



REDUCING OUTPUT DELAY FOR BUMPING PROCESS

JCTVC-G583

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Background

- › In H.264/AVC the encoder has no possibility to give direct information to the decoder when pictures are ready to be displayed
- › The encoder could via `max_num_ref_frames` and `max_dec_frame_buffering` control how many frames should be buffered before bumping
- › Output is performed by bumping when the DPB is full

Observation

- › The encoder knows if it will encode any picture with lower POC than what has previously been encoded
- › But it does not have the possibility to transfer this information to the decoder

What we propose

- › A flag in the slice header; `output_process_flag` that controls the output process
- › If the flag is set to 1 all pictures in the DPB with POC lower than the current picture are outputted
- › Replaces bumping
- › The flag must have the same value in all slices of a picture

Proposed changes to HRD C.4.2 relative to AHG21 candidate WD

- Otherwise (the current picture is not an IDR picture), frame buffers containing a picture which are marked as "not needed for output" and "unused for reference" are emptied (without output), and the DPB fullness is decremented by the number of frame buffers emptied. When **the output_process_flag of the current picture is set to 1 and there is one or more pictures in the DPB that are marked as "needed for output" with PicOrderCnt lower than the current picture the output process specified in subclause C.4.2.1 is invoked repeatedly until all pictures with PicOrderCnt lower than the PicOrderCnt of the current picture have been marked as "not needed for output"**.

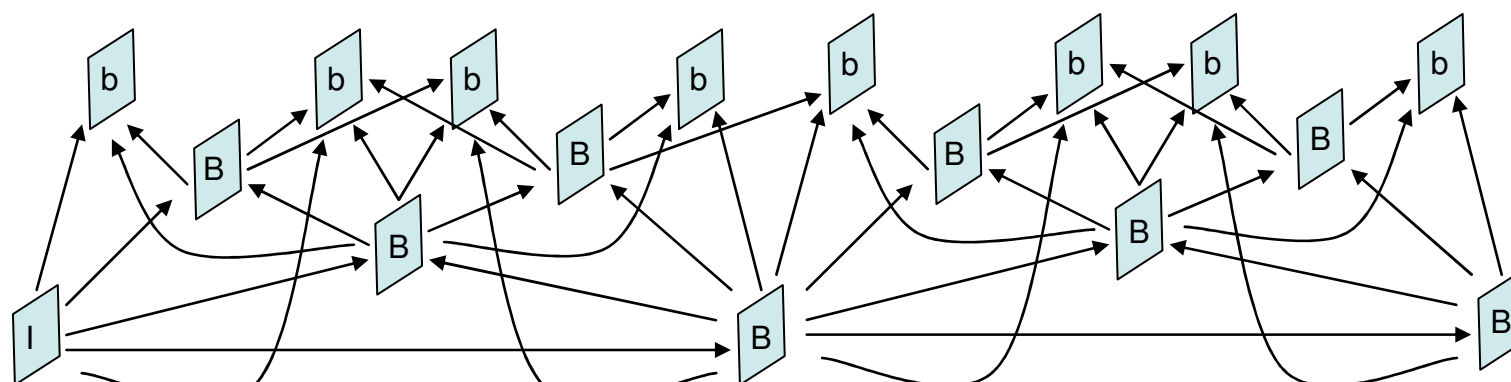
← Removed:

there is no empty frame buffer (i.e., DPB fullness is equal to DPB size), the "bumping"

← Removed:

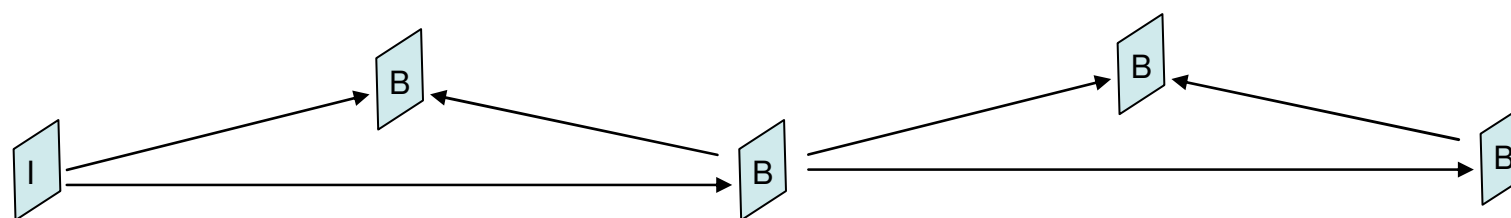
there is an empty frame buffer to store the current decoded picture

Example coding structure



POC:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Decoding order:	0	5	3	6	2	7	4	8	1	13	11	14	10	15	12	16	9
diplay_process_flag:	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1

Only decoding two temporal layers



POC:	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
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diplay_process_flag:	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1

Difference to SVC

- › In SVC it is possible to send max_dec_frame_buffering for each layer
- › The encoder would have to do multi-layer analysis to check that pictures are outputted at the time intended by the encoder – is not always possible

Summary

- › We propose to introduce a slice header flag to give encoder control of the output process
- › Can reduce delay in general
- › Makes it possible to control the output and delay in temporally scalable sequences



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