



& A about H.264

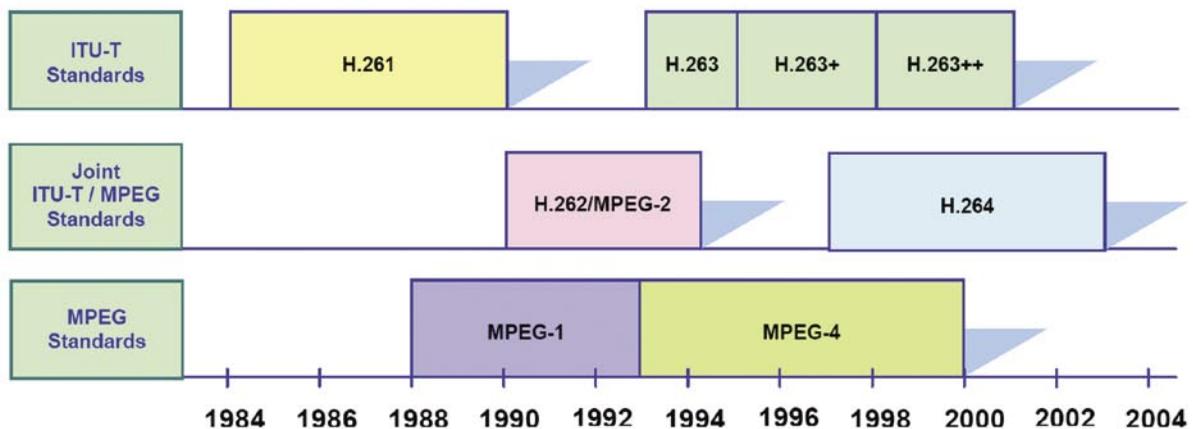
Questions and Answers from the Apple web site about the new H.264 video compression implemented in their new Quicktime

Broadcast television and home entertainment have been revolutionized by the advent of digital TV and DVD-video. These applications and many more were made possible by the standardization of video compression technology. MPEG2 is widely used as a broadcast standard, the new MPEG4 standard is enabling a new generation of internet-based video applications whilst the ITU-T H.263 standard for video compression is now widely used in videoconferencing systems. CCTV is no exception, using all of these standard in one product or another.

MPEG4 (Visual) and H.263 are standards that are based on video compression technology from around 1995. The groups responsible for these standards, the Motion Picture Experts Group and the Video Coding Experts Group (MPEG and VCEG) are have finalised developing a new standard that promises to significantly outperform MPEG4 and H.263, providing better compression of video images together with a range of features supporting high-quality, low-bitrate streaming video. The history of the new standard, "Advanced Video Coding" (AVC),

goes back at least 7 years. After finalizing the original H.263 standard for video telephony in 1995, the ITU-T Video Coding

Experts Group (VCEG) started work on two further development areas: a "short-term" effort to add extra features to H.263 (resulting in Version 2 of the standard) and a "long-term" effort to develop a new standard for low bitrate visual communications. The long-term effort led to the draft "H.26L" standard, offering significantly better video compression efficiency than previous ITU-T standards. In 2001, the ISO Motion Picture Experts Group (MPEG) recognized the potential benefits of H.26L and the Joint Video Team (JVT) was formed, including experts from MPEG and VCEG. JVT's main task was to develop the draft H.26L "model" into a full International Standard. In fact, the outcome now has two identical standards: ISO MPEG4 Part 10 of MPEG4 and ITU-T H.264. The "official" title of the new standard is Advanced Video Coding (AVC); however, it is widely known by its old working title by its ITU document number, H.264.



Progression of the ITU-T recommendations and MPEG standards

One of the first companies to embrace this new standard is Apple. Their new QuickTime 7 features an ultra-efficient new video codec - the H.264. H.264 delivers stunning video quality at remarkably low data rates, so you see crisp, clear video in much smaller files. Chosen as the industry-standard codec for 3GPP (mobile multimedia), HD-DVD and Blu-ray, H.264 represents the future of next-generation, high-definition DVD playback. Numerous broadcast, cable and videoconferencing groups consider H.264 the video codec of choice for their deployments.

What is H.264?

H.264 is the next-generation video compression technology in the MPEG-4 standard, also known as MPEG-4 Part 10. H.264 can match the best possible MPEG-2 quality at up to half the data rate. H.264 also delivers excellent video quality across the entire bandwidth spectrum — from 3G to HD and everything in between (from 40 Kbps to upwards of 10 Mbps).

What are H.26L, AVC and JVT?

These names are sometimes also used to refer to the H.264 video codec. H.264 is the result of the combined efforts of two standards bodies — the ITU (International Telecommunication Union) and ISO MPEG (International Organization for Standardization's Moving Picture Experts Group) — that together formed a body called the Joint Video Team (JVT). ITU originally referred to this new technology as H.26L, while MPEG originally referred to this technology as AVC. During the development of the standard, some also referred to the codec as JVT. H.264, however, is emerging as the most commonly-used name.

Why is H.264 being included in QuickTime7?

A few years ago, the International Organization for Standardization selected the QuickTime file format as the basis for MPEG-4. QuickTime in turn embraced open standards and now leads the market in MPEG-4, 3GPP and 3GPP2 content creation and playback. Apple continues to build on this commitment to open standards by incorporating H.264 — the latest MPEG-4 video

codec — directly into QuickTime. And since H.264 is an open standard, companies around the world can create products that will interoperate with one another. In addition to the enormous benefits of H.264 being a worldwide standard, Apple is very excited about the incredible video quality that H.264 can provide. Not only does it deliver excellent video; it does so at data rates much lower than MPEG-2 and plays back seamlessly on today's shipping hardware.

Will application developers be able to access H.264 via QuickTime APIs?

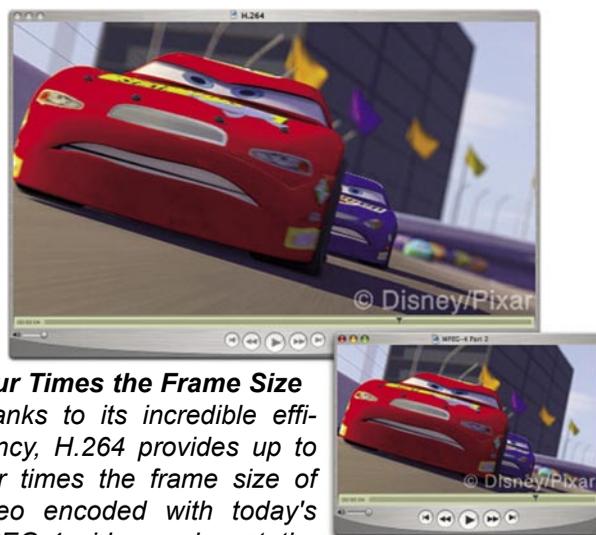
Yes, H.264 is built into the QuickTime media architecture just like other QuickTime video codecs. So application developers can use QuickTime APIs to add H.264 encoding and decoding capabilities to their software products. For example, iChat AV in Tiger as well as hundreds of other applications that use the QuickTime architecture can take advantage of the new H.264 support in QuickTime 7.

When will H.264 be available?

H.264 is one of the features of QuickTime 7, coming in the first half of 2005.

Does H.264 require special hardware?

While H.264 is a computationally advanced codec, it runs on today's shipping computers with no additional hardware required. For example,



Four Times the Frame Size
Thanks to its incredible efficiency, H.264 provides up to four times the frame size of video encoded with today's MPEG-4 video codec at the same data rate

a full HD movie (1920x1080, 8 Mbps, 24 fps) encoded with H.264 plays back beautifully on a dual Power Mac G5. Internet-sized content (40kbps - 300kbps) will run on the most basic of processors, like those in mobile phones and consumer-level computers.

better quality. H.264 provides DVD quality at about half the data rate of MPEG-2. Because of this efficiency, H.264, an ISO standard, stands to be the likely successor to MPEG-2 in the professional media industry.

In which industries does H.264 play a role?

H.264 is an extremely scalable codec. From 3G to HD and beyond, H.264 provides excellent quality to the broadest range of bandwidths and user scenarios. Best of all, H.264 is a standard — so companies across the telecommunications, consumer electronics and broadcast industries can create products that will interoperate with one another. H.264 has been broadly adopted by organizations representing everything from mobile phones to HDTV, and you will find a broad spectrum of interoperating products — consumer and professional, hardware and software — supporting this standard.



How does H.264 compare with Windows Media 9?

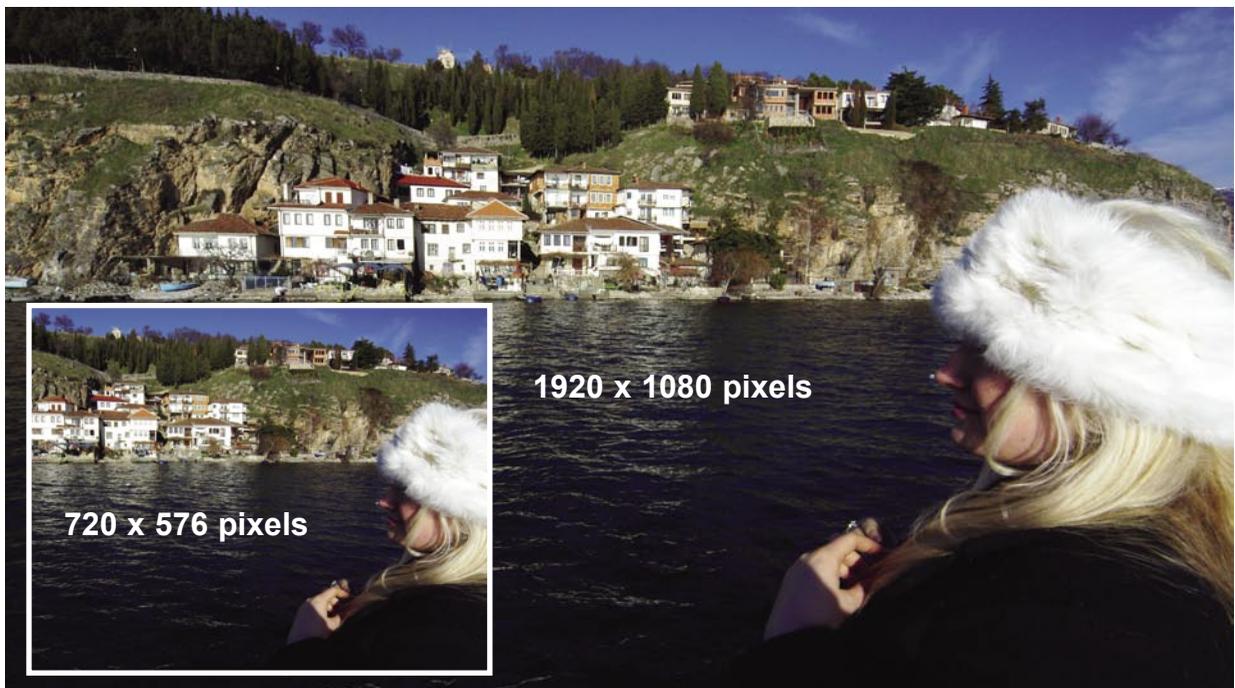
Windows Media 9 is proprietary, developed by a single company; H.264 has been through intense peer review by worldwide experts from a large number of industry segments and is ratified as a worldwide standard. And while video quality tests are subjective, we believe H.264 delivers superior video quality when compared with Windows Media 9.

How does H.264 compare with MPEG-4 in QuickTime 6?

The MPEG-4 video in QuickTime 6, referred to as MPEG-4 Part 2, plays an important role in the evolution of standards for the Internet and wireless multimedia industries, where it has been widely adopted. H.264, also known as MPEG-4 Part 10, is a newer technology than MPEG-4 Part 2, providing up to four times the frame size of video encoded with the MPEG-4 Part 2 video

How does H.264 compare with MPEG-2?

HD MPEG-2 content at 1920x1080 traditionally runs at 12-20 Mbps, while H.264 can deliver 1920x1080 content at 7-8 Mbps at the same or



Comparing the "Real Estate" of a standard definition PAL and HD TV frame

codec at a given data rate. H.264 will undoubtedly build upon the success of MPEG-4 Part 2.

Is there still a use for MPEG-4 Part 2 after MPEG-4 Part 10 is available?

Absolutely. Just as MPEG-1 and MPEG-2 are still used in the industry today, MPEG-4 Part 2 will continue to be used. You will use MPEG-4

Part 2 anywhere you want to be compatible with MPEG-4 Part 2 devices or players, such as the millions of 3G mobile phones and digital still cameras that capture and play back MPEG-4 Part 2 video.

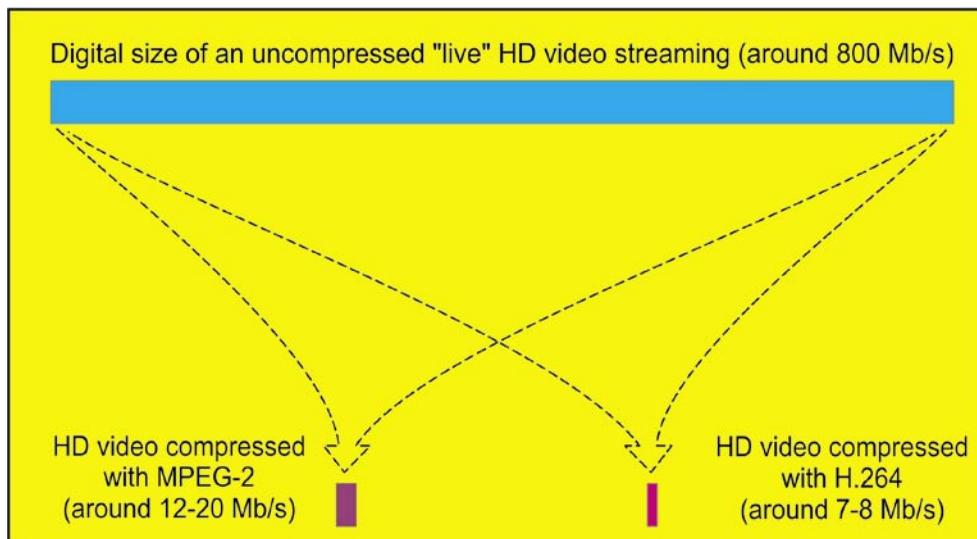
How does H.264 compare with H.263?

H.263, created by the ITU, is primarily known as a video codec designed for low-latency video conferencing applications. H.264 has been adopted by the ITU as the successor to H.263 for these same low-latency video conferencing scenarios. H.264 provides much higher quality than H.263 across the entire bandwidth spectrum, thanks to advancements in technology since the introduction of H.263 more than a decade ago. H.264 is already being adopted in video conferencing solutions such as Apple's iChat AV in Tiger and products from Tandberg and Polycom, the two main suppliers of professional video conferencing systems.

How does H.264 compare with Pixlet?

H.264 and Pixlet are designed for different uses.

Pixlet is focused on workflow, designed for digital filmmakers, animators and effects artists to easily review high-resolution image sequences on a standard PowerMac or PowerBook. Pixlet plays every frame of a sequence without frame-to-frame dependencies so that a media professional can scrutinize every detail of a sequence. Pixlet enables high-end digital film frames at 960x540 (at



about 20 Mbps) to play in real time with a 1GHz G4 or faster Macintosh, while 1920x1080 frames (at about 40 Mbps) will play in real time on a dual 2GHz G5 or faster. This capability eliminates the need to invest in costly, proprietary hardware for the professional review process.

H.264 is a delivery codec, optimized for high quality and efficiency. It leverages data that does not change between frames for more efficient compression. While Pixlet may require about 40 Mbps for 1920x1080 content, H.264 delivers 1920x1080 content at about 8 Mbps. This efficiency in H.264 enables delivery to and playback on a wide range of devices, from mobile phones to computers to HDTV and beyond.

What is the relationship between H.264 and the new standards for High Definition DVDs?

H.264 has been ratified as mandatory in both the HD-DVD and Blu-ray specifications for High Definition DVD.

Has H.264 been adopted by other standards bodies?

Yes. In terms of broadcast, H.264 has already been adopted by Europe's DVB, the top 6 Japanese broadcasters, and is under final consideration in the US's ATSC. The ITU-T has chosen H.264 for its H.241 videoconferencing specification. And in the mobile arena, H.264 has been adopted by the 3GPP (for GSM) organization and is under final consideration with the 3GPP2 (for CDMA2000) organization. [•]