 ISO/IEC JTC 1/SC 29/WG 3 N00760

**ISO/IEC JTC 1/SC 29/WG 3**

**MPEG Systems   
Convenorship: KATS (Korea, Republic of)**

**Document type:** Output Document

**Title:** **Procedures for standard development, test scenarios and reference software for ISO/IEC 23090-14 (MPEG-I Scene Description)**

**Status:** Approved

**Date of document:** 2023-01-20

**Source:** ISO/IEC JTC 1/SC 29/WG 3

**Expected action:** ACT

**Action due date:** 2023-01-20

**No. of pages:** 12 (with cover page)

**Email of Convenor:** young.L@samsung.com

**Committee URL:** <https://isotc.iso.org/livelink/livelink/open/jtc1sc29wg3>

**INTERNATIONAL ORGANISATION FOR STANDARDISATION**

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**ISO/IEC JTC 1/SC 29/WG 3**

**CODING OF MOVING PICTURES AND AUDIO**

**ISO/IEC JTC 1/SC 29/WG 3 N** **00760**

**Online, Elbonia – January 2023**

|  |  |
| --- | --- |
| **Source** | **WG03 (MPEG Systems)** |
| **Title** | **Procedures for standard development, test scenarios and reference software for ISO/IEC 23090-14 (MPEG-I Scene Description)** |
| **Editor** | **Thomas Stockhammer** |
| **MPEG number** | **22284** |

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# Scope

This document provides information and agreed processes in order to support the development of ISO/IEC 23090-14, "MPEG-I Scene Description" as well as ISO/IEC 23090-24, "Conformance and Reference Software for MPEG-I Scene Description".

# Time Plans and Projects

Time Plans and Projects for MPEG-I scene description can be checked here:

* ISO/IEC FDIS 23090-14 Information technology — Coded representation of immersive media — Part 14: Scene Description for MPEG Media
  + <https://www.iso.org/standard/80900.html>
  + <https://sd.iso.org/projects/project/80900/overview>

Graphical user interface, application, Teams

Description automatically generated

* ISO/IEC 23090-24 Information technology — Coded representation of immersive media — Part 24: Conformance and Reference Software for Scene Description for MPEG Media
  + <https://www.iso.org/standard/83696.html>
  + <https://sd.iso.org/projects/project/83696/overview>

Graphical user interface, text, application, email

Description automatically generated

* ISO/IEC DIS 23090-14/AMD 1 Information technology — Coded representation of immersive media — Part 14: Scene description — Amendment 1: Support for immersive media codecs in scene description
  + <https://www.iso.org/standard/84769.html>
  + <https://sd.iso.org/projects/project/84769/overview>

Graphical user interface, application

Description automatically generated

* ISO/IEC DIS 23090-14/AMD 2 Information technology — Coded representation of immersive media — Part 14: Scene description — Amendment 2: Support for Haptics, Augmented Reality, Avatars, Interactivity, MPEG-I Audio and Lighting
  + No project yet, but: “This project has been approved via CIB. I will upload the SOV today. Please proceed with the work. I suppose this project goes to CDAM at this meeting.”
  + Editors: Imed Bouazizi, Emmanuel Thomas, Patrice Hirtzlin
  + Target dates
    - PDAM 2023-01
    - DAM 2023-07
    - FDAM 2024-01

# Extending Khronos glTF2.0

## General

Based on the agreement during MPEG#128, MPEG-I Scene Description is developed as an extension to Khronos' glTF2.0 specification. This specification can be accessed here: <https://github.com/KhronosGroup/glTF/blob/master/specification/2.0/README.md>

According to the specification, glTF defines an extension mechanism that allows the base format to be extended with new capabilities. Any glTF object can have an optional extensions property. For details see <https://github.com/KhronosGroup/glTF/blob/master/specification/2.0/README.md#specifying-extensions>. For more information on glTF extensions, consult the [extensions registry specification](https://github.com/KhronosGroup/glTF/blob/master/extensions/README.md).

glTF supports different ways on extending the specification as documented here: <https://github.com/KhronosGroup/glTF/blob/master/extensions/README.md#promoting-extensions>

The following principles are agreed:

* MPEG develops extensions to Khronos glTF2.0 under the *Vendor Extensions framework*. Contributing companies should be aware of this. If contributions do not provide a statement that says otherwise, it is expected that the proponents agree to this.
* MPEG has been assigned an extension with the prefix MPEG <https://github.com/KhronosGroup/glTF/blob/master/extensions/Prefixes.md>. Contact person is the MPEG convenor, the JTC1 SC29 WG3 MPEG Systems chair as well as the chair of the MPEG-I Scene Description BOG. An update request has been submitted here: https://github.com/KhronosGroup/glTF/issues/2247
* If MPEG contributors are generally interested that their proposal may be considered as a KHR extension without any binding commitment, input contributions may state so. However, such a statement or the absence of such a statement does not impact the processing of a contribution in the context of the MPEG-I scene description work.

## Template for MPEG Extensions submitted to Khronos

It is proposed that all MPEG agreed extensions after DIS and FDIS has been issued, are added to the Khronos repository as follows

* Contributors
  + ISO/IEC SC29 WG3 (MPEG Systems) - Scene Description Breakout Group
  + Contacts: Thomas Stockhammer (MPEG-I Scene Description BoG Chair, tsto@qti.qualcomm.com)
* Status
  + Draft at DIS
  + Stable at FDIS
  + Based on [ISO/IEC FDIS 23090-14](https://www.iso.org/standard/80900.html)
* Dependencies
  + Written against the glTF 2.0 spec
* Overview:
  + Introduction should be provided on the extension
  + Pointer to ISO/IEC 23090-14 where the extension is defined
* glTF Schema Updates
  + Pointer to MPEG schema updates
* JSON Schema
  + Link to schema
* Known Implementation
  + Pointer to reference software: [ISO/IEC 23090-24](https://www.iso.org/standard/83696.html)
* Resources:
  + [ISO/IEC FDIS 23090-14](https://www.iso.org/standard/80900.html), Information technology — Coded representation of immersive media — Part 14: Scene Description
  + [ISO/IEC WD 23090-24](https://www.iso.org/standard/83696.html), Information technology — Coded representation of immersive media — Part 24: Conformance and Reference Software for Scene Description for MPEG Media
  + Comments may be submitted here: <https://github.com/MPEGGroup/Scene-Description>
* Best Practices:
  + Implementation Guidelines, Fallback mechanisms, etc.
* License:
  + Copyright (c), ISO/IEC
  + The use of the "MPEG scene description extensions" is subject to the license as accessible here: <https://standards.iso.org/> and is subject to the IPR policy as accessible here: <https://www.iso.org/iso-standards-and-patents.html>.

The extensions are also collected in the internal github here: here <http://mpegx.int-evry.fr/software/MPEG/Systems/SceneDescription/Specification/23090-14/-/tree/master/Extensions>.

## Status Extension Submission for first Edition

During MPEG#139, MPEG decided to submit all extensions of ISO/IEC 23090-14 and register those with Khronos based on document MDS21744\_SCWG3\_N0615. The first edition of MPEG-I Scene description is currently under ISO editing regime to be sent to FDIS ballot hopefully soon. Target publication date is February 25, 2023.

During MPEG#140, there was significant activity to progress the registration of the extensions at Khronos gltf – [a pull request](https://github.com/KhronosGroup/glTF/pull/2203) was submitted. This pull request was introduced to the chairs of Khronos in a call during the MPEG#140 week (and slightly updated to include the appropriate ISO copyright statement) and then presented to the 3D Formats group using these [slides](https://dms.mpeg.expert/doc_end_user/documents/140_Mainz/wg11/m61454-v1-m61454.zip). The feedback was positive, and it seemed that the decision to approve our merge request was already taken after the unofficial chair call.

After MPEG#140, the submission of the pull request to add the Khronos extensions was progressed, but not yet completed.

* For the first edition, the status can be followed here: <https://github.com/KhronosGroup/glTF/pull/2203>
* Additions to the pull requests are forked here: <https://github.com/haudiobe/glTF>.
* The commits can be followed here: <https://github.com/KhronosGroup/glTF/pull/2203/commits>. Those were triggered by comments from the main gltf editor.

It is expected that shortly after MPEG#141 (Jan 2023), the pull request will be merged.

The extensions are tracked here:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS22293](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86293&id_meeting=193) | WG 03 | 00769 | 2023-01-21 14:27:20 |  | WG 03 MPEG-I | Revised registration of Khronos extensions for 1st edition | WG 03 MPEG Systems |

## Status Extension Submission for second Edition

At the last meeting MPEG#140, we decided to register the extensions early in the progress to promote the work to Khronos, after the first edition is completed. Unfortunately, as the first edition extensions are not yet completed, the pull request for the second edition has not yet been created.

During MPEG#141 it was decided to properly format the extensions and to make them available as an output from MPEG#141. They are collected here:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS22339](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86339&id_meeting=193) | WG 03 | 00815 | 2023-01-21 14:27:20 |  | WG 03 MPEG-I | Draft registration of Khronos extensions 2nd edition | WG 03 MPEG Systems |

# Communication with Khronos

## Overview

Khronos has active work in the context of glTF2.0, see the KHR extensions under development here: <https://github.com/KhronosGroup/glTF/blob/master/extensions/README.md>. It is also identified that there is an overlap between MPEG members and glTF participants. Khronos and graphics experts meet in Khronos meetings, but also at developer and research conferences such as GDC and Siggraph. For meetings, please refer to <https://www.khronos.org/events/>.

Khronos Member Meetings occur 3 times per year and offer the opportunity for Khronos members to come together in a face-to-face environment to discuss technical work, industry feedback, network with colleagues and have some fun.

The scheduled upcoming meetings are here:

|  |  |  |
| --- | --- | --- |
| Meeting | Date | Location |
| F2F Osaka 2023 | May 8-12, 2023 | Osaka, Japan |

## Communication prior to MPEG#141

### MPEG#133

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [MDS20159](https://dms.mpeg.expert/doc_end_user/current_document.php?id=78184&id_meeting=185) | WG 03 | 00180 | All | Liaison to Khronos on Scene Description for MPEG Media | WG 03 MPEG Systems | [MDS20159\_WG03\_N00180](https://dms.mpeg.expert/doc_end_user/documents/133_OnLine/wg11/MDS20159_WG03_N00180.zip) |

### MPEG#135

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [MDS20563](https://dms.mpeg.expert/doc_end_user/current_document.php?id=79965&id_meeting=187) | WG 03 | 00309 | WG 03 All | Liaison statement to Khronos on MPEG-I Scene Description | WG 03 MPEG Systems | [MDS20563\_WG03\_N00309](https://dms.mpeg.expert/doc_end_user/documents/135_OnLine/wg11/MDS20563_WG03_N00309.zip) |

### MPEG#136

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [MDS21056](https://dms.mpeg.expert/doc_end_user/current_document.php?id=81135&id_meeting=188) | WG 03 | 00434 | WG 03 All | Liaison statement to Khronos on MPEG-I Scene Description | WG 03 MPEG Systems | [MDS21056\_WG03\_N00434](https://dms.mpeg.expert/doc_end_user/documents/136_OnLine/wg11/MDS21056_WG03_N00434.zip) |

### MPEG#137

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [MDS21327](https://dms.mpeg.expert/doc_end_user/current_document.php?id=82177&id_meeting=189) | WG 03 | 00511 | WG 03 All | Liaison statement to Khronos on MPEG-I Scene Description | WG 03 MPEG Systems | [MDS21327\_WG03\_N00511](https://dms.mpeg.expert/doc_end_user/documents/137_OnLine/wg11/MDS21327_WG03_N00511.zip) |

### MPEG#138

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [MDS21435](https://dms.mpeg.expert/doc_end_user/current_document.php?id=82962&id_meeting=190) | WG 03 | 00542 | WG 03 MPEG-I | Registration of Khronos extensions | WG 03 MPEG Systems | [MDS21435\_WG03\_N00542](https://dms.mpeg.expert/doc_end_user/documents/138_OnLine/wg11/MDS21435_WG03_N00542.zip) |
| [MDS21603](https://dms.mpeg.expert/doc_end_user/current_document.php?id=83120&id_meeting=190) | WG 03 | 00588 | WG 03 All | Liaison statement to Khronos on mesh attributes in glTF 2.0 | WG 03 MPEG Systems | [MDS21603\_WG03\_N00588](https://dms.mpeg.expert/doc_end_user/documents/138_OnLine/wg11/MDS21603_WG03_N00588.zip) |

### MPEG#139

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| [MDS21744](https://dms.mpeg.expert/doc_end_user/current_document.php?id=83961&id_meeting=191) | WG 03 | 00615 | WG 03 MPEG-I | Registration of Khronos extensions | WG 03 MPEG Systems | [MDS21744\_WG03\_N00615](https://dms.mpeg.expert/doc_end_user/documents/139_OnLine/wg11/MDS21744_WG03_N00615.zip) |
| [MDS21885](https://dms.mpeg.expert/doc_end_user/current_document.php?id=84100&id_meeting=191) | WG 03 | 00671 | WG 03 All | Liaison statement to Khronos on MPEG-I Scene description | WG 03 MPEG Systems | [MDS21885\_WG03\_N00671](https://dms.mpeg.expert/doc_end_user/documents/139_OnLine/wg11/MDS21885_WG03_N00671.zip) |

### MPEG#140

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS21968](https://dms.mpeg.expert/doc_end_user/current_document.php?id=85069&id_meeting=192) | WG 03 | 00689 | 2022-10-28 15:29:21 | 2023-01-15 18:33:04 | WG 03 MPEG-I | Final registration of Khronos extensions for 1st edition | WG 03 MPEG Systems | [MDS21968\_WG03\_N00689](https://dms.mpeg.expert/doc_end_user/documents/140_Mainz/wg11/MDS21968_WG03_N00689.zip) |
| [MDS22198](https://dms.mpeg.expert/doc_end_user/current_document.php?id=85289&id_meeting=192) | WG 03 | 00751 | 2022-10-28 15:29:21 | 2023-01-15 18:37:40 | WG 03 MPEG-I | Draft registration of Khronos extensions 2nd edition | WG 03 MPEG Systems | [MDS22198\_WG03\_N00751](https://dms.mpeg.expert/doc_end_user/documents/140_Mainz/wg11/MDS22198_WG03_N00751.zip) |
| [MDS22200](https://dms.mpeg.expert/doc_end_user/current_document.php?id=85291&id_meeting=192) | WG 03 | 00753 | 2022-10-28 15:29:21 | 2023-01-15 18:38:56 | WG 03 All | Liaison to Khronos on MPEG-I Scene Description | WG 03 MPEG Systems | [MDS22200\_WG03\_N00753](https://dms.mpeg.expert/doc_end_user/documents/140_Mainz/wg11/MDS22200_WG03_N00753.zip) |



## Proposed Communication at MPEG#141

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS22293](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86293&id_meeting=193) | WG 03 | 00769 | 2023-01-21 14:27:20 |  | WG 03 MPEG-I | Revised registration of Khronos extensions for 1st edition | WG 03 MPEG Systems |
| [MDS22339](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86339&id_meeting=193) | WG 03 | 00815 | 2023-01-21 14:27:20 |  | WG 03 MPEG-I | Draft registration of Khronos extensions 2nd edition | WG 03 MPEG Systems |

# Requirements, Scenarios and Test Assets

## Requirements

The work of the MPEG-I scene description is based on the requirements defined in N18965, later revised to N19511. The coverage of the requirements and the progress is documented in

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS22285](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86285&id_meeting=193) | WG 03 | 00761 | 2023-01-21 14:27:20 |  | WG 03 MPEG-I | Requirements Coverage of MPEG-I Scene Description | WG 03 MPEG Systems |

## Scenarios

Providing Extension to MPEG-I Scene Description is based on well-defined and agreed scenarios. WG3\_N0761 also covers the mapping of requirements to scenarios.

Scenarios include:

* Description of the scenario
* A set of test assets that are needed for the scenario

Agreed scenarios and test assets can be accessed:

* <https://gitlab.com/mpeg-i/scene-description/scenarios/>

Agreed Test Assets can be accessed here.

* <http://mpegfs.int-evry.fr/mpegcontent/ws-mpegcontent/MPEG-I/Part14-SceneDescriptions>

Note: access and contribution to this requires an account. To request an account, please contact the test asset coordinators (see clause 9)

For adding new scenarios, please provide an input contribution to MPEG with the following information

* Description of the scenario
* A set of test assets that are needed for the scenario

A template for the scenario is provided in clause 5.3.

## Template for Test Scenario

The following table should be used to propose test scenarios for scene description:

|  |  |
| --- | --- |
| Item | Description |
| Title | <give it a catchy title, e.g. as those listed in clause 2> |
| Description | * What is the basic use case? * How does it relate to MPEG-I Requirements and Use Cases? |
| Required test assets | * 3D scene, real-time assets for media (2D/3D) * Anything else * References to test assets |
| Current Support | * How can glTF Scene Description be used today * What are gaps/inefficiencies of glTF2.0 to address this scenario? |
| Criteria | * What are relevant criteria for the user experience/QoE? * What are relevant criteria for passing the test scenario? |

## Continuous Call for Test Data

Among others, we solicit the following material to be used as content for the creation and validation of MPEG-Scene Descriptions:

* 2D content that can server as overlays, video textures
* 2D and 3D content that is captured from a local camera, e.g. representing a conference room or flat surfaces for overlay
* 3D game content, e.g. provided in Unity, that can be used for the online gaming scenario
* 3D cinematographic content that includes complete scenes
* VR content and 3D mesh and point cloud content that can be used for VR scenes
* etc…

We welcome contributions of content that can be made available to the MPEG community for the sake of the MPEG-I Scene Description activity.

## Timeline

The data sets should be submitted as input contributions to the 142nd MPEG meeting (April 2023), but early submission into AHG is welcome.

## Available Test Assets

The following table lists the available assets and provides a brief description:

http://mpegx.int-evry.fr/software/MPEG/Systems/SceneDescription/test-assets

# Contributions for Extensions

## General

For every extension documented in ISO/IEC 23090-14 under the framework in clause 3 the following information is expected to be provided:

* The schema for the extension as part of the standard as well as a json document
* The semantics for the extension
* The processing model on the "Presentation Engine"
* The conformance description, i.e. conformance requirements for the Presentation Engine that supports the extension
* *A promise for example content that uses the extension that is finally available within 1 meeting after the technology was added. If not fulfilled, the feature is expected to be removed and this will be documented as a note in the draft standard.*
* *A promise of a reference implementation in one of the agreed reference software libraries as documented in clause 7, that is finally available within 2 meetings after the technology was added. If not fulfilled, the feature is expected to be removed and this will be documented as a note in the draft standard.*

Hence, contributions addressing extensions to glTF under the framework in clause 3 should include the following:

* The scenarios that this extension is addressing. The scenarios are documented in clause 5.8.
* All information from above

As long as not all the above information is available, a documented extension is not moved into the WD/CD, but is maintained in the Technology under Consideration (TuC) document. The status of the completed information and the missing one is documented in the TUC.

The following text processes is recommended, but needs final verification:

*To fulfil the requirement on the reference software, it is sufficient to demonstrate that the reference software is able to properly process the test scenario. The test scenario content shall at least have a scene description file in glTF textual format that makes use of the proposed extension. The test scene description glTF document should use one of the available assets. The proposal must indicate any dependencies on other extensions.*

*The following is an example of this procedure:*

* *A test scenario is defined around support for video textures*
* *The proposal is to make use of the MPEG\_video\_texture extension*
* *A sample content is proposed based on the "conferenceroom" glTF file, which is part of the assets. The glTF file is extended to include the MPEG\_video\_texture extension. The bbb.mp4 asset is used to describe the video texture, which is attached to a rectangular mesh in the "conferenceroom" scene.*
* *The reference software is run with the modified scene description document and the expected behavior is demonstrated, showing the video texture.*

## Extension Principles

The following extension principles apply

* If the extension adds a new top-level array (by extending the root glTF object), its elements should inherit all properties of glTFChildOfRootProperty.schema.json.
* Other objects introduced by the extension should inherit all properties of glTFProperty.schema.json.
* By glTF 2.0 conventions, schemas should allow additional properties.
* Names MUST begin with an MPEG prefix, followed by an underscore.
* Names MUST use lowercase snake-case following the prefix, e.g. MPEG\_materials\_sand.
* Names SHOULD be structured as MPEG\_<scope>\_<feature>, where scope is an existing glTF concept (e.g. mesh, texture, image) and feature describes the functionality being added within that scope. This structure is recommended, but not required.
* Scope SHOULD be singular (e.g. mesh, texture), except where this would be inconsistent with an existing Khronos extension (e.g. materials, lights).

# Reference Software

The reference software for the scene description is documented in ISO/IEC 23090-24 as available in :

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS22295](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86295&id_meeting=193) | WG 03 | 00771 | 2023-01-21 14:27:20 |  | WG 03 MPEG-I | Text of ISO/IEC CD 23090-24 Conformance and reference software for scene description | WG 03 MPEG Systems |

Procedures are documented in WG3 N0703.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS22306](https://dms.mpeg.expert/doc_end_user/current_document.php?id=86306&id_meeting=193) | WG 03 | 00782 | 2023-01-21 14:27:20 |  | WG 03 MPEG-I | Procedures for test scenarios and reference software development for MPEG-I Scene Description | WG 03 MPEG Systems |

# Gitlab Management

For details on test assets, conformance and reference software, as well as test scenarios, refer to WG3 N0782. A summary of the assets is provided here:

|  |  |  |
| --- | --- | --- |
| **Asset** | **Hosting** | **Location name** |
| Repository | Gitlab.com | https://gitlab.com/mpeg-i/scene-description |
| MPEG Trimesh (mpegtrimesh) Reference software | Gitlab.com | https://gitlab.com/mpeg-i/scene-description/mpegtrimesh |
| Conformance software | Gitlab.com | https://gitlab.com/mpeg-i/scene-description/conformance |
| Scenarios | Gitlab.com | https://gitlab.com/mpeg-i/scene-description/scenarios |
| Test vectors | Gitlab.com with LFS for binary files | <https://gitlab.com/mpeg-i/scene-description/test-vectors> |
| Test assets | MPEG content | <http://mpegfs.int-evry.fr/mpegcontent/ws-mpegcontent/MPEG-I/Part14-SceneDescriptions> |

For access to the project, please register an account on GitLab.com at <https://gitlab.com/users/sign_in> and collect the following information:

* GitLab.com username
* GitLab.com email address

Please then send an email containing this information to the gitlab managers as listed in clause 9.

For uploading content to the Test Assets, please bring an input contribution to the MPEG meeting.

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