



Internet-Based Dissemination of Educational Audiocasts: A Primer in Podcasting—How to Do It

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OBJECTIVE. “Podcasting” is a relatively new Internet-based broadcast technology with unique characteristics that may prove valuable in radiologic education. In this article, we describe the procedure for generating, distributing, and downloading a podcast.

CONCLUSION. Podcast technology holds promise as an inexpensive method to rapidly and cost effectively disseminate educational Internet audio broadcasts (“audiocasts”).

The Internet has become an integral component of medical education, providing physicians with instant access to the literature and educational materials. Published studies report the widespread use of the Internet by physicians seeking information [1] and the value of personal digital assistants (PDAs) as a portable instrument to deliver information and educational materials to radiology residents [2]. Digital dissemination of educational content is well suited for radiology, a field based on image interpretation.

However, some information essential to the practice of radiology does not require the review of images. Such topics include CT data acquisition and IV contrast infusion protocols, understanding advances in CT hardware and software, patient preparation, and departmental policy. Dissemination of this type of information is well suited for an audio broadcast (“audiocast”). The channels currently available for dissemination of audio materials present a unique opportunity to readily deliver educational audiocasts to a wide audience. Educational lectures can be broadcast and downloaded through a process known as “podcasting.” In CT, where technology is quickly progressing, podcasting can be used to guide practitioners new to the latest-generation CT scanners or to instruct those who are learning how to perform acquisitions not currently used in their department.

First developed by former MTV (Music Television) veejay (video deejay) Adam Curry, podcasts can be downloaded and played by any device that can play MP3 (Moving Picture Experts Group [MPEG], au-

dio layer 3) files. Podcasting is a form of really simple syndication (RSS) feed. RSS feeds are a way to enable users to receive up-to-date syndicated news stories. Podcasts are simply syndicated news feeds that are in an audio format. Many major news Web sites, such as Reuters.com, use RSS feeds to provide their content to third-party vendors, such as Salon.com. Currently many enterprises such as Newsweek, ESPN (Entertainment and Sports Programming Network), and the BBC (British Broadcast Corporation) are embracing podcasting.

The advantages of this form of audiocast are numerous. Podcasts can be generated and published extremely quickly. If the proper hardware and software are available, podcasts can be created and distributed at little or no cost. Recipients can download podcasts free in just seconds and review them on their computer or through the many channels available using a handheld device. We believe that the value of this technology is the ability to rapidly disseminate radiologic information at very little cost.

To our knowledge, the procedure of creating podcasts and the role in radiology education have not been discussed in the published medical literature. The purpose of this article is to describe in detail the procedure for creating, distributing, and downloading a podcast and discuss potential uses of this technology.

Creating a Podcast

Creating and publishing a podcast are surprisingly easy. We will discuss this process and the software and hardware involved with each step. There are many ways to go about creating

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A Primer in Podcasting

a podcast; however, we have used Apple's (Apple Computer) recommended techniques and software to create our podcast. Most of the Macintosh-based software we used is free and comes standard on all new models of Apple computers or as part of new operating system upgrades. QuickTime 7 Pro (Apple Computer) is available for Macintosh and IBM-compatible computers at a price of \$29.99. To create and subscribe to podcasts, the user needs the following minimum requirements.

Macintosh

- Macintosh operating system: Mac OS X 10.2.8 or later
- GarageBand (Apple Computer) or QuickTime 7 Pro (QuickTime 7 Pro requires OS X 10.3.9 or later)
- iTunes 4.9 or later (Apple Computer)
- microphone

IBM-Compatible Computer

- Microsoft Windows 2000 or Windows XP
- QuickTime 7 Pro or other audio recording software for IBM-compatible computers
- iTunes 4.9 or later
- microphone

Recording an MP3

The first step in creating a podcast is recording the audio content that you would like to broadcast. We use GarageBand or QuickTime 7 Pro for recording and use iTunes as our Player and podcast subscriber. If iTunes is not already on your computer, it is available for downloading from Apple's Web site free to both Apple and IBM-compatible computer users. For Mac users, GarageBand is the least expensive option (comes free with new computers and OS X upgrades) and the simplest way to record your audio file, although QuickTime 7 Pro can be used as well and is relatively inexpensive. GarageBand does not run on IBM-compatible computers at the moment, and users will need to download QuickTime 7 Pro to record audio or another audio recording software for IBM-compatible computers, such as those offered by Steinburg. A built-in microphone or small external microphone will work in a pinch to record a quick lecture. Just plug an external microphone into the microphone input on your computer. If you would like to acquire high-quality professional audio, you need to purchase extra hardware. We suggest a Shure SM58 microphone (\$100) and a small single-channel microphone input with a FireWire (Apple Computer) audio interface (\$100–\$300). This module will supply power

to the microphone and send the microphone signal to the computer.

After you have the microphone connected to the computer, open GarageBand and create a new file. GarageBand will open with an instrument track already created and displayed in your mixing board. Select and delete this track: Delete Track is located under the Track menu. Next, add a new track. Both Add and Delete Track functions are located under the Track menu. After choosing New Track, another menu will appear on the monitor. Select Real Instrument and then choose Basic Track or Vocals as your instrument. Choosing vocals will allow you to apply many different effects processors to your voice. Apply these at your discretion, although we do not recommend it under normal circumstances. After the vocals have been recorded, the user has the ability to apply effects, processing, and equalization. Last, choose Mono as your input technique. There is no need for stereo when recording a single vocal track. Now, create your new track.

This track will appear in your mixing board, and a red button should be highlighted; if not, click the round button on the track. When the button is activated it means you are "record enabled." If the microphone is on and the input device is ready, you should see a microphone signal on the track Peak Level Meter display on the mixer. Edit your levels so they peak in the yellow area, just under the red area. Press the red Record button on the Record and Play buttons on the mixer to begin recording. If you have any problems getting a microphone signal, ensure that GarageBand is recognizing the microphone input or the FireWire audio interface. Read the manual for the specific microphone, input device, and GarageBand information.

After you are finished recording, simply export the recorded file to iTunes. The Export function is located in the menu under File. GarageBand exports files as AIFF (audio interchange file format) audio files. iTunes will automatically open, and your file will be selected. Next, convert your AIFF file to an MP3 file with your desired settings. We recommend 128 kB/sec. These settings are located in the iTunes Preferences under Importing. Most of the techniques and functions used on an Apple computer and in GarageBand are similar to those used by other similar software packages for both Mac and IBM-compatible computers. Users will need to quickly read their instructions for information about recording audio files through their specific software package.

Creating an RSS File

The second step is to create the RSS file. "RSS" stands for real simple syndication. Basically the RSS file is a file that provides information that creates an audio feed or podcast using information that you specify in the file. This can include article headlines, links to articles, and MP3 files (podcasts) among other things.

To create an RSS file, you need a simple text editor, such as Notepad (Microsoft) on an IBM-compatible computer or SimpleText (Apple Computer) on a Mac. Do not attempt to use Microsoft Word to write an RSS file because it inserts data that will make the file invalid.

RSS files have two main components. The first is the <Channel> component and the second is the <Item> component. By defining these two components in an RSS file you can create a podcast.

The <Channel> component of the RSS file provides general information about the entity that is broadcasting the podcast. Some important subcomponents of the <Channel> component are the following: <title>, <link>, <description>, <language>, <managingEditor>, <copyright>, <pubDate>, <lastBuildDate>, and <webmaster>. Copy the text from Appendix 1 into Notepad or SimpleText.

The <title> subcomponent in Appendix 1 should contain the title of your channel, not the individual podcast (we will get to that later). The <link> subcomponent should include a link to your Web site. The <description> subcomponent is very important: When you submit your podcast channel to any sort of directory, the information that you provide here will be used to describe it. Word this section carefully and be sure to include important keywords that people might use to locate your podcast channel. The <language> subcomponent lists the language in which the data will be delivered. The <managingEditor> subcomponent lets users know who is responsible for the content of the channel. The editor's e-mail address should be included and the editor's name should be listed in parentheses. The <copyright> subcomponent lists the copyright date and owner of the channel. The <pubdate> subcomponent gives the publication date of the channel. This is useful for those who wish to publish on a regular basis, like on a weekly basis. It is important that you list the date in the format listed in the example in Appendix 1; otherwise, your RSS file will be invalid. The <lastBuildDate> subcomponent lists the last

time that the content was updated. The <webmaster> subcomponent lists the e-mail address of a person whom users can contact in the event of technical problems with the channel. There are other subcomponents, but for our purposes we will define only those listed in Appendix 1. For a complete list of <Channel> subcomponents, please see the RSS 2.0 specification here: blogs.law.harvard.edu/tech/rss.

The <Channel> component does not provide any actual content for the RSS file (i.e., the sound file for your podcast). To insert content—in this case, an MP3 file—you must insert the <Item> component of the RSS file. To do this, copy the text from Appendix 2 into your RSS file just after the <webmaster> subcomponent.

In Appendix 2, the two <Item> components denote two separate podcasts, each with its individual title, link, and other information. All of the subcomponents (<title>, <description>, and <pubdate>) are similar to those earlier described. The <author> subcomponent lists the e-mail address and the name of the author of this particular podcast. The <enclosure> subcomponent denotes the actual podcast file and is very important. You must include the complete URL of the MP3 file that you placed on your server, its length (without the use of commas; the files in Appendix 1 and Appendix 2 are 6,808 kB and 9,724 kB, respectively), and the type of audio file, which, for our purposes, is an MPEG (MP3).

The RSS file must be saved as a plain text file. Notepad may give the file a “.txt” file extension. You will need to remove this extension and rename the file with an “.rss” as the file extension (Fig. 1). Upload this file to your Web server using an FTP program and make note of its URL; this is the URL that you will give people who want to subscribe to your podcast (Fig. 2). Your Web server may not recognize the “.rss” file extension, which leads us to our next step: creating an .htaccess file.

Creating an .htaccess File

Next a simple text file named “.htaccess” may need to be modified or placed on Apache Web servers. The .htaccess files are used on Apache servers for purposes such as preventing certain computers from accessing a Web server or to password-protect directories on a Web server. If your Web server is other than Apache, you may skip this step. This step is to ensure that an Apache server recognizes the file extension (“.rss”) of your RSS file. If your Web server already has an .htaccess file, download this file and add the text below to it.

If the Web server does not have an .htaccess file, use Notepad or SimpleText to create this file. Open a new document and type the text below into it:

AddType application/rss+xml .rss

Save this file as “.htaccess.” You will probably need to rename the file manually because Notepad may automatically add a “.txt” file extension. Upload this file to your Web server and put it in the same directory as your Web site’s main page (i.e., index.html) (Fig. 3).

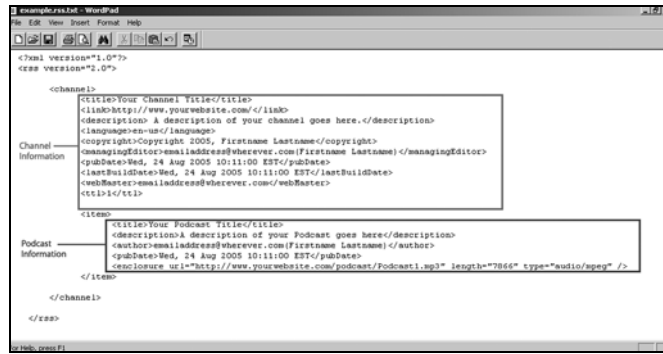


Fig. 1—The .rss (real simple syndication) file contains information about a group of podcasts’ content, author or authors, and publication date in the “Channel” portion. The “Item” portion of the page contains information about each individual podcast, such as its author, where it resides on a Web server, and its length.

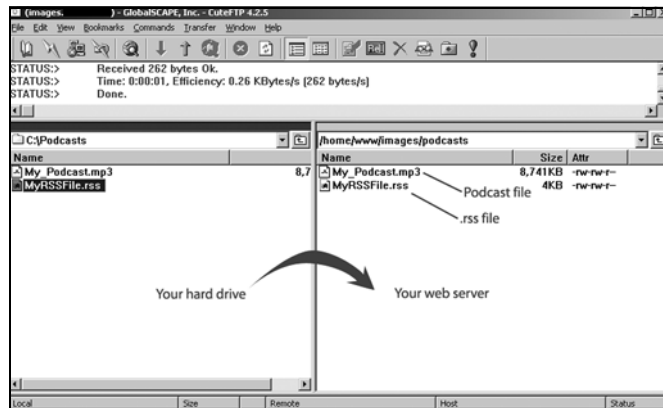


Fig. 2—We use the FTP program Fetch (Globalscape) to upload files to our Web server. Simply drag and drop the files into the preferred directory.

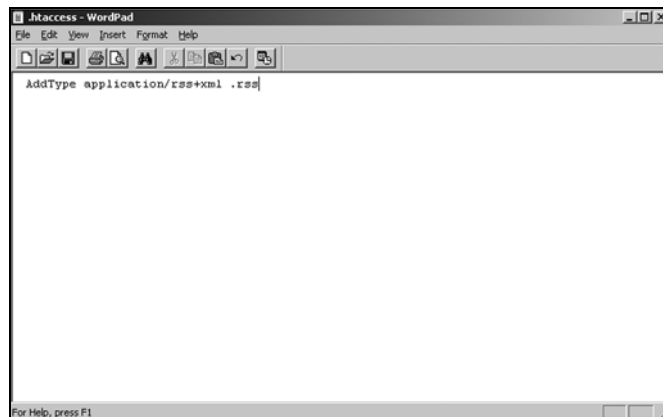


Fig. 3—The .htaccess file must also be placed on the Web server in the same directory as the main page of the Web site.

A Primer in Podcasting

Validate Your RSS File

The easiest way to validate your RSS file is to use online validation software such as Feed Validator at www.feedvalidator.org. Type the complete URL of the RSS file into the Feed Validator Web page. This will make certain that there are no errors that would cause the feed to malfunction. If you vary at all from the format given, it could produce an error, so make sure that you type the data for the RSS file in exactly as it appears in the examples in Appendixes 1 and 2 (Fig. 4).

Subscribing to Your Podcast

Many software products are available to download and play podcasts; iTunes (Apple Computer) and iPodder (multiple developers) are two such products. For a detailed list of podcast playback software, please see the following Web site: www.podcastingsnews.com/topics/Podcast_Software.html.

If users have the URL of your RSS feed (the URL of the RSS file on your server), they can subscribe to your podcast. In iTunes, complete the following steps (Fig. 5):

- Open iTunes.
- Click on "Advanced/Subscribe to Podcast" in the top navigation bar of the interface.
- Type the URL of your RSS file into the space given.
- The Channel title will appear in iTunes. Click on the small arrow directly in front of the channel title to see all podcasts provided in this channel.

Once the user has subscribed to a particular podcast channel, the software used to play the podcast will automatically download new podcasts that appear on the channel. More information and tutorials about podcasting are available on the Web.

Discussion

Podcasting presents a new conduit to quickly provide practicing radiologists with state-of-the-art information about CT scanners, acquisition protocols, and postprocessing of data sets, available 24 hours a day. The ease of creation and delivery enables the information to be rapidly updated. The advantage of this type of mobile audio-cast is that the user is not tied to the computer to review the information. It can be reviewed virtually anywhere that one would listen to an MP3 player—for example, while commuting to work or exercising. Examples of our use of podcasting can be found linked from the main page of our Web site, www.ctisus.com (Fig. 6).

We are currently adding a new podcast each week. At the present time, we have published lectures on 64-MDCT, IV contrast administration, coronary CT angiography, virtual colonoscopy, pancreatic imaging, the evaluation of hematuria, incidental adrenal masses, CT screening, workflow, and an introduction to

podcasting through our Web site. A concise lecture of short duration is well suited to communicate the key points on a topic, and our available audiocasts range from 2.5 to 14.5 minutes. It is difficult for us to ascertain how many users actually listen to each podcast; however, our best measure of the number people who are in-

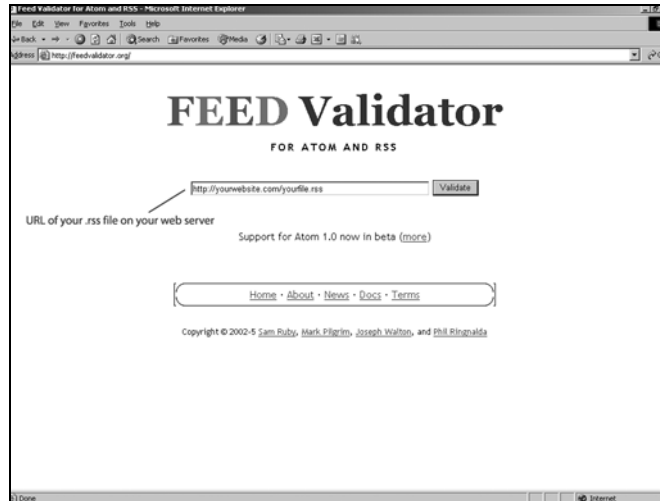


Fig. 4—An online tool such as Feed Validator (www.feedvalidator.org) should be used to ensure that there are no errors in the .rss file (real simple syndication). Type the URL of the .rss file into the blank field and press the Validate button.



Fig. 5—The iTunes (Apple Computer) interface shows a list of available podcasts, indicating those that you have downloaded.

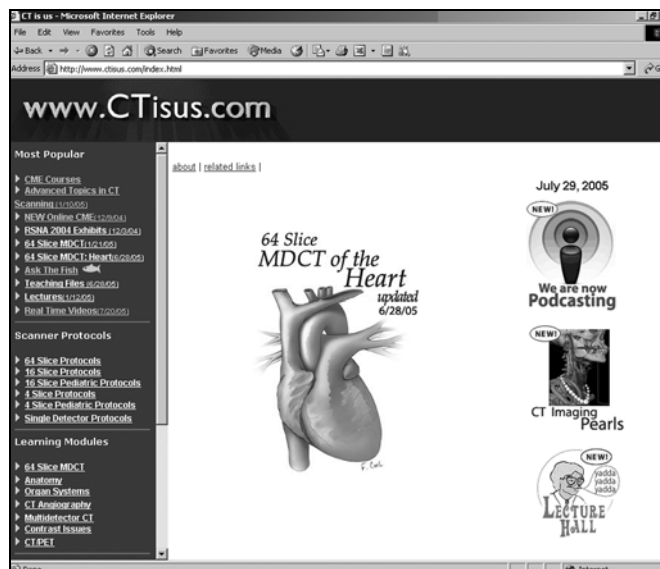


Fig. 6—Our Web site, www.ctisus.com, makes use of podcasting to address topics such as IV contrast material and cardiac CT angiography.

interested in the podcasts is how many requests we have had for our .rss file, which must be accessed whenever the user downloads a podcast. We had 3,268 requests in the 5-month period from March 22, 2005, to August 20, 2005. The Web site also provides a means for users to provide comments or pose questions after listening

to a podcast. As the technology becomes mainstream, such feedback from the users will be integral in guiding implementation.

References

1. Bennett NL, Casebeer LL, Kristofco RE, Strasser

SM. Physicians' Internet information-seeking behaviors. *J Contin Educ Health Prof* 2004; 24:31-38

2. Busch JM, Barbaras L, Wei J, Nishino M, Yam C-S, Hatabu H. A mobile solution: PDA-based platform for radiology information management. *AJR* 2004; 183:237-242

APPENDIX 1: <Channel> Component of the RSS (Real Simple Syndication) File: General Information About the Entity That Is Broadcasting the Podcast

Copy the text below into Notepad (Microsoft) or SimpleText (Apple Computer):

```
<?xml version="1.0"?>
<rss version="2.0">
<channel>
<title>My Podcast</title>
<link>www.yourwebsite.com</link>
<description>Describe your Web site here. Be sure to use keywords that will help people find it.</description>
<language>en-us</language>
<managingEditor>youremail@wherever.com (Firstname, Lastname)</managingEditor>
<copyright>Copyright 2005, Firstname Lastname</copyright>
<pubDate>Wed, 13 Jul 2005 02:52:00 EST</pubDate>
<lastBuildDate>Wed, 13 Jul 2005 02:52:00 EST</lastBuildDate>
<webMaster>yourname@wherever.com</webMaster>
</channel>
</rss>
```

APPENDIX 2: <Item> Component of the RSS (Real Simple Syndication) File

To insert content—in this case, an MP3 file—you must insert the <Item> component of the RSS file. To do this, copy the text below into your RSS file just after the <webmaster> subcomponent, which is shown in Appendix 1.

```
<?xml version="1.0"?>
<rss version="2.0">
<channel>
<title>My Podcast</title>
<link>www.yourwebsite.com</link>
<description>Describe your Web site here. Be sure to use keywords that will help people find it.</description>
<language>en-us</language>
<managingEditor>youremail@wherever.com (Firstname, Lastname)</managingEditor>
<copyright>Copyright 2005, Firstname Lastname</copyright>
<pubDate>Wed, 13 Jul 2005 02:52:00 EST</pubDate>
<lastBuildDate>Wed, 13 Jul 2005 02:52:00 EST</lastBuildDate>
<webMaster>yourname@wherever.com</webMaster>
<item>
<title>Podcast number 1</title>
<description>Describe Podcast number 1.</description>
<author>youremail@whever.com (Firstname, Lastname)</author>
<pubDate>Wed, 13 Jul 2005 02:52:00 EST</pubDate>
<enclosure url=www.yourserver.com/podcast/yoursoundfile1.mp3 length="6808" type="audio/mpeg"/>
</item>
<item>
<title>Podcast number 2</title>
<description>Describe Podcast number 2.</description>
<author>youremail@whever.com (Firstname, Lastname)</author>
<pubDate>Wed, 13 Jul 2005 02:52:00 EST</pubDate>
<enclosure
url=www.yourserver.com/podcast/yoursoundfile2.mp3 length="9724" type="audio/mpeg"/>
</item>
</channel>
</rss>
```
