CLAIMS

What is claimed is:

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

receiving a bitstream comprising an output layer set (OLS) and a video parameter set (VPS), wherein the OLS includes one or more layers of coded pictures and the VPS includes an OLS mode identification code (ols_mode_idc);

wherein the ols_mode_idc equal to one specifies that a total number of OLSs specified by the VPS is equal to vps_max_layers_minus1 plus 1, the i-th OLS includes the layers with layer indices from zero to i, inclusive, and for each OLS, all layers in the each OLS are output layers; wherein the vps_max_layers_minus1 plus 1 specifies a maximum allowed number of layers in each coded video sequence (CVS) referring to the VPS;

determining the output layers based on the ols_mode_idc in the VPS; and

decoding a coded picture from the output layers to produce a decoded picture.

2. The method of claim 1, wherein the ols_mode_idc equal to 2 specifies that the total number of OLSs specified by the VPS is explicitly signaled.

3. The method any one of claims 1-2, wherein the VPS comprises an each_layer_is_an_ols_flag, wherein when the each_layer_is_an_ols_flag equal to one specifies that each output layer set contains only one layer; when the each_layer_is_an_ols_flag equal to zero specifies that at least one OLS contains more than one layer; when the vps_max_layers_minus1 is equal to zero, the value of the each_layer_is_an_ols_flag is inferred to be equal to one.

4. The method of any one of claims 1-3, wherein the VPS includes the vps_max_layers_minus1 that specifies the number of layers specified by the VPS, which is the maximum allowed number of layers in each CVS referring to the VPS.

5. The method of any one of claims 1-4, wherein a number of layers in an i-th OLS (NumLayersInOls[i]) and a network abstraction layer (NAL) unit header layer identifier (nuh_layer_id) value of a j-th layer in the i-th OLS (LayerIdInOLS[i][j]) are derived as follows:

```
NumLayersInOls[ 0 ] = 1
LayerIdInOls[ 0 ][ 0 ] = vps_layer_id[ 0 ]
for( i = 1, i < TotalNumOlss; i++ ) {
    if( each_layer_is_an_ols_flag ) {
        NumLayersInOls[ i ] = 1
        LayerIdInOls[ i ][ 0 ] = vps_layer_id[ i ]
    } else if( ols_mode_idc  = =  0  ||  ols_mode_idc  = =  1 ) {
        NumLayersInOls[ i ] = i + 1
        for( j = 0; j < NumLayersInOls[ i ]; j++ )
            LayerIdInOls[ i ][ j ] = vps_layer_id[ j ]
```

wherein the NumLayersInOls[i] represents the number of layers in the i-th OLS, the LayerIdInOLS[i][j] represents the nuh_layer_id value of the j-th layer in the i-th OLS, vps_layer_id[i] is an i-th VPS layer identifier, TotalNumOlss is a total number of OLSs specified by the VPS, and an each_layer_is_an_ols_flag is an each layer is an OLS flag that specifies whether at least one OLS contains more than one layer.

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

encoding a bitstream comprising one or more output layer sets (OLSs) including one or more layers of coded pictures;

encoding into the bitstream a video parameter set (VPS), wherein the VPS includes an output layer set (OLS) mode identification code (ols_mode_idc);

wherein the ols_mode_idc equal to one specifies that a total number of OLSs specified by the VPS is equal to vps_max_layers_minus1 plus 1, the i-th OLS includes the layers with layer indices from zero to i, inclusive, and for each OLS, all layers in the each OLS are output layers; wherein the vps_max_layers_minus1 plus 1 specifies a maximum allowed number of layers in each coded video sequence (CVS) referring to the VPS.

7. The method of claim 6, wherein the ols_mode_idc equal to 2 specifies that the total number of OLSs specified by the VPS is explicitly signaled.

8. The method of any one of claims 6-7, wherein the VPS comprises an each_layer_is_an_ols_flag, wherein when the each_layer_is_an_ols_flag equal to one specifies that each output layer set contains only one layer; when the each_layer_is_an_ols_flag equal to zero specifies that at least one OLS contains more than one layer; when the

vps_max_layers_minus1 is equal to zero, the value of the each_layer_is_an_ols_flag is inferred to be equal to one.

9. The method of any one of claims 6-8, wherein the VPS includes the vps_max_layers_minus1 that specifies the number of layers specified by the VPS, which is the maximum allowed number of layers in each CVS referring to the VPS.

10. The method of any one of claims 6-9, wherein a number of layers in an i-th OLS (NumLayersInOls[i]) and a network abstraction layer (NAL) unit header layer identifier (nuh_layer_id) value of a j-th layer in the i-th OLS (LayerIdInOLS[i][j]) are derived as follows:

```
NumLayersInOls[ 0 ] = 1
LayerIdInOls[ 0 ][ 0 ] = vps_layer_id[ 0 ]
for( i = 1, i < TotalNumOlss; i++ ) {
    if( each_layer_is_an_ols_flag ) {
        NumLayersInOls[ i ] = 1
        LayerIdInOls[ i ][ 0 ] = vps_layer_id[ i ]
    } else if( ols_mode_idc == 0 || ols_mode_idc == 1 ) {
        NumLayersInOls[ i ] = i + 1
        for( j = 0; j < NumLayersInOls[ i ]; j++ )
            LayerIdInOls[ i ][ j ] = vps_layer_id[ j ]
```

wherein the NumLayersInOls[i] represents the number of layers in the i-th OLS, the LayerIdInOLS[i][j] represents the nuh_layer_id value of the j-th layer in the i-th OLS, vps_layer_id[i] is an i-th VPS layer identifier, TotalNumOlss is a total number of OLSs specified by the VPS, and an each_layer_is_an_ols_flag is an each layer is an OLS flag that specifies whether at least one OLS contains more than one layer.

11. 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 one of claims 1-10.

12. 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 one of claims 1-10.

13. A decoder comprising:

a receiving means for receiving a bitstream comprising an output layer set (OLS) and a video parameter set (VPS), wherein the OLS includes one or more layers of coded pictures and the VPS includes an OLS mode identification code (ols_mode_idc);

wherein the ols_mode_idc equal to one specifies that a total number of OLSs specified by the VPS is equal to vps_max_layers_minus1 plus 1, the i-th OLS includes the layers with layer indices from zero to i, inclusive, and for each OLS, all layers in the each OLS are output layers; wherein the vps_max_layers_minus1 plus 1 specifies a maximum allowed number of layers in each coded video sequence (CVS) referring to the VPS;

a determining means for determining the output layers based on the ols_mode_idc in the VPS;

a decoding means for decoding a coded picture from the output layers to produce a decoded picture.

14. The decoder of claim 13, wherein the decoder is further configured to perform the method of any one of claims 1-5.

15. An encoder comprising:

an encoding means for:

encoding a bitstream comprising one or more output layer sets (OLSs) including one or more layers of coded pictures; and

encoding into the bitstream a video parameter set (VPS), wherein the VPS includes an output layer set (OLS) mode identification code (ols_mode_idc);

wherein the ols_mode_idc equal to one specifies that a total number of OLSs specified by the VPS is equal to vps_max_layers_minus1 plus 1, the i-th OLS includes the layers with layer indices from zero to i, inclusive, and for each OLS, all layers in the each OLS are output layers; wherein the vps_max_layers_minus1 plus 1 specifies a maximum allowed number of layers in each coded video sequence (CVS) referring to the VPS.

16. The encoder of claim 15, wherein the encoder is further configured to perform the method of any of claims 7-10.

17. A non-transitory computer readable medium storing a bitstream, wherein the bitsteam comprising an output layer set (OLS) and a video parameter set (VPS), wherein the OLS includes one or more layers of coded pictures and the VPS includes an OLS mode identification code (ols_mode_idc), wherein the ols_mode_idc equal to one specifies that a total number of OLSs specified by the VPS is equal to vps_max_layers_minus1 plus 1, an i-th OLS includes the layers with layer indices from zero to i, inclusive, and for each OLS, all layers in the each OLS are output layers; wherein the vps_max_layers_minus1 plus 1 specifies a maximum allowed number of layers in each coded video sequence (CVS) referring to the VPS.