

# JVET-AG0148 AHG9: On object mask information SEI message



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# Background

- Annotated Region (AR) SEI message adopted in VSEI, HEVC and AVC can indicate the object position by a bounding box, but the shape information of object is lost.
- Thus, in the AD meeting, it was proposed to send object shape information with object masks which are coded as auxiliary pictures, and signal the related information in a new type of SEI message named object mask information (OMI) SEI message in JVET-AD0175.
- In the AE meeting, the OMI SEI message was improved in JVET-AE0095 and was included in the first draft of technology under considerations (TuC) for future extensions of VSEI.
- In the AF meeting, JVET-AF0088 fixed some reported issues for OMI SEI message and provided software implementation, which was already merged into git repository of TuC branch.  
Moreover, experiments of coding the objects masks as auxiliary pictures using VTM-21.2 multi-layer coding were conducted in JVET-AF0087 and the results showed it was feasible to do it.

# Introduction

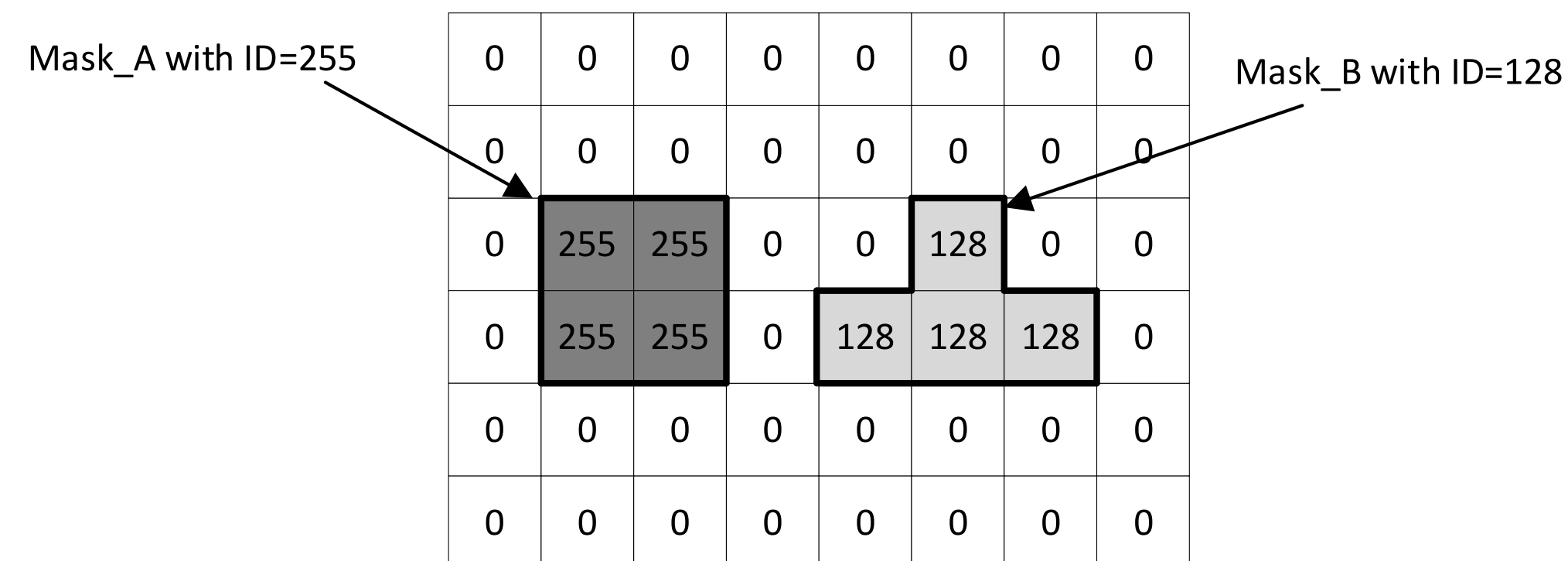
## ■ This contribution

- ✓ cleans the OMI SEI message design by separating object IDs from the auxiliary picture sample values.
- ✓ suggests to establish at least a preliminary working draft for VSEI v4 and include the OMI SEI message in it.
- ✓ suggests to include the OMI SEI message in the next draft of technical report (TR) on optimization of encoders and receiving systems for machine analysis of coded video content.



# Problem statement

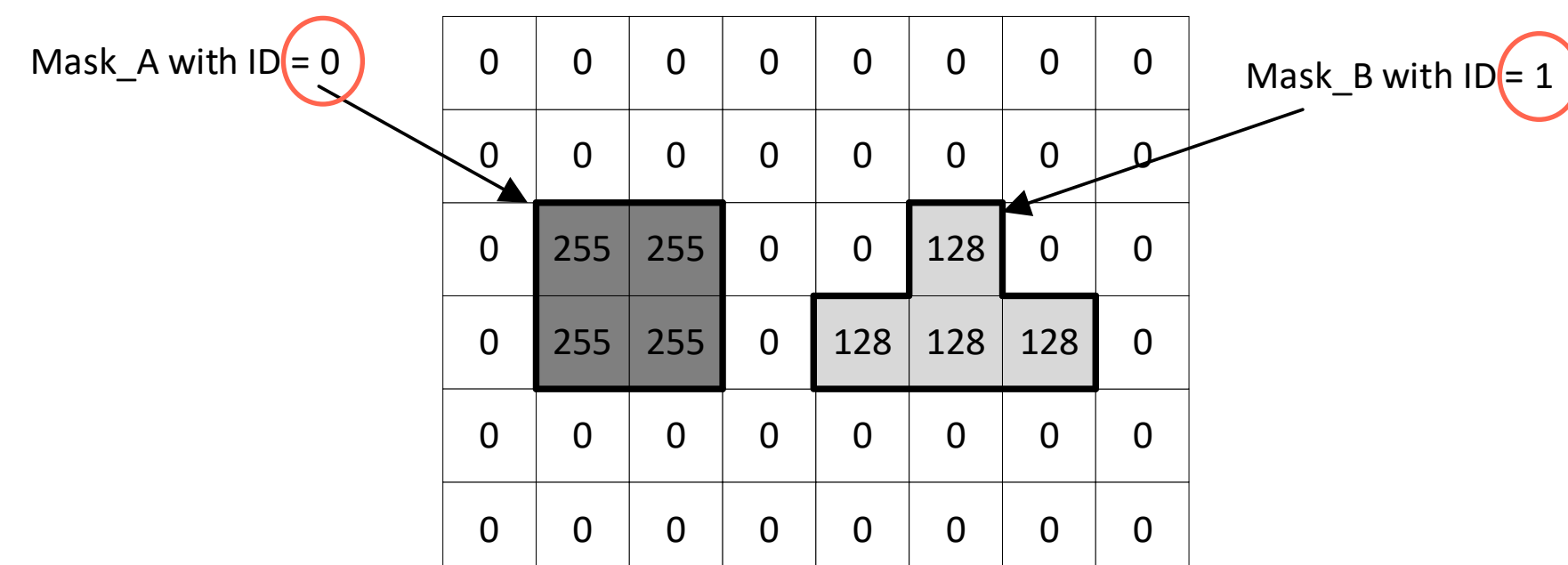
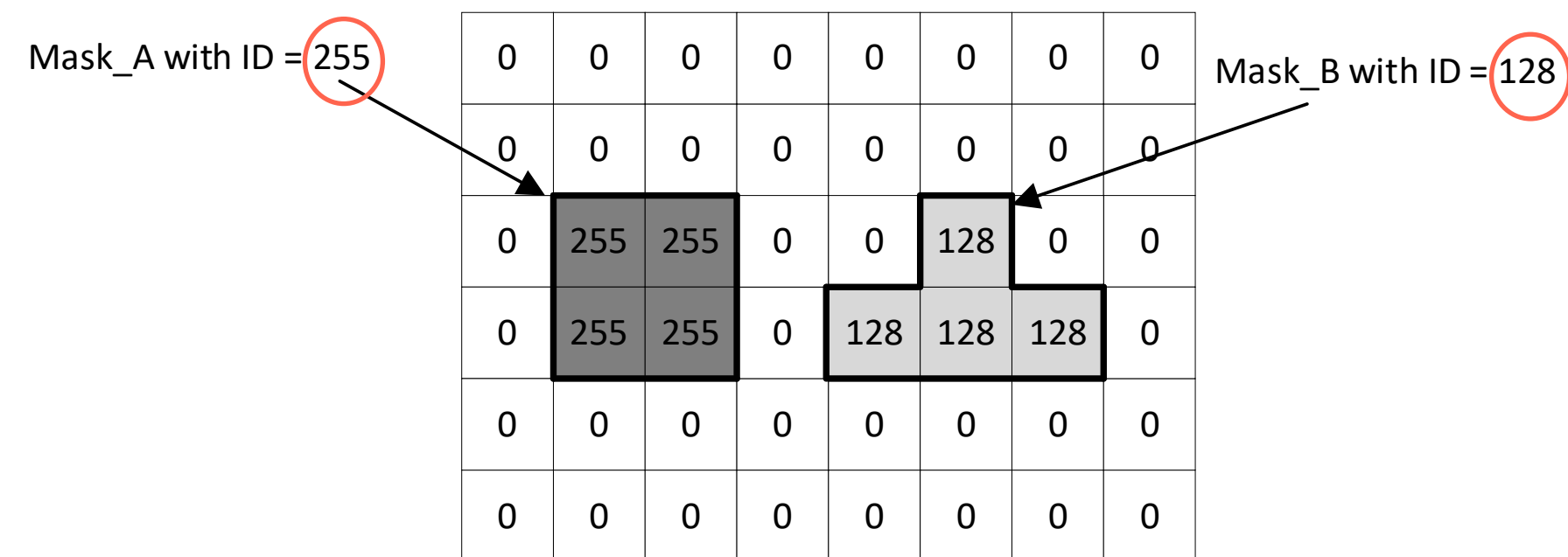
- In the current design of OMI SEI message, the object mask identifier and the sample value are tied together. Specifically, the object mask identifier is represented by the sample values of the auxiliary picture.



- However, conceptually the mask identifier and the sample value are two different things. And mask identifiers are not necessary equal to sample values.

# Proposed changes

- It is proposed to separate object mask identifier from the auxiliary picture sample value by signaling the sample value for each object mask.
  - ✓ Make the design cleaner and more logical
  - ✓ Give the encoder flexibility to assign the mask identifiers.



## The proposed syntax changes

object_mask_info( payloadSize ) {	Descriptor
<b>omi_cancel_flag</b>	u(1)
if( !omi_cancel_flag ) {	
<b>omi_aux_id_minus128</b>	ue(v)
<b>omi_num_primary_pic_layer_minus1</b>	ue(v)
for( i = 0; i <= omi_num_primary_pic_layer_minus1; i++ )	
<b>omi_primary_pic_layer_id[ i ]</b>	ue(v)
<b>omi_mask_id_length_minus1_minus8</b>	ue(v)
<b>omi_mask_sample_value_length_minus8</b>	ue(v)
<b>omi_mask_confidence_info_present_flag</b>	u(1)
...	
...	
for( i = 0; i <= omi_num_primary_pic_layer_minus1; i++ )	
for( j = 0; j < numAuxLayer[ omi_primary_pic_layer_id[ i ] ]; j++ ) {	
<b>omi_mask_pic_update_flag[ i ][ j ]</b>	f(1)
if( omi_mask_pic_update_flag[ i ][ j ] ) {	
<b>omi_num_mask_in_pic_update[ i ][ j ]</b>	ue(v)
for( k = 0; k < omi_num_mask_in_pic_update[ i ][ j ]; k++ ) {	
<b>omi_mask_id[ i ][ j ][ k ]</b>	u(v)
<b>omi_aux_sample_value[ i ][ j ][ k ]</b>	u(v)
<b>omi_mask_bounding_box_present_flag[ i ][ j ][ k ]</b>	u(1)
if( omi_mask_bounding_box_present_flag[ i ][ j ][ k ] ) {	
...	

# Summary

- Considering VSEI version 3 was finalized in July 2023 which was more than half a year ago, it is proposed to establish at least a preliminary working draft (WD) for VSEI v4 in this meeting.
  - ✓ a joint contribution on this topic was submitted as JVET-AG0204
- Given that the OMI SEI message
  - ✓ was already included in TuC two meeting cycles ago and it was fixed and refined in several contributions
  - ✓ was implemented on VTM and the experimental results showed the feasibility of coding masks as auxiliary picturesSuggest to include the OMI SEI message in the preliminary WD (or WD) of VSEI v4.
- Further, as TR on optimization of encoders and receiving systems for machine analysis of coded video content included the SEI messages useful to the machine tasks, which include AR SEI message
  - ✓ The OMI SEI message is a kind of extension of AR SEI message to send the finer shape information of objects
  - ✓ Object shape information is essential to many machine tasks like object detection, segmentation and trackingSuggest to include the OMI SEI message into the next draft of TR.



Thanks

