|  |  |
| --- | --- |
| **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-AL0021-v1 |

|  |  |  |  |
| --- | --- | --- | --- |
| *Title:* | **Proposed modifications of the draft shutter interval information SEI message syntax** | | |
| *Status:* | Input document to JCT-VC | | |
| *Purpose:* | Proposal | | |
| *Author(s) or Contact(s):* | Gary Sullivan Microsoft Corp 1 Microsoft Way Redmond, WA 90852 USA | Tel: Email: | +1 425 703 5308 garysull@microsoft.com |
| *Source:* | Microsoft | | |

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

# Abstract

This contribution discusses the draft shutter interval information SEI message as found in JCTVC-AK1005, which was adopted at the 37th JCT-VC meeting of October 2019. It asserts that the syntax has some undesirable characteristics, including the following:

* That it seems pointless and confusing to send sii\_num\_units\_in\_shutter\_interval when fixed\_shutter\_interval\_within\_clvs\_flag is equal to 0, since the syntax element has no apparent purpose or meaning in that case.
* That it seems pointless and confusing to send sii\_max\_sub\_layers\_minus1 when fixed\_shutter\_interval\_within\_clvs\_flag is equal to 1, since the syntax element has no apparent purpose in that case.
* That when the value of sps\_max\_sub\_layers\_minus1 in the SPS is equal to 0, it is strange to allow fixed\_shutter\_interval\_within\_clvs\_flag to be equal to 0, since this case becomes just an alternative way to express the same case as with fixed\_shutter\_interval\_within\_clvs\_flag to be equal to 1.
* That the syntax seems excessive in terms of bit usage, using 68 + *n* \* 32 bits for a CLVS with *n* temporal sub-layers.

Six potential variations of the syntax are proposed to address these issues.

# Introduction and problem statement

The current draft syntax (of JCTVC-AK1005) is as follows:

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

The problems described in the abstract are asserted to exist with this syntax.

# Proposed syntax modifications

### Proposed variation #1 (addressing only the first two issues)

This variation has no changes of the syntax elements; it only rearranges them so that they are only sent when they have a reason to be sent.

|  |  |
| --- | --- |
| 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) |
| } |  |
| } |  |

The semantics changes would be obvious, simply removing descriptions of what to do when the syntax elements are present but have no meaning.

### Proposed variation #2 (like variation 1 but with byte alignment for the fixed case)

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

The semantics of this should be apparent from the names of the modified syntax elements. The value of subLayerShutterInterval[ 0 ] is computed from sub\_layer\_num\_units\_in\_shutter\_interval[ 0 ]. When fixed\_shutter\_interval\_within\_clvs\_flag is equal to 1, this is used for all values of i, and when fixed\_shutter\_interval\_within\_clvs\_flag is equal to 0, additional numerator values are sent for i > 0.

additional\_sub\_layers would be required to be equal to the value of sps\_max\_sub\_layers\_minus1 in the SPS.

Alternatively, we could use additional\_sub\_layers\_minus1 and require it to be equal to sps\_max\_sub\_layers\_minus1 − 1. (When the value of sps\_max\_sub\_layers\_minus1 in the SPS is equal to 0, fixed\_shutter\_interval\_within\_clvs\_flag would need to be equal to 1.)

### Proposed variations #3 and #4 (one way to reduce bit usage)

In this variation, the syntax would be the same as in proposed variations #1 and #2, but some or all of the numerator values (sii\_num\_units\_in\_shutter\_interval and sub\_layer\_num\_units\_in\_shutter\_interval[ i ]) would be sent using ue(v) encoding rather than 32-bit FLCs.

### Proposed variations #5 and #6 (a different way to reduce bit usage)

In variation #5, the syntax is very similar to the current draft, but the sub-layer numerators are expressed as a multiplier of a common clock tick.

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

This case closely resembles the syntax of current scheme, but the actual shutter intervals would be derived as:

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

By doing this, the first syntax element is no longer useless when fixed\_shutter\_interval\_within\_clvs\_flag is equal to 0, and the values sent for each temporal sub-layer should not need as many bits. They could be sent as u(8) or u(16) or ue(v). We suggest ue(v), as shown above.

As variation #6, it could also be reasonable to avoid sending sii\_max\_sub\_layers\_minus1 when it is not needed, as shown below.

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

Of course, sii\_num\_units\_in\_tick and/or sii\_time\_scale could also use ue(v) encoding if desired, although this would be inconsistent with what is done for vui\_num\_units\_in\_tick and vui\_time\_scale.

# Patent rights declaration(s)

**Microsoft Corporation does not have any current or pending patent rights relating to the technology described in this contribution (to the extent of the personal awareness of the author).**