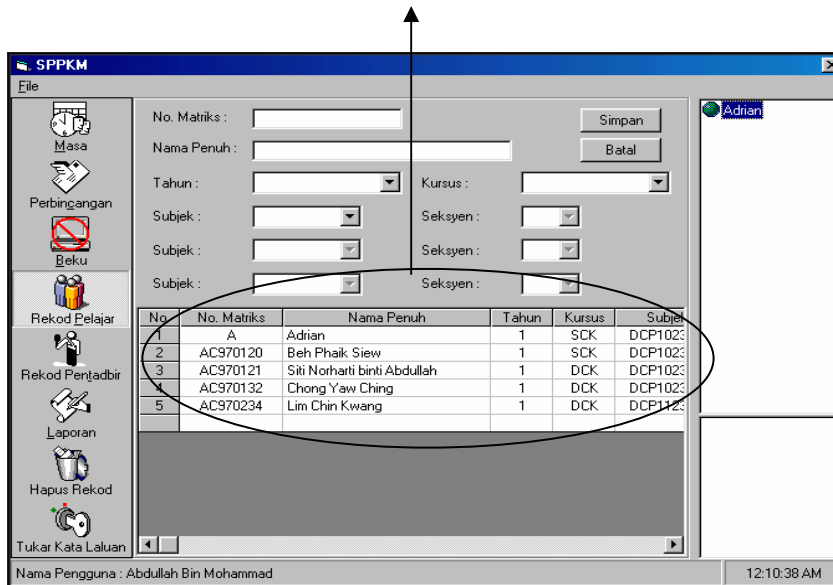


Figure 4.3 : Listing of registered students

Below is a screen capture showing how students and instructors can participate in a real-time discussion session.

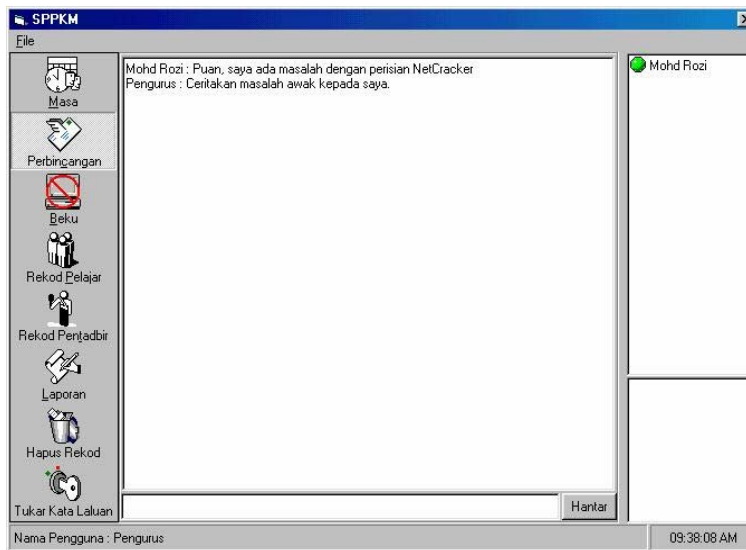


Figure 4.4 : Chat Screen

The screenshot below is the report produced by the system on the students' attendance.

| Laporan Kehadiran Pelajar | | |
|---------------------------|------------------|-----------------------------|
| Tarikh : | 7/16/02 | Ahmad Tarmizi is present |
| Pensyarah : | Junaidah Bte Ali | |
| Subjek : | DCP1023 | |
| Seksyen : | 1 | |
| No. Pelajar | Nama Penuh | Nama Komputer |
| S1 | AHMAD TARMIZI | SENIBINA1 |
| S2 | AMINAH AYUB | |
| S3 | PHING PONG | |
| S4 | MUTHU SAMY | |
| S5 | ZAINI ABDULLAH | |

Figure 4.5: Attendance Report

4.2 Discussion

Below is the table which compares SLRTMS features with some commercially available on-the-shelf products (which has been discussed in **Literature Review Chapter**). We have added 2 extra features which are *Attendance* and *Report*.

Table 4.1 : Common features in school lab management system

| Product Feature | NetSupport School v.6 | SynchronEyes 3.0 Software | NetOp School v2.5 | SLRTMS (describes in the paper) |
|--------------------|---|--|--|--|
| Monitoring | Displaying up to 16 student PCs' simultaneously | View all student screen | Remote control students for one-on-one instruction | Capture real time screen (discrete) |
| Locking | Screen, keyboard and mouse | Screen, keyboard and mouse | Screen, keyboard and mouse | Screen |
| Chatting/Message | Group (chat room) | 1-to-many (<i>Instructor to student</i>) Group (chat room) | 1-to-1 (<i>Student to instructor</i>) 1-to-many (<i>Instructor to student</i>) Group (chat room) | 1-to-1 (<i>Student to instructor</i>) One-to-many Instructor to student |
| Broadcast screen | Instructor to students | Instructor and student (both) | Instructor to students | Instructor to students (<i>in discussion context</i>) |
| File transfer | Instructor to students | Not available | Instructor to students | Not available |
| Generate report | Not available | Not available | Not available | Available (**) |
| Attendance | Not available | Not available | Not available | Available (**) |
| Operating System | Windows | Windows & Macintosh | Windows | Windows |
| Place | Same place | Same place | Different places | Same place |

SLRTMS is a distributed LAN-based system [1]. The application is designed with distribution in its scope so that it can accommodate diverse clients with different capabilities. This fact is taken into consideration because computer laboratories usually have more than one type of machines running at different speed and performing different modules. To manage this situation, SLRTMS has deployed Microsoft Distributed Component Object Model (DCOM) in the implementation of its system. DCOM simplifies the task of distributing application components for optimum overall performance because of its location independence. In addition to this, DCOM is language independent, uses simple connection management as well as efficient ping protocol for active client detection [2].

CHAPTER 5

CONCLUSION

5.0 Introduction

The report has presented the development and implementation of SLRTMS. SLRTMS is a client-server system using Windows 98 as the platform and exploited the functionality of COM/DCOM and Microsoft Access for its development. The system has the potential to improve the teaching delivery method which can be beneficial to the instructor as well as to the students. With this system class instructor can work more effectively. Instructor's role can be focused to guide, support, encourage, suggest, and perhaps most revolutionary of all is to join in the learning process as a learning partner. For the students, they can communicate with the instructor without interrupting other students. SLRTMS not only revolutionizes the teaching style, but it also contributes to a better and greater interaction between an instructor and the students.

5.1 Future Work

One of our concerns is the implementation of the collaborative learning environment into the system. The role of collaborative learning in Smart School environment has been discussed in [8]. Other concern is to improve the existing system by upgrading and implementing the following features: flexibility in updating database, file transfer, chat and password database security. In the case of file transfer for example, server application will be equipped with this facility as to facilitate the distribution of assignment. Meanwhile, the students work can be collected or passed up via this ftp facility. Since the current work does not take into consideration on the security aspect, the system is vulnerable to the attack especially on its database. This SLRTMS can be upgraded to include an encryption of password mechanism. Finally, we intend to test the system for its usability.

References

- [1] Beh Phaik Siew, Makmal Bestari : Sistem Pengawalan Penggunaan Komputer Makmal B. Sc. Computer Science, Universiti Teknologi Malaysia, Malaysia (2001).
- [2] DCOM Technical Overview. November 1996. Microsoft Corporation. Available online at: <http://msdn.microsoft.com/library/>
- [3] Fryer, W. A. School Computer Lab Management Software (2001). Available online at: <http://www.wtvi.com/teks/exchange/netop/default.htm>
- [4] NetOp School for Windows v2.5 Software for Networked Classrooms. Crosstech Corporation (2002). Available online at: <http://www.crossteccorp.com/netopschool/index.html>
- [5] NetOp School – A Cost Effective Solution. Review Special, Network Computing June 2001, pp 14 (2001). Available online at: <http://www.networkcomputing.co.uk>
- [6] NetSupport School version.6 (2002). Available online at: <http://www.netsupport-inc.com/nss5/nss.html>
- [7] Mohamed Fadzil Che Din. Virtec Journal 1(1), November 2001 Kajian Tinjauan Mendengar di kalangan Pelajar Sekolah-sekolah Menengah Selangor.
- [8] Mohd Aizaini Maarof, Anazida Zainal, Rashidah Kadir and Firoz Yusuf Patel Dawoodi, CSCL: Collaborative Learning in Smart School Environment, *COSTAM 2001*, Universiti Sains Malaysia, Pulau Pinang, 8 – 10 Nov. 2001.
- [9] SynchronEyes Software. Smart Technologies Inc. (2002). Available online at: <http://www.smarttech.com/products/synchroneyes/index.asp>