

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 scalable-nested SEI messages and a scalable nesting all layers flag (`all_layers_flag`) that specifies whether the scalable-nested SEI messages apply to all layers that have a layer identifier (Id) that is greater than or equal to a layer Id 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 `all_layers_flag` equals one when specifying that the scalable-nested SEI messages apply to all layers that have a NAL unit header layer Id (`nuh_layer_id`) greater than or equal to a `nuh_layer_id` of the current SEI NAL unit.
3. The method of any of claims 1-2, wherein the scalable nesting `all_layers_flag` equals zero when specifying that the scalable-nested SEI messages might or might not apply to all layers that have a `nuh_layer_id` greater than or equal to a `nuh_layer_id` 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:

```

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 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, scalable nesting num_layers_minus1 plus one specifies a number of layers to which the scalable-nested SEI messages apply, and scalable nesting layer_id[i] specifies a nuh_layer_id value of an i-th layer to which the scalable-nested SEI messages apply.

7. The method of any of claims 1-6, wherein the scalable nesting SEI message provides a mechanism to associate SEI messages with specific layers.

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

9. 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 scalable-nested SEI messages and a scalable nesting all layers flag (all_layers_flag) that specifies whether the scalable-nested SEI messages apply to all layers that have a layer identifier (Id) that is greater than or equal to a layer Id 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.

10. The method of claim 9, further comprising setting the scalable nesting all_layers_flag equal to one when specifying that the scalable-nested SEI messages apply to all layers that have a NAL unit header layer Id (nuh_layer_id) greater than or equal to a nuh_layer_id of the current SEI NAL unit.

11. The method of any of claims 9-10, further comprising setting the scalable nesting all_layers_flag equal to zero when specifying that the scalable-nested SEI messages might or might not apply to all layers that have a nuh_layer_id greater than or equal to a nuh_layer_id of the current SEI NAL unit.

12. The method of any of claims 9-11, 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.

13. The method of any of claims 9-12, 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.

14. The method of any of claims 9-13, 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 `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, scalable nesting `num_layers_minus1` plus one specifies a number of layers to which the scalable-nested SEI messages apply, and `scalable_nesting_layer_id[i]` specifies a `nuh_layer_id` value of an *i*-th layer to which the scalable-nested SEI messages apply.

15. The method of any of claims 9-14, wherein the scalable nesting SEI message provides a mechanism to associate SEI messages with specific layers.

16. 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 1-15.

17. 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 1-15.

18. 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 scalable-nested SEI messages and a scalable nesting all layers flag (`all_layers_flag`) that specifies whether the scalable-nested SEI messages apply to all layers that have a layer identifier (Id) that is greater than or equal to a layer Id 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.

19. The decoder of claim 18, wherein the decoder is further configured to perform the method of any of claims 1-8.
20. 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 scalable-nested SEI messages and a scalable nesting all layers flag (`all_layers_flag`) that specifies whether the scalable-nested SEI messages apply to all layers that have a layer identifier (`Id`) that is greater than or equal to a layer `Id` 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.
21. The encoder of claim 20, wherein the encoder is further configured to perform the method of any of claims 9-15.