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 coded picture and a current supplemental enhancement information (SEI) message that comprises a decoding unit (DU) hypothetical reference decoder (HRD) parameters present flag (du_hrd_params_present_flag) that specifies whether DU level HRD parameters are present in the bitstream, wherein the current SEI message is a Buffering Period (BP) SEI message;

wherein the coded picture is contained in one or more video coding layer (VCL) network abstraction layer (NAL) units, the BP SEI message is contained in an SEI NAL unit, the SEI NAL unit is an non-VCL NAL unit; the BP SEI message is contained in a scalable nesting SEI message, the BP SEI message has an payloadType equal to zero, and the SEI NAL unit containing the scalable nesting SEI message has a nal_unit_type set equal to PREFIX_SEI_NUT; and a TemporalId of the non-VCL NAL unit with nal_unit_type equal to PREFIX_SEI_NUT is equal to a TemporalId of an access unit containing the non-VCL NAL unit; and

decoding, by a processor of the decoder, the coded picture to produce a decoded picture.

2. The method of claim 1, wherein the du_hrd_params_present_flag further specifies whether a HRD operates at an access unit (AU) level or a DU level.

3. The method of any of claims 1-2, wherein the du_hrd_params_present_flag is set to one when specifying that DU level HRD parameters are present and the HRD can be operated at the AU level or the DU level, and wherein the du_hrd_params_present_flag is set to zero when specifying that DU level HRD parameters are not present and the HRD operates at the AU level.

4. The method of any of claims 1-3, wherein the current SEI message further comprises a DU coded picture buffer (CPB) parameters in picture timing (PT) SEI flag (du_cpb_params_in_pic_timing_sei_flag) that specifies whether DU level CPB removal delay parameters are present in a PT SEI message.

5. The method of any of claims 1-4, wherein the du_cpb_params_in_pic_timing_sei_flag further specifies whether DU level CPB removal delay parameters are present in a decoding unit information (DUI) SEI message.

6. The method of any of claims 1-5, wherein the du_cpb_params_in_pic_timing_sei_flag is set to one when specifying that that DU level CPB removal delay parameters are present in a PT SEI message and no DUI SEI message is available, and wherein the du_cpb_params_in_pic_timing_sei_flag is set to zero when specifying that DU level CPB removal delay parameters are present in a DUI SEI message and PT SEI messages do not include DU level CPB removal delay parameters.

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

encoding, by a processor of the encoder, a coded picture into a bitstream;

encoding into the bitstream, by the processor, a current supplemental enhancement information (SEI) message that comprises a decoding unit (DU) hypothetical reference decoder (HRD) parameters present flag (du_hrd_params_present_flag) that specifies whether DU level HRD parameters are present in the bitstream, wherein the current SEI message is a Buffering Period (BP) SEI message;

wherein the coded picture is contained in one or more video coding layer (VCL) network abstraction layer (NAL) units, the BP SEI message is contained in an SEI NAL unit, the SEI NAL unit is an non-VCL NAL unit; the BP SEI message is contained in a scalable nesting SEI message, the BP SEI message has an payloadType equal to zero, and the SEI NAL unit containing the scalable nesting SEI message has a nal_unit_type set equal to PREFIX_SEI_NUT; and a TemporalId of the non-VCL NAL unit with nal_unit_type equal to PREFIX_SEI_NUT is equal to a TemporalId of an access unit containing the non-VCL NAL unit;

performing, by the processor, a set of bitstream conformance tests on the bitstream based on the current SEI message.

8. The method of claim 7, wherein the du_hrd_params_present_flag further specifies whether a HRD operates at an access unit (AU) level or a DU level.

9. The method of any of claims 7-8, wherein the du_hrd_params_present_flag is set to one when specifying that DU level HRD parameters are present and the HRD can be operated

at the AU level or the DU level, and wherein the du_hrd_params_present_flag is set to zero when specifying that DU level HRD parameters are not present and the HRD operates at the AU level.

10. The method of any of claims 7-9, wherein the current SEI message further comprises a DU coded picture buffer (CPB) parameters in picture timing (PT) SEI flag (du_cpb_params_in_pic_timing_sei_flag) that specifies whether DU level CPB removal delay parameters are present in a PT SEI message.

11. The method of any of claims 7-10, wherein the du_cpb_params_in_pic_timing_sei_flag further specifies whether DU level CPB removal delay parameters are present in a decoding unit information (DUI) SEI message.

12. The method of any of claims 7-11, wherein the du_cpb_params_in_pic_timing_sei_flag is set to one when specifying that that DU level CPB removal delay parameters are present in a PT SEI message and no DUI SEI message is available, and wherein the du_cpb_params_in_pic_timing_sei_flag is set to zero when specifying that DU level CPB removal delay parameters are present in a DUI SEI message and PT SEI messages do not include DU level CPB removal delay parameters.

13. 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 1-12.

14. 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 1-12.

15. A decoder comprising:

a receiving means for receiving a bitstream comprising a coded picture and a current supplemental enhancement information (SEI) message that comprises a decoding unit (DU)

hypothetical reference decoder (HRD) parameters present flag (du_hrd_params_present_flag) that specifies whether DU level HRD parameters are present in the bitstream, wherein the current SEI message is a Buffering Period (BP) SEI message;

wherein the coded picture is contained in one or more video coding layer (VCL) network abstraction layer (NAL) units, the BP SEI message is contained in an SEI NAL unit, the SEI NAL unit is an non-VCL NAL unit; the BP SEI message is contained in a scalable nesting SEI message, the BP SEI message has an payloadType equal to zero, and the SEI NAL unit containing the scalable nesting SEI message has a nal_unit_type set equal to PREFIX_SEI_NUT; and a TemporalId of the non-VCL NAL unit with nal_unit_type equal to PREFIX_SEI_NUT is equal to a TemporalId of an access unit containing the non-VCL NAL unit; and

a decoding means for decoding the coded picture to produce a decoded picture.

16. The decoder of claim 15, wherein the du_hrd_params_present_flag further specifies whether a HRD operates at an access unit, AU, level or a DU level.

17. The decoder of claim 15 or 16, wherein the du_hrd_params_present_flag is set to one when specifying that DU level HRD parameters are present and the HRD can be operated at the AU level or the DU level, and wherein the du_hrd_params_present_flag is set to zero when specifying that DU level HRD parameters are not present and the HRD operates at the AU level.

18. The decoder of any of claims 15-17, wherein the current SEI message further comprises a DU coded picture buffer, CPB, parameters in picture timing, PT, SEI flag, du_cpb_params_in_pic_timing_sei_flag, that specifies whether DU level CPB removal delay parameters are present in a PT SEI message.

19. The decoder of any of claims 15-18, wherein the du_cpb_params_in_pic_timing_sei_flag further specifies whether DU level CPB removal delay parameters are present in a decoding unit information, DUI, SEI message.

20. The decoder of any of claims 15-19, wherein the du_cpb_params_in_pic_timing_sei_flag is set to one when specifying that that DU level CPB removal delay parameters are present in a PT SEI message and no DUI SEI message is

available, and wherein the du_cpb_params_in_pic_timing_sei_flag is set to zero when specifying that DU level CPB removal delay parameters are present in a DUI SEI message and PT SEI messages do not include DU level CPB removal delay parameters.

21. An encoder comprising:

an encoding means for:

encoding a coded picture into a bitstream; and

encoding into the bitstream a current supplemental enhancement information (SEI) message that comprises a decoding unit (DU) hypothetical reference decoder (HRD) parameters present flag (du_hrd_params_present_flag) that specifies whether DU level HRD parameters are present in the bitstream, wherein the current SEI message is a Buffering Period (BP) SEI message;

wherein the coded picture is contained in one or more video coding layer (VCL) network abstraction layer (NAL) units, the BP SEI message is contained in an SEI NAL unit, the SEI NAL unit is an non-VCL NAL unit; the BP SEI message is contained in a scalable nesting SEI message, the BP SEI message has an payloadType equal to zero, and the SEI NAL unit containing the scalable nesting SEI message has a nal_unit_type set equal to PREFIX_SEI_NUT; and a TemporalId of the non-VCL NAL unit with nal_unit_type equal to PREFIX_SEI_NUT is equal to a TemporalId of an access unit containing the non-VCL NAL unit;

a hypothetical reference decoder (HRD) means for performing a set of bitstream conformance tests on the bitstream based on the current SEI message.

22. The encoder of claim 21, wherein the du_hrd_params_present_flag further specifies whether a HRD operates at an access unit, AU, level or a DU level.

23. The encoder of claim 21 or 22, wherein the du_hrd_params_present_flag is set to one when specifying that DU level HRD parameters are present and the HRD can be operated at the AU level or the DU level, and wherein the du_hrd_params_present_flag is set to zero when specifying that DU level HRD parameters are not present and the HRD operates at the AU level.

24. The encoder of any of claims 21-23, wherein the current SEI message further comprises a DU coded picture buffer, CPB, parameters in picture timing, PT, SEI flag,

du_cpb_params_in_pic_timing_sei_flag, that specifies whether DU level CPB removal delay parameters are present in a PT SEI message.

25. The encoder of any of claims 21-24, wherein the du_cpb_params_in_pic_timing_sei_flag further specifies whether DU level CPB removal delay parameters are present in a decoding unit information, DUI, SEI message.

26. The encoder of any of claims 21-25, wherein the du_cpb_params_in_pic_timing_sei_flag is set to one when specifying that that DU level CPB removal delay parameters are present in a PT SEI message and no DUI SEI message is available, and wherein the du_cpb_params_in_pic_timing_sei_flag is set to zero when specifying that DU level CPB removal delay parameters are present in a DUI SEI message and PT SEI messages do not include DU level CPB removal delay parameters.

27. A non-transitory storage medium storing an encoded bitstream for video signals, the encoded bitstream comprising a coded picture and a current supplemental enhancement information (SEI) message that comprises a decoding unit (DU) hypothetical reference decoder (HRD) parameters present flag (du_hrd_params_present_flag) that specifies whether DU level HRD parameters are present in the bitstream, wherein the current SEI message is a Buffering Period (BP) SEI message, wherein the coded picture is contained in one or more video coding layer (VCL) network abstraction layer (NAL) units, the BP SEI message is contained in an SEI NAL unit, the SEI NAL unit is an non-VCL NAL unit; the BP SEI message is contained in a scalable nesting SEI message, the BP SEI message has an payloadType equal to zero, and the SEI NAL unit containing the scalable nesting SEI message has a nal_unit_type set equal to PREFIX_SEI_NUT; and a TemporalId of the non-VCL NAL unit with nal_unit_type equal to PREFIX_SEI_NUT is equal to a TemporalId of an access unit containing the non-VCL NAL unit.

28. The non-transitory storage medium of claim 27, wherein the du_hrd_params_present_flag further specifies whether a HRD operates at an access unit, AU, level or a DU level.

29. The non-transitory storage medium of claim 27 or 28, wherein the du_hrd_params_present_flag is set to one when specifying that DU level HRD parameters are

present and the HRD can be operated at the AU level or the DU level, and wherein the du_hrd_params_present_flag is set to zero when specifying that DU level HRD parameters are not present and the HRD operates at the AU level.

30. The non-transitory storage medium of any of claims 27-29, wherein the current SEI message further comprises a DU coded picture buffer, CPB, parameters in picture timing, PT, SEI flag, du_cpb_params_in_pic_timing_sei_flag, that specifies whether DU level CPB removal delay parameters are present in a PT SEI message.

31. The non-transitory storage medium of any of claims 21-24, wherein the du_cpb_params_in_pic_timing_sei_flag further specifies whether DU level CPB removal delay parameters are present in a decoding unit information, DUI, SEI message.

32. The non-transitory storage medium of any of claims 21-25, wherein the du_cpb_params_in_pic_timing_sei_flag is set to one when specifying that that DU level CPB removal delay parameters are present in a PT SEI message and no DUI SEI message is available, and wherein the du_cpb_params_in_pic_timing_sei_flag is set to zero when specifying that DU level CPB removal delay parameters are present in a DUI SEI message and PT SEI messages do not include DU level CPB removal delay parameters.