

CLAIMS

What is claimed is:

1. A method of decoding implemented by a video decoder, comprising:
 - receiving, by the video decoder, a video bitstream including a plurality of layers having sublayers and a video parameter set (VPS) including a first flag having a first value, wherein the first flag having the first value specifies that a temporal identifier (ID) of a highest sublayer representation for level information, a temporal identifier (ID) of a highest sublayer representation for decoded picture buffer (DPB) parameters, and a temporal identifier (ID) of a highest sublayer representation for hypothetical decoder refresh (HRD) parameters are not present in the VPS and are inferred to be equal to a maximum number of the sublayers that may be present in a layer of the plurality of layers specified by the VPS;
 - obtaining, by the video decoder, the level information, the HRD parameters, and the DPB parameters corresponding to the temporal ID of the highest sublayer representation from the VPS; and
 - decoding, by the video decoder, a picture from one of the plurality of layers to obtain a decoded picture.
2. The method of claim 1, wherein the maximum number of sublayers is in a range of one to seven, and wherein the first value is one and the second value is zero.
3. The method of any of claims 1 to 2, wherein the level information is included in profile, tier, and level (PTL) parameters.
4. The method of any of claims 1 to 3, wherein the level information is present in an i-th `profile_tier_level()` syntax structure in the VPS.
5. The method of any of claims 1 to 4, wherein the DPB parameters are present in an i-th `dpb_parameters()` syntax structure in the VPS.

6. The method of any of claims 1 to 5, wherein the HRD parameters in an i-th `ols_timing_hrd_parameters()` syntax structure are in the VPS or a sequence parameter set (SPS).
7. The method of any of claims 1 to 6, wherein the picture is decoded using one or both of the level information and the DPB parameters.
8. The method of any of claims 1 to 7, wherein the picture is decoded without using the HRD parameters.
9. The method of any of claims 1 to 8, further comprising displaying the decoded picture on a display of an electronic device.
10. A method of encoding implemented by a video encoder, the method comprising:
 - generating, by the video encoder, a plurality of layers having sublayers and a video parameter set (VPS) including a first flag;
 - setting, by the video encoder, the first flag to a first value to specify that a temporal identifier (ID) of a highest sublayer representation for level information, a temporal identifier (ID) of a highest sublayer representation for decoded picture buffer (DPB) parameters, and a temporal identifier (ID) of a highest sublayer representation for hypothetical decoder refresh (HRD) parameters are not present in the VPS and should be inferred to be equal to a maximum number of the sublayers that may be present in a layer of the plurality of layers specified by the VPS;
 - encoding, by the video encoder, the plurality of layers and the VPS into a video bitstream; and
 - storing, by the video encoder, the video bitstream for communication toward a video decoder.
11. The method of claim 10, wherein the maximum number of sublayers is in a range of one to seven.

12. The method of any of claims 10 to 11, wherein the level information is included in profile, tier, and level (PTL) parameters.

13. The method of any of claims 10 to 12, wherein the level information is present in an i-th profile_tier_level() syntax structure in the VPS, the DPB parameters are present in an i-th dpb_parameters() syntax structure in the VPS, and the HRD parameters in an i-th ols_timing_hrd_parameters() syntax structure in the VPS or a sequence parameter set (SPS).

14. The method of any of claims 10 to 13, further comprising determining whether the video bitstream that was encoded is conforming using the HRD parameters.

15. A decoding device, comprising:

a receiver configured to receive a video bitstream including a plurality of layers having sublayers and a video parameter set (VPS) including a first flag having a first value, wherein the first flag having the first value specifies that a temporal identifier (ID) of a highest sublayer representation for level information, a temporal identifier (ID) of a highest sublayer representation for decoded picture buffer (DPB) parameters, and a temporal identifier (ID) of a highest sublayer representation for hypothetical decoder refresh (HRD) parameters are not present in the VPS and are inferred to be equal to a maximum number of the sublayers that may be present in a layer of the plurality of layers specified by the VPS; and

a processor coupled to the memory, the processor configured to execute the instructions to cause the decoding device to:

obtain the level information, the HRD parameters, and the DPB parameters corresponding to the temporal ID of the highest sublayer representation from the VPS; and

decode a picture from one of the plurality of layers to obtain a decoded picture.

16. The decoding device of claim 15, wherein the maximum number of sublayers is in a range of one to seven.

17. The decoding device of any of claims 15 to 16, wherein the level information is included in profile, tier, and level (PTL) parameters.
18. The decoding device of any of claims 15 to 17, wherein the level information is present in an i-th profile_tier_level() syntax structure in the VPS, the DPB parameters are present in an i-th dpb_parameters() syntax structure in the VPS, and the HRD parameters in an i-th ols_timing_hrd_parameters() syntax structure in the VPS or a sequence parameter set (SPS).
19. The decoding device of any of claims 15 to 18, wherein the picture is decoded using one or both of the level information and the DPB parameters.
20. The decoding device of any of claims 15 to 19, further comprising a display configured to display the decoded picture.
21. An encoding device, comprising:
a memory containing instructions;
a processor coupled to the memory, the processor configured to implement the instructions to cause the encoding device to:
generate a plurality of layers having sublayers and a video parameter set (VPS) including a first flag;
set the first flag to a first value to specify that a temporal identifier (ID) of a highest sublayer representation for level information, a temporal identifier (ID) of a highest sublayer representation for decoded picture buffer (DPB) parameters, a temporal identifier (ID) of a highest sublayer representation for and hypothetical decoder refresh (HRD) parameters is not present in the VPS and should be inferred to be equal to a maximum number of the sublayers that may be present in a layer of the plurality of layers specified by the VPS; and
encode the plurality of layers and the VPS into a video bitstream; and
a transmitter coupled to the processor, the transmitter configured to transmit the video bitstream toward a video decoder.

22. The encoding device of claim 21, wherein the maximum number of sublayers is in a range of one to seven.
23. The encoding device of any of claims 21 to 22, wherein the level information is included in profile, tier, and level (PTL) parameters.
24. The encoding device of any of claims 23 to 25, wherein the level information is present in an i-th `profile_tier_level()` syntax structure in the VPS, the DPB parameters are present in an i-th `dpb_parameters()` syntax structure in the VPS, and the HRD parameters in an i-th `ols_timing_hrd_parameters()` syntax structure in the VPS or a sequence parameter set (SPS).
25. A coding apparatus, comprising:
a receiver configured to receive a picture to encode or to receive a bitstream to decode;
a transmitter coupled to the receiver, the transmitter configured to transmit the bitstream to a decoder or to transmit a decoded image to a display;
a memory coupled to at least one of the receiver or the transmitter, the memory configured to store instructions; and
a processor coupled to the memory, the processor configured to execute the instructions stored in the memory to perform the method in any of claims 1 to 9 and any of claims 10 to 14.
26. The coding apparatus of claim 25, further comprising a display configured to display a decoded picture.
27. A system, comprising:
an encoder; and
a decoder in communication with the encoder, wherein the encoder or the decoder includes the decoding device, the encoding device, or the coding apparatus of any of claims 15 to 26.
28. A means for coding, comprising:
receiving means configured to receive a picture to encode or to receive a bitstream to decode;

transmission means coupled to the receiving means, the transmission means configured to transmit the bitstream to a decoding means or to transmit a decoded image to a display means;

storage means coupled to at least one of the receiving means or the transmission means, the storage means configured to store instructions; and

processing means coupled to the storage means, the processing means configured to execute the instructions stored in the storage means to perform the method in any of claims 1 to 9 and any of claims 10 to 14.