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Computing in the Arts

Recent Internet2 Performances and Programs

By Jeffrey Bary

Since Fall 2001, the Arts Technology Group of NYU's ITS Academic Computing Services (ACS) has helped produce three very different Internet2 (I2) events. These network-enabled performances were the result of collaborative efforts between NYU, various performing artists, and three universities: The University of Delaware, The University of California at Irvine, and the University of Kansas. Each performance will be described in more detail later in this article.

Preparations for Internet2 events begin several months in advance, as there are many technical, logistical, and artistic details that need to be addressed when producing a network-enabled performance. In addition to the requirements of a regular performance piece, the coordination of an Internet2 event also involves network bandwidth testing and television production. Each of the three events described below used a similar codec configuration. A codec is a device that COmpresses and DECompresses video and audio signals, and transmits them over Internet2. In these three events, the I2 network was used as a way to transmit one or two video streams with CD-quality stereo audio in each direction. Each site had several video cameras and microphones that were fed to an audio or video mixer and then to the codec. At both ends, the video was projected either in the performing area or, in the case of the University of Deleware, displayed in an electronic classroom.

For each event, we used a codec from vBrick. In Delaware, we used a vBrick 6200. This device uses the MPEG2 format to transmit audio and video at about 12 megabits/second. For the performances at UC-Irvine and the University of Kansas (described below), we used two pairs of vBrick 3200's. These codecs use the MPEG1 format to transmit video at about 3 megabits/second. MPEG2 quality is the same as DVDs and satellite television, while MPEG1 is similar to VHS. The advantage of using the MPEG1 format is that it uses less bandwidth, and therefore causes fewer network congestion problems when transmitting and receiving the signal.

One final technical note: there are two ways to transmit information on Internet2 (and the regular Internet as well). The methods are called UDP, which stands for User Datagram Protocol, and TCP, which stands for Transmission Control Protocol. In both cases, the data is first divided into smaller groups or packets. TCP sends the packets and requests a receipt acknowledging successful reception. If the receipt is not sent, the packet is retransmitted until it is reliably received. This is the case with most services, like the Web and e-mail. The other method, UDP, sends the data off without a request for a receipt. This is the approach used by vBricks and other video and audio streaming, e.g., Real Media and QuickTime. The advantage of this method is that it is faster because there is no receipt returned and no retransmitted data, and, as long as the loss of data is minimal, there is little or no noticeable impact on quality. Intertnet2 provides excessive bandwidth, known as the "fat pipe" technique, to minimize the amount of data loss.

University of Delaware, School of Music / NYU ITS / Bobst Library

"How did you ever come up with that?" - The Work of Six Creative Artists - Spring Semester 2002

Professor Lloyd Shorter of the University of Delaware Department of Music designed a course to study the creative process. He wanted his class to have access to contemporary artists; to hear and see them as well as ask questions, much like in a classroom situation. It was difficult for the New York-based artists to visit the University of Delaware campus due to their schedules, but the possibility of using video and Internet2 technology to talk to the class in Delaware without leaving New York enticed the artists to participate.

Figure #1 - The University of Delaware classroom during the Rinde Eckert talk. The original version of this picture and additional photos of the classroom during this and other events are available online at: http://www.udel.edu/UMS/itv/i2nyu-ud.

The Avery Room in Bobst Library was used as the studio/classroom at NYU. Sometimes there was a local interviewer as well as an interviewer at the University of Delaware. The students in the class had studied the artist and each had prepared several questions to ask. In addition, there was an invited audience at NYU who were also encouraged to participate in the discussion and to ask questions of their own. There were local video projections of the people in Delaware to provide the feeling of a merged classroom.

Over the course of the semester, the class was able to talk to: Rinde Eckert (composer, actor, singer; see fig. #1), Moses Pendleton (choreographer), Merce Cunningham (choreographer), Aaron J. Kernis (composer) and Ellen Gallagher (visual artist).

In addition to the work done by Professor Lloyd C. Shorter at the University of Delaware, this event was co-sponsored by NYU's Avery Fisher Center, Studio for Digital Projects and Research, and ITS Arts Technology Group, with support from ITS Network Services.

University of California at Irvine, Department of Dance / NYU Steinhardt School of Education, Music & Performing Arts Professions

Voyages of Aeneas: Fixed/Not West-East Dialogues (Aeneas & Cassandra) - November 21, 2003

This was a collaborative performance based on the myths involving Aenaes and Cassandra. Here, the video and audio were used to join geographically distinct stages into a single performance space. Both stages had musicians, dancers, and actors, as well as an audience. Video projection and a rich sound mix were used to merge the two spaces into one, in the mind of the performer and the audience.

Figure #2 - A GIF animation from the Aeneas website. Please visit http://www.nyu.edu/classes/gilbert/aeneas2/ to see the original. Refresh your browser to restart this animation.

As part of the creative process, a score/script was created that was sensitive to the technical limitation of network-based music and dramatic interaction. The limitation is that of latency, in this case, the time it takes for the signal to travel from New York to Los Angeles and back-typically between a quarter and a half of a second. This amount of delay makes is impossible to play music that requires simultaneity on the part of musicians at both locations. A score was developed that passed the "leadership" back and forth between New York and Los Angeles--at times one group was following and, at others, leading. In addition, each side had solo sections to contrast the group material.

See http://www.nyu.edu/classes/gilbert/aeneas2/ for more information about the myth, the performance, and the production. This website will give you an inside view of the preparation as well. The site also has links to a rough

score, "Scene," and the rehearsal schedule, as well as links to a similar production, "Songs of Sorrow, Songs of Hope," which took place in November 2001.

University of Kansas, Art / NYU Steinhardt School of Education, Culture & Communication

Barbara Rose Haum - Lunar Performances: Creating Architecture of Text in Time Disrupting Pharaoh's Dream: Devouring Mother - December 6, 2002

In this piece, performance artists Barbara Rose Haum and Joe Wachs at NYU, and Janet Davidson-Hues and Maria Velasco of the University of Kansas, celebrated the new moon with Barbara's 6th Lunar Performance. This performance took place in the television studios at NYU-TV in the Pless Annex. This allowed us to take advantage of professional equipment and facilities, included lighting, video, and sound equipment, as well as audio and video mixers.

The facilities of NYU-TV, recently wired for Internet2, were an ideal location to produce a small network-based performance. Many of these types of performances have the same needs as a television production. Other venues may be appropriate for a live performance, but having built-in television lighting and sound makes the production tasks easier. There was no audience at the Kansas location, but video was projected in order to help the remote performers place themselves into the piece, and to provide both visual and audio cues. Due to the limited space in the television studio, there were only about 12 people in the audience.

In addition to Barabra Haum at the NYU Steinhardt School of Education, Culture & Communication, this production was done with the generous assistance of the New York University Libraries--Television & Media Services--NYU-TV. For more information about this performance, see http://www.nyu.edu/projects/haum/lunar6.html.

Figure #3 - An image from the Lunar Performance website. Please visit http://www.nyu.edu/projects/haum/lunar6.html to see the original of this photograph and many others.

Future

There are still a number of relatively unexplored technologies that could be used in future network-based performances. Computers are used today to generate, record and playback (perform) different types of art. We hope to investigate techniques such as the use of MIDI signals or sophisticated motion tracking systems to control music, video, lighting, or other aspects of a performance from a remote location.

International events pose an interesting challenge as well. Internet2 networking applications are supported by Abilene, http://abilene.internet2.edu, a high-speed network that is currently only available in the United States. Thus, any international project would involve working with high-speed networks similar to the Abilene network, e.g., CANARIE in Canada or GÉANT (Europe) (see http://international.internet2.edu). International events duplicate and magnify the problems encountered with Abilene-based events. Network congestion, asysmetric routing, equipment configuration, and timezone differences must be reconciled across differing languages, work days, and cultural and institution practices.

For additional background information about Internet2 at NYU, see: "Internet2: The Next Generation Theatre", *Connect*, Fall 2001; "How Can I Create an Internet2 Performing Arts Event", *Connect*, Fall 2001; and "Internet2 Multi-Site Performing Arts Events - Practical Notes for Internet2 Artists and Technicians" (PDF). Please send your questions or comments to: jeffrey.bary@nyu.edu.

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