International Standard

ISO/IEC 23090-6

First edition
2021-06

AMENDMENT 1
2024-01

Information technology — Coded representation of immersive media —

Part 6: Immersive media metrics

AMENDMENT 1: Immersive media metrics for V3C Data and OMAF

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

Reference number
ISO/IEC 23090-6:2021/Amd. 1:2024(en)

© ISO/IEC 2024

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

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

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 not 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.

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

© ISO/IEC 2024 – All rights reserved

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

Information technology — Coded representation of immersive media —

Part 6: Immersive media metrics

AMENDMENT 1: Immersive media metrics for V3C Data and OMAF

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

Normative references

Add the following reference:

ISO/IEC 23090-10, *Coded representation of immersive media — Part 10: Carriage of visual volumetric video-based coding data*

Terms and definitions

Replace the first sentence with: "For the purposes of this document, the terms and definitions given in ISO/IEC 23090-10 apply."

Clause 4

Add the following abbreviated terms:

3DoF	Three Degrees of Freedom
6DoF	Six Degrees of Freedom
V3C	Visual Volumetric Video-based Coding (ISO/IEC 23090-10)

6.1, first paragraph

Replace the third sentence with the following:

> A VR client may be an OMAF player or a V3C content player for file/segment reception or file access, file/segment decapsulation, decoding of audio, video, or image bitstreams, audio and image rendering, and viewport selection.

Figure 1

Update the figure to add missing text as follows:

© ISO/IEC 2024 – All rights reserved

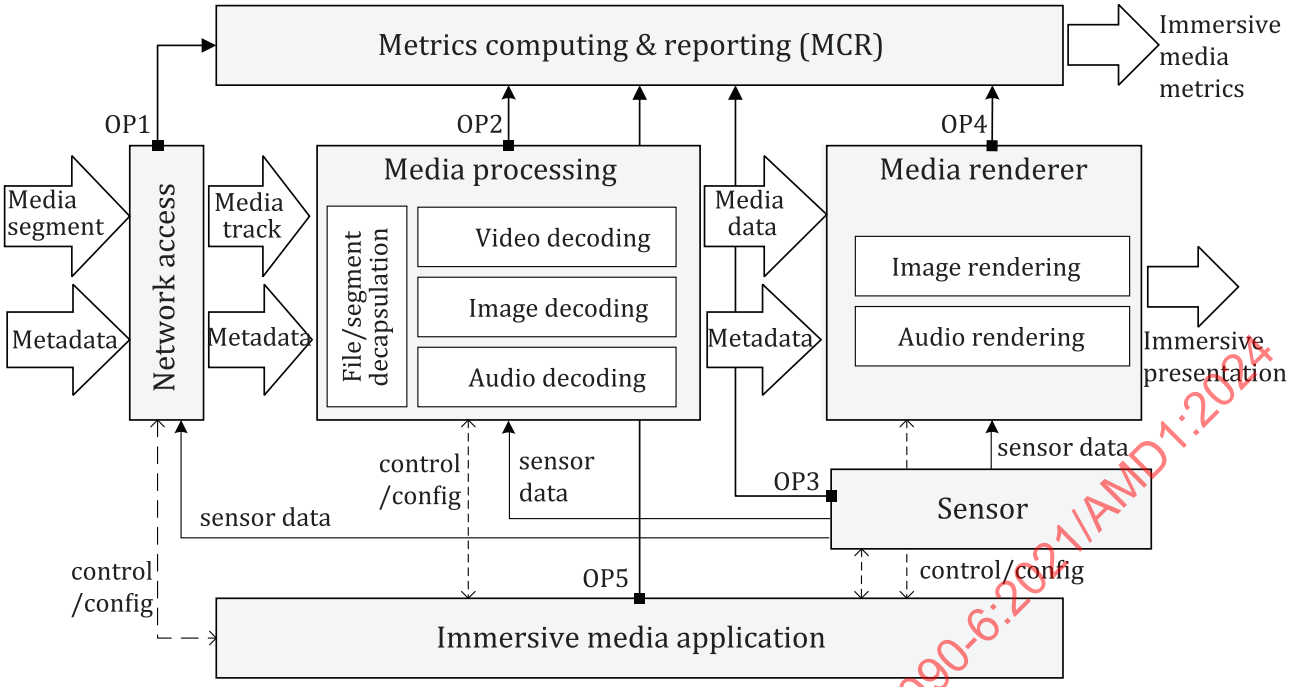

Figure 1 — Immersive media metrics client reference model

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

6.2.3

Add the following bullets before the last bullet:

— MIV metadata, for example:

  — viewport camera information;

  — viewport position information;

  — viewing space information

— V-PCC metadata, for example:

  — volumetric annotation information;

  — scene object information;

6.2.4

Add the following bullet at the end:

— Location information (i.e., x-y-z coordinates) corresponding to the current viewport

7.1

Delete Table 1 and replace the second paragraph with the following:

Two new data types are defined: `ViewportDataType` and `ViewpointDataType`. `ViewportDataType` is an object that defines a viewport and is defined as shown in Table 1, while `ViewpointDataType` is an object that defines a viewpoint and is defined as shown in Table 2.

© ISO/IEC 2024 – All rights reserved

Table 1 — ViewportDataType

Key		Type	Description
ViweportDataType		Object	
	media_type	Integer	Specifies the type of the immersive media: 0 indicates omnidirectional media, 1 indicates V3C media, and other values are reserved.
	viewport_omnidirectional	OmnidirectionViweportDataType	Specifies the viewport as an omnidirectional viewport. Shall only be present if the media_type is equal to 0.
	viewport_v3c	V3CViewportDataType	Specifies the viewport as a V3C viewport. Shall only be present if the media_type is equal to 1.

Table 2 — ViewpointDataType

Key		Type	Description
ViewpointDataType		Object	
	media_type	Integer	Specifies the type of the immersive media: 0 indicates omnidirectional, 1 indicates V3C, and other values are reserved.
	viewpoint_omnidirectional	OmnidirectionViewpointDataType	Specifies the viewpoint as an omnidirectional viewpoint. Shall only be present if media_type is equal to 0.
	viewpoint_v3c	V3CViewpointDataType	Specifies the viewpoint as a V3C viewpoint. Shall only be present if media_type is equal to 1.

For omnidirectional media, OmnidirectionalViewportDataType and OmnidirectionalViewpointDataType are defined as shown in Table 3 and Table 4, respectively.

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

© ISO/IEC 2024 – All rights reserved

Table 3 — OmnidirectionalViewportDataType

Key		Type	Description
OmnidirectionalViewportDataType		Object	
	viewpoint_id	Integer	Specifies the identifier of the viewpoint to which the viewport belongs. Each viewpoint has a unique viewpoint_id.
	centre_azimuth	Integer	Specifies the azimuth of the centre of the viewport in units of 2^{-16} degrees. The value shall be in the range of $-180 * 2^{16}$ to $180 * 2^{16} - 1$, inclusive.
	centre_elevation	Integer	Specifies the elevation of the centre of the viewport in units of 2^{-16} degrees. The value shall be in the range of $-90 * 2^{16}$ to $90 * 2^{16}$, inclusive.
	centre_tilt	Integer	Specifies the tilt angle of the viewport in units of 2^{-16} degrees. The value shall be in the range of $-180 * 2^{16}$ to $180 * 2^{16} - 1$, inclusive.
	azimuth_range	Integer	Specifies the azimuth range of the viewport through the centre point of the viewport, in units of 2^{-16} degrees.
	elevation_range	Integer	Specifies the elevation range of the viewport through the centre point of the viewport, in units of 2^{-16} degrees.

Table 4 — OmnidirectionalViewpointDataType

Key		Type	Description
OmnidirectionalViwepointDataType		Object	
	viewpoint_id	Integer	Specifies an identifier for the viewpoint. Each viewpoint has a unique viewpoint_id.
	centre_azimuth	Integer	Specifies the azimuth of the centre of the viewport in units of 2^{-16} degrees. The value shall be in the range of $-180 * 2^{16}$ to $180 * 2^{16} - 1$, inclusive.
	centre_elevation	Integer	Specifies the elevation of the centre of the viewport in units of 2^{-16} degrees. The value shall be in the range of $-90 * 2^{16}$ to $90 * 2^{16}$, inclusive.
	centre_tilt	Integer	Specifies the tilt angle of the viewport in units of 2^{-16} degrees. The value shall be in the range of $-180 * 2^{16}$ to $180 * 2^{16} - 1$, inclusive.

For V3C media, V3CViewportDataType and V3CViewpointDataType are defined as shown in Table 5 and Table 6, respectively.

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

© ISO/IEC 2024 – All rights reserved

Table 5 — V3CViewportDataType

Key		Type	Description
V3CViewportDataType		Object	
	viewpoint	V3CViewpointDataType	Specifies the viewpoint to which the viewport belongs. Note that each viewpoint has a unique viewpoint_id.
	camera_type	Integer	Specifies the projection method of the viewport camera. The value 0 specifies ERP projection. The value 1 specifies a perspective projection. The value 2 specifies an orthographic projection. Values in the range 3 to 255 are reserved for future use by ISO/IEC.
	erp_horizontal_fov	SignedInt	Specifies the longitude range for an ERP projection corresponding to the horizontal size of the viewport region, in units of radians. The value shall be in the range 0 to 2π. This is for camera_type = 0.
	erp_vertical_fov	SignedInt	Specifies the latitude range for an ERP projection corresponding to the vertical size of the viewport region, in units of radians. The value shall be in the range 0 to π. This is for camera_type = 0.
	perspective_horizontal_fov	SignedInt	Specifies the horizontal field of view for perspective projection in radians. The value of shall be in the range of 0 and π. This is for camera_type = 1.
	perspective_aspect_ratio	Float	Specifies the relative aspect ratio of viewport for perspective projection (horizontal/vertical). The value shall be expressed in 32-bit binary floating-point format with the 4 bytes in big-endian order and with the parsing process as specified in IEEE 754. This is for camera_type = 1.
	ortho_aspect_ratio	Float	Specifies the relative aspect ratio of viewport for orthogonal projection (horizontal/vertical). The value shall be expressed in 32-bit binary floating-point format with the 4 bytes in big-endian order and with the parsing process as specified in IEEE 754. This is for camera_type = 2.

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD 1:2024

© ISO/IEC 2024 – All rights reserved

Table 5 *(continued)*

Key		Type	Description
	ortho_horizontal_size	Float	Specifies the horizontal size of the orthogonal in metres. The value shall be expressed in 32-bit binary floating-point format with the 4 bytes in big-endian order and with the parsing process as specified in IEEE 754. This is for camera_type = 2.
	clipping_near_plane	Float	Specifies the near depth (or distance) based on the near clipping plane of the viewport in metres. The value shall be expressed in 32-bit binary floating-point format with the 4 bytes in big-endian order and with the parsing process as specified in IEEE 754.
	clipping_far_plane	Float	Specifies the far depth (or distance) based on the far clipping plane of the viewport in metres. The value shall be expressed in 32-bit binary floating-point format with the 4 bytes in big-endian order and with the parsing process as specified in IEEE 754.

Table 6 — V3CViewpointDataType

Key		Type	Description
V3CViewpointDataType		Object	
	viewpoint_id	String	Specifies the identifier of the viewpoint for V3C content.
	vp_pos_x	SignedInt	Indicates the x-coordinate of the position of the viewpoint in meters in the global reference coordinate system, as defined in ISO/IEC 23090-10:2022, subclause 10.2.1.2. The values shall be expressed in 32-bit binary floating point format with the 4 bytes in big-endian order and with the parsing process as specified in IEEE 754.
	vp_pos_y	SignedInt	Indicates the y-coordinate of the position of the viewpoint in meters in the global reference coordinate system, as defined in ISO/IEC 23090-10:2022, subclause 10.2.1.2. The values shall be expressed in 32-bit binary floating point format with the 4 bytes in big-endian order and with the parsing process as specified in IEEE 754.
	vp_pos_z	SignedInt	Indicates the z-coordinate of the position of the viewpoint in meters in the global reference coordinate system, as defined in ISO/IEC 23090-10:2022, subclause 10.2.1.2. The values shall be expressed in 32-bit binary floating point format with the 4 bytes in big-endian order and with the parsing process as specified in IEEE 754.

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD1:2024

© ISO/IEC 2024 – All rights reserved

Table 6 *(continued)*

Key		Type	Description
	vp_quat_x	Integer	Indicates the x component of the rotation of the viewpoint region using the quaternion representation, as defined in ISO/IEC 23090-10:2022, subclause 10.2.1.2. The values shall be a floating-point value in the range of –1 to 1, inclusive.
	vp_quat_y	Integer	Indicates the y component of the rotation of the viewpoint region using the quaternion representation, as defined in ISO/IEC 23090-10:2022, subclause 10.2.1.2. The values shall be a floating-point value in the range of –1 to 1, inclusive.
	vp_quat_z	Integer	Indicates the z component of the rotation of the viewpoint region using the quaternion representation, as defined in ISO/IEC 23090-10:2022, subclause 10.2.1.2. The values shall be a floating-point value in the range of –1 to 1, inclusive.
	vp_center_view_flag	Booelan	As defined in ISO/IEC 23090-10:2022, subclause 10.2.3.2: Value equal to 1 indicates that the viewpoint position signalled corresponds to the center of the viewport. Value equal to 0 indicates that the viewpoint position signalled corresponds to one of two stereo positions of the viewpoint.
	vp_left_view_flag	Boolean	As defined in ISO/IEC 23090-10:2022, subclause 10.2.3.2: Value equal to 1 indicates that the viewpoint information signalled correspond to the left stereo position of the viewpoint. Value equal to 0 indicates that the viewpoint information signalled correspond to the right stereo positions of the viewport.
	viewport_type	Integer	Specifies the type of the viewport as listed in ISO/IEC 23090-10:2022, subclause 10.3.2.3, Table 11.

Renumber previous Tables 2 to 6 as Tables 7 to 11 respectively.

Clause 7

Add the following subclause at the end of the clause:

7.6 OMAF viewpoint switching latency

The viewpoint switching latency metric reports the latency experienced by the user when switching to a target viewport not being rendered until a viewport of the target viewpoint is rendered.

The viewpoint switching latency metric is specified in Table 12.

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/Amd 1:2024

© ISO/IEC 2024 – All rights reserved

Table 12 — Viewpoint switching latency

Key	Type	Description
ViewpointSwitchingLatency	List	List of viewpoint switching latencies
Entry	Object	
originViewpoint	OmnidirectionalViewportDataType	Specifies the spherical region corresponding to a viewport of the origin viewpoint (i.e., before switching).
targetViewpoint	OmnidirectionalViewportDataType	Specifies the spherical region corresponding to a viewport of target viewpoint (i.e., after the switching).
t	Real-Time	Specifies the measurement time of the viewpoint switching latency in wall-clock time.
latency	Integer	Specifies the delay in milliseconds between the time when switching from a source viewpoint to the target viewpoint is initiated, as specified in subclause 8.4, and the time when content corresponding to the target viewpoint is reflected on the display.

IECNORM.COM : Click to view the full PDF of ISO/IEC 23090-6:2021/AMD 1:2024

Clause 8

Add the following subclause at the end of the clause:

8.4 OMAF viewpoint switching latency metric measurement

A potential viewpoint switch event is detected when a network request is made for a segment from a representation of a new viewpoint, whose representations are not currently being rendered, in response to an explicit user request or the user's interaction with the scene. In the case of sub-picture-based viewport-dependent streams, one or more segments corresponding to sub-pictures of the new viewpoint may be requested. The event is finally identified (i.e., completed) when a viewport from the new viewpoint (not currently being rendered) is eventually rendered after the requested segment(s) are downloaded and decoded.

When a potential viewpoint switch is detected, the client creates a record containing the detection time and the target viewpoint and adds this record to an in-memory data structure (e.g., a list) that keeps track of all pending viewpoint switching measurements. When rendering module renders a viewport with a new viewpoint ID that is different from the viewpoint ID of the preceding rendered viewport, the

© ISO/IEC 2024 – All rights reserved