**3GPP TSG-SA4 Meeting #115-e *S4-211171***

**18th – 27th August 2021**

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| *CR-Form-v12.1* | | | | | | | | |
| **pseudo CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **26.998** | **CR** |  | **rev** |  | **Current version:** | 0.8.0 |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Background on MPEG Standards for Encapsulation and Signalling of Volumetric Media | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | InterDigital Communications | | | | | | | | | |
| ***Source to TSG:*** | SA4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | FS\_5GSTAR | | | | |  | ***Date:*** | | | 2021-08-19 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | 17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
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| ***Reason for change:*** | | Add relavant technologies for encapsulation and signalling of volumetric media to improve TR 26.998. | | | | | | | | |
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| ***Summary of change:*** | | Add information on relevant encapsulation and manifest formats for volumetric media including point clouds. | | | | | | | | |
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| ***Consequences if not approved:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 6 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

Introduction

Recent advances in technologies for capturing and rendering 3D points have resulted in novel applications in the areas of tele-presence, virtual reality, and large-scale dynamic 3D maps. High-quality 3D point clouds have recently emerged as an advanced representation of immersive media, enabling new forms of interaction and communication with virtual worlds. The large volume of information required to represent such dynamic point clouds requires efficient coding algorithms. To this end, the MPEG 3D Graphics work group ISO/IEC JTC1/SC29/WG7 has developed two 3D point cloud compression (PCC) standards: a geometry-based point cloud compression (G-PCC) standard for static and dynamically acquired point clouds, and a video-based point cloud compression (V-PCC) standard for dynamic point clouds. These standards support lossy and/or lossless coding of point cloud geometry coordinates and attributes.

To provide systems layer support for these point cloud codecs, the MPEG Systems work group ISO/IEC JTC1/SC29/WG3 developed two standards for the carriage of the V-PCC and G-PCC bitstreams. These two standards are ISO/IEC 23090-10 (Carriage of Visual Volumetric Video-based Coding Data) and ISO/IEC 23090-18 (Carriage of Geometry-based Point Cloud Compression Data). The goal of these standards is to support efficient and interoperable storage and transmission of the encoded 3D point clouds. This document proposes introducing additional text to provide a brief description of these specifications.

Proposed Changes

**===== CHANGES START =====**

**===== CHANGE-1 BEGIN =====**

[4.3.j] ISO/IEC 23090-10:2021 FDIS: “Information technology — Coded representation of immersive media — Part 10: Carriage of Visual Volumetric Video-based Coding Data”

[4.3.k] ISO/IEC 23090-18:2021 DIS: “Information technology — Coded representation of immersive media — Part 18: Carriage of Geometry-based Point Cloud Compression Data”

[4.3.l] ISO/IEC 23008-1:2017: “Information technology — High efficiency coding and media delivery in heterogeneous environments

**===== CHANGE-1 END =====**

**===== CHANGE-2 BEGIN =====**

#### 4.4.5.2 Storage and Delivery Formats

An encapsulation format encapsulates an elementary stream with its coding structure information and metadata information. ISOBMFF (ISO based Media File Format, ISO/IEC 14496-12) is one of encapsulation format technology. DASH initialization/media segment and CMAF track are the extensions of ISOBMFF for both adaptive streaming and storage purpose. They are extended to provide partial access of a media fragment on time axis.

For the encapsulation and storage of coded volumetric media, two MPEG Systems standards, ISO/IEC 23090-10 and ISO/IEC 23090-18, define how to structure and carry the various components in a V3C bitstream or G-PCC bitstream, respectively, in an ISOBMFF media container to support flexible and partial access (e.g., using multiple component tracks and tile tracks) as well as adaptive streaming. Both specifications support single track encapsulation as well as multi-track encapsulation, where different components of the bitstream are carried in separate tracks in the container. In addition, these standards also define metadata tracks that carry additional timed information that signal changes in the spatial partitioning of the volumetric content and the mapping to different independently decodable tiles as well as viewport-related information.

A delivery manifest provides a description of media service consisting of multiple media components such as video and audio. Adaptation to device capability or network bandwidth is key features of a delivery manifest. In a delivery manifest, there is a group of multiple different encodings of the same media component context with the description of the encoding variations. An encapsulation format for an adaptive streaming is used to allow temporal access of media fragment to enable adaptive switching of a group of different encodings. MPD (Media Presentation Description) for DASH is one of delivery manifest for the purpose.

For immersive volumetric media, ISO/IEC 23090-10 and ISO/IEC 23090-18 define how to signal V3C and G-PCC content in a DASH MPD file. This includes defining new DASH descriptors that signal metadata about the type of component carried by each adaptation set and using preselections to group the adaptation sets of the different components associated with the volumetric media content. Other descriptors are also defined for signalling independently decoded spatial sub-divisions of the content to support partial streaming. In addition to signalling for DASH-based delivery, ISO/IEC 23090-10 and ISO/IEC 23090-18 also define descriptors for signalling volumetric media assets for delivery over MMT.

Editor’s note) A further study is required of how to describe adaptation of delivery and presentation of immersive media.

**===== CHANGE-2 END =====**

**===== CHANGES END =====**