CLAIMS

What is claimed is:

1. A method implemented by a decoder, the method comprising:

receiving, by a receiver of the decoder, a bitstream comprising a picture parameter set (PPS) in a PPS network abstraction layer (NAL) unit and a coded picture comprising a set of video coding layer (VCL) NAL units, wherein a particular VCL NAL unit does not refer to the PPS NAL unit unless a value of a NAL unit header layer identifier (nuh_layer_id) of the PPS NAL unit is less than or equal to a value of a nuh_layer_id of the particular VCL NAL unit; and

decoding, by a processor of the decoder, the coded picture from the set of VCL NAL units based on the PPS in the PPS NAL unit to produce a decoded picture when the value of the nuh_layer_id of the PPS NAL unit is less than or equal to the value of the nuh_layer_id of the particular VCL NAL unit;

wherein the particular VCL NAL unit comprises a slice of the coded picture and a header containing data elements pertaining to the slice, and wherein the header specifies an APS identifier (ID) of the APS.

2. The method of claim 1, wherein the bitstream further comprises an adaptation parameter set (APS) in an APS NAL unit, and wherein the particular VCL NAL unit does not refer to the APS NAL unit unless a value of a nuh_layer_id of the APS NAL unit is less than or equal to the value of the nuh_layer_id of the particular VCL NAL unit.

3. The method of claim 1, wherein the particular VCL NAL unit comprises a slice of the coded picture, wherein the slice is associated with a header that contains syntax elements that apply to the slice of the coded picture, and wherein the header specifies a PPS ID of the PPS.

4. The method of claim 1, wherein the bitstream is a result of a sub-bitstream extraction process that removes NAL units from the bitstream based on nuh_layer_id value.

5. The method of claim 1, wherein the set of VCL NAL units are part of a layer when the set of VCL NAL units all have a particular value of nuh_layer_id.

6. The method of claim 1, wherein the layer includes non-VCL NAL units that are associated with the set of VCL NAL units that all have a particular value of nuh_layer_id.

7. The method of claim 1, further comprising:

receiving, by the decoder, a second bitstream comprising a second PPS in a second PPS NAL unit and a second coded picture comprising a second set of VCL NAL units, wherein a second VCL NAL unit refers to the second PPS NAL unit with a value of a nuh_layer_id of the second PPS NAL unit is not less than or equal to a value of a nuh_layer_id of the second VCL NAL unit; and

receiving a conforming bitstream corresponding to the second bitstream by taking corrective measures prior to decoding the coded picture from the second set of VCL NAL units.

8. A non-transitory computer-readable medium storing computer instructions that when executed by at least one hardware processors, cause the at least one hardware processors to perform the method of any one of claims 1 to 7.

9. A decoding device, comprising:

a receiver configured to receive a bitstream comprising a picture parameter set (PPS) in a PPS network abstraction layer (NAL) unit and a coded picture comprising a set of video coding layer (VCL) NAL units, wherein a particular VCL NAL unit does not refer to the PPS NAL unit unless a value of a NAL unit header layer identifier (nuh_layer_id) of the PPS NAL unit is less than or equal to a value of a nuh_layer_id of the particular VCL NAL unit;

a memory coupled to the receiver, the memory storing instructions; and

a processor coupled to the memory, the processor configured to execute the instructions to cause the decoding device to perform the method according to any one of claims 1 to 7.

10. A method implemented by an encoder, the method comprising:

generating, by a processor of the encoder, a bitstream comprising a picture parameter set (PPS) in a PPS network abstraction layer (NAL) unit and a coded picture comprising a set of video coding layer (VCL) NAL units, wherein a particular VCL NAL unit is configured such that it does not refer to the PPS NAL unit unless a value of a NAL unit header layer identifier (nuh_layer_id) of the PPS NAL unit is less than or equal to a value of a nuh_layer_id of the particular VCL NAL unit; and

inserting, by the encoder, in the particular VCL NAL unit, a header containing data elements pertaining to a slice of the coded picture, the header specifying an adaptive parameter set (APS) identifier (ID) of the APS; wherein the coded picture is configured to be decodable from the set of VCL NAL units based on the PPS in the PPS NAL unit when the value of the nuh_layer_id of the PPS NAL unit is less than or equal to the value of the nuh_layer_id of the particular VCL NAL unit.

11. The method of claim 10, wherein the bitstream further comprises an adaptation parameter set (APS) in an APS NAL unit, and wherein the particular VCL NAL unit does not refer to the APS NAL unit unless a value of a nuh_layer_id of the APS NAL unit is less than or equal to the value of the nuh_layer_id of the particular VCL NAL unit.

12. The method of claim 10, wherein the particular VCL NAL unit comprises a slice of the coded picture, wherein the slice is associated with a header that contains syntax elements that apply to the slice of the coded picture, and wherein the header specifies a PPS ID of the PPS.

13. The method of claim 10, wherein the bitstream is a result of a sub-bitstream extraction process that removes NAL units from the bitstream based on nuh_layer_id value.

14. The method of claim 10, wherein the set of VCL NAL units are part of a layer when the set of VCL NAL units all have a particular value of nuh_layer_id.

15. The method of claim 10, wherein the layer includes non-VCL NAL units that are associated with the set of VCL NAL units that all have a particular value of nuh_layer_id.

16. The method of claim 10, further comprising:

generating a second bitstream comprising a second picture parameter set (PPS) in a second PPS network abstraction layer (NAL) unit and a second coded picture comprising a second set of video coding layer (VCL) NAL units, wherein a second VCL NAL unit refers to the second PPS NAL unit while a value of a NAL unit header layer identifier (nuh_layer_id) of the second PPS NAL unit is not less than or equal to a value of a nuh_layer_id of the second VCL NAL unit; and

taking corrective measures to generate a conforming bitstream corresponding to the second bitstream prior to outputting the second bitstream.17. An encoding device, comprising:

a processor;

a memory coupled to the processor, the memory storing instructions; and

an output interface configured to output a bitstream comprising a picture parameter set (PPS) in a PPS network abstraction layer (NAL) unit and a coded picture comprising a set of video coding layer (VCL) NAL units, wherein the processor is configured to execute the instructions to cause the encoding device to perform the method according to any one of claims 10 to 16.

18. A non-transitory computer-readable storage medium storing a bitstream generated according to the method of any one of claims 1 to 7 and decodable according to the method of any one of claims 10 to 16.