
**Information technology — Media
context and control —**

**Part 4:
Virtual world object characteristics**

Technologies de l'information — Contrôle et contexte de supports —

Partie 4: Caractéristiques d'objet du monde virtuel

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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

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

This fourth edition cancels and replaces the third edition (ISO/IEC 23005-4:2016), which has been technically revised.

The main changes compared to the previous edition are the addition of:

- new element “SensoryEffectList” to VWOBaseType.

A list of all parts in the ISO/IEC 23005 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.

Introduction

The ISO/IEC 23005 series provides an architecture and specifies information representation of data flowing in and out of the real world and virtual worlds.

The data for the real world are communicated through sensors and actuators. The data for virtual worlds consist of properties of virtual objects and multi-sensorial data embedded in audio-visual content. MPEG-V specifies data formats for sensors, actuators, virtual objects, and audio-visual content.

Data captured from the real world may need to be adapted for use in a virtual world and data from virtual worlds may also need to be adapted for use in the real world. The ISO/IEC 23005 series does not specify how the adaptation is carried out but only specifies the interfaces.

Data for sensors are sensor capabilities, sensed data, and sensor adaptation preferences.

Data for actuators are sensory device capabilities, sensory device commands, and sensory effect preferences.

Data for virtual objects are characteristics of avatars and virtual world objects.

Sensory effect may be needed to enrich audio-visual contents.

The system architecture of the ISO/IEC 23005 series is depicted in Figure 1 and the scope of this document is highlighted in yellow. The information representation that acts as an input to the possible R→V/V→R Adaptation and as an exchangeable information format to support interoperability between the virtual worlds – as defined in ISO/IEC 23005-1 – is specified in this document.

NOTE The actual R→V/V→R Adaptation is deliberately informative and left open for industry competition.

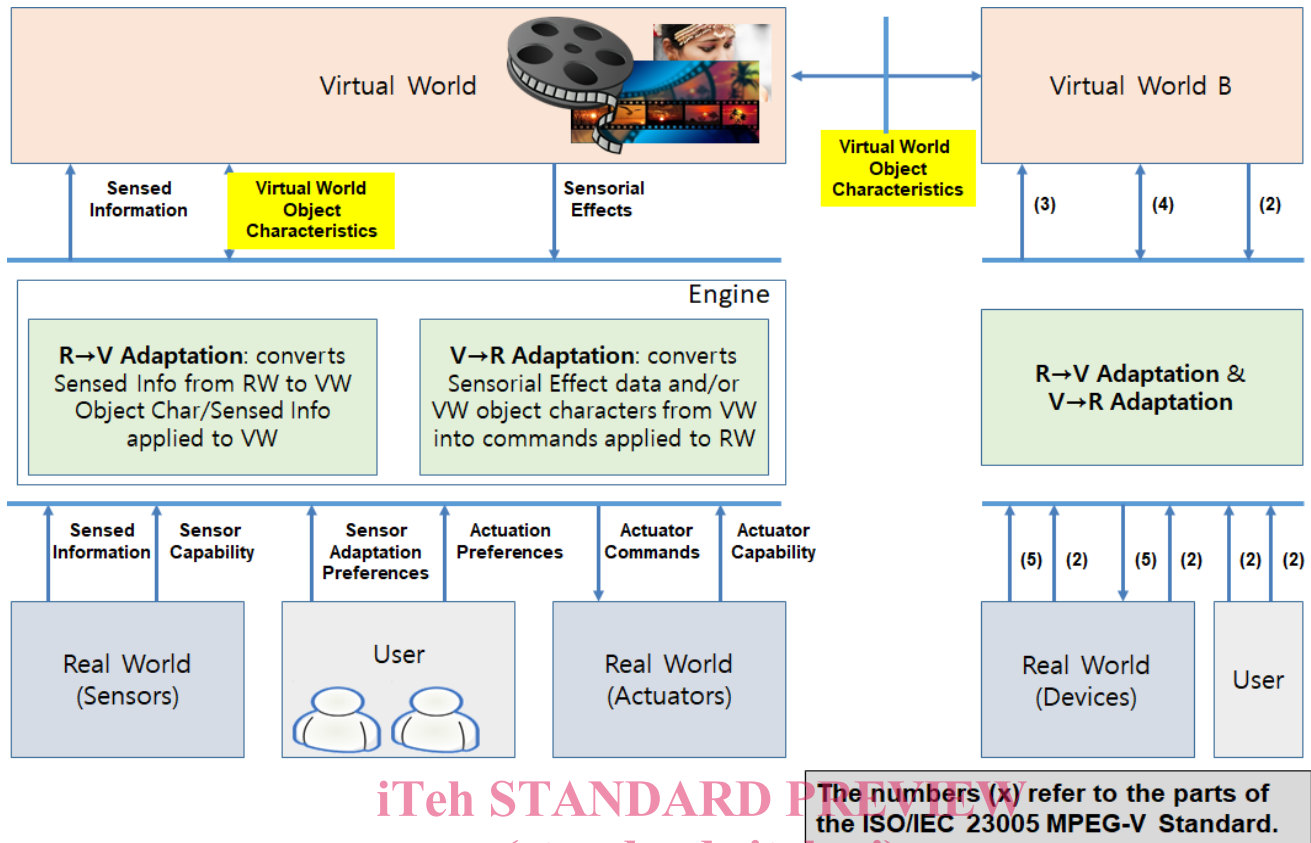


Figure 1 — Scope of the ISO/IEC 23005 series (showing this document in yellow)

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This document contains the tools for describing the virtual world object characteristics making it possible to migrate a virtual world object (or only its characteristics) from one virtual world to another and to control a virtual world object in a virtual world by real world devices (Annex C). It addresses the normative aspects of the virtual world object characteristics including avatars and virtual objects, and also illustrates some non-normative examples.

The International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) draw attention to the fact that it is claimed that compliance with this document may involve the use of patents.

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ISO (www.iso.org/patents) and IEC (<http://patents.iec.ch>) maintain online databases of patents relevant to their standards. Users are encouraged to consult the databases for the most up to date information concerning patents.

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Information technology — Media context and control —

Part 4: Virtual world object characteristics

1 Scope

The technologies of this document specified are description languages and vocabularies to describe virtual world objects.

The adaptation engine is not within the scope of this document.

This document specifies syntax and semantics of the tools used to characterize a virtual world object related metadata:

- Virtual World Object Characteristics (VWOC) as an XML Schema-based language which enables one to describe a basic structure of avatars and virtual world objects in virtual environments.

2 Normative references

[ISO/IEC 23005-4:2018](https://standards.iteh.ai/catalog/standards/sist/063eddef-0551-4790-9c9d-9e67cad849f5/iso-iec-23005-4-2018)

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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. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 639 (all parts), *Codes for the representation of names of languages*

ISO/IEC 15938-5:2003, *Information technology — Multimedia content description interface — Part 5: Multimedia description schemes*

ISO/IEC 21000-5, *Information technology — Multimedia framework (MPEG-21) — Part 5: Rights Expression Language*

ISO/IEC 23005-6:—,¹ *Information technology — Media context and control — Part 6: Common types and tools*

3 Terms, definitions, abbreviated terms, schema documents and prefixes

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 23005-6 and the following apply.

¹ Under preparation. Stage at time of publication: ISO/IEC FDIS 23005-6:2018.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <https://www.iso.org/obp>

3.1.1

avatar

entity that can be used as a (visual) representation of the user inside the virtual environments

EXAMPLE A player's representation in the video game and human or fantastic representations of a person's self in non-gaming online worlds.

3.1.2

avatar metadata

definition of the description schemes and descriptors to represent *avatars* (3.1.1)

3.1.3

extensible markup language

XML

set of rules for encoding documents in machine-readable form

3.1.4

rights expression language

REL

machine-readable language that declares rights and permissions

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3.1.5

uniform resource identifier

URI

compact string of characters for identifying an abstract or physical resource

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3.1.6

uniform resource locator

URL

compact string representation for a resource available via the Internet

3.1.7

virtual object

entity that is any (visual) object except for avatars in the virtual environment

3.1.8

virtual object metadata

definition of the description schemes and descriptors to represent *virtual objects* (3.1.7)

3.1.9

virtual world object

entity that includes avatars and virtual objects in the virtual world

3.1.10

virtual world object metadata

definition of the description schemes and descriptors to represent *virtual world objects* (3.1.9)

3.2 Schema documents

In the main text of this document, the syntax of description schemes and descriptors is provided whenever possible as a single schema document.

In order to form a valid schema document, these schema components should be gathered in a same document with the schema wrapper provided at the head of the clause. For better readability, the relevant schema documents are provided in Annex B.

In all cases, each schema document has a `version` attribute, the value of which is "ISO/IEC 23005-4". 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.

In addition, Annex A specifies a set of classification schemes that may be used by applications using description tools specified in this document.

3.3 Use of prefixes

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

"`xsi:`" prefix is not normative. It is a naming convention in this document to refer to an element of the `http://www.w3.org/2001/XMLSchema-instance` namespace.

"`xml:`" and "`xmlns:`" are normative prefixes defined in [1]. The prefix "`xml:`" is by definition bound to "`http://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., "`sedl:`", "`sev:`", "`dia:`", "`si:`", "`mpeg7:`".

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

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

Prefix	Corresponding namespace
ct	urn:mpeg:mpeg-v:2018:01-CT-NS
sedl	urn:mpeg:mpeg-v:2018:01-SEDL-NS
sev	urn:mpeg:mpeg-v:2018:01-SEV-NS
dia	urn:mpeg:mpeg21:2003:01-DIA-NS
si	urn:mpeg:mpeg21:2003:01-DIA-XSI-NS
mpeg7	urn:mpeg:mpeg7:schema:2004
xsi	http://www.w3.org/2001/XMLSchema-instance
xsd	http://www.w3.org/2001/XMLSchema

4 Virtual world object metadata

4.1 General

A specificity of virtual environments (VEs) with respect to other multimedia applications consists in the representation of virtual world objects inside the environment. The "virtual world object" can be classified into two types: avatars and virtual objects. An avatar can be used as a (visual) representation of the user inside the environment. These virtual world objects serve different purposes:

- characterize various kinds of objects within the VE;
- provide an interaction with the VE.

In general, creating an object is a time consuming task. Even though some components of the object may be related to the VE (e.g. the avatar wearing a medieval suit in a contemporary style VE may be inappropriate), there is a real need of being able to create the object once and import/use it in different VEs. To serve the latter purpose, it should be possible to control the object from external applications (e.g. the emotions one avatar exposes in the VE can be obtained by processing the associated user's physiological sensors). This document proposes an XML schema, called virtual world object characteristics XSD, for describing an object by considering three main requirements:

- it should be possible to easily create importers/exporters from various VEs implementations;
- it should be easy to control an object within an VE;
- it should be possible to modify a proprietary template (specific to the virtual world) of the object by using data contained in the virtual world object characteristics file.

In detail, once the object is created (possibly by an authoring tool specific to a virtual world), it can be used in any other virtual worlds (VW). In case of avatars, a user can have one's own unique presentation inside all VWs, like in real life. He can change and upgrade his avatar, i.e. "virtual himself" in one VW and then all the updated properties will be reflected in all the other VWs. The avatar itself contains representation and animation features but also higher level semantic information. However, each VW may have its own internal structure for handling avatars. The ISO/IEC 23005 series does not impose any specific constraints on the internal structure of representing data by the VW, but proposes a descriptive format able to drive the transformation of a template or a creation from scratch of an avatar compliant with the VW. All the associated characteristics of the avatar (including the associated motion) can be exported from a VW and then imported to another VW. Similarly, any virtual object created by a user can also be exchangeable between VWs by exporting and importing the associated characteristics of the object. In case of interfacing between virtual worlds and the real world, the sensed real world information will be processed to obtain the meaningful data which can be used as control parameters on the associated characteristics of the object in the VW. As for avatar, the captured gesture of a user can be used to control the gesture of the avatar in the VW by updating the associated characteristics of the avatar. Similarly, the avatar motions created in the virtual world can be mapped onto a real robot for use in dangerous areas, for maintenance tasks, to support disabled and/or elderly people, and so on.

The proposed schema deals only with metadata and does not include representation of the geometry, sound, scent, animation or texture. To represent the latter, references to media resources are used. To provide a full interoperable solution, it may be combined with ISO/IEC 14496-16, which includes a framework for defining and animating avatars, and/or ISO/IEC 14496-11, which includes a framework for defining graphical assets.

There is a base type of attributes and characteristics of the virtual world objects which is shared by both avatars and virtual objects.

The base type of the virtual world object characteristics is composed of following type of data.

- **Identity**: contains identification descriptors.
- **Sound**: contains sound resources and the related properties.
- **Scent**: contains scent resources and the related properties.
- **Control**: contains a set of descriptors for controlling motion features of an object such as translation, orientation and scaling.
- **Event**: contains a set of descriptors providing input events from a mouse, keyboard and etc.
- **Behaviour model**: contains a set of descriptors defining the behaviour information of the object according to input events.
- **id**: contains a unique identifier for identifying individual virtual world object information.

The virtual world object base type is inherited to both avatar metadata and virtual object metadata to extend the specific aspects of each of metadata.

4.2 Schema wrapper conventions

The syntax defined in this Clause assumes the following schema wrapper to form a valid XML schema document.

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```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:r="urn:mpeg:mpeg21:2003:01-REL-R-
NS" xmlns:mpegvct="urn:mpeg:mpeg-v:2018:01-CT-NS" xmlns:vwoc="urn:mpeg:mpeg-
v:2018:01-VWOC-NS" targetNamespace="urn:mpeg:mpeg-v:2018:01-VWOC-NS"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="ISO/IEC 23005-4" id="MPEG-V-VWOC.xsd">
  <!-- ##### -->
  <!-- Import of reference schema -->
  <!-- ##### -->
  <import namespace="urn:mpeg:mpeg7:schema:2004"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
7_schema_files/mpeg7-v2.xsd"/>
  <import namespace="urn:mpeg:mpeg21:2003:01-REL-R-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
21_schema_files/rel-r/rel-r.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2018:01-CT-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-CT.xsd"/>
```

Additionally, the following line should be appended to the resulting schema document in order to obtain a well-formed XML document.

```
</schema>
```