

Source: [commons.wikimedia.org](https://commons.wikimedia.org)

# Digital Video: A Global View

The image shows a screenshot of the SMPTE website homepage. At the top left is the SMPTE logo with the text "SINCE 1916". To the right of the logo is a navigation menu with the following items: "ABOUT", "MEMBERSHIP", "STANDARDS", "EDUCATION & EVENTS", and "PUBLICATIONS". There are also icons for a user profile, a shopping cart, a document, and a search function. The main content area features a large, colorful collage of images. The central text reads "WE ARE SMPTE" in large, bold, multi-colored letters, with "WE ARE" in white, "S" in yellow, "M" in blue, "P" in green, and "TE" in red. Below this, the tagline "We Set the Standard for Motion Imaging" is displayed in white. The collage includes images of a group of people, a man in a tuxedo holding a tablet, a woman looking at a camera, a man looking at a camera, and a group of people wearing 3D glasses. At the bottom left, there is a light blue box with the text "SMPTE is a professional membership association of technical geniuses who". At the bottom right, there is a yellow banner with a left-pointing arrow icon and the text "SMPTE PUBLISHES STUDY GROUP REPORT ON FLOW MANAGEMENT IN PROFESSIONAL MEDIA NETWORKS".

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# Motion Fast Facts

- Motion is a sequence of pictures taken at constant time intervals
- Each image is called a Frame
- How fast the pictures are captured is determined by the frame rate, which is measured in Frames per Second (fps)
- Three original Analog Broadcast Standards for Color TV: NTSC (U.S. National Television Systems Committee) PAL (Phase Alternating Line) and SECAM (Sequential Couleur aver Memoire)

## Choosing a Frame Rate

Movies on film are almost exclusively projected at 24 fps. Television, however, does not have an internationally accepted frame rate. In Europe and many other countries, PAL and SECAM use 25 fps, whereas NTSC video in North America and Japan uses 29.97 fps. Other common frame rates are usually multiples of these.

**Note:** Converting video formats from one frame rate to another is technically challenging, and there are often unwanted visual side effects. This is especially true when the frame rates do not evenly divide. For example, converting 30 fps to 60 fps is fairly easy to do, but converting 29.97 fps to 25 fps is much more difficult. Making sure audio stays in sync throughout the conversion is yet another challenge.

Some digital video formats support several frame rates within a single format, allowing variable frame rate video recording and film (24 fps) compatibility.

Frame rate	Media	Description
24 fps	Film; high definition video	This is the universally accepted film frame rate. Movie theaters worldwide almost always use this frame rate. Many high definition formats can record and play back video at this rate, though 23.98 is usually chosen instead (see below).
23.98 (23.976) fps	Film; high definition video with NTSC compatibility; NTSC	This is 24 fps slowed down by 99.9% (1000/1001) to easily transfer film to NTSC video. Many high definition video formats (and some SD formats) can record at this speed, and it is usually preferred over true 24 fps because of NTSC compatibility.
25 fps	PAL; high definition video	The European video standard. Film is sometimes shot at 25 fps when destined for editing or distribution on PAL video.
29.97 fps	NTSC; high definition video	This has been the color NTSC video standard since 1953. This number is sometimes inaccurately referred to as 30 fps.
30 fps	High definition video; early black-and-white NTSC video	Some high definition cameras can record at 30 fps, as opposed to 29.97 fps. Before color was added to NTSC video signals, the frame rate was truly 30 fps. However, this format is almost never used today.
50 fps	PAL; high definition video	This refers to the interlaced field rate (double the frame rate) of PAL. Some 1080i high definition cameras can record at this frame rate.
59.94 fps	High definition video with NTSC compatibility	High definition cameras can record at this frame rate, which is compatible with NTSC video. It is also the interlaced field rate of NTSC video. This number is sometimes referred to as 60 fps, but it is best to use 59.94 fps unless you really mean 60 fps.
60 fps	High definition video	High definition equipment can often play and record at this frame rate, but 59.94 fps is much more common because of NTSC compatibility.

**Important:** Many people round 29.97 fps to 30 fps, but this can lead to confusion during post-production. Today, it is still very rare to use a frame rate of 30 fps, but very common to use 29.97 fps. When in doubt, ask people to clarify whether they really mean 30 fps, or if they are simply rounding 29.97 fps for convenience.

# Frame Size

- In Digital Video, Frame size is referred to as resolution and is given in pixels.
  - HDV format: 1440 X 1080 pixels  
1280 X 720 pixels
  - DVCPRO HD: 1280 X 1080 pixels  
1440 X 1080 pixels  
960 X 720 pixels
  - NTSC DV Frame: 720 X 480 pixels  
PAL DV Frame:

## Data Rate

The following table lists the data rates for MPEG-2 HDV as well as HDV transcoded to the Apple Intermediate Codec and the Apple ProRes 422 codec. DV data rates are included for comparison.

Format	Native frame size	Data rate
DV NTSC	720 x 480	3.6 MB/sec. (equivalent to 12 GB/hr.)
DV PAL	720 x 576	3.6 MB/sec. (equivalent to 12 GB/hr.)
MPEG-2 HDV 720p30	1280 x 720	2.5 MB/sec. (equivalent to 9 GB/hr.)
MPEG-2 HDV 1080i60/50	1440 x 1080	3.3 MB/sec. (equivalent to 12 GB/hr.)
Apple Intermediate Codec HDV 720p30 <sup>1</sup>	1280 x 720	7 MB/sec. (equivalent to 25 GB/hr.)
Apple Intermediate Codec HDV 1080i50 <sup>1</sup>	1440 x 1080	12 MB/sec. (equivalent to 42 GB/hr.)
Apple Intermediate Codec HDV 1080i60 <sup>1</sup>	1440 x 1080	14 MB/sec. (equivalent to 49 GB/hr.)
Apple ProRes 422 codec HDV 1080p24	1440 x 1080	12.6 MB/sec. (equivalent to 45 GB/hr.)

<sup>1</sup> Data rates for the Apple Intermediate Codec are variable; these figures are approximate and may vary according to the complexity of your footage. Images with a lot of detail have a higher data rate, and images with less detail have a lower data rate.

Source: FinalCut Pro Manual

# Frame Aspect Ratio

The ratio of horizontal to vertical dimensions of a film or video frame is called the aspect ratio. These are both horizontal (landscape) views so don't film your video holding your phone vertically



The 16:9 image on the left has approximately 30% more picture than the 4:3 on the right, which is lost on the right and left hand side of the screens

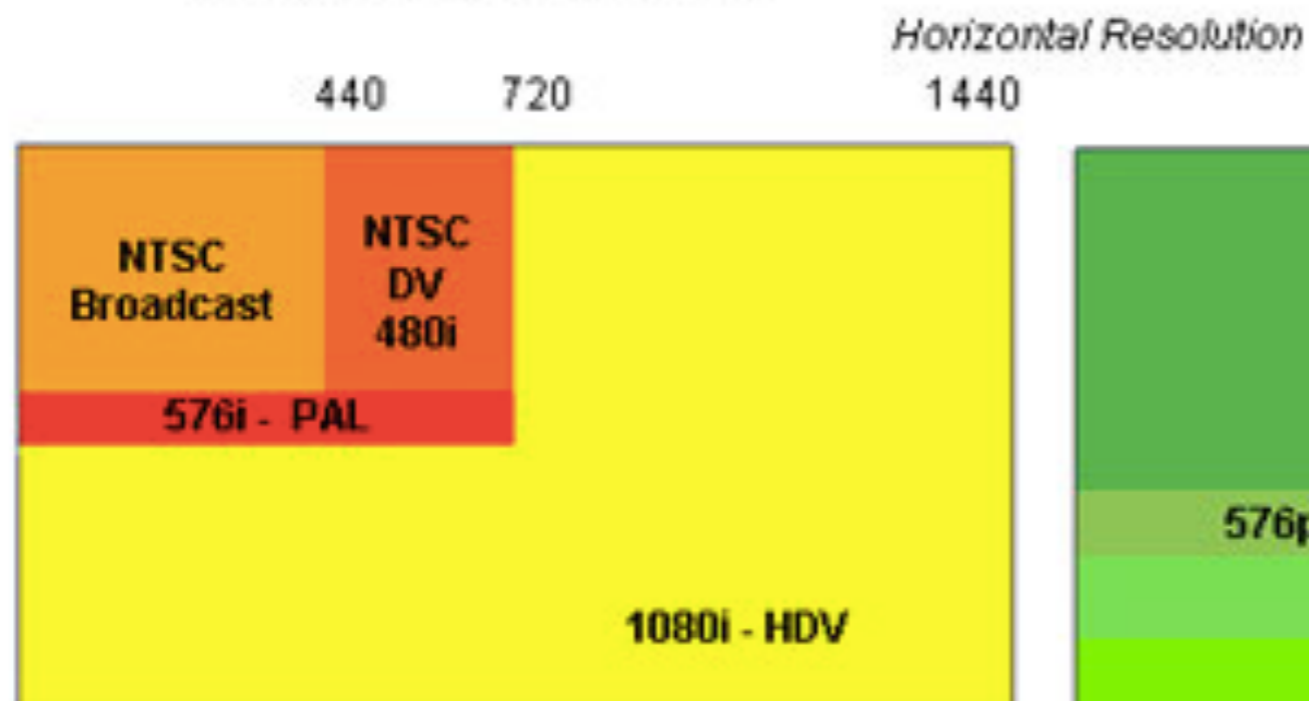
16 : 9 wide-format HDV

4 : 3 Standard Def TV

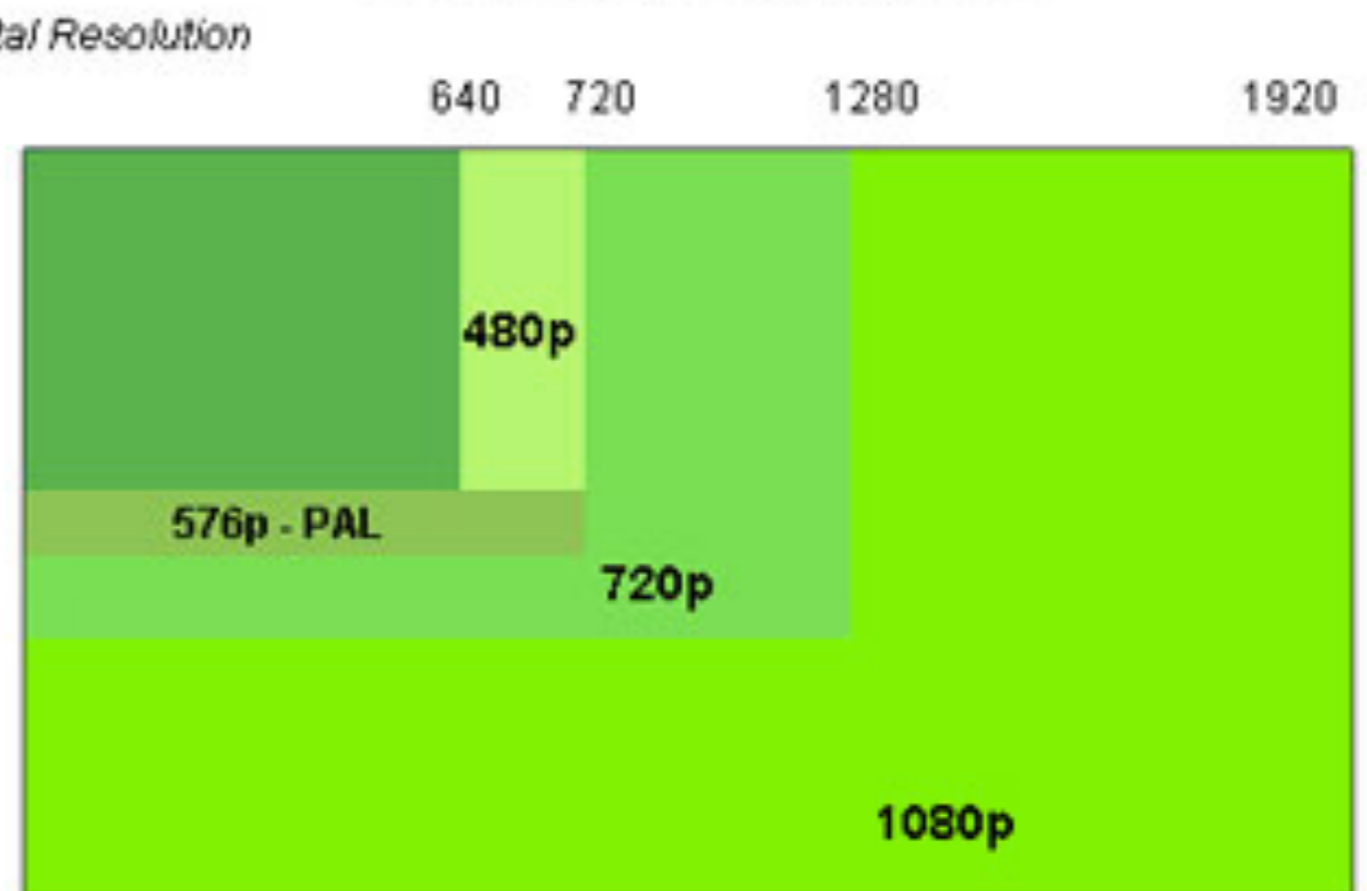
Source: <https://www.bhphotovideo.com/c/find/newsLetter/Aspect-Ratios-to-Frame-Rates.jsp>



## INTERLACE RESOLUTION

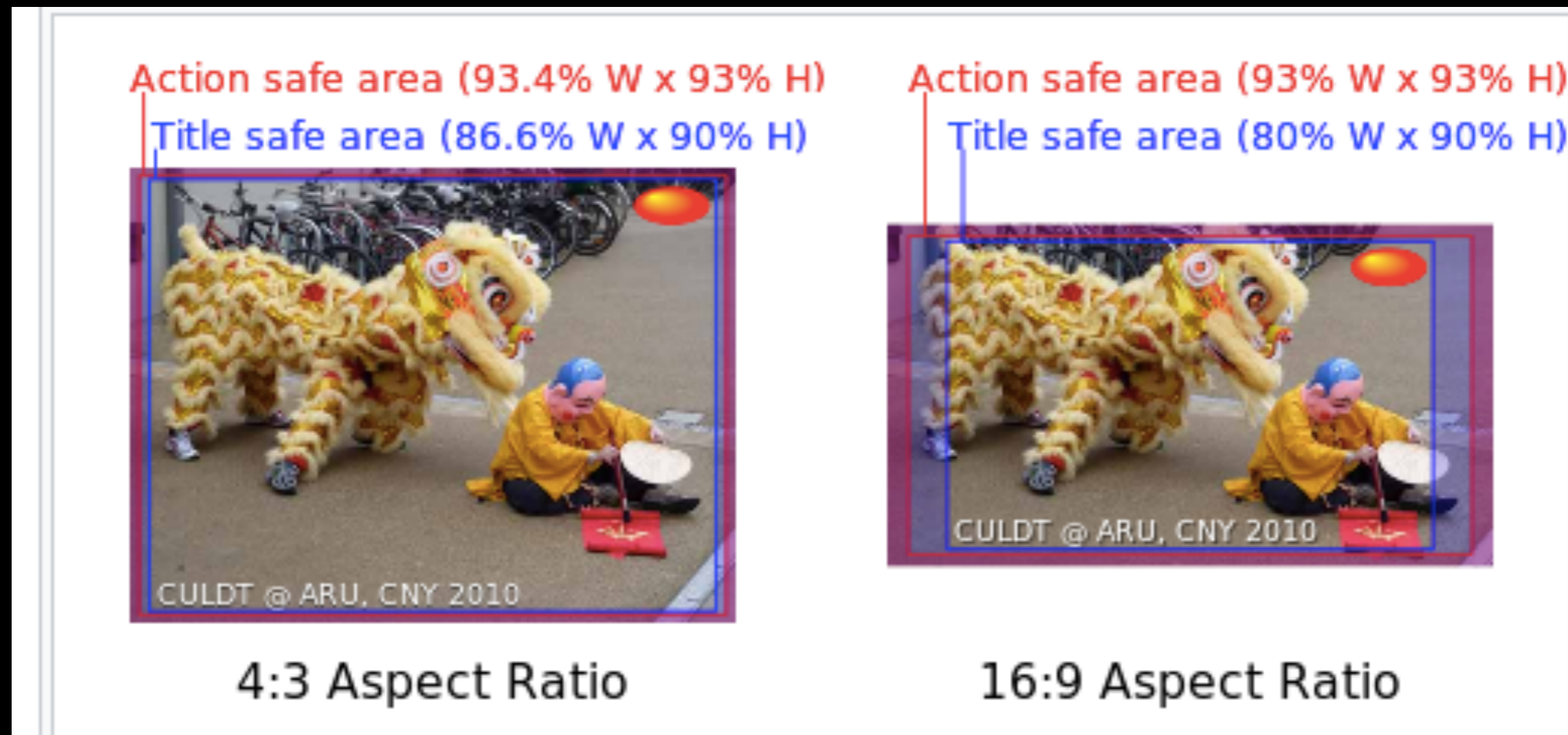


## PROGRESSIVE RESOLUTION



Source: <https://www.bhphotovideo.com/c/find/newsLetter/Aspect-Ratios-to-Frame-Rates.jsp>

# Image of Action and Title Safe Area From the BBC



The area of a video outside the screen is called the Overscan. So, plan for an action safe area and a title safe area as seen above. Conceptually, this is similar to having to plan for live matter, safety and bleed in Print.

Source: <https://en.wikipedia.org/wiki/Overscan/>

# Common Film Video File Formats

## Most common Video file formats compared

Video File Format	Characteristics
ASF, WMV (Advanced Streaming Format) (Windows Media Video)	<ul style="list-style-type: none"> <li>Can be streamed across the Internet and <b>viewed before entire file</b> has been downloaded when using a Windows Media server.</li> <li>Requires Windows Media Player be installed.</li> <li>Typically placed on an internet streaming server.</li> </ul>
AVI (Audio Video Interleave)	<ul style="list-style-type: none"> <li>Can be viewed with standard Windows Players such as Windows Media Player.</li> <li>Uncompressed yields a high quality video but uses a lot of storage space.</li> <li>If downloading from the Internet, the <b>entire file must be downloaded</b> before being played.</li> <li>Typically stored on local hard disk or CDROM or made available as download from web server.</li> </ul>
MOV (Apple Quicktime Movie)	<ul style="list-style-type: none"> <li>Requires Apples Quicktime Movie Player</li> <li>Depending on Compressor chosen, can provide a very high quality video clip, but better quality uses more storage space</li> <li>Can be streamed across the Internet and <b>viewed before entire file</b> has been downloaded if using a Quicktime streaming server</li> <li>Can be placed both on an internet streaming server, or local storage such as hard disk or CDROM.</li> </ul>
MPEG (Motion Pictures Experts Group)	<ul style="list-style-type: none"> <li>Can provide VHS quality movies or better</li> <li>Mpeg1 is equal to VHS</li> <li>Mpeg2 is better than VHS and used for DVD</li> <li>Mpeg4 is best quality</li> <li>Requires an MPEG player to view</li> <li>If downloading from the Internet, the entire file must be downloaded before being played because files sizes are very large.</li> <li>Typically MPEG2 is used to make DVD movies</li> <li>Can be placed on any storage media large enough to hold the file, but at current time the <b>internet speed will not support streaming MPEG files</b>. Any MPEG files found on the Web will have to be downloaded to the local drive and played using an MPEG player.</li> </ul>
RM (Real Media)	<ul style="list-style-type: none"> <li>Can be streamed across the Internet and <b>viewed before entire file</b> has been downloaded when using a Real Networks Streaming server</li> <li>Has very high compression, but at a cost to quality.</li> <li>Requires RealPlayer to view content.</li> </ul>

# Strategies for Reducing File Size

- Shorten the Duration of the video IF the intended use allows for this. Unlike static image files, with audio files one has the extra dimension of time. Lower the frame rate of the video.
- Lower the Frame size of the video
- Lower the frame rate of the video
- Lower the picture quality of the video
- Lower the color depth
- Lower the sampling rate, bit depth and number of channels for the audio
- Compress the File; As with static image and audio file formats, there are both lossy and lossless types of compression. With video, there are spatial and temporal compression methods.

# Video Playback Key points

- Play from the Local storage of the user's device
- Play over the network (usually the Internet but it could be a Intranet of a company as well) Both streaming video and progressive video are played over a network.
- Streaming allows for encoding of multiple copies of the same video in different data rates which works for many different servers.

# When Selecting the Format, Consider:

- the target audience for your video —what equipment do they have? Will they be on different platforms? If intended for Web playback then HTML 5 formats are best option
- The file size and data rate limits. Is the file being used on the web? If so, then you need a file format with high compression or streaming support.
- Keeping the file as a source file in case you need to make edits later in which case you need an uncompressed format or a lossless compression

# Digital Video Editors

- Adobe Premiere Elements & Adobe Premiere
- Apple Final Cut Pro
- Sony Vegas Movie Studio
- Avid Media Composer
- Corel VideoStudio Pro
- Cyberlink PowerDirector
- <https://adespresso.com/blog/best-video-editing-apps/>

# Workspace of Video Editors

- Asset List: Listing of the files imported into the program
- Preview Window: previews the entire project
- Timeline Panel: space where you arrange source clips in sequence, both video and audio source clips
- Effects and Transitions: separate panel or menu item. Effects are like image filters in Photoshop. They allow you to blur, sharpen, and stylize the video clip. The most common effect is Cross Dissolve.



# Interface of Adobe Premier

Source: T. Goetz

