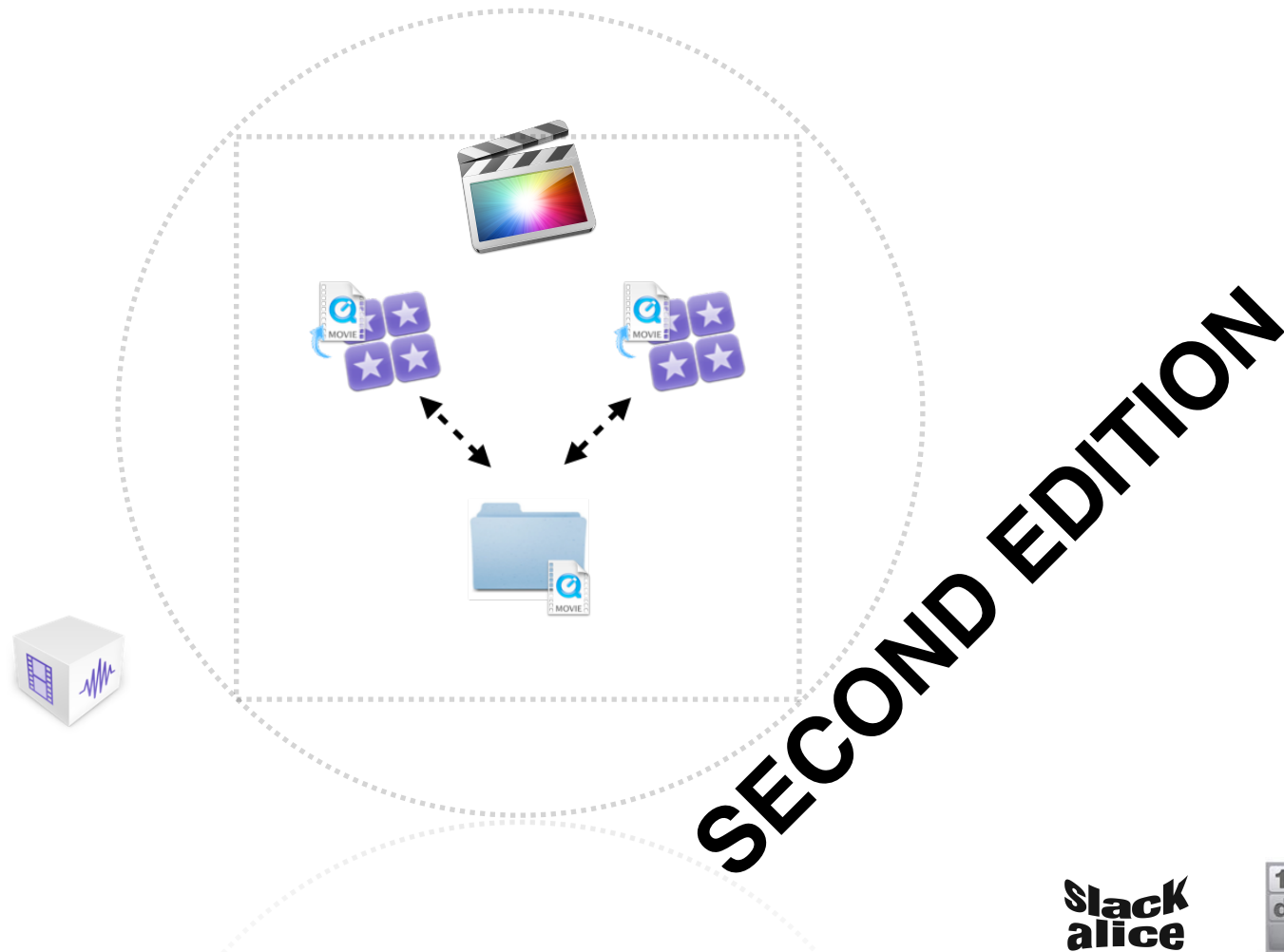


Final Cut Pro X in a Shared Environment

v10.1.2 July 2014

A practical guide to collaborating and sharing media workflow with Final Cut Pro X



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Media Caveats

All tests made in the creation of this document have used been performed using a variety of file-based HD, 2K and 4K media. We have not tested any Standard Definition or tape-originated formats.

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Introduction

The release of Final Cut Pro X Version 10.1 in December 2013, with its production-focussed Library structure, opened up the whole ecosystem to massively flexible potential and the update is being embraced by professionals at all levels.

The original version of this document, released on the same day as the 10.1 update was downloaded 5000 times in 24 hours proving that there was rabid interest in professional workflows in Final Cut Pro X. This is an update to our document to coincide with the release of Final Cut Pro X 10.1.2.

In Final Cut Pro X 10.1.2, there have been subtle but significant changes to media management; this document update reflects those changes. To accommodate those who have already read this rather lengthy tome, we start with a summary of the changes in 10.1.2 that affect the workflows detailed in the original document. For anyone new to the software or this document, just read on and we hope it is useful.

These scenarios are based on our ongoing experience with Final Cut Pro X, using workflows derived from real situations. The examples must be seen as theoretical as we cannot divulge client confidentiality.

Our intention is to create a document that will be adapted to specific needs and purposes. There is no single catch-all solution so consider the points and functionality detailed here and then move on to create your own solution.

- Editors - use this paper as a primer for shared-workflow in Final Cut Pro X.
- Integrators / IT departments / post production supervisors / managers - use this to help evaluate your software / hardware needs (but please speak to the editors before you design your great scheme!).
- Please do not expect to find an absolute solution here. There are simply too many variables that define the workflow.
- ALWAYS run your own tests using your own hardware. Feel free to contact us to discuss things further.

NOTE

(For advice on upgrading to v10.1, please read the Apple White Paper **Managing Media with Final Cut Pro X Libraries**. For details of the changes to the software refer to the Apple release notes and the user manual.)

UPDATE Final Cut Pro X 10.1.2

The latest update to Final Cut Pro, although a dot release, is a significant change. It is not backwards compatible so be sure to upgrade only the Libraries you want to - better still make copies of your Libraries before you upgrade.

10.1.2 brings with it a batch of clever new features but the key changes that affect the shared process are summarised below;
(If you are new to Final Cut Pro X skip this section and start at page 9.)

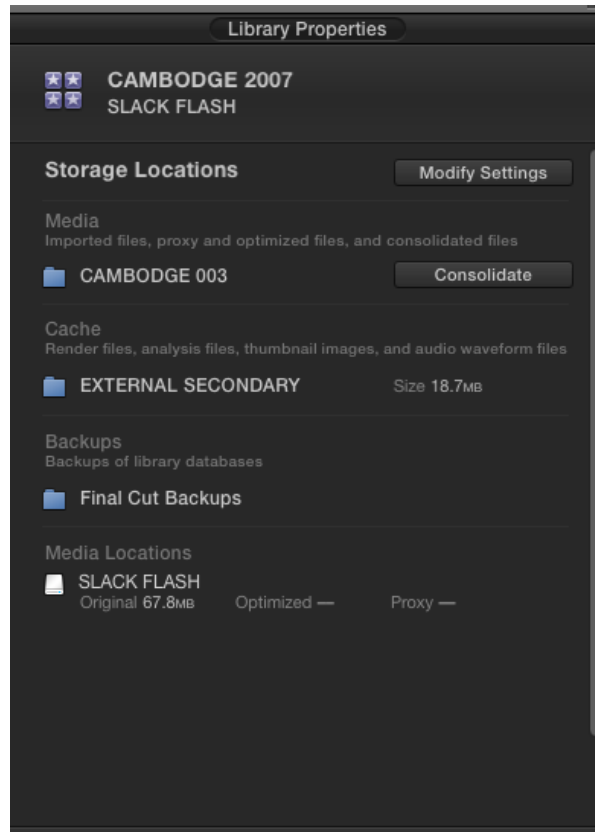
Libraries

- Libraries become much more flexible, in that the user can specify and save media storage options per library in the new **Library Properties** pane (select a Library and open the Inspector). These storage options are stored with and remain with each Library allowing the user to jump between Libraries with different storage locations. These storage options will travel with a copied library - e.g. a library copied to a shared volume will retain the original storage locations.
- Media transcoded by Final Cut Pro (optimised and proxy media) and cache files (render, waveform, thumbnail and analysis files) can be placed at any user selectable location, including external volumes. Some would consider this the missing link from the 10.1 release for certain workflows. Final Cut Pro X is now totally customisable in terms of media storage. These files can now be deleted at once or separately from a dialogue in the File menu at either Library or Event level. Furthermore, render files, waveforms and thumbnails (now known as Cache Files) can be stored separate to media files, circumventing potential issues caused by writing small files to Xsan volumes and also allowing for much smaller efficient Library sizes. All media files can now be placed on a shared volume allowing for the workflows documented later in this paper to be further optimised, especially in the sharing of Optimised and Proxy Media. All files can now be consolidated to other locations which adds another level of control to media management.
- Keywords can be created from Finder tags on import.
(This opens up huge possibilities for third party logging applications, even automated Finder actions.)
- An entire library can now be exported as a single xml file (which imports back into an existing library as a number of events, not a discrete library).
- FCPXML (now 1.4) has been updated to reflect this new Library model along with other changes.

Lets look in more detail at the basic functionality of the first two and most significant feature changes.

Library Inspector

Select a library and open the Inspector and you will now see the **Library Properties** pane. Here is all the info you need about the selected Library.



Storage Locations is broken down into three sections; Media, Cache and Backups (see next page for Modify Settings).

Media (Original, Optimized and Proxy Media) is where any new media will be created (Imported or Consolidated). Note: this does not necessarily mean any of your media is stored here.

Cache files are Render, Analysis, Waveform and Thumbnail files and are saved together as a bundle. In contrast to media files, these are very small files, and you may want to consider storing them separately from media files to achieve optimal performance.

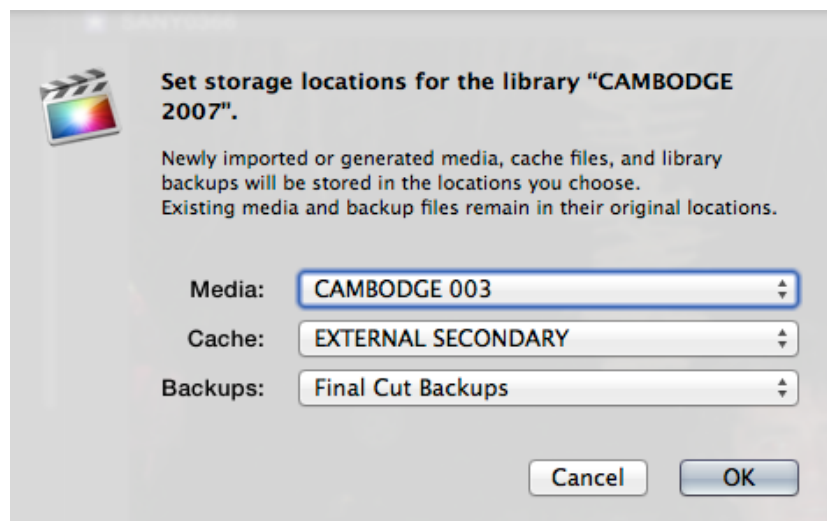
Backups are where backups are stored. Ideally a drive separate from the original Library.

Consolidate is now available here as well as in the File menu. This command will only consolidate the entire library. If you want to work at event or clip level, that needs to be done from the File Menu.

Consolidate will affect only the Media Files, not the render files.

IMPORTANT: These settings can be changed at any time mid job but media will remain where it is. This may result in media in two or more locations; managed or external or a mixture of both.

Click the **Modify Settings** button in the Library Inspector to bring up the following dialogue, which should be fairly self explanatory.



The main thing to understand about this menu is that Media includes Optimized and Proxy Files. In the example on the left, external locations have been selected for the first two options - it is also of course possible to direct media to a managed location, within a library bundle.

Vitally important here is that changing these settings *do not move any media*.

To move media, use this menu to select appropriate storage locations and then use **Consolidate** to move (or copy) any pre-existing media to these locations.

So to summarise, here is a simple table of media definitions. All this media can be saved anywhere you like.



CACHE files; Render, Waveform, Thumbnail and Analysis files



MEDIA files; Original, Optimized and Proxy Media.

From here on, this paper is a modified version of the first version with changes made to reflect the above updates, which in some parts are significant.

What is Final Cut Pro X?

Final Cut Pro X is of course a non-linear editor (NLE). Let us consider for a moment that it is actually a dual-purpose NLE.

Final Cut Pro X is designed to work on a single stand-alone computer but also as a professional editor with multiple clients on a shared network. These two scenarios are likely to be radically different when it comes to media management, with rules for the standalone user often the opposite of those for multiple users.

Why is Final Cut Pro X different?

Final Cut Pro X is run on databases. Databases are catalogues of information which are much faster to read than the old-style project files used in FCP7. Databases contain way more information. Think of how quick it is to search on Google. This is made possible by huge databases.

Run these databases on 64-bit, PCIe architecture, high capacity RAM, increasingly faster CPUs & GPUs, massively faster storage & connectivity and the future for editing can only get brighter for Final Cut Pro X.

What is also changing fast are the traditional hardware models we have been relying on for the last 20 years.

No longer is external storage necessarily your fastest option - a paradigm shift that underpins a lot of the discussion in this document.

What is Sharing?

First let's be clear what we mean by sharing and collaborating.

Collaborating - sharing information

We are using the term collaborate to indicate when two or more users transfer information between one another.

Sharing media

Two or more users sharing actual media assets, (files; movies, graphics, audio).

This document covers both these elements and can broadly be divided into two sections:

1. A Guide to Media Management

A guide to functionality and media structures in Final Cut Pro X.

2. Example collaborative workflows

Practical examples based on real world set-ups.

This section assumes the key concepts from part 1 which underpin these workflows.

Please note all these examples are just that - examples.

You may discover better or more efficient workflows as you put these into practice - that is our intention.

Technical Considerations

There are many factors that influence performance; among them hardware, software, storage and load.

Hardware

The new Mac Pro, with its blazingly fast next generation architecture, portability and expandability changes the game completely. Even with Xsan, the fastest read / write speeds may now be found on local internal PCIe flash storage (currently advertised at 1200 MB/s). Coupled with Thunderbolt 2 (up to 20Gb/s), this opens up a whole new way of thinking which is integrated into this document.

Most importantly, performance will be limited by your **slowest technical bottleneck**, whether it be storage or connectivity. It is important to understand what and where this bottleneck is on your own system and to design a workflow accordingly.

Software

Software variations can include third-party plug-ins, productivity tools and media asset management packages. All of these may affect performance, in particular some third-party plug-ins if used a lot, can slow things down. Final Cut Pro X performance will be affected by GPU(s), CPU(s), RAM and boot drive speed.

Storage

Capacity is not so much of an issue so long as it is enough to hold media with headroom. Performance is impacted on all storage types as they fill up. 20% is the minimum required headroom but performance will be impacted from 65% full and above. For this reason and allowing for Parkinson's Law, we would recommend that you plan for 50% as a maximum as you will always exceed this. Another important question with storage is "how is media going to come off?" Do you have a strategy for archiving and deleting unwanted footage and will this hold strong at stressful times? Always consider a modular storage system that allows adding capacity without rebuilding.

Load

(The amount of work a system has to do).

Essentially, this will be defined by the job in hand and cannot change. Production and delivery formats will normally be set in stone but the post production department will get to choose the "mezzanine" format; in other words the intermediate format used for editing. This chosen mezzanine format will affect performance. There are many different codecs for many different purposes; ProRes is optimised for editing. Also influencing load is the amount of users. Bandwidth requirements for shared storage are determined by the number of concurrent users and the number of streams of video they are using. Two editors working on composited opening sequences using 10 video layers each, is roughly equivalent to 10 editors craft editing with 2 streams each.

Ensuring the storage can support the desired workflow is key to preventing bottlenecks.

What are Libraries?

There are three vertical levels of media container within Final Cut Pro X. The top level is an independent container called a Library.



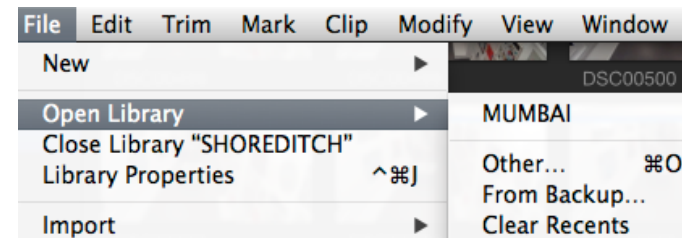
Libraries contain Events.



Events contain clips as well as Projects.



Projects are simply timelines



Libraries can be opened and closed via the file menu. They are independent bundles of Events and Projects.

Library Properties can also be selected from here



Libraries are independent master containers for Events (& Projects).

Final Cut Pro X must have at least one Library open but can work with several Libraries open at one time, allowing transfer of assets across Libraries. Libraries leave media management choices up to you and can be stored almost ANYWHERE on your system. Libraries can be shared, although only one user has access at any one time.

Open or close libraries from within Final Cut Pro X - for those in a hurry, these functions can be assigned keyboard shortcuts, making it a one-button process to close (and effectively share) a Library.

A Library contains one or more Event and the clever management of Events within and across Libraries



Events are storage containers for assets within Final Cut Pro X.

Final Cut Pro X provides a window to your media via clips in the Event Browser.

Events are where you import, log, organise, view and prepare clips for editing.

At Finder level, Events will be hidden inside a Library and media can be stored inside the Event folder (Managed) or anywhere else (External). This can be changed at any time.

Understanding the portability of Events between Libraries is key to shared workflow.



Projects are sequences.

They are stored inside Events.

A project can contain clips from multiple Events in the same Library.

Projects can easily be moved and copied between Events.

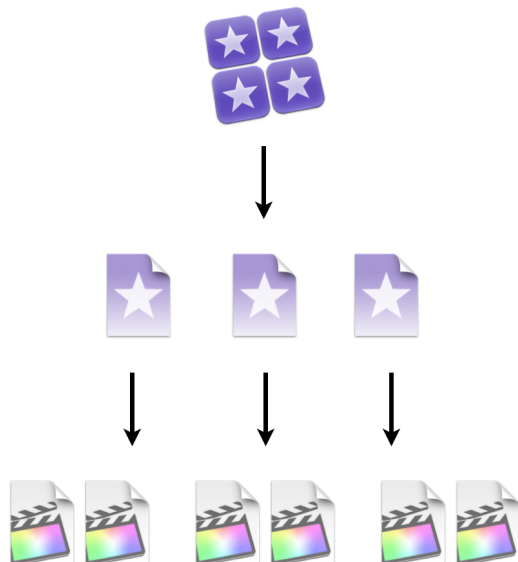
Some Basic Library Rules

Each Library is self-contained and totally independent from any other.

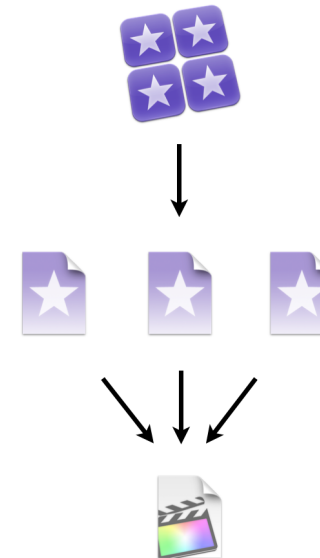
Clips can move freely between Events within the same Library but must be copied across Libraries.

Media assets within the same Library are tracked via a Library database, making it very easy to move and combine clips between Events. Events could be seen as having similar functionality to bins but with a lot more flexibility.

Multiple Projects can (of course) be formed from the same clips.



A single Project can mix clips from separate Events.



All clips for a given Project **MUST** come from the same Library.

If you edit a clip into a Project from a different Library, Final Cut Pro X will copy the clip across to the Library that contains that Project. This means that for any given Project, ALL necessary clips will always be in the same Library.

(The same applies to moving clips between Events in separate Libraries and dragging clips from the Finder.)

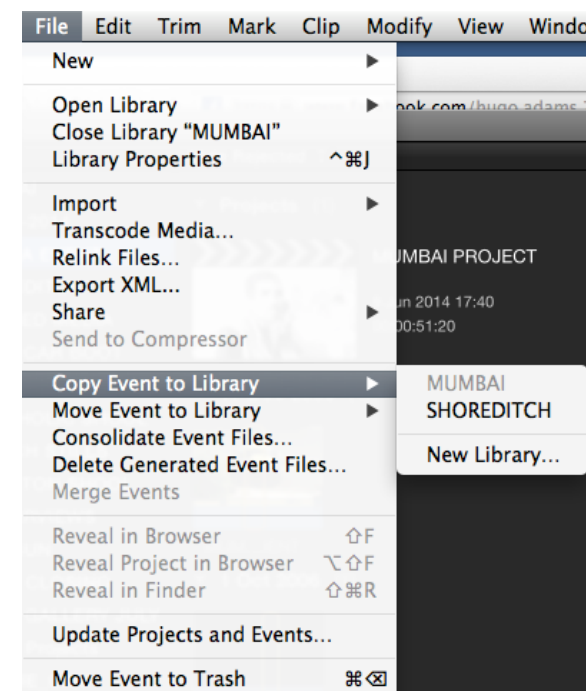


Projects and Events can be copied or moved between Libraries.

This function opens the door to moving and managing shared media quickly and efficiently as well as selectively archiving parts of Libraries.

Copy an Event into a new Library to share it with a co-worker or to split work into several Libraries. There are many uses for this function as we will see later. The same process can be invoked by dragging (be sure to check whether you are copying or moving).

NOTE: Just because clips are in an Event, it does not mean the underlying media is in the Event folder or even in the selected Storage Location - Media can be linked from anywhere. This is discussed in the next section.



Understanding Media in Final Cut Pro X 10.1

Before we look at Libraries in any more detail we need to understand the media structures underlying them.

There are two main forms of media to understand in Final Cut Pro X - **External & Managed** - differentiated only by their storage location.

Managed media is stored within a Library bundle whereas External, as the name suggests, is outside of a Library bundle.

Which option you chose is set in the Library Properties. External Media lends itself perfectly to sharing as we will see in the coming pages.

Ingesting Media

After choosing which clips to ingest in the import dialogue, you are presented with the following screen. The lower section, determines whether media is Managed or External (and is now simplified in 10.1.2 as seen).

1. First choose which Event, clips will be associated with (or create a new one if required).

2. This dialogue specifies where media files will be stored (i.e. Managed or External). Storage location must now be set in the Library before you come to import.

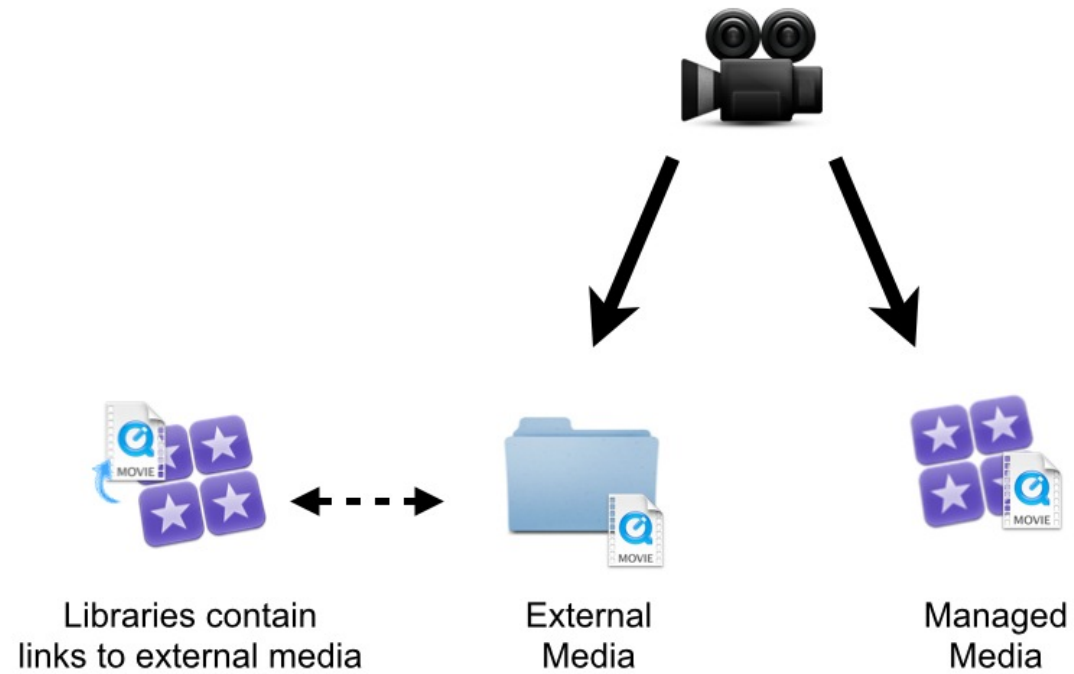
It's your choice

Camera media is directed to any storage device or network volume via Library Properties in the Inspector. Upon file import there is the additional option for media files to be left in place.

Libraries can be stored on any storage attached directly, through SAN or NFS mounts.

External media folders can be set **ANYWHERE YOU LIKE**, including shared network-attached storage (NAS).

In other words it is up to you to devise a media storage plan. Bear in mind, performance may be vastly different depending on connection speeds and any other number of factors.

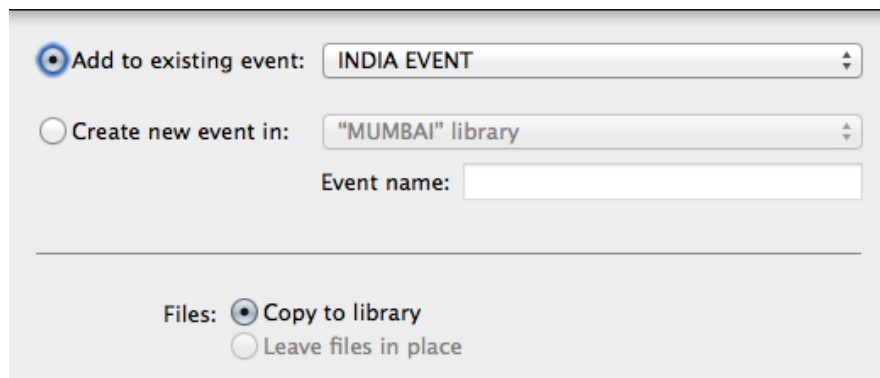


Above, the two options for media storage
(and the icons used in this paper to represent them).

Managed Media

If you ingest or import media directly into the Library (set in the Inspector), files will be hard-imported into the Library bundle itself. This is Managed Media.

The main advantage of managed media is that everything is in the same place and therefore very easy to keep track of (or manage

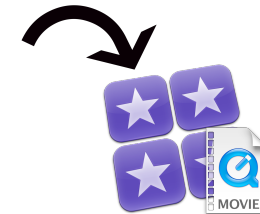





☒ Add to existing event: INDIA EVENT

☐ Create new event in: "MUMBAI" library

Event name:

Files: ☒ Copy to library
☐ Leave files in place



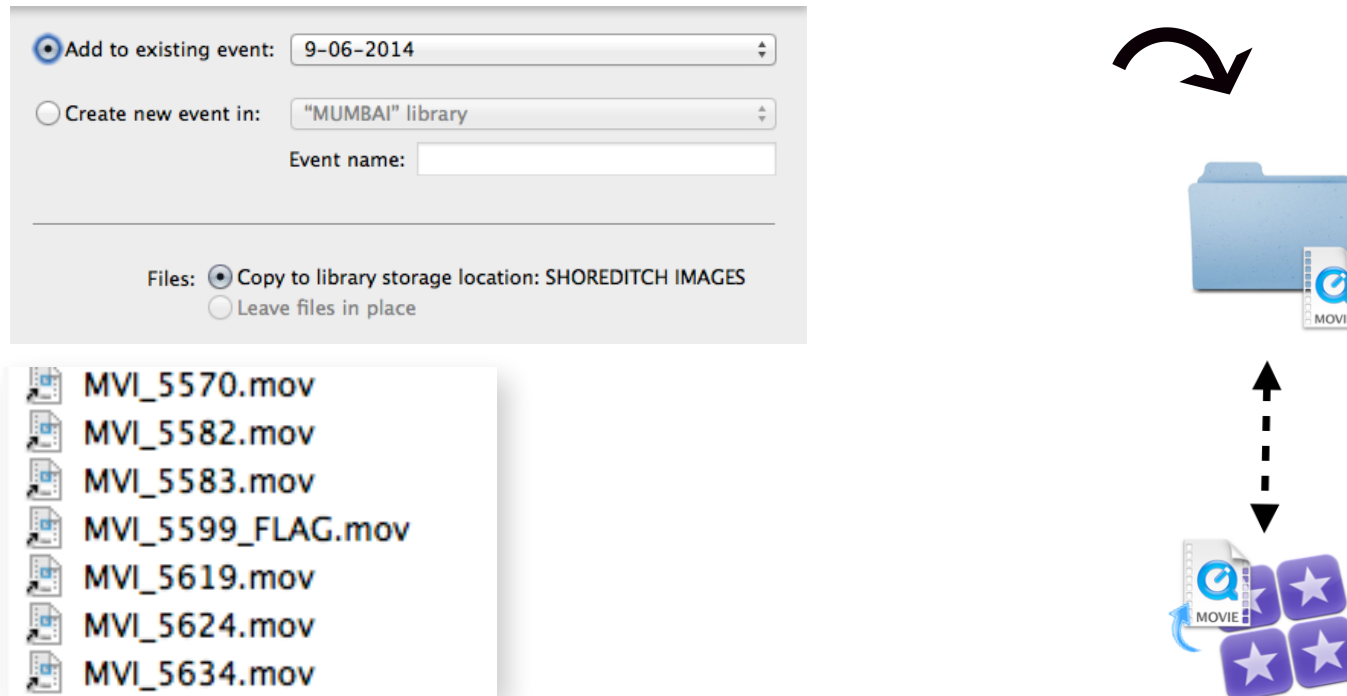
Name	Size ▼
 Movies	5.84 GB
 London City	1.59 GB
 RED GALLERY	947.8 MB



Managed Media results in Libraries growing substantially in size as media is added.

External Media

If you ingest or import media into an External Folder (as below), files will be placed into a location of your choice with reference files in the Library bundle (as illustrated by the curly blue arrow).



Above: Final Cut Pro X keeps track of media via reference files in the Library / Event folder.

***** One of the main premises of this document is that shared media should almost always be External Media *****

The proper understanding and use of Library Storage Locations is the key to shared workflow in Final Cut Pro X.

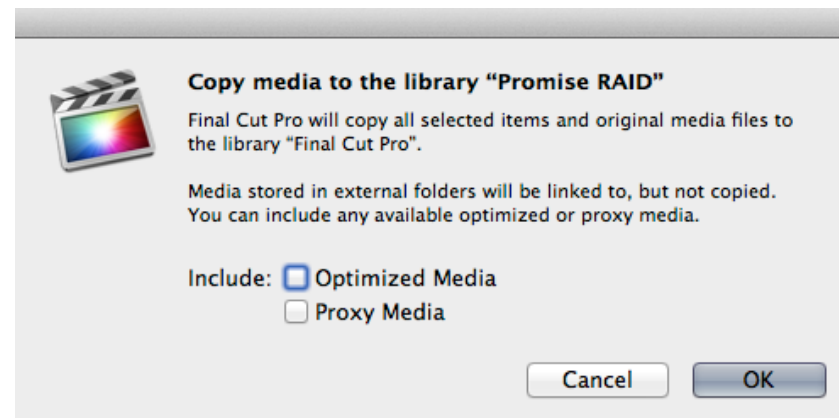
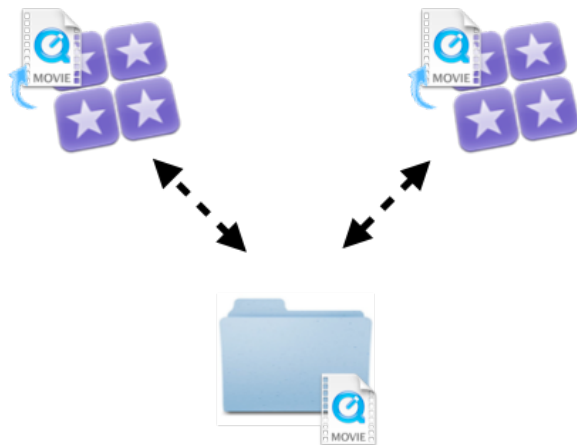
Reference Files

Reference files (often called symlinks or aliases) live inside Libraries and link to External Media.



In this document, externally-linked Libraries will always be represented with the curly blue arrow.

Essentially more than one Library or user can link to the same External Media at the same time.
Final Cut Pro X will never delete External Media (in order to protect other users).



When copying or moving reference files, the media stays where it is, opening up the way for a very efficient shared workflow.

Media Types

It is important to understand that the category of file given to media (whether External or Managed) is just that - a category. The files are absolutely identical wherever they are stored and can be moved at any time using the Consolidate function.

It might be useful to mentally sort the files associated with Final Cut Pro X into two separate groups; media and cache.

Media are the main building blocks of your edit and may take up a lot of disk space and will need a fast drive for optimum playback. The most important of these files are of course Original Media whereas Optimized and Proxy can always be regenerated.

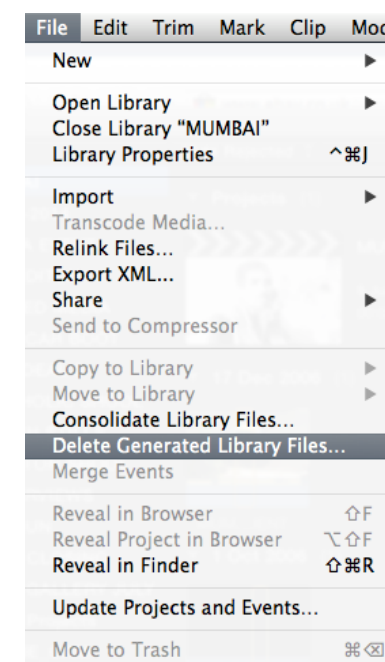
In the workflow diagrams that follow in this document, the media we refer to is generally this type of file. Cache files are much smaller files which take up less space and can easily be stored locally as well as inside the library - in fact, local would be the best place for cache files and certainly not on a Xsan. If sharing libraries across a shared transfer space, it may be simplest (and safest) to keep cache files in side your library; this will increase the library size but ensure that everything is copied when sharing.



MEDIA files; Original, Optimized and Proxy Media.



CACHE files; Render, Waveform, Thumbnail and Analysis files



Render files, Optimised Media and Proxy Media can all be deleted at anytime using the File menu.

How do I store my media?

Store your media anywhere you want, ideally on a fast and shared hard drive, array or network volume.

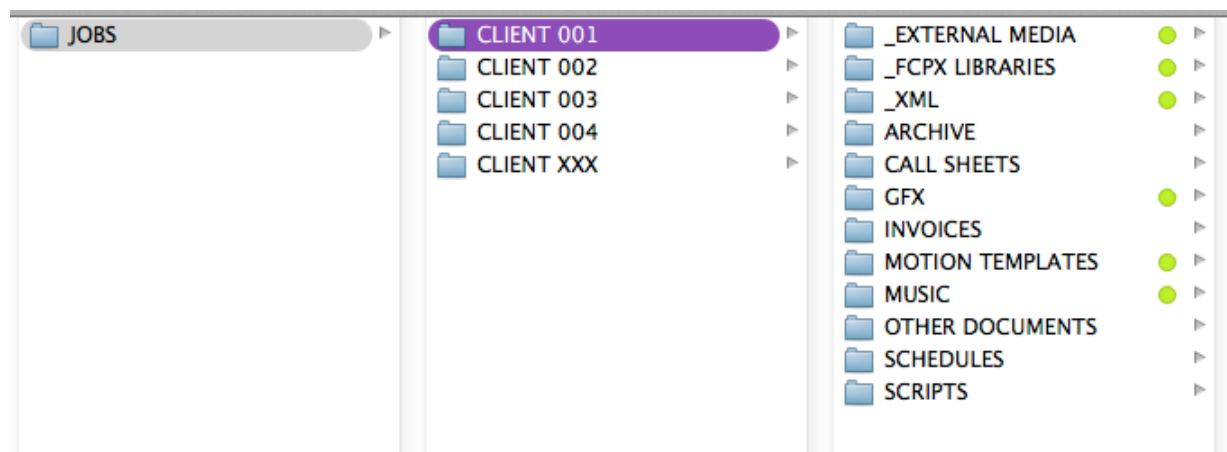
Here is one suggestion for a folder hierarchy.

A lot of our customers work on a master folder basis with everything associated with a particular job, including media, stored inside a central folder. This allows the easy location, movement and archiving of files when required.

Please note; be very careful storing text documents or in fact any small files on an Xsan, for reasons explained elsewhere in this document.

Adding several editors / producers to the mix will of course add complexity to the issue however we would always recommend a central repository of master folders for Final Cut Pro X transfer & sharing.

Archiving and copying is very easy with a set-up like the one below.



An important note about Local flash / SSD storage

As mentioned at the beginning of this document, if you have a recent Mac, your internal drive is very likely to be your fastest storage solution. This is a potential game changer and has implications for both media and Library storage.

Mac Pro flash storage is offering up to 1200MB/s and with Thunderbolt 2, the ability to copy files to and from shared storage is very very fast. The copy / move / consolidate commands in Final Cut Pro X, facilitate this easily and what is more perform tasks in the background.

Using the above architecture, the Xsan now becomes the bottleneck - what a luxury!

We may soon be looking at set-ups where central storage is used as a media repository but files are copied locally for playback - this goes against everything we have been taught!! Until now!

A couple of examples of how this may affect workflow:

1. Portability - if media is moved locally, computers will have all is needed for full resolution playback, offering true portability for up to 4K playback from a laptop. No longer are offline quality files needed (although Final Cut Pro X retains the ability to create and easily move these files).
2. Load-sharing - consider a 40-seat Xsan trying to playback 40 (or more) streams of 4K video. It may be easier to copy and playback these files locally taking the load off the central server. With current transfer speeds and background processing, the copy process is no longer a major obstacle.

Backing Up

Before we crack into the meaty part of this document, let's briefly look at the back-up options now available in Final Cut Pro X.

Backups

Final Cut Pro X will regularly create backups of open Libraries if this function is enabled.

Location of backups are specified in Library Properties, to ensure for example that backups are written to a separate location (ideally a separate drive) for additional security.

Duplicates and Snapshots

In addition to backing up an entire library, you can now backup your projects very easily. There are two choices for this and it is important to understand the difference between Duplicate and Duplicate As Snapshot.

Duplicate - literally does just that - it duplicates a project inside of a library. If any shared compound clips or multicam clips are changed in the original Project (or Event), they will also be changed in a duplicate. This can be a good thing however great care is needed.

Imagine you have a project template for an ongoing show made up of 12 episodes with a compound clip at the beginning for the title sequence. After finishing all 12 episodes you realise you want to make a change to the title sequence. All you have to do is change this one compound clip and the changes will ripple through to all 12 episodes. A huge time saver but also very dangerous if you didn't want that to happen. To keep versions of the title sequence independent in each episode, you would use "Duplicate As Snapshot" to copy the project as a wholly independent entity. Exactly the same rules apply for multicam as compound clips (for example you could colour grade the clips in a multicam clip and these changes would ripple through the entire Library - unless you had used Duplicate As Snapshot.

Snapshot - A snapshot will do exactly the same as Duplicate however any compound clips or multicam clips shared between other projects will be become independent to the original, effectively writing this Snapshot Project in stone whatever changes are made to the original Project. In fact, when this happens, a new independent "parent" copy of multicam or compound clips will be created in the Library.

Render files - both Duplicate and Duplicate As Snapshot share the render files from the original Project meaning that the process is both very quick and a clever space saver.

Shared Workflow

There are two specific methods to share work in Final Cut Pro X.

- Libraries / Events / Projects
- XML

Before we look at specific examples, let's have a brief look at some of the functions that can help with shared workflow. These functions (most from the File Menu) are:

Move / Copy Events, Projects & Clips

Use to move Final Cut Pro X assets between Libraries (new or existing).

Consolidate (Media)

Use to move media between locations External or Managed.

This function affects media files and may not produce any visible change within the Final Cut Pro X GUI.

Essential to keep track of media and at the end of a job for archiving media into one place.

Merge Events

Use to combine two or more Events from the same Library into one Event.

Export / Import XML

XMLs are small files that describe almost everything about Libraries and Events. No media is contained inside XML so transfer is lightening quick. XML is particularly important for metadata exchange between third party apps (such as sending a Project to a colour grading or sound missing application).

It is also a useful method for backing-up but there are many more clever uses, such as transferring keywords and collections between users, even before any media is added. Take care with project XML as only a limited range of information is transferred with Project xml.

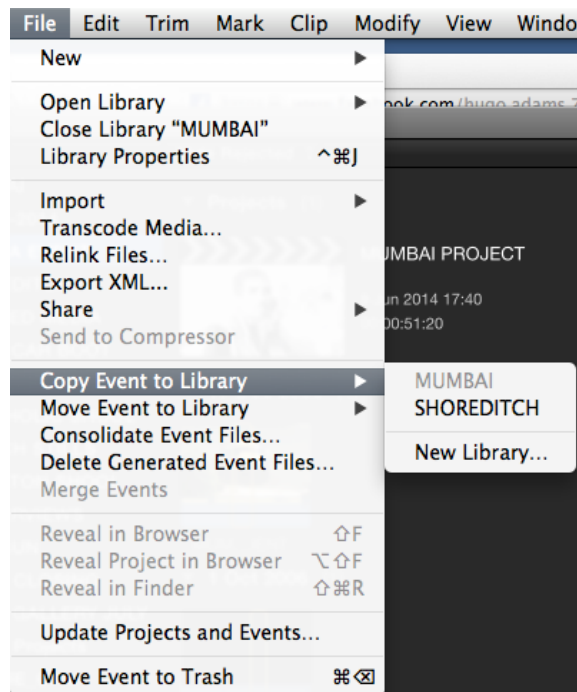
The basics of these functions are described below:

Copying and Moving Events

Copying / Moving Events is one of the most powerful media management tools in Final Cut Pro X. You can use it to copy an Event to an existing Library or create a new one.

A master Library can be split into constituent Events allowing only relevant media and metadata to be allocated to different users; such as teams or episodes.

The use of centrally located, External media makes this process very quick and efficient, whereby multiple users can access the same media whilst accessing totally separate working Libraries.



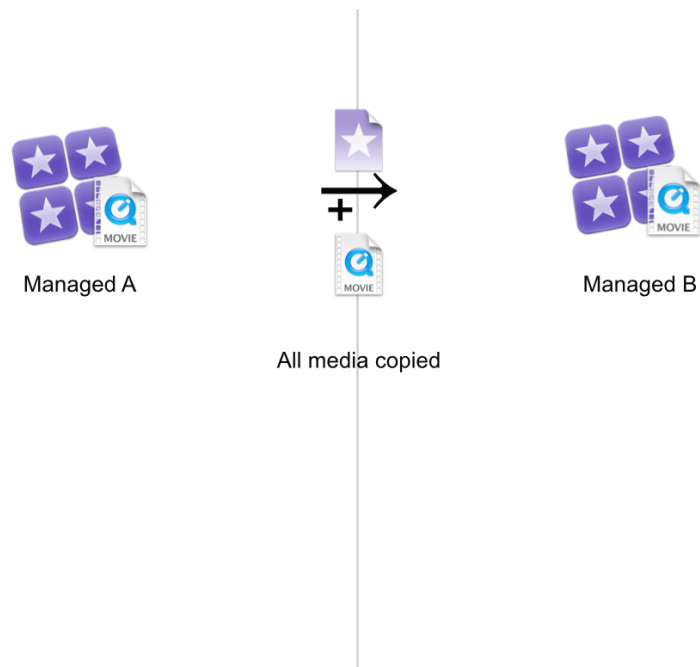
The move command is just below “Copy” in the above picture.

(We would not recommend using move too often - however there may be times when you need to, because you are getting low on space drive.)

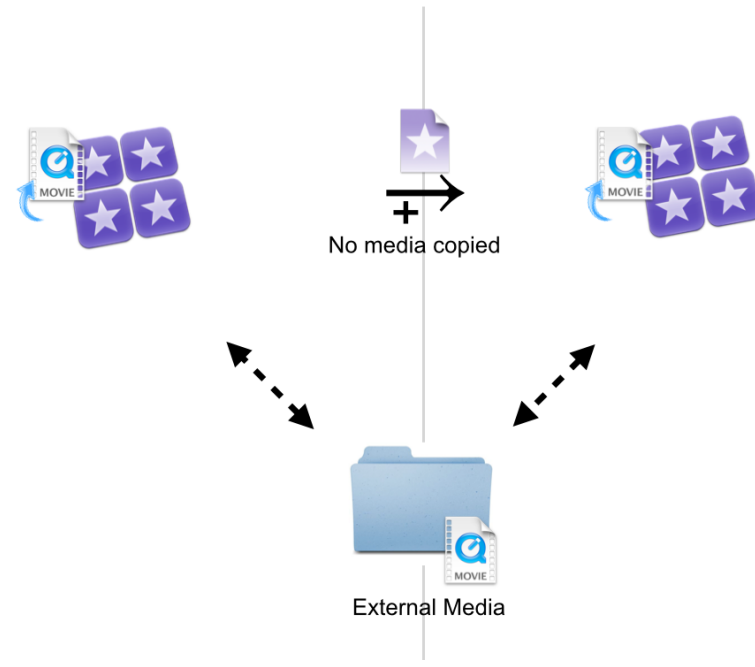
Copying and Moving Events - What happens to media?

The most important rule for using these functions is illustrated below.
Refer to the Final Cut Pro X manual for detail.

**Copying / Moving Events with Managed Media
results in media being copied.**



**Copying / moving Events with External Media
NEVER results in media being copied.**



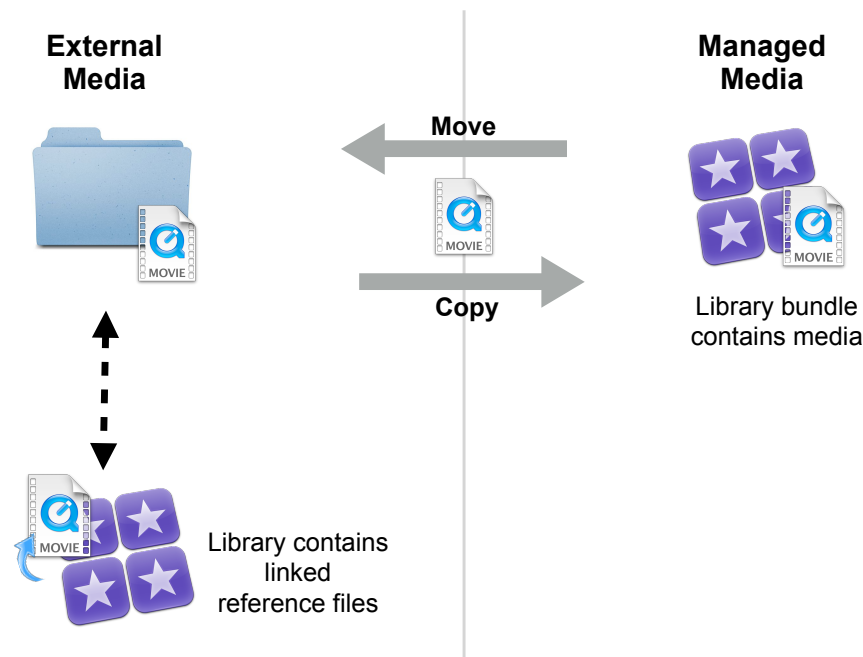
NOTE: Consider that it is very possible to have a mixture of Managed & External media in all these scenarios - hence the Consolidate function.

Consolidate

This command in the File menu or Library Properties allows media to be moved around without making any changes to the Events. Make sure you understand the difference between this and the Copy / Move functions on the previous page. There are VERY important differences to understand in this function depending on whether you are consolidating Managed or External media (or a mixture of both).

- Consolidate Managed Media to External - MOVES the media and leaves reference files in the source Library.
- Consolidate External Media to Managed - COPIES the media, leaving the original media in place
- Consolidate External Media to External - COPIES the media.

This functionality ensures that no shared media is ever deleted by Final Cut Pro X. (That is up to you when the time comes.)



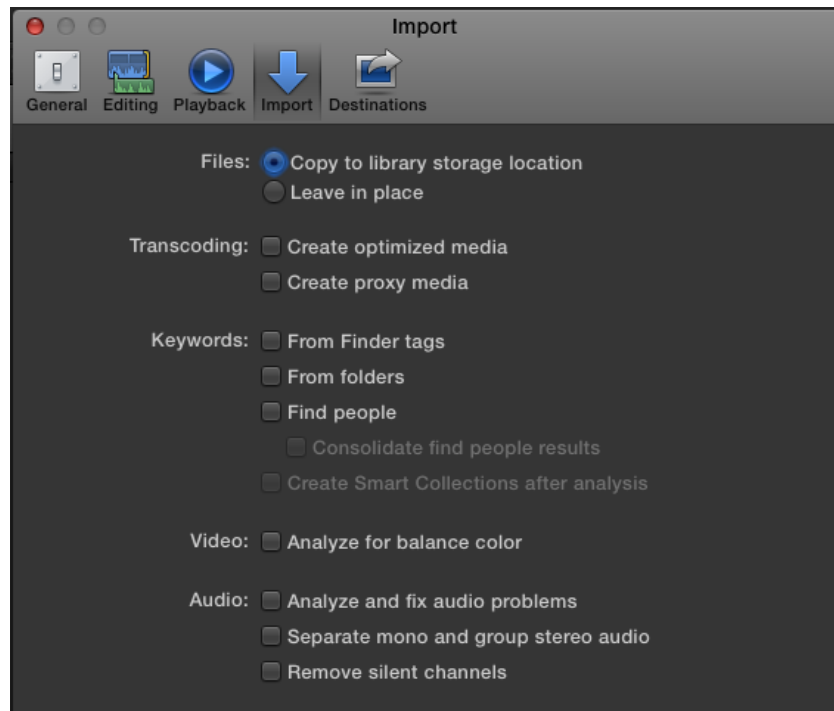
Bear in mind that Consolidating media across drives will effectively be a copy / delete process and so will take time.

A few XML rules

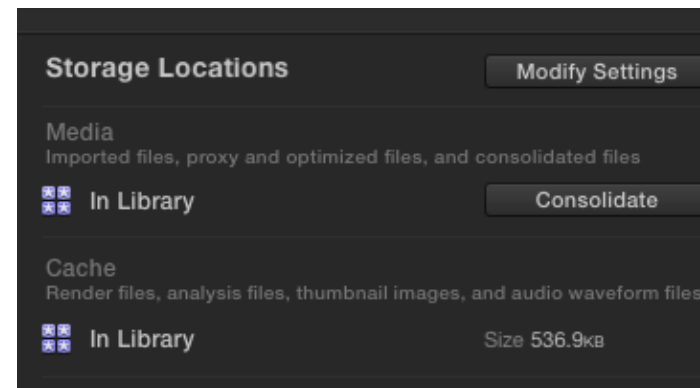
This is not a comprehensive list of XML functionality - just a few of the most common tasks that you may need to perform.

- If an Event XML is imported, a new Event will be created identical to the one that was exported.
External links are retained and media will automatically relink to clips.
- If on import, an Event already exists with the same name, a duplicate Event will be created with an incremental number after the name.
(e.g. - an Event originally called Monday will import a second time as “Monday 1”).
- If a Project XML is imported into a Library, Final Cut Pro X will look for existing clips to link to.
If no clips are present, Final Cut Pro X will create an Event that contains ONLY the clips needed for that Project.
- More than one XML file can be imported at the same time and an entire Library can be exported (resulting in multiple Events on reimport).
- XML files can be created from Events with no media - in other words, just metadata; keyword and smart collections.
- When importing an XML, the setting in the preferences dialogue (see below) will determine if media is copied or left in place HOWEVER the Library Properties dialogue will determine where media is imported to (if any).

XML Import



When importing an XML, the setting in the preferences dialogue (above) will determine if media is copied or left in place.



The Library Properties dialogue will determine where media is imported to (if any) HOWEVER you must set this before importing the XML.

PROs and CONS of XML

Pros

XML files are effectively read-only - no danger of valuable metadata being lost (you can change an XML if so desired but it is not a one-click process).

Third party compatible - can send work for colour-grade and audio mix (media needed).

Very small to copy / send.

Can share almost immediately.

Cons

Extra stage of managing import / export can confuse editors.

Naming conventions of files may not be obvious - (an xml file can be called something different to the contained Event or Project).

Can get messy with lots of versions - needs a bit of housekeeping to delete older versions.

XML does not contain render or other cache files which will have to be rebuilt on import. This can be a major factor if there are a lot of long files.

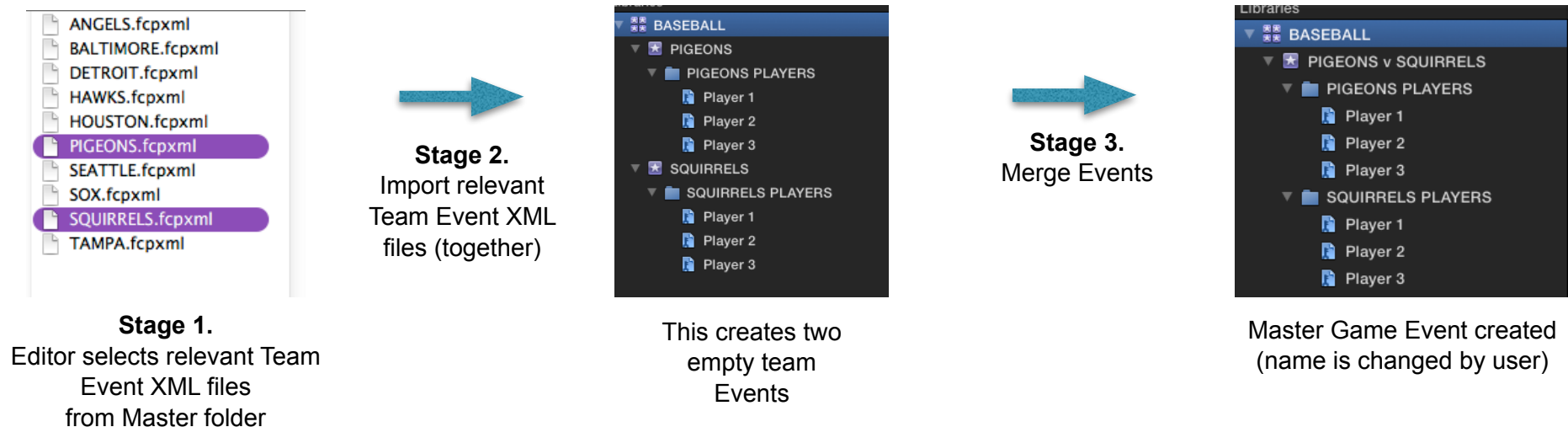
Project xml does not contain all information about the project.

An XML example - Baseball

One fantastic but not obvious use for XML is the transfer of logging criteria BEFORE an event has happened, before media has been created.

Imagine the baseball season - in short, a lot of games, a lot of players. For every match, it would be great to have a log of every ball with each player's name involved in that ball. In other words keywords. There is a lot we can do to prepare for the logging before each match begins.

- At the beginning of the season each team provides a team-sheet.
- A master "team" Event is created for each team with team name & player's names as keyword collections.
- Anything else could be added as keyword collections such as "Home Run", "Strike", "Catch" etc etc.
- At the beginning of the season, the metadata department will have an empty team Event (empty meaning no media) for each team.
- Each team Event is then exported as xml into a central transfer folder (Stage 1).
- These team XMLs are distributed to all editors, who can then import (Stage 2) & combine them (Stage 3) into single game specific Events.



Library Storage

This really is the key to shared workflow. How are Final Cut Pro X Libraries stored and shared?

Libraries can be stored almost anywhere: locally; on an Xsan; or on an NFS-mounted network volume.

(Sparse-disk images / bundles will allow Libraries to be opened from AFP or SMB network volumes but this is not recommended for performance reasons).

Central / Local locations?

Whilst central locations might initially seem the best place to put Libraries, there are other factors to consider very carefully.

In fact this may be the single most important factor affecting your entire workflow.

If you are using thunderbolt-attached local storage or an internal SSD, this will probably be the fastest location from which to run your FCPX databases. The reason? Your Xsan will most likely have been optimised for large media files and therefore not best suited to hosting the small file sizes involved in Final Cut Pro X Libraries. This may seem counterintuitive to shared workflow, however it does draw a very clear line between shared / transfer libraries which can be stored on the Xsan and working Libraries which would be best running off local storage.

Our recommendation is to use a folder on the Xsan as a “Library transfer folder” for users to copy to their own working Library storage location; to have media centrally stored and cache files local (either inside Libraries or in another local folder).

The following page illustrates potential single-user set-ups and the page after, shared media set-ups in regard to this Library storage conundrum. All of these are perfectly reasonable set-ups; their efficiency will depend on the technical considerations we have discussed.

These two pages may be the most important to consider in this whole document when evaluating workflow choices.

NOTE: With Final Cut Pro X 10.1.2 there are now two choices to make for storage - Media & Cache.

As well as Library placement, do not underestimate the importance of where you store your cache files, especially if you are using a lot of footage.

Bearing in mind that these files can also grow quite large (Render Files) an external but locally attached drive will perhaps be the best option.

Final Cut Pro X Library / Media Placement Options: Single User, direct-attached storage

A



METHOD - For managed media, create a library on external storage and choose “*In library*” in the Media/ Cache settings in Library Properties.

PROS - Safe and secure - all media is contained in one place.
Lots of storage space and minimum worry about media location.

CONS - Performance limited by connection to and speed of external drive.

B



METHOD - For managed media, create a library on local storage and choose “*In library*” in the Media/ Cache settings in Library Properties.

PROS - Safe and secure - media in one place
Current Mac Pro specs indicate internal speeds quicker than many disk arrays.
Library close to CPU / GPU / RAM.

CONS - Space limited to internal drive (often a 256G SSD)
Playing media from the boot drive may add extra load.

C



METHOD - For external media, choose a folder on the storage as the Media Location in Library Properties.

PROS - Very versatile. Splits load between drives - external (media) and internal (Libraries) may yield the best performance.

CONS - Requires extra degree of media management, as it involves External Media .
May not be as fast as B above, depending on hardware speeds.

Final Cut Pro X Library / Media Placement Options: Shared Media / Xsan

A



METHOD - To create external media, choose an external location in the Media & Cache storage settings. Store library locally.

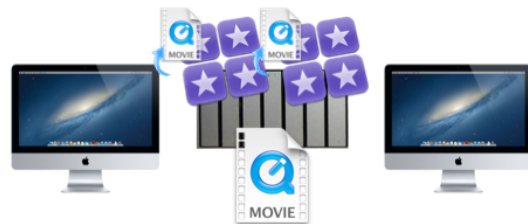
PROS

Media load placed on server while local drives do the heavy lifting with Libraries. Keeping Libraries local protects work and metadata.

CONS

Libraries (or xml) have to be transferred to / from central storage for sharing.

B



METHOD - To create external media, choose an external location in the Media & Cache storage settings. Store library externally (in another folder).

PROS - Centrally stored Libraries easier to share.

CONS - Not taking advantage of fast internal architecture

Danger to metadata in shared environment.

Potentially confusing - who owns what? Danger of deletion!!

Small database files not good working on an Xsan.

C



METHOD - To create managed media, choose "In library" in the Media & Cache storage settings and store library on the Xsan. (This solution not recommended for shared storage).

PROS - Media all together.

CONS - Shared managed media has extra levels of complexity and danger of deletion.

Library Placement Options - Xsan Storage Pool Configurations

In terms of shared storage / shared workflow, our main recommendation is option A on the previous page.

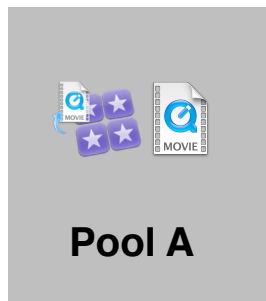
However, as we hope we have made abundantly clear, there is not one simple answer to where you should store Libraries. If your workflow involves continuously sharing Libraries (as in option B or C above), it may be worth considering centrally-stored Libraries.

If this is the case, we can go another level deeper; into the realm of volumes, LUNs and storage pools to try to optimise the Xsan location for Library storage.

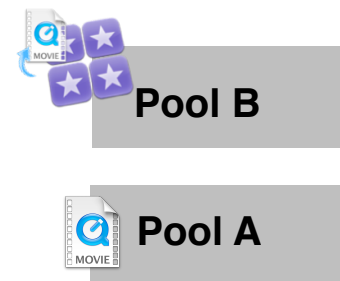
One way to achieve this would be using dedicated volumes / pools on an Xsan. Whilst this would certainly help to an extent, it will most probably not give you the performance of working from a Library on a local flash drive inside a Mac Pro with connectivity of 1200MBs.

Then again if you are working with an older Mac, this may be your best option.

Speak to a specialist for more details on Xsan configuration and test, test and test again before committing to a set-up.



One large pool



Separate storage pools

*The above schematics represent two (of many) ways to configure an Xsan.
Usually the media pool would be allocated more space than the Libraries.*

Where is my metadata?

And where does it come from?

Metadata can originate from almost any source. In Final Cut Pro X it is captured and stored in the databases of Libraries, Events and Projects.

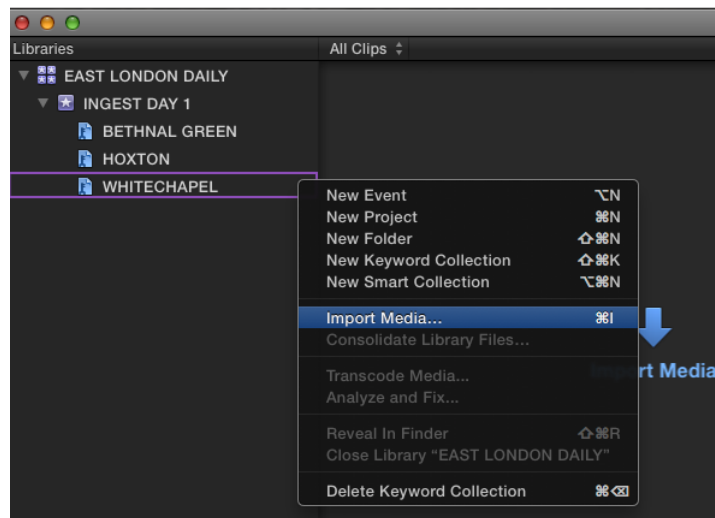
Some metadata is created in camera, some might be created on set and some is created inside of Final Cut Pro X. Format, keywords, favorites, notes, markers, names and camera angles are all metadata.

Final Cut Pro X being database-driven, is almost infinitely capable of creating and working with bespoke metadata that fits any need. Example metadata might be footballers' names, bird species, gps data, fashion season, model name, catalogue number and barcode.

In large organisations and modern workflows, the retention of this metadata is essential. This is often referred to as maintaining genealogy. In other words, the media remembers where it came from and what it is (a positive quality in most situations!) Once word is out, clients will start to expect a clear metadata route through any job so they can take away richer data than simple rushes.

Log once, use many times

An example; a reality TV show has a scene that everyone wants to use in their trailers, promos, graphic stings, title sequences and interviews. Rather than everyone searching through hours of rushes, a team of people log the footage allowing all staff to access this database.



Left; Import clips directly into a keyword collection to add that keyword to the clips on import.

Example Workflows

For the rest of this document, we illustrate real world situations that many people will already be familiar with. We have broken this up into two parts:

Collaborative

These scenarios will help explain workflows that involve swapping out work with another user as opposed to sharing media. Examples would be handing off a job to a colorist for grading or sending viewing copies to producers. Who as an editor hasn't had a client walk through the door with a hard drive?

Shared

This is the real deal - two or more people sharing the same media at the same time.

KEY

In our diagrams;

A solid arrow denotes media transfer from one storage location to another



A broken arrow denotes workflow with no media transfer
(e.g. XML or Library copy)



Collaborative Workflows

These next four workflows involve one person doing the work and then handing that off to a second party as opposed to working together concurrently. Users could be next door to each other, down the street or in different countries.

A. Physical Drive Swap

Sending a drive physically from A to B



B. Library Cloud Workflow

Uploading a Library to the cloud



C. XML Event Workflow

Emailing an Event XML



D. XML Project Workflow

Emailing a Project XML

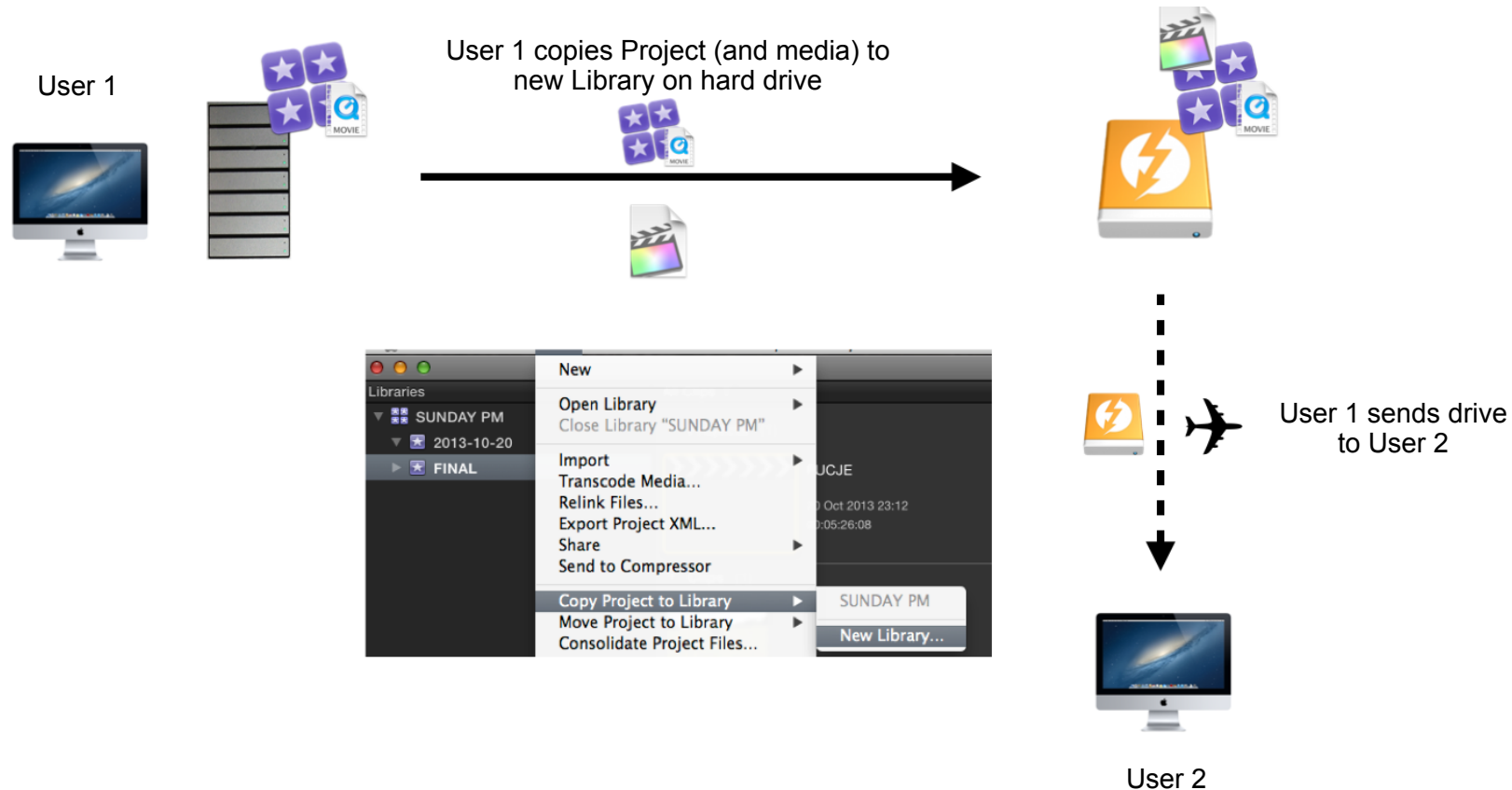


Note; generated files are not so important in these collaborative workflows as they can always be recreated.

Collaborative Scenario A - Physical Drive Swap

Two Users, separate locations - Portable Drive.

User 1 finishes cut and sends Project and media to User 2 for finishing



Suggested workflow

Managed Media

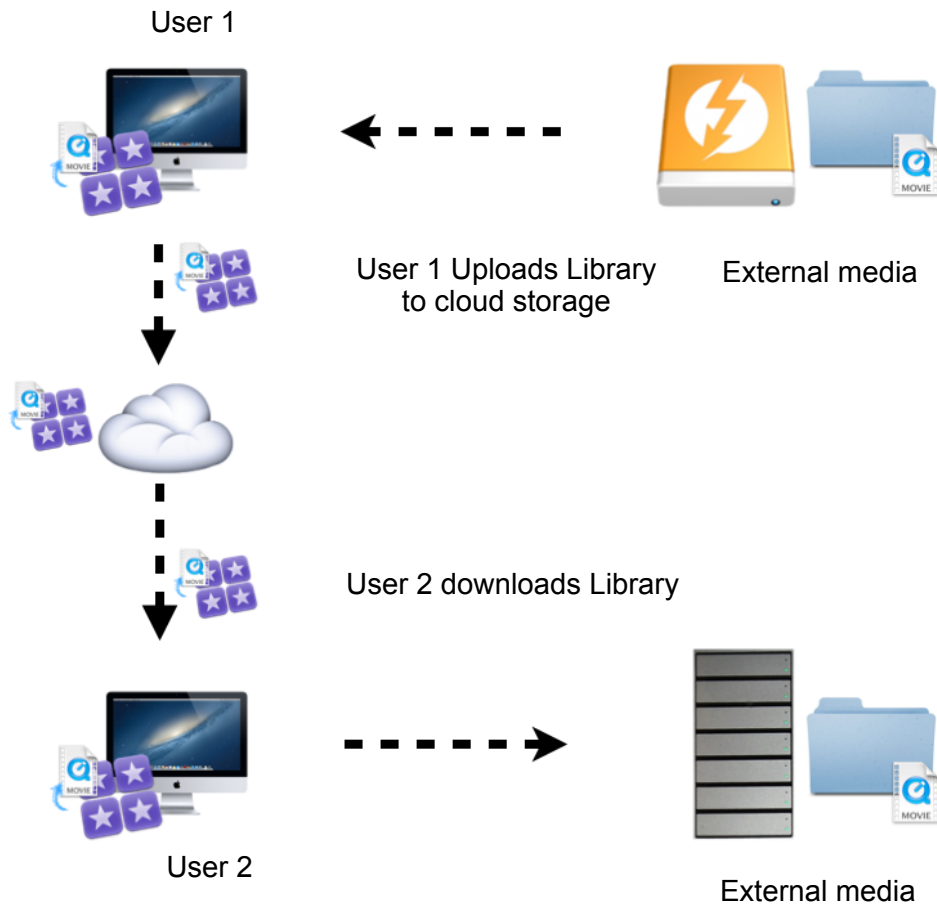
Simple transfer of drive is all that required.

Simple plug and play.

Collaborative Scenario B - Library Cloud Workflow

Remote users, both have identical copies of media.

User 1 uploads Library to cloud storage.

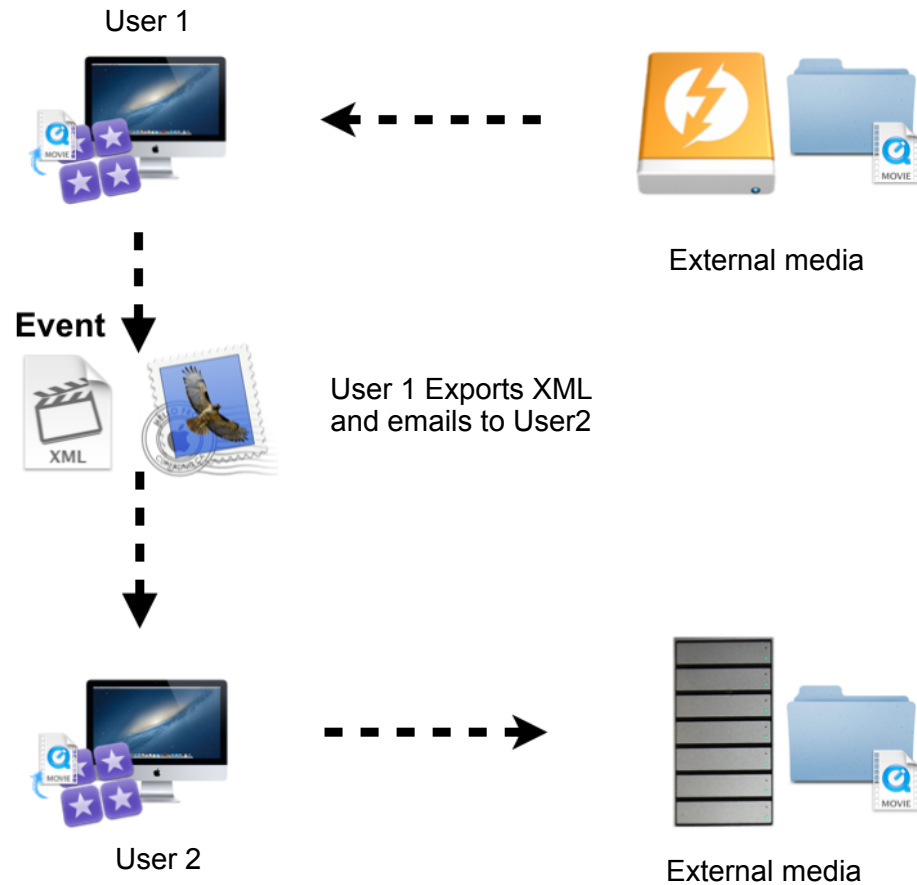


Suggested workflow
External Media & Cache.

Collaborative Scenario C - XML Event Workflow

Remote users, both have identical copies of media.

User 1 emails Event XML.



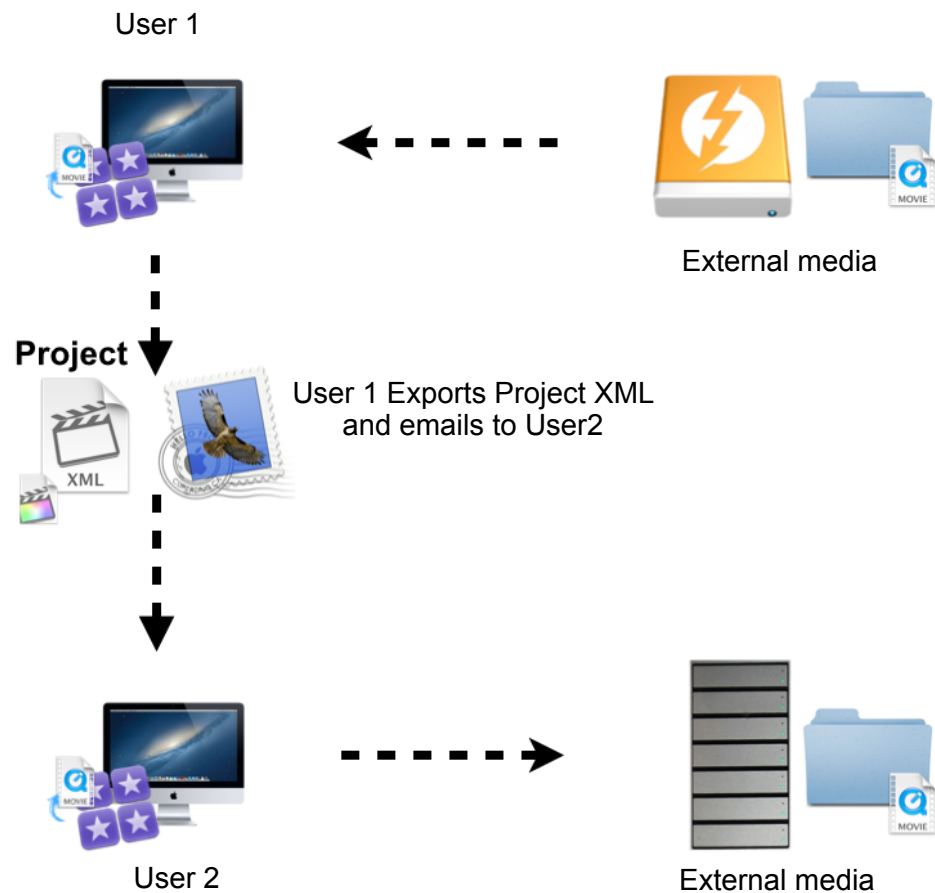
Suggested workflow

External Media (identical folder structure)
Event XML exported, emailed & imported

Collaborative Scenario D - XML Project Workflow

Remote users, both have identical copies of media.

User 1 emails Project XML (the associated event created will only contain the used clips).



Suggested workflow

External Media (identical folder structure)
Project XML exported, emailed & imported

What about Extra Media?

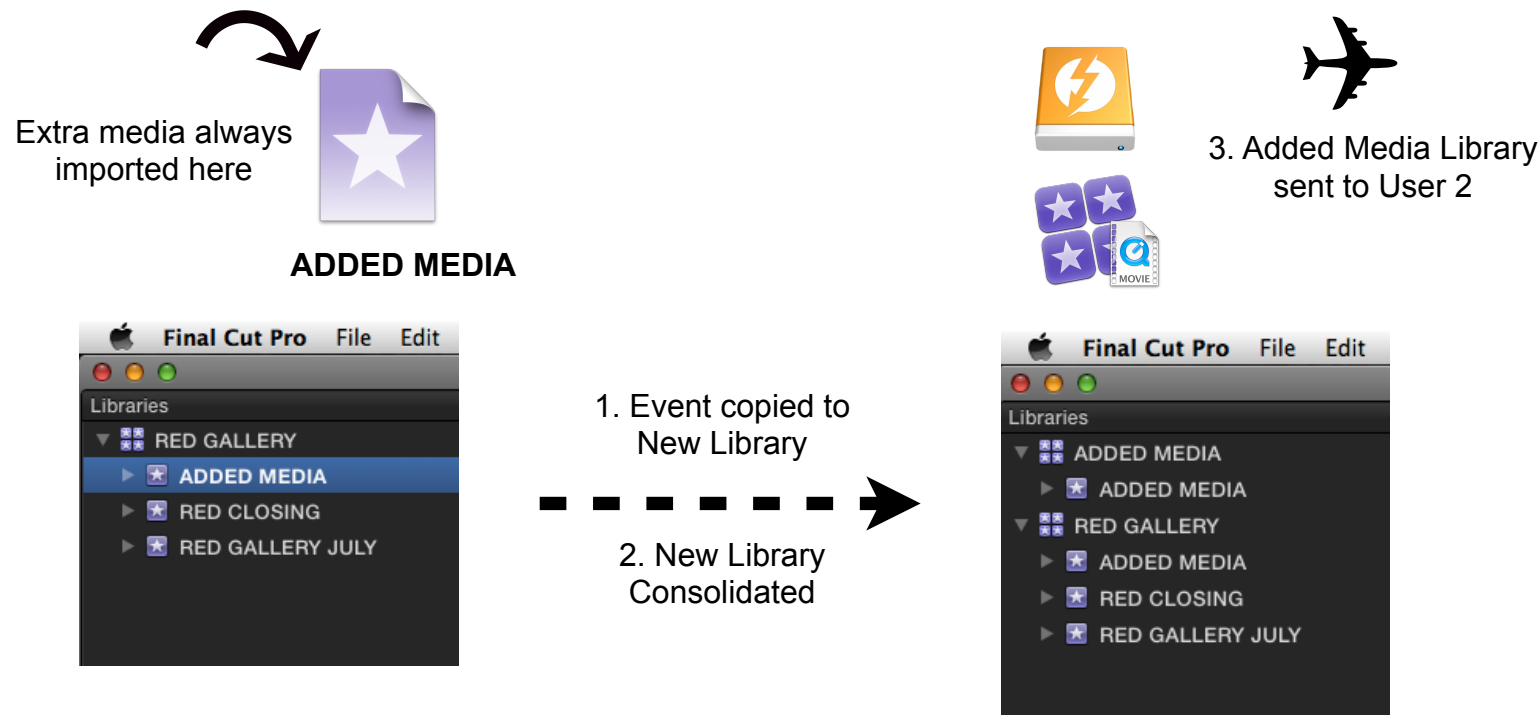
In all the above scenarios, it will of course happen that extra material will be added to Events and Projects after the job has started. This is inevitable - for example, pick-ups, last minute graphics, titles, music and voiceover.

Suggestion

To keep track of these extra files, keep an ADDED MEDIA Event specifically for this purpose. If possible, bring all new footage into this Event as managed files.

When exchange is necessary, the new ADDED MEDIA Event (and media) will have to be sent to User 2. The consolidate command will copy media into a single folder which must also be sent with the Library. (Hence managed being the easiest option). Keeping this media separate from other Events will make this process infinitely more manageable when the time comes to consolidate.

NOTE: Motion Templates and plug-ins will have to be copied separately.



Shared Media Workflow

The following examples start with a basic Xsan share in example 1. This is then broken down into detailed stages. Examples 2 to 6 then add levels of complexity to this same basic set-up. The majority of these cases use Xsan but we also look at working with network volumes - the principles are almost the same.

In general, these workflows move left-to-right.



1. Basic shared set-up

The classic Xsan, fibre-connected solution. Here we break down the workflow into several stages, starting with a detailed macro-diagram and ending with a finishing diagram, involving colour-grading and audio mix.

2. Ongoing production / shooting

Adding logging software such as Shot Notes X or Lumberjack which use XML as their conduit for metadata.

3. Growing Files

In many live or “as-live” events, there will be growing files. These files will essentially need to be accessed before they have finished writing to disk. Final Cut Pro X is more than capable of this with both Quicktime and MXF files.

4. Add a Media Asset Manager

Now we add a MAM. The set-up and the number of users increases in size.

5. Network volume

Now we add a network volume for storage as opposed to Xsan. (Could equally have both). This will work best with 10GigE but could be a good solution for companies already running ethernet solutions.

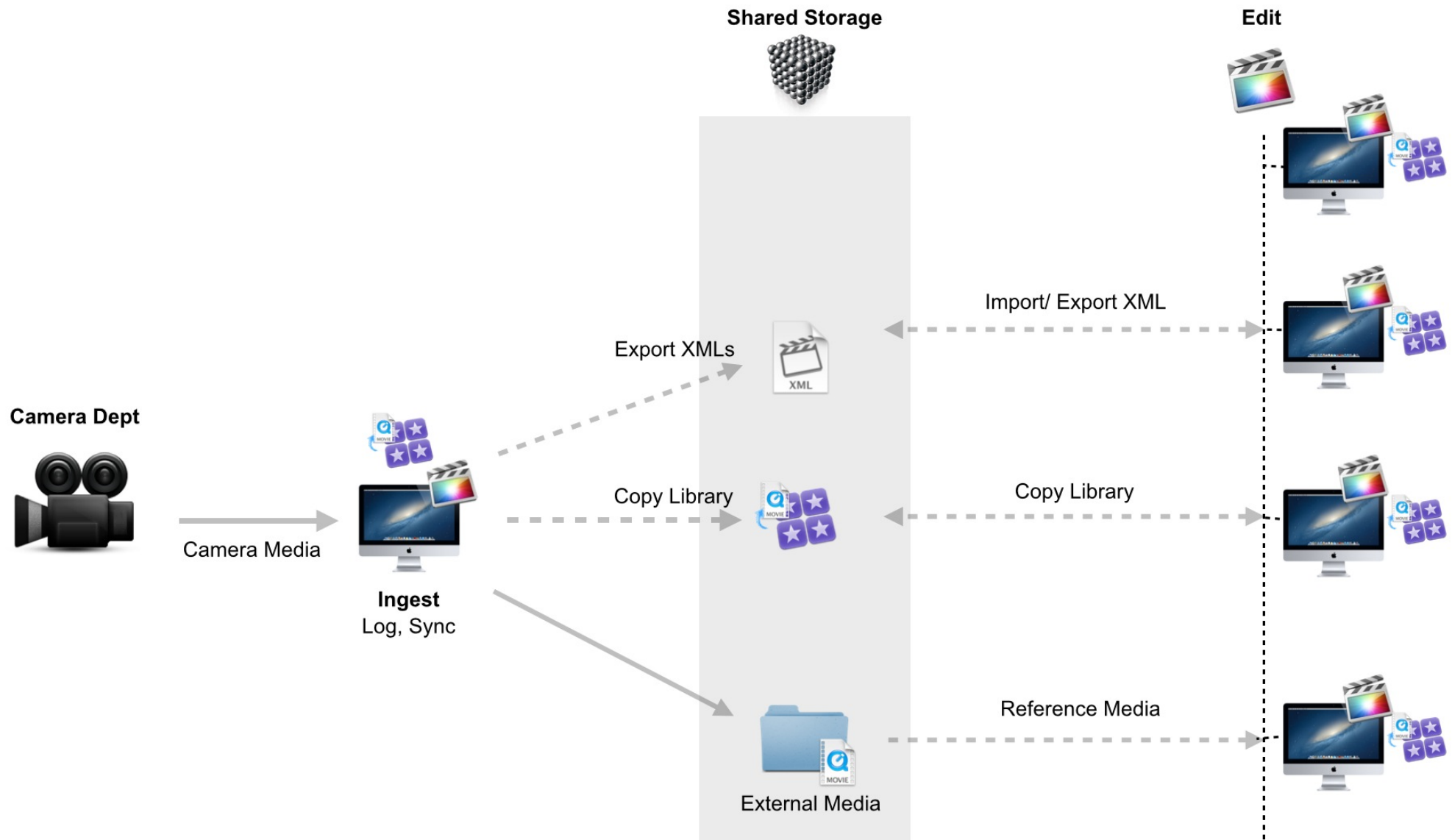
6. 4K film workflow

There are many variations on this theme depending on format and many other variables. This is simply one example.

NOTE:

We have already discussed Library placement but just to reiterate, there is no silver bullet, no catch-all solution. There are simply too many variables. What these workflow diagrams illustrate is tested working proof-of-concept only. We have run these on a working Xsan and tested media workflow. This is no guarantee of performance once multiple users start hammering away depending on a host of variables.

Shared Scenario 1 - Basic Xsan Sharing



Shared Scenario 1 - Basic Xsan Sharing continued

Let us consider this set-up in detail and use these principles for the basis of all the other set-ups. Once you have grasped this one set-up, the same rules apply across the board.

Here we have several editors (four shown, but many more possible) being fed by one ingest station (others could be added). The ingest editor creates uniquely External Media on the Xsan, directing all media into a master folder, probably creating discrete media folders for each Library.

USERS WORK FROM LOCAL LIBRARIES - shared storage is only used for media and transfer folders. This is proven to be much more responsive.

Once ingest is finished, copies of Libraries or Events (or both) are shared into the transfer folders on the SAN.

Editors then copy locally to edit.

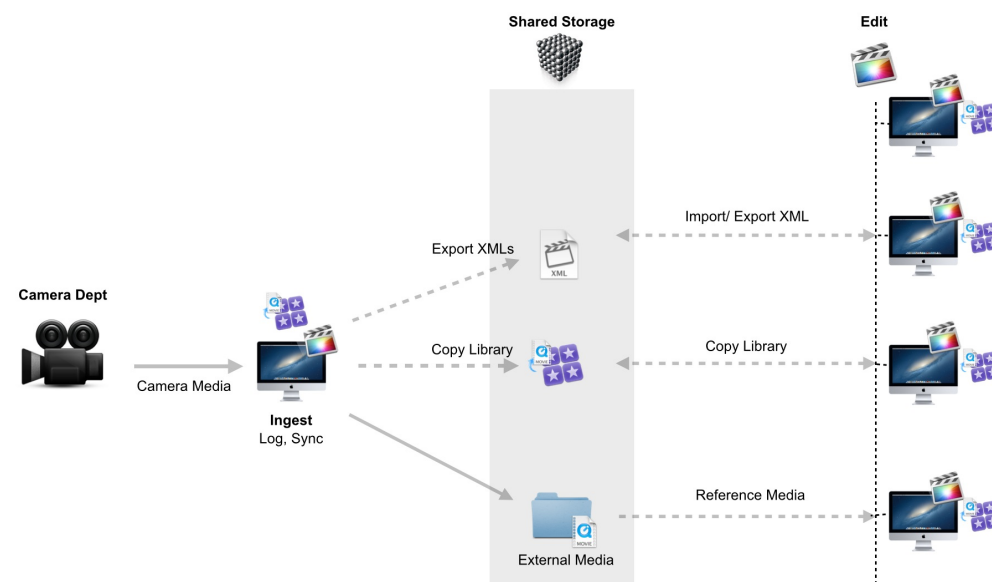
Each editor has their own “Share” folder which can be used for exchange between editors.

XMLs for each event are also placed into another Master folder, providing not only a back up but also an alternative, safer way of metadata access.

In addition to “Share” folders, each user has “Output” folders which they can use to copy Projects / XMLs when they have finished working.

The server-side folders may look something like this.

- ▶ EDIT 1 OUTPUT
- ▶ EDIT 1 SHARE
- ▶ EDIT 2 OUTPUT
- ▶ EDIT 2 SHARE
- ▶ EDIT 3 OUTPUT
- ▶ EDIT 3 SHARE
- ▶ EDIT 4 OUTPUT
- ▶ EDIT 4 SHARE
- ▶ MASTER EVENTS READ ONLY
- ▶ MASTER XML READ ONLY



Let's now break this workflow down into stages...

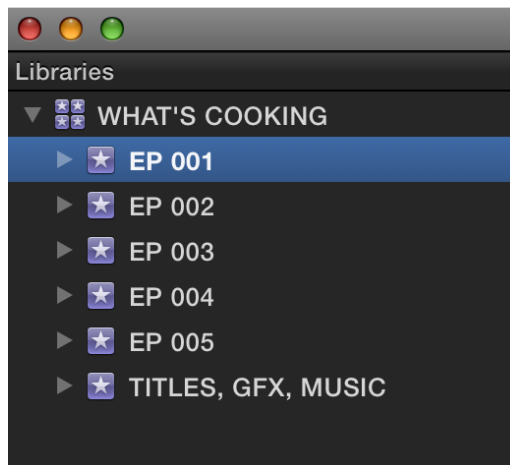
Shared Scenario 1 - Basic Workflow Breakdown

Stage 1 - Ingest

As an example, let us imagine a series (season) of half-hour cookery programmes that combines various elements (studio, location, archive) into weekly episodes. One editor is in charge of each programme with a dedicated ingest editor.

For the purposes of simplicity, let us assume initially that all the rushes are shot before the editing starts.

First off, over a period of days, the ingest editor pulls everything into one Library using External media storage only. A discrete Event is created for each episode and there is a generic Event for titles and graphics.



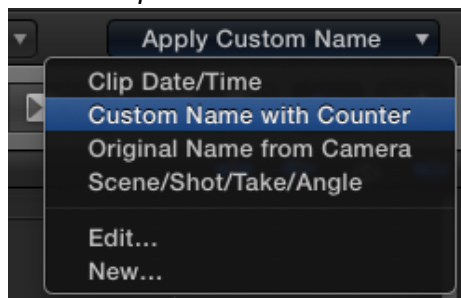
Shared Scenario 1 - Basic Workflow Breakdown

Stage 2 - Logging

Logging can be done by the ingest editor or by the actual story editor (or realistically both).

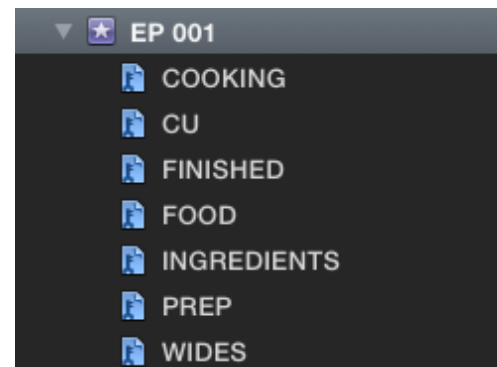
If logging is done at ingest into a Master Library, everyone receives the same set of metadata or editors can request their own sets of logging criteria.

Below: Clips can be batch-renamed at any time from the inspector (best to do this earlier rather than later).



Keywords are one of the most versatile and easy ways to quickly log footage.

Add keywords to entire clips to quickly categorise them and use range-based keywords to break clips into portions.



Other common logging fields are reel, scene, notes, markers.

(Favorite / rejected ratings are also useful but do not transfer to a Project).

Shared Scenario 1 - Basic Workflow Breakdown

Stage 3 - Sharing Libraries and Events

Once logging is done, discrete Libraries containing just the clips and metadata needed for a particular episode can be shared out to the relevant editor. As all media is central, this is just a simple information exchange. This can be done two ways - via Libraries or XML. Or both.

Library method

Each episode Event (along with the Generic Titles) is copied into a separate Library in a shared transfer folder on the server - this Library is then copied to each editor's own folders when necessary.

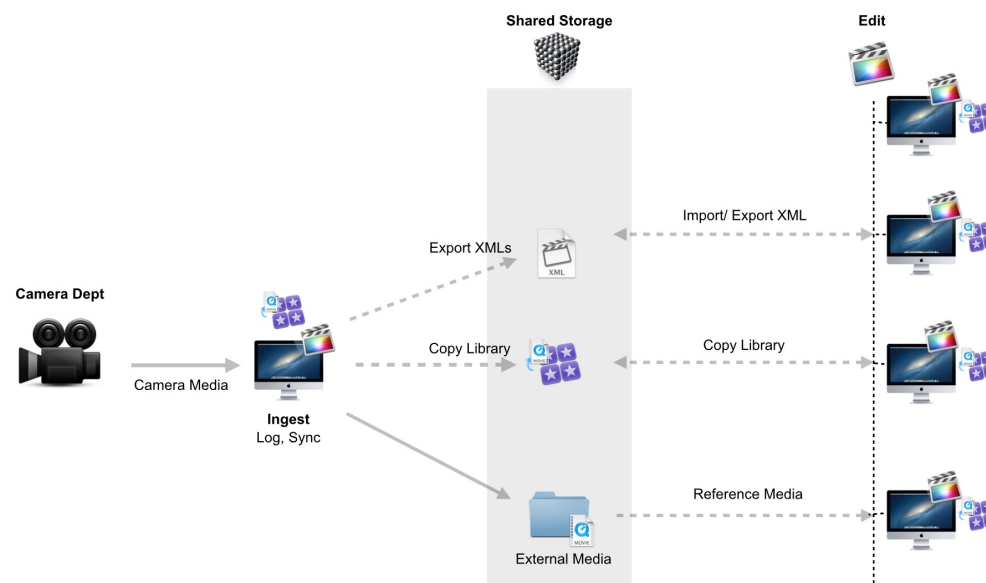
(Note - copied not moved - always much safer!!)

Alternative (Complementary) XML Method

Discrete events or entire libraries are exported as xml files into shared folders.

As we have seen previously, two or more Event XMLs can be imported in one go. If a Library is exported, it will be imported as its constituent events.

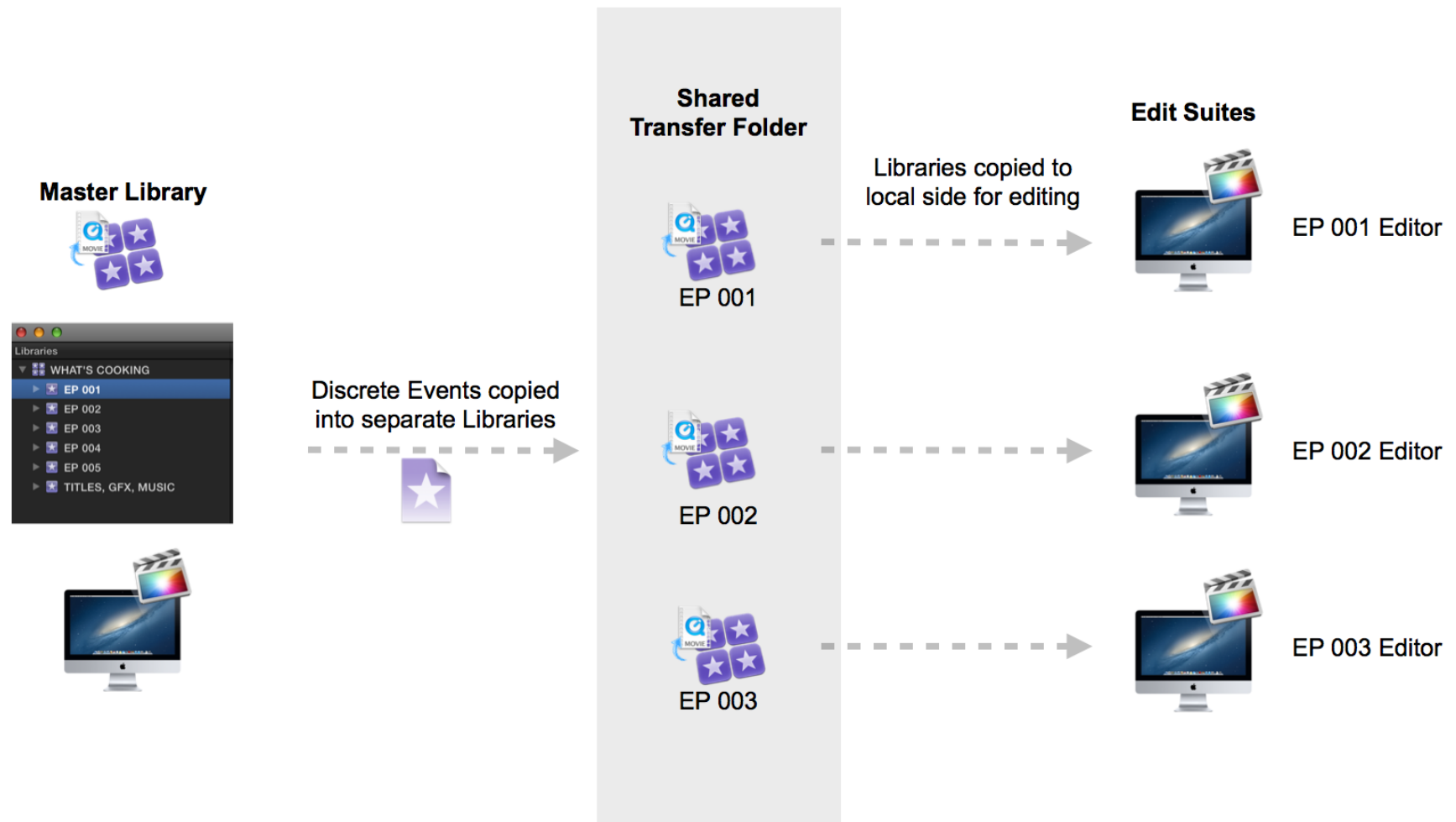
Let's concentrate on the Library method for the diagram on the next page...



Splitting Libraries Into Components

The Master Library created by the ingest editor is copied into discrete Libraries in the Shared Transfer Folder.

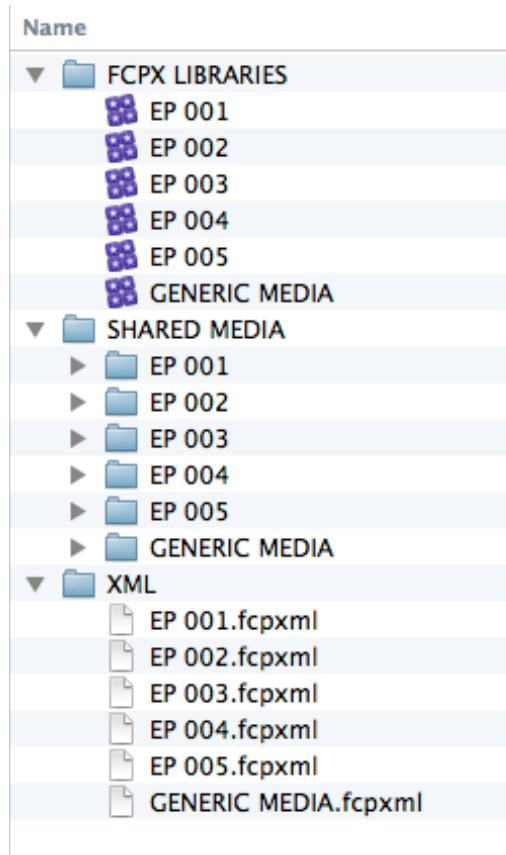
In our example, it is the ingest editor doing the sharing. An alternative would be for the Master Library to be placed on the server and for each editor to access it to copy just what they need, however one dedicated staff member will ensure a coherent genealogy (the same keywords).



Shared Scenario 1 - Basic Workflow Breakdown

Stage 4 - Set-up working Libraries

The sharing operation above may result in a server-side Master folder structure like this.



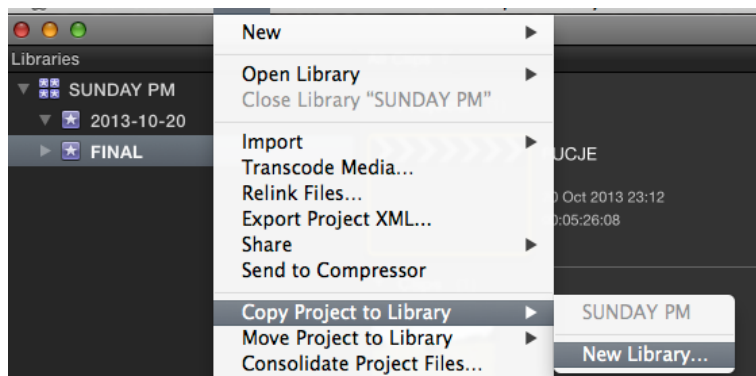
The story editors now copy the relevant Libraries (or import xml) to their local machines and start editing.

As Libraries contain no media the copy process is very quick. XML import is even quicker (and arguably safer with the caveat that Cache Files will need to be recreated with XML).

Shared Scenario 1 - Basic Workflow Breakdown

Stage 5 - Editing

Editors now get on with editing until it is time to share again. When a segment is finished, they copy the final Project to a new Library in their output folder for import into the finishing suite. Again XML can be used but in fast turnaround situations, using Libraries may result in quicker transfer.



The next job to do is collate (or assemble) the programme master. Once the final master is ready, that is is when XML comes into its own.

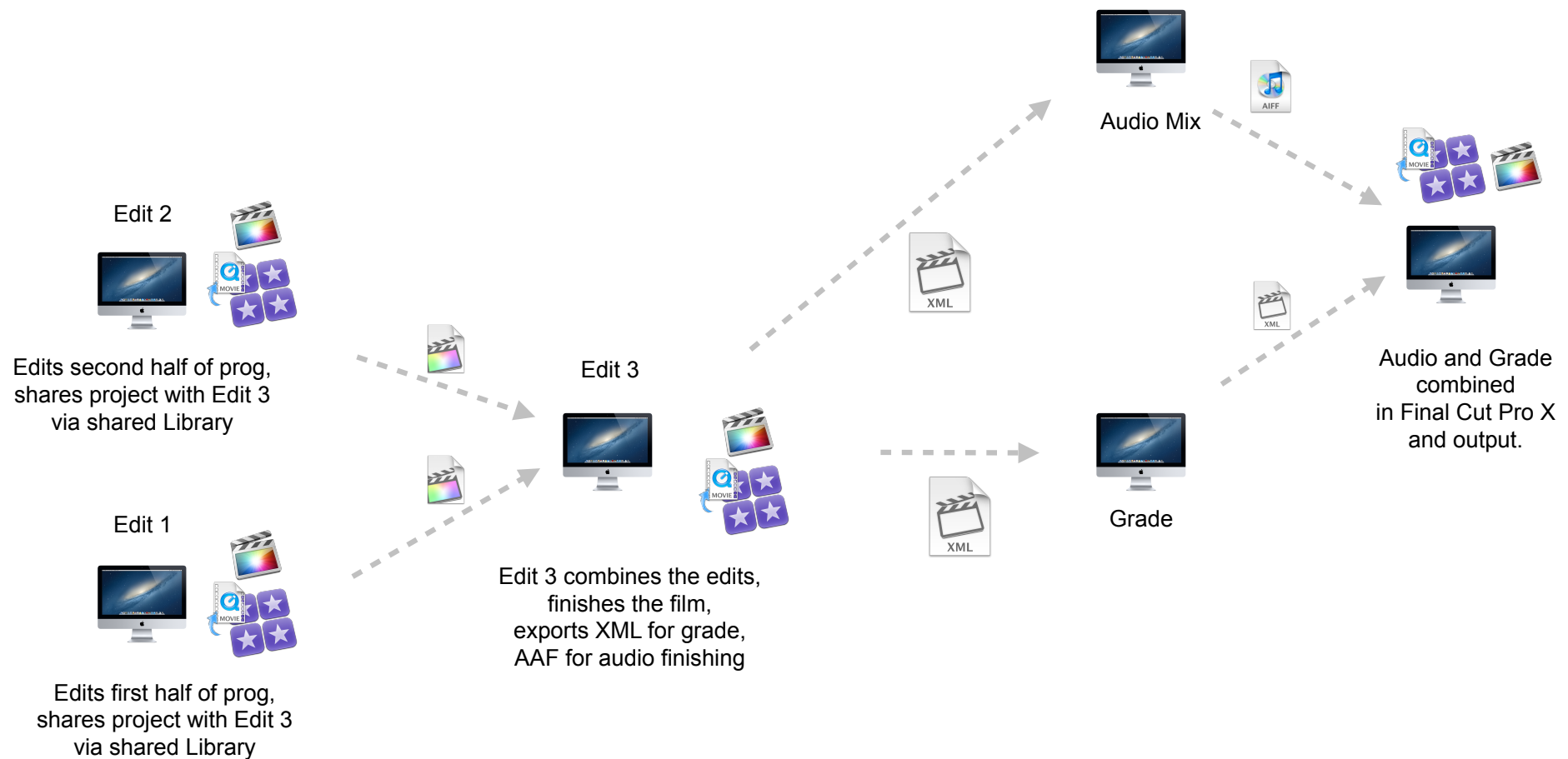
XML finishing

Using XML and optional 3rd party apps, the edit can be sent for color-grading, audio finishing, subtitling and archiving.

Shared Scenario 1 - Basic Workflow Breakdown

Stage 6 - Finishing

If an assemble of separate segments is required (as below), one editor (Edit 3) collates everything together using Final Cut Pro X and then exports a single XML for grading. The same can be done for audio.



Shared Scenario 2 - On Set Logging

Building on Scenario 1 above, we now add on-set loggers into the mix. (This we see as a major part of future media workflow.) Anyone from make-up artists to continuity and location managers can upload metadata from on set.

This metadata can come from almost any source. iOS device (with location specific data) or the wifi from the camera. The ingest editor merges metadata from loggers and matches this to media clips using various methods (timecode, time of day, gps, clip number etc).

PROS

Rich metadata from on-set / location is ready for edit.

Time saving can be immense.

CONS

Loggers & Editors will have to learn and use the metadata terminology. Will need to be managed.

On-set Logging

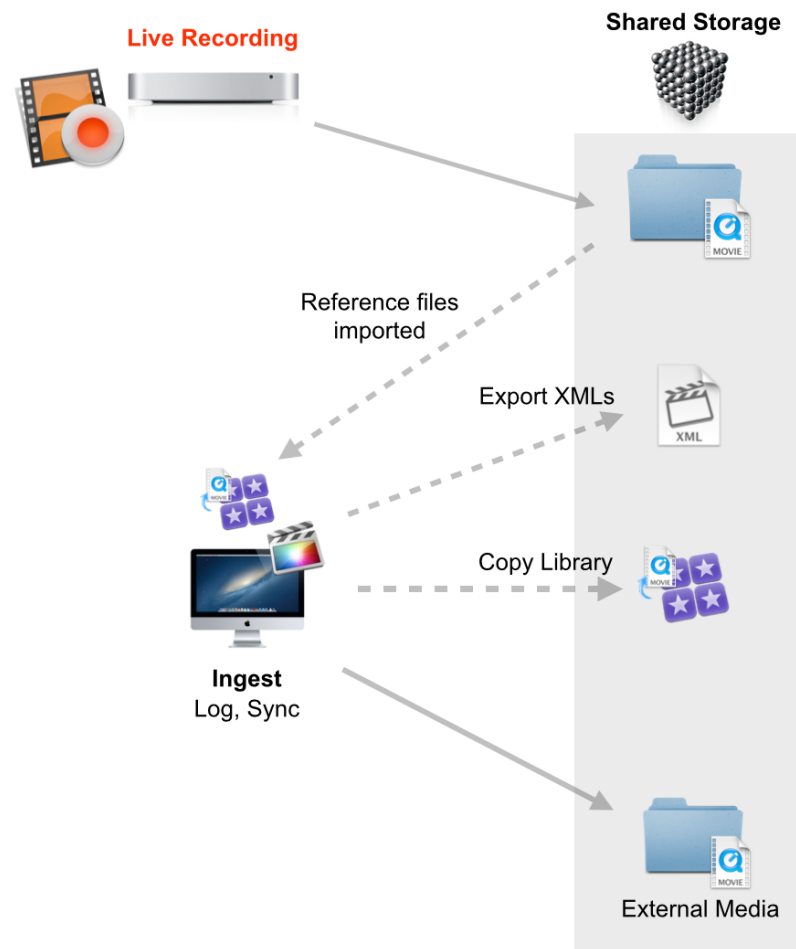


Shared Scenario 3 - Growing Files

Growing files can be edited while ingesting.
This requires a specialist application. And a lot of planning and testing. A LOT!

By their very nature, growing files will involve fast turnaround so Cache files will need to be considered here - it is generally much quicker to copy cache files than recreate them so Libraries may be the way to go here.

This diagram only shows the record side of the workflow.



Growing files can be created by multimillion dollar hardware, or these days, by software running directly on Macs. Hardware will need to be robust enough for sustained writes and possibly ring-fenced from other users to prevent fluctuating bandwidth.

In the above example, we show MovieRecorder by Softron which can record multiple streams, add metadata on the fly and produce proxy files.

On import to Final Cut Pro X, simply choose “Leave files in place” in the following dialogue.

Files: ☐ Copy to library
☒ Leave files in place

This allows us to start editing before the file has finished importing - sometimes called “Edit-While-Ingest”.

Accessing growing files before they have finished recording will of course impact the system in many ways and a lot of stress-testing is needed to get a system like this working under critical conditions.

PROS

Edit while media is recording - the golden chalice of live events.

Finish editing much sooner.

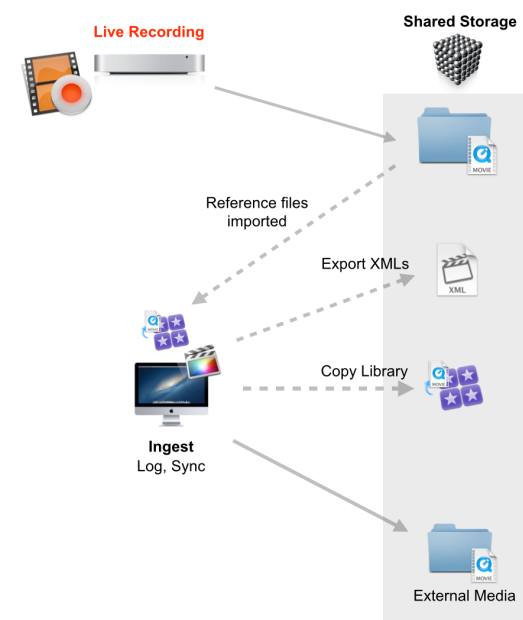
Media can be logged in realtime (almost) as it is recorded.

CONS

Critical

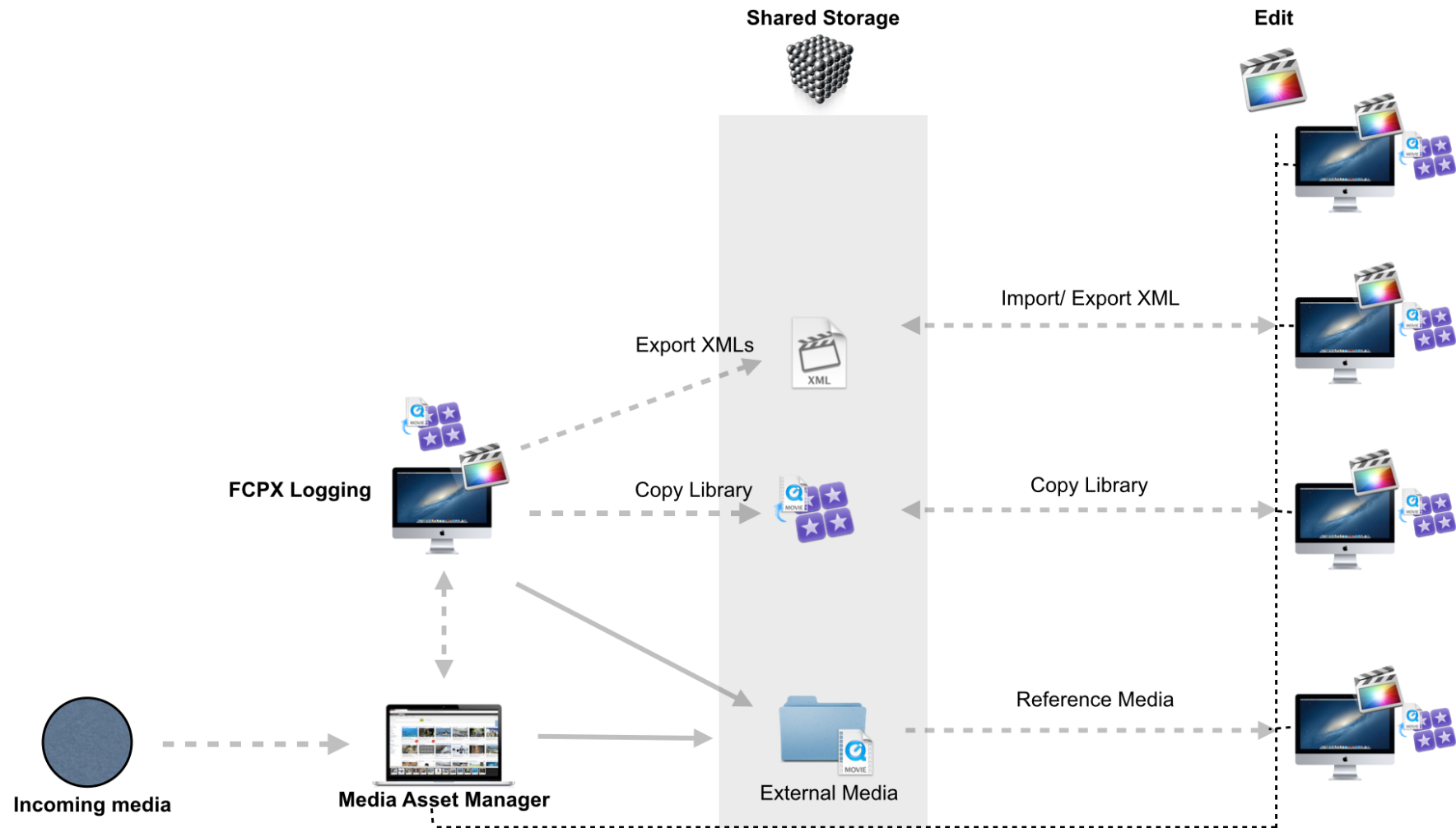
More media management required.

Requires very robust hardware.



Shared Scenario 4 - Add a MAM

The media asset manager is the missing link in many large organisations, allowing them to move to the next level of monetising their media. Most MAMs these days are created to order so it is enough to say here that the way to interface with Final Cut Pro X is currently via XML. Along with many other functions, most MAMs will allow network users to log from a browser whether running OSX or iOS. This diagram is extremely simplified.



Adding a MAM Pros & Cons

PROS

An extra incoming media-pool keeps media separate from edit media.

(This could also be seen as a disadvantage in some cases such as fast turnaround.)

Clips can be viewed, logged and even rough-cut via a browser or wifi-enabled device.

Clips can be pushed onto the Xsan and then pulled into Final Cut as and when necessary.

Multiple metadata sets can be stored for the same media (this is also possible with Final Cut Pro X).

Media transcoding not taking up edit machines.

Allows remote access to media proxies and finished approval edits via iOS devices.

Dedicated department running media asset management software full time, with editors / producers searching for media via the browser-based MAM.

Archiving easier.

CONS

Staff need to learn more kit.

Costs money.

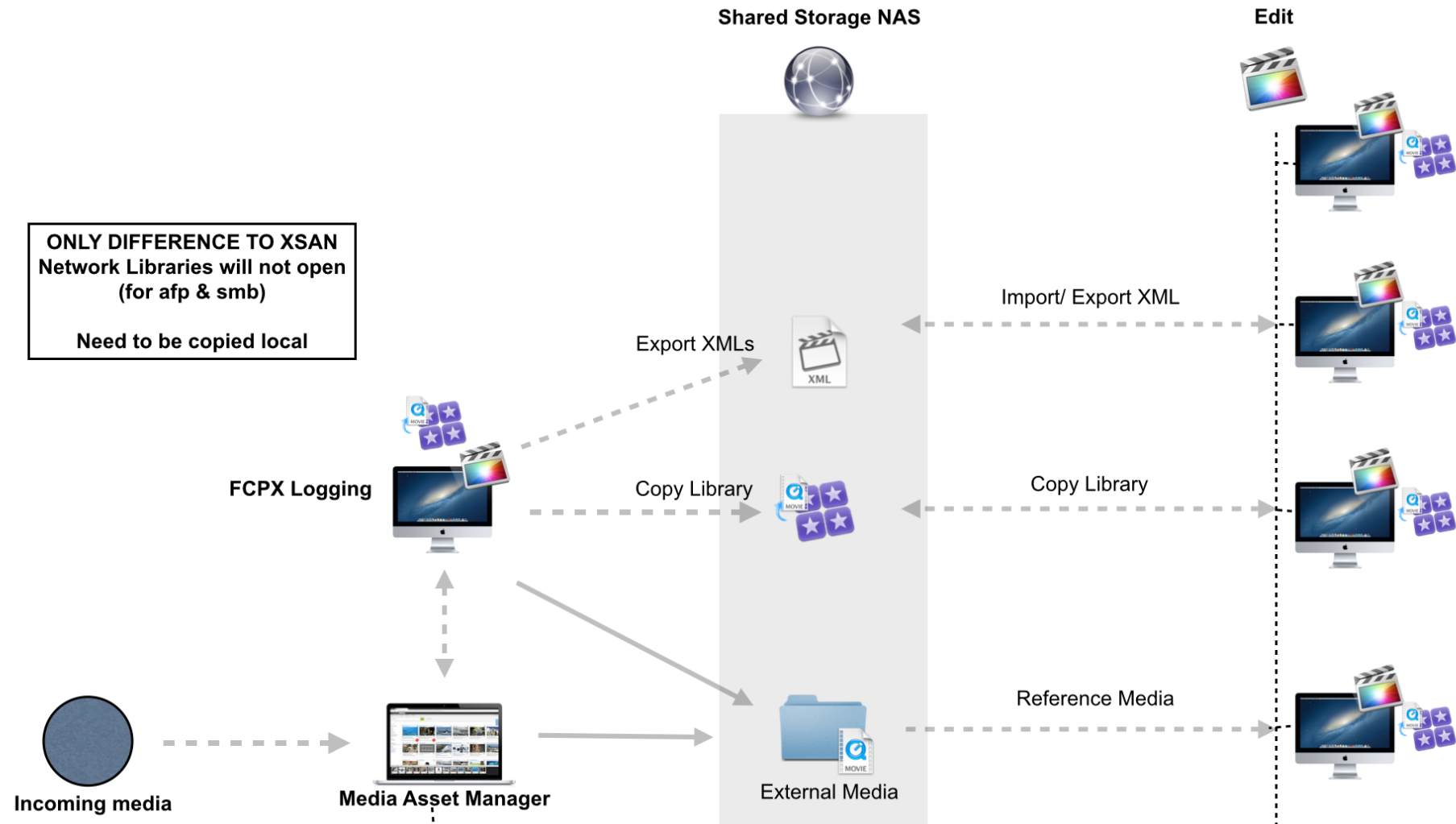
Needs a support team (or contract).

A MAM is only as good as whoever configured it.

Can get very complicated and users tend to get lost in the more sophisticated features.

Shared Scenario 5 - Network storage

The use of network storage volumes is making its way into Final Cut Pro X workflows as word gets out that media can be stored anywhere. With the advent of 4K, 1GigE is no longer going to be cutting it so any serious high-end network solution will have to involve 10GigE. This is entirely possible with Final Cut Pro X using a number of third-party thunderbolt to ethernet adaptors.



Network storage

(diagram above)

Of course the underlying hardware and software is different to Xsan and not having a sophisticated dedicated file system and metadata control is going to impact multiple users accessing the same file but to the user, the only real difference between this and our previous examples, is that media is stored on a network volume.

Many factors, including different codecs and file formats used will give varying results playing off a network and it may not be simply a question of replacing an Xsan with a network and expecting things to run as smoothly.

Libraries can still be stored on the server in an exchange folder, but must be copied to local to open in Final Cut Pro X.
(Unless the network is an NFS mount).

PROS

Existing heterogenous networks and equipment may be used to view footage.

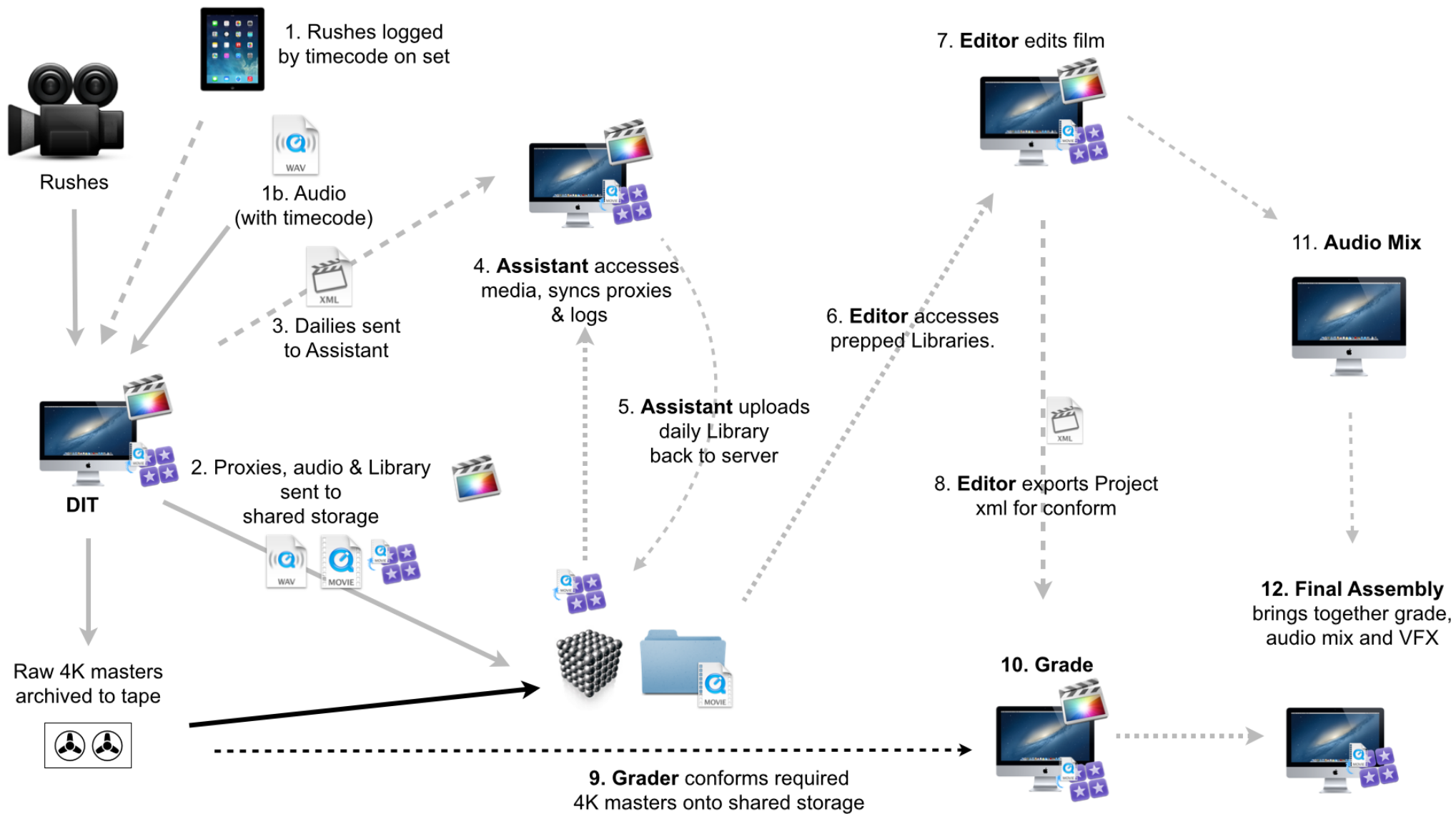
May seem cheaper if equipment is already purchased (however 10GigE is an expensive option at the moment).

CONS

Libraries will currently only open from nfs mounts.

Accessing storage via the NAS head vs directly via fibre is more susceptible to technical bottlenecks and forfeits all the benefits of managed storage.

Shared Scenario 6 - 4K film workflow



We include an example 4K film workflow above really only for completeness. This is just a template, even more so than the previous examples.

There are already some very good examples of film workflow out there, so this workflow diagram should help explain how the new Final Cut Pro X functionality can be integrated into that ecosystem.

With the further evolution of 4K (and RAW), the return to offline / proxy workflow (as above), may see a renaissance, however with the new Mac Pro, real time playback of 4K without rendering is now possible so the race is on again between playback requirements and computer speeds.

Proxy workflow

Final Cut Pro X v 10.1.2 now allows proxies to be stored anywhere on centralised storage (via the Library Properties menu) so it is now even easier to take an “offline” version of your work away with you on a laptop for the weekend.

To create a proxy version of your work, you could action the following steps.

Choose a new media location in the Library Properties menu such as “Editing In The Mountains” - on an external (or even internal hard drive on your chosen computer).

Choose the clips you want to transcode as proxy files.

Transcode the clips as proxy (control click or from the File Menu) - choose Proxy, (not Optimized).

Make a copy of the relevant Library and take this with you as well as the external folder.

On the proxy (offline) machine, in the Viewer pulldown menu, choose “Proxy” from the Media section. Work as normal and copy the library back to the central master machine and relink to the original folder if required (this should normally not be necessary if the media remains in the same place.)

Note that audio files are not transcoded to a proxy version and so you will have to manually copy these using a discrete Library and take that with you as well. Also proxy files do not contain an alpha channel so this will limit your compositing work at proxy level.

PROS

Proxy files much smaller and faster to playback.

CONS

You cannot see your full res master files.

May not have access to raw log colour data.

The ever-present danger of files losing their link to the masters (always test your workflow right the way through and NEVER change it halfway).

Full res online workflow

PROS

WYSIWYG - what you see is what you get (as long as your monitoring is calibrated through the pipeline).

There are no surprises waiting for you when you see the full res masters.

Grading and other effects can be performed and integrated at any stage.

CONS

Slower playback (Better hardware needed)

Much more storage needed.

Conclusion

Rather than dictating a prescriptive workflow, Final Cut Pro X now leaves the path open to you to choose how you proceed at almost every stage. For the nontechnical single user, the Managed media workflow provides a safe and simple solution. For enterprise-level shared workflow, the External media workflow puts the onus on you to design your own workflow.

There are two ways to share work - Libraries / Events / Projects and XML. Each have their own pros / cons but both are very simple and media can be stored anywhere you like.

So that is the end of this document. It's much longer than we originally intended but we could have gone on for a lot longer. Hopefully it will be useful to you for various reasons.

For those who said shared workflow is not possible with Final Cut Pro X, it is time to look again. Current hardware is changing the way we work and one thing is for sure, computers are not getting slower.

It is an exciting time to be using Final Cut Pro X.

As a final note:

Take some time to test your workflow all the way through, using the same media format that you plan to use for the job. Then test it again.

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