**INTERNATIONAL ORGANISATION FOR STANDARDISATION**

**ORGANISATION INTERNATIONALE DE NORMALISATION**

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

**CODING OF MOVING PICTURES AND AUDIO**

**ISO/IEC JTC 1/SC 29/WG 3 N** **00368**

**Online – October 2021**

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

Contents

[1 Scope 3](#_Toc77377287)

[2 Time Plan 3](#_Toc77377288)

[3 Extending Khronos glTF2.0 4](#_Toc77377289)

[3.1 General 4](#_Toc77377290)

[3.2 MPEG Extensions submitted to Khronos 5](#_Toc77377291)

[4 Communication with Khronos 5](#_Toc77377292)

[4.1 Overview 5](#_Toc77377293)

[4.2 Communication prior to MPEG#132 6](#_Toc77377294)

[4.3 Proposed Communication after MPEG#132 7](#_Toc77377295)

[4.4 Communication during MPEG#133 7](#_Toc77377296)

[4.5 Communication during MPEG#134 9](#_Toc77377297)

[4.6 Communication during MPEG#135 10](#_Toc77377298)

[5 Requirements, Scenarios and Test Assets 11](#_Toc77377299)

[5.1 Requirements 11](#_Toc77377300)

[5.2 Scenarios 11](#_Toc77377301)

[5.3 Template for Test Scenario 12](#_Toc77377309)

[5.4 Continuous Call for Test Data 12](#_Toc77377310)

[5.5 Timeline 12](#_Toc77377311)

[5.6 Available Test Assets 13](#_Toc77377312)

[5.7 Agreed Test Scenarios 13](#_Toc77377313)

[6 Contributions for Extensions 13](#_Toc77377314)

[6.1 General 13](#_Toc77377315)

[6.2 Extension Principles 14](#_Toc77377316)

[7 Reference Software 15](#_Toc77377317)

[8 Gitlab Management 15](#_Toc77377323)

[8.1 Reference implementation software 15](#_Toc77377324)

[8.2 Conformance software 15](#_Toc77377325)

[8.3 Scenarios 15](#_Toc77377326)

[8.4 Test assets 15](#_Toc77377327)

[8.5 Test vectors 16](#_Toc77377328)

[8.6 Summary logistics 16](#_Toc77377329)

[9 Candidate Phase 2 Technologies 17](#_Toc77377330)

[This clause provides and overview of candidate phase 2 technologies 17](#_Toc77377331)

[- Advanced Audio functionalities 17](#_Toc77377332)

[- Support for AR in Scene Description 17](#_Toc77377334)

[- Partial Access Support for Scene Description 17](#_Toc77377335)

[- CoAP Support for IoT streaming devices in Scene Description 17](#_Toc77377336)

[- Interactivity in Scene Description 17](#_Toc77377337)

[- Nodes with External Transformation 17](#_Toc77377338)

[- Basic support for Haptics 17](#_Toc77377339)

[10 Coordinators for Efforts until MPEG#136 17](#_Toc77377340)

# Scope

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

# Time Plan

The work on MPEG-I scene description is part of MPEG-I phase 2a as defined in N18965, clause 3.

In order to address the proper completion of the first version of the standard for ISO/IEC 23090-14, the following time plan is considered:

* WD: 2020-01
* CD: 2020-10
  + With and editing period until end of November
* Potential Improvements of CD: 2021-01
  + It is expected that NBs comment on this document
* DIS: 2021-04
  + With a short editing period to meet FDIS ballot comments
* Potential Improvements of DIS: 2021-07
* FDIS: 2021-10
* Publication: 2022-01

The project was approved, and details are here: https://www.iso.org/standard/80900.html

ISO/IEC WD 23090-14 Information technology — Coded representation of immersive media — Part 14: Scene Description for MPEG Media

For ISO/IEC 23090-24, the conformance software, the following time plan is considered

* CD: 2021-10
* DIS: 2022-01
* FDIS: 2022-07
* IS: 2022-10

The project was approved, and details are here: https://www.iso.org/standard/83696.html

ISO/IEC WD 23090-24 Information technology — Coded representation of immersive media — Part 24: Conformance and Reference Software for Scene Description for MPEG Media

# 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 requested 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.
* 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.

## MPEG Extensions submitted to Khronos

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

* Contributors
  + Editor of MPEG spec, Affiliation, e-mail
  + Others as agreeable
* Status
  + Draft at DIS
  + Stable at FDIS
* Dependencies
  + Written against the glTF 2.0 spec
* Overview:
  + Two sentences 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
* Resources:
  + Pointer to all available resources
* Best Practices:
  + Implementation Guidelines, Fallback mechanisms, etc.

During MPEG#135 MPEG decided to collect all extensions and register those with Khronos. The extensions are documented in <http://mpegx.int-evry.fr/software/MPEG/Systems/SceneDescription/Specification/23090-14/-/tree/master/Extensions>.

Registration with Khronos requires the following steps:

* To create a new extension, use the [extension template](https://github.com/KhronosGroup/glTF/blob/main/extensions/Template.md) and open a pull request into [this repo](https://github.com/KhronosGroup/glTF/tree/main/extensions). Make sure to add the extension to the glTF Extension Registry (top of this file).
* If you know how to fix an [issue](https://github.com/KhronosGroup/glTF/issues), consider opening a pull request for it.
* You can read this repository’s [contributing guidelines](https://github.com/KhronosGroup/glTF/blob/e5519ce05055da8c3e2f292ba124132991b621cf/CONTRIBUTING.adoc) to learn how to open a good pull request.
* CONTRIBUTING file for the KhronosGroup/glTF project <https://github.com/KhronosGroup/glTF/blob/e5519ce05055da8c3e2f292ba124132991b621cf/CONTRIBUTING.adoc>

On Sep 24, 2021, the extensions above were submitted to Khronos for review via e-mail. In the future, it would be beneficial to create an MPEG repository that hosts the extensions and can be updated to create pull request.

On the procedures, in particular the collaboration and registration of extensions with Khronos require some coordination. It is agreed to

* clarify copyright ISO/Khronos
* submit extensions to Khronos as pull requests
* keep them sufficiently verbose, but make sure that the normative specification is in ISO spec

In order to keep the extensions up to date

* We keep the extensions in the gitlab and improve there.
* We do not add the markdown to our spec.
* We attempt to reference to informatively reference to the gitlab in the FDIS text.

# 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.

However, due to the COVID-19 situation, Khronos meetings have been put on hold and are only scheduled for later in 2022.

|  |  |  |
| --- | --- | --- |
| Meeting | Date | Location |
| F2F Phoenix 2022 | October 17-21, 2022 | Phoenix, Arizona |
| F2F Osaka 2023 | May 8-12, 2023 | Osaka, Japan |

## Communication prior to MPEG#136

In preparation for the above communication, some initial exchanges with Khronos leadership has been taken place, in particular a call between MPEG Scene Description leadership and Khronos leadership (see document [m54843](http://wg11.sc29.org/doc_end_user/current_document.php?id=75900&id_meeting=183)). In this call, the following was provided:

* Background
* Overview on output documents, in particular N19447 on procedures.
* Explained why MPEG asked for vendor extensions and what we attempting to do and to clarify if and how we can formalize the process (see clause 3 of the document)
* Explain the rest of the procedures in the document
* Provided overview on considered extensions (attached are the provided slides)

Based on this initial communication, the following feedback was provided from the Khronos president Neil Trevit.

1. glTF’s priority is driving widespread adoption as a practical and pragmatic real-time 3D asset delivery format.
2. glTF 2.0 established use of PBR in a widely adopted real-time open standard delivery format for the first time in the industry. By necessity, that meant carefully selecting PBR functionality.
3. The glTF working group contains many of the industry’s leading PBR practitioners, who are designing the next wave of PBR functionality that can be widely deployed, avoiding functionality that would hinder pervasive adoption across current platforms.
4. Third party extensions can add any functionality needed for use cases not addressed by Khronos-defined core and extension specifications.
5. Communication and cooperation between Khronos and any entity defining significant extended glTF functionality is desirable to avoid confusion and fragmentation which would hurt all ecosystem participants. Some problems to avoid could include:
   1. definition of extensions that duplicate Khronos-defined, or upcoming Khronos-defined functionality
   2. definition of extensions that are not designed to co-exist with other extended functionality or future core specifications.

After the initial communication, Khronos experts joined our AHG call on August 17, 2020. The initial presentation was represented and discussed. We received the following feedback.

*Hello Thomas,*

*Thank you again for putting Khronos glTF on the MPEG-I August 17th call. We appreciated the discussion.*

*Good news, we have reviewed the updated MPEG-I roadmap presented at the meeting, and the Khronos glTF Working Group is in general agreement with the current design to use and extend glTF.*

*Consequently, we suggest the following ongoing communication channels between MPEG-I and Khronos:*

* + *if MPEG-I has any updated public roadmap information, we are happy to receive, review and provide feedback*
  + ***we encourage MPEG-I to make any glTF extension proposals, or raise issues and questions, directly on the*** [*Khronos public glTF GitHub*](https://github.com/KhronosGroup/glTF)
  + *we are open to attending MPEG-I meetings if needed , or arranging specific joint discussions or meetings*

*And of course, Qualcomm and other MPEG-I participants are Khronos members and are welcome at any weekly glTF meeting where we can put MPEG-I cooperative issues on the agenda as needed.*

*How does this sound? Any other suggestions welcome!*

*Thanks,*

*Neil*

We identified that before engaging with Khronos gltf on github, we need to clarify any IPR aspects when submitting and discussing comments on github and generally around sharing documents. We agreed to use the official liaison.

## Communication during MPEG#133

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS20159](https://dms.mpeg.expert/doc_end_user/current_document.php?id=78184&id_meeting=185) | WG 03 | 00180 | 2021-01-16 01:57:39 | 2021-01-20 07:05:53 | 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) | |

|  |  |
| --- | --- |
| **Title** | **Liaison statement to Khronos on Scene Description for MPEG Media** |
| **Source** | **WG 03, MPEG Systems** |
| **Serial Number** | **20159** |

MPEG Systems would like to inform Khronos on the availability of the Committee Draft of ISO/IEC 23090-14 on MPEG-I Scene Description for MPEG Media in WG03N0026.

As part 14 of the MPEG-I project on "Coded representation of immersive media", MPEG developed use cases and requirements on 3D/immersive/6DoF media and concluded that a scene description is needed. MPEG decided to rather extend an existing format than starting from scratch. Khronos glTF2.0 was recognized by MPEG as the best candidate for a baseline. However, a few gaps were identified in gltf2.0, among others

* No support for Audio
* No support for timed media (dynamic meshes/point clouds, video textures, …)
* No support for scene updates
* No interfaces to media access functions

Based on these requirements, MPEG is defining extensions to address these gaps in ISO/IEC 23090-14. All extensions will use the MPEG\_ namespace which has been registered with Khronos.

Along with this standard, MPEG Systems is also developing test assets and reference software that verifies the extensions. We continue to improve the Committee Draft with expectation of a final first version by late 2021. We also anticipate a second phase, for example addressing support for interactivity.

MPEG Systems would appreciate feedback on the CD of ISO/IEC 23090-14 and on any other activities related to our MPEG-I project.

In addition, MPEG would like to invite Khronos to plan a joint workshop or conference at a convenient time for MPEG and Khronos experts during the development phase of the MPEG-I Scene Description, preferably in mid or late 2021. Due to the COVID-19 situation, an online webinar is suggested. Potential topics include

* Latest development in Khronos on gltf, openXR, OpenMAX and other immersive media centric topics
* Expected future work in Khronos
* Immersive video in MPEG: V-PCC, G-PCC
* MPEG-I Scene Description
* Immersive media and 5G: The role of Khronos and MPEG-I
* Ongoing and future work in both orgs
* Potentially other topics

If you would be interested in such possible event, please contact us.

For your information, our future meeting schedule is as follows:

* 134th MPEG meeting on April 26-30, 2021.

## Communication during MPEG#134

Incoming response from Khronos:

*Dear Mr. Lim,*

*I am replying to your Liaison statement to Khronos on Scene Description for MPEG Media (Serial Number 20159).*

*Khronos continues to value and support our cooperative relationship with SC 29/WG 3 over the reference to glTF from MPEG-I.*

*>> MPEG Systems would appreciate feedback on the CD of ISO/IEC 23090-14 and on any other activities related to our MPEG-I project.*

*Khronos is actively reviewing the CD and will communicate and feedback or concerns.*

*>> MPEG would like to invite Khronos to plan a joint workshop or conference in mid or late 2021*

*Khronos is willing to discuss planning a joint workshop for second half 2021. Please let us know the best way to progress those discussions.*

*>> For your information, our future meeting schedule is as follows: 134th MPEG meeting on April 26-30, 2021.*

*Please let me know if Khronos should attend any sessions of the MPEG meeting next week, we are happy to prepare any updates that are needed.*

*Also, as you may know Khronos has applied to be a JTC 1 PAS Submitter, the ballot closes on May 5th, 2021.*

*Finally, Khronos’ formal liaison with SC 29 was a Cat C liaison with the previous WG 11 and our PAS Mentor has confirmed that liaison is no longer listed since the SC 29 re-organization.*

*As Khronos has a Cat A liaison with SC 24, and we need a liaison with SC 29/WG 3 and SC 29/WG 7 and perhaps other SC 29 working groups, should we consider a Cat A liaison between Khronos and SC 29? We welcome any thoughts or feedback.*

*Thank you, and please let us know if you need any more actions or information from Khronos,*

*Best regards,*

*Neil*

***Neil Trevett***

*Vice President Developer Ecosystems | NVIDIA*

*President | Khronos Group*

*M: +1 (408) 464-7053*

[*ntrevett@nvidia.com*](mailto:ntrevett@nvidia.com)

Meanwhile during the week:

* Khronos completed application for a Category A liaison with SC 29.
* This form goes through ISO CS and they may contact you for further information. (though I assume this would not happen considering the liaison states Khronos Group has already established with other ISO organizations).
* After that, SC 29 does Committee Internal Ballot (CIB - 4 weeks) and JTC 1 does CIB (4 weeks).
* We hope the relationship is established before the 135th MPEG meeting in July.
* And Thomas and Young - please do let us know if our attendance would be helpful at SC 29/WG 3 meetings in the meantime.
* Workshop planning should start (Ask Imed to add this to slides for joint meeting)

No response, we will maintain informal communication.

## Communication during and after MPEG#135

A Liaison was sent to Khronos from MPEG#135:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [MDS20563](https://dms.mpeg.expert/doc_end_user/current_document.php?id=79965&id_meeting=187) | WG 03 | 00309 | 2021-07-17 01:13:34 | 2021-07-17 03:59:37 | 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) | |

Extensions were submitted and a response was received:

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| [m57835](https://dms.mpeg.expert/doc_end_user/current_document.php?id=80295&id_meeting=188) | 2021-09-29 12:48:59 | 2021-09-29 20:00:30 | MPEG-I | [SD] Feedback from Khronos 3D Formats Group | [Thomas Stockhammer](mailto:tsto@qti.qualcomm.com) | |  | | --- | | [m57835](https://dms.mpeg.expert/doc_end_user/documents/136_OnLine/wg11/m57835-v1-m57835.zip) | |

## Joint Workshop

A joint workshop was held, here is the summary

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **428** | **Report of Joint Workshop on Streamed Media in Immersive Scene Descriptions** | **Thomas Stockhammer** | **Y** | **2021-10-15** | **21042** |

# 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 WG3\_N0294.

## Scenarios

Providing Extension to MPEG-I Scene Description is based on well-defined and agreed scenarios. WG3\_N0294 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 136th MPEG meeting (July 2021), but early submission into AHG is welcome.

## Available Test Assets

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

|  |  |
| --- | --- |
| **Asset** | **Description** |
| conferenceroom.zip | a glTF asset that represents a conference room. |
| livingroom.zip | a glTF asset that represents a living room. |
| island.zip | a glTF asset that represents an island. |
| chair.zip | a glTF asset that represents a chair. |
| bbb.mp4 | Big Buck Bunny video file in mp4 format. |
| longdress\_frame.ply | a binary PLY file from the longress point cloud sequence. |
| Scenario 11 | Test Assets:  1. Pine Forest  "author": "fangzhangmnm (https://sketchfab.com/fangzhangmnm)",  "license": "CC-BY-4.0 (http://creativecommons.org/licenses/by/4.0/)",  "source": "https://sketchfab.com/3d-models/pine-forest-ece69535f7584e099488f65f2072264e",  2. woodland-5\_trim\_SN3D.wav  Obtained and modified from EigenScape.  EigenScape is a database of acoustic scenes recorded spatially using the mh Acoustics EigenMike. https://doi.org/10.5281/zenodo.1012809  Marc Green <marc.c.green@york.ac.uk> |

Note that the first 4 assets are downloaded from sketchfab and are available for download and usage under the Creative Commons license as describe in CC Attribution License: <https://creativecommons.org/licenses/by/4.0/>.

## Agreed Test Scenarios

Agreed Test scenarios are provided here:

http://mpegx.int-evry.fr/software/-/ide/project/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 fulfill 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.*

The currently considered extensions

## 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 WD of ISO/IEC 23090-24 as available in WG3 N0326.

# Gitlab Management

## Reference implementation software

Candidate Reference Software Libraries are documented in clause 7 . Each of these software projects are be forked at the start time of the project and the development of the MPEG extensions will be done in the 'mpeg' branch. This would ease future import from and export to the original repositories if this needs to happen.

One Git repository per library will be created. The reason is repositories are free to create and separation of different software, build platform, documentation, etc. is desirable. The names of the repositories are documented in clause 7.

## Conformance software

JSON glTF file are validated using JSON schema. For glTF binary files, it is proposed to define the binary structure in the [Kaitai](https://kaitai.io/) format (YAML based). This will allow the automatic generation of parsing libraries which can in turn be used to validate these binary files.

Both the JSON schemas and the Kaitai files, if needed, are proposed to be hosted on the same Git repositories here: https://gitlab.com/mpeg-i/scene-description/conformance.

## Scenarios

In order to provide use cases that are to be supported by the standard, scenarios are collected. Scenarios are described on what the basic setup an experience is expected to be and provides along with this test assets and test vectors (may be compressed or uncompressed) that may be used in the scenario. These test scenarios are collected the same Git repository with a folder at the root per library then a folder for each scenario inside each library. The name of this repository is https://gitlab.com/mpeg-i/scene-description/scenarios.

## Test assets

Test assets are not accessed on a frequent basis but usually requires protection by password to comply with the corresponding usage licenses, at least as it is commonly done in MPEG.

A folder in the MPEG content server will be created for the MPEG-I scene description standard. All the original "raw" test assets will be stored there along with the corresponding usage licenses.

## Test vectors

The test vectors are exercising the normative aspects of the specification. They will be stored in a single Git repository. When test vectors are binary, the LFS feature of the Git hosting service will be used in order to avoid polluting the Git tree with binary files. The location of the repository is here https://gitlab.com/mpeg-i/scene-description/test-vectors.

## Summary logistics

|  |  |  |
| --- | --- | --- |
| **Asset** | **Hosting** | **Location name** |
| Repository | Gitlab.com | https://gitlab.com/mpeg-i/scene-description |
| Candidate Reference software Diligent Graphics | Gitlab.com | <https://gitlab.com/mpeg-i/scene-description/reference-diligentengine> |
| 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.

# Candidate Phase 2 Technologies

# This clause provides and overview of candidate phase 2 technologies

# Advanced Audio functionalities

# Support for AR in Scene Description

# Partial Access Support for Scene Description

# CoAP Support for IoT streaming devices in Scene Description

# Interactivity in Scene Description

# Nodes with External Transformation

# Basic support for Haptics

# Coordinators for Efforts until MPEG#136

* BOG Chair:
  + Thomas Stockhammer (tsto@qti.qualcomm.com)
* AHG Chairs:
  + Thomas Stockhammer (tsto@qti.qualcomm.com)
  + Mary-Luc Champel (champelmaryluc@xiaomi.com)
* Editor of ISO/IEC 23090-14
  + Imed Bouazizi (bouazizi@qti.qualcomm.com)
  + Lukasz Kondrad ([lukasz.kondrad@nokia.com](mailto:lukasz.kondrad@nokia.com))
* Editor of Technology under Considerations Document
  + Lukasz Kondrad ([lukasz.kondrad@nokia.com](mailto:lukasz.kondrad@nokia.com))
  + Imed Bouazizi (bouazizi@qti.qualcomm.com)
* Test Asset and Scenario Coordinator
  + Emmanuel Thomas (emmanuel.thomas@tno.nl)
  + Imed Bouazizi ([bouazizi@qti.qualcomm.com](mailto:bouazizi@qti.qualcomm.com))
  + Shuai Zao (shuaiizhao@tencent.com)
* Gitlab Management
  + Emmanuel Thomas (emmanuel.thomas@tno.nl)
  + Imed Bouazizi ([bouazizi@qti.qualcomm.com](mailto:bouazizi@qti.qualcomm.com))
* Editor of ISO/IEC 23090-24
  + Ahmed Hamza (Ahmed.Hamza@InterDigital.com)
  + Gurdeep Bhullar (Gurdeep.Bhullar@InterDigital.com)