

**HLS:**

**Extensions to Temporal Motion-constrained tile sets SEI message**

**JCTVC-O0063**

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# Introduction

## ■ Background

- At previous JCT-VC Meeting at Vienna, the concept of tile level indication for motion-constrained tile sets were proposed in JCTVC-N0117.

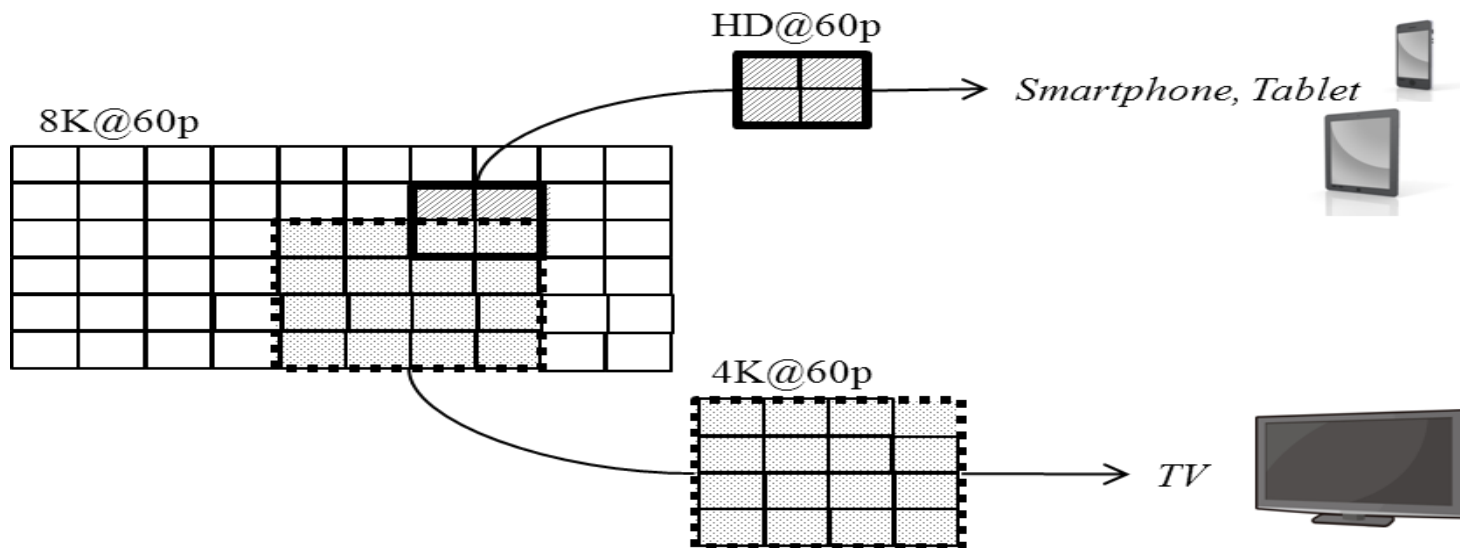
## ■ Motivation

- To use HEVC tile structures for Tiled Streaming application
- Tiled Streaming application requires,
  - The switching of tiles to be decoded/displayed and
  - The switching region (one or more tile sets) must be independently decodable – all tile may be independently decodable

## ■ Discussion result from JCT-VC Meeting in Vienna (JCTVC-N0374)

- *“Proposes to send a level\_idc for each motion constrained tile set. It was generally agreed that such functionality would be useful.*
- *Additional semantic text would be required to more fully describe how to apply a level calculation to a tile rather than a coded picture. Further study encouraged to better define what a level indicator means for a tile.”*

# Tiled Streaming Application Image



- The region to be streamed & displayed(decoded) varies depending on the display devices.
- The region can be switched based on user interaction(preference) – similar to ROI.

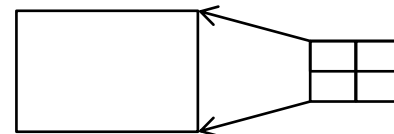
# Proposal

temporal_motion_constrained_tile_sets ( payloadSize ) {	Descriptor
mc_all_tiles_exact_sample_value_match_flag	u(1)
each_tile_one_tile_set_flag	u(1)
mcts_level_idc_present_flag	u(1)
if ( !each_tile_one_tile_set_flag ) {	
num_sets_in_message_minus1	ue(v)
for( i = 0; i <= num_sets_in_message_minus1; i++) {	
mcts_id[ i ]	ue(v)
num_tile_rects_in_set_minus1[ i ]	ue(v)
for( j = 0; j <= num_tile_rects_in_set_minus1[ i ]; j++) {	
top_left_tile_index[ i ][ j ]	ue(v)
bottom_right_tile_index[ i ][ j ]	ue(v)
}	
if ( ! mc_all_tiles_exact_sample_value_match_flag )	
exact_sample_value_match_flag[ i ]	u(1)
if ( mcts_level_idc_present_flag )	
mcts_level_idc[ i ]	u(8)
}	
} else {	
if ( mcts_level_idc_present_flag )	
max_mcts_level_idc	u(8)
}	
}	

- Level indication for each tile set in case each tile set is NOT tile set
- One Level indication which is applicable for all tiles in case each tile IS one tile set.

# Level constraints for MCTS

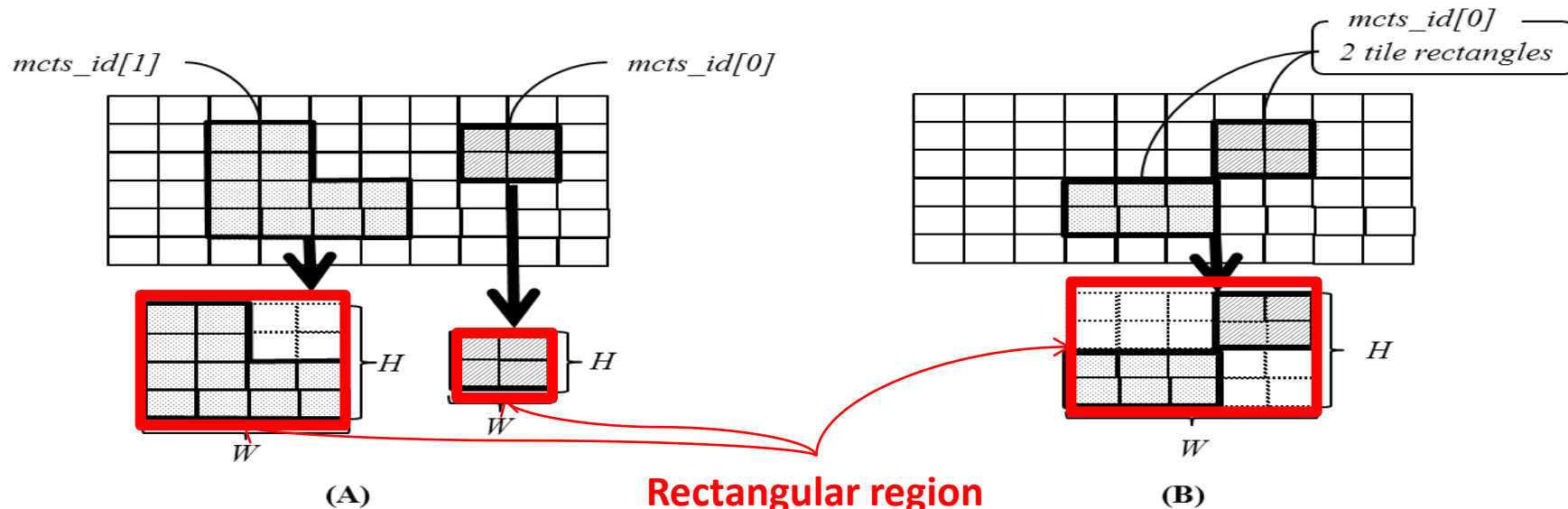
- **Basic Concept:** Map the shape of a “picture” to a rectangular shaped region constructed by motion-constrained tiles.
- The variables **PicSizeInSamplesY** is inferred to be equal to total number of luma samples in **the rectangular region** for the defined motion-constrained tile set.
- NOTE – **A rectangular region** for a motion-constrained tile set is a region with minimum width and height which **covers all tiles** defined for each motion-constrained tile set as illustrated in Figure 2. In case the region of motion-constrained tile sets is not in rectangular shape, the width and height are inferred to be equal to the value of a rectangle which covers the entire tile sets horizontally and vertically.



# Level constraints for MCTS

- The value of **pic\_width\_in\_luma\_samples** and **pic\_height\_in\_luma\_samples** are inferred to be equal to the **width and height of rectangular region** for motion-constrained tile sets in units of luma samples, respectively.
- The value of **num\_tile\_columns\_minus1** plus 1 and **num\_tile\_rows\_minus1** plus 1 are inferred to be equal to **the total number of tile columns and rows in the rectangular region** for the defined motion-constrained tile set.
- For the VCL HRD parameters and NAL HRD parameters, the values should be inferred to be equal to the values when the HRD parameters are not present for an indicated level.

# Example of Rectangular region for MCTS



**Rectangular region**  
 $W$ : Infer as `pic_width_in_luma_samples`  
 $H$ : Infer as `pic_height_in_luma_samples`  
`PicSizeInSamplesY`:  $W * H$

# Conclusion

- The extension to a temporal motion-constrained tile sets SEI message is proposed to signal a **level indication** for **motion-constrained tile set**.
- The proposal provides flexibility of HEVC tile structure to be applied for various applications, such as tiled streaming applications.





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