

The background is a solid red color. Overlaid on this are various faint, semi-transparent white and light red graphics. On the left side, there are icons resembling a code editor window with a '</>' symbol, a circular gauge or speedometer, and a waveform graph. In the center and right, there are abstract network diagrams consisting of interconnected nodes (small circles) and lines, with some nodes highlighted in a brighter red. Faint binary code (0s and 1s) is also visible in the lower-left quadrant.

Profile and Level Definitions

JVET-Q0485

W. Wan, T. Hellman, M. Zhou, B. Heng, P. Chen
Brussels, Belgium, January 2020 meeting



Introduction

- Profile and level definitions critical to commercial viability
- Contends that the “main” profile (since there are efforts to target a single profile in v1) should be focused on supporting traditional single layer 2D planar video without significantly burdening the profile to support other usages
- Advise support for but not optimization for other applications as anticipate traditional single layer 2D planar video will continue to remain the dominant application for the VVC codec
- Commercial adoption of “Main” profile should not be impeded by unnecessary cost (implementation, licensing, etc.) or immature features

Overview

- Level limits for RPR
- Level limits for scalability
- Subpictures
- Compression of 360 video
- Compression of screen content
- Lossless Compression

Level limits for RPR

- Current level text inherited from HEVC/H.265 so only considers current picture size but this does not account for the memory bandwidth impact of RPR stream compared to non-RPR stream
- Consider two examples of RPR where the first switches from 720p30 to 1080p30 and the second from 1080p30 to 720p30.
- Clear that a decoder that supports decoding a 1080p30 bitstream should conceptually have no issues with supporting either of these two cases
- The effective picture size for level limits when reference picture resampling is invoked should be computed with each picture treated as the maximum of the current picture size and all the reference pictures' sizes.

Level limits for scalability (1/2)

- Traditionally scalability support in another profile
- Idea of “simplified scalability” or “scalability for free”
- Assert that one cannot assume a given pixel throughput can be configured in any number of ways for scalability as there are other practical decoder implications besides the pixel rate
 - processing and latencies to switch between different resolutions,
 - firmware capabilities to handle multiple layer support,
 - etc, as well as differences across implementations
- Difficult to assume or compute the degree of multi-decode support from its single layer decoder capabilities

Level limits for scalability (2/2)

- Suggest defining a conservative, worst case bound that can be assured that single layer decoders can satisfy.
- Consider an example with three layers (720p30, 1080p30, 2160p30). A decoder that can decode a 2160p90 bitstream should conceptually have no issues with supporting these three layers as the scalability example is clearly a subset of 2160p90 decoding.
- The effective picture size for level limits when scalability is invoked should be computed with each picture treated as the maximum picture size across all layers.

Subpictures

- Much discussed features with claims it is a critical feature
- Significant work done on the conceptual design but lack of actual subpicture support in the VTM SW is concerning
 - No encoder configuration parameters / ability to generate bitstreams
 - Low-level support missing entirely: no “treat a subpicture as picture” motion compensation logic, no “filter across subpictures” implementation in the loop filters, etc.
- First version finalization fast approaching, when are the bugs going to be flushed out?
- Without substantial progress in the maturity of the VTM SW, JVET should consider defining profiles in version 1 to have no more than 1 subpicture per picture to avoid commercial and reputation problems

Compression of 360 video

- Tools already added to support 360 video coding
 - 360 video virtual boundaries
 - reference picture wrap-around
 - Subpictures for view dependent 360 video streaming
- All of these add cost/burden to decoders who may not be interested in 360 video coding
- Claim effective compression of 360 video is already satisfied and assert no need to further optimize 360 video coding by adding more tools to a “main” profile

Compression of screen content

- Tools already added to support screen content coding (SCC)
 - IBC (Intra Block Copy)
 - Transform skip residual coding
 - BDPCM (Block-based Delta Pulse Code Modulation)
- All of these add cost/burden to decoders who may not be interested in screen content coding
- Currently ~40% RA gain for class F and 35% RA gain for natural content
- Has been commented in previous meetings that generally SCC content is often “easier to code” than traditional content.
- Claim effective compression of SCC is already satisfied and assert no need to further optimize SCC by adding more tools to a “main” profile

Lossless compression

- The ability to code losslessly is not a major use case and should be enabled rather than optimized
- Lossless coding already supported with minimal impact to a decoder by properly configuring quantization parameters and existing coding tools.
- Claim design criteria of enabling lossless compression is already satisfied and assert no need to further optimize lossless coding by adding more tools

Summary

- Contribution asserts supporting traditional single layer 2D planar video will remain the dominant application for this codec.
- Care must be taken to define a main profile to not overburden the profile to support other usages.
- Additional flexibility and tools may be viable for alternative profiles but especially if there is only a single “main” profile, the profile definition should be conservative as every decoder must support every tool in this profile which has implications for its adoption in the industry.



BROADCOM[®]

connecting everything[®]