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

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The Center for Computation and Technology at Louisiana State University in cooperation with Masaryk University (Czech Rep.), the University of Arkansas, Louisiana Tech University, and MCNC in North Carolina has endeavored to produce a class offered in the Spring of 2007 that incorporates the Access Grid, Ultragrid, web-streaming using the NCast streaming system, and the Webex shared desktop software as well as a handful of other technologies. This class, entitled Introduction to High Performance Computing, is being taught by Dr. Thomas Sterling and is the first class to ever be presented via uncompressed, low latency, interactive high definition video.

The development of this course was accomplished through a year of planning with each University involved in weekly Access Grid meetings. Through these meetings, it was determined that the high definition link would be carried using the Louisiana Optical Network Initiative (LONI) that connects the state of Louisiana to the National Lambda Rail (NLR). This connection allows for transfers of up to 10gb per second and accommodates the need to both receive and send information to multiple sites. The information is being sent from LSU to the various sites via the Starlight reflector in Chicago. Institutions that are not able to receive HD video are being sent both audio and video through the Access Grid and viewing presentation material using Webex meeting solutions.

The importance of this class is two-fold. Primarily, it will demonstrate the ability and the need to link various modes of interactivity to provide an environment that allows a cohesive classroom environment to form. Secondarily, it also offers the possibility for professors to adequately cross-instruct between universities.
In order to understand the benefits and possible drawbacks of combining modes of interactivity, there needs to be discussion of the testing and initial implementation of the course. Specific planning and troubleshooting issues that will be discussed are:

- What is a general cost run-down of setting up a course of this magnitude?
- What is a list of the specific technologies used and for what purpose were each used for?
- What solutions were developed in order to assist universities operating on a different course timetable?
- How did the Access Grid assist in the initial setup of the course?
- What were some of the requirements in the initial setup of the course?
- How did the day-to-day presentation of the course proceed?

While the increase in clarity of the uncompressed high definition video is striking, it must also be decided whether or not the cost needed to implement the networking of such video streams is necessary (1.5 Gbps per site sent and received). A study being performed throughout the semester will offer insight to both student and faculty response to the course as a whole as well as their perceptions of the various pieces necessary to run the course.

Four to six students from each satellite classroom and the originating classroom, will be interviewed using a standard interview protocol in order to ascertain their feeling of connectedness to Dr. Sterling and the students at the other sites. Faculty will also be interviewed to determine their opinions of presentation and to determine the best methods for increasing community connectedness within the class. At the end of the course, each student enrolled will be offered the opportunity to fill out a general survey to offer their
opinion of the class progression, the professor, and the supporting faculty and staff. When analyzed this information should offer insight into whether or not the high definition streams increased the feeling of community within the entire class project.

It is hoped that the uncompressed high definition video will allow students to interact with their professor at a scale not before seen in other video-conferencing technologies. As a side portion of this study students will also be asked to discuss their use of a wide variety of presentation as well as interactivity formats. Each class is being offered as a downloadable or streaming video from a class website which students may access at any time during the course. Students will also have access to a super-computing node in order to run their assignments. This allows students to both have continued access to material as well as provides them hands on connection with the material that they are learning.

While the results of the study will only be preliminary at the time of the Access Grid Retreat, there should be enough analysis to allow for general results to be presented that will demonstrate both the changes that need to be made in future courses as well as generalities in student response that may offer insight as to how interconnectivity can be increased. The primary discussion that will be presented at the retreat in regards to this study will be analyzing the success of the course in developing community among both onsite and offsite student populations.

In conclusion, this course will be presented again in the spring of 2008 after taking into regard the study as well as technological improvements. It is hoped that by implementing compressed high definition codecs over the Access Grid that even more sites may be able to access the class itself. When this is possible, there will then be the
ability to offer expert instructors to community colleges, smaller universities, and universities located at various locations across the globe without the need for exorbitant expenditures. The final result of both the course and the studies that will be run is that students from all walks of life will have equal opportunity to access material that will both enable and inspire them to move into fields that were once only located at primary institutions.