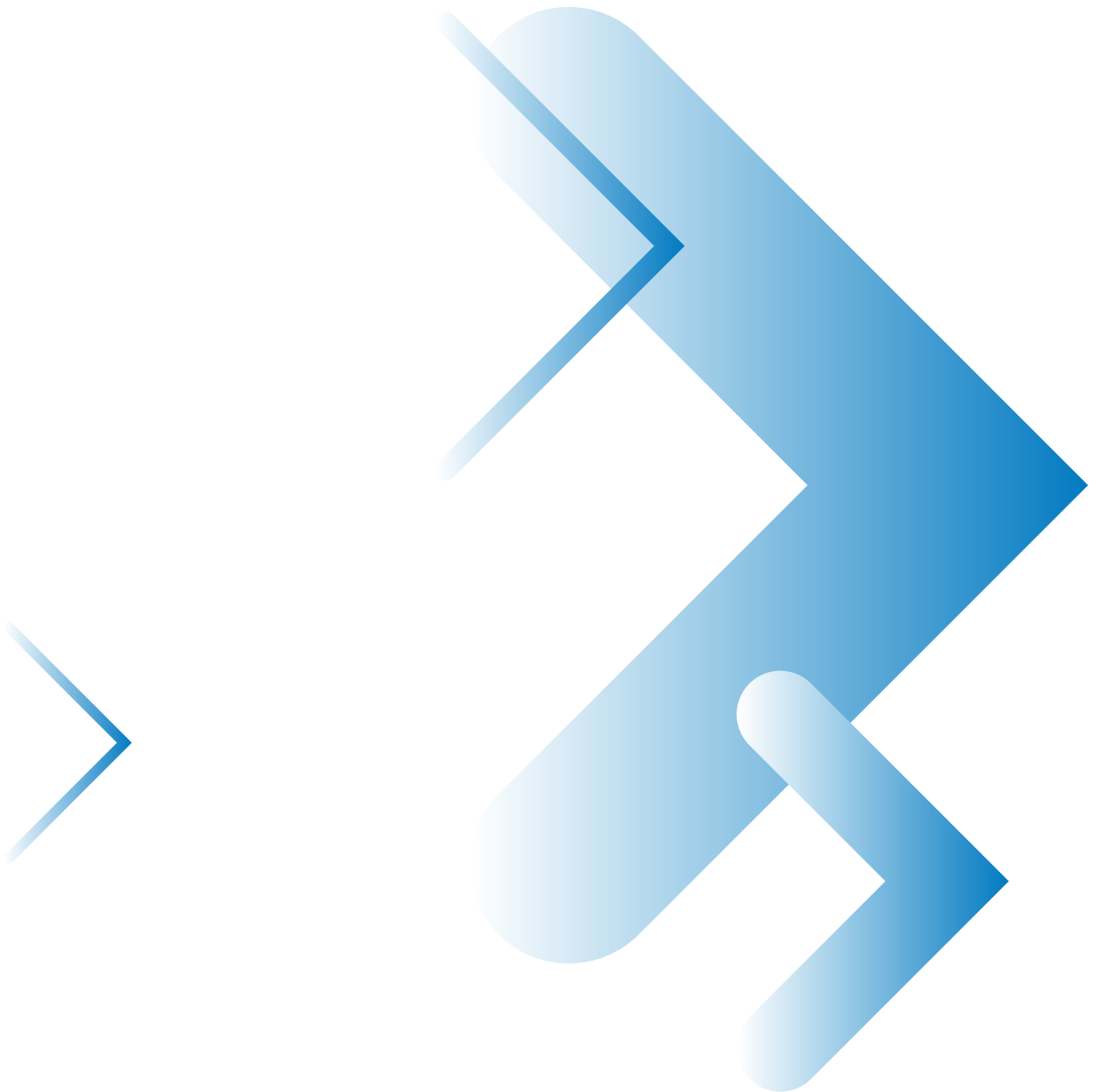




Overview of MPEG Standards for 3DTV





For over a decade, a group of top technologists have been meeting quietly all around the world to launch a series of not-so-quiet revolutions.

It sounds like something out of the latest spy novel, but it's not. The group of technologists is the Motion Picture Experts Group, more commonly known as MPEG, and the closely related Video Coding Experts Group of the International Telecommunications Union. The revolutions they have launched include MPEG-1, MPEG-2, and MPEG-4 AVC/H.264 digital video, which made widespread HDTV and mobile video possible. All of these digital video standards have been immensely successful at providing consumers with better experiences, more choices, and enhanced mobility.

The next wave of the MPEG digital video revolution is 3DTV, or more precisely, stereoscopic video. Stereoscopic video creates a perception of 3D using two 2D images. Each 2D image is selectively targeted at either the left eye or right eye in a way designed to recruit the brain's natural depth sensing abilities. In everyday vision, the eyes swivel towards or away from each other in order to track objects at different distances. The angle between the left and right eye provides the brain with one of its most powerful depth cues. In 3DTV, slight mismatches between the left- and right-eye images cause the eyes to swivel relative to each other so as to mimic natural depth sensing.

While the basic science behind stereo imaging is well known, there have been until now technical implementation gaps that have prevented 3DTV from becoming a sustained success story. Indeed, the 3DTV revolution has been a stop-and-go affair. Queen Victoria was a big fan of stereo imaging over a century ago, and the bobby-sox crowd donned 3D glasses in droves in the 1950's. Not surprising, naysayers claim that today's incarnation of the 3DTV "revolution" of is no more than a blip that will be yesterday's news in no time at all. But the naysayers may be overlooking the fact that important pieces of the 3D-at-home puzzle have fallen into place only in the past year or so.

Flat panel TVs are one of the critical enablers of 3DTV. The newest versions of LCDs, plasmas, and the like all have the high resolution, the high refresh rates, and the support for high frame rate inputs that are needed for good quality 3D experiences. Just as important, flat panel TVs can be outfitted with optical capabilities – such as passive and active polarization or frame-sequential programming – that selectively display left- and right-eye stereo views so efficiently that viewers see 3D smoothly. Looking back, it is clear that the old tube TVs just never had the right physics to do the 3D job well.



The transition from analog to digital television also opens an important door for 3DTV's move into the home. The newly ubiquitous digital nature of television creates both a framework and a necessity for new forms of home media connections such as HDMI, which is already 3D capable and has a schedule of 3D improvements for the near future. Moreover, almost all TV programmers and service operators have built MPEG-based infrastructures to support digital television and HDTV. Those existing infrastructures need little if any modification to deliver 3DTV into homes already served.

It's clear that 3DTV, like all other forms of TV before it, needs to be based on well defined and documented technical standards. In many ways, the MPEG committee has been anticipating the widespread deployment of 3DTV for some time. As early as 1996, 3DTV capabilities were included in the MPEG-2 standard. Over the past several years, MPEG has worked to amend MPEG-4 AVC/H.264 to include Multiview Coding (MVC), which is a way of improving compression between multiple views (camera angles) of the same content. Last year, Stereo High Profile was added to deal specifically with the case in which the multiple views of MVC were the left- and right-eye stereo views. Also last year, Frame Packing Arrangement Supplemental Enhancement Information (SEI) messages were added to MPEG-4 AVC. (SEI messages inform decoders about any special attributes of the compressed video.) The Frame Packing Arrangement SEI message tells the decoder that the left- and right-eye stereo views are packed into a single high-resolution video frame either in a top-to-bottom, side-by-side, checkerboard, or other arrangement. Packing both left- and right-eye stereo views into a single video frame makes it possible to use existing encoders and decoders to distribute 3DTV immediately without having to wait for MVC & Stereo High Profile hardware to be deployed widely.

All this activity at the standards committees is now playing out in the commercial realm. Several broadcasters have announced plans to deliver 3DTV using MPEG technologies. Most will use frame packing methods to leverage existing infrastructure and will benefit from the new signaling protocols provided by Frame Packing Arrangement SEI messaging and HDMI connections. The Blu-ray Disc Association announced that they have adopted full 1080p resolution MPEG-4 MVC as part of their specification. And as the 3DTV market grows, it is easy to foresee that broadcasters will also move towards MPEG-4 Stereo High Profile.

When done right, 3DTV is a compelling experience – richer with information and far more naturally immersive than the curiosities of Queen Victoria and 1950's monster movies. Fortunately, thanks to MPEG and related digital video standards, the key technical issues that have prevented optimal 3DTV are now resolved with everything in place for the digital revolution to embrace 3DTV in earnest and provide consumers with great new experiences and more viewing choices than ever before.



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