A Brief Guide to Video Formats
By Laurence Fenn

With Broadband and multimedia become the latest buzzwords around the Internet and computing fields, video on your PC is now more than a postage stamp size picture in 256 colours with a muffled mono soundtrack. The type of file can anything from a variety of formats that have arisen over the last few years, and being able to play them means installing several players. Here's a description of the major file formats you may encounter:

AVI (Audio/Video Interleaved)

The oldest and most commonly found video file format available today is the AVI format. This was Microsoft's early file format that allowed you to interleave audio and video data into a single file. It is a simple format that can run on many media players (Windows Media Player, Real Player, QuickTime Player) but the file size can be very large, and is not suited for streaming content from the Internet. By the way, those animations you get when copying/moving/deleting files in Explorer are AVI files. The video and audio are compressed with a Compressor/Decompressor, or codec. Some of the early codecs like Cinepak (www.cinepak.com), Indeo (www.ligos.com) and RLE are included in the operating system, but many more have been written and can produce better picture quality and smaller file sizes. When capturing video, some people use an uncompressed option to keep the quality high, but this means large file sizes. With the DivX codec (www.divx.com), you can fit an entire DVD movie onto a standard CD-ROM. Some DVD players can read these AVI files, but most will not. However, if you are only going to view the video on your PC, then it's not a problem. Media Player will try to download a codec if you play an AVI file that is encoded with a codec you do not have installed, but sometimes it cannot find one. There are some programs like Gspot (www.headbands.com/gspot/), which you can use to find the exact codec used in a file, and then search the web to download the exact codec to enable playback. To find out what codecs are installed on your system, you can use the Control Panel, Sounds and Multimedia icon. On the Hardware tab, select the properties of the Video Codecs option and choose the Properties tab.

Microsoft has since given up development of the AVI format, instead preferring to develop its own video compression technology in the form of Windows Media Video (WMV).

DV (Digital Video)

DV is the format used by most digital camcorders for capturing movies with CD-quality sound, usually on Mini DV cassettes. Though the DV format employs a form of video compression (applied in real-time as you record with your camera), it's still memory intensive. When transferred to a computer, a DV clip requires roughly 1 GB of storage per 5 minutes of video. It has a resolution of 720x576 pixels, which is the standard PAL TV size, and if your camera has a DV out, you can transfer the footage digitally to your PC via a Fire wire connection. You can then edit your video safe in the knowledge that the quality is as good as the original, but you can only transfer your final masterpiece back to tape if your camera has a DV in.

DV uses a type of compression known as "intraframe" — that is, it encodes video at the full standard frame rate of 25 frames per second. This not only makes for high-quality video, but also allows frame-by-frame editing. In contrast, video codecs like MPEG1 or MPEG2, which can "squeeze" clips into smaller sizes, tend to handle a video sequence by reducing the number of full frames per second and encoding the differences between frames. These are known as "interframe" forms of compression.

MPEG

MPEG stands for Moving Picture Experts Group — a committee that sets international standards for the digital encoding of movies and sound. The file extension can be mpg, mpeg, or mpe, plus variations specific to the format. There are several audio/video formats that bear this group's name.

MPEG1. Permits the coding of progressive video at a transmission rate of about 1.5 million bits per second (bps). This file format was designed specifically for use with Video-CD and CD-i media, which were the cheaper alternative to Laserdisc in the 1980s. VCD has a resolution of 352x288 (or quarter screen) and is comparable to VHS in quality. You can store up to 80 minutes of film in the VCD format on a standard CD-ROM, and most DVD players can view Video CDs. Video CD 2.0 discs can also include full screen photos, with audio music. You can produce attractive menus with a video CD authoring system, but the different files or slideshows can only be accessed using your remote's number pad, rather than on screen menu buttons, like DVD menus. MPEG files can be played by Media Player and you can drag usually drag the files

from a VCD (with a DAT extension) onto Media Player and play them. Files that use the .m1v extension typically are MPEG-1 elementary streams that contain only video information.

MPEG2. Commercially produced DVD movies, home-recorded DVD discs, and digital satellite TV broadcasts all employ MPEG2 video compression to deliver their high-quality picture. MPEG2 can rival, or even slightly outperform, the DV format when it comes to picture quality — despite the fact that MPEG2 is a "heavier" form of compression (i.e., it removes a larger portion of the original video signal). The MPEG2 codec allows for selectable amounts of compression to be applied, which is how home DVD recorders and hard disk video recorders can offer a range of recording "speeds." It has a resolution of 720x576, and you can fit 45 minutes of film on a CD-ROM. You can make Mini DVD discs on CD but this format is not widely recognised by DVD players. You can of course create DVDs using this format, but you are limited to single sided, single layered discs (4.7GB). Most commercial DVDs are dual layered or double sided, so you cannot make a straight copy of a film. But newer dual layer drives are coming out soon, and the dual layered blank discs will be available. SVCD uses this format, and with a resolution of 480x576, offers a higher quality picture than VCD. Depending on the compression you can store 30-60 minutes of film on a SVCD disc, and as it squashes the picture, gives a better picture than VHS. Not as common as VCD, but if your DVD player can read it, you can burn your video on CD-ROM with a higher picture quality if they're not too long. Most DVDs will use this format, but store the video as VOB files (DVD Video Object), which can be encrypted to prevent unauthorised copying.

MPEG4. This newer, very flexible MPEG codec is used for both streaming and downloadable Web content, and is also the video format employed by a growing number of portable video recorders. This can be used with AVI or MPEG file formats or with its own mp4 extension, but very few DVD players can read type of video. Although video compression and file container definition are two separate and independent entities of the MPEG-4 specification, many people incorrectly believe that the two are interchangeable. You can implement only portions of the MPEG-4 specification and remain compliant with the standard. Microsoft has chosen to implement the video compression portion of the MPEG-4 standard. Microsoft has currently produced the following MPEG-4-based video codecs: Microsoft MPEG-4 v1, Microsoft MPEG-4 v2, Microsoft MPEG-4 v3, ISO MPEG-4 v1.

QuickTime
Though developed and supported primarily by Apple Computer, Inc., this flexible format isn't limited to Macintosh operating systems — it's also commonly used in Windows systems, and other types of computing platforms. The format can contain video, animation, graphics, 3D and virtual reality (VR) content. There are many sites dedicated to this panoramic part of the format, which can give you a 360-degree view of an area (created by stitching several carefully taken pictures together). In Windows, QuickTime files have the MOV filename extension, and the compression used can produce great results. The Apple trailer website (www.apple.com/trailers) has many film trailers in this format, commonly using the Sorenson codec. DVD players cannot play QuickTime files so they must be converted if you want to play them on your television. Apart from a full screen playback with little loss of quality, QuickTime also allows music playback through a virtual software synthesizer. The QuickTime player can also play SWF (Shockwave Flash) files, and convert them to video if you have the Pro version.

RealMedia
One of the most popular formats for streaming content on the Internet, RealMedia includes the RealAudio codec for sound clips and RealVideo codec for movies. RealAudio usually has an ra extension and RealVideo commonly has an rm file extension. RealMedia files are often heavily compressed so they can stream over dial-up Internet connections and so the quality may not be good. The BBC makes extensive use of this format to allow visitors to view programs (like the news) and listen to radio programs at any time of the day. These files are played by the Real Player, downloaded from their website (www.realnetworks.com/info/freeplayer). If you want to offer video clips on your website, you can 'stream' the file using a RAM file, which is text file pointing to an RM file. If you linked to an RM file on your web page, the browser would download the entire file BEFORE attempting to play it. With the RAM file, it will launch the Real Player and start playing when it has enough of the file in it's buffer. Live video feeds can be achieved this way as the video/audio can be continuously created and fed through the web server.

WMV (Windows Media Video)
Microsoft's proprietary compression format for motion video, Windows Media Video is used for both streaming and downloading content via the Internet, similar to RealMedia. Files have the extensions WMA

(for audio) and WMV (for video) and can be played by Media Player. WMV files can be of any size, and be compressed to match many different bandwidths or connection speeds.

The ASF Format
The Advanced Systems Format (ASF) is the file format used by Windows Media and is specially designed to run over the Internet. ASF files can be highly compressed and of any size. It supports data delivery over a wide variety of networks and protocols while still proving suitable for local playback. ASF supports advanced multimedia capabilities including extensible media types, component download, scaleable media types, author-specified stream prioritisation, multiple language support, and extensive bibliographic capabilities, including document and content management. Typically, ASF files that contain audio content that is compressed with the Windows Media Audio (WMA) codec use the .wma extension. Similarly, ASF files that contain audio content, video content, or both, that is compressed with Windows Media Audio (WMA) and Windows Media Video (WMV) codecs use the .wmv extension. Finally, content that is compressed with any other codec use the generic .asf extension.

The ASX Format
Advanced Stream Redirector (.asx) files, also known as Windows Media Metafiles, are text files that provide information about a file stream and its presentation. ASX files go beyond the simple task of defining play lists to provide Windows Media Player with information about how to present particular media items of the play list. Windows Media Metafiles are based on XML syntax and can be encoded in either ANSI or UNICODE (UTF-8) format. They are made up of various elements with their associated tags and attributes. Each element in a Windows Media metafile defines a particular setting or action in Windows Media Player. ASX files can point to any media file type that Windows Media Player recognizes and supports. There are several programs that will generate asx files, like ASX Maker (www.baldgorilla.com/products/asxmaker.html), which means you can create play lists of video files compatible with Media Player 6.4

When producing your own multimedia material, the final destination can determine what format you will use. If you were creating clips to post on or stream from a web site, then you would probably create a small frame size (180 pixels wide or so) and encode it as an asf or RealMedia file. If you want to produce a movie that does not need to be downloaded from the web, then you can create a larger frame size (352 pixels wide or bigger) and use AVI, MPG or MOV (if you have upgraded to the Pro version) format. If you want to create a Video CD to play on a DVD player then you must use the MPG format, with a frame size of 352x288 (for UK PAL TV standard). If you want a better quality picture, and the video isn't too long, you can use the SVCD format. Finally, if you have a DVD writer and a large hard drive, you can create your own DVDs, in the MPEG-2 format. In any case, for best results you should capture your video in an uncompressed AVI format. If you don't intend to edit the video, you can capture in the final format that you want to use.

As MPEG is a lossy format (i.e. it throws away information and only records the changes between key frames) you will notice degradation in the picture quality if you capture in this format, and re-render your final video in the format again. Some video editing software programs will have a smart render option to compensate for this, and only recode the parts of your video that have changed (due to adding effects or transitions). Even though VCD or DVD is standard, it doesn't mean that all video software will produce the same quality of picture when you write your file. This is because of the algorithm the software will use to remove the extra information. Commercial DVDs are analysed scene by scene, using difference settings depending on picture content, but your software may use one setting for the entire clip.