Technology Deans Group
Joint ITAC Proposal

Automated Instructional Video, Podcasting and Blogging

For AY2008-09

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 and 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 four years, the College of Communication has worked with solution providers to develop highly automated digital video and audio recording, encoding and streaming system. Instructors can record classroom presentations automatically, making them immediately available via the Web. This proposal seeks to increase the number of classrooms available and to incorporate newer, podcasting-centric solutions. The collaborating colleges and schools will utilize both new and existing infrastructure developed and maintained jointly by the College of Communication and the Division of Instructional Innovation and Assessment (DIIA). The net result will be a rapid proliferation of digital video and audio in support of the University's instructional and research mission.

The following University units are represented in this proposal:

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While the participating units are requesting funds to directly augment teaching facilities, this new service will be available to all University departments, at no charge. The College of Liberal Arts, for example, hopes to add audio recording capability to many of its classrooms. This new solution would serve their efforts well.

We may seek additional funding in two or three years, as system components require upgrades or service contract renewals, but this is intended to be maintained by existing staff and maximize the use of facilities in which we have already invested quite heavily over the years.

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 and assembling source materials. Much of this recording is done using "camcorder" technology, particularly in the miniDV format. However, 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 generated and stored 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 "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. This storage is not only inefficient in terms of physical space utilization. It is inherently less accessible. Assets must be visited in person, and a nontrivial effort must be exerted in order to use them online or outside the building.

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. "Fair Use" doctrine requires that we make deliberate efforts to safeguard copyrighted materials. Content about which there are security concerns arising from copyright or privacy issues can be protected from access with passwords, EIDs, Access Control Lists 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.

Finally, digital media assets are the perfect candidates for utilizing Information Lifecycle Management (ILM) solutions to reduce the cost to store them. ILM does this by moving files that have not been accessed recently from disk systems onto tape, which is up to one tenth the cost. Because the Texas Advanced Computer Center (TACC) has purchased a University-wide license for such an ILM solution, we could reduce our cost to store these assets and maximize the use of our existing disk and tape infrastructure.

Delivery

Delivery generally falls into two categories: streaming and download. If you have used YouTube or Google Video, you have experienced streamed video. There is only a slight delay before a stream begins to play, and the media is not permanently downloaded to your computer. However, if you have a slow network connection, the stream may be so degraded as to be unmatchable. The campus has spent a great deal on maintaining a robust, high-performance network, so streaming works very well on campus and to many locations, particularly through the local cable affiliate's broadband service and to other national and international educational institutions.

The alternative is downloading. If you have used iTunes to subscribe to podcasts, you have used downloaded content. A benefit to downloading is that network bandwidth is not critical. Nearly the same amount of data is transmitted as if the content were streamed. However, it may take several times longer than the length of the media to download. A more important benefit, however, is that we live in the age of the iPod. Many students routinely carry one or more devices capable of playing downloaded media. Many of these devices support both audio and video. Efforts to expand the "learning environment" to "anywhere, any time" must take advantage of the ubiquity and popularity of such devices. This is how many students prefer to consume media. And targeting such devices virtually assures that playback on more sophisticated computer systems is flawless.

Each campus 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 and downloaded content. This will be re-engineered to incorporate the latest Podcast Producer system from Apple, Inc. 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. This system will resolve a shortcoming identified by many Colleges: a lack of streaming and media video hosting capacity on existing campus systems. And unlike our Blackboard courseware management system, it allows instructors to either allow or disallow public viewing of the blogs, videos and podcasts.

Our existing streaming-only solution will be re-engineered to support the real-time streaming and recording of campus-wide events (i.e. "webcasting"), a task for which our appliance model is perfectly matched. We will also increase the disk and tape storage that will be required as usage consumes available resources.

1. Podcast, Wiki, Blog, Streaming servers ($82,000)

The principal component of the server infrastructure is a cluster of Apple Xserve systems. Together, they provide the Podcast Producer, Wiki Server, Blog Server and Streaming Server capabilities. Instructors and students gain these abilities:

- Capture high-quality audio and video from local and remote cameras
- Record screen captures, complete with audio "voiceover"
- Upload existing content using simple web forms
- Collaborate on online articles using a "wiki" tool
- Create blog entries rapidly, using web tools that work very much like Google and Yahoo! applications

Technology specialists can develop specialized workflows that automatically convert the above media into various formats, suitable for delivery in the classroom, via the Internet or on iPods and other handhelds. These workflows can also add watermarks, still images, "closed captioned text" and other objects that enhance the original media. All of this is automatic, allowing IT professionals to spend time working with instructors to achieve their goals, rather than manually generating this content.

The system will work with campus identity management systems, so students, faculty and staff will gain access using their UT EIDs. If an instructor has requested a podcast-enabled blog, students enrolled in that course will automatically be able to add content. Comments can be enabled, and these can be closed to just class participants or open to the general public.

We will also invest in a "professional services" agreement that provides complex engineering and deployment support, as well as 7/24 responses for service.

2. Classroom infrastructure ($244,000)

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 systems, classroom cameras and microphones. These will record high quality "DV" video to the Podcast Producer servers, whereupon they will automatically be converted into the desired formats (e.g. audio only, podcast, or stream). Additionally, automated camera control will provide camera preset switching based on a presenter's movement around the room, using infrared or pressure-pad sensors. This will cost approximately $10,000 per classroom.

The College's existing VBrick Systems MPEG-4 real-time encoders will be repurposed for streaming events in real time ("webcasting"). Recording and on-demand of these streams will be managed through the existing Media Control System maintained by the College of Communication. Each mobile unit will consist of an encoder, a microphone mixer, a pair of wireless microphones (lapel and handheld), a high-quality camera, a tripod and a cable "snake" for rapid deployment to campus event venues.

Unit	Rooms/Application	Approx. Cost
College of Communication	CMA 2.320 CMA 3.112 CMA 3.116 CMA 3.120 CMA 3.124 CMA 5.136 CMA 5.156	$42,000
College of Fine Arts	WIN 1.134 WIN 1.148	$20,000
College of Education	SZB 104 BEL 328	$20,000
School of Nursing	1 Mobile	$7,000
College of Pharmacy	PHR 2.108 PHR 2.110	$20,000
School of Social Work	SSW 3.132	$10,000
LBJ School	SRH 3.109	$10,000
Cockrell School of Engineering	1 Mobile	$7,000
School of Law	1 Mobile	$7,000
School of Information	SZB 468 1 Mobile	$17,000
McCombs School of Business	GSB 3.128 2 Mobile Units	$24,000
Undergraduate Studies	MAI 221 MAI 222 MAI Unassigned MAI Unassigned MAI Unassigned	$60,000

	MAI Unassigned	
		$244,000

3. Storage upgrade ($96,000)

As thousands of hours of instructional video are recorded, available disk space capacity will be exhausted. We propose to add a high capacity Network Attached Storage server and additional tape capacity for our existing library. With the addition of the TACC-provided software, this constitutes our aforementioned ILM solution. This will provide essentially boundless expansion potential and maximize the return on investment for existing storage equipment and processes.

Total Funding Requested - $422,000

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 real-time 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, installation and service contract costs will total approximately $422,000.

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