How to use DCP-o-matic to create a DCP?

When creating a DCP (Digital Cinema Package) for your film, are you thinking of going to an expensive DCP creating company? Did you know you can create a DCP by yourself at home? 😉

Many easy to use softwares like DCP-o-matic, Open DCP, Adobe Premiere and Easy DPC can create a DCP. In this write-up, we will guide you through how to use **DCP-o-matic**, a free open source DCP creation software, to make your DCP.

But first some background information about DCP.

What is DCP (Digital Cinema Package)?

As a quick summary, a DCP is:

- Video as JPEG 2000 image sequence with XYZ color space inside an MXF wrapper
- Audio as broadcast wav files in MXF wrapper at 24bit 48khz
- XML files that hold it all together

Why do I need a DCP?

If you are planning on showing your film on a large cinema screen, chances are you will need a DCP to get the absolute best digital quality. Most cinemas are now installing 2k and 4k digital cinema projectors, working from DCP servers. It is becoming common practice and a major player for delivery to the big screen.

What is the process of creating a DCP?

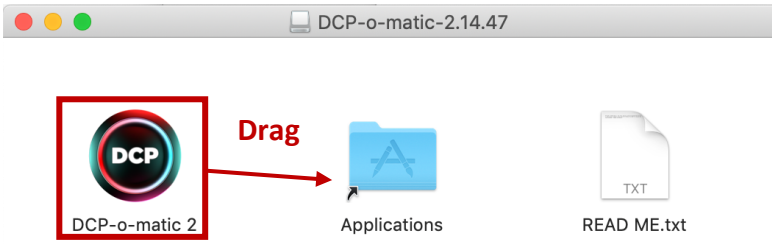
- Use free, open source DCP software (or other converting software like AME) to export your film as a 16-bit TIFF sequence.
- Then the DCP software converts the TIFF sequence into JPEG2000.
- Later, the DCP software wraps the video (JPEG2000) and audio (WAV) into MXF files.
- Finally, the software packages these files in a way that will be recognized by a DCP server.

💪💪💪 Ok, Let's get started!!!

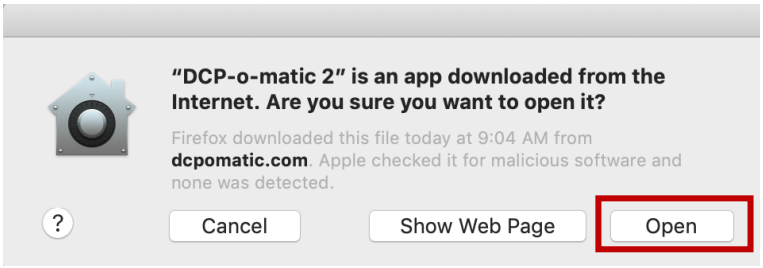
Step 1: Download, Install and Open the DCP-o-matic

Go to the DCP-o-matic website to download the software:
https://dcpomatic.com/download

After successfully downloading the software, install it on your computer.



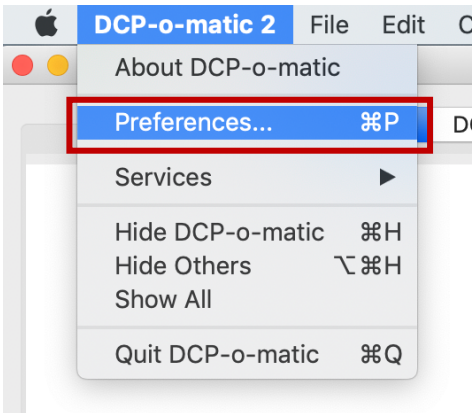
When you open DCP-o-matic, a warning window will appear. Click "Open."

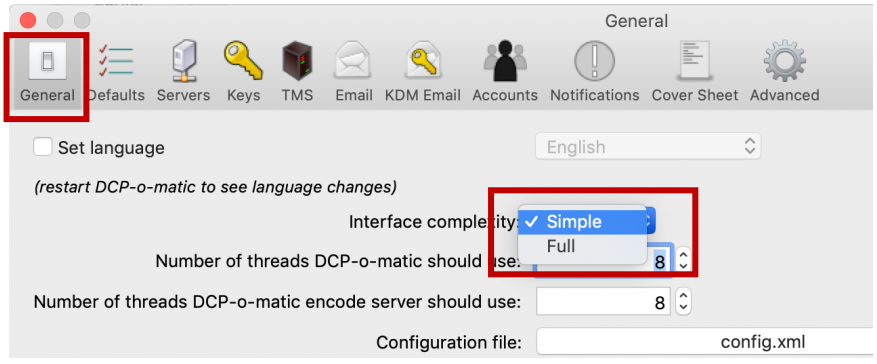


When you start DCP-o-matic for the first time, it will ask you if you want to use **"Simple" or "Full" mode. Choose "Full" mode.**

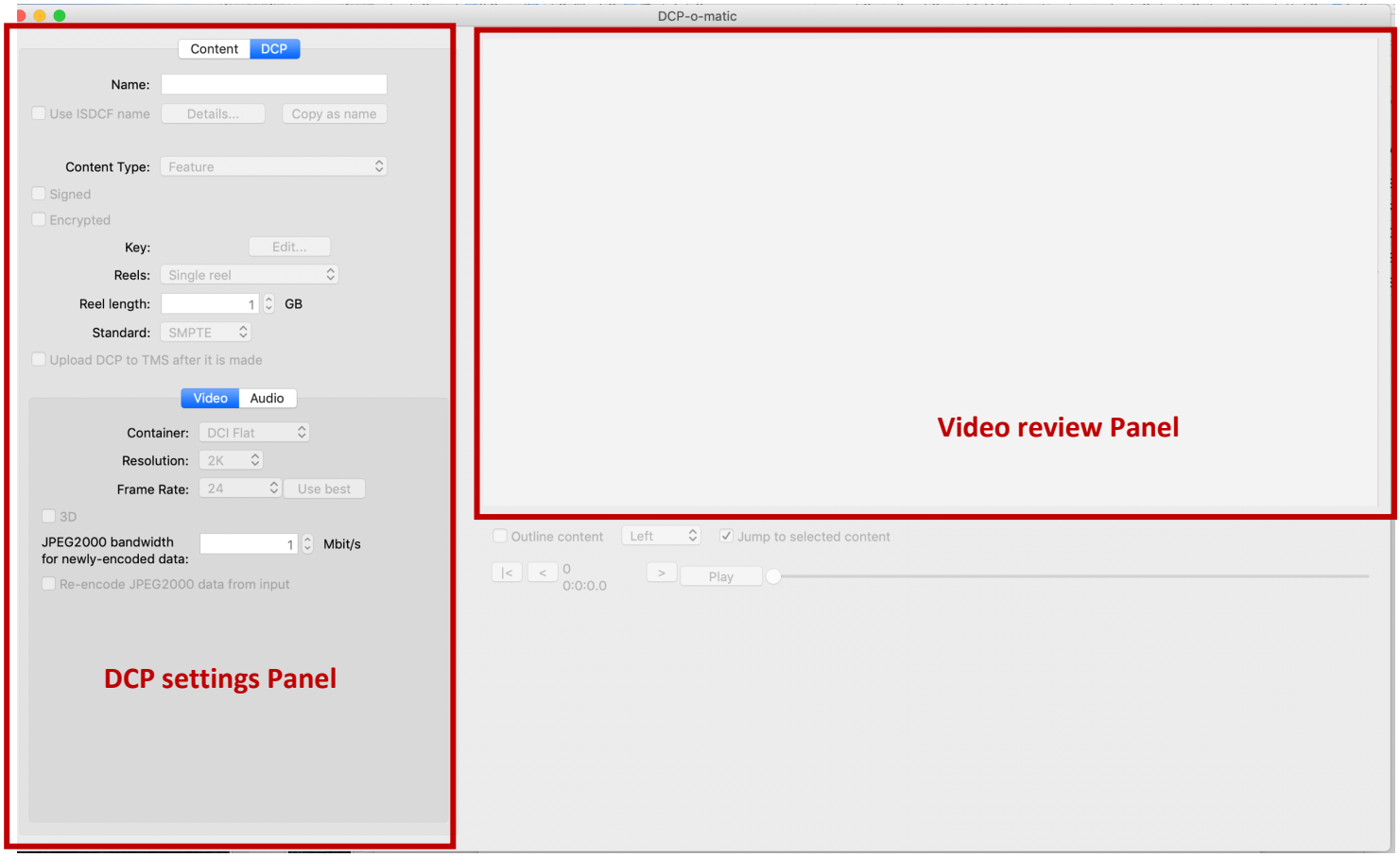
The difference between these two is that some of DCP-o-matic's more complex or less-used controls are hidden from view in "Simple" mode. This makes the interface simpler to navigate. You may wish to choose this mode if you do not have much experience with DCP or video processing.

If you decide you no longer want to access to advance settings, you can choose "Simple" mode with the Interface complexity setting in the General tab of **Preferences.**





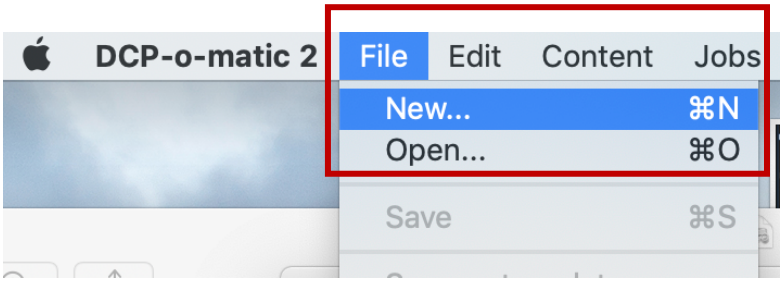
When you open DCP-o-matic in full mode, the interface will look like this:



Step 2: Create a new film

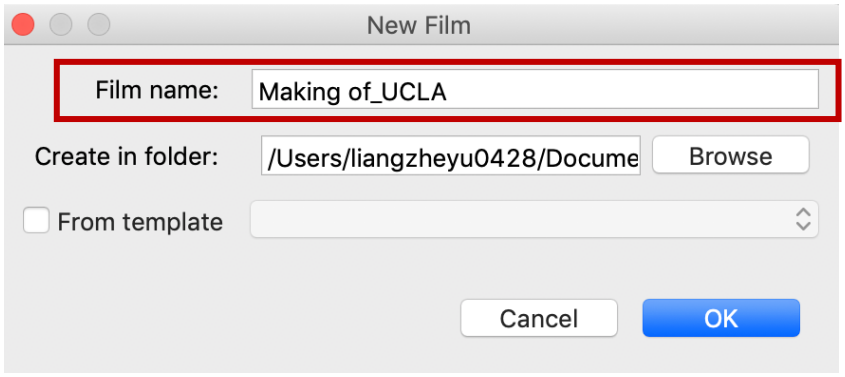
A "film", like a project, is how DCP-o-matic refers to some pieces of content, along with some settings, which you will make into a DCP. DCP-o-matic stores its data in a folder on your disk while it creates the DCP.

a. Select "File" – "New" or shortcut "cmd+N"

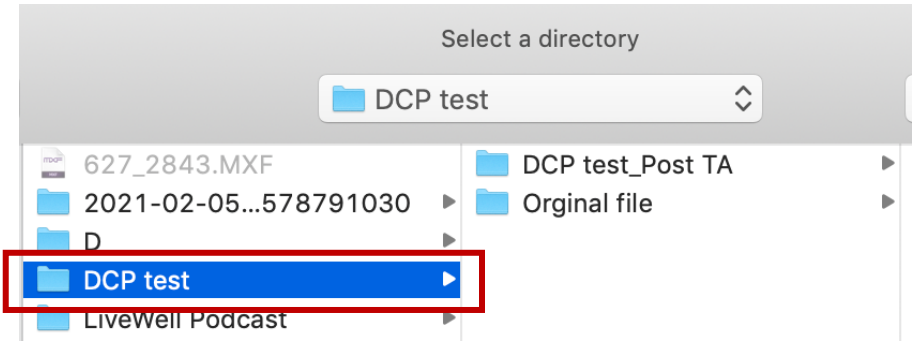


A dialogue box “New film” will appear, as shown below.

b. Give your film a name

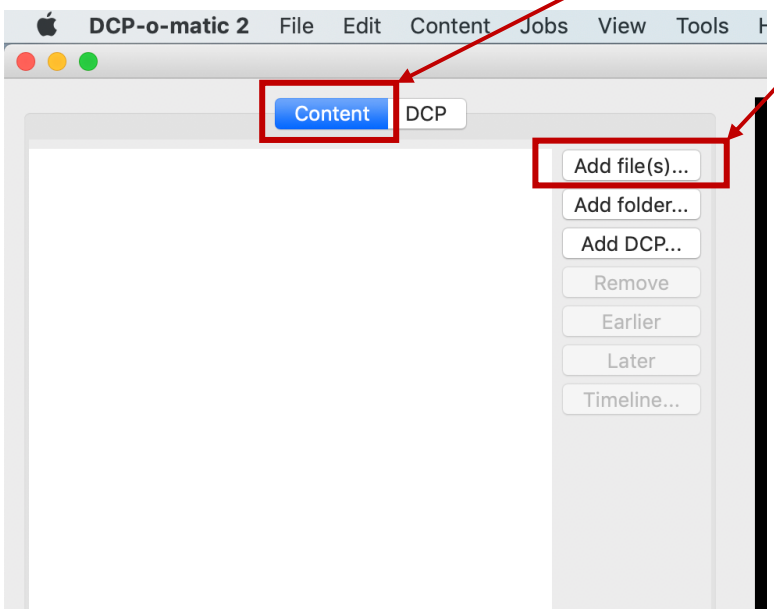


c. Choose a place to store your film and its data

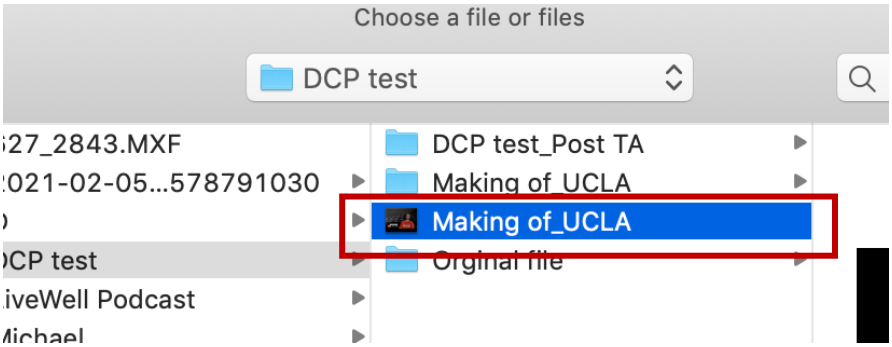


Step 3: Add the content

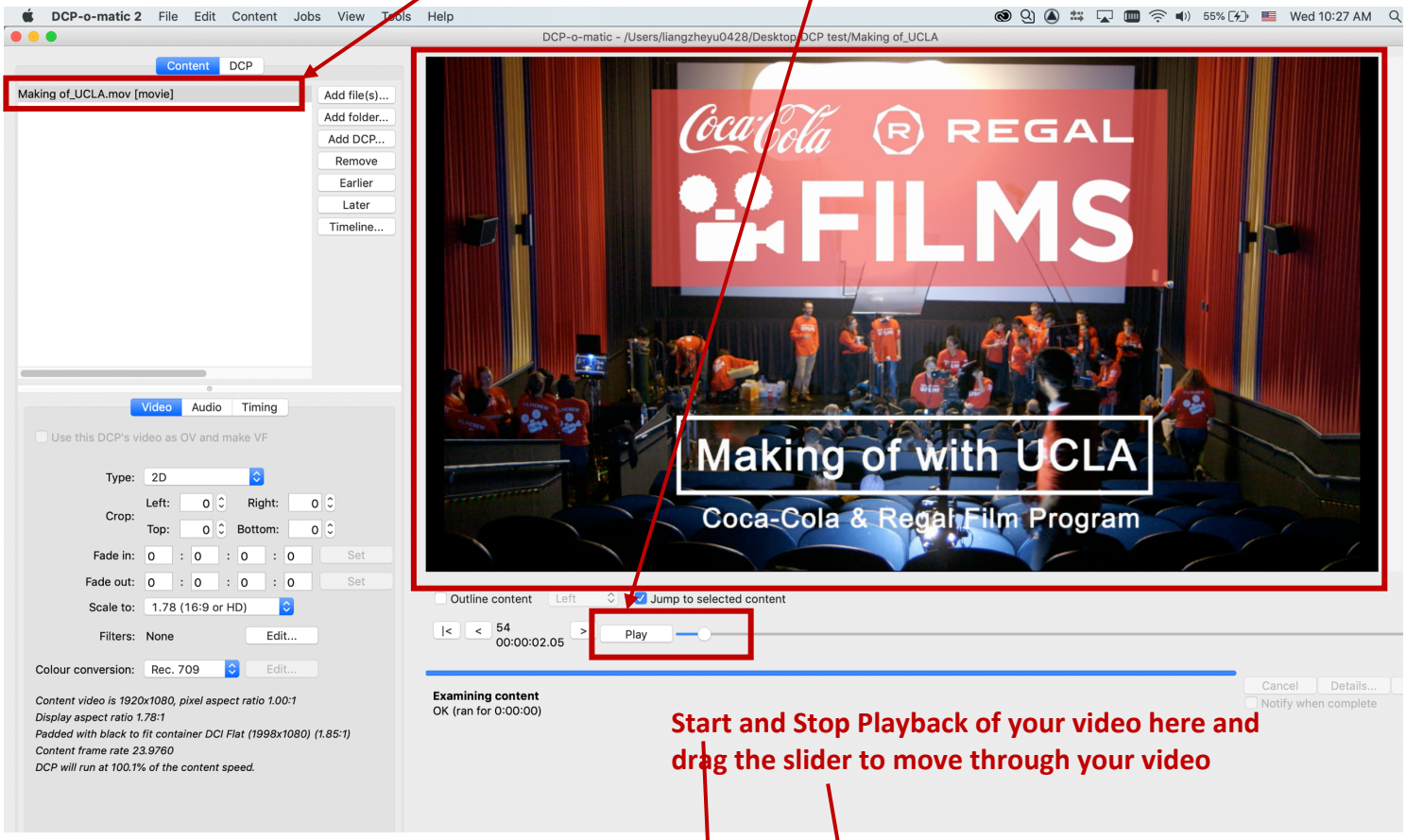
a. In the Content tab, click “Add file(s)...”



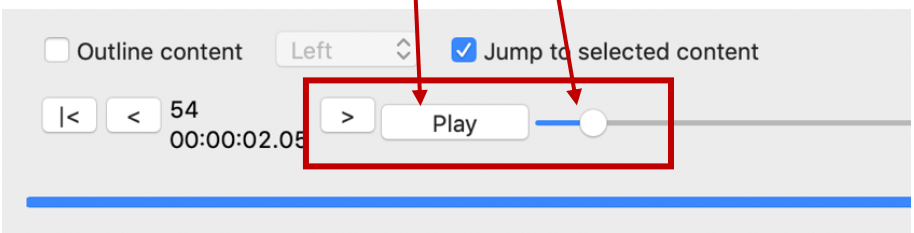
b. Choose the file that you want to make a DCP for

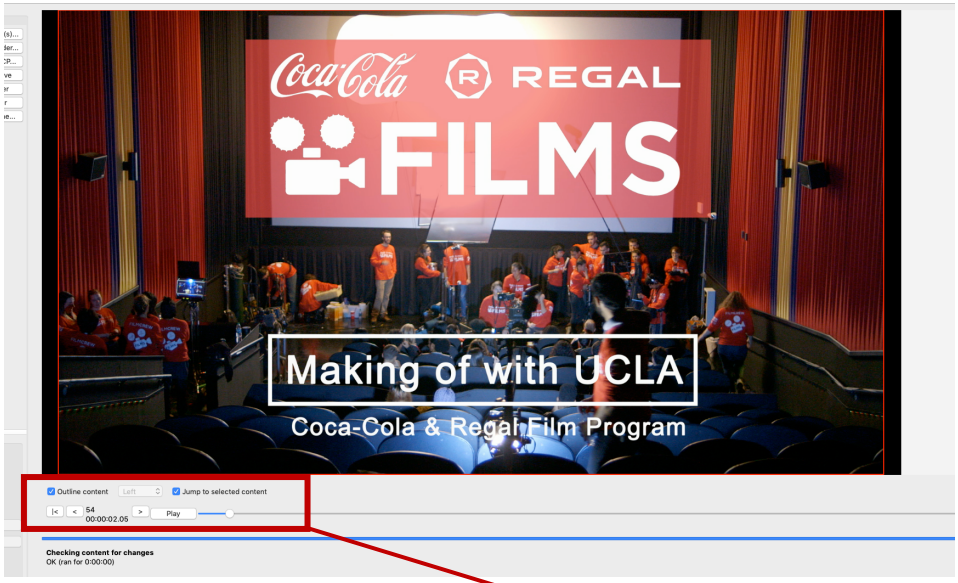


Your video is now added to the DCP-o-matic film. You can also play your video here.

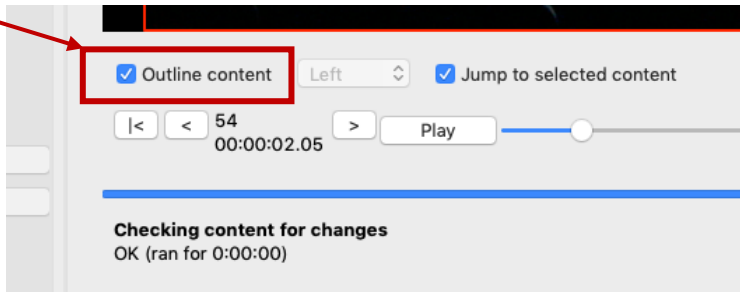


Start and Stop Playback of your video here and drag the slider to move through your video



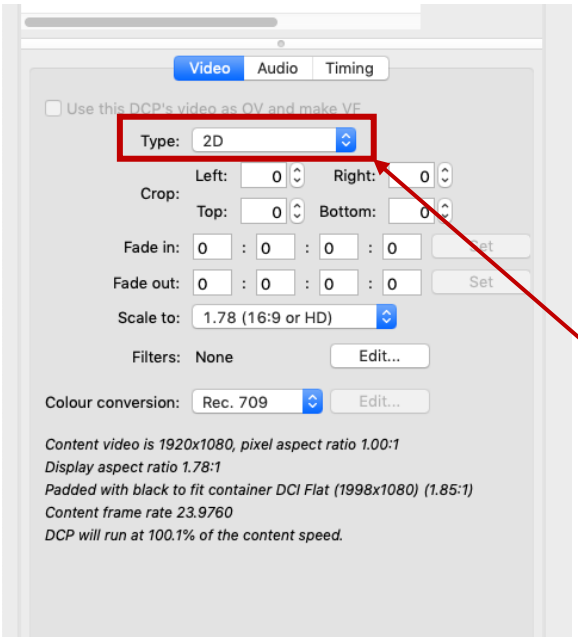


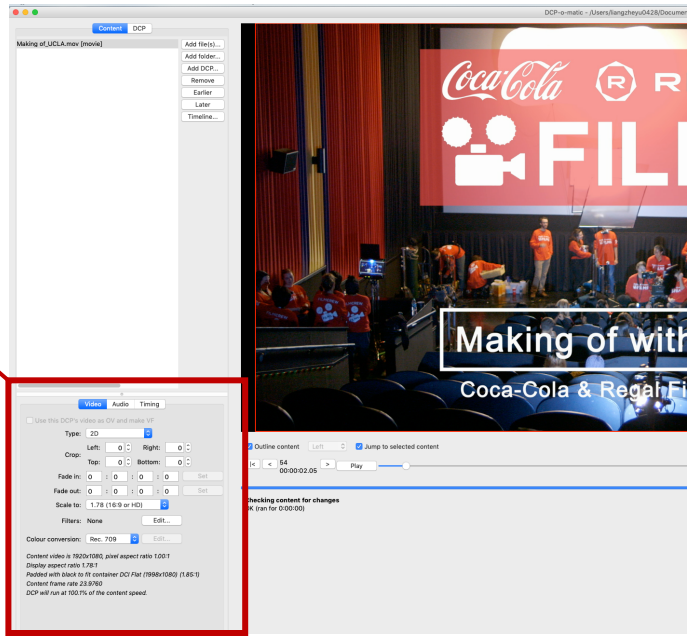
c. Check "Outline content" to highlight the image area of your film that will be used to make your DCP. This will help you determine if you want to adjust your Video Settings.



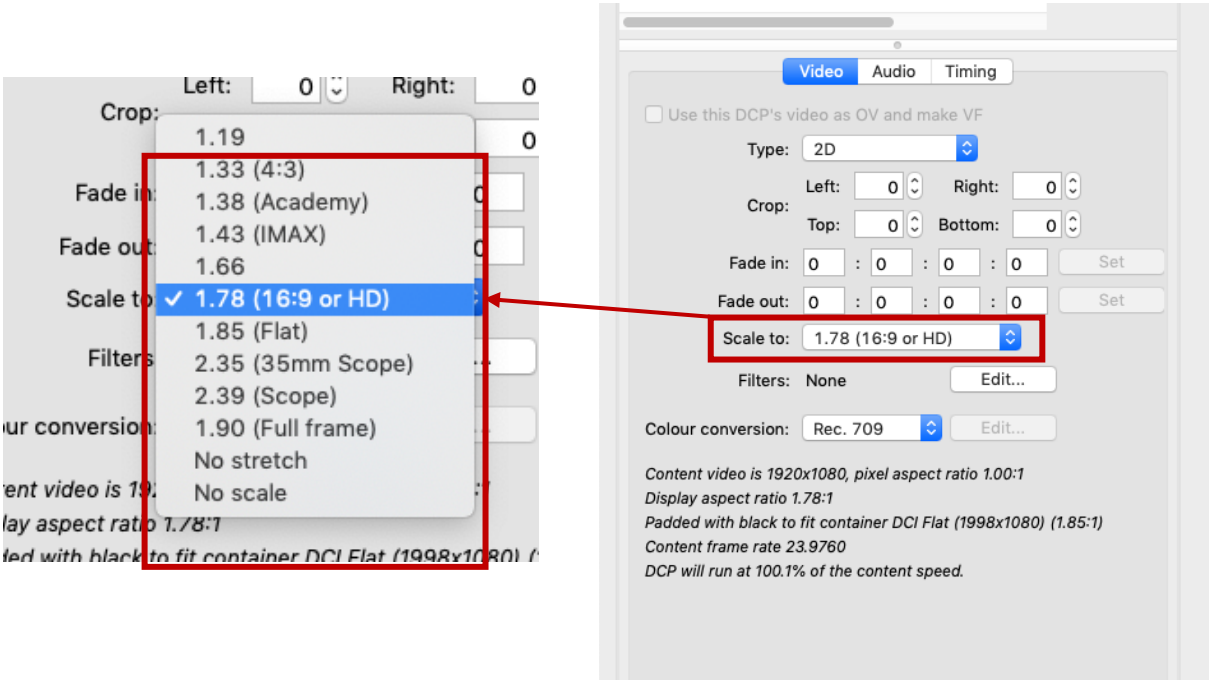
Step 3: Manage Video Settings

a. Set the type to "2D" if the film is 2D

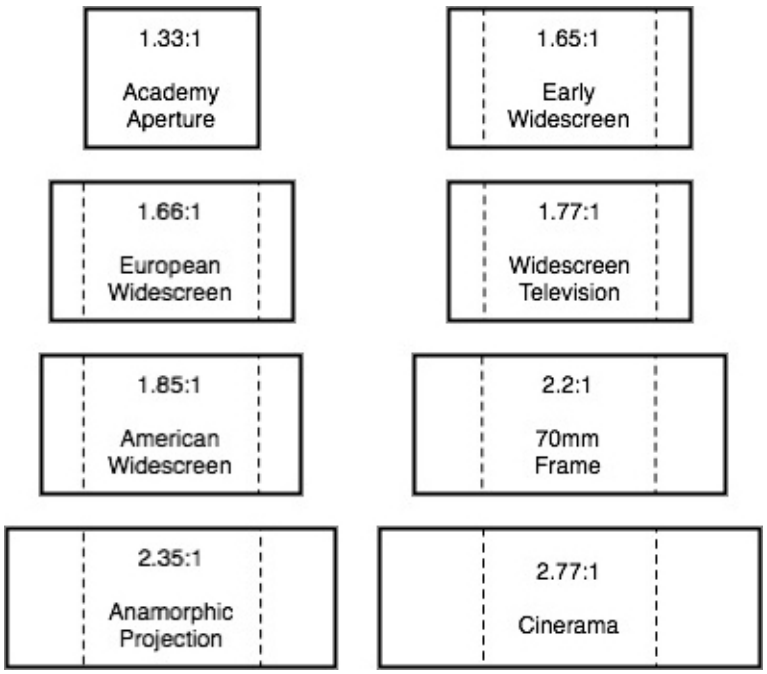




b. Select an aspect ratio that your content should be presented in

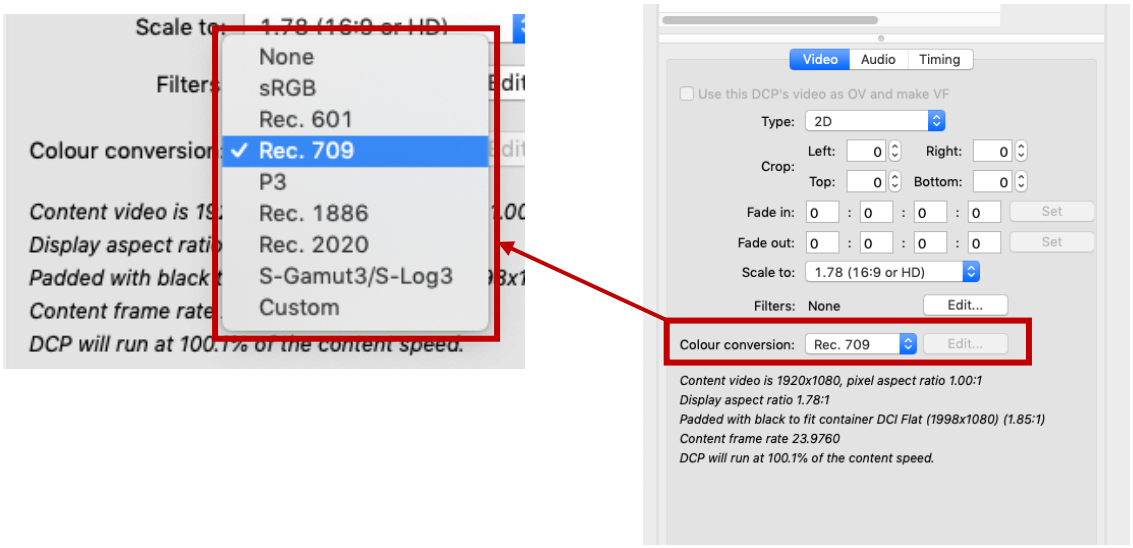


Aspect ratio:



(*If your film's aspect ratio is 16:9, but you set the scale as 1.85 (flat) or others, then your film will be stretched. Some people don't mind a little bit of stretching for different theatres' screenings. But remember not to push it too far, or your film will look very weird.)

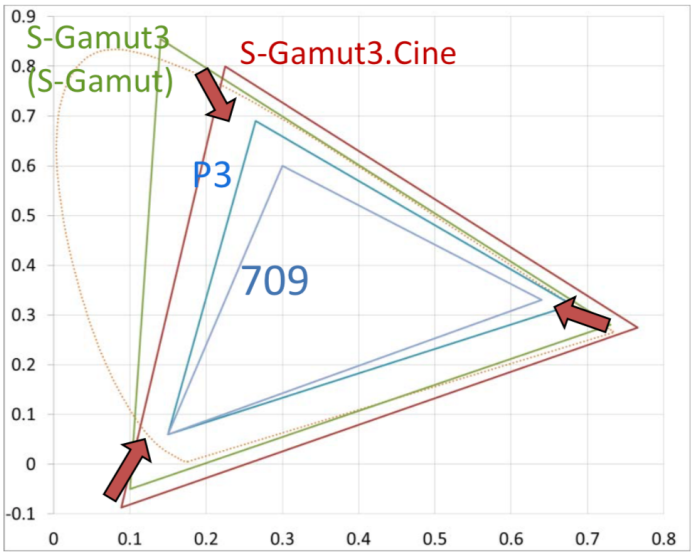
c. Select the right "Color Conversion" for your film (usually Rec.709)

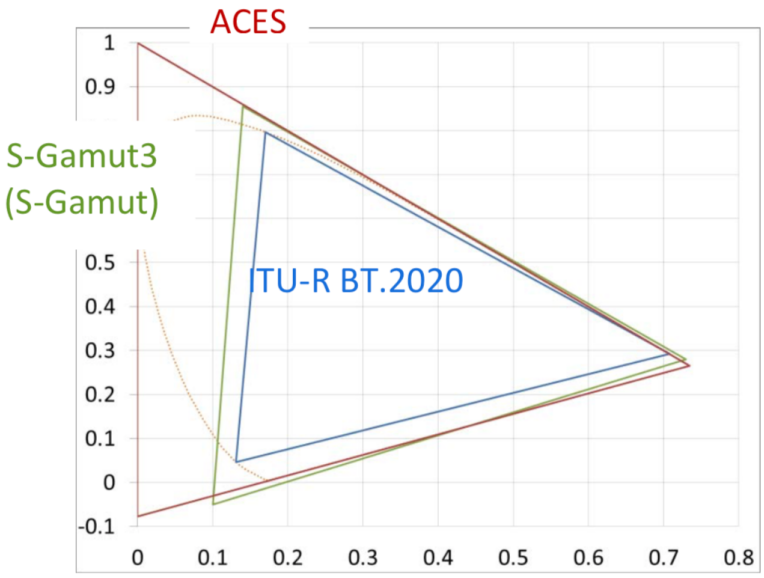


The Color Conversion setting specifies **what color transforms and gamma correction** that DCP-o-matic will use when converting the selected content into the **XYZ colorspace** for the DCP.

The easiest way to select the required conversion is to choose one of DCP-o-matic's presets. DCP-o-matic knows how to convert from four common color spaces (sRGB, Rec.601, and P3) as well as three specialized color spaces (Rec. 1886, Rec. 2020, and S-Gamut3/S-Log3.)
If you do not know which present you should use, refer to the suggestions below.

sRGB	Stills images in RGB, e.g. photographs
Rec. 601	Standard-definition content (fewer than about 1000 pixels across) including DVD
Rec. 709	High-definition content including Blu-Ray
P3	Content explicitly graded to P3
Rec. 1886	High Definition flat panel displays, determined and adopted by the International Telecommunications Union (ITU)
Rec. 2020	A set of specifications covering various aspects of video broadcasting which the ITU recommends as standards for Ultra HD projectors and televisions, along with any gear related to their broadcasting
S-Gamut3.Cine/S-Log3	Pure log workflow

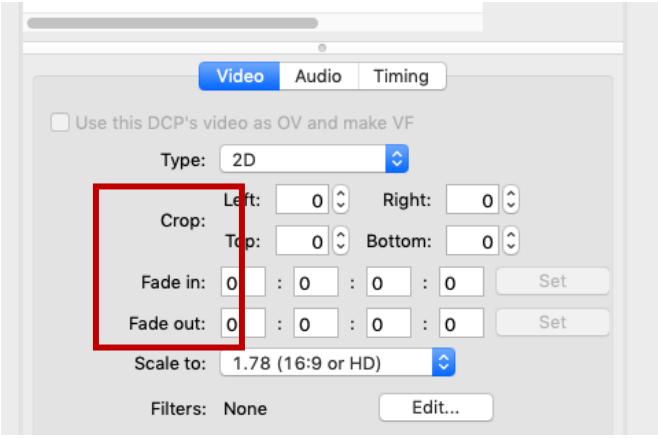




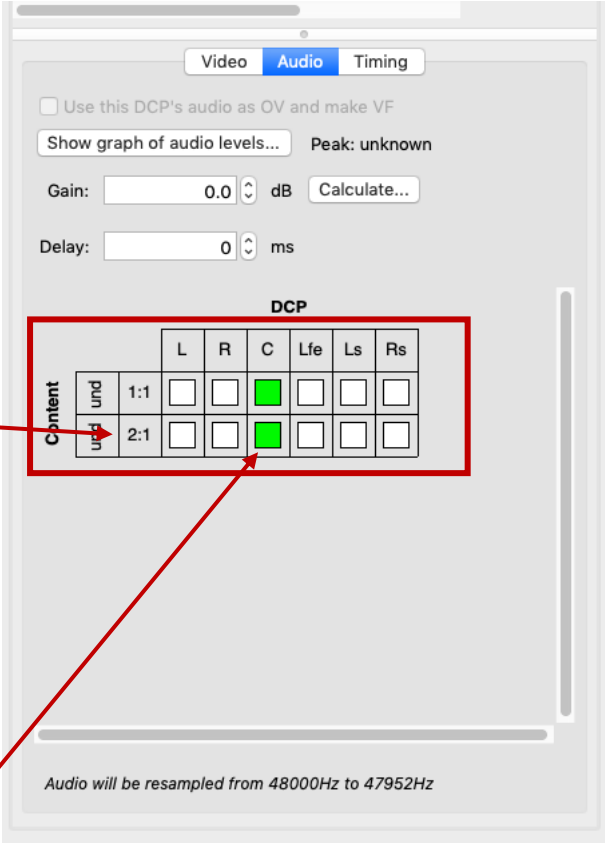
ITU-R BT.2020 is color space of UHDTV (Ultra-high definition television).

d. Other Video settings (optional)

The **Crop Settings** can be used to crop your content, which is often used to remove black borders from the edges of the image. The specified number of pixels will be trimmed from each edge, and the image content in the window on the right will be updated to show the effect of the crop.



The **Fade in** and **Fade out** settings can be used to apply linear fades into and out of a piece of content. Specify the time for each and click “Set” to apply the changes.



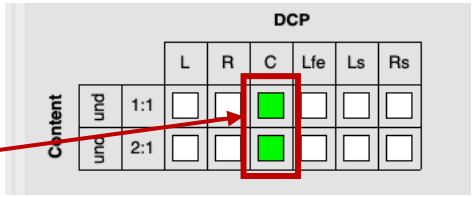
Step 4: Set Audio Settings

Down the left-hand side of the audio map is the list of audio channels in the currently selected piece of content. These are labelled with **two numbers;**

The first is the stream index within the content and **the second** is the channel number within that stream.

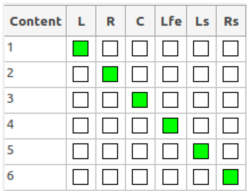
Some content will have different streams for different languages or audio mixes (like 5.1).

Along the top is each channel in the DCP. **A green box** means that the corresponding content channel will be copied into the corresponding DCP channel.

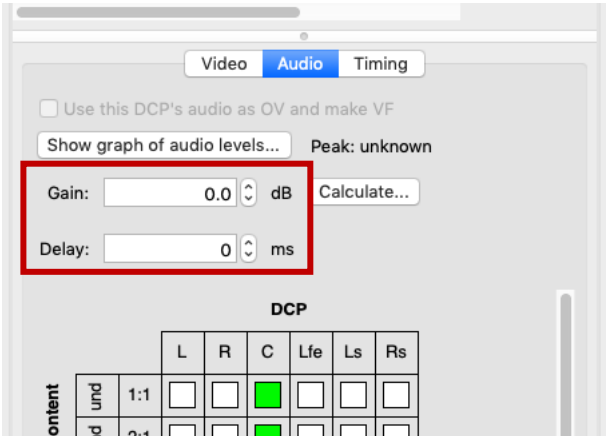


The green boxes of the audio mapping view tell you (very roughly) how much gain is applied to each channel. **A full-height box means 0dB gain.** Any less height indicates lower gain.

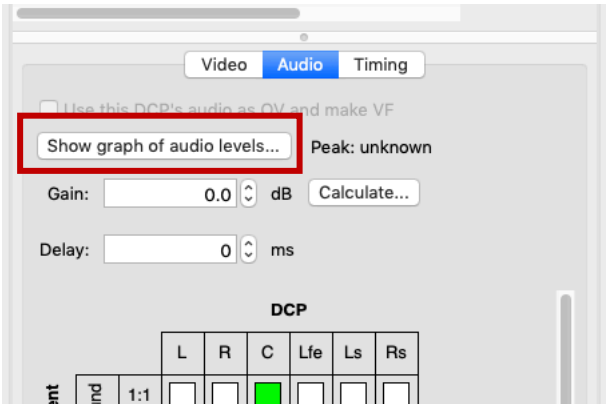
If your content has a **5.1 audio mix**. Your audio map will look like this:



a. **Set the Gain or Delay for your audio (if needed). But how do you know if you need it?**

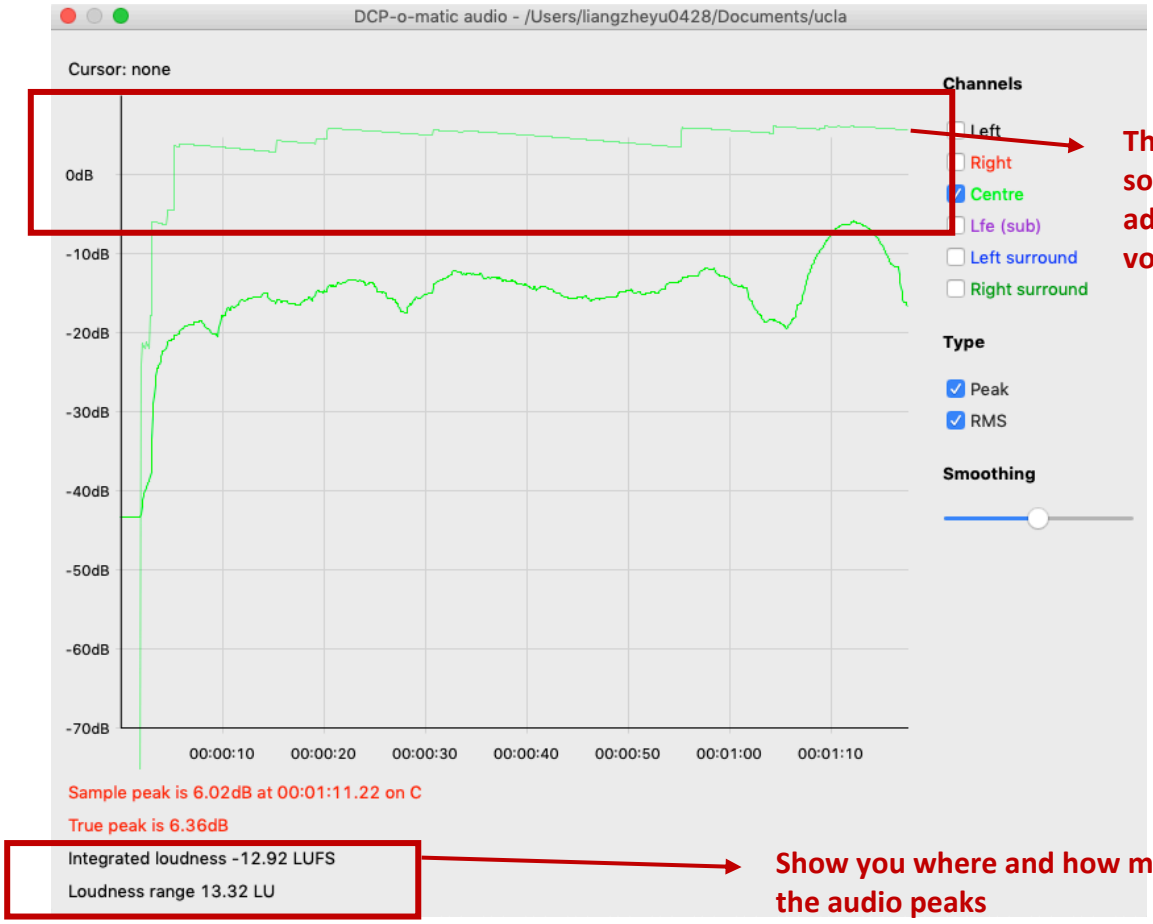


b. Click "Show graph of audio levels…" to examine the audio in your content. Then a window like below will show.



The Show Audio button will instruct DCP-o-matic to examine the audio in your content and plot a graph of its level over time.

This can be useful for getting a rough idea of how loud the sound will be in a theatre.



This is way too loud, so it reminds you to adjust the audio volume

Show you where and how much the audio peaks

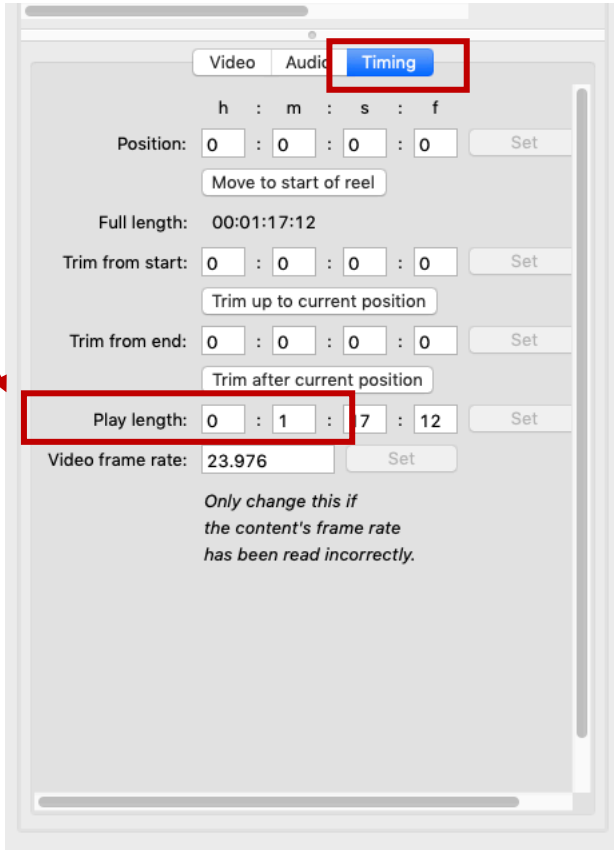
The plot gives the audio level (vertical axis) with time (horizontal axis). 0dB represents full scale, so if there is anything near this you are **in danger of clipping the projector's audio outputs**. "True Peak" should never be above -2dB. "Integrated Loudness" should be between -23 and -28 LUFS depending on where you are delivering. Obviously, the audio plot is no substitute for listening in a theatre, but it can be useful to get your audio mix closer to standardized levels. **Always remember to test your DCP in a real theatre!!!**

Step 5: Make sure your video frame rate is correct

a. **In the Timing tab, make sure the "Video frame rate" shown in the box matches your video's frame rate.**

** Only change this if the content's frame rate has been read incorrectly!

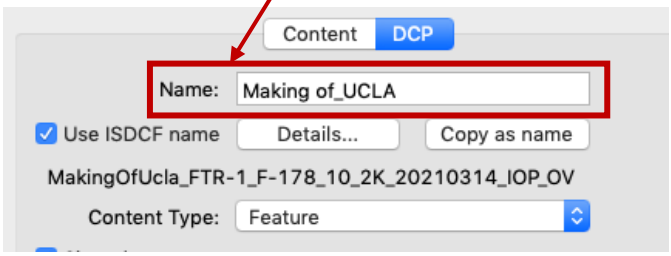
b. **Trim your content (if needed).**

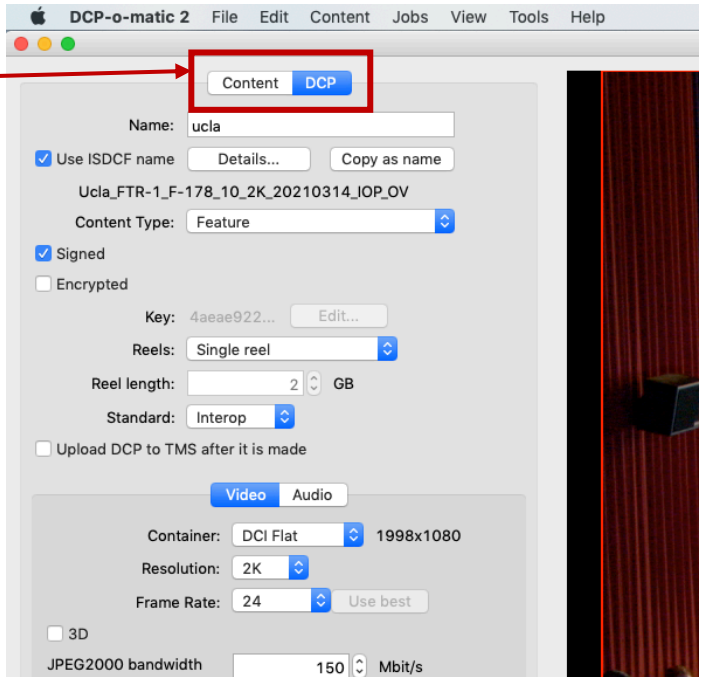


Step 6: Set DCP Settings

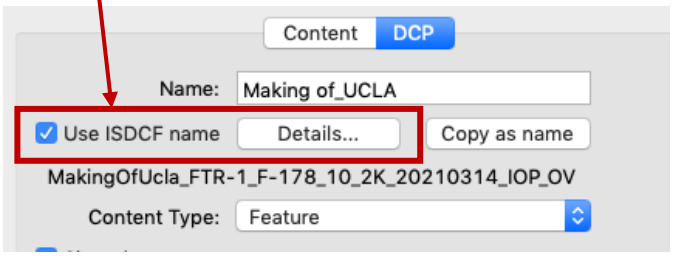
a. **Click DCP tab to enter the DCP Settings panel**

b. **Give your DCP a name**



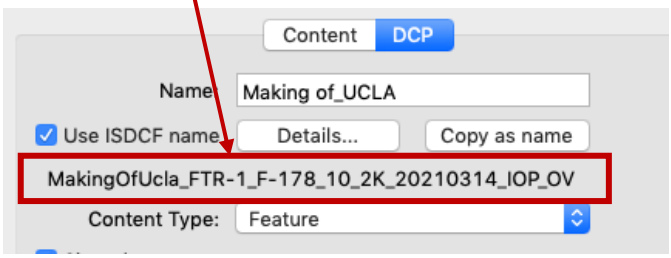


c. Check "Use ISDCF name"

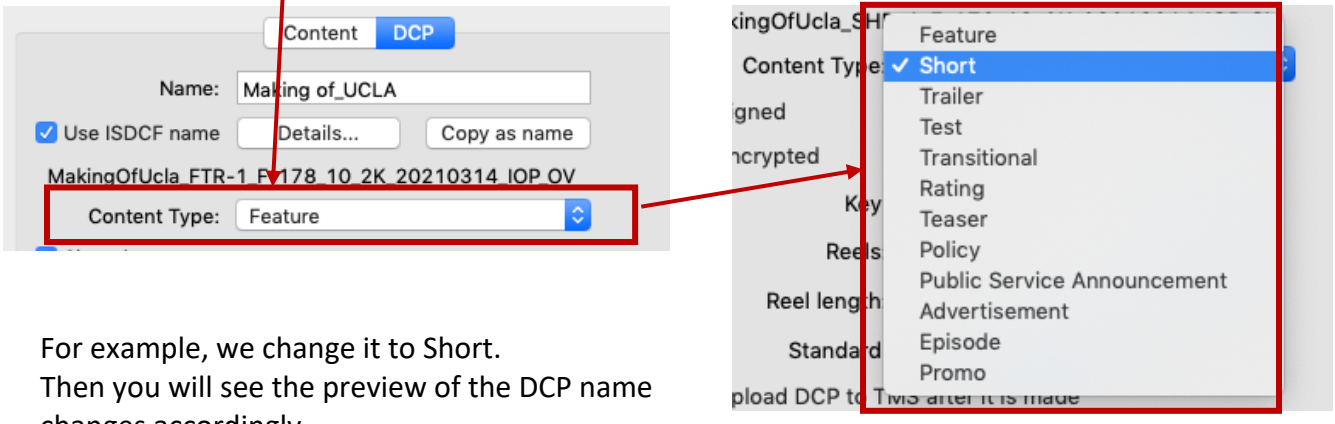


The ISDCF name will be composed using **details of your content's soundtrack, the current date and other things that can be specified** in the ISDCF name details dialogue box, which you can open by clicking on the Details button.

Underneath the name field is a **preview of the name** that the DCP will get.

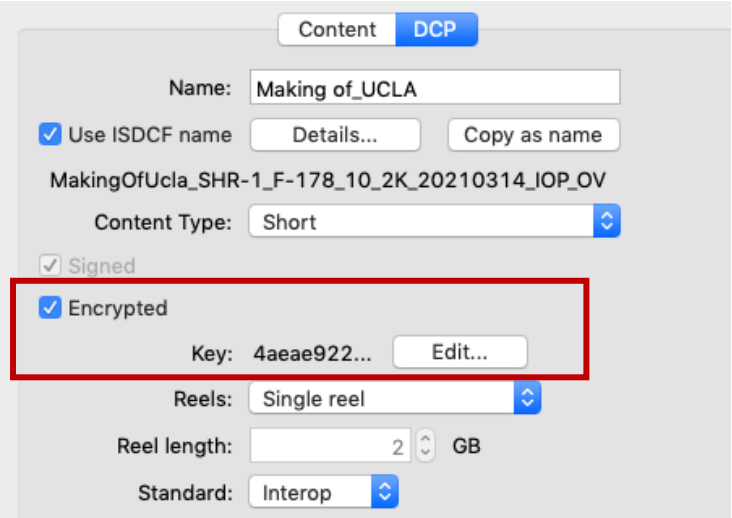


d. Change the Content Type



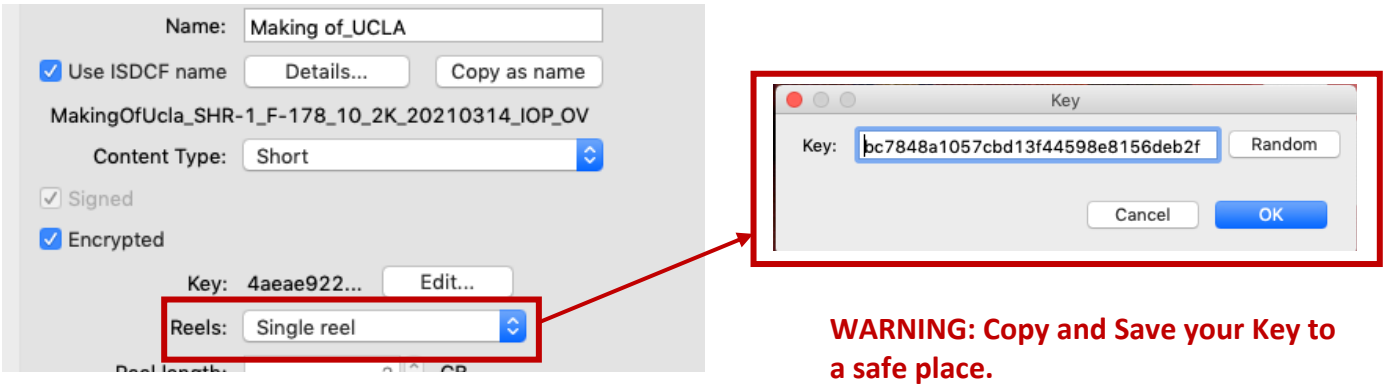
For example, we change it to Short.
Then you will see the preview of the DCP name changes accordingly.

e. Check "Encrypted" and add an encryption for your DCP (if needed).



DCP doesn't have to be encrypted, but it can be. **This means that the picture and sound data are encoded in such a way that only a cinema "approved" by the DCP's creator can read them.**
In particular, this means copies of the DCP can be distributed by insecure means: if a bad person 😈 obtains a hard drive containing an encrypted DCP, there is no way that bad person can play it. Only cinemas that receive a correct key delivery message (KDM) can play the DCP.

f. Click "Edit" to see and save your key; or you can create your own key



WARNING: Copy and Save your Key to a safe place.

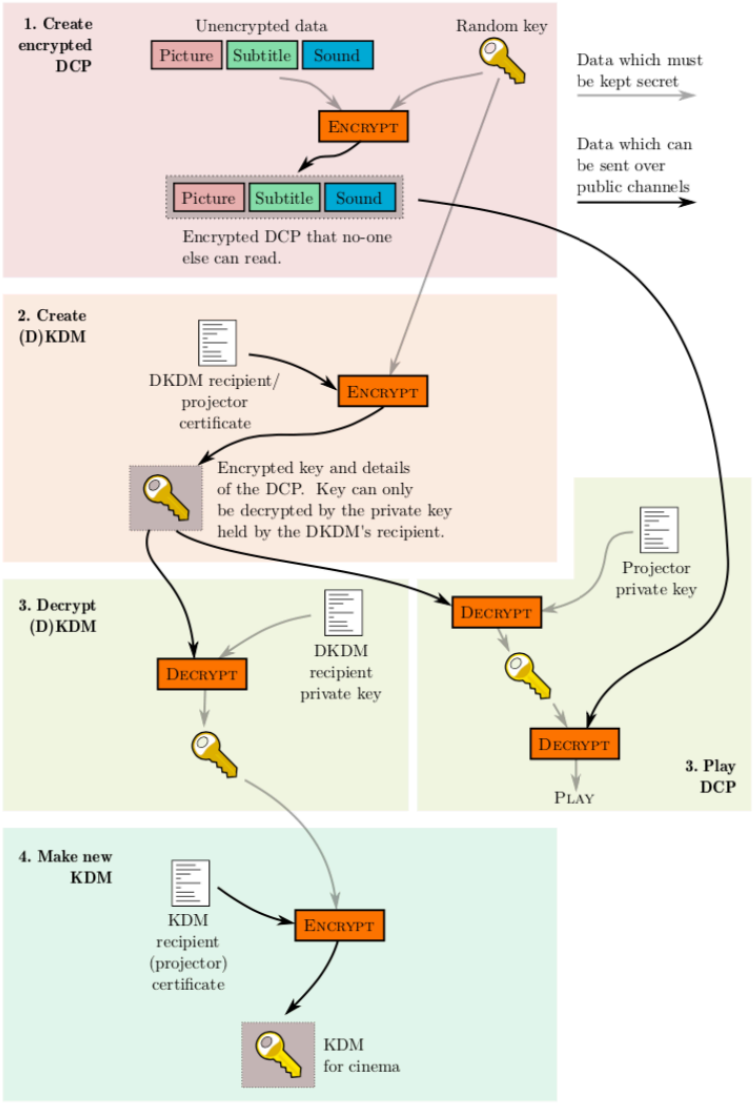
**You must be careful when using encryption so as not to lose important keys. If you are making KDMs from a DCP-o-matic, you must ensure that you have backups of the metadata.xml file from the project, as well as the DCP itself.

Should I encrypt? The question of if encryption is appropriate for a given project is tricky.

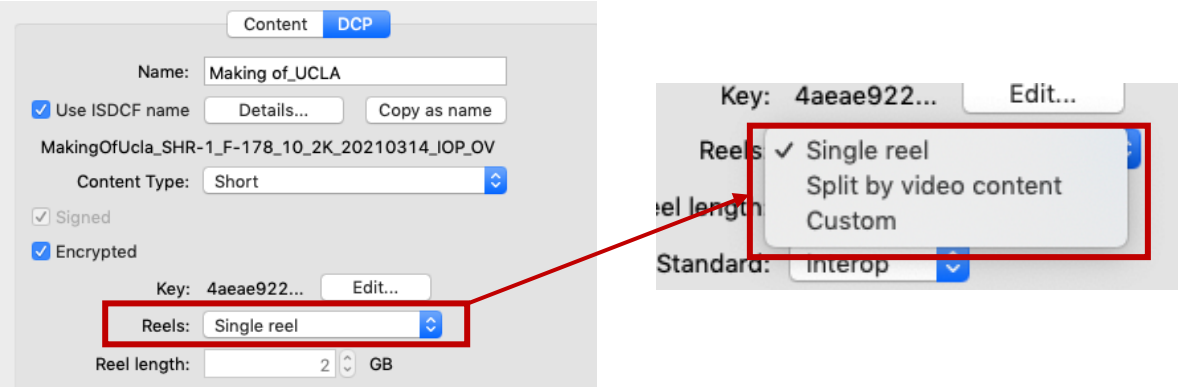
On the one hand, if you distribute an unencrypted DCP it is easy for anybody to take it and do whatever they want with its contents. They could use DCP-o-matic to convert it to a MP4, show it in their cinema, or even edit and redistribute it in ways that you do not like.

Encryption prevents this but brings its own problems. It will be impossible for a cinema to screen your DCP unless they have the correct KDM. This is easy enough if things work as they should, but problems can occur. For example, a cinema may substitute its broken playout server with a new one without telling you. Given that each individual KDM is tied to a specific projector based on its certificate, the KDM that you sent them will be invalid and a new one required. If the cinema can't get in touch with you, or somebody else who can create a new KDM, they can't screen your DCP. Often these problems are only discovered very close to showtime, with little time for fixes.

If you are distributing encrypted DCPs widely it is worth thinking about who will make the KDMs, and who will provide quick-response technical support. It may be a good idea to engage a company who can provide such services.



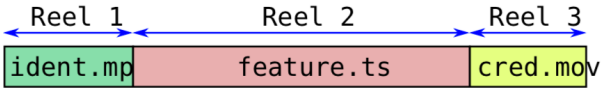
g. Manage Reels settings (usually we recommend “Single reel”)



DCP-o-matic offers three options for setting up the reels in your DCP: Single reel, Split by video content or Custom. Sometimes people like to have an academic leader at the beginning because it can let projectionist know when to split the leader from the video content.

Single reel (usually recommended): keeps the whole DCP as one reel. This is a good option if you have no particular reason to need reels.

Split by video content: puts each piece of source video content in its own reel, as shown below:



Custom: splits reels by the size of the files that will make up their own video content.

h. Manage Standard settings (usually we recommend “SMPTE” as it is more modern.)

*__SMPTE__: The implementation of Composition and DCP standardized by SMPTE (Society of Motion Picture and Television Engineers). **This is more widely supported by theatres.**

*__Interop__: The original implementation of Composition and DCP deployed during the rollout of digital cinema, based on an early draft of this work in SMPTE.

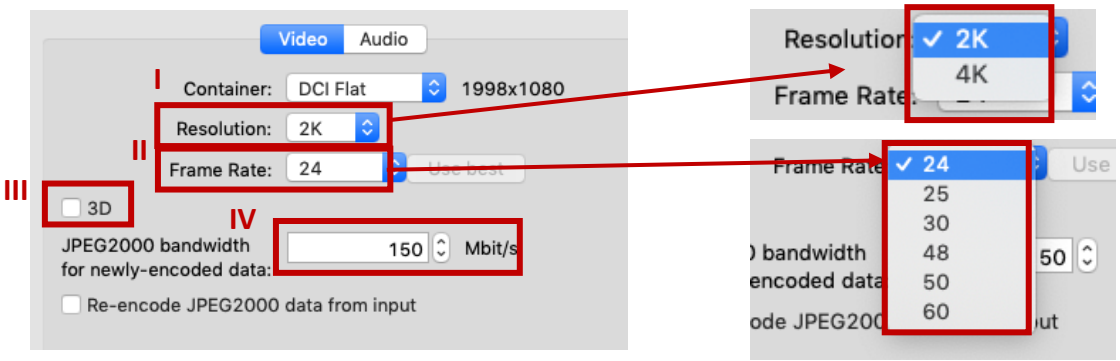
i. Manage Container settings

Please choose a right container based on your film's aspect ratio:
DCI Flat: 1998x1080
DCI Scope: 2048x858
Full Frame: 2048x1080

The Container option sets the ratio of the image in the DCP. If this ratio is different from the ratio used for any content, DCP-o-matic will pad the content with black. **In simple cases this should be set to the same ratio as that for the primary piece of video content.**

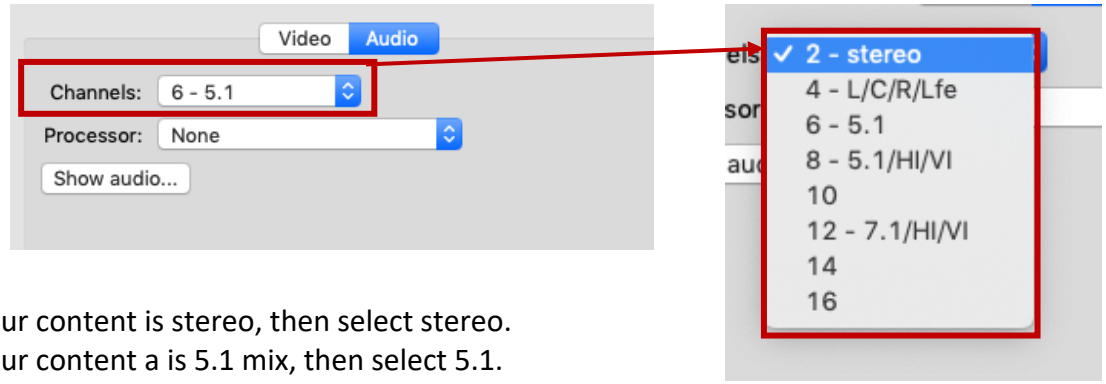
Alternatively, you might want to pillarbox a small format into a Flat container: in this case, select the small format for the content's ratio and 'Flat' for the DCP.

j. Manage other settings for your project



I. **If your content is 2K, then select 2K.**
II. **If your content's frame rate is 23.976 or 24, then select "24."**
III. **Don't check "3D" if your content is not 3D.**
IV. **Keep the bandwidth as 150 (default.)**

k. Manage DCP Audio settings to match your content

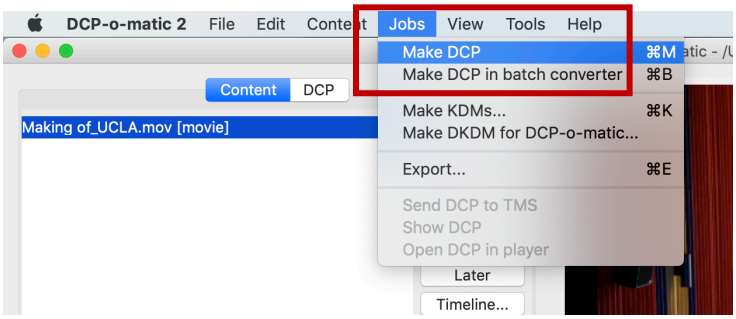


If your content is stereo, then select stereo.
If your content a is 5.1 mix, then select 5.1.

All your settings are done. Now you are ready to make your DCP!!
Let's do it! 😃😃😃

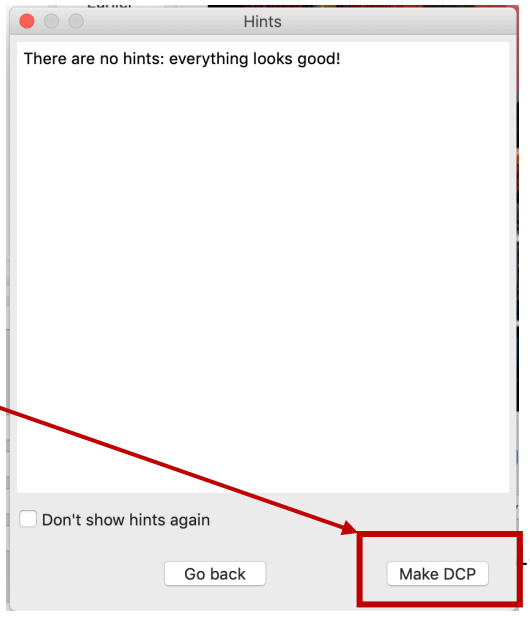
Step 7: Make your DCP

a. Click "Jobs" -> "Make DCP" or shortcut "cmd+M"

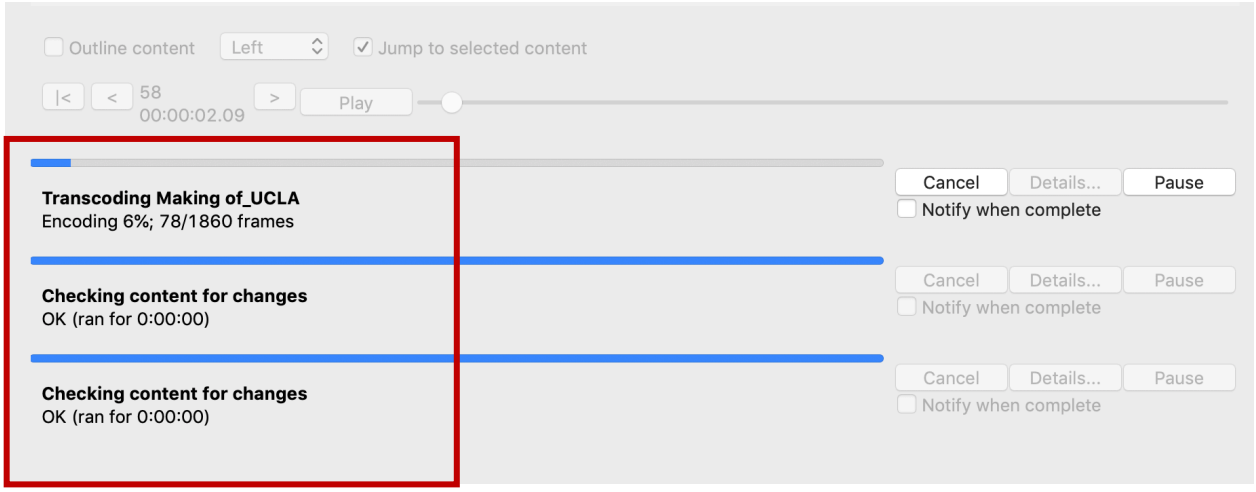


Then a Hints window will appear to show if everything looks good.

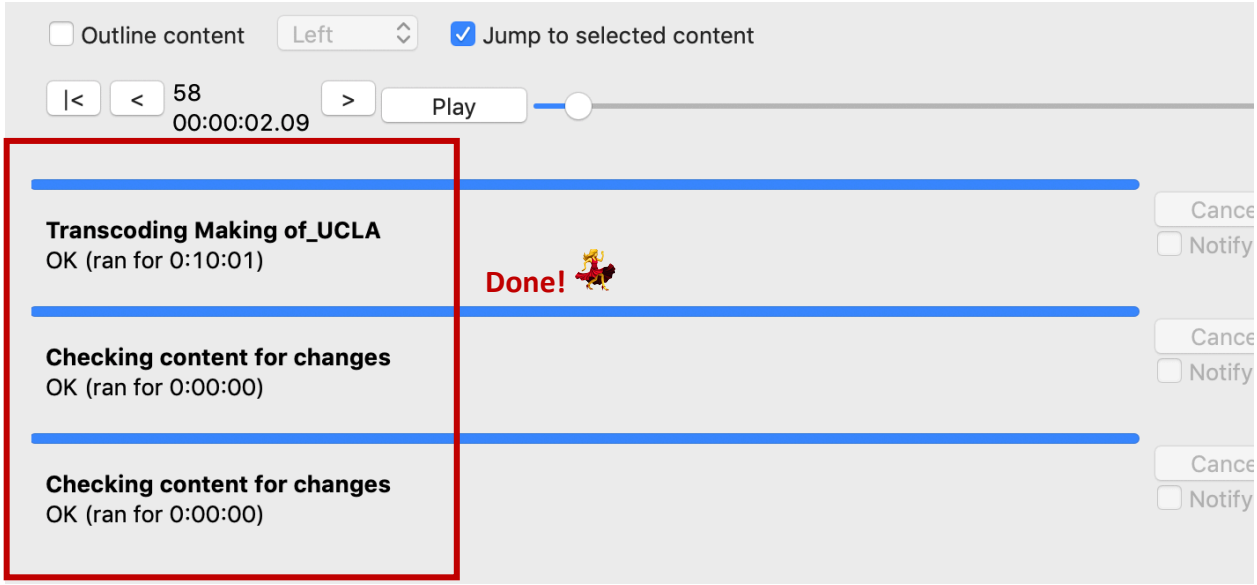
b. Click "Make DCP" to start



After you hit “Make DCP”, the process starts. While the job is in progress, DCP-o-matic will update you on with a series of progress bars in the bottom of its window.

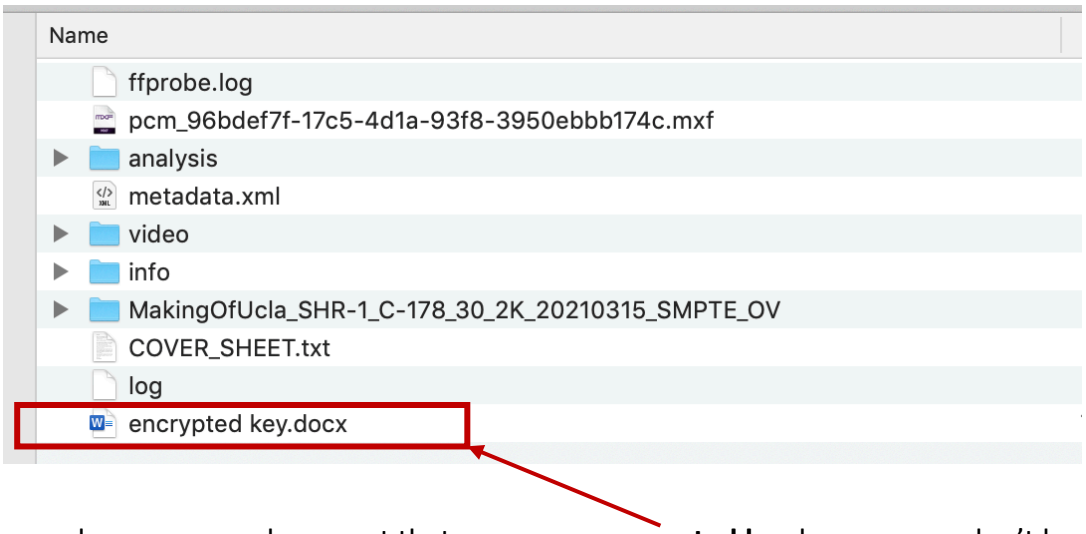


Sit back, relax and let your DCP-o-matic do the work. 😌😌😌🍲🍲🍲



Step 8: Confirm the DCP you just created

When it has finished, the DCP will end up on your disk inside the folder that you chose earlier. You can then provide a copy of the entire DCP folder to a projector via a USB stick, hard-drive or online network connection.



*You can also copy your document that saves your **encrypted key** here, so you don't lose it.

Step 9: Play and verify your DCP

We highly recommend you do a DCP screening test in a theater and check if it loads and plays well without any color/gamma shift or audio issues.

WOOHOOO! You created your first professional DCP!!!

🥳🥳🥳🥳🥳🥳🥳

🎉🍾🍾🍾🎉