
**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*



Reference number
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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 23005-5 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This second edition cancels and replaces the first edition (ISO/IEC 23005-5:2011) which has been technically revised.

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*

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 in existing Metaverses permit users to have unique experiences. Resistance to real-world commercial encroachment still exists in many virtual worlds, where users primarily seek an escape from real life. Hence, marketers should get to know a virtual world beforehand and the rules that govern each individual universe.

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.

Such new media will benefit from the standardization of control and sensory information which consists of 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 actuators.

This part of ISO/IEC 23005 contains the tools for exchanging information for interaction devices. To be specific, it specifies normative command formats for controlling actuators and data formats for receiving information from sensors. It also specifies 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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The holders of these patent rights have assured ISO and the IEC that they are willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statements of the holders of these patent rights are registered with ISO and the IEC. Information may be obtained from the companies listed in Annex C.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights other than those identified in Annex C. ISO and the IEC shall not be held responsible for identifying any or all such patent rights.

Information technology — Media context and control —

Part 5: Data formats for interaction devices

1 Scope

This part of ISO/IEC 23005 specifies syntax and semantics of the data formats for interaction devices, i.e., Device Commands and Sensed Information, required for providing interoperability in controlling interaction devices and in sensing information from interaction devices in real as well as virtual worlds as depicted in Figure 1.

This part of ISO/IEC 23005 aims to provide data formats for industry-ready interaction devices: sensors and actuators. The same data formats for interaction devices can be utilized by various applications supported by different MPEG technologies. Not only ISO/IEC 23005 but also other International Standards such as ISO/IEC 23007 (MPEG-U) and scene representation specifications (for example ISO/IEC 14496-20) can simply refer to this part of ISO/IEC 23005 to use the defined data formats.

Two cases can occur for controlling a virtual world by using the MPEG tools. When the virtual world is using a scene description defined by MPEG tools (BIFS, Laser, etc.), the sensors and actuators can be directly connected to it through an MPEG-U interface. When the virtual world is defined by non MPEG tools, an adaptation engine and common formalism for effects are needed. In Figure 1, the first case is illustrated by VirtualWorld2 and the second by VirtualWorld1.

When this part of ISO/IEC 23005 is used in the context of pure ISO/IEC 23005, 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 part of ISO/IEC 23005. 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 controls of devices in both real and virtual worlds.

On the other hand, the defined data formats (Sensed Information and Device Command) can be mapped to MPEG-U defined interfaces when this part of ISO/IEC 23005 is utilized in the context of other standards such as MPEG-U Framework. For example, the interface can be provided as ISO/IEC 23007-2 in the context of MPEG-U. Also defined, Sensed Information can be used by scene representation specifications as input data formats for a scene. The Device Command data format can also be used as output data formats to communicate with the outer world by mapping onto the interfaces defined in specific specifications.

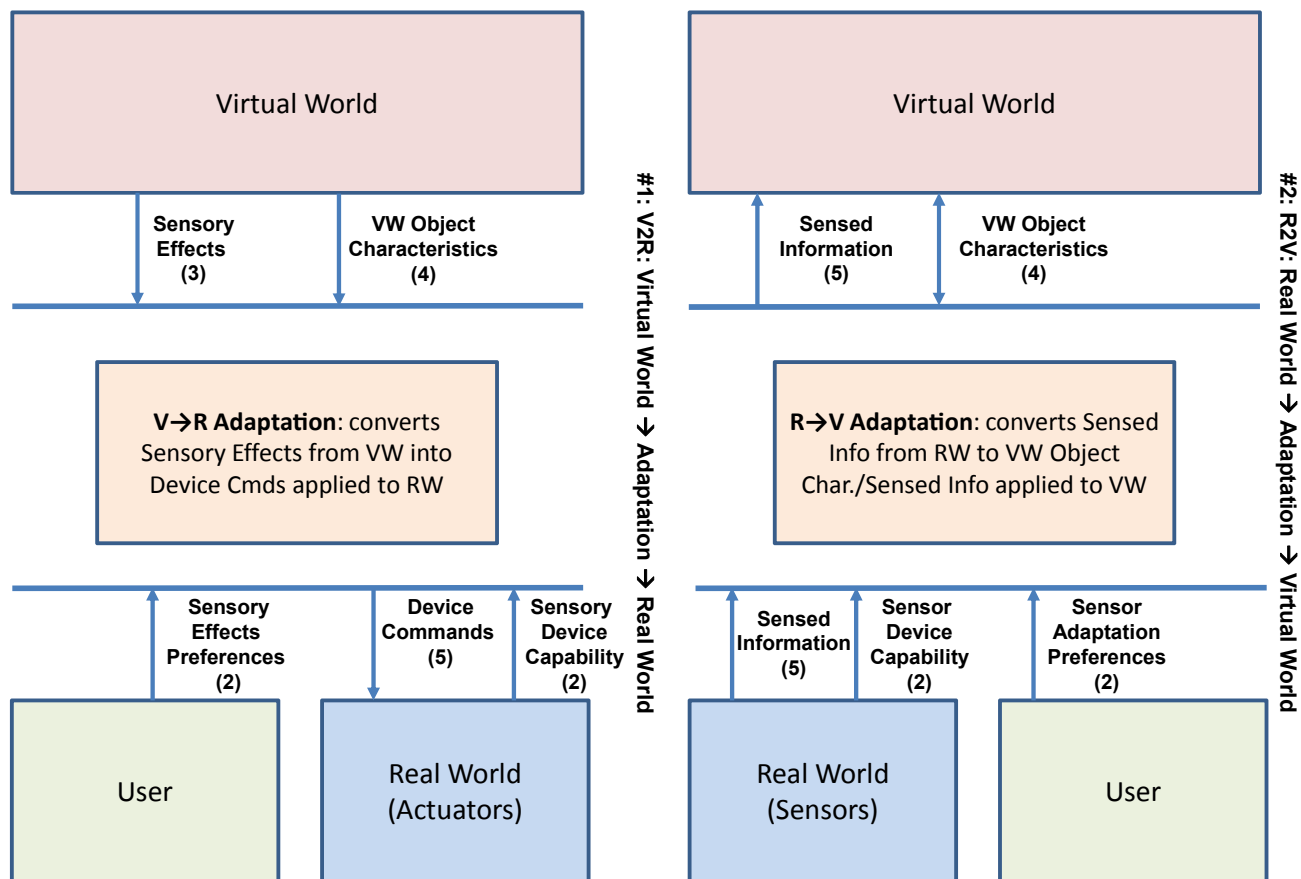


Figure 1 — Scope of the Data formats for interaction devices

In Figure 1, V→R adaptation takes Sensory Effects (ISO/IEC 23005-3) from a Virtual World, optionally Sensory Device Capabilities (ISO/IEC 23005-2) from the actuators and the Sensory Effect Preferences (ISO/IEC 23005-2) from users; it generates the Device Commands by adapting the Sensory Effects based on the Capabilities and/or the Preferences.

R→V adaptation takes the Sensed Information with/without the Sensor Capabilities (ISO/IEC 23005-2) from Sensors, the Sensor Adaptation Preferences (ISO/IEC 23005-2) from Users, and/or the Virtual World Object Characteristics (ISO/IEC 23005-4) from a Virtual world. It has two usages: it controls the Virtual World Object Characteristics or it transmits an adapted version of the Sensed Information by using the Sensor Capabilities and/or the Sensor Adaptation Preferences coming from the user.

The usage scenarios are described in detail in MPEG-V Architecture (ISO/IEC 23005-1).

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

3.2 Abbreviated terms

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

CS:	Classification Scheme (see ISO/IEC 15938-5)
DAC:	Digital-to-Analog Conversion
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 Introduction

This Clause describes basic structure of the tools in this part of ISO/IEC 23005 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.

```
<schema xmlns="http://www.w3.org/2001/XMLSchema"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:iidl="urn:mpeg:mpeg-v:2012:01-
IIDL-NS" xmlns:mpegvct="urn:mpeg:mpeg-v:2012:01-CT-NS" xmlns:dcv="urn:mpeg:mpeg-
v:2012:01-DCV-NS" xmlns:siv="urn:mpeg:mpeg-v:2012:01-SIV-NS"
targetNamespace="urn:mpeg:mpeg-v:2012:01-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:2012:01-CT-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-CT.xsd"/>
  <import namespace="urn:mpeg:mpeg-v:2012:01-DCV-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V_schema_files/MPEG-V-DCV.xsd"/>
```

```
<import namespace="urn:mpeg:mpeg-v:2012:01-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>
```

4.3 Root element and top-level tools

4.3.1 Introduction

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 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 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> .
<code>IndividualSensedInfoType</code>	This field, which is only present in the binary representation, describes which <code>SensedInfo</code> type shall be used.

In the binary description, the following mapping table is used,

Terms of Sensor	Binary representation for sensor type (8 bits)
Light sensor	00000000

Name	Definition
Ambient noise sensor	00000001
Temperature sensor	00000010
Humidity sensor	00000011
Distance sensor	00000100
Atmospheric pressure Sensor	00000101
Position sensor	00000110
Velocity sensor	00000111
Acceleration sensor	00001000
Orientation sensor	00001001
Angular velocity sensor	00001010
Angular acceleration sensor	00001011
Force sensor	00001100
Torque sensor	00001101
Pressure sensor	00001110
Motion sensor	00001111
Intelligent camera sensor	00010000
Multitouch point sensor	00010001
Gaze tracking sensor	00010010
Wind sensor	00010011
Global position sensor	00010100
Altitude sensor	00010101
Bend sensor	00010110
Gas sensor	00010111
Dust sensor	00011000
Body height sensor	00011001
Body weight sensor	00011010
Body temperature sensor	00011011
Body fat sensor	00011100
Blood type sensor	00011101

Name	Definition																																		
	<table> <tr><td>Blood pressure sensor</td><td>00011110</td></tr> <tr><td>Blood sugar sensor</td><td>00011111</td></tr> <tr><td>Blood oxygen sensor</td><td>00100000</td></tr> <tr><td>Heart rate sensor</td><td>00100001</td></tr> <tr><td>Electrograph sensor</td><td>00100010</td></tr> <tr><td>EEG sensor</td><td>00100011</td></tr> <tr><td>ECG sensor</td><td>00100100</td></tr> <tr><td>EMG sensor</td><td>00100101</td></tr> <tr><td>EOG sensor</td><td>00100110</td></tr> <tr><td>GSR sensor</td><td>00100111</td></tr> <tr><td>Bio sensor</td><td>00101000</td></tr> <tr><td>Weather sensor</td><td>00101001</td></tr> <tr><td>Facial expression sensor</td><td>00101010</td></tr> <tr><td>Facial morphology sensor</td><td>00101011</td></tr> <tr><td>Facial expression characteristics sensor</td><td>00101100</td></tr> <tr><td>Geomagnetic sensor</td><td>00101101</td></tr> <tr><td>Reserved</td><td>00101110-11111111</td></tr> </table>	Blood pressure sensor	00011110	Blood sugar sensor	00011111	Blood oxygen sensor	00100000	Heart rate sensor	00100001	Electrograph sensor	00100010	EEG sensor	00100011	ECG sensor	00100100	EMG sensor	00100101	EOG sensor	00100110	GSR sensor	00100111	Bio sensor	00101000	Weather sensor	00101001	Facial expression sensor	00101010	Facial morphology sensor	00101011	Facial expression characteristics sensor	00101100	Geomagnetic sensor	00101101	Reserved	00101110-11111111
Blood pressure sensor	00011110																																		
Blood sugar sensor	00011111																																		
Blood oxygen sensor	00100000																																		
Heart rate sensor	00100001																																		
Electrograph sensor	00100010																																		
EEG sensor	00100011																																		
ECG sensor	00100100																																		
EMG sensor	00100101																																		
EOG sensor	00100110																																		
GSR sensor	00100111																																		
Bio sensor	00101000																																		
Weather sensor	00101001																																		
Facial expression sensor	00101010																																		
Facial morphology sensor	00101011																																		
Facial expression characteristics sensor	00101100																																		
Geomagnetic sensor	00101101																																		
Reserved	00101110-11111111																																		
DeviceCommandListType	A type that serves as the placeholder for the sequence of device commands.																																		
NumOfDeviceCmd	This field, which is only present in the binary representation, specifies the number of DeviceCmd instances accommodated in the DeviceCommandList.																																		
IndividualDeviceCmdType	This field, which is only present in the binary representation, describes which DeviceCmd type shall be used. In the binary description, the following mapping table is used, <table> <tr> <th>Terms of Device</th><th>Binary representation for device type (8bits)</th></tr> <tr> <td>Light device</td><td>00000000</td></tr> <tr> <td>Flash device</td><td>00000001</td></tr> <tr> <td>Heating device</td><td>00000010</td></tr> </table>	Terms of Device	Binary representation for device type (8bits)	Light device	00000000	Flash device	00000001	Heating device	00000010																										
Terms of Device	Binary representation for device type (8bits)																																		
Light device	00000000																																		
Flash device	00000001																																		
Heating device	00000010																																		

Name	Definition
Cooling device	00000011
Wind device	00000100
Vibration device	00000101
Sprayer device	00000110
Scent device	00000111
Fog device	00001000
Color correction device	00001001
Initialize color correction parameter device	00001010
Rigid body motion device	00001011
Tactile device	00001100
Kinesthetic device	00001101
Global position command device	00001110
Reserved	00001111-11111111

4.3.5 Examples

The following shows two use cases of `InteractionInfo` element, which are for listing device commands and for listing sensed informations.

The first example shows the case when the `InteractionInfo` is used for `DeviceCommandList`.

```
<iidl:InteractionInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:mpegvct="urn:mpeg:mpeg-v:2012:01-
CT-NS" xmlns:iidl="urn:mpeg:mpeg-v:2012:01-IIDL-NS" xmlns:dcv="urn:mpeg:mpeg-
v:2012:01-DCV-NS" xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-DCV-
NS http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V\_schema\_files/MPEG-V-DCV.xsd">
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:FogType" activate="true"
deviceIdRef="fdc1" id="command1" intensity="20"/>
    ...
    <iidl:DeviceCommand xsi:type="dcv:..." .../>
    ...
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

The second example shows the case when the `InteractionInfo` is used for `SensedInfoList`.

```
<iidl:InteractionInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:mpegvct="urn:mpeg:mpeg-v:2010:01-
CT-NS" xmlns:iidl="urn:mpeg:mpeg-v:2012:01-IIDL-NS" xmlns:siv="urn:mpeg:mpeg-
v:2012:01-SIV-NS" xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-SIV-
NS http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V\_schema\_files/MPEG-V-SIV.xsd">
  <iidl:SensedInfoList>
    <iidl:SensedInfo xsi:type="a_type_derived_from_SensedInfoBaseType" .../>
    ...
    <iidl:SensedInfo xsi:type="siv:AccelerationSensorType" .../>
    ...
  </iidl:SensedInfoList>
</iidl:InteractionInfo>
```

The third example shows the case when the `DeviceCommand` is used directly as the root element.

```
<iidl:DeviceCommand xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:mpegvct="urn:mpeg:mpeg-v:2012:01-
CT-NS" xmlns:dcv="urn:mpeg:mpeg-v:2012:01-DCV-NS" xmlns:iidl="urn:mpeg:mpeg-
v:2012:01-IIDL-NS" xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-DCV-
NS http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V\_schema\_files/MPEG-V-DCV.xsd" xsi:type="dcv:LightType" id="light1"
color="urn:mpeg:mpeg-v:01-SI-ColorCS-NS:red" intensity="5">
  <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
</iidl:DeviceCommand>
```

The fourth example shows the case when the `SensedInfo` is used directly as the root element.

```
<iidl:SensedInfo xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004" xmlns:mpegvct="urn:mpeg:mpeg-v:2010:01-
CT-NS" xmlns:iidl="urn:mpeg:mpeg-v:2012:01-IIDL-NS" xmlns:siv="urn:mpeg:mpeg-
v:2012:01-SIV-NS" xsi:schemaLocation="urn:mpeg:mpeg-v:2012:01-SIV-
NS http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V\_schema\_files/MPEG-V-SIV.xsd" xsi:type="siv:LightSensorType" id="LS001"
sensorIdRef="LSID001" activate="true" value="200" color="#FF0000">
  <iidl:TimeStamp xsi:type="mpegvct:ClockTickTimeType" timeScale="1000"
pts="600000"/>
</iidl:SensedInfo>
```

Note that these examples are only showing a part of the complete XML description to show the use of the root element, `InteractionInfo`, with the choice of `DeviceCommandList` or `SensedInfoList`.

4.4 Device commands

4.4.1 Introduction

This Subclause specifies tools for describing actions that each individual device (actuators) is supposed to take. Instances of following device commands defined in the Clause may be generated as an output of the VR engine and used to drive actuators. The following Subclause defines an abstract complex type of `DeviceCommandBaseType`, which the device command types of individual device should inherit.

4.4.2 Reference coordinate system

The origin of the reference coordinate for actuators is located at the position of the user. Each axis is defined as follows. X-axis is in the direction of the right hand side of the user facing the screen. Y-axis is in the reverse direction of gravity. Z-axis is in the direction of the user's facing the screen. The x-, y-, and z-axis are depicted in Figure 2.

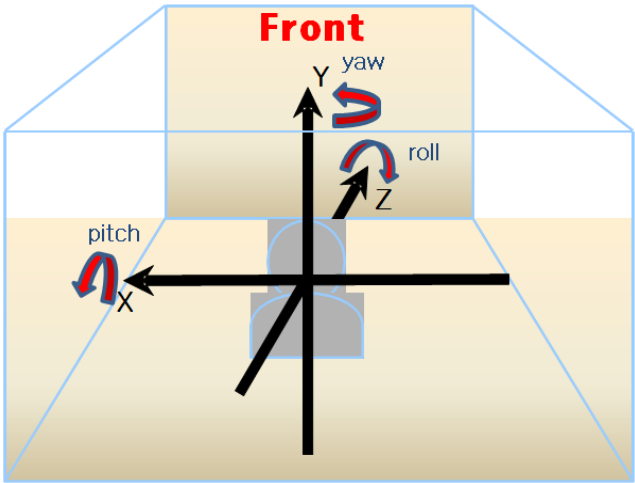


Figure 2 — Reference Coordinate System for Actuators

4.4.3 Device command base type

4.4.3.1 Syntax

```
<!-- ##### -->
<!-- Device command base type -->
<!-- ##### -->
<complexType name="DeviceCommandBaseType" abstract="true">
  <sequence>
    <element name="TimeStamp" type="mpegvct:TimeStampType"/>
  </sequence>
  <attributeGroup ref="iidl:DeviceCmdBaseAttributes"/>
</complexType>
```

4.4.3.2 Binary representation syntax

DeviceCommandBaseType{	Number of bits	Mnemonic
TimeStamp		TimeStampType
DeviceCmdBaseAttributes		DeviceCmdBaseAttributesType
}		

4.4.3.3 Semantics

Semantics of the DeviceCommandBaseType:

Name	Definition										
DeviceCommandBaseType	Provides the topmost type of the base type hierarchy which each individual device command can inherit.										
TimeStamp	Provides the timing information for the device command to be executed. As defined in ISO/IEC 23005-6, there is a choice of selection among three timing schemes, which are absolute time, clocktick time, and delta of clock tick time.										
DeviceCmdBaseAttributes	Describes a group of attributes for the commands.										
TimeStampType	This field, which is only present in the binary representation, describes which time stamp scheme shall be used. "1" means that the absolute time stamp type shall be used, "2" means that the clock tick time stamp type shall be used, and "3" means that the clock tick time delta stamp type shall be used. "0" is reserved. <table border="1"> <thead> <tr> <th>TimeStamp Select</th><th>Type Stamp Type</th></tr> </thead> <tbody> <tr> <td>00</td><td>Reserved</td></tr> <tr> <td>01</td><td>AbsoluteTimeType</td></tr> <tr> <td>10</td><td>ClockTickTimeType</td></tr> <tr> <td>11</td><td>ClockTickTimeDeltaType</td></tr> </tbody> </table>	TimeStamp Select	Type Stamp Type	00	Reserved	01	AbsoluteTimeType	10	ClockTickTimeType	11	ClockTickTimeDeltaType
TimeStamp Select	Type Stamp Type										
00	Reserved										
01	AbsoluteTimeType										
10	ClockTickTimeType										
11	ClockTickTimeDeltaType										
AbsoluteTimeStamp	The absolute time stamp is defined in A.2.3 of ISO/IEC 23005-6.										
ClockTickTimeStamp	The clock tick time stamp is defined in A.2.3 of ISO/IEC 23005-6.										
ClockTickTimeDeltaStamp	The clock tick time delta stamp, which value is the time delta between the present and the past time, is defined in A.2.3 of ISO/IEC 23005-6.										

4.4.3.4 Examples

For the examples of the DeviceCommandBaseType, please see the examples of individual types of device commands.

4.4.4 Device command base attributes

4.4.4.1 Syntax

```

<!-- ##### -->
<!-- Definition of Device Command Base Attributes -->
<!-- ##### -->
<attributeGroup name="DeviceCmdBaseAttributes">
  <attribute name="id" type="ID" use="optional"/>
  <attribute name="deviceIdRef" type="anyURI" use="optional"/>
  <attribute name="activate" type="boolean" use="optional" default="true"/>
</attributeGroup>

```

4.4.4.2 Binary representation syntax

DeviceCmdBaseAttributesType{	Number of bits	Mnemonic
idFlag	1	bslbf
deviceIdRefFlag	1	bslbf
activateFlag	1	bslbf
if(idFlag) {		
id	See ISO 10646	UTF-8
}		
if(deviceIdRefFlag) {		
deviceIdRef		UTF-8
}		
if(activateFlag) {		
activate	1	bslbf
}		
}		

4.4.4.3 Semantics

Semantics of the DeviceCmdBaseAttributes:

Name	Definition
DeviceCmdBaseAttributes	Specifies the common attributes for any type inherits from the DeviceCommandBaseType.
id	To be used to identify each individual device command.
deviceIdRef	To specify an individual device to which the command is associated.
activate	Describes whether the effect shall be activated. A value of <code>true</code> means the device shall be activated (switch on) and <code>false</code> means the device shall be deactivated (switch off).
DeviceCmdBaseAttributesType	Provides the topmost type of the base type hierarchy which the attributes of each individual device command can inherit.
idFlag	This field, which is only present in the binary representation, signals the presence of the id attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

Name	Definition
deviceIdRefFlag	This field, which is only present in the binary representation, signals the presence of the sensor ID reference attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
activateFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

4.4.4.4 Examples

The following is a snippet of an XML document showing the use of the DeviceCmdBaseAttributes. It shows a device command specified by the identifier of `command1` to activate a device type *any_specific_device_command_type* with device identifier `fdc1`.

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:any_specific_device_command_type"
activate="true" deviceIdRef="fdc1" id="command1"/>
    ...
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

4.5 Sensed information description tools

4.5.1 Introduction

This Subclause specifies tools for describing information acquired through each individual sensor. Instances of following sensed information defined in the Clause may be generated as an output of the sensors. The following subclause defines an abstract complex type of *SensedInfoBaseType*, which the sensed information types for each individual sensor should inherit.

4.5.2 Global coordinate for sensors

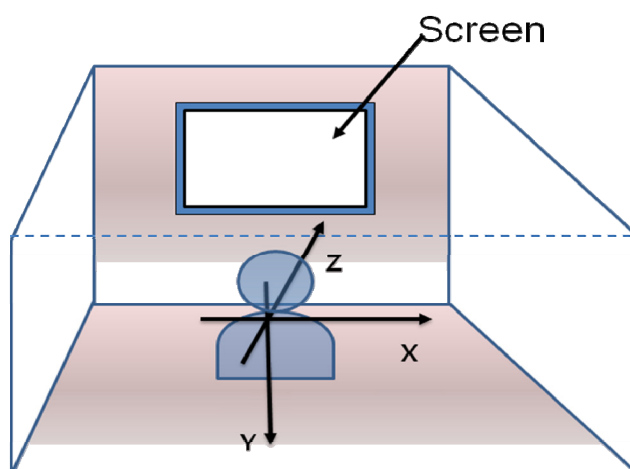


Figure 3 — Reference coordinate for sensors

The reference coordinate for sensors is defined adapting the right handed coordinate system. Each axis is defined as follows: Y-axis is in the direction of gravity; Z-axis is in the direction of user's front (in common sense) which is orthogonal to the y-axis; X-axis is in the direction of user's right side which is also orthogonal to both y-axis and z-axis. The x-, y-, and z-axis are depicted in Figure 3. The default origin of the reference coordinate for sensors is the position of the user. The origin of the coordinate system differs depending on the type of the sensor.

4.5.3 Sensed information base type

4.5.3.1 Syntax

```
<!-- ##### -->
<!-- Sensed information base type -->
<!-- ##### -->
<complexType name="SensedInfoBaseType" abstract="true">
  <sequence>
    <element name="TimeStamp" type="mpegvct:TimeStampType" minOccurs="0"/>
  </sequence>
  <attributeGroup ref="iidl:sensedInfoBaseAttributes"/>
</complexType>
```

4.5.3.2 Binary representation syntax

SensedInfoBaseTypeType{	Number of bits	Mnemonic
TimeStampFlag	1	bslbf
SensedInfoBaseAttributes		SensedInfoBaseAttributesType
If(TimeStampFlag){		
TimeStamp		TimeStampType
}		
}		

4.5.3.3 Semantics

Semantics of the SensedInfoListType:

Name	Definition
SensedInfoBaseType	Provides the topmost type of the base type hierarchy which each individual sensed information can inherit.
sensedInfoBaseAttributes	Describes a group of attributes for the sensed information.
TimeStamp	Provides the time information at which the sensed information is acquired. As defined in ISO/IEC 23005-6, there is a choice of selection among three timing schemes, which are absolute time, clocktick time, and delta of clock tick time.

Name	Definition
TimeStampFlag	This field, which is only present in the binary representation, signals the presence of the TimeStamp element. A value of "1" means the element shall be used and "0" means the element shall not be used.

4.5.4 Sensed information base attributes

4.5.4.1 Syntax

```

<!-- ##### -->
<!-- Definition of Sensed Information Base Attributes -->
<!-- ##### -->
<attributeGroup name="sensedInfoBaseAttributes">
  <attribute name="id" type="ID" use="optional"/>
  <attribute name="sensorIdRef" type="anyURI" use="optional"/>
  <attribute name="linkedlist" type="anyURI" use="optional"/>
  <attribute name="groupID" type="anyURI" use="optional"/>
  <attribute name="activate" type="boolean" use="optional"/>
  <attribute name="priority" type="nonNegativeInteger" use="optional"
default="0"/>
</attributeGroup>

```

4.5.4.2 Binary representation syntax

SensedInfoBaseAttributesType{	Number of bits	Mnemonic
IDFlag	1	bslbf
sensorIdRefFlag	1	bslbf
linkedlistFlag	1	bslbf
groupIDFlag	1	bslbf
priorityFlag	1	bslbf
activateFlag	1	bslbf
If(IDFlag) {		
ID	See ISO 10646	UTF-8
}		
if(sensorIdRefFlag) {		
sensorIdRef		UTF-8
}		
if(linkedlistFlag) {		

linkedlist		UTF-8
}		
if(groupIDFlag) {		
groupID		UTF-8
}		
If(priorityFlag) {		
priority	32	uimbsf
}		
if(activateFlag) {		
activate	1	bslbf
}		
}		

4.5.4.3 Semantics

Semantics of the sensedInfoBaseAttributes:

<i>Name</i>	<i>Definition</i>
sensedInfoBase Attributes	Describes a group of attributes for the commands.
id	Unique identifier for identifying individual sensed information
sensorIdRef	References a sensor that has generated the information included in this specific sensed information.
linkedlist	Describes the multi-sensor structure that consists of a group of sensors in a way that each record contains a reference to the ID of the next sensor.
groupID	Identifier for a group multi-sensor structure to which this specific sensor belongs.
activate	Describes whether the sensor shall be activated. A value of "true" means the sensor shall be activated and "false" means the sensor shall be deactivated. In the binary representation, A value of "1" means the sensor shall be activated and "0" means the sensor shall be deactivated.

<i>Name</i>	<i>Definition</i>
priority	Describes a priority for sensed information with respect to other sensed information sharing the same point in time when the sensed information becomes adapted. A value of one indicates the highest priority and larger values indicate lower priorities. The default value of the priority is one. If there are more than one sensed information with the same priority, the order of process can be determined by the Adaptation engine itself. NOTE The priority might be used to apply the sensed information on the virtual world object characteristics – defined within a group of sensors – according to the capabilities of the adaptation VR. EXAMPLE The adaptation RV processes the individual sensed information of a group of sensors according to their priority in descending order due to its limited capabilities. That is, the sensed information with the lower priority might get lost.
SensedInfoBaseAttributes Type	Tool for describing sensed information base attributes.
IDFlag	This field, which is only present in the binary representation, signals the presence of the ID attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
sensorIdRefFlag	This field, which is only present in the binary representation, signals the presence of the sensor ID reference attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
linkedlistFlag	This field, which is only present in the binary representation, signals the presence of the linked list attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
groupIDFlag	This field, which is only present in the binary representation, signals the presence of the group ID attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
priorityFlag	This field, which is only present in the binary representation, signals the presence of the priority attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
activateFlag	This field, which is only present in the binary representation, signals the presence of the activation attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.

4.5.4.4 Examples

The example of the BaseAttributes is given in the examples of sensed information vocabulary.

5 Device Command Vocabulary

5.1 Introduction

This Clause describes syntax and semantics of the device command vocabulary to implement commanding of individual devices.

This Clause also describes the binary representation of each individual device command. There are two possible modes for the devices requiring a high speed update rate and large data, such as color correction type, rigid body motion type, and tactile type, can utilize the update mode in addition to the normal mode. The device commands with the update mode parse the elements, which values are different from their corresponding values in the previous device command.

5.2 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:dcv="urn:mpeg:mpeg-v:2012:01-DCV-
NS" xmlns:iidl="urn:mpeg:mpeg-v:2012:01-IIDL-NS" xmlns:mpegvct="urn:mpeg:mpeg-
v:2012:01-CT-NS" targetNamespace="urn:mpeg:mpeg-v:2012:01-DCV-NS"
elementFormDefault="qualified" attributeFormDefault="unqualified"
version="ISO/IEC 23005-5" id="MPEG-V-DCV.xsd">
  <import namespace="urn:mpeg:mpeg-v:2012:01-IIDL-NS"
schemaLocation="http://standards.iso.org/ittf/PubliclyAvailableStandards/MPEG-
V\_schema\_files/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:2012:01-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>
```

5.3 Light type

5.3.1 Introduction

This Subclause specifies a device command type which can generate a light effect. The properties of the command can be generated by the adaptation engine, which is combining the light effect specified by ISO/IEC 23005-3 with the user preference toward the light effect and the light device capabilities specified by ISO/IEC 23005-2.

5.3.2 Syntax

```

<!-- ##### -->
<!-- Definition of DCV light type -->
<!-- ##### -->
<complexType name="LightType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="color" type="mpegvct:colorType" use="optional"/>
      <attribute name="intensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

5.3.3 Binary representation syntax

LightType{	Number of bits	Mnemonic
colorFlag	1	bslbf
intensityFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(colorFlag) {		
color	8	colorType
}		
if(intensityFlag) {		
intensity	7	uimsbf
}		
}		

colorType {	Number of bits	Mnemonic
NamedcolorFlag	1	
If(namedcolorFlag) {		
NamedColorType	9	bslbf
} else {		
RGBType	56	Bslbf
}		
}		

5.3.4 Semantics

Semantics of the `LightType`:

<i>Name</i>	<i>Definition</i>
<code>LightType</code>	Tool for describing a command for a lighting device to follow.
<code>color</code>	Describes the list of colors, which the lighting device can provide, that shall be used either as a reference to a classification scheme term using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003 or as RGB value. A CS that may be used for this purpose is the <code>ColorCS</code> defined in A.2.2 of ISO/IEC 23005-6. The binary representation of the <code>ColorCS</code> is defined in A.2.2 of ISO/IEC 23005-6. EXAMPLE <code>urn:mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue</code> would describe the color Alice blue. EXAMPLE The RGB representation of the color Alice blue is <code>#F0F8FF</code>.
	Describes the intensity that the lighting device shall emit in percentage with respect to the maximum intensity that the specific device can generate.
<code>colorFlag</code>	This field, which is only present in the binary representation, signals the presence of color attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>intensityFlag</code>	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>DeviceCommandBase</code>	Provides the topmost type of the base type hierarchy which each individual device command can inherit.
<code>NamedcolorFlag</code>	This field, which is only present in the binary representation, indicates a choice of the color descriptions. If it is 1 then the color is described by <code>mpeg7:termReferenceType</code> , otherwise the color is described by <code>colorRGBType</code> .
<code>NamedColorType</code>	This field, which is only present in the binary representation, describes color in terms of <code>ColorCS Flag</code> defined in A.2.2 of ISO/IEC 23005-6.
<code>colorRGBType</code>	This field, which is only present in the binary representation, describes color in terms of <code>colorRGBType</code> .

5.3.5 Examples

This example shows the description of a device command of light effect with the following semantics. The displaying device for the light effect is "light1". The intensity shall be 5 % with the color "red" from the classification scheme described in A.2.2 of ISO/IEC 23005-6.

```

<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:LightType" id="light1"
color="urn:mpeg:mpeg-v:01-SI-ColorCS-NS:red" intensity="5">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>

```

5.4 Flash type

5.4.1 Introduction

This Subclause specifies a device command type which can generate a flash effect. The properties of the command can be generated by the adaptation engine, which is combining the flash effect specified by ISO/IEC 23005-3 with the user preference toward the flash effect and the flash device capabilities specified by ISO/IEC 23005-2.

5.4.2 Syntax

```

<!-- ##### -->
<!-- Definition of DCV flash type -->
<!-- ##### -->
<complexType name="FlashType">
  <complexContent>
    <extension base="dcv:LightType">
      <attribute name="frequency" type="positiveInteger" use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

5.4.3 Binary representation syntax

FlashType{	Number of bits	Mnemonic
frequencyFlag	1	bslbf
Light		LightType
if(frequencyFlag) {		
frequency	7	uimsbf
}		
}		

5.4.4 Semantics

Semantics of the `FlashType`:

Name	Definition
FlashType	Tool for describing a flash device command.
intensity	Describes the intensity of the flash effect in terms of illumination in percentage with respect to the maximum light intensity that the specific device can generate.
frequency	Describes the number of flickering in percentage with respect to the maximum frequency that the specific flash device can generate.
Color	Describes the color of the flash effect as a reference to a classification scheme term or as RGB. A CS that may be used for this purpose is the ColorCS defined in A2.2 of ISO/IEC 23005-6. The binary representation of the ColorCS is defined in A.2.2 of ISO/IEC 23005-6. EXAMPLE urn:mpeg:mpeg-v:01-SI-ColorCS-NS:alice_blue would describe the color Alice blue. EXAMPLE The RGB representation of the color Alice blue is #F0F8FF.
frequencyFlag	This field, which is only present in the binary representation, signals the presence of color attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

5.4.5 Examples

This example shows the description of a device command of flash effect with the following semantics. The displaying device for the flash effect is "flash1". The intensity shall be 5% of the maximum intensity of "flash1", while the frequency is 10 % of the maximum frequency of "flash1".

```
<InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:FlashType" id="flash1"
      color="urn:mpeg:mpeg-v:01-SI-ColorCS-NS:red" intensity="5"
      frequency="10">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</InteractionInfo>
```

5.5 Heating type

5.5.1 Introduction

This Subclause specifies a device command type which can generate a heating effect. The properties of the command can be generated by the adaptation engine, which is combining the heating effect specified by ISO/IEC 23005-3 with the user preference toward the heating effect and the heating device capabilities specified by ISO/IEC 23005-2.

5.5.2 Syntax

```

<!-- ##### -->
<!-- Definition of DCV heating type -->
<!-- ##### -->
<complexType name="HeatingType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="intensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

5.5.3 Binary representation syntax

HeatingType{	Number of bits	Mnemonic
intensityFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(intensityFlag) {		
intensity	7	uimsbf
}		
}		

5.5.4 Semantics

Semantics of the HeatingType:

Name	Definition
HeatingType	Tool for describing a command for heating device.
intensity	Describes the intensity of the temperature effect of heating in percentage with respect to the capable range of temperature control. If the intensity is not specified, this command shall be interpreted as turning on at the maximum intensity. Example: If the device can control temperature between 20 and 40 degrees Celsius, intensity of 20 percent means the intensity of 24 degrees Celsius.
intensityFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
DeviceCommandBase	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

5.5.5 Examples

This example shows the description of a device command of heating effect with the following semantics. The identifier for this command is "heater1" and the identifier for the heating device for which this command is issued is "heater001". The intensity shall be 28 % of the maximum intensity of "heater001".

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:HeatingType" id="heater1"
      deviceIdRef="heater001" activate="true" intensity="28">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.6 Cooling type

5.6.1 Introduction

This Subclause specifies a device command type which can generate a cooling effect. The properties of the command can be generated by the adaptation engine, which is combining the cooling effect specified by ISO/IEC 23005-3 with the user preference toward the cooling effect and the cooling device capabilities specified by ISO/IEC 23005-2.

5.6.2 Syntax

```
<!-- ##### -->
<!-- Definition of DCV cooling type -->
<!-- ##### -->
<complexType name="CoolingType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="intensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.6.3 Binary representation syntax

CoolingType{	Number of bits	Mnemonic
intensityFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(intensityFlag) {		
intensity	7	uimsbf
}		
}		

5.6.4 Semantics

Semantics of the `CoolingType`:

Name	Definition
<code>CoolingType</code>	Tool for describing a command for cooling device
<code>intensity</code>	Describes the intensity of the temperature effect of cooling in percentage with respect to the capable range of temperature control. The larger intensity value the <code>CoolingType</code> description has, the cooler the environment is intended to be driven. If the intensity is not specified, this command shall be interpreted as turning on at the maximum intensity. Example: If the device can create cooling effect from 30 to 10 degrees Celsius, intensity of 20 percent means the intensity of 26 degrees Celsius.
<code>intensityFlag</code>	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>DeviceCommandBase</code>	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

5.6.5 Examples

This example shows the description of a device command of cooling effect with the following semantics. The identifier for this command is "cooling01" and the identifier for the cooling device for which this command is issued is "cooler001". The intensity shall be 40 % of the maximum intensity of "cooler001."

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:CoolingType" id="cooling01"
      deviceIdRef="cooler001" activate="true" intensity="40">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.7 Wind type

5.7.1 Introduction

This Subclause specifies a device command type which can generate a wind effect. The properties of the command can be generated by the adaptation engine, which is combining the wind effect specified by ISO/IEC 23005-3 with the user preference toward the wind effect and the wind device capabilities specified by ISO/IEC 23005-2.

5.7.2 Syntax

```

<!-- ##### -->
<!-- Definition of DCV wind type -->
<!-- ##### -->
<complexType name="WindType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="intensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>

```

5.7.3 Binary representation syntax

WindType{	Number of bits	Mnemonic
intensityFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(intensityFlag) {		
intensity	7	uimsbf
}		
}		

5.7.4 Semantics

Semantics of the WindType:

Name	Definition
WindType	Tool for describing a wind device command.
intensity	Describes the intensity of the wind effect in terms of strength in percentage with respect to the maximum intensity of the specified device. If the intensity is not specified, this command shall be interpreted as turning on at the maximum intensity.
intensityFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
DeviceCommandBase	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

5.7.5 Examples

This example shows the description of a device command of wind effect with the following semantics. The identifier for this command is “wind01” and the identifier for the wind device for which this command is issued is “wind001”. The intensity shall be 30 % of the maximum intensity of “wind001.”

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:WindType" id="wind01"
      deviceIdRef="wind001" activate="true" intensity="30">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.8 Vibration type

5.8.1 Introduction

This Subclause specifies a device command type which can generate a vibration effect. The properties of the command can be generated by the adaptation engine, which is combining the vibration effect specified by ISO/IEC 23005-3 with the user preference toward the vibration effect and the vibration device capabilities specified by ISO/IEC 23005-2.

5.8.2 Syntax

```
<!-- ##### -->
<!-- Definition of DCV vibration type -->
<!-- ##### -->
<complexType name="VibrationType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="intensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.8.3 Binary representation syntax

VibrationType{	Number of bits	Mnemonic
intensityFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(intensityFlag) {		
intensity	7	uimsbf
}		
}		

5.8.4 Semantics

Semantics of the `VibrationType`:

Name	Definition
<code>VibrationType</code>	Tool for describing a vibration device command.
<code>intensity</code>	Describes the intensity of the vibration effect in terms of strength in percentage with respect to the maximum intensity of the specified device. If the intensity is not specified, this command shall be interpreted as turning on at the maximum intensity.
<code>intensityFlag</code>	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>DeviceCommandBase</code>	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

5.8.5 Examples

This example shows the description of a device command of vibration effect with the following semantics. The identifier for this command is "vibe01" and the identifier for the vibration device for which this command is issued is "vibe001". The intensity shall be 60 % of the maximum intensity of "vibe001".

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:VibrationType" id="vibe01"
      deviceIdRef="vibe001" activate="true" intensity="60">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.9 Sprayer type

5.9.1 Introduction

This Subclause specifies a device command type which can generate a spraying effect. The properties of the command can be generated by the adaptation engine, which is combining the spraying effect specified by ISO/IEC 23005-3 with the user preference toward the spraying effect and the spraying device capabilities specified by ISO/IEC 23005-2.

5.9.2 Syntax

```
<!-- ##### -->
<!-- Definition of DCV sprayer type -->
<!-- ##### -->
<complexType name="SprayerType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="sprayingType" type="mpeg7:termReferenceType"/>
    </extension>
  </complexContent>
</complexType>
```

```

        <attribute name="intensity" type="integer" use="optional"/>
    </extension>
</complexContent>
</complexType>

```

5.9.3 Binary representation syntax

SprayerType{	Number of bits	Mnemonic
sprayingFlag	1	bslbf
intensityFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(sprayingFlag) {		
sprayingType	8	bslbf
}		
if(intensityFlag) {		
intensity	7	Uimsbf
}		
}		

5.9.4 Semantics

Semantics of the `SprayerType`:

Name	Definition
<code>SprayerType</code>	Tool for describing a liquid spraying device command.
<code>sprayingType</code>	Describes the type of the sprayed material that shall be used as a reference to a classification scheme term using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003. A CS that may be used for this purpose is the <code>SprayingTypeCS</code> defined in Annex A.2.7 of ISO/IEC 23005-6. The binary representation of the <code>SprayingTypeCS</code> is defined in A.2.7 of ISO/IEC 23005-6.
<code>intensity</code>	Describes the intensity that the liquid is sprayed in percentage with respect to the maximum intensity described in the device capability. If the intensity is not specified, this command shall be interpreted as turning on at the maximum intensity.

Name	Definition
sprayingFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
intensityFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
DeviceCommandBase	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

5.9.5 Examples

This example shows the description of a device command of sprayer effect with the following semantics. The identifier for this command is “sprayer01” and the identifier for the sprayer device for which this command is issued is “sprayer001”. The intensity shall be 50 % of the maximum intensity of “sprayer001.” The material to be sprayed is pure water as specified in the `SprayingTypeCS` of A.2.7 of ISO/IEC 23005-6.

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcm:SprayerType" id="sprayer01"
      deviceIdRef="sprayer001" activate="true" intensity="50"
      sprayingType="urn:mpeg:mpeg-v:01-SI-SprayingTypeCS-NS:water">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.10 Scent type

5.10.1 Introduction

This Subclause specifies a device command type which can generate a scent effect. The properties of the command can be generated by the adaptation engine, which is combining the scent effect specified by ISO/IEC 23005-3 with the user preference toward the scent effect and the scent device capabilities specified by ISO/IEC 23005-2.

5.10.2 Syntax

```
<!-- ##### -->
<!-- Definition of DCV scent type -->
<!-- ##### -->
<complexType name="ScentType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="scent" type="mpeg7:termReferenceType" use="optional"/>
      <attribute name="intensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.10.3 Binary representation syntax

ScentType{	Number of bits	Mnemonic
scentFlag	1	bslbf
intensityFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(scentFlag) {		
scent	16	bslbf
}		
if(intensityFlag) {		
intensity	7	uimsbf
}		
}		

5.10.4 Semantics

Semantics of the ScentType:

Name	Definition
ScentType	Tool for describing a scent device command.
intensity	Describes the intensity of the scent effect in percentage with respect to the maximum intensity described in the device capability. If the intensity is not specified, this command shall be interpreted as turning on at the maximum intensity.
scent	Describes the scent that shall be used as a reference to a classification scheme term using the <code>mpeg7:termReferenceType</code> defined in 7.6 of ISO/IEC 15938-5:2003. A CS that may be used for this purpose is the <code>ScentCS</code> defined in the Annex .2.4 of ISO/IEC 23005-6. The binary representation of the <code>ScentCS</code> is defined in A.2.4 of ISO/IEC 23005-6.
scentFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
intensityFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
DeviceCommandBase	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

5.10.5 Examples

This example shows the description of a device command of scent effect with the following semantics. The identifier for this command is "scent01" and the identifier for the sprayer device for which this command is issued is "scentdevice001". The intensity shall be 30 % of the maximum intensity of "scentdevice001." The scent is defined to be the scent of acacia according to the definition of ScentCS of A.2.4 of ISO/IEC 3005-6.

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:ScentType" id="scent01"
      deviceIdRef="scentdevice001" activate="true" intensity="30"
      scent="urn:mpeg:mpeg-v:01-SI-ScentCS-NS:acacia">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.11 Fog type

5.11.1 Introduction

This Subclause specifies a device command type which can generate a fog effect. The properties of the command can be generated by the adaptation engine, which is combining the fog effect specified by ISO/IEC 23005-3 with the user preference toward the fog effect and the fog device capabilities specified by ISO/IEC 23005-2.

5.11.2 Syntax

```
<!-- ##### -->
<!-- Definition of DCV fog type -->
<!-- ##### -->
<complexType name="FogType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <attribute name="intensity" type="integer" use="optional"/>
    </extension>
  </complexContent>
</complexType>
```

5.11.3 Binary representation syntax

FogType{	Number of bits	Mnemonic
intensityFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(intensityFlag) {		
intensity	7	uimsbf
}		
}		

5.11.4 Semantics

Semantics of the `FogType`:

Name	Definition
<code>FogType</code>	Tool for describing a fog device command.
<code>intensity</code>	Describes the intensity of the fog effect in percentage with respect to the maximum intensity described in the device capability. If the intensity is not specified, this command shall be interpreted as turning on at the maximum intensity.
<code>intensityFlag</code>	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
<code>DeviceCommandBase</code>	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

5.11.5 Examples

This example shows the description of a device command of fog effect with the following semantics. The identifier for this command is "fog01" and the identifier for the sprayer device for which this command is issued is "fog001". The intensity shall be 50 % of the maximum intensity of "fog001."

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:FogType" id="fog01" deviceIdRef="fog001"
      activate="true" intensity="50">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.12 Color correction type

5.12.1 Introduction

This Subclause specifies a device command type which can generate a color correction effect. The properties of the command can be generated by the adaptation engine, which is combining the color correction effect specified by ISO/IEC 23005-3 with the user preference toward the color correction effect and the color correction device capabilities specified by ISO/IEC 23005-2.

5.12.2 Syntax

```
<!-- ##### -->
<!-- Definition of DCV color correction type -->
<!-- ##### -->
<complexType name="ColorCorrectionType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <sequence minOccurs="0" maxOccurs="unbounded">
        <element name="SpatialLocator" type="mpeg7:RegionLocatorType"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```

    </sequence>
  </extension>
</complexContent>
</complexType>

```

5.12.3 Binary representation syntax

ColorCorrectionType{	Number of bits	Mnemonic
UpdateMode	1	bslbf
if(UpdateMode ==0){		
ColorCorrectionNormal		ColorCorrectionNormalType
}else{		
ColorCorrectionUpdate		ColorCorrectionUpdateType
}		
}		

ColorCorrectionNormalType{	Number of bits	Mnemonic
SpatialLocatorFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if (SpatialLocatorFlag) {		
LoopSpatialLocator		vluimsbf5
for(k=0;k< LoopSpatialLocator;k++){		
SpatialLocator[k]		mpeg7:RegionLocatorType
}		
}		
}		

ColorCorrectionUpdateType {	Number of bits	Mnemonic
idFlag	1	bslbf
deviceIdRefFlag	1	bslbf

activateFlag	1	bslbf
SpatialLocatorFlag	1	bslbf
ListUpdate	idFlag+ deviceIdRef Flag+ activateFlag+ SpatialLocatorFlag	bslbf
TimeStamp		TimeStampType
ListItemNum = 0		
if(idFlag){		
if(ListUpdate[ListItemNum]){		
id	See ISO 10646	UTF-8
}		
ListItemNum++		
}		
if(deviceIdRefFlag){		
if(ListUpdate[ListItemNum]){		
deviceIdRef		UTF-8
}		
ListItemNum++		
}		
if(activateFlag){		
if(ListUpdate[ListItemNum]){		
activate	1	bslbf
}		
ListItemNum++		
}		
if (SpatialLocatorFlag) {		
if(ListUpdate[ListItemNum]){		
LoopSpatialLocator		vluimsbf5
UpdateMask	LoopSpatialLocator	bslbf

for(k=0;k< LoopSpatialLocator; k++){		
if(UpdateMask[k]){		
SpatialLocator[k]		mpeg7:RegionLo catorType
}		
}		
}		
}		
}		

5.12.4 Semantics

Semantics of the `ColorCorrectionType`:

<i>Name</i>	<i>Definition</i>
<code>ColorCorrectionType</code>	Tool for commanding a display device to perform color correction.
<code>SpatialLocator</code>	Describes the spatial localization of the still region using <code>SpatialLocatorType</code> (optional), which indicates the regions in a video segment where the color correction effect is applied. The <code>SpatialLocatorType</code> shall be used as defined in ISO/IEC 15938-5.
<code>activate</code>	Describes whether the color correction effect should be used or not.
<code>UpdateMode</code>	This field, which is only present in the binary representation, signals whether the command is on the normal mode or on the update mode. A value of "1" means the update mode shall be used and "0" means the normal mode shall be used.
<code>ColorCorrectionNormal</code>	This field is used to command a display device to perform color correction.
<code>ColorCorrectionUpdate</code>	This field is used to command a display device to perform color correction only for the updated elements.
<code>ColorCorrectionNormalType</code>	Tool for commanding a display device to perform color correction on the normal mode.
<code>ColorCorrectionUpdateType</code>	Tool for commanding a display device to perform color correction on the update mode.
<code>DeviceCommandBase</code>	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

Name	Definition
LoopSpatialLocator	This field, which is only present in the binary representation, specifies the number of SpatialLocator contained in the description.
ListUpdate	Describes the updated list among all the active elements in the command.

5.12.5 Examples

This example shows the description of a device command of color correction effect with the following semantics. The displaying device for the color correction effect is "tv1". The color correction effect is applied only to the region defined by the SpatialLocator.

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcv:ColorCorrectionType" id="tv1"
      activate="true">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
      <dcv:SpatialLocator>
        <mpeg7:Polygon>
          <mpeg7:Coords mpeg7:dim="8">5 25 0 -2 15 0 0 2 </mpeg7:Coords>
        </mpeg7:Polygon>
      </dcv:SpatialLocator>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
```

5.13 Initialize color correction parameter type

5.13.1 Introduction

This command delivers the parameters supporting the color correction effect to devices.

5.13.2 Syntax

```
<!-- ##### -->
<!-- Definition of initialize color correction parameter Type -->
<!-- ##### -->
<complexType name="InitializeColorCorrectionParameterType">
  <complexContent>
    <extension base="iidl:DeviceCommandBaseType">
      <sequence>
        <element name="ToneReproductionCurves"
          type="mpegvct:ToneReproductionCurvesType" minOccurs="0"/>
        <element name="ConversionLUT" type="mpegvct:ConversionLUTType"/>
        <element name="ColorTemperature" type="mpegvct:IlluminantType"
          minOccurs="0"/>
        <element name="InputDeviceColorGamut"
          type="mpegvct:InputDeviceColorGamutType" minOccurs="0"/>
        <element name="IlluminanceOfSurround" type="mpeg7:unsigned12"
          minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```

    </sequence>
  </extension>
</complexContent>
</complexType>

```

5.13.3 Binary representation syntax

InitializeColorCorrectinParameterType{	<i>Number of bits</i>	<i>Mnemonic</i>
ToneReproductionCurvesFlag	1	bslbf
ConversionLUTFlag	1	bslbf
ColorTemperatureFlag	1	bslbf
InputDeviceColorGamutFlag	1	bslbf
IlluminanceOfSurroundFlag	1	bslbf
DeviceCommandBase		DeviceCommandBaseType
if(ToneReproductionCurvesFlag) {		
ToneReproductionCurves		ToneReproductionCurvesType
}		
ConversionLUT		ConversionLUTType
if(ColorTemperatureFlag) {		
ColorTemperature		IlluminantType
}		
if(InputDeviceColorGamutFlag) {		
InputDeviceColorGamut		InputDeviceColorGamutType
}		
if(IlluminanceOfSurroundFlag) {		
IlluminanceOfSurround	12	uimsbf
}		
}		

ToneReproductionCurvesType {	Number of bits	Mnemonic
NumOfRecords	8	uimsbf
for(i=0;i< NumOfRecords;i++){		
DAC_Value	8	mpeg7:unsigned8
RGB_Value	32*3	mpeg7:doubleVector
}		
}		

ConversionLUTType {	Number of bits	Mnemonic
RGB2XYZ_LUT	32*3*3	mpeg7:DoubleMatrixType
RGBScalar_Max	32*3	mpeg7:doubleVector
Offset_Value	32*3	mpeg7:doubleVector
Gain_Offset_Gamma	32*3*3	mpeg7:DoubleMatrixType
InverseLUT	32*3*3	mpeg7:DoubleMatrixType
}		

IlluminantType {	Number of bits	Mnemonic
ElementType	1	bslbf
if(ElementType==00){		
XY_Value	32*2	dia:ChromaticityType
Y_Value	7	uimsbf
}else if(ElementType==01){		
Correlated_CT	8	uimsbf
}		
}		

InputDeviceColorGamutType {	Number of bits	Mnemonic
typeLength		vluimsbf5
IDCG_Type	8 * typeLength	bslbf
IDCG_Value	32*3*2	mpeg7:DoubleMatrixType
}		

5.13.4 Semantics

Semantics of the InitializeColorCorrectionParameterType:

<i>Name</i>	<i>Definition</i>
InitializeColorCorrectionParameterType	Tool for describing an initialize color correction parameter command.
ToneReproductionCurves	This curve shows the characteristics (e.g., gamma curves for R, G and B channels) of the input display device.
ConversionLUT	A look-up table (matrix) converting an image between an image color space (e.g. RGB) and a standard connection space (e.g. CIE XYZ).
ColorTemperature	An element describing a white point setting (e.g., D65, D93) of the input display device.
InputDeviceColorGamut	An element describing an input display device color gamut, which is represented by chromaticity values of R, G, and B channels at maximum DAC values.
IlluminanceOfSurround	An element describing an illuminance level of viewing environment. The illuminance is represented by lux.
ToneReproductionCurvesFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
ConversionLUTFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
ColorTemperatureFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.
InputDeviceColorGamutFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of "1" means the attribute shall be used and "0" means the attribute shall not be used.

<i>Name</i>	<i>Definition</i>
IlluminanceOfSurroundFlag	This field, which is only present in the binary representation, signals the presence of device command attribute. A value of “1” means the attribute shall be used and “0” means the attribute shall not be used.
DeviceCommandBase	Provides the topmost type of the base type hierarchy which each individual device command can inherit.

Semantics of the ToneReproductionCurvesType:

<i>Names</i>	<i>Description</i>
NumOfRecords	This field, which is only present in the binary representation, specifies the number of record (DAC and RGB value) instances accommodated in the ToneReproductionCurves.
DAC_Value	An element describing discrete DAC values of input device.
RGB_Value	An element describing normalized gamma curve values with respect to DAC values. The order of describing the RGB_Value is R_n, G_n, B_n .

Semantics of the ConversionLUTType:

<i>Names</i>	<i>Description</i>
RGB2XYZ_LUT	This look-up table (matrix) converts an image from RGB to CIE XYZ. The size of the conversion matrix is 3×3 such as $\begin{pmatrix} R_x & G_x & B_x \\ R_y & G_y & B_y \\ R_z & G_z & B_z \end{pmatrix}$. The way of describing the values in the binary representation is in the order of $[R_x, G_x, B_x, R_y, G_y, B_y, R_z, G_z, B_z]$.
RGBScalar_Max	An element describing maximum RGB scalar values for GOG transformation. The order of describing the RGBScalar_Max is $R_{\max}, G_{\max}, B_{\max}$.
Offset_Value	An element describing offset values of input display device when the DAC is 0. The value is described in CIE XYZ form. The order of describing the Offset_Value is X, Y, Z.
Gain_Offset_Gamma	An element describing the gain, offset, gamma of RGB channels for GOG transformation. The size of the Gain_Offset_Gamma matrix is 3×3 such as $\begin{bmatrix} Gain_r & Gain_g & Gain_b \\ Offset_r & Offset_g & Offset_b \\ Gamma_r & Gamma_g & Gamma_b \end{bmatrix}$. The way of describing the values in the binary representation is in the order of $[Gain_r, Gain_g, Gain_b; Offset_r, Offset_g, Offset_b; Gamma_r, Gamma_g, Gamma_b]$.

InverseLUT

This look-up table (matrix) converts an image form CIE XYZ to RGB.

The size of the conversion matrix is 3×3 such as $\begin{pmatrix} R_x^l & G_x^l & B_x^l \\ R_y^l & G_y^l & B_y^l \\ R_z^l & G_z^l & B_z^l \end{pmatrix}$. The way of describing the values in the binary representation is in the order of $[R_x^l, G_x^l, B_x^l; R_y^l, G_y^l, B_y^l; R_z^l, G_z^l, B_z^l]$.

Semantics of the IlluminantType:

Names	Description						
ElementType	This field, which is only present in the binary representation, describes which Illuminant scheme shall be used. In the binary description, the following mapping table is used, <table border="1"> <tr> <th>Illuminant</th><th>IlluminantType</th></tr> <tr> <td>00</td><td>xy and Y value</td></tr> <tr> <td>01</td><td>Correlated_CT</td></tr> </table>	Illuminant	IlluminantType	00	xy and Y value	01	Correlated_CT
Illuminant	IlluminantType						
00	xy and Y value						
01	Correlated_CT						
XY_Value	An element describing the chromaticity of the light source. The ChromaticityType is specified in ISO/IEC 21000-7.						
Y_Value	An element describing the luminance of the light source between 0 and 100.						
Correlated_CT	Indicates the correlated color temperature of the overall illumination. The value expression is obtained through quantizing the range [1667, 25000] into 28 bins in a non-uniform way as specified in ISO/IEC 15938-5.						

Semantics of the InputDeviceColorGamutType:

Names	Description
typeLength	This field, which is only present in the binary representation, specifies the length of each IDCG_Type instance in bytes. The value of this element is the size of the largest IDCG_Type instance, aligned to a byte boundary by bit stuffing using 0-7 '1' bits.
IDCG_Type	An element describing the type of input device color gamut (e.g., NTSC, SMPTE).
IDCG_Value	An element describing the chromaticity values of RGB channels when the DAC values are maximum. The size of the IDCG_Value matrix is 3×2 such as $\begin{bmatrix} x_r & y_r \\ x_g & y_g \\ x_b & y_b \end{bmatrix}$. The way of describing the values in the binary representation is in the order of $[x_r, y_r, x_g, y_g, x_b, y_b]$.

5.13.5 Examples

Examples of the color correction parameters.

```
<iidl:InteractionInfo>
  <iidl:DeviceCommandList>
    <iidl:DeviceCommand xsi:type="dcm:InitializeColorCorrectionParameterType">
      <iidl:TimeStamp xsi:type="mpegvct:AbsoluteTimeType" absTime="1:30:23"/>
      <dcm:ToneReproductionCurves>
        <mpegvct:DAC_Value>0</mpegvct:DAC_Value>
        <mpegvct:RGB_Value>0.0000 0.0000 0.0000</mpegvct:RGB_Value>
        <mpegvct:DAC_Value>16</mpegvct:DAC_Value>
        <mpegvct:RGB_Value>0.0093 0.0087 0.0076</mpegvct:RGB_Value>
        <mpegvct:DAC_Value>32</mpegvct:DAC_Value>
        <mpegvct:RGB_Value>0.0304 0.0312 0.0274</mpegvct:RGB_Value>
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        <mpegvct:DAC_Value>64</mpegvct:DAC_Value>
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        <mpegvct:DAC_Value>80</mpegvct:DAC_Value>
        <mpegvct:RGB_Value>0.1391 0.1486 0.1388</mpegvct:RGB_Value>
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        <mpegvct:DAC_Value>112</mpegvct:DAC_Value>
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        <mpegvct:RGB_Value>0.2907 0.3082 0.2960</mpegvct:RGB_Value>
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        <mpegvct:RGB_Value>0.4582 0.4778 0.4673</mpegvct:RGB_Value>
        <mpegvct:DAC_Value>176</mpegvct:DAC_Value>
        <mpegvct:RGB_Value>0.5491 0.5666 0.5576</mpegvct:RGB_Value>
        <mpegvct:DAC_Value>192</mpegvct:DAC_Value>
        <mpegvct:RGB_Value>0.6510 0.6653 0.6528</mpegvct:RGB_Value>
        <mpegvct:DAC_Value>208</mpegvct:DAC_Value>
        <mpegvct:RGB_Value>0.7503 0.7644 0.7635</mpegvct:RGB_Value>
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        <mpegvct:DAC_Value>240</mpegvct:DAC_Value>
        <mpegvct:RGB_Value>0.9445 0.9546 0.9438</mpegvct:RGB_Value>
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        <mpegvct:RGB_Value>1.0000 1.0000 1.0000</mpegvct:RGB_Value>
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      <dcm:ConversionLUT>
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          .6000 67.6000 38.0000
          .0000 137.0000 16.5000
          .3650 19.4100 203.9000
        </mpegvct:RGB2XYZ_LUT>
        <mpegvct:RGBScalar_Max>0.9910 0.9860 0.9820</mpegvct:RGBScalar_Max>
        <mpegvct:Offset_Value>0.2150 0.2050 0.4250</mpegvct:Offset_Value>
        <mpegvct:Gain_Offset_Gamma mpeg7:dim="3 3">
          .0228 -0.0228 1.6222
          .0242 -0.0242 1.5624
          .0220 -0.0220 1.6180
        </mpegvct:Gain_Offset_Gamma>
        <mpegvct:InverseLUT mpeg7:dim="3 3">
          .0155 -0.0073 -0.0023
          .0052 0.0099 0.0002
        </mpegvct:InverseLUT>
      </dcm:ConversionLUT>
    </iidl:DeviceCommand>
  </iidl:DeviceCommandList>
</iidl:InteractionInfo>
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