**INTERNATIONAL ORGANISATION FOR STANDARDISATION**

**ORGANISATION INTERNATIONALE DE NORMALISATION**

**ISO/IEC JTC1/SC29/WG11**

**CODING OF MOVING PICTURES AND AUDIO**

**ISO/IEC JTC1/SC29/WG11 N17928**

**October 2018, Macau SAR, CN**

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| **Source** | **Requirements** |
| **Status** | **Output** |
| **Title** | **Requirements for a New Video Coding Standard** |
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1. **Introduction**

There is a constant demand for more efficient video coding technologies, however coding efficiency is not the only factor which determines the industry choice of video coding technology for products and services.

1. **Background**

Video coding technologies should address the needs of existing and emerging real-world use cases. Video coding technology should also be easy to adopt from both technological and business perspectives.

At MPEG meeting 122 in April 2018 some industry representatives identified the need for a “licensing-friendly” video codec that would facilitate the timely availability of clear and transparent Type 2 licensing terms. Discussions during the meeting resulted in draft Requirements for a New Video Coding Standard [1] which suggested a streamlined standard development process.

1. **Objectives**

The primary objective is to develop a new video coding standard that addresses combinations of technical and business requirements that are not adequately met by existing standards.

The new video coding standard should provide a video compression solution which combines:

* coding efficiency similar to that of HEVC
* complexity suitable for real time encoding and decoding
* timely availability of licensing terms
* the ability to address existing and emerging use cases, including
  + offline encoding for streaming VOD
  + live OTT streaming

1. **Streamlined Development Process**

It is anticipated that the following development process will achieve the above objectives:

* A brief statement of requirements, as contained in the present document
* A call for proposals
* A testing of the responses received
* Identification of functionalities, each of which provides a specific benefit in terms of efficiency, complexity or ease of implementation
* Definition of a test model, test sequences and test conditions
  + The test model should consist of two tool sets: a base and an enhanced tool set
  + The base tool set should be configured with tools that were made public more than 20 years ago or for which a Type 1 declaration is received
  + There should be additional tools in the enhanced tool set, each of which shall provide a significant improvement in coding efficiency and be capable of being cleanly switched off on an individual basis
* Specifying a target threshold level of performance improvement for the addition of any new tool to the enhanced tool set (e.g. 3% improvement in compression efficiency)
* Systematically reviewing the contribution to performance of previously adopted tools and removing those whose removal results in performance loss that falls below a target removal threshold (e.g. 1% loss of compression efficiency)
* Giving preference to adopting a smaller number of high performance tools relative to a larger number of lower performance tools
* Giving preference to the adoption of only one proposal (from one or more organizations) per functionality if the conditions so allow

The standard should be written so that tools can be cleanly switched off wherever possible and practical. All other considerations being equal, preference may be given to tools that were made public more than 20 years ago.

Proponents shall be encouraged to commit to the timely publication of licensing terms (e.g. within 2 years of FDIS stage) either individually or as part of a patent pool.

1. **Profiles and Levels**

The standard shall define profiles and levels targeted at different application scenarios that are of interest to industry.

In addition, the standard shall facilitate the creation of defined subsets of the standard by external bodies, e.g. by making tools as switchable as possible. Examples of such external bodies may include ATSC, BDA, DVB, etc.

1. **Requirements**
   1. **Compression Performance**

For 10 bit operation, the base tool set should have a compression performance that is at least as good as AVC High 10. A combination of base plus enhanced tool sets should have a compression performance that is similar to or better than that of HEVC Main 10.

* 1. **Picture Formats**

The new codec shall support rectangular picture formats that will include all commonly used picture formats, ranging at least from VGA to 8Kx4K. Picture formats of arbitrary size shall also be supported, within limits specified by Levels.

* 1. **Colour Spaces and Colour Sampling**

1. YCbCr colour spaces with 4:2:0 sampling, 10 bits per component shall be supported
2. High dynamic range and wide colour gamut shall be supported
3. YCbCr/RGB 4:4:4 and YCbCr 4:2:2 should be supported
4. Bit depths up to 16 bits per component should be supported
   1. **Frame Rates**

Fixed and variable rational frame rates shall be supported, with upper limits specified by levels.

* 1. **Source Video Content Characteristics**

The standard shall support the encoding of the full variety of characteristics of video content encountered in the envisioned applications (to the maximum extent feasible). This includes (electronic and film) camera-captured scenes, text and graphics mixed into a camera-captured video source, rendered animation content, rendered computer graphics, etc.

* 1. **Complexity**

The complexity shall allow for feasible implementation of encoding and decoding within the constraints of the available technology at the expected time of usage.

A decoder conforming to a profile consisting of base plus enhanced tool sets should be no more than three times as complex as for HEVC Main 10.

Key hardware and software metrics may include memory bandwidth, maximum block sizes, decoder runtime, power consumption, etc.

* 1. **Low Delay**

Encode plus decode latency as low as one frame duration shall be supported.

* 1. **Random Access and Trick Modes**

The standard shall support random access to certain positions in time of a stored video stream, and allow fast channel switching in the case of multi-channel services.

Pause, fast forward, normal speed reverse, and fast reverse access to a stored video bitstream shall be supported.

* 1. **Error Resilience**

Video bitstream segmentation and packetization methods for the target networks shall be supported.

Proper balance of increase in complexity, loss in coding efficiency and benefits achieved by the error resilience measures at the coding layer should be achieved.

* 1. **Buffer Models**

Buffer models shall be specified for target applications.

1. **Timeline**

The tentative timeline is as follows:

* Finalize Requirements and Evaluation Guidelines documents in October 2018
* Submission of decoded sequences and bitstreams by 9 January 2019
* Evaluation of proposals in January 2019
* Working draft in January 2019
* CD in March 2019
* DIS in July 2019
* FDIS in January 2020

1. **References**
2. “Draft Requirements for a New Video Coding Standard”, ISO/IEC JTC1/SC29/WG11 N17539, April 2018, San Diego