

Technology Deans Group ad hoc Subcommittee  
**Instructional Video Infrastructure Collaboration**  
December 3, 2004

**Overview**

The academic use of digital video technology continues to grow on the University campus and throughout education. Advances in network bandwidth and availability to the home and school and advances in digital video technologies have dramatically improved our ability to deliver instructional video to the student.

The use of video varies widely between academic departments. However, this variability is chiefly found in the nature of the original material. Nearly all uses of video depend on the same requirements: acquisition, storage, and delivery. This project focuses on providing an efficient and effective infrastructure to meet these requirements. Most importantly, it provides an infrastructure capable of meeting the academic requirements set by our instructors.

This proposal presents a plan to secure the hardware, software, and human resources necessary to create a campus infrastructure to provide these services. A total of \$250,000 of ITAC funding is requested to accomplish these goals.

The following University units are represented in this proposal:

Unit	Subcommittee Representative
College of Communication	Charles Soto, <a href="mailto:csoto@mail.utexas.edu">csoto@mail.utexas.edu</a>
College of Fine Arts	Jim Kerkhoff, <a href="mailto:kerkhoff@mail.utexas.edu">kerkhoff@mail.utexas.edu</a>
College of Liberal Arts	Joe Tenbage, <a href="mailto:tenbage@mail.utexas.edu">tenbage@mail.utexas.edu</a>
School of Nursing	Betty Skaggs, <a href="mailto:bskaggs@mail.nur.utexas.edu">bskaggs@mail.nur.utexas.edu</a>
College of Pharmacy	David Fudell, <a href="mailto:fuddell@mail.utexas.edu">fuddell@mail.utexas.edu</a>
School of Social Work	John Trapp, <a href="mailto:jtrapp@mail.utexas.edu">jtrapp@mail.utexas.edu</a>
Center for Instructional Technologies/Division of Instructional Innovation and Assessment	Coco Kishi, <a href="mailto:coco@uts.cc.utexas.edu">coco@uts.cc.utexas.edu</a>
Libraries	Mark McFarland, <a href="mailto:m.mcfarland@austin.utexas.edu">m.mcfarland@austin.utexas.edu</a>

**Current Activities and Methods**

At present, each represented unit is engaged in the process of acquiring, storing, and delivering digital video.

Acquisition

Also known within the video industry as ingest, acquisition is the process of recording or assembling source material. At this point in time, nearly all acquisition is done in digital form, for example, miniDV format. However, the CIT/DIIA, Engineering, and Communication have experimented with more elaborate, content-rich forms of digital acquisition that feature not only the typical (talking head) video and audio of lecture material, but add high-resolution graphics and some random access as well.

Some source material could simply be the video and audio of the lecturer. In some cases, the visual image of the lecturer is not desired or important. In some cases, a visual demonstration of a physical skill is vital to the presentation. In others, high-resolution PowerPoint slide images along with audio from the lecturer suffice. The point is that the requirements of acquisition vary widely with the subject material. Because of this, the process of acquisition will be ordinarily focused upon the College, School, or Department's abilities and needs.

What is critical is that the acquired source material be easily transmitted from its point of origination to where it will reside as a digital file. The campus is well-wired with fast Ethernet circuits. Nearly all formats can be encoded in a form that will travel over existing TCP/IP (Ethernet) networks, but equipment is necessary to convert analog or digital baseband (raw) video and audio to a file type transmittable over Ethernet.

Such 'black boxes' exist in some number now, as opposed to even a few years ago. They are priced in the neighborhood of a couple thousand dollars and up. Having a centralized set of equipment available for any campus use would be a powerful facilitator for Colleges/Schools/Departments that are either just getting started in digital video retransmission or that only require it on a periodic basis.

### Storage

Assume that a University entity is capturing a digital video file of a lecture recording, probably the simplest configuration of this activity. Where does the content go once it is imaged in camera on digital tape; conformed to a streaming video format such as QuickTime or Windows Media; or burned onto a recordable DVD? The traditional answer is that it goes on a shelf somewhere for storage or circulation.

Centrally stored digital video offers a far more flexible, secure, and useful set of options. Content unlikely to be frequently viewed may simply be stored as a file like any other computer file with the benefit of routine backup and maintenance. Content about which there are security concerns arising from copyright or privacy issues can be protected from access with passwords, EIDs, and similar gateways.

Content likely to be viewed frequently is best converted to a digital form for streaming and presented to as many simultaneous viewers as the hosting hardware will allow. Furthermore, with our robust campus Ethernet network, it is quite simple to allow campus-wide access. Finally, the continued growth of cable- and DSL-networks makes the home delivery of such streams quite feasible.

Storage of digital assets would best be located within the General Libraries, as they are the traditional caretakers of archived media. Centralized, library-based storage will best enable the participation of efforts such as UTopia, which is library-centered.

### Delivery

Delivery is perhaps the most highly-developed part of this activity. QuickTime, Windows Media, and Real Networks have each offered the technology to deliver digital video assets to end-users over networks for quite some time.

What began as postage stamp video with ragged audio has now evolved to a point where relatively high-quality media can be delivered over digital networks that have adequate bandwidth. Certainly, the

campus ethernet network fits that description. Cable modem and DSL networks do not provide as much bandwidth but offer enough to be capable providers of digital video to the home.

Recent developments in this rapidly evolving area have also worked to education's advantage. For example, digital storage continues to become more affordable. Better compression algorithms, such as MPEG 4, enable higher quality delivery using less bandwidth as well as the capability of presenting multiple windows (typically one for video, one for high-resolution graphics, and one for navigation, plus audio, of course). Years of experience with streaming media have made a once-fragile technology quite robust and accessible to the content creator. All of these factors are moving digital video delivery into the category of mature technology, which is a natural time for education to begin heavy utilization. Digital video has moved from a demonstration or pilot stage to a solid, dependable technology.

Each unit requires an automated system for encoding video and audio from classroom presentations and performances that will support at least two "streams" per recording. In most cases, this would include a camera and microphones trained on the lecture or performance, and another capturing what is presented on the video projector or technology console. In other cases, this may be multiple camera views of medical procedures or clinical practicum sessions, as in our Communication Sciences and Disorders Speech and Hearing Clinic, or in Nursing. Some of this may be made available to the general public, for their use in public education and outreach. Pharmacy and Social Work intend to deliver classroom content to students placed in the field, away from Austin. In each case, the digital systems provide a much less manpower-dependent alternative than traditional analog video recording and distribution methods.

The system will allow faculty to log in using their EID, record a session, then make this available on the video-on-demand server for the general public, or to selected individuals or groups (such as a particular class or section). Regular classes or events can also be pre-scheduled for recording. Some uses, such as in Fine Arts and Advertising will provide live video feeds to other users on campus or on the Internet, so that other students and their friends or families can participate in real time from a distance.

Many units simply are not engaging in video instruction, typically as a result of the extreme amounts of labor required to produce products of value. The need for real-time, as needed capture and reproduction of activities in the classroom is paramount for these units, who would otherwise never be able to participate in the digital video revolution.

## **Our Plan**

Several academic units have made considerable headway into producing digital video materials for academic use. We propose the creation of a campus-wide infrastructure that will strongly enhance existing programs while making possible the participation in this activity by any interested campus agency.

### **1. Assess**

The involved units have each dedicated considerable efforts to determining the needs within each organization, as well as general needs to suit the majority of perceived campus uses. There are current efforts within Communication, Liberal Arts and CIT/DIIA that can form the basis of a campus-wide solution. However, there are still nuances that remain to be determined.

Creating a campus-wide system is much like similar activities in the broadcast and cable television arenas and the services of a paid consultant with wide-ranging information and experience may prove helpful. As such, funds to hire such consultants are requested.

## **2. Plan**

This subcommittee will use analyses presented from any consultants, internal investigations and ongoing video streaming projects to develop a “toolkit” of technologies, methods and systems, maintained for use by the participating units, and open to possible use by the rest of the University (which may require additional expense by those later adopting units).

## **3. Procure and Deploy**

The next step is to implement the Plan. As the primary goal of this project is to develop automated systems to take the place of traditional, labor-intensive methods of video acquisition and delivery, it is not anticipated that additional staffing will be required. Most of the expense will be in the form of equipment, software licenses and software development and integration.

Primary technology expenditures involve the following areas:

### **A. Capture**

We will investigate and invest in Ethernet-based, flexible transport mechanism available to all members of campus community such as the Vbrick VBXCast: <http://www.vbrick.com/products/vbxcast.asp>

### **B. Storage**

While the existing video-on-demand system is scaled to handle many hundred hours of video, additional storage capacity will be required as day-to-day use of the recording systems increases the demand. Attention has been paid to the extent to which existing systems can be scaled in this regard. It is likely that the storage directly available to the VOD system will need to be increased, and that it be integrated with existing storage and backup management systems on campus to assure availability and capacity.

### **C. Delivery**

It is not anticipated that during the first year of deployment, we will exceed the 250 megabit-per-second bandwidth capability of the video-on-demand system being installed today. However, the current system is not redundant, and delivery failures would be minimized by deploying a second, redundant VOD system. The existing system and the newly acquired redundant unit will be moved to the Libraries datacenter to support the greater campus effort.

An important aspect of delivery is that of authentication and access control. Many Colleges have taken the view that access to these materials is at the faculty members’ discretion. However, other concerns related to student, and sometimes patient or research subject confidentiality must be taken into account. Our systems must be developed to enable the delivery of materials only to those who are appropriately authorized to view the material. The creation of the EID system has made possible centralized authentication and many computer-based functions now depend upon the security it provides. With the addition of the ability to cross-reference EIDs/individuals to authorized access (for example, a database

listing courses for which the student is registered), authentication can and must be a feature of any storage of digital video assets.

Since some customization of the authentication/asset management system will likely need to be performed, funding is requested to obtain contract programming assistance.

#### **4. Test and Evaluate – The Pilot Process and forward**

Once an adequate infrastructure has been deployed, we must put it to the test. There are immediate applications of the system planned within each College and School. Most of the units will form internal Pilot Project Focus Groups, composed of faculty and information technology staff, to assess the effectiveness of the systems and methods, discuss future potential of the technologies and propose any changes to meet our academic needs and any unforeseen requirements. The ad hoc Subcommittee will meet to consider these analyses and implement those changes that are appropriate. CIT/DIIA has already developed and shared various instructional and functional metrics for evaluating the delivery of instructional digital video, and they have made a commitment to facilitating the surveys and focus group activities we will depend upon.

It is hoped and anticipated that this will be an ongoing process. As the instructional environment and our applications evolve, this re-evaluation process will serve to keep the project relevant for an extended period and maximize our investments, in both financial and human capital.

#### **Funding Requested**

This project builds upon current academic projects, as we investigate the use of digital classroom recording and video on demand. We are requesting funds to implement a dedicated audio/video capture solution for classrooms and performance spaces in the participating Colleges' buildings, and to scale our existing realtime encoding and video on demand system to support the additional streams these Colleges require, and provide storage space for the numerous hours of recording we expect to encode. We will may also hire contract programmers and consultants to customize certain portions of the systems to meet our academic goals, as well as University privacy and fair use requirements. Finally, additional encoding technologies will be deployed to investigate the best available technologies to meet individual College requirements.

Estimated hardware and software costs will total \$250,000, while programming and consulting contracts will total \$50K for the year.

---

Prepared by:

- David Fudell, Manager, College of Pharmacy Learning Resources Center, [fudell@mail.utexas.edu](mailto:fudell@mail.utexas.edu)
- Charles Soto, Director of Information Technology, College of Communication Dean's Office, [csoto@mail.utexas.edu](mailto:csoto@mail.utexas.edu)