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**ISO/IEC JTC 1/SC 29/WG 03 MPEG SYSTEMS**

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| **Title** | **WD of ISO/IEC 23090-18 AMD 2 Point reliability indication and other improvements** |
| **Source** | **WG 03, MPEG Systems** |
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# *Change 1:* *Point reliability indication*

*Add following clauses after clause 9.2*

**9.x G-PCC confidence score**

**9.x.1 General**

When a point cloud scene is acquired and transmitted in real-world conditions, scanning or transmission failure can occur which degrade the acquired data, e.g. inaccuracy of points’ position, missing points. In this case, the acquiring system can provide confidence score associated with different regions of the point cloud data. Upon reception of this information, the application can process the point cloud data differently whether the confidence score is high or low.

This subclause specifies signaling of confidence score information of points in a particular region in ISOBMFF.

**9.x.2 G-PCC confidence score structure**

GPCCConfidenceScoreStruct provides the confidence score of points within a given 3D spatial region.

**9.x.2.1 Syntax**

aligned(8) class GPCCConfidenceScoreStruct() {  
 unsigned int(16) region\_id;  
 unsigned int(1) bounding\_box\_present\_flag;  
 unsigned int(1) dimensions\_included\_flag;  
 unsigned int(1) confidence\_score\_present\_flag;  
 unsigned int(5) reserved;  
 if(bounding\_box\_present\_flag) {  
 GPCCBoundingBox bounding\_box(dimensions\_included\_flag);  
 }  
  
 if(confidence\_score\_present\_flag) {  
 unsigned int(8) confidence\_score;  
 }  
}

**9.x.2.2 Semantics**

region\_id is an identifier for the confidence score region.

bounding\_box\_present\_flag indicates the presence of bounding box information. For sync samples in confidence score region metadata track this flag shall be set to 1. For non-sync samples in confidence score region metadata track, this flag shall be set to 1 when the position and/or dimensions of this confidence score region are updated with reference to the previous sync sample.

dimensions\_included\_flag indicates the presence of the bounding box with the scale field. For sync samples in confidence score region metadata sample, this flag shall be set to 1. For non-sync samples in confidence score region metadata sample, this flag shall only be set to 1 when the dimensions of this confidence score region are updated with reference to the previous sync sample. This flag may be set to 1 only if bounding\_box\_present\_flag is set to 1.

confidence\_score\_present\_flag indicates the presence of the confidence score for the confidence score region.

confidence\_score indicates the degree of confidence in unit of 1/255 in the range of 0 to 1 for the data in the confidence score region. A signaled value of 0 expresses a score of 0 which means the confidence in the data in the confidence score region is the lowest. A signaled value of 255 expresses a score of 1 which means the confidence in the data in the confidence score region is the highest. An application should take into account the confidence score when processing the data and deriving actions, results, interpretations, etc… When not present, the confidence score is unknown.

**9.x.3 Signalling of confidence score information**

**9.x.3.1 Definition**

Box Types: 'gcsr'  
Container: GPCCSampleEntry ('gpe1', 'gpeg', 'gpc1', 'gpcg', 'gpeb', 'gpcb') or DynamicGPCCConfidenceScoreSampleEntry  
Mandatory: No  
Quantity: Zero or one

The GPCCConfidenceScoreInfoBox provides information of one or more confidence scores.

When GPCCConfidenceScoreInfoBox is present in the sample entry of the G-PCC bitstream track, it provides the static confidence score information of G-PCC bitstream carried in the track.

When GPCCConfidenceScoreInfoBox is present in the sample entry of the G-PCC geometry track, it indicates the static confidence score information of G-PCC bitstream carried in the G-PCC geometry track and associated G-PCC attribute tracks. It shall not be present in the sample entry of any G-PCC attribute tracks.

When GPCCConfidenceScoreInfoBox is present in the sample entry of the G-PCC tile base track, it provides the static confidence score information of G-PCC bitstream carried in all G-PCC tile tracks. It shall not be present in the sample entry of any G-PCC tile tracks.

**9.x.3.2 Syntax**

aligned(8) class GPCCConfidenceScoreInfoBox extends FullBox('gcsr', version=0, 0) {  
 unsigned int(16) num\_regions;  
 for (int i=0; i < num\_regions; i++) {  
 GPCCConfidenceScoreStruct score();  
 }  
}

**9.x.3.3 Semantics**

num\_regions indicate the number of confidence score structure presented in the box.

score provides the confidence score information.

**9.x.4 Sample entry**

**9.x.4.1 Syntax**

aligned(8) class GPCCConfidenceScoreConfigurationStruct() {  
 bit(7) reserved=0;  
 unsigned int(1) dynamic\_dimension\_flag;  
}

aligned(8) class DynamicGPCCConfidenceScoreSampleEntry extends MetaDataSampleEntry('gcdc') {  
 GPCCConfidenceScoreInfoBox info\_box;  
 GPCCConfidenceScoreConfigurationStruct configuration;  
}

**9.x.4.2 Semantics**

dynamic\_dimension\_flag equal to 0 specifies that the dimension of the 3D spatial region remains unchanged in all samples referring to this sample entry. dynamic\_dimension\_flag equal to 1 specifies that the dimension of the 3D spatial region is indicated in samples.

info\_box indicates one or more initial 3D spatial region with the associated confidence score of the G-PCC data.

configuration contains configuration related to the samples referring to this sample entry.

**9.x.5 Sample format**

**9.x.5.1 General**

A sample in the confidence score region timed metadata track shall be set as a sync sample or as a non-sync sample. At least one sync sample shall be present in the confidence score region timed-metadata track.

Sync samples in the confidence score region timed metadata shall carry the dimension for all G‑PCC confidence score regions. In sync samples for all confidence score regions, the value of dimensions\_included\_flag and bounding\_box\_present\_flag shall be set to 1.

Non-sync samples in confidence score region timed metadata track shall signal only the updated confidence score regions information with reference to the confidence score regions information available in the nearest preceding sync sample. Non-sync samples shall signal only the confidence score regions whose position, dimensions, the added and cancelled confidence score regions with reference to the nearest sync sample.

For Non-sync samples in this timed metadata track, the value of canceled\_region\_flag shall be set to 1 when a confidence score region is cancelled with reference to the preceding sync sample. The value of dimensions\_included\_flag shall only be set to 1, when the dimensions of a confidence score region in the current sample is updated with reference to the preceding sync sample. The value of dimensions\_included\_flag shall be set to 0, when dynamic\_dimension\_flag in the referred sample entry equals to 0. The value of bounding\_box\_present\_flag shall only be set to 1, when the position and/or dimensions of a confidence score region in the current sample is updated with reference to the preceding sync sample.

**9.x.5.2 Sync samples**

**9.x.5.2.1 Syntax**

The sync sample syntax of this sample entry type 'gcdc' is specified as follows:

aligned(8) class ConfidenceScoreRegionSample() {  
 unsigned int(16) num\_regions;  
 for (i=1; i <= num\_regions; i++){  
 GPCCConfidenceScoreRegionStruct score\_region;  
 }  
}

**9.x.5.2.2 Semantics**

num\_regions indicate the number of updated confidence score regions signalled in the sample. The confidence score regions whose dimensions are updated with reference to the previous sync sample are considered as updated regions. The confidence score regions that are cancelled in this sample with reference to the previous sync sample are also considered as updated regions.

score\_region provides the confidence score region when this sample is applied. The value of dimensions\_included\_flag and bounding\_box\_present\_flag shall be set to 1.

**9.x.5.3 Non-sync samples**

**9.x.53.1 Syntax**

aligned(8) class ConfidenceScoreRegionSample() {  
 unsigned int(16) num\_regions;  
 for (i=1; i <= num\_regions; i++){  
 unsigned int(1) canceled\_region\_flag;  
 unsigned int(7) reserved;  
 if(!canceled\_region\_flag)  
 GPCCConfidenceScoreRegionStruct score\_region;  
 } else {  
 unsigned int(16) region\_id;  
 }  
 }  
}

**9.x.5.3.2 Semantics**

num\_regions indicate the number of updated confidence score regions signalled in the sample. The confidence score regions whose dimensions are updated with reference to the previous sync sample are considered as updated regions. The confidence score regions that are cancelled in this sample with reference to the previous sync sample are also considered as updated regions.

canceled\_region\_flag indicates whether a confidence score region is cancelled or updated in the current sample with reference to the previous sync sample. Value 1 indicates confidence score regions is cancelled in this sample with reference to the previous sync sample. Value 0 indicates the confidence score region dimensions are updated with reference to the previous sync sample.

score\_region provides the confidence region data when this sample is applied. dimensions\_included\_flag value shall only be set to 1 when the dimensions of this confidence region are updated with reference to the previous sync sample. The value of dimensions\_included\_flag shall be set to 0, when dynamic\_dimension\_flag in the referred sample entry equals to 0. bounding\_box\_present\_flag shall only be set to 1 when the position and/or dimensions of this confidence region are updated with reference to the previous sync sample.

region\_id identifies a cancelled confidence region with reference to the previous sync sample.

# *Change 2: Alternative indication when temporal scalability is applied*

*Add the following clause*

### **X.X.X Indication of alternatives**

When different encoded versions of the same point cloud sequence are stored in a same file and any of them are encapsulated in temporal level tracks, temporal level track carrying the geometry component of temporal level with an id equal to 0 of each alternative shall have the same alternate\_group value with other alternatives in the TrackHeaderBox. Any temporal level tracks which do not carry temporal levels with an id equal to 0 shall not have non-zero alternate\_group value in their TrackHeaderBox. When temporal level attribute tracks are present, non-zero alternate\_group value shall not be present in TrackHeaderBox of temporal level attribute tracks.

When one of alternatives, which is encapsulated into temporal level tracks, is selected among same alternate group, only the tracks with the same track\_group\_id of a GPCCTemporalScalabilityGroupBox shall be combined.

NOTE – The G-PCC player combines the bitstream from more temporal level tracks in same temporal scalability group when temporal level track carrying temporal level equal to 0 is selected among alternatives.

When different encoded versions of the same point cloud sequence are stored in a same file and any of them are encapsulated in temporal level tile tracks, the G-PCC tile base track of each alternative shall have the same alternate\_group value with other alternatives in the TrackHeaderBox and the associated temporal level tile tracks shall not have non-zero alternate\_group value in their TrackHeaderBox.

When different encoded versions of the same point cloud sequence are stored in a same file and one or more versions are encapsulated in temporal level tile tracks, and other versions are encapsulated in temporal level tracks, the G-PCC tile base track of a version shall have the same alternate\_group value in the TrackHeaderBox with other alternatives of G-PCC geometry temporal level track with temporal level identifier value 0. The associated temporal level tile tracks shall not have non-zero alternate\_group value in their TrackHeaderBox. The associated temporal level tracks with temporal level id greater than 0 and the attribute temporal level tracks shall not have non-zero alternate\_group  value in their TrackHeaderBox.

Annex XXX contains examples of how alternatives are indicated in temporal level tracks or temporal level tile tracks when alternatives are stored in a same file with various encapsulations.

*Add the following clause in Annex E*

### **Annex XXX: Alternative indication examples**

The below figures demonstrate how the alternatives are indicated when two alternatives are available, i.e., one is lossless coded version and the other is lossy coded one, lossless coded version is encapsulated with temporal level tracks and the other is encapsulated in various ways in a same file.

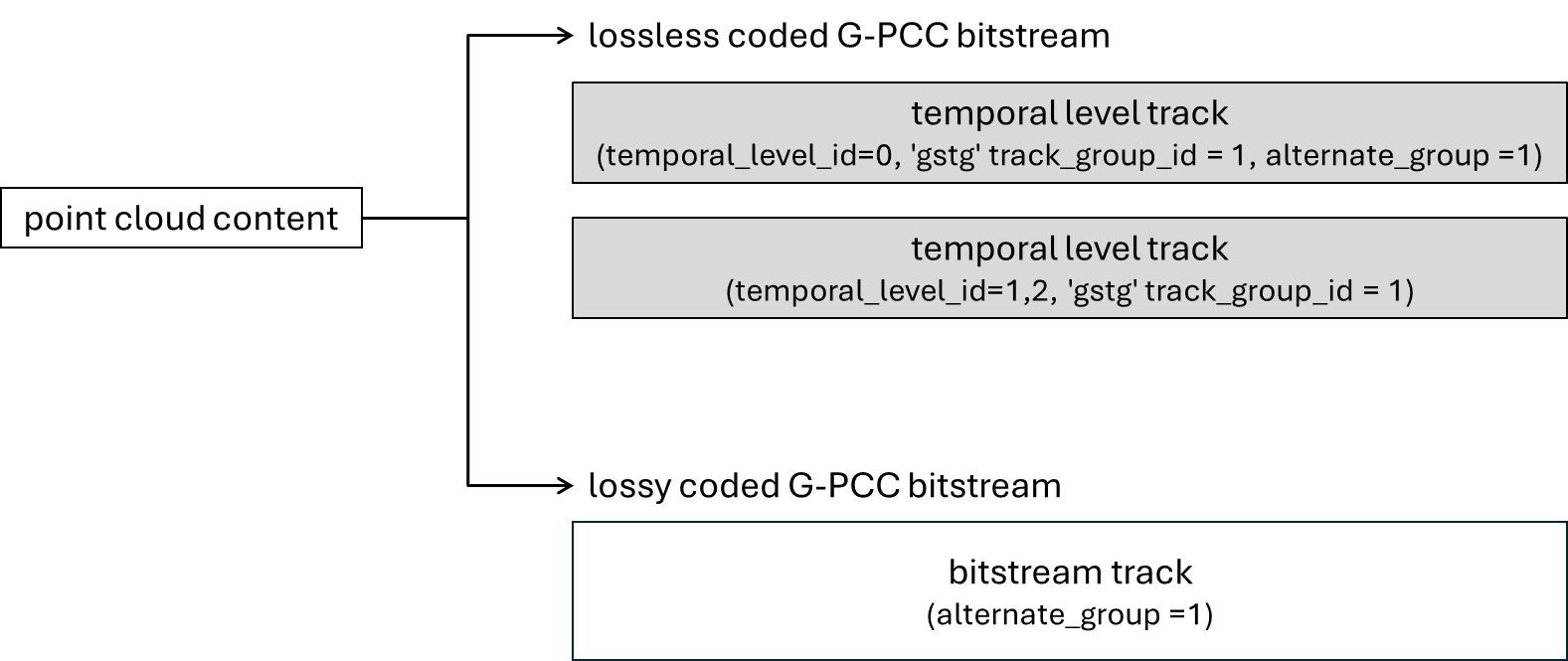


Figure X.1. Alternative indication when one is encapsulated into temporal level tracks and the other is encapsulated into a single G-PCC bitstream track.

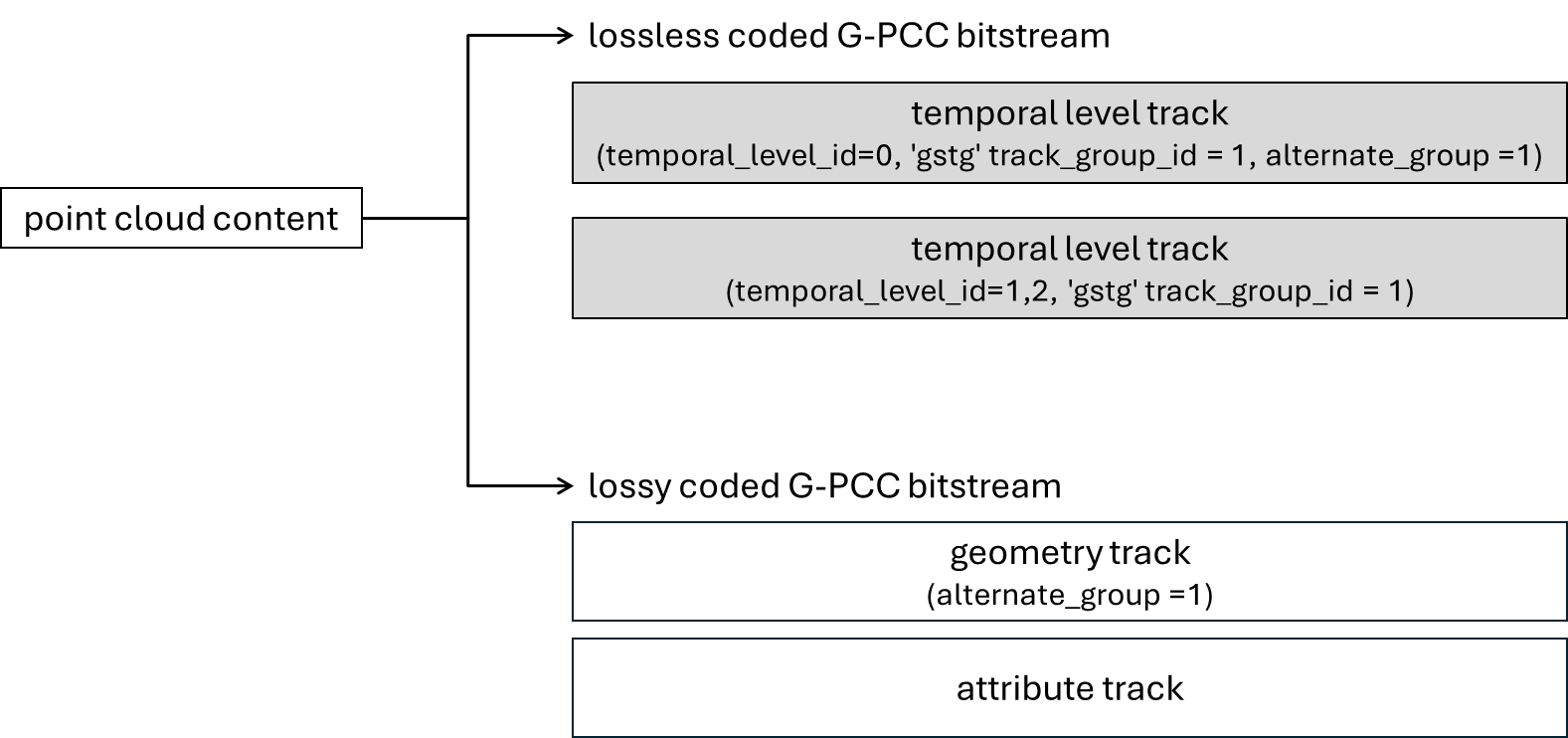


Figure X.2. alternative indication when one is encapsulated into temporal level tracks and the other is encapsulated into component-based multiple tracks.

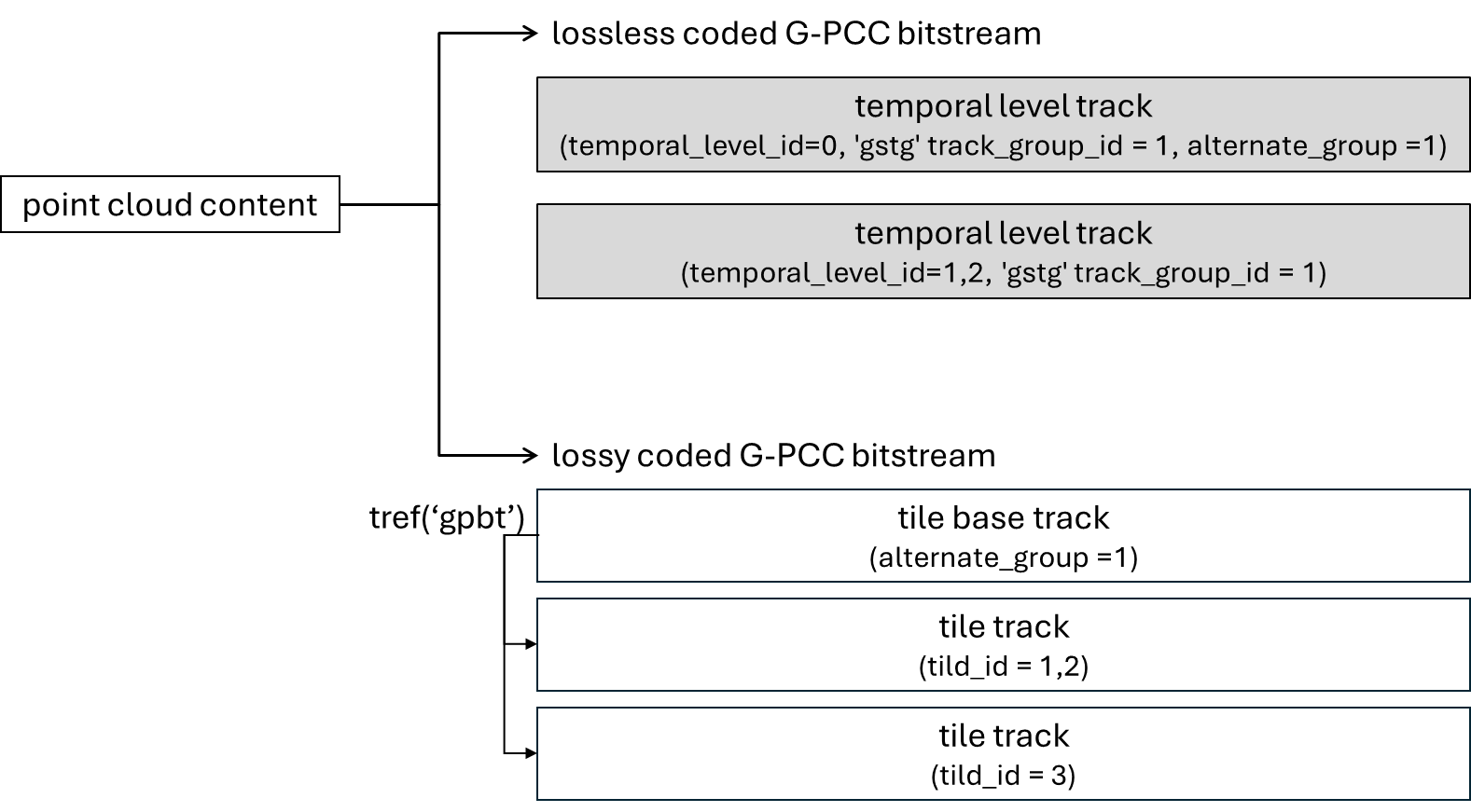


Figure X.3. alternative indication when one of alternative is encapsulated into temporal level tracks and the other is encapsulated with tile tracks.

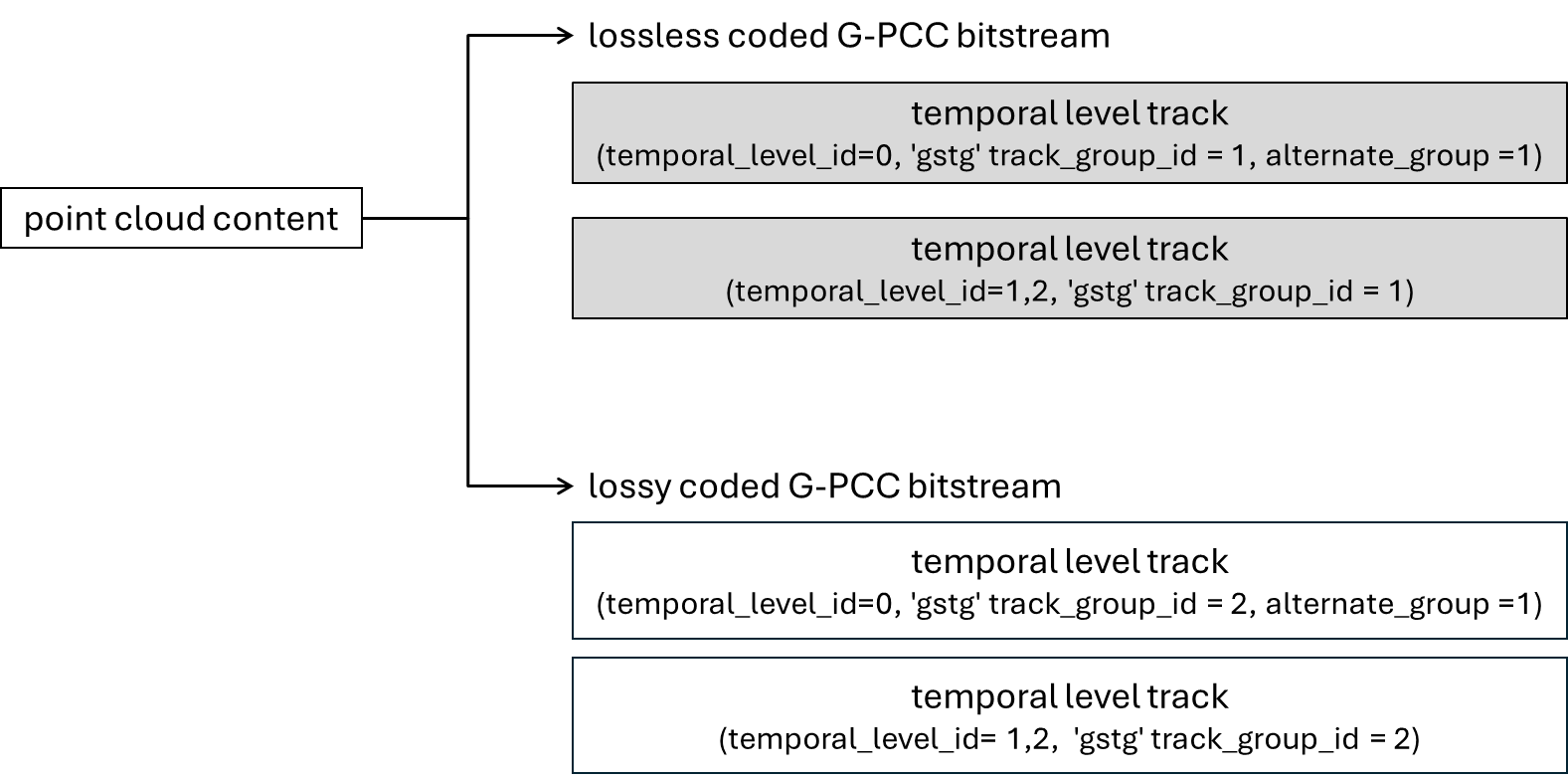


Figure X.4. alternative indication in all alternatives is encapsulated into temporal level tracks, respectively

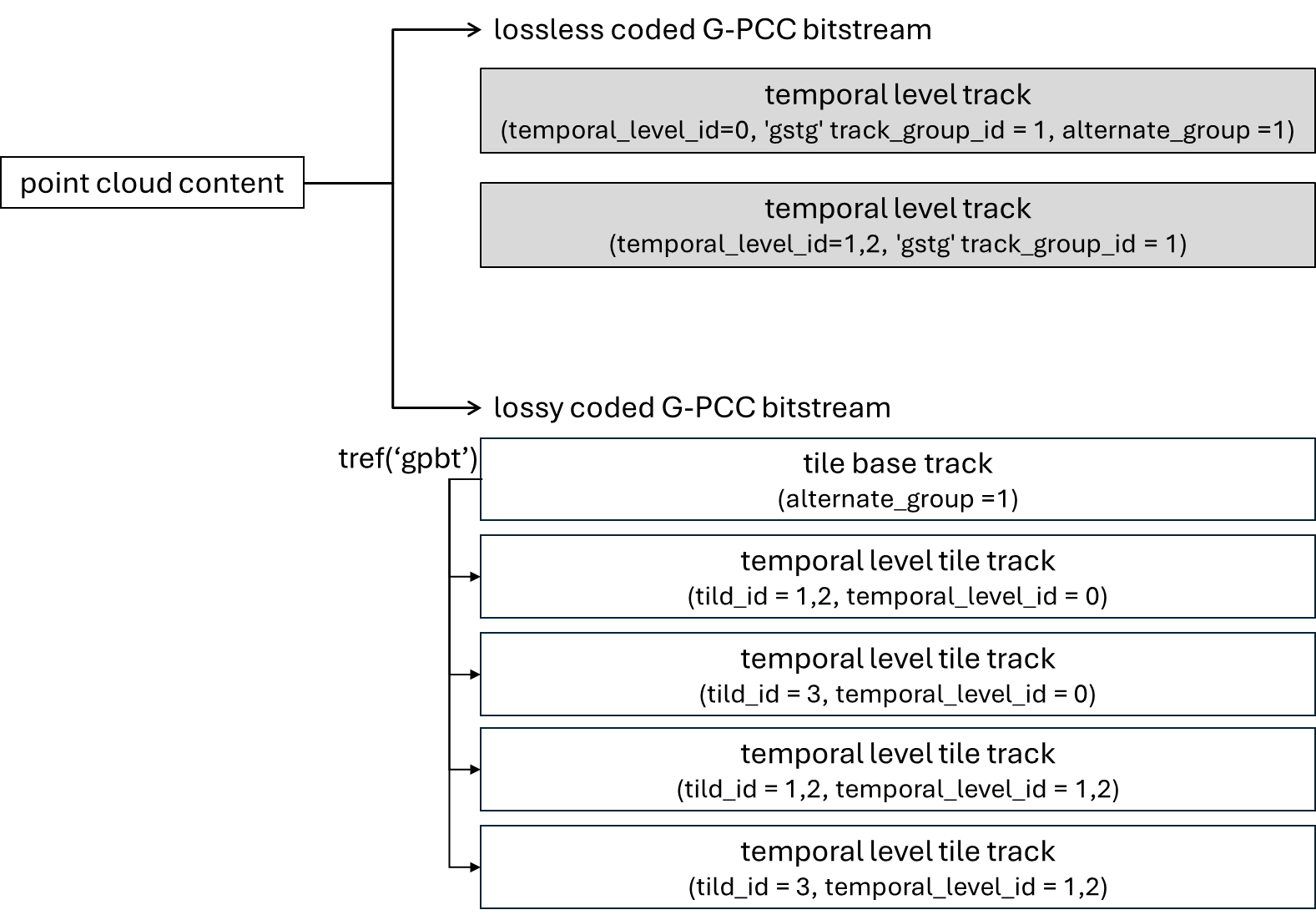


Figure X.5. alternative indication in all alternatives is encapsulated into temporal level tracks and the other is encapsulated with temporal level tile tracks