

Title: JCT-3V AHG report: MV-HEVC / 3D-HEVC Test Model editing (AHG3)

Status: AHG report input to JCT-3V

Purpose: AHG report

Author(s) or Contact(s): Gerhard Tech (Fraunhofer HHI) Email: gerhard.tech@hhi.fraunhofer.de
 Krzysztof Wegner (Poznan Univ. of Tech.) kwegner@multimedia.edu.pl
 Jill Boyce (VidyO) jill@vidyo.com
 Ying Chen (Qualcomm Incorporated) cheny@qti.qualcomm.com
 Teruhiko Suzuki (Sony) teruhikos@jp.sony.com
 Sehoon Yea (LGE) sehoon.yea@lge.com
 Jens-Rainer Ohm (RWTH Aachen) ohm@ient.rwth-aachen.de
 Gary Sullivan (Microsoft) garysull@microsoft.com

Source: AHG

Abstract

This document reports on the work of the JCT-3V ad hoc group on MV-HEVC / 3D-HEVC Test Model editing (AHG3) between the 4th JCT-3V meeting in Incheon (20 - 26 April 2013) and the 5th meeting in Vienna (27 Jul. – 02 Aug. 2013).

1 Mandates

Title and Email Reflector	Chairs	Mtg
<p>MV-HEVC / 3D-HEVC Test Model editing (AHG3)</p> <p>(jct-3v@lists.rwth-aachen.de)</p> <ul style="list-style-type: none"> Produce and finalize JCT3V-D1005 3D-HEVC Test Model Description draft 4. Produce and finalize JCT3V-D1004 MV-HEVC text specification draft 4. Study the alignment of the 3D-HEVC Test Model Description with HEVC version 1. Gather and address comments for refinement of these documents. Coordinate with the 3D-HEVC Software Integration AhG to address issues relating to mismatches between software and text. 	<p>G. Tech, K. Wegner (co-chairs), J. Boyce, Y. Chen, M. Hannuksela, T. Suzuki, S. Yea, J.-R. Ohm, G. Sullivan (vice chairs)</p>	<p>N</p>

2 Introduction

The fourth MV-HEVC draft and the fourth 3D-HEVC Test Model were developed from the third MV-HEVC working draft and the third 3D-HEVC Test Model following the decisions taken at the 4th JCT-3V meeting in Incheon.

Two editorial teams were formed to work on the two documents that were to be produced:

- JCT3V-D1004 MV-HEVC Draft Text 4 [1]
 - Gerhard Tech
 - Miska Hannuksela
 - Ying Chen
 - Jill Boyce
 - Krzysztof Wegner
- JCT3V-D1005 3D-HEVC Test Model 4 [2]
 - Gerhard Tech
 - Ying Chen
 - Krzysztof Wegner
 - Sehoon Yea

Moreover Ye-Kui Wang, Jianle Chen, Yan Ye, and Gary Sullivan supported editing of the MV-HEVC draft text. AHG3 wants to thank for reviewing and for valuable comments.

3 Status

3.1 *MV-HEVC Draft Text*

Four versions of JCT3V-D1004 were published by the AHG following the 4th JCT-3V meeting in Incheon. The last version corresponds to the text submitted to MPEG secretariat as ISO/IEC PDAM study text.

3.1.1 Incorporated changes

In total 24 changes compared to working draft JCT3V-C1004:

General (4)

- ([M0208](#)/NumPocTotalCurr) Clarify that the value of NumPocTotalCurr shall be equal to 0 for a BLA or CRA picture if nuh_layer_id is equal to 0.
- ([M0045](#)/Stereo Main/no mixed scal.) The principle not to support mixed scalability types for now.
- ([M0168](#)/AUD Layer Id) #1 The allowed layer ID value for the AUD should correspond to the lowest VCL NAL unit layer ID in the AU.
- ([M0168](#)/SPS activation) An IRAP NAL unit of each layer with NoRaslOutputFlag equal to 1 may activate a new SPS for the corresponding layer
- (M0264 and M0208) AU definition

Reference picture signaling and management (1)

- ([M0458](#)/Active inter-layer ref pics in slice header) 1.) max_one_active_ref_layer_flag in VPS, 2.) slice segment header indicates inter-layer ref. pics, 3.) Change IL-RPS and ref pic list construction. Have a semantic constraint that inter_layer_idc[i] shall be increasing.

Parameter sets (7)

- ([M0268](#)/Output Layer Sets, Profile Tier) #7 Section 3 of the v2 document; An alternative method for signalling of profile, tier, and level information and output layer sets
- ([M0163](#)/No sig.last dimension_id_len_minus1) No signalling of the last dimension_id_len_minus1[i], when splitting_flag is equal to 1.
- ([M0268](#)/SPS Flag signalling) Don't signal sps_max_sub_layers_minus1 and sps_temporal_id_nesting_flag when nuh_layer_id > 0.
- ([M0268](#)/output_layer_set_idx) Change the syntax element output_layer_set_idx[i] to output_layer_set_idx_minus1[i].
- ([M0268](#)/PositionDirectDependencyFlags) Move the direct dependency flag syntax section to directly follow the dimension_id syntax (ahead of profile/tier/level) signalling.
- ([D0311](#)/Dim. ID not when SplittingFlag) Replaces a semantic constraint on dimension_id with an inference when splitting_flag is equal to 1.
- ([D0220](#)/ViewId) Adopt view id aspect.

Signaling of inter-layer processing (6)

- ([M0162](#)/discardable_flag dependent marking) A picture that has nuh_layer_id greater than 0 and discardable_flag equal to 1 is marked as "unused for reference" after its decoding.
- ([M0152](#)/discardable_flag) One reserved flag in the slice header, when equal to 1, indicates that the picture is not used for inter-layer prediction and not used for inter prediction.
- ([M0209](#)/IL RPS decoding) Decoding of inter-layer reference picture set and reference picture list construction based on TemporalId.
- ([M0209](#)/marking non ref temp sub layer) Marking of certain pictures as "unused for reference" base on max_sublayer_for_ilp_plus1.
- ([M0203](#)/max_sublayer_for_ilp_plus1) Signalling of maximum TemporalId used in inter-layer prediction.. Agreed with a change "<=" to "<" in the loop of the added syntax.
- ([M0457](#)/Dependency type, Alt coll. ref. idx., TMVP change) Signalling of inter layer prediction type (motion/sample), alternative collocated picture, flags for kind of enabled inter-layer prediction per slice, modified TMVP)

Parallel Processing (2)

- ([M0463](#)/Parallel processing delay indication) Incorporated improved version provided by the editors.
- ([M0464](#)/Tile alignment flag) Incorporated first aspect (tile boundary alignment flag).

Special functionalities (2)

- ([M0040](#)/single_layer_for_non_irap_flag) Adaptive resolution change and efficient trick (added reserved syntax elements)
- ([M0309](#)/Extended spatial scalability) Signalling of extended spatial scalability. (added reserved syntax elements)

SEI (2)

- ([D0218](#)/3DRefDispSEI) 3D reference displays information SEI message.
- ([M0043](#)/Layers present SEI message) Agreed with the following change: the persistence scope of the SEI message should be further restricted to be within a CVS.

3.1.2 Open issues

Open issues in JCT3V-D1004 that need discussion (details can be found as editor's comments in the draft text):

- ViewId: Adoption of the ViewId as proposed in D0220 breaks original intention of DimensionIds, such that layers can directly be discarded based on this value. Moreover possible ViewIds are restricted to be increasing with coding order when splitting_flag is equal to 1.
- 3D reference display SEI message D0218: Persistence scope of SEI needs to be clarified.

3.2 3D-HEVC Test Model

Four versions of JCT3V-D1005 have been published by the editing AHG following the 4th JCT-3V meeting in Geneva.

3.2.1 Incorporated changes

All adoptions of the last meeting have been incorporated. Moreover existing text has been revised and improved and missing text from previous meeting has been added.

Changes (25) of JCT3V-D1005 relative to JCT3V-C1005 are:

Depth Intra (8)

- ([D0035](#)) DLT for DMM deltaDC coding
- ([D0195](#)) Unification of new intra modes in 3D-HEVC
- ([D0193](#)) Clean-up for 64x64 SDC
- ([D0183](#)) Simplified DC predictor for depth intra modes
- ([D0110](#)) Sample-based simplified depth coding.
- ([D0032](#)/[D0141](#)/[D0034](#)) SDC Residual CABAC contexts.

Disparity derivation (4)

- ([D0112](#)) Default disparity vector derivation
- ([D0181](#)) CU-based Disparity Vector Derivation
- ([D0135](#)) Unification of disparity vector rounding
- ([D0138](#)) Simplified DV derivation for DoNBDV and BVSP

Inter-view prediction (2)

- ([D0177](#)) Advanced residual prediction for multiview coding
- ([D0122](#)) AMVP candidate list construction

VSP (4)

- ([D0105](#)) BVSP NBDV
- ([D0191](#)) Clean-ups for BVSP in 3D-HEVC.
- ([D0092](#)) BVSP mode inheritance
- ([D0166](#)) On reference view selection in NBDV and VSP

SEI (2)

- ([D0272](#)) Signaling Global View and Depth
- ([D0103](#)) Signaling Warp Maps as an Alternative 3D Format

HLS (2)

- ([D0220](#)) ViewId not reflecting coding order any more
- ([D0156](#)) HLS for stereo compatibility

Others (3)

- ([D0091](#)) SAO process update
- ([D0060](#)) Removal of parsing dependency for illumination compensation
- Removal of tools in Test Model description includes that are not integrated in software.

3.2.2 Open issues

General issues:

- Inter-view residual/motion prediction: With the adoption of tools related to inter-view motion prediction (JCT3V-A0126, JCT3V-A0049, JCT3V-A0097) the issue was introduced that inter-view motion prediction is reasonably specified for CTC only.

Editorial issues:

- Update of low-level specification to HEVC 1 is required.
- Mismatches to HTM-7.0r1 or HTM-DEV-2.0 software exist since the 3D-HEVC “normative” Annex H is based on HEVC text specification 8 [3].

Text is missing or not sufficient for the following adoptions, AHG3 kindly asks proponents to provide further input:

- For Edge Intra the derivation of edge position is not sufficiently specified (#3, JCT3V-A0070).
- For illumination compensation the test model description needs to be extended (#13, JCT3V-B0045).
- The specification of a table related to DMMs is missing (#8, JCT3V-B0039).

A list of other minor issues is listed in the bug tracking system.

4 Related input documents

Following AHG 3 related input documents have been submitted:

[JCT3V-E0100](#): JCT-3V AHG 3: Editorial improvements on MV-HEVC Draft Text 4:

- Restructured version of MV-HEVC draft 4.
- HEVC is now completely specified in Annex G with references to clauses 2 - 9 and Annex A to F.
- Annex F contains now "Common syntax, semantics and decoding processes for multi-layer video coding extensions" and is also referenced by the SHVC extension.
- Annex D has been included to specify changes of the general SEI message syntax.

5 Recommendations

The recommendations of the MV-HEVC / 3D-HEVC Test Model editing AHG are to:

- Approve the edited JCT3V-D1004 and JCT3V-D1005 documents as JCT-3V outputs.
- Continue to edit both documents to ensure that all agreed elements of 3D- and MV-HEVC are fully described.
- Compare the documents with the HTM-software and resolve any discrepancies that may exist, in collaboration with the Software AHG.
- Continue to improve the overall editorial quality of the MV-HEVC working draft 3D-HEVC test model description.
- Ensure that properly drafted candidate text for both the MV-HEVC working draft and the 3D - HEVC Test Model (if appropriate) is available prior to making any decision to change the MV-HEVC or 3D-HEVC specification.
- Used [JCT3V-E0100](#) as the starting basis for future editing work on MV-HEVC.

- Discuss reported open issues.

6 References

- [1] JCT-3V, “MV-HEVC Draft Text 4”, JCT3V-D1004, JCT-3V Meeting, Incheon, April 2013
- [2] JCT-3V, “3D-HEVC Test Model 4”, JCT3V-D1005, JCT-3V Meeting, Incheon, April 2013
- [3] JCT-VC, “High Efficiency Video Coding (HEVC) text specification draft 8”, JCTVC-J1003, JCT-VC Meeting, Stockholm, July 2012