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1 Introduction

This contribution reviews signaling of implicit and explicit reconstruction process for the L-HEVC file format.

2 Implicit reconstruction

The specification states:

“If the track containing the highest sub-layer of the highest layer of a desired operating point has 'scal' track references, all tracks access units for that operating point are reconstructed by solving the extractors and aggregators in the samples of that track, and the result is the bitstream of the operating point; this reconstruction process is referred to as explicit reconstruction.

Otherwise, an access unit is reconstructed from the respective samples in the required tracks, selected based on the layers they carry and their reference layers as indicated by the Operating Points Information and Layer Information sample groups.”

It is however not clear on which kind of tracks this rule apply. An hvcl/hev1 track will likely be in the computed list of needed track for “implicit reconstruction”, yet we don’t want to force an hvcl reader to perform implicit reconstruction (backward compatibility). We therefore suggest clarifying this as follows:

“Note: implicit reconstruction can be skipped when the required layer is only the base layer and all required temporal sublayers are carried in the base track, as identified by the HEVCDecoderConfigurationRecord of the base layer.”

3 Extractor usage

3.1 Extractors and track entry point

As per table 10, an lhv1 or lhe1 cannot carry NAL units from the base layer. Extractors may point to other L-HEVC NALUs but not to HEVC base layer. This implies that when using extractors, an L-HEVC track can never be the entry point of the file reader.

This should be made explicit through a note:

“NOTE: lhe1/lhv1 tracks never carry base layer NALUs; consequently, a file reader looking for a desired operation point described through extractors only needs to inspect hev2/hvc2 tracks.”

3.2 Extractors and lhv1/lhc1 tracks

Since extractors are back to non-recursive extractors (i.e. cannot reference extractors in other samples), we fail to see any use case for extractors in lhv1/lhe1:

- if implicit reconstruction is used, those extractors are ignored
- otherwise, the hev2/hvc2 track entry point has to extract each NAL without referencing extractors, so extractors in lhv1/lhc1 are ignored

Consequently, we believe that extractors should be removed from lhv1/lhc1 tracks and table 10 should be updated as follows:

'lhv1', 'lhe1'	L-HEVC Configuration Only	An L-HEVC track with NAL units with nuh_layer_id greater than 0 and without NAL units with nuh_layer_id equal to 0; Extractors shall not be present; Aggregators may be present to contain and reference NAL units.
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4 New extractor format

The extractor format has been changed during the DIS comment processing. While introducing such drastic technical changes at such a late process is not very safe, we acknowledge that the use cases covered are interesting (and provide the first and only true use case for extractors in the LHEVC file format).

However, the new format uses different constructor types:

- extract data from sample (previous behavior of extractors)
- insert raw opaque data
- extract data from the sample description

While the first two constructors make a lot of sense and are quite safe, the third method is very tricky: it imposes that file parsers (re-interleavers, dashers, streamers...) keep the sample description intact (same size, same order of parameter sets arrays, ...) which might not currently be the case. Since there is no signaling that a given LHEVC track uses such extractor constructors, the file parser will have to inspect and patch the extractors in each sample of each track and this is not desirable.

Additionally this constructor imposes file readers to keep the complete stsd box in memory to correctly parse this constructor, which is a heavy requirement on most implementations.

Since the same functionality can be achieved by embedding (part of) the parameter sets and SEIs in the extractor using the raw data constructor, we kindly ask MPEG to remove the sample description data constructor from the extractor mechanism and only keep the first two constructors.

5 Conclusion

We recommend adopting the proposed changes in the FDIS text.