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# Introduction

Video-based point cloud compression (V-PCC) ‎[1] enables efficient capturing, compression, reconstruction, and rendering of dynamic point clouds by utilizing existing MPEG video codecs, such as HEVC. In the MPEG 125 meeting in Marrakesh, it was agreed to develop a new standard for the carriage of point cloud data. This standard is developed as MPEG-I Part-10 ‎[2] and defines how point cloud data, defined by MPEG-I Part 5 (V-PCC) and MPEG-I Part 9 (G-PCC) ‎[3], are carried in an ISOBMFF ‎[4] container and how they are signaled for streaming.

In the latest V-PCC SCD document ‎[1], information on pulse code modulation (PCM) points can either be geometry data or attribute data. This information is either packed in the video stream of the relevant component or provided as separate video streams (one for each component). The current working draft of MPEG-I Part 10 does not currently address the storage of PCM point information in separate tracks.

This contribution describes how PCM point tracks can be signaled in an ISOBMFF V-PCC container.

# Proposal

When PCM point information is available as separate video streams, they shall be carried in separate tracks (one track for the information related to a certain component). As with other V-PCC component tracks, these tracks shall be signaled as restricted video scheme tracks.

In the F2F ad-hoc group meeting on systems technologies for PCC, it was agreed that component tracks shall include a VPCCHeaderBox that includes the vpcc\_unit\_header() struct. Therefore, it is proposed to include a requirement in the WD that tracks carrying PCM points only shall have **vpcc\_pcm\_video\_flag** set to 1 in the VPCCHeaderBox.

In ‎[5], we proposed using ISOBMFF track grouping to group all the tracks carrying V-PCC layers of a single component. To avoid having separate references to tracks carrying PCM points data, it is proposed that each track carrying PCM points information shall be included in the track group of the relevant component. Therefore, a track reference from the main track to the track\_group\_id of a V-PCC component would collectively reference tracks for PCM and non-PCM points (as well as tracks carrying V-PCC layers of that component).

Alternatively, to easily identify tracks with PCM point information, a new track grouping is defined using a VPCCPCMTrackGroupBox as follows.

aligned(8) class VPCCPCMTrackGroupBox extends TrackGroupTypeBox('vpcm') {
 // additional data related to the PCM points can be defined here

}

All tracks carrying information related to PCM points of a certain V-PCC content shall have a VPCCPCMTrackGroupBox within the TrackGroupBox. The value of track\_group\_id in each of these VPCCPCMTrackGroupBoxes shall be the same.

A new 4CC value ('pccp') is defined for the reference\_type field of the TrackReferenceTypeBox is used to signal references to tracks carrying PCM points data (including geometry and attribute data).

# References

1. N18479, “Continuous Improvement of Study Text of ISO/IEC CD 23090-5 Video-based Point Cloud Compression”, MPEG 126, March 2019
2. N18413, “WD of ISO/IEC 23090-10 Carriage of PC Data”, MPEG 126, March 2019
3. N18179, “PCC WD G-PCC (Geometry-based PCC)”, MPEG 125, January 2019
4. ISO/IEC 14496-12, “Coding of Audio-Visual Objects, Part 12: ISO Base Media File Format”, 2015
5. m49105, “On Carriage of V-PCC Layers in ISOBMFF”, MPEG 127, July 2019.