Channel Count

Notes

Codec

Audio Role

Keywords

File Type

Conquering

the metadata foundations of Final Cut Pro X

Philip Hodgetts

Camera

Stabilization

Reel

Frame Size

People

Still

File Type

Shot

Media Start

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Part 1:

Working with the Metadata Foundations of Final Cut Pro X

The Metadata Foundations of Final Cut Pro X

Final Cut Pro X is a new application built to support modern file-based cameras and metadata-based workflows in fast turnaround situations. In Final Cut Pro X metadata of all types is the very foundation of the application's media organization and discovery.

If we go back just over a decade to the release of Final Cut Pro 1 at NAB in 1999, we see a very different set of needs from an NLE (Non-Linear Editing software) than we do now. Back then, acquisition was universally on tape and the new DV format was just starting to become prominent.

In fact, Final Cut Pro had been shown at NAB 1998 (in an off-show-floor basement room) working nicely with the Truevision Targa 2000 hardware, but when Apple purchased Final Cut from Macromedia they immediately focused the development attention on the — then new — FireWire/DV combination. When released at NAB 1999 there was no official support for third party hardware at all. That was added back in subsequent releases.

So, right from the first release of Final Cut Pro, Apple have focused on meeting the needs of the largest groups of users.

Figure 1.01. My Macromedia Final Cut T shirt from NAB 1998. I caught the last demo before the end of NAB (and the sale to Apple three weeks later).

Final Cut Pro 1 turned out to be the foundation of Apple's first professional NLE and for the transition from tape-based acquisition to non-tape based acquisition. Over the decade of its development it gained many additional features that ultimately made it fit more workflows. We also gained a new way of accessing non-tape media: Log and Transfer.

Final Cut Pro survived the OS 9 to OS X transition; and then the transition from PowerPC to Intel and trying to bridge the Carbon (OS 9) code structure to the more modern (OS X) Cocoa code structures. A lot of work had to be done to simply keep Final Cut Pro running on Apple's own ever-changing hardware and Operating Systems.

Final Cut Pro's foundations were quite weak: Metadata consisted of the link to the media file, which was by simple file path as a consequence of its cross-platform origins. (Final Cut at Macromedia ran on Windows and OS 9).

The Production World has Changed

With Final Cut Pro 1, Apple chose to focus on the emerging digital video world, starting with the very accessible, and relatively affordable, DV format.

I think that tells us where Apple's focus is, and always will be: on the democratized future of media production. The industry that Final Cut Pro was released into, was still relatively small and had some very heavy "gatekeepers", not least of which was cost. Final Cut Pro's breakthrough price of $999 (without any hardware of course) was shocking and "jaw dropping"!

We have another data point on Apple's focus in Steve Job's Special Event Keynote to announce the new iMac DV and iMovie:

> "We think Desktop video is going to be the next big thing. Imagine this in classrooms. Imagine classroom video reports, imagine this with parents, imagine the Steven Spielbergs of the world being able to use this technology when they were kids. It's going to be unbelievable."

Steve Jobs, and therefore Apple, believes that video production is for everyone. I've written about this democratization, or shift to where video production becomes another form of literacy, before at PhilipHodgetts.com (my blog).

Indeed the decade of Final Cut Pro's rise to be the industry standard of today has been a decade of very serious change:

- The fade out of analog video and the take over of digital.
- Digital on tape gave way to digital on solid state media.
- The Industry has grown dramatically[1] to probably 20 times its size.
- We've discovered the power of metadata to make organizing and finding media easier, and to ease the burden of repetitive tasks, such as neutral color balance, or fixing audio hum.

Because of this changing focus, the traditional NLE design has become less suited to the new workflows. More and more people need to produce high quality video, with very quick turnaround as budgets are crunched; where one person frequently fills more than one role; where we have high quality native formats that don't work well with traditional workflows.

It was time for a rethink

Apple is in a unique situation when it comes to NLE developers. Unlike Avid, Adobe, Grass Valley or Sony they control the operating system. Like Grass Valley and Sony (Vegas) they build for one platform. Apple has been developing very good technologies for high performance applications in its OS X Cocoa Frameworks, but Final Cut Pro couldn't take advantage of them without a rewrite.

But a complete rewrite would be very expensive, and take many years. I suspect that if it wasn't for the Operating System side of Apple's sudden reversal in 2007 with the announcement that the OS 9/OS X shared Carbon library was not going to be developed for 64 bit, then we might well have had a 64 bit Final Cut Pro 8 by now. I've hypothesized[2] that Final Cut Pro 7 was to be that 64 bit release!

With the reality that Final Cut Pro was to be completely rebuilt as Cocoa code, Apple took the decision to also rethink the NLE, with a new design that would serve the next decade as well as Final Cut Pro 1 to 7 had served the previous decade.

Apple also had to wait for the Operating System folks — again — because QuickTime, which has been at the foundation of Final Cut Pro since the first day of development, was not up to the demands of modern media management. More importantly, most of QuickTime was also Carbon and not suitable for a 64 bit application.

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[1] When Final Cut Pro was released, the professional video market was largely Film, Television and high end corporate. These days the number of professionals involved as editors in full, or part, of their employment has grown 20 x.

[2] http://www.philiphodgetts.com/?p=2573

The new media foundation came from iOS: AV Foundation[3]. AV Foundation is included in OS X 10.7 Lion, but has been used for the development of Final Cut Pro X. Being all modern code, and highly efficient at that (as it runs on iPhone etc with performance QuickTime couldn't give Final Cut Pro 7) media frameworks that allow developers to work fully Cocoa and hook into all the other high performance frameworks that Apple have for developers. In addition to AV Foundation Final Cut Pro X gains from:

- Grand Central Dispatch, so every core on your computer will be used.
- Open CL so you'll get the power of the graphics card's supercomputer-like performance for non-graphic tasks (although you'll get better results with ATI cards over Nvidia for Final Cut Pro X and Motion 5).
- Being 64 bit means it can use as much RAM as you can throw at it.
- Color Sync so the gamma and color shifts that plagued QuickTime will no longer be a problem.

I believe it was two things that triggered a complete rethink:

- What are better ways of meeting the needs of the modern, quick-turnaround editor;
- How can metadata be used to make the editor's life easier.

Final Cut Pro X's fundamental foundation is metadata: metadata from the source camera; keywords and notes added by the editor or an Assistant; and metadata derived from an analysis of the image and audio for offering corrections for color, stabilization and audio fixes as well as identifying shots with people in them and the shot angle.

Before I get into any more discussion, let's consider what is metadata?

[3] While AV Foundation replaces QuickTime at the System level, ProRes and other codecs, will be supported in the future, as will the .MOV container format.

What is Metadata?

The classic answer to “What is Metadata” is “Data about the content”, which — while accurate — is not a helpful answer to anyone! Metadata is really the technical term for things you’ve likely been doing for years: adding log notes.

Metadata is not something new. You’ve experienced metadata if you’ve:

- slid a sheet of paper with some notes into a tape case;
- named a reel in an edit system;
- relied on timecode (which is frame count metadata).

As you can see, working with metadata isn’t new. In fact you’ve likely already worked with metadata based automation! If you’ve used Final Cut Pro’s DV Start/Stop Detect (or captured HDV tapes) then you’ve used metadata-based automation. DV Start/Stop detection looks at invisible metadata, which is a time-of-day timecode track. There is a “visible” continuous “SMPTE” timecode track, but also an additional hidden one. Start/Stop detection examines that time-of-day timecode track and when it finds a discontinuity, it adds a Marker. A discontinuity happens in time-of-day timecode when the pause is used to stop and start the recording.

Figure 1.02. 1983: A client reads my log notes to guide my edits. Yes that’s an Apple][controlling two ¾” U-matic decks!

So, before we get into great detail about metadata, you are likely already using it and have even enjoyed the advantages of using metadata to automate boring functions, like breaking down clips into shots and takes.

I was somewhat surprised, when I really started to explore metadata nearly a decade ago to discover that I'd been a big metadata fan since my earliest days in the industry. That was in the era of ¾" U-matic, which really didn't deal with metadata in any way, other than — if you were lucky — someone put a label on the tape!

Now, I meticulously logged every shot, on every tape, because it was so much faster to search through the log for a shot than search through multiple tapes. Put that another way: It was easier to search with the metadata rather than the actual data (in this case the video).

Now this was a long time ago, and my log was hand written on paper, but it set the foundation for a life of metadata wrangling. Paper gave way to log notes within an NLE, but the principle of logging footage so it will be more easily found, has never left me.

There are now more types of metadata than simply tape name, timecode and manually created log notes. In fact, even tape or reel names had to be manually added if we wanted to correctly identify a tape again.

Since those days, metadata has become more important because:

- It makes content more valuable;
- It gets you home earlier;
- It has the potential to save significant amounts of time in post production; and
- You really won't have much choice.

Metadata makes content more valuable

Metadata makes content move valuable. Look at these three images:

The tape alone has no metadata. I'd have to find a deck, play at least some of the tape before I even know if it's the tape I want.

A tape with a label tells me whether or not it's

the tape I want, even though I may have to scan through to determine if specific content I want is on the tape. But the metadata on the label adds value to the tape.

Media that has log notes, that has a lot of good metadata with it, is the most valuable of all.

Final Cut Pro X makes content more valuable by creating a lot of metadata during media analysis, and fully supporting entry of custom keywords, notes and other metadata.

Metadata gets you home earlier

Final Cut Pro X's use of metadata helps you get home earlier in a number of ways. First off, background rendering means you never spend time sitting at the computer while it renders. So, sorry, less time for Facebook and Twitter in the edit bay but more time with friends and family.

Auto-analysis does the basic audio cleanup and visual white balancing that you're likely to do anyway, as part of the ingest process (or at a time of your choosing). While you can ignore the analysis and start over with color correction, or enhance Apple's basic first pass, having the basic balance done saves time.

Similarly audio analysis can optionally remove empty audio tracks to reduce timeline clutter and correct known audio problems like hum or background noise, automatically.

Analysis also derives metadata by recognizing faces in the media and tagging them appropriately. The facial detection is also used to derive the shot type: is it wide, medium or close up. This metadata makes clips easier to find.

The date, time and format metadata also makes it easier to find media by combining this metadata with logged Keywords. For example, we can easily create a Smart Collection, which is really just a search you've saved, that looked for all footage with one person in it, shot with a DSLR in May 2011 (or a specific date).

Or take a similar Smart Collection search and add in a name. Now you'll just get shots with that person by themselves within the date range specified.

Final Cut Pro X also has another smart metadata trick: metadata based clip renaming! We'll go into this in more depth in Batch Renaming based on Metadata but it's a huge time saver when you get media that has those inscrutable file names loved of P2, AVCCAM, RED and other media formats. Now non-destructively rename to something logical

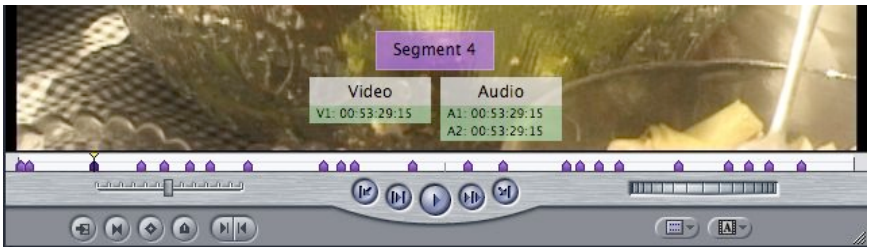

Figure 1.03. DV Start/Stop detection is a metadata-based time saver because DV Start/Stop detection uses the (hidden) time-of-day Timecode to determine where the camera started and stopped.

instantly, based on Keywords added, in combination with any of the analysis metadata, with almost complete flexibility.

Metadata can take days or weeks out of post

Final Cut Pro X may not, right now, take days or weeks out of postproduction but the faster organization, and much faster findability of clips, along with a new fluid editing interface, means editing will go faster.

Beyond that, we see innovative software, like my own company's First Cuts that takes the logged metadata and generates first pass edits so you can explore the content by story not clip.

If you're working on a long form documentary and you do a reasonable job of logging your selects, and putting some log notes in your selects, then the first pass, or the exploration of the material, can happens as stories that are created, literally within the blink of an eye. Just one or two seconds to create a complete story. They take longer to save to disk than they do to create.

As we explore the new interoperability features of Final Cut Pro X, we expect to be able to offer even more workflow automation.

You won't have much choice!

Already many of the major media companies — TV Networks, the Cable Networks, the Studios — are requiring that you deliver metadata about what you've done. For example Disney require a complete log of every clip that has been used in every Sequence.

While we at Assisted Editing do have a tool that helps automate that process[4], the way the industry is developing, you really won't have much choice.

The deliverables of data about your project, which is Metadata, are going to become more and more demanding. Where a clip has been used, what episode, which show, what scene. Along with information about the Digital Rights that carry with the clip, scene and episode this will all become part of the deliverables. Depending where you fit into the industry it may already be part of your workload or it will be something that's coming up for you.

The Great iPhoto Disaster of 2009

In May 2009 I experienced an iPhoto disaster. One day I opened my iPhoto library and it was empty. Gone. None of the repair routines worked at all.

Fortunately all the images were still present, but nothing I could do would restore the iPhoto metadata. All the metadata I'd painstakingly entered was gone. Without the metadata I couldn't access a single photo!

Without accurate date[5], without Event breakup, without any person identification, without locations being known, without comments, and without keywords the photos were much less valuable without all the metadata that I had painstakingly entered as I added photos to my library that made my iPhoto library valuable.

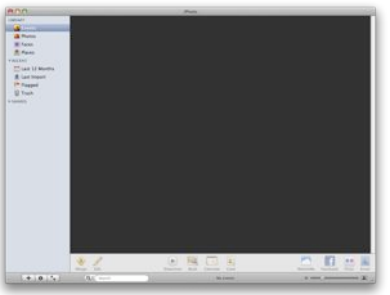

Figure 1.04. No-one's iPhoto library should look like this when they've added more than 3000 images!

[4] http://assistedediting.com/SequenceClipReporter

[5] Many images had been scanned and the file date was the date of scanning, not the date the image was taken, as would be the case with digital images. In iPhoto 09, which was used to rebuilt the library metadata, there is the ability to force the file date to accurately represent the date of the occasion.

The metadata I had entered over time, meant I could find any specific image very, very quickly, by searching on, or limiting a search, to particular metadata.

My little metadata disaster should serve to give some indication of how valuable metadata is. It took me about 90 hours to remake the metadata for just 3,000 photos. Some metadata was never fully recovered as prints and slides were discarded after scanning, and some of the important "source" metadata was printed or written on the back, or carrier.

This lead me to think about metadata even more deeply. Now with Final Cut Pro X the concepts and practice from that disaster make it clear to me how useful the metadata foundation to Final Cut Pro X will be, and how it will speed editing and media organization.