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Application Briefs by Polycom

Polycom 
Video Communications

H.264 and Pro-Motion™ : The Polycom Office™
Video Advantage

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As the world market leader in video conferencing technology, Polycom provides video conferencing systems that deliver the highest quality video capabilities. There are many elements that affect a conference's video quality. Polycom continues to invest in the development of cutting edge video technologies and improve upon them within system architectures. The result: video conference solutions with world-class video quality.

This Polycom Application Brief will explore Polycom's advantage in video compression technology-H.264, the newest industry standard for video compression and Polycom's Pro-Motion- a unique video algorithm that enables the highest quality video picture.

H.264: Next Generation Video Coding

A Brief History of H.264

H.264 began in the mid-1990s as a discussion item within the ITU's video technical standardization community. They believed that future costs for computational power and memory would fall dramatically, allowing substantially improved video compression performance. These discussions evolved into the "H.26L" project under the ITU Video Coding Experts Group (VCEG), and in December 2001, joint work with MPEG under the ITU/ISO Joint Video Team (JVT). The result became the H.264 standard (known also as "H.26L", the "JVT" codec, ISO/IEC 14496-10, MPEG-4 Part 10, and MPEG-4 AVC).

Polycom played an important role in developing the new video standard, contributing numerous technical proposals and supplying chairpersons for H.264 sub-groups. Polycom is one of a select number of companies to hold intellectual property in the standard.

How does H.264 benefit the Video Conference User?

H.264 video compression enables video conferencing users to experience either significantly improved video quality at the same bit rate, or current quality at approximately half the bit rate required previously. For example, the high-quality H.263 encoded video that users are accustomed to at 768 kilo bits per second (kbps) is achievable using H.264 at 384kbps. That translates to a bottom line benefit: More efficient use of an existing communications infrastructure and an increase in the accessibility and cost-effectiveness of business-quality video conferencing. In addition, the profile structure in H.264 – that is, the collections of compression techniques that are allowed by the standard - is vastly simpler than in H.263.

In H.263, there were over 1 million possible mode combinations. The sheer number of combinations had the undesired effect of potentially compromising successful call completion. In practice, often only the baseline mode would be used between different vendor's implementations resulting in sub-optimal and potentially compromising call completion and video quality

There are only 3 profiles defined for H.264: Baseline, Main and Extended. The Baseline profile is nearly perfectly designed for video conferencing applications as it provides robust error resilience tools (which provide for good video quality even on error-prone networks such as the Internet) and allows for low latency coding and decoding, which makes video conferences feel more natural. The Main and Extended profiles are better suited for television applications (digital broadcast, DVD), and for video streaming applications where latency is less critical.

Another benefit for H.264 users is greatly improved performance with network errors, including Polycom's patent-pending **flexible macroblock ordering (FMO)**, an H.264 exclusive coding tool that supports

powerful real-time, interactive video error concealment algorithms. What this means is that when network errors cause video data to be lost, the video quality will degrade gracefully instead of breaking up completely, rendering the video image unusable.

H.264 Applications

The dramatically increased compression performance of H.264 will enable existing applications like video conferencing, streaming video over the Internet, and digital television on satellite and cable to offer better quality video at lower cost, and will allow new video applications that were previously impractical because of economics or technology. High-Definition television on DVD, video on mobile phones, and video conferencing over low bandwidth connections will become practical. Just as weblogs, instant messaging, and MP3 music have become important applications in the last few years, we believe that important new video applications will be invented that leverage H.264 technology.

Polycom Office Solutions as represented in the MGC multipoint bridge solutions, the VSX 7000 and iPower 9000 product lines support the H.264 video algorithms. ViewStation™ FX/EX/VS4000 systems will support the H.264 algorithm in a future software release.

Polycom Pro-Motion: When the highest quality video is needed

To understand Polycom Pro-Motion, a discussion of how video is handled within the video compression process is needed. Our equipment supports two major television standard formats: NTSC and PAL. NTSC produces 30 video frames per second, with a spatial resolution of 480 lines by 720 pixels. One NTSC frame contains two fields spatially interlaced in the vertical dimension (i.e., one field contains all the even numbered lines while the other contains the odd numbered lines). The two fields are produced at different times with an interval of roughly $1/60^{\text{th}}$ of a second. Sometimes the phrase 60 fields per second is used to describe 30 frames per second NTSC video. Similarly, PAL format video produces 25 frames per second with a spatial resolution of 576 lines by 720 pixels. Each frame consists of two interlaced fields, each field occupying a $1/50^{\text{th}}$ of a second period, yielding 50 fields per second.

During a typical compressed video call (without Polycom Pro-Motion), one of the fields of video is discarded. With Pro-Motion, both fields are preserved, thereby allowing smoother motion with twice the picture resolution.

When to use H.264 Vs Polycom Pro-Motion video

In real life scenarios for video carrying the images of the conference room participants, a user may have a better experience by choosing a lower frame rate in order to improve each frame's overall image quality and reducing the appearance of unnatural video coding artifacts. Polycom's video systems automatically choose the best video algorithm by optimized trade-offs between frame rate, picture resolution and frame quality based on the channel bit rate, and the nature of the scene. This yields video with excellent overall quality at any given rate.

Polycom Pro-Motion is supported within Polycom VSX 7000, iPower video systems and the MGC multipoint bridge solutions.

Some Concluding Thoughts

By leveraging its years of expertise and through its continued technology leadership, Polycom continues to advance video technology – through enhancement of video compression technologies within their video conferencing systems and multipoint bridges, by advancing the adoption of standards through work within industry organizations, and by contributions to the ITU standards development process. No other vendor can claim so much.

The Polycom Office

With integrated video, audio, data, and Web capabilities, The Polycom Office is the only solution that offers an easy way to connect, conference, and collaborate any way you want. Work faster, smarter, and better with The Polycom Office.

Polycom, Inc. develops, manufactures and markets a full range of high-quality, easy-to-use and affordable voice and video communication endpoints, video management software, web collaboration software, multi-network gateways, and multi-point conferencing and network access solutions. Its fully integrated end-to-end solution, The Polycom Office, is supported by the Polycom accelerated communications architecture and enables business users to immediately realize the benefits of integrated video, voice data and web collaboration over rapidly growing converged networks. For additional information, call 1-800-POLYCOM (765-9266) or +1-408-526-9000, or visit the Polycom web site at www.polycom.com.

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