International Standard

ISO/IEC 23093-6

First edition
2026-07

Information technology — Internet of media things —

Part 6: Media data formats and application programming interface (API) for distributed artificial intelligence (AI) processing

Reference number
ISO/IEC 23093-6:2026(en)

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Published in Switzerland

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Foreword

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

A list of all parts in the ISO/IEC 23093 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.

Introduction

The ISO/IEC 23093 series provides an architecture and specifies APIs and compressed representation of data flowing between media things (MThings).

The APIs for MThings facilitate the discovery of other MThings in the network, as well as connecting and efficiently exchanging data between Them. The APIs also support transaction tokens to access valuable functionalities, resources, and data from MThings.

MThing-related information comprises characteristics and discovery data, mission descriptions from system designers and end-users, raw and processed sensed data, and actuation information. The ISO/IEC 23093 series specifies input and output data formats for media sensors, actuators, storages, and analysers. In addition, media analysers can process sensed data from media sensors to produce analysed data, which can be cascaded to other media analysers to extract semantic information. Multiple MThings can be gathered and operated autonomously using mission descriptions given by system designers and end-users.

This document contains the tools to describe data generated from media analysers capable of distributed AI processing and their APIs. It addresses the normative aspects of the data and APIs for media analysers and illustrates non-normative examples.

Information technology — Internet of media things —

Part 6: Media data formats and application programming interface (API) for distributed artificial intelligence (AI) processing

1 Scope

This document specifies the syntax and semantics of description schemes to represent data exchanged by media analysers for distributed artificial intelligence (AI) processing. Moreover, it specifies the application programming interfaces (APIs) to exchange these data between media things.

This document does not specify how analysis is carried out, but defines the interfaces between the media things.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes the 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 23093-1, *Information technology — Internet of media things — Part 1: Architecture*

ISO/IEC 23093-2, *Information technology — Internet of media things — Part 2: Discovery and communication API*

ISO/IEC 23093-3:—[1)], *Information technology — Internet of media things — Part 3: Media data formats and API*

ISO/IEC 23005-5:2019, *Information technology — Media context and control — Part 5: Data formats for interaction devices*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 23093-1, ISO/IEC 23093-2, ISO/IEC 23093-3 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

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

3.1.1
media analyser
MAnalyser
MThing that can analyse media or metadata and produce interpreted media, metadata, or commands

1) Under preparation. Stage at the time of publication: ISO/IEC/FDIS 23093-3:2025.

3.2 Abbreviated terms

API	application programming interface
MACV	media actuator command vocabulary
MAOV	media analyser output vocabulary
MTDL	media thing description language
IIDL	interaction information description language
DCV	device command vocabulary
XML	extensible mark-up language
XSI	XML schema instance

4 Schema documents and prefixes

4.1 Schema documents

The syntax and semantics of data interfacing MThings are provided as schema snippets imbricated with other text. To form a valid schema document, users can gather these schema components in this document with the schema wrapper provided at the head of the clause. For better readability, the relevant schema documents are available at: https://standards.iso.org/iso-iec/23093/-6/ed-1/en/.

Each schema document has a version attribute, the value of which is always "ISO/IEC 23093-6." Furthermore, an informative identifier is given as the value of the `id` attribute of the `schema` component. This identifier is non-normative and used as a convention in this document to reference another schema document. In particular, it is used for the `schemaLocation` attribute of the `include` and `import` schema components.

4.2 Use of prefixes

For clarity, consistent namespace prefixes are used throughout this document.

The "`xsi:`" prefix is not normative. It is a naming convention in this document to refer to an element of the XML schema instance namespace[4].

"`xml:`" and "`xmlns:`" are normative prefixes defined in Reference [1]. By definition, the prefix "xml:" is bound to "`https://www.w3.org/XML/1998/namespace`." The prefix "`xmlns:`" is used only for namespace bindings and is not itself bound to any namespace name.

All other prefixes used in either the text or examples of this document are not normative, e.g. "`mtdl:`", "`macv:`", "`maov:`", "`iidl:`", "`dcv:`".

— In particular, most informative examples in this document are provided as XML fragments without the typically required XML document declaration and, thus, miss a correct namespace binding context declaration. The different prefixes are bound to the namespaces in these description fragments, as in Table 1.

Table 1 — Mapping of prefixes to namespaces in examples and text

Prefix	Corresponding namespace
mtdl	urn:mpeg:mpeg-IoMT:2024:01-MTDL-NS
macv	urn:mpeg:mpeg-IoMT:2024:01-MACV-NS
maov	urn:mpeg:mpeg-IoMT:2024:01-MAOV-NS
iidl	urn:mpeg:mpeg-v:2019:01-IIDL-NS
dcv	urn:mpeg:mpeg-v:2019:01-DCV-NS
xsi	https://www.w3.org/2001/XMLSchema-instance

Unlike the informative descriptions examples, the normative specification of the syntax of tools in XML schema follows the namespace binding context defined in the relevant schema declaration, such as the one described in Table 1.

5 APIs

5.1 General

This subclause specifies the APIs and their descriptions for operating MAnalyser and exchanging structured data between MThings. Figure 1 shows an example of the "GET" and "SET" functions invoked between MThings. For example, an MSensor should have "GET" functions to evoke and provide its sensed data. An MStorage should have "SET" functions to save sensed data obtained by an MSensor or to save analysed data provided by an MAnalyser. An MAnalyser should provide "GET" functions to produce metadata by analysing sensed data from MSensors or by generating metadata by analysing data supplied by other MAnalysers. Finally, an MActuator should provide "SET" functions to control its functionalities. If no structured data is exchanged between MThings, each MThing can have simple "SET" functions controlled by other MThings.

Figure 2 demonstrates an example of a function call sequence diagram between MThings. A face verifier (AS2) requests detected face regions extracted from the image (i.e. sensed data from S1) to the face region detector (AS1) by invoking the function `getFaceRegions()`. After receiving the function call, a face region detector (AS1) requests an image to a camera (S1) by invoking the function `getImageURL()`. The camera (S1) sends the corresponding URL to the face region detector (AS1). In this case, the return type of the URL is a simple string. Suppose an MSensor returns data with standard structures. In that case, the data can be delivered by the return type class, either "MPEGVSensedDataType" or "SensedDataType," which can be represented in either XML or binary format.

After detecting the face region from the input image, the face region detector (AS1) sends back the recognised face regions with the standard structure to the face verifier (AS2). The data provided by an MAnalyser can be delivered in either a simple string, such as a URL, or in the return type class "AnalysedDataType," which can be represented in XML or binary format.

Finally, the face verifier (AS2) invokes the setLight() function to actuate (i.e. generate the coloured light) the lighting device (AC1). Again, the actuation data feeding to a MActuator can be delivered by either a simple string like a URL or the return type class of "MPEGVCommandType" or "ActuationDataType," which can be described by XML or Binary representation.

The function calls trigger MThings to generate and exchange data or control MThings.

The function definitions (APIs) for MAnalyser and their return type classes are defined in the following subclauses.

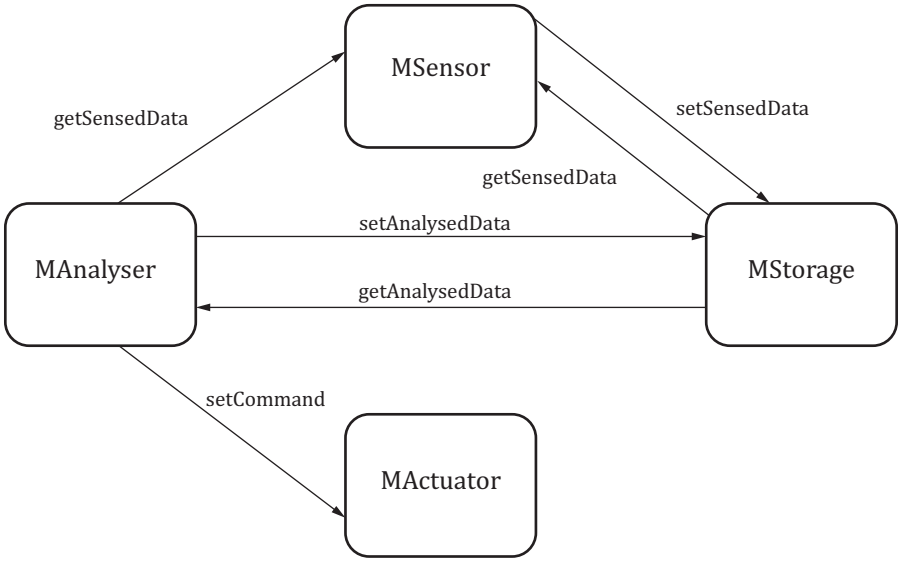

Figure 1 — Function invocation between MThings

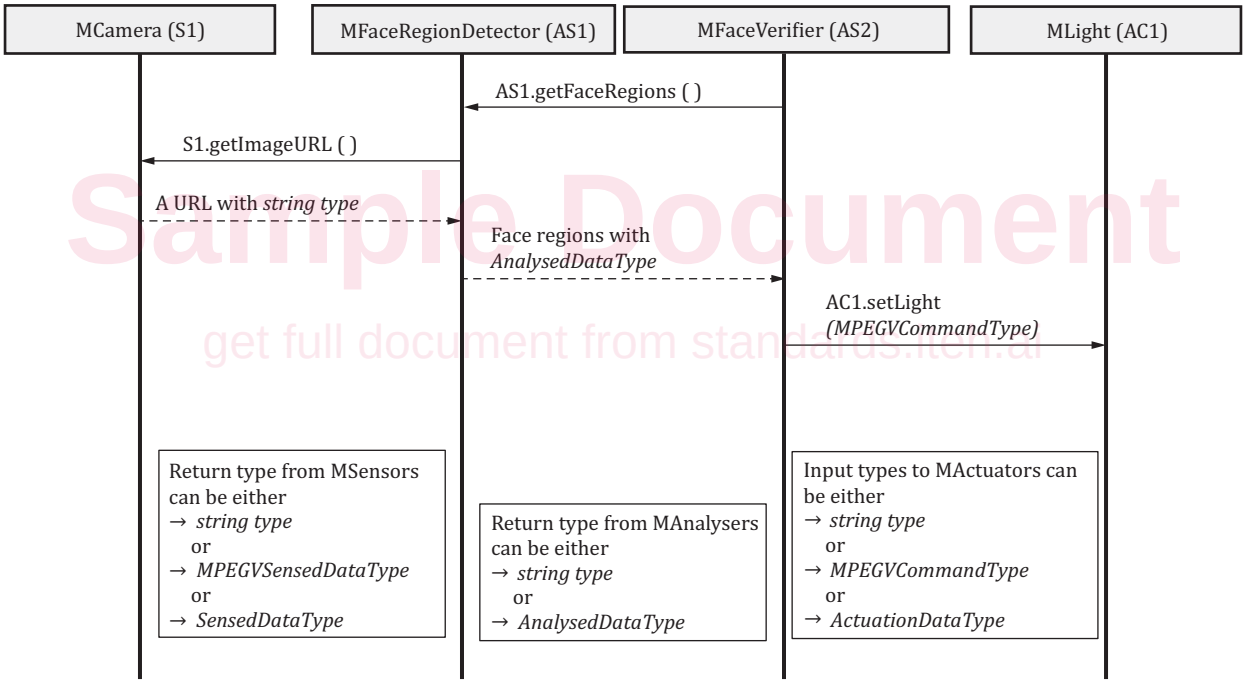

Figure 2 — Sequence diagram of function calls between MThings

5.2 MAnalyser class

5.2.1 General

This subclause defines an `MAnalyser` class that shall inherit the features of the `MThing` class defined in ISO/IEC 23093-2:2025.

5.2.2 APIs

Table 2 presents the basic APIs of `MAnalyser`.

Table 2 — MAnalyser API

Nested Classes	
Modifier and Type	**Method and Description**
Constructor	
Constructor and Description	
MAnalyser()	
Default constructor.	
MAnalyser(string id)	
MAnalyser(string id, string serverIPAddress, int serverPort)	
Fields	
Modifier and Type	**Field and Description**
Methods	
Modifier and Type	**Method and Description**
CapabilityListType	getAnalyserCapabilityList();
	This function returns a class (i.e. object-oriented programming like C++) or a structure (i.e. C) that shall include a returning type (e.g. XML, Binary) and a capability list using data formats defined in subclause A.1.1.
CapabilityListType	getAvailableAnalyserCapabilityList()
	This function returns a class (i.e. object-oriented programming like C++) or a structure (i.e. C) that shall include a returning type (e.g. XML, Binary) and an available capability list using data formats defined in subclause A.1.1.
CapabilityListType	getAppliedAnalyserCapabilityList()
	This function returns a class (i.e. object-oriented programming like C++) or a structure (i.e. C) that shall include a returning type (e.g. XML, Binary) and an applied capability list using data formats defined in subclause A.1.1.
AnalysedDataType	getAnalysedData()
	This function returns a class (i.e. object-oriented programming like C++) or a structure (i.e. C) that shall include a returning type (e.g. XML, Binary) and analysed data following the specification in subclause A.3.

5.3 IoMT time synchroniser

5.3.1 General

This subclause defines a class of an IoMT time synchroniser that shall inherit the features of the `MAnalyser` class. IoMT time synchroniser's APIs can obtain analysed data, including two video sources, time offset, and token information, to use the `getSyncedVideo` APIs.

5.3.2 APIs

Table 3 presents the APIs of an IoMT time synchroniser.