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

**Part 5:
Data formats for interaction devices**

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

Partie 5: Formats des données pour dispositifs d'interaction

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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.

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.

For an explanation of 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: www.iso.org/iso/foreword.html.

This document was prepared by Joint 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 23005-5:2016), which has been technically revised.

The main changes compared to the previous edition are as follows:

- added new device command type of ThreeDPrinterType;
- added new device command type of SoundDisplaySettingType;
- added new device command type of ThreeDPrintingColorReproductionType;
- added new device command type of ArrayLightType;
- added new sensed information type of RADARSensorType;
- added new sensed information type of RADARSensorType;
- added new sensed information type of ArrayCameraType;
- added new sensed information type of MicrophoneSensorType;

— added new sensed information type of E-NoseSensorType.

A list of all parts in the ISO 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.

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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. The ISO/IEC 23005 series 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 standard 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.

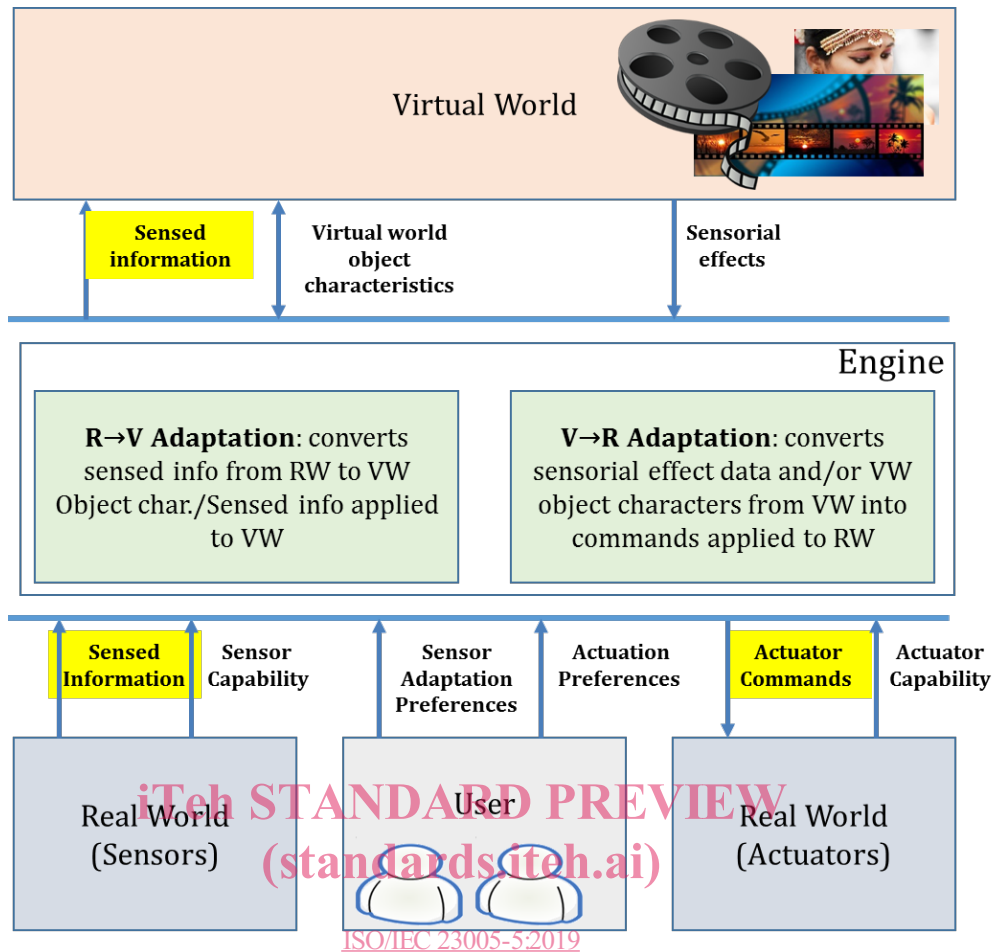
Data for actuators are sensory device capabilities, sensory device commands, and sensory effect preferences.

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

Data for audio-visual content are sensory effects.

This document contains the tools for exchanging information for interaction devices. To be specific, it specifies normative command formats for controlling actuators (e.g., actuator commands for sensory devices) and data formats for receiving information from sensors (e.g., sensed information from sensors) as illustrated as the yellow boxes in Figure 1. It also specifies some non-normative examples. The adaptation engine is not within the scope.

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Figure 1 — Scope of the data formats for interaction devices

When this document is used, the adaptation engine (RV or VR engine), which is not within the scope of standardization, performs bi-directional communications using data formats specified in this document. The adaptation engine can also utilize other tools defined in ISO/IEC 23005-2, which are user's sensory preferences (USP), sensory device capabilities (SDC), sensor capabilities (SC), and sensor adaptation preferences (SAP) for fine controlling devices in both real and virtual worlds.

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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Gwangju Institute of Science and Technology	261 Cheomdan - gwagiro (Oryong-dong), Buk-gu, Gwangju 500-712, Korea
Electronics and Telecommunications Research Institute (ETRI)	218 Gajeongno, Yuseong-gu, Daejeon, 305-700, Korea
Konkuk University	1 Hwayang-dong, Gwangjin-gu, Seoul, 143-701, Korea

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Information technology — Media context and control —

Part 5: Data formats for interaction devices

1 Scope

This document specifies syntax and semantics of the data formats for interaction devices by providing a standardized format for interfacing actuators and sensors by defining XML schema-based language named Interaction Information Description Language (IIDL). IIDL provides a basic structure with common information for communication with various actuators and sensors in consistency. Device Command Vocabulary (DCV) is defined to provide a standardized format for commanding individual actuator, and Sensed Information Vocabulary (SIV) is defined to provide a standardized format for holding information from individual sensors either to get environmental information from real world or to influence virtual world objects using the acquired information on the basis of IIDL.

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

ISO/IEC 15938-5:2003, *Information technology — Multimedia content description interface — Part 5: Multimedia description schemes* ISO/IEC 23005-5:2019
https://standards.iteh.ai/catalog/standards/sis/cac01240-0e45-4819-b69a-73a853013ba9/iso-iec-23005-5-2019

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

ISO/IEC 10646, *Information technology — Universal Coded Character Set (UCS)*

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 23005-6 apply.

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>

3.2 Abbreviated terms

CS classification scheme (see ISO/IEC 15938-5)

DAC digital-to-analog conversion

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

RV	real to virtual
URI	Uniform Resource Identifier (see RFC 2396)
VR	virtual to real
XML	Extensible Markup Language (W3C, http://www.w3.org/XML/)
RW	real world
VW	virtual world

4 Interaction information description language

4.1 General

This Clause describes basic structure of the tools in this document in the form of interaction information description language including the schema wrapper conventions, basic data types, root element, and top-level elements.

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:iidl="urn:mpeg:mpeg-v:2018:01-
IIDL-NS" xmlns:mpegvct="urn:mpeg:mpeg-v:2018:01-CT-NS" xmlns:dcv="urn:mpeg:mpeg-
v:2018:01-DCV-NS" xmlns:siv="urn:mpeg:mpeg-v:2018:01-SIV-NS"
targetNamespace="urn:mpeg:mpeg-v:2018:01-IIDL-NS" elementFormDefault="qualified"
attributeFormDefault="unqualified" version="ISO/IEC 23005-5" id="MPEG-V-
IIDL.xsd">
  <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:mpeg-v:2018:01-CT-NS" schemaLocation="
http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-CT.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2018:01-DCV-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-DCV.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2018:01-SIV-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-SIV.xsd"/>
```

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

```
</schema>
```

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 Reference [10]. 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 specification are not normative, e.g., "sedl:", "sev:", "dia:", "si:", "mpeg7:".

In particular, most of the informative examples in this specification 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.

The XML schema defined in this standard is available through appendix 1.

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

Prefix	Corresponding namespace
mpegvct	urn:mpeg:mpeg-v:2018:01-CT-NS
iidl	urn:mpeg:mpeg-v:2018:01-IIDL-NS
dcv	urn:mpeg:mpeg-v:2018:01-DCV-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

4.3 Root element and top-level tools

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4.3.1 General

This subclause specifies the root elements and the top-level tools which can follow a root element in interactive information. The root elements are the only elements, one of which can appear as the topmost element when the interactive information specified in this document is instantiated. The top-level tools are defined as the elements which are allowed to appear as the topmost element within the root element.

4.3.2 Syntax

```

<!-- ##### -->
<!-- Root and Top-Level Elements -->
<!-- ##### -->
<element name="InteractionInfo" type="iidl:InteractionInfoType"/>
<element name="DeviceCommand" type="iidl:DeviceCommandBaseType"/>
<element name="SensedInfo" type="iidl:SensedInfoBaseType"/>

<complexType name="InteractionInfoType">
  <choice>
    <element name="DeviceCommandList" type="iidl:DeviceCmdListType"/>
    <element name="SensedInfoList" type="iidl:SensedInfoListType"/>
  </choice>
</complexType>

<complexType name="DeviceCmdListType">
  <sequence>
    <element ref="iidl:DeviceCommand" maxOccurs="unbounded"/>
  </sequence>

```

```

</complexType>
<complexType name="SensedInfoListType">
  <sequence>
    <element ref="iidl:SensedInfo" maxOccurs="unbounded" />
  </sequence>
</complexType>

```

4.3.3 Binary representation syntax

InteractionInfo {	Number of bits	Mnemonic
InteractionType	1	bslbf
If (InteractionType){		
DeviceCommandList		DeviceCmdListType
}else{		
SensedInfoList		SensedInfoListType
}		
}		
SensedInfoListType{		
NumOfSensedInfo	32	uimsbf
for(i=1;i<NumOfSensedInfo;i++){		
IndividualSensedInfoType	8	bslbf
SensedInfo		SensedInfoType specified by IndividualSensedInfoType
}		
}		
}		
DeviceCmdListType{		
NumOfDeviceCmd	32	uimsbf
for(i=1;i<NumOfDeviceCmd;i++){		
IndividualDeviceCmdType	8	bslbf
DeviceCmd		DeviceCmdType specified by

		IndividualDeviceCmdType
}		
}		

4.3.4 Semantics

Semantics of the `InteractionInfo` type:

<i>Name</i>	<i>Definition</i>
<code>InteractionInfo</code>	One of the root elements that serve as the topmost element in the interaction information description. This element may have <code>DeviceCommandList</code> and <code>SensedInfoList</code> as its subelements.
<code>DeviceCommand</code>	One of the root elements that serve as the topmost element in the interaction information description. It specifies a single command for a certain device. This element can be instantiated as a root element or subelements of <code>DeviceCommandList</code> .
<code>SensedInfo</code>	One of the root elements that serve as the topmost element in the interaction information description. It specifies a single description of information acquired through a sensor. This element can be instantiated as a root element or subelements of <code>SensedInfoList</code> .
<code>InteractionInfoType</code>	The root type provides basic structure that the interaction information description should follow through the root element.
<code>DeviceCommandList</code>	Optional wrapper element that serves as the placeholder for the sequence of device commands.
<code>SensedInfoList</code>	Optional wrapper element that serves as the placeholder for the list of information acquired through sensors (<code>SensedInfo</code>).
<code>DeviceCommandBaseType</code>	<code>DeviceCommandBaseType</code> is an abstract type providing a base for individual command (<code>DeviceCommand</code>).
<code>SensedInfoBaseType</code>	<code>SensedInfoBaseType</code> is an abstract type providing a base for description of individual type of sensor.
<code>InteractionType</code>	This field, which is only present in the binary representation, indicates the type of the <code>InteractionInfo</code> element. If it is "1" then the <code>DeviceCommandList</code> element is present, otherwise the <code>SensedInfoList</code> element is present.
<code>SensedInfoListType</code>	A type that serves as the placeholder for the list of information acquired through sensors.
<code>NumOfSensedInfo</code>	This field, which is only present in the binary representation, specifies the number of <code>SensedInfo</code> instances accommodated in the <code>SensedInfoList</code> .