

Technology Deans Group
Joint ITAC Proposal
Instructional Video Infrastructure Collaboration
For FY2007-08

Overview

The academic use of digital video technology continues to grow at The University and throughout education. Additionally, the training of clinical skills and procedures has proven the value of instructional video in health and social sciences professions. Advances in network bandwidth and its availability to the home and school and advances in digital video technologies have dramatically improved our ability to deliver instructional video to the student. New methods to deliver audio and video such as “podcasting” and “vodcasting” (video podcasting) present a tremendous opportunity to provide students with instructional content they can review any place at any time, using equipment they may already own. Students quoted in the *Chronicle of Higher Education: Information Technology* (2005) indicate a desire to review classroom materials and discussions from both current or previous semesters: “A more formal, organized, universitywide effort to help preserve that content would be really useful.”

Until recently, the biggest impediment to widespread use of network video and audio has been the amount of effort and time required to produce the content. Over the past two years, the College of Communication has worked with solution providers to develop a highly automated digital video and audio recording, encoding and streaming system. The system allows instructors to record classroom presentations automatically, making them immediately available via the Web. This proposal seeks to increase the number of classrooms available. The collaborating colleges and schools will utilize the existing infrastructure developed by the College of Communication. The net result will be a rapid proliferation of digital video in support of the University’s instructional and research mission.

The following University units are represented in this proposal:

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Current Activities and Methods

At present, each represented unit is engaged in the process of acquiring, storing, and delivering digital video. Work processes and procedures vary, but all current methods require a moderate to high amount of time and effort to produce.

Acquisition

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 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. In some cases, a visual demonstration of a physical skill or performance is vital to the presentation. In others, high-resolution PowerPoint slide images along with audio from the lecturer suffice. 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 (Internet) networks, but equipment is necessary to convert analog or digital baseband (raw) video and audio to such a file type.

Such 'black boxes' exist in some number now, as opposed to even a few years ago. The College of Communication and others have tested numerous solutions. Having a centralized set of equipment available for any campus use would be a powerful facilitator for colleges, schools and departments that are either just getting started in digital video or anticipate needs beyond their current capacity to produce manually.

Storage

Video and audio taping have been used in the classroom for years. Where do these classroom experiences wind up? The traditional answer is that it goes on a shelf somewhere for storage or circulation. Lectures, presentations, performances and clinical demonstrations fill closets and cabinets everywhere.

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 duplication. 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.

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 provide 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 have moved digital video delivery into the category of a 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 Communication Sciences and Disorders, Social Work or 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, and as part of joint-degree programs with other Texas universities. In each case, the digital systems provide a much less manpower-dependent alternative than traditional analog video recording and distribution methods.

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.

The system allows 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 or audio 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. Departments such as Music and Communication Studies must produce increasingly large numbers of student audio and video recordings, wherein students review the tapes with their instructors, send copies to their friends or prospective employers, maintain them for posterity, or throw them away. Today, this requires tremendous amounts of staff labor. It will be impossible to generate more recordings, at the same staffing levels, without an automated system such as this.

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. The College of Communication has developed a system that enables the automatic creation of streaming content. 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. Secondary to this is the storage and bandwidth expansion that will be required as usage consumes available resources.

1. Add to existing technology classroom infrastructure (\$326,000)

Each of the participating units maintains technology classrooms (both departmental and General Purpose), which provide for media-rich presentations and lectures. Because of this ubiquitous infrastructure, it is easy to add video encoding appliances, classroom cameras and microphones. These appliances will deliver high quality MPEG-4 video to the Video Control System installed at the College of Communication, mentioned below. This video appliance infrastructure will cost between \$18,000-26,00 per classroom, depending on size. Mobile setups (for use in any classroom) are approximately \$14,000, but require the use of existing cameras and microphone systems, already available to the units. Finally, applications in Fine Arts and Communication take advantage of existing camera and microphone infrastructure and therefore only require additional encoder appliances, at roughly \$8,000 each.

Unit	Rooms/Application	Approx. Cost
College of Communication	CMA 2.320	\$42,000
	2 Encoders	
College of Fine Arts	WIN 1.134	\$52,000
	WIN 1.148	
	2 Encoders	
College of Education	SZB 104	\$52,000
	BEL 328	
School of Nursing	1 Mobile	\$14,000
College of Pharmacy	PHR 2.108	\$52,000
	PHR 2.110	
School of Social Work	1 Mobile	\$14,000
LBJ School	SRH 3.109	\$26,000
College of Engineering	1 Mobile	\$14,000
School of Law	1 Mobile	\$14,000
School of Business	GSB 3.128	\$46,000
	2 Mobile Units	
		\$326,000

2. Upgrade storage (\$48,000)

While the College of Communication's Video Control System is capable of supporting every one of the classrooms upgraded through this proposal, as thousands of hours of classroom video are recorded, the available disk space capacity will be exhausted. The software runs on standard Dell enterprise-class server hardware, which can be upgraded relatively inexpensively.

3. Deploy additional video on demand server (\$0)

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 server component of the College of Communication's Video Control System. Adding a second server will double the available bandwidth. However, because of our strategic use of "virtualized" servers (see the College of Communication's IT Vision Plan for 2007-08), this can be accommodated using existing equipment and licenses.

Total Funding Requested - \$374,000

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.

Estimated hardware, software and installation costs will total approximately \$374,000.

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