

CLAIMS

What is claimed is:

1. A method implemented in a decoder, the method comprising:
receiving, by a receiver of the decoder, a bitstream comprising one or more layers and a scalable nesting supplemental enhancement information (SEI) message in a current SEI network abstraction layer (NAL) unit, wherein the scalable nesting SEI message contains one or more scalable-nested SEI messages and one or more scalable nesting layer identifiers (Ids) that specify layer Id values of the layers to which the scalable-nested SEI messages apply except a layer Id value of the current SEI NAL unit;
decoding, by a processor of the decoder, a coded picture from the one or more layers to produce a decoded picture; and
forwarding, by the processor, the decoded picture for display as part of a decoded video sequence.
2. The method of claim 1, wherein the scalable nesting layer Ids are a scalable nesting layer_id[i] syntax element that specifies a NAL unit header layer Id (nuh_layer_id) value of an i-th layer to which the scalable-nested SEI messages apply when a scalable nesting all layers flag (all_layers_flag) is equal to zero.
3. The method of any of claims 1-2, wherein each value of scalable nesting layer_id[i] is greater than a nuh_layer_id value of the current SEI NAL unit.
4. The method of any of claims 1-3, further comprising deriving, by the processor, a number of nesting layers (nestingNumLayers) variable that specifies a number of layers to which the scalable-nested SEI messages apply.
5. The method of any of claims 1-4, further comprising deriving, by the processor, a list of nesting layer Ids (NestingLayerId[i]) that specifies a list of nuh_layer_id values of the layers to which the scalable-nested SEI messages apply for i in a range of zero to nestingNumLayers minus one, inclusive.

6. The method of any of claims 1-5, wherein the nestingNumLayers and the NestingLayerId[i] are derived as follows:

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if( scalable nesting all_layers_flag ) {
    nestingNumLayers = vps_max_layers_minus1 + 1 - GeneralLayerIdx[ nuh_layer_id ]
    for( i = 0; i < nestingNumLayers; i ++ )
        NestingLayerId[ i ] = vps_layer_id[ GeneralLayerIdx[ nuh_layer_id ] + i ]
} else {
    nestingNumLayers = scalable nesting num_layers_minus1 + 1
    for( i = 0; i < nestingNumLayers; i ++ )
        NestingLayerId[ i ] = ( i == 0 ) ? nuh_layer_id : scalable nesting layer_id[ i ]
}

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where scalable nesting all_layers_flag specifies whether the scalable-nested SEI messages apply to all layers, vps_max_layers_minus1 plus one specifies a number of layers specified by a video parameter set (VPS), GeneralLayerIdx is a variable specifying a layer index of a layer with nuh_layer_id equal to vps_layer_id[i], vps_layer_id[i] specifies a nuh_layer_id value of an i-th layer, and scalable nesting num_layers_minus1 plus one specifies a number of layers to which the scalable-nested SEI messages apply.

7. The method of any of claims 1-6, wherein scalable nesting num_layers_minus1 is in a range of zero to vps_max_layers_minus1 - GeneralLayerIdx[nuh_layer_id], inclusive, where nuh_layer_id is the nuh_layer_id of the current SEI NAL unit.

8. The method of any of claims 1-7, wherein the coded picture is decoded based on the scalable nested SEI messages.

9. The method of any of claims 1-8, wherein the scalable nesting SEI message includes at least one scalable-nested SEI message that applies to a layer of the current SEI NAL unit.

10. A method implemented in an encoder, the method comprising:
 encoding, by a processor of the encoder, a bitstream comprising one or more layers;
 encoding into the bitstream, by the processor, a scalable nesting supplemental enhancement information (SEI) message in a current SEI network abstraction layer (NAL) unit, wherein the scalable nesting SEI message contains one or more scalable-nested SEI messages and one or more scalable nesting layer identifiers (Ids) that specify layer Id values

of the layers to which the scalable-nested SEI messages apply while applying a constraint to omit a layer Id value of the current SEI NAL unit;

performing, by the processor, a set of bitstream conformance tests on the layers based on the scalable-nested SEI messages; and

storing, by a memory coupled to the processor, the bitstream for communication toward a decoder.

11. The method of claim 10, wherein the scalable nesting layer Id is a scalable nesting layer_id[i] syntax element that specifies a NAL unit header layer Id (nuh_layer_id) value of an i-th layer to which the scalable-nested SEI messages apply when a scalable nesting all layers flag (all_layers_flag) is equal to zero.

12. The method of any of claims 10-11, wherein each value of scalable nesting layer_id[i] is greater than a nuh_layer_id value of the current SEI NAL unit.

13. The method of any of claims 10-12, wherein performing the set of bitstream conformance tests further comprises deriving a number of nesting layers (nestingNumLayers) variable that specifies a number of layers to which the scalable-nested SEI messages apply.

14. The method of any of claims 10-13, wherein performing the set of bitstream conformance tests further comprises deriving a list of nesting layer Ids (NestingLayerId[i]) that specifies a list of nuh_layer_id values of the layers to which the scalable-nested SEI messages apply for i in a range of zero to nestingNumLayers minus one, inclusive.

15. The method of any of claims 10-14, wherein the nestingNumLayers and the NestingLayerId[i] are derived as follows:

```
if( scalable nesting all_layers_flag ) {
    nestingNumLayers = vps_max_layers_minus1 + 1 - GeneralLayerIdx[ nuh_layer_id ]
    for( i = 0; i < nestingNumLayers; i ++ )
        NestingLayerId[ i ] = vps_layer_id[ GeneralLayerIdx[ nuh_layer_id ] + i ]
} else {
    nestingNumLayers = scalable nesting num_layers_minus1 + 1
    for( i = 0; i < nestingNumLayers; i ++ )
```

NestingLayerId[i] = (i == 0) ? nuh_layer_id : scalable nesting layer_id[i]
 }

where scalable nesting all_layers_flag specifies whether the scalable-nested SEI messages apply to all layers, vps_max_layers_minus1 plus one specifies a number of layers specified by a video parameter set (VPS), GeneralLayerIdx is a variable specifying a layer index of a layer with nuh_layer_id equal to vps_layer_id[i], vps_layer_id[i] specifies a nuh_layer_id value of an i-th layer, and scalable nesting num_layers_minus1 plus one specifies a number of layers to which the scalable-nested SEI messages apply.

16. The method of any of claims 10-15, wherein scalable nesting num_layers_minus1 is in a range of zero to vps_max_layers_minus1 – GeneralLayerIdx[nuh_layer_id], inclusive, where nuh_layer_id is the nuh_layer_id of the current SEI NAL unit.

17. The method of any of claims 10-16, wherein the scalable nesting SEI message includes at least one scalable-nested SEI message that applies to a layer of the current SEI NAL unit.

18. A video coding device comprising:

a processor, a receiver coupled to the processor, a memory coupled to the processor, and a transmitter coupled to the processor, wherein the processor, receiver, memory, and transmitter are configured to perform the method of any of claims 1-17.

19. A non-transitory computer readable medium comprising a computer program product for use by a video coding device, the computer program product comprising computer executable instructions stored on the non-transitory computer readable medium such that when executed by a processor cause the video coding device to perform the method of any of claims 1-17.

20. A decoder comprising:

a receiving means for receiving a bitstream comprising one or more layers and a scalable nesting supplemental enhancement information (SEI) message in a current SEI network abstraction layer (NAL) unit, wherein the scalable nesting SEI message contains one or more scalable-nested SEI messages and one or more scalable nesting layer identifiers (Ids) that specify layer Id values of the layers to which the scalable-nested SEI messages apply except a layer Id value of the current SEI NAL unit;

a decoding means for decoding a coded picture from the one or more layers to produce a decoded picture; and

a forwarding means for forwarding the decoded picture for display as part of a decoded video sequence.

21. The decoder of claim 20, wherein the decoder is further configured to perform the method of any of claims 1-9.

22. An encoder comprising:

an encoding means for:

encoding a bitstream comprising one or more layers; and

encoding into the bitstream a scalable nesting supplemental enhancement information (SEI) message in a current SEI network abstraction layer (NAL) unit, wherein the scalable nesting SEI message contains one or more scalable-nested SEI messages and one or more scalable nesting layer identifiers (Ids) that specify layer Id values of the layers to which the scalable-nested SEI messages apply while applying a constraint to omit a layer Id value of the current SEI NAL unit;

a hypothetical reference decoder (HRD) means for performing a set of bitstream conformance tests on the layers based on the scalable-nested SEI messages; and

a storing means for storing the bitstream for communication toward a decoder.

23. The encoder of claim 22, wherein the encoder is further configured to perform the method of any of claims 10-17.