|  |  |
| --- | --- |
|  | **2011** |
|  | SEN Group 13 |

|  |
| --- |
| **[System Requirement Specification]** |
| This document is made to specify the capabilities of the software Connect2Learn. The functional, behavioral and quality requirements mentioned in this document, once agreed upon by the client shall become benchmark for the development team. |

|  |
| --- |
| **CONNECT2LEARN** |
| An interactive virtual classroom |

**TABLE OF CONTENTS**

**1. Introduction**

* Purpose………………………………………………………
* Scope…………………………………………………………
* Document Convention………………….………………….
* Definition and Abbreviation…………………………………….
* References………………………………………………………
* Overview………………………………………………………

**2. Overall Description**

* Product Perspective…………………………………………
* Product Features……………………………………………
* User classes and characteristics………………………………
* Operating Environment………………………………………….
* User Documentation………………………………………
* Constraints (Design and Implementation)………………
* Assumption and Dependencies………………………………

**3. Requirement Analysis**

* Background Reading……………………………………………..
* Interview with Stakeholders………………………………….
* Questionnaire……………………………………………………
* Group meeting…………………………………………………
* Participation in elicitation……………………………………..

**4. External Interface Requirements**

* User Interface…………………………………………………….
* Hardware and Software Interface………………………….
* Communication Interface……………………………………...

**5. Functional Requirements**

* Functional requirements………………………………………..
* Performance Requirements…………………………………...

**6. Other Non-Functional Requirement**

* Performance requirements…………………………………….
* Safety Requirements……………………………………………
* Security Requirements…………………………………………..
* Software Quality…………………………………………………

**7. Process Model** …………………………………………………

**8. Traceability Matrix** ……………………………………………

**9. Use Case Diagram** ……………………………………………

**10. Project Deliverables** ………………………………………….

**Appendix A** ………………………………………………………

**Appendix B** ………………………………………………………

**Introduction**

**1. Purpose**

The purpose of this document is to provide an overview of the capabilities of the system we are to build. It will define how our team and the client visualize the final product and the characteristics or functionalities it must have and also establishes the basis of understanding between the client and our developing team as to what the software would do. It provides all the functional, non-functional requirements, performance requirements and design constraints of our VIRTUAL CLASSROOM software. The specifications contained in this document will be used as base for development of the system in the later stages. SRS doesn't offer design suggestions, possible solutions to other related issues, or any other information other than what the development team understands the customer's system requirements to be. This document also makes note of the requirements which we plan to implement which are not mandatory for the functioning of our software.

**2. Scope**

The current perceived scopes of our software are as follows

* It shall make distributed learning a reality.
* It will help the students to have an interactive on-line session.
* It will work well even in the low bandwidth connections.
* The application is to override a web portal where the concerned information about the lectures would be posted, students can ask for a particular topic etc.
* Besides education, it can help professionals in business training programs, student clubs, NGO’s in their effort in rural areas etc.
* The application shall also be an excellent way to present presentations to an audience.
* The features like attendance, ‘hand-up’ and ask-questions shall make the application interactive and close to a real classroom.

**3. Document Convention**

The convention used in the size of fonts remains the same as for other documents in the project. The section headings have the largest font of 18; subheadings have a font size of 16. We have used Calibri as our font in the entire document.

**4. Definition and Abbreviation**

**Appendix A**

**5. References**

**Appendix B**

**6. Overview**

The remainder of this document is organized as follows:

**Section 2**

Overall description of project is been provided in this section. It mentions *the product perspectives, project features, user characteristics and classes*. In addition to this it also mention about operating environment, design and implementation constraints and various assumptions and dependencies taken by the system.

**Section 3**

It gives us the background reading and also tells us the purpose of *Questionnaire, Interview and group* meetings to be done during our project development.

**Section 4**

This section provides a description of the *user interface* for the different categories of proposed users. It also provides a description of the hardware, software and communication aspects of the interfaces involved.

**Section 5**

Functional requirements and brief description of each of the function is been provided.

**Section 6**

Provides a brief idea about our *non-functional requirements* namely performance, safety, security and software quality

**Section 7**

Tells about *the Process Model* we are following and reason behind using that.

**Section 8**

It contains *traceability Matri*x.

**Section 9**

Tells about the *Deliverables* we will deliver by the end of our software.

Finally, APPENDIX A and APPENDIX B for Definition, abbreviation and References have been presented for clear understanding of the document.

**Overall Description**

**2.1 Project Perspective**

The Software Engineering course structure requires a team of 9 members to be formed and develop a software with as high a degree of professionalism as possible by the end of the semester. The system that has been finalized for development is CONNECT2LEARN. The motivation behind this project being that the current implementations in this field require resources like high bandwidth which generally are not available in a remote or rural environment. One should keep in mind that this is not an attempt to improve upon the current systems but trying to build up a system more efficient and functional along the same lines from base up.

The system needs to aim at using the minimal bandwidth possible and still providing the general classroom experience. This being an interactive classroom the student will be able to ask the instructor any questions they like during the lecture which is not possible when learning from video tutorials. It also supports distributed learning.

**2.2Product Features**

* Doodle Screen: There would be a small screen where a Professor will write in what he wishes to explain to his students. All that is doodled over there should come to the Student’s screen without a significant lag. The Doodle Panel will also have the extra features like setting the color of the pen used, size of the Doodle Screen.
* Chat Box: This would be the small box below the Doodle Panel where a Student will be able to discuss with the Professor. This Box will also support the feature of Raising Doubts.
* Lecture as a Subtitle: What the Professor speaks will be translated to text and delivered to the Student without a significant delay.
* Raising doubts: The user types in his doubt and uses a Button to tell the Professor of presence of a doubt. The Professor has the liberty to entertain that doubt when he wishes to.
* Poll: The Professor gets the function to create a Poll, view its results, stop it and change it as and when he wishes to.
* Menu Bar: There would be a Menu Bar with functions like Close, Minimize, Maximize, and Modify Connection.

**2.3User classes and characteristics**

* Professor: He is the host of the lecture. He conducts the lectures.
* Students: They connect to the host server and attend the lecture. They form the User end of the entire interaction.

**2.4 Operating Environment**

The system will primarily be developed and tested on Microsoft windows based Operating Systems using JVM platform. But our goal is to make it a platform independent solution. The target platforms are:

* Linux
* Microsoft Windows
* MAC

**2.5 User Documentation**

To effectively provide products and services that meet stakeholders‟ and users' real needs, it is necessary to identify and involve all of the stakeholders as part of the Requirements Modeling process. Here we identify the users of the system and ensure that the stakeholder community represents them adequately. This section provides a profile of the stakeholders and users involved in the project and the key problems that they perceive to be addressed by the proposed solution. It does not describe their specific requests or requirements instead it provides the background and justification for why the requirements are needed.

**2.6 Constraints**

Constraints to be adhered to:

1. The product has to work in *low bandwidth environments*.

2. To ensure fast and efficient transfer as well as processing of images to minimize lag and give a feeling of *continuity*, matching as close as possible to a video.

3. The user is expected to have *minimal knowledge of the computer system*, and hence a user friendly system needs to be created.

**2.7 Assumption and Dependencies**

Assumptions

The following points are a prerequisite to using this software:

* Both the student and the instructor should be familiar with basic functions of a computer system (regardless of the operating system).
* Both the student and the instructor should be on a network architecture. The system is not targeted at any particular architecture, but it assumes one.(minimum bandwidth for the connection still under discussion)
* The instructor should have a microphone and a doodle pad with all the necessary drivers installed on his/her machine. In case of unavailability of a doodle pad/pen tablet, the professor needs to use the whiteboard and necessary tools provided in the software. He can also use mouse for doodling.
* The student should be familiar with the language being used by the professor.(Under discussion)
* The time of the lecture, global timeframe, is predefined and conveyed to the students for optimal results.

Dependencies

* Microsoft’s Speech API (SAPI) for speech-to-text and text-to-speech
* Drivers for the microphone and sound input and drivers for the pen tablet.
* JAVA Virtual Machine installed in the professor and student side computers.

**Requirement Analysis**

**3.1 Background Reading:**

For a deeper knowledge and better understanding of the system and to develop an insight about the project we visited many relevant websites and conducted research on our system from various other sources. We learnt about the existing virtual classroom projects ,the various features they provides and on what trade-offs so that we can built a system that can provide more functionalities efficiently. A detailed background study was done in order to provide a user friendly efficient system that can provides a real classroom environment.

**3.2 Interviews with Stakeholders:**

Purpose:

* To understand the current procedure and resources that is followed in current virtual classroom systems. That is to know how existing system works.
* To understand what are the functionalities and features that a current system lacks and due to what reasons. Also to understand what features a system can provide and on what trade-offs.
* To develop a common understanding as to what is included in, or excluded from, a project i.e. the proposed system. This is in terms of a broad idea about the deliverables and the functionalizes that the proposed system will provide
* Preliminary Meeting to gather the requirements, needs and current implementations of virtual classrooms.

**Summary of Professors’ Interview:**

To get an idea of the response to CONNECT2LEARN, we questioned some professors who could turn out to be users of the system in future. When asked about the need and usability of such software in present day scenario, most of the professors gave a positive response to this idea, and were willing to use it. Some, though, were of the opinion that such a teaching methodology will be very mundane, and will not be able to capture the interest of the audience.

* A common requirement was to maximize interactivity. A poll (multiple choice questions to be answered by students, followed by a performance graph) was highly appreciated by all. Also, a search feature to quickly browse through the recorded lectures was suggested. Another proposal was for the professor to divide the lecture into small segments, anticipate areas of difficulty and allow all students to participate in a question answer session at regular intervals. Some of the professors insisted on the concept of collaborated learning rather than competitive learning, and hence encouraged a facility for students to be able to discuss issues amongst themselves, though this was also seen as a major distraction.
* Writing with a mouse was seen as a major hurdle and inconvenience for the professors, thus making the presence of a digital writing pad or tablet PC almost inevitable.
* Overall, the project idea was well appreciated and the professors look forward to such a system.

**3.3 Purpose of Questionnaire:**

* To know what is the majority of opinions on the system.
* To measure the quality of features of the system.
* It is also a main source of information for many other evaluation activities.
* It also give an idea about what is the belief, behavior and attitude of the respondents towards the project
* To improve data quality by bringing clarity and consistency and improve the tasks of data entry and analysis.

**Summary of questionnaire**

1. **Have you ever used a virtual classroom kind of software?**

Most of the students interviewed had not used any kind of virtual classroom before. It shows either unpopularity or unawareness of studying through such an interface.

1. **Have you ever done a correspondence or a distance learning course?**

**If yes, what are the advantages and disadvantages you felt?**

Those who have used a correspondence course in the past, they have a general view that distance learning saves time and money. It can also be used to study from anywhere.

But, on the other hand, not all doubts can be solved by joining such a distance learning course.

Some even had the feeling that due to distance learning, there was no compulsion, no pressure to study; which wasn’t good for the student.

1. **What are your ideas for a virtual classroom?**

By using such a virtual classroom method to study, we can get the opportunity to study through different Professors. If we are not able to understand what one professor is explaining, we can study through another professor.

For students who feel shy to ask doubts in front of other students, a virtual classroom will allow the student raise his/her doubts anonymously.

Some students even feel that with recorded lecture, it would be easy to get back to topics which they have not understood properly.

1. **What features you think should be incorporated?**
2. **Whiteboard**
3. **Video**
4. **Hands up(questions asked during session)**
5. **Attendance**
6. **Recording of lecture**

Nobody wants Attendance to take place. Other features were necessary for a proper learning experience. Some students wanted interaction with peers as a necessity for query sharing and solving doubts amongst the students itself.

1. **Do you think it’s a good idea to just provide subtitles and snapshots instead of video/voice?**

We got a mixed opinion from people. Some students told they would not be comfortable to study without having any kind of Audio from the Professor. A few said they would get adjusted to the condition and absence of Audio will not affect them much.

1. **Do you think students can understand this way?**Many students said that having a real classroom was much better than a virtual classroom. Understanding the concepts would not be as easy as it would be in a real class. But they also pointed out that such a method of studying would be good for children who are not able to get proper teachers, especially in villages.
2. **Do you think that nowadays we have enough bandwidth to support live video lectures?**Students who want to study through such a method would find sufficient bandwidth internet connection. Some Students said that with increasing technology, especially with the introduction of 3G, bandwidth problem would not remain for long.

**3.4 Group meetings:**

Analysing the quality and conflicts of stake holder’s opinion and to perform collation of those estimates and come to a final decision that is most appropriate and beneficial for the proposed system. Through group meetings we tried to bring a consistent and clear solution to all the ambiguities that was created during questionnaires and interviews from different sources.

**3.5 Participants in the Elicitation:**

* Group members
* Stakeholders
* Faculty
* Students

**External User Interface**

**1.User Interface**

The user interface required for the software has to be having the stated utilities but keeping in mind the ease of handling the software and user-friendly feature of connect2learn software. The user interface can be broadly classified into:

A) On the Professor End

1. Doodle Panel
2. Chat Box
3. Drawing-Tool Panel(enabled only at the professor end)

4) Menu Bar

5) Notification Panel

6) Poll Panel

B) On the Student End

1) Doodle Panel

2) Chat Box

3) Subtitle Panel

4) Menu Bar

5) Poll Panel

6) Extra features

Doodle Panel

* **Server End:** It will be the main panel consuming about 60-70% of the screen. It will enable the lecturer to scribble the lecture notes. Such functionality gives the software a feel of a classroom and thus makes it more user-friendly.
* **Client End**: The doodle panel on the client end has simple display functionality. It displays all the scribbled material by the lecturer.

Drawing-Tool Panel

A sub-panel of the main panel should have extra facilities for setting the size of the doodle panel, setting the width of lines drawn, setting color of the doodle pen. Other functionalities to be provided in the drawing tool will be different shapes (in both 2-D and 3-D) to be included for giving an illustrative lecture. This is visible and enabled only at the server end (to prevent students from scribbling anything and giving the permission to scribble only to the lecturer)

Chat Box

* **Server End**: The software should have a small area or panel to enable users to chat (peers cannot chat with each other and there can be communication only between the lecturer and the student). The chat box enables the person at server end to answer any question by typing in the answer.
* **Client End**: The chat box at client end has a button attached to it, which on being clicked sends a notification to the lecturer. Along with sending notification, the button enables the client to type in his/her question

Notification Panel

It is a functionality provided at the server end that displays a list of users connected to the portal referring to that particular lecture. It has an added functionality of blinking the name of the user whenever it receives any notification message. On clicking the highlighted user, the chat box at server end should get enabled so that the lecturer can access the question asked by student and also reply by typing in the answer.

Poll Panel

* **Server End**: A rectangular area below the notification panel that enables the lecturer to type in the question for quizzing students. It gives the lecturer a general idea whether the students are able to understand the things being taught. Along with the question, the poll panel should enable the lecturer to add options for asking multiple-choice questions. An added feature to the poll panel can be the received answers can be plotted on a graph after the poll closes (a time set by the lecturer).
* **Client End**: The poll panel on the client end has no such privileges and just displays the question asked and options with checkboxes to answer. It should have an answer button that sends the option selected by the student.

Subtitle Panel

A subtitle panel should be placed just below the doodle panel that displays text (received from the server end obtained after speech to text conversion). It is a functionality provided only at the client end.

Extra features

A panel provided on the client end facilitates the student with some extra features like a dictionary (to enable the user to refer to dictionary meaning of any word mentioned during the lecture)

**2.Software and Hardware Interface**

Software Interface

Software Interface on the Server side should comprise of the following components:

1. XAMPP
2. Apache Tomcat 6.0 will be used as web server
3. Database Server: MySQL
4. Operating System: Our system is a free-ware. Thus, the latest Microsoft, Linux or Mac or OS X can be used.
5. Development Tools: Rational Suite Enterprise, NetBeans IDE, XAMPP server

The software interface on the client side would have nothing more than a working OS

Hardware Interface

The hardware interface for the application is a Computer System with QWERTY Keyboard and other finely working hardware components like monitor screen (in case of a PC) or a mouse. The application primarily deals with making an entry to the central database.

The computer system is to be equipped with the following hardware requirements for proper functioning:

* 256 MB of RAM (Physical Memory)
* Processor - ‘P3’ or greater
* Additional Hard disk space for software installation of at least 100MB
* Ethernet Card (10/100)

Communication Interface

The Communication module we have developed is a web based system that follows the traditional server-client architecture. Using this model, a lecturer would create a server host process on his computer and students will connect to that server on a paaticular predecided date and time on an ip address notified by to the students beforehand.We are not using any sophisticated network models as this one is very easy to handle and implement.

The client is a computer with access to the Internet, running a student version of the software.The client communicates with the application server via the Hypertext Transfer Protocol(HTTP) and TCP/IP protocol.In this configuration, the application server provides authentication services to the instructor as to get the lecturer privileges and student logins should also be provided.

**Functional Requirements**

**5.1Objective:**

Develop a virtual classroom system to promote a greater count of students to splurge into the field of Education. It integrates the benefits of a physical classroom with the convenience of a ‘no-physical-bar’ virtual learning environment, minus the commuting hazards and expenses. It will usher in the immense flexibility and sophistication in the existing learning platform structures, with the perfect blend of synchronous and asynchronous interaction. It provides a means of collaborative learning for the students.

In order to do so we are creating a web portal where we will allow users to register. Users are of mainly two types in our project, one is Instructor and other is Student. At the time of registration the users are asked to enter their personal details, course preferences, courses they want to listen to(Suggestions) and if the user is Instructor he is asked to enter his/her Qualification, his/her specialization and on what topic he want to take up.

**5.2 Functional Requirements**

**Students View**

* Student should register on the website to view the lectures.
* Students must have valid User ID and password to login thus creating their individual profiles.
* Students can choose courses and enroll in them if he/she is interested.
* After enrolling in the course, students are mailed a link where he/she can connect through software developed according to schedule mentioned in the site.
* Students can attend lectures either at the scheduled time or on request view lecture at a later time.
* Student can upload and download of various assignments, student’s notices, journals, videos.
* Asynchronous communication in the form of Emails, discussion boards that enable communication to occur at "convenient- times" that suit student schedules and are not accessed at simultaneous or prearranged times.
* There can be forums, blogs etc., to discuss various queries and to put up suggestions posted both by students and teachers.
* Shared documents and media library that can help in active learning of a student.
* Students can take up various quizzes which can help them to realize were they stand.
* Students are also given Hands Up feature were he is given an option to interrupt Insructor.(To ask a Query).

**Instructor's view:**

* Instructors should register and create an account on the name of the course.
* If the Instructor wants to teach another course he/she are asked to create another account but no to accounts are given same schedule.
* Instructor can take lectures, upload assignments, announcements, evaluate answer sheets and also can upload lectures and other discussions in various formats as in videos, power point presentation etc.
* Instructor's is given a option to take attendence of the students connected.
* Instructor is given a check box where he/she is supposed to queries asked by students through Hands Up feature or at the end

**5.3 Performance requirement**

This software should perform in the same way irrespective to its Operating System environments. An internet connection with a minimum bandwidth of 40 kbps is required, and may still lead to some amount of time lag between the teacher and student. The time taken for importing files and multimedia presentation should be less than a minute, depending on the file size, its contents and the capabilities of the underlying hardware.

**Non Functional Requirements**

**6.1 Performance Requirements:**

* The system should be able to handle around 50 users when working at the minimal bandwidth of 30 kbps.
* Responding to frequent ‘hand up’s (more than 5 per minute) can make the system quite slow and inefficient.
* Whiteboard should be used properly, for teaching purposes only. Scribbling too much too fast on the whiteboard will not be retrieved wholly and clearly on the students’ screen.

**6.2 Security Requirements:**

A trivial security issue is to ensure that proper authentication and authorization checks are performed for the users of the software so that no user can access or modify the work of another user. However, any one can start a new class as a teacher if he/she has students attending the class, and there cannot be kept a check on what is being taught or discussed.

**6.3Quality requirements:**

Quality has a number of attributes. Some of the important attributes for this software are

Portability: As this software is to work on multiple platforms portability is an essential attribute and we ensure this by using JAVA as our programming language.

User Training: We assume that the users already have some previous experience in working with basic computer applications and devices, as well as have the minimum knowledge required to use the internet. So the users will not need any specific training for using this software.

Testability: As a basic characteristic the software needs to be testable to ensure correctness.

**6.4 Safety Requirements:**

This software does not pose any serious threat to the computer or the users. It does not involve sharing of any personal information, and also has no monetary transactions.

**Process Model**

After looking at the merits and demerits of all the models, we decided on a type of evolutionary model that would be suitable for us. The fact that even the most basic version of our project can be used as a working application by the client made **evolutionary model** as the best available choice for our project. We plan to build on this basic model, adding new modules and refining the earlier ones with each new version. Following are the reasons for us choosing a flavour of the evolutionary model:

1.Product can be easily divided into modules based on functionality – E-Whiteboard, Speech-to-text module, Networking aspect, plug-ins, other features like attendance, hands-up, lecture log etc.

2. Functionalities in the core product can be improved in later versions, thus giving us the power to focus fully on the main core of the software and main aim of achieving minimal bandwidth usage.

3. The ability to dilute the risks of the core, which requires more time and effort shall be borne by appropriate number of people which is facilitated by the incremental model.

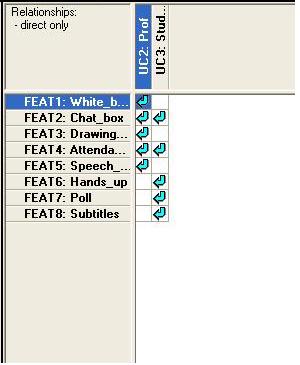
4. Gives time to work on technology and detailed design of later versions later. Thus the aspect of modularity and breaking down the problem works to our advantage in two ways:   
a) decreases the load in each iteration, thus we can tackle each problem at a time

b) The risks are broken down.

5. Efficient usage of man power as parallel work on the other modules can be started while one is being tested.

6. As each release demands coverage of all the aspects of the development cycle of requirements, design, development and testing of a module, each member shall get an opportunity to learn the principles of software engineering.

**Traceability Matrix**



**USE CASE**

**Use Case Diagram**

**9.0 Project Deliverables**

Software application:

**Software:** Connect2Learn is virtual classroom software which shall give a package containing an .exe file by which it can be directly installed on the user’s computer easily as it will deploy for public use. It will have two different soft, for both professors and the students.

**User Manual:** Will contain the necessary instructions and guidelines for using this software.

An effort to provide with the respective running environment along with the package will be made.

Documentation:

The following documentation would be provided:

**Project Plan:** It is a document to guide project execution and project control. It defines the project objectives and goals to be achieved and plans on the milestones to be achieved within the deadline and the resources required on the project.

**Software Requirements Specification:** After an exhaustive requirements gathering phase, these requirements shall be documented and presented as a SRS report. It gives all the requirements of the software under development e.g. tools that teachers like while doodling etc.

At the end of the project it will contain the details of the functional requirements like interaction, notes, speech-to-text etc and will contain a set of use cases which describes all the interaction which user can have with the software. The System Traceability Matrix shall be provided inside the SRS report.

**Design Model:** The design of the system has a major impact on the later phases like testing and maintenance and is perhaps the most critical factor affecting the quality of the software. The layout of the application as to where and how the different modules like doodle pad, speech-to-text, plug-ins etc are to work individually and synchronously. Design model builds on the analysis model by describing, in greater detail, the structure of the system and how the system will be implemented.

**System Test Plan:** Provides a systematic approach for testing the newly made software. It shall include all the test cases and results expected out of the software. The test cases and environment shall check the robustness of the application.

**Appendix A**

**Appendix B**