1. Annex D  
     
   Supplemental enhancement information

(This annex forms an integral part of this Recommendation | International Standard)

This annex specifies syntax and semantics for SEI message payloads.

SEI messages assist in processes related to decoding, display or other purposes. However, SEI messages are not required for constructing the luma or chroma samples by the decoding process. Conforming decoders are not required to process this information for output order conformance to this Recommendation | International Standard (see Annex 0 for the specification of conformance). Some SEI message information is required to check bitstream conformance and for output timing decoder conformance.

In Annex D, specification for presence of SEI messages are also satisfied when those messages (or some subset of them) are conveyed to decoders (or to the HRD) by other means not specified by this Recommendation | International Standard. When present in the bitstream, SEI messages shall obey the syntax and semantics specified in subclauses 7.3.2.3 and 0 and this annex. When the content of an SEI message is conveyed for the application by some means other than presence within the bitstream, the representation of the content of the SEI message is not required to use the same syntax specified in this annex. For the purpose of counting bits, only the appropriate bits that are actually present in the bitstream are counted.

* 1. SEI payload syntax

|  |  |  |
| --- | --- | --- |
| sei\_payload( payloadType, payloadSize ) { | C | Descriptor |
| if( payloadType = = 0 ) |  |  |
| buffering\_period( payloadSize ) | 5 |  |
| else if( payloadType = = 1 ) |  |  |
| pic\_timing( payloadSize ) | 5 |  |
| … |  |  |
| else if( payloadType = = X ) |  |  |
| interlaced\_field\_indication( payloadSize ) | 5 |  |
| else |  |  |
| reserved\_sei\_message( payloadSize ) | 5 |  |
| if( !byte\_aligned( ) ) { |  |  |
| **bit\_equal\_to\_one** /\* equal to 1 \*/ | 5 | f(1) |
| while( !byte\_aligned( ) ) |  |  |
| **bit\_equal\_to\_zero** /\* equal to 0 \*/ | 5 | f(1) |
| } |  |  |
| } |  |  |

* + 1. Buffering period SEI message syntax

[Ed: insert table]

* + 1. Picture timing SEI message syntax

[Ed: insert table]

…

A.1.X Interlaced field indication SEI message syntax

|  |  |  |
| --- | --- | --- |
| interlaced\_field\_indication( payloadSize ) { | C | Descriptor |
| **interlaced\_field\_indication\_id** | 5 | u(4) |
| } |  |  |

…

* 1. SEI payload semantics
     1. Buffering period SEI message semantics

[Ed: insert descriptions]

* + 1. Picture timing SEI message semantics

[Ed: insert descriptions]

…

A.2.X Interlaced field indication SEI message semantics

The presence of interlaced field indication SEI message in the bitstream is specified as follows.

– If interlaced\_field\_indication\_present\_flag is equal to 1, one interlaced field indication SEI message shall be present in every access unit of the coded video sequence.

– Otherwise (interlaced\_field\_indication\_present\_flag is equal to 0), no interlaced field indication SEI messages shall be present in any access unit of the coded video sequence.

**interlaced\_field\_indication\_id** indicates the field of the pictures as specified in Table D-1.

Table D‑1 – Interpretation of interlaced\_field\_indication\_id

|  |  |
| --- | --- |
| **Value** | **Indicated field of picture** |
| 0 | unspecified |
| 1 | top field |
| 2 | bottom field |
| 3-15 | reserved |

The nominal vertical and horizontal sampling locations of samples in top and bottom fields for 4:2:0, 4:2:2, and 4:4:4 chroma formats are shown in Figure D-1, Figure D-2, and Figure D-3, respectively.



Figure D-1 – Nominal vertical and horizontal sampling locations of 4:2:0 samples in top and bottom fields



Figure D-2 – Nominal vertical and horizontal sampling locations of 4:2:2 samples in top and bottom fields



Figure D-3 – Nominal vertical and horizontal sampling locations of 4:4:4 samples in top and bottom fields

…

[Ed: insert descriptions]

1. Annex E  
     
   Video usability information

(This annex forms an integral part of this Recommendation | International Standard)

This annex specifies syntax and semantics of the VUI parameters of the sequence parameter sets.

VUI parameters are not required for constructing the luma or chroma samples by the decoding process. Conforming decoders are not required to process this information for output order conformance to this Recommendation | International Standard (see Annex 0 for the specification of conformance). Some VUI parameters are required to check bitstream conformance and for output timing decoder conformance.

In Annex E, specification for presence of VUI parameters is also satisfied when those parameters (or some subset of them) are conveyed to decoders (or to the HRD) by other means not specified by this Recommendation | International Standard. When present in the bitstream, VUI parameters shall follow the syntax and semantics specified in subclauses 7.3.2.1 and 7.4.2.1 and this annex. When the content of VUI parameters is conveyed for the application by some means other than presence within the bitstream, the representation of the content of the VUI parameters is not required to use the same syntax specified in this annex. For the purpose of counting bits, only the appropriate bits that are actually present in the bitstream are counted.

* 1. VUI syntax
     1. VUI parameters syntax

|  |  |  |
| --- | --- | --- |
| vui\_parameters( ) { | C | Descriptor |
| **aspect\_ratio\_info\_present\_flag** | 0 | u(1) |
| if( aspect\_ratio\_info\_present\_flag ) { |  |  |
| **aspect\_ratio\_idc** | 0 | u(8) |
| if( aspect\_ratio\_idc = = Extended\_SAR ) { |  |  |
| **sar\_width** | 0 | u(16) |
| **sar\_height** | 0 | u(16) |
| } |  |  |
| } |  |  |
| **overscan\_info\_present\_flag** | 0 | u(1) |
| if( overscan\_info\_present\_flag ) |  |  |
| **overscan\_appropriate\_flag** | 0 | u(1) |
| **video\_signal\_type\_present\_flag** | 0 | u(1) |
| if( video\_signal\_type\_present\_flag ) { |  |  |
| **video\_format** | 0 | u(3) |
| **video\_full\_range\_flag** | 0 | u(1) |
| **colour\_description\_present\_flag** | 0 | u(1) |
| if( colour\_description\_present\_flag ) { |  |  |
| **colour\_primaries** | 0 | u(8) |
| **transfer\_characteristics** | 0 | u(8) |
| **matrix\_coefficients** | 0 | u(8) |
| } |  |  |
| } |  |  |
| **chroma\_loc\_info\_present\_flag** | 0 | u(1) |
| if( chroma\_loc\_info\_present\_flag ) { |  |  |
| **chroma\_sample\_loc\_type\_top\_field** | 0 | ue(v) |
| **chroma\_sample\_loc\_type\_bottom\_field** | 0 | ue(v) |
| } |  |  |
| **timing\_info\_present\_flag** | 0 | u(1) |
| if( timing\_info\_present\_flag ) { |  |  |
| **num\_units\_in\_tick** | 0 | u(32) |
| **time\_scale** | 0 | u(32) |
| **fixed\_frame\_rate\_flag** | 0 | u(1) |
| } |  |  |
| **nal\_hrd\_parameters\_present\_flag** | 0 | u(1) |
| if( nal\_hrd\_parameters\_present\_flag ) |  |  |
| hrd\_parameters( ) | 0 |  |
| **vcl\_hrd\_parameters\_present\_flag** | 0 | u(1) |
| if( vcl\_hrd\_parameters\_present\_flag ) |  |  |
| hrd\_parameters( ) | 0 |  |
| if( nal\_hrd\_parameters\_present\_flag | | vcl\_hrd\_parameters\_present\_flag ) |  |  |
| **low\_delay\_hrd\_flag** | 0 | u(1) |
| **pic\_struct\_present\_flag** | 0 | u(1) |
| **interlaced\_field\_indication\_present\_flag** | 0 | u(1) |
| **bitstream\_restriction\_flag** | 0 | u(1) |
| if( bitstream\_restriction\_flag ) { |  |  |
| **motion\_vectors\_over\_pic\_boundaries\_flag** | 0 | u(1) |
| **max\_bytes\_per\_pic\_denom** | 0 | ue(v) |
| **max\_bits\_per\_mb\_denom** | 0 | ue(v) |
| **log2\_max\_mv\_length\_horizontal** | 0 | ue(v) |
| **log2\_max\_mv\_length\_vertical** | 0 | ue(v) |
| **num\_reorder\_frames** | 0 | ue(v) |
| **max\_dec\_frame\_buffering** | 0 | ue(v) |
| } |  |  |
| } |  |  |

* + 1. HRD parameters syntax

|  |  |  |
| --- | --- | --- |
| hrd\_parameters( ) { | C | Descriptor |
| **cpb\_cnt\_minus1** | 0 | 5 | ue(v) |
| **bit\_rate\_scale** | 0 | 5 | u(4) |
| **cpb\_size\_scale** | 0 | 5 | u(4) |
| for( SchedSelIdx = 0; SchedSelIdx <= cpb\_cnt\_minus1; SchedSelIdx++ ) { |  |  |
| **bit\_rate\_value\_minus1[** SchedSelIdx **]** | 0 | 5 | ue(v) |
| **cpb\_size\_value\_minus1[** SchedSelIdx **]** | 0 | 5 | ue(v) |
| **cbr\_flag[** SchedSelIdx **]** | 0 | 5 | u(1) |
| } |  |  |
| **initial\_cpb\_removal\_delay\_length\_minus1** | 0 | 5 | u(5) |
| **cpb\_removal\_delay\_length\_minus1** | 0 | 5 | u(5) |
| **dpb\_output\_delay\_length\_minus1** | 0 | 5 | u(5) |
| **time\_offset\_length** | 0 | 5 | u(5) |
| } |  |  |

* 1. VUI semantics

**aspect\_ratio\_info\_present\_flag** equal to 1 specifies that aspect\_ratio\_idc is present. aspect\_ratio\_info\_present\_flag equal to 0 specifies that aspect\_ratio\_idc is not present.

…

[Ed: insert description]

…

**pic\_struct\_present\_flag** equal to 1 specifies that picture timing SEI messages (subclause D.2.2) are present that include the pic\_struct syntax element. pic\_struct\_present\_flag equal to 0 specifies that the pic\_struct syntax element is not present in picture timing SEI messages. When pic\_struct\_present\_flag is not present, its value shall be inferred to be equal to 0.

**interlaced\_field\_indication\_present\_flag** equal to 1 specifies that one interlaced field indication message SEI message (subclause D.2.X) shall be present in every access unit of the coded video sequence. interlaced\_field\_indication\_present\_flag equal to 0 specifies that no interlaced field indication SEI messages shall be present in any access unit of the coded video sequence. When interlaced\_field\_indication\_present\_flag is not present, its value shall be inferred to be equal to 0.

NOTE – interlaced\_field\_indication\_present\_flag equal to 0 implies the coded video sequence comprises of coded frame pictures.

**bitstream\_restriction\_flag** equal to 1, specifies that the following coded video sequence bitstream restriction parameters are present. bitstream\_restriction\_flag equal to 0, specifies that the following coded video sequence bitstream restriction parameters are not present.

…

[Ed: insert description]

* + 1. HRD parameters semantics

[Ed: insert description]