

Laurel Beckman, UCSB Department of Art

Digital Video Work Flow and Standards

It's best if to know how your video will ultimately be presented, how it's being delivered to an audience, before you start, so you can tailor your parameters- resolution/size, frame rate, container and codec etc., to be compatible with the native specs of the delivery device & environment. In lieu of that, or if you expect to be screening across different delivery platforms, it's best to make a 'master' hi-res/hi-def, lossless version of your video that anticipates different delivery/environments settings, and you can always make other versions from the master using different settings.

Back up your work often, especially all project files, on a separate drive (project files are the documents you've created using After Effects or Final Cut, etc., and your source media). **I highly recommend also using a cloud-based back up for double back-up.**

Resolution

The pixel dimension of the frame, higher means larger files but better resolution for devices able to deliver them. For example, high definition (HD) resolutions are 1280x720 & full HD is 1920x1080. The new digital cinema standard is 4K at 4096x2160 (2K is 2048x1556) as well as 5K and up, used by film industry pros. For SD (standard def), an ipod nano's resolution is 240x240, your average SD older data/video projector's native resolution is 1024x768.

Aspect Ratio

The ratio of width to height of the frame, usually represented as two numbers separated by a colon, such as 4:3 or 16:9 (wide screen)

Frame Rate and Standards

The number of frames that are shown per second (fps). The digital video standard is 30fps or 25 fps, animation standard is 30fps. Newer production and cameras use higher rates for super smooth action & to facilitate slow motion. Traditional film standard is 24fps.

The frame rate for SD video is often standardized depending on country/continent, though this is becoming less important due to advances in video streaming technologies. In North America, Central America and parts of South America the standard NTSC (standard definition) frame rate is 30 fps. Technically, NTSC runs at 29.97 fps. In much of Europe, Eastern Europe, Asia, Australia and much of Africa, the standard for regular (standard def-SD) definition video is PAL and uses 25 fps.

NTSC and PAL also have common standard 'resolution' or frame sizes.

NTSC 720x486 also known as 'D1' (720x480)

PAL 720x576 (there is also a high def PAL format)

NTSC and PAL are size/ratio + frame rate standards that come into play mostly when you send off videos to festivals and the like, often on dvd. If you are streaming/playing video through a computer or display that uses (for example) VLC or a media player, the NTSC & PAL standards are not applicable.

Formats- Containers (also known as Wrappers)

Containers are video file formats, where video files get their file extensions, and they can contain video and audio. By definition, a container format could wrap any kind of data. The most popular video + audio containers are Quicktime .mov, mp4/mpeg-4, Windows .avi, Flash Video .flv. The most popular audio only containers are .aiff (used mostly on macs), and .wav (used mostly on windows). Containers are NOT codecs. After Effects does not like .mp3 files.

Codecs

A video codec is a device or software that enables video compression and/or decompression for digital video (and audio). The process usually employs lossy data compression. It's best to choose common in-use codecs such as H.264 (the codec of choice for many applications where you need a smaller file), DivX (older popular codec, fading from use), mp4 video, MPEG-2, JPG 2000, DV stream, etc. New codecs come out from time to time, but don't use them unless you know that your video presentation device can support it.

Codecs and Rendering

When you are editing digital video for a final product, or for use in another application (such as final cut > after effects) it's best if you can to work with lossless files, and to render or export also as lossless (no compression or loss of data), then you can export lossy versions from there that give you smaller file sizes. However, unless you're working on a set up that allows for very large files, then that may be difficult or impossible. The Art Dept. computers are not generally equipped to deal with super large files. For a lossless codec when rendering from After Effects, in the Render Queue use Best Settings & Lossless or Animation settings. After Effects is primarily designed to create lossless, full files, that you would then render/export down for smaller more portable files (such as mp4/H264); though you can render out single pass mp4/h264/etc from AE as well. Current versions of After Effects CS6 allows you to render out using it's sister program- Adobe Media Encoder (AME), in CC this is the primary option for all exports. AME is sometimes better, sometimes not, depending on the situation.

Bit rate

(Files that are too big are often the result of an unnecessarily large bit rate)
Bit rate controls both the visual quality of the video and its data file size. It is the number of bits (data) that the video will process in a given period of time (usually seconds). Bit rate is commonly measured in kilobits per second (kbits), or megabits per second (mbits). For example, a DSL connection may be able to download data at 768 kbits, while a Firewire 800 connection can transfer data up to 800 mbits. Bit rate can also describe the quality of an audio file. For example, an MP3 audio file that is compressed at 192 kbits

will have a greater dynamic range and may sound slightly more clear than the same audio file compressed at 128 kbits. This is because more bits are used to represent the audio data for each second of playback. Similarly, a video file that is compressed at 3000 kbits will look better than the same file compressed at 1000 kbits. More bits per second means more information, more resolution, a better looking and sounding video. It also means bigger file size. **For HD video use 20,000-30,000 kbits (for vimeo uploads 10,000) Use an audio rate of 320 when possible.**

Audio

Audio files are best saved in format AIFF to ensure they import well into editing programs (mp3's don't work as well). In iTunes you can select a track and right click to 'Create AIFF Version'. If you want to bring that .aif file into another program (FC, AE, sound editing. etc), you can then select the .aif version in iTunes and right click (or in File menu) to "Show in Finder" to locate the file. If you are using a sound-editing program, like Garageband, import (just drag it in) the .aif file to manipulate or add to other tracks. To output your audio from Garageband use the 'Share' menu > 'Export Song to Disk', but do not compress it unless you really have to. The export will make an .aif file that reads well in editing programs. Audio bit rates: If your source material is from mixed sources, then you should probably encode your audio at the bit rate of the source that has the lowest audio bit rate; generally though, 320 is best.

Square Pixels vs not square

Square pixel ratios are used on computers and HD (high definition) video. The pixel aspect ratio for square pixels is 1:1. Non-square pixel ratios are typically used in SD (standard definition) video. If you are working with SD or mixed SD and HD footage, you may have some tweaking to do in order to bring all ratios in line (the same) for the final project.

Progressive and Interlaced

Video can be interlaced or progressive. If your video has jagged lines, or a "stairstep" effect, particularly when your subject is moving, this is typically due to an interlace problem. Computer screens handle video differently than televisions do. Playing an obviously interlaced video on a computer will look terrible, but output that same video to a standard DVD and play it on your old TV, it will look great. 1080i- stands for 1080 interlaced, 1080p- stands for 1080 progressive. **Generally, you want progressive.**

Interlaced - analog cameras and videotape

Interlaced scan-based images use techniques developed for Cathode Ray Tube (CRT) TV monitor displays, made up of 576 visible horizontal lines across a standard TV screen. Interlacing divides these into odd and even lines and then alternately refreshes them at 30 frames per second. The slight delay between odd and even line refreshes creates some distortion or 'jaggedness'. This is because only half the lines keeps up with the moving image while the other half waits to be refreshed.

Progressive – computer and LCD displays, projectors, digital cameras

Progressive scanning, as opposed to interlaced, scans the entire picture line by line every sixteenth of a second. In other words, captured images are not split into separate fields like in interlaced scanning. Computer monitors do not need interlace to show the picture on the screen. It puts them on one line at a time in perfect order i.e. 1, 2, 3, 4, 5, 6, 7 etc. so there is virtually no "flickering" effect. As such, in a surveillance application, it can be critical in viewing detail within a moving image such as a person running away. However, a high quality monitor is required to get the best out of this type of scan. 'Deinterlace' your files to convert interlaced files for computer, projector, and LCD displays.

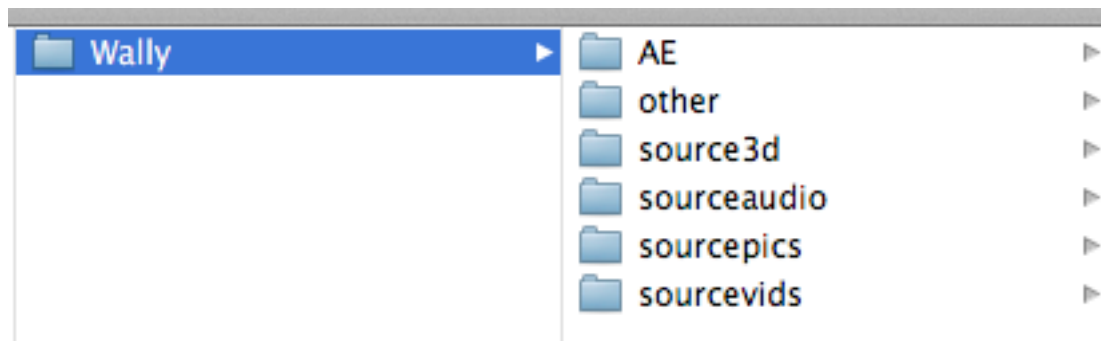
Importing Camera footage

When you connect your camera or memory card to your computer sometimes the video footage is not directly accessible. If the camera/card does not mount as a drive, or as, say raw or Pro Res files, but rather as a series of folders with strange names/numbers, then you'll need to get to your footage by importing it. Most camera capture video will open directly through FCP/X- File>Log and Transfer on older versions to get your footage, or file>import>media, or simply drag and drop, on newer versions.

SUGGESTED WORK FLOW

After Effects (AE)

Before beginning your project, set up your folder/s with a main project folder, inside that have folders for your After Effects files, your source media (video, audio, image) files. Try not to move files around. When you move files already in use in a project, you have to update by selecting missing file in AE project tab and File Menu>Replace File to locate and replace.



- Suggested settings/specs:
- FPS: 30, Progressive (not interlaced)
- Shoot original footage in HD, 16:9 for widescreen, or SD 4:3 ratio
- Audio codec: AAC, 48kHz (cd's use 44, but 48 is standard in digital video),
- 320kbps for audio if you have the option
- Faster

Faster working in AE (CS6 version):

1. In AE Preferences>Memory and Multiprocessing

>configure Installed Ram to allot most to AE and Adobe suite

>Start off by not selecting the "Render Multiple Frames Simultaneously" option.

MAYBE select it, but note that many people/systems don't like using this because AE doesn't take good advantage of multi-core processing. If you do use it, allot half your CPU cores to AE. The rule of thumb is that there should be (minimum) 2GB of Installed RAM for each CPU core used.

2. While working in AE, set resolution on top of timeline to 'auto' or half or quarter size instead of full, change back to full before rendering; and, set the Fast Previews (the lightning bolt icon on the bottom of the composition window) to "Adaptive Resolution".

3. Use separate drives (ssd drives are best) for your applications + OS, and to read and write files. If you only have 2 drives, you can have your applications + OS + disk cache on the same 'main' drive, and your project files on another. Don't forget to back up often.

A good set up though is 3 drives (professionals routinely use 5 or more)- set up like this:

>your applications (including AE) and OS (the computer's operating system) on the 'main' hard drive of your computer

>all your project & media files on another drive (internal or external, ssd!)

>your AE disk cache on another drive (ssd!-faster is better).

Note- you can get, for example, an external 1TB SSD drive that has the ability to partition (or used as a RAID) into 2 virtual drives. This means you can use the one SSD device for 2 drives.

Always back up your work (project files and renders) hourly or every time you make a change you want to keep; remember you have the option to 'save as' to keep multiple versions.

4. If you are getting a lot of buffering (spinning ball) then Purge all memory: first in the AE menu>Edit>Purge both options, and then purge the cache in AE menu>Preferences>Media and Disk Cache>Empty Disk Cache, and disable layer cache. This is not great for previewing while working, but for render time and stuck previewing only.

Render settings in AE:

1. Put caps lock ON (on the keyboard) when rendering.

2. Have already set up multiprocessing (see #1 in Faster Working in AE).

3. Close all other programs if memory/processing power is an issue.

4. 'Render' (do not use the 'Export' function) video to Quicktime lossless, Animation codec, for a master/original copy, set size and use 'best setting'.

This produces very large files, so will not be practical for many uses. If you do use a lossless format, you could use Adobe Media Encoder (AME) to make smaller files from the big one, AME gives you more control over settings, importantly, the ability to render H.264 and/or mp4 files with a double pass, which is MUCH better than AE's single pass. You can also set Quicktime to double pass H.264's. For smaller files rendered directly from AE- use the .h264 format, High, 5.1, VBR (variable bit rate) for better quality HD at around 30,000 mbits; use CBR (constant bit rate) of around 30 for HD for medium quality/faster renders, resolution half or less for even smaller size files (smaller resolution/image).

5. Do not use 'Open GL'. This is a setting in AE>Preferences>Previews. Open GL is for speedier previews for when you are working in AE on a file, but NOT for when you are rendering that file. If you want to use it for previewing only you can Enable Open GL (& set to use 80% of your video card) and set to 'Open GL Interactive' in AE to balance speedy previews and decent rendering.
6. Quit and restart AE if you get an error.
7. If you are having trouble with the Animation codec, try format>Quicktime>options>JPEG 2000 or PNG (with a pre-set up folder for all the files that will make) sequence for almost lossless files.

Quicktime:

Use Quicktime 7 Pro (not Quicktime 10+).

When exporting from Quicktime to make a smaller (say H.264) version, always use 'Quicktime Conversion', not 'Quicktime Movie'.

Use the Quicktime menu Window>Show Movie Properties to extract/delete audio, and make adjustments in Visual Settings (choose 'high quality' for example). You can also trim videos in Quicktime and place more than one video in a file (drag onto).