

Multi-  
tasking  
24/7  
in  
Mac OS X  
**Wow**



**It's fast, it's crashproof, and now Mac OS X can make Apple's new QuickTime 6 with MPEG-4 fly like a bat out of you-know-where.**

## by Bob Connolly

QuickTime 6 with MPEG-4 compression has finally arrived, and as a video producer, I couldn't be happier.

According to recent polls, the adoption of high speed Internet connections in Canada is as much as two and a half times greater than in the U.S., with estimates as high as 50% of Canadian households using DSL or cable modem. Of course, Canadians take for granted their relatively inexpensive cost for broadband access, while Americans still suffer with inconsistent and higher pricing from region to region.

But with broadening high speed Internet penetration and movies a favorite item for downloads, more members of the corporate community are now seriously looking at the addition of video to company websites. Video-specific .tv domains are now starting to show up on search engines, and the adoption of the .tv extension by broadcast giants such as AOL-owned Turner Network Television ([www.TNT.tv](http://www.TNT.tv)) is a sure sign that the Internet video age has arrived.

As web and television production companies now ramp up for new opportunities to repurpose video for resale on the Internet, digital video compression suddenly becomes a key consideration. And MPEG-4, the new compression codec for delivering video over the Internet, will be a pivotal component of web-based video distribution.

MPEG-4 was specifically developed to eliminate the codec wars that make Internet video such a nightmare to produce and deliver. The television industry adopted MPEG-2 for digital television via cable or satellite, and it works perfectly for DVD Video, too. But Internet video has been a real Tower of Babel, with Windows Media, Real Media, QuickTime, etc. all vying for control. That meant that if you created a website which contained video, you needed to compress the same video three times and at several different data rates and sizes.

The ideal situation is for every player—whether it's QuickTime Player, Windows Media Player, or Real Media Player—to be capable of compressing and playing MPEG-4. The goal is to establish one codec that works everywhere. And QuickTime 6 with MPEG-4 is trying to satisfy that objective.

### DRIVEN TO A NEW WORKFLOW

For digital producers, rebuilding workflows to accommodate the demanding deadlines of .tv websites and network television will be the next new challenge.

In our company's case, the problem of rethinking our workflow came to a head when we accepted a contract to deliver a project called [VirtualCanada.tv](http://VirtualCanada.tv), sponsored in part by Bell Canada, which has been supporting the convergence of television and traditional print media. Now we had to be able to handle an overwhelming amount of video, which needed to be edited, rendered, compressed and delivered in several formats.

One of our objectives with *Virtual Canada* was to merge television and eBooks. We decided to produce a one-hour TV special

taking you right across Canada and showing highlights of the country. At the same time we would introduce several photographers who are doing spectacular photography using Virtual Reality cameras. The *Virtual Canada* TV special would promote a companion eBook ([www.Canada-eBook.com](http://www.Canada-eBook.com)) where virtual reality photography and related broadband video clips could be viewed.

In addition to the one hour TV special, over 20 hours of DV-CAM footage had to be edited and compressed into small bite-size clips that could be viewed in real-time with a high speed connection or downloaded through a dial-up connection. Unlike traditional PDF eBooks, the *Virtual Canada* eBook is interactive and has Internet links to panoramic photography plus 135 video clips. In total, there would be over three hours of video to be viewed or downloaded.

However our biggest concern with this project was rendering the vast amounts of video. We just couldn't afford to wait overnight (when our workstations usually sit idle) for videos to be compressed in several different resolutions and media player formats. We needed to change our existing production methods to accommodate the video-intensive task at hand.

Deciding which of our Macs seemed up to doing the job required some testing. But after the initial tests were completed, we ended up buying new computers better suited to the job. The results of these benchmark tests are an important part of this article.

### TAKING THE PLUNGE INTO OS X

After witnessing some impressive demonstrations of OS X at an Apple Learning seminar, we decided to take the giant (although scary) leap to the new operating system. In the past, we would edit a video on one computer, then transfer the movie on a Firewire drive to another computer that was better for rendering. We were now hoping that OS X's multitasking capabilities would let us use any computer for editing and rendering the same footage without transferring files to another workstation. Our staff all knew how to edit video; using DV via Firewire allowed all the computers to be used as editing workstations.

The first thing we noticed in running OS X was the speed increase when copying files from internal hard drives to external Firewire drives—transferring DV files was *twice* as fast. A one minute 218MB DV movie clip took eight seconds, compared to 16 seconds under OS 9, and that's because OS X speaks "native" Firewire.

Now I get it—Firewire: the name unquestionably suits the transfer speed of the drive.

Logging and digitizing stock footage can be pretty boring, and this job is often assigned to a co-op student or apprentice. But you can make the experience much more pleasant with iTunes and OS X. Whistle while you work—with a good pair of headphones to isolate the music to the workstation, you can log footage in Final Cut Pro and play your favorite tunes at the same time without missing a beat. OS X lets you work with several applications run-

ning simultaneously, so playing audio as you work is a breeze, even with processor-intensive applications running.

We often have to burn CDs or DVDs for backups; under OS X, we now create graphics with Photoshop, render MPEG-2, upload videos to our server, and burn backup DVDs at the same time on the same computer! It's still hard to break the habit of stopping everything just to burn a disc. In fact, it has turned into a sort of battle of the processors—how many applications can you run at one time before the machine locks up?

Under OS 9, a Mac will crash at some point during the day—we all know that. For us, it usually happened when we had too many applications open. So, until OS X came along, Final Cut and Photoshop would be the maximum open at one time.

But now, building a website is a breeze. You don't need to open and close programs to preserve RAM because the operating system does it all for you. No more assigning memory to an application—it just takes what it needs, when it needs it. If an application crashes (and for us this is now a rare occasion), it doesn't take down the whole system. Just restart that application and continue. Under OS X, at the start of the session we launch everything that we might require to make a website—InDesign, GoLive, Photoshop, ImageReady, LiveMotion, QuickTime Player, Windows Media Player, Word, Internet Explorer, Netscape, Toast, Entourage, even Virtual PC to check out Windows issues—and they all work, all the time, even in the background.

### CATCHING MEGAHERTZ MANIA

The primary reason we moved to OS X was to take advantage of its stability and workflow speed increases. In a digital video production workflow, the word “rendering” usually has negative connotations. “Real-time” is positive; “Our system is real-time” beats “I need to render the video over lunch”. Compressing video or rendering it in Adobe After Effects is the biggest pain in a production workflow. However, in OS X, you can be doing other things.

But first we need to define real-time and rendering in realistic terms. If you capture a 30-minute video and compress it to MPEG-2 at the same time, you are using a “real-time” capture card. If you edit a 30-minute video and export it to MPEG-2 in 30 minutes, that's also real-time. The latter is where dual processor G4 Macs and OS X really shine. I've been simply astonished at the speed of the new dual 1GHz G4, especially under OS X.

Using a video compression application such as QuickTime Player Pro, Media Cleaner Pro or Sorenson Squeeze, real-time rendering with almost any codec from MPEG-2 to Sorenson to MPEG-4 on a dual 1GHz G4 running OS X is *fast*. Five minutes of edited video takes five minutes to compress.

I should mention that real-time rendering doesn't always yield the best results. The best way to compress video for the Internet is to use a two-pass approach with an application like Sorenson Squeeze or Media Cleaner Pro. The first pass analyzes the video clip, and the second pass actually performs the compression. This

takes much more time, but the quality is much higher and the file size much smaller. This method is called dual pass variable bit rate compression and is still highly recommended for broadband delivery of QuickTime Sorenson Internet video clips.

We have also rendered video to the MPEG-4 codec using QuickTime Pro Player, and its single pass export capabilities provide very good results. In fact, it's faster than real-time on a 800MHz Titanium PowerBook and delivers higher quality video than Variable Bit Rate Sorenson at the same data rates. In addition, MPEG-4 delivers killer audio. Muffled digital noise is gone, now replaced by very clear sound, even at the lowest data rates for streaming audio over dial-up connections.

### SPEED TESTS PROVE THE POINT





The first time I tried rendering a test video on a dual 1GHz G4, I thought something must have been wrong. It was just too fast to be true. So I decided to benchmark various Macs we had around the studio to determine what computers would be best suited to rendering.

For this test, we made a one-minute video using DV codec and rendered it to MPEG-2 for DVD presentation and 320 x 240 using the Sorenson codec at 30KB per second for the Internet. With the release of QuickTime 6, we're now test-rendering our videos to MPEG-4. Based on my initial observations, I think the Sorenson codec will gradually be abandoned in favor of the superior MPEG-4 format, but it all depends on how fast QuickTime 6 is adopted by the general public.

The chart below shows the details of our tests.

### Comparison of DV Export using Mac G4s

Four Macintosh computers were tested for this comparison, each running a G4 processor with the AltiVec chip. Test 1: One-minute DV video clip exported to MPEG-2 using DVD Studio Pro's MPEG-2 export extension. Single pass, constant bit rate of 9 Mb per second; Test 2: Same one-minute DV video clip compressed to 320 x 240 using Sorenson Squeeze Variable bit rate, dual pass, 30 KB per sec, 15 frames per second

System	DV to MPEG 2 export	DV to Sorenson
 <b>G4 Tower</b> 400MHz 512MB RAM 1MB Level 2 cache	2 min 19 sec	9 min 10 sec
 <b>iMac (LCD)</b> 800MHz 256MB RAM 256k Level 2 cache	1 min 43 sec	5 min 14 sec
 <b>Powerbook (TI)</b> 800MHz 512MB RAM 256k Level 2 cache 1MB Level 3 cache	1 min 22 sec	4 min 15 sec
 <b>Dual Processor Tower</b> (2) 1000MHz 512MB RAM 256k Level 2 cache 2MB Level 3 cache	51 sec	3 min 36 sec

## HOW TO INTERPRET THE SPECS

The new 1GHz dual processor G4 was almost three times faster than our 400MHz G4 tower. One minute of MPEG-2 video took 51 seconds to compress—better than real-time. One minute of dual pass variable bit rate Sorenson video took 3 1/2 minutes.

However we noticed significant differences in the speeds of the PowerBook and the iMac, both of which have 800MHz processors. Puzzled, we checked with Apple, who informed us that “the Velocity Engine (AltiVec technology), high bandwidth MaxBus, dual instruction and data caches (Level 1) and built-in backside L2 or L3 cache all affect the computers’ performance.”

Upon closer scrutiny, it seems “backside cache” is the unsung hero. However most Mac users don’t recognize the importance of this feature. But it will make a *big* difference when determining which computer model is right for them.



The iMac has only 256K of level 2 cache, whereas the Titanium PowerBook has an additional 1MB of Level 3 cache. The latest offering in the G4 family is the tower Mac with two 1GB processors. This beast features Level 3 cache and uses 2MB of high-speed, Double Data Rate (DDR) SRAM running at a data rate of up to 500MHz. The reason for significant speed increases is because the L3 cache

helps the processor by providing fast access to data and application code at speeds of up to 4GB per second (GBps). This L3 cache has a dedicated bus to the G4 chip, making the full 4GB per second data throughput always available, and enabling the G4 processor to receive data five times faster than it could from main memory. The L3 cache is large enough to store active application code and data, so that when you run a program most of the active code, along with most of the data being used, is stored in L3 cache. The information most requested by the processor is readily available, much the same as caching web pages in your browser when you click the back button, and your computer uses the data which you loaded several pages ago, skipping the step of downloading the same page over again.

Now, consider two 1GB processors each having separate 2MB Level 3 caches running applications under OS X. OS X is now operating at its full potential because it has the ability to assign tasks to each processor. Most of us are familiar with the G4 AltiVec chip that co-processes data, but this only happens if applications are written to communicate with the chip. Programs needed to become AltiVec-aware.

Under OS X, if the application was written for OS X and the operating system sees two processors, it uses both processors and effectively increases the computer’s speed two-fold. This is when the Mac really shines with rendering-intensive applications and achieves real-time or better rendering for DV, MPEG, and Sorenson—and it does all this in the background!

## YES, I'M A MAC FANATIC, BUT...

Now we have lots of fun dazzling associates who pop by for a visit. I tend to start the demo by playing two videos at the same time—even that gets them excited. Then I pop up iTunes and listen to Bare Naked Ladies, edit some video in Final Cut (by this time the audio gets really busy, but all the sounds keep coming out of the box clearly mixed) and for the grand finale—I surf the Internet and get my mail!

This display of OS X’s capabilities usually has a dramatic effect on people familiar with Macs.

In conjunction with this article I produced a few presentations which can be viewed on the Graphic Exchange website at [www.gxo.com](http://www.gxo.com). These are QuickTime movies that will show via video the actual rendering speed tests that I ran on the various computers. While you’re there, you can also view a video that demonstrates the multitasking capabilities of OS X.

Windows users might find this article far too Mac-biased for their liking, but here’s a story about a freelancer who works for us. This individual was pro-Linux—a real code warrior. His responsibility is to manage our Apache web server.

One day he showed up with an iBook under his arm. He plugged it into our network, booted it up under OS X, started up the free Telnet shell application that comes with the OS, then logged on to our server.

“You’ve switched to Mac, you’ve ditched Linux and Windows—you’re a Mac head!” I remarked.

“Not really,” he replied. “It’s just that the Mac has finally gone Unix, and this OS X operating system and cool iBook is the best way for a mobile guy like me to work.”

Moving to the Mac via Telnet was a natural evolution. Virtual PC in OS X works well on a Mac, allowing PC users to feel at home with Windows running on UNIX. And many PC users are now adding a Mac to their video suites just to get Final Cut Pro. Of course, people who have never used a computer love the new iMac with its fancy Aqua colors and zooming windows.

But for pros who depend on Macs for their livelihoods, the jump to OS X is one which must be thought out carefully. OS X is quite different than OS 9, and it takes time to get used to running a version of Unix that resembles part OS 9 and part Win XP.

But now I can see that the road ahead is worth travelling. I’m working faster and more productively. And I’m saving money, too, since previously I needed many computers to do the same amount of work.

To see samples of our *Virtual Canada* videos in MPEG-4 format and the bench test videos mentioned, just go to [www.gxo.com/osx](http://www.gxo.com/osx). And watch for much more video on the Internet now that MPEG-4 has been released. 🍎

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