

JVT-T052

Splitting inter-layer prediction information

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research & development



Outline

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Problem statement

■ Problem :

- Inter layer prediction is not always fully efficient. About 60-70% of the blocks are used for ILP (may be less – see T080)

■ Goal :

- Avoid transmission of useless ILP information : Preliminary results shown at Geneva meeting gave promising results.
- Keep MPEG-4 AVC / H.264 base layer compatibility



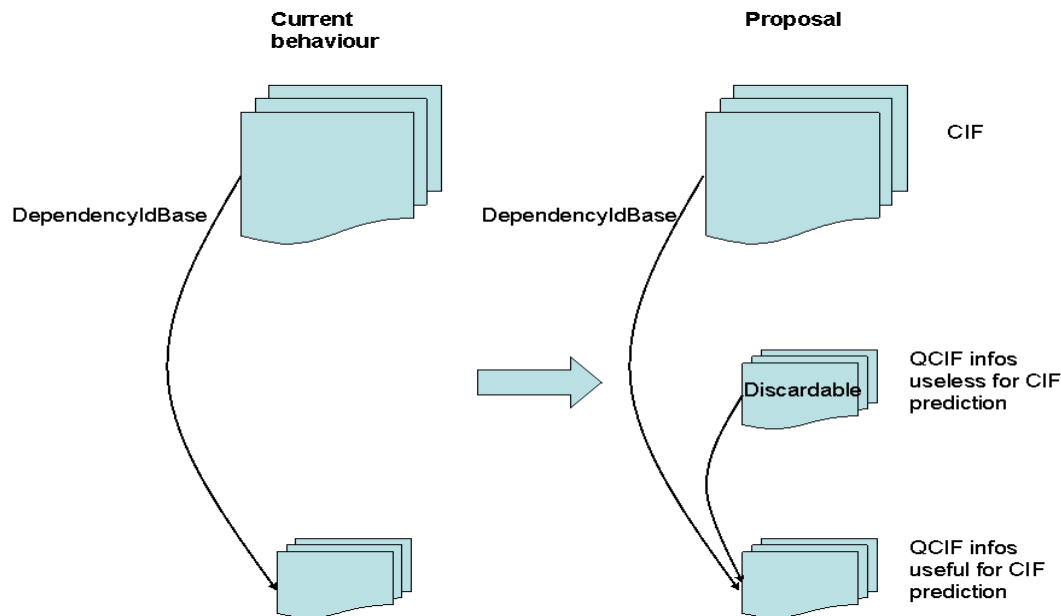
Previous proposals

- JVT-R050 (Discardable bits and Multi-layer RD estimation for Single loop decoding)
 - Proposes to code discardable residuals in a separate NAL/Slice with the `discardable_flag` set
 - JVT-S069 (Independent parsing of spatial and CGS layers)
 - Proposes the use of slice groups and `discardable_flag`
 - JVT-S039 (On discardable lower layer adaptations)
 - Proposes the use of slice groups, data partitioning and `discardable_flag`
 - preliminary results shown during the meeting shown very promising results
- Need for syntax modifications, and the support of tools defined in the MPEG-4 AVC / H.264 Baseline profile (not in the main profile)
- Incompatible with already deployed set-top boxes or terminals



Proposed alternative

- Use of two layers for the same spatio-temporal-quality resolution
 - First layer with discardable flag reset
 - Useful MBs encoded
 - Useless MBs (for ILP prediction) may be skipped in the first (non discardable) layer
 - Second with the discardable_flag set.
- Example (2layers - QCIF15 - CIF15):



Preliminary results

■ Simple tests :

- Classical 2 layers coding (QCIF15/CIF15)

versus

- 3 layers coding (QCIF15/QCIF15Discard/CIF15) :
 - QCIF residual is coded in the QCIF15 discardable layer
 - residual prediction is prohibited in the CIF layer
- QP values (30, 36, 42)

→ Bit-rate gain (up to 14% on Mobile QP30, without quality loss) can be observed in the CIF layer, at the cost of a slight global overhead (1.5% on Mobile QP30)

→ Psnr loss only for the Football sequence (between 0.1 dB and 0.2 dB)

■ Other encoding strategies have been tested

- Skipping complete MBs in the non-discardable QCIF layer if not used for ILP
- Resulted in a too damaged quality on the QCIF layer.
 - probably due to a too « brute » algorithm
 - only inter-layer dependencies were considered, but not the intra-layer dependencies
 - neighboring context used in CABAC is significantly modified

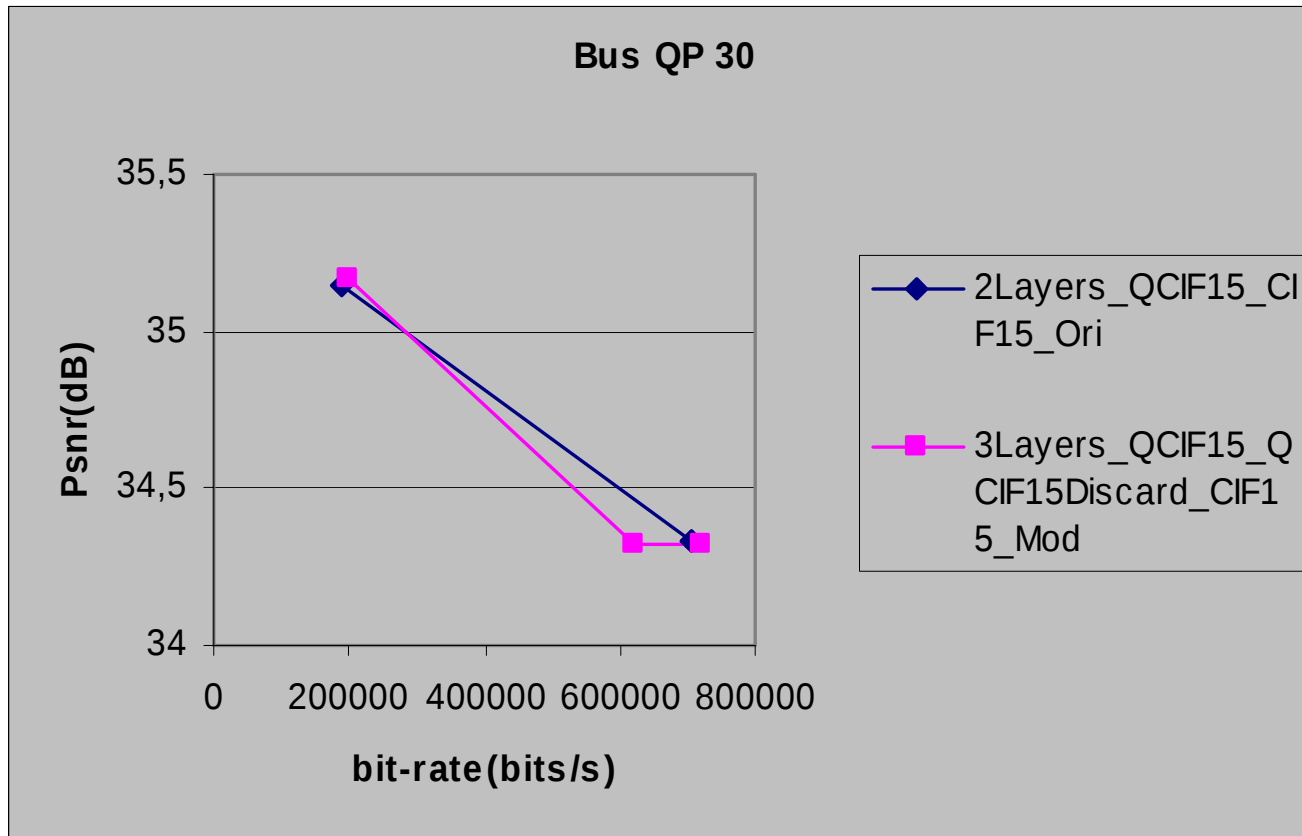


Preliminary results - summary

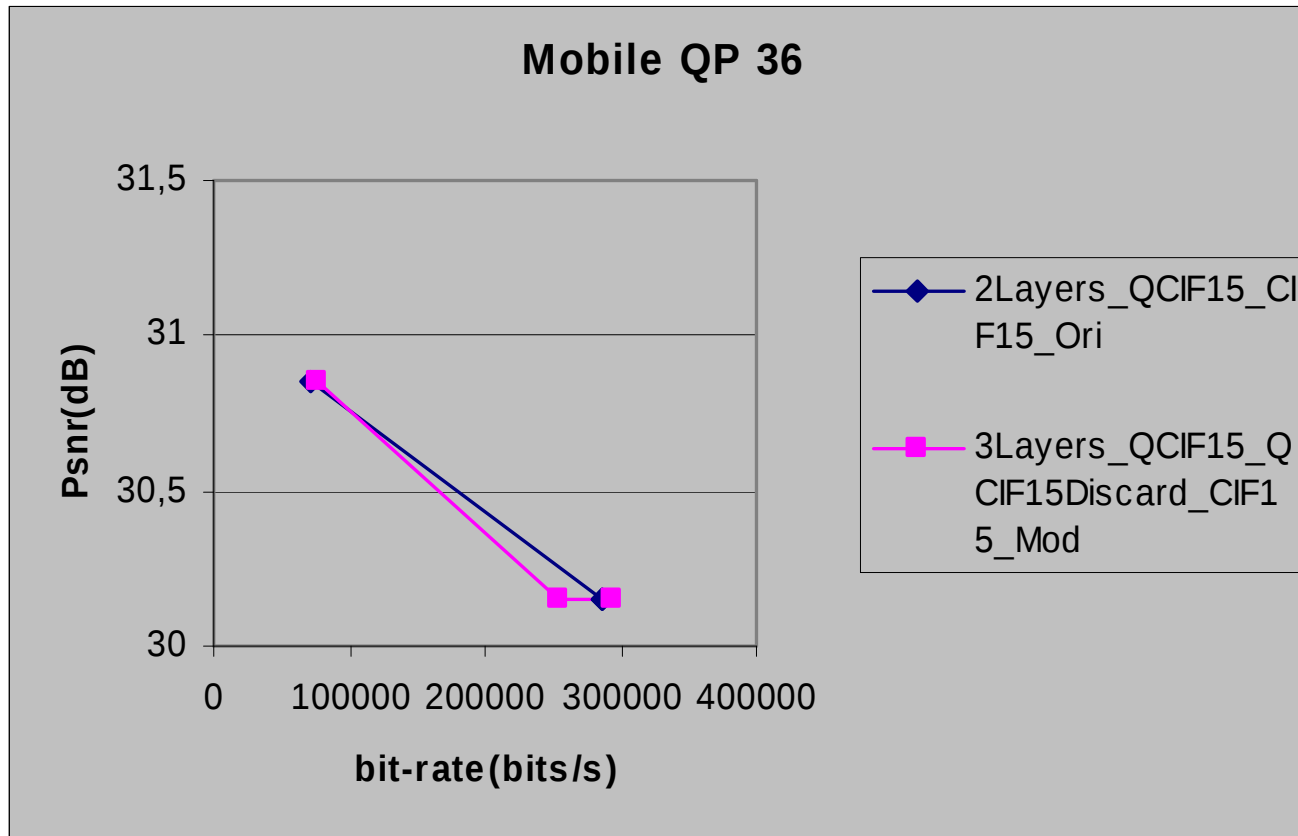
	Bus	Football	Foreman	Mobile	Average
QP 30					
%rate overhead for full stream embedding	-2,1	-4,6	-5,8	-1,5	-3,5
%rate gain for optimized CIF stream without discardable QCIF information	11,6	8,7	8,6	14,8	10,9
%rate overhead for useful QCIF decoded point	-3,2	-2,8	-6,2	-3,6	-3,9
QP 36					
%rate overhead for full stream embedding	-2,3	-5,3	-6,5	-2,7	-4,2
%rate gain for optimized CIF stream without discardable QCIF information	8,9	7,1	6,5	11,4	8,5
%rate overhead for useful QCIF decoded point	-5,2	-4,2	-10,1	-7,1	-6,6
QP 42					
%rate overhead for full stream embedding	-3,4	-6,1	-5,8	-4,1	-4,9
%rate gain for optimized CIF stream without discardable QCIF information	5,8	6,0	6,4	7,9	6,6
%rate overhead for useful QCIF decoded point	-10,5	-7,0	-17,6	-12,7	-12,0



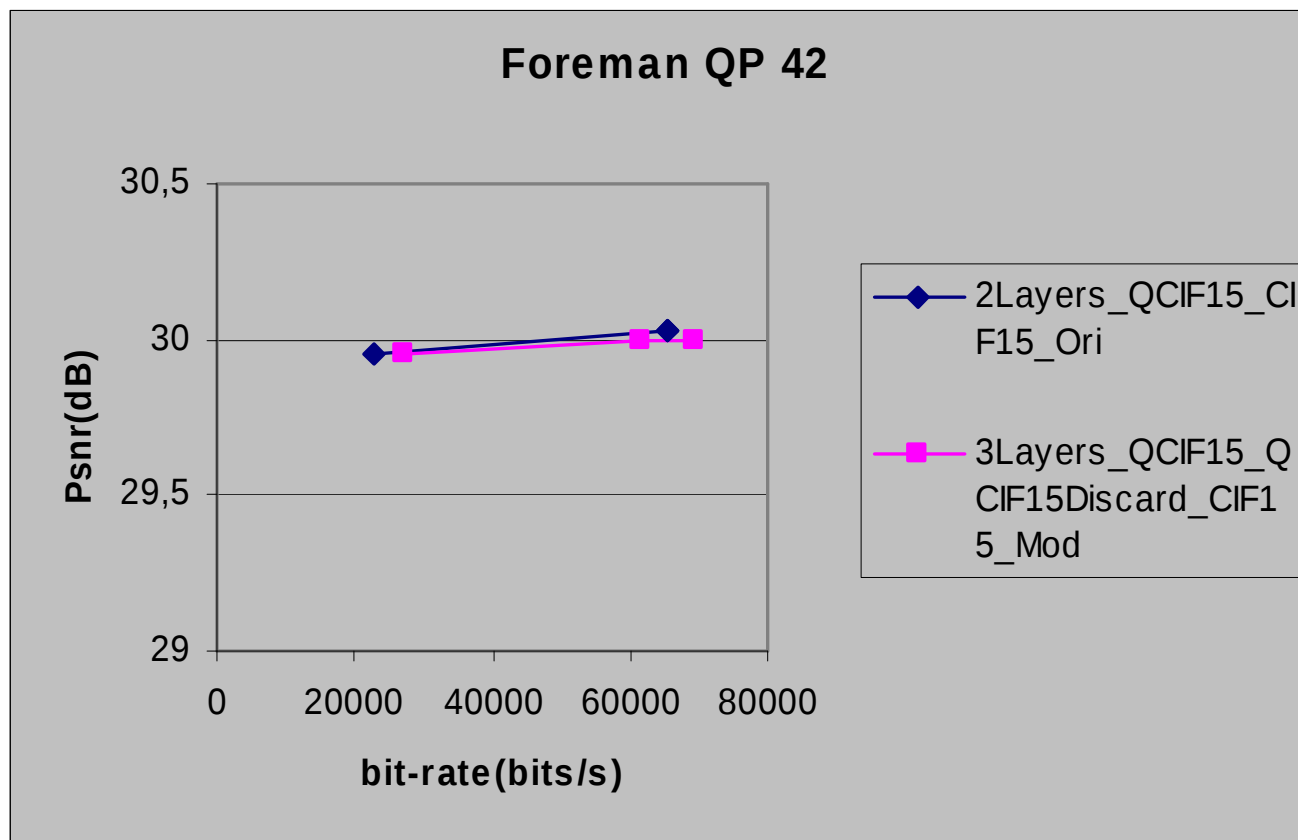
Preliminary results



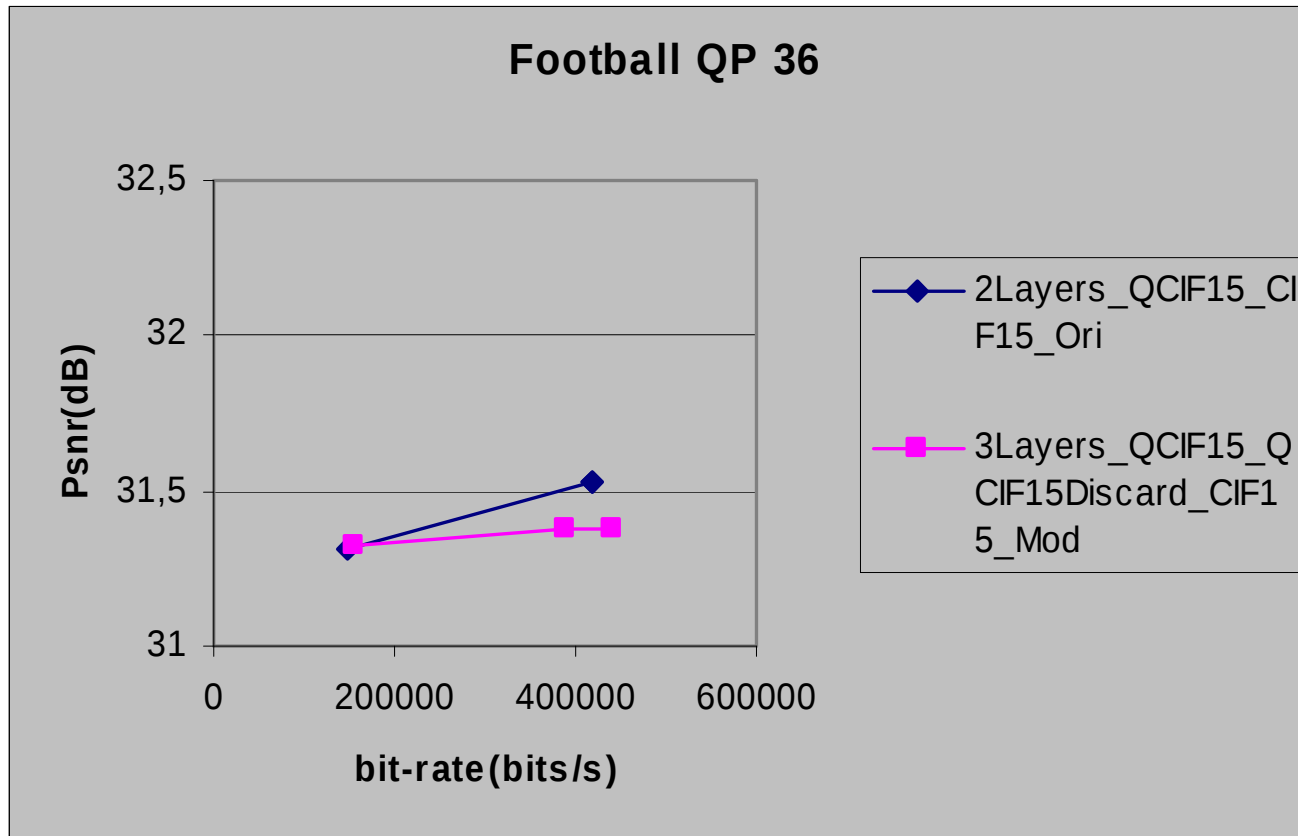
Preliminary results



Preliminary results



Preliminary results



The only sequence where PSNR loss is observed at CIF level



Conclusion

- Solution to avoid transmission of useless ILP information
- No need to modify current syntax
 - as long as the discardable information is put in a new layer
- Keep an AVC Main profile base layer, to ensure a compatibility with already deployed set-top boxes or terminals

