Community Building in Distance Learning Environments:
Using Uncompressed High-Definition Video as a Medium for Classroom Interactivity.

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Many Thanks

- **Institutions**
  - The Center for Computation and Technology @ Louisiana State University, University of Arkansas, Louisiana Tech University, Masaryk University (The Czech Republic), MCNC

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Outline:

• I. Course Introduction
• II. Technologies and Planning
• III. Student Response
• IV. Looking Forward
• V. Conclusions and Questions
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General Overview

• Course Name:
  Introduction to High Performance Computing

• Professor:
  Dr. Thomas Sterling

• Host Site:
  Louisiana State University

• Satellite Sites:
  Uark, LaTech, MCNC, Masaryk University (Czech Republic)
Reasons For The Course

• Uncompressed HD Video as a medium for interactivity
• Multiple Technologies as a method for increased site and student participation
• Ease of interaction to encourage experts in various fields to be willing to instruct via distance learning environments
• Because we can!!!
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• I. Course Introduction
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• III. Student Response
• IV. Further Analysis
• V. Looking Forward
Planning

- 8 months of planning between sites
  - Weekly Access Grid Meetings
  - Regular testing sessions and demos
  - A number of permutations of the course were discussed before its final presentation
Initial Issues

- Networking
- Uncompressed HD Video
- Time and Schedule Shifting
- Cost
  - At the time, the video capture card alone cost approx 10k (Centaurus Capture Card)
Technologies

• Ultragrid -
  – Used to send the uncompressed high definition video.
  – HD video was sent over fiber optic networking via the National Lambda Rail through various reflectors to each site.
    • This allowed for bandwidth up to 10GB per second and virtually eliminated latency.
    • Each site chose the number of video streams that would be received over the HD. The host site displayed all available streams via 30 inch LCD monitors. Other sites generally only displayed the host site.
  – HD Audio was sent through the RAT.
Technologies

• Access Grid
  – Used to send video to sites that could not implement HD video as well as sites who could receive but not send HD video.
  – Also acted as the first backup solution if HD failed.
Technologies

- Ncast Webstreaming Technologies
  - Used to record lectures for later viewing by students.
  - Combined video, presentation material, desktop viewing, etc. into one compressed video stream.
  - Second backup if both HD and AG failed.
  - (www.ncast.com)
Technologies

• Webex Presentation Sharing
  – Used to assist in sharing the professors laptop to be presented on a large viewing area.
  – A bit easier to use than VNC
  – (www.webex.com)
Technologies

- Because of the time differential, Masaryk University made use of their own hardware design which recorded the uncompressed HD Video and Audio for later viewing.
- Allowed for storage of both HD Video and Audio in one multiplexed file that was file indexed for fast seeking capability.
- Storage: 1.5 hours = 1 TB
Other Technologies

- Website
- Podcasts (Experimental)
- Student accessible Super Computing Nodes
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Student Response

- Ascertained by surveys and questionnaires given to students from all sites.
- Questioned the students reactions to:
  - Technologies
  - Interactive Qualities
  - General Instruction
- Focused more strongly on those who used the HD video on a regular basis
Student Response: Technologies

• Video Quality:
  – Received the highest marks within the surveys. Especially in regards to professor visibility at the host site.
  – One request: A closer view of the lecturer

• Audio Quality:
  – Received the lowest marks within the survey. Audio control constituted a day to day troubleshooting problem.
  – Issues were resolved only as the semester ended:
    • Audio Cards (Audigy)
    • Wiring and Distortion
    • Effects on Interaction
Student Response
Technologies

- Ncast, Website, and other Out of Class Technologies
  - Perhaps one of the most interesting developments in the class
  - Students made extensive use of out of class videos, supercomputing nodes, power-point presentations, recorded demos, etc.
  - An evolving textbook?
Student Response: Interaction

- This course in its present permutation was not adequately designed for interaction between host site and remote sites.
- Students, in general, did not feel comfortable asking questions or communicating.
  - This was both in part to the style of lecture as well as the technological issues.
Student Response
General Instruction

• Material:
  – PowerPoint slides were too numerous and too dense (avg. 60 - 80 per ppt)
    • This is in part due to a lack of a textbook.
    • This also exacerbated the interaction issues
  – The lecturers (including both the professor, graduate assistants, and guest lecturers) did not encourage interaction within the general instructive material.
    • This is in part to the lack of training provided before the class began, and because of the nature of an introductory course.
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Technological Needs

• The need for better visible screens for the presenting site to see multiple universities.
  – Universities across the country and world are already expressing interest in the course when it will be represented in Spring 2008

• The need for a better method of interaction and question asking
  – In regards to instruction
  – In regards to technology

• The Need for a Framework to assist in design and implementation across other universities
Instructional Needs

• Training
  – Interactive training is necessary to assure that instructors understand the nature of interactive courses.

• Course Development Protocol
  – Assistance needs to be given to instructors in porting their coursework to interactive materials

• Student Training
  – Perhaps the first class meeting could involve training in interaction.
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Thank You.

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