

**STANDARDS COORDINATION DOCUMENT (SCD) FOR ITU-T RECOMMENDATION H.265:
“HIGH EFFICIENCY VIDEO CODING”**

The XXVII Meeting of Permanent Consultative Committee I: Telecommunications/Information and Communication Technologies (PCC.I),

CONSIDERING:

- a) That there is a consensus that new forms of communication are fundamentally transforming the way in which people, communities, businesses and governments interact with each other;
- b) That PCC.I identifies multimedia communications as a priority issue for examination;
- c) That PCC.I emphasizes the advantages of a prompt evolution towards networks supporting multimedia; and
- d) That the WGDTS maintains a Technical Notebook on Next Generation Standards related to the latest standardization activities including multimedia technologies,

RECOGNIZING:

- a) That the region's economy can be strengthened and its communities transformed by supporting the latest multimedia communications throughout the Americas;
- b) That today, the most advanced forms of communication require high bandwidth interconnection;
- c) That ITU.T Recommendation H.265, “High Efficiency Video Coding” defines a multimedia technology that exploits compression techniques to reduce the bandwidth required for video transmission;
- d) That the ITU-T Study Group 16 approved Recommendation H.265 in February 2015 under the "Alternative Approval Process" (AAP) and it is now in force,

RESOLVES:

To endorse ITU.T Recommendation H.265, “High Efficiency Video Coding” with no deletions, additions or modifications; and

INSTRUCTS:

1. The Working Group on Deployment of Technologies and Services to continue to monitor the multimedia standards work of ITU-T Study Group 16 and determine its applicability for the Americas as this work evolves; and

¹ CCP.I-TIC/doc. 3736/15 rev. 1

2. The Working Group on Deployment of Technologies and Services to continue addressing the multimedia technology needs of the Americas and provide additional recommendations for endorsing standards that meet customer demands for multimedia and other innovative services.

ANNEX TO RESOLUTION PCC.I/RES. 252 (XXVII-15)

SCD FOR ITU-T RECOMMENDATION H.265 : “HIGH EFFICIENCY VIDEO CODING”

EXECUTIVE SUMMARY

The Working Group on Deployment of Technologies and Services (WGDTS) has addressed multimedia technologies as part of its studies of standards for Next Generation Networks (NGN), Services, Signaling, and Operations as they relate to the service access needs of the Americas. Part of this activity has included monitoring the work of the ITU-T. ITU-T Study Group 16 (Multimedia) has been designated as the Lead ITU-T Study Group for multimedia coding, systems and applications – including Internet of Things (IoT) applications and IPTV. In this capacity, Study Group 16 approved, in February 2015, Recommendation H.265, specifying high compression video coding for various applications such as Internet streaming, communication, videoconferencing, digital storage media and television broadcasting. The latest version includes Three-Dimensional High Efficiency Video Coding (3D-HEVC).

At the XXV Meeting of PCC.I (Asuncion; August 2014), it was reported that SG 16 had approved ITU-T Recommendation H.265, “High Efficiency Video Coding” in April 2013. This Recommendation represented an evolution of the existing video coding and was developed in response to the growing need for higher compression of moving pictures for various applications such as Internet streaming, communication, videoconferencing, digital storage media and television broadcasting. This Specification had also been jointly developed by the ITU-T Video Coding Experts Group (VCEG) and the ISO/IEC Moving Picture Experts Group (MPEG). The WGDTS discussed this multimedia technology and the implications of advanced video compression.

At the XXVI Meeting of PCC.I (Cusco; May 2015), the WGDTS discussed the latest published version of formal specifications for ITU-T Recommendation H.265, approved by Study Group 16 in February 2015. This latest version extends the compression techniques to 3D video. The WGDTS now presents this SCD in order to endorse ITU-T Rec. H.265 for implementation in the Region of the Americas.

1. BACKGROUND

Introduction

ITU-T Recommendation H.265 (February 2015) represents an evolution of the existing video coding Recommendations (ITU-T H.261, ITU-T H.262, ITU-T H.263 and ITU-T H.264) and was developed in response to the growing need for higher compression of moving pictures for various applications such as Internet streaming, communication, videoconferencing, digital storage media and television broadcasting. It is also designed to enable the use of the coded video representation in a flexible manner for a wide variety of network environments. The use of this Recommendation allows motion video to be manipulated as a form of computer data and to be stored on various storage media, transmitted and received over existing and future networks and distributed on existing and future broadcasting channels.

This Recommendation is designed to cover a broad range of applications for video content including but not limited to the following:

- Broadcast (cable TV on optical networks / copper, satellite, terrestrial, etc.)
- Content production and distribution
- Digital cinema
- Internet streaming, download and play
- Medical imaging
- Mobile streaming, broadcast and communications
- Real-time conversational services (videoconferencing, videophone, telepresence, etc.)
- Storage media (optical disks, digital video tape recorder, etc.)

This Specification has been jointly developed by the ITU-T Video Coding Experts Group (VCEG, Q6/16) and the ISO/IEC Moving Picture Experts Group (MPEG, WG11, SC29, ISO/IEC JTC1).

Design Characteristics

This Recommendation is designed to be generic in the sense that it serves a wide range of applications, bit rates, resolutions, qualities, and services. Applications should cover, among other things, digital storage media, television broadcasting and real-time communications. In the course of creating this standard, various requirements from typical applications have been considered, necessary algorithmic elements have been developed, and these have been integrated into a single syntax. Hence, this specification will facilitate video data interchange among different applications.

Coded video content conforming to this Recommendation uses a common syntax. In order to achieve a subset of the complete syntax, flags, parameters, and other syntax elements are included in the bitstream that signal the presence or absence of syntactic elements that occur later in the bitstream. Considering the practicality of implementing the full syntax of this specification, however, a limited number of subsets of the syntax are also stipulated by means of "profiles", "tiers", and "levels".

A "profile" is a subset of the entire bitstream syntax that is specified in this Recommendation. Within the bounds imposed by the syntax of a given profile it is still possible to require a very large variation in the performance of encoders and decoders depending upon the values taken by syntax elements in the bitstream such as the specified size of the decoded pictures. In many applications, it is currently neither practical nor economic to implement a decoder capable of dealing with all hypothetical uses of the syntax within a particular profile.

In order to deal with this problem, "tiers" and "levels" are specified within each profile. A level of a tier is a specified set of constraints imposed on values of the syntax elements in the bitstream. These constraints may be simple limits on values. Alternatively they may take the form of constraints on arithmetic combinations of values (e.g., picture width multiplied by picture height multiplied by number of pictures decoded per second). A level specified for a lower tier is more constrained than a level specified for a higher tier.

Design Objectives

The coded representation specified in the syntax is designed to enable a high compression capability for a desired image or video quality. The algorithm is typically not lossless, as the exact source sample values are typically not preserved through the encoding and decoding processes. A number of techniques may be used to achieve highly efficient compression. Encoding algorithms (not specified in this Recommendation) may select between inter- and intra- coding for block-shaped regions of each picture. Inter-coding uses motion vectors for block-based inter prediction to exploit temporal statistical dependencies between different pictures. Intra-coding uses various spatial prediction modes to exploit spatial statistical dependencies in the source signal for a single picture. Motion vectors and intra prediction modes may be specified for a variety of block sizes in the picture. The prediction residual may then be further compressed

using a transform to remove spatial correlation inside the transform block before it is quantized, producing a possibly irreversible process that typically discards less important visual information while forming a close approximation to the source samples. Finally, the motion vectors or intra prediction modes may also be further compressed using a variety of prediction mechanisms, and, after prediction, are combined with the quantized transform coefficient information and encoded using arithmetic coding.

New Developments

The latest version of the “High Efficiency Video Coding” standard (ITU-T H.265) contains a new Annex dedicated to the specification of 3D video coding. This annex specifies syntax, semantics, and decoding processes for efficient multi-view coding of video textures and depth maps for 3D video applications. The annex also specifies profiles, tiers, and levels for 3D High Efficiency Video Coding (3D-HEVC).