

Final Cut Pro X & AS-11



AS-11



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Intro

With Final Cut Pro X as of December 2014 and the accompanying free ProVideoFormats download, comes the very welcome news that most common MXF formats are now natively supported for import, edit and share, completely free of charge.

Let me repeat that; native MXF import, edit and share in Final Cut Pro X.

If ever there was a subtle message to the broadcast community that Apple are very serious about this sector, then this is it.

If you are in a position where you need to deliver a broadcast master you should know all about MXF and in particular AS-11. Confusing as it is, Apple just made it very easy to deliver AS-11 but there are strict rules in place to maintain broadcast standards and to standardise procedures.

The first part of these rules come in the form of quality control (such as picture quality, PSE and EBU R128 loudness checks) but are not the concern of this document. This document looks at how to deliver a file once all the manual (eyeball), automatic and technical checks have been made (by whatever means) and the programme is ready to be mastered.

The next two sections detail a short history and background of AS-11 and the rest of the paper details how to get best use out of this new functionality with Final Cut Pro X.

Background

When programmes were delivered on tape, producers usually relied on post houses (or in-house editors) to deliver their correctly formatted master tapes (usually HDCAM SR in the case of HD). This was often expensive and long-winded.

File-based delivery has changed all this; a simple exported file can now become a broadcast master, effectively allowing clued-up producers to deliver directly to broadcasters, sometimes via a simple upload.

So what format should this file be? What codec, what audio spec etc etc?

The answer in most cases is contained within the AS-11 spec which is becoming the widely adopted broadcast standard for delivery.

Essentials

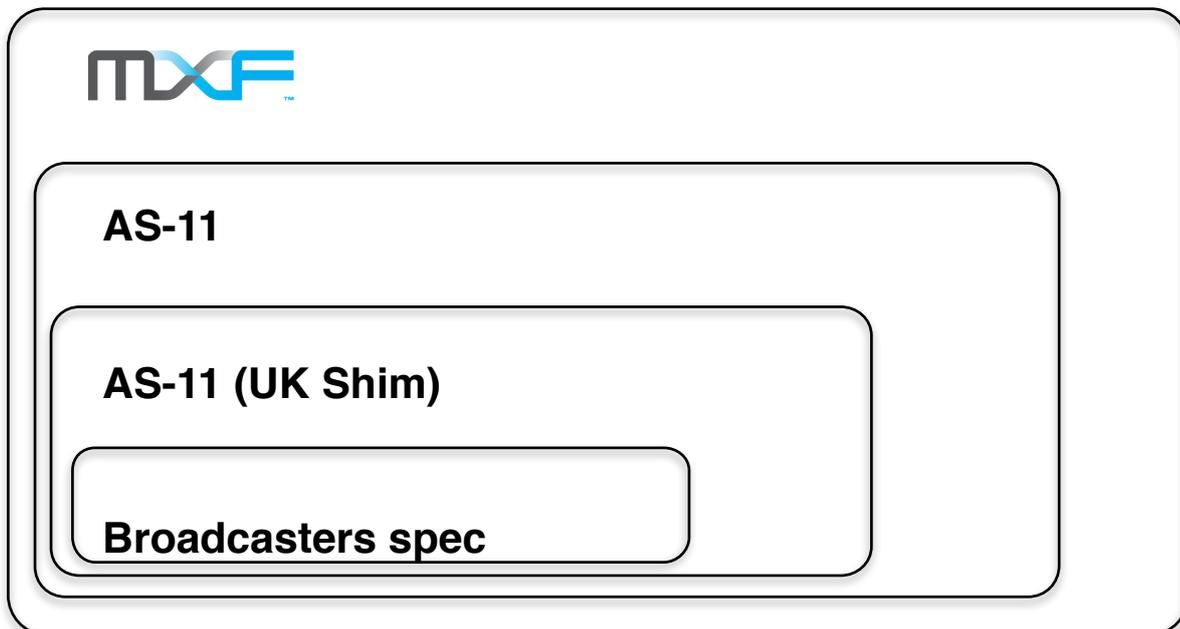
AS-11 is a subset of the MXF format. It is a specification that describes a format for delivery of finished programming from programme producers developed together by AMWA and the DPP, summarised in this [AMWA white paper](#). The aim of AS-11 is to level the playing field and to standardise the delivery process to enable as much interoperability as possible.

The DPP (Digital Production Partnership) is a consortium of UK broadcasters who have helped create UK broadcast delivery specs based on AS-11. It currently looks possible that these adopted UK DPP standards may well be rolled out in an attempt to create a European & North American standard, if not worldwide.

At the moment, there currently exists a subset of AS-11 created by the UK DPP that is intended for use within the UK and defined by the DPP “shim”. (A shim is simply a specific set of technical requirements and descriptive metadata that define an AS-11 file.)

Acutely aware that this is all becoming rather confusing before it even started, the DPP created an application that makes the creation of compliant files much easier. The DPP app is intended to be the final step in the AS-11 creation process and will validate and then finally wrap the file into an AS-11 deliverable. The current version of the DPP app can be downloaded [here](#) and its place in the workflow is described below.

The final caveat, is that various broadcasters may have their own extra technical specs (especially for live programming) which should always be cross-checked before delivery. Confused? Here is a (not to scale) Venn diagram which might demystify things.



The current AS-11 UK DPP HD Shim Spec (summarised below) is taken from [the AMWA website](#). A more detailed shim is in Appendix F of the same document.

13 Appendix E – AS-11 UK DPP HD Shim Specification

Shim Parameter	Shim Value
Shim Name	UK DPP HD
Shim Version	1.1
Video Encoding	HD AVC-Intra Class 100
Video Format	1080i50
Audio Encoding	PCM
Audio Channel Arrangement	mono-only
Audio Track Allocation	EBU R 48:2a (Stereo with silence, 4 tracks) EBU R 123:4b (Stereo with M&E) EBU R 123:4c (Stereo with AD) EBU R 123:16c (5.1 with M&E) EBU R 123:16c (5.1 with AD) [To be used in conjunction with AD flag] EBU R 123:16d (two 5.1 languages) EBU R 123:16f (three languages)
Closed Caption Presence	not present
Closed Caption Standard	N/A
Timecode Mode	non-drop frame
Default Timecode	N/A
Additional Descriptive Metadata Schemes	DM_AS_11_UKDPP
Program Segmentation	required
Index Strategy Frame	lead
Essence Partition Strategy	single
Permitted AFD Set	9, 10, 14

A template UK broadcaster technical standards document is provided at this [link](#). (Dec 2014)

AS-11 Cheat Sheet

What follows is a 2-page cheat sheet outlining the very basic steps to create an AS-11 and then a more detailed look at the specifics.

Essentially this is a two stage process as Final Cut Pro X cannot export the required audio configuration directly into an MXF file.

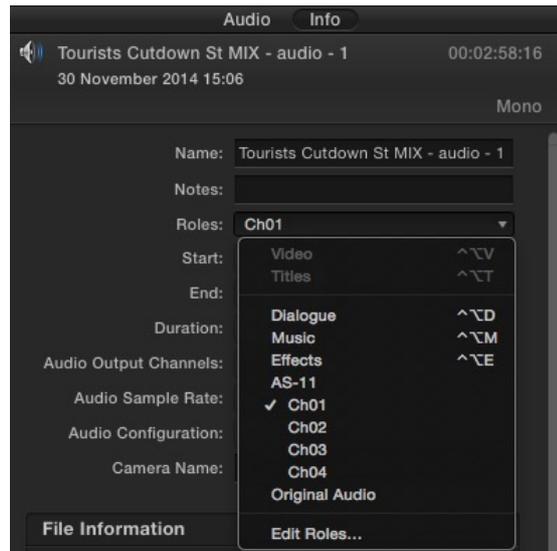
1. Export a multichannel master file from Final Cut Pro X using Roles.
2. Take this file into Compressor and from there export a multi-channel AS-11 compliant file.

FCPX AS-11 Cheat Sheet 01

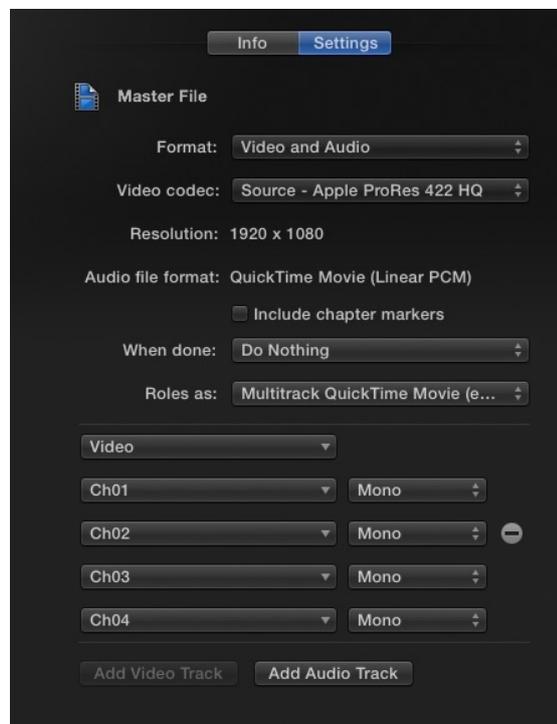
1. Make sure all audio is mono in the Final Cut Pro X project timeline.



2. Assign roles for channels 1-4 or 1-16.



3. Export master file using roles into Multitrack Quicktime



FCPX AS-11 Cheat Sheet 02

4. Export mxf from Compressor using correct 4 or 16 channel preset



5. Check file in DPP app and export final AS-11 file



Final Cut Pro X AS-11 Workflow

From hereon in, is a deep dive into how to create a UK DPP AS-11 file. Other countries should be aware of local specs but the procedure up to using the DPP app should be very similar, if not identical.

If the above intro seems crazily complicated, don't worry, creating an AS-11 in Final Cut Pro X is technically very easy with many of the above specs taken care of automatically.

1. Make sure you know what audio channel assignment you are supposed to be delivering.

The following grab shows the various audio layouts possible in an HD AS-11 file.

EBU Reference code	Prog Type	Audio track numbers															
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
R48: 2a	Stereo	St. Final Mix L	St. Final Mix R	Silence	Silence												
R123:4b	Stereo with M&E	St. Final Mix L	St. Final Mix R	St. M&E L	St. M&E R												
R123:4c	Stereo with Audio Description	St. Final Mix L	St. Final Mix R	St. Aud Desc L	St. Aud Desc R												
R123:16c (5.1 with M&E)	Stereo, 5.1 and M&E	St. Final Mix L	St. Final Mix R	St. M&E L	St. M&E R	5.1 Final Mix L	5.1 Final Mix R	5.1 Final Mix C	5.1 Final Mix LFE	5.1 Final Mix Ls	5.1 Final Mix Rs	5.1 M&E L	5.1 M&E R	5.1 M&E C	5.1 M&E LFE	5.1 M&E Ls	5.1 M&E Rs
R123:16c (5.1 with AD)	Stereo, 5.1 and Audio Description	St. L Mix	St. R Mix	St. Aud Desc L	St. Aud Desc R	5.1 Final Mix L	5.1 Final Mix R	5.1 Final Mix C	5.1 Final Mix LFE	5.1 Final Mix Ls	5.1 Final Mix Rs	5.1 M&E L	5.1 M&E R	5.1 M&E C	5.1 M&E LFE	5.1 M&E Ls	5.1 M&E Rs
R123:16d	5.1 Two languages	5.1 Lang 1 L	5.1 Lang 1 R	5.1 Lang 1 C	5.1 Lang 1 LFE	5.1 Lang 1 Ls	5.1 Lang 1 Rs	*	*	5.1 Lang 2 L	5.1 Lang 2 R	5.1 Lang 2 C	5.1 Lang 2 LFE	5.1 Lang 2 Ls	5.1 Lang 2 Rs	*	*
R123:16f	Three Languages	St. Lang 1 L	St. Lang 1 R	Not Used	Not Used	St. Lang 2 L	St. Lang 2 R	Not Used	Not Used	St. Lang 3 L	St. Lang 3 R	Not Used	Not Used	*	*	*	*

* additional mono or stereo (e.g. audio description, language)

The following workflow illustrates the delivery of a file with EBU R123:4b audio (highlighted in red above). This is the standard 4 track format for stereo delivery. This technique can be applied to all other formats however, including surround delivery.

Mono audio

The main point to understand is that rather than using tracks (which we know don't exist in Final Cut Pro X), we are going to use Roles to control audio channel output assignments.

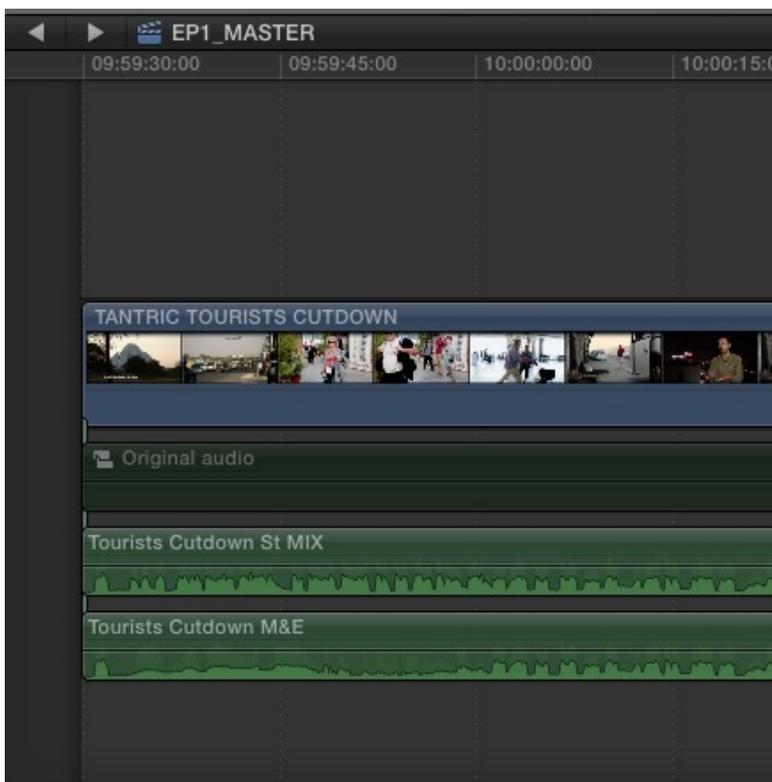
This requires a full understanding how FCP deals with audio channel configuration within a timeline and on export using Roles. I would guess that a good many people think they understand this functionality but haven't gone really deeply into it - so this is a great exercise to fully grasp the versatility of Roles as well learning how to create AS-11 files.

So here goes:

Firstly we must be aware that there are two possible scenarios.

- a. Finished audio is reimported to FCPX from an application such as Pro Tools or Logic.
- b. Audio is finished and exported from inside FCPX - eg fast turnaround news style or as-live.

Below we have an example of the first scenario (a) in which we have reimported finished audio wav files (stereo mix and stereo M&E) and added these to the master timeline, having detached and grouped the original audio in a compound clip and turned this off (we leave this here to enable cross-checking for sync etc). The second scenario is discussed at the end of this document.



The next vital thing to understand (as per the shim) is that **all audio is delivered to AS-11 as discrete mono channels**.

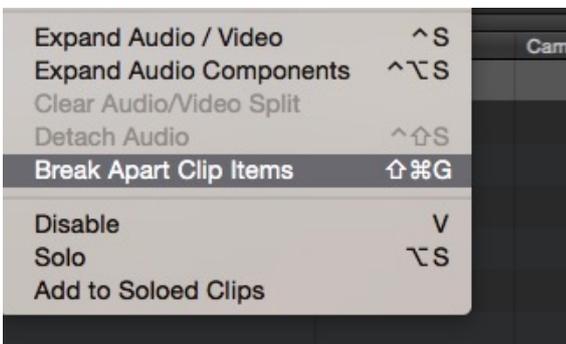
Unless you already have mono files, this will involve a bit of audio wrangling.

1. Change all audio to mono in the timeline.
Select an audio clip in the timeline, go to the audio Inspector and change the channel config to dual mono.

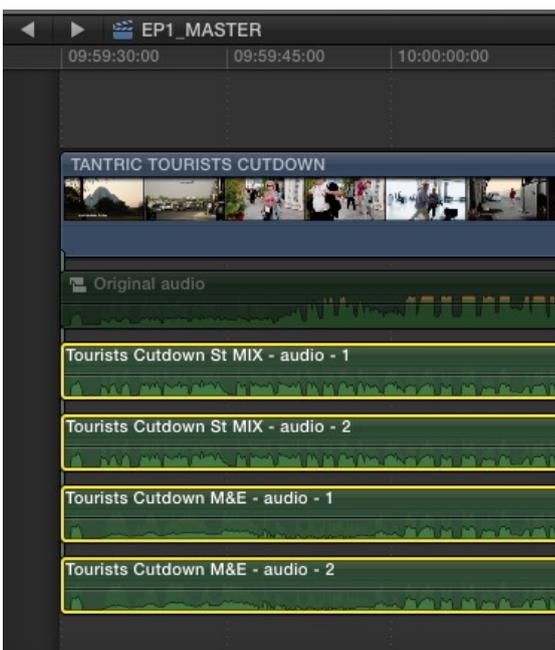


In our case we do this on both stereo clips in the timeline.

2. Now select all clips in the timeline and choose Break Apart Clip Items (from the Clip menu). (You may have to choose Break Apart Clip Items twice to achieve this.) (In some cases, you may also choose to Expand Audio Components here)



In our case, the result is below with individual mono clips now visible

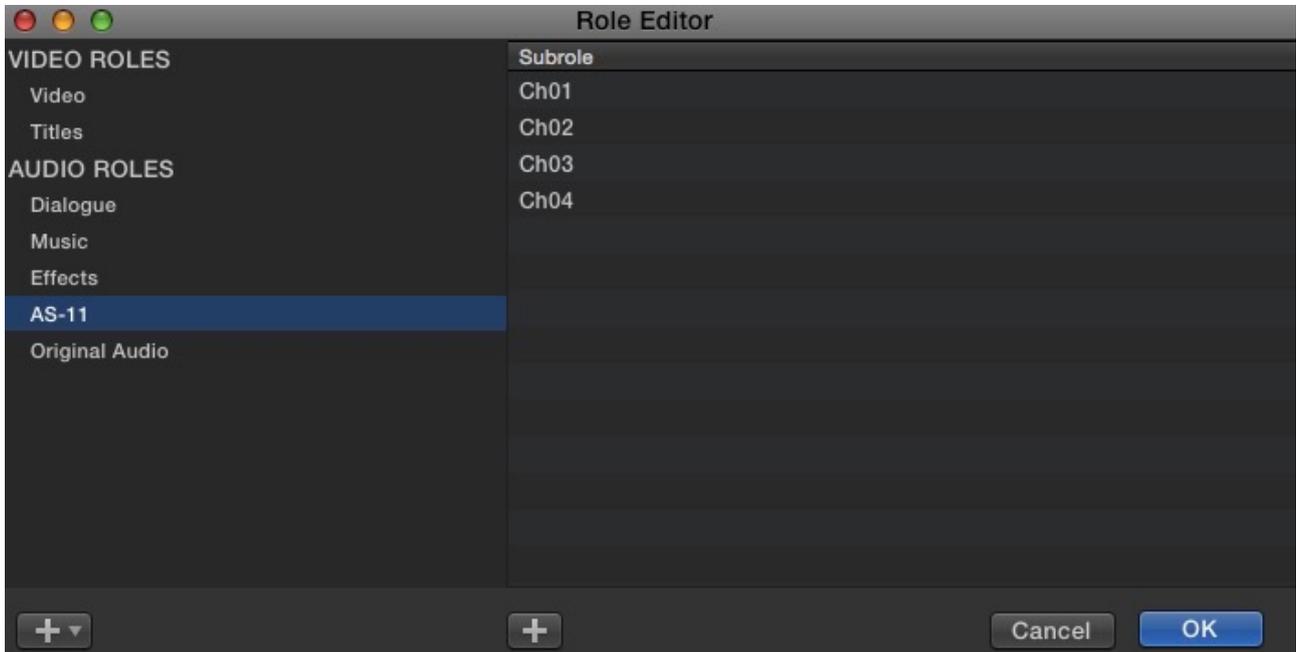


We now have four discrete mono channels, to which we need to apply Roles in order to get them out of Final Cut Pro X in the right config for AS-11.

Applying Roles

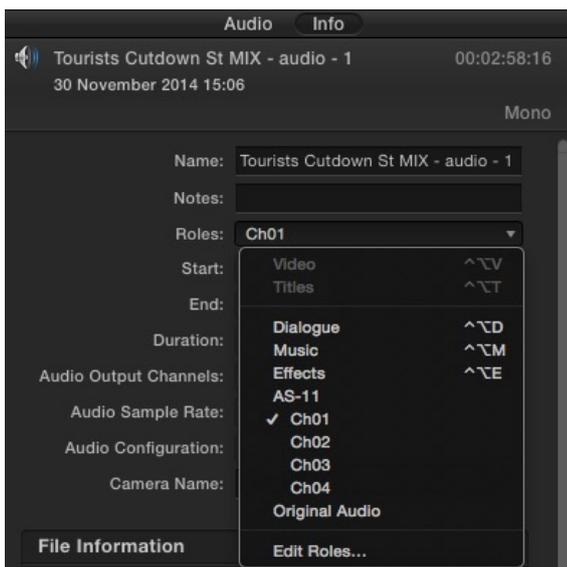
3. Create subroles in the Role Editor. You can do this from the info tab in the Inspector.

It doesn't matter what you call your Roles but the easiest way is simply to create one AS-11 Audio Role and then Subroles (In this case Ch01, Ch02, Ch03, CH04.)



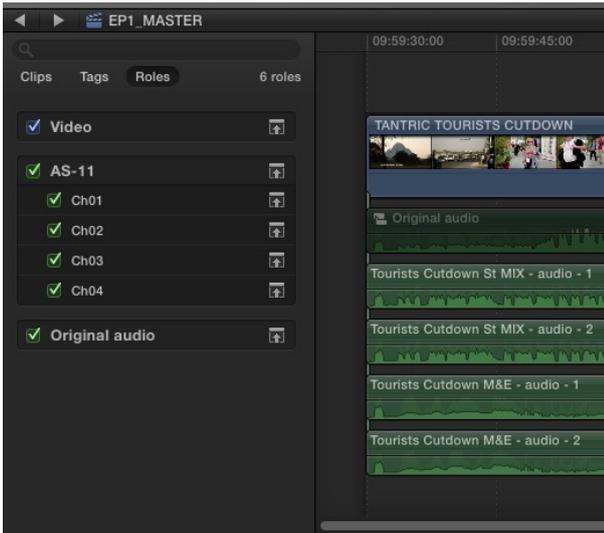
Create subroles here.

4. Next assign the relevant Subroles to the clips in the timeline using the pulldown in the info tab in the Inspector. (Note the 4 Subroles below in our case).



It should be fairly obvious which clip is which in the timeline. In our case, we only need Ch01, CH02, CH03, CH04.

5. Check the Timeline Index to see your assigned roles.



6. You can also choose to view Roles in the Timeline from the Timeline Clip Appearance Menu.

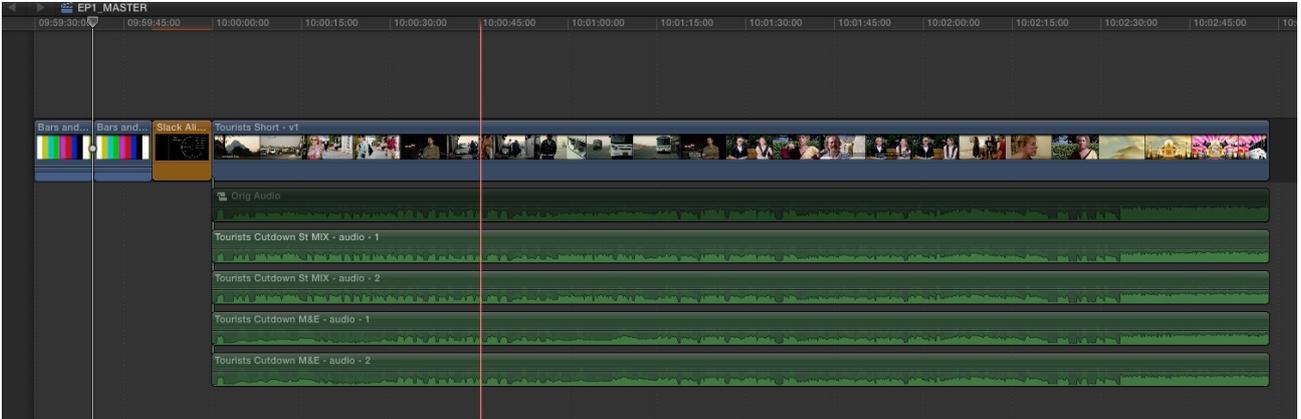


In our case, this results in the following result which can be a really useful aid if in a hurry.



Export Master File

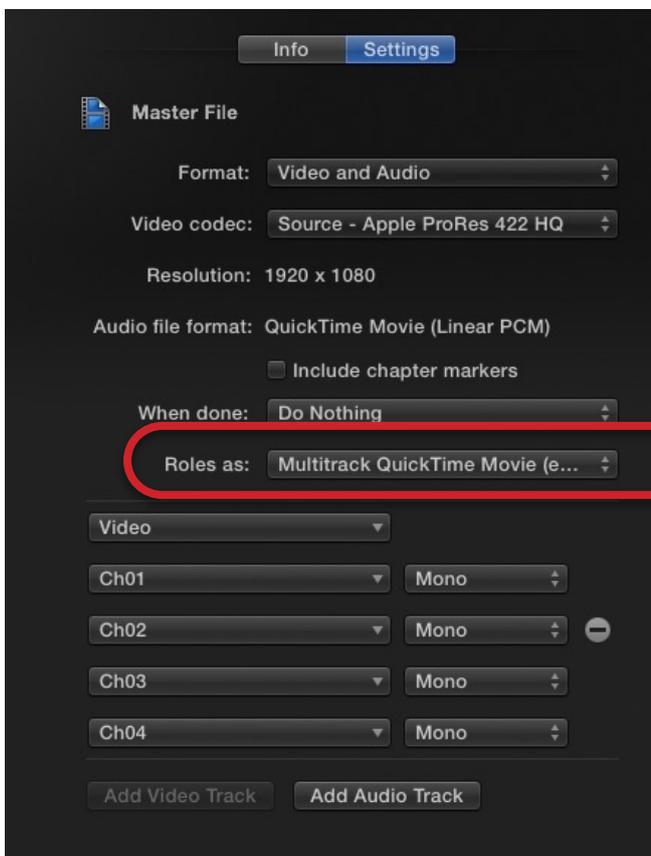
Before export, you will need to set the timecode for the Project to a compliant time. (Currently both 09:59:30:00 or 09:58:00:00 are acceptable.) Add a clock, along with bars and tone with programme start at 10:00:00:00 (for the UK). Acceptable ways of delivering programmes with multiple parts are described in the DPP delivery spec.



Above: Bars, clock and one programme part in Final Cut Pro X.

7. Choose Share > Master File.

8. Add any metadata in the Info tab and then select the Settings tab.



It would be safest to choose Pro Res HQ as the Video Codec here but very possibly not necessary depending on the type of programme.

9. Choose "Roles as: Multitrack Quicktime Movie"

10. "Patch" your audio clips to the relevant tracks in the QT, making sure all tracks are mono. You will need to add Audio Tracks depending on whether you need 4 or 16 channels.

Once you have done this you can save this Roles configuration setting for next time.

11. Once exported, you can double check the file by bringing it back into Final Cut Pro X.

Ours looks like this with 4 mono channels.



Please note that as these tracks are configured as mono, they will play (and sound) in Final Cut Pro X as mono, however once patched to a stereo (or surround) output they will give the desired result. This can be quickly checked by changing the channel config to in the Inspector to stereo.

Once you have checked the master file you can export an AS-11 using Compressor.

Empty tracks

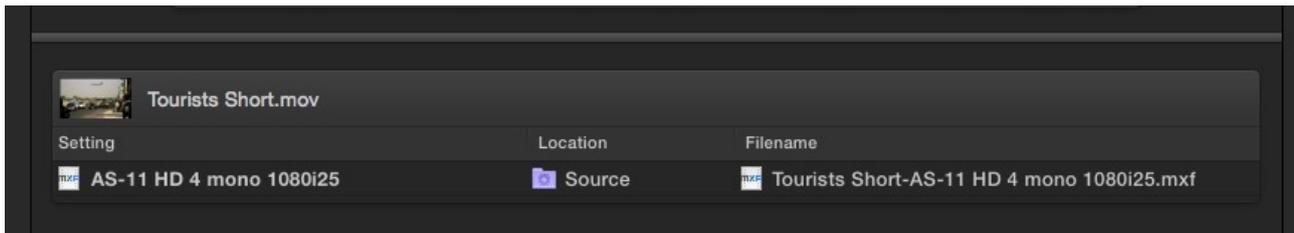
Important note: For empty tracks (such as those required in the first and final two examples in the audio table), you will need to edit and assign Subroles to a “dummy” piece of silence in the timeline and then export these channels of silence as the relevant Subroles, creating silent tracks. (Silence is easily created with any piece of audio with the volume turned down.)

Exporting the AS-11 from Compressor

12. Open the exported master file in Compressor and choose a relevant AS-11 preset.

NOTE: UK DPP AS-11 stipulates 4 or 16 audio tracks but the presets that ship with Final Cut Pro X and Compressor are all 8 track so you will either need to create your own AS-11 presets or download the set of presets provided by us.

A link to these presets is on the 10dot1 website where this document was downloaded from. These presets will facilitate the compliant number of audio channels in a file.



13. Export the file as an AS-11 file.

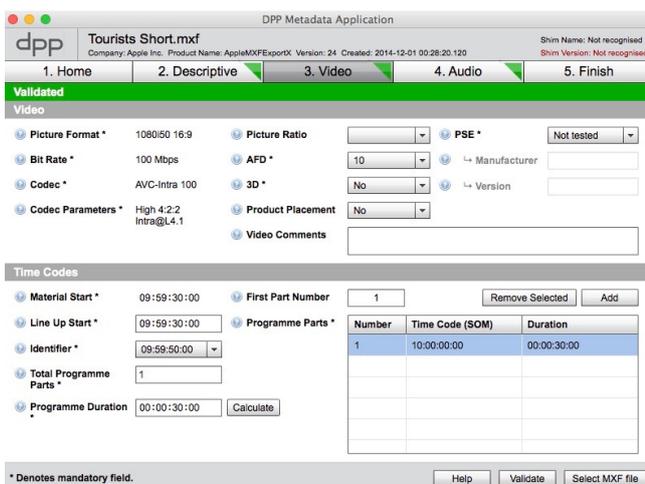
(The reason we use Compressor and not Final Cut Pro X is because FCP will effectively mixdown all the audio into one stereo or surround track however Compressor will retain the track layout and allow all mono tracks to be output, which is what is needed.)

Checking and finalising your AS-11 file

Now you have created an MXF file from Final Cut Pro X, the one thing that remains (if you are in the UK at least) is to check the file using the DPP metadata application which is downloadable from the [DPP website here](#).



The functionality of this app is well documented by the DPP and in the help menus available throughout the app. The outcome you want is a green light in sections 2,3 & 4 which is achieved by creating the right sort of file in the first place (as we have just shown you) and then adding all the required metadata. The first time you do this will take a while but you can then save a template and use that for future versions.

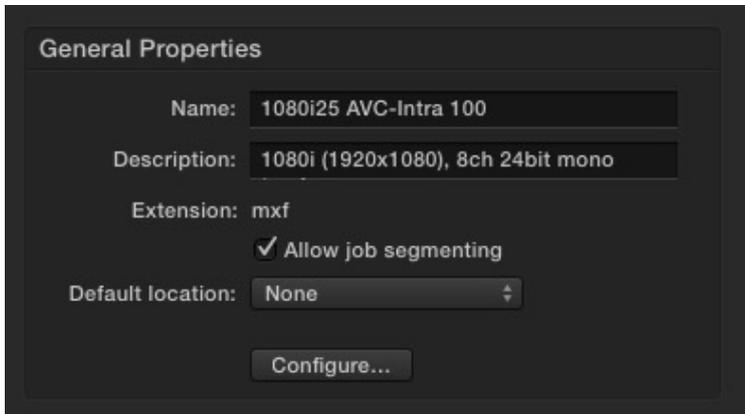


Once everything is validated you can then generate an AS-11 wrapped mxf file for delivery.

Further Notes

Creating presets

To create your own preset, make a copy of one of the 8-track mxf settings and use the “configure” button in the General pane of the Inspector in Compressor.



This will bring up this menu from where you can make the necessary adjustments.



Above are the correct settings for a UK (25fps) HD 4 channel AS-11 file.

The only thing to change for other formats is the frame rate (for 29.97 countries) and the number of audio channels.

For direct export of audio from Final Cut Pro X

For simplicity, especially if you have a long timeline we would recommend exporting audio master files, reimporting them into FCP and then treating them as we have above.

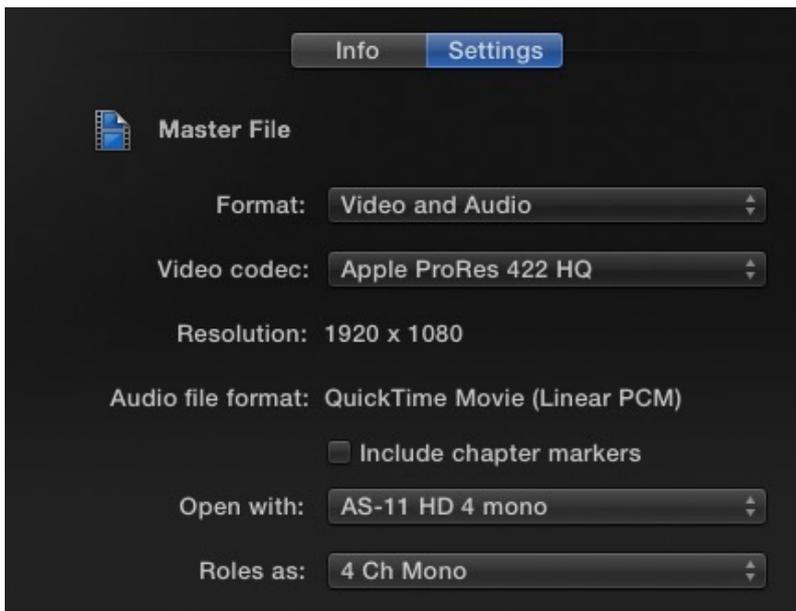
SD files

The workflow is exactly the same for SD files but with different codecs and audio layouts. We have provided SD presets too. Be aware of aspect ratio.

Using Droplets

If you are going to be doing this a lot and you fancy being really clever you can do the whole thing in one go using Droplets.

Create a Droplet for each of your AS-11 Compressor settings and on export of the Master file, select “Open with” and choose the Droplet for the correct setting - in this case **AS-11 HD 4 mono**.



Alternatively you could make a folder action on your output folder to open the droplet.

Note: Droplets will not function without Compressor installed.

Final Note

Please be aware that the workflow above is a single working example and does not guarantee your files to be compliant in anyway. At the moment, the broadcast world is suffering a lot of pain in the transition to file-based delivery and some companies are making a lot of money out of providing the necessary services to confused producers. It is not always in the interests of everyone to make these services easy to understand so the waters can be extremely murky. To add to that, the standards are changing constantly as the world gets to grips with this new technology.

Be sure to stay on top of new developments by checking the various websites we have mentioned and believe that with Apple joining the party, this is the beginning of much easier workflows that are now open to anyone with a copy of Final Cut Pro X and Compressor.

The more practice you get, the easier it will get. Good luck.

Alexander Snelling, December 2014.

References

The UK DPP

<http://www.digitalproductionpartnership.co.uk>

AMWA

<http://www.amwa.tv>

EBU tech site

<https://tech.ebu.ch>

10 dot 1 website (download Compressor presets here)

<http://www.10dot1.co.uk/guides>