CLAIMS

What is claimed is:

1. A method comprising:

receiving video information corresponding to a plurality of subpictures within a picture;

identifying first subpictures from among the plurality of subpictures, the first subpictures being picture-in-picture regions extracted from a base layer of the video information;

enlarging and encoding the first subpictures in a high quality mode as subpictures, respectively, in a plurality of enhancement layers;

encoding remaining subpictures of the plurality of subpictures in a low quality mode in the base layer; and

outputting a video parameter set (VPS) including a plurality of output layer sets, each output layer set comprising one or more encoded subpictures from the base layer and one or more encoded subpictures from the enhancement layers, each output layer set including, for each output layer, subpicture identifiers of the encoded subpictures in the output layer and profile-tier-level information for the output layer,

wherein the video parameter set includes a plurality of flags;

wherein a first flag of the plurality of flags indicates whether subpicture partitions are aligned across layers, wherein the first flag equal to 1 specifies that vps_max_subpics_minus1 and vps_sub_pic_id_layer[j] are present in the VPS, vps_max_subpics_minus1[i] is inferred to be equal to vps_max_subpics_minus1, and vps_sub_pic_id_layer[i][j] is inferred to be equal to vps_sub_pic_id_layer[j], when i is greater than 0, the first flag equal to 0 specifies that vps_max_subpics_minus1[i] and vps_sub_pic_id_layer[i][j] are present, when i is in the range of 0 to vps_max_layers_minus1, inclusive; and

wherein a second flag of the plurality of flags indicates whether subpicture identifiers are present in each layer.

2. The method of claim 1, further comprising outputting the first encoded subpicture in an enhancement layer, the encoded remaining subpictures in a base layer, and the output layer set of the output layer sets including the enhancement layer and the base layer.

3. The method of claim 1, wherein the second flag is a video parameter set subpictures present flag.

4. The method of claim 1, wherein the plurality of flags comprises:
a video parameter set maximum subpictures minus one flag; and
a video parameter set subpicture identification layer flag.

5. A 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 the computer program code stored in the one or more computer-readable non-transitory storage media and operate as instructed by the computer program code, the computer program code comprising:
receiving code configured to cause the one or more computer processors to receive video information corresponding to a plurality of subpictures within a picture;
identifying code configured to cause the one or more computer processors to identify first subpictures from among the plurality of subpictures, the first subpictures being picture-in-picture regions extracted from a base layer of the video information;
first encoding code configured to cause the one or more computer processors to enlarge and encode the first subpictures in a high quality mode, as subpictures, respectively, in a plurality of enhancement layers;
second encoding code configured to cause the one or more computer processors to encode remaining subpictures of the plurality of subpictures in a low quality mode in the base layer; and
outputting code configured to cause the one or more computer processors to output a video parameter set (VPS) including a plurality of output layer sets, each output layer set comprising one or more encoded subpictures from the base layer and one or more encoded subpictures from the enhancement layers, each output layer set including, for each output layer, subpicture identifiers of the encoded subpictures in the output layer and profile-tier-level information for the output layer,

wherein the video parameter set includes a plurality of flags;

wherein a first flag of the plurality of flags indicates whether subpicture partitions are aligned across layers, wherein the first flag equal to 1 specifies that vps_max_subpics_minus1 and vps_sub_pic_id_layer[j] are present in the VPS, vps_max_subpics_minus1[i] is inferred to be equal to vps_max_subpics_minus1, and vps_sub_pic_id_layer[i][j] is inferred to be equal to vps_sub_pic_id_layer[j], when i is greater than 0, the first flag equal to 0 specifies that vps_max_subpics_minus1[i] and vps_sub_pic_id_layer[i][j] are present, when i is in the range of 0 to vps_max_layers_minus1, inclusive; and

wherein a second flag of the plurality of flags indicates whether subpicture identifiers are present in each layer.

6. The computer system of claim 5, wherein the outputting code is configured to cause the one or more computer processors to output the first encoded subpicture in an enhancement layer, the encoded remaining subpictures in a base layer, and the output layer set of the output layer sets including the enhancement layer and the base layer.

7. The computer system of claim 5, wherein the second flag is a video parameter set subpicture present flag.

8. The computer system of claim 5, wherein the plurality of flags comprises:

a video parameter set maximum subpictures minus one flag; and

a video parameter set subpicture identification layer flag.

9. A non-transitory computer readable medium having stored thereon a computer program for coding a video sequence, the computer program configured to cause one or more computer processors to perform the method in any one of claims 1 to 4.