WestVirginiaUniversity
THE RESEARCH REPOSITORY @ WVU

Graduate Theses, Dissertations, and Problem Reports

1998

Implementation of courseware for Internet delivery

Sohail Ramzan Khan
West Virginia University

Follow this and additional works at: https://researchrepository.wvu.edu/etd

Recommended Citation

Khan, Sohail Ramzan, "Implementation of courseware for Internet delivery" (1998). *Graduate Theses, Dissertations, and Problem Reports*. 916.
https://researchrepository.wvu.edu/etd/916

IMPLEMENTATION OF COURSEWARE FOR INTERNET DELIVERY

by

Sohail Khan

A thesis submitted to the Faculty of

College of Engineering and Mineral Resources

at

West Virginia University

In Partial Fulfillment of the Requirements for

The Degree of Mater of Science

in

Engineering of Mines

West Virginia University

December, 1998

ACKNOWLEDGMENTS

ABSTRACT

A process centered environment for implementing courseware is presented. The proposed environment addresses some of the constraints in the existing state of the art technology, presently used for distance education. The environment interface is developed using MS FrontPage 98 web development software. The thesis describes the design and implementation of the environment, which is named WVUCT. WVUCT utilizes MS NetMeeting software as a mode for interacting with the students in many different ways. WVUCT uses MS FrontPage 98 for developing a web-based course. The course web once developed using the environment can be published to any httpd server for student's use as well as instructor use. The process model presented specifies the major and minor steps, which can be followed by instructors in preparing effective web-based educational modules. These modules may include lecture notes, assignments and tests. At each step of the process, the environment provides templates and examples on developing the different parts of an educational module using suggested tools and resources. The process model assumes no previous experience on the part of instructors in developing web-based educational modules.

TABLE OF CONTENTS

TABLE OF CONTENTS

(Continued)

TABLE OF CONTENTS

(Continued)

LIST OF FIGURES

Number   **Page**

GLOSSARY

Analog: A signal that is received in the same form in which it is transmitted, while the amplitude and frequency may vary.

Amplitude: The amount of variety in a signal. Commonly thought of as the height of a wave.

American Standard Code for Information Interexchange (ASCII): A computer language used to convert letters, numbers, and control codes into a digital code understood by most computers.

Asynchronous: Communication in which interaction between parties does not take place simultaneously.

Asynchronous Transmission Mode (ATM): A method of sending data in irregular time intervals using a code such as ASCII. ATM allows most modern computers to communicate with one another easily.

Audio Bridge: A device used in audioconferencing that connects multiple telephone lines.

Audioconferencing: Voice only connection of more than two sites using standard telephone lines.

Backbone: A primary communication path connecting multiple users.

Band: A range of frequencies between defined upper and lower limits.

Bandwidth: Information carrying capacity of a communication channel.

Binary: A computer language developed with only two letters in its alphabet.

Bit: Abbreviation for a single binary digit.

Byte: A single computer word, generally eight bits.

Browser: Software that allows you to find and see information on the Internet.

Central Processing Unit (CPU): The component of a computer in which data processing takes place.

Channel: The smallest subdivision of a circuit, usually with a path in only one direction.

Codec (COder/DECoder): Device used to convert analog signals to digital signals for transmission and reconvert signals upon reception at the remote site while allowing for the signal to be compressed for less expensive transmission.

Compressed Video: When video signals are downsized to allow travel along a smaller carrier.

Compression: Reducing the amount of visual information sent in a signal by only transmitting changes in action.

Computer Assisted Instruction (CAI): Teaching process in which a computer is utilized to enhance the learning environment by assisting students in gaining mastery over a specific skill.

Cyberspace: The nebulous "place" where humans interact over computer networks. Coined by William Gibson in Neuromancer.

Dial-Up Teleconference: Using public telephone lines for communications links among various locations.

Digital: An electrical signal that varies in discrete steps in voltage, frequency, amplitude, locations, etc.. Digital signals can be transmitted faster and more accurately than analog signals.

Digital Video Interactive (DVI): A format for recording digital video onto compact disc allowing for compression and full motion video.

Distance Education: The process of providing instruction when students and instructors are separated by physical distance and technology, often in tandem with face-to-face communication, is used to bridge the gap.

Distance Learning: The desired outcome of distance education.

Download: Using the network to transfer files from one computer to another.

Echo Cancellation: The process of eliminating the acoustic echo in a videoconferencing room.

Electronic Mail (E-mail): Sending messages from one computer user to another.

Facsimile (FAX): System used to transmit textual or graphical images over standard telephone lines.

Fiber Optic Cable: Glass fiber that is used for laser transmission of video, audio, and/or data.

File Transfer Protocol (FTP): A protocol that allows you to move files from a distant computer to a local computer using a network like the Internet.

Frequency: The space between waves in a signal. The amount of time between waves passing a stationary point.

Frequently Asked Questions (FAQ): A collection of information on the basics of any given subject, often used on the WWW.

Full Motion Video: Signal which allows transmission of complete action taking place at the origination site.

Fully Interactive Video: (Two way interactive video) Two sites interact with audio and video as if they were co-located.

Home Page: A document with an address (URL) on the world wide web maintained by a person or organization which contains pointers to other pieces of information.

Host: A network computer that can receive information from other computers.

Hyper Text Markup Language (HTML): The code used to create a home page and is used to access documents over the WWW.

Hypertext Transfer Protocol (HTTP): The protocol used to signify an Internet site is a WWW site, i.e. HTTP is a WWW address.

Httpd: HTTP Demon.

Hypertext: A document which has been marked up to allow a user to select words or pictures within the document, click on them, and connect to further information.

Instructional Television Fixed Service (ITFS): Microwave-based, high-frequency television used in educational program delivery.

Integrated Services Digital Network (ISDN): A telecommunications standard allowing communications channels to carry voice, video, and data simultaneously.

Interactive Media: Frequency assignment that allows for a two-way interaction or exchange of information.

Internet: An international network of networks primarily used to connect education and research networks begun by the United States government. Internet Protocol (IP): The international standard for addressing and sending data via the Internet.

Listserv: An e-mail program that allows multiple computer users to connect onto a single system, creating an on-line discussion.

Local Area Network (LAN): Two or more local computers that are physically connected.

Microwave: Electromagnetic waves that travel in a straight line and are used to and from satellites and for short distances (i.e., up to 30 miles).

Modem: A piece of equipment to allow computers to interact with each other via telephone lines by converting digital signals to analog for transmission along analog lines.

Mosaic: An example of browser software that allows WWW use.

Multimedia: Any document which uses multiple forms of communication, such as text, audio, and/or video.

Multi-Point Control Unit (MCU): Computerized switching system which allows point-to-multipoint videoconferencing.

Netscape: An example of browser software that allows you to design a home page and to browse links on the WWW.

Network: A series of points connected by communication channels in different locations.

On-Line: Active and prepared for operation. Also suggests access to a computer network.

Origination Site: The location from which a teleconference originates.

Point of Presence (POP): Point of connection between an interexchange carrier and a local carrier to pass communications into the network.

Point-to-Point: Transmission between two locations.

Point-to-Multipoint: Transmission between multiple locations using a bridge.

PPP: A software package which allows a user to have a direct connection to the Internet over a telephone line.

Protocol: A formal set of standards, rules, or formats for exchanging data that assures uniformity between computers and applications.

Satellite TV: Video and audio signals are relayed via a communication device that orbits around the earth.

Serial Line Internet Protocol (SLIP): Allows a user to connect to the Internet directly over a high speed modem.

Server: A computer with a special service function on a network, generally receiving and connecting incoming information traffic.

Slow Scan Converter: Transmitter/receiver of still video over narrow band channels. In real time, camera subjects must remain still for highest resolution.

Synchronous: Communication in which interaction between participants is simultaneous.

T-1 (DS-1): High speed digital data channel that is a high volume carrier of voice and/or data. Often used for compressed video teleconferencing. T-1 has 24 voice channels.

T-3 (DS-3): A digital channel which communicates at a significantly faster rate than T-1.

Telecommunication: The science of information transport using wire, radio, optical, or electromagnetic channels to transmit receive signals for voice or data communications using electrical means.

Teleconferencing: Two way electronic communication between two or more groups in separate locations via audio, video, and/or computer systems.

Transmission Control Protocol (TCP): A protocol which makes sure that packets of data are shipped and received in the intended order.

Transponder: Satellite transmitter and receiver that receives and amplifies a signal prior to re-transmission to an earth station.

Video Teleconferencing: A teleconference including two way video.

Uniform Resource Locator (URL): The address of a homepage on the WWW.

Uplink: The communication link from the transmitting earth station to the satellite.

World Wide Web (WWW): A graphical hypertext-based Internet tool that provides access to homepages created by individuals, businesses, and other organizations.

Chapter 1

INTRODUCTION

Distance education is strategic to the 21st century university. While the first and second generations of distance education were delivered through print and broadcast media respectively, the third generation of distance education requires interactivity. Interactive technologies from the convergence of telecommunications and computers span distance but also foreshorten time. The ability to increase the speed of access and cycles of feedback has fundamentally reshaped the way that the economy and business work in today's world. Distance learning is simply defined as delivering courses to remote sites. Distance learning also involves a physical separation of faculty and students. The thought of transforming a conventional university course to the Internet platform can be very intimidating to an instructor not familiar with the process[1]. Effective use of students and technical people can ease this burden. Teaming with colleagues who have transformed courses provides a support group for speeding up the process. Incremental deployment and testing of a rapidly developing technical environment is accepted by most students, because they have a desire to be on the technological edge[2].

The student clientele also has changed and will continue to change. A higher percentage of students seeking university level courses will prefer to receive courses outside the traditional campus classroom and outside the weekday, daytime class schedule[3]. Some will want to move at a pace other than that typical of the conventional university term. Even traditional students, having a broader selection of course options, likely will avail themselves

of alternative course offerings. Furthermore, students enrolling in college courses will have more variable academic backgrounds and may not have the expected prerequisite courses.

Noam [4] asserts that the university as we know it has outlived its usefulness and that traditional university functions, such as a repository for information and a meeting place for scholars, are rapidly being taken over by other institutions (e.g., websites and professional societies, respectively). A third function, transmission of information, which includes the teaching role, also is likely to be partly supplanted by electronic alternatives. This change comes not necessarily on the basis of superior methods but, rather, due to lower costs. Traditional classes that simply involve transfer of information will be the first to be replaced, leaving primarily contact-intensive programs as survivors in university residence curricula. Although these assertions are highly speculative, they have an element of credibility.

As developing countries enter the information age and recognize the need to learn the latest technologies, they will create a new market for US higher education offerings, an opportunity likely not to be overlooked by university administrative officers seeking new sources of revenue[3,10].

Distance education is making its way as more and more universities are setting up courses, which can be taken by the student's off-campus as well as on-campus. The existing tools, which are presently being used are lacking the concept of interactivity, such as streaming audio. It is important that the instructors should be able to deliver the lecture, as they do in classrooms while still maintaining the fact that the students should be able to access the course material at their leisure.

Chapter 2

BACKGROUND

This chapter introduces the concept of distance education, and the organizational hierarchy currently used in distance education programs. Survey of the tools currently developed for distance education at the universities is presented with their features. Finally the assumptions and objectives of the research are listed.

2.1 An Introduction to Distance Education

In recent years, educators have witnessed the rapid development of computer networks, dramatic improvements in the processing power of personal computers, and striking advances in magnetic storage technology. These developments have made the computer a dynamic force in distance education, providing a new and interactive means of overcoming time and distance to reach learners. The Internet is the largest, most powerful computer network in the world. It encompasses 1.3 million computers with Internet addresses that are used by up to 30 million people in more than fifty countries. As more and more colleges, universities, schools, companies, and private citizens connect to the Internet either through affiliations with regional not-for-profit networks or by subscribing to information services provided by for-profit companies, more possibilities are opened for distance educators to overcome time and distance to reach students. The WWW is an exciting and innovative front-end to the Internet. The WWW provides Internet users with a uniform and convenient

means of accessing the wide variety of resources (pictures, text, data, sound, video) available on the Internet. Popular software interfaces, such as Mosaic and Netscape, facilitate navigation and use of the WWW. The central organizing feature of the WWW is the "home page". Every organization and even every individual user of the WWW can create a home page that contains whatever information they want to present. The hypertext capabilities of the WWW facilitate linking of information within your own home page and with all other home pages on the WWW.

Distance education via satellite has been around since the early 80s but the concept of low cost distance learning was evolved with the technological development of the World Wide Web(WWW). The concept is simple, which is to provide education to people who cannot attend the regular class sessions at the universities. The sophistication in the technology towards the web browser, and at the same time with improved software used for web page development and publication, it is apparently easy to build a web site where people can publish information. This information can be used for education purpose, which is nothing but distance education. The word distance signifies the physical separation between the author of the web page and the person, who can be anywhere in the world, accessing the information from the web site by using a web browser.

2.2 Organizational Hierarchy Presently Used

The World Wide Web (WWW) is a framework of httpd servers which essentially deliver documents encoded in HTML format. Browsers like Netscape, Internet Explorer act as clients to the httpd server, requesting documents and displays the documents transmitted by the httpd server.
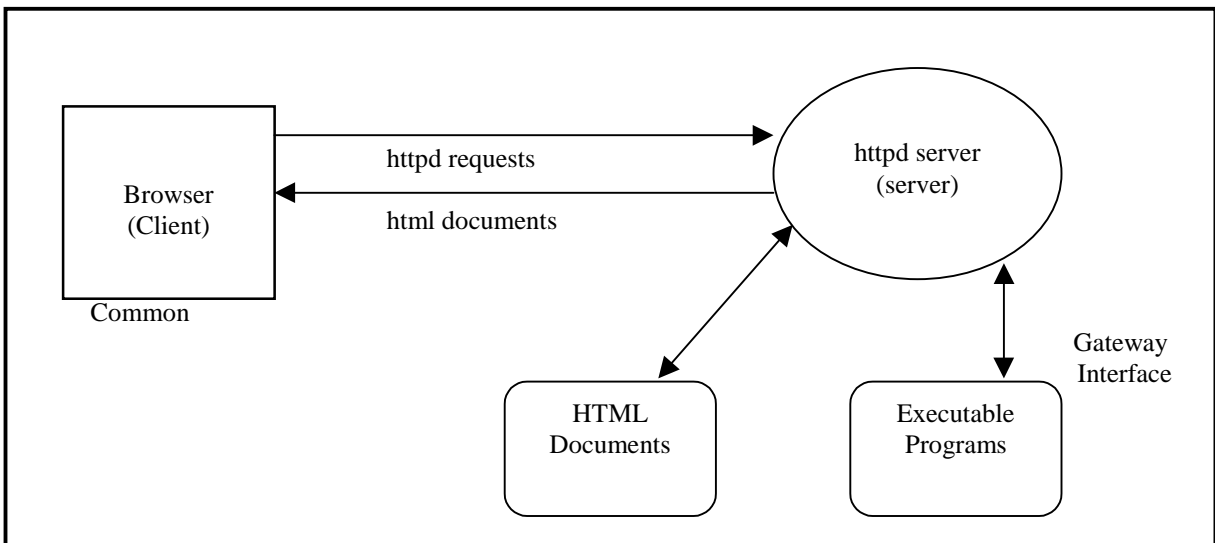
Figure 2.1: Organization hierarchy presently used for distance education

When the user clicks on a hypertext link or submits a form, the browser (client) makes an httpd request. The client sends information on the requested document in the case of an hypertext link, and the inputs in the form and the executable to which the inputs should be delivered in the case of a form, to the httpd server. Based on the nature of the request the httpd server either delivers the html document or executes the script identified by the client and transfers the inputs to the script. The script processes the inputs and generates the outputs in HTML format. The httpd server forwards this output to the browser. The Common Gateway Interface (CGI) is a mechanism supported by the httpd server to interact with executable scripts. The scripts are executable programs, which are stored in the cgi-bin directory, beneath the httpd directory. The httpd server also provides a means to store executables in other directories with which the httpd server can interact.

In the presently used distance education model the instructor prepares the html documents of the course material, such as syllabus, notes, assignments, quizzes, exams etc., and puts them on the httpd server (publish). Students at their ease use the browser to access the course information and send the completed assignments and exams to the instructor through email or the form submit option as explained before. CGI executable programs are being used for different applications such as form results automatically checked by feeding the results.

2.3 Survey of State of The Art Tools

Two of the existing tools for Distance Learning developed by the University Research groups are;

    1. ClassNet.

    2. WebCT.

2.3.1 ClassNet

ClassNet[5] is a World Wide Web server software, which manages Internet class activities. Some of the activities include

* Creation of a class by an instructor

* Enrollment in the class by students.

* Creation of tests.

* Submission and grading of tests.

* Reporting of scores by class and student.

* Discussion forums and chat rooms.

* E-mail between students and instructors.

* Portfolio development by students.

ClassNet[5] stores class administrative information and scores, not class contents. Anyone can access ClassNet[5] from anywhere, anytime. All information is password protected.

The process begins where an instructor accesses ClassNet[5] via URL and creates a class using the options provided. Once the class is created, the students may choose the Enroll option using the same URL. The student may then view the student Menu to view grades, communicate with classmates or change their passwords. Students access their class content and tests through URLs provided by the instructor. Tests are in web pages, which may contain multiple-choice, short answer and essay questions. When students submit tests, the answers are forwarded to ClassNet[5] for grading and storage. Students need only access ClassNet[5] directly to complete assignments, view scores, change their password or E-mail address or communicate with classmates. Links in the class content can route students directly to the ClassNet[5] main menu.

Instructors access ClassNet[4] to create tests, update class information, change student's passwords and communicate with the students. All testing is automated and occurs after the due date. If a test includes essay questions, the answers are routed to the instructor via E-mail.

2.3.2 WebCT

WebCT[6] is a tool that facilitates the creation of sophisticated World Wide Web-based educational environment. It can be used to create entire on-line courses, or to simply publish materials that supplement existing courses.

WebCT[6] not only produces pages for the WWW, but also uses WWW browsers as a user interface for the course building environment. Aside from facilitating the organization of course material on the web, WebCT[6] also provides a wide variety of Tools and Features that can be added to the course for interactive learning.

WebCT[6] Tools and Features consist of:

1. Student Tools.

2. Designer Tools. (Instructor Tools).

Each of these tools is briefly described in the following subsections.

2.3.2.1 Student Tools

WebCT[6] provides the following tools

*Bulletin Board (Course Conferencing System): This allows communication among all course participants. WebCT[6] keeps track of which articles are read by each student and, by default, initially presents only unread articles. The bulletin board can be searched for contents, sender, date of sending and more. Articles can have embedded URLs, which are made clickable by WebCT[6]. When a message is posted directly from a content page, the reader can click on the message subject to present that page in a separate window.

*Electronic Mail: An electronic mail facility can be added to a course allowing one-to-one message transfer among course participants.

*Chat Tool: WebCT[6] provides a chat tool for real-time communication among course participants. The student's view shows the course chat room, their names, and a list of course participants in each room. The list of users in each room, their names, and a list for users in each chat area are available. There is also one general chat room that allows communication among students in any course on the same WebCT[6] server.

*Timed On-Line Quizzes: Quizzes can be written by the designer and delivered on-line on a predetermined day. A clock on the quiz page counts down the number of minutes assigned to the quiz once the student has begun.

*Student Self-Evaluation: Multiple choice questions can supplement any page of notes. Clicking on that button presents the questions, the student responses are automatically marked correct or incorrect by WebCT[6].

*Searchable and Linkable Glossary: A searchable glossary of terms can be created by the course-author and the links from the notes to the glossary entries are added automatically by WebCT[6].

*Searchable Image Archive: The course author can upload images to be included in the course. WebCT[6] provides a page that allows the association of annotations and free text with each image. Students can search for images based on these. The Image database can be private to a course or can be shared by any number of WebCT[6] courses running on the same server.

*Page Annotation: The designer can add a button to any page of notes which, when clicked by a student, allows that student to make personal annotations for that page of notes. The annotation created is private to the student and persists as long as the student has an account for that course

*Learning Goals: The designer can associate learning goals with any page of course content. If such a goal is associated, a target icon appears on the button-bar of that page. When pressed, the learning goals are presented.

*Student Presentation Areas: WebCT[6] allows the designer to designate icons, which serve as the document homepage link for student-generated web pages. Students with authoring privileges can upload pre-prepared web pages to their area for view by all course participants. This tool is useful for displaying course projects, student work, student newsletter and more.

2.3.2.2 Design Tools

There are tools that are used by the course designer in tackling and administering the course. Design tools includes the following:

*Timed-on-line-Quizzes: A status page available to the designer indicates for each student whether that student has not yet begun, has begun but not yet completed, or has completed the quiz. A complete quiz, along with an indication of how long the student took to complete the quiz, is automatically entered into the WebCT[6] grade database, along with comments made available to the students.

*Program Tracking: Program tracking pages allow the designer to monitor student progress. Indications such as date of the first and the last access, time spent on the system, percentage of pages visited and more is available.

*Student Management: Class lists can be entered one student at a time, or can be uploaded (in a simple, predetermined format) as a whole. Class lists can be presented and printed in a variety of confirmations and orderings. Grades for other activities can be assigned to each activity, allowing WebCT[6] to automatically generate final grades. Grade statistics can be displayed for the entire class or for any queried subset of the class.

*Access Control: The course designer creates Student accounts. Optionally the designer can allow students to create their own accounts. In either case, once the accounts are created, the student is able to change his own password.

*Tool Integration: Many of the WebCT[6] administration tools are integrated. For example, in student management you can perform a query to list only those students who achieved more than say 90% on the midterm. Then you can choose to copy those students' names to the WebCT[6] clipboard.

*Course Look and Feel: WebCT[6] provides and interface for the design of course pages, and the look and feel of the course as a whole. Courses can be customized in terms of several attributes. For example, the layout of the links on the homepage and tool pages can be displayed as one or two columns. The color schemes of the homepage, toolpages and content pages are configurable by the designer. Defaults can be chosen, and overridden for individual pages. Several sets of icons are available to be chosen by the course designer, one providing a formal look, the other providing a more casual look. WebCT[6] also provides a set of built

in images that can be used, for example, as course banners and icons. Finally a counter can be added to any page that records and displays the number of accesses to that page.

*Course Welcome Page: Although every course has one main homepage, this homepage is only viewable by those with course accounts. WebCT[6] also provides an authoring interface for a course welcome page. The authoring interface for the welcome page is much like that for the homepage. The difference, though, is that the welcome page lies outside the access-controlled course. Thus anyone, even those without a course account, can view the welcome page. This page is useful for information on how to obtain an account and for contacts for information about he course. This page also has a link directly to the Main homepage for the course, and to a guest account creation facility should the designer allow guest accounts for this course.

*Course Backup and Transfer: The WebCT[6] backup utility allows the course designer to backup a course and download it to his desktop for safekeeping. This utility also allows courses to be restored on a different server allowing the movement and replication of courses from one server to another.

2.3.3 Software and Hardware Requirements to use WebCT

All WebCT[6] users access WebCT[6] using a web browser (Netscape 2.0 or above). Thus, other than the browser there is no special software to install. All that is required is that the user has access to a networked computer.

The WebCT[6] server to which the user connects can be installed by the course developer or by the network administrator at the developers institution. Alternatively, some internal

14

service providers who have installed the WebCT[6] and can provide access. Currently the computer running the WebCT[6] server must be running the UNIX operating system.(Solaris, SunOS, Irix, FreeBSB, Linux, AIX, HPUX and Digital UNIX/OSF1 are supported). One WebCT[6] server can be used to develop and serve a large number of courses.

2.4 Goals of this Research

The objectives of this research are:

1. Analyze the constraints of existing distance education tools due to factors like:

a) Software and hardware requirements.

b) Support for streaming real time audio.

2) Define a process-centered model incorporating the recent developments in real time audio over the Internet and also conferencing tools, which help to communicate in a distance education program. The process would utilize a hierarchy similar to one currently used by distance education programs, incorporating features that would make this process more interactive, with increased direct participation and feedback.

3) Identify the requirements for an infrastructure support tool.

4) Build an environment that would support the features identified in step

Chapter 3

PROCESS CENTERED ENVIRONMENT

This chapter outlines the implementation architecture of the process-centered environment (WVUCT). Then the design of the environment is discussed. The primary actions performed using the environment such as course development, course delivery and student course taking are explained using an example course, developed with this environment.

3.1 Architecture Overview

The environment utilizes a World Wide Web (WWW) based interface, primarily to address the constraints of providing access to the university courses from geographically distributed sites. The following figures provide an overview of the implementation architecture.
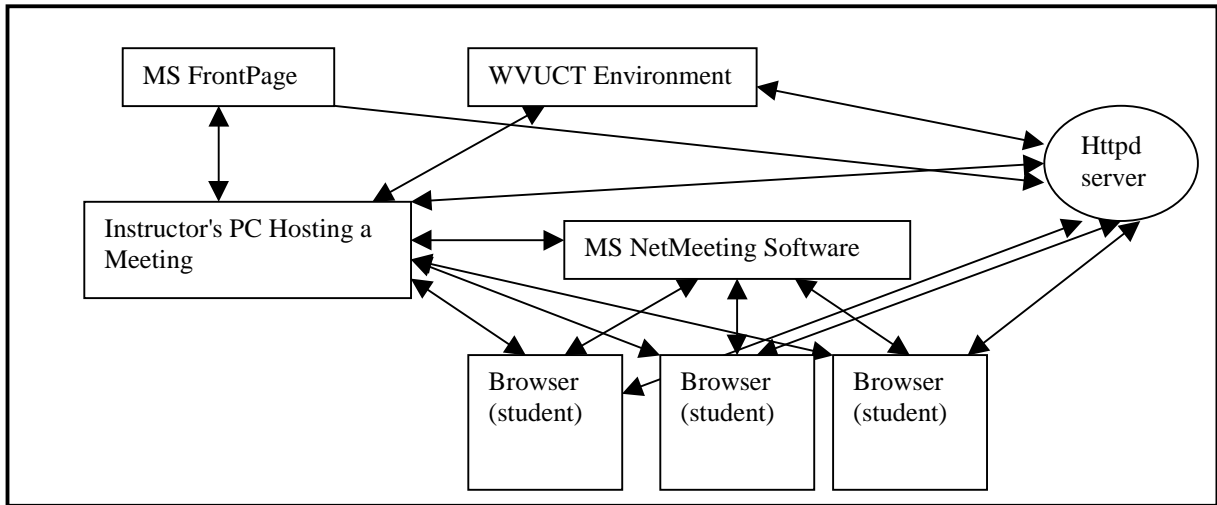
Figure3.1Architecture Overview

Internet Explorer 4.0 browser can be used as an user interface as it support ActiveX technology and also Netscape 4.0 can be used but limitation being it does not support ActiveX. The browser connects to the httpd server requesting information. The httpd server responds to the request of the client and sends the html documents to the browser. The architecture involves the three processes that are course development, course delivery and student course taking. MS FrontPage is used to develop the course and MS NetMeeting for course delivery and student course taking process.

3.2 Design Overview

Process centered environment [9] consists of three main processes.

1. The Instructor Course Development Process.

2. The Instructor Course Delivery Process.

3. The Student Course Taking Process.

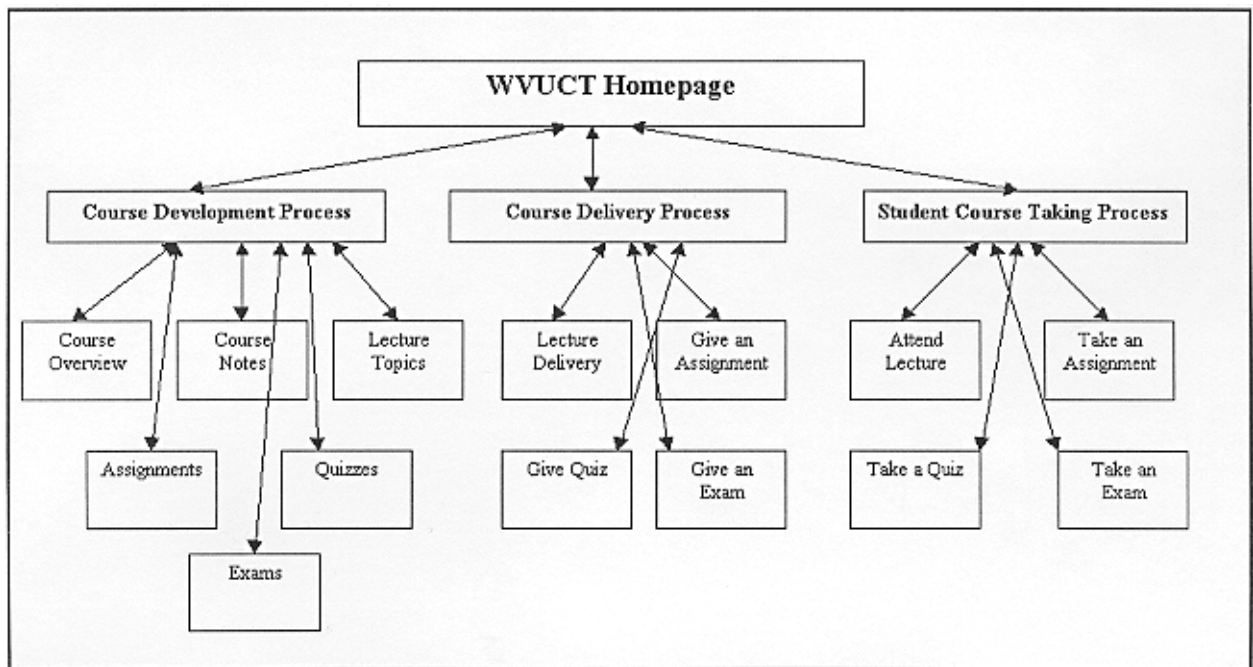The structured template for WVUCT is shown in the figure below and explained

Figure 3.2: Design Overview of the Environment

The first process consists of the steps and activities followed by an instructor in developing a web-based course material using the environment which is supported by a structured course web site as a template. These steps are supported by existing tools developed in environments such as WebCT[5] and other tools for web-based publishing such as Microsoft Office 97. The second process captures the steps to be followed by instructors in delivering the course material to students. Real-time interactive course delivery, simulating a classroom environment, is implemented by making use of MS NetMeeting[7]. Streaming audio, web-based course slides, and interactive chat facility for questions. The process of taking a course guides the student by organizing the steps or activities needed to go through the course material and attend lectures.

3.2.1 Course Development Process

This process guides the instructor through development of a course homepage and arranges the course material. Course information such as syllabus, notes, assignments, lecture slides, quizzes and tests are developed using the environment. The course development area will be a combination of the WWW server applications and the WWW client applications. The instructor will use the downloaded environment following the installation instructions mentioned in the Appendix B for developing the course using MS FrontPage 98[8].

The navigation view in MS FrontPage explorer gives the structure of the downloaded environment. This is helpful to locate the three processes and add different pages for course development and editing.

As explained in the design overview, the steps involved in developing a course are specifying the course overview, putting up course notes for student reference, lecture topics, assignments, quizzes and exams. Clicking on each of these buttons will take the course designer to a web page where he can put up course syllabus, notes, and lecture topics, assignments, quizzes and exams.

a) Specify Course Overview Page: This page is provided for the course designer to provide course overview and can specify the course syllabus. Course overview and syllabus can be put using three different ways. First by a link to a web page where course overview is located, second by uploading a file from local drive of a PC, third by typing the material in the bottom frame of the page.

Hyperlink: Open this page in the MS FrontPage Editor [8], click in the bottom frame and from the menu select insert and hyperlink. In the template location give the URL of the web page where course overview is specified.

Uploading a file: Using the insert file from the menu the file containing course overview can be uploaded in the bottom frame. The file format can be a text, word document or a Html page.

Typing the document: Click in the bottom frame and start typing the material for course overview.

b) Course Notes Page: Course designer can put up the course notes on this page. The three different ways which explained above in the specify course overview section 3.2.1.a holds good for this page too. Course notes can be divided into different chapters and can be explained using figures as well as graphics. Course designer can provide the course notes in a

hierarchy dividing the course chapters into number of sub sections. When putting them on course page can use a tab space to distinguish between main topic and sub topics.

c) Lecture Topics Page: Instructor can put his lecture slides using this page. These, lecture slides are used by the instructor, while delivering the lecture using the course delivery process. The lecture slides can be uploaded or can be linked to a web page as explained in the specify course overview section 3.2.1.a. The structure for putting up the course lecture slides can be similar as one mentioned in course overview with a tab space for sub topics. Lecture slides can be prepared using MS Power Point software and can be saved as html using the save as html option from file menu in MS Power Point. These slides can be directly imported from the c drive using the import option in FrontPage[8] editor and can be linked to the structure using the navigation view in FrontPage[8] explorer.

Students can access these lecture topics to refresh their memory while preparing for the course exams and quizzes.

d) Course Assignments Page: Following the link by clicking on the button course assignment will take the designer to course assignment development page. Assignments can be added in the bottom frame of the web page, using the FrontPage[8] editor. The three different ways explained in specify course overview section 3.2.1.a, can be used for developing course assignments. The designer can develop the assignments using the FrontPage[8] forms and other features mentioned in Appendix A, so as to make the assignments interactive using the form and text area buttons, and initializing them with a value to check.

These assignments can be given to the students in a normal lecture delivery session so that if students have questions they can clarify with the instructor.

e) Course Quizzes: Quizzes are considered to be important in education as they help instructor to determine whether the students are following his or her lecture. This type of feedback is necessary in any educational program. Clicking on the course quizzes button links the designer to the quiz development page. The features of FrontPage[8] as mentioned in chapter 3 section 3.2.1, such as text area, forms etc can be used for the quiz development. The insert form field can be used for different form components to build interactive quiz. The Quizzes can be developed in the bottom frame by using the three different ways as explained in the section 3.2.1.a.

f) Course Exams: Course Development homepage's last feature is course exams development page. This page helps the designer to design the course exams similar to course quizzes but with more number of form pages, by using the FrontPage insert form field features from the FrontPage[8] editor menu. The designer can put up multiple choice questions, short answers and essay type questions on the exam page. Exams can be taken online or can be done in a specific period of time and can be submitted to the instructor. Student can use the text area to provide the answer as well as use different word processor to applications to complete the exam and send the files using the MS NetMeeting send file option to the instructor. The submit button on the exam page can be helpful for submitting the completed exams. The form results when clicked on the submit button are sent to the instructor through email.

After the course is developed the course web has to be published or put on the httpd server for WWW access. This can be done using publish the FrontPage[8] web option in the file menu of the FrontPage[8] Explorer. Once clicked on publish, a template will guide the instructor to put the course page on to a httpd server. An example on how to publish a

FrontPage[8] web is explained and shown in Appendix B. Some of the deficiencies in the course development process when using the environment are

i)   Timing constraints for quizzes and exams are not implemented.

ii)   Scoring or grading tool is not available which can be helpful when the students want to check their understanding of the subject by taking quizzes.

3.2.2 Course Delivery Process

This process helps the instructor to deliver the course to class participants using MS NetMeeting[7]. Course delivery process interacts with the course development process in which the instructor develops the course material and publishes the course web site as explained in Appendix C on the Internet. Delivery process starts with the instructor hosting a meeting using NetMeeting[7] software. Meeting is hosted by clicking on call from the menu bar and selecting host a meeting. Instructor has to open the course web site developed using the course development process through a internet explorer browser. The features such as, share application can be used by the instructor to display the course web page on the participants PC's logged into the meeting. The students can log into the meeting hosted by the instructor by clicking on the ActiveX button join meeting provided on the student course taking homepage, which will be discussed, in the next section 3.2.3.

The course delivery process can be sub-divided into four major sub-processes as shown in the graphical user interface. For reference and quoting the course notes button is also included in the delivery page.

a) Lecture Delivery: Once the instructor has his lecture topic development page ready, using the course development process, he/she can start delivering the lectures using the lecture slides and streaming audio capability provided by NetMeeting[7]. Technology using streaming audio has reached a satisfactory level of performance, which is not yet achieved by streaming video tools.

If a student has questions while the instructor is delivering the lecture, he can interrupt the instructor and use the chat facility to ask questions regarding the lecture. The instructor can keep the chat window open and can pause for questions while delivering the lecture.

b) Give an Assignment: The Instructor can give the assignments to the students when delivering the lecture as in case of a real-time class. The instructor can use NetMeeting[7] features such as audio and chat to interact with the students in real-time if they have any questions regarding the assignment. Unlike the other tools which are used for distance education the process centered environment makes it easy for student professor interaction using NetMeeting[7] software. This is a constraint in many of state of the art tools being used for distance education. Instructions on how to do the assignment can be given to the students during a lecture session. The instructor can also help the students by providing hints or posting messages using bulletin board.

c) Give a Quiz: In a similar way as giving an assignment the instructor can put up a quiz. The instructor can give a quiz to the students and specify the time. The instructor can give the quiz in a regular class session and asks the students to send the files to him in a specified period of time. The transferring of files can be done using the Send file option in NetMeeting[7]. Other option, for sending the files is by using the submit button on the quiz

page. The instructor can monitor the students while taking the quiz as well as answer if they have any questions using real-time audio.

d) Give an Exam: The exams are of two types: in-class exam and take home exam. If it is an in-class exam the students work out the exam problems and use the text area provided for answers and can transfer their file using NetMeeting[7] file transfer feature. For take home exam the students have a liberty of finishing it at their will and can use email for sending the answer file to the instructor or still can use the file transfer feature from NetMeeting[7]. For an in-class exam the students can clarify their questions using the audio mode of NetMeeting[7] for dialog with the professor.

The deficiencies in the course delivery process when using the environment are

      i)   Lack of eye contact between students and instructor.

      ii)   Monitoring the students while giving a quiz and an exam.

3.2.3 Student Course Taking Process

This process presents the course homepage to the students where they can use the course tools to participate in the course. In a classroom based educational system the students get handouts of course overview, they take down notes in a lecture session, they submit course assignments, take quizzes and course exams. Student course taking process does help the students to perform these activities through the Web with out actually attending the course physically.

The student can obtain information regarding the course by reading the course overview, which was put by instructor using the course development process as mentioned in section

3.2.1. Clicking on the course overview button students can browse through the course overview. Similarly the course notes can be used for reference purposes. Clicking on the course notes button will take to the course notes page, which was developed by the instructor using the environment.

Student course taking process can be sub divided into four parts. They are attending a lecture session hosted by instructor, taking the assignments, taking quizzes, and exams. All of these sub-processes buttons are included in the student course taking homepage from where on click of the button can get into the process. The four sub-processes are explained in detailed below.

a) Attend Lecture: The students can log into the meeting hosted by the instructor by clicking on the join NetMeeting link. Once students join the lecture session they are in a virtual classroom and MS NetMeeting[7] will automatically appear on their screen. The students can now take advantage of the tools in MS NetMeeting[7] so as to share application by clicking on the share application button in MS NetMeeting[7]. With the share button the students will be viewing the applications started on the instructor's PC . Instructor can open the browser and start delivering the lecture using the lecture slides, which he/she prepared for the session. These slides will be posted on the students PC with the share option and the students can listen to the lecture simultaneously as the instructor will be using a microphone to transmit voice signal using MS NetMeeting[7]. This is in a way a virtual class lecture where they can hear instructor delivering the lecture as well as see him using the video display using NetMeeting. If the students have any questions they can interrupt the lecture by sending a message using the chat window of NetMeeting or by asking the question using the audio when the instructor stops.

27

b) Take an Assignment: Clicking on this button takes a student to the course assignments page where by they can work on assignments and submit the course assignments via email or send file option of NetMeeting[7]. Bulletin board and chat tool, can be used by the students to post questions, to the instructor and class. The other option for communicating with the instructor is in a lecture session where by the students can ask the questions on the given assignment using audio.

c) Take Quiz: This button leads to the quiz page where the students can take quizzes. Quiz can be given to students in a regular lecture session. These quizzes are time restricted and are monitored by the instructor the students have to attempt the quiz and are posed to send them within the specified time via the submit button or through send file option of NetMeeting..

d) Take an Exam: This sub process is similar to quiz taking process. Upon clicking this button the students can go to the exams page which is developed by the instructor using the course development process as mentioned in section 3.2.1. The in-class exams are time restricted as quizzes and can be submitted by the options mentioned in the above section 3.3.3.c. For the take home exams students can complete them and can send the files to the instructor via email or NetMeeting send file option.

Chapter 4

METHODS FOR TESTING

THE PROCESS CENTERED ENVIRONMENT

The instruction laboratory at Room 243 in Mineral Resources Building, WVU can be used to test the environment for the courseware developed.

Case I) Students logging into the meeting hosted by the instructor using the ActiveX link provided on the student course taking homepage.

Case II) Student logging into the meeting using the IP address of the host machine. The students can establish this by typing in the IP address of the instructor's PC thereby requesting an entry into the meeting.

Case III) Efficiency with which the environment allows an instructor to change from one mode of delivery to other.

Case IV) Number of applications that can be simultaneously posted to students side using NetMeeting.

Case V) Instructor's control on the student's.

If a student misbehaves in the class, can the instructor remove the student from the meeting was tested. Instructor can right click on the name of the student who is in the meeting. Using the drop down menu, the instructor can use remove from meeting option to remove a student from the meeting.

The software was also tested for the case when a third person not registered for the course gives a call for meeting to the student who is already in a meeting with the instructor. In this case a message window first appears on the student PC asking whether to allow the person to join the meeting, if he clicks yes then this message is posted on the instructor PC who actually hosted the meeting. In this way the instructor can deny the entry of the person into the meeting who is not registered for the course.

Case VI) Student group projects using share and collaborate tools of MS NetMeeting.

The setup mentioned in the above test cases can be used to test the share and collaborate tools of NetMeeting software so that the student's taking a course can work in a group. A session can be established between a group of student's where a student hosts a meeting and other group members join the meeting to discuss about the project, which they are going to do. They can even work together using the collaborate mode where the application running on the host machine can be collaborated by the others logged in the meeting. The group members can edit the matter and even can save to the disk of the host machine.

Case VII) Audio transmission when delivering and attending a lecture.

Test Case III and Case IV can be repeated to check the audio quality and delay associated with transmission. Using the audio facility in the NetMeeting a real time lecture delivery and attending session can be performed with the same set up mentioned in test Case III and IV. In this test case the lecture delivery PC can be hosted in and the lecture attending PC's hosted in the instruction computer laboratory, Room 243 Mineral Resources building, WVU.

Chapter 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

Although the emerging area of web-based distance learning has gained much attention, instructional tools for facilitating the development, delivery, and taking of courses are yet to be fully exploited[9]. This is due to the fact that the existing environments generally use such tools in an adhoc manner.

In this work, a process-centered environment was proposed. The research identified the constraints in the existing state-of-the-art tools, especially in the lecture delivery area. The constraints identified by the survey of the tools, were lack of proper lecture delivery tools for real time audio and the cost of software and hardware required to implement one.

A process-centered environment has been established to address the constraints summarized in the previous paragraph. The process-centered model was based on conference mode of lecture delivery and utilized an organization hierarchy similar to one presently used for distance education. The three modes course development, course delivery and student course taking, by which distance education is carried out, is properly supported by the process centered environment proposed in this work.

A support environment WVUCT, can be implemented to effectively support the distance education modes. The salient features of WVUCT are:

1. WVUCT environment supports distance education for teaching courses to geographically distributed sites.

2. WVUCT utilizes an Internet Explorer 4.0 and Netscape 4.0 client as user interface and makes use of MS NetMeeting as conferencing tool for lecture delivery with exception that Netscape 4.0 cannot be used on ActiveX pages. MS FrontPage98 is used for instructor course development.

3. WVUCT provides a complete mode for distance education, which is first of its kind, using streaming audio and video.

5.2 RECOMMENDATIONS

Further research, related to the above work, can be conducted in the following areas:

1. Development of an object-oriented model to capture the behavior of students and instructors engaged in a distance learning experience. Such an object model will facilitate the development of flexible environments for distance learning.

2. Distance education is constantly growing and new ideas are being proposed. The process centered environment could be updated by incorporating the new features.

3. Features such as group discussion for group project and segmented chat room for group projects could be implemented.

4. New tools can be developed for different applications such as grading tool, quiz tool, exam tool where interactivity can be increased.

5. The process-centered environment, which is a PC based environment, could be made portable to Unix environment.

6. Testing of the environment can be carried out on the actual course being given in the university with students logged from different places and instructor sitting in the office.

BIBLIOGRAPHY & REFERENCES

[1] Douglas N. Yarger, Eugene S. Takle and Michael R. Taber, 1996: Distance Learning on a Tight Budget. Distance Education Conference and Professional Development Seminar.

[2] Eugene S. Takle, 24 February, 1996: Taking the Plunge. First Annual Symposium on Methods and Tools for Improving post-secondary Education: Network Enhanced Learning: Vision 2000. Iowa State University.

[3] Eugene S. Takle and Michael R. Taber, 16-19 October, 1996: Use of the Web as a Tool for Interactive Learning. World Conference of the Web Society, San Francisco, California.

[4] Noam, Eli M., 1995: Electronics and the dim future of the universities. Science 270, 247-249.

[5] ClassNet Overview: Developed at Iowa State University.
URL: http://classnet.cc.iastate.edu

[6] WebCT Tutorials: Developed at University of British Columbia.
URL: http://homebrew1.cs.ubc.ca/WebCT/tutorial

[7] MS NetMeeting Resource Kit developed by Microsoft Corp, 1997.

[8] MS FrontPage 98 online help manual developed by Microsoft Corp, 1997.

[9] Huges, K.. Entering the World-Wide Web: A Guide to Cyberspace. Enterprise Integration Technologies, (1994).

[10] Willis, B. (Ed.) Distance education: Strategies and tools. Educational Technology Publications, Inc.: Englewood Cliffs, N. J. (1994).

A p p e n d i x   A

SUPPORT SOFTWARE: MS NETMEETING

AND MS FRONTPAGE 98

Using MS NetMeeting[7] instructor can schedule a class to the remote students and deliver the lecture in real time using streaming audio. MS FrontPage98[8] is a user friendly software and web publishing is made very easy by clicks of the mouse buttons following the wizards and templates. The following sections describe features of the MS NetMeeting 2.0[7] and MS FrontPage 98[8].

MS NetMeeting 2.0

Until recently, to hear a sound-file that was on a computer somewhere on the Internet, one use to download it into a computer over the modem and then, play it with some audio program. But for streaming audio in real-time a server on the Internet sends a stream of information across the Internet which can be converted into audio as it is received by a software application such as NetMeeting2.0.

MS NetMeeting 2.0 Features

For the first time, people can use voice communication to interact and collaborate over the Internet. The software is also the first to introduce multi-point data conferencing capabilities based on the International Telecommunications Union (ITU) T.120standard.

*Internet phone/H.323 standards-based audio support.

***Real-time, point-to-point audio conferencing** over the Internet or corporate Intranet enables you to make voice calls to associates and organizations around the world. NetMeeting[7] audio conferencing offers many features, including half-duplex and full-duplex audio support for real-time conversations, automatic microphone sensitivity level setting to ensure that meeting participants hear each other clearly, and microphone muting, which lets users control the audio signal sent during a call. This audio conferencing supports network TCP/IP connections. *NetMeeting uses the MMX-enabled audio codes to improve performance for audio compression and decompression algorithms. This will result in lower CPU use and improved audio quality during a call.

*Intelligent Audio/Video Stream Control: NetMeeting[7] features intelligent control of the audio and video stream, which automatically balances the load for network bandwidth, CPU use, and memory use. This intelligent stream control ensures that audio, video, and data are prioritized properly, so that NetMeeting[7] maintains high-quality audio while transmitting and receiving data and video during a call.

*Multi-point data conferencing: Two or more users can communicate and collaborate as a group in real time. Participants can share applications, exchange information through a shared clipboard, transfer files, collaborate on a shared whiteboard, and use a text-based chat feature. The following features comprise multi-point data conferencing:

*Application sharing: A user can share a program running on one computer with other participants in the conference. Participants can review the same data or information, and see the actions as the person sharing the application works on the program (for example, editing content or scrolling through information.) Participants can share Windows-based applications transparently without any special knowledge of the application capabilities. The person sharing the application can choose to collaborate with other conference participants, and they can take turns editing or controlling the application. Only the person sharing the program needs to have the given application installed on their computer.

*Shared clipboard: The shared clipboard enables a user to exchange its contents with other participants in a conference using familiar cut, copy, and paste operations. For example, a participant can copy information from a local document and paste the contents into a shared application as part of group collaboration.

*File transfer: With the file transfer capability, a user can send a file in the background to one or all of the conference participants. When one user drags a file into the main window, the file is automatically sent to each person in the conference, who can then accept or decline receipt.

*Whiteboard: Multiple users can simultaneously collaborate using the whiteboard to review, create, and update graphic information. The whiteboard is object-oriented (versus pixel-oriented), enabling participants to manipulate the contents by clicking and dragging with the mouse. In addition, they can use a remote pointer or highlighting tool to point out specific contents or sections of shared pages.

*Chat: A user can type text messages to share common ideas or topics with other conference participants, or record meeting notes and action items as part of a collaborative process. Also, participants in a conference can use chat to communicate in the absence of audio support. A new "whisper" feature lets a user have a separate, private conversation with another person during a group chat session.

*System Policies: Administrators can implement NetMeeting[7] system policies to control user and computer privileges. Using system policies, they can pre-define settings and restrictions, such as preventing the use of audio features, and provide standard configurations for their user community. New system policies include the ability to limit the network bandwidth for audio and video streams.

Support for Windows

NT Workstation 4.0: Windows NT® users can communicate and collaborate with each other and with users of NetMeeting 1.0 and 2.0 on Windows 95. Functionality of NetMeeting 2.0[7], including audio, video, and multi-user data conferencing for electronic whiteboard, text-based chat, and file transfer, is supported for Windows NT. Windows NT Service Pack 3 is required for a Windows NT user to share applications.

NetMeeting 2.0 Architecture

NetMeeting 2.0 is both a client and a platform. The NetMeeting[7] client enables users to experience the benefits of a real-time, multi-point communication and collaboration program. Microsoft implemented NetMeeting 2.0[7] capabilities using an open architecture of inter-working components. Each component communicates with and passes data to and from the component layer above and below.

NetMeeting 2.0 Architecture Components

At the core of the NetMeeting 2.0[7] architecture is a series of data, audio, and video conferencing and directory service standards. These standards work together with transport, application, user interface, and ActiveX® conferencing components to form the NetMeeting 2 architecture, shown in the diagram.
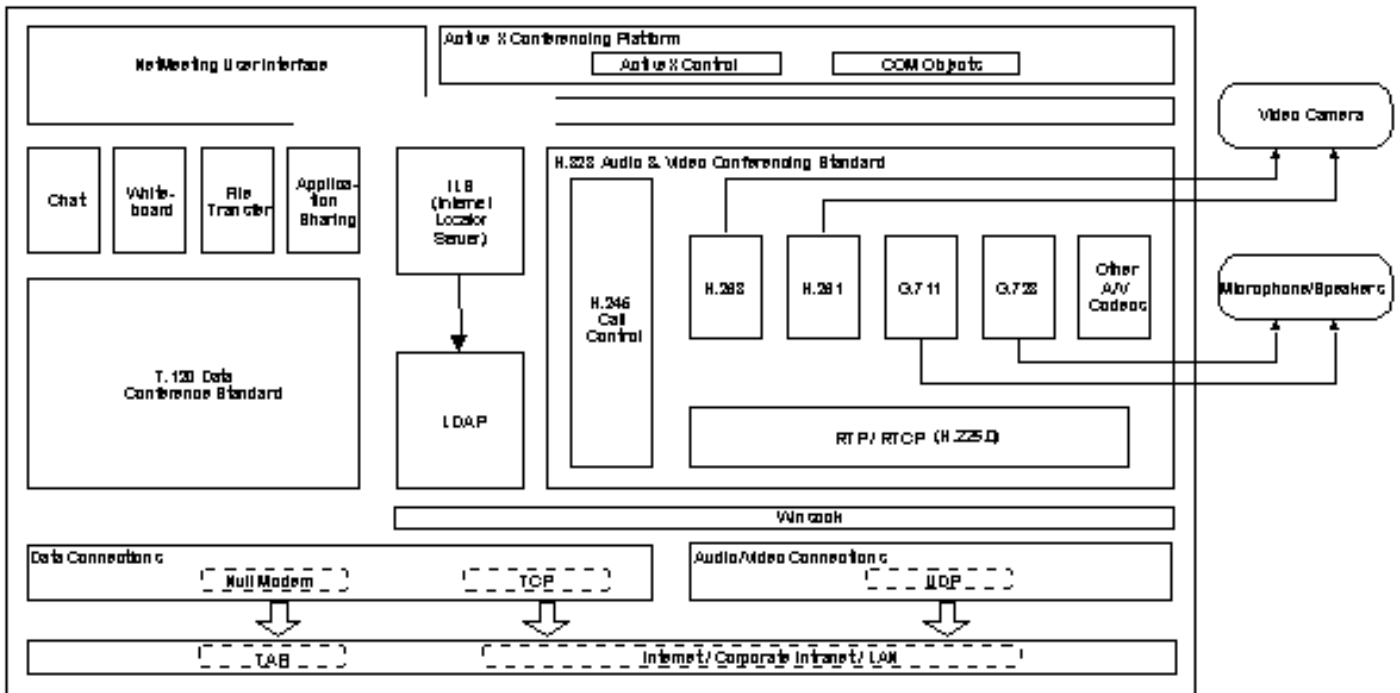
Figure A1: NetMeeting Architecture

The following sections describe the key components that comprise the NetMeeting 2.0[7] Architecture, beginning from the bottom of the diagram.

Transport Layer

At its lowest level, standards are responsible for translating, sending, and receiving NetMeeting 2.0 information. The NetMeeting 2.0 architecture includes protocols for modem, inter-network packet exchange (IPX), and network transport control protocol/Internet protocol (TCP/IP) connections. Modem and IPX protocols support data-only conferencing connections; only TCP/IP connections support NetMeeting audio and video.

Information can be transported over the Internet or corporate Intranet using transport control protocol (TCP) and user data-gram protocol (UDP) connections. TCP is used primarily for data transport and call control, while UDP represents secondary connections for sending and receiving NetMeeting 2.0[7] audio and video. Winsock provides the interface to the network stack and maps information between the applications and the network. The following diagram highlights this transport layer.
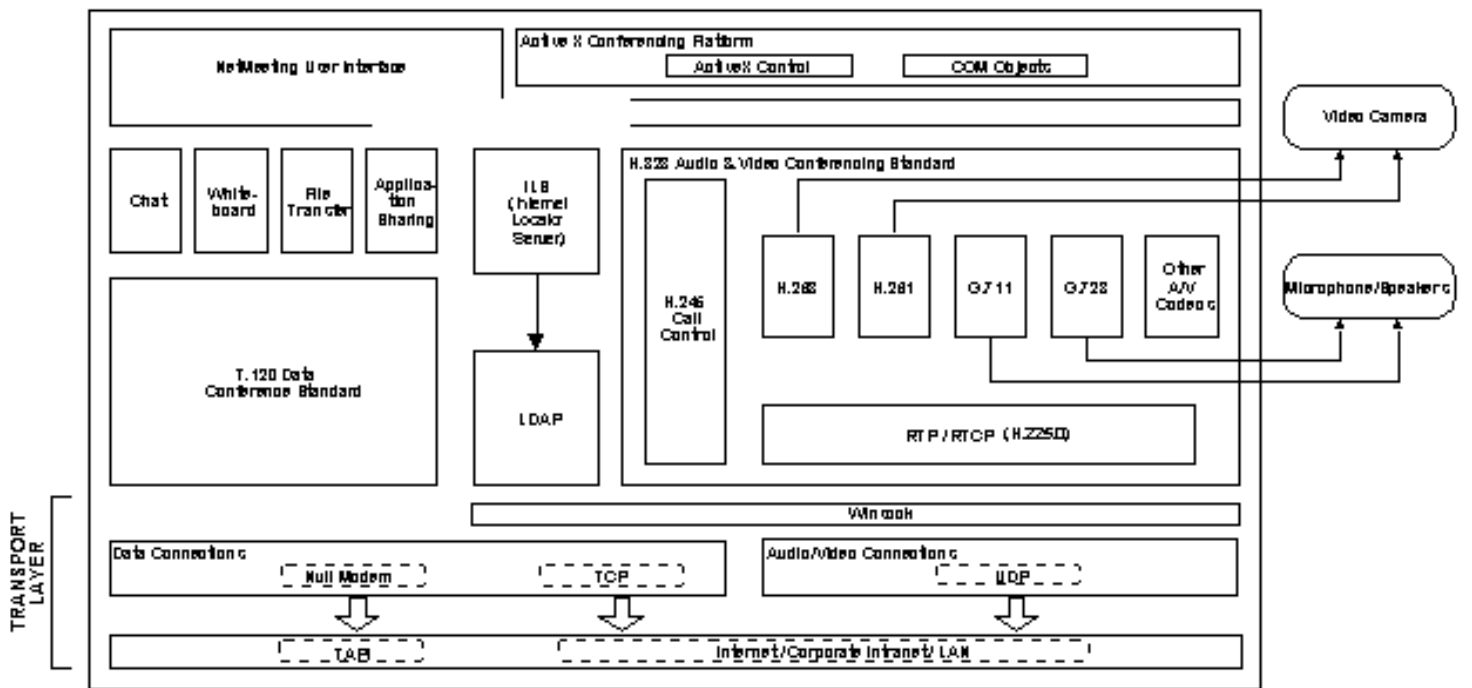
Figure A2: Transport Layer Architecture of NetMeeting

Core Standard and Application Components

The NetMeeting 2.0 architecture is based on the following industry standards:

The International Telecommunications Union (ITU) T.120 standard for data conferencing

The ITU H.323 standard for audio and video conferencing

The Internet Engineering Task Force (IETF) lightweight directory access protocol (LDAP)standard for directory services support

These standards provide the framework for managing NetMeeting 2.0[7] connections, data-conferencing, audio and video capabilities, and directory server access, highlighted in the diagram.
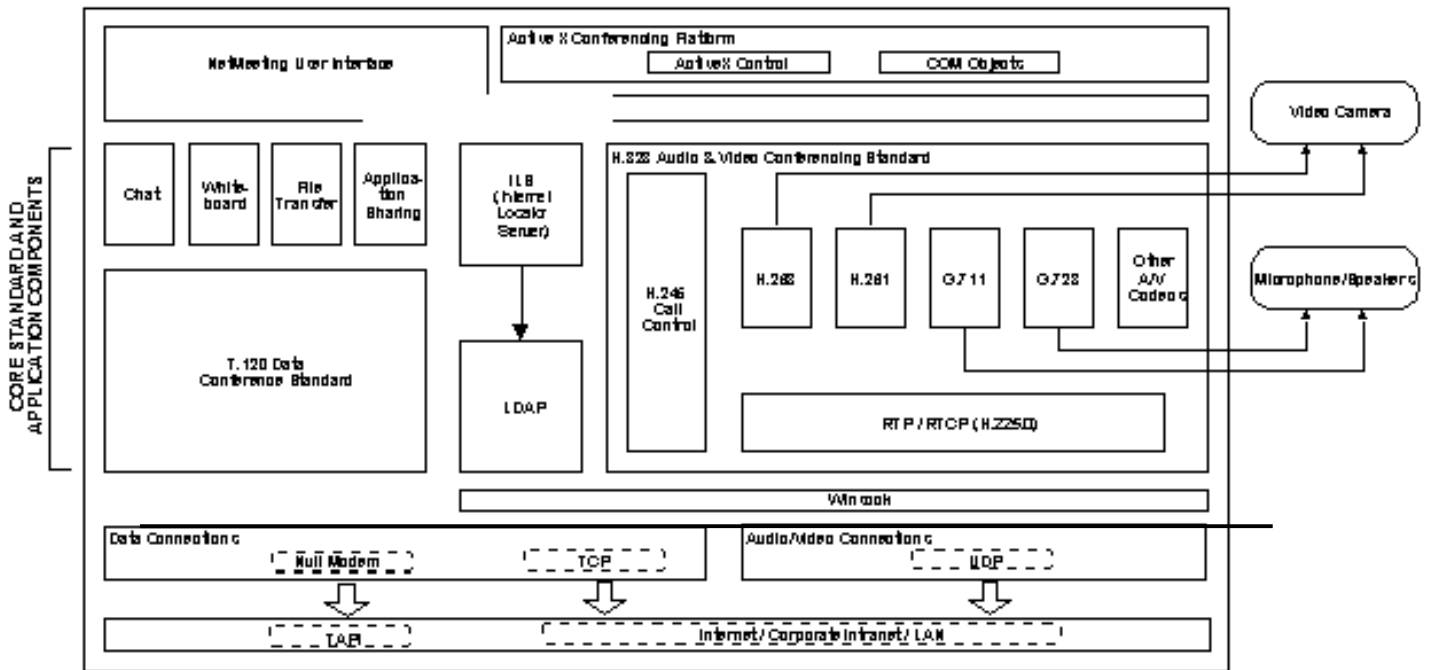
Figure A3: Core Standard and Application Components of NetMeeting

Each of these standards is summarized in the following paragraphs.

T.120. NetMeeting 2.0[7] contains a wealth of collaborative data capabilities, including chat, whiteboard, file transfer, and application sharing. At the heart of these capabilities is the ITU T.120 standard for multi-point data conferencing. T.120 provides the protocols for establishing and managing NetMeeting 2.0[7] data flow, connections, and conferences.

H.323. NetMeeting 2.0[7] includes audio and video codes as well as framing and call control protocols. H.323 codes provide the format for audio and video that is transmitted over various connection rates. NetMeeting 2.0[7] supports a suite of codes appropriate for many different modes of Internet telephony.

ITU H.323 protocols enable NetMeeting 2.0[7] to send and receive audio and video information between NetMeeting 2.0[7] and H.323-compatible nodes. A microphone, speakers, and a video camera provide the necessary input/output devices for these audio and video capabilities.

User Interface

NetMeeting 2.0 data, audio, and video conferencing capabilities are available to end-users through the NetMeeting 2.0 user interface. This interface presents NetMeeting 2.0 features in an easy to use and understand format of visual icons, "hot" buttons, simple adjustment bars, tabbed windows and call directories. The following diagram highlights this level of the NetMeeting 2.0[7] architecture.
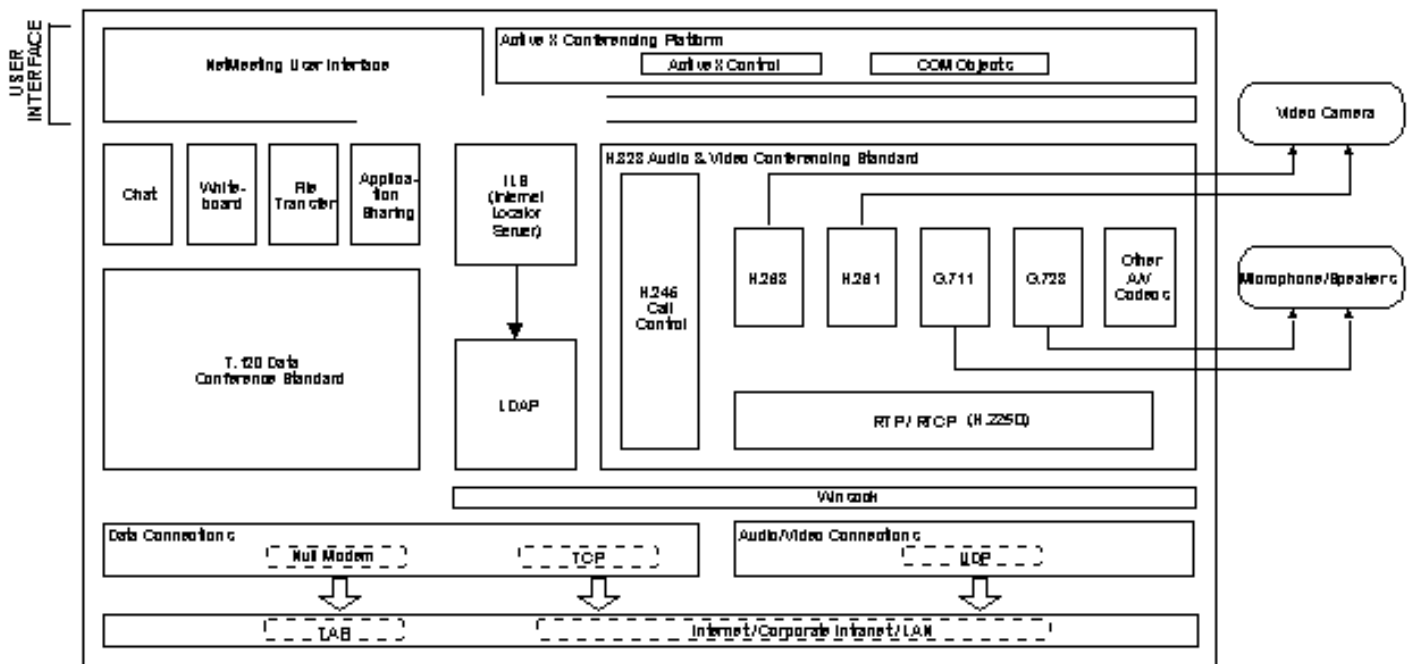

Figure A4: NetMeeting User Interface

ActiveX Conferencing Platform

The NetMeeting 2.0[7] platform enables developers to incorporate NetMeeting 2.0[7] features, such as chat and whiteboard, into their applications and World Wide Web pages. This platform is based on ActiveX conferencing, which includes the following components:

ActiveX control for adding conferencing support to World Wide Web pages, Visual Basic® applications, and to OLE-enabled documents and applications.

An enhanced set of objects based on the OLE Component Object Model (COM) for adding conferencing support to COM applications

A set of COM objects for building LDAP directory support into applications, including support for LDAP-based directories (ILSs) used by NetMeeting 2.0.

A set of COM objects for installing custom audio and video codes that NetMeeting can leverage during calls.
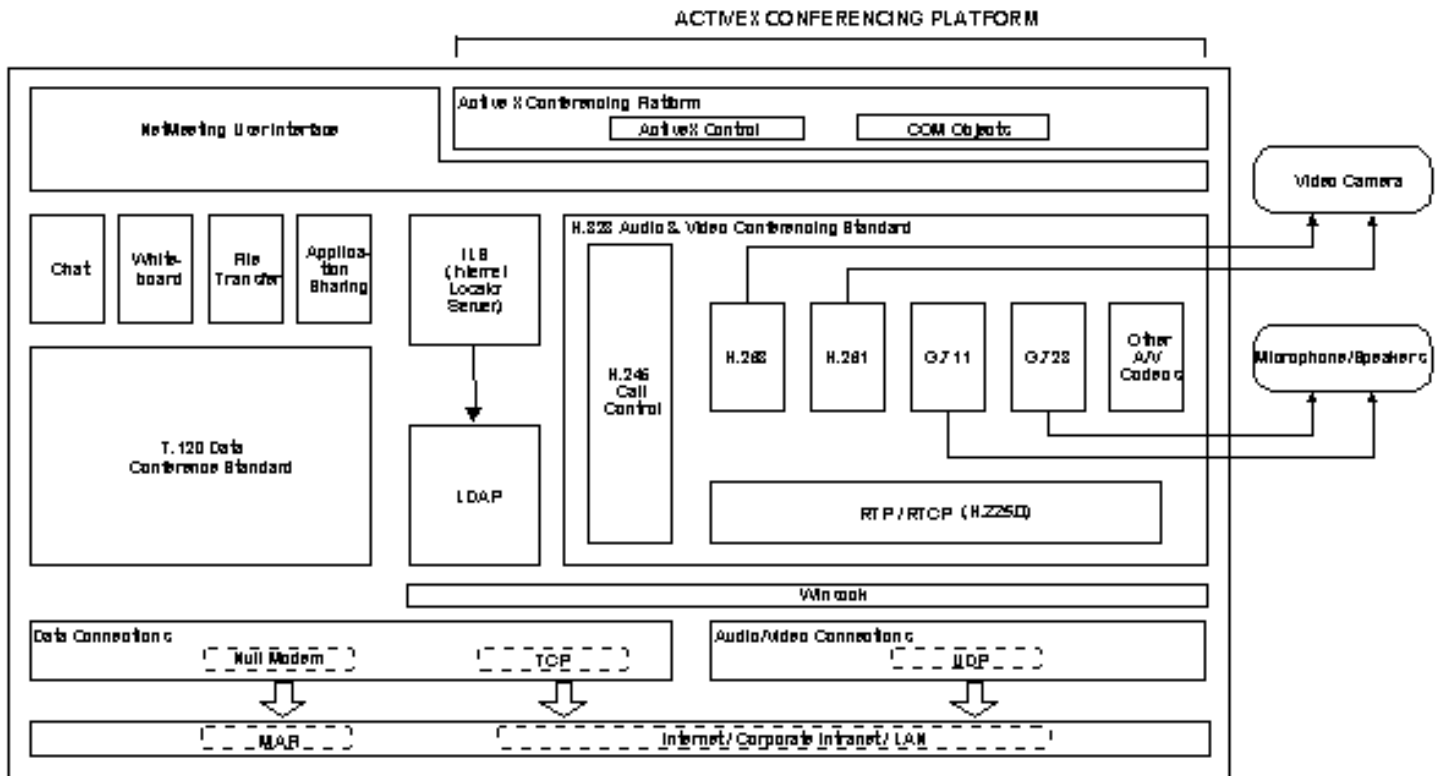
Figure A5: NetMeeting ActiveX Platform

MS FrontPage 98

Microsoft FrontPage 98[8] is a quick, effective way to create and manage professional - quality Internet or Intranet sites without programming. It makes it easy for new users and professional Web developers alike to build and maintain great looking, professional-quality Web sites in no time.

Features

*FrontPage Themes: Over 50 professionally designed FrontPage[8] themes (or graphical designs) provides consistent backgrounds, bullets, banners, hyperlinks and navigation bars across entire Web site.

*The Navigation View: The navigation view helps to create and manage the navigational structure of Web site within seconds. It's easy to build and connect new pages and move pages around.

*Shared Borders: Shared borders allow us to specify shared headers and footers, or right and left margins across the pages in a site. This provides a great deal of design flexibility in creating a great-looking, but consistently designed, Web site.

*Automatic Navigation Bars: Easily adds universal navigation bars to a Web based on site's navigational structure. If modified the structure of a site, FrontPage 98[8]-update navigation bars automatically, saving time and keeping the links current.

*Editing Tools: Using the new table editing tools and mouse one can draw and erase entire tables, rows and columns of Web pages with ease. Plus, one can use drag and drop to resize table cells and move or copy table rows and columns.

*Page Editing: One can create and view WYSIWYG frames pages and edit them directly on the screen in the FrontPage[8] 98 Editor. By dragging a frame border one can add a new frame on the page or can change the size of an existing frame, or can easily drag and drop content between frames.

*Form Save Results to Email: With the new form save results FrontPage[8] component, one can easily create a form that will send submissions directly to the e-mail address specified.

*Hover Buttons: FrontPage 98[8] enables us to automatically create small Java applet hover buttons, so that when a user "hovers" over the buttons or clicks on them, they will change colors, change shape, or animate depending on the user.

*Banner Ad Manager: FrontPage[8] automatically creates rotating banner advertisements on Web pages. Just by specifying the banner images that one would like rotated and can choose the transitional effect between the images.

*Integration with Microsoft Internet Explorer 4.0: If you are using Internet Explorer 4.0 to browse to a Web page that you've published and press the edit button, you can automatically edit the page in FrontPage[8], then save the changes back to the server.

*Dynamic HTML Support: FrontPage allows easy addition of dynamic HTML features to Web sites without programming. Simply by using the FrontPage menus and dialogs one can add text animations, collapsible outlines, and page transitions.

*Cascading Style Sheet Support: FrontPage 98 makes it easier to create and design impressive Web pages through support of Cascading Style Sheets (CSS). CSS allow one to define complex styles for titles, paragraphs, and headers.

*FrontPage Image Editing Tools: New image editing tools in the FrontPage Editor make it easy to bevel, crop, flip, rotate, or automatically washout images on Web pages. FrontPage 98 also lets you shrink or resample an image in order to reduce its download time.

*Editor Views Tabs: New editor tabs let you quickly toggle between views of Web page. The normal tab is for WYSIWYG editing, the HTML tab is for editing HTML directly, and the preview tab lets you view your Web pages in browser mode from within the FrontPage editor.

*Easier Hyperlinking: FrontPage 98 hyperlink dialog box simplifies the process of linking new pages, existing pages in a Web, pages on the Internet, e-mail addresses, or bookmarks on a specific page or targets within frame sets.

*One-button Web Publishing: FrontPage 98 makes publishing the site to the Web by only publishing those files that have changed since last published, and FrontPage 98[8] will automatically detect changes made by others in a multi-user environment.

*Import Wizard: FrontPage 98 makes it easier to import existing sites and existing content from one's computer file directory structure, a Web server, or a URL location on the World Wide Web.

System Requirements

    Computer/Processor: Personal or multimedia computer with a 486 or higher processor

Memory: 16 MB of memory for use on Windows 95, 32 MB for use on Windows NT

Hard Disk: 36 MB of available hard-disk space required

Drive: CD-ROM drive required

Display: VGA or higher-resolution video adapter (Super VGA, 256-color recommended)

Operating System: Microsoft Windows 95 operating system or later, Microsoft Windows NT

Workstation operating system 4.0 or later, or Microsoft Windows NT Server 4.0 or later (will

not run on earlier versions)

Appendix B

WEB PUBLISHING WITH MS FRONTPAGE98

After developing the course web sites using the environment the web site has to be published onto the WWW server that is httpd server. MS FrontPage98 helps the users for publishing the web sites through a wizard template. This appendix will help an instructor in publishing his web site using the following steps.

1. Go to the file menu in the FrontPage Explorer and click on publish FrontPage web option. The window shown below appears
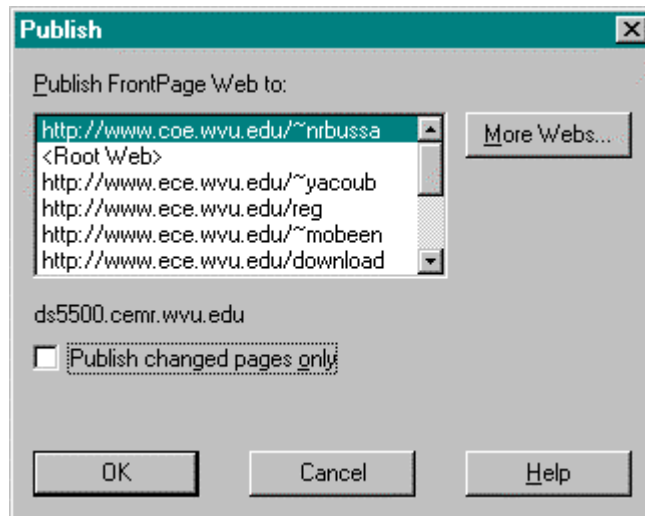
2. First time users select the More Webs button and click. This will take to the figure

shown.

Publish FrontPage Web

Click here to find an Internet service provider to host your FrontPage Web.

Please specify the location to which you want to publish your FrontPage web:

http://www.coe.wvu.edu

☐ Secure connection required (SSL)

OK   Cancel   Help
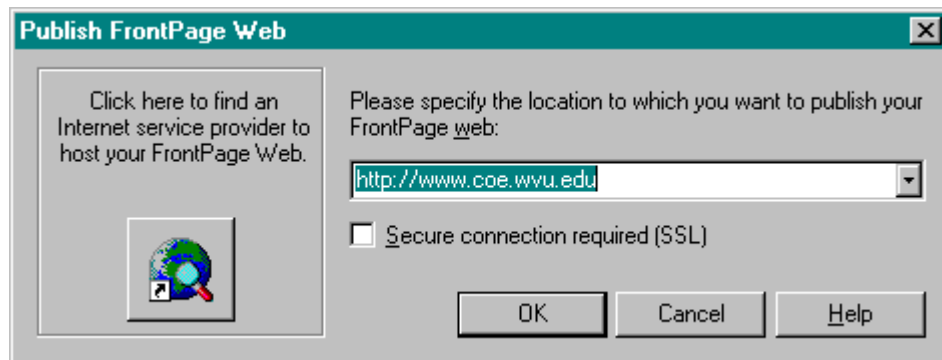
3. Type in the location for the web site. For example if the web site has to be published on the coe server then type as shown in previous figure. Then click OK. This will take to a template as shown below.
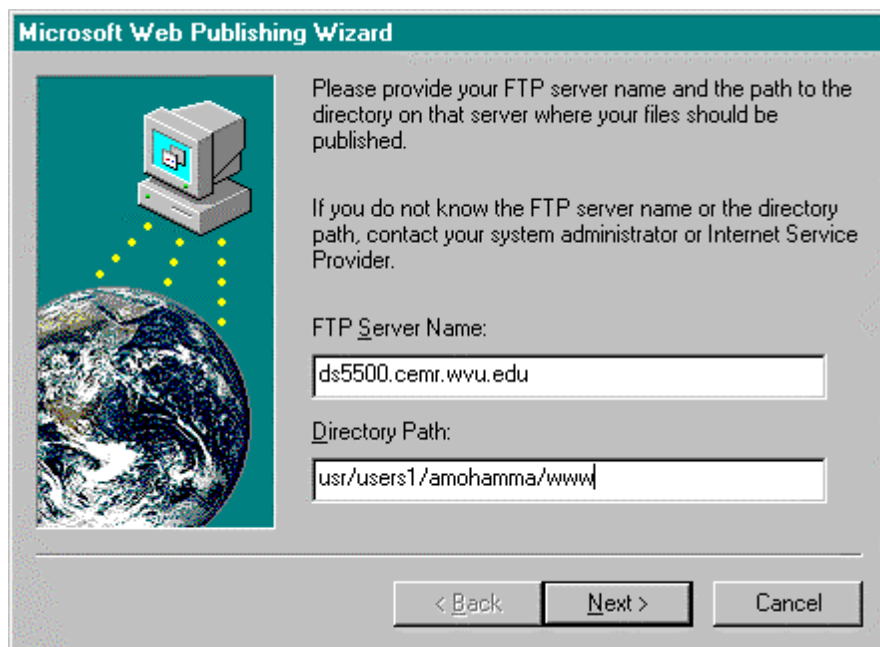
4. Type the ftp server name as shown and the directory path where the web site has to be put. The directory path can be viewed by typing the pwd command when working in a Unix account.

On clicking next the following window appears.
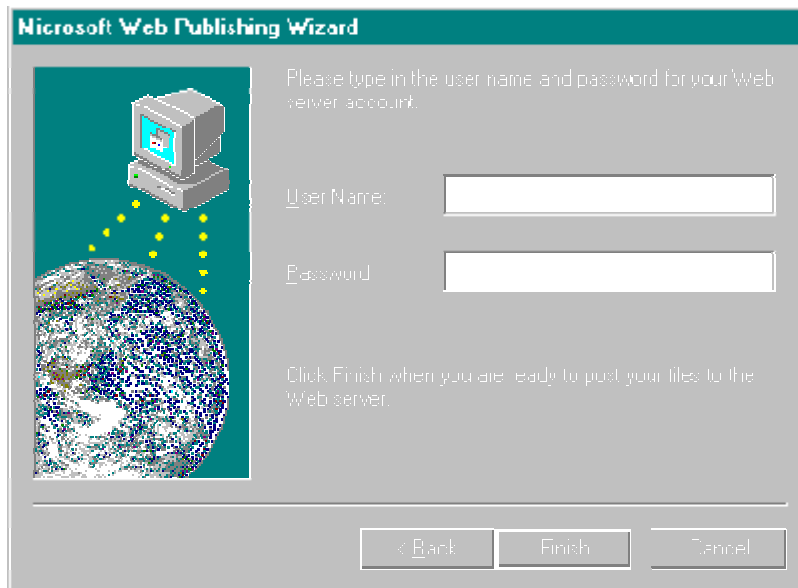
5.Type the user name and password for the Unix server where the web site has to be published. Click on finish to publish the course web site on to the httpd server. MS FrontPage98 automatically transfers all the files and still maintains the directory structure after publishing the web site. If the web site is not properly visible then check the permissions of the files and correct the file permissions to suit the needs.

Appendix C

Editing an Existing Course Web with MS FrontPage 98

This appendix helps and guides an instructor for updating his course web. After developing the course web and publishing with initial contents if an instructor wants to update or edit the existing course web, he/she can follow the steps as described below with different situations.

Case I) If the course web is in c\front page\ content folder which is the default folder.

1. When FrontPage 98 application is started the following window shown appears on the screen.
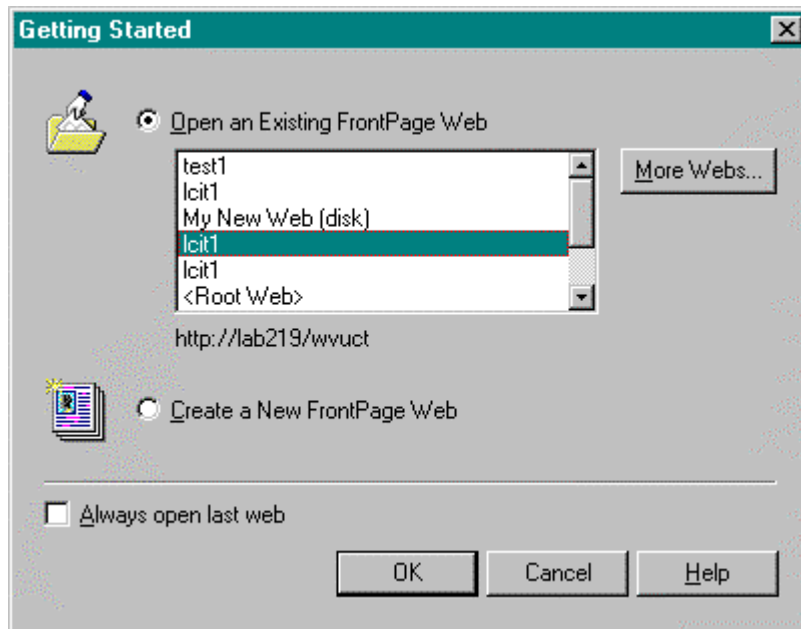
Choose the Open an Existing FrontPage Web option and select the course web, which was already developed then click OK. On clicking OK you will be asked to provide the password.

2. If correct password is provided it opens the web and using the folders and navigation view from the explorer one can edit and republish the web using the instructions provided in Appendix C. Only the changed pages are published on the existing course web thus saving time of transfer.

Case II) If the course web is in folder other than default folder but on c drive

1. Open FrontPage 98 explorer and click cancel on the window titled getting started and from files menu select import option. Once you select import option the window shown below appears.
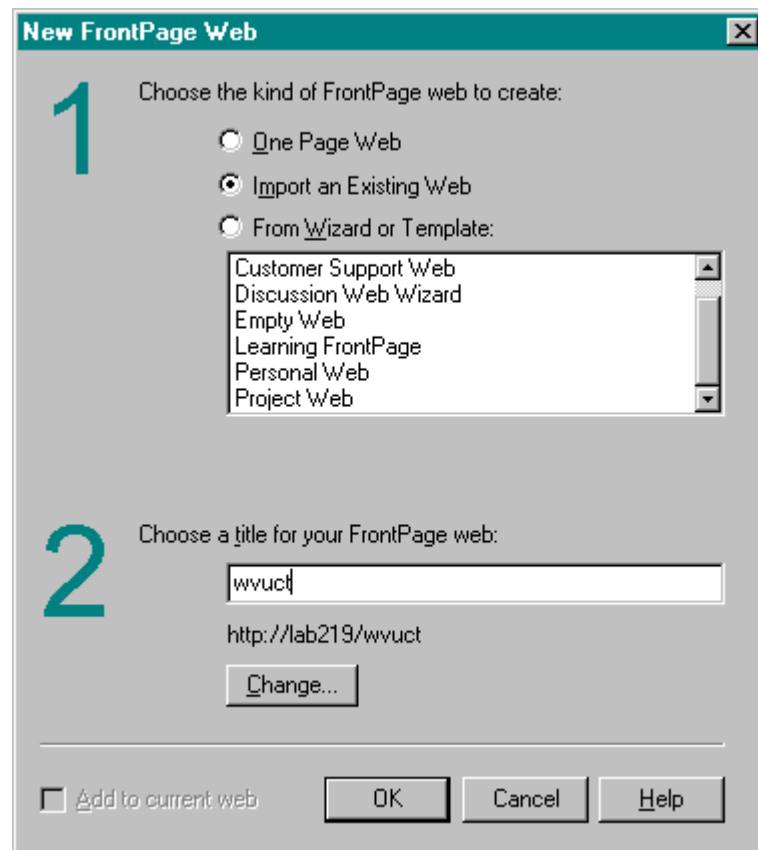
2. Choose the Import an Existing Web and give a title as shown in the above figure and click OK. On clicking OK another window appears as shown in the following page. Select the first option from a source directory of files on a local computer or network and browse for the course web as shown in the following figure and click on next.
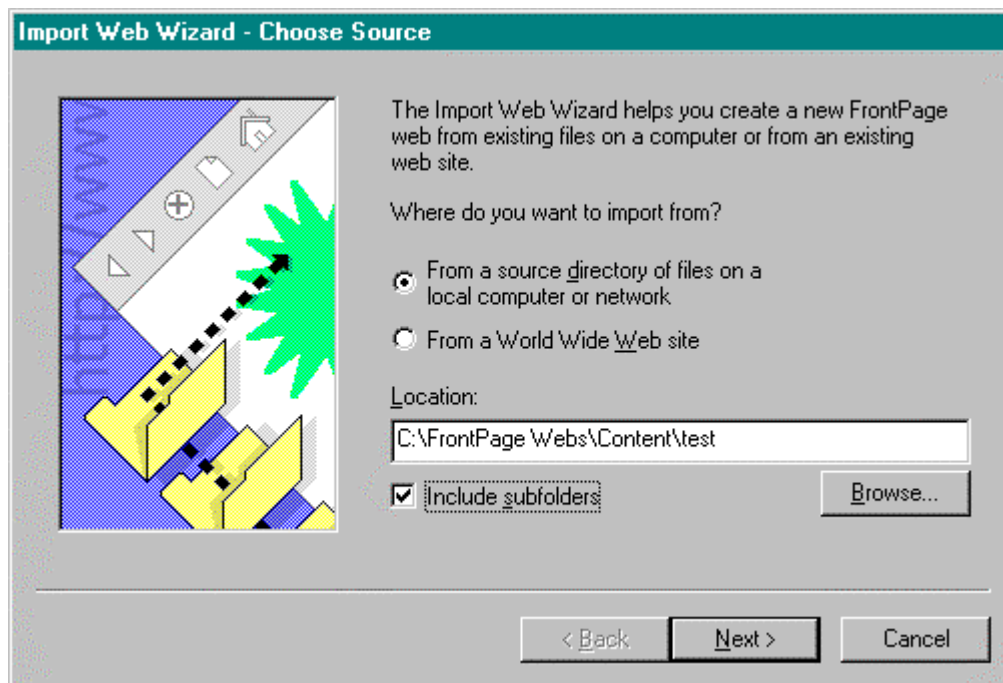
3. Clicking on next another window appears as shown below. This window gives all the files associated with the course web which was already developed. At this stage one has the option of excluding the unwanted files as shown in the figure above.

Click on next to continue with the import of course web.
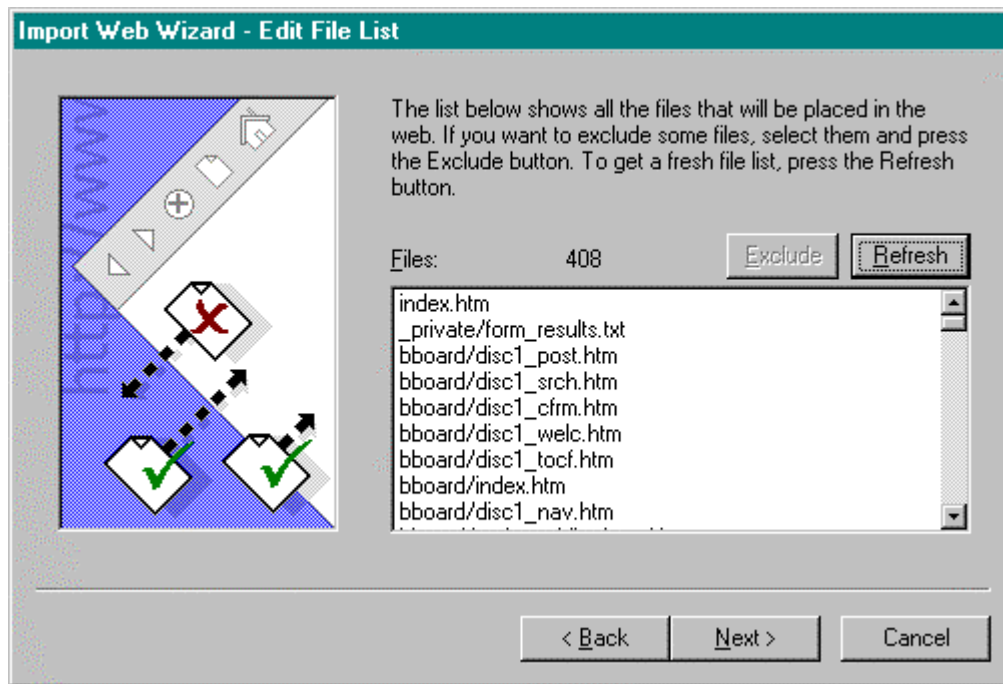
4. On clicking the next button another window as shown below appears confirming that the import was successfully carried out. Upon clicking finish the course web will be imported and one can work on it using the tools of FrontPage 98 for editing and updating pages.
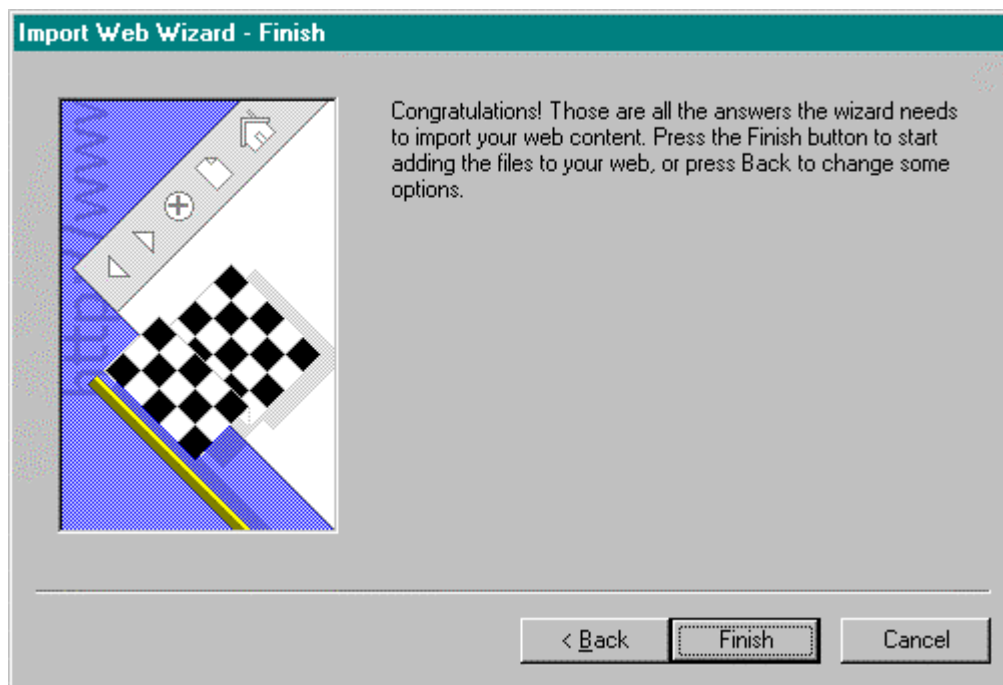
**Case III)** Importing an existing web from world wide web site.

1. Follow the step 1 of Case II and once clicked on OK the following window appears as shown in the next page. Choose the second option that is from World Wide Web site and specify the URL in the area provide and click next.
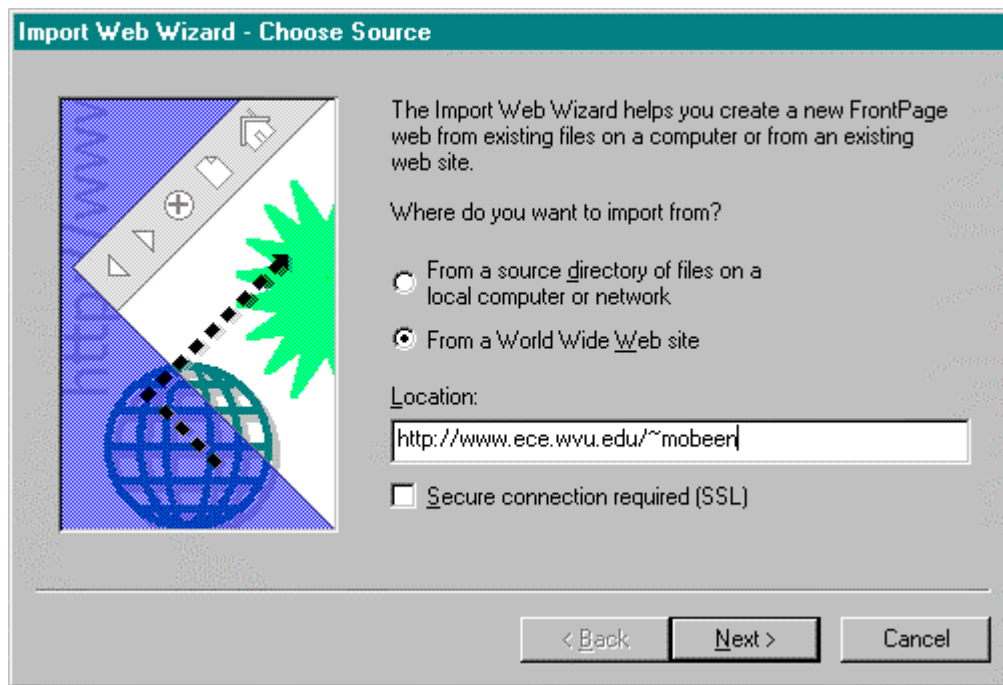
3. Once you click on next the window shown below appears asking you to limit the size and time of download. Select whichever is appropriate as shown below depending on the size of the course web.
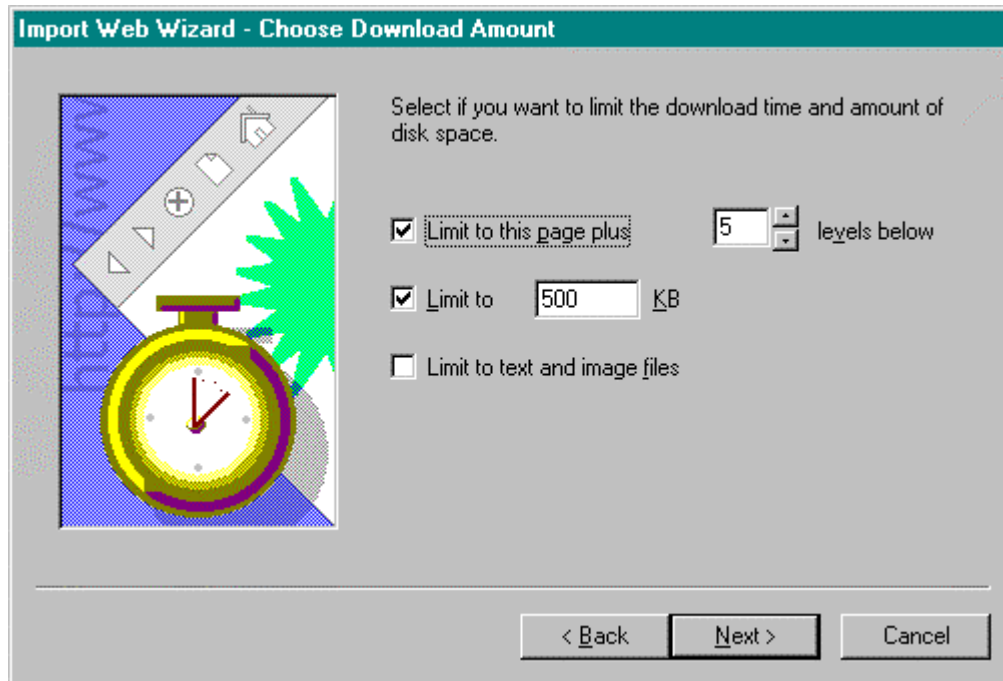
3. Clicking on next a completion window appears conforming the completion of the import process. Click on the finish or back to make changes and open the FrontPage editor and do the necessary changes and publish back again using the instructions described in the Appendix
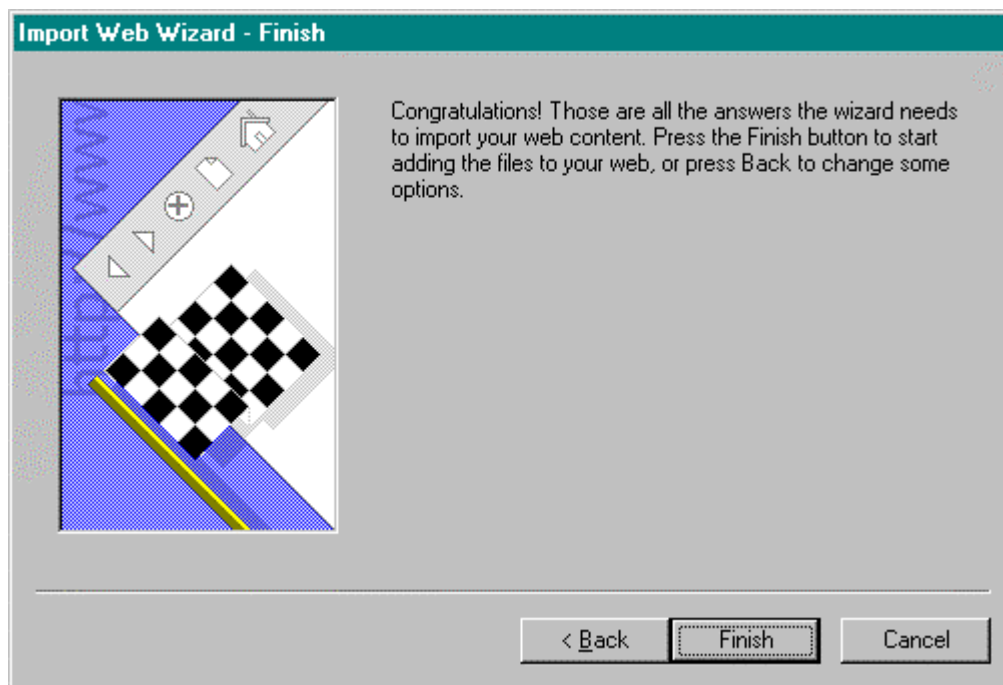
VITA

He was born on January 11, 1969 at Lahore, Pakistan. He lived in Quetta, Pakistan until he was 4 years old when he went to Dubai with his mother and younger brothers to his father. He went to school in Dubai and passed his Secondary School Certificate Examination from Pakistan Islamia Secondary and High School in Dubai. He passed his 12th grade Examination from Government College of Science, Lahore. After that he got admission to The University of Engineering & Technology, Lahore from where he got his BS. in Mining Engineering. He worked as a Trainee Engineer in at Pakistan Mineral Development Corporation, Quetta, Pakistan in summer 1993.

He started his masters at West Virginia University in May 1997 and currently he is a candidate for MS in Engineering of Mines.

APPROVAL

Abdul Wahab Khair, Ph. D., Professor,
Committee Chair.

Felicia F. Peng, Ph. D..
Associate Professor..

Date

Syd. S. Peng, Ph. D.
Department Chair and
Charles T. Holland Professor.