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Strategies and Techniques for Designers, Developers, and Managers of eLearning

THIS WEEK — DEVELOPMENT TECHNIQUES

Repurposing Taped Video for e-Learning, Part 2: From Hard Drive to Optimized Video File

BY STEPHEN HASKIN

Video is an increasingly important part of e-Learning and there are many ways to deliver it to the learner's desktop. With the right tools, making use of these delivery options is easy. This week, learn how to move digitized video to the Web, to CD-ROM, or to DVD from your hard drive. You'll be glad you did!

In Part 1 of this two-part series, we learned how to move video content from digital or analog tape onto a hard drive. This is half the job of repurposing taped video. This week, we'll learn how to use Adobe Premiere to render digitized video to other media: the Web, CD-ROM, and DVD.

You've got the tape. You've got the computer. You've grabbed the video. Now it's in the computer and you have to do something with it. A file in your computer is nice, but it's not going to get any training done. So what do you do?

Setting up projects in Premiere

Let's start with the video you just grabbed. You've saved the video file, but you haven't yet saved the project you are doing as a file in Premiere. The first thing you'll do is save the project just like any other document. Your computer really does not much care about the kind of files that are on the hard drive. Some files are big and some are smaller. Your video file is separate from the Premiere project file so you have to save the project. Name it the same as the video if you want, or give it another name. Remember, the schema for naming files is yours and I can't know what kinds of file names your organization uses, so whatever you call the Premiere project is OK.

Last week, I didn't explain what happens after you finish grabbing your video and give the file a name. When you do that, the video clip will appear in the Project window of Premiere's editing screen. (See Figure 1 on page 2.) If you've forgotten where this window is located, look at Figure 2 in last week's article — it's in the bottom third of the Adobe Premiere editing screen.

In the Project window there's all sorts of

Continued on next page

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information about the video: its pixel size (in this case it's a little smaller than I recommend, but it was not destined for full screen video output), clip length in hours;minutes;seconds;frames format and the average data rate. You will need this information at different times during all of the rendering processes, so note where it is located.

Rendering for the Web

Rendering is not as straightforward as capturing the video. I'll get right to the point by starting with the kind of job that will probably be of most interest to e-Learning developers — rendering video for the Web.

You need to know before you start what kind of server the video will be served from. You need a dedicated video server. You can rent space on servers and pay by the view, or your IT department may have a video server. In fact there are several ways to get on other servers, but you do need a server.

(Please note: You can actually put video on almost any server, but I wouldn't suggest it. Video will bring down a file server faster than you can snap your fingers if you have more than two or three simultaneous connections.)

So how many kinds of video server are there? For your purposes, there are three main types of video server according to their format, or architecture. (See Sidebar 1, Digital video architectures.) You may be using a Real server, a Windows Media server, a QuickTime server, or some combination. A video server (the physical machine) can be set up to use any of these video architectures. The reason this is important is that you must tell Premiere which algorithm, or codec, to use to compress your video file in the way that your particular kind of video server expects. (See Sidebar 2 on page 5, codecs.)

I'll say this right now: it really doesn't matter what kind of video you serve, be it Real, Windows Media, or QuickTime. What matters is that your video has good temporal quality — make it look as good as you can. All three of the major architectures look and work about the same, flame wars between their supporters notwithstanding.

So now we're ready to render the video for the Web. You know what kind of video (architecturally) you want to render, so let's do it. For our purposes, we're going to make a Windows Streaming Media video. QuickTime and Real are almost identical.

Two warnings: There are ways to render the video for the Web where you can speci-

FIGURE 1 *The Project window shows information about the current video clip in Premiere.*

Sidebar 1 *Digital video architectures*

Architecture, or format, refers to the structure of the software used to create, store, and display video content. Architectures usually include compression support, system extensions, server software, and browser plug-ins. Each architecture generally has its own file format for storing video content, and this format is not compatible with the file formats of other architectures.

There are three principal proprietary digital video architectures, and one non-proprietary.

QuickTime is Apple Computer's multi-platform, industry-standard, multimedia software architecture. It is used to publish video as well as other multimedia content including animation, sound, text, music, VR and 3D. QuickTime movies are a very common type of video on both CD-ROM and the Web.

RealMedia (referred to in the article as "Real") includes RealAudio as well as RealVideo. It is exclusively for use on the Web and does not support video delivery on CD-ROM or DVD. RealVideo supports both live and on-demand video and works with or without a dedicated server.

Windows Media is a family of Microsoft solutions for delivery of multimedia on the Web, CD-ROM and DVD. In the case of video, Windows Media uses a highly optimized standards-compliant MPEG-4 video codec to deliver superior picture quality at all bandwidths. The frame rates delivered are higher than RealMedia and the feature set includes intelligent streaming that detects network conditions to adjust the video stream and maximizes quality. Although Windows Media is proprietary, the architecture is open and extensible, and supports a broad set of content formats, including QuickTime.

MPEG (Motion Pictures Expert Group of the International Organization for Standardization, or ISO) is both an architecture and a family of audio and video compression standards that includes MPEG-1, MPEG-2, and MPEG-4. MPEG-1 is the standard for compressing analog motion video to digital motion video that includes both audio and video data. It meets the needs of CD-ROM and video-on-demand. MPEG-2 was designed to meet the needs of broadcast. MPEG-2 is the standard for DVDs and requires a hardware decoder (a DVD-ROM player) for playback. MPEG-4 is the de facto standard for digital media distribution via the Web. It allows a single form of compression on all media players. It is popular with developers because it allows the addition of text, animations, and graphics in an object-based setting.

Each of the architectures, including MPEG, may involve fees for decoder, encoder, and encoder/decoder use. Other fees may also be involved, depending on the number of subscribers and other factors. In the case of MPEG-4, for example, there are content use fees. Fee structures can become quite complex.

fy how fast the connection speed is going to be. For the sake of the people you are training, and if you want or need to get your message across, *DO NOT* encode at a lower data rate than dual ISDN or the consumer speed of DSL. If you encode at a lower rate, you will seriously compromise the quality of the experience for all users. There is not yet (and there probably never will be) a method for delivering high quality video consistently over dial-up connections at 56K or less, and there is no reason to reduce your delivery to this lowest common denominator.

In addition, *DO NOT* scale your Web video smaller than 320 X 240 pixels. Digital video, because it needs to fit into an NTSC television, has pixels that are not actually square. It's all relative, but whatever size you choose (and there are only three that make sense), make sure it will fit the streaming rate (data rate) your viewers can support. For example, if your viewers only have DSL, 720 X 480 might be too large and your video will stop and start. A full-sized regular "TV" screen is 720 X 480, but it usually won't fill up a computer screen. Half that size in each dimension, 360 X 240, will be small and may be too small if there are other distractions on the screen. Sometimes (and only sometimes) 180 X 120 will work. However, this is postage-stamp size and is still too big for most dial-up connections if you want to show smooth video. These are your basic choices. If you use other dimensions, your video will look stretched in one direction or another — too "wide" or too "skinny."

Streaming media procedure

Step by step, here is the process:

1. Take the video in the Project window and "grab" it with your mouse (Click down and hold.)

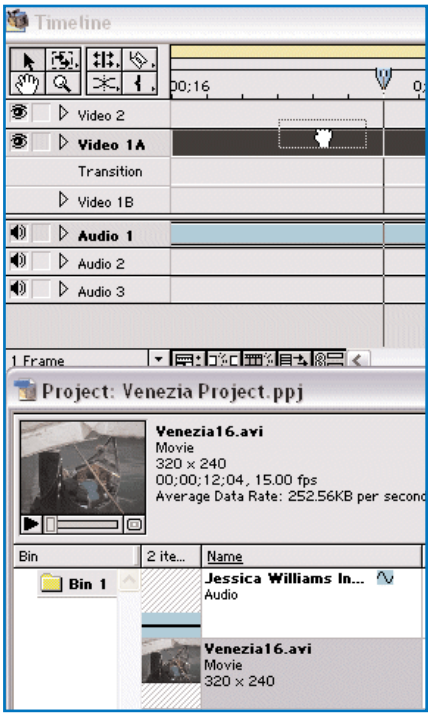

FIGURE 2 *Drag the video from the Project window up to the Timeline to begin the rendering process.*

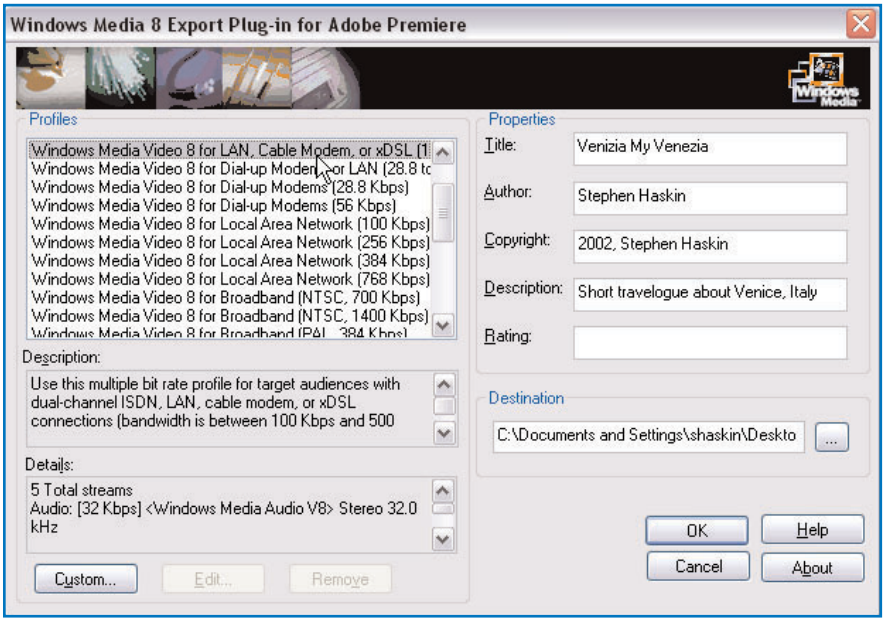

FIGURE 3 *The Windows Media dialog box is where you select the encoding to match your Web server.*

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2. Drag it up to the Timeline and let go of it when you see the Video 1A box fill up with the video. (See Figure 2 on page 3.) You can tell this has happened when the box turns black.

3. Save the project again, so if something goes wrong, the video will still be on the Timeline.

4. On the file menu go to File > Export Timeline > Advanced Windows Media. The Windows Media dialog box will appear. (See Figure 3 on page 3.)

NOTE: Windows Media 9 is now available from Microsoft. If you know that all your users will have the Windows Media 9 player on their systems, then it could be advantageous to use this right now. Go to: http://www.microsoft.com/windows/windowsmedia/download/default.asp and download the media player and encoder. However, most Windows computers will have an earlier version, unless they are brand new.

5. On the right side you'll note the boxes for title, author, copyright, etc. in the dialog. Fill them out. This is what will appear in the media player in your final output version. At the bottom of the right side, you'll see a box for destination. I usually name the file, and make the destination my desktop so I can move the file to the server or wherever it needs to go for my project. QuickTime and Real dialog boxes have about the same data input.

> It really doesn't matter what kind of video you serve, be it Real, Windows Media, or QuickTime. What matters is that your video has good temporal quality — make it look as good as you can. All three of the major architectures look and work about the same, flame wars between their supporters notwithstanding.

6. On the left side you'll note there are a whole bunch of possibilities for encoding. Select the appropriate profile, and click on OK.

7. After the video renders, you're done.

That's it. That's all there is to making streaming media files. You still have to move your new optimized video file to the video server and link it to someplace on the Web, but for our purposes the work is done.

Rendering for CD-ROM

Rendering for a CD is even easier than rendering for the Web. You've already got a video file on your computer that's the equivalent of what is going on a CD.

Mac procedure: QuickTime

If your organization only uses Macs, you're done. You grabbed the video with a Mac, so it's already in QuickTime, and that's what you'll be putting on your CD. You can go right ahead and burn that CD.

PC procedure: MPEG-4 or Cinepak

On a PC it's only a few more steps.

1. Go to the menu: File > Export Timeline > Movie. A standard dialog will appear. Name the file to which you are going to export the movie on the Timeline. Then click on the Settings button.

2. In the dialog box that opens next, you'll see the first settings are the General Settings. This part of the dialog gives you the properties of the video as it will be saved and you can select the format. (See Figure 4.) For our purposes, we'll choose Microsoft AVI. This means the file will be saved with the familiar ".avi" suffix.

3. Click on Next in the bottom right and you'll go to the Video part of the Export Movie Settings dialog. (See Figure 5.) The "Compressor" title on the first drop-down list refers to the codec, or compression algorithm, that will be used to put the video file onto the CD-ROM. There are many choices, and you should select the one that matches the kind of computer the CD-ROM will be played on. If you don't know what kind of computer it will be played on, use the Cinepak codec or the Microsoft MPEG-4 codec. Almost all com-

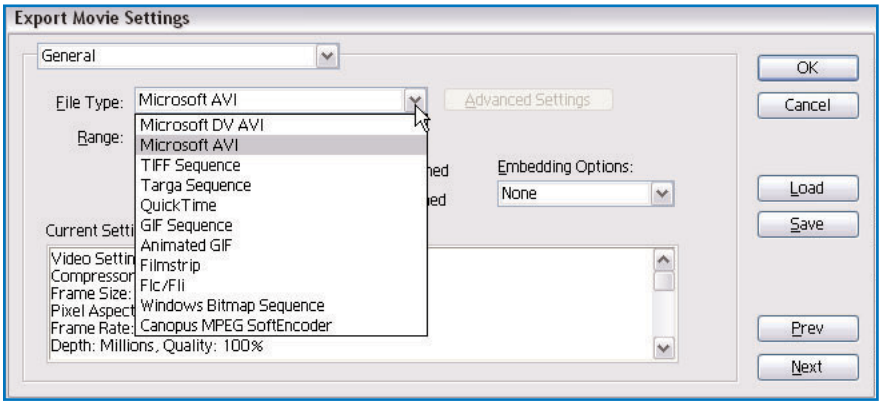

FIGURE 4 *The General Settings for export to a CD-ROM file.*

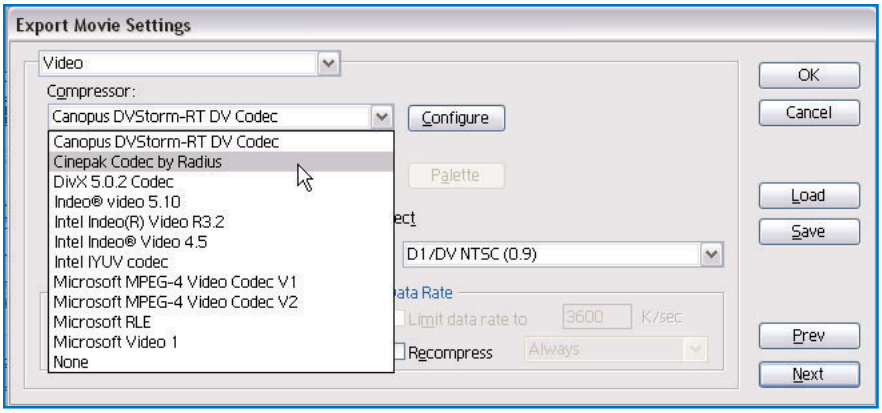

FIGURE 5 *Using the Video dialog, select the compression codec and size your video.*

puters, old and new, Mac or PC, can read video files optimized with these codecs, so you should play it safe here. Do note however, that the MPEG-4 files will be much smaller than the Cinepak files.

4. Make sure the video is sized the way you want. Your basic choices are 720 X 480, 360 X 240, and 180 X 120. If you use other proportions, your video will look stretched one way or another.

5. Click on Next and you will get the Audio dialog. The default setting for Rate, 44,100 Hz, is CD quality. The 16 bit default for Format is how most video is captured, so both of these can be left "as is."

6. Click on Next and you'll come to the Keyframe and Rendering dialog. For our purposes you don't really need to worry about keyframe and rendering.

7. Click on Next and you'll come to Special Processing. All things being equal, your tape should already look pretty decent, so we'll pass this one by as well, without making any changes.

8. If you click on Next again, you'll return to the General Settings dialog where you started. You've come full circle.

9. Click on OK and you'll be back at the Export Movie Dialog. Double-check the name of your export file, assign it to the directory of your choice, and click on OK. The video will render.

10. You're done. You can now burn your CD. You will have an exact non-interactive copy of the original non-interactive videotape.

Rendering for DVD

This is the hard one. Not difficult, but hard because rendering your video into an MPEG-2 is the first of two steps to get your video ready for DVD. After you have an MPEG-2 file you need to open a DVD authoring program and make a menu, etc.

Step 1: Simple video-on-a-DVD

Encoding the video for DVD is pretty straightforward. We'll do the same things

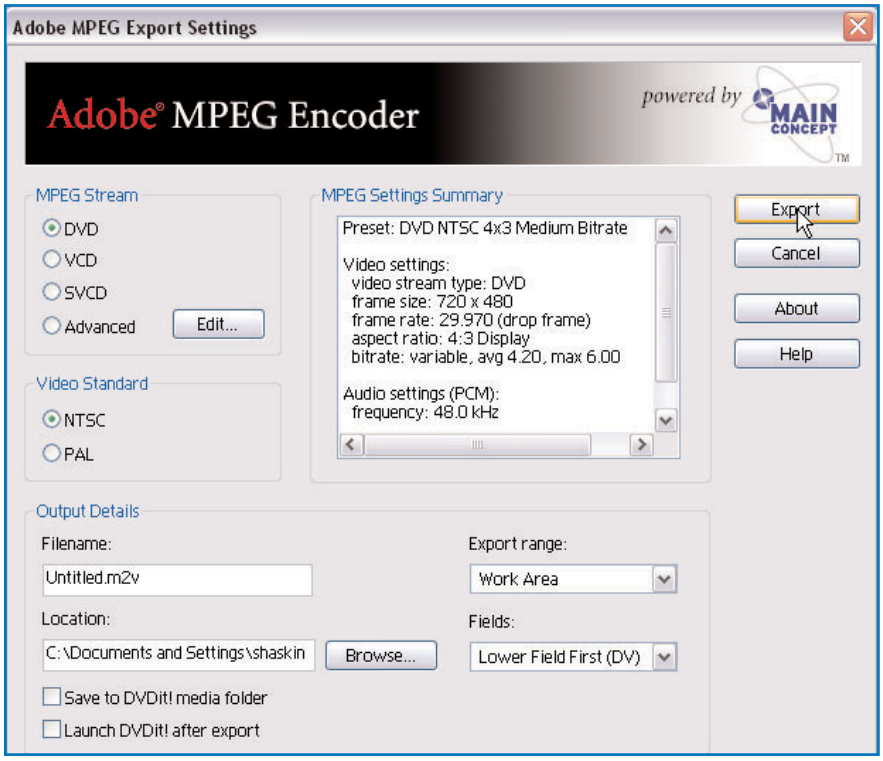

FIGURE 6 *The MPEG Encoder dialog sets up the video file for use on a DVD.*

Sidebar 2 *codecs*

The term "codec" is an acronym for "**co**mpression/**dec**ompression." A codec is a specialized computer program and the name refers to the main function of these programs: compressing and decompressing large files.

Video files tend to be very large. This creates two kinds of problems. If the video file is going to be sent across or displayed over a network connection, it could take a very long time to transmit. If the video file is going to be recorded onto physical media, such as a CD-ROM or a DVD, it might not fit. In both cases, the video file will need to be compressed for transmission or for storage, and will need to be decompressed later in order to play back on the user's system. In order to be optimum the particular medium involved — network transmission or plastic disc — requires different compression and decompression methods.

This means that there are several varieties of codec, and many different specific codecs within each variety. Here are a few of them and their specialized purposes.

Hardware (capture) codecs
- Radius VideoVision Studio
- Avid Media Composer
- TrueVision
- Apple Component Video
- DV Camera (new format, digitizing done in-camera)

Editing, storage, and special-purpose codecs
- Motion-JPEG (MJPEG) (general purpose)
- Apple Graphics (for images with limited colors)
- Apple Animation ("lossless" storage)
- Photo-JPEG (storage and transfer, very small files)

Web codecs
- RealVideo (Standard)
- RealVideo (Fractal) (better compression)
- MPEG-4 (high quality)

CD-ROM/DVD codecs
- Cinepak (medium quality CD-ROM video — widest compatibility)
- MPEG-1 (high quality CD-ROM video — requires special hardware or fast computer)
- MPEG-2 (high quality DVD video — requires special hardware)

(Additional information can be found at http://www.siggraph.org/education/materials/HyperGraph/video/codecs/Default.htm)

as before:

1. On the menu bar go to File > Export Movie > Adobe MPEG Encoder.
2. The MPEG Encoder box will open. (See Figure 6 on page 5).
3. On the upper left in this box, you'll see the MPEG stream selection box. If you are going to make a menu DVD (Step 2), then leave the default alone. However, if you are only going to make a CD with a DVD file, then click on VCD (Video CD) or SVCD (Super Video CD). The advantage of making a VCD or SVCD is that they are made on CD and not DVD disks (less expensive) and they will play on almost anything that will spin and show video. This includes CD, DVD in a computer, stand-alone DVD player, etc. The SVCD has higher quality MPEG-2 video so, if your video will fit, this is what you should use. The lower quality MPEG will look OK, but not stellar like a SVCD video.
4. If the video is going to be shown in the US on regular television sets, then select NTSC for the Video Standard. If it will only be shown in a computer, then it doesn't matter. If you need to show this in Europe, then you'll need to make two files, one PAL (the European standard) and one NTSC.
5. If you need to customize your settings and you click on the edit button the Advanced Settings dialog will appear. There's far too much there to go into in this article, but DVD is a still-developing medium as is the encoding methodology. Unless you want to get way deep into what the video stream is going to do after you encode the video, leave the default settings.
6. Once you've named the file, let it render and you're done with Step 1 (and possibly with the project).

Step 2: Using an authoring tool

You can actually see an MPEG-2 file on a regular DVD player, but it will just play the video. Not much different from tape, except that pause looks lots better. But if you want to make your training more than just a video, then you should use a DVD authoring program. DVDit! Light comes with Premiere 6.5, so you'll want to think about what else besides the video will be on the DVD. That's a subject for another article.

Conclusion

This has been a short (very short) course in getting your video ready for a variety of delivery methods. You can now capture your old videos, archive them, and

deliver them in several different ways.

This is just the beginning. Computers are opening up all kinds of venues for media delivery as well as making video. The most exciting aspect of computing, for me anyway, is the "democratization" of video production. In the not too distant past, it took a lot of money to make video that had a professional look. The art of editing aside (and that's the most important part), once a video is shot, you can edit it on a general purpose computer and have a very fine look to your video. You can also get a camera for less than a thousand dollars that will give you visual results of a quality that less than a decade ago required a $50,000 camera.

Sometimes progress is really neat!

AUTHOR CONTACT

Stephen Haskin has been involved in the world of digital video for education since the late 1980s and in computing since the 1970s. He has worked in the worlds of corporate education and training and film/video production. Always keenly interested in medicine and medical training, he moved to the arena of academic medicine four years ago. He currently directs the development of Internet and Intranet educational Web sites and works on video projects for the University of Michigan, Department of Surgery. Steve is also the author of several books on video production in the computer environment and wine (yes, wine). Contact Steve at shaskin@med.umich.edu

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