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Second edition
2013-04-01

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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

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.

ISO/IEC 23005-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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This second edition cancels and replaces the first edition (ISO/IEC 23005-4:2011), which has been technically revised.

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ISO/IEC 23005 consists of the following parts, under the general title *Information technology — Media context and control*:

— *Part 1: Architecture*

— *Part 2: Control information*

— *Part 3: Sensory information*

— *Part 4: Virtual world object characteristics*

— *Part 5: Data formats for interaction devices*

— *Part 6: Common types and tools*

— *Part 7: Conformance and reference software*

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Introduction

ISO/IEC 23005 (MPEG-V) provides an architecture and specifies associated information representations to enable interoperability between virtual worlds, e.g. digital content provider of a virtual world, gaming (serious), simulation, DVD, and the real world, e.g. sensors, actuators, vision and rendering, robotics (e.g. for revalidation), (support for) independent living social and welfare systems, banking, insurance, travel, real estate, rights management and many others.

Virtual worlds (often referred to as 3D3C for 3D visualization and navigation and the 3Cs of Community, Creation and Commerce) integrate existing and emerging media technologies (e.g. instant messaging, video, 3D, VR, AI, chat, voice, etc.) that allow for the support of existing and the development of new kinds of social networks. The emergence of virtual worlds as platforms for social networking is recognized by businesses as an important issue for at least two reasons:

1) it offers the power to reshape the way companies interact with their environments (markets, customers, suppliers, creators, stakeholders, etc.) in a fashion comparable to the Internet;

2) it allows for the development of new (breakthrough) business models, services, applications and devices.

Each virtual world, however, has a different culture and audience making use of these specific worlds for a variety of reasons. These differences permit users to have unique experiences.

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Although realistic experiences have been achieved via devices such as 3D audio/visual devices, it is hard to realize sensory effects only with presentation of audiovisual contents. The addition of sensory effects leads to even more realistic experiences in the consumption of audiovisual contents. This will lead to the application of new media for enhanced experiences of users in a more realistic sense.

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Such new media will benefit from the standardization of control and sensory information which includes sensory effect metadata, sensory device capabilities/commands, user sensory preferences, and various delivery formats. The MPEG-V architecture can be applicable for various business models for which audiovisual contents can be associated with sensory effects that need to be rendered on appropriate sensory devices.

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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Information technology — Media context and control —

Part 2:
Virtual world object characteristics

1 Scope

This part of ISO/IEC 23005 specifies syntax and semantics of description schemes and descriptors used to characterize a virtual world object related metadata, 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.

The system architecture of ISO/IEC 23005 is depicted in Figure 1 — System Architecture and the scope of this part of ISO/IEC 23005 is highlighted. That is, only 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 part of ISO/IEC 23005.

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

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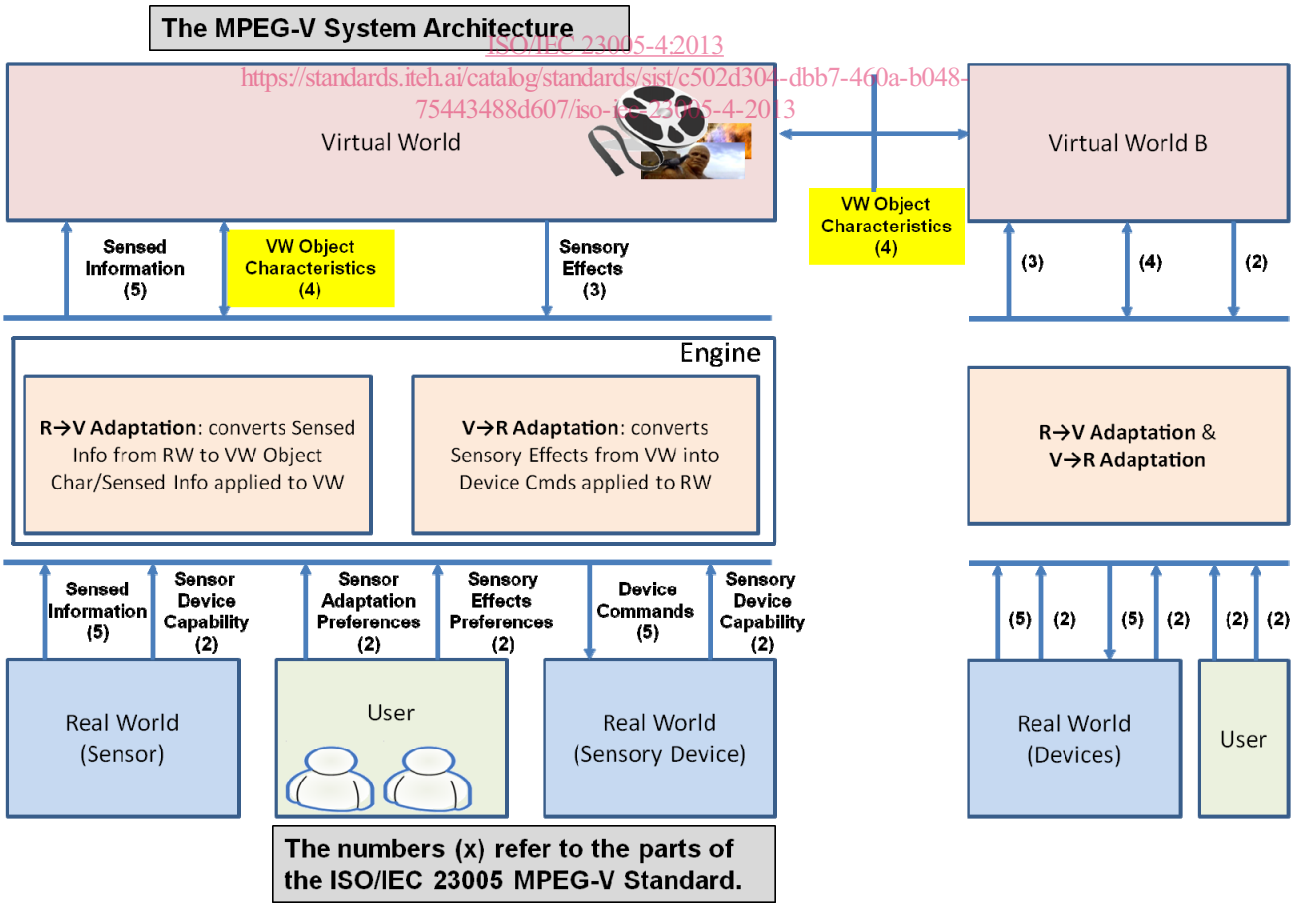

Figure 1 — System Architecture

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2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. 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, *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, *Information technology — Media context and control — Part 6: Common types and tools*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

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

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.

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3.1.2
avatar metadata
defines the description schemes and descriptors to represent **avatars** (3.1.1)

3.1.3
Extensible Markup Language
set of rules for encoding documents in machine-readable form

3.1.4
Rights expression language
machine-readable language that declares rights and permissions

3.1.5
Uniform Resource Identifier
compact string of characters for identifying an abstract or physical resource

3.1.6
Uniform Resource Locator
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
defines the description schemes and descriptors to represent **virtual objects** (3.1.7)

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3.1.9
virtual world object
entity that includes avatars and virtual objects in the virtual world

3.1.10
virtual world object metadata
defines the description schemes and descriptors to represent **virtual world objects** (3.1.9)

3.2 Abbreviated terms

For the purposes of this document, the following abbreviated terms apply.

MPEG-21: multimedia framework (ISO/IEC 21000-5)

MPEG-7: multimedia content description interface (ISO/IEC 15938-5)

REL: rights expression language

URI: Uniform Resource Identifier

URL: Uniform Resource Locator

XML: Extensible Markup Language

4 Virtual world object metadata

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4.1 Introduction

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 virtual environment (e.g. the avatar wearing a medieval suite 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).The current standard 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 Virtual World Object Characteristics file.

In detail, once the object is created possibly by an authoring tool specific to a VW, it can be used in any other VWs. 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. ISO/IEC 23005 (MPEG-V) is not imposing any specific constraints on the internal structure of representing

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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 a 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 the use in dangerous areas, the maintenance tasks, the support for disabled and/or elderly people, and the like.

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 (MPEG-4 Part 16) which includes a framework for defining and animating avatars) and/or ISO/IEC 14496-11 (MPEG-4 Part 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 an 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 behavior information of the object according to input events.
- **id**: contains a unique identifier for identifying individual virtual world object information.

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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.

```
<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:2012:01-CT-NS" xmlns:vwoc="urn:mpeg:mpeg-
v:2012:01-VWOC-NS" targetNamespace="urn:mpeg:mpeg-v:2012:01-VWOC-NS"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="ISO/IEC 23005-4" id="VWOCSchema.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"/>
```


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```
    <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:2012:01-CT-NS" schemaLocation="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>
```

4.3 Root element and top-level tools

4.3.1 Introduction

This Subclause specifies the root element and the top-level tools which can follow root element in virtual world object characteristics information. The root element is the only element which can appear as the topmost element when the world object characteristics information specified in this Part of ISO/IEC 23005 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 XML representation syntax

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```
<!-- ################################################ -->
<!--  Declaration of Root Element                     -->
<!-- ################################################ -->
<element name="VWOCInfo" type="vwoc:VWOCInfoType"/>

<complexType name="VWOCInfoType">
    <sequence>
        <element name="AvatarList" type="vwoc:AvatarListType" minOccurs="0"/>
        <element name="VirtualObjectList" type="vwoc:VirtualObjectListType"
minOccurs="0"/>
    </sequence>
</complexType>

<complexType name="AvatarListType">
    <sequence>
        <element name="Avatar" type="vwoc:AvatarBaseType" maxOccurs="unbounded"/>
    </sequence>
</complexType>

<complexType name="VirtualObjectListType">
    <sequence>
        <element name="VirtualObject" type="vwoc:VirtualObjectBaseType"
maxOccurs="unbounded"/>
    </sequence>
</complexType>
```

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4.3.3 Binary representation syntax

	Number of bits	*Mnemonic*
VWOCInfo		VWOCInfoType
VWOCInfoType{		
AvatarListFlag	1	bslbf
VritualObjectListFlag	1	bslbf
if(AvatarListFlag){		
AvatarList		AvatarListType
}		
if(VirtualObjectListFlag){		
VirtualObjectList		
}		
AvatarListType{		
NumAvatarType		vluimsbf5
for(k=0;k< NumAvatarType;k++){		
IndividualAvatarType	8	bslbf
Avatar		AvatarBaseType
}		
}		
VirtualObjectListType{		
NumVirtualObjectType		vluimsbf5
for(k=0;k< NumVirtualObjectType;k++){		
IndividualVirtualObjectType	16	bslbf
VirtualObject		VirtualObjectBaseType
}		
}		

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4.3.4 Semantics

Name	*Description*
VWOCInfo	The root element that serves as the topmost element in the virtual world object characteristics description.
VWOCInfoType	The root type provides basic structure that the virtual world object characteristics information description should follow through the root element.
AvatarListFlag	This field, which is only present in the binary representation, signals the presence of the AvatarList element. "1" means that the element shall be used. "0" means that the element shall not be used.
VirtualObjectListFlag	This field, which is only present in the binary representation, signals the presence of the VirtualObjectList element. "1" means that the element shall be used. "0" means that the element shall not be used.
AvatarList	Optional wrapper element that serves as the placeholder for the list of avatar characteristics information.
VirtualObjectList	Optional wrapper element that serves as the placeholder for the list of virtual object characteristics information.
AvatarListType	Wrapper element type which allows multiple occurrences of avatar characteristics information.
NumAvatarType	This field, which is only present in the binary representation, specifies the number of Avatar information contained in the AvatarListType.
Avatar	Specifies the description of avatar characteristics information.
AvatarBaseType	AvatarBaseType is a type providing a characteristic description of an individual avatar.
IndividualAvatarType	This field, which is only presented in the binary representation, specifies the types of each avatar. *Individual Avatar Type* / *Binary representation for sensor type (8 bits)* AvatarType / 00000000 Reserved / 00000001-11111111
VirtualObjectListType	Wrapper element type which allows multiple occurrences of virtual object characteristics information.
NumVirtualObjectType	This field, which is only present in the binary representation, specifies the number of virtual object information contained in the virtual object list type.
VirtualObject	Specifies the description of virtual object characteristics information.
VirtualObjectBaseType	VirtualObjectBaseType is a type providing a characteristic description of an individual virtual object.
IndividualVirtualObjectType	This field, which is only presented in the binary representation, specifies the types of each virtual object. *Individual Virtual Object Type* / *Binary representation for sensor type (16 bits)* VirtualObjectType / 0000hex Reserved / 0001hex-FFFFhex

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4.3.5 Examples

The following shows two use cases of VWOCInfo element, which are for listing avatar characteristics information and for listing virtual object characteristics information.

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The first example shows the case when the VWOCInfo is used for AvatarList.

```
<vwoc:VWOCInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-VWOC-NS
VWOCSchema.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpegvct="urn:mpeg:mpeg-v:2012:01-CT-NS" xmlns:vwoc="urn:mpeg:mpeg-
v:2012:01-VWOC-NS" xmlns:r="urn:mpeg:mpeg21:2003:01-REL-R-NS"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004">
    <vwoc:AvatarList>
        <vwoc:Avatar xsi:type="vwoc:AvatarType" id="ID_1" gender="male">
            . . .
        </vwoc:Avatar>
    </vwoc:AvatarList>
</vwoc:VWOCInfo>
```

The second example shows the case when the VWOCInfo is used for VirtualObjectList.

```
<vwoc:VWOCInfo xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-VWOC-NS
VWOCSchema.xsd" xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpegvct="urn:mpeg:mpeg-v:2012:01-CT-NS" xmlns:vwoc="urn:mpeg:mpeg-
v:2012:01-VWOC-NS" xmlns:r="urn:mpeg:mpeg21:2003:01-REL-R-NS"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004">
    <vwoc:VirtualObjectList>
        <vwoc:VirtualObject xsi:type="vwoc:VirtualObjectType" id="ID_80">
            . . .
        </vwoc:VirtualObject>
    </vwoc:VirtualObjectList>
</vwoc:VWOCInfo>
```

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Note that these examples are only showing a part of the complete XML description to show the use of the root element, VWOCInfo, with the AvatarList and the VirtualObjectList.

4.4 Virtual world object base type

4.4.1 Introduction

This Subclause defines a complex type of VWOBaseType, which the avatar characteristics information and virtual object characteristics information should inherit.

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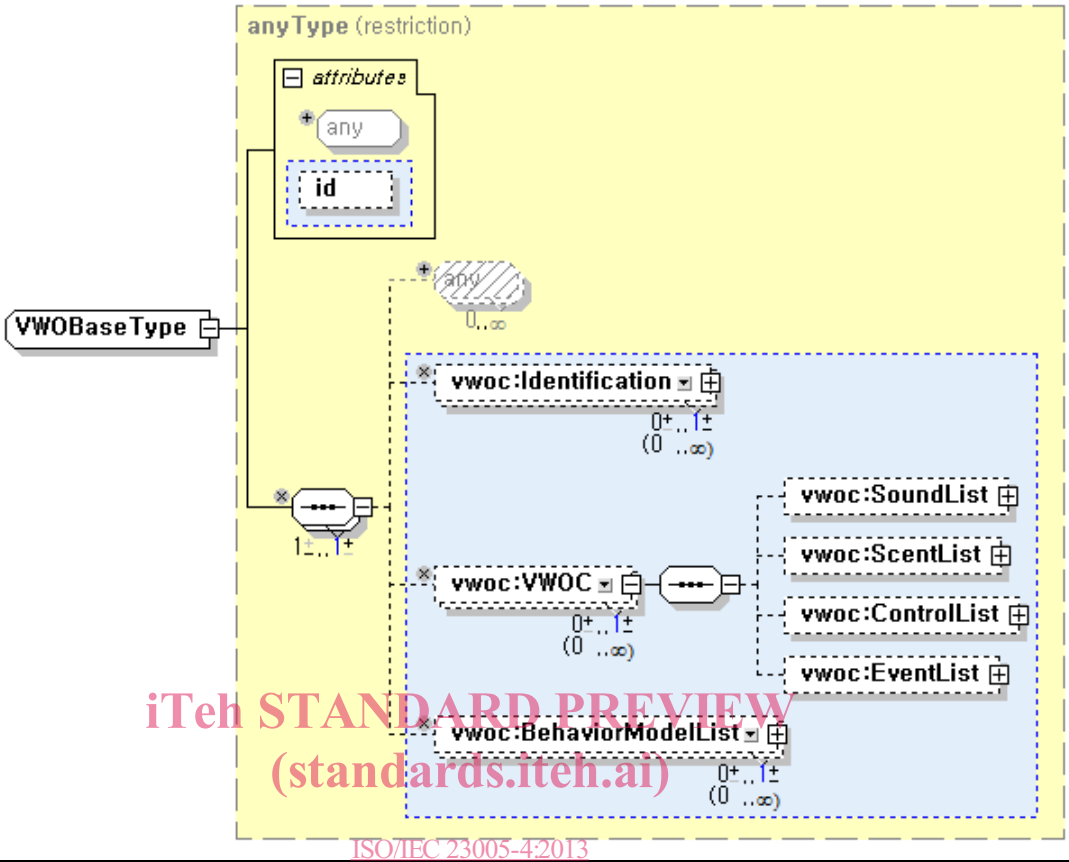
4.4.2 XML representation syntax

Diagram



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Source

```
<!-- ################################################ -->
<!--  VWO Base Type                                   -->
<!-- ################################################ -->
<complexType name="VWOBaseType" abstract="true">
  <complexContent>
    <restriction base="anyType">
      <sequence>
        <element name="Identification" type="vwoc:IdentificationType" minOccurs="0"/>
        <element name="Description" type="string" minOccurs="0"/>
        <element name="VWOC" minOccurs="0">
          <complexType>
            <sequence>
              <element name="SoundList" type="vwoc:VWOSoundListType" minOccurs="0"/>
              <element name="ScentList" type="vwoc:VWOScentListType" minOccurs="0"/>
              <element name="ControlList" type="vwoc:VWOControlListType" minOccurs="0"/>
              <element name="EventList" type="vwoc:VWOEventListType" minOccurs="0"/>
            </sequence>
          </complexType>
        </element>
        <element name="BehaviorModelList" type="vwoc:VWOBehaviorModelListType" minOccurs="0"/>
      </sequence>
      <attribute name="id" type="ID" use="optional"/>
    </restriction>
  </complexContent>
</complexType>

<!-- ################################################ -->
<!--  Avatar BaseType                                 -->
<!-- ################################################ -->
<complexType name="AvatarBaseType" abstract="true">
  <complexContent>
    <extension base="vwoc:VWOBaseType"/>
  </complexContent>
```

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