JCTVC-M0043: Layers present SEI message

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Problem

- Enable a middle box to communicate to a decoder when layers are removed during sub-bitstream extraction
- Proposed for inclusion in both SHVC and MV-HEVC
  - SVC has a layers not present SEI message
  - MVC has an operation point not present SEI message
  - Both use variable length coding
- Proposed SEI message uses only fixed length coding

Proposed layers present SEI message

- Uses layer mask approach, similar to approach used in the VPS for operation points and layer dependency relationships
- Easy for middle box to read and modify
  - Particularly helpful for cascaded middle boxes
    - Example: 3 layer bitstream
    - Middle box A removes layer 2, inserts SEI message indicating layers 0 and 1 present, layer 2 not present
    - Middle box B removes layer 1, modifies SEI message to indicate layer 0 present, layers 1 and 2 not present
- Single SEI message design can be used for SHVC and MV-HEVC
  - Variable for layer set present flag derived for MV-HEVC, similar to MVC's operation point not present SEI message

Proposed layers present SEI message

layers_present(payloadSize) {	
lp_sei_active_vps_id	u(4)
for(i = 0; i <= vps_max_layers_minus1 ; i++)	
layer_present_flag[i]	u(1)
}	

Table D-1 – Persistence scope of SEI messages (informative)

SEI message	Persistence scope
..	
Layers present	The access unit containing the SEI message and up to but not including the next access unit, in decoding order, that contains a layers present SEI message

Proposed semantics

Layers present SEI message semantics

The layers present SEI message provides a mechanism for signalling that NAL units of particular layers indicated by the video parameter set extension are present or not present in a particular set of access units.

When present, the layers present SEI message applies to the target access unit set that consists of the current access unit and all the subsequent access units, in decoding order, until the next layers present change SEI message or the end of the CVS, whichever is earlier in decoding order.

A layers present SEI message shall not be included in a scalable nesting SEI message.

A layers present SEI message shall not be included in a NAL unit with TemporalId > 0.

lp_sei_active_vps_id identifies an active VPS that contains the information about the layers in the CVS. The value of lp_sei_active_vps_id shall be equal to the value of video_parameter_set_id of the active VPS for the VCL NAL units of the access unit containing the SEI message.

layer_present_flag[i] equal to 1 specifies that there may or may not be NAL units in the target access units with nuh_layer_id equal to layer_id_in_nuh[i]. layer_present_flag[i] equal to 0 specifies that there shall be no NAL units in the target access units with nuh_layer_id equal to layer_id_in_nuh[i].

When layer_present_flag[i] equal to 1 and i greater than 0, layer_present_flag[RefLayerId[i][j]] shall be equal to 1 for j in 0 .. NumDirectRefLayers[i] − 1.

Proposed semantics (continued)

The variable LayerSetPresentFlag[i] is derived as follows.

```
for (i = 0; i <= vps_num_layer_sets_minus1; i++) {
    LayerSetPresentFlag[ i ] = 1
    for (j = 0; j <= vps_max_layer_id ; j++) {
        if ( layer_id_included_flag[ i ][ j ] )
            LayerSetPresentFlag[ i ] &= layer_present_flag[ j ]
    }
}
```

Background: SVC's layers not present SEI

layers_not_present(payloadSize) {	C	Descriptor
num_layers	5	ue(v)
for(i = 0; i < num_layers; i++) {		
layer_id[i **]**	5	ue(v)
}		
}		

Background: SVC's layers not present SEI

Layers not present SEI message semantics

The layers not present SEI message provides a mechanism for signalling that NAL units of particular scalable layers indicated by the preceding scalability information SEI message are not present in a particular set of access units.

In the following specification of this subclause, the terms scalable layer and primary coded VCL NAL unit are used as specified in subclause G.13.2.1.

A layers not present SEI message shall not be included in a scalable nesting SEI message.

A layers not present SEI message shall not be present in an access unit that does not belong to the target access unit set of any scalability information SEI message. A layers not present SEI message shall not be succeeded, in decoding order, by a scalability information SEI message inside the same access unit. The set of access units consisting of the access unit associated with the layers not present SEI message and all succeeding access units in decoding order until, but excluding, the next access unit that contains a layers not present SEI message or that does not contain any primary coded VCL NAL units with IdrPicFlag equal to 0 (if present), or the end of the bitstream (otherwise) is referred to as the target access unit set. The layers not present SEI message applies to the target access unit set.

A layers not present SEI message refers to the most recent scalability information SEI message in decoding order. Each scalable layer that is referred to in this subclause is a scalable layer indicated in the most recent scalability information SEI message in decoding order. Each layer identifier for a scalable layer that is referred to in this subclause is a layer identifier for a scalable layer indicated in the most recent scalability information SEI message in decoding order.

NOTE 1 – Layers not present SEI messages do not have a cumulative effect.

num_layers specifies the number of syntax elements layer_id[i] that are present in the layers not present SEI message. The value of num_layers shall be in the range of 0 to 2047, inclusive.

layer_id[i] indicates the layer identifier of a scalable layer for which no VCL NAL units are present in the target access unit set. The value of layer_id[i] shall be in the range of 0 to 2047, inclusive. The value of layer_id[i] shall be equal to one of the values of layer_id[i] in the most recent scalability information SEI message. The target access unit set shall not contain any VCL NAL unit of the scalable layer having a layer identifier equal to layer_id[i]. When i is greater than 0, the value of layer_id[i] shall not be equal to any of the values of layer_id[j] with j = 0..(i − 1).

NOTE 2 – When an application removes NAL units from a scalable bitstream, e.g. in order to adapt the bitstream to a transmission channel or the capabilities of a receiving device, and keeps the present layers not present SEI messages, it might need to modify the content of some of the layers not present SEI messages and remove some other layers not present SEI messages in order to obtain a bitstream conforming to this Recommendation | International Standard.

Background: MVC's operation point not present SEI message

operation_point_not_present(payloadSize) {	C	Descriptor
num_operation_points	5	ue(v)
for(k = 0; k < num_operation_points; k++)		
operation_point_not_present_id[k]	5	ue(v)
}		

Conclusions

- Recommend to adopt proposed SEI message into the SHVC and MV-HEVC designs