CENTRAL COMPUTER CONTROLLED POWER SUPPLY

A PROJECT REPORT

Submitted by

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In fulfillment for the award of the degree

of

BACHELOR OF ENGINEERING

in

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SARDAR VALLABHBHAI PATEL

INSTITUTE OF TECHNOLOGY-VASAD

Gujarat Technological University, Ahmedabad

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SARDAR VALLABHBHAI PATEL
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COMPUTER ENGINEERING

2012

CERTIFICATE

Date:

This is to certify that the dissertation entitled "Central Computer Controlled Power Supply" has been carried out by AGHERA MITESH, BUCH PRANAV and JOSHI RUSHIKESH under my guidance in fulfillment of the degree of Bachelor of Engineering in COMPUTER ENGINEERING(8th Semester) of Gujarat Technological University, Ahmedabad during the academic year 2011-12.

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Lastly we would also like to thank GOD and our Parents empowering our spirit in this everlasting journey for the quest of knowledge.

AGHERA MITESH
BUCH PRANAV
JOSHI RUSHIKESH

ABSTRACT

In today's world if we can help in saving environment then it would be the best help we can to do our world. We came across the fact that all the organizations use lots of electrical equipments. Employees being a bit careless, usually forget to switch off the electrical equipments when they leave their offices. Controlling all such equipments through central Computer or server when they are not required will may help in reducing the wastage of electricity.

The other issue affecting environment is the excessive usage of papers. In present attendance records for lab sessions are maintained manually at our institute. For that a separate muster has to be maintained. Major issue with this system is the excessive use of papers. If we mark attendance of students without use of papers, we can avoid this wastage. Present we have barcodes on all student's ID cards, as a part of our project we will use these barcodes to mark attendance of students.

By our implementation, we are planning to provide solution to attendance marking and device switching. Proposed design that we are going to follow will use client-server communication. The server will send message to the client using TCP sockets (which will be handled by application module).Client in turn will forward the message to the control circuit from its parallel port. Control circuit will be used to turn on/off the devices. Feedback from the device will be used to verify the status (on/off) of the particular device. And similarly we are going to mark attendance using barcodes.

After implementation we can get benefits like decreased power wastage, elimination of manual attendance marking, which in turn saves a lot of papers. The hardware we are going to design will be pluggable so in case of any failure

(client machine or hardware itself), mechanical switch will become the super controller.

In this way our major goal is to help industries "Go Green", by reducing wastage of electricity and papers that are used in attendance registers. Our solution will help the industry both ecologically and economically.

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LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE

Abbreviations	Symbol Name
CCCPS	Central Computer Controlled Power Supply
SVIT	Sardar Vallabhbhai patel Institute of Technology
ICs	Integrated Circuits
HTTP	Hyper Text Transfer Protocol
GUI	Graphical User Interface
DFD	Data Flow Diagram
E-R Diagram	Entity Relationship Diagram
OO Diagrams	Object Oriented Diagrams

TABLE OF CONTENTS

1. INTRODUCTION TO THE SYSTEM

1.1. DETAILED DESCRIPTION OF PROBLEM

During our "Shodh Yatra" of various industries, we came across the fact that all the organizations use lots of electrical equipments. Employees being a bit careless, usually forget to switch off the electrical equipments when they leave their offices.

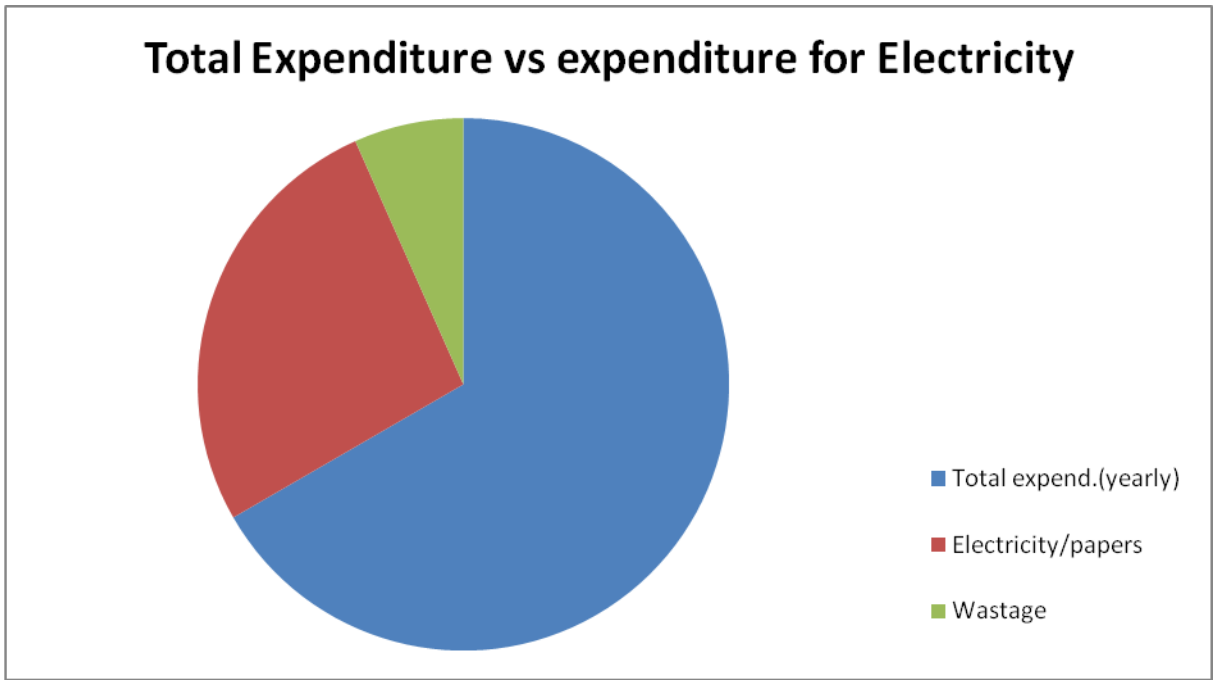
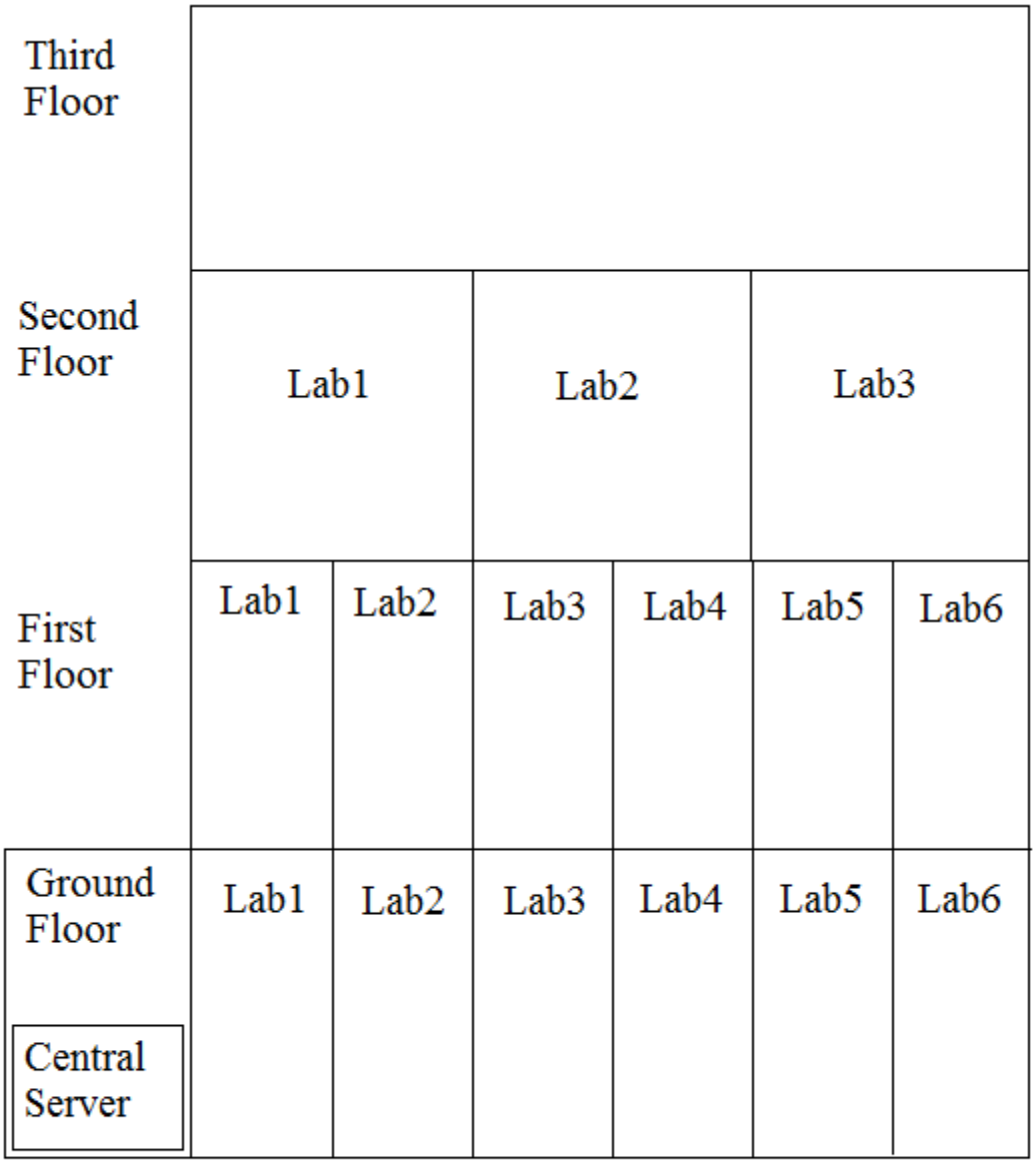


Diagram 1.1
A Simple Statistics

From statistics we can conclude that all most 20 to 25% energy is wasted due to this carelessness. So if we can save this energy any how then it makes huge difference in company's statistics. By reducing energy wastage, we can reduce the variable part of the company's expenses, which in turn increases profit. Saving energy will also be beneficial to environment and will help the organization in "Going Green".

Controlling all such equipments through central Computer or server when they are not required will may resolve the issue.

This is the generic problem that we have come across. Due to ease of implementation and infrastructure, we are going to implement working model of this project in our college.
Floor plan of Computer Engineering Department of our collage is as shown in the figure:



Floor Plan of Computer Department

Diagram 1.2

The diagram of our lab network is as shown below:

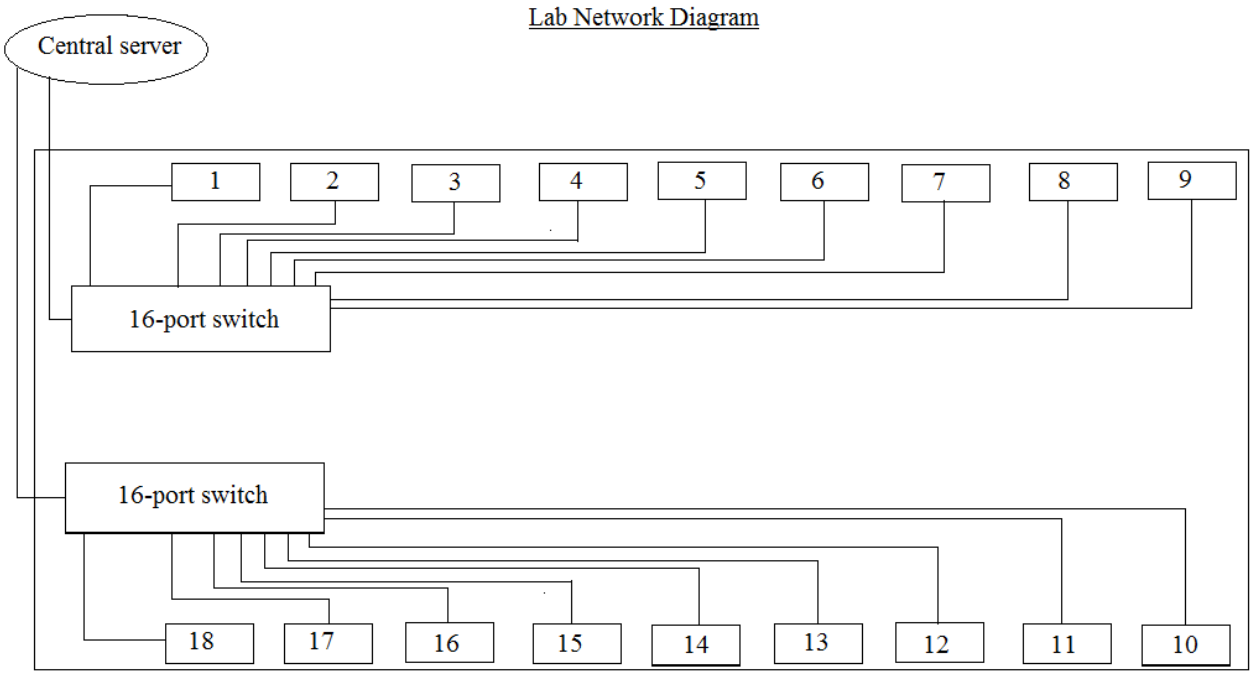


Diagram 1.3
Lab Plan

Our server is located at the ground floor of our department. All the other computers of the departments are connected through the same. Each of our lab has 12 tube lights, 19 computers and 2 air conditioners. In all we have six labs and a server on ground floor, six labs on second floor and three labs on the second floor. Thus total current load coming into computer department can be calculated as shown.

Computer department has electrical load of 385 A (approx.) in lighting purpose. In that approximately 265 computers, 210 tube lights, 40 fans and some other devices are included. Another 230 A (approx.) load in power consumption which includes 28 Ac approximately is consumed. So, total load in computer department is 615 A. Out of which around 20% is wasted, as the students leave lights/fans on even when there is no one in classroom.

The other issue affecting environment is the excessive usage of papers. In present attendance records for lab sessions are maintained manually at our institute. For that a separate muster has to be maintained. Major issue with this system is the excessive use of papers. One muster contains approx 40 pages, out of which at most 20 pages are utilized. Thus 50% of papers are wasted. In addition the attendance records of students have to be maintained at least until the students pass out. So, storage of musters is also an issue. If there are 20 teachers in the department, then calculating 20 pages per teacher, makes total

of 400 pages wasted per semester. If we take attendance of students without use of papers, we can avoid this wastage. Present we have barcodes on all student's ID cards, as a part of our project we will use these barcodes to mark attendance of students.

After implementation of the project, it won't be necessary to maintain paperwork, which will save huge amount of paper currently being used for recoding attendance. This in turn, will help the organization in "Going Green".

1.2. OBJECTIVES

1.2.1. PROPOSED ARCHITECTURE

The figure below shows the structure of project. The server will send message to the client using TCP sockets (which will be handled by application module).Client in turn will forward the message to the control circuit from its parallel port. Control circuit will be used to turn on/off the devices. Feedback from the device will be used to verify the status (on/off) of the particular device.

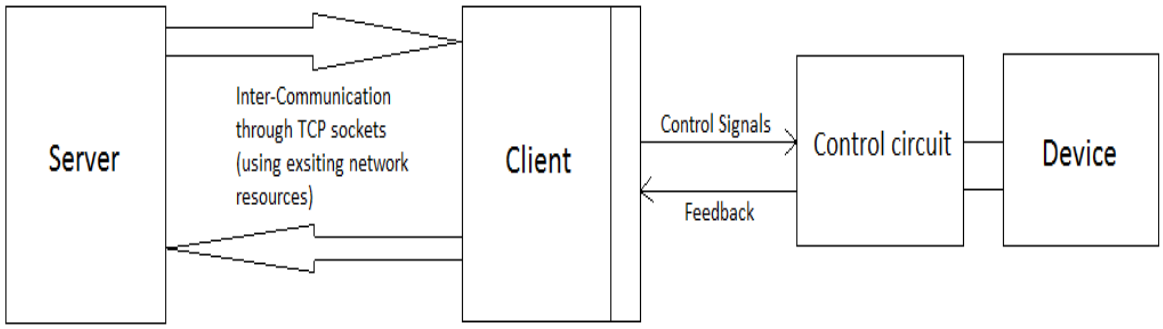


Diagram 1.4

Simple block diagram showing the structure of the system to be implemented

1.2.2. FACILITIES TO BE PROVIDED

- Power Supply Switching:

  This is the core module of this project. This is the module which controls power supply through relays, which are connected to parallel port of the client handled by a server. Feedback from the device will be fed into the parallel port, to verify whether the device was turned on/off or not.

- Scheduling Based Power Supply:

  This module will be used for controlling power supply according to the pre-entered schedule. The module will automatically show an alert on the server machine. It will show a pop up message on the screen to remind that the session has been completed. Then the administrator may turn devices on or off. A schedule can be set according to the timetable of particular lab session or lecture session

- Communication Module:
  This module will be used for exchanging messages between client and server. This module will take message from server and send it to the client machine and vice-versa. The Module will use pre-established network. Reliability of this module depends on network speed and robustness.

- Attendance Logging:
  This module will be used to maintain the database of attendance records. The module will use the data read by the barcode reader. Barcode reader will scan the barcode from the identity card and mark attendance of the students accordingly.

- Hardware / Circuit:
  This is the actual circuit that will be used to switch power supply on/off. This is NOT a software module. The schematics of circuit diagram are as shown below.

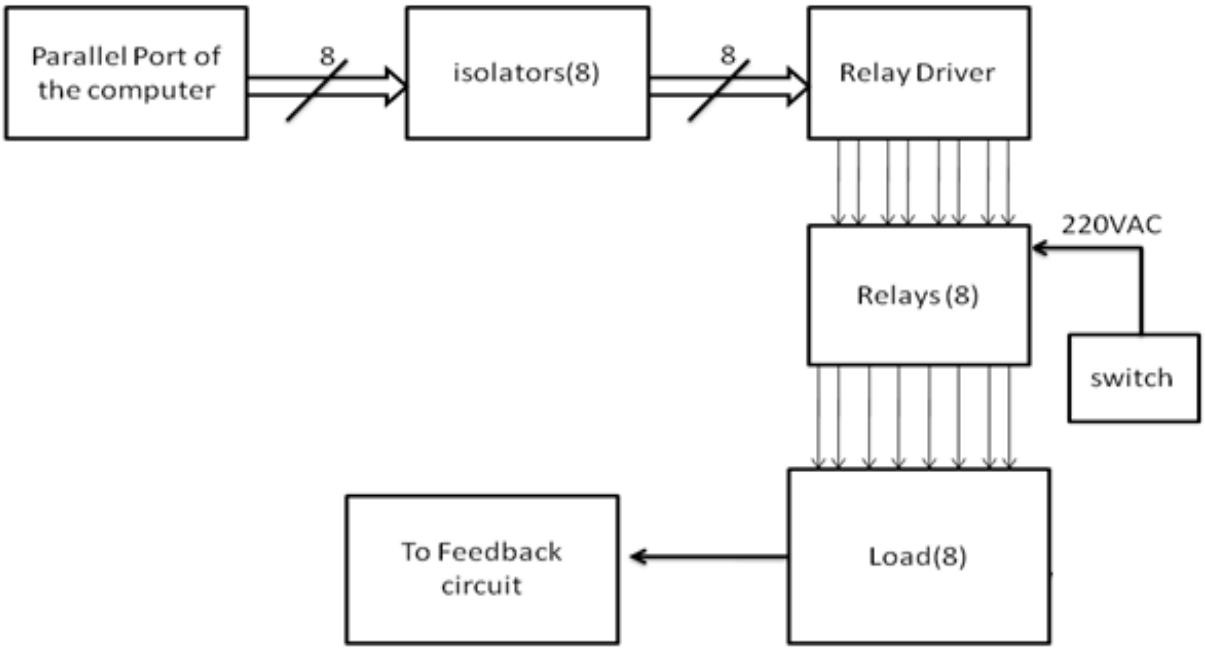


Diagram 1.5
Circuit Design (block diagram)

Here the parallel port is connected to a relay driver through opto-couplers, to prevent the damage to the parallel port due to the back current from the circuit. Then the relays are connected in series with the mechanical switches. The circuit is completely pluggable i.e. if in any circumstances the circuit or the client pc gets failed then master control will be transferred to the mechanical switch.

1.3. EXPECTED OUTCOME:

With the new system put into use, the drawbacks of the previous manual system will be overtaken by the following benefits:

- Power wastage will be decreased.
- All the electrical devices can be controlled from single place.
- Feedback at the server assures whether the device is on or off.
- Environmental benefits.
- Person handling the server will be informed at the end of the time spell of any specific lab/lecture, so if there is none in the lab, server operator can directly turn off the electrical device from the server itself.
- No need to maintain manual attendance records for lab sessions, which in turn saves a lot of papers.
- The hardware is pluggable so in case of any failure (client machine or hardware itself), mechanical switch will become the super controller.

2. BRIEF HISTORY

Presently at our institute electric devices are not controlled automatically. And usually at the end of a lab session students tend to forget turning off the lights and AC. This is not the issues with only our institute, it is common in all institutions. Wastage of electricity due to this costs around 18-20% of total yearly expenditure of an institution. In addition to this, attendance is also maintained on registers. According to our calculation at the end of the semester almost 50% papers of a register are left unused. This wastage of paper affects environment a lot.

So by making a few changes in the current system at our institute, we can help environment a lot. Our project is thought and designed on this fact only. In the early phase of the project the idea was to only develop a controlling system for electrical devices. After the preliminary analysis phase we extended the functionality of the project to attendance recording also. As of now we have planned to use java as a core development platform, C for hardware communication code.

3. PLANNING

3.1. SOFTWARE PROCESS MODEL

The software process model chosen for the project is the "waterfall model". Reasons behind the selection of this model are as mentioned:

- All the requirements are well defined and stable.
- Definition of the final product is stable.
- All the technologies to be used are known to the developer team.
- It is one of the simplest and best suited models for our project.
- Final product is to be delivered at the end of the deadline only.

3.2. TOOLS AND TECHNOLOGY

3.2.1. TOOLS:

- Netbeans 6.9 (for JAVA based development)
- Eclipse Indigo(for JAVA based development)
- Code:Blocks with GNU GCC compiler (for C based development)
- circuit simulator for circuit testing purpose
- Microsoft VISIO
- Oracle SQL Developer

3.2.2. TECHNOLOGIES:

- JAVA (jdk 6.0)
- GNU GCC
- JNI-Java Native Interface
- Oracle database

3.3. TEAM ORGANIZATION

Team member	Workload
Aghera Mitesh N.	GUI design-implementation, circuit design-implementation, (final)deployable.
Buch Pranav M.	native implementation, hardware interface, circuit design-implementation, Networking program.
Joshi Rushukesh P.	Database design-implementation, Report generation, circuit design-implementation.

Table 3.1

3.4. PROJECT SCHEDULE

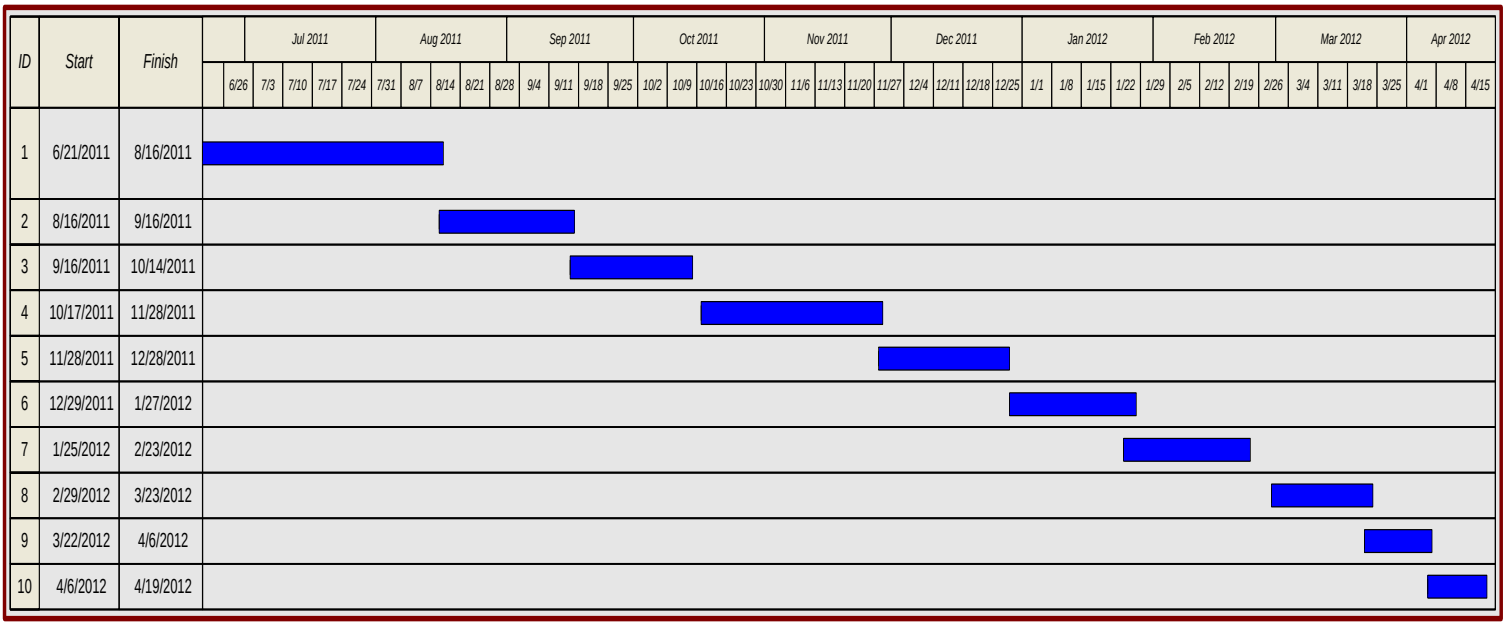


Figure 3.1

Task Id	Tasks to be completed
1	• Study of current work environment at SVIT
2	• The concept design • Introductory documentation submission.
3	• Requirement analysis • Feasibility study • Selection of development model
4	• Project documentation • Revision of core project concept
5	• Database design • UI Design
6	• Circuit design • Modular development • Integration of barcode reader
7	• Integration of modules for device control • Integration of modules for attendance recording • Complete system integration • Finalization of whole project
8	• Development of deployable files • Deployment and Testing
9	• Checks and updates for any kind of bugs or system flaws
10	• Delivery of project along with all deployable files and complete documentation.

Table 3.2

4. SYSTEM ANALYSIS

4.1. FEASIBILITY STUDY

4.1.1. OPERATIONAL FEASIBILITY

4.1.1.1. Organizations Involved

The only organization involved in development and deployment of the final project is Sardar Vallbhbhai Patel Institute of Technology. Developers, computer centers and network infrastructure used are as mentioned below

Developer Team	• Aghera Mitesh • Buch Pranav • Joshi Rushikesh
Developed for	SVIT-Vasad
Computer Center And Network Infrastructure	SVIT-Vasad

Table 4.1

4.1.1.2. I/O Feasibility

The project being developed is a closed system. So the major inputs are 1) The timetable which is stored on the server and 2) The feedback from the device which comes from the device which is connected to the server.

The other major input is the attendance which is to be recorded by the barcode reader. These records will be forwarded to the server where it will be stored on a persistent storage.

The flow diagram of data is as shown below:

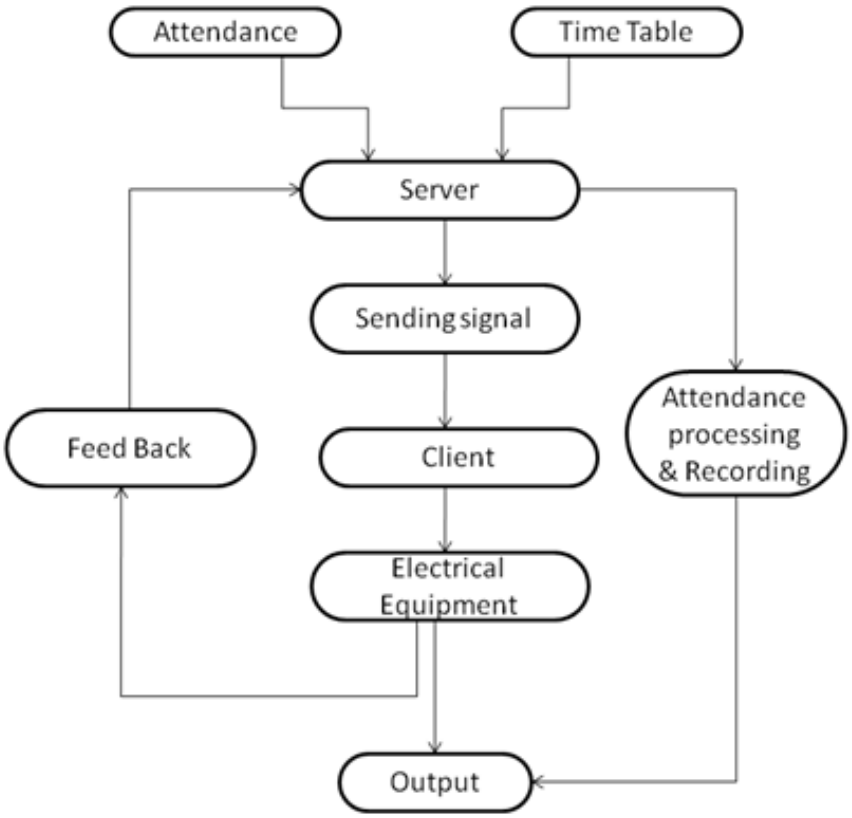


Diagram 4.1
Flow of System

4.1.1.3. Processing Feasibility

The input taken from sever GUI is forwarded to the client and then in turn the signals are sent out on the parallel port of the client. The same can be seen in diagram 1.4(chapter 1).

Required processor on both server and client side is at least 1.1GHz processor (Pentium4 and other compatible).Least required RAM is 256MBs.Required network bandwidth will be at least 100Mbps.Required storage space is at least 50 GBs.
All the requirements are met by the computers in the computer center of SVIT and it is feasible to develop and deploy the project at the same place.

4.1.1.4. Security Feasibility

The communication between client and server is done through HTTP sockets. The only legitimate place from where the messages can be sent to the clients is the server itself. Therefore there is no need for encryption of the traffic between client-server. Only requirement of the system is the authentication of the incoming packet at the client. This requirement is FEASIBILE and the proposed solution to be used is the authentication using IP address.

4.1.2. TECHNICAL FEASIBILITY

4.1.2.1. Overview Of Proposed System

The system is focused on saving environment and "Going Green". It is a client-server application. The person handling server sends out the signals to turn off the devices that are connected at the remote location. On the client side the signals are forwarded to the parallel port, which in turn are forwarded to the circuit attached. In the other part of this project attendance of the students is to be marked using barcodes and this attendance records are going to be maintained on the server.

4.1.2.2. Technical Description

The system uses HTTP ports for communication between client and server. The server will be having a GUI to control all the devices, this GUI is only available at the server so trivially there is no need to provide any kind of traffic encryption. The client system will have no GUI but a file containing socket programming and JNI related codes. The server will send the message to the client whenever any device is to be switched on/off. The other hardware interface of the system will be the barcode reader which will record the attendance of the students. The communication between client and server will use HTTP sockets and communication between client computer and (external) circuit will be handled by a C program. JNI will be used as a bridge between JAVA's socket communication and C's hardware communication.

4.1.2.3. Overall Feasibility

4.1.2.3.1. Hardware Feasibility

Block representation can be referred from diagram 1.5(chapter 1)

Hardware requirements:

Requirement	Description	Feasibility
Client system	A system that has at least of 128MBs RAM, 450MHz processing power (PIII compatible).	This option is FEASIBLE as these types of systems are available in the computer center at SVIT-Vasad.
Server system	A system that has at least processing power of 1.1GHz (Core2Duo or compatible), storage size of 50 GBs, RAM of 1 GB.	This option is FEASIBLE as these types of system are available in the computer center at SVIT-Vasad.
Network infrastructure	A network which has the bandwidth 100Mbps.	This network is FEASIBLE as the network is available.
Relay coil	A relay coil which will be used for actual switching purpose of AC supply.	The option is FEASIBLE as the required relays are easily available in the market.
OptoCouplers	This will be used to provide isolation between high voltage circuit and parallel port of the client PC.	Optocouplers are easily and economically available in the market.
Barcode reader	The reader will be used to mark the	This option is FEASIBLE as

	attendance of the students.	the reader is available at SVIT-Vasad.
Wireless Network	This can be used to communicate wirelessly between client and server.	This option is INFEASIBLE as none of the developers have the knowledge about wireless communication and the time constraint is also an issue.

Table 4.2

4.1.2.3.2. Software Feasibility

Requirement	Description	Feasibility
JAVA(as a programming language)	This is the core programming language in which socket communication and database connections will be handled.	This option is FEASIBLE as all the developers have the knowledge of JAVA.
C(as a programming language)	Parallel port communication will be programmed using C(This code will be platform dependent)	This option is FEASIBLE as all the developers have the knowledge of C.
Oracle DB Server	For maintaining and managing attendance records	This option is FEASIBLE as the required database server is already installed in the computer center.

Table 4.3

4.1.3. ECONOMICAL FEASIBILITY

4.1.3.1. Costs Feasibility

Requirement	Description	Feasibility
Client and Server Computer Systems	The requirement is the system must have one capable server and a client for each remote locations, that are required to be controlled from the server.	This requirement is FEASIBLE. As the computer centers at SVIT have the servers that meet the requirements of the project
Network Infrastructure	This network will be used for communication between client and server.	This requirement is FEASIBLE, as the infrastructure has already been established at the computer center of SVIT.
Barcode Reader	The reader will be used to mark the attendance of the students.	The reader will be provided by the institute.
ICs (optocouplers, relay coil etc.)	These ICs will form the control circuit that will actually turn the devices on or off.	The requirement is FEASIBLE as all the required ICs are available at economical rates in market.

Table 4.4

4.1.4. SCHEDULE FEASIBILITY

Month/Year	Tasks to be completed	Status
July 2011	• Study of current work environment at SVIT	COMPLETED
August 2011	• The concept design • Introductory documentation submission.	COMPLETED
September 2011	• Requirement analysis • Feasibility study • Selection of development model	COMPLETED
October-November 2011	• Project documentation • Revision of core project concept	COMPLETED
December 2011	• Database design • UI Design	COMPLETED
January 2012	• Circuit design • Modular development • Integration of barcode reader	COMPLETED
February 2012	• Integration of modules for device control • Integration of modules for attendance recording • Complete system integration • Finalization of whole project	COMPLETED
March 2012	• Development of deployable files • Deployment and Testing	COMPLETED
April 2012	• Checks and updates for any kind of bugs or system flaws	COMPLETED
Late April 2012-Early May 2012	• Delivery of project along with all deployable files and complete documentation.	IN PROGRESS

Table 4.5

4.2. REQUIREMENT SPECIFICATION

4.2.1. FUNCTIONAL REQUIREMENTS

4.2.1.1. Client-Server Communication

Description: This module deals with communication between server and client. It includes authentication of clients. It takes the client detail from the server and sends to the appropriate one.

- **Client management:**
  Description: These sub modules manages incoming feedback from clients and react appropriately. It also works with the messages which are sent to the client to turn off or on the power supply.
  - **Command management:**
    Input: command to turn on or off the power supply.
    Output: client will receive the command
  - **Feedback**
    Input: command to get feedback of any device to inspect whether it is on or off.
    Output: give the feedback of appropriate device whether it is working or not.
- **Authentication**
  Description: This module is for IP-based authentication of clients.
  Input: sends the packet
  Output: authenticate the response from where it is coming.

4.2.1.2. Hardware interface:

Description: This module resides on client side. It directly communicates with the control circuitry. It communicates with server also.

- **Signal management:**
  Input: commands from the server.
  Output: device turns on or off.

4.2.1.3. Schedule management:

Description: This module is for time based scheduling.

- **Lab handler:**
  Description: This is for scheduling over labs. It is for inputting of schedules and management of them.
  Input: time table
  Output: signal to reminder module

- **Reminder:**
  Description: This module deals with the prepared schedule. It reminds the user to turn on/off the equipment as per the schedule.
  Input: signal from lab handler module

Output: pop up on screen

4.2.1.4. Attendance manager:

Description: It is used for recording attendance of students and management of it.

- **Reader:**
  Description: This module is activated when student comes to the lab and punches his/her id card to scanner.
  Input: Barcode from Id-Card.
  Output: Barcode-Id number.

- **Check-in/Check-out marker:**
  Description: This module is activated when student checks in/out the lab.
  Input: Barcode-Id number from the Reader and data related to that particular id
  Output: confirm with check-in/check-out marker data.

4.2.2. NON-FUNCTIONAL REQUIREMENTS

- **Reliability:**
  The system should be reliable that it does not crash under power failure or lost of network connection. Database consistency should be preserved. In-between lost to network connection might not lead to data inconsistency. Proper backup algorithms should be used

- **Availability:**
  The system must be highly available.

- **User friendly GUI:**
  The system must have intuitive user interface. Whoever uses the system, he must get the idea of the system very easily.

4.2.3. CONSTRAINTS / LIMITATIONS

- No provision for wireless device control.
- Barcode punching has to be monitored manually to prevent false entries.
- System's output quality is completely dependent on the existing intra-network of the company, i.e. if present intra-net is not able to cope up with the software (in terms of transfer speed) then there can be delays in device switching.
- All the clients must have a static IP address.

5. SYSTEM DESIGN

5.1. DESIGN METHODOLOGY

Design methodology to be used for the project is the Procedure Oriented Methodology.

5.2. DIAGRAMS

5.2.1. DATAFLOW DIAGRAMS

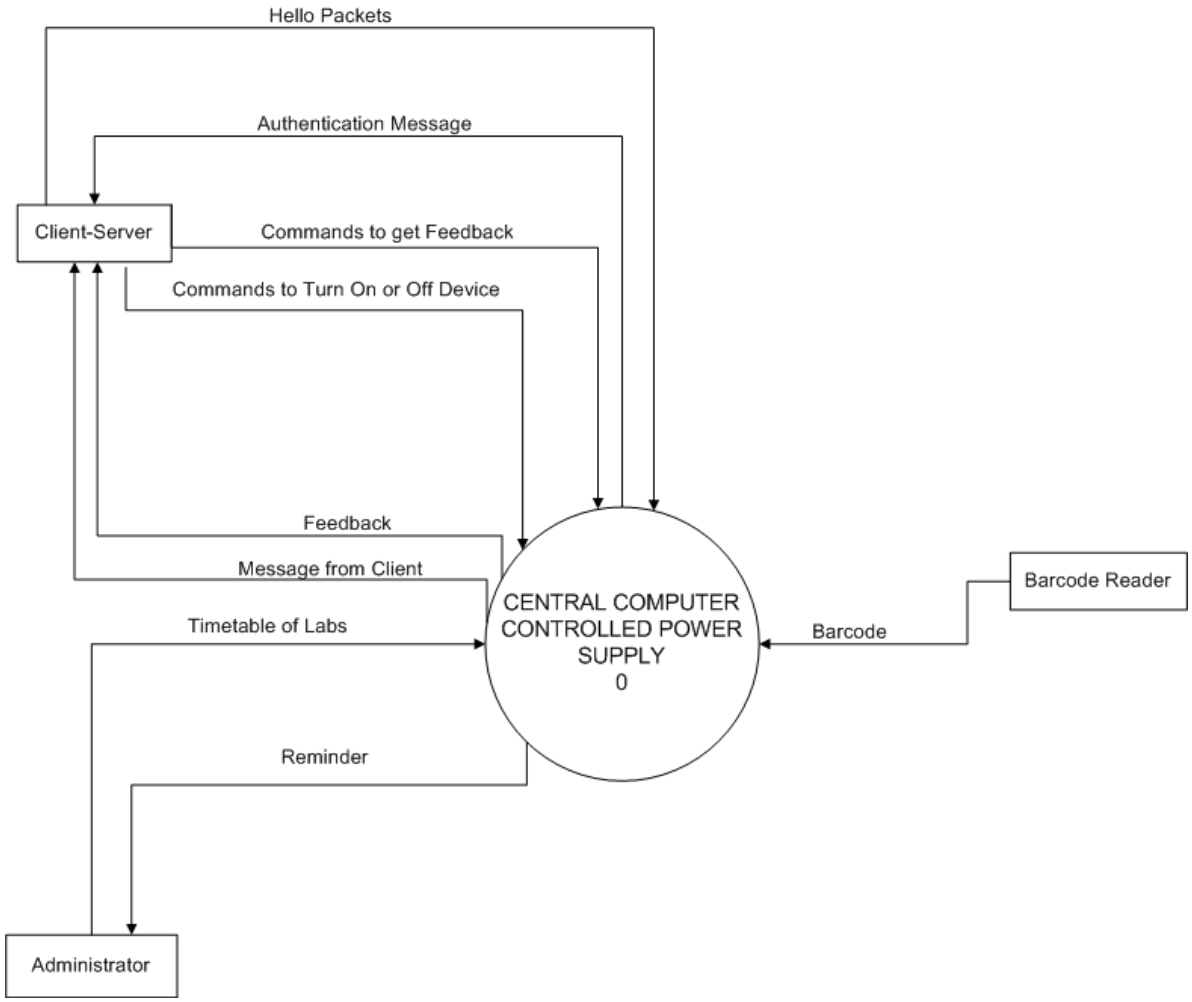


Diagram 5.1
Level-0 DFD

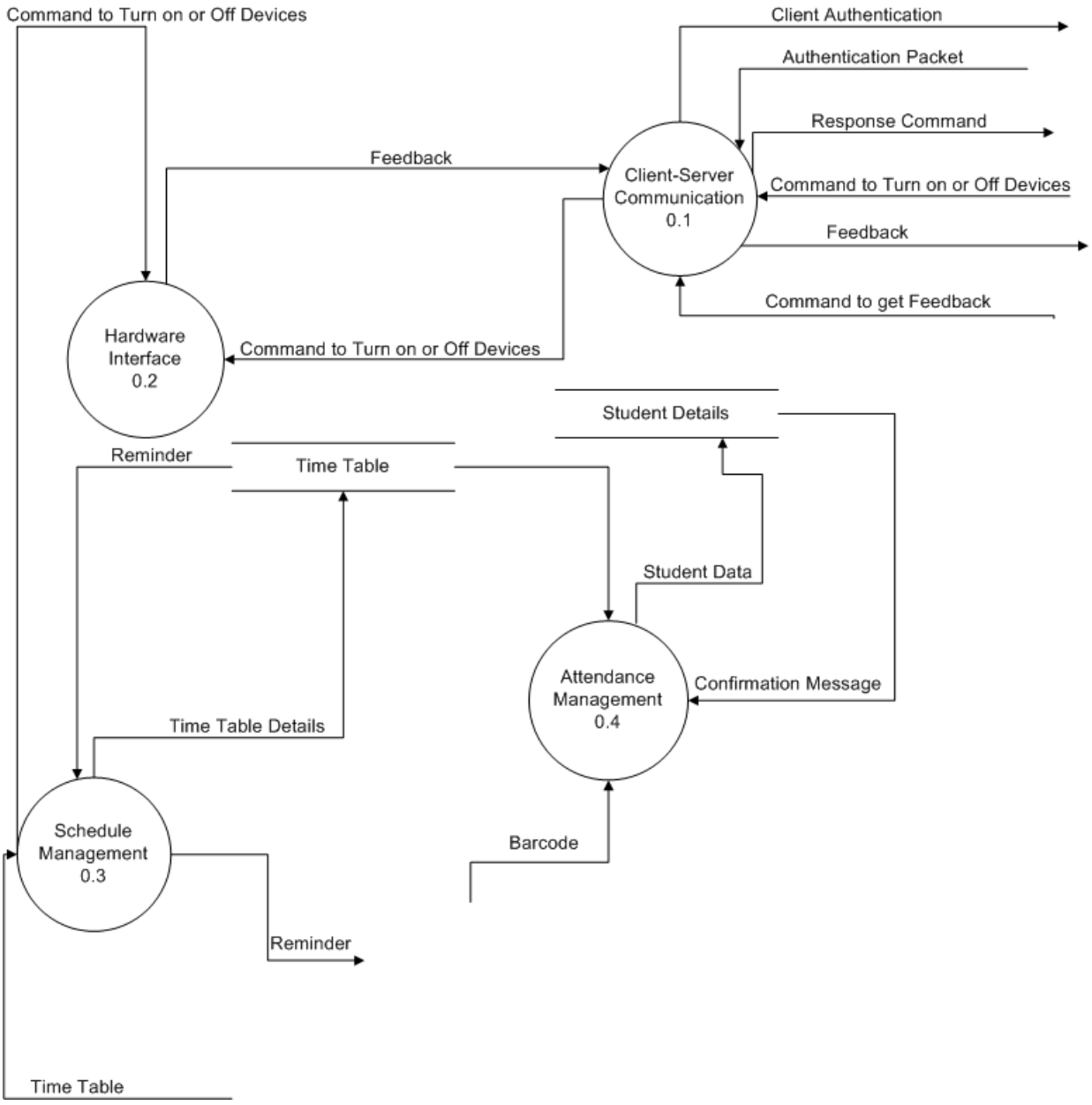


Diagram 5.2
Level-1 DFD

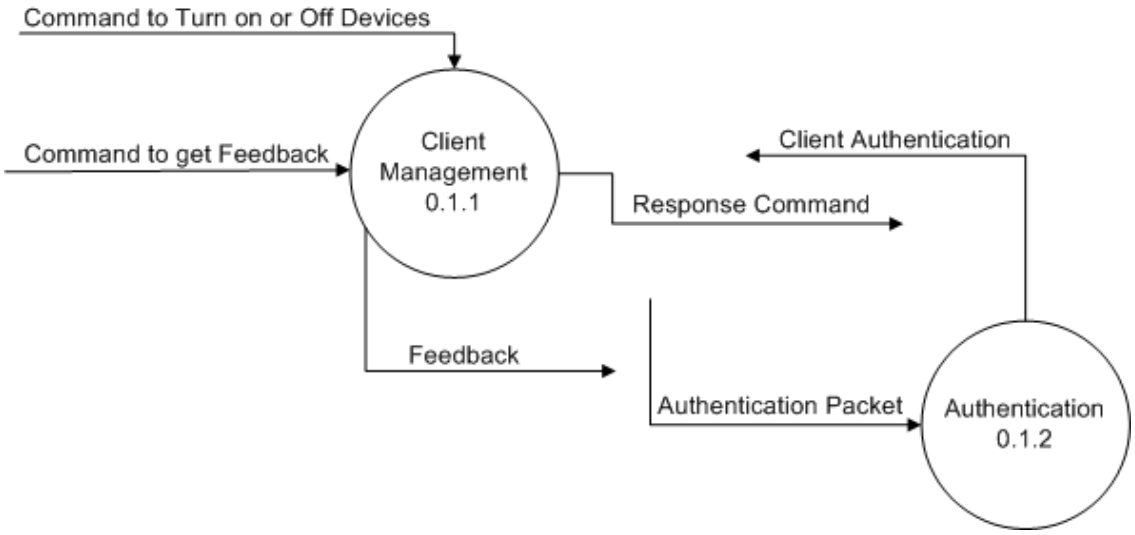


Diagram 5.3
Client-server management
Level-2 DFD

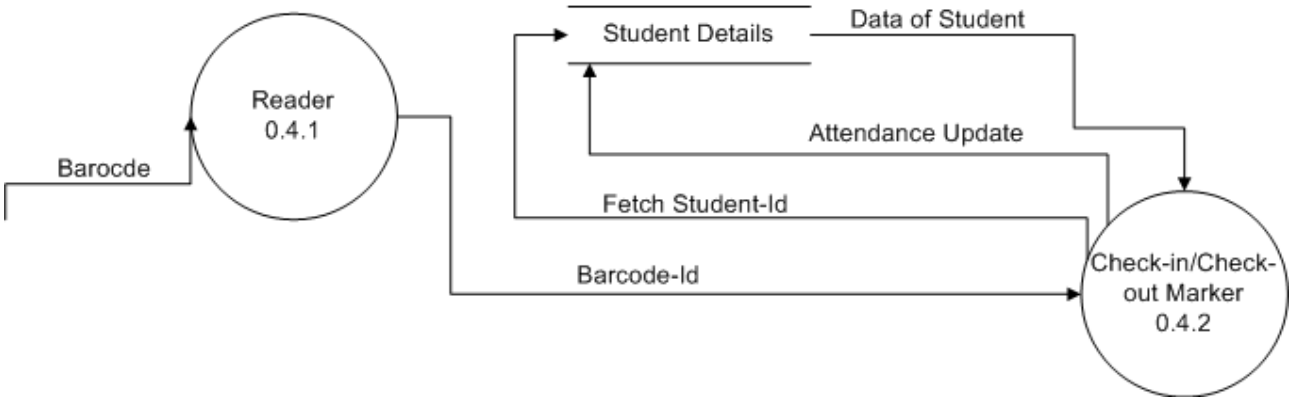


Diagram 5.4
Attendance management
Level-2 DFD

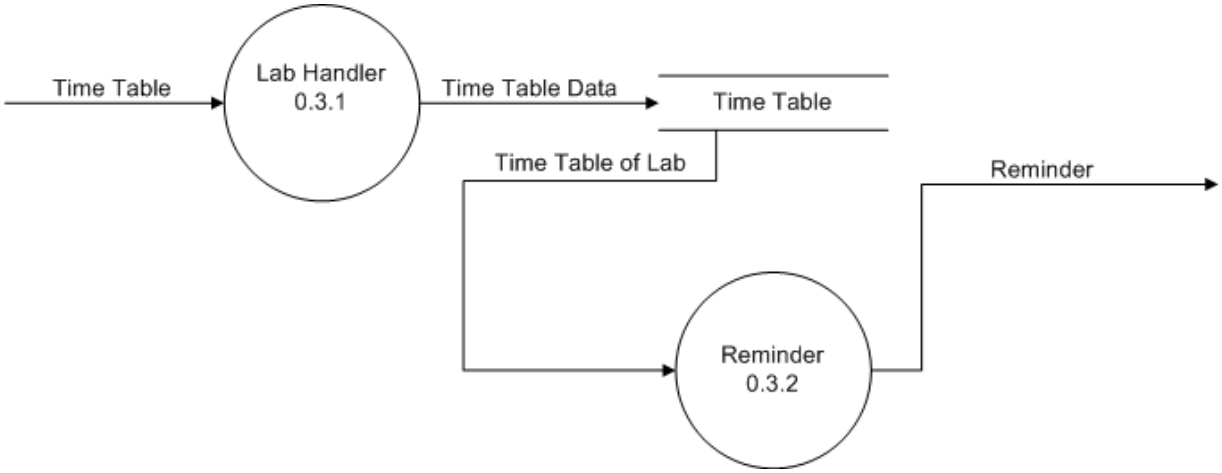


Diagram 5.5
Schedule management
Level-2 DFD

5.2.2. OO DIAGRAMS

5.2.2.1. Class Diagram

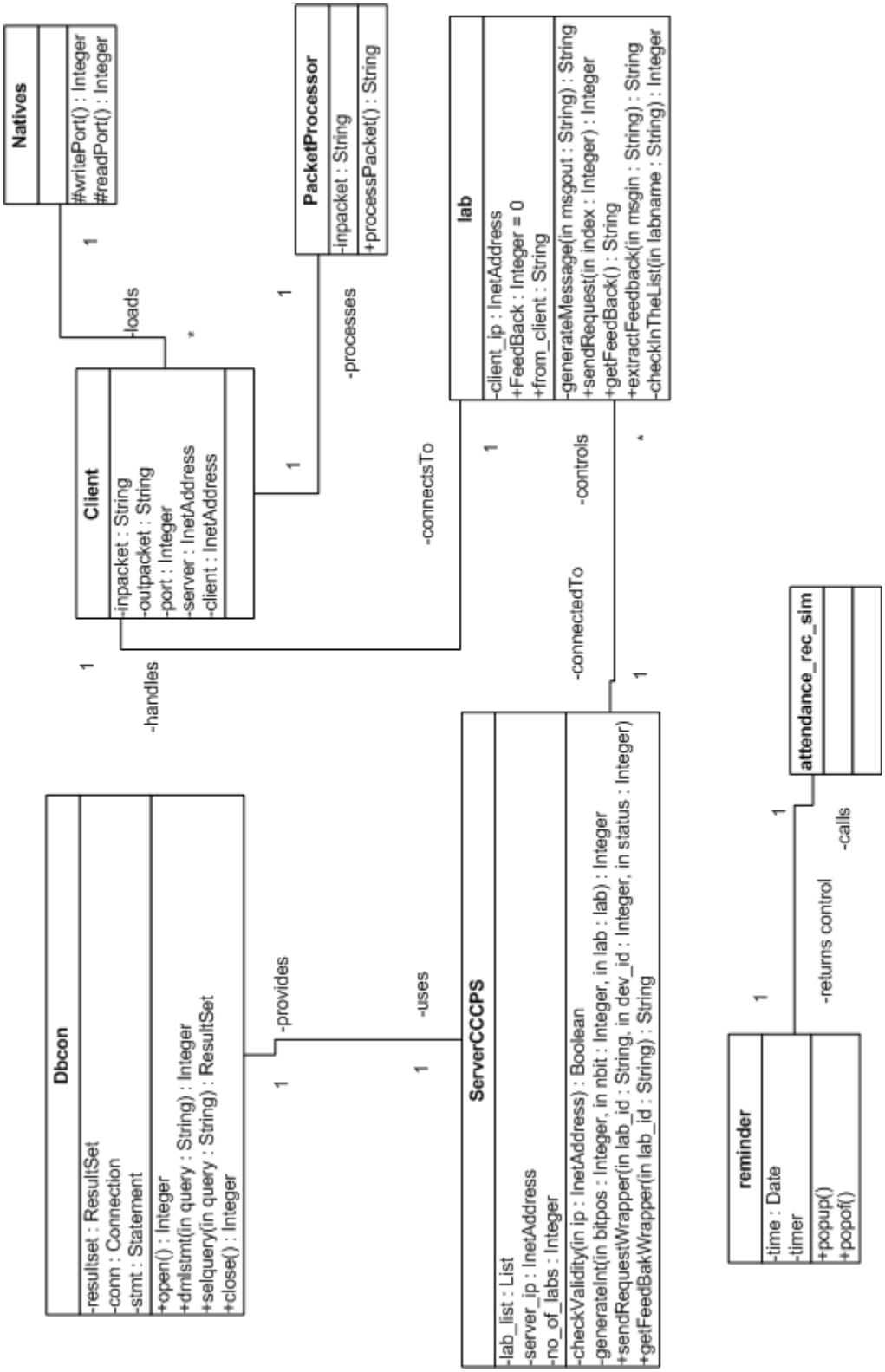


Diagram 5.6

5.2.2.2. Use Case Diagram

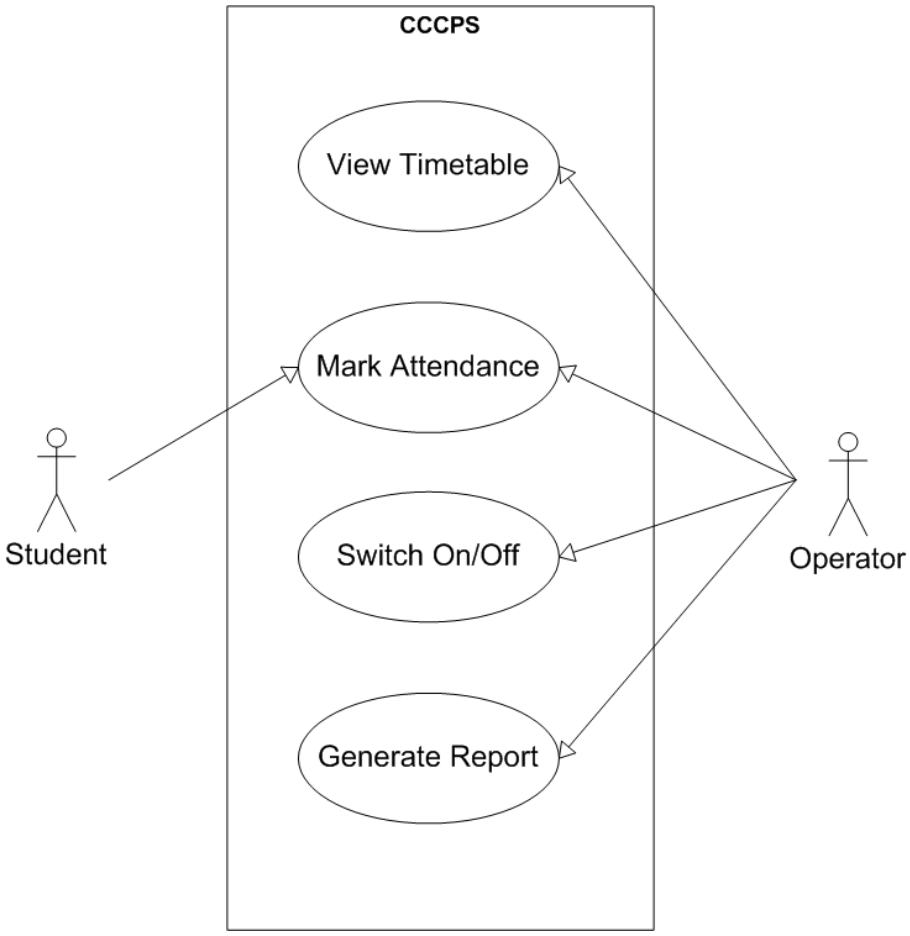


Diagram 5.7
Use Case Diagram-I

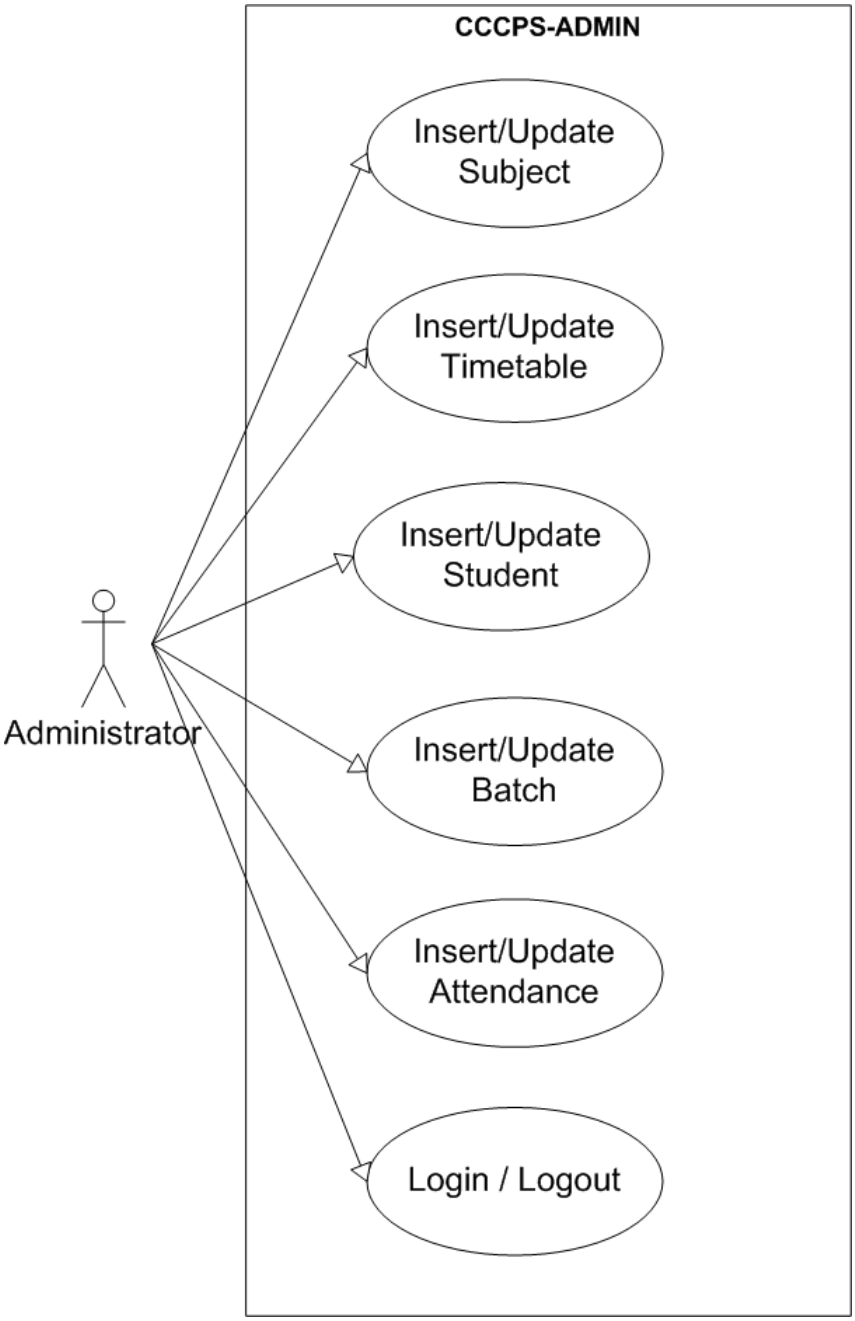


Diagram 5.8
Use Case Diagram- II

5.2.2.3. Sequence Diagram

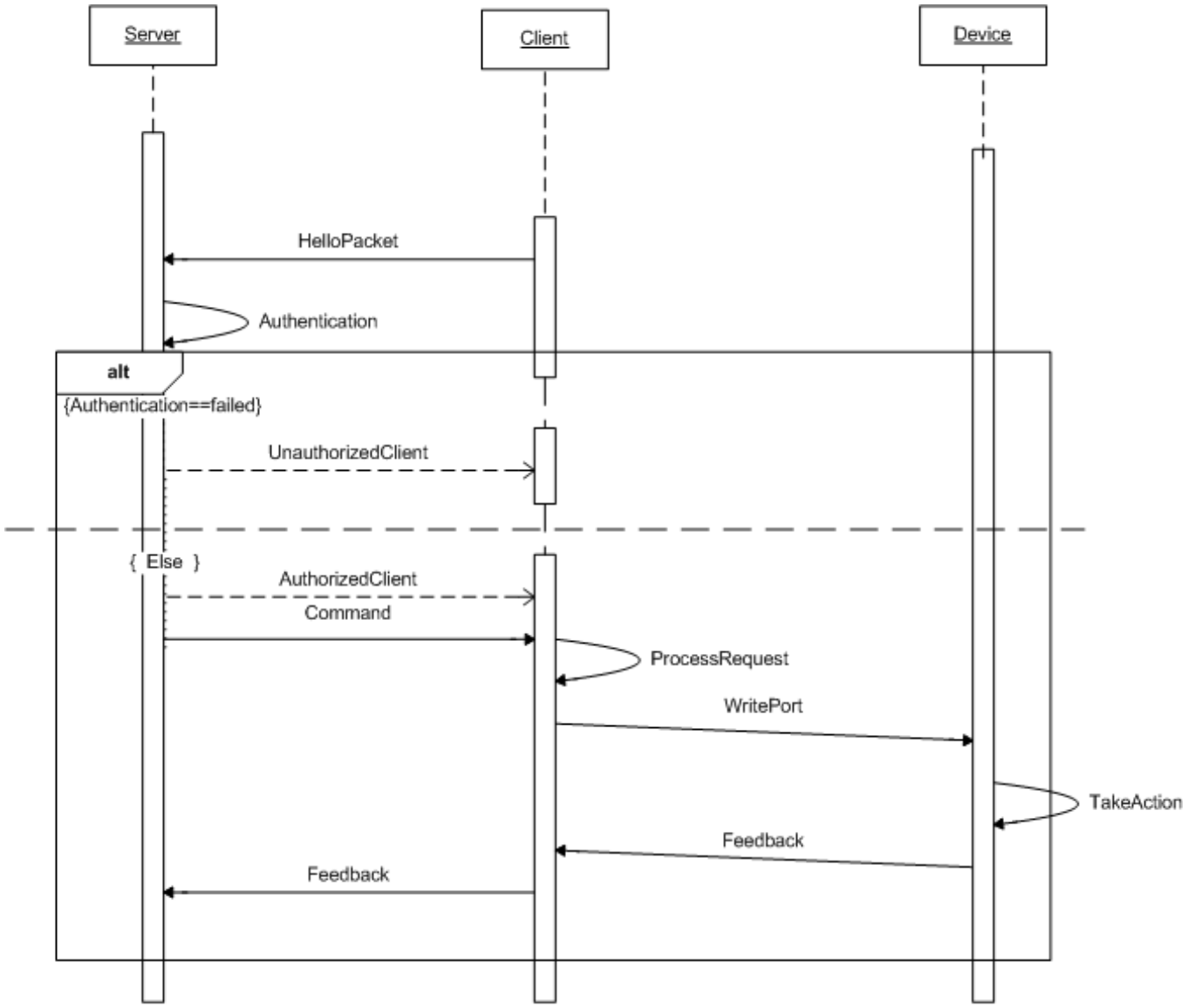


Diagram 5.9
Sequence Diagram
Client Server Communication

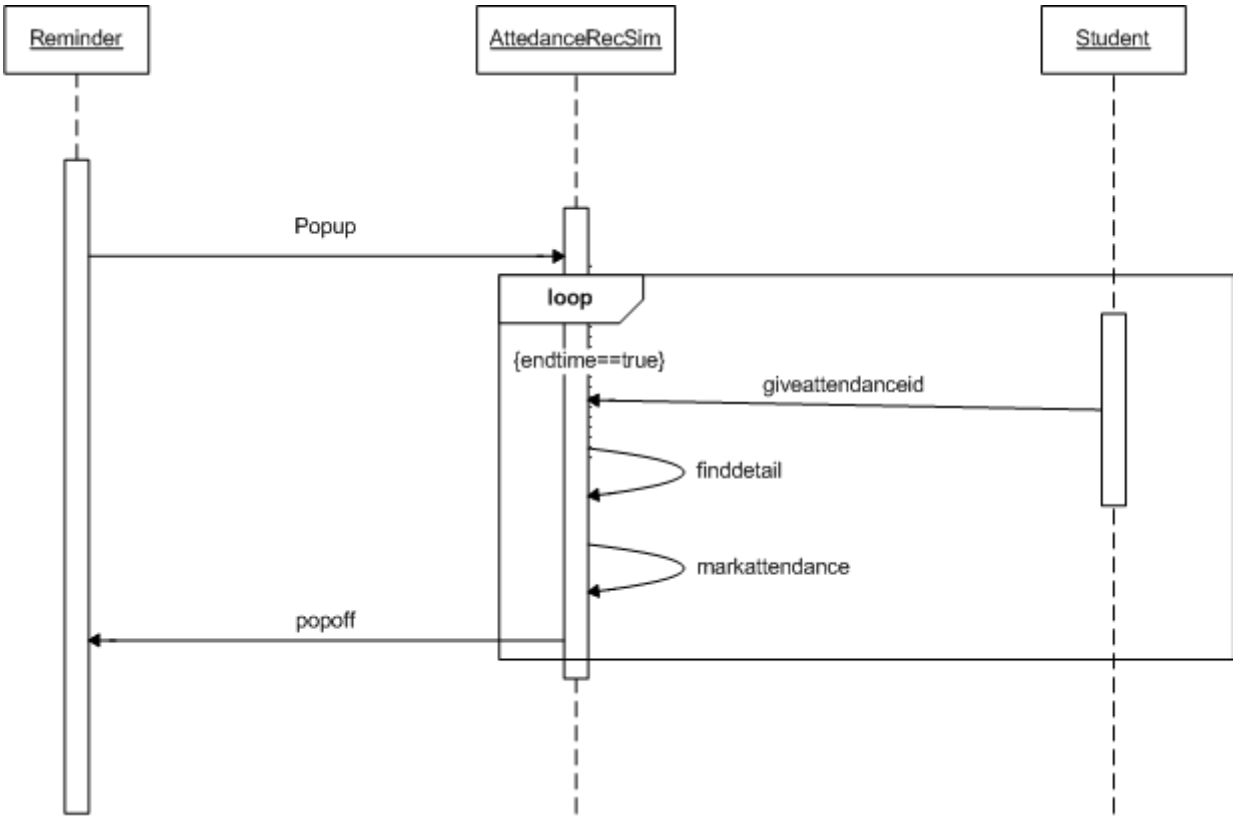


Diagram 5.10
Sequence Diagram
Attendance Recording

5.2.2.4. Activity Diagram

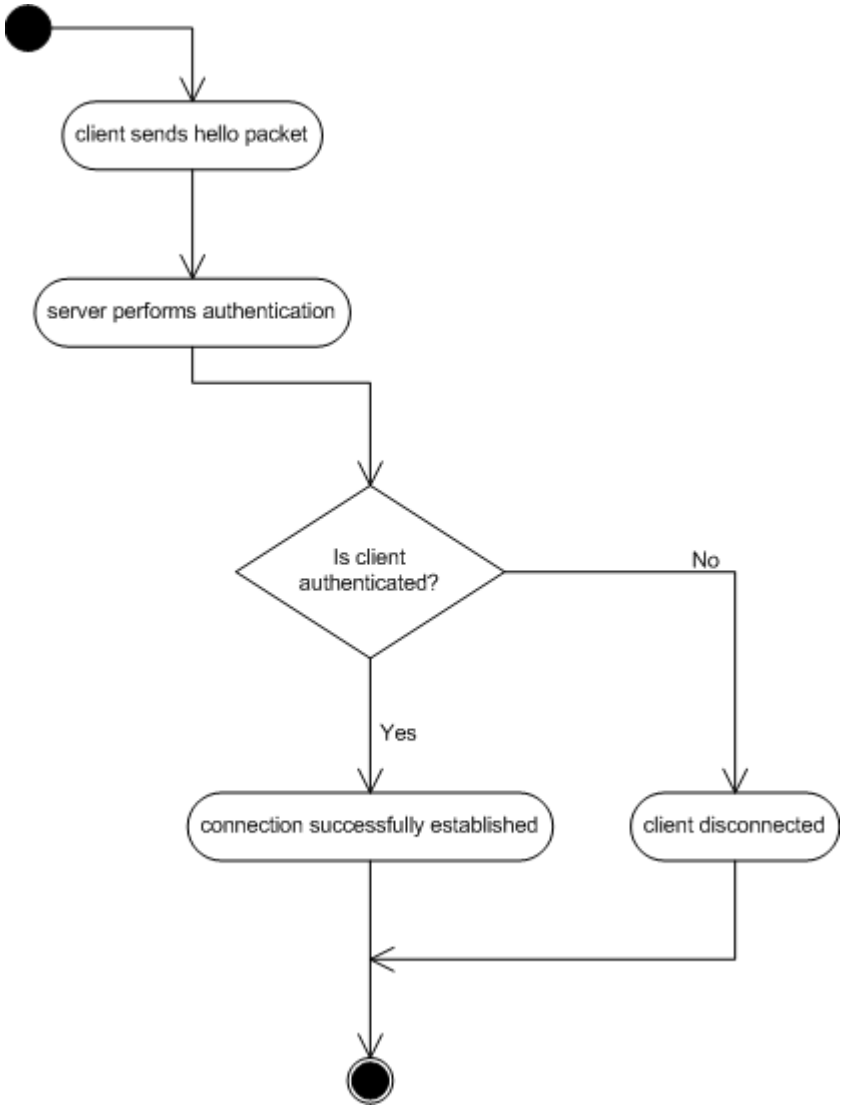


Diagram 5.11
Activity Diagram
Client Arrival and Connection

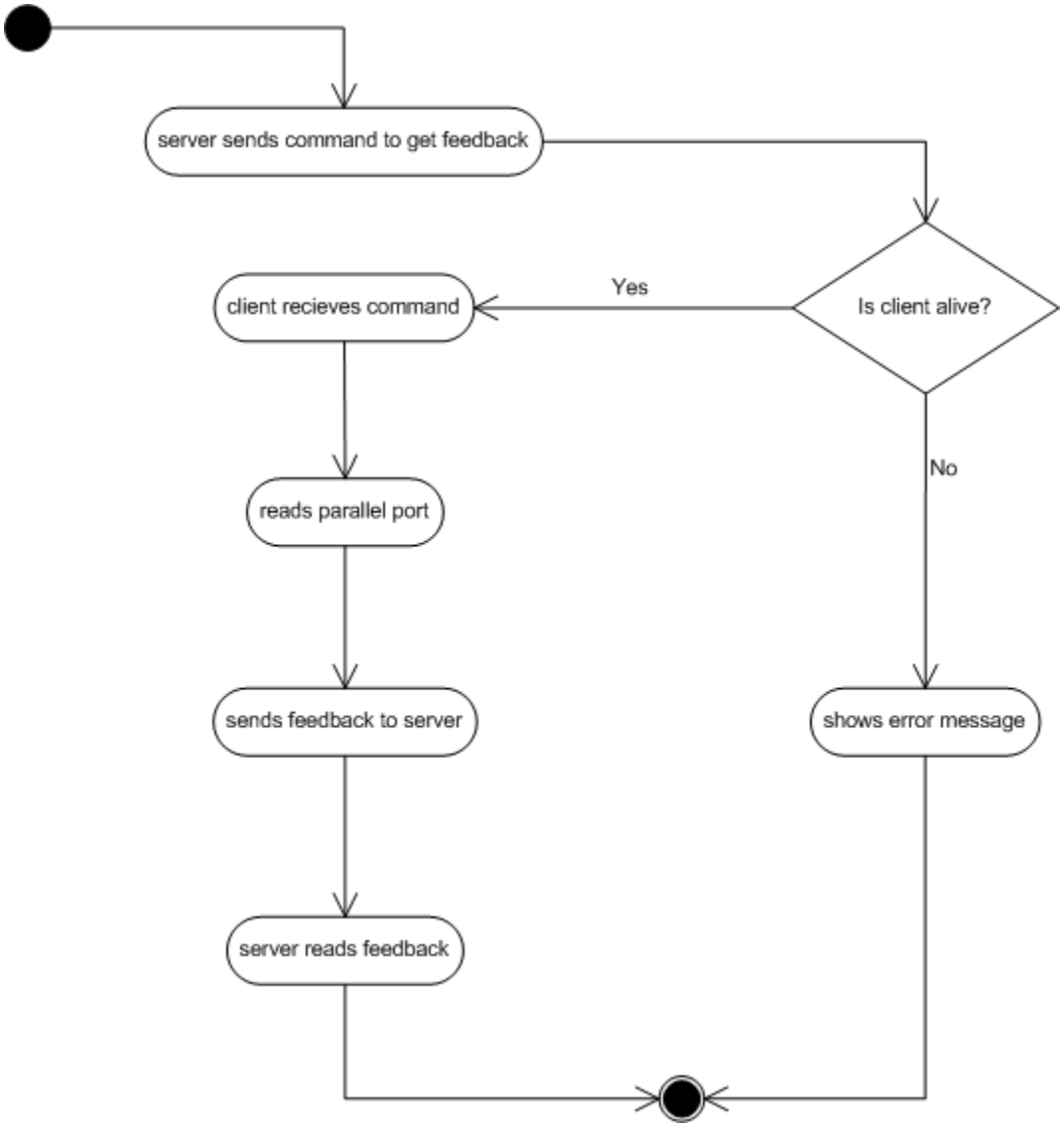


Diagram 5.12
Activity Diagram
Feedback

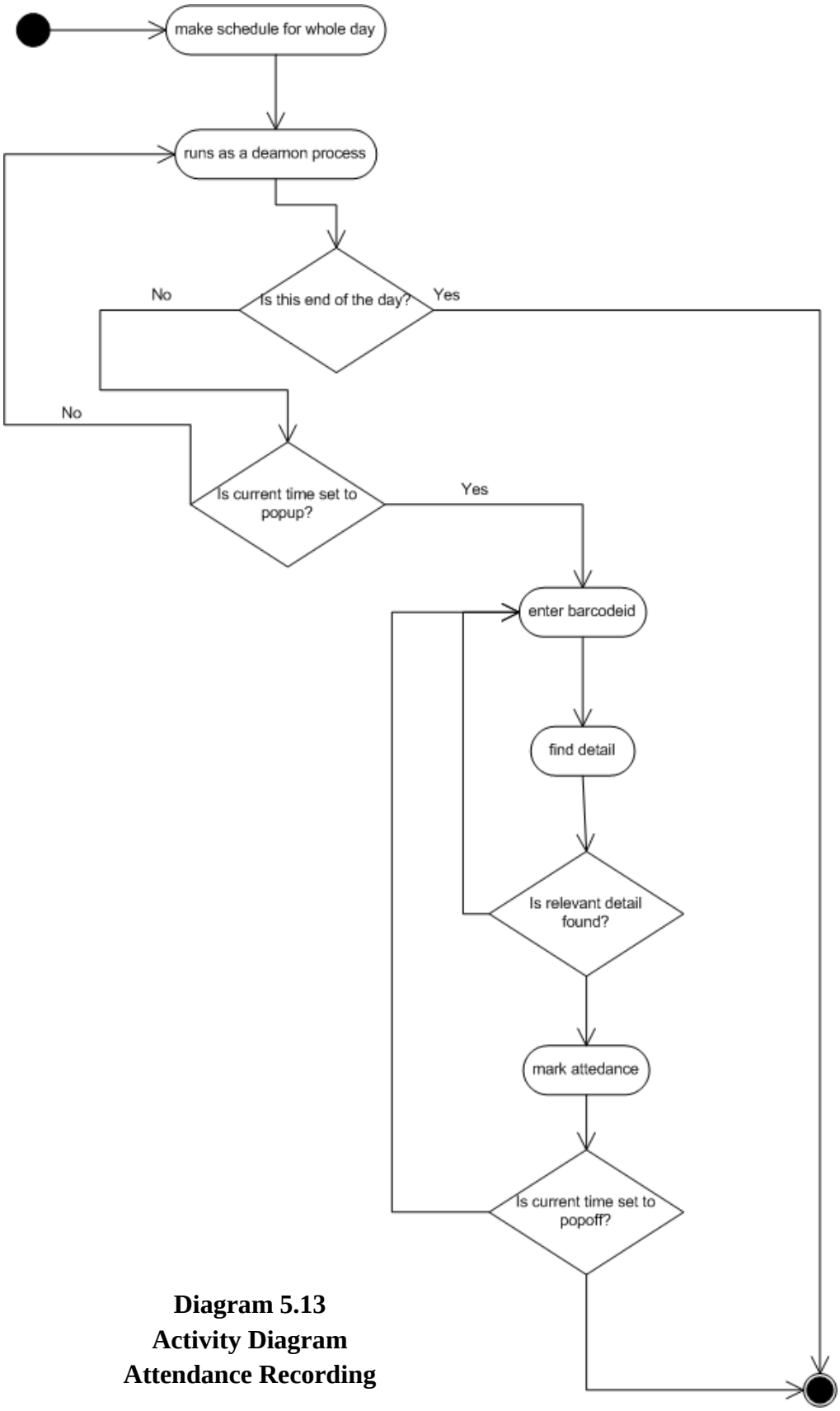


Diagram 5.13
Activity Diagram
Attendance Recording

5.3. DATABASE DESIGN

5.3.1. ER DIAGRAM

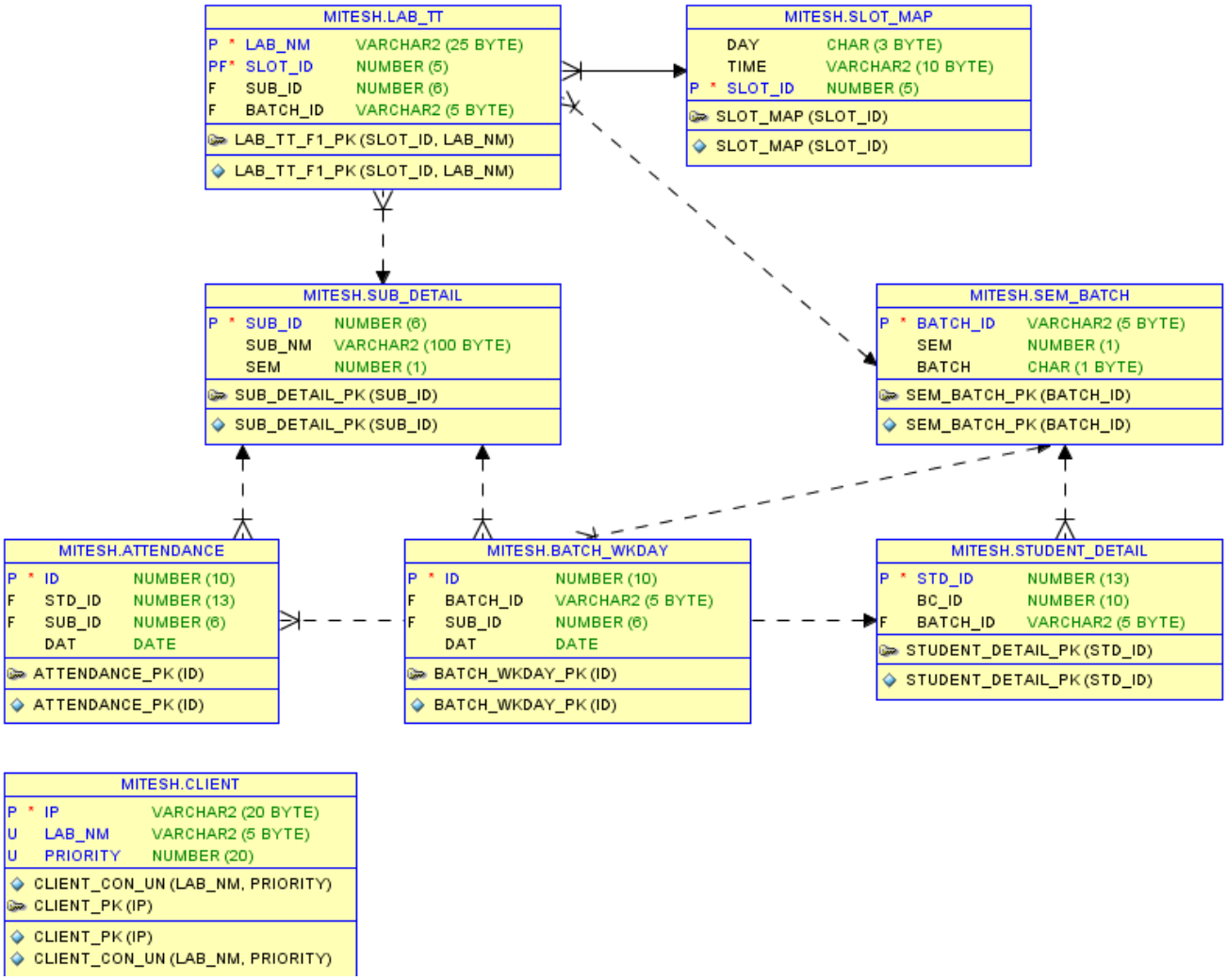


Diagram 5.14
ER diagram*

DATA DICTIONARY

Entity	Attribute	Data Type	Precision	Scale	Pk	Fk	Reference Entity	Reference Attribute	Description
Sub_Detail	Sub_id	Number	6	0	Y				To keep the detail of all subjects
	Sub_nm	Varchar	100						
	Sem	Number	1	0					
Sem_batch	Batch_id	Varchar	5		Y				For mapping of semester with batch
	Sem	Number	1	0					
	Batch	Char	1						
Student_detail	Std_id	Number	13	0	Y				Maintain the record of students
	Bc_id	Number	10	0					
	Batch_id	Varchar	5			Y	Sem_batch	Batch_id	
Slot_map	Slot_id	Number	5	0	Y				Keeps the mapping of day with time slots.
	Day	Char	3						
	Time	Varchar	10						
Batch_wkday	Id	Number	10	0	Y				It keeps the entry for working day of particular batch.
	Batch_id	Varchar	5			Y	Sem_batch	Batch_id	
	Sub_id	Number	6	0		Y	Sub_detail	Sub_id	
	Dat	Date							
Lab_tt	Lab_nm	Varchar	25		Y				For storing the time table of labs
	Slot_id	Number	5	0	Y	Y	Slot_map	Slot_id	
	Sub_id	Number	6	0		Y	Sub_detail	Sub_id	
	Batch_id	Varchar	5			Y	Sem_batch	Batch_id	

Attendance	Id	Number	10	0	Y				For maintaining the record of student attendance
	Std_id	Number	13	0		Y	Std_detail	Std_id	
	Sub_id	Number	6	0		Y	Sub_detail	Sub_id	
	Dat	Date							
Client	Ip	Varchar	20		Y				In purpose of authentication of client
	Lab_nm	Varchar	4						
	Priority	Number	2	0					

Table 5.1
Data Dictionary*

6. STANDARDS USED FOR CODING

6.1. NAMING CONVENTION

Type	Standard	Examples (from our source code)
Structural entities		
Class/Structure Name	(Noun) ClassName	Lab
Member/ Module Level Variable	Variable_name	No_of_labs
Objects	classname(lowercase)	lab
Subroutine/Functions	(Verb) functionName	getFeedBack
Function Parameters	parameter_name	lab_id
Constants	CONS_VAL	
Local Module Variable	Variablename	inpacket
Local Objects	Objname	dbcon
Design Entities		
JFrame	jfrmName	frmCCCPSControl
JPanel	pid	p1,p2
JMenu	mnName	mnFile
JMenuItem	mntmName	mntmExit
JButton	btnName	btnUpdate
JLabel	lblName	lblLab
JComboBox	cbName	cbDay

Table 6.1

- **Standards used in coding**
  - For methods , classes and loops format shown below is used:

```
while(i<10){
    System.out.println("i= "+i);
}
```

  - Single tab(4 character) is used for indenting the levels of the code as shown below:

```
if(condition){
    if(otherCondition){

    }
}
```

- If the name of the variable is longer than one word ,the name is separated by an underscore character.

- Variables have been explicitly declared and used wherever needed and according to the demand.

- The scopes of variables have been kept as small as possible to avoid confusion and to ensure maintainability.

- The codes have been structured and made into small concise blocks representing each functionality which would enable in easily understanding the codes, maintenance and correction when needed.

6.2. TESTING

Testing is done to verify and validate the software. Verification and validation are the checking processes employed to ensure that the software conforms to its specifications and meets the needs of the end user. We have performed following tests on the system during and after the development.

6.2.1. Module Wise BlackBox Testing:

Module testing is carried out on various modules of the system to test their functionalities. The method used for the same id the black box testing. Black box testing is carried out in a situation when no internal details of modules are known. It covers the boundry value analysis.

Sr. No	Test Case / Scenario	Test Data	Expected Result	Actual Result	REMARK
Network Module					
1	Client starts before server	Client, Server	Client should wait until the the server is available	Client waited till the server came up	Test successful
2	Server starts before client	Client, Server	Server should wait for clients	Server waited for the clients	Test successful
3	Client goes down suddenly and comes back	Client, Server	Server should display a message when client is	Actual result was same as the expected result.	Test successful

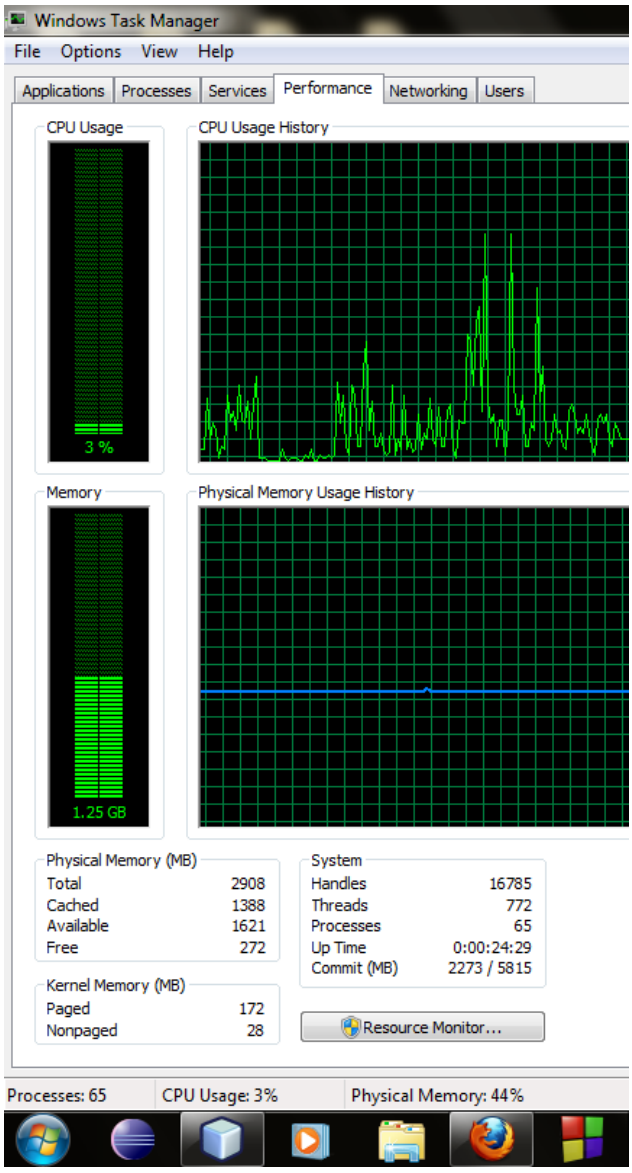
	later		unavailable and when it returns, the panel corresponding to that client should be shown.		
4	Invalid client tries to connect to the server	Client(invalid), Server	The connection should be denied.	The connection was denied.	Test successful
5	Message from invalid sender is received at the client	Message, Client	The message should be discarded.	The message was discarded.	Test successful
6	Malformed message is received at server/client	Message, Server/Client	The message should be discarded.	The message was discarded.	Test successful
7	Proper message from a valid sender is received	Message	The message should be processed and action should be taken accordingly.	The message was processed and GUI rendering/calling end procedure was done.	Test Successful
Hardware Interface Module					
1	Write message from a valid server is received	Message, Hardware	The integer contained in the incoming message should be written on the parallel port	The integer was written to the parallel port	Test Successful
2	Read message from a valid server is received	Message ,Hardware	The bit pattern from parallel port should be read as an integer and sent to the network module	The data from parallel port was read and sent to the network module	Test Successful
3	Message is written to the parallel port	Message, Parallel Port	The bit pattern corresponding to the integer should be written on parallel port.	The bit pattern was written on parallel port(tested using LEDs)	Test Successful

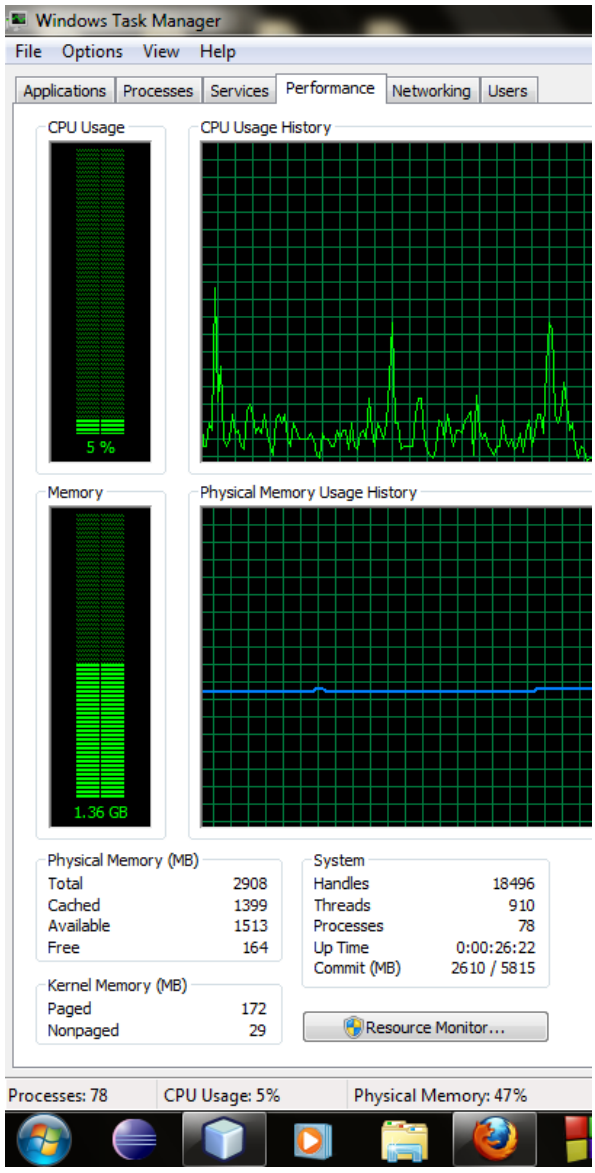
Hardware					
1	A bit is altered to the high/low state.	Parallel Port, Control Circuit	The corresponding relay should be operated.	Corresponding relay was operated	Test Successful
2	A device is switched	Parallel Port, Feedback Circuit	The bit corresponding to the device should get altered	The bit got altered when the device was switched	Test Successful
Attendance Management Module					
1	A lecture/lab is about to start	Timetable, Current Time	The attendance recording module should get activated	The module got activated at the beginning of each lab/lecture session	Test Successful
2	A student who doesn't have lab ,punches his barcode	BarcodeID, Time Table	Attendance of that student must not be marked	Attendance of the student was not marked in the database	Test Successful
3	A student who has a lab, punches his barcode	BarcodeID, Time Table	Attendance of the student should be marked in appropriate lab session	Attendance of the student was marked in appropriate lab session	Test Successful
4	A student reaches late in lab/lecture, when the attendance recording module is in sleeping mode	BarcodeID, Session details	Administrator should be able to mark the student's attendance	Admin was able to mark the attendance of the student	Test Successful

Table 6.2

6.2.2. Load Testing

In any GUI based, it is important that the application uses least possible amount of memory. During this test,when all the six labs were kept alive and the performance of the server's GUI was tested. The screen shots below show the amount of memory used when all the six clients + a server were launched on a single machine.





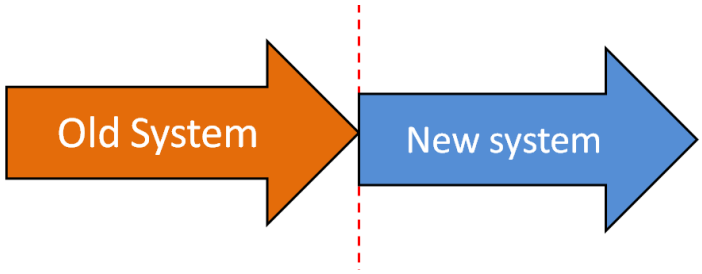
The images show that the system uses 100 MB memory when all clients and server are running on same single machine. Thus, this is the upper bound on memory usage of the system. Server behaved normally under this loaded condition also.

6.3. IMPLEMENTATION/DEPLOYMENT

When a new system needs to be implemented in an organization, there are different ways to adopt this new system: Direct changeover ,Parallel running ,Pilot introduction ,Well-trade.

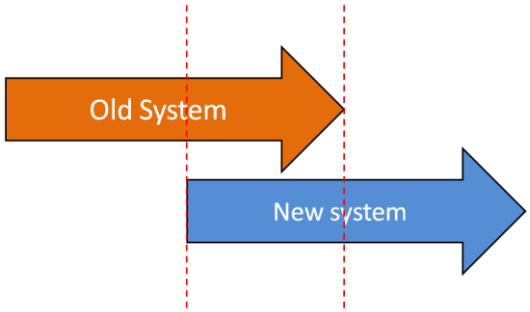
- *Direct Changeover* :

  This approach causes the changeover from the old system to the new system to occur immediately when the new system becomes operational. It is the least expensive but involves more risks than other changeover methods. The figure below shows this approach.



- *Parallel running* :

  The parallel operation changeover method requires that both the old and the new information systems operate fully for a specified period. Data is input to both systems and output generated by the new system is compared with the equivalent output from the old system. When users, management, and IT group are satisfied that the new system operates correctly then the old system is terminated. It is the most costly changeover method and involves lower risks.

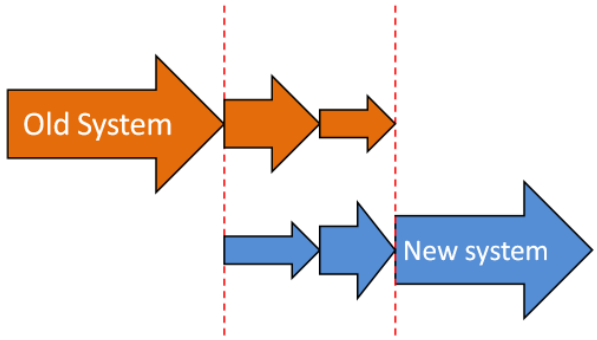


- *Pilot implementation :*

  The pilot changeover method involves implementing the complete new system at a selected location of a company. Direct cutover method and operating both systems for only the pilot site. The group that uses the new system first is called the pilot site. By restricting the implementation to a pilot site reduces the risk of system failure as compared with is less expensive than a parallel system.

- *Phased Implementation* :

  The phased operation changeover method involves implementing the new system in stages, or modules. We can implement each subsystem by using any of the other three changeover methods. In this approach risk of errors or failures is limited to the implemented module only as well as it is less expensive than the full parallel operation.



- As our project is a completely new concept, where there is no old system available for controlling devices through a computer. And the users of the system are fairly aware of the system and require no further training of the same. Thus the best suitable methodology is the Direct Changeover methodology, and hence we have used the same.

7. FUTURE ENHANCEMENTS

Currently our project has been deployed at our institute (SVIT- Vasad). It has all the basic functionalities, but improvements and enhancements are always possible. Some of the possible enhancements are as mentioned below:

Addition of Wireless Control Capability:
Currently the control circuit is connected to the client pc using parallel port connector. This wire based connection can be replaced with the wireless connection.

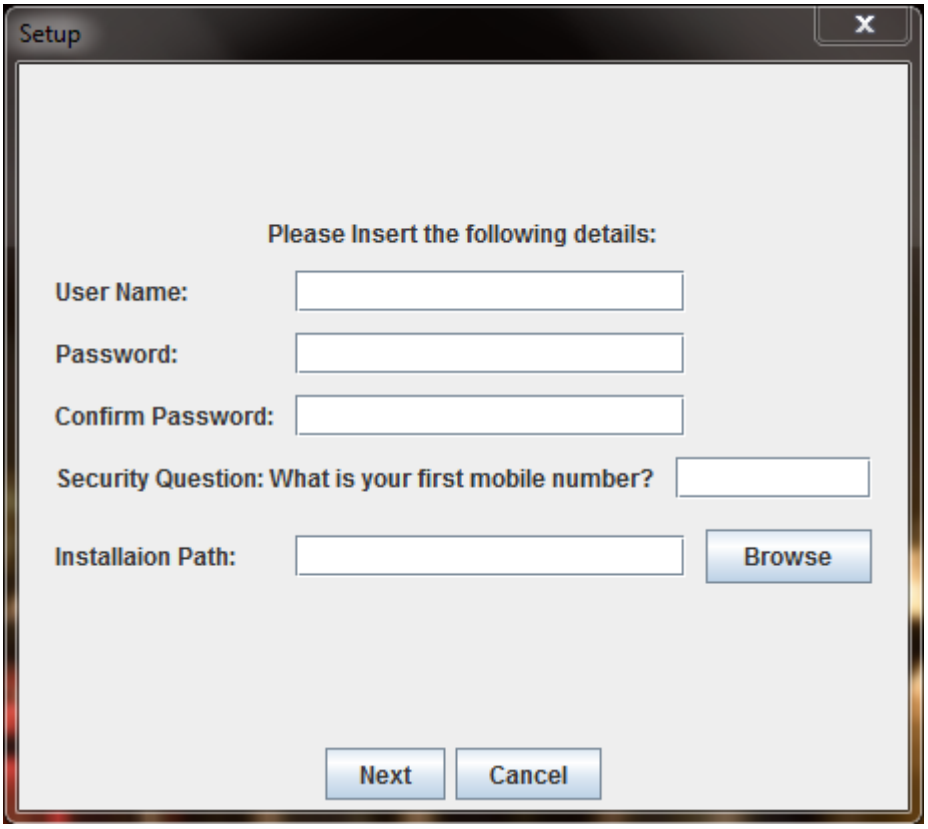
Possible Removal of Client PC:
In our system, a client PC is used as the endpoint where the control circuit is attached. By developing a circuit that can process HTTP packets and make decisions accordingly, the client PC can be made optional.

APPENDIX - 1: INSTALLATION MANUAL

Installation Manual (Server)

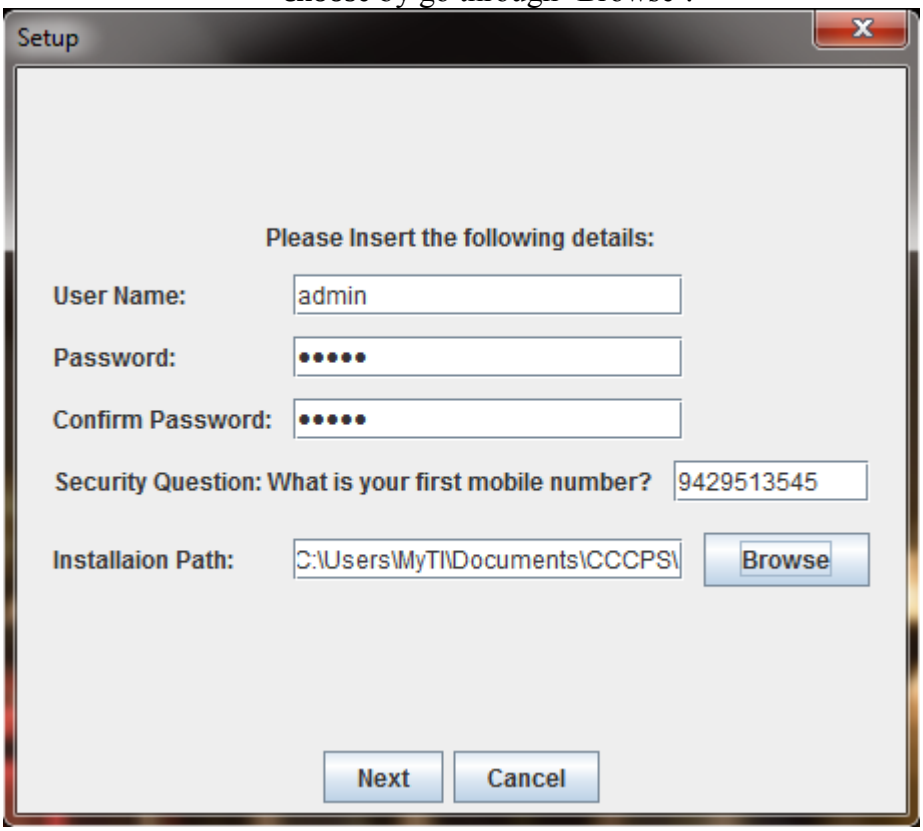
1. Requirements
   a. Java Runtime 6 or grater
   b. Oracle Database*
   c. Administrator Rights

2. Installation Steps
   a. Run ServerSetup.jar as a administrator because it needs rights to access the system files.

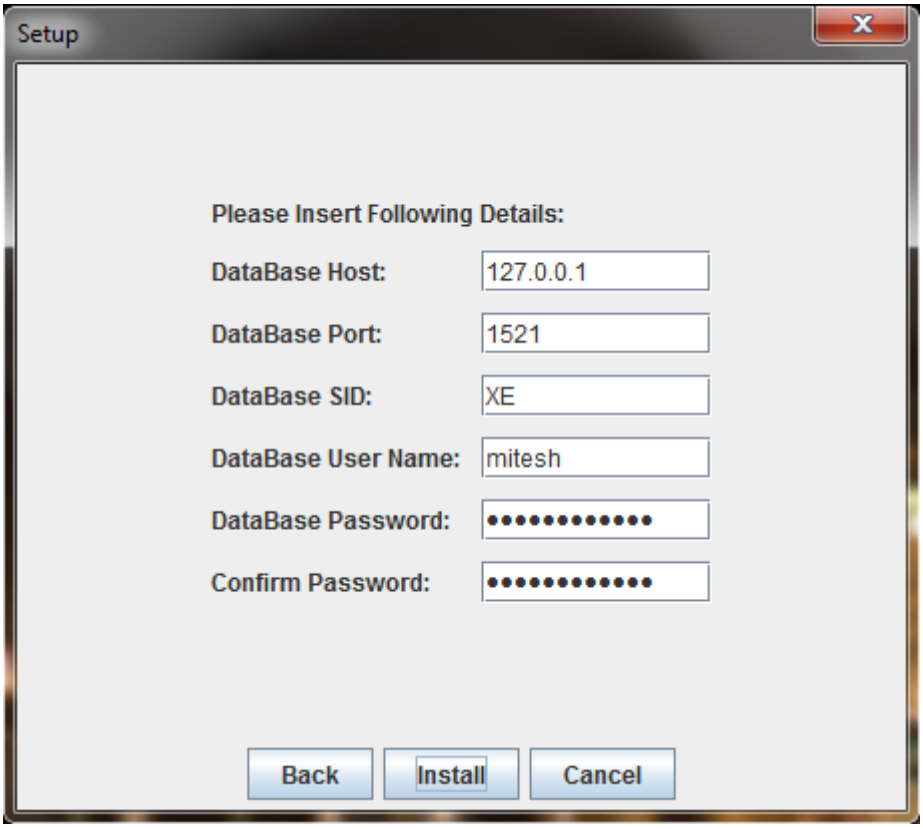


   b. Enter all the Details then press next.
   User Name: Enter the username(name of user) e.g. administrator
   Password: Enter the password for the user. Choose password such a way that it is easy to remember but difficult to crack. e.g. adMiN32
   Confirm Password: Retype the same password here.
   Security Question: (What is your first mobile number?) Enter first mobile number which is used in the case of recovery of password and change in password. e.g. 9429534345

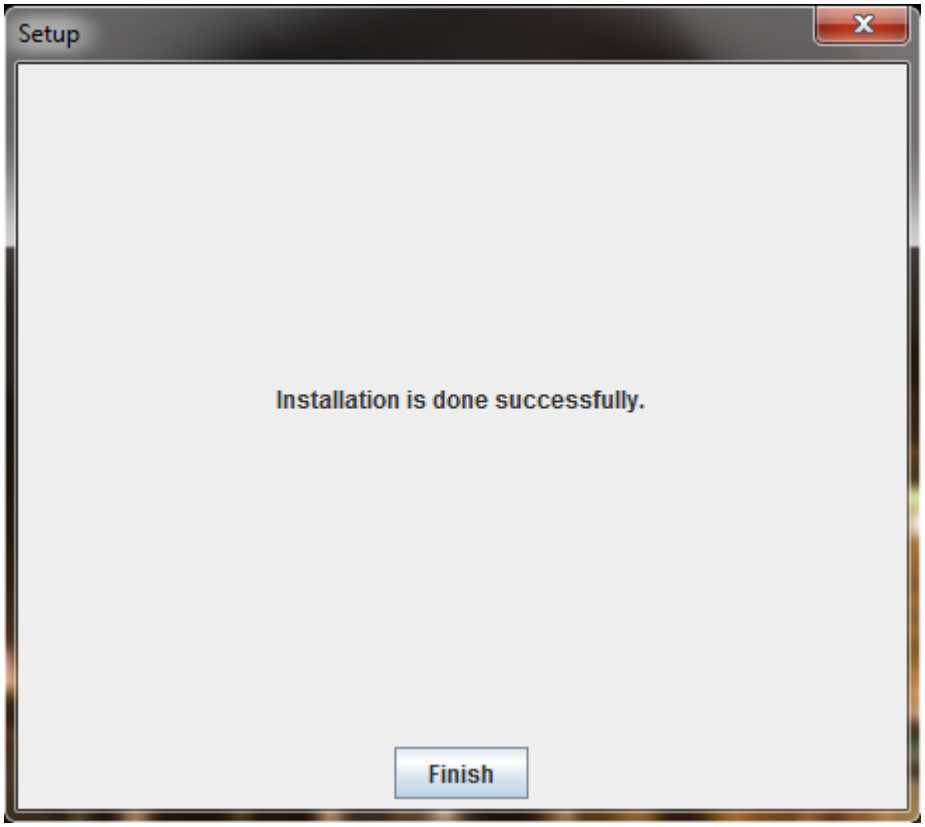
Installation Path: choose the installation directory. You can either type or choose by go through 'Browse'.



c. Enter the details then press install.
DatabaseHost: Enter the ip address of the server on which oracle database is running. e.g. 100.100.100.2
DatabasePort: Enter the TCP port number of server on which oracle database is listening the request. e.g. 1521
DatabaseSID: Enter the Service ID of the oracle database which may be name of database. e.g. orcl
DatabaseUser: Enter the username to login into oracle database. e.g. hr
DatabasePassword: Enter the password for database user given before. e.g. hr21
ConfirmPassword: Retype the password.


Setup
Please Insert Following Details:
DataBase Host:
127.0.0.1
DataBase Port:
1521
DataBase SID:
XE
DataBase User Name:
mitesh
DataBase Password:
Confirm Password:
Back
Install
Cancel

3. Press Finish to complete the setup.



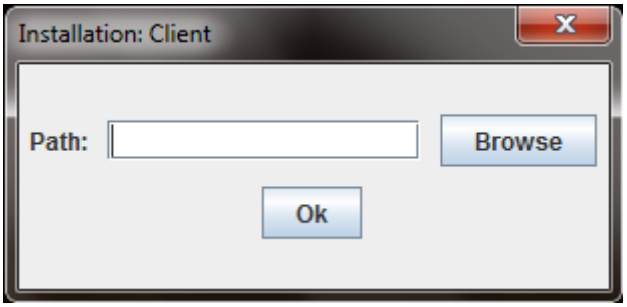
Notes:

- *Any edition but version of that edition is later than 9i. If you are using multi tire structure then database must be accessible from network.

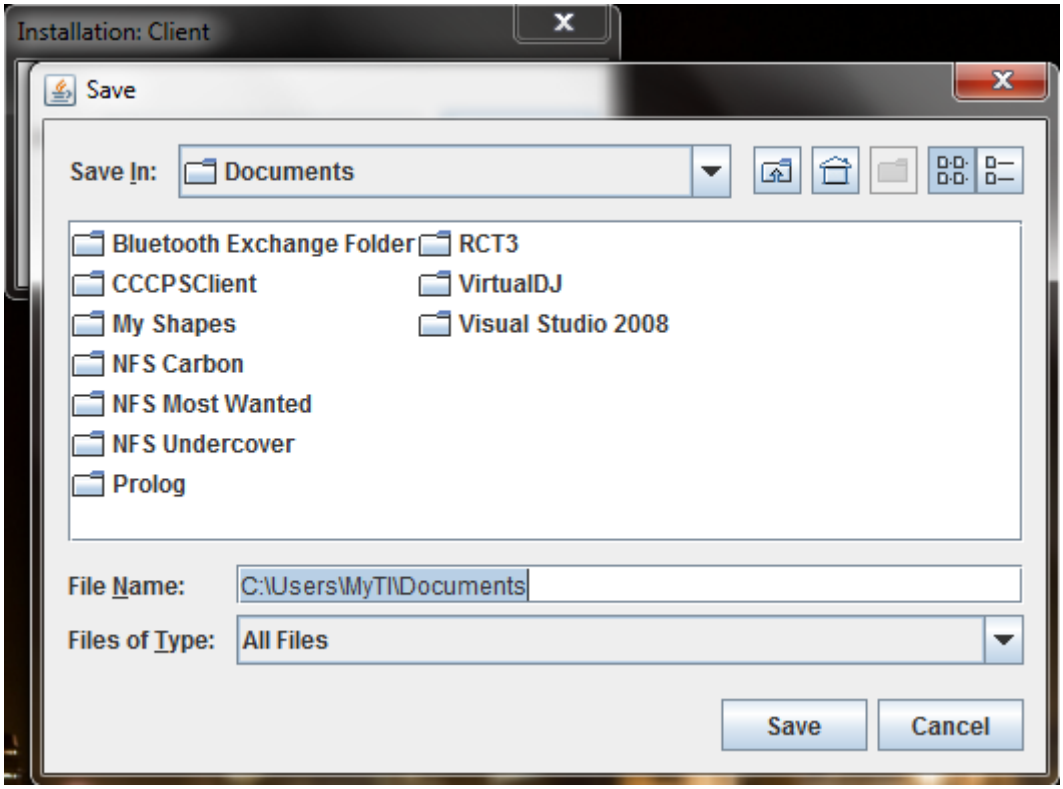
Installation Manual (Client)

1. Requirements for installation
    a. Java runtime 6 or later.
    b. Administrator Rights.

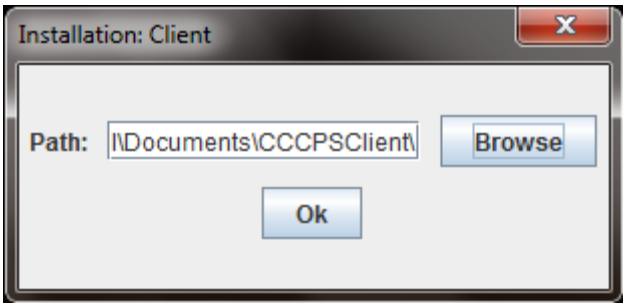
2. Follow the following steps for installation.
    a. Run the ClientSetup.jar



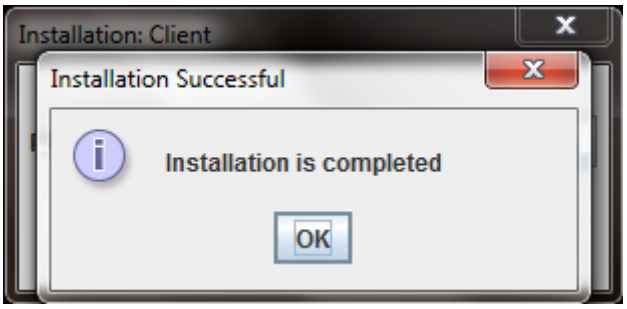
    b. Choose the installation directory by go through ‘Browse’ or type in textbox.



    c. Press Save.


Installation: Client
Path:
\Documents\CCCPSClient\
Browse
Ok

d. Press Ok


Installation: Client
Installation Successful
Installation is completed
OK

APPENDIX - 2: USER MANUAL

INTRODUCTION TO THE SYSTEM:

This system is designed to control electronic devices located remotely from server. Additionally there are another two sub systems. One is for manage all database related to student details and lab time-table. Second one is to record attendance of the student in lab sessions.

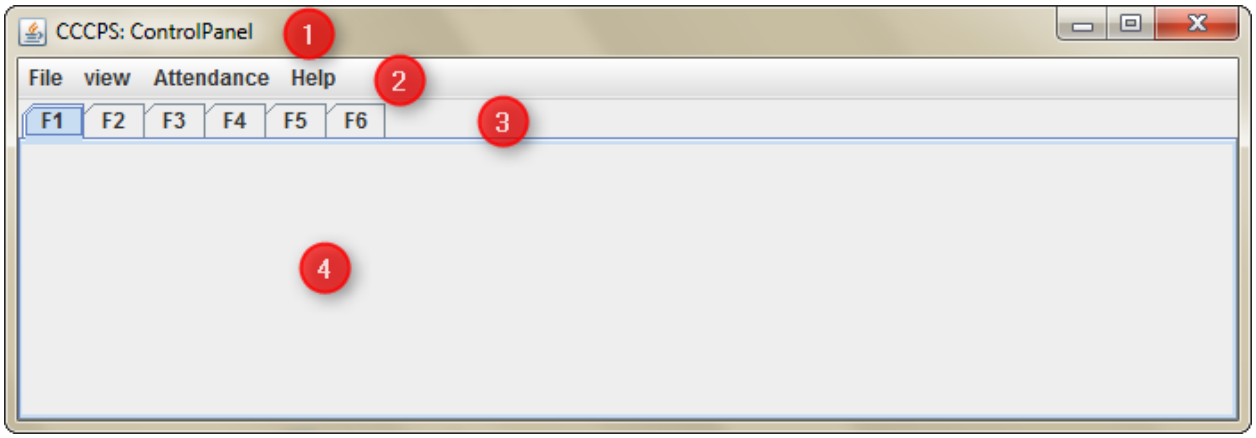
The main system is control panel through which operator can see status of all devices and according to status he can send command to turned on/off . Additionally operator can see the current lab session in individual labs. By seeing current lab session operator can decide the places where there is no use of electrical devices. This system also provides utility to print various types of reports of student's attendance according to user inputs.

First sub system manages the databases of all students and lab's time-table. Admin can log in system and insert, update, delete student's detail. System also provides utility to manage the schedule of all labs and client security (IP security).

Second sub system marks the attendance of student at the beginning of lab session. This system automatic invokes at the starting time of lab and start recording attendance of student for some time period. After that time period window automatically pop offs and run as daemon process.

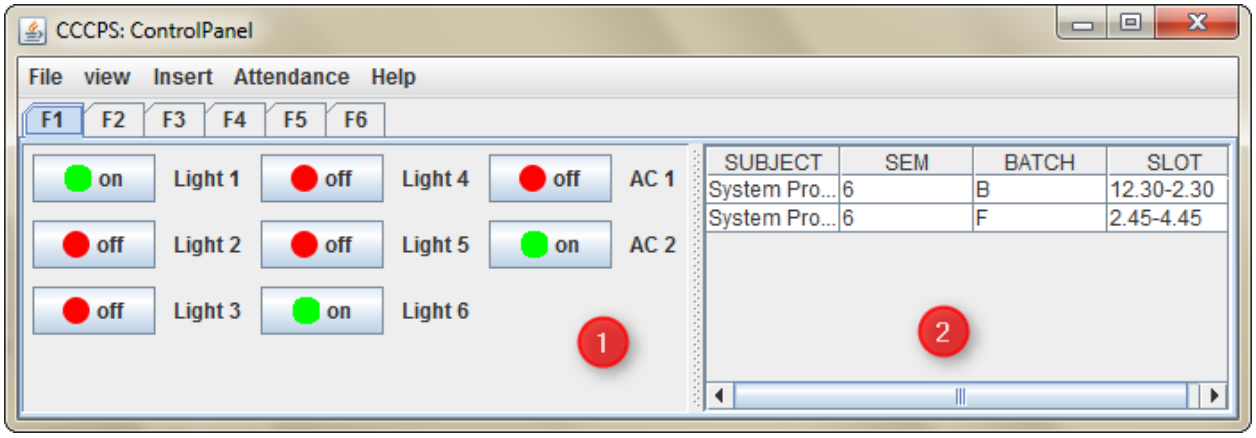
GETTING FAMILIAR WITH GUI PANEL:

The screen below is the main control panel of the CCCPS system. When the server's jar file will be started the GUI as shown below will be displayed. The major components of this GUI are:



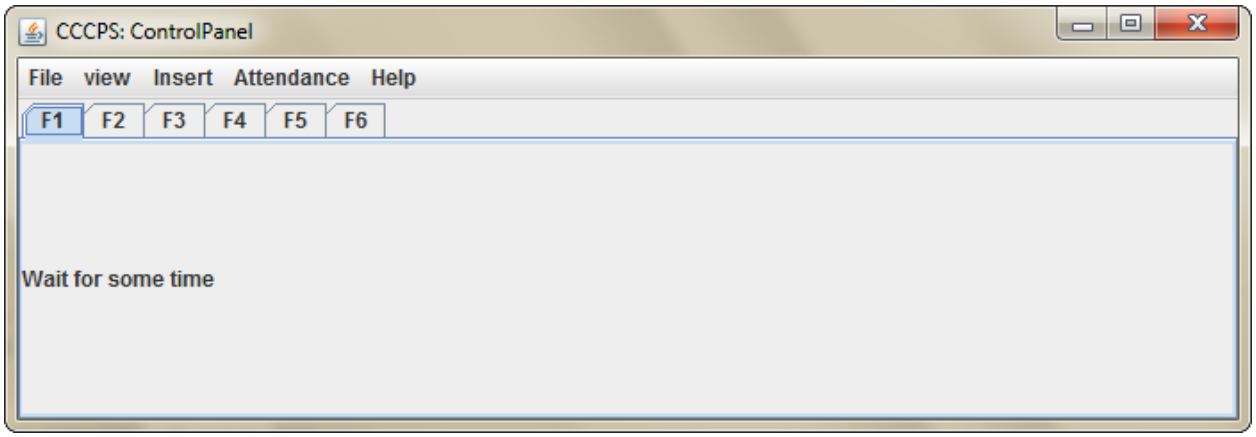
1. Main GUI frame, which can be minimized. There is a lower bound on the size of this panel i.e. while resizing this window manually, the size will not decrease after it has reached its min size.
2. This is the standard menu bar.
3. This is the set of tabs, where each tab represents a lab(location whose devices are to be controlled) .All the tabs will have their GUI drawn once the lab is connected to the server.
4. GUI part where in the left half the status of devices of corresponding labs will be shown and in the right half time table of the current day will be shown.

GUI when lab is connected:



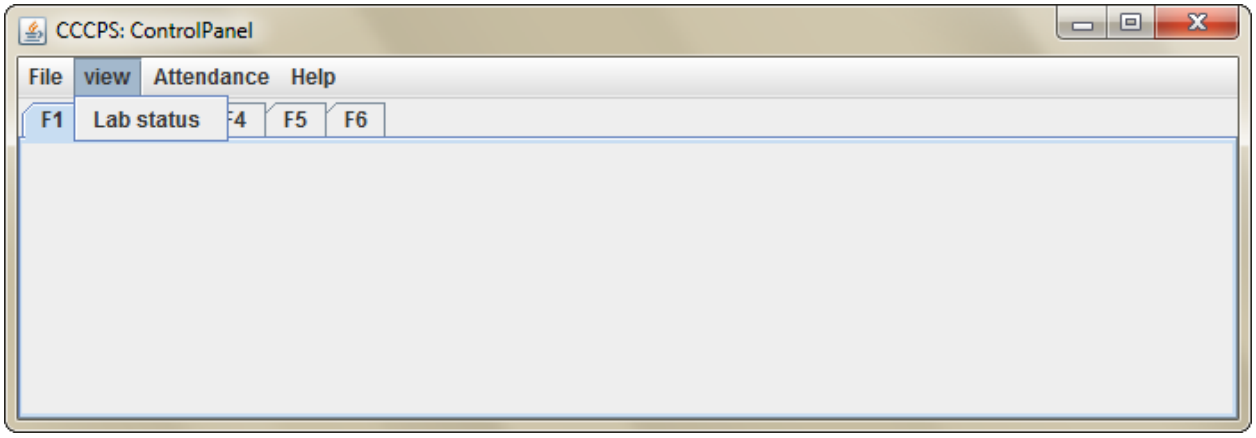
1. Shows the current status of the devices in the lab "F1".
2. Shows the time table of current day.

GUI when lab is disconnected:

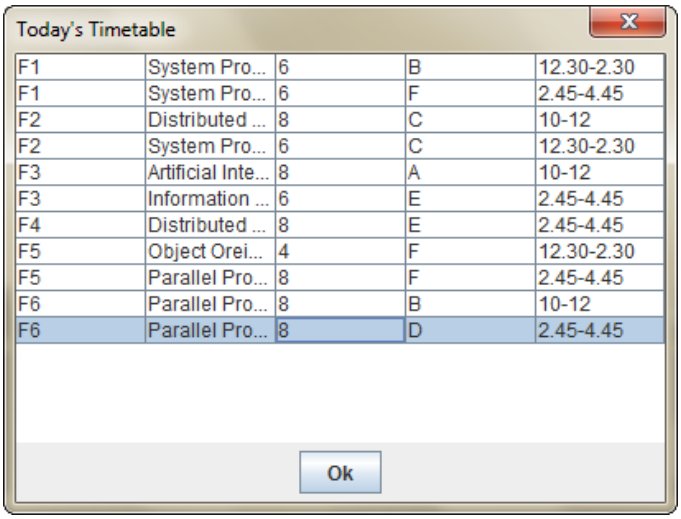


KNOWING MENUS:

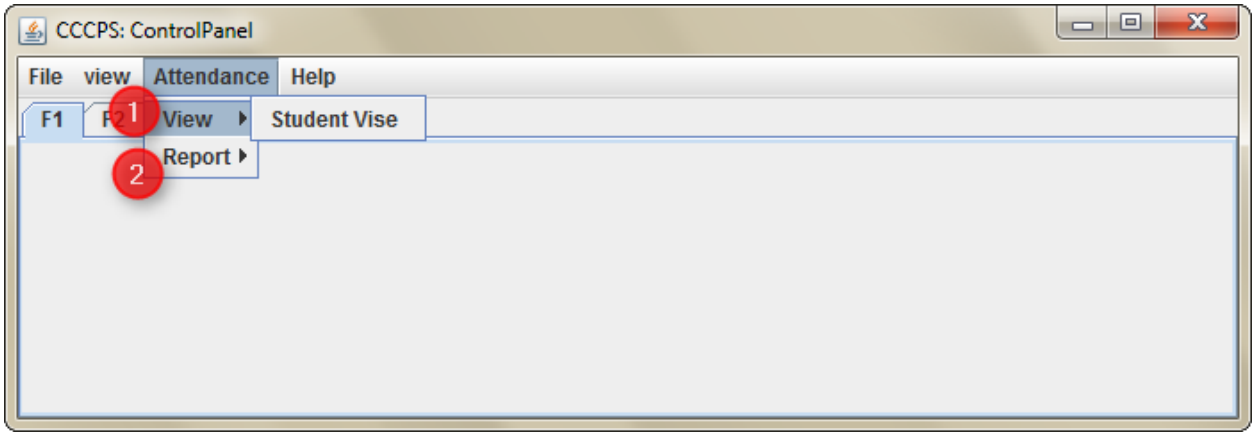
- VIEW MENU:
  This menu is used to view the lab session of that particular day.



On clicking the “Lab Status”, time table will be shown as below:

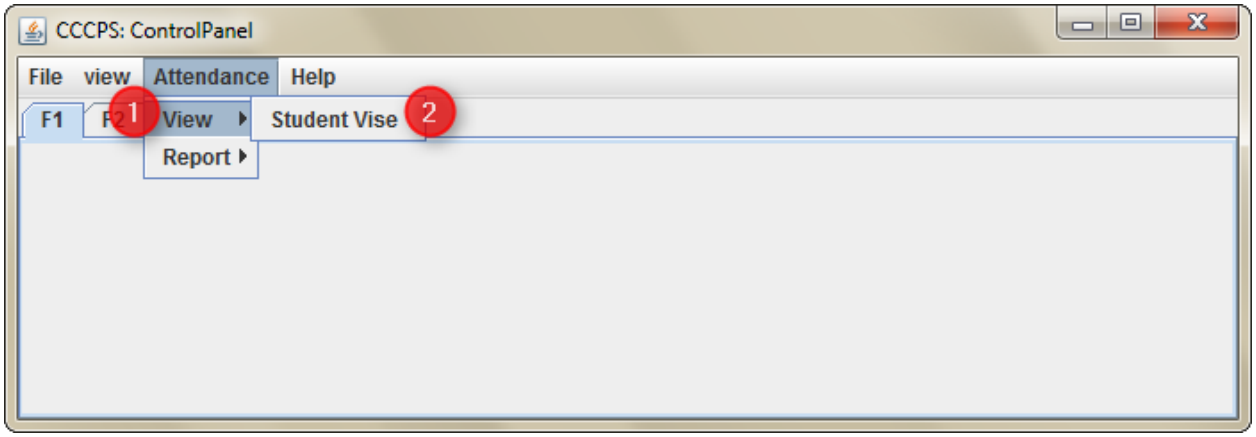


- ATTENDANCE MENU:
  This menu has the options to deal with various types of attendance related functionalities.

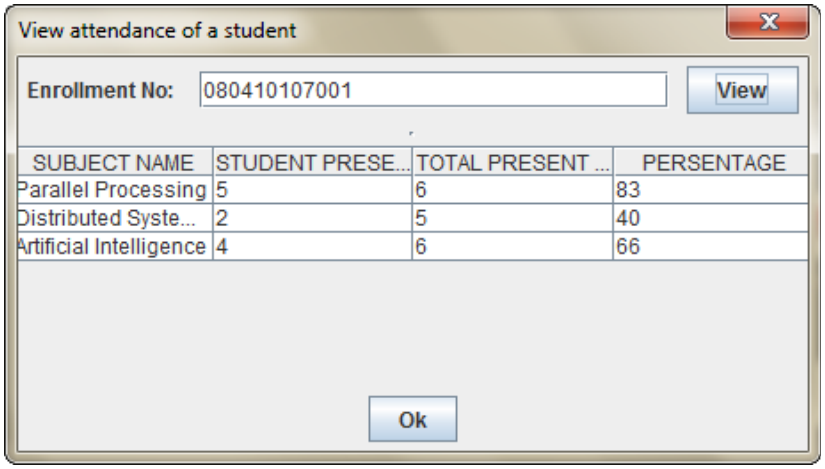


1. *View*: to view the attendance of the student.
2. *Report*: to generate various types of reports.

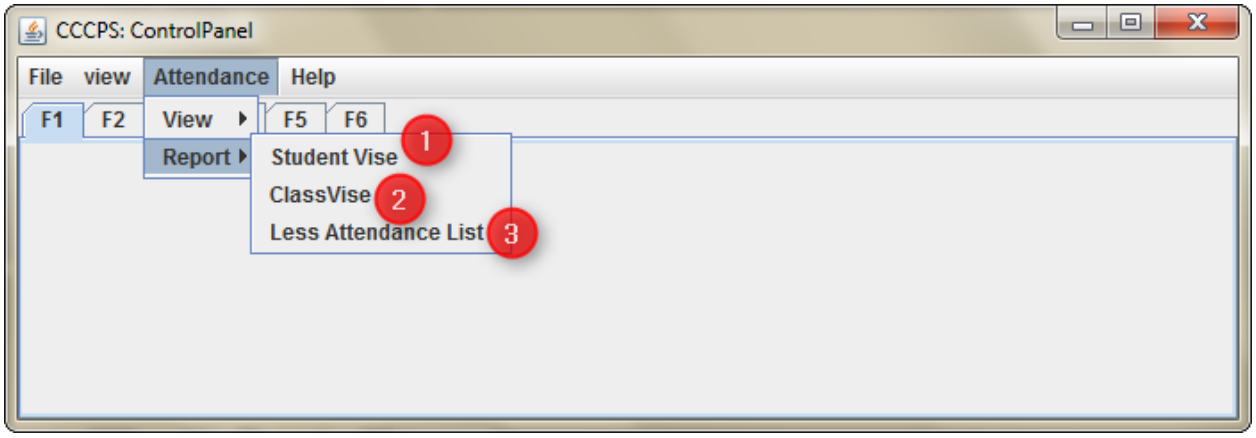
VIEW:



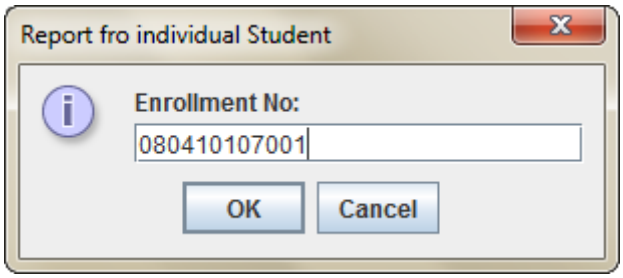
1. *View*: This is used to view the attendance of an individual student.
2. On clicking it will ask for en number and then show the attendance report of the current semester of that individual student of the current semester.



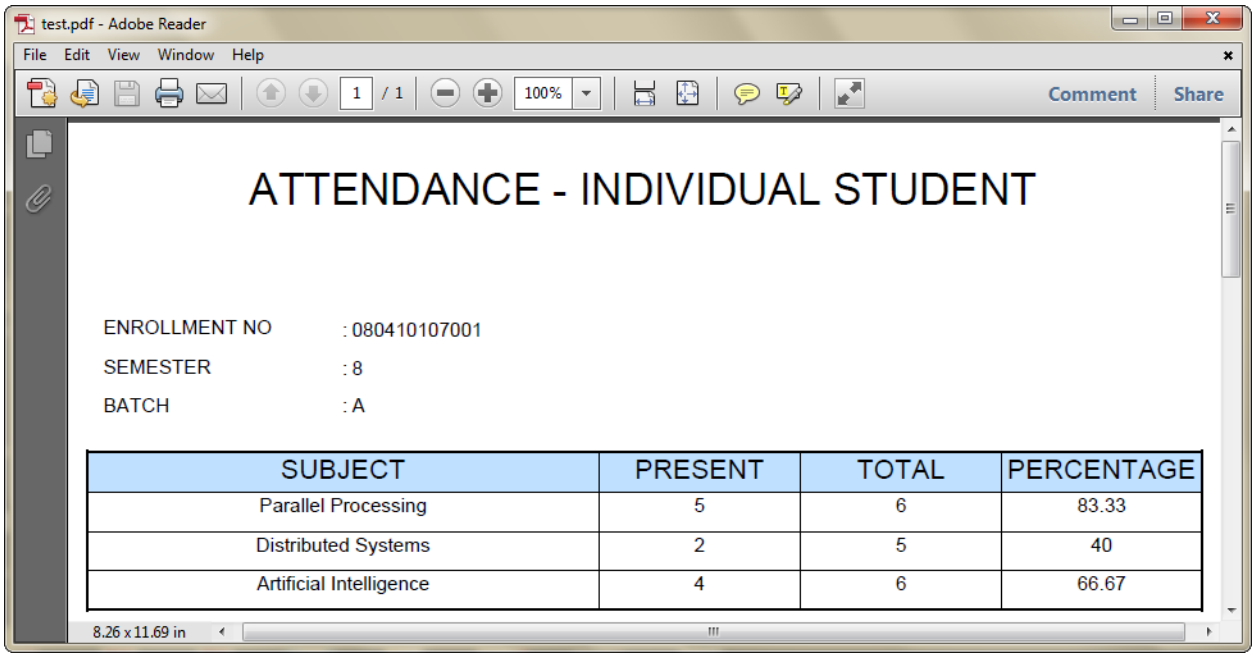
REPORT:



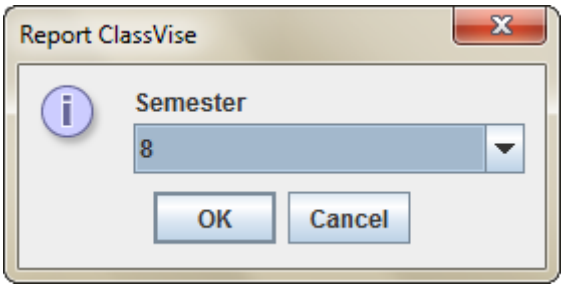
1. *Student vise*: This is used to generate a report for the individual student. User has to enter the enrollment no of the student as shown below and then a PDF file of report will be generated.



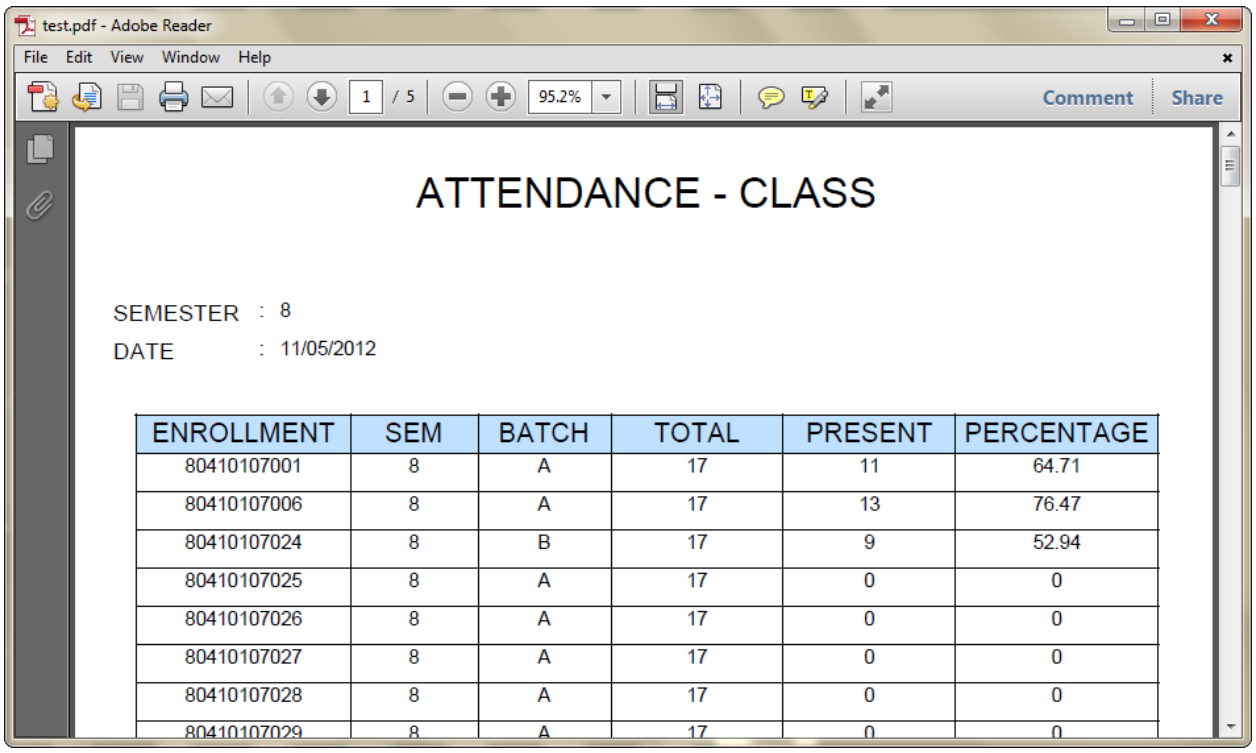
By pressing OK, and giving path of the location where the report is to be stored a PDF as shown below will be generated.



2. Class vise: This is used to gerate the report of the whole class,in first step the system asks for the class



And after pressing OK, a pdf will be generated as shown below,

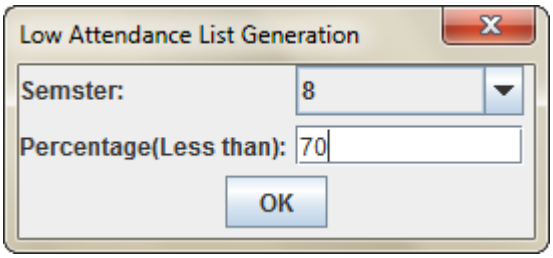


ATTENDANCE - CLASS

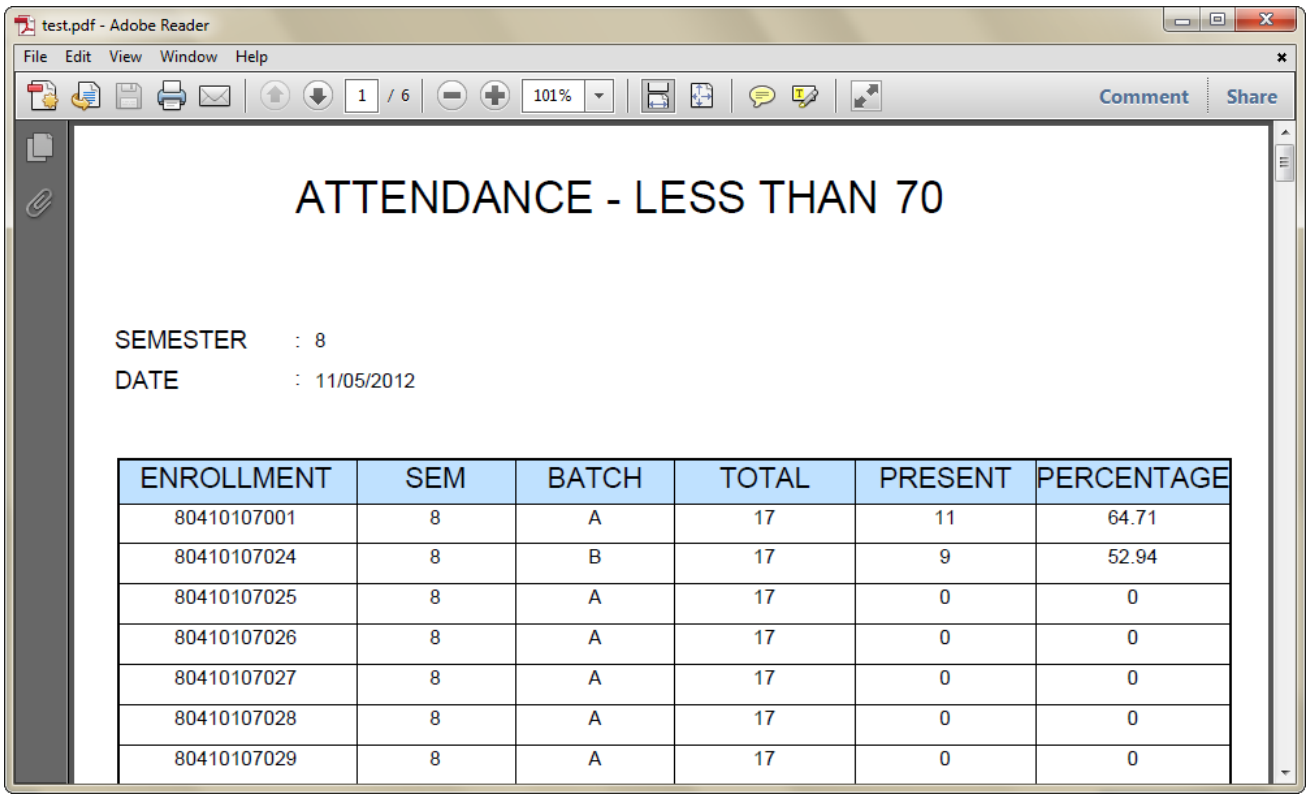
SEMESTER : 8
DATE : 11/05/2012

ENROLLMENT	SEM	BATCH	TOTAL	PRESENT	PERCENTAGE
80410107001	8	A	17	11	64.71
80410107006	8	A	17	13	76.47
80410107024	8	B	17	9	52.94
80410107025	8	A	17	0	0
80410107026	8	A	17	0	0
80410107027	8	A	17	0	0
80410107028	8	A	17	0	0
80410107029	8	A	17	0	0

3. Similarly this option is used for generating less attendance list, which shown the detail of the student who have attendance less than given percentage.



After pressing OK a pdf will be generated as shown below.



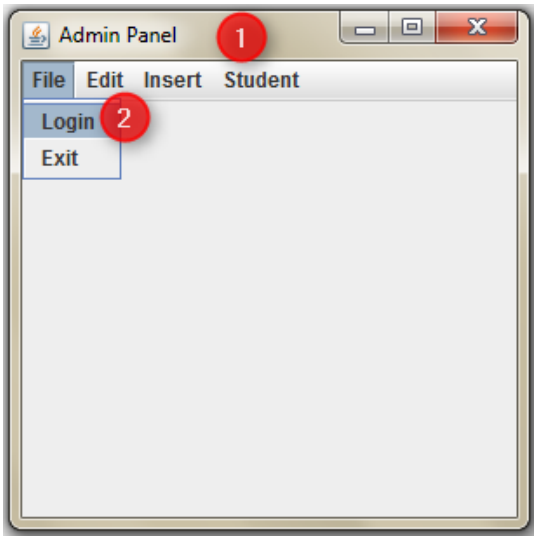
ATTENDANCE - LESS THAN 70

SEMESTER : 8
DATE : 11/05/2012

ENROLLMENT	SEM	BATCH	TOTAL	PRESENT	PERCENTAGE
80410107001	8	A	17	11	64.71
80410107024	8	B	17	9	52.94
80410107025	8	A	17	0	0
80410107026	8	A	17	0	0
80410107027	8	A	17	0	0
80410107028	8	A	17	0	0
80410107029	8	A	17	0	0

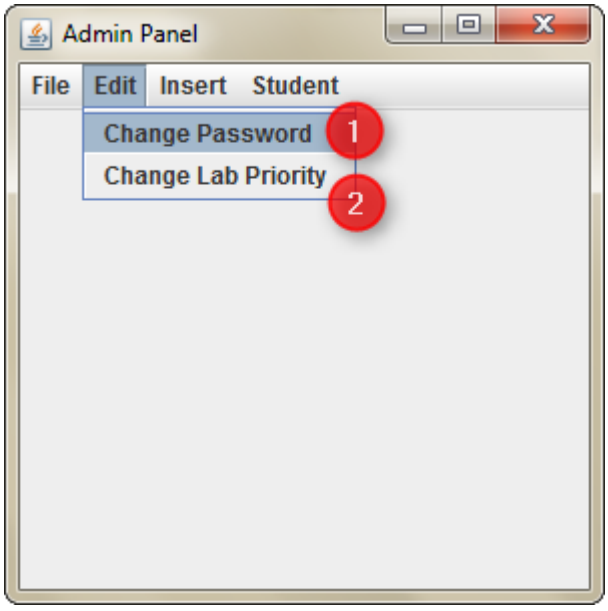
ADMIN PANEL:

Admin panel is only available to the administrator, the admin can login into the panel and perform database alteration, insertion and removal. The screen below shows the admin panel.



1. Admin panel window
2. *Login* menu item: On clicking this, admin username and password will be asked ,on entering them successfully , user will be logged in.

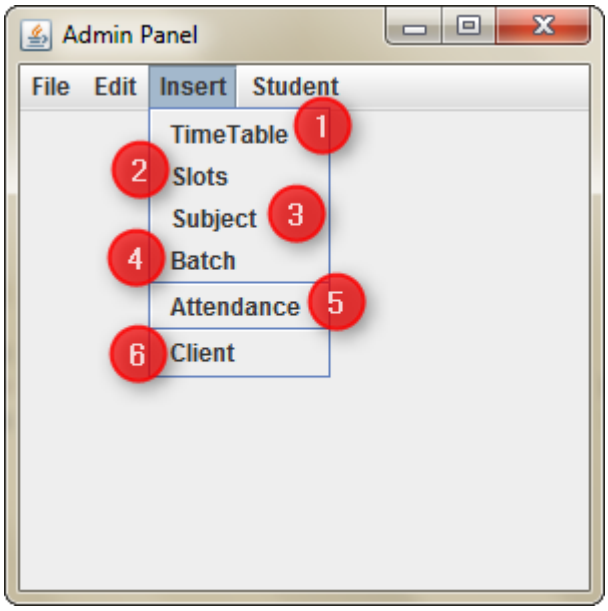
EDIT MENU:



1. *Change password*: Used to change administrator password.
2. *Lab priority* : Used alter the priorities of the IP addresses of a lab which are used for IP security. This feature will be useful in case a client pc goes down and a new client has to be setup.

INSERT MENU:

As the name suggests this menu is used to perform various types of insertion operations.

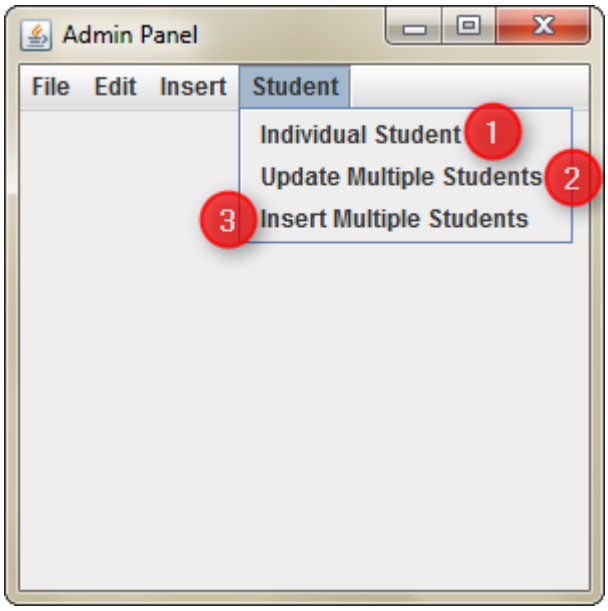


1. *Time Table*: is used to insert the time table details into the database.
2. *Slots*: is used to change the timetable slot details if there are any changes in the slots.

3. *Subject*: is used to enter and alter subject details of any particular subject in any particular semester.
4. *Batch*: is used to enter a new batch for a particular semester.
5. *Attendance*: is used to enter attendance of a student manually in the database. This is useful in the case of late arrival of the student.
6. *Client*: is used to enter details of all client pc's IP addresses along with their priorities in a particular lab

STUDENT MENU:

This menu is typically used for inserting/updating details of students.



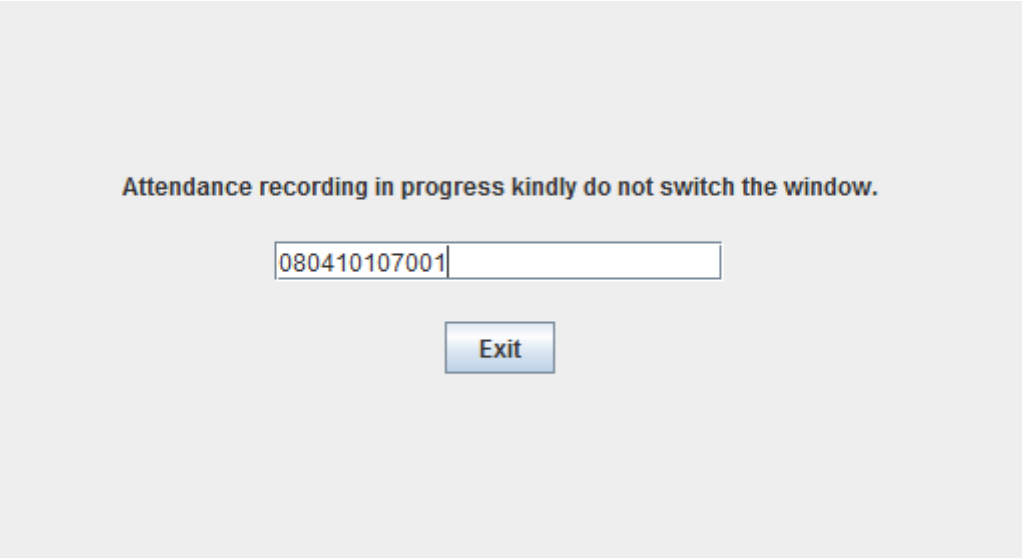
1. *Individual Student*: is used to enter/alter details of a particular student identified by his enrollment number.
2. *Update Multiple Students*: is used to update the semester of the students. This menu gives a list of all the students with a checkbox option to alter multiple entries in student database.
3. *Insert Multiple Student* : is used to allow insertion of multiple students from external file. Here a CSV file in the specific format is used as an input file.The format of the file is as shown below
   "En no","Barcode id","Semester","Batch"
   The values must be entered in a comma separated format as shown.

ATTENDANCE RECORDING UI:

At the beginning of each lab session the full screen attendance recorder will come up. Certain keys will be blocked during the attendance recording procedure, to prevent task switching. List of the keys blocked is as under:

Ctrl, Alt, Tab, Space, Fn keys, Esc, Enter etc.

The attendance recording GUI is as shown in next screen shot:



This is a full screen window that cannot be minimized or switched. The barcode from student's ID card will be read from the reader and shown in the textbox for a moment and then his attendance will be marked in the database. The Users are requested NOT to interfere into this process. Exit button should only be used in case of emergency as exiting from this will end the attendance marking session, which cannot be manually re-invoked.

TROUBLESHOOTING:

Issue: GUI at server is not changed even if a button is clicked many times.
Solution: Check the client computer's parallel port and the attached circuit. There are possibilities of loose connection or component failure.

Issue: Lab's are not being shownin their respective tabs.
Solution: Check whether the IP address of the pc connected to the parallel port is having priority "1" in the database.

Issue: Setup file shows some errors in installation procedure.
Solution: Run the setup file with "Run as Administrator" option.

APPENDIX - 3: REFERENCES

[1] *Electronics For You*, March 2005 issue PP 61-64

[2] *java.sun.com/developer/Books/javaprogramming/cookbook/11.pdf*

[3] *www.ibm.com/developerworks/java/tutorials/j-jni/j-jni-pdf.pdf*

[4] *java.sun.com/docs/books/jni/download/jni.pdf*

[5] *http://download.oracle.com/javase/tutorial/networking/sockets/index.htm*

[6] *http://en.wikipedia.org/wiki/Relay#Basic_design_and_operation*

[7] Client-Server Relationship, *www.eecs.berkeley.edu/~messer/netappc/Slides/05.ppt*

[8] *http://www.makebarcode.com/specs/speclist.html*

[9] *http://www.instructables.com/id/Computer-control-of-AC-devices/*

[10] *http://www.codeproject.com/KB/cs/control_e_appliances.aspx*

[11] *http://www.electro-tech-online.com/electronic-projects-design-ideas-reviews/126707-relays-getting-automatically-clicked-when-connected-ac-loads.html*

[12] *http://www.luberth.com/cstep/parallel.htm*

[13] *http://www.epanorama.net/circuits/parallel_output.html#input*

[14]