

Syntax on List Combination (JCTVC-H0292)

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Background

- ❖ LC (List Combination) is always used for referencing of uni-prediction in B-slices
- ❖ (# of LC) is derived from (# of List0) and (# of List1)
→ (# of LC) = $[0, (\# \text{ of List0}) * (\# \text{ of List1})]$

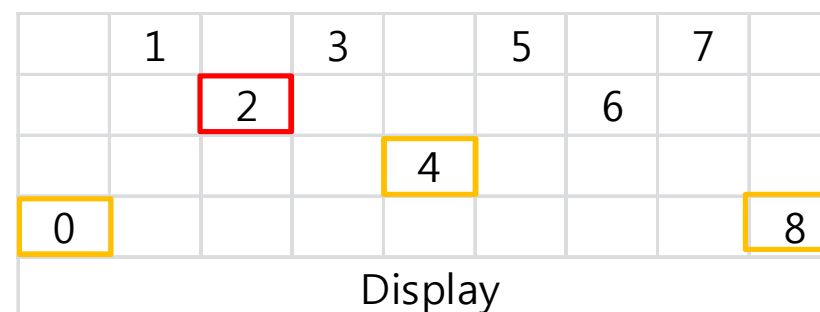
GOP=8

NumOfReference=4

NumOfReference_L0=2

NumOfReference_L1=2

POC	L0	L1	LC
0	-	-	-
8	0	0	0
4	0,8	8,0	0,8
2	0,4	4,8	0,4,8
6	4,2	8,4	4,8,2
1	0,2	2,4	0,2,4
3	2,0	4,6	2,4,0,6
5	4,2	6,8	4,6,2,8
7	6,4	8,6	6,8,4
16	8,6,4,2	8,6,4,2	8,6,4,2



WD(G1103_d3) Syntax

- ❖ LC related syntax are in Slice Header and has two functionality
 - Specify the number of LC
 - LC reordering if requested

slice_header() {	Descriptor
<snip>	
ref_pic_list_combination()	
...	

ref_pic_list_combination() {	Descriptor
if(slice_type % 5 == 1) { // b slice	
ref_pic_list_combination_flag	u(1)
if(ref_pic_list_combination_flag) {	
num_ref_idx_lc_active_minus1	ue(v)
ref_pic_list_modification_flag_lc	u(1)
if(ref_pic_list_modification_flag_lc)	
for (i=0; i <= num_ref_idx_lc_active_minus1; i++) {	
pic_from_list_0_flag	u(1)
ref_idx_list_curr	ue(v)
}	
}	
}	
}	

Specify the number of LC

LC Reordering

Proposal 1-1

❖ Problem

- Syntax for the **number of LC** should be signaled in every slice even though encoder wants to restrict the number to specific value
- In case of List0 and List1, the **default number** of each List can be signaled in PPS
 - "num_ref_idx_l0/l1_default_active_minus1"

❖ Proposal

- Define the default number of LC in PPS as like List0 and List1
 - "num_ref_idx_lc_default_active_minus1"
- Example) When encoder wants to fix the number of LC to 2,
 - The PPS level signaling is sufficient
 - ⊕ num_ref_idx_lc_default_active_minus1 = 1
 - Needs not to signal in every slice

pic_parameter_set_rbsp() {	Descriptor
num_ref_idx_l0_default_active_minus1	ue(v)
num_ref_idx_l1_default_active_minus1	ue(v)
num_ref_idx_lc_default_active_minus1	ue(v)
}	

num_ref_idx_lc_default_active_minus1 = 1			
POC	List0 (POC)	List1 (POC)	LC (POC)
0	-	-	-
8	0	0	0
4	0,8	8,0	0,8
2	0,4	4,8	0,4
6	4,2	8,4	4,8
1	0,2	2,4	0,2
3	2,0	4,6	2,4
5	4,2	6,8	4,6
7	6,4	8,6	6,8
16	8,6,4,2	8,6,4,2	8,6

Proposal 1-2

- ❖ When the number of LC is to be signaled in each slice level
 - Send the override flag as the same reason for List0 and List1
 - "num_ref_idx_lc_active_override_flag"
 - Send the active number of LC minus1 syntax
 - "num_ref_idx_lc_active_minus1"

slice_header() {	Descriptor
entropy_slice_flag	u(1)
...	
if(slice_type == P slice_type == B) {	
num_ref_idx_active_override_flag	u(1)
if(num_ref_idx_active_override_flag) {	
num_ref_idx_l0_active_minus1	ue(v)
if(slice_type == B)	
num_ref_idx_l1_active_minus1	ue(v)
}	
if(slice_type == B) {	
num_ref_idx_lc_active_override_flag	u(1)
if(num_ref_idx_lc_active_override_flag)	
num_ref_idx_lc_active_minus1	ue(v)
}	
}	

Proposal - 2

❖ One Syntax has additional information

▪ "ref_pic_list_combination_flag"

- 1 → List0 and List1 are different → Construct LC based on List0 and List1
- 0 → List0 and List1 are identical → Use List0 as LC
- Without this syntax, the status of List0 and List1 has been determined

ref_pic_list_combination_flag equal to 1 indicates that the reference picture list 0 and the reference picture list 1 are combined to be an additional reference picture lists combination used for the prediction units being uni-directional predicted. This flag equal to 0 indicates that the reference picture list 0 and reference picture list 1 are identical thus reference picture list 0 is used as the reference picture lists combination. The reference picture lists combination is set to be empty at the start of the loop defined in this table.

❖ Remove this additional information

ref_pic_list_combination() {	Descriptor
if(slice_type % 5 == 1) { // b slice	
ref_pic_list_combination_flag	u(1)
if(ref_pic_list_combination_flag) {	
num_ref_idx_lc_active_minus1	ue(v)
ref_pic_list_modification_flag_lc	u(1)
if(ref_pic_list_modification_flag_lc)	
for (i =0; i <= num_ref_idx_lc_active_minus1; i++) {	
pic_from_list_0_flag	u(1)
ref_idx_list_curr	ue(v)
}	
}	
}	
}	

Proposal 3

- ❖ Syntax for LC reordering can be moved to similar syntax group for List0 and List1 reordering

ref_pic_list_combination() {
if(slice_type % 5 == 1) { // b slice
ref_pic_list_combination_flag
if(ref_pic_list_combination_flag) {
num_ref_idx_lc_active_minus1
ref_pic_list_modification_flag_lc
if(ref_pic_list_modification_flag_lc)
for (i=0; i <= num_ref_idx_lc_active_minus1; i++) {
pic_from_list_0_flag
ref_idx_list_curr
}
}
}
}

Move

ref_pic_list_modification() {	Descriptor
if(slice_type % 5 != 2 && slice_type % 5 != 4) {	
ref_pic_list_modification_flag_l0	u(1)
if(ref_pic_list_modification_flag_l0)	
do {	
modification_of_pic_nums_idc	ue(v)
if(modification_of_pic_nums_idc == 0	
modification_of_pic_nums_idc == 1)	
abs_diff_pic_num_minus1	ue(v)
else if(modification_of_pic_nums_idc == 2)	
long_term_pic_num	ue(v)
} while(modification_of_pic_nums_idc != 3)	
}	
if(slice_type % 5 == 1) {	
ref_pic_list_modification_flag_l1	u(1)
if(ref_pic_list_modification_flag_l1)	
do {	
modification_of_pic_nums_idc	ue(v)
if(modification_of_pic_nums_idc == 0	
modification_of_pic_nums_idc == 1)	
abs_diff_pic_num_minus1	ue(v)
else if(modification_of_pic_nums_idc == 2)	
long_term_pic_num	ue(v)
} while(modification_of_pic_nums_idc != 3)	
ref_pic_list_modification_flag_lc	u(1)
if(ref_pic_list_modification_flag_lc) {	
for (i=0; i <= num_ref_idx_lc_active_minus1; i++) {	
pic_from_list_0_flag	u(1)
ref_idx_list_curr	ue(v)
}	
}	
}	
}	

Conclusion

[Proposal 1]

- ❖ Define the default number of LC in PPS as like List0 and List1
 - "num_ref_idx_lc_default_active_minus1"
- ❖ When the number of LC is required to be signaled in each slice level, send the number of LC directly in slice header
 - "num_ref_idx_lc_active_minus1"

[Proposal 2]

- ❖ Remove the additional syntax
 - "ref_pic_list_combination_flag"

[Proposal 3]

- ❖ Move LC reordering syntax inside "ref_pic_list_modification()"

Proposed Syntax (1/2)

	Descriptor
pic_parameter_set_rbsp() {	
pic_parameter_set_id	ue(v)
seq_parameter_set_id	ue(v)
entropy_coding_synchro	u(v)
cabac_istate_reset_flag	u(1)
if(entropy_coding_synchro)	
num_substreams_minus1	ue(v)
num_temporal_layer_switching_point_flags	ue(v)
for(i = 0; i < num_temporal_layer_switching_point_flags; i++)	
temporal_layer_switching_point_flag[i]	u(1)
num_ref_idx_l0_default_active_minus1	ue(v)
num_ref_idx_l1_default_active_minus1	ue(v)
num_ref_idx_lc_default_active_minus1	ue(v)

	Descriptor
slice_header() {	
entropy_slice_flag	u(1)
if(!entropy_slice_flag) {	
slice_type	ue(v)
pic_parameter_set_id	ue(v)
if(sample_adaptive_offset_enabled_flag adaptive_loop_filter_enabled_flag)	
aps_id	ue(v)
frame_num	u(v)
if(IdrPicFlag)	
idr_pic_id	ue(v)
if(pic_order_cnt_type == 0)	
pic_order_cnt_lsb /*	u(v)
if(slice_type == P slice_type == B) {	
num_ref_idx_active_override_flag	u(1)
if(num_ref_idx_active_override_flag) {	
num_ref_idx_l0_active_minus1	ue(v)
if(slice_type == B)	
num_ref_idx_l1_active_minus1	ue(v)
}	
if(slice_type == B) {	
num_ref_idx_lc_active_override_flag	u(1)
if(num_ref_idx_lc_active_override_flag)	
num_ref_idx_lc_active_minus1	ue(v)
}	
}	
ref_pic_list_modification()	
ref_pic_list_combination()	

Proposed Syntax (2/2)

ref_pic_list_modification() {	Descriptor
if(slice_type % 5 != 2 && slice_type % 5 != 4) {	
ref_pic_list_modification_flag_l0	u(1)
if(ref_pic_list_modification_flag_l0)	
do {	
modification_of_pic_nums_idc	ue(v)
if(modification_of_pic_nums_idc == 0 modification_of_pic_nums_idc == 1)	
abs_diff_pic_num_minus1	ue(v)
else if(modification_of_pic_nums_idc == 2)	
long_term_pic_num	ue(v)
} while(modification_of_pic_nums_idc != 3)	
}	
if(slice_type % 5 == 1) {	
ref_pic_list_modification_flag_l1	u(1)
if(ref_pic_list_modification_flag_l1)	
do {	
modification_of_pic_nums_idc	ue(v)
if(modification_of_pic_nums_idc == 0 modification_of_pic_nums_idc == 1)	
abs_diff_pic_num_minus1	ue(v)
else if(modification_of_pic_nums_idc == 2)	
long_term_pic_num	ue(v)
} while(modification_of_pic_nums_idc != 3)	
ref_pic_list_modification_flag_lc	u(1)
if(ref_pic_list_modification_flag_lc) {	
for (i=0; i <= num_ref_idx_lc_active_minus1; i++) {	
pic_from_list_0_flag	u(1)
ref_idx_list_curr	ue(v)
}	
}	
}	