Low-Cost Internet Synchronous Distance Education Using Open-Source Software

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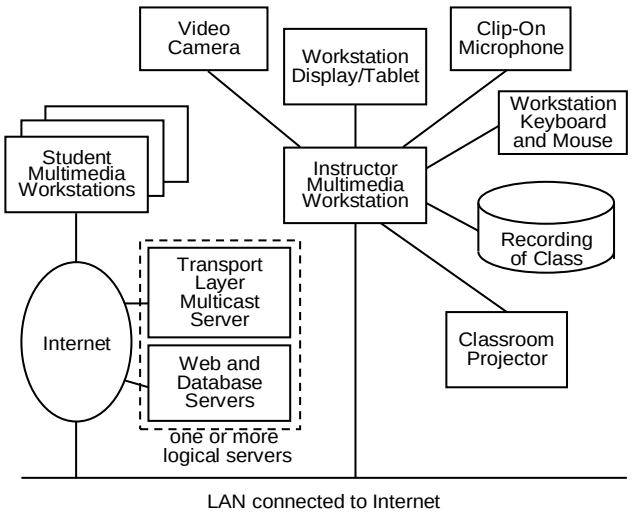
Presentation Overview

- Introduction - motivation
- Software requirements
- Open source software
- System structure
- Scaling up to many students
- Conclusions

Motivation

- Experience shows instructor-led education is most effective
- Synchronous course delivery from live instructors via Internet is practical today
  - Audiographic delivery is most cost-effective
  - Best when combined with asynchronous delivery
- How to make this affordable?
  - *Simulteaching* to in-person and Internet students
  - Dialup using inexpensive personal computers
  - Record as it is taught, for missed classes/review
  - No-cost, open-source software

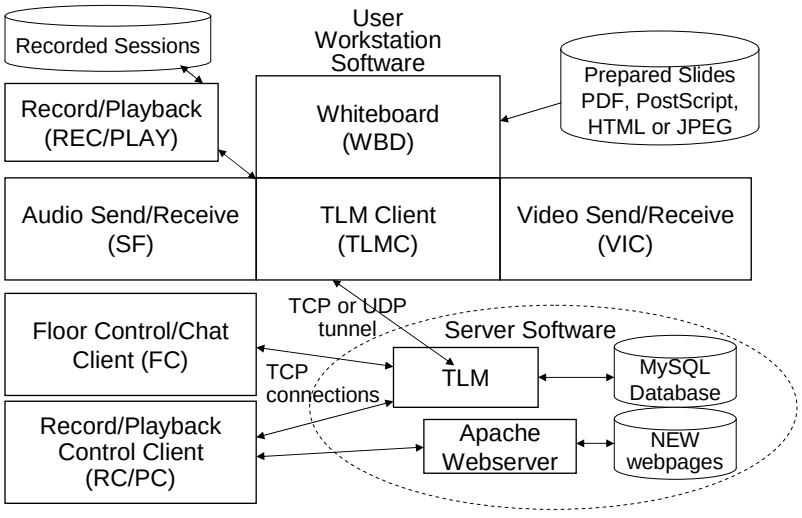
Simulteaching Setup



Simulteaching Software Requirements

- Works on inexpensive PC
- Works over dialup modem
- Quality: well designed, doesn't break
- Simple, robust, easy to use
- Scalable to large numbers of students
- Works despite firewalls and NATs
- Authentication and floor control

Modular, Open-Source Software



Parameters of the Solution

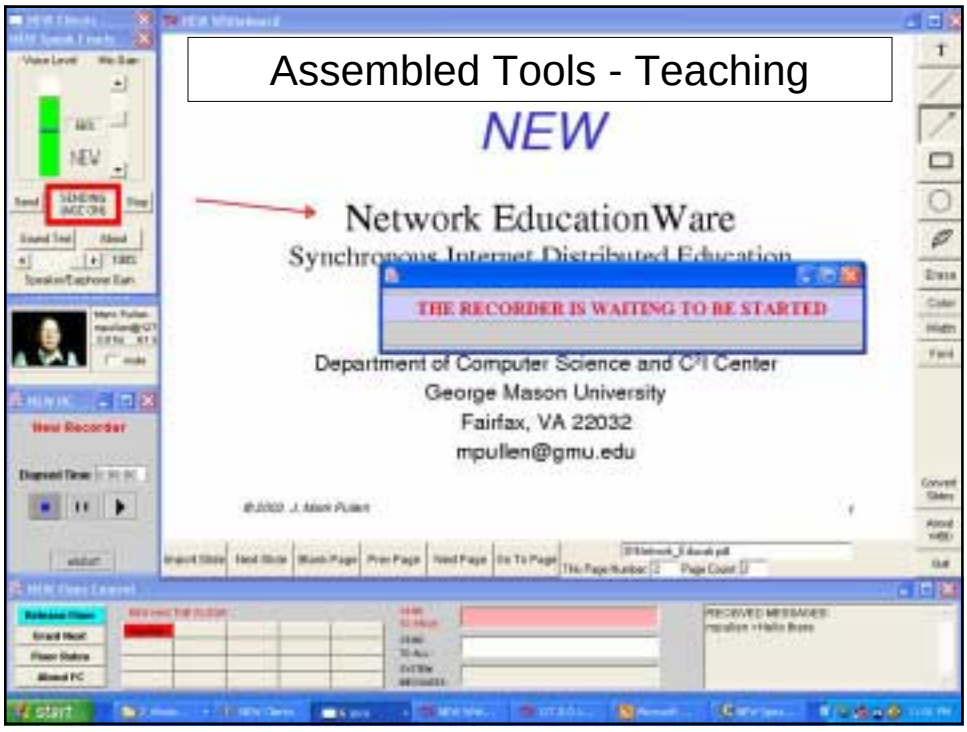
- We have determined through experience:
  - Entire system, from teaching to online delivery, must be designed to be simple and robust, functioning in almost any Internet environment.
  - Quality, robust software is essential.
  - System must make online teaching and learning easy
    - Comparable to teaching with overhead projector
  - Software must function over low-capacity Internet connections to reach most students.
  - Use with (not in place of) email, Website, WebCT/Blackboard.

Software Components

- Internet audio: Speak Freely by John Walker
- Whiteboard: WBD by U. of Loughborough
  - Authoring via PDF, for example LaTeX or PowerPoint
- Internet video: VIC by Lawrence Berkeley Labs, U. of Southern California and U. College London
- Record/Playback by GMU NETLAB
- Floor Control by GMU NETLAB
- Transport Layer Multicast (live) server and client by GMU NETLAB
- Apache Webserver by Apache Digital
- MySQL database by MySQL AB
- Chat: browser-based phpMyChat (also MySQL)

System Structure

- Multi-platform target architecture
  - first release client is Windows-only
- Thirteen building blocks
  - all communicate via Internet Protocol
  - allows flexible configuration
- Generally, one server per classroom
  - peer-to-peer client supports range of modes
  - lecture, seminar, conferencing
  - two-way audio (also text questions and chat)



Talking Head Video Interface

(NEW also supports downloaded video clips)

Scaling Up Course Management

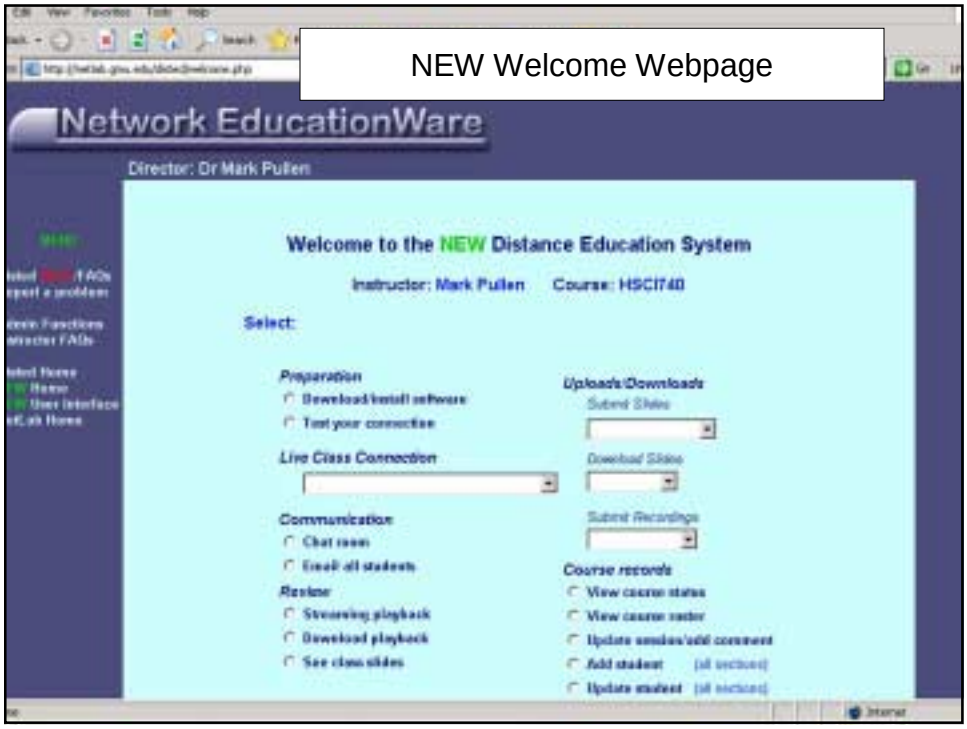
- Started with one course per semester
  - Ran it on desktop computer
- Now have twelve per semester
  - Need a real server
  - More than that: webpages and a database
- Learned how to scale up
  - And stay cost-effective

Scaling Issues

- Worldwide or regional access?
- Technologies used must be scalable
- System design and procedures too
- Webpages make system easy to use
  - Students are no longer “early adopters”
- Dialup modem for quality of service
- Not all students want online access
  - But nearly all of them want playback

NEW Webpage Functions

- User authentication
- Download/install software
- Connect to live class
  - Spoken input and video optional
- Connect with a recorder for teaching
- Class chat room
- Review: playback, teaching slides
- Instructor email to class
- Upload/download slides and recordings
- Database and server administration



Institutional Issues

- Do this to make education more accessible
  - Probably no cost savings to university
  - But it reaches an underserved group
- Even progressive faculty members resist new media
  - Simulteaching helps (known paradigm)
- Online teaching requires more institutional support
  - Save on classrooms; pay for assistants

Instructors Must Be Reminded

- The online student does not benefit when you point your hand at the screen- use the WBD arrow!
- The online student can't hear other student questions from the back row
  - repeat the question!

Conclusions

- Synchronous online teaching with open source software is popular with our students
  - And the faculty are growing to like it too
- Software must be simple to use and scalable
- Requires some extra support
- Inexpensive computers and free software allow cost break-even or better
  - While reaching a new group of students!

For more information:

http://netlab.gmu.edu/NEW