

CHAPTER 5

Translating a Visual Basic Application For The Web

Introduction

There are undoubtedly millions of applications throughout the world that have been written in Visual Basic and many of these would make excellent Web applications, either for public use on the Internet /WWW or for internal corporate use on an intranet. When linked with Internet Information Server systems and Web Enabled database systems, these become formidable and useful applications. Many experts in the field of Internet technology are predicting that it will soon be a common practice in IT departments across the world to create majority of applications and business solutions for an environment very similar to the Web or based on its concepts. A fact that corroborates this is that almost every major software company in these times is redesigning and restructuring its products to be more "Internet-friendly".

CyberQuest is one such existing stand-alone Visual Basic application that would present certain if not extreme utility if and when converted for use as a Web application. (refer Chapter 1, Introduction to CyberQuest)

Much of the work involved in translating or transferring a desktop VB application to operate on the Web is, as observed commonly, in the mindset of the developer/programmer. It was observed that instead of faithfully reproducing the original application, the developer can re-invent a newer more creative approach to the problem by taking full advantage of the fact that the Web provides new features and functionality that is absent in conventional ways of writing standalone applications.

With the application of the process of software engineering as a guideline and keeping in mind at each stage that this is a new and exciting environment and media, the developer can fashion a very sophisticated and easy to use application. This makes it possible to create an application that is both user-friendly and much more efficient than its standalone predecessor.

Successful Web designers have realized that instead of trying to replicate traditional media in a Web page, they should treat the Web as its own medium with its own unique set of opportunities and limitations. This results in a chance to improve on the once desktop-faithful interfaces and functionality of older applications.

So, faced with the task of translating CyberQuest to an Internet application for collaborative processes, where does one start?

5.1 Replacing Visual Basic Elements

Each VB (Visual Basic) application is made up of a number of constituent components. These are Forms,

Controls like command buttons, text boxes, labels, text areas etc., and event handlers or methods.

First and foremost factor to be kept in mind is that, all these component *must* be treated separately.

- Forms
- Controls
- Event Handlers
- The "Back-end"

5.1.1 Replacing Visual Basic Forms

The form has to be replaced by either an HTML Web page or preferably an ActiveX Layout.

The design and functionality of an ActiveX Layout is very similar to a VB form, allowing easy and accurate placement of controls.

Almost any Visual Basic form can truly and faithfully be recreated or reproduced as a Web page using the HTML Layout Control, and the developer has the added advantage that a Web page can offer useful functionality such as hyperlinking and easy multimedia extensions.

5.1.2 Replacing Visual Basic Controls

The vast majority of standard controls such as text boxes, combo boxes and labels can be easily and quickly replaced with an equivalent ActiveX control. Some of the more rare controls might be available as ActiveX controls, and many more are currently under production. Table 1.1 in Appendix I gives an idea as to what can and cannot be replaced as of this writing.

The following explanations are used in the second column of that table:

- ◆ **Part of MSIE 5.0 (MICROSOFT INTERNET EXPLORER 5.0):** An equivalent ActiveX control should be available to users who have installed the full version of MSIE 3.0 and higher. However, some methods, properties and events might differ slightly from the VB4.0 and higher equivalent. Many of the controls are part of the Windows 95/98/NT4.0 install.
- ◆ **Not available:** An equivalent ActiveX control is not available at the time of this writing. However, it is recommended that the ActiveX Gallery be checked regularly. There are updates posted there frequently. It might be possible to use VB OCX controls, which will be explained in the next chapter "Advanced ActiveX Techniques".
- ◆ **Cannot be used:** For reasons concerning security, it is not possible to use these controls in a web page. These controls are usually those that deal with file I/O and disk housekeeping or in other words need direct access to the client systems' hard disk.

Here, it must be noted that if certain controls are not available in VBScript, they can easily be replaced by Java applets that achieve the same functionality.

5.1.3 Replacing Event Handlers, Procedures and Functions

Several conversion utilities have started to appear on the market to turn VB applications into Web/VBScript applications and the resultant files can save the developer/programmer a significant amount of manual recoding. However they are not a 100-percent translation and some convert the form controls into HTML intrinsic controls - all of which means that, at some point, the developer has no choice but to do some manual translation work.

From observation and research, there is one very simple but important rule to keep in mind while translating a VB program to VBScript. This is - any routine that deals directly with the computer

in terms of disk or file I/O, printer or monitor, CANNOT be done. This is definitely one of the biggest limitations the developer has to deal with when translating VB applications to VBScript. A few other functions have been left out of VBScript to save space. For example, `Format` is missing. But in general, the basic programming functionality has been left intact.

Table 1.2 in Appendix I lists all the language and runtime features not available in VBScript at the time of this writing.

5.1.4 The Back End

The conversion of an applications back end is somewhat more complex because it depends on what software or system is currently being used to feed data to the application. In other words, the back end of an application refers to the actual programmed functionality, which is accessed through the user interface. In client/server environments, like the proposed WebCQ will be, it refers to the server-side tasking incorporated in the scripting. In the case of WebCQ, VBScript along with ASP are the languages that will most likely provide the back end functionality.

5.2 Introduction To ActiveX Technology

ActiveX is a set of technologies that enable software components to interact with one another in a networked environment, regardless of the language in which the components were created. An ActiveX control is a user interface element created using ActiveX technology. ActiveX controls are small, fast, and powerful, and make it easy to integrate and reuse software components. [7] ActiveX controls are a product of Distributed Component Object Model (DCOM) technology. DCOM is a software architecture that allows applications to be built from binary software components. Because of this capability, if a component was replaced by a newer version, new clients could take advantage of new interfaces, but existing clients could continue to use the old interfaces. An ActiveX control is a user interface element created using ActiveX technology. ActiveX controls are small, fast, and powerful, and make it easy to integrate and reuse software components.[8]

The Web is almost without doubt, the single most important communication development since man first doodled an image of tomorrow's meal on the wall of his prehistoric cave dwelling! The opportunity is now available to all of us to produce and re-produce that very medium itself, to

communicate our ideas and concepts to the rest of the planet within minutes of the concept taking form in our creative minds! For the first time we can experience a virtual world within the real world, one in which time races by at a speed which never ceases to astonish, and where information distribution times are counted in nanoseconds if not seconds rather than days. For the first time businesses all over the world have a flexible and instantly updateable medium, one which they can use to communicate with potential clients, current customers, employees, shareholders and the rest of us.

What has followed this revolution in communication is an unprecedented frenzy of software development activity. Product after product has rolled out via the Web as beta copies. Development followed development, and the "Internet year" has shrunk to the point where just a few days off the Web could leave a user feeling like they had withdrawal symptoms or with a feeling like they might have just missed the boat!

The ramifications of this feverish activity are indeed no less than a revolution, a renaissance of sorts in the information age. In a few short months, the face of the Web has been transformed to the point where is now possible to create applications held within a humble Web page that feel, act and for all practical purposes are Windows© applications!

At the core of this revolution is ActiveX technology. The reason that the technological revolution on the web has been achieved with such speed (apart from the instantaneous distribution the web facilitates) is that ActiveX is not really new. It is actually an extension of the technology that makes up nearly all Windows programs in use today - the building blocks used by programmers to construct Windows (and now Web) applications. However, ActiveX controls and components need an adhesive to bind them together; therefore a programming technique is required. A technique which is easy to learn and use, safe to transmit across the Web, and able to interface with HTML controls. VBScript can be that adhesive that holds the ActiveX controls together and allows controls to interact and interface with each other and the outside world.

ActiveX and VBScript together, form the foundation for future development of Web and Intranet applications. There is a growing need for more interactivity within Web pages. A need to produce Web sites that are easy to navigate and easy to use - in short, there is a need to go beyond what HTML has to offer. Furthermore, within the Web there is a great deal of healthy competition. Web developers need to use their creativity and skill to set their web pages apart from other average web pages to attract people to their site. ActiveX and VBScript are useful in creating Active Content, which is the way to achieve new, exciting, intuitive, interactive and user-friendly web pages.

The Visual Basic Scripting Edition (VBScript) language is a subset of the Microsoft Visual Basic for Applications (VBA) and Microsoft Visual Basic. VBScript can be used for interfacing both ActiveX controls and Java applets as well as writing stand-alone scripts that act directly upon the browser object itself.

5.3 Using VBScript with ActiveX Controls and Containers

Since CyberQuest is written entirely in Visual Basic (VB) and VBScript is the scripting language selected, this thesis will concentrate on how VBScript facilitates the use of ActiveX controls. In many ways, an ActiveX control is much like the standard controls provided in Visual Basic for use in programs. In fact some of VB's intrinsic controls are already ActiveX controls. At this point, one of the most important facts to keep in mind is the realization that an ActiveX control can do nothing on its own. To function, an ActiveX control must be *contained* within something else. A simple illustration of this fact is that in VB the ActiveX control is contained in a VB form; in that case the form serves as the container. In the case of WebCQ, this container is going to be a Web page or, in other words, an HTML file.

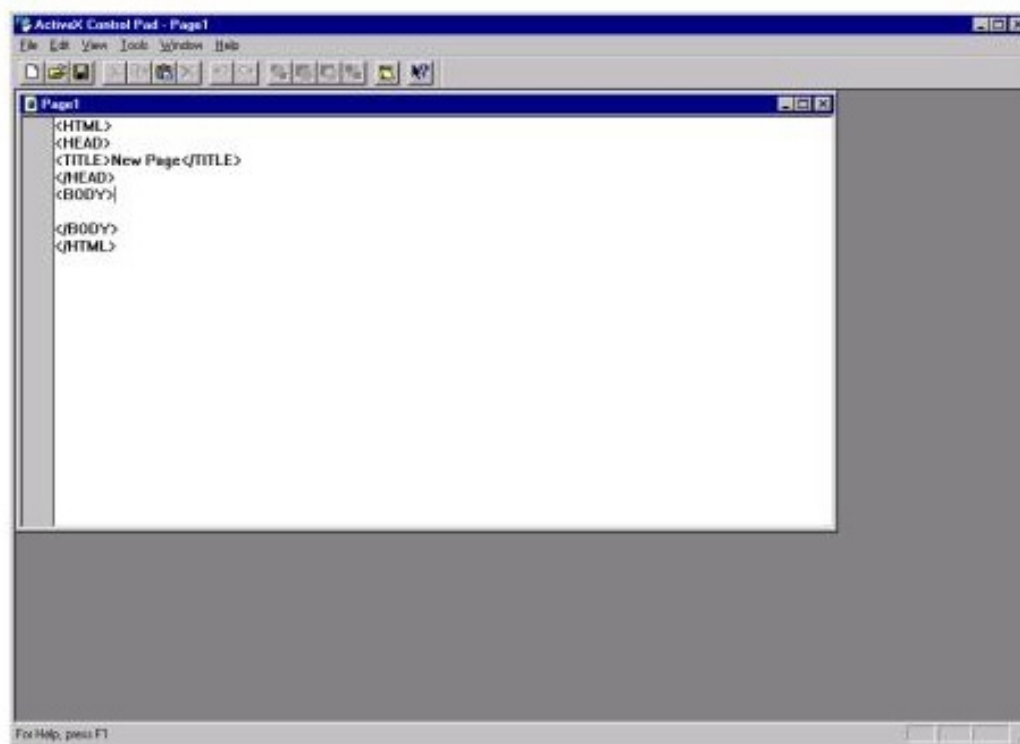
In the case of CyberQuest, all forms, frames, controls and event handlers can be converted into ActiveX controls. Plain VB controls like text boxes, labels, list boxes and command buttons can be replaced by corresponding ActiveX controls and they can then to be coded to replicate the same actions using VBScript as the scripting language. This is achieved using a combination of Microsoft ActiveX Control Pad®, Visual Basic's DHTML (Dynamic HTML) and ActiveX user

document utilities. Using Microsoft ActiveX Control Pad®, the forms in the first 3 steps of CQ have been converted into ActiveX Layouts and later inserted as objects into HTML pages using the <OBJECT>...</OBJECT> tags.

As stated, the method selected to convert some of CQ's existing forms to be able to run off the Web was with the help of Microsoft ActiveX Control Pad (MAXP). This application can be found at <http://download.cnet.com/downloads/>. The Control Pad is a simple, easy to use application that lets the developer create HTML pages with ActiveX controls.

Fig 5.1 shows the ActiveX Control Pad's basic HTML template.

Figure 5.1 The Microsoft ActiveX Control Pad's HTML Template



There are two ways to replicate a CQ form into HTML:

- Use intrinsic HTML controls to interact with VBScript or
- Recreate the entire form using the Control Pad's 'create HTML layout' utility under the Edit menu.

For the purpose of this study, the second option has been selected.

Once an HTML layout is designed, it is saved as a file with an .ALX extension. Within this layout itself, MAXCP facilitates the integration of VBScript functionality by providing the Script Wizard utility. Fig 5.2 Illustrates the Aim form from CQ as an ActiveX Layout and Fig 5.3 Illustrates the same form as an HTML form viewed in the browser.

When the .ALX file is inserted into an HTML document, it is treated as an object. When an object is inserted into an HTML page, one can access its properties, events, and methods by using a format that is the same as that of Microsoft Visual Basic for Applications. An important point to note is the connection between the `OnClick` event of the intrinsic HTML button control and the event procedure written in Microsoft Visual Basic, Scripting Edition. Initially, events such as `OnClick` will be confusing to Visual Basic developers because the same event in Visual Basic for Applications is called `Click`. The difference is due to the fact that `OnClick` is part of the HTML language, not the Visual Basic for Applications language. HTML has always supported some intrinsic controls, and these are supported by Internet Explorer for backward compatibility. Simple substitution of the intrinsic HTML controls with ActiveX controls (almost certainly available freely to download off the Internet) can achieve total adherence to Visual Basic for Applications standards.

Figure 5.2 The Aim form from CQ as an ActiveX Layout

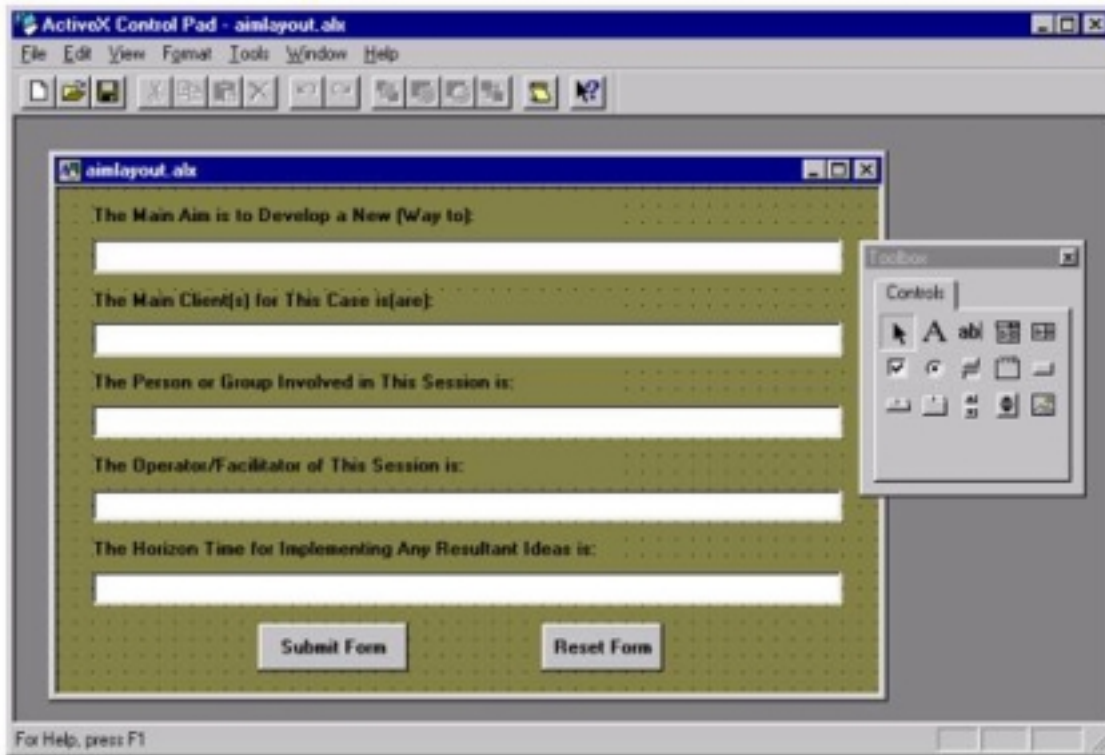


Figure 5.3 The Aim form as an HTML form viewed in the browser

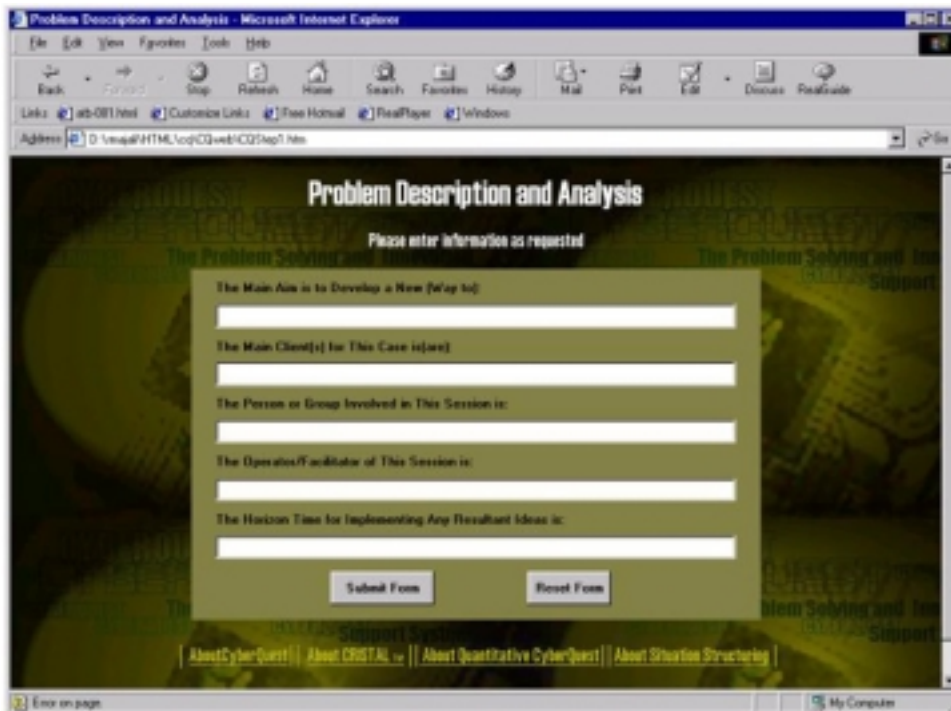
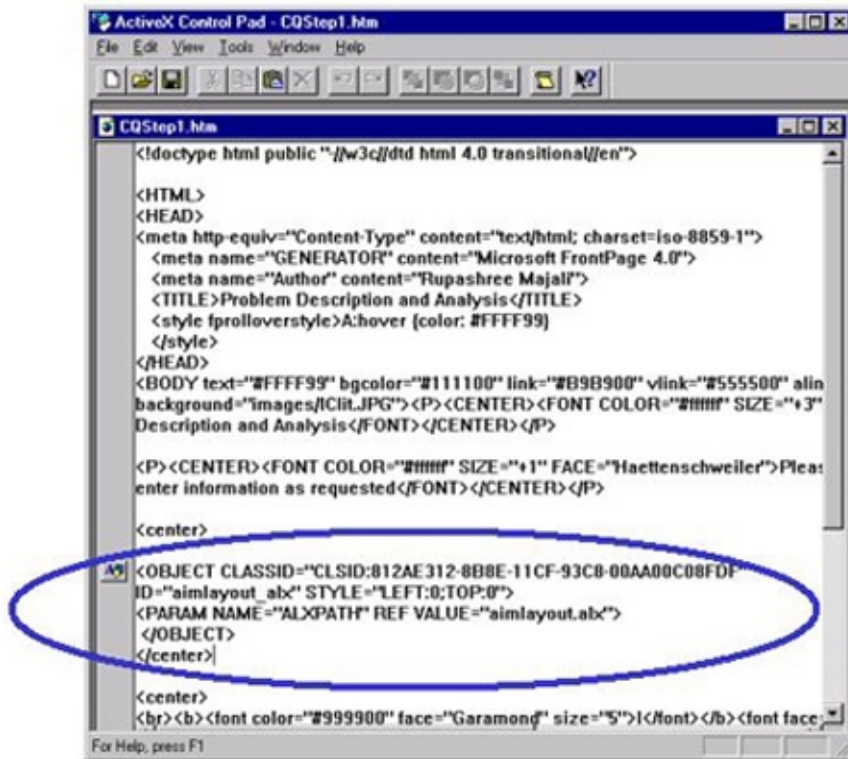


Fig 5.4 illustrates the Aim form in HTML code with the ActiveX layout of the customized aim form embedded in it.

Figure 5.4 The Aim form in HTML



In the preceding illustration (fig 5.4):

The first line of code ie **<!doctype html public “//w3c//dtd html 4.0 transitional//en”>** lists the type of document the HTML file is, meaning it is publicly accessible through a given URL and is written in HTML release 4.0.

The **<HTML>** tag is followed by the **</HTML>** tag placed after all the body content is inserted, and simply indicates to the browser that the following content is to be interpreted as HTML.

The **<HEAD>....</HEAD>** tags enclose all the heading information like the title in the **<TITLE>....</TITLE>** tag which appears on the top left of that page when viewed in the browser.

The **<BODY>...</BODY>** tags indicate the body content of the file, within which are inserted all the formatting tags like the paragraph **<P>..</P>**, the line break **
, the centering **<CENTER>...</CENTER> tags.

The highlighted **<OBJECT>...</OBJECT>** tag is the one that holds the information about the inserted ActiveX Control created in MAXP to replicate one of the input forms of CQ.

Similarly, the remaining forms can be converted into HTML layouts and then inserted into HTML files as objects. Here are a few illustrations of such forms.

CHAPTER 6

Exploring CQ Desktop Inter-Connectivity Using Application Sharing Software

To test CQ's effectiveness over a system of inter-networked computers, three different computer conferencing software applications were considered. These are listed below:

- Lotus-DataBeam Corp.'s Sametime™
- Microsoft NetMeeting 2000™ and
- Centra Software's Symposium.

6.1 Over view of Lotus-DataBeam Corp.'s Sametime™

Lotus Sametime™ is a family of real-time collaboration products which provides instant awareness, communication and document sharing capabilities.

With the selected awareness of coworkers, partners, or customers online, users can communicate in a variety of ways -- from one-on-one instant messages to launching virtual meetings. And Sametime™ also provides live document and application sharing.

Sametime™ delivers real-time collaboration for presenting a new program to a field sales force or offering live assistance to Web customers.

This software application seemed to have very poor audio-fidelity and capability. It was found to be inadequate in terms of audio-conferencing requirements and seemed more geared towards on-screen data-sharing than voice-sharing.

The company also displayed very poor customer service and client satisfaction was not stressed upon when using the product or when contacting them for support services!

The DataBeam Server product was used for multipoint NetMeeting sessions and for collaboration over T.120.

6.2 Over view of Microsoft NetMeeting 2000™

Microsoft NetMeeting is a seemingly popular desktop conferencing software, much used and publicized for its ease of use as a tool for enabling online meetings and virtual conferencing. One of the reasons it has grown immensely in popularity is because it is downloadable free from the Microsoft website. Cost is a hugely important factor to keep in mind when designing and developing a software application for desktop conferencing. Most applications designed for virtual-meetings over the Internet are elaborate, highly sophisticated in functionality and capability making them more expensive and hence less likely to be implemented in the average work place.

The audio quality in NetMeeting is very good, though not quite as good as the leading products. NetMeeting's real strength is in the collaboration tools built around the foundation of voice communications. NetMeeting supports a whiteboard that can share any Windows® program. For example, you can share a CyberQuest Session, so everyone in the online conference can see it. More importantly, the only user who must have CyberQuest running is the user sharing the document--everyone else gets a graphical image of the running application. NetMeeting seems to run well over 28.8-kbps modems, though it runs much better over ISDN or faster Internet connections.

Microsoft promises standards support, but for now NetMeeting remains largely a Microsoft-only product. One such piece of Microsoft-developed technology is the User Location Service (ULS), which allows users to search an online database for someone to talk to. Microsoft has proposed ULS to the IETF as an Internet standard, but for now only NetMeeting supports this feature.

6.2.1 Useful Features of NetMeeting™ pertaining to CQ sharing:

Video and Audio Conferencing: NetMeeting's audio and video conferencing features let you communicate with anyone on the Internet.

Whiteboard: The whiteboard lets you collaborate in real time with others via graphic information.

File Transfer: File transfer lets you send one or more files in the background during a NetMeeting conference.

Application/Program Sharing: NetMeeting's Program Sharing feature lets you flexibly share multiple programs during a conference and retain greater control over the way they're used.

Remote Desktop Sharing: Remote Desktop Sharing lets you operate a computer from a remote location.

Figure 6.1 NetMeeting™ Sample Connection Screen

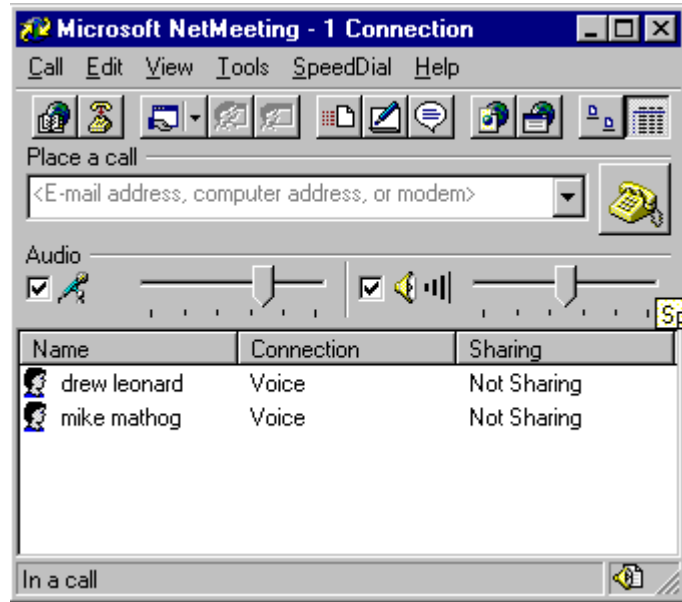


Figure 6.2 NetMeeting™ Sample Video Connection Screen



6.2.2 System Specifications

Table 6.1 Microsoft NetMeeting™ system requirements

90 megahertz (MHz) Pentium processor
16 megabytes (MB) of RAM for Microsoft Windows 95, Windows 98
24 megabytes (MB) of RAM for Microsoft Windows NT version 4.0 (Microsoft Windows NT 4.0 Service Pack 3 or later is required to enable sharing programs on Windows NT.)
Microsoft Internet Explorer version 4.01 or later
28,800 bps or faster modem, integrated services digital network (ISDN), or local area network (LAN) connection (a fast Internet connection works best).
4 MB of free hard disk space (an additional 10 MB is needed during installation only to accommodate the initial setup files).
Sound card with microphone and speakers (required for audio support).
To use the data, audio, and video features of NetMeeting, your computer must meet the following hardware requirements:
For Windows 95, a Pentium 90 processor with 16 MB of RAM (a Pentium 133 processor or better with at least 16 MB of RAM is recommended).
For Windows NT, a Pentium 90 processor with 24 MB of RAM (a Pentium 133 processor or better with at least 32 MB of RAM is recommended).
4 MB of free hard disk space (an additional 10 MB is needed during installation only to

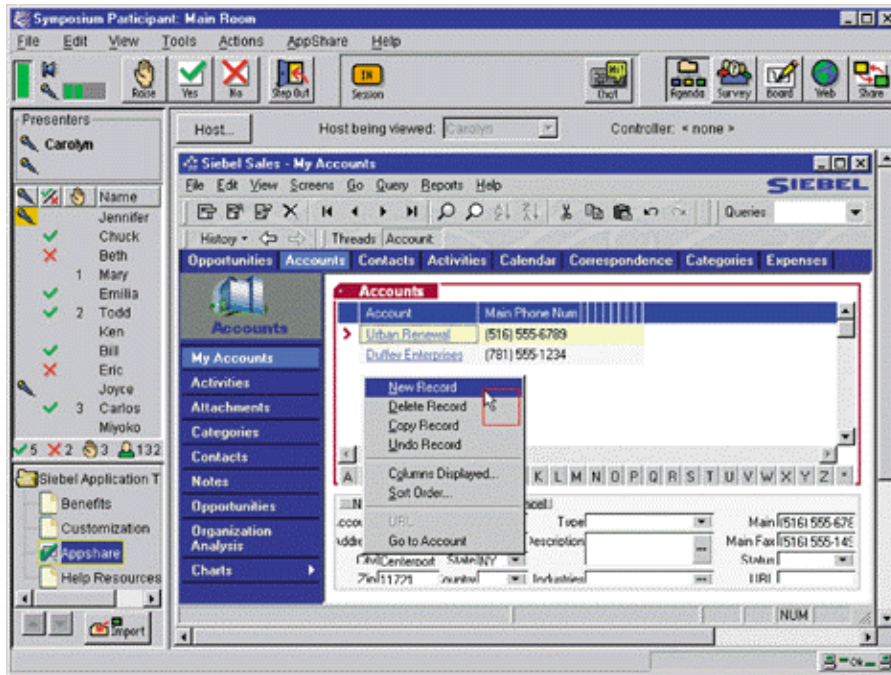
accommodate the initial setup files).
56,000 bps or faster modem, ISDN, or LAN connection.
Sound card with microphone and speakers (sound card required for both audio and video support).
Video capture card or camera that provides a Video for Windows capture driver (required for video support).

6.3 Over view of Centra Symposium™

This software suite uses a combination of the Centra Symposium™ and Centra Conference™ Web client for all live business collaboration - from ad hoc meetings, 1:1 marketing, product demonstrations and team collaboration to interactive seminars, large scale presentations, and hands-on training sessions.

The Centra Symposium client includes all functionality in a single, intuitive interface. Features include advanced integrated multi-way audio conferencing, interactive Body Language™ for instant yes/no responses and feedback, live application sharing, whiteboard, Web Safari™, breakout rooms and labs, just-in-time content updates, IP multicast option, text chat, control hand-off to co-presenters, spontaneous polling and evaluation tools. Perfect for highly interactive team collaboration, workshops and hands-on training, Centra Symposium supports up to 250 simultaneous users per event in a live environment.

Figure 6.3 Centra Symposium tm Sample Participant Screen



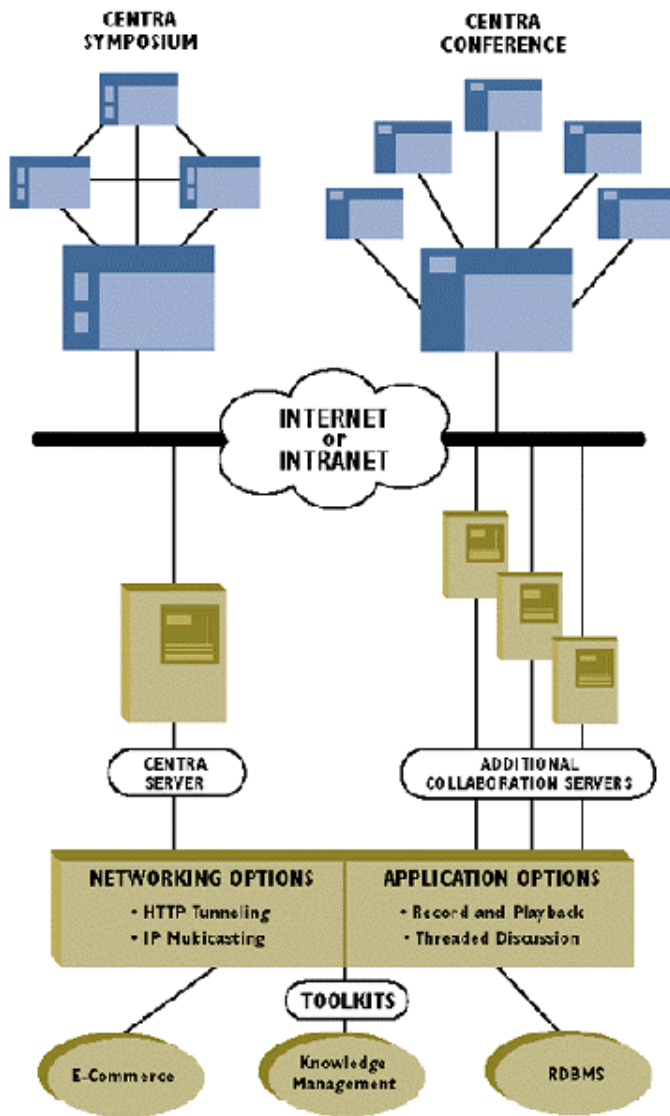
6.3.1 Three-Tier Distributed Architecture of Centra Symposium®:

Table 6.2 Description of Architecture:

<p>Integrated</p>	<p>The Centra 99 collaborative software suite integrates multiple collaboration clients - for a full range of event formats - into a single system supported by centralized log-in, security, management, administration, reporting and content delivery. Centra 99 events can be planned or spontaneous, structured or ad hoc, for internal or external audiences. When the live session ends, Centra 99 enables self-paced viewing of recorded event content, interactions and session agendas for a total solution.</p>
<p>Accessible</p>	<p>The Centra 99 collaborative software suite supports users on multiple desktop operating systems and browsers, through firewalls, proxy servers and over slow modem or WAN connections. Presentations, demonstrations and conferences can be conducted easily with the Centra Conference client over the Internet without the need to install user software, modify firewalls or arrange for dial-up modem banks. The Centra Symposium client provides the same network independence with rich user-to-user collaboration and</p>

	integrated, multi-way audio and application sharing. Centra Symposium is also the only live collaboration software available today that delivers full functionality over a single, 28.8 kbps dial-up connection.
Scalable	<p>The Centra 99 collaborative software suite scales to support the needs of the largest enterprises and public Internet sites. With a three-tier, distributed Internet architecture, Centra 99 can centrally manage a large number of distributed servers each managing multiple events with hundreds of thousands of participants.</p> <p>Highly collaborative sessions with integrated Web-based audio conferencing host up to 250 simultaneous users. Presentation-style events can scale up to a thousand or more simultaneous online participants per event. An IP multicasting option is also available to minimize network impact in enterprise-scale implementations.</p>
Open	<p>Centra 99 has an open architecture that can be integrated with the users' self-paced content delivery and learning management systems, as well as existing IT infrastructure standards for databases, e-commerce, directory services, and e-mail for user event notification. Centra 99 supports all public, de facto standards for enterprise applications and the Internet, including HTML, HTTP, TCP/IP, XML, SMIL, IMS, ODBC/JDBC, and LDAP.</p>

Fig 6.4 Three-Tier Distributed Architecture of Centra Symposium®



6.3.2 System Specifications:

Table 6.3 Centra 99 system requirements

Client	Minimum Requirements
Centra Conference (Cross Platform. Contact Centra for most recent list of requirements.)	Windows Platforms Requirements: <ul style="list-style-type: none"> • Pentium 100 MHz • 32 MB RAM • 800 x 600, 256 colors screen resolution • Netscape 3.01+ or Internet Explorer 3.02+ • 28.8 kbps or faster network connection

Centra Symposium	<ul style="list-style-type: none"> • Windows 95, 98, NT 4.0 Workstation with SP 3, 4 or 5 • Pentium 100 MHz • 32 MB RAM • 16 bit sound card • 800 x 600, 256 colors screen resolution • microphone-headset or microphone & speakers • Netscape 3.01+ or Internet Explorer 3.02+ • 28.8 kbps or faster network connection
Anyone Sharing an Application	Same as above except: <ul style="list-style-type: none"> • Pentium 133 MHz • 64 MB RAM
Server:	
Centra Server	<ul style="list-style-type: none"> • Windows NT 4.0 Server with SP4 or SP5 • Pentium 300 MHz • 128 MB RAM • 250 MB free disk space • Dedicated server with static IP address

6.4 How Microsoft's NetMeeting Compares with Centra Symposium

Table 6.4 Comparison between Microsoft NetMeeting™ and Centra Symposium™

Microsoft NetMeeting™	Centra Symposium™
Connects computers over the Internet using IP addresses.	Completely Client-Server based architecture where Users connect to the Symposium Server as 'participant' computers.
Speed and connection time depends largely on speed of internet connection (if Modem/Ethernet)	Speed and connection time depends less on speed of connection since users connect to a dedicated server in the facility.
Good Audio/Video Quality	Good Audio/Video quality
User Interface inclined towards 'virtual meetings' and computer connectivity and less toward on-line interaction.	User interface designed to accommodate both virtual meetings and virtual classrooms with plenty of tools for feedback and interaction
Audio seems to falter when no of users is more than 10	Audio capability is robust
Supports fewer users and tends to become unreliable when there are more than 10 users connected and sharing an application	Supports upto 250 users at one time without faltering. Robust application sharing capability
There can be only one 'leader' that brings up the application on the screen. Other 'attendees' do not have keyboard input privileges and can only be passive observers when an application is being shared.	There is one leader but he can 'promote' another user as a leader. All users have access to the application being shared and can use the feedback tools to interrupt and then convey their inputs ideas/thoughts via the keyboard.
No such capability	Speed of audio can be controlled by user. It can be made slower or faster depending on the complexity of speech transmitted.
Sessions can be recorded	Sessions can be recorded and archived for future use

Whiteboard feature present	Enhanced whiteboard feature with a variety of input tools present.
Typical Microsoft Interface requiring pre-installation of few other MS products like Explorer, Media Player etc	Easy to use Interface geared toward decision support/plenty of real time interactivity
Not server based and hence needs all machines to have NetMeeting Installed	Server based and hence, once the dedicated server is established, users only need to log on into their sessions and everything can be scheduled from a customized 'home page' created for each user.
Microsoft has licensing limitations and hence becomes uneconomical after a certain point	Purchasing Centra Server automatically entitles user to a site license of up to 250 users.

6.5 How Application Sharing compares with a Web-enabled CQ

Table 6.5 Comparison between Application Sharing and Web-enabled CQ

Application Sharing	Web-enabled Version
Connections are dialed up between IP addresses- and this is not always reliable (Pinging)	Connection is usually fast and reliable since they are through a LAN/WAN intranet/LAN
Number of users must be between 5-50 depending on kind of application sharing software being used	Number of users can be as many as needed, Since a web server will be hosting the site. Server capacities are usually very large and even if the limit is reached, a programmed message can be displayed for required action to be taken
Sessions have to be coordinated with server administrator – less flexible	Sessions need no administrative coordination, User details can all be programmed into server side scripting
Less manageable since 'leader' can 'promote' member and there is no control hierarchy once control has been handed over	More manageable since group privileges can be customized.
Sharing access is pre-determined	Sharing access can be controlled by setting access preferences of group members
Sessions have to be completed in fixed time, Since there is no easy way of storing/recording and reusing recorded info.	Sessions can be completed as and when possible, and users can pick up where they left off.

At this juncture, it becomes clear that a Web-enabled CQ would have many advantages over the application sharing software.

CHAPTER 7

Findings and Future Direction

The purpose of this study was to shed light on the fact that computer-based conferencing systems are going to be the immediate need in the not too distant future when collaborative work environments become a way of life. It used CyberQuest as an example of an application which would result in an effective Web-based groupware if adapted in programming code to be Internet-aware. Because of its interdisciplinary nature, CQ would prove to be very useful as a desktop tool for collaborative processes. When enabled for the Internet, CQ will prove to be much more than just a desktop application for audio-video based meetings over the internet which have some weak application-sharing capabilities. On its own, it will be a powerful tool for exchanging ideas and innovation support.

The “push” induced by technology which is the basis of the general underlying techniques and concepts and the “pull” that the applications software demand define an active matrix of research issues where desktop conferencing is involved. There is a lot of research being carried out in areas of computer-based conferencing for enabling more productive working environments. Organizations of all sizes are looking toward some sort of conferencing software to help enhance their performance by implementing collaboration techniques of some sort, but there still remains an important, if not too much researched issue. The issue of an easily adaptable application for enhanced group problem solving which can be made available over the Internet and that is inexpensive, effective yet immensely user friendly.

7.1 Where To From Here?

Even as the Web continues to evolve rapidly, chaotically, and unpredictably, it's safe to say that the Web will be a popular platform for conferencing. [3]

As long as there will be development in online collaboration, there will be an equally steady demand for software that enhances innovation, idea generation and idea sharing. CQ presents itself as a “suitable candidate” for further development as a web-based software for economical and easy desktop PC collaboration and problem solving. There are almost no limitations to the

disciplines that CyberQuest can encompass in its application. The complete conversion of CQ into WebCQ will result in a innovation and problem solving system that will prove itself very valuable in the areas of collaborative thought processes especially since it presents a very affordable and desktop computer friendly interface

This conversion can be carried out by a meticulous process of re-writing the entire software application in VBScript, using which, the entire tasking process and event handling utilities written in VB are to be replicated. With the exception of a few limitations of VBScript functionality, most of VB's event handling can be re-created, and there are easy ways of working around these limitations.

Findings can be summarized as follows:

- There is a need for innovative software to compliment on-line conferencing.
- The Web presents capabilities like multimedia support which will enhance collaboration
- A collaboration application designed for the Web will scale well, since data can be distributed over any number of servers and there are few limits to growth.
- It is definitely possible to convert CQ into a Web-based collaboration software indicating that many more such applications can be made available over the Internet.
- Developing custom ActiveX controls will result in security issues, machines set with high Internet security options will not download custom controls unless authenticated by a certified agency.
- Using ActiveX controls will also result in a browser dependent interface depending on the underlying scripting language used.
- Application sharing is a time-saving alternative to re-writing an application for collaborative environments.
- Even though application sharing is convenient, it might not always be the best solution – it involves too many variables (refer Chapter 6, section 6.5)
- There is no standard solution for desktop conferencing using an existing conferencing software.

7.2 Future Direction

The following are some enhancements that can be added to WebCQ and hence to any group problem solving software which is desktop based:

- Integrating Internet Chat utility with WebCQ - This will encourage consensus before final data is fed in
- Integrating Internet telephonic conferencing with WebCQ for real time voice communication
- Integrating a desktop conferencing application with WebCQ for video.

From the research conducted through the duration of this study, it became apparent that there is an emerging need for applications suited for group problem solving activity. This need will be better fulfilled with the development of desktop-based Internet/Web enabled applications for collaborative problem solving. There is a significant amount of research being conducted in areas of computer-assisted conferencing and collaborating systems, much of the stress of this research and development is focused on large-scale organizational performance enhancement software. Most research concentrates computer-based conferencing for specialized tasking like manufacturing process automation, technology aided product development and performance enhancing software. Most of these projects are tailored for large-scale facilities and concentrate on centralized systems, which have one main computer at the core of their collaboration.

However, there are very few researchers concentrating on the development of a relatively more inexpensive, economical, affordable and hence highly accessible collaboration system, which connects over the Internet and uses an inexpensive desktop to generate and transmit data. There is some sporadic product development or research being focused on inexpensive, small-scale, desktop-based applications software for online conferencing. Most available desktop conferencing software is geared toward online audio-video conferencing or large scale, virtual classrooms for distance learning. Products like Microsoft NetMeeting and Net2Phone have only risen to the kind of popularity they enjoy at the present time because of the fact that they do not cost anything to the user since they are freely downloadable over the Internet. If there could be a specialized application which lets one collaborate a technical thought process without the cost of the expensive and situation-specific virtual discussion software but with the reach, simplicity and

accessibility of a desktop conferencing software, it would revolutionize online group problem solving software to a great extent.