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| **Joint Collaborative Team on Video Coding (JCT-VC)**  **of ITU-T SG 16 WP 3 and ISO/IEC JTC 1/SC 29/WG 11**  38th Meeting: Brussels, BE, 10–17 January 2020 | Document: JCTVC-AL1005-v1 |

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| *Title:* | **Shutter interval information SEI message for HEVC (Draft 2)** | | |
| *Status:* | Output document approved by JCT-VC | | |
| *Purpose:* | Draft text | | |
| *Author(s) or Contact(s):* | Sean T. McCarthy Gary J. Sullivan Ye-Kui Wang | Email: | [sean.mccarthy@dolby.com](mailto:sean.mccarthy@dolby.com) [garysull@microsoft.com](mailto:garysull@microsoft.com) [yekui.wang@bytedance.com](mailto:yekui.wang@bytedance.com) |
| *Source:* | Editors | | |

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# Abstract

This document contains the draft text for changes to the High Efficiency Video Coding (HEVC) standard (Rec. ITU-T H.265 | ISO/IEC 23008-2) to specify the shutter interval information SEI message.

**Changes to the specification text:**

*Add abbreviation to clause 4, as follows:*

ATSC Advanced Television Systems Committee

*Replace D.2.1 with the following:*

**D.2.1 General SEI message syntax**

|  |  |
| --- | --- |
| sei\_payload( payloadType, payloadSize ) { | **Descriptor** |
| if( nal\_unit\_type = = PREFIX\_SEI\_NUT ) |  |
| if( payloadType = = 0 ) |  |
| buffering\_period( payloadSize ) |  |
| else if( payloadType = = 1 ) |  |
| pic\_timing( payloadSize ) |  |
| else if( payloadType = = 2 ) |  |
| pan\_scan\_rect( payloadSize ) |  |
| else if( payloadType = = 3 ) |  |
| filler\_payload( payloadSize ) |  |
| else if( payloadType = = 4 ) |  |
| user\_data\_registered\_itu\_t\_t35( payloadSize ) |  |
| else if( payloadType = = 5 ) |  |
| user\_data\_unregistered( payloadSize ) |  |
| else if( payloadType = = 6 ) |  |
| recovery\_point( payloadSize ) |  |
| else if( payloadType = = 9 ) |  |
| scene\_info( payloadSize ) |  |
| else if( payloadType = = 15 ) |  |
| picture\_snapshot( payloadSize ) |  |
| else if( payloadType = = 16 ) |  |
| progressive\_refinement\_segment\_start( payloadSize ) |  |
| else if( payloadType = = 17 ) |  |
| progressive\_refinement\_segment\_end( payloadSize ) |  |
| else if( payloadType = = 19 ) |  |
| film\_grain\_characteristics( payloadSize ) |  |
| else if( payloadType = = 22 ) |  |
| post\_filter\_hint( payloadSize ) |  |
| else if( payloadType = = 23 ) |  |
| tone\_mapping\_info( payloadSize ) |  |
| else if( payloadType = = 45 ) |  |
| frame\_packing\_arrangement( payloadSize ) |  |
| else if( payloadType = = 47 ) |  |
| display\_orientation( payloadSize ) |  |
| else if( payloadType = = 56 ) |  |
| green\_metadata( payloadsize ) /\* specified in ISO/IEC 23001-11 \*/ |  |
| else if( payloadType = = 128 ) |  |
| structure\_of\_pictures\_info( payloadSize ) |  |
| else if( payloadType = = 129 ) |  |
| active\_parameter\_sets( payloadSize ) |  |
| else if( payloadType = = 130 ) |  |
| decoding\_unit\_info( payloadSize ) |  |
| else if( payloadType = = 131 ) |  |
| temporal\_sub\_layer\_zero\_idx( payloadSize ) |  |
| else if( payloadType = = 133 ) |  |
| scalable\_nesting( payloadSize ) |  |
| else if( payloadType = = 134 ) |  |
| region\_refresh\_info( payloadSize ) |  |
| else if( payloadType = = 135 ) |  |
| no\_display( payloadSize ) |  |
| else if( payloadType = = 136 ) |  |
| time\_code( payloadSize ) |  |
| else if( payloadType = = 137 ) |  |
| mastering\_display\_colour\_volume( payloadSize ) |  |
| else if( payloadType = = 138 ) |  |
| segmented\_rect\_frame\_packing\_arrangement( payloadSize ) |  |
| else if( payloadType = = 139 ) |  |
| temporal\_motion\_constrained\_tile\_sets( payloadSize ) |  |
| else if( payloadType = = 140 ) |  |
| chroma\_resampling\_filter\_hint( payloadSize ) |  |
| else if( payloadType = = 141 ) |  |
| knee\_function\_info( payloadSize ) |  |
| else if( payloadType = = 142 ) |  |
| colour\_remapping\_info( payloadSize ) |  |
| else if( payloadType = = 143 ) |  |
| deinterlaced\_field\_identification( payloadSize ) |  |
| else if( payloadType = = 144 ) |  |
| content\_light\_level\_info( payloadSize ) |  |
| else if( payloadType = = 145 ) |  |
| dependent\_rap\_indication( payloadSize ) |  |
| else if( payloadType = = 146 ) |  |
| coded\_region\_completion( payloadSize ) |  |
| else if( payloadType = = 147 ) |  |
| alternative\_transfer\_characteristics( payloadSize ) |  |
| else if( payloadType = = 148 ) |  |
| ambient\_viewing\_environment( payloadSize ) |  |
| else if( payloadType  = =  149 ) |  |
| content\_colour\_volume( payloadSize ) |  |
| else if( payloadType  = =  150 ) |  |
| equirectangular\_projection( payloadSize ) |  |
| else if( payloadType  = =  151 ) |  |
| cubemap\_projection( payloadSize ) |  |
| else if( payloadType  = =  152 ) |  |
| fisheye\_video\_info( payloadSize ) |  |
| else if( payloadType  = =  154 ) |  |
| sphere\_rotation( payloadSize ) |  |
| else if( payloadType  = =  155 ) |  |
| regionwise\_packing( payloadSize ) |  |
| else if( payloadType  = =  156 ) |  |
| omni\_viewport( payloadSize ) |  |
| else if( payloadType  = =  157 ) |  |
| regional\_nesting( payloadSize ) |  |
| else if( payloadType  = =  158 ) |  |
| mcts\_extraction\_info\_sets( payloadSize ) |  |
| else if( payloadType  = =  159 ) |  |
| mcts\_extraction\_info\_nesting( payloadSize ) |  |
| else if( payloadType = = 160 ) |  |
| layers\_not\_present( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 161 ) |  |
| inter\_layer\_constrained\_tile\_sets( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 162 ) |  |
| bsp\_nesting( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 163 ) |  |
| bsp\_initial\_arrival\_time( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 164 ) |  |
| sub\_bitstream\_property( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 165 ) |  |
| alpha\_channel\_info( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 166 ) |  |
| overlay\_info( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 167 ) |  |
| temporal\_mv\_prediction\_constraints( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 168 ) |  |
| frame\_field\_info( payloadSize ) /\* specified in Annex F \*/ |  |
| else if( payloadType = = 176 ) |  |
| three\_dimensional\_reference\_displays\_info( payloadSize ) /\* specified in Annex G \*/ |  |
| else if( payloadType = = 177 ) |  |
| depth\_representation\_info( payloadSize ) /\* specified in Annex G \*/ |  |
| else if( payloadType = = 178 ) |  |
| multiview\_scene\_info( payloadSize ) /\* specified in Annex G \*/ |  |
| else if( payloadType = = 179 ) |  |
| multiview\_acquisition\_info( payloadSize ) /\* specified in Annex G \*/ |  |
| else if( payloadType = = 180 ) |  |
| multiview\_view\_position( payloadSize ) /\* specified in Annex G \*/ |  |
| else if( payloadType = = 181 ) |  |
| alternative\_depth\_info( payloadSize ) /\* specified in Annex I \*/ |  |
| else if( payloadType = = 200 ) |  |
| sei\_manifest( payloadSize ) |  |
| else if( payloadType = = 201 ) |  |
| sei\_prefix\_indication( payloadSize ) |  |
| else if( payloadType  = =  202 ) |  |
| annotated\_regions( payloadSize ) |  |
| else if( payloadType = = 203 ) |  |
| shutter\_interval\_info( payloadSize ) |  |
| else |  |
| reserved\_sei\_message( payloadSize ) |  |
| else /\* nal\_unit\_type = = SUFFIX\_SEI\_NUT \*/ |  |
| if( payloadType = = 3 ) |  |
| filler\_payload( payloadSize ) |  |
| else if( payloadType = = 4 ) |  |
| user\_data\_registered\_itu\_t\_t35( payloadSize ) |  |
| else if( payloadType = = 5 ) |  |
| user\_data\_unregistered( payloadSize ) |  |
| else if( payloadType = = 17 ) |  |
| progressive\_refinement\_segment\_end( payloadSize ) |  |
| else if( payloadType = = 22 ) |  |
| post\_filter\_hint( payloadSize ) |  |
| else if( payloadType = = 132 ) |  |
| decoded\_picture\_hash( payloadSize ) |  |
| else if( payloadType = = 146 ) |  |
| coded\_region\_completion( payloadSize ) |  |
| else |  |
| reserved\_sei\_message( payloadSize ) |  |
| if( more\_data\_in\_payload( ) ) { |  |
| if( payload\_extension\_present( ) ) |  |
| **reserved\_payload\_extension\_data** | u(v) |
| **payload\_bit\_equal\_to\_one** /\* equal to 1 \*/ | f(1) |
| while( !byte\_aligned( ) ) |  |
| **payload\_bit\_equal\_to\_zero** /\* equal to 0 \*/ | f(1) |
| } |  |
| } |  |

*Renumber clause D.2.48 (Reserved SEI message syntax) as D.2.49.*

*Add clause D.2.48, as follows:*

**D.2.48 Shutter interval information SEI message syntax**

|  |  |
| --- | --- |
| shutter\_interval\_info( payloadSize ) { | **Descriptor** |
| **sii\_time\_scale** | u(32) |
| **fixed\_shutter\_interval\_within\_clvs\_flag** | u(1) |
| if( fixed\_shutter\_interval\_within\_clvs\_flag ) |  |
| **sii\_num\_units\_in\_shutter\_interval** | u(32) |
| else { |  |
| **sii\_max\_sub\_layers\_minus1** | u(3) |
| for( i = 0; i <= sii\_max\_sub\_layers\_minus1; i++ ) |  |
| **sub\_layer\_num\_units\_in\_shutter\_interval**[ i ] | u(32) |
| } |  |
| } |  |

*In D.3.1, replace the following paragraphs:*

The list SingleLayerSeiList is set to consist of the payloadType values 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, and 200 to 202, inclusive.

The list VclAssociatedSeiList is set to consist of the payloadType values 2, 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, and 200 to 202, inclusive.

The list PicUnitRepConSeiList is set to consist of the payloadType values 0, 1, 2, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 133, 135 to 152, inclusive, 154 to 159, inclusive, and 200 to 202, inclusive.

*with the following:*

The list SingleLayerSeiList is set to consist of the payloadType values 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, and 200 to 203, inclusive.

The list VclAssociatedSeiList is set to consist of the payloadType values 2, 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, and 200 to 203, inclusive.

The list PicUnitRepConSeiList is set to consist of the payloadType values 0, 1, 2, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 133, 135 to 152, inclusive, 154 to 159, inclusive, and 200 to 203, inclusive.

*In D.3.1, in Table D.1, append the following row to the end of the table:*

|  |  |
| --- | --- |
| Shutter interval information | The CLVS containing the SEI message |

*Add clause D.3.48, as follows:*

**D.3.48 Shutter interval information SEI message syntax**

The shutter interval information SEI message indicates the shutter interval for the associated video source pictures prior to encoding and display, e.g., for camera-captured content, the shutter interval is amount of time that an image sensor is exposed to produce each source picture.

When a shutter interval information SEI message is present for any picture of a CLVS of a particular layer, a shutter interval information SEI message shall be present for the first picture of the CLVS. The shutter interval information SEI message persists for the current layer in decoding order from the current picture until the end of the CLVS. All shutter interval information SEI messages that apply to the same CLVS shall have the same content.

**sii\_time\_scale** specifies the number of time units that pass in one second. The value of sii\_time\_scale shall be greater than 0. For example, a time coordinate system that measures time using a 27 MHz clock has an sii\_time\_scale of 27 000 000.

**fixed\_shutter\_interval\_within\_clvs\_flag** equal to 1 specifies that the indicated shutter interval is the same for all temporal sub-layers in the CLVS. fixed\_shutter\_interval\_within\_clvs\_flagequal to 0 specifies that the indicated shutter interval may not be the same for all temporal sub-layers in the CLVS. When the value of sps\_max\_sub\_layers\_minus1 is equal to 0, the value of fixed\_shutter\_interval\_within\_clvs\_flag shall be equal to 1.

NOTE – For example, the information conveyed in this SEI message is intended to be adequate for purposes corresponding to the use of ATSC A/341:2019 Annex D when sii\_max\_sub\_layers\_minus1 is equal to 1 and fixed\_shutter\_interval\_within\_clvs\_flag is equal to 0.

**sub\_layer\_num\_units\_in\_shutter\_interval**[ i ], when present, specifies the number of time units of a clock operating at the frequency sii\_time\_scale Hz that corresponds to the shutter interval of each picture in the sub-layer representation with TemporalId equal to i in the CLVS. The sub-layer shutter interval for the sub-layer representation with TemporalId equal to i, denoted by the variable subLayerShutterInterval[ i ], in units of seconds, is equal to the quotient of sub\_layer\_num\_units\_in\_shutter\_interval[ i ] divided by sii\_time\_scale.

The variable subLayerShutterInterval[ i ], corresponding to the indicated shutter interval of each picture in the sub-layer representation with TemporalId equal to i in the CLVS, is thus derived as follows:

if( fixed\_shutter\_interval\_within\_clvs\_flag )  
 subLayerShutterInterval[ i ] = sii\_num\_units\_in\_shutter\_interval ÷ sii\_time\_scale (D.X)  
else  
 subLayerShutterInterval[ i ] = sub\_layer\_num\_units\_in\_shutter\_interval[ i ] ÷ sii\_time\_scale

*In F.14.3.1 (General SEI payload semantics), replace the following paragraphs:*

The list VclAssociatedSeiList is set to consist of the payloadType values 2, 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, 161, 165, 167, 168, and 200 to 202, inclusive.

The list PicUnitRepConSeiList is set to consist of the payloadType values 0, 1, 2, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 133, 135 to 152, inclusive, 154 to 168, inclusive, and 200 to 202, inclusive.

*with the following:*

The list VclAssociatedSeiList is set to consist of the payloadType values 2, 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, 161, 165, 167, 168, and 200 to 203, inclusive.

The list PicUnitRepConSeiList is set to consist of the payloadType values 0, 1, 2, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 133, 135 to 152, inclusive, 154 to 168, inclusive, and 200 to 203, inclusive.

*In G.14.3.1 (General SEI payload semantics), replace the following paragraphs:*

The list VclAssociatedSeiList is set to consist of payloadType values 2, 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, 161, 165, 167, 168, 177, 178, 179, and 200 to 202, inclusive.

The list PicUnitRepConSeiList is set to consist of payloadType values 0, 1, 2, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 133, 135 to 152, inclusive, 154 to 168, inclusive, 176 to 180, inclusive, and 200 to 202, inclusive.

*with the following:*

The list VclAssociatedSeiList is set to consist of payloadType values 2, 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, 161, 165, 167, 168, 177, 178, 179, and 200 to 203, inclusive.

The list PicUnitRepConSeiList is set to consist of payloadType values 0, 1, 2, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 133, 135 to 152, inclusive, 154 to 168, inclusive, 176 to 180, inclusive, and 200 to 203, inclusive.

*In I.14.3.1 (General SEI payload semantics), replace the following paragraphs:*

The list VclAssociatedSeiList is set to consist of payloadType values 2, 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, 161, 165, 167, 168, 177, 178, 179, and 200 to 202, inclusive.

The list PicUnitRepConSeiList is set to consist of payloadType values 0, 1, 2, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 133, 135 to 152, inclusive, 154 to 168, inclusive, 176 to 181, inclusive, and 200 to 202, inclusive.

*with the following:*

The list VclAssociatedSeiList is set to consist of payloadType values 2, 3, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 131, 132, 134 to 152, inclusive, 154 to 159, inclusive, 161, 165, 167, 168, 177, 178, 179, and 200 to 203, inclusive.

The list PicUnitRepConSeiList is set to consist of payloadType values 0, 1, 2, 6, 9, 15, 16, 17, 19, 22, 23, 45, 47, 56, 128, 129, 131, 132, 133, 135 to 152, inclusive, 154 to 168, inclusive, 176 to 181, inclusive, and 200 to 203, inclusive.

*Add the following additional entry to the Bibliography (replacing “xx” with the appropriate bibliography entry number):*

[xx]     ATSC A/341 (2019), *Video – HEVC*