CLAIMS

What is claimed is:

1. A method of aligning across layers in a coded video stream, executable by a processor, comprising:

decoding a video bitstream having multiple layers;

identifying one or more subpicture regions from among the multiple layers of the decoded video bitstream~~, the subpicture regions comprising a background region and one or more foreground subpicture regions~~;

aligning the one or more subpictures across the multiple layers;

wherein, based on a network abstraction layer (NAL) unit having a nal_unit_type equal to STSA_NUT, a TemporalID of a NAL unit in a reference picture list is different than a TemporalID of the NAL unit having the nal_unit_type equal to STSA_NUT, wherein the NAL unit in the reference picture list comprises a picture parameter set (PPS) NAL unit, and wherein the NAL unit having the NAL unit type equal to STSA_NUT comprises a coded slice NAL unit

~~decoding and displaying an enhanced subpicture based on a determination that a foreground subpicture region is selected; and~~

~~decoding and displaying the background region based on a determination that a foreground subpicture region was not selected~~.

~~2. The method of claim 1, further comprising:~~

~~selecting a subset of the layers from among the multiple layers, based on bandwidth; and~~

~~transmitting the selected subset of layers.~~

~~3~~2. The method of claim 1, wherein ~~in-loop filtering is disabled across boundaries between the layers~~ the PPS NAL unit and the coded slice NAL unit are included in a same access unit (AU).

~~4~~3. The method of claim 1, wherein a first access unit includes the PPS NAL unit and a step-wise temporal sublayer access (STSA) NAL unit, and a second access unit includes the coded slice NAL unit ~~motion compensated prediction or intra-block copy is disabled across boundaries between the layers~~.

~~54~~. The method of claim 1, ~~further comprising:~~

~~processing boundary padding for motion compensated prediction or in-loop filtering at boundaries of the subpicture regions~~wherein a nuh_layer_id of the NAL unit in the reference picture list is different from a nuh_layer_id of the NAL unit having the nal_unit_type equal to STSA_NUT.

~~65~~. The method of claim 1, wherein layout information of subpicture regions is signaled by parameter set data.

~~76~~. The method of claim ~~65~~, wherein the layout information comprises a size and a position associated with the subpicture regions.

~~87~~. The method of claim ~~65~~, wherein ~~one or more of~~ the subpicture regions may be relocated and displayed based on the layout information.

~~98~~. The method of claim 1, wherein each subpicture region may be coded as an independent layer corresponding to a local region having a unique layer identification value.

~~109~~. The method of claim ~~98~~, wherein each of the subpicture regions corresponding to the independent layers has a unique picture order count value within a respective~~an~~ access unit.

~~1110~~. A computer system for aligning across layers in a coded video stream, the computer system comprising:

one or more computer-readable non-transitory storage media configured to store computer program code; and

one or more computer processors configured to access said computer program code and operate as instructed by said computer program code, said computer program code including:

first decoding code configured to cause the one or more computer processors to decode a video bitstream having multiple layers;

identifying code configured to cause the one or more computer processors to identify one or more subpicture regions from among the multiple layers of the decoded video

bitstream~~, the subpicture regions comprising a background region and one or more foreground subpicture regions~~; and align the one or more subpictures across the multiple layers; wherein, based on a network abstraction layer (NAL) unit having a nal_unit_type equal to STSA_NUT, a TemporalID of a NAL unit in a reference picture list is different than a TemporalID of the NAL unit having the nal_unit_type equal to STSA_NUT, wherein the NAL unit in the reference picture list comprises a picture parameter set (PPS) NAL unit, and wherein the NAL unit having the NAL unit type equal to STSA_NUT comprises a coded slice NAL unit

~~second decoding and first displaying code configured to cause the one or more computer processors to decode and display an enhanced subpicture based on a determination that a foreground subpicture region is selected; and~~

~~third decoding and second displaying code configured to cause the one or more computer processors to decode and display the background region based on a determination that a foreground subpicture region was not selected~~.

~~12. The computer system of claim 11, further comprising:~~

~~selecting code configured to cause the one or more computer processors to select a subset of the layers from among the multiple layers, based on bandwidth; and~~

~~transmitting code configured to cause the one or more computer processors to transmit the selected subset of layers.~~

~~13~~11. The computer system of claim ~~11~~10, wherein ~~in-loop filtering is disabled across boundaries between the layers~~ the PPS NAL unit and the coded slice NAL unit are included in a same access unit (AU).

~~14~~12. The computer system of claim ~~11~~10, wherein a first access unit includes the PPS NAL unit and a step-wise temporal sublayer access (STSA) NAL unit, and a second access unit includes the coded slice NAL unit ~~motion compensated prediction or intra-block copy is disabled across boundaries between the layers~~.

~~15~~13. The computer system of claim ~~11~~10, further comprising:

~~processing code configured to cause the one or more computer processors to process boundary padding for motion compensated prediction or in-loop filtering at boundaries of the~~

~~subpicture regions~~wherein a nuh_layer_id of the NAL unit in the reference picture list is different from a nuh_layer_id of the NAL unit having the nal_unit_type equal to STSA_NUT.

~~16~~14. The computer system of claim ~~11~~10, wherein layout information of subpicture regions is signaled by parameter set data.

~~17~~15. The computer system of claim ~~16~~14, wherein ~~one or more of~~ the subpicture regions may be relocated and displayed based on the layout information.

~~18~~16. The computer system of claim ~~11~~10, wherein each subpicture region may be coded as an independent layer corresponding to a local region having a unique layer identification value.

~~19~~17. The computer system of claim ~~18~~16, wherein each of the subpicture regions corresponding to the independent layers has a unique picture order count value within a respective~~an~~ access unit.

~~20~~18. A non-transitory computer readable medium having stored thereon a computer program for aligning across layers in a coded video stream, the computer program configured to cause one or more computer processors to:

decode a video bitstream having multiple layers;

identify one or more subpicture regions from among the multiple layers of the decoded video bitstream~~, the subpicture regions comprising a background region and one or more foreground subpicture regions~~;

align the one or more subpictures across the multiple layers;

wherein, based on a network abstraction layer (NAL) unit having a nal_unit_type equal to STSA_NUT, a TemporalID of a NAL unit in a reference picture list is different than a TemporalID of the NAL unit having the nal_unit_type equal to STSA_NUT, wherein the NAL unit in the reference picture list comprises a picture parameter set (PPS) NAL unit, and wherein the NAL unit having the NAL unit type equal to STSA_NUT comprises a coded slice NAL unit

~~decode and display an enhanced subpicture based on a determination that a~~

~~foreground subpicture region is selected; and~~

~~decode and display the background region based on a determination that a foreground subpicture region was not selected~~.