Title:	JCT-VC AHG report: Range extensions software (AHG 7)
Status:	Input Document to JCT-VC
Purpose:	Ad-hoc group report

Author(s):	David Flynn	*dflynn@rim.com*
	Karl Sharman	*karl.sharman@eu.sony.com*
Source:	AHG 7	

Abstract

This report summarizes the activities of Ad Hoc Group 7 on support for range extensions between the 12th and 13th JCT-VC meetings.

Mandates

The ad hoc group was mandated to:

- Coordinate development of the HM RExt software and its distribution to JCT-VC members.

- Produce documentation of software usage for distribution with the software

- Prepare and deliver HM-10.0+RExt-2.0 software version and the reference configuration encodings according to JCTVC-L1006.

- Prepare and deliver additional "dot" version software releases and software branches as appropriate.

- Perform analysis and reconfirmation checks of the behaviour of the draft design, and report the results of such analysis.

- Suggest configuration files for additional testing of tools.

- Coordinate with AHG6

History of revisions

Multiple versions of the HM Rext software were produced and announced on the JCT-VC email reflector. The following sections give a brief summary of the changes made for each version. A detailed history of all changes made to the software can be viewed at http://hevc.hhi.fraunhofer.de/trac/timeline.

Released versions of the software are available on the SVN server at the following URL:

https://hevc.hhi.fraunhofer.de/svn/svn_HEVCSoftware/tags/*version_number*,

where version_number corresponds to one of the versions described below (eg., HM-10.0_RExt-2.0). Intermediate development work is conducted on the HM-range-extensions branch, available at:

https://hevc.hhi.fraunhofer.de/svn/svn_HEVCSoftware/branches/HM-range-extensions/

Revision table

The following commit numbers have been used to label particular releases:

Version	Revision
HM9.1_RExt1.0	3357
HM9.2_RExt1.0	3358
HM10.0_RExt1.0	3359
HM10.0_RExt2.0	3369

Date saved: 2013-04-21

Version RExt-1.0

Subsequent versions of RExt-1.0 incrementally based against HM-9.1, HM-9.2 and HM-10.0[1] were released on the 11th of February 2013. These do not include any of the changes relating to RExt-2.0, but are intended to make the deltas more readable.

We would like to thank those volunteers that performed verification testing of these intermediate versions.

Version RExt-2.0

Version 2.0 was released on the 19th February 2013. It includes all the changes adopted at the 12th JCT-VC meeting relating to the range extensions.

Tables 1 and 2 show the performance of this version against HM-9.0.1+RExt-1.0 and JM-18.4 respectively according to the common conditions [1].

Table 1 – Performance of HM-10.0-rext-2.0 vs HM-9.0.1-rext-1.0

(a) R'G'B'

	Main-tier			High-tier			Super-High-tier		
	Y	Cb	Cr	Y	Cb	Cr	Y	Cb	Cr
All Intra	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Random Access	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Low Delay B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

(b) Y'CbCr 4:4:4

	Main-tier			High-tier			Super-High-tier		
	Y	Cb	Cr	Y	Cb	Cr	Y	Cb	Cr
All Intra	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Random Access	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
Low Delay B	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

(c) Y'CbCr 4:2:2

	Main-tier			High-tier			Super-High-tier		
	Y	Cb	Cr	Y	Cb	Cr	Y	Cb	Cr
All Intra	0.2%	2.9%	4.2%	0.1%	1.4%	1.6%	0.1%	0.8%	0.5%
Random Access	0.3%	3.4%	4.5%	0.3%	1.4%	2.2%			
Low Delay B	0.2%	3.0%	3.9%	0.3%	1.4%	1.7%			

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[1] The HM-10.0+RExt-1.0 candidate was made available to volunteers for verification within one day of the HM-10.0 release

Date saved: 2013-04-21

Table 2 – Performance of HM-10.0-rext-2.0 vs HM-9.0.1-rext-1.0

(a) R'G'B'

	Main-tier			High-tier			Super-High-tier		
	Y	Cb	Cr	Y	Cb	Cr	Y	Cb	Cr
All Intra	-17.4%	-10.6%	-11.9%	-12.9%	-10.0%	-10.4%	-10.2%	-8.2%	-8.2%
Random Access	-24.8%	-25.8%	-20.6%	-15.7%	-24.4%	-15.9%			
Low Delay B	-25.6%	-28.1%	-24.5%	-17.1%	-26.6%	-19.6%			

(b) Y'CbCr 4:4:4

	Main-tier			High-tier			Super-High-tier		
	Y	Cb	Cr	Y	Cb	Cr	Y	Cb	Cr
All Intra	-21.3%	-13.2%	-15.0%	-17.5%	-14.4%	-15.5%	-13.1%	-13.6%	-14.0%
Random Access	-35.1%	-32.1%	-27.2%	-29.3%	-31.9%	-25.3%			
Low Delay B	-39.7%	-45.5%	-48.4%	-32.7%	-39.7%	-41.2%			

(c) Y'CbCr 4:2:2

	Main-tier			High-tier			Super-High-tier		
	Y	Cb	Cr	Y	Cb	Cr	Y	Cb	Cr
All Intra	-19.2%	-9.9%	-9.2%	-15.5%	-10.4%	-12.1%	-11.4%	-8.4%	-9.8%
Random Access	-29.4%	-14.5%	-9.9%	-27.5%	-19.0%	-13.7%			
Low Delay B	-34.3%	-19.1%	-15.8%	-30.8%	-22.0%	-18.9%			

Recommendations

- Continue to develop reference software based on HM version 10.1 and improve its quality.

- Consider developing HM-10.0+RExt-3.0 rather than performing an intermediate release of HM-11.0+RExt-2.0.

- Update encoder and documentation to be consistent with the current usage.

- Remove macros introduced in HM previous HM versions before starting integration towards HM 11.0 such as to make the software more readable

- Continue to identify bugs and discrepancies with text, and address them

- Test reference software more extensively outside of common test conditions

References

[1] D. Flynn and K. Sharman, "Common test conditions and software reference configurations for hevc range extensions." JCTVC-L1006, Jan. 2013.

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