

Distance Education Using Consumer-Level Hardware and Software

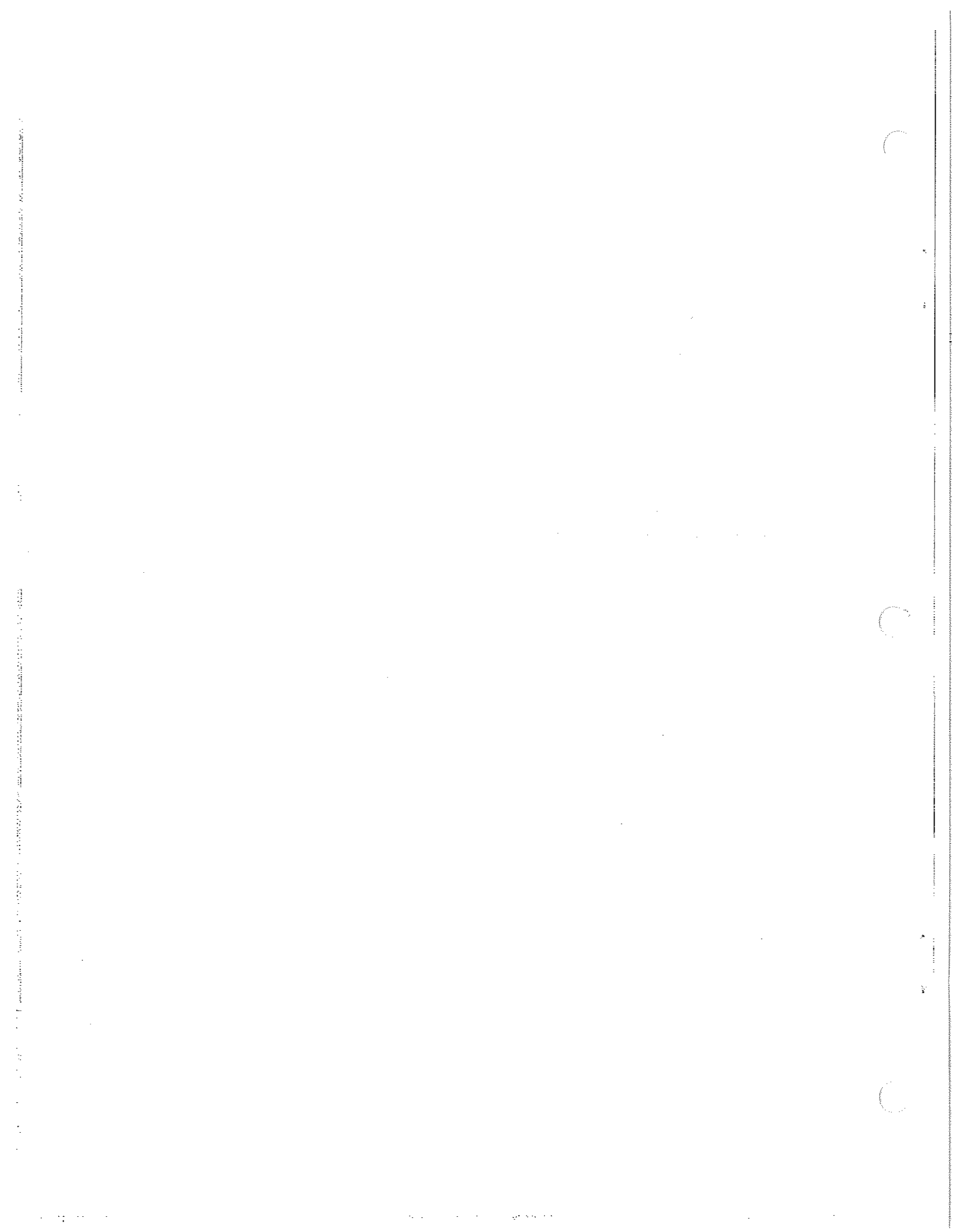
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DISTANCE EDUCATION USING CONSUMER-LEVEL HARDWARE AND SOFTWARE

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ABSTRACT

A report on a proof of concept experiment to provide a distance education experience using consumer-level hardware and software while maintaining acceptable quality levels in video, audio, and text display.

KEYWORDS

Distance Education, Skype, Skype shared desktop, consumer-level hardware and software

INTRODUCTION

The traditional "lecture to a classroom of students" paradigm is constrained by geography and is outdated in the age of globalization. Globalization creates the need to provide access to educational resources to anyone, anywhere, at any time. Most often these educational resources are non-interactive. They are in the form of text or pre-recorded video, or audio. The ability to design and implement interactive education experiences enhances the learning of the participants and providers. The ability to provide these educational experiences regardless of geography increases their utility.

Using telecommunications technology and the Internet, the constraint of geography is easily overcome. Interactive distance lectures are nothing new in the university environment. However, with these there is an economic constraint determined by the equipment and facilities needed to provide an acceptable level of quality to the interactive session. In addition, there is a physical constraint in that the provider and participants need to be in specific locations. The provider needs to be in a studio-like facility to produce the near real-time interactive experience. The participants need to be in facility that is capable of receiving the presentation in its production format. Both the producer and participants need to have symmetric facilities. In a global education environment, an asymmetry of education facilities is likely, in particular, with regard to interactive media.

These issues lead to the thesis of the experiment stated below.

THESIS

The thesis is: to use existing techniques that provide inexpensive real time interactive educational experiences independent of specialized facilities and geography. The following is a description of the experiment which allowed us to realize our thesis.

EXPERIMENT

A colleague at Wuhan University of Science and Technology (WUST) requested that I honor him by guest lecturing to his current class. His course was a graduate course on IT Service Management. The course was based on the theme of the book by Jan van Bon – "Foundations of IT Service Management: Based on ITIL". Please refer to [5] for details.

Case study

From his course students had learned basic principles of IT service management in previous lectures, and requested I present a case study from the real world from a different perspective. He requested a discussion of how IT services are provided at my university. In particular, he requested addressing the following questions:

1. From the service providers perspective, how the ITS at Washburn University aligns IT services with the business needs of the university and how the services are provided.
2. From the user's perspective, how students and faculties at Washburn University access the IT services?
3. Is there any conflict between the services provided and the expectations, and how had the conflicts been solved if there were any?

In essence, what was requested was a presentation of static information concurrent with an interactive session over the material that was being presented. The constraints were: content presentation and interaction were over widely separated geographic locations and a time difference of 14 hours.

The time difference was simple to solve. The presentation would take place on December 20th at 6:30PM and be viewed December 21st at 8:30AM.

The solution to the geographic locations constraint was solved by the use inexpensive consumer-based communication technology.

Implementation

A real time and interactive educational experience of acceptable quality was required to meet the needs of presenting the case study. This was achieved by using existing inexpensive technology.

Initially we agreed to use Skype voice and video to lecture and student-lecturer interaction. MS-SharedView would be used simultaneously to display the power point slides (PPTs) required for the lecture. Both Skype and Shared View are available for no cost.

Skype

Skype is a free application that allows users to communicate using voice or text messaging in real time. In addition, it provides video conferencing between two users. Please refer to [6] and [7] below for more detail.

SharedView

SharedViewed is an application provided by Microsoft that allows up to 15 users to participate in a joint session. Please refer to [4] below for more detail. A joint session is initiated by a user extending an invitation via e-mail that contains the necessary information to join the session. The user extending the invitation can share his/her desktop or a portion (i.e. a specific application) with those users who accepted the invitation.

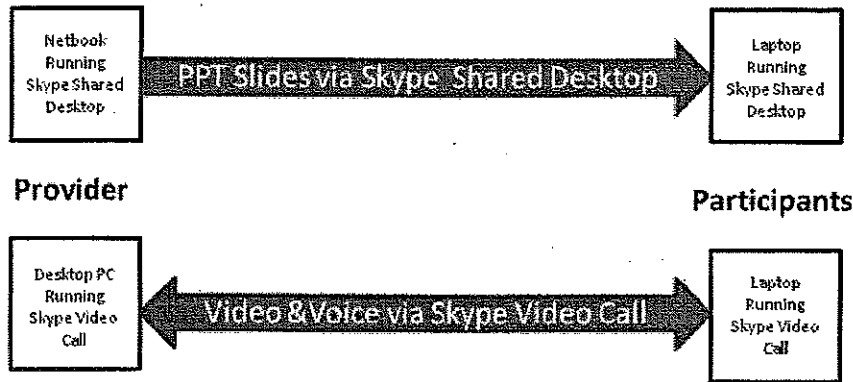
SharedView was intended to be used to present the necessary static information of the case study – i.e. the PPTs. A preliminary test found that the lag time between slide transitions on the provider's side was too long on the participant's side. It was too easy for the provider to "out talk" the slide on the participants side. Clearly this would lead to confusion.

Skype Shared Desktop

The Skype software's most recent version allows for a "shared desktop". As the name suggests a Skype user can share his/her desktop or a specific application to another Skype user. A user may share all or part of the desktop. Please see [1] for details.

Solution Used

The final implementation used Skype utilizing two "channels": one for voice/video and a second for PPTs using Skype's shared desktop. Each channel is established between two computers each having users with unique Skype IDs. Figure 1 below provides a logical view of the implementation.



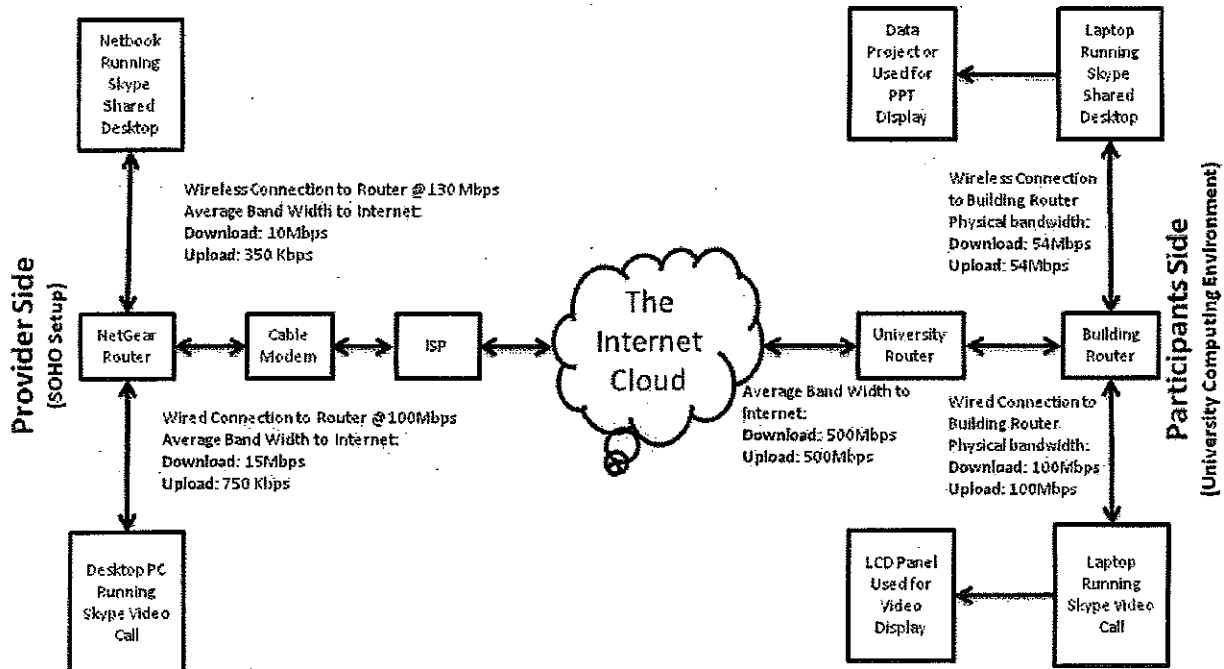
Application Layer View of Experiment

Figure 1

Each side of the communication utilized two PCs, one for static information (PPTs) and the other for interactive information (video and voice). The PCs used for interactive information employed web cams with microphones and had auxiliary speakers attached to the PCs.

To improve video resolution quality web cams were used. The cost these was less than \$100.00 USD. In addition changes were made to the Skype configuration file that would enhance the video resolution. Please refer to [2] for the details on the changes made to this XML file in order to capture an improved video resolution.

Because of the timing of the case study presentation, classes had ended at Washburn University; the provider used his small office home office (SOHO) facility to provide the case study presentation. The participants, since classes were in session, were able to use a university computing environment to receive the presentation. Figure 2 below illustrates the physical implementation of the experiment.



Physical Layer View of Experiment

Figure 2

On the provider's side please note the upload and download bandwidths. This will affect the participant's experience of the presentation.

Results

Participant's Side

In a subsequent e-mail Dr. Zhang, on the participant's side, reported the following, quoting the e-mail,

"The PPT slides we saw on our screen are of high quality, without blur. I think the delay didn't exceed 0.5 second when changing slides, and the movement of your mouse pointer on a slide transmitted to my side almost in real time, however the video quality was not good enough, it stalled couple of times. I guess it were due to the limited upstream bandwidth provided to home users, if you could see my image consistently. Hopefully universities' campus networks can provide wider bandwidth when someone offering a credit course remotely."

Provider's Side

From the provider's side the follow observations were made.

Based on the question and answer session following the presentation, the experiment using Skype and Skype Shared Desktop was an effective and useful presentation for the graduate students. This implies that the presentation method was effective.

The provider reports that student interaction during and after the presentation was similar to lectures given on site at University Y in China. In effect there appeared to be no difference between on-site information delivery and remote information delivery.

CONCLUSION

Given Dr. Zhang's comments above, the last solution solves the problem but with limitations.

CONS

It appears SOHO's Upload bandwidth may not be sufficient for acceptable real-time video.

PROS

This solution is at minimal cost. Skype is free and a quality web cam with microphone is less than \$100.00 USD

There is no intitutional overhead. No distance learning studio or proprietary software is required.

These types of quality learning experiences can be spontaneous. Dr. Zhang made his request on December 4th and the case study presentation was delivered on December 20th.

The provider believes this method of information delivery is as effective as traditional methods.

FUTURE ACTIONS

As Dr. Zhang states: "It (this experiment) demonstrates that some kind of remote education can already build upon consumer-level equipments and software, which facilitates many new education paradigms."

As an example, by employing Skype and other technology Washburn University professors can offer lectures on 18 of 36 lecture hours required for three hours credit to WUST students remotely. Then the Washburn University professor comes to WUST to finish the whole course. The deans of WUST like the idea. This Skype lecture is a starting point for such practice.

ACKNOWLEDGMENTS

We wish to acknowledge the graduate students of WUST willing to participate in this "adventure."

Professor Boncella wishes to acknowledge his colleague, Professor Zhang, who is always willing to "push the envelope" in order for his students to have unique educational experiences.

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