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**ISO/IEC JTC 1/SC 29/WG 11**

**CODING OF MOVING PICTURES AND AUDIO**

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# Abstract

This document provides a description of the Exploration Experiment on future Extensions 2.7 on multiple video codec integration in V-PCC software.

# Introduction

The goal of the Exploration Experiment on future extensions 2.7 on multiple video codec integration in V-PCC software is to evaluate the video codec agnostic approach in V-PCC solution for various video codecs applied for different components and codec implementations. The video codec implementations used for this benchmarking are based on ffmpeg distribution package [4].

The performance of the approach described in m52889 [3] is evaluated in the scope of the EE4FE 2.7, in terms of RD performance and computation speed, compared to the reference software for the HEVC standard, the HM video codec, used in TMC2 release-v9.0 [1], release-v8.1 under the CTC conditions [2].

# Mandates

The mandates for CE are as follows:

1. To study the coding performance of separate components and their combinations with the reference HM video codec implementation and the video codecs available in ffmpeg distribution package
2. To generate best practices for video coding of v-pcc components as geometry, attribute and occupancy map using various video coding solutions.
3. To verify the codec-agnostic approach feasibility in the v-pcc architecture

# Participants

|  |  |  |  |
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(P=proponent, C=crosss checker)

# Methods to be evaluated

## M52889 [V-PCC][SW] on ffmpeg integration in TMC2

The ffmpeg package [4] provides multiple image and video compression technology integrations in a single package. The integration of the ffmpeg implementation of the hevc decoder has demonstrated significant decoder performance improvement. It has been suggested to conduct an expiration experiment that would confirm the possibility of re-using existing video codec capabilities and come up with the best practices for dynamic point cloud compression using the v-pcc codec.

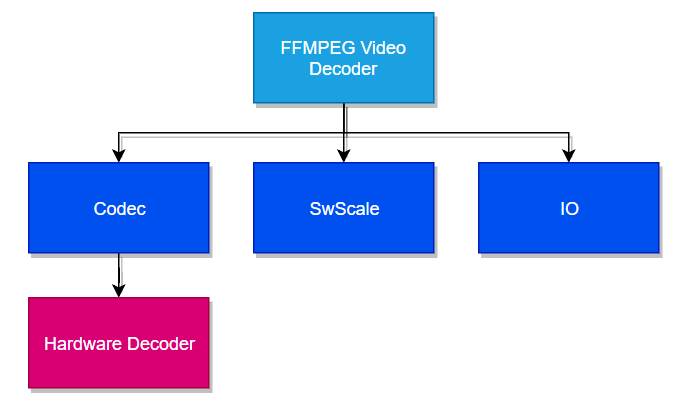


figure. 1. ffmpeg decoder architecture

# Evaluation

## Item

1. CTC anchor
2. CTC anchor with 3d motion compensation disabled
3. TMC2v8.1 with ffmpeg implementation of the hevc encoder and ffmpeg implementation of the hevc decoder
4. TMC2v8.1 with ffmeg implementation of the avc encoder for occupancy map and geometry and the ffmpeg implementation of the hevc encoder for the attribute coding
5. TMC2v8.1 with ffmeg implementation of the jpeg encoder for occupancy map and geometry and the ffmpeg implementation of the hevc encoder for the attribute coding
6. TMC2v8.1 with ffmeg implementation of the avc encoder for occupancy map and the ffmpeg implementation of the hevc encoder for the geometry and attribute coding
7. Additional combinations suggested at the evaluation process

## Test

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Test no |  | Component | Occupancy map component | Geometry component | Attribute component |
|  | Codec |  |
| 1.0 | Reference, CTC | | HM18.20 | HM18.20 | HM18.20 + 3DME |
| 1.1 | Reference, constrained | | HM18.20 | HM18.20 | HM18.20 |
| 2.1 | OM-ACV | | AVC | HM18.20 + 3DME | HM18.20 + 3DME |
| 2.2 | OM-HEVC-ffmpeg | | ffmpeg hevc | HM18.20 + 3DME | HM18.20 + 3DME |
| 2.3 | OM-X | | ffmpeg-x | HM18.20 + 3DME | HM18.20 + 3DME |
| 3.1 | GM-HEVC-ffmpeg | | HM18.20 | ffmpeg hevc | HM18.20 + 3DME |
| 3.2 | GM-X | | HM18.20 | ffmpeg-x | HM18.20 + 3DME |
| 4.1 | ATTR-HEVC-ffmpeg | | HM18.20 | HM18.20 + 3DME | ffmpeg hevc |
| 4.2 | ATTR-X | | HM18.20 | HM18.20 + 3DME | Ffmpeg-x |
| 5.1 | ffmpeg-hevc | | ffmpeg hevc | ffmpeg hevc | ffmpeg hevc |
| 5.2 | ffmpeg-xyz | | ffmpeg-x | ffmpeg-y | ffmpeg-z |
| 6.0 | Additional combinations | | TBD | TBD | TBD |

## BDBR performance

The coding efficiency and runtime are evaluated between 2 items. For the full decoded point cloud, the BDBR in the CTC spreadsheet is used for evaluation.

## Additional software modifications

It should be noted that current HM version output format is in bytestream format, however the V-PCC spec requires the corresponding video sub-bitstreams are required to be in a sample stream format. Corresponding modification os the reference software is highly encouraged.

# Timeline

* 2020-02-14: Expected date for the release of cross-verified TMC2v8.1 software and anchors
* 2020-03-27: EE Software and results are released to cross-checkers
* 2020-04-08: Preliminary feedback from cross-checkers to proponents
* 2020-04-15: MPEG document upload deadline

# References

1. “V-PCC Test Model v9”, ISO/IEC JTC1/SC29/WG11 MPEG2020 Doc. w19085, Brussels, BE, January 2020
2. “Common Test Conditions for PCC” ISO/IEC JTC1/SC29 WG11 MPEG2020 Doc, w19083, Brussels, BE, January 2020
3. “[V-PCC][SW] on ffmpeg integration in TMC2”, ISO/IEC JTC1/SC29 WG11 (MPEG) input document m52889, Brussels, BE, January 2020
4. ffmpeg software implementation - https://www.ffmpeg.org/download.html#get-sources