

Syntax On Picture Size Signaling (JCTVC-H0288)

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Background

- ❖ At the last Geneva meeting picture size signaling was changed **from "u(16)" to "ue(v)"**

- To remove the restriction of picture size up to 2^{16} (u(16))
- To be bit-rate efficient at a certain resolution

pic_width_in_luma_samples	u(16) ue(v)
pic_height_in_luma_samples	u(16) ue(v)

- ❖ Even though it removes the range restriction, the bit cost of "ue(v)" is **not efficient** compared to "u(16)"

	Resolution		Current Method (ue(v))				Previous Method (u(16))			
			SPS(%)	Used Bits			SPS(%)	Used Bits		
	Width	Height		Total	Width	Height		Total	Width	Height
QVGA	320	240	24%	32	17	15	24%	32	16	16
Class D	416	240	24%	32	17	15	24%	32	16	16
Class C	832	480	26%	36	19	17	24%	32	16	16
Class E	1280	720	29%	40	21	19	24%	32	16	16
Class B	1920	1080	31%	42	21	21	24%	32	16	16
Class A	2560	1600	32%	44	23	21	24%	32	16	16
4K	4096	3112	35%	48	25	23	24%	32	16	16

- HEVC SPS is about 16~17 bytes based on HM5.0 S/W (AVC is about 7~8 bytes)
 - It is supposed that SPS is 17 bytes

Proposed Methods (1/2)

- ❖ First, signal the length of $u(v)$ by using $ue(v)$
 - `pic_size_in_luma_samples_length_minus10` ($ue(v)$)
- ❖ Then, read the picture width and height as many as pre-sigaled bits

<code>pic_size_in_luma_samples_length_minus10</code>	$ue(v)$
<code>pic_width_in_luma_samples_minus1</code>	$u(v)$
<code>pic_height_in_luma_samples_minus1</code>	$u(v)$

❖ Proposed Details

Picture Size Length Minus10 ($ue(v)$)			Width (bits)	Height (bits)	Total Bits	Picture Size
index	binary	used bits				
0	0	1	10	10	21	[1-1024]
1	010	3	11	11	25	[1-2048]
2	011	3	12	12	27	[1-4096]
3	00100	5	13	13	31	[1-8192]
4	00101	5	14	14	33	[1-16384]
5	00110	5	15	15	35	[1-32768]
6	00111	5	16	16	37	[1-65536]

Proposed Method (2/2)

❖ Bit-rate comparison

	Resolution		Current Method (ue(v))				Previous Method (u(16))				Proposed (ue(v) + u(v))						
			SPS(%)	Used Bits			SPS(%)	Used Bits			SPS(%)	Used Bits				Bits Saving (vs. Current)	
	Width	Height		Total	Width	Height		Total	Width	Height		Total	Size	Width	Height		
QVGA	320	240	24%	32	17	15	24%	32	16	16	15%	21	1	10	10	66%	
Class D	416	240	24%	32	17	15	24%	32	16	16	15%	21	1	10	10	66%	
Class C	832	480	26%	36	19	17	24%	32	16	16	15%	21	1	10	10	58%	
Class E	1280	720	29%	40	21	19	24%	32	16	16	18%	25	3	11	11	63%	
Class B	1920	1080	31%	42	21	21	24%	32	16	16	18%	25	3	11	11	60%	
Class A	2560	1600	32%	44	23	21	24%	32	16	16	20%	27	3	12	12	61%	
4K	4096	3112	35%	48	25	23	24%	32	16	16	20%	27	3	12	12	56%	

❖ Advantages

- Bit-rate Efficient
 - About 60% bits compared to current method
 - The bit-rate of picture size signaling compared to SPS
 - ⊕ Current method → 24% ~ 35%
 - ⊕ Proposed method → 15% ~ 20%
- No limits for resolution ranges
 - The bit length of "u(v)" is signaled as "ue(v)"
- Simple process

Conclusion

- ❖ SPS has a possibility to be parsed at a system level for server and client capability negotiation
 - The size of SPS is critical
 - AVC is about 7~8 bytes & HEVC is about 16~17 bytes (HM-5.0)
 - Parsing process should be simple
 - Usually only "u(n)", "ue(v)" and "se(v)" are used for easy parsing in header
- ❖ Picture size signaling
 - It is preferred to signal the picture size directly
 - Much simpler and needs not other processing such as getting SCU and LCU size or cropping information
- ❖ It is recommended that the proposed method should be adopted as picture size signaling for HEVC
 - Picture size is directly signaled
 - Bits Efficient compared to current or previous method (about 60% bit cost)
 - The size of SPS is important
 - No limits for resolution ranges
 - The bit length of "u(v)" is signaled as "ue(v)"