

## ***Classcaster : Podcasting Meets the Classroom***

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#### **CLASSCASTER – QUICK SUMMARY**

*The instructor uses a cell phone with a hands-free attachment and places a call to Classcaster right before starting the lecture in the classroom. The instructor enters a password for identification to the system and slips the phone into their pocket. Everything the instructor says from now on is being recorded as a long voice mail via the cell phone to the Classcaster system. When the lecture is over, the instructor hangs up and Classcaster does the following...*

- *saves the voice mail as a digital recording,*
- *converts the sound file into MP3,*
- *Posts the MP3 to a blog previously setup by the instructor, and,*
- *Adds the post to a RSS2 feed that the students can use to listen or download to their iPod.*

*This should take a couple of minutes at most. After compression, a 60 minute class yields an MP3 that is a rather large file of about 15 megabytes, but it is now available to students who can download the MP3 to their PCs and copy to their iPod to listen to on their way home.*

*All of these steps could be performed by a competent and technically knowledgeable instructor or IT staff with an PC in the classroom. Classcaster does not require the PC or any technical setup in the classroom. This lowers the barrier to easily recording class lectures for technophobic, stressed or busy instructors. Classcaster is a “low threshold application” that is...*

*“...a teaching/learning application of information technology that is reliable, accessible, easy to learn, non-intimidating and (incrementally) inexpensive...”<sup>2</sup>*

The goal is to release a downloadable version and a CD of Classcaster for any institution to setup a Classcaster server. The website <http://www.classcaster.net> will soon be setup for this purpose and to gather the community of users around Classcaster. A full featured version of the Classcaster system designed for use by the CALI community is currently in production at <http://www.classcaster.org/>. A simple public demonstration of the audio recording and podcasting features of Classcaster is available at <http://hotdiggityblog.classcaster.org/>.

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### **iPOD NATION**

One in five Americans under the age of 30 owns an MP3 players according to a recent Pew survey.<sup>3</sup> A February 13, 2005, *Washington Post* article<sup>4</sup> reports the death of the CD as downloadable music grows. Cell phone manufacturers will soon be including music streaming or download as a standard feature on **all** cell phones. But you can play more than music on your iPod.

In the fall of 2004, Duke University arranged to give their 1800 entering freshman a brand new Apple iPod preloaded with educational content.<sup>5</sup> Professor Richard Lucic is conducting an iPod project at Duke where...

*“In order to capture and carry forward class discussions begun by guest lecturers, Lucic records those classes ... then he posts the recordings on a class Web site for students to download and review...”<sup>6</sup>*

A quote from a student user explains...

*“I downloaded the lectures from the [class Web site] and I put them on my iPod ... One of them I listened to while I was at work...”<sup>7</sup>*

On the last slide of this presentation, the following statement appears...

*“Necessary for Success: **Seamless Integration** of Audio in Courses...”* (emphasis mine)

The crux of this, of course, is “seamless integration” and what is required for “seamless integration” is the engagement of faculty. The faculty must be willing and able to integrate audio into their classes in order for the students to be able to download the audio and listen to it.

How does audio from the teacher or the classroom get to where students can listen to it?

There are four steps to getting students to listen to audio posted on the web.

1. Recording the audio,
2. Converting the audio to a web-friendly format (i.e. MP3),
3. Posting a link to the MP3 file somewhere where students can find them, and,
4. Downloading the MP3 file to the iPod and listening to it.

Recording the audio can be a cumbersome step. Even if the school has a well-staffed and competent educational technology department and excellent facilities, faculty are often put off by the process of making the arrangements and dealing with the technical details. The classroom belongs to the faculty and faculty do not lightly invite others into the classroom teaching process. It's disruptive, confusing and problematic when dealing with new technologies. At the very least, the instructor will have to wear a microphone and arrange for that microphone to be connected to some kind of recording device. The recording device can be a computer in the

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room, a tape deck or a server where the audio is streamed to a hard disk.

Faculty can home-brew this system all by themselves by recording the audio on their own notebook PCs or MP3 recorders, but in this case, the instructor has made the investment into understanding exactly how to do this - what software and hardware to install and operate - and is willing to deal with the problems and unfamiliarities that inevitably crop up. This paper does not address those faculty directly.

Once the audio is recorded, it may need to be converted to MP3 format. This can be a rather minor step, but if the audio is on tape or was not originally recorded to MP3, it is a fraught with technical issues that may be intimidating to technically averse or just plain busy faculty.

Once the MP3 audio recording is in hand, it must be posted on a website somewhere where students can find it. If the instructor's institution already supports some kind of course management system like BlackBoard or WebCT, then it's not too much trouble to upload the file and create a link. At schools where there are not officially sanctioned course management systems or they are tightly controlled such that uploading a multi-megabyte binary file (e.g. MP3) is problematic, then the instructor may have to rely on institutional support to get the file uploaded for student access and that may result in delays or difficulties.

Finally, the students need to be able to find the MP3, download it to their iPod and listen to it. Let us assume that our technologically astute students can handle the downloading and listening. It's the finding that may be problematic. If there is an already established location for course materials, then they can easily find the file there. If the instructor is managing their own webspace, they will have to provide some sort of organization - presumably by date - for the MP3s and will have to have sufficient bandwidth to handle multiple downloads from dozens or hundreds of students.

Now, take this process and do it three times a week for 15 weeks and if everything works without too much hassle, tech-guru intervention or frustration by the instructor, then you have the beginnings of *seamless integration*. This is just the beginning because the ability to podcast your classroom will doubtless have effects on how and what is taught in the classroom. New technical capabilities end up changing the real-world processes that they simplify, assist or enhance (or complicate, obfuscate or encumber depending on the situation). Once you open up a new communication channel to students, it's guaranteed that the design of the education being delivered will change.

All of what is described above is possible right now with widely available technology. This doesn't mean that it is or will be widely used. Technically adept faculty would be able to manage putting together the resources necessary to record audio for student use. To the less technically inclined faculty mustering the resources necessary to record their own audio for students is a significant barrier. The Classcaster system is designed specifically to lower that barrier by making the creation and dissemination of audio for student use as simple as a phone call and completing a web form.

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### **CLASSCASTER**

Faculty may be unfamiliar with microphones in the classroom and they may be unfamiliar with using a computer to record their lectures and they may be unfamiliar with processing and posting these recordings to a website. Classcaster simplifies this entire process. Classcaster is a server-based hardware and software system assembled entirely from open source software. The hardware can be a plain vanilla x86 PC with at least one PCI phone card installed like the Digium Wildcard X100P that you can buy on Ebay for \$9.99<sup>8</sup> or a PSTN connection via VoIP using a service like VoicePulse or Broadvoice.

### **CELL PHONE = MICROPHONE**

The key insight in Classcaster is that the cell phone is a wireless microphone and a phone call is a convenient, reliable and simple technology that any faculty can handle. This is not a huge insight. We don't claim to have thought of this first by any means. Moblogging<sup>9</sup> has been around for several years and [www.audioblog.com](http://www.audioblog.com) offers a service where for \$4.95 per month, you can call and post an audio message that is automatically posted to your blog on one of the major blog services<sup>10</sup> (i.e. Movable Type, Typepad, Blogger and LiveJournal).

What is exciting is the possibility of applying this convergence of technologies to education. Classcaster is part of a research project to explore these ideas in education and the classroom. Too many educational technology projects of the past could not lower the barrier of unfamiliarity, confusion and lack of interest in faculty. The cell phone as microphone may lower the barrier sufficiently so that the instructor can concentrate on the teaching issues and not the technology issues.

### **CLASSCASTER USE CASES<sup>11</sup>**

There are quite a number of uses for Classcaster that have us excited.

Classroom Lectures - Instructors can record their lectures for their students to listen to again and again. For commuting students, re-listening to a lecture on the bus or in the car home could be quite a boon. For students who miss a class, the recorded lecture could be a life-saver. There is obvious danger here that students will forgo the live lecture entirely and just catch the recording, but the Classcaster system allows for recorded posts to be released only at certain times and the posts can be expired to remove them from public view. This gives the instructor some control over how recorded lectures are posted to the blog.

Sick day lectures - Instead of cancelling a class, the instructor could record a lecture from home or their office via telephone into Classcaster and the school could arrange to play the recorded lecture to the class at the appointed time or inform the students of the availability of the lecture. This might bring new meaning to the term "phone it in" as it applies to education.

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Guest interviews - Instructors could arrange for outside guest appearances by scholars, prominent industry players or other relevant individuals. With a three-way conference call - the last call being to Classcaster - the instructor could “interview” the guest in much the same way it would be done on a radio talk show. The instructor could play the guest’s talk to the class and pause and discuss it at various points or make it available to the students. The point is the ease with which this could be recorded and web-posted via the telephone.

Student audio presentations - many courses have student presentations as part of the course. Larger classes make this impractical for the entire class to listen to everyone’s presentation. Using Classcaster, the students could post audio recordings of their presentations and the instructor could assign portions of the class to listen and review the presentations in addition to listening to all of the presentations themselves. In an especially large class, the students could each be assigned to listen and critique one presentation in a round-robin fashion. This is a variation on the Rotisserie software created by the Harvard Berkman Center.<sup>12</sup>

Repurposed content for distance learning - a motivated instructor could record an entire semester’s worth of lectures and then re-purpose the recordings for distance learning courses or for resale.<sup>13</sup>

Transcribed for the deaf - recorded lectures could be transcribed into text form for deaf students. Indian companies that perform transcription entirely via the web cost between \$1.10 and \$1.80 per minute depending on how quickly you need it done.<sup>14</sup> This is not real-time and so does not solve most ADA needs, but transcriptions have other value like being able to search the text for mentions of “exam” or “grade” (which would be *very* interesting to students).

Read (synthesized speech) for the Blind - Classcaster could be the foundation for the reading of print-based courses materials. Readings can be phoned in for later listening by blind students.

Mystery Science Theater Education - Music, parts of movies, plays, television, interviews could be recorded and the instructor could provide commentary much like the director commentary commonly available on DVDs today.

Students notes and hyperlinks to audio bookmarks - One of the applications that CALI is working on is an audio book marking web service. The students would be taking notes on their notebooks in class while the instructor is lecturing and recording the lecture on Classcaster. The students could invoke a macro or click a button and a local program would ping Classcaster which would return a link and a timestamp which would be inserted as a hyperlink into the student’s notes. Days or weeks later, the student could be reading their notes and wonder what the instructor was saying at the time they took certain notes. If the student clicked on the hyperlink, it would open a browser and start playing the Classcaster lecture at the point that the note was taken. This would require the student to be connected to the Internet when they are taking their notes and when they want to play back the lecture or perhaps we could set it up so that the link looks for a local copy of the lecture instead. This would be much faster and require no Internet connection. Microsoft’s OneNote has this kind of capability when recordings are

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made on a Tablet PC<sup>15</sup>, but it is not based on a server model.

Post lecture transcription and translation for foreign students - If the instructor has foreign students or students who do not fluently speak the language of the instructor, it could be arranged for someone else to listen and translate the lecture into an MP3 file in the language that the students understands. The translator could download the original lecture and play it (e.g. on their IPod) and make a phone call back into Classcaster to provide the translation.

Recorded exam review lectures – Many law professors hold a special review lecture near the end of the semester with the general theme of 'This is what will be on the final exam!'. This review could be made more effective by recording the lecture part for students to listen to before coming to the review. The review time would then be spent addressing specific student questions about the materials.

These are just the initial ideas we came up with when considering applications for Classcaster.

Doubtless others will be considered as this technology gets more ubiquitous. Assuming that classcasting becomes more widespread, there are some second order effects that are likely to crop up once there is an ecology of classcasting.

### **SECOND ORDER EFFECTS**

Instructor training and evaluation -Instructors who are new to teaching a subject would greatly benefit from listening to experienced lecturers. Recorded lectures could also be used to evaluate instructors. Many instructors would benefit from impartial and constructive evaluation of their speaking or presentation skills.

Educational refinement and improvement - Over the years, great instructors develop many excellent vignettes, examples and “turns of a phrase” that brilliantly illustrate a particular teaching point. Not all instructors have excellent examples for all teaching points. Recorded lectures could be the starting point for sharing excellence lecture nuggets between among faculty who teach the same subject.

Caught on tape - Inevitably an instructor will misspeak during a lecture and the recording will be the proof. A technology like Classcaster challenges the notion that the classroom lecture is sacrosanct and requires a greater measure of care be given by the faculty when speaking. Like the notion of P2P swapping of faculty audio, this too may serve as a disincentive for recording.

P2P Underground - Even if instructors do not license their material to others or wish to participate in an open source-like ecosystem, once an MP3 lecture is in the “wild”, it may be shared by students using any number of P2P systems like Kazaa, BitTorrent, etc. However, this may be a disincentive for faculty to record lectures for their IPodding students.

Remixing education - Once there is a large enough corpus of recorded lectures in a particular

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subject area, one could imagine creating a buffet of the best lectures or parts of lectures (mini-lectures?, lecturettes?) that can be recombined or “mixed” into new set of course materials. If open source principles are applied to this ecosystem, instructors will allow others to use their lectures or portions of lectures in their teaching under a Creative Commons<sup>16</sup> license or equivalent.

### **ISSUES OF SOUND QUALITY**

Our initial tests subjectively indicate that the sound quality of the lecture is technically what we call “good enough”. Quality will vary, though, depending on several factors outside of the system’s control.

- Cell phone reception in the classroom,
- Hands-free microphone quality and it’s ability to cancel external noise, and,
- Distance between the speaker’s mouth and the microphone.

The Classcaster system has the ability to sample and record sounds files at quite high fidelity. The trade-off is in the size of the resultant data file and time it takes to process and convert. The fact that it’s “good enough” encourages us to continue our research to determine the best practices for operation of the system.

### **TECHNICAL DETAILS**

The technical details of Classcaster are straightforward. The goal is to create a custom Linux distribution that can be installed on most any plain vanilla x86 PC with at least 512 MB RAM, 600 MB of disk space, at least a 500 MHZ processor and some kind of incoming phone connection (either using a PSTN card or via a VoIP link from the Internet). We do not yet know how multiple, simultaneous connections or the size of the audio files increases these requirements. One goal of our research is to figure this out.

We are starting from a Linux distribution that already includes the Asterisk PBX software: Asterisk@Home.<sup>17</sup>

Asterisk<sup>18</sup> is the centerpiece of Classcaster. From the [www.asterisk.org](http://www.asterisk.org) website...

*“... Asterisk is a complete PBX in software. It runs on Linux and provides all of the features you would expect from a PBX and more. Asterisk does voice over IP in three protocols, and can interoperate with almost all standards-based telephony equipment using relatively inexpensive hardware.*

*Asterisk provides Voicemail services with Directory, Call Conferencing, Interactive Voice Response, Call Queuing. It has support for three-way calling, caller ID services...*

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*... Asterisk needs no additional hardware for Voice over IP. For interconnection with digital and analog telephony equipment, Asterisk supports a number of hardware devices, most notably all of the hardware manufactured by Asterisk's sponsors, Digium™ ...”*

For Classcaster, we are not actually using most of the Asterisk's advanced features and almost none of it's PBX-related features. We just want it to answer the phone and take a message. We could have gone the route of designing this around mgetty<sup>19</sup> and modems, but the compelling features of a full-blown PBX open up so many more possibilities for further research and expansion. Asterisk is designed for the coming VoIP world and this makes it possible for Classcaster to be a “plug and play” solution without any physical connections to the PSTN system if you are using a service such as VoicePulse<sup>20</sup> or Broadvoice<sup>21</sup>. For as little as \$5.95 per month, these two services give you a PSTN phone number that can be answered by our Internet-attached PBX, thus, you do not need rent a land line from your local or regional Bell. This is significant, because getting a new phone line in some educational institutions can be rather difficult. Classcaster, through Asterisk, can also be configured to work with SIP and IAX softphones<sup>22</sup> allowing recording directly from the PC.

For CALI, Classcaster is just the beginning as we wish to explore all sorts of different ways to integrate audio and perhaps video recordings in education. Asterisk gives us a rich and powerful foundation to make those explorations and there is a burgeoning community and marketplace of Asterisk users whom we can tap for support.

To handle the blogging needs of Classcaster, we chose pLog<sup>23</sup> because it provides the feature set that most closely matches our requirements. It allows for fast and automatic deployment of multiple blogs using a single database and code base, has a well documented API for plugins, supports the Metweblog API<sup>24</sup> via XML-RPC<sup>25</sup>, supports enclosures in RSS 2.0 feeds<sup>26</sup>, and has an active and supportive developer community.

### **CONVERGENCE...FINALLY!**

We have been hearing about convergence for over a decade. A George Gilder article in Forbes ASAP back in 1992 called “Into the Fibersphere”<sup>27</sup> opined that television used to be in the air and was heading into the cables, telephony that used to be cables is heading into the airwaves and that everything is going to get digital and put into the “fibersphere”. Well, HDTV is a taking off now, I can get WiFi at my local Dunkin Donuts and almost everyone has a cell phone. Maybe convergence is really here!

Classcaster is a solution that services CALI's research and development needs and since it borrows all its power from open source projects, it makes sense for CALI is make the results of its efforts available to others as well. We plan to make a CD-installable version of Classcaster available for free download from our website or we'll sell you a copy of the CD for a reasonable cost to cover shipping and handling. We also invite others to build on our efforts (as we have) and to contribute them back for the benefit of educational improvement.

## Endnotes

1. The Center for Computer-Assisted Legal Instruction (CALI) is a 501(c)(3) non-profit consortium of 190 law schools in the United States and an increasing number of international affiliate law schools. CALI's mission is to applied research in the use of technology in teaching of law. See <http://www.cali.org> for more information about CALI.
2. From <http://www.tltgroup.org/resources/rltas.html> which has many excellent resources.
3. See [http://publications.mediapost.com/index.cfm?fuseaction=Articles.showArticleHomePage&art\\_aid=27298](http://publications.mediapost.com/index.cfm?fuseaction=Articles.showArticleHomePage&art_aid=27298)
4. See <http://www.washingtonpost.com/wp-dyn/articles/A19831-2005Feb12.html>
5. See [http://www.dukenews.duke.edu/news/ipods\\_0704.html](http://www.dukenews.duke.edu/news/ipods_0704.html)
6. From a powerpoint at <http://www.cs.duke.edu/csed/ipod/ipodtalk.ppt>.
7. Ibid.
8. Search on www.ebay.com conducted in September 2005 for "Digium Wildcard". It should be noted that Digium no longer sells or supports the Wildcard X100P which is probably why there are so many for sale, so cheaply on Ebay.
9. Moblog = mobile + weblog - see <http://en.wikipedia.org/wiki/Moblog>.
10. See <http://www.audioblog.com/>
11. A good definition of a "use case" is "A *use-case model consists of actors, use cases, and relations among them. Actors represent everything that must exchange information with the system, including what are typically called users. When an actor uses the system, the system performs a use case. A good use case is a sequence of transactions that yields a measurable result of value for an actor. The collection of use cases is the system's complete functionality.*" found at <http://www.canri.nsw.gov.au/glossary.html#U>
12. See <http://h2oproject.law.harvard.edu/roisserie.html> for more information.
13. Barnes and Nobles publishes lectures on CD from prominent scholars called the "Portable Professor" series. Here is the description from the website: "*PORTABLE PROFESSOR™ is a series of exciting and informative lectures recorded by some of today's most renowned university and college professors. Each course introduces listeners to fascinating, and sometimes startling, insights into the intellectual forces that shape our understanding of the world. Each package includes 14 riveting lectures presented by notable professors as well as a book-length course guide.*" from <http://search.barnesandnoble.com/booksearch/results.asp?SID=329213>.
14. See <http://www.tech-synergy.com/>. Information obtained via request in early February 2005: The cost for our standard 2 day ( 48 hr turnaround service) is \$1.1 / minute of the audio file. The cost for our Express 1 day (24 hr turnaround service) is \$1.4/ minute of the audio file. The cost for our Expedited service ( 12 hr turnaround service) is \$1.8/minute of the audio file.
15. See <http://www.microsoft.com/office/onenote/prodinfo/occupation/education/default.mspx>
16. See <http://creativecommons.org/>
17. See <http://asteriskathome.sourceforge.net>
18. See <http://www.asterisk.org>
19. See <http://www.die.net/doc/linux/man/man8/mgetty.8.html> for information about mgetty.
20. See <http://www.voicepulse.com>
21. See <http://www.broadvoice.com>
22. Numerous examples are available but one of the easiest to use is X-Lite, a SIP phone from www.xten.com.
23. see <http://www.plogworld.net/>
24. see <http://www.xmlrpc.com/metaWeblogApi>
25. see <http://www.xmlrpc.com/>
26. RSS2.0 enclosures are the thing that makes podcasting work so well. For information about enclosures see <http://blogs.law.harvard.edu/tech/rss#ltenclosureegtSubelementOfLitemgt> and <http://www.thetwowayweb.com/payloadsforrss>.
27. The article was widely distributed on Usenet at the time and can now be found on the web at <http://www.seas.upenn.edu/~gaj1/fiber.html>.