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| --- | --- | --- | --- |
| *Title:* | **AHG4: Signaling sub-stream entries in APS for paralleling decoding** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Proposal | | |
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# Abstract

In the current HM7.0 design, sub-stream entries are signaled in slice header only to facilitate single sub-stream switching of decoding parallelized streams with single core decoders. No entry points are available in the bitstream to assist parallel decoding on multiple core platforms. This contribution advocates signaling of sub-stream entry points in the APS as well to facilitate parallel decoding. Each sub-stream entry point in the APS shall be a parallel decoding entry point; the number of sub-stream entry points signaled in APS is not necessarily equal to the number of WPPs, tiles or slices in the picture referring to the APS.

# Introduction

In the current HM7.0 design, sub-stream entries are signaled in slice header to facilitate single sub-stream switching of decoding parallelized streams with single core decoders. No entry points are available in the bitstream to assist parallel decoding on multiple core platforms. For example, if a picture is divided into tiles and each tile contains multiple slices, then there will be no sub-stream entries present in the bitstream based on the current design. However, in this particular example, tile entry points are needed for a multi-core decoder to be able to dispatch the bitstreams to cores in parallel for parallel processing.

# Proposed solution

To resolve the issue discussed above, it is recommended to add sub-stream entry points in APS as well. Different from the sub-stream entry points signaled in slice header, here each sub-stream entry point should be a parallel decoding entry point, the number of sub-stream entry points signaled in APS does not necessarily equal to the number of WPPs, tiles or slices in the picture referring to the APS. The modified APS syntax is shown in Table 1.

|  |  |  |
| --- | --- | --- |
| aps\_rbsp( ) { | Descriptor | |
| **aps\_id** | ue(v) | |
| **aps\_adaptive\_loop\_filter\_flag** | u(1) | |
| if( aps\_adaptive\_loop\_filter\_flag ) |  | |
| alf\_param( ) |  | |
| **aps\_sub\_stream\_entry\_present\_flag** | u(1) | |
| if (aps\_sub\_pic\_entry\_present\_flag) { |  | |
| **num\_entry\_point\_offsets** | | ue(v) |
| if( num\_entry\_point\_offsets > 0 ) { | |  |
| **offset\_len\_minus1** | | ue(v) |
| for( i = 0; i < num\_entry\_point\_offsets; i++ ) | |  |
| **entry\_point\_offset**[ i ] | | u(v) |
| } |  | |
| **aps\_extension\_flag** | u(1) | |
| if( aps\_extension\_flag ) |  | |
| while( more\_rbsp\_data( ) ) |  | |
| **aps\_extension\_data\_flag** | u(1) | |
| rbsp\_trailing\_bits( ) |  | |
| } |  | |

**Table 1 Modified APS syntax with sub-stream entry point signaling**

# References

[1] F. Bossen, “Common test conditions and software reference configurations,” JCT-VC Document, JCTVC-I1100, 9th Meeting: Geneva, Switzerland, 27 April – 07 May, 2012

[2] [B. Bross](mailto:benjamin.bross@hhi.fraunhofer.de), [W.-J. Han](mailto:wjhan.han@samsung.com), [J.-R. Ohm](mailto:ohm@ient.rwth-aachen.de), [G. J. Sullivan](mailto:garysull@microsoft.com), [T. Wiegand](mailto:thomas.wiegand@hhi.fraunhofer.de) “High Efficiency Video Coding (HEVC) text specification draft 7,” JCT-VC Document, JCTVC-I1003, 9th Meeting: Geneva, Switzerland, 27 April – 07 May, 2012.

# Patent rights declaration(s)

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# CD text

Changes marked as yellow

#### Replace 7.3.2.6 Adaptation parameter set RBSP syntax

with

|  |  |  |
| --- | --- | --- |
| aps\_rbsp( ) { | Descriptor | |
| **aps\_id** | ue(v) | |
| **aps\_adaptive\_loop\_filter\_flag** | u(1) | |
| if( aps\_adaptive\_loop\_filter\_flag ) |  | |
| alf\_param( ) |  | |
| **aps\_sub\_stream\_entry\_present\_flag** | u(1) | |
| if (aps\_sub\_pic\_entry\_present\_flag) { |  | |
| **num\_entry\_point\_offsets** | | ue(v) |
| if( num\_entry\_point\_offsets > 0 ) { | |  |
| **offset\_len\_minus1** | | ue(v) |
| for( i = 0; i < num\_entry\_point\_offsets; i++ ) | |  |
| **entry\_point\_offset**[ i ] | | u(v) |
| } |  | |
| **aps\_extension\_flag** | u(1) | |
| if( aps\_extension\_flag ) |  | |
| while( more\_rbsp\_data( ) ) |  | |
| **aps\_extension\_data\_flag** | u(1) | |
| rbsp\_trailing\_bits( ) |  | |
| } |  | |

#### Replace 7.4.2.6 Adaptation parameter set RBSP semantics

with

**aps\_id** identifies the adaptation parameter set that is referred to in the slice header. The value of aps\_id shall be in the range of 0 to TBD, inclusive.

[Ed. (BB): Proponent suggests that this could be made level/profile dependend. ]

**aps\_adaptive\_loop\_filter\_flag** equal to 1 specifies that the ALF is on for slices referring to the current APS; equal to 0 specifies that the ALF is off for slices referring to the current APS. When there is no active APS, the aps\_adaptive\_loop\_filter\_flag value is inferred to be 0.

**aps\_sub\_stream\_entry\_present\_flag** equal to 1 specifies that the sub-stream entry points are present in the APS; equal to 0 specifies that the sub-stream entry points are not present in the APS

**num\_entry\_point\_offsets** specifies the number of entry\_point\_offset[ i ] syntax elements in the APS.

When tiles\_or\_entropy\_coding\_sync\_idc is equal to 0, the value of num\_entry\_point\_offsets shall be in the range of 0 to number of slices in the picture referring to the APS minus -1, inclusive. When tiles\_or\_entropy\_coding\_sync\_idc is equal to 1, the value of num\_entry\_point\_offsets shall be in the range of 0 to ( num\_tile\_columns\_minus1 + 1 ) \* ( num\_tile\_rows\_minus1 + 1 ) − 1, inclusive. When tiles\_or\_entropy\_coding\_sync\_idc is equal to 2, the value of num\_entry\_point\_offsets shall be in the range of 0 to PicHeightInCtbs − 1, inclusive. When not present, the value of num\_entry\_point\_offsets is inferred to be equal to 0.

**offset\_len\_minus1** plus 1 specifies the length, in bits, of the entry\_point\_offset[ i ] syntax elements.

**entry\_point\_offset**[ i ] specifies the i-th entry point offset, in bytes and shall be represented by offset\_len\_minus1 plus 1 bits. The coded slice data after the APS consists of num\_entry\_point\_offsets + 1 subsets, with subset index values ranging from 0 to num\_entry\_point\_offsets, inclusive. Subset 0 consists of bytes 0 to entry\_point\_offset[ 0 ] − 1, inclusive, of the coded picture data, subset i, with k in the range of 1 to num\_entry\_point\_offsets - 1, inclusive, consists of bytes entry\_point\_offset[ i − 1 ] to entry\_point\_offset[ i ] + entry\_point\_offset[ i − 1 ] − 1, inclusive, of the coded picture data, and the last subset (with subset index equal to num\_entry\_point\_offsets) consists of the remaining bytes of the coded picture data.

When tiles\_or\_entropy\_coding\_sync\_idc is equal to 0 and num\_entry\_point\_offsets is greater than 0, each subset i with i in the range of 0 to num\_entry\_point\_offsets − 1, inclusive, shall contain all coded bits of an integer number of slices, the last subset (with subset index equal to num\_entry\_point\_offsets) shall contain all coded bits of the remaining coding blocks included in the picture.

When tiles\_or\_entropy\_coding\_sync\_idc is equal to 1 and num\_entry\_point\_offsets is greater than 0, each subset shall contain all coded bits of an integer number of tiles, and the number of subsets (i.e, the value of num\_entry\_point\_offsets + 1) shall be equal to or less than the number of tiles in picture.

When tiles\_or\_entropy\_coding\_sync\_idc is equal to 2 and num\_entry\_point\_offsets is greater than 0, each subset i with i in the range of 0 to num\_entry\_point\_offsets − 1, inclusive, shall contain all coded bits of an integer number of rows of coding tree blocks, the last subset (with subset index equal to num\_entry\_point\_offsets) shall contain all coded bits of the remaining coding blocks included in the picture.

**aps\_extension\_flag** equal to 0 specifies that no aps\_extension\_data\_flag syntax elements are present in the picture parameter set RBSP syntax structure. aps\_extension\_flag shall be equal to 0 in bitstreams conforming to this Recommendation | International Standard. The value of 1 for aps\_extension\_flag is reserved for future use by ITU‑T | ISO/IEC. Decoders shall ignore all data that follow the value 1 for aps\_extension\_flag in a picture parameter set NAL unit.

**aps\_extension\_data\_flag** may have any value. Its value does not affect decoder conformance to profiles specified in this Recommendation | International Standard.