

# JCTVC-J0074

## AHG10 Hooks for Scalable Coding: Sequence Parameter Set Design

# Problem Setting (1)

1. Extending H.264/AVC, SVC, and MVC with new scalability types, such as depth views, has been and is complicated due to:

- a. Different sets of HRD parameters are needed depending on the interpretation of the NAL unit types to either VCL or non-VCL NAL units, because:
  - NAL unit types are considered VCL or non-VCL NAL units depending on the profile in use
  - The HRD makes a difference between the VCL and non-VCL NAL units in its operation
- b. The sub-bitstream extraction process(es) ignore any future scalable extensions.
  - In SVC and MVC there are syntax elements specified on the basis of the sub-bitstream extraction process of H.264/AVC Annex G and Annex H, respectively
  - E.g. sub-bitstream extraction of H.264/AVC Annex H leaves coded depth views (of H.264/AVC PDAM2) intact even if they would be subject to extraction based on view\_id and temporal\_id

More details in [JCT2-A0002](#).

# Problem Setting (2)

2. A different sequence parameter set is needed even if very few syntax element values (e.g. only profile and level indications) change between layers (in SVC) or views (in MVC)
  - JCTVC-I0535: “typically at least around 300 bits per SPS, and potentially more, is introduced”
3. Addition of a layer/view to an existing bitstream requires re-writing of SPSes
4. Sub-bitstream extraction does not remove or rewrite SPSes, i.e. extracted bitstream subsets may contain information that concerns layers no longer present in the bitstream.

# Proposals

1. Reserve a few NAL unit type values specifically for VCL NAL units.
2. Sub-bitstream extraction process for HEVC version 1 with `temporal_id` **and a set of reserved\_one\_5bits values** as inputs.
3. Sequence parameter set RBSP may use `temporal_id` greater than 0 to convey proper profile and level information and HRD parameters for `temporal_id`-based bitstream subsets.
4. Sequence parameter set syntax and semantics are modified to allow copying syntax elements other than profile and level indications from another sequence parameter set of the same `seq_parameter_set_id`.
5. The HRD parameters for conformance are taken from the sequence parameter set of the highest layer (even if that highest layer were not decoded).

# Proposal 1

Proposal 1: Reserve a few NAL unit type values specifically for VCL NAL units

Motivation:

- Enable introduction of new VCL NAL unit types in future extensions
- Avoid classification of NAL unit type values to VCL NAL units and non-VCL NAL units differently depending on the profile in use
- Allow a single set of HRD parameters to be signalled regardless of which profile the decoder conforms to

# Proposal 2

Proposal 2: Sub-bitstream extraction process for HEVC version 1 with temporal\_id and a set of reserved\_one\_5bits values as inputs

Motivation:

- Sub-bitstream extraction process can remain unchanged in all scalable extensions
- Syntax elements the semantics of which depend on sub-bitstream extraction, such as HRD parameters, can be specified in a manner where no changes between version 1 and scalable extensions would be needed

# Proposal 3

Proposal 3: Sequence parameter set RBSP may use temporal\_id greater than 0 to convey proper profile and level information and HRD parameters for temporal\_id-based bitstream subsets.

- SPS NAL units can have temporal\_id value greater than 0

Motivation:

- Enable addition of temporal layers to an existing bitstreams
- Sub-bitstream extraction with temporal\_id as input removes SPS NAL units that are no longer referred in the resulting bitstream subset

# Proposal 4

Proposal 4: Sequence parameter set syntax and semantics are modified to allow copying syntax elements other than profile and level indications from another sequence parameter set of the same seq\_parameter\_set\_id

Motivation:

- Reduction of bits spent for layer/view specific SPSeS



# Proposal 4 - Details

seq_parameter_set_rbsp() {
profile_space
profile_idc
constraint_flags
level_idc
for(i = 0; i < 32; i++)
profile_compatibility_flag[ i ]
seq_parameter_set_id
if( reserved_one_5bits != 1 && !temporal_id ) {
short_sps_flag
if( short_sps_flag )
src_layer_id_plus1
}
if( !short_sps_flag ) {
video_parameter_set_id
chroma_format_idc
...

- “Prediction” source
  - SPS having the same sps\_id
    - a single PPS can therefore refer to different SPSes
    - association of SPSes with each other can be done based on sps\_id – easy for middle-boxes
  - For other than temporal layers, the source layer\_id is indicated
  - For temporal layers, the source is the SPS of the same layer\_id with temporal\_id 0

# Proposal 5

Proposal 5: The HRD parameters for conformance are taken from the sequence parameter set of the highest layer (even if that highest layer were not decoded).

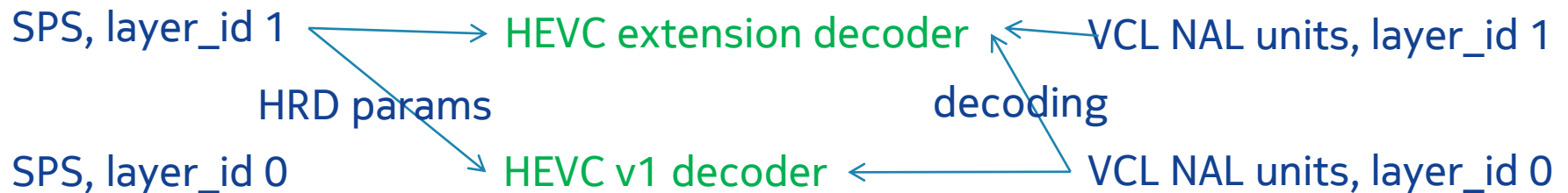
## Motivation:

- As HEVC v1 and scalable extensions classify NAL unit types to VCL and non-VCL NAL units identically, no different sets of HRD parameters needed
- There may be "scalable extension" NAL units (with `reserved_one_5bits > 0`) in the bitstream that HEVC v1 ignores but which affect the HRD operation
- HRD parameters remain correct through sub-bitstream extraction if they only concern the sub-bitstream for which the containing SPS is the highest active one

# Proposal 5

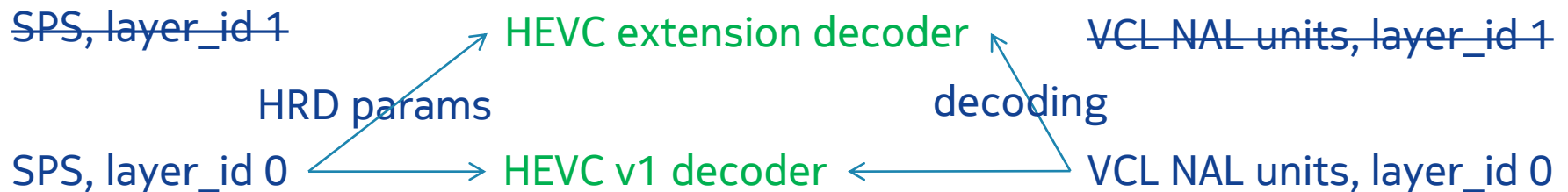
## Illustration of the Source of Valid HRD Parameters

Decoding of scalable bitstream:



Decoding of "base-layer" sub-bitstream:

(data with strikethrough have been removed in sub-bitstream extraction)



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