JCTVC-E474: Robust solution for parsing issues CE9-ROB01 CE9-ROB02

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Introduction

- The predictor index coding on AMVP and Merge Modes is based on the predictors pruning process (remove duplicate candidates):
  - This offers an optimal use of bits dedicated to the predictor index
  - But this causes some parsing issues on robustness and throughput

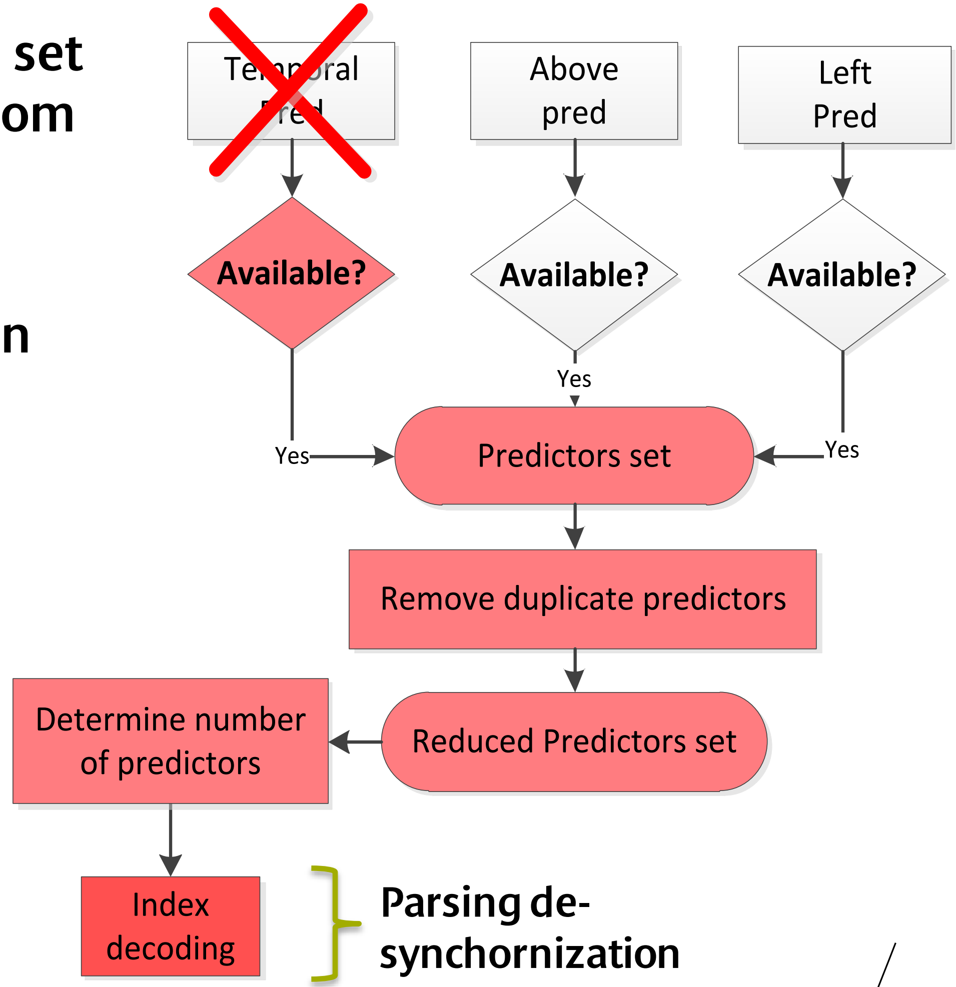
- JCTVC-E219 proposed a scheme to fully solves:
  - the parsing robustness
  - the parsing issue throughput

- Aims of CE9-ROB01 and CE9-ROB02:
  - Adapt scheme of JCTVC-E219 to the new HM3 MV derivation process
  - Obtain similar coding efficiency than JCTVC-E219
  - Reduce encoding and decoding complexity

Parsing robustness issue

- The amount of predictors in the set depends on data which come from **another** slice:
- This causes de-synchronization between encoder and decoder in case of loss

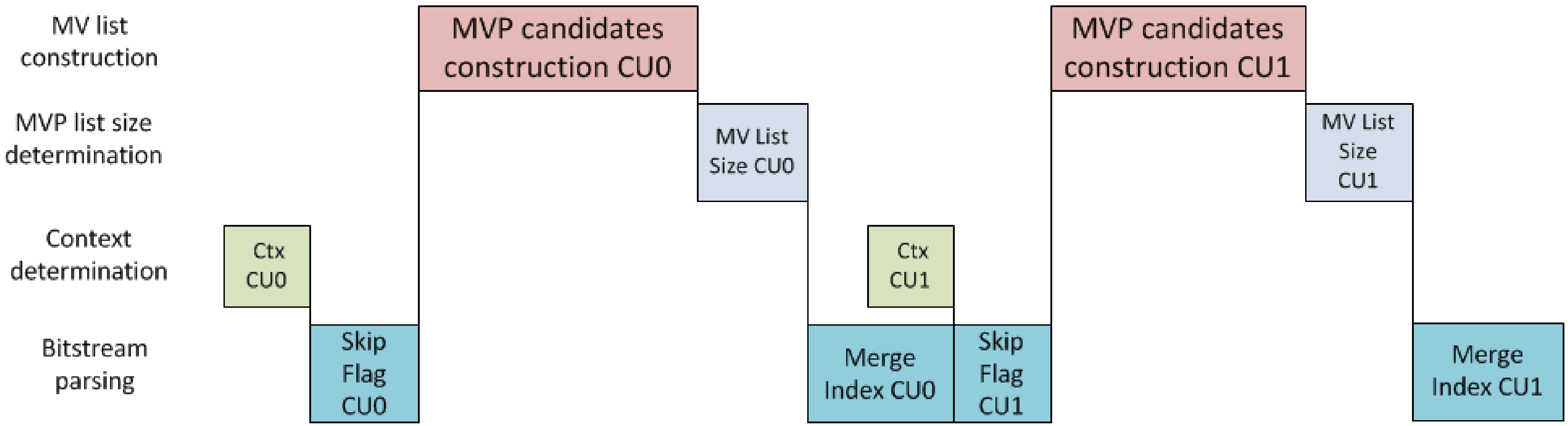
HM3.0 Parsing process



Parsing de-synchornization

Parsing throughput issue

CABAC Skip parsing HM3.0



Proposal solution in HM3.0

- Tool 1: Predictors list size depends on spatial predictors availability
  - Temporal predictor forced to be always available
  - Merge: remove first PU candidates based on Avoid Merge concept

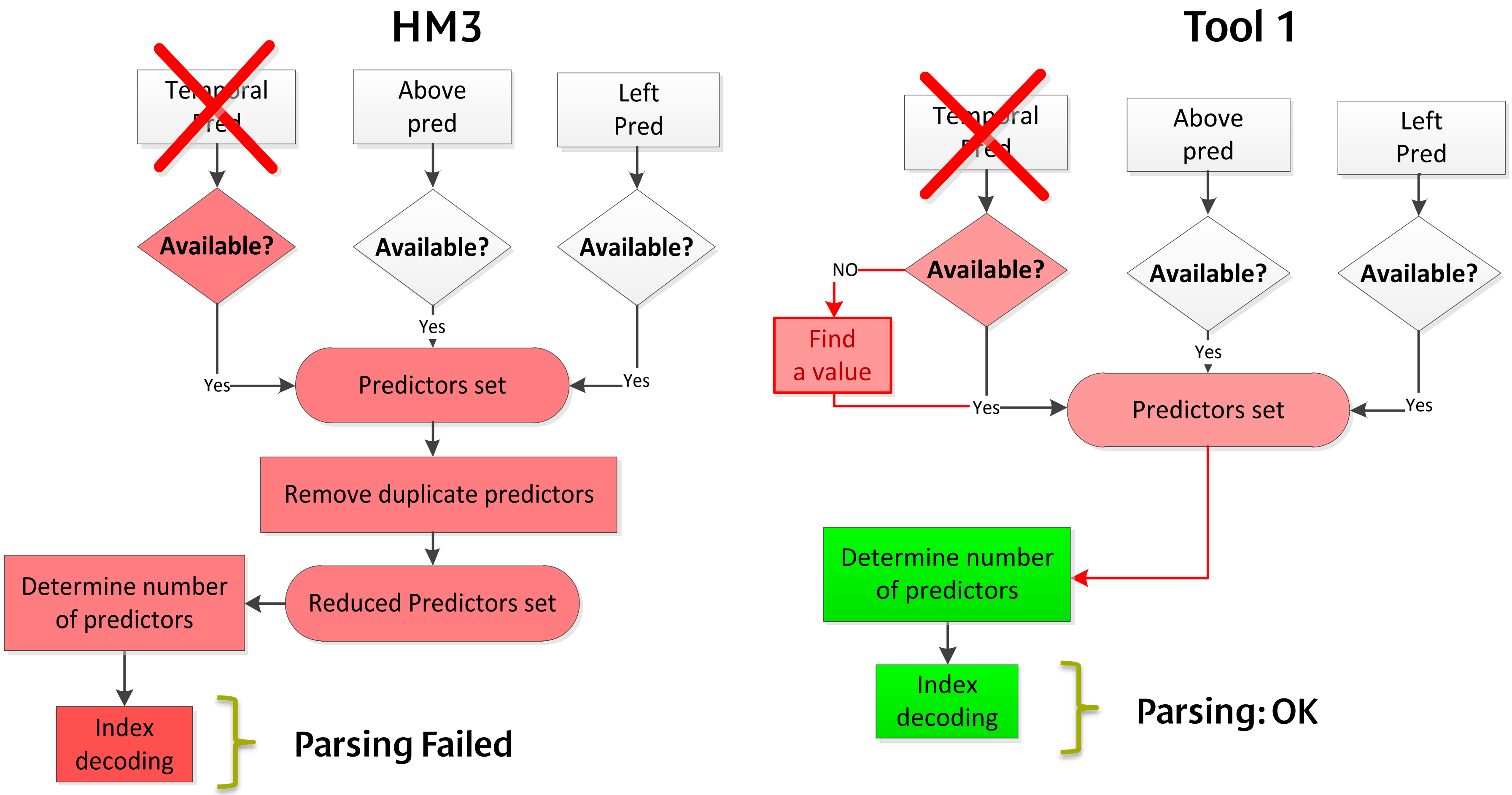
Fully solves parsing issues:

Robustness: the list size depends only on data from the current slice

Throughput: the spatial availability can be easily computed in advance

- Tool 2: Replacement of redundant candidates
  - Each predictor index represents a non redundant MVP
  - Improve the coding efficiency

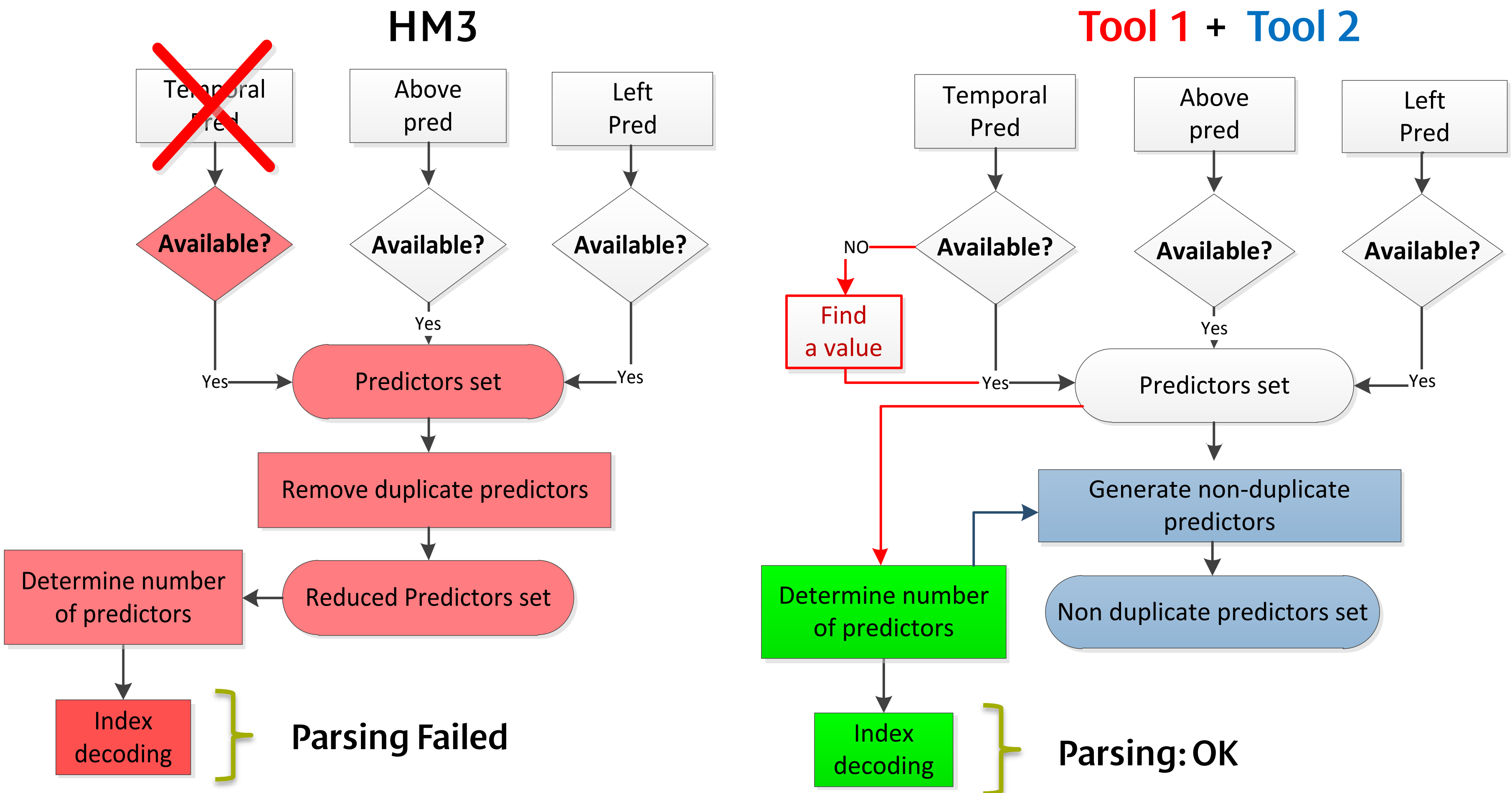
Predictor index parsing: ROB01



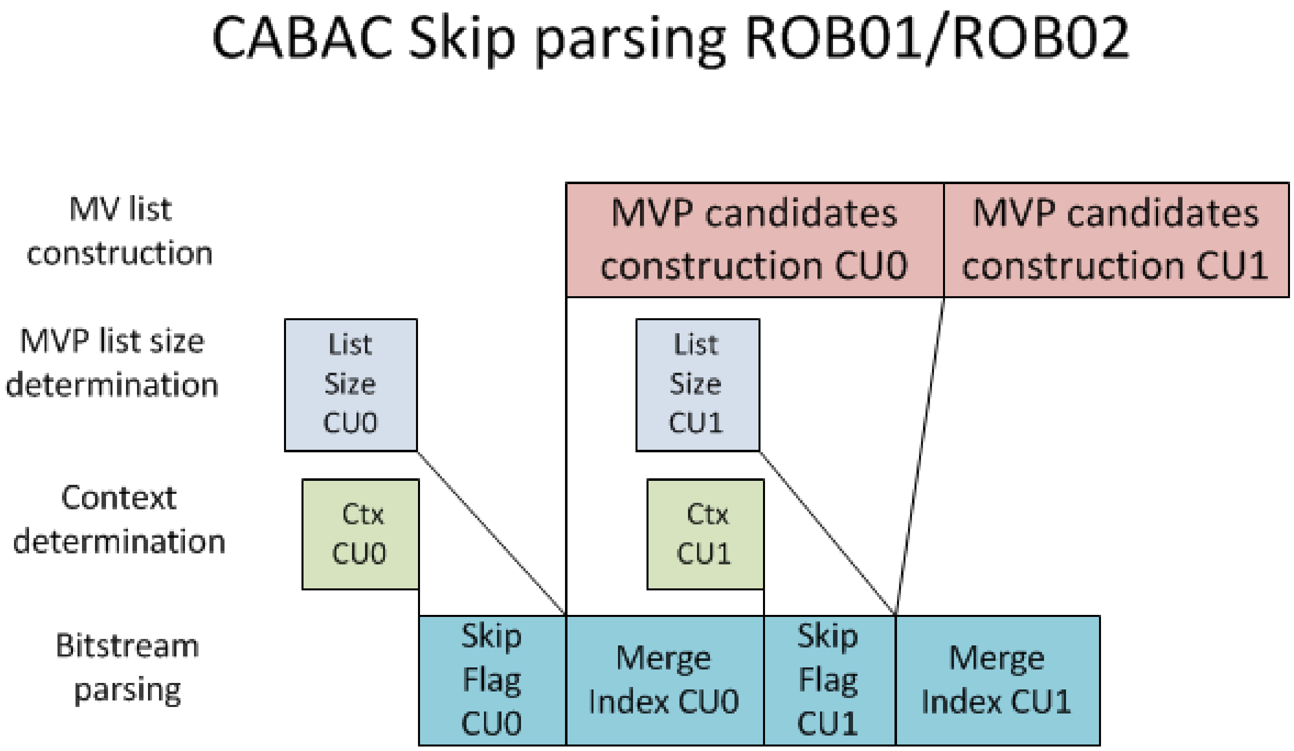
Parsing Failed

Parsing: OK

Predictor index parsing: ROB02

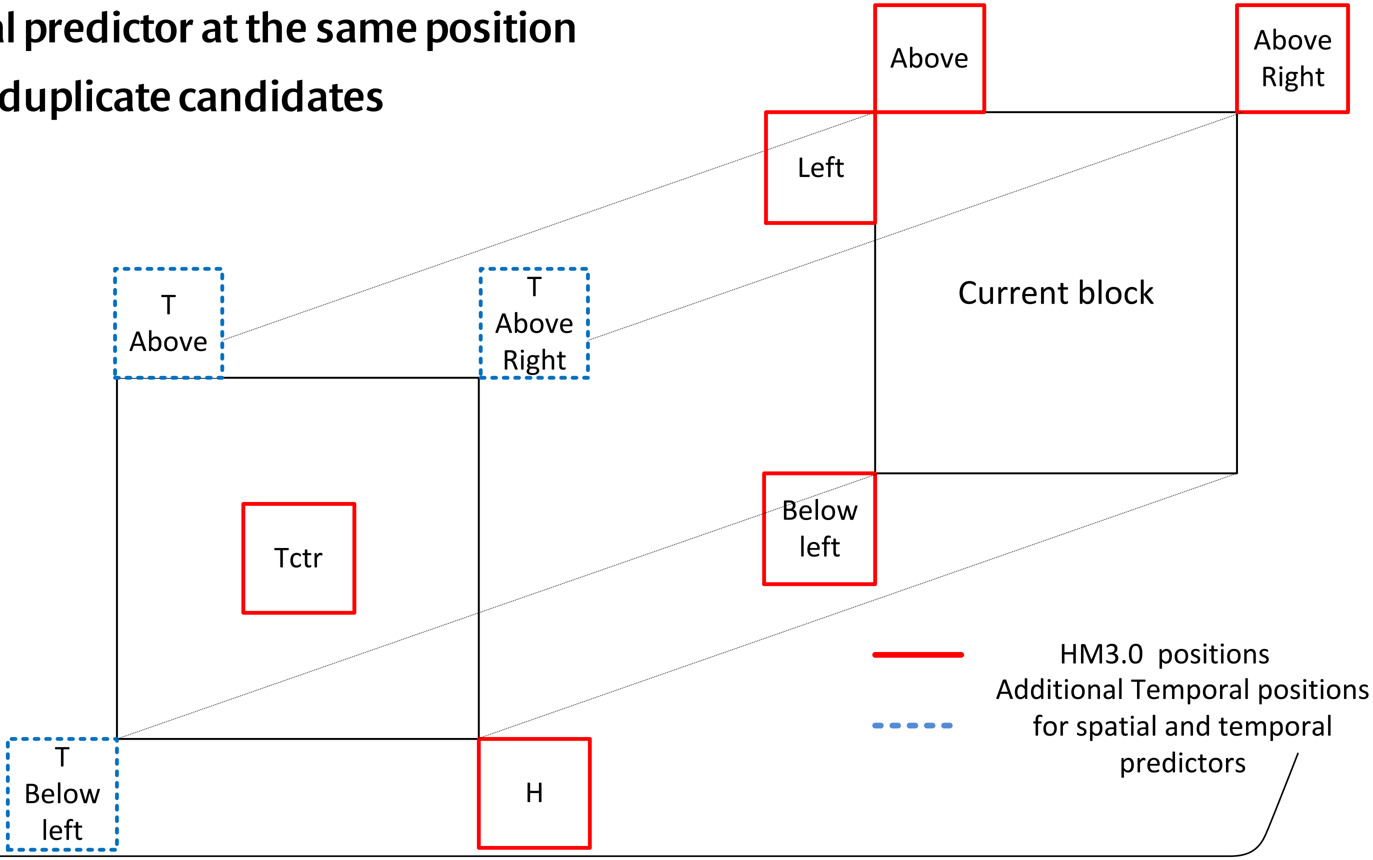


Parsing throughput issue



Tool 2: Replacement of redundant candidates

- Aim: **Use efficiently the bits dedicated to the predictor index**
- The value of the duplicate candidates are changed by non-duplicate values:
  - Value of temporal predictor at the same position
  - Add offset to the duplicate candidates



Others modifications on ROB02 software

- Slice header: Signaling of the use temporal predictor in the set
  - To avoid signaling temporal predictor when the collocated frame is an Intra frame.

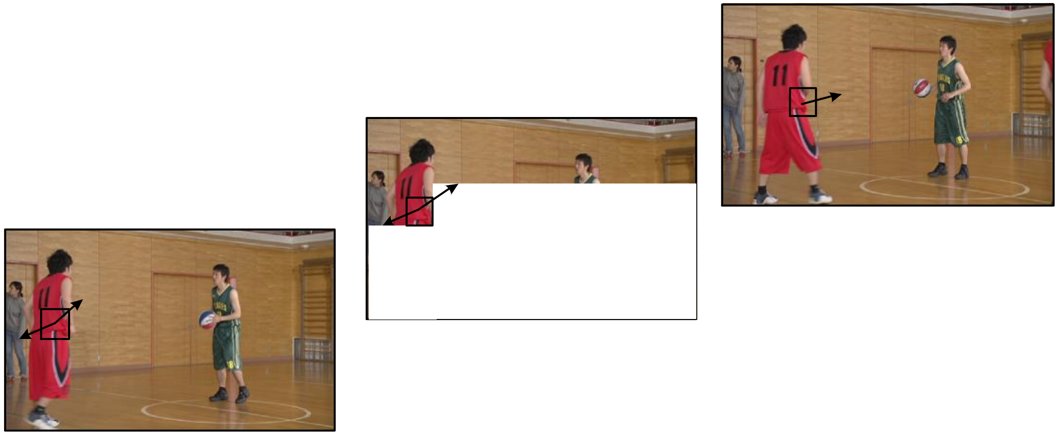
- Encoding choice:
  - No RD estimation for candidates which were changed by a non redundant candidates for Merge 2Nx2N.
  - This reduces significantly the encoding time with small impact on coding efficiency.

- Decoder implementation:
  - At decoder side the predictor index « i» is decoded before the MV derivation process
  - Consequently, only i first motion vectors need to be derived
  - **5% decoding time reduction**

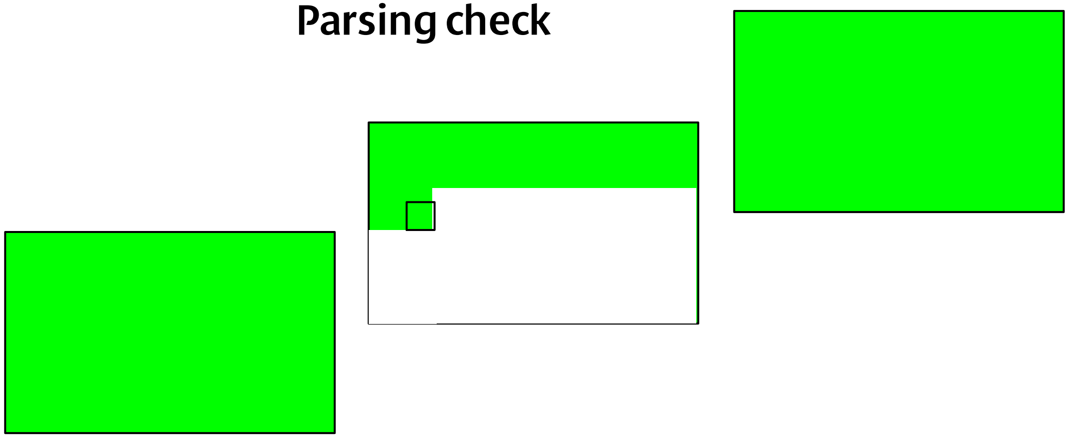
Parsing Check

- Re-initialization of the reference frames:
  - MV,
  - Ref indexes
  - Modes
  - Pixel values
  - CU/PU partitioning
  - Slice header
  - Etc.
  - Except POC (Same issue in H.264/AVC)

Decoding process



Parsing check



All bitstreams are fully parsed

Experimental Results ROB01

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.8	0.7	0.5	0.9	0.9	0.5
Class B	1.0	0.7	0.5	1.1	0.8	0.7
Class C	1.1	1.0	0.9	1.1	0.9	1.0
Class D	1.1	0.9	0.9	1.1	0.6	0.7
Class E						
Overall	**1.0**	**0.8**	**0.7**	**1.1**	**0.8**	**0.7**
Enc Time[%]	100%			101%		
Dec Time[%]	99%			98%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	1.4	1.1	0.8	1.5	1.0	1.1
Class C	1.3	1.0	1.0	1.2	0.8	0.8
Class D	1.3	1.1	1.0	1.3	0.7	0.6
Class E	3.5	3.5	2.8	3.8	2.8	3.5
Overall	**1.7**	**1.5**	**1.3**	**1.8**	**1.2**	**1.3**
Overall wo CL E	**1.3**	**1.1**	**0.9**	**1.3**	**0.8**	**0.8**
Enc Time[%]	99%			100%		
Dec Time[%]	98%			98%		

Experimental Results ROB02

	Random Access HE			Random Access LC		
	Y	U	V	Y	U	V
Class A	0.4	0.3	0.5	0.2	0.4	0.2
Class B	0.6	0.5	0.4	0.5	0.6	0.5
Class C	0.7	0.8	0.8	0.4	0.5	0.5
Class D	0.6	0.7	0.6	0.3	0.3	0.3
Class E						
Overall	**0.6**	**0.6**	**0.6**	**0.4**	**0.4**	**0.4**
Enc Time[%]	102%			104%		
Dec Time[%]	96%			94%		

	Low delay B HE			Low delay B LC		
	Y	U	V	Y	U	V
Class A						
Class B	0.5	0.1	-0.4	0.1	0.2	0.5
Class C	0.5	0.4	0.2	0.2	0.1	0.3
Class D	0.5	0.1	1.0	0.4	-0.2	0.0
Class E	1.9	2.2	1.4	1.4	2.1	2.7
Overall	**0.8**	**0.6**	**0.4**	**0.4**	**0.4**	**0.7**
Overall wo CL E	**0.5**	**0.2**	**0.2**	**0.2**	**0.1**	**0.3**
Enc Time[%]	102%			104%		
Dec Time[%]	95%			94%		

Simplified ROB02

- During CE9 result **discussions** on the **reflector** it was pointed that our Tool 2 use many scaling operations.
- Simplified ROB02:
  - AMVP: Use only one scaling per candidate
  - Merge: No scaling for spatial positions
    Only one for temporal predictor

	Merge modes	AMVP (L0/L1)
HM3	2	10
ROB02	16	24
Simplified ROB02	**2**	**6**

	RALC	RAHE	LDHE	LDLC
ROB02	0.6%	0.4%	0.8%	0.4%
Simplified ROB02	0.6%	0.4%	0.7%	0.4%

→ **Same coding efficiency as ROB02**

Canon

Conclusion

- Proposed ROB02 experiment
  - **Fully solves the parsing robustness issue**
  - **Fully solves the parsing throughput issue**
  - Small impact on coding efficiency
  - Decoding time reduction

Propose to adopt ROB02 in the HM design