International Standard

ISO/IEC 23090-18

First edition
2024-01

Information technology — Coded representation of immersive media —

Part 18: Carriage of geometry-based point cloud compression data

Technologies de l'information — Représentation codée de média immersifs —

Partie 18: Transport des données de compression des nuages de points basée sur la géométrie

Reference number
ISO/IEC 23090-18:2024(en)

© ISO/IEC 2024



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2024

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

Published in Switzerland

Contents

Page

Foreword ..... **v**
Introduction ..... **vi**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Abbreviated terms **3**
5 Overview **3**
5.1 Overall architecture for carriage of geometry-based point cloud compression data 3
5.2 Referenceable code points 5
5.2.1 Brands 5
5.2.2 Sample entry type 5
5.2.3 Box types 5
5.2.4 Track reference types 6
5.2.5 Entity grouping types 6
5.2.6 Sample grouping types 7
5.2.7 Uniform resource names 7
6 Volumetric media **7**
6.1 Volumetric visual media 7
6.1.1 General 7
6.1.2 Volumetric visual media header 7
6.1.3 Volumetric visual sample entry 8
6.1.4 Volumetric visual sample group entry 8
6.1.5 Volumetric visual samples 8
7 Timed G-PCC data storage in ISOBMFF **8**
7.1 General 8
7.2 Common boxes and data structures 9
7.2.1 G-PCC decoder configuration record 9
7.2.2 G-PCC decoder configuration box 10
7.2.3 G-PCC component information box 10
7.2.4 Tile inventory information sample group 12
7.3 Single track encapsulation 12
7.3.1 General 12
7.3.2 Sample entry 13
7.3.3 Sample format 13
7.4 Multiple track encapsulation 15
7.4.1 General 15
7.4.2 Sample entry 15
7.4.3 Sample format 16
7.4.4 Track references 17
7.5 Encapsulation of tiled G-PCC bitstream 17
7.5.1 General 17
7.5.2 G-PCC tile base track 18
7.5.3 G-PCC tile tracks 19
7.5.4 Relationship between samples in G-PCC tile base track and tile track 20
7.5.5 Track references 21
7.6 Indication of alternatives 21
8 Non-timed G-PCC data storage in ISOBMFF **21**
8.1 General 21
8.2 Image item 22
8.2.1 G-PCC item 22
8.2.2 G-PCC tile item 23
8.3 Image properties 23

© ISO/IEC 2024 – All rights reserved

8.3.1 G-PCC configuration item property 23
8.3.2 G-PCC component information item property 24
8.3.3 G-PCC spatial region item property 24
8.3.4 sub-sample item property 25
8.3.5 G-PCC tile information item property 25
8.4 Entity grouping 26
8.4.1 Viewport association 26

9 Signalling of metadata in ISOBMFF 26
9.1 G-PCC Spatial region information 26
9.1.1 Information structure 26
9.1.2 Signalling of static spatial region information 29
9.1.3 Signalling of dynamic spatial region information 29
9.2 G-PCC viewport information 32
9.2.1 General 32
9.2.2 Information structure 32
9.2.3 Signalling of static viewport information 35
9.2.4 Signalling of dynamic viewport information 36

10 Encapsulation and signalling in DASH 37
10.1 Single-track mode 37
10.1.1 General 37
10.2 Multi-track mode 37
10.2.1 General 37
10.2.2 DASH MPD descriptors 38
10.2.3 GPCC Preselection 41
10.2.4 Supporting multiple versions of GPCC data 41
10.3 Partial delivery and access 41
10.3.1 Signalling of static spatial regions 41
10.3.2 Signalling of dynamic spatial regions 43
10.3.3 Tiled G-PCC data encapsulation and signalling 43
10.4 Signalling recommended viewports 45
10.4.1 Signalling of static recommended viewports 45
10.4.2 Signalling of dynamic recommended viewports 47

11 Encapsulation and signalling in MMT 47
11.1 Encapsulation of G-PCC bitstream for MMT streaming 47
11.2 MMT signalling descriptors 47
11.2.1 Asset reference descriptor 47
11.2.2 G-PCC Asset descriptor 48
11.3 MMT application-specific signalling messages 49
11.3.1 General 49
11.3.2 GPCC Asset Group Metadata Message 50
11.3.3 GPCC Asset Selection Message 52
11.3.4 GPCC View Change Feedback Message 53

Annex A (normative) **File format toolsets and brands 56**

Annex B (normative) **GPCC DASH Schema 57**

Annex C (normative) **MIME types and sub-parameters 59**

Annex D (informative) **Sample entry type and sample format 60**

Annex E (informative) **Alternative Indication Examples 61**

Annex F (informative) **Partial access support with G-PCC tile tracks 63**

Annex G (informative) **Partial access support with non-timed G-PCC data 65**

Annex H (informative) **DASH MPD examples 67**

Bibliography 75

© ISO/IEC 2024 – All rights reserved

Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

ISO and IEC draw attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO and IEC take no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO and IEC had received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at www.iso.org/patents and https://patents.iec.ch. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

A list of all parts in the ISO/IEC 23090 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

© ISO/IEC 2024 – All rights reserved

Introduction

Advances in 3D capturing and rendering technologies have unleashed a new wave of innovation in Virtual/Augmented/Mixed reality (VR/AR/MR) content creation and communication. Point clouds have arisen as one of the main representations for such applications. Geometry-based point cloud compression data is used for representing sparse dynamically varying point clouds such as those used in vehicular LiDAR or 3D mapping, as well as dense static point clouds used in cultural heritage, and industrial applications.

This document addresses technologies defining the carriage of geometry-based point cloud compression data for storage and delivery purposes. This document includes(but is not limited to):

— Storage of geometry-based point cloud compression data and the associated metadata using the ISO Base Media File Format (ISOBMFF) as specified in ISO/IEC 14496-12;

— Storage of non-timed geometry-based point cloud compression data and the associated metadata using HEVC Image File Format (HEIF) as specified in ISO/IEC 23008-12;

— Encapsulation, signalling, and streaming of geometry-based compression data in a media streaming system, for example, dynamic adaptive streaming over HTTP (DASH) as specified in ISO/IEC 23009-1 or MPEG media transport (MMT) as specified in ISO/IEC 23008-1.

© ISO/IEC 2024 – All rights reserved

Information technology — Coded representation of immersive media —

Part 18:
Carriage of geometry-based point cloud compression data

1 Scope

This document specifies a media format that enables the storage and delivery of geometry-based point cloud compression data. The geometry-based point cloud compression data can be timed or non-timed. It supports flexible extraction of geometry-based point cloud compression data at delivery or decoding time.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 9834-1, *(Rec. ITU-T X.660), Information technology — Procedures for the operation of object identifier registration authorities — Part 1: General procedures and top arcs of the international object identifier tree*

ISO/IEC 9834-8, *(Rec. ITU-T X.667), Information technology — Procedures for the operation of object identifier registration authorities — Part 8: Generation of universally unique identifiers (UUIDs) and their use in object identifiers*

ISO/IEC 14496-12, *Information technology — Coding of audio-visual objects — Part 12: ISO base media file format*

ISO/IEC 23008-1:2023, *Information technology — High efficiency coding and media delivery in heterogeneous environments — Part 1: MPEG media transport (MMT)*

ISO/IEC 23008-12:2022, *Information technology — MPEG systems technologies — Part 12: Image File Format*

ISO/IEC 23009-1:2022, *Information technology — Dynamic adaptive streaming over HTTP (DASH) — Part 1: Media presentation description and segment formats*

ISO/IEC 23090-9:2023, *Information technology — Coded representation of immersive media (MPEG-I) — Part 9: Geometry-based point cloud compression*

IEEE 754-2019, *IEEE Standard for Floating-Point Arithmetic.*

W3C Recommendation, *XML schema part 1: Structures*

W3C Recommendation, *XML schema part 2: Datatypes*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 23090-9 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

© ISO/IEC 2024 – All rights reserved