

.mp4

Bring on Internet Video and VideoOnDemand

BY BOB CONNOLLY



Imagine a full-length broadcast-quality movie file that fits on a CD. Then think of games, home videos or tutorials as close as your favourite URL. Or movies and TV shows on demand whenever you want.

MPEG-4 is here.

Apple has always been known for its hardware innovations—the iPod, Firewire, the iMac and DVD SuperDrives are prime examples. Yet Apple software development—with the notable exception of its operating system—was historically almost invisible, especially when viewed in Microsoft’s shadow.

But in the past few years Apple has evolved into a primary application software developer. The core of Apple’s suite consists of QuickTime Pro—the professional version of QuickTime—the deal of the century for US\$30; Final Cut Pro, now recognized as a full broadcast non-linear editing system by many major television stations and post production companies; and DVD Studio Pro, its flagship digital video creation application which is now penetrating even the corporate world.

Had there been any doubt that Apple’s July/2001 purchase of Spruce Technologies and its DVD software authoring technology was a clear indicator that the company’s sights are set on video production and music? If so, it was confirmed this June when Apple announced that it had bought Silicon Grail Technologies, including the RAYZ and Chalice film compositing products, as well as Prismo Graphics, developers of DV Fonts and title animation software India Titler Pro, just after having swallowed the Oscar-winning film compositing software Shake and its originators, Nothing Real in February. These acquisitions are all obviously focused on video. And a few weeks later, almost as an afterthought, Apple added Emagic, a killer Mac music software company in Hamburg, Germany.

Apple seems content to leave the graphics industry to Adobe, office products to Microsoft and website creation to Macromedia. Instead, Steve Jobs has his company aimed squarely at assuming the throne of desktop video. And what ties together Apple’s software monarchy is QuickTime.

QuickTime acts as the universal language translator between Apple’s operating system and applications, magically transcoding DV, MPEG, AIFF, MIDI, PSD, SWF and many more extensions and compression codecs. And now QuickTime 6, released in July, has added ISO-compliant MPEG-4.

MPEG-4 — IT’S BEEN A LONG TIME COMING

I have heard MPEG-4 described by TV broadcasting company executives as the midwife for Internet television and Video On Demand delivery. Some say that its importance is on a parallel with television’s evolution from black-and-white to color. For those of you may have missed its significance, I’ll explain further.

In the beginning, there was analog. And then they said, “Let there be digital.”

The transition from analog to digital video for the masses was first made possible by Apple. At first, Apple’s QuickTime technology provided only crude postage stamp-size videos, but as processing power improved and new techniques for compressing video evolved, digital video was eagerly embraced as an alternative to analog VHS videotape.

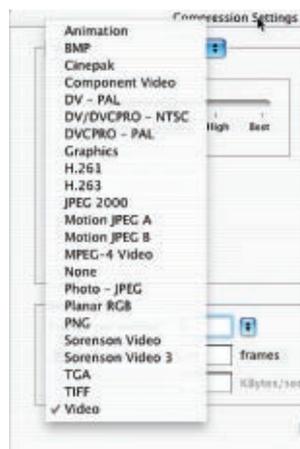
As CDs became popular with consumers, Japanese hardware manufacturers readily embraced the idea of video on CD. But who was going to create the video standard? Not Apple, they said, and not Microsoft either. It required someone neutral, someone who would open the digital video world for all to use fairly. Let’s create a body which would merge ideas together to create a standard—an expert group of people from the motion picture industry which would decide the best way to replace VHS: a moving pictures expert group!

And so the first digital video standard was born.

MPEG stands for Moving Pictures Expert Group. This is a consortium of software and hardware specialists, patent holders, manufacturers, lawyers, accountants and others which chooses audio and video compression standards and then licenses these standards to people who want to use MPEG technologies. The current list of patent holders includes Canon Inc.; France Télécom; Fujitsu Limited; GE Technology Development, Inc.; General Instrument Corp.; Hitachi, Ltd.; Hyundai Curitel, Inc.; KDDI Corporation; Matsushita Electric Industrial Co., Ltd.; Microsoft Corporation; Mitsubishi Electric Corporation; Oki Electric Industry Co., Ltd.; Philips Electronics; Samsung Electronics Co., Ltd.; Sanyo Electric Co., Ltd.; Sharp Kabushiki Kaisha; Sony Corporation; Telenor AS; Toshiba Corporation, Victor Company of Japan, Limited, and Apple Computer.

The first digital video standard created in 1991 was called MPEG-1. This compression codec (“co” for compressor, “dec” for decompressor) was conceived for VideoCD, a new generation of digital players intended to be replacements for VHS. Although popular in Asia, VideoCD suffered from quality so poor that the U.S. market never bought its set-top box format.

However, the multimedia industry boldly adopted MPEG-1 for touch-screen kiosks and consumer CD-ROM titles, and both Apple and Microsoft incorporated it into their operating systems so that VideoCDs could also be played on computers. This firmly established MPEG’s presence on the desktop and prepared the way for the next stage in digital video codec development.



QUICKTIME 6 PRO COMPRESSION SETTING WINDOW. Video can be transcoded to several formats—displayed here are the “standard issue” formats with QuickTime 6. Other compression codecs can be easily added for uncompressed video such as Pinnacle’s TargaCine.

JVC first with pro model MPEG-4 streaming digital video camera

In February, JVC introduced the world's first professional quality camcorder capable of streaming MPEG-4 video live to the Internet. The JVC *STREAMCORDER GY-DV300U* is manually controllable with a 14:1 power zoom lens and includes optical image stabilizer, gamma adjustments, and two XLR microphone inputs.



By adding a KA-DV300U network adapter, this 1/3-inch 3-CCD camera can *STREAM LIVE MPEG-4 VIDEO* out to cyberspace at 15 frames per second or more.

The KA-DV300 network package runs on LINUX, and attaches to the bottom of the camcorder, with connection for a LAN card or CF card. Full end-user control over camera functions can be performed from a remote location on any computer in Java using a web browser. The camera's IP is available just like any other URL. However, JVC's MPEG-4 is not the "0" ISO-compliant base version. JVC designed the Streamcorder to be software-based and field upgradable, so other compression/streaming variations may conceivably be supported in the future. Apple and JVC are currently in discussions regarding the GY-DV300U Streamcorder and its technology.

The GY-DV300U camera/server system lists for US\$4794, about CDN\$7,500. The camera only is US\$3,495, while the KA-DV300U adapter is an additional US\$1,299. Optional accessories include shotgun microphone and holder, and wide angle and telephoto adapters.

More details may be found at pro.jvc.com/prof/new_models.jsp

NEAR-ANCIENT HISTORY: MPEG-1 LAYER 3 = .MP3

The MPEG-1 video codec was far from perfect, but it was a beginning—and its audio portion was to change the face of the music industry. Today's familiar MP3 file format originated more than ten years ago as the audio codec in MPEG-1 video.

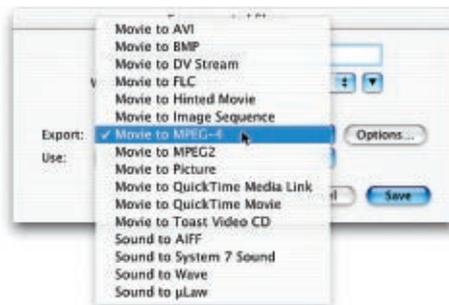
Over the past three years MP3 has been universally adopted as a standard for exchanging music files over the Internet. It seems competing companies can take a long time to work together on a common format, but when it happens, it's revolutionary! Witness Napster, iPod and iTunes. But for better video, it was back to the drawing board for the MPEG consortium.

They gathered their resources again, looking for a way to make a better new DV codec. It needed to be used for new DVD players, broadcast digital cable and satellite television transmissions, and it needed to at least match the quality of VHS—and it would also have to be as good as broadcast television.

This new codec consumed another two years of development. But eventually every major hardware vendor brought out DVD players using the new video chip specifications. Soon DVD swept the globe, as MPEG-2 also enabled the explosion of new digital TV stations that are now on the air. If you have Direct TV or Expressview, then you have an MPEG-2 video decoder chip inside the box. Digital video is compressed, stored and transmitted right to your home in MPEG-2, where your set-top box decodes it. Because it is a world standard, it works everywhere. And software developers such as Apple once again licensed the MPEG-2 codec, allowing you to watch DVDs on your computer.

MPEG-2 content may now be played back through QuickTime 6 using an add-on component that is sold separately by the Apple online store. For DVD producers, it's a great way to check

MPEG-2 video files without having to import them into DVD Studio Pro, and video editors can now review their work before sending video files to the DVD authoring department.



QuickTime content that uses the .mov extension can be exported to **OTHER COMPRESSION FORMATS** such as Windows .avi, and MPEG-1, 2 and 4. Note: to compress QuickTime to MPEG-2 using QuickTime Pro, you need to purchase DVD Studio Pro, which includes an MPEG-2 export extension. To play back MPEG-2 files via QuickTime, you must purchase a QuickTime MPEG-2 player extension from Apple for US\$20.

SO WHERE IS MPEG-4?

While the industry was adopting the MPEG-2 compression scheme as the de facto digital video codec for broadcast quality productions, the MPEG consortium was again working to create a third generation codec.

The next one needed to be just as good as MPEG-2, but much more efficient—and scalable. One hour of DVD-quality MPEG-2 fills a 4.6 GB DVD disc, but this is too bandwidth-intensive for newer purposes—such as sending broadcast-quality video over the Internet and through satellites for Video On Demand (VOD) services. The new MPEG-4 codec needed to consume one-tenth the data rate of MPEG-2 to satisfy these delivery technologies. MPEG-2 for DVD has a 10-megabit per second maximum data rate. That meant MPEG-4 at only 1 megabit per second would have to look just as good.

However, cable modems are capable of handling 1-megabit per second data rates, so DVD-quality video via the Internet should technically be possible for video to be downloaded and saved for viewing. MPEG-4 Video On Demand via satellite at the same rate is also quite achievable.

In late 1998, the consortium finalized the specifications for MPEG-4, and they became an ISO standard in 2000. But this time, nobody jumped on it. New MPEG-4 royalty fees were viewed as unreasonable; onerous accounting procedures which went along with the revised structure made MPEG-4's use even less compelling. Worse still, this time the MPEG group allowed for various flavours or "profiles" of MPEG-4, which only exacerbated problems with hardware companies. Which MPEG-4 profile would be adopted? Different profiles would be incompatible. The Internet video player conflict between QuickTime, Real and Windows Media was starting all over again.

A group called ISMA (Internet Streaming Media Alliance) was formed. ISMA's job has been to sort out the various MPEG-4



QUICKTIME 6 MPEG-4 COMPRESSION SETTINGS PALETTE. MPEG-4 allows for proprietary compression codecs. “Basic” allows playback on all ISO-compliant MPEG-4 decoders. “Improved” is Apple’s higher quality “profile”, although it might be incompatible with some MPEG-4 decoders.

varieties and concur on the standard ISO MPEG-4 profile (-o).

But in addition, the MPEG licensing association wanted to charge a “per stream” fee. In order to sell a digital video stream on the Internet, providers would have to pay royalties to the consortium (although if you gave it away free, the royalties were waived). And this stopped the introduction of MPEG-4 dead in its tracks.

Contending that the mountains of paperwork for website developers would be detrimental, Apple postponed the release of QuickTime 6 (which featured MPEG-4 based on the ISO standard) until licensing agreements could be worked out.

Meanwhile, Microsoft decided to develop its own codec, called Corona (which it said was better than standard MPEG-4), and of course, it would be free. But Microsoft’s MPEG-4 codec is simply another version of Windows Media Player, proprietary code which would not be compatible with many of the “Internet-aware” hardware set-top boxes to be produced. Much of the digital world is plenty worried already about Windows’ dominance in operating systems and Explorer’s overwhelming share of the browser market, and hardware manufacturers are not enthusiastic about being bound to Microsoft for Internet video as well.

COULD VIDEO ON DEMAND PAY LICENSING FEES?

What the market needs is a set-top box with a hard drive and a standardized MPEG-4 digital chip. The name of the game will be to enable digital video services through cable, satellite or broadband connections so that consumers can simply order movies, download them to their set-top boxes, and play them.

For example, TiVo (www.tivo.com) is a digital video recorder with a TV tuner that allows you to record TV programming while you’re away from your TV. Add an Internet connection via Ethernet or cable, and voila!—Video On Demand. This type of product and service is where the MPEG group could make its per stream license fee instead of taxing web developers.

Apple said, let’s just get MPEG-4 into the market—and it released QuickTime 6. Steve Jobs has already watched Microsoft take a different approach and realizes that Ballmer and Gates might even try to kill off the efforts of the MPEG consortium. So Apple proceeded to get the show rolling, hoping hardware vendors will buy MPEG-4 chips and install them into DVD set-top boxes right beside the MPEG-2 chips. Many DVD players will now play discs burned with MP3 files downloaded from the Internet, so why not let users download videos, burn discs and play them in the very same DVD set-top player? Deliver video via the Internet, burn it to disc, watch it on TV—simple!

WHAT THE HYPE’S REALLY ABOUT

Since it has made CD and DVD creation so easy, we can expect Apple’s software tools to lead the market for the creation of CD videos using MPEG-4 compression. But let’s be clear on one point: this isn’t a war over Real, Windows Media or QuickTime playback on computers. It has bigger implications in a near-future where anyone could be enjoying the convenience of downloading a full-screen, full-motion, 30-frame-per-second digital video file, copying it to disc, and watching it on TV.

Think of the possibilities. There are millions of corporate and educational videos currently making the rounds as VHS videotapes (or, more recently, on DVD). Any or all of them could be posted on websites in MPEG-4. Or, how cool would it be to make an iMovie and upload it as .mp4 to the Internet for your friends to download—just like they do with .mp3 files? They’d just burn it to a CD and play it back on a DVD player in full screen. Or better still, transfer it to their MP4 portables! Imagine a new generation of MP4 hardware—transferring the latest .mp4 videos to tiny, portable digital video players that plug in via Firewire. And now Apple has licensed iPOD for Windows. Is iPOD-TV next?

YOU WON’T SEE MPEG-4, BUT YOU’LL LIKE IT

I’ll confess that most people probably won’t see or hear much difference between MP4 and the latest Windows Media and Real digital video codecs—the various artefacts in each codec aren’t apparent to the average user. But they are to me, simply because I stare at them all day long. And even at high data rates, MPEG-4 video is near-DVD quality—and certainly looks as good as VHS.

If you set up your server properly, QuickTime Pro 6 lets you create and deliver a digital video using the .mp4 extension, or you can embed the MPEG-4 video codec into a .mov file. If you create a .mov file, only QuickTime will be able to play it back. But if you create an ISO-compliant .mp4 file, any video player with the capability to read an MPEG-4 file should (in theory) be able to play it back. However, until we see more compliant .mp4 video on the Internet, it will be difficult to judge the quality and see what other people are doing with it.

Apple has a few videos on its sample page to get you started. However, we have also posted a few .mp4 samples of our own on the GRAPHIC EXCHANGE web site at www.gxo.com.

Interest in the supernatural has been high of late. Perhaps the August release of *Signs* will inspire you to get away from that computer monitor and see the world outside—in which case don’t forget to take along your digital video camera, just in case something shows up where you least expected—like crop circles...

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