JCTVC-G158
Undiscardable Leading Pictures for CRA

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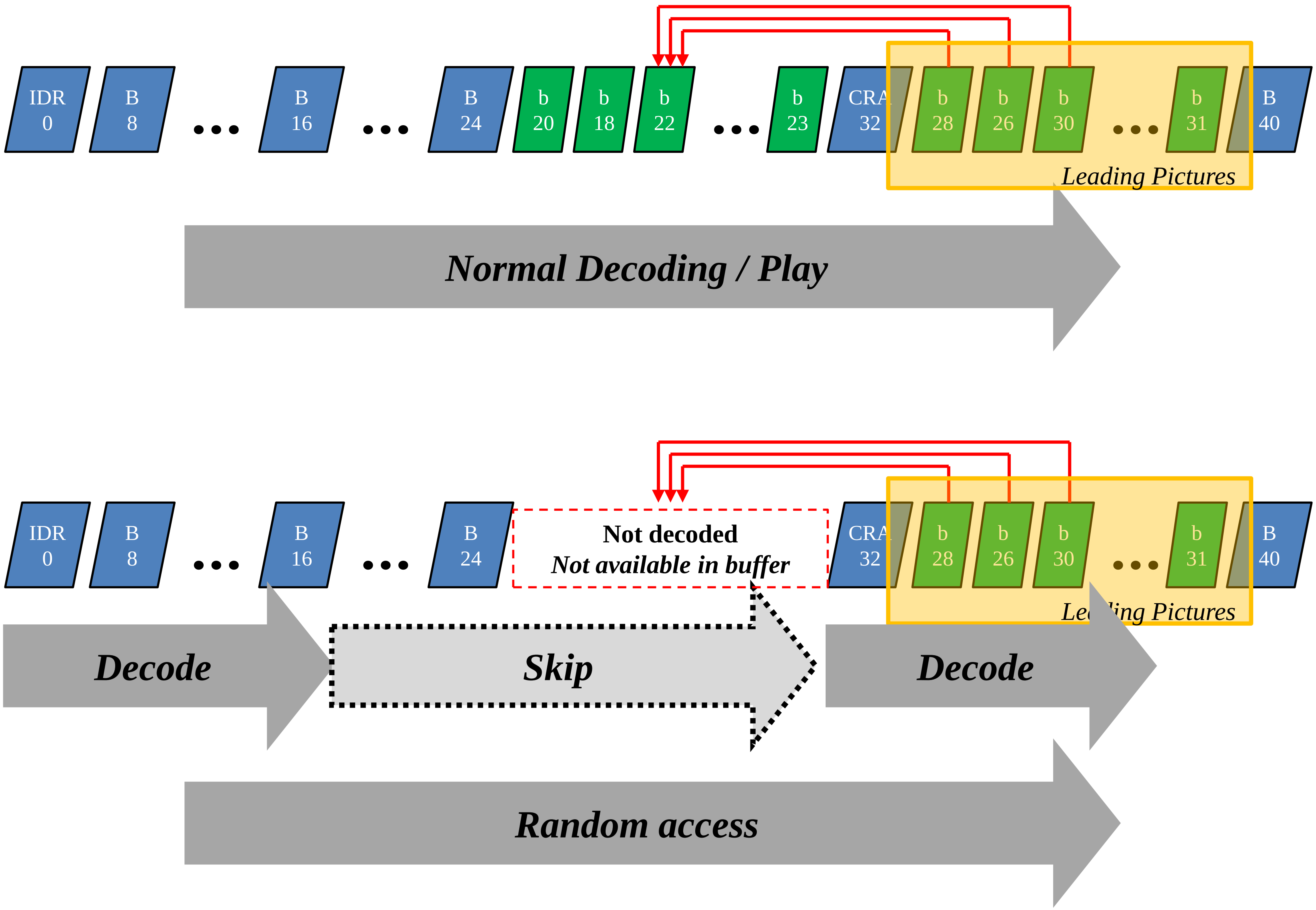
Proposal Item & Motivation

- When CRA picture is used, leading picture can still use pictures that are coded before CRA as reference
- When random access occurs
  - Decoder should know that random access occurs, then
  - It skip decoding and outputting leading pictures
- However, current HEVC spec does not have any specified mechanism to detect random access event

- Proposals
  - Random access detection method
  - Random access notification method

Normal play vs. random access



Random Access Detection & Notification

- Detection : allow decoder to actively check whether a CRA is to be decoded in normal play or in random access event
- Notification: allow external entity (e.g., video player) to notify decoder that random access has occurred

- Two methods are proposed for RA detection

1. Utilize work item about explicit reference picture signaling (ERPS) in AHG21
2. Use new SEI message to check DPB state when CRA is received

- Method for RA notification:
  - Propose a new flag in NAL unit header to be toggled by external entity when certain event happens (e.g., random access event)
  - Does not change NAL unit header size.

RA Detection with ERPS

- If ERPS is adopted, decoder can always the content of DPB when any picture is received
- Thus, when CRA is received, decoder can check DPB
  - If all reference pictures that suppose to be existed in DPB are there, then it is normal play
  - Otherwise, random access event
- No new syntax or semantics are needed. Just some rules / clarification in decoding process and also in hypothetical reference decoder

RA Detection with SEI Message

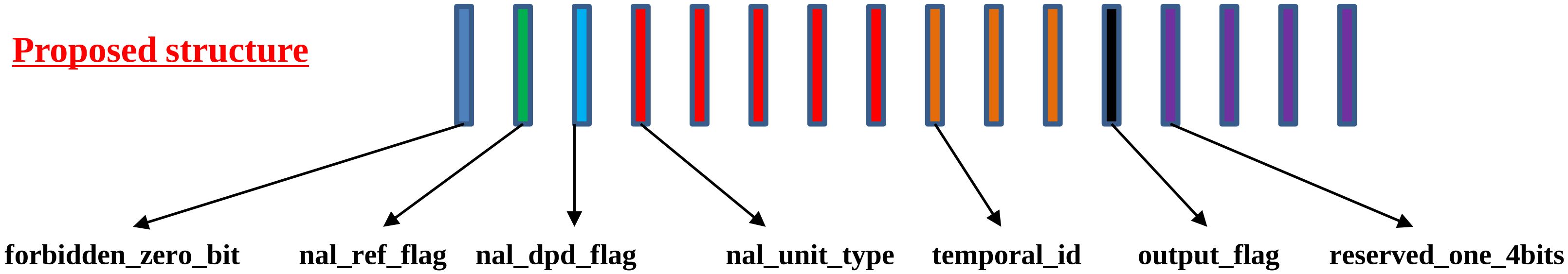
- If ERPS is not used, then there should be similar way to check DPB state when CRA picture is received.
- An SEI message can be suitable for this purpose

ref_pic_synch (payloadSize) {	**Descriptor**
target_frame_poc	ue(v)
number_of_ref_frame	ue(v)
for(i = 0; i < number_of_ref_pic_minus1 + 1; i++) {	
sign_bit_of_ref_frame[i]	f(1)
abs_ref_frame[i]	ue(v)
}	
}	

target_frame_poc describes the POC of picture to which this SEI is applied.
number_of_ref_frame indicates the number of reference frames explicitly signaled.
sign_bit_of_ ref_frame[**i**] describes the sign bit of the ith reference frame. 1 indicates positive sign while 0 indicates otherwise.
abs_ref_frame[**i**] indicates the relative POC of the ith reference frames

RA Notification

- Have a flag in NALU header
  - Always set to zero by encoder
  - When certain event occurs, it can be set to 1 to notify decoder
  - If NALU type = 4 and this flag is 1 → random access has occurred
- Called NAL dependent flag, “nal_dpd_flag”
  - Type of event that occurs depends on the NALU type



RA Notification

nal_unit(NumBytesInNALunit) {	**Descriptor**
forbidden_zero_bit	f(1)
nal_ref_flag	f(1)
nal_dpd_flag	f(1)
nal_unit_type	u(5)
NumBytesInRBSP = 0	
nalUnitHeaderBytes = 1	
if(nal_unit_type = = 1 || nal_unit_type = = 4 || nal_unit_type = = 5) {	
temporal_id	u(3)
output_flag	u(1)
reserved_one_4bits	u(4)
nalUnitHeaderBytes += 1	
}	
for(i = nalUnitHeaderBytes; i < NumBytesInNALunit; i++) {	
if(i + 2 < NumBytesInNALunit && next_bits(24) = = 0x000003) {	
rbsp_byte[NumBytesInRBSP++ **]**	b(8)
rbsp_byte[NumBytesInRBSP++ **]**	b(8)
i += 2	
emulation_prevention_three_byte /* equal to 0x03 */	f(8)
} else	
rbsp_byte[NumBytesInRBSP++ **]**	b(8)
}	
}	

Conclusion

- Decoder ability to know whether random access has occurred is essential to skip decoding & outputting leading pictures
- Such ability is not present yet in current HEVC specification

- 3 schemes are proposed
  - 2 schemes for RA detection
  - 1 scheme for RA notification
- Recommendation:
  - Consider the three schemes, and
  - Adopt at least one of them to allow decoder to deal with random access event