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**Information technology — Coded representation of immersive media — Part 37: Conformance and reference software for carriage of haptics data**

CD stage

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Contents

[Foreword iv](#_Toc195278152)

[Introduction v](#_Toc195278153)

[1 Scope 1](#_Toc195278154)

[2 Normative references 1](#_Toc195278155)

[3 Terms and definitions 1](#_Toc195278156)

[4 Abbreviated terms 1](#_Toc195278157)

[5 Reference software for carriage of haptics data 1](#_Toc195278158)

[5.1 General 1](#_Toc195278159)

[5.2 Overview 2](#_Toc195278160)

[5.3 Features list 3](#_Toc195278161)

[5.4 Haptics carriage library API 5](#_Toc195278162)

[6 Conformance for ISO/IEC 23090-32 5](#_Toc195278163)

[Annex A (informative) Reference software development process 6](#_Toc195278164)

[A.1 General 6](#_Toc195278165)

[A.1.1 Reference software development process 6](#_Toc195278166)

[Annex B (informative) Reference software building process 7](#_Toc195278167)

[B.1 General 7](#_Toc195278168)

[B.1.1 Dependencies 7](#_Toc195278169)

[B.1.2 Building 7](#_Toc195278170)

[Bibliography 9](#_Toc195278171)

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.

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This document was prepared by 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 23090 series can be found on the ISO website.

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](https://www.iso.org/members.html) and [www.iec.ch/national-committees](https://www.iec.ch/national-committees).

Introduction

The conformance and reference software in this document serves two main purposes:

— Validation of the written specification of ISO/IEC 23090-32;

— Conformance testing for checking interoperability for the various applications against the reference software which aims to be compliant with ISO/IEC 23090-32.

The reference software is structured as an extension of the ISOBMFF reference software library and provides additional functions required for ISO/IEC 23090-32. In addition, it includes a small command line application that uses the library to perform some basic file operations such as multiplexing and demultiplexing a file.

Furthermore, this document is accompanied by a collection of conformance files. These files provide practical demonstrations of various features of ISO/IEC 23090-32, aiding in a more comprehensive understanding and application of ISO/IEC 23090-32.

Information technology — Coded representation of immersive media — Part 37: Conformance and reference software for carriage of haptics data

# Scope

This document specifies the reference software for carriage of haptics data as specified in ISO/IEC 23090-32. The information provided describes the reference software modules and the features that it supports. It also provides a description of how the reference software can be utilized. Finally, it also provides a description of conformance test vectors.

# 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.

* ISO/IEC 23090-32, Information technology — Coded representation of immersive media — Part 32: Carriage of Haptics data

# Terms and definitions

No terms and definitions are listed in this document.

[Editor’s Note: We may revisit in the future.]

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](https://www.iso.org/obp/ui)

— IEC Electropedia: available at <https://www.electropedia.org/>

# Abbreviated terms

ISOBMFF ISO base media file format

MIHS MPEG-I haptics stream

# Reference software for carriage of haptics data

## General

The source code of the reference software for the carriage of haptics data is available in the following project URL on MPEG’s GitLab server and is accessible to MPEG members.

https://git.mpeg.expert/MPEG/Systems/FileFormat/hapticscarriageconfrefsoft

## Overview

Figure 1 shows a simplified overview of the reference software implementation architecture for the carriage of haptics data. The reference software implementation implements the features defined in ISO/IEC 23090-32 and is based on the reference software for ISOBMFF (*libisomediafile*) specified in ISO/IEC 14496-32 [3], the reference software for haptics coding [2], and a number of 3rd party open-source libraries. Boxes with a white background in Figure 1 are part of the scope of the reference software implementation and are described in more detail in the following sections.

A diagram of a software

AI-generated content may be incorrect.

Figure 1 Reference software overview

The *libHapCarriageIso* library is implemented in the C programming language and extends the *libisomediafile* specified in ISO/IEC 14496-32 [3] by implementing all code points defined in ISO/IEC 23090-32 and providing a public API which can be used by applications in order to write and parse the corresponding syntax elements.

[Editor’s Note: The initial version includes a public API which can be used by applications to write and parse ISOBMFF files with the brand 'mih1', as specified in ISO/IEC 23090-32. Support for the ‘mhb1’ brand will be added.]

The Haptics Carriage library *libHapticCarriage* enables the packaging and extraction of MIHS bitstreams using MPEG Haptics reference model specified in ISO/IEC 23090-33 [2] and manages boxes declared in *libHapticCarriageIso*.

The *HapticsMultiplexerApp* and *HapticsDeMultiplexerApp* are command-line applications which use *libHapCarriage* and the library in the reference software for haptics coding [2] to multiplex and demultiplex haptics MIHS bitstreams to and from an ISOBMFF container. These command-line applications use a number of 3rd party open-source libraries such as spdlog [4], json [5], and cxxopts to facilitate logging and parsing of JSON and command-line arguments.

## Feature list

Table 1 summarizes a list of features defined in ISO/IEC 23090-32 and indicates which features are currently supported by the reference software.

Table 1 Reference software feature list

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Feature** | | **4CCs** | **Version** | **Status** |
| Haptics media handler type | | hapt |  | \* |
| Haptics media header (NullMediaHeaderBox) | | nmhd | 0 | \* |
| Haptics sample entry | |  | 0 | \* |
| Single track | MIHS sample entry | mih1 | 0 | ü |
| MIHS configuration Box | mh1C | 0 | ü |
| Haptics Experience Description Box | hexd | 0 | ü |
| Haptic Experience Description Header Box | hexh | 0 | ü |
| Haptic Avatar Description Box | havd | 0 | ü |
| Haptic Perception Description Box | hprd | 0 | ü |
| Haptic Perception Description Header Box | hprh | 0 | ü |
| Haptic Reference Device Description Box | hrdd | 0 | ü |
| Haptic Channel Description Box | hchd | 0 | ü |
| Haptic Channel Description Header Box | hchh | 0 | ü |
| Multiplexer | N/A |  | ü |
| Demultiplexer | N/A |  | û |
| Common | Haptic Band Description Box | hbnd | 0 | ü |
| Haptics Presentation Dep Group Entry | mhpg | 0 | û |
| Track Reference Type (synchronization with other media) | rsyn | - | \*\* |
| Haptics Silent Unit Sample Group Entry | mhsu | 0 | û |
| MIHS sample format |  |  | û |
| MIHS sync sample |  |  | û |
| Multi-track | MIHS band sample entry | mhb1 | 0 | û |
| Haptic Band Configuration Box | mibC | 0 | û |
| Multiplexer | N/A |  | û |
| Demultiplexer | N/A |  | û |
| MIHS Band Group Box  (Entity To Group Box) | mhbd |  | û |
| Track Reference Type  (Referring MIHS band track) | mhbd | - | û |
| **Legend:**  û : not implemented  ü : implemented  \* : implemented by libisomediafile | | | | |

[Editors’ Note: Status \*\* indicates that this may be implemented by libisomediafile and needs to be checked.]

## Haptics carriage library API

(TBD)

# Conformance for ISO/IEC 23090-32

(TBD) MP4 Files, fMP4 Files and DASH MPD Files

1. (informative)  
     
   Reference software build process
   1. General

This annex describes the reference software build process.

* + 1. Dependencies

Dependencies are installed automatically using CMake. Currently this project has the following dependencies:

* + [libisomedia](https://github.com/MPEGGroup/isobmff" \t "_blank): ISOBMFF reference software[3]
  + [spdlog](https://github.com/gabime/spdlog): C++ logging library[4]
  + [json](https://github.com/nlohmann/json): JSON header only library[5]
  + [cxxopts](https://github.com/jarro2783/cxxopts): Header only command-line options parser[6]
  + MPEG Haptics reference model (RM): MPEG Haptics Coding reference software[2] that supports parsing of ISO/IEC 23090-31:2025[1] conformant
    1. Building

Git and CMake are needed to be installed on the system. The following steps can be followed to checkout the repository and build it:

1. Clone project

git clone https://git.mpeg.expert/MPEG/Systems/FileFormat/hapticscarriageconfrefsoft.git 23090-32\_reference-software

1. Clone submodules

cd 23090-32\_reference-software

git submodule update --init --recursive

1. Apply a patch on submodules (bug fix, warnings fix). Done only once.

external/applyPatches.sh

1. Build

mkdir build

cd build

cmake ..

cmake --build . --config Release

1. Run and test

cd ..

bin/HapticsMultiplexerApp.exe -h

bin/HapticsMultiplexerApp.exe -i data/sample.hmpg

ls -al data/sample.mp4

Bibliography

1. ISO/IEC 23090-31, Information technology — Coded Representation of Immersive Media — Part 31: Haptics coding
2. ISO/IEC 23090-33, Information technology — Coded Representation of Immersive Media — Part 33: Conformance and reference software for haptics coding
3. ISO/IEC 14496-32, Information technology — Coding of audio-visual objects — Part 32: File format reference software and conformance
4. spdlog, Online: <https://github.com/gabime/spdlog>
5. json, Online: <https://github.com/nlohmann/json>
6. cxxopts, Online: <https://github.com/jarro2783/cxxopts>