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| *Title:* | **Syntax clean-up of profile, tier and level information** | | |
| *Status:* | Input Document to JCT-VC and JCT-3V | | |
| *Purpose:* | Proposal | | |
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# Abstract

This contribution proposes a syntax clean-up of profile, tier and level information in VPS extension by removing a syntax element of profile\_ref\_minus1. It is asserted that profile\_ref\_minus1 doesn’t achieve its intention (bit rate saving).

# Introduction

This contribution presents a clean-up regarding profile, tier and level information syntax.

A syntax element profile\_ref\_minus1 is used to decide which profile\_tier\_level information is referred in the case that vps\_profile\_present\_flag is equal to 0. The syntax constantly uses 6 bits, but it is introducing non-necessary flexibility. To generate profile tier\_level set, it is very likely to look through the layer sets and omit duplicate profile\_tier\_level information in layer sets. And if sorted in profile order through the process, the profile\_tier\_level information can be inferred from the previous one. So the referring flexibility by profile\_ref\_minus1 is not needed.

Table 1 and Table 2 show an example of profile\_ref\_minus1 value. In Table 1, profile\_tier\_level( ) are not sorted in profile order while in Table 2, profile\_tier\_level( ) are sorted in the order. In Table 2, most of the profile information of the i-th profile\_tier\_level( ) can be inferred from previous one.

Note that for each layer set, an associated profile\_tier\_level information is indicated by profile\_level\_tier\_idx in VPS extension. Hence, the profile\_tier\_level information order is independent of layer set order, so it can be ordered in any way.

**Table 1** Example of profile\_ref\_minus1 (non-sorted in profile order)

|  |  |  |
| --- | --- | --- |
| i –th PTL (nich name) | profile\_ref\_minus1 + 1 | Used profile |
| 0 (Ptl A) | - | Prof A |
| 1 (Ptl B) | - | Prof B |
| 2 (Ptl C) | - | Prof C |
| 3 (Ptl D) | 1 (Ptl B) | Prof B |
| 4 (Ptl E) | 2 (Ptl C) | Prof C |
| 5 (Ptl F) | - | Prof F |
| 6 (Ptl G) | 2 (Ptl C) | Prof C |

**Table 2** Example of profile\_ref\_minus1 (sorted in profile order)

|  |  |  |
| --- | --- | --- |
| i –th PTL (nich name) | profile\_ref\_minus1 + 1 | Used profile |
| 0 (Ptl A) | - | Prof A |
| 1 (Ptl B) | - | Prof B |
| 2 (Ptl D) | 1 (Ptl B) | Prof B |
| 3 (Ptl C) | - | Prof C |
| 4 (Ptl E) | 3 (Ptl C) | Prof C |
| 5 (Ptl G) | 4 (Ptl E) | Prof C |
| 6 (Ptl F) | - | Prof F |

# Proposal

We propose to remove profile\_ref\_minus1. When profile information is not present, it is inferred from the previous syntax structure.

# Text changes

Changes are highlighted in yellow, and both of removals and typos are stroke through in red.

**F.7.3.2.1.1 Video parameter set extension syntax**

|  |  |
| --- | --- |
| vps\_extension( ) { | Descriptor |
| …snipped… |  |
| **vps\_number\_layer\_sets\_minus1** | u(10) |
| **vps\_num\_profile\_tier\_level\_minus1** | u(6) |
| for( i = 1; i <= vps\_num\_profile\_tier\_level\_minus1; i ++ ) { |  |
| **vps\_profile\_present\_flag**[ i ] | u(1) |
| ~~if( !vps\_profile\_present\_flag[ i ] )~~ |  |
| **~~profile\_ref\_minus1~~**~~[ i ]~~ | ~~u(6)~~ |
| profile\_tier\_level( vps\_profile\_present\_flag[ i ], vps\_max\_sub\_layers\_minus1 ) |  |
| } |  |
| …snipped… |  |
| } |  |

**F.7.4.3.1.1 Video parameter set extension semantics**

**vps\_profile\_present\_flag**[ i ] equal to 1 specifies that the profile and tier information ~~for layer set i~~ is present in the i-th profile\_tier\_level( ) syntax structure.vps\_profile\_present\_flag[ i ] equal to 0 specifies that profile and tier information is not present in the i-th profile\_tier\_level( ) syntax structure and is inferred to be equal to the profile and tier information of the ( i − 1 )-th profile\_tier\_level( ) syntax structure. When the index i is equal to 1, vps\_profile\_present\_flag[i] shall be equal to 1.

**~~profile\_ref\_minus1~~**~~[ i ] specifies that the profile and tier information for the i-th profile\_tier\_level( ) syntax structure is inferred to be equal to the profile and tier information for the ( profile \_ref\_minus1[ i ] + 1 )-th layer set. The value of profile\_ref\_minus1[ i ] + 1 shall be less than or equal to i.~~

F.7.4.4. Profile, tier and level semantics

The profile\_tier\_level( ) syntax structure provides profile, tier and level information used for a layer set. When the profile\_tier\_level( ) syntax structure is included in a vps\_extension( ) syntax structure, the applicable layer set to which the profile\_tier\_level( ) syntax structure applies is specified by the corresponding lsIdx variable in the vps\_extension( ) syntax structure. When the profile\_tier\_level( ) syntax structure is included in a VPS, but not in a vps\_extension( ) syntax structure, the applicable layer set to which the profile\_tier\_level( ) syntax structure applies is the layer set specified by the index 0. When the profile\_tier\_level( ) syntax structure is included in an SPS, the layer set to which the profile\_tier\_level( ) syntax structure applies is the layer set specified by the index 0.

For interpretation of the following semantics, CVS refers to the CVS subset associated with the layer set to which the profile\_tier\_level( ) syntax structure applies.

When the syntax elements general\_profile\_space, general\_tier\_flag, general\_profile\_idc, general\_profile\_compatibility\_flag[ j ], general\_progressive\_source\_flag, general\_interlaced\_source\_flag, general\_non\_packed\_constraint\_flag, general\_frame\_only\_constraint\_flag, general\_reserved\_zero\_44bits are not present for the profile\_tier\_level( ) sytanx structure specified by the index k, and k in in the range of 1 to vps\_num\_profile\_tier\_level\_minus1 + 1, they are inferred to be equal to the corresponding values of the profile\_tier\_level() syntax structure specified by the index ( k – 1 ~~profile\_ref\_minsu1[ k ]+1~~).

When the syntax elements sub\_layer\_profile\_space[ i ], sub\_layer\_tier\_flag[ i ], sub\_layer\_profile\_idc[ i ], sub\_layer\_profile\_compatibility\_flag[ i ][ j ], sub\_layer\_progressive\_source\_flag[ i ], sub\_layer\_interlaced\_source\_flag[ i ], sub\_layer\_non\_packed\_constraint\_flag[ i ], sub\_layer\_frame\_only\_constraint\_flag[ i ], sub\_layer\_reserved\_zero\_44bits[ i ] are not present for the profile\_tier\_level( ) syntax structure specified by the index k , and k in in the range of 1 to vps\_num\_profile\_tier\_level\_minus1 + 1, they are inferred to be equal to the corresponding values of the profile\_tier\_level( ) syntax structure specified by the index (k – 1  ~~profile\_ref\_minus1[ k ]+1~~).

Note: the text isbased on the text of the SHVC WD bug ticket # 9.

# Conclusion

This contribution proposes a syntax clean-up of profile, tier and level information in VPS extension, by removing profile\_ref\_minus1.

It is recommended to adopt the proposal in SHVC and MV-HEVC.

# Reference

1. J. Chen, J. Boyce, Y. Ye, M. M. Hannuksela, Y.-K. Wang, “SHVC Draft 4”, JCTVC-O1008, Geneva, CH, 23 Oct. – 1 Nov. 2013.
2. G. Tech, K. Wegner, Y. Chen, M. Hannuksela, J. Boyce, “MV-HEVC Draft Text 6”, JCT3V-F1004, Geneva, CH, 23 Oct. – 1 Nov. 2013.

# Patent rights declaration(s)

**SHARP Corporation may have current or pending patent rights relating to the technology described in this contribution and, conditioned on reciprocity, is prepared to grant licenses under reasonable and non-discriminatory terms as necessary for implementation of the resulting ITU-T Recommendation | ISO/IEC International Standard (per box 2 of the ITU-T/ITU-R/ISO/IEC patent statement and licensing declaration form).**