|  |  |
| --- | --- |
| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG16 WP3 and ISO/IEC JTC1/SC29/WG11**  6th Meeting: Torino, IT, 14-22 July, 2011 | Document: JCTVC-F714 |

|  |  |  |  |
| --- | --- | --- | --- |
| *Title:* | **High-level syntax mismatches between WD and HM** | | |
| *Status:* | Input Document to JCT-VC | | |
| *Purpose:* | Information | | |
| *Author(s) or Contact(s):* | **Qiu Shen** Huawei Technologies Co., Ltd.  **Ye-Kui Wang**  Huawei Technologies Co., Ltd  **Karsten Sühring** Fraunhofer HHI | Email: | [shenqiu@huawei.com](mailto:shenqiu@huawei.com)  [yekui.wang@huawei.com](mailto:yekui.wang@huawei.com)  [karsten.suehring@hhi.fraunhofer.de](mailto:karsten.suehring@hhi.fraunhofer.de) |
| *Source:* | Huawei Technologies Co., Ltd., Fraunhofer HHI | | |

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

# Abstract

This document provides an analysis of high-level syntax related mismatches, including both syntax mismatches and behavior mismatches, between the HEVC WD (JCTVC-E603\_d8) and the reference software HM-3.2.

# Syntax mismatches

The syntax elements in the NAL unit header, SPS, PPS and slice header in the WD and the reference software (HM-3.2) are compared, and mismatches are pointed out as follows:

* A blue highlight indicates that the syntax element is present in the WD but not in HM-3.2.
* A yellow highlight indicates that the syntax element is present in HM-3.2 but not in the WD.
* A pink highlight indicates that the syntax element is present in both the WD and HM-3.2, but not in an aligned manner (e.g., syntax element name or “semantics”).

Note that in the tables below, the order of syntax elements in the right column is not exactly the same as in HM-3.2, because some syntax elements have been moved to correspond to the syntax element in the WD, for easy comparison.

## NALU header syntax

There is no mismatch in this part.

## SPS syntax

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **WD** | | seq\_parameter\_set\_rbsp( ) { | | **profile\_idc** | | **reserved\_zero\_8bits** /\* equal to 0 \***/** | | **level\_idc** | | **seq\_parameter\_set\_id** | | **max\_temporal\_layers\_minus1** | | **pic\_width\_in\_luma\_samples** | | **pic\_height\_in\_luma\_samples** | |  | |  | |  | |  | |  | | **bit\_depth\_luma\_minus8** | | **bit\_depth\_chroma\_minus8** | | **pcm\_bit\_depth\_luma\_minus1** | | **pcm\_bit\_depth\_chroma\_minus1** | | **log2\_max\_frame\_num\_minus4** | | **pic\_order\_cnt\_type** | | if( pic\_order\_cnt\_type = = 0 ) | | **log2\_max\_pic\_order\_cnt\_lsb\_minus4** | | else if( pic\_order\_cnt\_type = = 1 ) { | | **delta\_pic\_order\_always\_zero\_flag** | | **offset\_for\_non\_ref\_pic** | | **num\_ref\_frames\_in\_pic\_order\_cnt\_cycle** | | for( i = 0; i < num\_ref\_frames\_in\_pic\_order\_cnt\_cycle; i++ ) | | **offset\_for\_ref\_frame[ i ]** | | } | | **max\_num\_ref\_frames** | | **gaps\_in\_frame\_num\_value\_allowed\_flag** | | **log2\_min\_coding\_block\_size\_minus3** | | **log2\_diff\_max\_min\_coding\_block\_size** | |  | |  | |  | |  | | **log2\_min\_transform\_block\_size\_minus2** | | **log2\_diff\_max\_min\_transform\_block\_size** | | **log2\_min\_pcm\_coding\_block\_size\_minus3** | | **max\_transform\_hierarchy\_depth\_inter** | | **max\_transform\_hierarchy\_depth\_intra** | | **chroma\_pred\_from\_luma\_enabled\_flag** | | **loop\_filter\_across\_slice\_flag** | | **sample\_adaptive\_offset\_enabled\_flag** | | **adaptive\_loop\_filter\_enabled\_flag** | | **pcm\_loop\_filter\_disable\_flag** | | **cu\_qp\_delta\_enabled\_flag** | | **temporal\_id\_nesting\_flag** | | rbsp\_trailing\_bits( ) | | } | | |  |  | | --- | --- | | **HM-3.2** |  | | seq\_parameter\_set\_rbsp( ) { |  | |  | **done** | |  | **done** | |  | **done** | |  | **done** | | **max\_temporal\_layers\_minus1** |  | | **pic\_width\_in\_luma\_samples** | **fixed type u(16)** | | **pic\_height\_in\_luma\_samples** | **fixed type (u16)** | | **pad\_x** | **moved/open** | | **pad\_y** | **moved/open** | | **use\_ldc\_flag** | **removed** | | **use\_mrg\_flag** | **open:**  **supposed to be removed?** | | **~~use\_lm\_chroma\_flag~~** |  | | **bit\_depth\_increment** | **done (cleanup needed)** | |  | **done** | | **pcm\_bit\_depth\_luma\_minus1** |  | | **pcm\_bit\_depth\_chrom\_minus1** |  | |  | **open** | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | |  | **open** | |  | **open** | | **max\_cu\_width** | **fixed** | | **max\_cu\_depth** | **fixed** | | for(i=0; i<max\_cu\_depth; i++){ | **moved/open** | | **amvp\_mode** |  | | } |  | | **~~lf\_cross\_slice\_boundary\_flag~~** |  | | **log2\_min\_transform\_block\_size\_minus2** |  | | **log2\_diff\_max\_min\_transform\_block\_size** |  | | **pcm\_log2\_min\_size\_minus3** | **done** | | **max\_transform\_hierarchy\_depth\_inter\_minus1** | **done** | | **max\_transform\_hierarchy\_depth\_intra\_minus1** | **done** | | **use\_lm\_chroma\_flag** | **moved/done** | | **lf\_cross\_slice\_boundary\_flag** | **moved/done**  **possible overlap with other filter syntax** | | **use\_sao\_flag** | **done** | | **use\_alf\_flag** | **done** | | **pcm\_filter\_disable\_flag** | **done** | | **use\_dqp\_flag** | **done Problem: parsing dependency with PPS** | | **temporal\_id\_nesting\_flag** |  | | rbsp\_trailing\_bits( ) |  | | } |  | |

## PPS syntax

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | **WD** | | pic\_parameter\_set\_rbsp( ) { | | **pic\_parameter\_set\_id** | | **seq\_parameter\_set\_id** | | **entropy\_coding\_mode\_flag** | | **num\_temporal\_layer\_switching\_point\_flags** | | for( i = 0; i < num\_temporal\_layer\_switching\_point\_flags; i++ ) | | **temporal\_layer\_switching\_point\_flag**[ i ] | | **num\_ref\_idx\_l0\_default\_active\_minus1** | | **num\_ref\_idx\_l1\_default\_active\_minus1** | | **pic\_init\_qp\_minus26** **/**\* relative to 26 \*/ | | **constrained\_intra\_pred\_flag** | | **slice\_granularity** | | **shared\_pps\_info\_enabled\_flag** | | if( shared\_pps\_info\_enabled\_flag ) | | if( adaptive\_loop\_filter\_enabled\_flag ) | | alf\_param( ) | | if( cu\_qp\_delta\_enabled\_flag ) | | **max\_cu\_qp\_delta\_depth** | | rbsp\_trailing\_bits( ) | | } | | |  |  | | --- | --- | | **HM-3.2** |  | | pic\_parameter\_set\_rbsp( ) { |  | |  | **done** | |  | **done** | |  | **open** | | **num\_temporal\_layer\_switching\_point\_flags** |  | | for( i = 0; i < num\_temporal\_layer\_switching\_point\_flags; i++ ) |  | | **temporal\_layer\_switching\_point\_flag**[ i ] |  | |  | **open** | |  | open | |  | open | | **constrained\_intra\_pred\_flag** |  | | **slice\_granularity** |  | | **shared\_pps\_info\_enabled\_flag** |  | |  |  | |  | order? | |  |  | | if( cu\_qp\_delta\_enabled\_flag ) | dependency from SPS | | **max\_cu\_qp\_delta\_depth** |  | | rbsp\_trailing\_bits( ) |  | | } |  | |

PS：The parameter in alf\_param( ) are written outside the function of encodePPS(). Adoption to move to Slice Parameter Set.

## Slice header syntax

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  | | --- | | WD | | slice\_header( ) { | | **lightweight\_slice\_flag** | | if( !lightweight\_slice\_flag ) { | | **slice\_type** | | **pic\_parameter\_set\_id** | | **frame\_num** | | if( IdrPicFlag ) | | **idr\_pic\_id** | | if( pic\_order\_cnt\_type = = 0 ) | | **pic\_order\_cnt\_lsb /\*** | |  | | if( slice\_type = = P | | slice\_type = = B ) { | | **num\_ref\_idx\_active\_override\_flag** | | if( num\_ref\_idx\_active\_override\_flag ) { | | **num\_ref\_idx\_l0\_active\_minus1** | | if( slice\_type = = B ) | | **num\_ref\_idx\_l1\_active\_minus1** | | } | | } | | ref\_pic\_list\_modification( ) | | ref\_pic\_list\_combination( ) | | if( nal\_ref\_idc != 0 ) | | dec\_ref\_pic\_marking( ) | | } | | if( entropy\_coding\_mode\_flag && slice\_type != I) | | **cabac\_init\_idc** | | **first\_slice\_in\_pic\_flag** | | if(first\_slice\_in\_pic\_flag = = 0) | | **slice\_address** | | if( !lightweight\_slice\_flag ) { | | **slice\_qp\_delta** | | if( sample\_adaptive\_offset\_enabled\_flag ) | | sao\_param() | | if( deblocking\_filter\_control\_present\_flag ) { | | **disable\_deblocking\_filter\_idc** | | if( disable\_deblocking\_filter\_idc != 1 ) { | | **slice\_alpha\_c0\_offset\_div2** | | **slice\_beta\_offset\_div2** | | } | | } | |  | |  | |  | | if( slice\_type = = B ) | | **collocated\_from\_l0\_flag** | | if( adaptive\_loop\_filter\_enabled\_flag ) { | | if( !shared\_pps\_info\_enabled\_flag ) | | alf\_param( ) | | alf\_cu\_control\_param( ) | | } | | } | | } | | |  |  | | --- | --- | | **HM-3.2** |  | | slice\_header( ) { |  | | **entropy\_slice\_flag** | done | | if( !entropy\_slice\_flag ) { | (going to be renamed in WD) | | **slice\_type** |  | |  | done | |  | **open** | |  |  | |  | **open** | |  |  | | **pic\_order\_cnt** | **open, maybe WD text missing** | | **symbol\_mode** (pps :entropy\_coding\_mode\_flag) | **open** | | if( slice\_type = = P | | slice\_type = = B ) { |  | | **is\_referenced\_flag** | **done. now uses nal\_ref\_idc** | | **num\_ref\_idx\_l0** | done: always overrides! | | } |  | | if( slice\_type = = B ) { |  | | **num\_ref\_idx\_l1** | **done** | | } |  | |  | open | | ref\_pic\_list\_combination( ) |  | |  |  | |  | open | | } |  | |  |  | |  |  | |  | open | | **first\_slice\_in\_pic\_flag** |  | | if(first\_slice\_in\_pic\_flag = = 0) |  | | **slice\_address** |  | | if( !entropy\_slice\_flag ) { |  | | **slice\_qp** | **open (coded as absolute value)** | |  |  | |  |  | | **loop\_filter\_disable\_flag** | **WD: control flag missing!** | |  |  | |  |  | |  |  | |  |  | |  |  | |  |  | | **drb\_flag** | **???** | | if(!drb\_flag) |  | | **erb\_index** | **long-term?** | | if(slice\_type= =B) |  | | **col\_dir\_flag** | **done** | |  |  | |  |  | |  |  | |  |  | |  |  | | } |  | | } |  | |

PS：The parameter in sao\_param(), alf\_param( ) and alf\_cu\_control\_param( ) are written outside the function of encodeSliceHeader().sao\_param(), alf\_param( ) are being moved to slice parameter set.

# Behavior mismatches

The behaviors of the slice decoding process in the WD (JCTVC-E603\_d8) are compared to that in reference software (HM-3.2).

## Decoding process for picture order count

**WD:** No specifications about POC decoding process.

**SW:** The value of POC is get from directly from SliceHeader. The syntax element is pic\_order\_cnt, and no more decoding process is invoked.

## Decoding process for reference picture lists construction

**1） Decoding process for picture numbers**

**WD:** Specifies the decoding process for picture numbers.

**SW:** No frame\_num. No process for picture number decoding.

**2) Initialization process for reference picture lists**

**WD:** The reference picture list is ordered so that short-term reference pictures have lower indices than long-term reference pictures.

**SW:** The reference picture list is ordered like: 1 short-term + 1 long-term + n short-term.

**3)** **Modification process for reference picture lists**

**WD:** Specifies the modification process of reference picture lists.

**SW:** No modification process of reference picture lists.

**4) Mapping process for reference picture lists combination in B slices**

**WD:** Different mapping processes are invoked according to the value of ref\_pic\_list\_modification\_flag\_lc (0 or 1).

**SW:** Only mapping process for ref\_pic\_list\_modification\_flag\_lc equal to 0. No operation for ref\_pic\_list\_modification\_flag\_lc equal to 1.

## Decoded reference picture marking process

**WD:** Specifies two tools for reference picture marking: sliding window and MMCO.

**SW:** Two marking processes:1) Refresh marking for IDR and CDR; 2) pop picture from buffer when it come the maximum size. The process is similar to sliding window, but it is according to POC not frame\_num as specified in WD.

## Parameter set management

Storing multiple parameter sets and their actication is not possible in the software.

## Deblocking filter options

**disable\_deblocking\_filter\_idc** exists in the syntax, but there is no semantics for it. It is being referred to in the Deblocking Fiter process (8.6.1) filtering section. There is also overlap with **lf\_cross\_slice\_boundary\_flag**.

# Acknowledgement

We appreciate related inputs from Benjamin Bross, Frank Bossen, Rickard Sjöberg, and Ying Chen, which have been taken into consideration in the above analysis.