

# **Temporally adaptive POC coding**

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# Definition of *prevRefPic*

- In HEVC CD, *prevRefPic* is defined as “the previous reference picture in decoding order that has temporal\_id equal to 0”
- In some temporally scalable bitstreams only IDR and CRA pictures may have temporal\_id equal to 0.
  - In some cases, the DPB may contain no picture with temporal\_id equal to 0
- Desirable to change the definition

# Proposed definition of *prevRefPic*

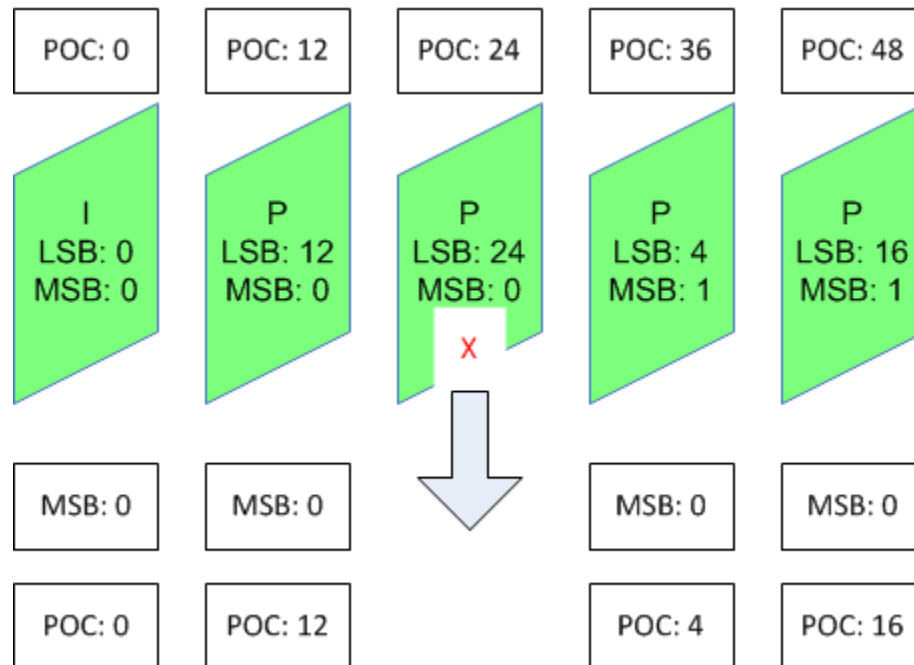
- The definition of *prevRefPic* in Section 8.3.1 is changed as follows:
  - Otherwise let *prevRefPic* be the previous reference picture in decoding order that has a *temporal\_id* less than or equal to the *temporal\_id* of the current picture.

# POC signalling in HEVC CD

- The number of bits used to represent POC in the slice header is fixed for the entire coded video sequence.
  - `pic_order_cnt_lsb` (8 bits in HM)
- The number of POC bits needed may be different for pictures at different temporal levels.
- For better error resilience, it may be desirable to use more bits to represent lower temporal levels.
  - Currently, this affects POC coding bits at all temporal levels.
  - Wasted bits.

# Error resilience example

- GOP size of 12, pic\_order\_cnt\_lsb = 5



# Temporally adaptive POC coding

- Sequence parameter set RBSP syntax

seq_parameter_set_rbsp( ) {	Descriptor
...	
<b>qpprime_y_zero_transquant_bypass_flag</b>	u(1)
<b>min_poc_lsb_len_minus2</b>	ue(v)
if(!max_temporal_layers_minus1) {	
for ( i=0; i < (max_temporal_layers_minus1); i++ ) {	
<b>poc_len_delta[ i ]</b>	ue(v)
}	
}	
...	
}	

- Derive PocLsbLen[i] and TemporalMaxPicOrderCntLsb[i]
- $\text{TemporalMaxPicOrderCntLsb}[i] = 2^{\text{PocLsbLen}[i]}$

# Decoding process for POC derivation

- Use TemporalMaxPicOrderCntLsb[tId] to derive prevRefPicMsb and prevRefPicLsb
  - tId is the temporal\_id for the current picture
- Use the existing POC derivation process but with TemporalMaxPicOrderCntLsb[tId] used in place of PicOrderCntMsb

# Bit Savings

- GOP size 8 (randomaccess\_main.cfg)

POC value (decoding order)	Temporal_id	B <sub>tld</sub> (No picture loss)	B <sub>tld</sub> (One picture loss)
16	0	4	5
12	1	4	4
10	2	3	4
9	3	2	3
11	3	2	3
14	2	3	4
13	3	2	3
15	3	2	3



# Bit Savings

- Bit savings for GOP size 8 (reference: 4 bits (no picture loss), 5 bits (one picture loss))
  - 31.25% (no picture loss)
  - 27.5% (one picture loss)
- Bit savings for GOP size 16 (reference: 5 bits (no picture loss), 6 bits (one picture loss))
  - 42.5% (no picture loss)
  - 36.5% (one picture loss)

# Bit Savings

- Higher bit-savings if the following constraint is assumed in the anchor
  - It is a requirement of bitstream conformance that the value of  $\text{maxPicOrderCnt} - \text{minPicOrderCnt}$  shall be less than  $\text{MaxPicOrderCntLsb} / 2$ .
- GOP size 8 (reference: 6 bits)
  - 54.2% (no picture loss)
  - 39.6% (one picture loss)

# Conclusions

- Change definition of prevRefPic
  - Otherwise let prevRefPic be the previous reference picture in decoding order that has a temporal\_id less than or equal to the temporal\_id of the current picture.
- Temporally adaptive POC coding
  - Better error resilience
  - Bit savings