Treepot Media

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Treepot DCP Guide

Updated 2013-03-14 | By Jith Paul

Treepot DCP Guide

I directed my first short film in 2012. It was a film called al-gebr(a), about a painter grappling with the loss of his eyesight. In preparation for submitting it to festivals around the world and I noticed that quite a few of them listed DCP as an exhibition format alongside HDCam, DigiBeta and 35mm film. Since the technology was fairly new, and since most major studios have switched to DCP as the delivery mechanism for their films, I thought I would research what it took to create and test a standards-compliant DCP.

If you are new to DCP, the Wikipedia page for Digital Cinema Package is a good primer.

I learned several lessons putting together and testing my first DCP so I thought I'd document my workflow, primarily for indie filmmakers who feel overwhelmed by the amount of information and different workflows available on the internet. This is by no means a definitive guide; just documentation related to a real world practical example. It is important to note that this was not a theoretical exercise. I actually went into real theatres and tested the resulting DCPs on real DCP servers, not emulators that ran on computers.

First off, since I'm so proud of what my team of brilliant actors and crew accomplished here's the short film al-gebr(a). It has had an incredible 3 year festival run screening in Canada, Scotland and France.

So flash back to 2012 and back to the task at hand: The goal with this example was to create a DCP with 2k scope image (1:2.39 aspect ratio) image and a dolby 5.1 soundtrack from an edit of 5k/4k footage in Premiere Pro CS6 running on a Mac.

Note: This guide was written to document the use of the open source application OpenDCP to create an industry-standard Digital Cinema Package. There are several commercial ($$$) tools out there to do the same in a much easier, streamlined way. In June 2014, Adobe added a licensed version of Wraptor 3 to the Creative Cloud 2014 enabling subscribers to create 2K DCPs from the Adobe Suite. The process is simple and works well. If you live in Ottawa, Canada and would like to convert your independent, non-commercial project to DCP, check out this update! #SAWSome

Step 1: Generate a sequence of images to feed OpenDCP

There's two ways to do this. One is to create a series of 16 bit TIFF images and then use OpenDCP to

About the Author
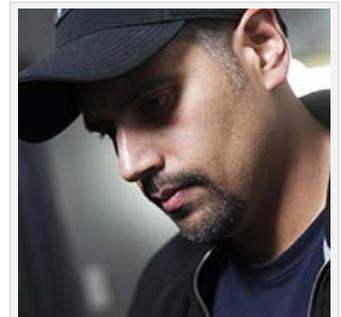
Jith Paul (Photo by: JF Dufault)

Jith Paul is a filmmaker based in Ottawa, Canada, producer, director, cinematographer and editor of several award-winning short films, documentaries and music videos. His current project is the kickstarter crowd-funded short film **A Clean Slate**, a short film related to the series **Mulligan's House Band**. The short film premieres in Ottawa in September 2014.

This guide came about because Jith needed to prepare DCPs for his directorial debut, **al-grbr(a)**, a short film about a painter grappling with the loss of his sight, an award winner at the Digi60 Filmmaker's Festival 2012 which went on to screen at the Toronto Independent Film Festival in 2013 and at festival screens in Scotland and France.

More: jithpaul.com.

References

This guide relies heavily on material from the following tutorials and seminars.

Danny Lacey Film Blog

Matt Cameron: DCP Tutorial

SAW Video seminar on DCP by Edward Folger

DCP Wikipedia Page

convert those into a stream of 12 bit xyz jpeg 2000 files as specified in the DCP standard. One thing I noticed is that TIFF images created directly from Premiere Pro via the Adobe Media Encoder were 8 bit. I did some research (using Google) and it doesn't look like there is a way to generate 16 bit TIFFs directly from Premiere. I ended up creating a dynamic link to the Premiere Pro sequence then exporting a TIFF sequence in After Effects. A couple of things to watch out for here. Make sure your composition has a bit depth of 16 bits per channel, and in the Output Module Settings, choose Trillions of Colors rather than Millions of Colors. Any other combinations will give you an 8 bit TIFF sequence. I am creating a 2k scope DCP so my images need to be 2048×858 to maintain the correct aspect ratio.

Special Thanks

I am fortunate to live in a city with a couple of indie-friendly cinemas that graciously permitted me to test out my DCP. I wouldn't be able to confidently state that this workflow works without their participation so I am including links to them.

Mayfair Theatre

Bytowne Cinema

Also special thanks to Josh Stafford and Marcus Lemm.

Fig 01: After Effects composition color depth. Click for larger image.
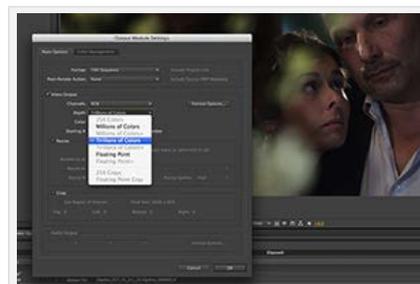
Fig 02: Choose Trillions of Colors. Click for larger image.

Tools

Links to useful tools.

OpenDCP

Paragon ExtFS

fnorware j2k plug-in

Digitall DCP Player

Faunhofer's EasyDCP Player+

3DTV's Steroscopic Player

It is a good idea to check one of the resting images by opening it up in photoshop to make sure that the dimensions and bit-depth are set correctly.
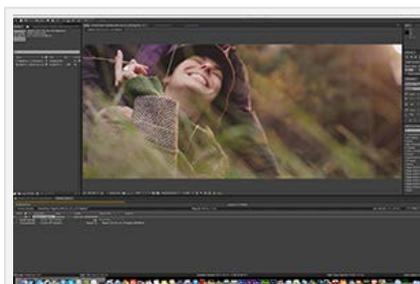
Fig 03: After Effects Render. Click for larger image.
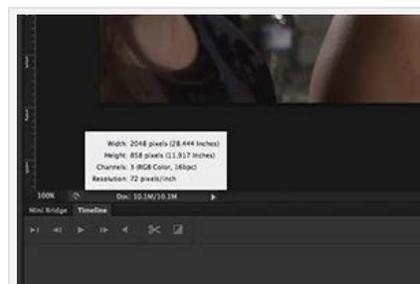
Fig 04: Checking dimensions and bit-depth in Photoshop. Click for larger image.

At a recent SAW Video DCP workshop Edward Folger provided a link to a free JPEG 2000 plug-in for Premiere Pro from a company called fnorware j2k that can be used to create the sequence of JPEG 2000 files directly from Premiere. That eliminates the TIFF step entirely. Check for a link under Tools along the right side of this post. This saves a lot of time and also provides the ability to create a lossless JPEG 2000 master of your sequence for archival.
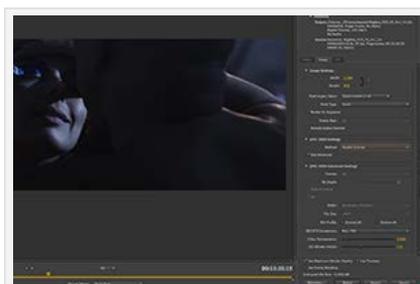
Fig 22: Generating Digital Cinema JPEG 2000 sequence directly from Premiere Pro. Click for larger image.
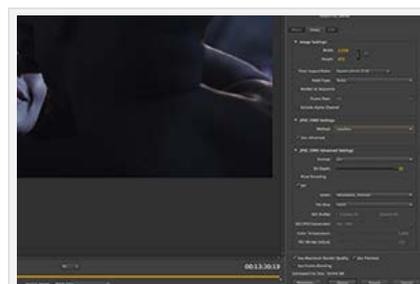
Fig 23: Generating Lossless JPEG 2000 sequence directly from Premiere Pro. Click for larger image.

Step 2: Generate Digital Cinema JPEG 2000 Sequence in OpenDCP

If you use the j2k plug-in to generate Digital Cinema JPEG 2000 files you can skip this step. If not, you can use OpenDCP to convert either Lossless JPEG 2000 files or 16-bit TIFF files (I have also read that it works with DPX files) to Digital Cinema JPEG 2000 files. The process is quite straightforward but can take quite a while depending on the length of your movie and the processing power at your disposal.
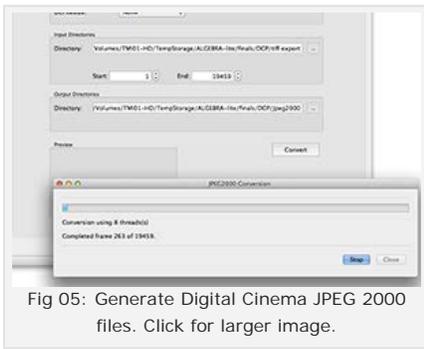
Fig 05: Generate Digital Cinema JPEG 2000 files. Click for larger image.

Step 3: Create MXF files of Video and Audio

Next point OpenDCP at your JPEG 2000 files and audio files (you need to split out each channel in to a separate 48/24 mono track, in my case the 5.1 mix is in 6 files clearly labelled). I didn't have subtitles to deal with for my example.
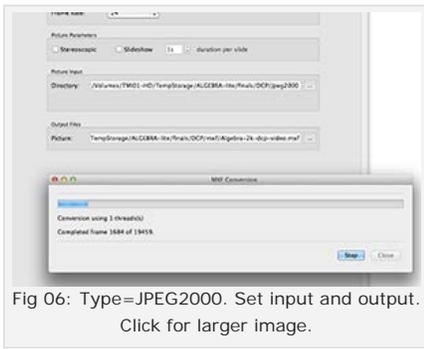
Fig 06: Type=JPEG2000. Set input and output. Click for larger image.
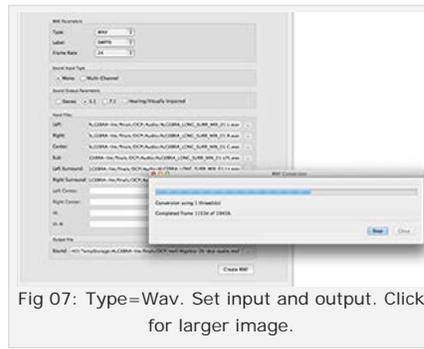
Fig 07: Type=Wav. Set input and output. Click for larger image.

Step 4: Title Generator

Next hit the DCP tab, use the Title Generator to set the various components and metadata related to the project. Each one of these items affects the name of the DCP package and will let the projectionist and the projector easily identify whether this is a short, a feature, the dimensions of the frame, whether it's 2D/3D etc.
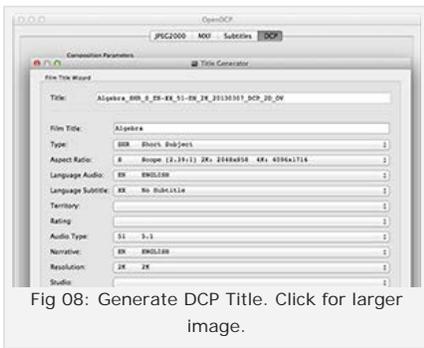
Fig 08: Generate DCP Title. Click for larger image.

Step 5: Generate the DCP

This step combines the image sequence and audio files to create the DCP. It won't take long and when you are done you end up with a folder containing the MXF files containing audio and video and some XML files with metadata.
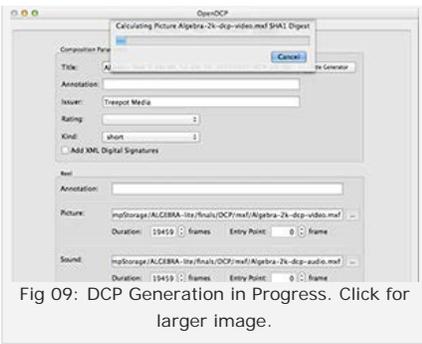
Fig 09: DCP Generation in Progress. Click for larger image.
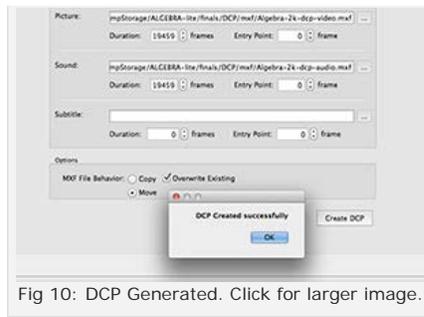
Fig 10: DCP Generated. Click for larger image.
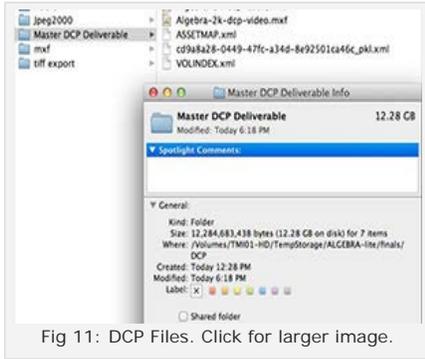
Fig 11: DCP Files. Click for larger image.

Step 6: Create transport drives

The next step is to copy these files on to removable media that you can then ship to a festival or take to a theatre for testing. There are several options here. I did read that some servers had problems with bus powered drives. There are many tutorials out there that state HFS drives work in most cases. Some state that they have to be ext2 or ext3. Some even report success with NTFS drives. I created bus powered exFAT and HFS drives to begin with, then subsequently purchased the Paragon extFS plugin (link on the right hand column of this post) to create an bus powered ext2 one.

Fig 12: exFAT, HFS drives. Click for larger image.

Fig 17: ext2 drive. Click for larger image.

Step 7: Testing

The best test is to actually take your drive to a cinema and try it out on a real DCP server. I first tested the DCP at the Mayfair Theatre in Ottawa. This theatre uses a Dolby DSS100 server and a Christie 2K Projector. The exFAT drive didn't work. The bus powered HFS formatted drive did! The picture was nice and crisp, the audio was great and the projection had the correct aspect ratio and used up the entire screen.
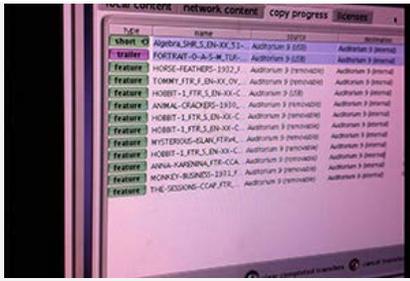
Fig 13: Dolby Server at the Mayfair Theatre. Click for larger image.

Fig 14: Projection at the Mayfair Theatre. Click for larger image.

Fig 15: Projection at the Mayfair Theatre. Click for larger image.

Fig 16: Projection at the Mayfair Theatre. Click for larger image.

My next test was at the Bytowne Cinema, which employs a doremi DCP-2K4 server and a Christie 2k projector. Here the HFS bus powered drive didn't work at all but the bus powered ext2 drive did. I suspect the ext2 drive would have worked at the Mayfair too, had I had that done at the time. From all reports that is the format (or the more recent ext3) that hollywood movies are formatted and delivered.

Fig 18: doremi server. Click for larger image.
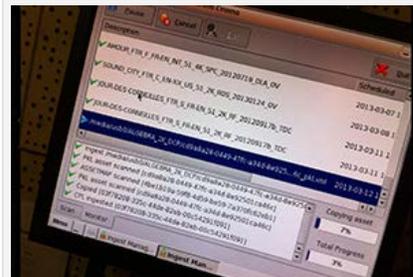
Fig 19: doremi server console. Click 260 larger image.

Fig 20: Projection at the Bytowne Cinema. Click for larger image.

Fig 21: Projection at the Bytowne Cinema. Click for larger image.

Heading down to the local cinema to test your DCP is not always the most effective (although it's the most sure-fire) way to test your project. There are a few software tools you can use as well. I couldn't find an open source one and they are all quite costly. I have included links to easyDCP and DCP Player, two of the more popular ones I found out about at the SAW Video workshop. The screenshots below are from the demo versions available on their sites just to prove that they actually work.

Fig 24: DCP Player demo in action (VMWare on Mac). Click for larger image.

Fig 25: Easy DCP demo Selection Screen. Click for larger image.

Fig 26: Easy DCP demo running. Click for larger image.

That's it. It's a summary of what I learned on my first DCP creation adventure. Use this info to help in the creation and testing of your DCPs and please use the comments section below to let me know of any tricks and tools you have come across.

Good luck!

UPDATE (2013-03-15):

Thanks for the recommendation, Edward Folger. The Stereoscopic Player from 3dtv works on a Mac via VMWare and is reasonably priced at 39 euros. The demo version can be used to view the first 5 minutes of your film. A tip: click on "Monoscopic Left Image Only" to view 2D material.

Fig 27: 3dtv Stereoscopic Player (demo version) playing Algebra. Click for larger image.

UPDATE (2013-03-19):

I heard back from the Empire theatre chain. They run Barco projectors and hardware. I planned to test the DCPs out at one of their theatres but it proved to be too expensive a test at the moment.

I posted a link to the guide on RedUser.net as well.

UPDATE (2013-06-05):

The Digi60 Filmmaker's Festival hired Treepot Media to build and test a 2K DCP for the Spring 2013 screening at the Bytowne Theatre (Doremi server, Christie 2K Projector) on May 30th 2013.

The task involved creating a feature length (around 90 minutes) compilation of Digi60 introductory material and 22 short films submitted by filmmakers across Canada. The majority of the films (about 70%) were 1920×1080, 50% were at 23.976, 20% were at 24.0 fps. The rest were a mix of

resolutions and frame rates. Films were provided compressed in either Avid DNxHD or Apple ProRes. The festival provided a run order. I decided to use Premiere Pro CS and the fnord j2k plug-in for this run. Since the DCP was to play on a Doremi server, I also needed to provide it to the cinema on a drive formatted to ext2 to guarantee it could be read.

I am happy to report that the this workflow was successful. It took 9 hours to render the JPEG2000 files, 3 hours to package up the DCP and 12 hours to complete the conversion to ext2 running on a 2012 iMac with 16GB of RAM, SSD for cache and 7200rpm internal drive. The resulting DCP was around 53 GB. The ingest process on the Doremi server at the Bytowne Cinema took around 40 minutes, with no movies streaming at the same time.
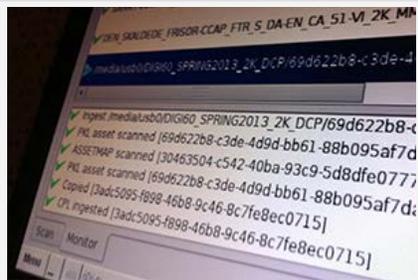
Fig 28: Doremi server at the Bytowne ingesting the Digi60 Spring 2013 DCP. Click for larger image.

Fig 29: Bus powered ext2 formatted USB drive connected to doremi server. Click for larger image.

Fig 30: Bytowne screen during DCP test. Click for larger image.

Fig 31: Bytowne cinema screen during DCP test. Click for larger image.

UPDATE (2013-11-30):

Exciting news: SAW Video in Ottawa, Canada has purchased and installed Quvis Wraptor 3.0 for DCP creation in Edit Suite A. You can use this commercial software or the open source OpenDCP (also installed) to create industry-standard Digital Cinema Packages of your films for exhibition at festivals and in theatres. Additionally, you can use the Quvis Digital Cinema Player to test your completed DCP.

SAW Media Art Centre is a no-for-profit and artist-run media art centre in Ottawa, Canada. For more information: http://sawvideo.com

Edit Suit A can be rented for $7.50/hour, $50/day, $35/night or $75/24 hours (rates current as of Nov 30/2013). Members can take advantage of theses fantastic indie rates for independent, non-commercial productions. There are instructions and a guide available at the premises. As an alternative, members can also have SAW Video personnel create a DCP for them. Contact SAW Video for pricing.

UPDATE (2014-02-25):

Treepot Media recently created a DCP of the feature-length documentary Partners for Peace for its US premiere at the DC Independent Film Festival held in Washington. The film was converted at Treepot Media using the f-nord plug-in and OpenDCP and tested using the facilities at SAW Video using their Quvis Digital Cinema Player. The ext2 formatted drive was sent to Washington where the audience enjoyed the experience of the film projected by a new NEC 4K projector on a gigantic 46'x16' curved screen on the opening night of the festival at the Naval Heritage Theatre.

The theatre at the Naval Heritage Threatre is equipped with an NEC NC3240S projector and a GDC Tech SX-3000 playback server.

UPDATE (2014-04-03):

The NAB 2014 Preview video for Adobe Media Encoder CC reveals that they have licensed Quvis Wraptor (the same software that you can currently use at the edit suites at SAWVideo in Ottawa) to add DCP creation to the CC suite. This means you will be able to create DCP packages directly from PremierePro with the next release. This is great news for CC subscribers.

Link: What's New in Adobe Media Encoder CC - NAB 2014 | Adobe Creative Cloud

UPDATE (2014-06-23):

Treepot Media recently created a DCP of the collaborative feature film project Treepot Cliffhanger for its theatrical premiere at the Mayfair Theatre in Ottawa. The DCP was prepared at Treepot Media using the Adobe Creative Cloud 2014 and an updated Wraptor plug-in from Quvis (slated for the next incremental release of CC14 ** update: CC14 update on July 25, 2014 includes this patch so you no longer need to manually update the plugin using the files from the Quvis website). The HFS formatted drive was ingested on the Dolby DSS100 server at the Mayfair Theatre and projected using a Christie 2K projector.
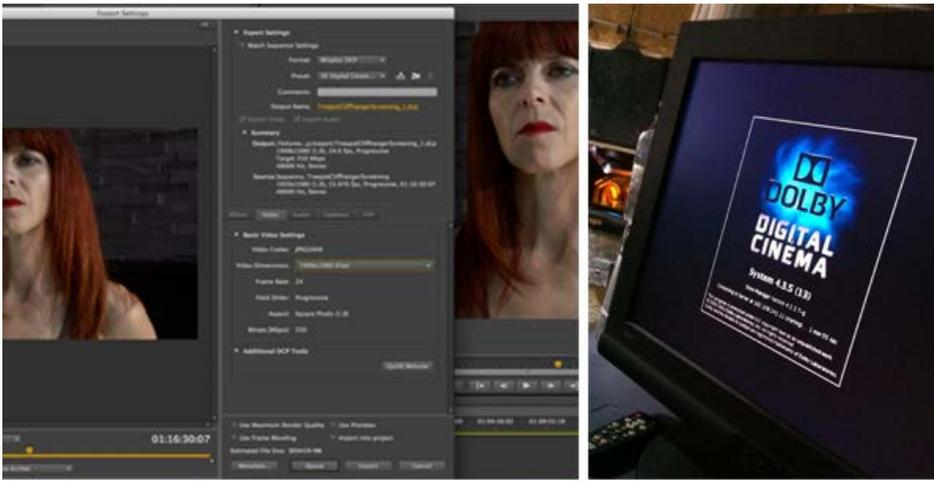
UPDATE (2014-09-26):

Treepot Media recently successfully created a 2K Scope 5.1 DCP for a feature film based on DPX files and 6 mono wav files provided by post houses. Here are the steps:

(1) Import the DPX sequence into PremiereProCC2014. Use the "Interpret footage" right-click menu option on the sequence to ensure that it is interpreted as expected. In this case, the film was shot at exactly 24.0 fps and that framerate was maintained through the post production workflow. Your case may vary so double-check.
(2) Import the 6 wav files as mono tracks.
(3) Create a new sequence, match the dimensions and attributes of the DPX sequence and ensure your audio master track is 5.1
(4) Drag in the DPX sequence onto the video layer and the 5 audio tracks into 5 standard audio tracks.
(5) Map your audio to the various segments of the 5.1 master as you normally would.
(6) Depending on your post house, you may need to synchronize your audio and video. Look for a frame of bars and align that with the sync beep (usually in the centre channel).
(7) Set an in point on the frame after the bars and sync beep.
(8) Locate the sync beep and bars (sometimes) also included at the end of the film.
(9) Set the end point one frame before the bars.
(10) Export your DCP.

Note: The developers of the wraptor plug-in, Quvis, recommends using the Queue function to send your render through the media encoder rather than encoding the DCP directly from Premiere to guarantee the correct colour mapping between sRGB and the XYZ colour space.
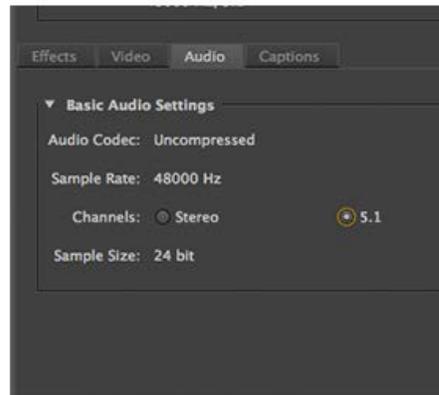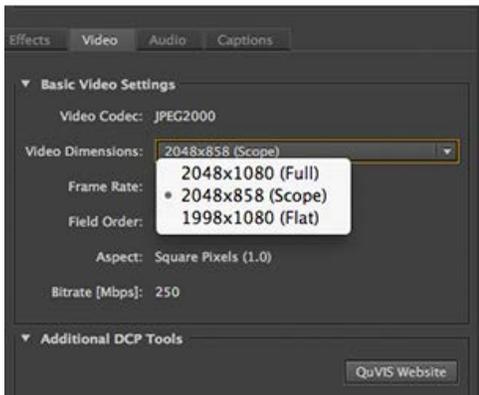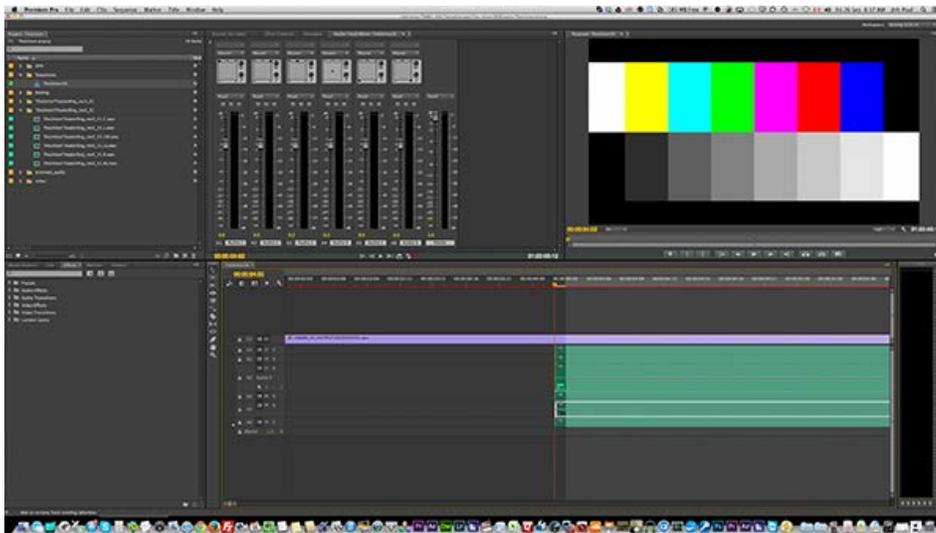
The resulting DCP was tested using the Wraptor player from Quvis at SAWVideo in Ottawa, an artist-run not-for-profit media centre. As the screen capture shows below, the resulting DCP includes a 5.1 audio track