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| *Title:* | **Random Access encoding with HM for video-based point cloud codec** | | |
| *Status:* | Input document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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| *Source:* | Ericsson | | |

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# Abstract

This contribution proposes a patch to HM software to enable subsequent coding of two pictures which originate from a single point cloud frame. The proponents assert that the current HM software does not enable such coding order for the Random Access configuration and that it would be beneficial for the point cloud work in MPEG if HM could support it. The proponents claim that the proposed approach is analogous to field coding, but that the latter cannot be reused due to additional dependencies such as internal deinterlacing. This contribution proposes to adopt a change to HM software that enables the coding order. It is proposed that the functionality is controlled by a config flag and not enabled in default HM configs but available for optional use.

# Introduction

MPEG group has been working on a codec for point cloud compression. One of the approaches is to reuse a video codec such as H.265/HEVC. In this approach point cloud encoder decomposes a single point cloud frame into several images. Those images can be arranged into separate video sequences that correspond to depth information or set of attributes such as texture. In some cases, there are two images constructed for a single point cloud frame. This is shown in Figure 1.

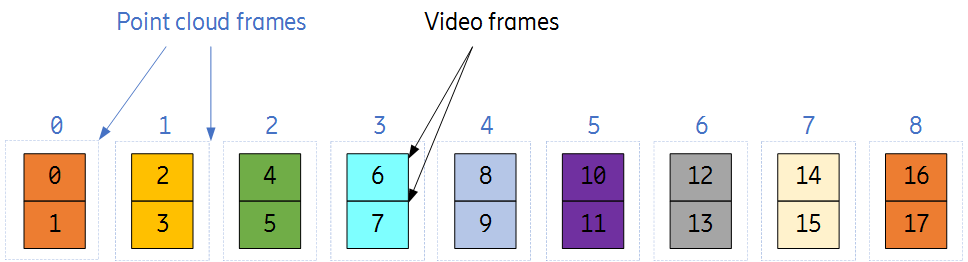


Figure 1: Relation between point cloud frames and generated video frames (such as for a texture sequence). Frames are color coded for convenience.

## Random Access in HM software

For some applications it will be beneficial to apply Random Access configuration for coding such video streams. However, current HM software would result in sub-optimal coding order of point cloud originated video sequences. This is because HM will split processing of some paired pictures into separate GOPs. This is shown in Figures 2 and 3 where one of the pictures (‘17’) is processed in the next GOP

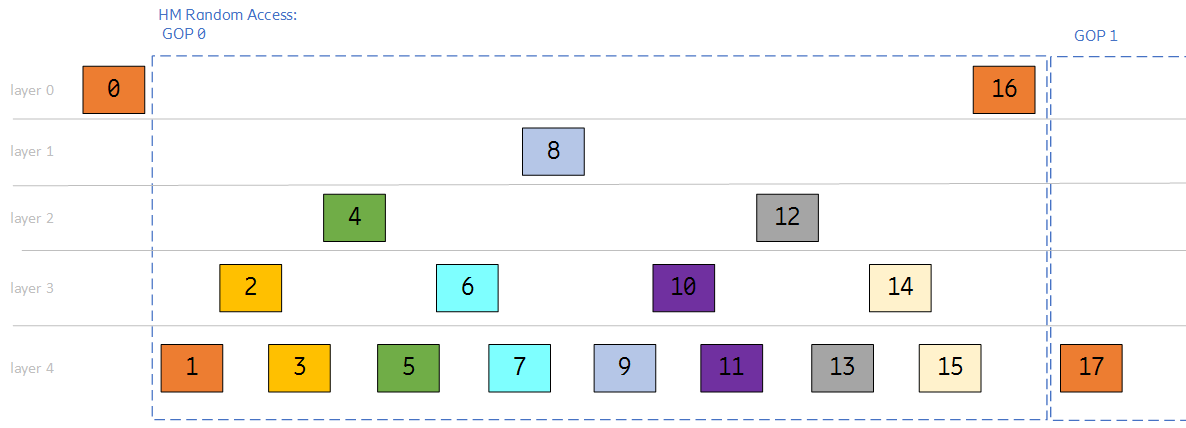
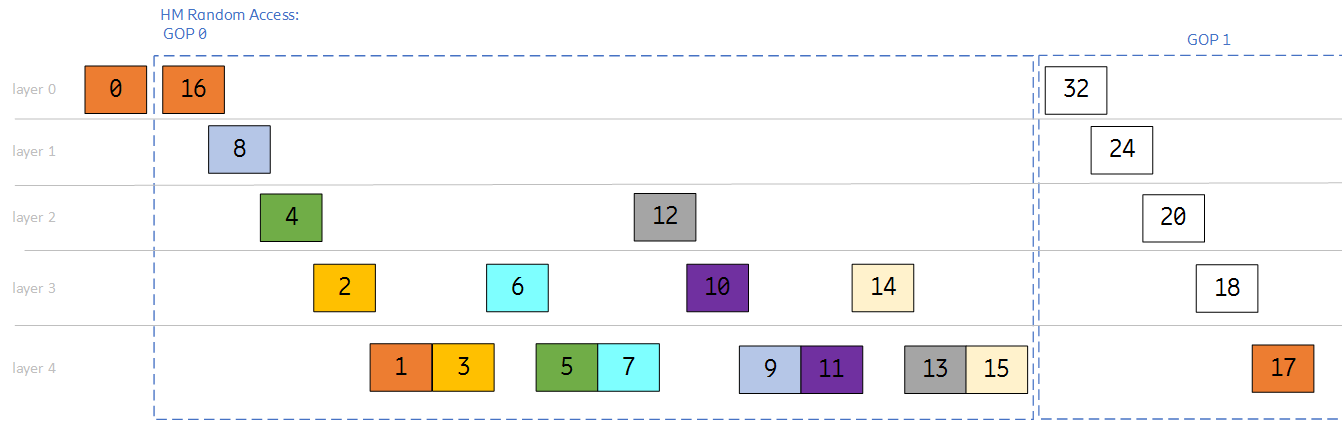


Figure 2: GOP hierarchy that follows progressive coding approach. The pictures are arranged in display order.



A consequence of the current behaviour is a video codec is additional incurred coding delay.

## Proposed optional processing for Random Access in HM software

Given the relation between point cloud sequence and generated video sequences the proposal is that following field coding configuration would be a better fit. In this approach both picture POC 0 and POC 1 are processed in consecutive order. Figures 4 and 5 show the corresponding picture hierarchy and processing order.

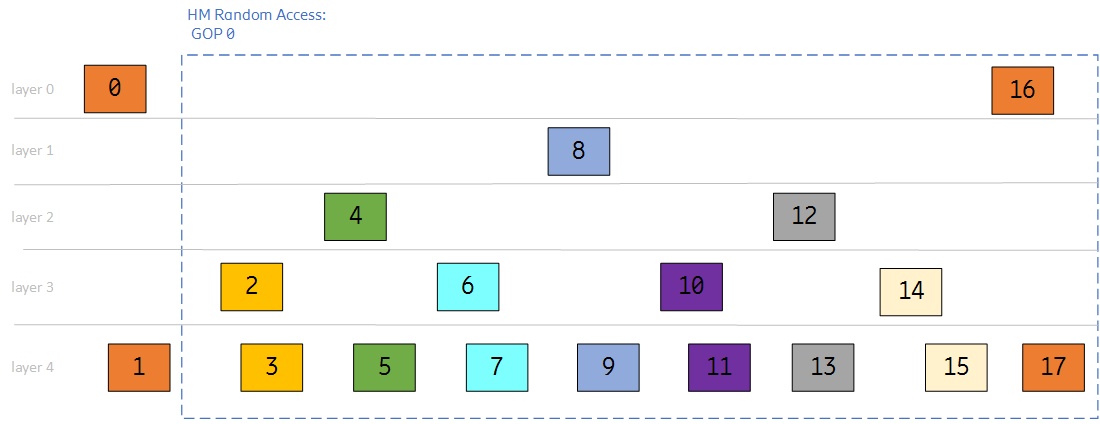


Figure 4: GOP hierarchy that follows a field coding approach. The pictures are arranged in display order.

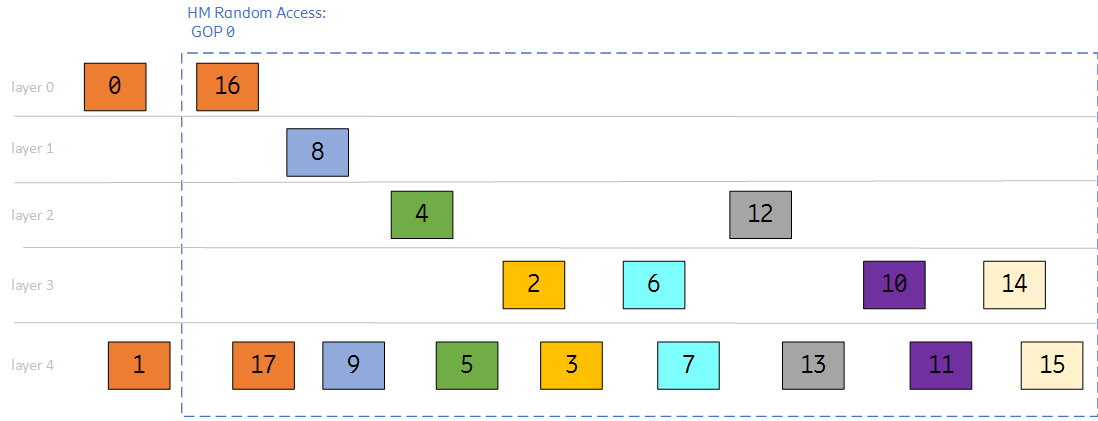


Figure 5: GOP hierarchy that follows a field coding approach. The pictures are arranged in coding order.

# Results

The patch was implemented on top of HM-16.18+SCM-8.7 the software. The functionality is controlled by an optional config file flag *FirstPicturePairConsecutiveCodingOrder* . We run regression results on the patched software for Random Access conditions.

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| --- | --- | --- | --- | --- | --- | --- |
|  | **Random Access Main** | | | **Random Access Main 10** | | |
|  | Y | U | V | Y | U | V |
| Class A1 | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
| Class A2 | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
| Class B | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
| Class C | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
| Class D | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
| Class E |  |  |  |  |  |  |
| Class F | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
| **Overall** | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
|  | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% | 0,0% |
| Enc Time[%] | 100% | | | 100% | | |
| Dec Time[%] | #NUM! | | | #NUM! | | |

# Conclusion

This contribution proposed to patch the HM software to enable consecutive coding of paired picture that originate from the same point cloud frame. It is proposed that the functionality is controlled by a config flag and not enabled in default HM configs but available for optional use.

# Patent rights declaration(s)

**Ericsson AB may have current or pending patent rights relating to the technology described in this contribution and, conditioned on reciprocity, is prepared to grant licenses under reasonable and non-discriminatory terms as necessary for implementation of the resulting ITU-T Recommendation | ISO/IEC International Standard (per box 2 of the ITU-T/ITU-R/ISO/IEC patent statement and licensing declaration form).**