

J0217 – On Dependent Slices

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Introduction

❖ The current specification

- Dependent slice is enabled only when dependent slice enabled flag is equal to 1 and either of the following condition is satisfied:
 - tiles_or_entropy_coding_sync_idc is in range of 0 ~ 2 (0: no parallel tools, 1: tiles, 2: WPP)
 - tiles or entropy coding sync idc is equal to 3 and cabac independent flag is equal to 0

pic_parameter_set_rbsp() {	Descriptor
...	
dependent_slice_enabled_flag	u(1)
tiles_or_entropy_coding_sync_idc	u(2)
if(tiles_or_entropy_coding_sync_idc == 1) {	
...	u(1)
} else if(tiles_or_entropy_coding_sync_idc == 3)	
cabac_independent_flag	u(1)
...	
}	

- Entropy slice is only enabled when dependent slice enabled flag == 1, tiles or entropy coding sync idc == 3 and cabac independent flag == 1
- Within coded pictures referring to the picture parameter set,
 - Dependent slice **can** be used with either WPP or tile
 - Dependent slice **cannot** be used with entropy slice

Motivation

❖ Parallel processing tools

- Entropy slice, WPP and tile are similar as regards parallel processing tool
- However, dependent slice can be enabled with only parts of those tools or without those tools
- It is proposed to have either of followings:
 - Extend the usage of dependent slice to be used with entropy slice for consistency
 - Restrict the usage of dependent slice to be used only with WPP for simplification

dependent_slice_enabled_flag

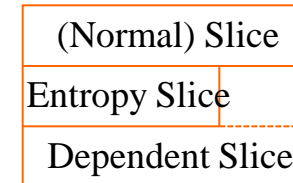
- ❖ Conditional coding of dependent_slice_enabled_flag
 - The current semantics indicates the presence or absence of dependent_slice_flag in the slice header. And when tiles_or_entropy_coding_sync_idc is equal to 3, the value of dependent slice enabled flag shall be equal to 1.
 - It is proposed to modify dependent_slice_enabled_flag coding order to be signaled after checking tiles_or_entropy_coding_sync_idc to impose it implicitly.

pic_parameter_set_rbsp() {	Descriptor
...	
dependent_slice_enabled_flag	u(1)
tiles_or_entropy_coding_sync_idc	u(2)
if(tiles_or_entropy_coding_sync_idc != 3)	
dependent_slice_enabled_flag	u(1)
if(tiles_or_entropy_coding_sync_idc == 1) {	
...	u(1)
} else if(tiles_or_entropy_coding_sync_idc == 3)	
cabac_independent_flag	u(1)
...	
}	

Extended usage of dependent slice

❖ Extended usage of dependent slice

- Technically, dependent slice also can be used with entropy slice in a picture like with WPP and tile
 - For example, a picture can contain three slices where the first slice is normal slice, the second slice is entropy slice and the third slice is dependent slice.
- For consistency, it is proposed to enable dependent slice extensively as follows:
 - Entropy slice, tile and WPP cannot be used concurrently
 - Dependent slice can be used with either entropy slice, tile or WPP
- The proposed syntax change is to move `cabac_independent_flag` from PPS to slice_header so as to enable slice to be entropy slice or dependent slice (or a normal slice) in a picture



pic_parameter_set_rbsp() {
...
dependent_slice_enabled_flag
tiles_or_entropy_coding_sync_idc
if(tiles_or_entropy_coding_sync_idc == 1) {
...
— } else if(tiles_or_entropy_coding_sync_idc == 3)
— cabac_independent_flag
...
}



slice_header() {
first_slice_in_pic_flag
pic_parameter_set_id
if(!first_slice_in_pic_flag)
slice_address
if(dependent_slice_enabled_flag && !first_slice_in_pic_flag)
dependent_slice_flag
if(dependent_slice_flag && tiles_or_entropy_coding_sync_idc == 3)
cabac_independent_flag
if(!dependent_slice_flag) {
...
}

Restricted usage of dependent slice (1)

❖ Restricted usage of dependent slice

- The motivation of dependent slices is to enable low delay coding for WPP
- Unless it is found that there are useful cases when dependent slice is enabled with tiles (or without any of parallel processing tools), it is proposed to restrict dependent slice on WPP by the proposed syntax modification
- In the proposed syntax,

	tiles_or_entropy_coding_sync_idc	dependent_slice_flag
Dependent slice	2 (WPP)	1
Entropy slice	3	1

Restricted usage of dependent slice (2)

❖ Restricted usage of dependent slice (Cont'd)

pic_parameter_set_rbsp() {
...
— dependent_slice_enabled_flag
tiles_or_entropy_coding_sync_idc
if(tiles_or_entropy_coding_sync_idc == 1) {
...
} else if(tiles_or_entropy_coding_sync_idc == 3)
— cabac_independent_flag
...
}

- By restriction of the usage, two syntax are removed in PPS
- **dependent_slice_flag** indicates either entropy slice or dependent slice
- and it is decided upon **tiles_or_entropy_coding_sync_idc**

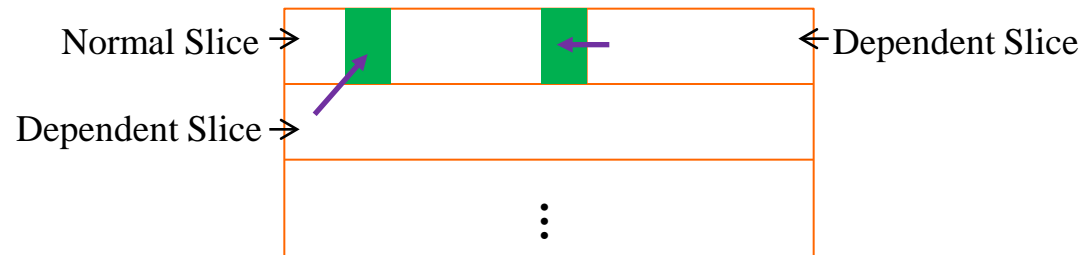
slice_header() {
first_slice_in_pic_flag
pic_parameter_set_id
if(!first_slice_in_pic_flag)
slice_address
— if(dependent_slice_enabled_flag && !first_slice_in_pic_flag)
if((tiles_or_entropy_coding_sync_idc == 2 tiles_or_entropy_coding_sync_idc == 3) && !first_slice_in_pic_flag)
dependent_slice_flag
if(!dependent_slice_flag) {
...
}

Restricted usage of dependent slice (3)

❖ Restricted starting position of dependent slice

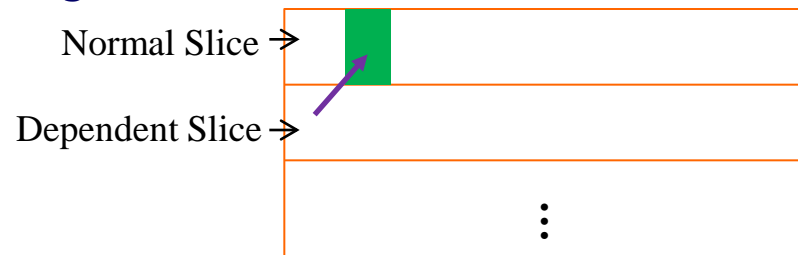
- If dependent slice is further restricted to be able to start only at the first CTB of CTB lines (i.e. $CtbAddrRS \% PicWidthInCtbs$ is equal to 0), the memorization process (or the initialization process) of the CABAC also can be simplified
- (Although the current WD doesn't specify the memorization process required for the normal slice,) the memorization process to store the CABAC status is required even for normal slice at the end of slice because it is required for the initialization process of the next slice if the next slice is dependent slice

For the example
of WPP with
dependent slice



- If dependent slice always starts at the first CTB of CTB lines, the specialized memorization process and initialization process for dependent slice are not needed and it is enough to follow those of WPP

For the example
of WPP with
dependent slice
starting at the
first CTB in lines



Summary

❖ Dependent slices

- For newly adopted dependent slice, the syntax modification is proposed either to extend the usability or restrict the usability
- If the current specification is maintained or extended for dependent slice usage, it is also proposed to have conditional coding of `dependent_slice_enabled_flag`
- If the current specification is restricted for dependent slice usage, it is also proposed to restrict the starting position of dependent slice

Thank you !