Automated Podcasting Solution Expands the Boundaries of the Classroom

David Aldrich
University of Washington
Box 353095
+1-206-685-1602
daldrich@u.washington.edu

Bradley Bell
University of Washington
Box 353095
+1-206-685-1602
bradleyb@u.washington.edu

Tim Batzel
University of Washington
Box 353095
+1-206-685-1602
tbatzel@u.washington.edu

ABSTRACT
A scalable podcast solution developed at the University of Washington makes the podcasting of class lectures easy for faculty by automating the capture, uploading, and delivery of MP3 audio recordings.

University of Washington staff create online class blog-space for participating instructors at the beginning of the quarter. Class location and meeting times are scheduled via a web interface. After the schedule has been established, the entire recording process happens seamlessly in the background while the instructor teaches.

A podcast server automatically captures data from networked MP3 streaming devices, which are wired into the classroom's PA system. The audio capture routine stops at the end of class and the resulting MP3 file is scripted to be published in a corresponding class blog where it is made available to students via an RSS feed.

Students are able to listen to the MP3 recordings online, or they can click on the provided link to subscribe to the podcast. Once students subscribe to a podcast, subsequent lectures are delivered automatically to the students' computers. These recordings can be played on personal computers, laptops, portable MP3 players, and some cell phones.

This convenient teaching and learning technology provides students with the ability to engage in lecture review and enhance their understanding of the material covered in class. The University's scalable podcasting solution helps to create the links between teaching and learning, and expands the boundaries of the traditional classroom.

Categories and Subject Descriptors
K.3.1 [Computer Uses in Education]: collaborative learning.

SIGUCCS'06, November 5-8, 2006, Edmonton, Alberta, Canada.

General Terms
Design, Experimentation, Reliability.

Keywords
Innovation, podcasting, automation, audio.

1. INTRODUCTION
For over 20 years, classes at the University of Washington have been audio taped -- a process which had faculty and staff members using tape recorders placed in classrooms to record lectures, and then having to make multiple copies of those tapes for distribution to students at the Odegaard Media Center. In addition to this process being labor intensive and time consuming, listening equipment in the Media Center had exceeded its useful life. Students were unhappy with both the quality of the lecture recordings and the limitations on access to the Media Center.

In late summer 2005, an ad hoc group of staff and students from Classroom Support Services, the Office of Learning Technologies, UW Libraries, and Computing & Communications assembled to discuss new and emerging technologies that would address these issues.

2. DESIGN CONSIDERATIONS
Classroom Support Services' Information Technology Group listed the following as critical factors to consider for the pilot program design:

- Resources for the pilot would be limited.
- Large lecture classes would be targeted.
- Rooms require PA systems and network connectivity.
- Automated lecture capture would be the key to success.
- Automated posting of audio lecture content and subsequent generation of RSS feeds would be highly desirable.
- Scheduling of recordings, configuration of devices, and other management tasks would need to be centralized so that the solution could scale to any number of classrooms.

- Class lecture recordings should be easy to find and easy to subscribe to.
- The program must address the idea that many students live in a TiVo culture.
- The program must strive to create learning opportunities that expand the traditional boundaries of the classroom and of the media center.

2.1 Final Design

The University of Washington implemented a podcasting pilot program that began in Fall Quarter 2005 and gave students "any time, anywhere" options for reviewing those formerly analog recordings. The final podcasting pilot design uses Barix Instreamers as capture and encoding devices and a Debian Linux server for storage and publishing of digital audio files to a Classroom Portal. The Classroom Portal is an interactive blog that allows integration of course materials, such as links to other web-based materials. Any student, faculty, staff, or alumni with a valid UW NetID can access the digital lecture recordings from a computer with an Internet connection. Students are able to subscribe to their designated class blog's RSS feed, which then automatically downloads each new lecture to their computers as they become available. The recording, encoding, and publishing process is fully automated with a simple shell script.

The pilot grew from three courses in Fall 2005 to 20 courses in Spring 2006. At the start of Spring Quarter 2006, the pilot was extended to Health Sciences. By the middle of Spring Quarter 2006, the podcast lectures had been accessed over 50,000 times. The service has been such a success that the Odegaard Media Center has since announced that they will no longer support analog audio recordings of courses.

2.2 How it all works

A key component of our podcasting solution is a device called a Barix Instreamer. The Instreamer is an inexpensive hardware device that provides reliable distribution of audio over a standard IP network. The Instreamer converts analog and digital audio into MP3 files which are then transmitted to a streaming server. This small, durable, low-power device has no fans or moving parts and eliminates the need to dedicate a computer solely to streaming.

In our system, the Instreamer is connected to the audio output on the PA rack. The Instreamer sends an MP3 audio stream via HTTP to our podcasting server, which can record the stream to a file. One Instreamer is required for each classroom, but one podcasting server can handle over 50 Instreamers.

The process of recording a class is as follows (see Figure 1):

1. Shortly before classes begin, each participating class is entered into our scheduling system. The class name, meeting days, location, start time, and duration are required.
2. A blog with an integrated RSS feed is created for the class.

All of the next steps are performed automatically by the podcasting server.

3. At the designated times, the podcasting server connects to the Instreamer and begins recording the MP3 stream to disc.
4. At the end of a class, the podcasting server stops recording.
5. Post-processing is done to the captured file. Post-processing tasks includes error-checking, re-encoding to a lower bit rate, and adding ID3 tags to the file.
6. Links to the finished MP3 file are added to the class blog via an XML-RPC request.

From the Classroom Portal, students can listen to the recordings directly on-line, or subscribe to the RSS feed for their class's blog. Once subscribed to the podcast / RSS feed, students will automatically receive the latest lecture after it has been posted. Recordings are typically available one to two minutes after the end of class.

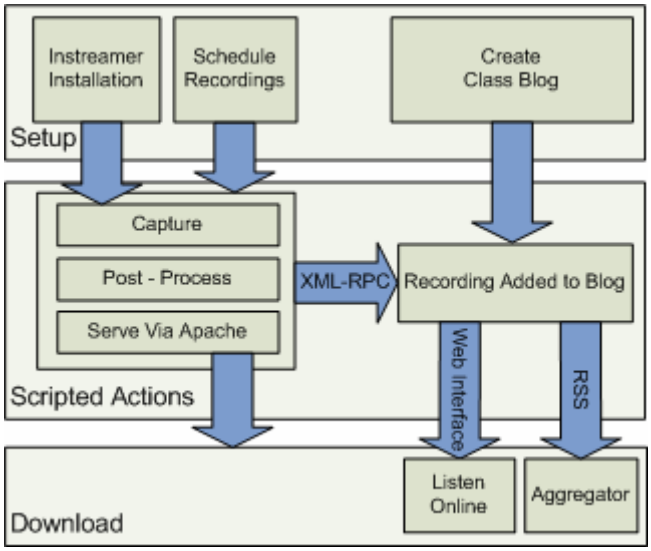

Figure 1. Podcasting Server Scheduling Process.

3. CLASSES

The initial podcasting pilot program, in Fall Quarter 2005, was offered in Kane Hall, which houses the main office of the University's Classroom Support Services, and two large lecture halls were outfitted for automated podcasting. Podcasting was offered to anyone teaching in those select rooms, although only three large freshmen-level survey classes opted in.

The number of rooms outfitted for automated podcasting was expanded prior to Winter Quarter 2006. During this second quarter of the podcasting pilot program, twelve classes were participating in the pilot program in eight different rooms on campus. Most of these classes still had large student populations, although it is worth noting that some sophomore level courses had signed up for the pilot program.

In Spring Quarter 2006, the pilot program grew to twenty classes in twelve different rooms, including two rooms in the Health Sciences section of campus. This quarter marked the

addition of smaller classes (under 30 students), two Health Sciences classes, and both a senior and graduate level course.

There is no restriction on class size or on class standing, although large survey courses appear to be the most compatible class type for our automated podcasting solution.

4. EVALUATION

One important factor in judging the success of the podcasting pilot was to gather survey and objective use data to determine how podcasts were being used by students and whether podcasts might be enhancing student learning. Students from classes in the Fall 2005 Podcasting Pilot were asked to participate in a survey. The survey queried students about the benefits and drawbacks of using podcasting in large lecture courses and asked other questions about how the students were using podcasts.

In January 2006, Cara Lane, PhD, a Research Scientist at the University of Washington, authored a report titled, "Podcasting at the UW: An Evaluation of Current Use." The report analyzes responses from one of the participating courses. The following is an excerpt:

> In both multiple-choice and open-ended questions, we asked students to identify the aspects of podcasting that supported their learning.… The top choices that students selected were that listening to the podcasts helped them catch up when they missed class and helped them prepare for homework and exams. The comments students made in response to open-ended questions expanded on these points. Students not only discussed the general usefulness of podcasts as study aids, but also provided specific details on how they used the podcasts to clarify materials covered in lectures, enhancing their comprehension of complex concepts. Students also used the podcasts to fill in gaps in their notes. These patterns are consistent with many students' tendencies, discussed earlier, to focus their listening on portions of the podcasts. These patterns indicate that the primary benefit of podcasting is its ability to provide repeat access to lectures. This attribute benefits all students who access the podcasts, not only those that miss a class.

The complete white paper can be viewed at the following web location:
http://catalyst.washington.edu/projects/podcasting_report.pdf

During Winter and Spring Quarters 2006, students completed more extensive surveys. Instructors also were asked to participate in a survey at the end of Spring Quarter 2006.

Students consistently stated the following with regard to whether course podcast support enhanced their learning:

- It was a convenient way to access course materials.
- It helped me catch up when I missed class.
- It helped me prepare for homework and exams.
- It clarified concepts discussed in class.

One student said, in response to a question about the greatest strength of podcasting, "In big lecture classes it is difficult to ask questions or for clarification, with podcasts you can relisten to parts that you didn't understand. Also, I have trouble focusing on everything the teacher says during class and I may fall behind in a lecture or miss what she is talking about. With podcasts you can go at your own pace on your own time."

Similarly, from the instructor survey, one participant responded, "The greatest strength is to allow students to learn even if they have to miss class. With a class that meets five times a week, it's a bit oppressive for college students. I think tied with this advantage is allowing students to listen to lectures again if they were uncertain about content or did not take adequate notes."

5. CONCLUSION

Podcasting has been one of the simplest teaching and learning technologies to implement at the University of Washington and one of the most immediately adopted by students who are engaged in the learning process. The technology is easy for students to use and requires minimal support. In fact, in our experience so far, almost all support questions have been answered by on-line tutorials and FAQs. The automated podcast solution developed at the University of Washington makes the podcasting of class lectures easy for faculty by automating the capture, uploading, and delivery of MP3 audio recordings. This solution is cost effective for large lecture classes, which typically have high quality sound systems that can easily be tapped into, and it is scalable. Expanding the boundaries of the traditional classroom by providing convenient access to anytime, anywhere, course materials helps students catch up on missed classes, prepare for homework and exams, and clarify concepts discussed in classes.

While the current University of Washington implementation has been successful on many levels, it has not fully taken advantage of one of the key benefits podcasting offers: mobility. Our survey data indicates that despite the fact that most students own an MP3 player, the majority choose to listen to recordings on their personal computers rather than transfer recordings to their MP3 players. This, of course, takes the "pod" out of podcasting. A smaller majority choose to either download or listen to content directly from the web without subscribing to the corresponding RSS feed, thereby removing the "casting" part as well. So much for podcasting, as we thought we understood it. We predict that the benefits of mobility in podcasting will not be realized until mobile consumption and production of information becomes more mainstream. We are seeing such trends taking hold with the development of mobile blogging, which is made possible by the convergence of audio, photo, video, and Internet access features that appear in most modern cell phones. However, while future improvements in podcasting may come from more flexible and more mobile approaches to audio distribution -- especially with the development of newer, smaller and more feature-rich mobile devices -- on-demand streaming of podcast content may remain the primary method of content acquisition in the university environment.

6. ACKNOWLEDGMENTS

We would like to acknowledge the following additional members of the podcasting pilot project partnership:

- David Cox, Technology Manager, Catalyst Client Services, The Office of Learning Technologies
- Bob Ennes, Administrator, Health Sciences Academic Services & Facilities
- Amy Halligan, Library Supervisor, Odegaard Undergraduate Library, Libraries
- Roberta Hopkins, Director, Classroom Support Services
- Tom Lewis, Director, Catalyst Research and Development, The Office of Learning Technologies
- Jill McKinstry, Head, Odegaard Undergraduate Library, Libraries
- Carmine Rau, Reference & Instruction Librarian, Odegaard Undergraduate Library, Libraries
- Oren Sreebny, Director, Client Services & Learning Technologies, Computing & Communications
- Stephanie Steppe, Director, Health Sciences Academic Services & Facilities
- Karalee Woody, Director, Catalyst Client Services, The Office of Learning Technologies