
**Information technology — Multimedia
framework (MPEG-21) —**

**Part 22:
User description**

*Technologies de l'information — Cadre multimédia (MPEG-21) —
Partie 22: Description de l'utilisateur*





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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives or www.iec.ch/members_experts/refdocs).

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

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

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

This third edition cancels and replaces the second edition (ISO/IEC 21000-22:2019), which has been technically revised.

The main changes are as follows:

- technologies related to vibro-haptic devices, that convey enriched information of consecutive vibrations to help elderly/fragilized persons, like load guidance or emergency warnings, for instance.

A list of all parts in the ISO/IEC 21000 series can be found on the ISO and IEC websites.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

Introduction

The four data formats standardized in this document are represented in [Figure 1](#): User Description (UD), Context Description (CD), Service Description (SD), and Recommendation Description (RD), where UD/CD/SD/RD indicate the formats specified by MPEG-21 User Description.

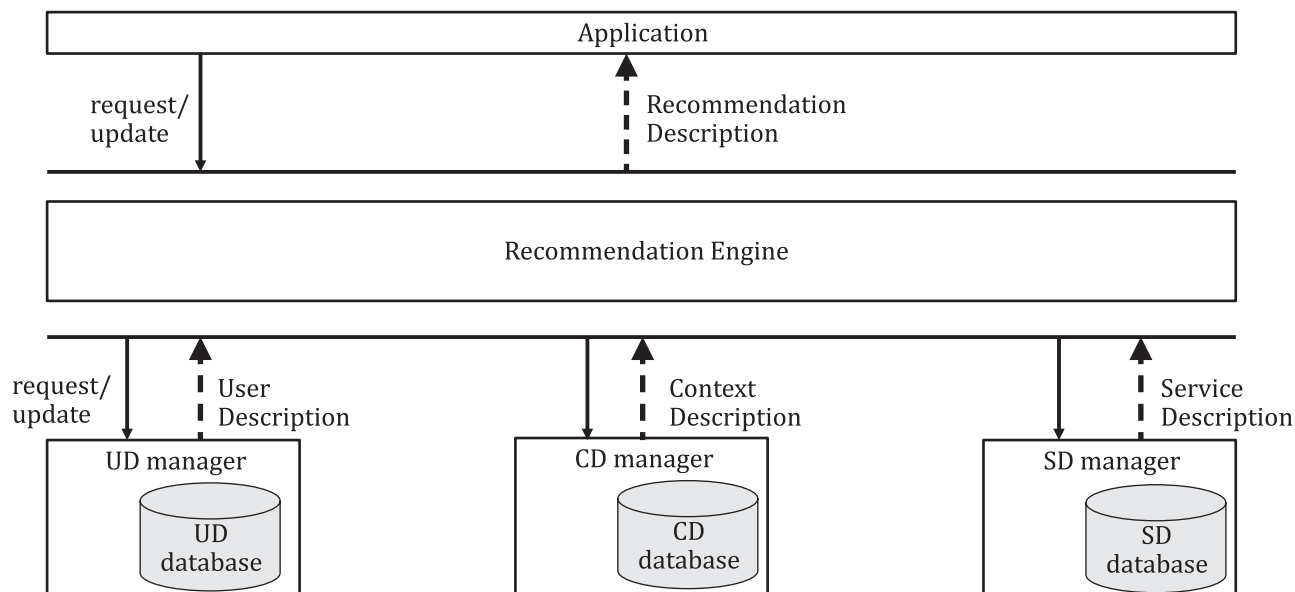


Figure 1 — Conceptual Model of MPEG-21 User Description

This document specifies User Description, Context Description, Service Description and Recommendation Description. Description Managers, Recommendation Engine and Application (in black in the figure) are outside of the scope of this document. The description managers of [figure 1](#) are in charge of:

- 1) Updating UD, CD and SD e.g. as a result of a User selection
- 2) Providing UD, CD and SD in response to requests coming from the Recommendation Engine.

Recommendation Engines process UD, CD and SD and provide Recommendations in the form of Recommendation Description (RD) typically to an Application.

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 a patent.

ISO and IEC take no position concerning the evidence, validity and scope of this patent right.

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Information technology — Multimedia framework (MPEG-21) —

Part 22: User description

1 Scope

This document specifies four data formats: User Description (UD), Context Description (CD), Service Description (SD), and Recommendation Description (RD). This document also specifies technologies related to consecutive vibration.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1

MPEG-21 UD

four standard descriptions that contain information about user, context, service and recommendation

3.2

user description

UD

set of data which may contain static and/or dynamic information about the user

EXAMPLE Identity, interactions, preferences, security settings.

3.3

context description

CD

set of data that describes the context and environmental situation in which the user is located,

EXAMPLE Device in use, physical position, environmental variables (such as temperature and humidity), traffic conditions, security settings.

3.4

service description

SD

set of data containing pertinent information (including security settings) about services (or a set of sub-services)

3.5 recommendation description RD

set of recommendation data, containing subsets from *UD* (3.2), *CD* (3.3), *SD* (3.4) and additional logical relations and metadata related to the subsets

3.6 user

human or software agent, industrial process or device that is performing autonomous activities

3.7 service

independent, value-adding operation, which brings values to users, or applications providing benefits responding to user's needs

3.8 context

environmental situation for the user

EXAMPLE Device in use, physical location, etc.

3.9 application

entity in charge of responding to the users' requests

EXAMPLE An interface allowing users to choose their preferred programs on a smart TV.

3.10 manager

<UD/CD/SD> entities that provide functionalities of filtering, accessing, storing, editing, updating and securing *UD* (3.2), *CD* (3.3) and *SD* (3.4)

3.11 recommendation engine

process (or a set of processes) in charge of exploiting all available information contained in *UD* (3.2), *CD* (3.3) and *SD* (3.4) to produce a recommendation, i.e. *RD* (3.5), for an enriched user experience

4 General description

Clauses 5, 6, 7, 8 and 9 present the specification of the general description, and of the *UD*, *CD*, *SD* and *RD*, respectively. Schemes for all these descriptions shall be as provided in [Annex A](#). Classification schemes shall be as provided in [Annex B](#).

4.1 commonAttributes

This `commonAttributes` describes basic properties of each sub element for *UD*, *CD*, *SD* and *RD*.

4.1.1 Syntax

```
<attributeGroup name="commonAttributes">
  <attribute name="generatedTime" type="dateTime"/>
  <attribute name="descriptionID" type="anyURI" use="required"/>
</attributeGroup>
```

4.1.2 Semantics

Name	Definition
<code>commonAttributes</code>	Describes properties of each sub element for <i>UD</i> , <i>CD</i> , <i>SD</i> and <i>RD</i> .

Name	Definition
generatedTime	Specifies generated time of description.
descriptionID	Indicates the ID of the description. This information can be a combination of numbers, alphabets, etc. All description need to have the unique descriptionID.

4.1.3 Examples

```
<ud:UD generatedTime="2015-0-25T09:30:47Z" descriptionID="UD1234">
  <ud:UserID>ID_132534</ud:UserID>
</ud:UD>
```

4.2 ValueTypes

Several value types can be used to precisely express the data according to various conditions. These simple types define a basic scale type and specify the constraints and information.

4.2.1 Syntax

```
<simpleType name="valueByNominal">
  <restriction base="NMTOKEN"/>
</simpleType>
<simpleType name="valueByOrdinal">
  <restriction base="integer"/>
</simpleType>
<simpleType name="valueByInterval">
  <restriction base="float"/>
</simpleType>
<simpleType name="valueByRatio">
  <restriction base="float"/>
</simpleType>
<simpleType name="valueByAll">
  <union memberTypes="ct:valueByNominal ct:valueByOrdinal ct:valueByInterval
ct:valueByRatio"/>
</simpleType>
<simpleType name="ZeroToOneRatioType">
  <restriction base="ct:valueByRatio">
    <minInclusive value="0"/>
    <maxInclusive value="1.0"/>
  </restriction>
</simpleType>
<simpleType name="ZeroToOnehundredRatioType">
  <restriction base="ct:valueByRatio">
    <minInclusive value="0"/>
    <maxInclusive value="100.0"/>
  </restriction>
</simpleType>
<simpleType name="ZeroToTenOrdinalType">
  <restriction base="ct:valueByOrdinal">
    <minInclusive value="0"/>
    <maxInclusive value="10"/>
  </restriction>
</simpleType>
```

```

<simpleType name="ZeroToOnehundredOrdinalType">
  <restriction base="ct:valueByOrdinal">
    <minInclusive value="0"/>
    <maxInclusive value="100"/>
  </restriction>
</simpleType>
<complexType name="normalizedRatioValueType">
  <choice>
    <element name="ZeroToOneRatio" type="ct:ZeroToOneRatioType"/>3D
    <element name="ZeroToOnehundredRatio" type="ct:ZeroToOnehundredRatioType"/>
  </choice>
</complexType>
<complexType name="normalizedOrdinalValueType">
  <choice>
    <element name="ZeroToTenOrdinal" type="ct:ZeroToTenOrdinalType"/>
    <element name="ZeroToOnehundredOrdinal" type="ct:ZeroToOnehundredOrdinalType"/>
  </choice>
</complexType>

```

4.2.2 Semantics

Name	Definition
valueByNominal	Describes categorically discrete value such as type of car, name of interest or type of personality. This one is easy to remember and describe. But it is difficult to standardize an internal name or naming convention.
valueByOrdinal	Describes a natural ordering value such as ranking of priorities, the order of people placed in a line, the choice on a rating scale from 1 to 100. In ordinal measurement, the attributes can be rank-ordered. The interval between values is not interpretable in an ordinal measure. On a 10-point scale, the difference between a 9 and a 10 is not necessarily the same as the difference between a 1 and a 2.
valueByInterval	Describes interval data. Interval data is like ordinal except it is clearly defined that the intervals between each value are equally split. The most common example is temperature in degrees Celsius or Fahrenheit. The difference between 10° and 150° is the same as the difference between 30° and 170°. In interval scales, it is possible to add, subtract and average, but multiplication and division are not possible.
valueByRatio	Describes the ratio value that can be divided and multiplied. For example, weight and height are ratio values, and these variables can be meaningfully added, subtracted, multiplied and divided.
valueByAll	Describes the value including nominal, ordinal, interval and ratio value type.
ZeroToOneRatioType	Describes the ratio value type of which the range is from 0 to 1. The value shall be a floating point number and cannot be lower than 0 or greater than 1.
ZeroToOnehundredRatioType	Describes the ratio value type of which the range is from 0 to 100. The value shall be a floating point number and cannot be lower than 0 or greater than 100.
ZeroToTenOrdinalType	Describes the ordinal value type of which the range is from 0 to 10. The value shall be an integer number and cannot be lower than 0 or greater than 10.
ZeroToOnehundredOrdinalType	Describes the ordinal value type of which the range is from 0 to 100. The value shall be an integer number and cannot be lower than 0 or greater than 100.
normalizedRatioValueType	Describes the normalized ratio value. Based on this type, only one of ZeroToOneRatio or ZeroToOnehundredRatio element shall be instantiated.
normalizedOrdinalValueType	Describes the normalized ordinal value. Based on this type, only one of ZeroToTenOrdinal or ZeroToOnehundredOrdinal element shall be instantiated.

4.2.3 Examples

```
<ud:value>
  <ct:ZeroToOneRatio>0.5</ct:ZeroToOneRatio>
</ud:value>
-----
<ud:value>
  <ct:ZeroToTenOrdinalType>3</ct:ZeroToTenOrdinalType>
</ud:value>
```

4.3 TimeType

TimeType describes a specific time point or a period of time, such as the starting and the ending time.

4.3.1 Syntax

```
<complexType name="TimeType">
  <sequence>
    <element name="startTime" type="dateTime"/>
    <choice minOccurs="0">
      <element name="endTime" type="dateTime"/>
      <element name="duration" type="duration"/>
    </choice>
  </sequence>
</complexType>
```

4.3.2 Semantics

Name	Definition
TimeType	Specifies a time point and duration to describe the specific time information. It describes start time and end time or duration.
startTime	Describes a start time point based on dateTime type defined in the XML Schema Part 2 (XML Schema). When neither endTime nor duration is defined, the startTime denotes a specific time point.
endTime	Describes an end time point based on dateTime type.
duration	Describes a duration time based on duration type.

4.3.3 Examples

```
<ud:PeriodOfOccurrence>
  <ct:startTime>2015-06-04T18:13:51.0Z</ct:startTime>
  <ct:endTime>2015-06-04T18:14:51.0Z</ct:endTime>
</ud:PeriodOfOccurrence>
```

4.4 ExtendedTimeType

The **ExtendedTimeType** can be used to describe added time information. The time interval may recur periodically, as indicated by the **recurrence** and **numOfRecurrences** attributes. The **ExtendedTimeType** can be used to describe a repetitive task.

4.4.1 Syntax

```
<complexType name="ExtendedTimeType">
```

```
<complexContent>
  <extension base="ct:TimeType">
    <attribute name="recurrence" default="none">
      <simpleType>
        <restriction base="NMTOKEN">
          <enumeration value="none"/>
          <enumeration value="daily"/>
          <enumeration value="weekly"/>
          <enumeration value="monthly"/>
          <enumeration value="annually"/>
        </restriction>
      </simpleType>
    </attribute>
    <attribute name="numOfRecurrences" type="positiveInteger"/>
  </extension>
</complexContent>
</complexType>
```

4.4.2 Semantics

Name	Definition
ExtendedTimeType	Describes added time information. The time interval may recur periodically, as indicated by the Recurrence and numOfRecurrences attributes.
Recurrence	Indicates whether the time interval recurs periodically, and the recurrence frequency. The values allowed are defined as follows: — none: indicates that the associated temporal interval is nonrecurring; — daily: indicates that the associated temporal interval recurs on a daily basis; — weekly: indicates that the associated temporal interval recurs on a weekly basis; — monthly: indicates that the associated temporal interval recurs on a monthly basis; — annually: indicates that the associated temporal interval recurs on an annual basis. Other values that are datatype-valid with respect to string (XML Schema Part 2) are reserved. By default, the time interval is non-recurring. If the value of this attribute is not “none”, the date and time given in this description specifies the date and time of the first occurrence of the event.
numOfRecurrences	Indicates how many times the time interval recurs (optional). For example, when Recurrence="daily", the value of numOfRecurrences denotes the number of days that the PreferenceCondition shall be in effect. This attribute shall not be used when the time interval is not recurring (Recurrence="none"). When a time interval recurs (as indicated by the recurrence attribute) and the numOfRecurrences attribute is not present, the time interval when the PreferenceCondition shall be in effect recurs indefinitely. When the time interval recurs and the numOfRecurrences attribute is present, the time interval indicated by the Time element is the first interval in the sequence of time intervals when the PreferenceCondition shall be in effect. In this case, the Time element shall include a specific time instant (date and time) that specifies the start of the first interval.

4.4.3 Examples

```
<ud:Schedule>
  <ud:ScheduleEvent xmlns:ct="urn:mpeg:mpeg-ud:2014:01-CT-NS"
descriptionMethod="byAgent" eventName="103rd Meeting" startTime="2015-09-30T10:00:00Z">
    <ud:RecurrenceInfo>
      <ct:startTime>2015-09-30T10:00:00Z</ct:startTime>
      <ct:duration>P10D</ct:duration>
    </ud:RecurrenceInfo>
  </ud:ScheduleEvent>
</ud:Schedule>
```

4.5 LocationType

This subclause describes a structure of `LocationType` element. `LocationType` include `Location` and `SemanticLocation` elements.

4.5.1 Syntax

```
<complexType name="LocationType">
  <sequence>
    <element name="GeographicLocation" type="mpeg7:PlaceType" minOccurs="0"/>
    <element name="SemanticLocation" type="mpeg7:SemanticPlaceType" minOccurs="0"/>
  </sequence>
</complexType>
```

4.5.2 Semantics

Name	Definition
<code>LocationType</code>	This data type represents geographical and semantic location of the user.
<code>GeographicLocation</code>	Describes a geographical location.
<code>SemanticLocation</code>	Describes a semantic location.

4.5.3 Examples

This example indicated use of `Location`. In this case, the place is a university in Madrid, Spain.

```
<cd:Location>
  <ct:GeographicLocation>
    <mpeg7:Name xml:lang="en">Madrid</mpeg7:Name>
    <mpeg7:GeographicPosition datum="itrf">
      <mpeg7:Point latitude="35.5" longitude="135.75" altitude="100"/>
    </mpeg7:GeographicPosition>
    <mpeg7:AdministrativeUnit type="city">Madrid</mpeg7:AdministrativeUnit>
    <mpeg7:PostalAddress>
      <mpeg7:AddressLine>E.T.S.Ing. Telecommunication</mpeg7:AddressLine>
      <mpeg7:AddressLine>Universidad Politecnica de Madrid</mpeg7:AddressLine>
      <mpeg7:AddressLine>Ciudad Universitaria s/n</mpeg7:AddressLine>
      <mpeg7:PostingIdentifier>E-2804</mpeg7:PostingIdentifier>
    </mpeg7:PostalAddress>
  </ct:GeographicLocation>
</cd:Location>
```

4.6 ClassificationSchemeAliasType

The `ClassificationSchemeAliasType` assigns an alias to a classification scheme. When a classification scheme is referenced, an abbreviated reference form can be used.

4.6.1 Syntax

```
<complexType name="ClassificationSchemeAliasType">
  <complexContent>
    <extension base="anyType">
      <attribute name="alias" type="NMToken" use="required"/>
      <attribute name="href" type="anyURI" use="required"/>
    </extension>
  </complexContent>
</complexType>
```

4.6.2 Semantics

Name	Definition
<code>ClassificationSchemeAliasType</code>	Describes an alias for a <code>ClassificationScheme</code> referenced by a URI
<code>alias</code>	Describes the alias assigned to the classification scheme. The scope of the alias assigned shall be the entire description regardless of where the <code>ClassificationSchemeAlias</code> appears in the description.
<code>href</code>	Describes a reference to the classification scheme that is being aliased using a URI. The classification schemes shall be referenced using the identifying value defined by the <code>uri</code> attribute of the <code>ClassificationScheme</code> .

4.6.3 Examples

```
<!-- Define schema aliases --> <ClassificationSchemeAlias alias="s1"
href="urn:mpeg: mpeg21:UD:CS:DeviceCategoryCS:2016"/>

<!-- Refer to the term using the schema aliases -->
<ud:DeviceCategory>:S1:1</ud:DeviceCategory> <!-- :S1:1 means watch --
>
```

4.7 ObjectType

This `ObjectType` describes the object which is used by user, service provider and recommendation engine.

4.7.1 Syntax

```
<complexType name="ObjectType">
  <sequence>
    <element name="ObjectID" type="ID" minOccurs="0"/>
    <element name="ObjectName" type="Name" minOccurs="0"/>
    <element name="ObjectActivity" type="mpeg7:ControlledTermUseType" minOccurs="0"
maxOccurs="unbounded"/>
    <element name="ObjectCategory" type="mpeg7:ControlledTermUseType" minOccurs="0"/>
    <element name="ObjectInformationURI" type="anyURI" minOccurs="0"/>
    <element name="ObjectLocation" type="ct:LocationType" minOccurs="0"/>
  </sequence>
```

```

<attribute name="ObjectFormat" use="optional">
  <simpleType>
    <restriction base="NMTOKEN">
      <enumeration value="Visual"/>
      <enumeration value="Audio"/>
      <enumeration value="Video"/>
      <enumeration value="Text"/>
      <enumeration value="Image"/>
    </restriction>
  </simpleType>
</attribute>
</complexType>

```

4.7.2 Semantics

Name	Definition
ObjectType	This data type describes the objects offered by the service. All kind of items that are provided by a service provider can be an object.
ObjectID	Describes an object ID used for identifying an object in ObjectType.
ObjectName	Describes the name of the object.
ObjectActivity	Describes the activity of the object intended by the user. In case of visual object, value for this element can be vibrating, flickering, appearing and disappearing.
ObjectCategory	Describes the category of the object, such as similar object's representative name. Terms for the ObjectCategory are specified by the ObjectCategoryCS (urn:mpeg:mpeg21:UD:CS:ObjectCategoryCS:2016).
ObjectInformationURI	Describes the information about URI associated with the object, if the object contains additional information for the other objects or services.
ObjectLocation	Describes the geographic location of the real-world location for the object (e.g. GPS).
ObjectFormat	Describes type for the media format of the object. (e.g. visual, audio, video, text, image).

4.7.3 Examples

```

<sd:ServiceObjectInformation ObjectFormat="Visual">
  <ct:ObjectID>ID195</ct:ObjectID> <ct:ObjectName>Burger_King</ct:ObjectName>
  <ct:ObjectCategory href="urn:mpeg:mpeg21:DU:CS:ObjectCategoryCS:2016:0203
"><Name>fast_food</Name></ct:ObjectCategory>
  <ct:ObjectInformationURI>http://www.mpeg-ud.com/</ct:ObjectInformationURI>
<ct:ObjectLocation>
  <ct:GeographicLocation>
    <GeographicPosition datum="itif">
      <Point longitude="-110" latitude="20" altitude="50"/>
    </GeographicPosition>
  </ct:GeographicLocation>
</ct:ObjectLocation>
</sd:ServiceObjectInformation>

```

4.8 InformationAccessUserGroup

4.8.1 Syntax

This Syntax is InformationAccessUserGroup type.

```
<complexType name="InformationAccessUserGroup">
  <sequence>
    <element name="UserID" type="mpeg7:UserIdentifierType" maxOccurs="unbounded"/>
  </sequence>
  <attribute name="GroupID" type="anyURI"/>
</complexType>
```

InformationAccessUserGroup type has InformationAccessID type. InformationAccessID describes the list of other users who can access private information.

4.8.2 Semantics

Name	Definition
InformationAccessUserGroup	Describes the group of other users who can access private information.
UserID	Specifies the list of user's ID belonging to the group that can access private information.
GroupID	Specifies the identifier of the group.

5 User description

5.1 UserDescriptionType

This clause specifies User Description (UD) which contains root elements at the basis of individual use cases.

5.1.1 Syntax

```
<complexType name="UD">
  <complexContent>
    <extension base="ud:BaseUserType">
      <sequence>
        <element name="InformationAccessGroup" type="ct:InformationAccessUserGroup"
minOccurs="0" maxOccurs="unbounded"/>
        <element name="ClassificationSchemeAlias" type="ct:ClassificationSchemeAli
asType" minOccurs="0" maxOccurs="unbounded"/>
        <element name="UserID" type="mpeg7:UniqueIDType"/>
        <element name="UserProfile" type="ud:UserProfileType" minOccurs="0"/>
        <element name="UsageHistory" type="ud:UsageHistoryType" minOccurs="0"/>
        <element name="Preference" type="ud:PreferenceType" minOccurs="0"/>
        <element name="Emotion" type="ud:EmotionType" minOccurs="0"/>
        <element name="Schedule" type="ud:ScheduleType" minOccurs="0"/>
        <element name="Activity" type="ud:ActivityType" minOccurs="0"/>
        <element name="Representation" type="ct:ObjectType" minOccurs="0"/>
        <element name="Intention" type="ud:IntentionType" minOccurs="0"/>
        <element name="Knowledge" type="ud:KnowledgeType" minOccurs="0"/>
        <element name="ObjectSharing" type="ud:ObjectSharingType" minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```

        <element name="ServiceUsagePattern" type="ud:UsagePatternType"
minOccurs="0"/>
        <element name="LoudnessPreferences" type="ud:LoudnessPreferencesType"/>
        <element name="VisualExpressionPreference" type="ud: VisualExpressionPreferenc
eType"/>
        <element name="ConsecutiveVibrationPreference" type="ud: ConsecutiveVibrationP
referenceType"/>
    </sequence>
    <attributeGroup ref="ct:commonAttributes"/>
</extension>
</complexContent>
</complexType>

```

5.1.2 Semantics

Name	Definition
UD	Serves as the root element of the MPEG-21 UD Format. The UD element shall be used as the topmost element to make user description in an instance of MPEG-21 UD Format.
UserDescriptionType	Specifies the syntax of the root element. This datatype is a set of descriptions which may contain static and dynamic information about user. Within this Type, <i>UserProfile</i> , <i>Preference</i> , <i>Emotion</i> , <i>Schedule</i> or <i>Activity</i> element shall be instantiated.
InformationAccessGroup	Describes the group of other users who can access private information.
ClassificationSchemeAlias	Specifies an alias for a <i>ClassificationScheme</i> to be referenced within the <i>UserDescriptionType</i> by a simplified URI.
UserID	Describes the unique identifier of a user.
UserProfile	Describes user profile based on <i>UserProfileType</i>
UsageHistory	Describes usage history based on <i>UsageHistoryType</i> . This element can represent user's history for a given service, such as searching or movie recommendations.
Preference	Describes preference based on <i>PreferenceType</i> .
Emotion	Describes emotion based on <i>EmotionType</i> . This type represents user's emotion, including its changes over time.
Schedule	Describes schedule based on <i>ScheduleType</i> .
Activity	Describes user activity based on <i>ActivityType</i> .
Representation	Describes the representation such as user character and image used by the user. This element can be used to describe user character on the social network.
Intention	Describes a list of intentions related to specific actions which a given user may perform with a multimedia object.
Knowledge	Describes a piece of knowledge that the user wants to share for recommendation purposes.
ObjectSharing	Describes the condition of authority (e.g. ID, ownership and accessibility of object) for the sharing and accessing of object to user or external service.
UsagePattern	Describes various patterns about usage of user based on <i>UsagePatternType</i> . Users use a lot of applications and services for a variety of reasons. <i>UsagePattern</i> might be used to figure out user's characteristics.
commonAttributes	Describes a group of attributes for the <i>CommonAttributes</i> . The syntax and semantics of <i>commonAttributes</i> are specified in General Description.
ServiceUsagePattern	Describes various patterns about usage of service by the user.
LoudnessPreferences	Describes static or dynamic personal and group audio preferences (e.g. audio levels, audio level history, and song preferences) and the usage history which helps with selecting appropriate audio service.

Name	Definition
VisualExpressionPreference	A set of data edited by user's intention/emotion or created by recognizing user's situation/condition.
ConsecutiveVibrationPreference	Describes preferred duration/interval/period/amplitude/ frequency of consecutive vibration

5.2 UserProfileType

The `UserProfileType` represents the abstract concept of a “user”. Concretely, a user can be a person, an organization (e.g. a company), a group of persons (e.g. a musical ensemble), a device or other mixed user (e.g. a cat and a person).

5.2.1 Syntax

```
<complexType name="UserProfileType" abstract="true">
  <complexContent>
    <extension base="ud:BaseUserType">
      <sequence>
        <element name="Specialty" type="mpeg7:termReferenceListType" minOccurs="0" />
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

5.2.2 Semantics

Name	Definition
<code>UserProfileType</code>	Describes a basic entity of user information (abstract). The User Profile entity shall correspond to one of a variety of a user including a person, a person group, an organization, a device, a mixed user and so forth.
<code>Specialty</code>	Describes a specialty that this user has in various fields.

5.2.3 Examples

```
<ud:UserProfile xsi:type="ud:PersonProfileType">
  <ud:Specialty>urn:mpeg:mpeg21:UD:CS:UserSpecialtyCS:2016:01</ud:Specialty>
</ud:UserProfile>
```

5.3 PersonProfileType

The `PersonProfileType` describes a person entity. The `PersonProfileType` can be used to describe individual basic properties of a human being.

5.3.1 Syntax

```
<complexType name="PersonProfileType">
  <complexContent>
    <extension base="ud:UserProfileType">
      <sequence>
        <element name="PersonInformation" type="mpeg7:PersonType" minOccurs="0"/>
        <element name="Birthtime" type="dateTime" minOccurs="0" />
        <element name="Language" type="ud:LanguageType" minOccurs="0"
maxOccurs="unbounded"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

```

    <element name="Accessibility" type="ud:AccessibilityType" minOccurs="0"/>
    <element name="RelationshipStatus" minOccurs="0">
      <simpleType>
        <restriction base="string">
          <enumeration value="single"/> <enumeration value="engaged"/> <enumeration
value="married"/> <enumeration value="separated"/> <enumeration value="divorced"/>
<enumeration value="widowed"/> <enumeration value="in_a_relationship"/> <enumeration
value="in_an_open_relationship"/> <enumeration value="it_is_complicated"/> <enumeration
value="other"/>
<enumeration value="unspecified"/>
        </restriction>
      </simpleType>
    </element>
    <element name="Gender" type="ud:GenderType" minOccurs="0"/> <element
name="SocialInformation" type="ud:SocialInformationType"
minOccurs="0" maxOccurs="unbounded"/>
  </sequence>
</extension>
</complexContent>
</complexType>

```

5.3.2 Semantics

Name	Definition
PersonProfileType	Describes some basic properties of a human being.
PersonInformation	Inherits the structure from the MPEG-7: PersonType.
Birthtime	This element describes the user's birthtime.
Language	Describe properties of one or more specific languages that this user is able to use.
Accessibility	Describe the user's need to access digital resources and the user's detail impairment information in the context of audiovisual condition.
RelationshipStatus	This element describes the relationship status of the user
Gender	This element indicates the gender of the user.
SocialInformation	Describes information on the social communities subscribed by the user, and provided by a given service.

5.3.3 Examples

```

<ud:UserProfile xsi:type="ud:PersonProfileType">
  <ud:Specialty>urn:mpeg:mpeg21:UD:CS:UserSpecialtyCS:2016: 01</ud:Specialty>
  <ud:PersonInformation>
    <mpeg7:Name xmlns:mpeg7="urn:mpeg:mpeg7:schema:2004">
      <mpeg7:GivenName>Jaewon</mpeg7:GivenName> </mpeg7:Name>
      <mpeg7:PersonDescription>Mpeg-UD Member</mpeg7:PersonDescription>
      <mpeg7:Nationality>KR</mpeg7:Nationality>
    </ud:PersonInformation>
    <ud:Gender>female</ud:Gender>
  </ud:UserProfile>

```

5.4 OrganizationProfileType

OrganizationProfileType can be used to describe the profile of an organization.

5.4.1 Syntax

```
<complexType name="OrganizationProfileType">
  <complexContent>
    <extension base="ud:UserProfileType">
      <sequence>
        <element name="OrganizationInformation" type="mpeg7:OrganizationType"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

5.4.2 Semantics

Name	Definition
OrganizationProfileType	Describes the profile of the organization.
OrganizationInformation	Describes basic properties of the organization using MPEG- 7:OrganizationType.

5.4.3 Examples

```
<ud:UserProfile xsi:type="ud:OrganizationProfileType">
  <ud:Specialty></ud:Specialty>
  <ud:OrganizationInformation>
    <mpeg7:Name>MPEG-UD Group</mpeg7:Name>
    <mpeg7:Kind>
      <mpeg7:Name>Mpeg- SYSTEM Subgroup</mpeg7:Name>
    </mpeg7:Kind>
  </ud:OrganizationInformation>
</ud:UserProfile>
```

5.5 DeviceProfileType

DeviceProfileType can be used to describe the profile of a device acting as user.

5.5.1 Syntax

```
<complexType name="DeviceProfileType">
  <complexContent>
    <extension base="ud:UserProfileType">
      <sequence>
        <element name="Device" type="mpeg21:TerminalCapabilityBaseType"/>
        <element name="DeviceCategory" type="mpeg7:termReferenceListType"
minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>
```

5.5.2 Semantics

Name	Definition
DeviceProfileType	Description of the device profile.

Name	Definition
Device	Description of the device capabilities
DeviceCategory	Terms for the DeviceCategory are specified by the DeviceCategoryCS (urn:mpeg:mpeg21:UD:CS:DeviceCategoryCS:2016).

5.5.3 Examples

```
<ud:UserProfile xsi:type="ud:DeviceProfileType">
  <ud:Device xsi:type="mpeg21:DisplaysType">
    <mpeg21:Display>
      <mpeg21:DisplayCapability xsi:type="mpeg21:DisplayCapabilityType">
        <mpeg21:ScreenSize horizontal="42" vertical="41"/>
      </mpeg21:DisplayCapability>
    </mpeg21:Display>
  </ud:Device>
  <ud:DeviceCategory>urn:mpeg:mpeg21:UD:CS:DeviceCategoryCS:2016:0001</ud:DeviceCategory>
</ud:UserProfile>
```

5.6 GroupedProfileType

GroupedProfileType can be used to describe basic attributes of a group, intended as a set of users.

5.6.1 Syntax

```
<complexType name="GroupedProfileType">
  <complexContent>
    <extension base="ud:UserProfileType">
      <choice minOccurs="2" maxOccurs="unbounded">
        <element name="User" type="ud:UserProfileType"/> <element name="UserRef" type="anyURI"/>
      </choice>
    </extension>
  </complexContent>
</complexType>
```

5.6.2 Semantics

Name	Definition
GroupedProfileType	Describes an individual group's basic profile.
User	Describes information about one of the group's members. (e.g. one of User Profile, Device Profile, Organization Profile).
UserRef	A reference to a group's member through the specification of its URI.

5.6.3 Examples

```
<ud:UD>
  <ud:UserID>
    <ud:UserID>ID_35243</ud:UserID>
  </ud:UserID>
  <ud:UserProfile xsi:type="ud:GroupedProfileType">
    <ud>User xsi:type="ud:PersonProfileType">
```

```

<ud:PersonInformation>
  <mpeg7:Name><mpeg7:GivenName>Jim</mpeg7:GivenName></mpeg7:Name>
</ud:PersonInformation>
</ud:User>
<ud>UserRef>ID_3023_Jim</ud>UserRef>
<ud>UserRef>ID_303_John</ud>UserRef>
</ud>UserProfile>
</ud:UD>

```

5.7 UsageHistoryType

The UsageHistoryType describes the history of interaction and consumption of multimedia..

5.7.1 Syntax

```

<complexType name="UsageHistoryType">
  <complexContent>
    <extension base="ud:BaseUserType">
      <sequence>
        <element name="DetailedUserInteraction" type="ud:DetailedUserInteractionType"
minOccurs="0"/>
        <element name="ServiceUsageInformation" type="ud:ServiceUsageInformationType"
minOccurs="0" />
      </sequence>
    </extension>
  </complexContent>
</complexType>
<complexType name="DetailedUserInteractionType">
  <annotation>
    <documentation>The main complex type describing detailed interaction with
multimedia items</documentation>
  </annotation>
  <sequence>
    <element name="MultimediaExperiences">
      <complexType>
        <sequence>
          <element name="MultimediaExperience" type="ud:MultimediaExperienceType"
maxOccurs="unbounded"/>
        </sequence>
      </complexType>
    </element>
  </sequence>
</complexType>
<complexType name="ServiceUsageInformationType">
  <sequence>
    <element name="ServiceID" type="sd:ServiceDescriptionType"/>
    <element name="UsageTime" type="ct:TimeType"/>
  </sequence>
</complexType>

```

5.7.2 Semantics

Name	Definition
UsageHistoryType	Specifies the history of interaction and consumption of multimedia.
MultimediaExperiences	The set of multimedia experiences of the user.
ServiceUsageInformation	Describes information about service usage based on ServiceUsageInformationType. Users use a lot of applications and services for a variety of reasons. When encountering a problem such as storage limitation and program errors, it might be difficult to describe usage history completely. In this case, ServiceUsageInformation element can be used to help to summarize information about usage history.
DetailedUserInteraction	Structure containing information about the multimedia experiences of the user.
UsageInformationType	Describes a general information related to usage.
ServiceID	Describes the service used by the user.
UsageTime	Describes time duration for service usage. The syntax and semantics of TimeType are specified in General Description.

5.7.3 Examples

```

<ud:UsageHistory>
  <ud:ServiceUsageInformation>
    <ud:ServiceID xmlns:ct="urn:mpeg:mpeg21:UD:CT:2016" xmlns:sd="urn:mpeg:mpeg21:UD:SD:2016">
      <sd:ServiceID>13243</sd:ServiceID>
      <sd:ServiceGeneralInformation>
        <sd:ServiceName>Service1</sd:ServiceName>          <sd:ServiceProviderName>ServiceProvider</sd:ServiceProviderName>
      </sd:ServiceGeneralInformation>
      <sd:ServiceTargetInformation></sd:ServiceTargetInformation>
      <sd:IsServiceAvailable>true</sd:IsServiceAvailable>
    </ud:ServiceID>
    <ud:UsageTime>
      <startTime xmlns="urn:mpeg:mpeg21:UD:CT:2016">2016-01-03T09:00:00Z</startTime>
      <endTime xmlns="urn:mpeg:mpeg21:UD:CT:2016">2016-01-03T09:40:00Z</endTime>
    </ud:UsageTime>
  </ud:ServiceUsageInformation>
</ud:UsageHistory>

```

5.8 EventType

An abstract representation of a generic event.

5.8.1 Syntax

```

<complexType name="EventType" abstract="true">
  <annotation>
    <documentation>An abstract representation of a generic real event</documentation>
  </annotation>
  <sequence minOccurs="1" maxOccurs="unbounded">
    <element name="Coordinates">
      <complexType>
        <sequence>

```

```

        <element name="Location" type="ct:LocationType" minOccurs="0"/>
      </element>
      <element name="Time" type="ct:TimeType" minOccurs="0"
maxOccurs="unbounded"/>
    </element>
  </sequence>
</complexType>
</element>
</sequence>
</complexType>

```

5.8.2 Semantics

Name	Definition
eventType	An abstract representation of a generic real event.
Coordinates	Spatial and temporal coordinates of the event. Multiple Coordinates model events occurring in distributed space and time (e.g. listening to a CD track by track when driving from office to home).
Location	The location where the event occurs.
Time	The (sequence of) time interval(s) or time point(s) at which the event occurs.

5.8.3 Examples

“EventType” is an abstract complex type. Examples are provided in sections related to derived types.

```

<ud:Schedule>
  <ud:ScheduleEvent xmlns:ct="urn:mpeg:mpeg-ud:2014:01-CT-NS"
descriptionMethod="byAgent" eventName="103rd Meeting" startTime="2015-09-30T10:00:00Z">
    <ud:RecurrenceInfo>
      <ct:startTime>2015-09-30T10:00:00Z</ct:startTime>
      <ct:duration>P10D</ct:duration>
    </ud:RecurrenceInfo>
  </ud:ScheduleEvent>
</ud:Schedule>

```

5.9 InteractionAtomType

This complex type specifies the common structure of pieces of multimedia consumed or provided by a user.

5.9.1 Syntax

```

<complexType name="InteractionAtomType">
  <annotation>
    <documentation>An abstract representation of observables and artefacts</documentation>
  </annotation>
  <sequence>
    <element name="Role" type="anyURI">
      <annotation>
        <documentation>A piece of metadata that expresses the functionality of an
interaction atom (e.g. an observable or an artefact) while in a specific state. For
example, if the user adds a text part (artefact) with the intention of annotating an
image (observable), then the role of such text will be "annotation"</documentation>

```

```

        </annotation>
      </element>
      <element name="MultimediaObject">
        <annotation>
          <documentation>Any type of data that can be handled by a device in order to
            produce multimedia contents, e.g. in video, audio, text formats. The description of a
            multimedia object may include its low-level characteristics (e.g. the "colour histogram"
            of a video). A multimedia object can play a role as an observable or as an artefact
            during a state of a multimedia experience. Multimedia objects comprise the following
            types of objects: Text, Image, Video, AudioVisual, Audio, Application
          </documentation>
        </annotation>
        <complexType>
          <complexContent>
            <extension base="didl:ItemType">
              <sequence>
                <element name="SourceService" type="sd:ServiceDescriptionType"
minOccurs="0"/>
              </sequence>
            </extension>
          </complexContent>
        </complexType>
      </element>
      <sequence minOccurs="0">
        <element name="Composition">
          <complexType>
            <sequence maxOccurs="unbounded">
              <element name="Artefact" type="ud:ArtefactType"/>
              <element name="Observable" type="ud:ObservableType"/>
            </sequence>
          </complexType>
        </element>
      </sequence>
    </sequence>
  </complexType>

```

5.9.2 Semantics

Name	Definition
InteractionAtomType	Specifies the common structure of pieces of multimedia consumed or provided by a user.
Role	Specifies the functionality of an interaction atom (e.g. an observable or an artefact) while in a state of a Multimedia Experience. Values for the content of this element are specified in InteractionAtomRoleCS (urn:mpeg:mpeg21:UD:CS:InteractionAtomRolesCS:2016).
MultimediaObject	Specifies descriptions of multimedia item consumed or provided by a user and its source service.
Composition	Any composition of Artefacts or Observables.

5.9.3 Examples

InteractionAtomType is an abstract representation of observables and artefacts available for a user in a certain State of a MultimediaExperience. The following example illustrates a case in which in the same State of a MultimediaExperience a user produced on Artefact and observed one Observable.

```
...
  <State>
    <Artefacts>
      <Artefact>
        <Role>...</Role>
        <MultimediaObject>...</MultimediaObject>
      </Artefact>
    </Artefacts>
    <Observables>
      <Observable>
        <Role>...</Role>
        <MultimediaObject>...</MultimediaObject>
        <UsageEvent>...</UsageEvent>
      </Observable>
    </Observables>
  </State>
...
```

5.10 ArtefactType

A specific multimedia object provided by the user while in a specific state of a Multimedia Experience. An artefact is any multimedia object actively generated by a user (e.g. tags, annotations, voice recording) or selected by the user during a specific state of his/her multimedia experience.

5.10.1 Syntax

```
<complexType name="ArtefactType">
  <annotation>
    <documentation>A specific multimedia object provided by the user while in a
specific state of a Multimedia Experience. An artefact is any multimedia object actively
generated by a user (e.g. tags, annotations, voice recording) or selected by the user
during a specific state of his/her multimedia experience</documentation>
  </annotation>
  <complexContent>
    <extension base="ud:InteractionAtomType"/>
  </complexContent>
</complexType>
```

5.10.2 Semantics

Name	Definition
artefactType	A specific multimedia object provided by the user while in a specific state of a Multimedia Experience. An artefact is any multimedia object actively generated by a user (e.g. tags, annotations, voice recording) or selected by the user during a specific state of his/her multimedia experience.

5.10.3 Examples

This example illustrates a case in which in a specific state of a MultimediaExperience a user has produced 3 artefacts.

```
<State>
<Artefact>
  <Role>...</Role>
```

```

    <MultimediaObject>...</MultimediaObject>
</Artefact>
<Artefact>
    <Role>...</Role>
    <MultimediaObject>...</MultimediaObject>
</Artefact>
<Artefact>
    <Role>...</Role>
    <MultimediaObject>...</MultimediaObject>
</Artefact>
...
</State>

```

5.11 ObservableType

A specific multimedia object that the user may decide to use, while in a specific state of his/her multimedia experience. An observable is any multimedia object enjoyable by the user in a specific state (e.g. an image displayed on the graphic interface).

5.11.1 Syntax

```

<complexType name="ObservableType">
  <annotation>
    <documentation>A specific multimedia object that the user may decide to use, while
in a specific state of his/her multimedia experience. An observable is any multimedia
object enjoyable by the user in a specific state (e.g. an image displayed on the graphic
interface)</documentation>
  </annotation>
  <complexContent>
    <extension base="ud:InteractionAtomType">
      <sequence minOccurs="0" maxOccurs="unbounded">
        <element name="UsageEvent">
          <annotation>
            <documentation>A specific event which occurs every time the user
decides to actually use an observable (e.g. when the user is reading a text, watching a
video, ...)</documentation>
          </annotation>
          <complexType>
            <complexContent>
              <extension base="ud:EventType">
                <attribute name="usageType" type="anyURI"/> </extension>
              </complexContent>
            </complexType>
          </element>
        </sequence>
      </extension>
    </complexContent>
  </complexType>

```

5.11.2 Semantics

Name	Definition
UsageEvent	Structure containing information about when the observable has been actually used by the user. A specific event which occurs every time the user decides to actually use an observable (e.g. when the user is reading a text, watching a video, etc.).

5.11.3 Examples

This example illustrates a case in which a user identified with U100 has observed an observable during a period starting and ending at specific points in time at an unknown location.

```
<?xml version="1.0" encoding="UTF-8"?>
<UD xmlns="urn:mpeg:mpeg21:UD:UD:2016" xmlns:xsi="http://www.w3.org/2001/XMLSchema-
instance" xsi:schemaLocation=" urn:mpeg:mpeg21:UD:UD:2016 1.MPEG-UD-UD.xsd">
<UserID>U100</UserID>
...
<Observables>
  <Observable>
    <Role>...</Role>
    <MultimediaObject>...</MultimediaObject>
    <UsageEvent>
      <Coordinates>
        <Time><ct:StartTime>2001-12-17T09:30:47Z </ct:StartTime</Time>
      </Coordinates>
    </UsageEvent>
  </Observable>
</Observables>
...
```

5.12 MultimediaExperienceType

The complex set of events (states and usage events) representing the fruition by the user, within a given time interval, of a certain number of multimedia contents.

5.12.1 Syntax

```
<complexType name="MultimediaExperienceType">
  <annotation>
    <documentation>The complex set of events (states and usage events) representing the
    fruition by the user, within a given time interval, of a certain number of multimedia
    contents</documentation>
  </annotation>
  <sequence>
    <element name="States">
      <complexType>
        <sequence maxOccurs="unbounded">
          <element name="State" type="ud:StateType"/> </sequence>
        </complexType>
      </element>
    </sequence>
  </complexType>
```

5.12.2 Semantics

Name	Definition
States	The states that compose the multimedia experience.
State	A specific event, identified by a set of “variables” or “coordinates” univocally identifying the set of interaction atoms and their respective roles in a given state of the multimedia experience.

5.12.3 Examples

This example shows the structure of a `MultimediaExperience` as a sequence of different states, each occurring at certain moments in time. In each state, the user may observe observables or produce artefacts. In the first and last state, there is information about the usage event of the observable.

```

<MultimediaExperience>
  <States>
    <State>
      <Coordinates>
        <Time>
          <ct:startTime>2001-12-17T09:30:47Z </ct:startTime>
        </Time>
      </Coordinates>
      <Observables>
        <Observable>
          <Role>...</Role>
          <MultimediaObject>...</MultimediaObject>
          <UsageEvent>
            <Coordinates>
              <Time>
                <ct:startTime>2001-12-17T09:30:47Z</ct:startTime>
              </Time>
            </Coordinates>
          </UsageEvent>
        </Observable>
      </Observables>
    </State>
    <State>
      <Coordinates>
        <Time>
          <ct:startTime>2001-12-17T09:40:47Z</ct:startTime>
        </Time>
      </Coordinates>
      <Artefacts>
        <Artefact>
          <Role>...</Role>
          <MultimediaObject>...</MultimediaObject>
        </Artefact>
      </Artefacts>
    </State>
    <State>
      <Coordinates>
        <Time>

```

```

        <ct:startTime>2001-12-17T09:40:47Z</ct:startTime>
    </Time>
</Coordinates>
<Artefacts>
    <Artefact>
        <Role>...</Role>
        <MultimediaObject>...</MultimediaObject>
    </Artefact>
</Artefacts>
</State>
<State>
    <Coordinates>
        <Time>
            <ct:startTime>2001-12-17T09:45:47Z</ct:startTime>
        </Time>
    </Coordinates>
<Observables>
    <Observable>
        <Role>...</Role>
        <MultimediaObject>...</MultimediaObject>
        <UsageEvent>
            <Coordinates>
                <Time>
                    <ct:startTime>2001-12-17T09:50:47Z </ct:startTime>
                </Time>
            </Coordinates>
        </UsageEvent>
    </Observable>
</Observables>
</State>
</States>
</MultimediaExperience>

```

5.13 StateType

A specific event, identified by a set of “variables” or “coordinates”, univocally identifying the set of interaction atoms and their respective roles in a given state of the multimedia experience.

5.13.1 Syntax

```

<complexType name="StateType">
    <annotation>
        <documentation>A specific event, identified by a set of “variables” or
“coordinates” univocally identifying the set of interaction atoms and their respective
roles in a given state of the multimedia experience</documentation>
    </annotation>
    <complexContent>
        <extension base="ud:EventType">
            <sequence>
                <element name="Artefacts" minOccurs="0">
                    <complexType>
                        <sequence>

```

```

        <element name="Artefact" type="ud:ArtefactType" maxOccurs="unbounded"/>
      </sequence>
    </complexType>
  </element>
  <element name="Observables" minOccurs="0"> <complexType>
    <sequence>
      <element name="Observable" type="ud:ObservableType"
maxOccurs="unbounded"/>
    </sequence>
  </complexType>
</element>
<element name="SemanticallyRelatedStates" minOccurs="0"> <complexType>
  <sequence>
    <element name="StatesRef" minOccurs="1" maxOccurs="unbounded">
      <simpleType>
        <list itemType="anyURI"/>
      </simpleType>
    </element>
  </sequence>
  <attribute name="criterion" type="anyURI"/> </complexType>
</element>
</sequence>
<attribute name="order" type="nonNegativeInteger"/> <attribute name="id"
type="anyURI"/>
</extension>
</complexContent>
</complexType>

```

5.13.2 Semantics

Name	Definition
Artefacts	Specifies the artefacts characterizing the state.
Observables	Specifies the observables characterizing the state.
SemanticallyRelatedStates	Specifies the structure pointing to semantically related states to the current state.
Criterion	Specifies the pointer to the specific semantic of the relation. The values for this attribute are specified in StatesSemanticRelationshipCS (urn:mpeg:mpeg21:UD:CS:StatesSemanticRelationshipsCS:2016).

5.13.3 Examples

This example shows the structure of a state inside a `MultimediaExperience` of user U100. A state can contain any number of artefacts and observables. It can also contain information about states that are semantically related to each other through the `SemanticallyRelatedStates` structure.

```

<?xml version="1.0" encoding="UTF-8"?>
<UD xmlns="urn:mpeg:mpeg21:UD:UD:2016"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance" xsi:schemaLocation="
urn:mpeg:mpeg21:UD:UD:2016 1.MPEG-UD-UD.xsd">
  <UserID>U100</UserID>
  ...
  <States>
    <State>

```

```

        <Artefacts>...<Artefacts>
        <Observables>...</Observables>
        <SemanticallyRelatedStates>
            <StatesRef>...</StatesRef>
        </SemanticallyRelatedStates>
    </State>
</States>
...

```

5.14 PreferenceType

PreferenceType describes the preference related to the various services. Preference could be conceived of as an individual's attitude towards a set of objects. Interested topics, preference on presentation style, sensory effects preference, score of satisfaction, service usage preferences, preference on service provider, interested topics and multimedia can be a preference.

5.14.1 Syntax

```

<complexType name="PreferenceType">
  <complexContent>
    <extension base="ud:BaseUserType">

      <sequence>
        <element name="UserPreferences" type="mpeg7:UserPreferencesType"
minOccurs="0"/>
        <element name="AudioPresentationPreferences" type="ud:AudioPresentationPrefe
rencesType" minOccurs="0"/>
        <element name="DisplayPresentationPreferences" type="mpeg21:DisplayPresentati
onPreferencesType" minOccurs="0"/>
        <element name="GraphicsPresentationPreferences" type="mpeg21:GraphicsPresenta
tionPreferencesType" minOccurs="0"/>
        <element name="TextPresentationPreferences" type="ud:TextPresentationPreferen
cesType" minOccurs="0" maxOccurs="unbounded"/>
        <element name="ServicePreference" type="ud:ServicePreferencesType"
minOccurs="0"/>
        <element name="TranslationPreference" type="ud:TranslationPreferenceType"
minOccurs="0"/>
        <element name="WebLinkPreferences" type="ud:WebLinkPreferenceType"
minOccurs="0" maxOccurs="unbounded"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

```

5.14.2 Semantics

Name	Definition
PreferenceType	Describes the preference related to the various services. Preference could be conceived of as an individual's attitude towards a set of objects. Interested topics, preference on presentation style, sensory effects preference, score of satisfaction, service usage preferences, preference on service provider, interested topics and media can be a preference.

Name	Definition
UserPreferences	Describes the user's preferences pertaining to consumption of multimedia content, in particular, filtering, searching and browsing of multimedia content. The <code>mpeg7:UserPreferencesType</code> contains <code>FilteringAndSearchPreferences</code> , <code>BrowsingPreferences</code> and <code>RecordingPreferences</code> , and contains an attribute indicating whether the user's preferences may be updated automatically.
AudioPresentationPreferences	Describes the preferences of a user regarding the presentation or rendering of audio resources. This element refers <code>AudioPresentationPreferencesType</code> .
DisplayPresentationPreferences	Describes preferences of a User regarding the presentation or rendering of images and videos. This <code>mpeg21:DisplayPresentationPreferencesType</code> includes descriptors of preferences related to the color and the conversion of stereoscopic video. The <code>ColorTemperaturePreference</code> , the <code>BrightnessPreference</code> , the <code>SaturationPreference</code> and the <code>ContrastPreference</code> describe the preferences of a User regarding the color of the displayed visual contents in terms of color temperature, brightness, saturation and contrast, each of which is a usual color attribute of images. <code>StereoscopicVideoConversion</code> describes the preferences of a User related to the conversion of 2D video to 3D stereoscopic video and also the conversion of 3D stereoscopic video to 2D video.
GraphicsPresentationPreferences	Describes presentation preferences related to graphics media. This <code>mpeg21:GraphicsPresentationPreferencesType</code> contains <code>GeometryEmphasis</code> , <code>TextureEmphasis</code> and <code>AnimationEmphasis</code> element.
TextPresentationPreferences	Describes user's presentation preference related to text to be presented in the display device.
ServicePreference	Describes the level of preferences for specific services.
TranslationPreference	Describes the preferences for translation services.
WebLinkPreferences	Describes the preference related to the various weblinks

5.15 TextPresentationPreferencesType

This `TextPresentationPreferencesType` describes the user's presentation preference related to text to be presented in the display device.

5.15.1 Syntax

```
<complexType name="TextPresentationPreferencesType">
  <sequence>
    <element name="TextPropertyPreference" type="ud:TextPropertyPreferenceType"/>
    <element name="TargetDisplayDeviceCapability" type="mpeg21:DisplayCapabilityType"
minOccurs="0"/>
  </sequence>
</complexType>

<complexType name="TextPropertyPreferenceType">
  <complexContent>
    <extension base="mpeg21:FontType">
      <attribute name="italic" type="boolean" use="optional" default="false"/>
<attribute name="oblique" type="boolean" use="optional" default="false"/>
      <attribute name="bold" type="boolean" use="optional" default="false"/>
<attribute name="smallcap" type="boolean" use="optional" default="false"/>
<attribute name="underline" type="boolean" use="optional" default="false"/>
<attribute name="overline" type="boolean" use="optional" default="false"/>
    </extension>
  </complexContent>
</complexType>
```

5.15.2 Semantics

Name	Definition
TextPropertyPreference	Describes the user's preference of text properties such as font type, font colour, font size, font style, etc.
TargetDisplayDeviceCapability	Describes the capabilities of the target display device to which text presentation preferences describing in TextPropertyPreference element are applied. The syntax and semantics of DisplayCapabilityType are specified in ISO/IEC 21000-7.
italic	Specifies whether italic style is used or not. The default value is "false".
oblique	Specifies whether oblique style is used or not. The default value is "false". The oblique style is slightly slanted but the letterforms do not change shape.
bold	Specifies whether bold style is used or not. The default value is "false".
smallCap	Specifies whether small-cap style is used or not. The default value is "false". The small-cap style is that all lowercase letters are converted to uppercase letters.
underline	Specifies whether underline style is used or not. The default value is "false".
overline	Specifies whether overline style is used or not. The default value is "false".

5.15.3 Example

```
<ud:UD>
  <ud:UserID>keti</ud:UserID>
  <ud:Preference>
    <ud:TextPresentationPreferences>
      <ud:TextPropertyPreference fontColor="black" fontSize="10" fontType="arial"
italic="true" underline="true"/>
      <ud:TargetDisplayDeviceCapability>
        <mpeg21:Mode>
          <mpeg21:Resolution horizontal="720" vertical="480"/>
        </mpeg21:Mode>
        <mpeg21:ScreenSize horizontal="49" vertical="52"/>
      </ud:TargetDisplayDeviceCapability>
    </ud:TextPresentationPreferences>
  </ud:Preference>
</ud:UD>
```

5.16 WebLinkPreferenceType

WebLinkPreferenceType type describes the preference related to the various weblinks.

WebLinkPreferenceType type is composed of WebLinkAddress element, WebLinkUsageHistoryType element and preferenceLevel attribute for that link.

5.16.1 Syntax

```
<complexType name="WebLinkPreferenceType">
  <sequence>
    <element name="WebLinkAddress" type="anyURI"/>
    <element name="WebLinkUsageHistory" type="ud:WebLinkUsageHistoryType" minOccurs="0"
maxOccurs="unbounded"/>
  </sequence>
  <attribute name="preferenceLevel" type="ct:ZeroToOnehundredRatioType"
use="optional" default="50"/>
</complexType>
```

```
</complexType>
```

5.16.2 Semantics

Name	Definition
WebLinkPreferenceType	Describes the preference related to the specific weblink.
WebLinkAddress	Describes the URI of the preferred weblink.
WebLinkUsageHistory	Describes the usage history of a specific weblink
preferenceLevel	Describes a ranking of the weblink preference. Value ranges from 0 to 100 and default value is 50.

5.16.3 Example

```
<ud:Preference>
  <ud:WebLinkPreferences>
    <ud:WebLinkAddress></ud:WebLinkAddress>
    <ud:WebLinkUsageHistory feedback="true">
      <ud:Coordinates>
        <ud:Time>
          <ct:startTime xmlns:ct="urn:mpeg:mpeg21:UD:CT:2016">2015-06-
04T18:13:51.0Z</ct:startTime>
        </ud:Time>
      </ud:Coordinates>
    </ud:WebLinkUsageHistory>
  </ud:WebLinkPreferences>
</ud:Preference>
```

5.17 WebLinkUsageHistoryType

WebLinkUsageHistoryType type describes the usage history of a specific weblink.

5.17.1 Syntax

```
<complexType name="WebLinkUsageHistoryType">
  <complexContent>
    <extension base="ud:EventType">
      <attribute name="feedback" type="boolean"/>
    </extension>
  </complexContent>
</complexType>
```

5.17.2 Semantics

Name	Definition
WebLinkUsageHistoryType	Describes the usage history of a specific weblink.
feedback	Describes the user feedback of a specific weblink. It represents one of two values: TRUE or FALSE. (TRUE: positive feedback, False: negative feedback)

5.18 ServicePreferenceType

ServicePreferencesType describes the level of preferences for specific services. Every user can have his personal preferences of the various services, respectively. A UD instance can contain preferences about specific services.

5.18.1 Syntax

```
<complexType name="ServicePreferencesType">
  <sequence>
    <element name="ServiceGeneralInformation" type="sd:ServiceGeneralInformationType"/>
  </sequence>
  <attribute name="preferenceLevel" type="ct:ZeroToOnehundredOrdinalType"
use="required"/>
</complexType>
```

5.18.2 Semantics

Name	Definition
ServiceGeneralInformation	Describes general information of the service. Service name, provider name, generic service information, service URI, service category, etc. can be described by this type.
Specialty	Indicate the priority or weight assigned to a particular user preference, relative to other components. The range of the preference values is from 0 to 100.

5.18.3 Examples

```
<ud:Preference>
  <ud:ServicePreference preferenceLevel="95">
    <ud:ServiceGeneralInformation>
      <sd:ServiceName>Service</sd:ServiceName>
      <sd:ServiceProviderName>Company</sd:ServiceProviderName>
    </ud:ServiceGeneralInformation>
  </ud:ServicePreference>
</ud:Preference>
```

5.19 GeneralAudioPreferenceType

This GeneralAudioPreferencesType describes the preferences for lossless and lossy audio services.

5.19.1 Syntax

```
<complexType name="GeneralAudioPreferenceType">
  <sequence>
    <element name="CreationInfo" type="cd:AudioEnvironmentType" minOccurs="0"/>
  <element name="LosslessAudioFormat" type="ud:LosslessAudioFormatType" minOccurs="0"/>
    <element name="LossyAudioFormat" type="ud:LossyAudioFormatType" minOccurs="0"/>
    <element name="AudioFileSize" type="ud:LosslessAudioFileSizeType" minOccurs="0"/>
    <element name="AudioMusicPreference" type="ud:AudioMusicPreferenceType"
minOccurs="0"/>
  </sequence>
  <attribute name="id" type="ID" use="optional"/>
  <simpleType name="LosslessAudioFormatType">
    <restriction base="NMTOKEN">
      <enumeration value="AppleLossless"/>
      <enumeration value="AdaptiveTransformAcousticCoding"/>
      <enumeration value="aptXLossless"/>
      <enumeration value="AudioLosslessCoding"/>
      <enumeration value="DirectStreamTransfer"/>
      <enumeration value="DolbyTrueHD"/>
    </restriction>
  </simpleType>
</complexType>
```

```

    <enumeration value="DTSMasterAudio"/>
    <enumeration value="FreeLosslessAudioCodec"/>
    <enumeration value="MeridianLosslessPacking"/>
    <enumeration value="MonkeyAudio"/>
    <enumeration value="MPEG4SLS"/>
    <enumeration value="OptimFROG"/>
    <enumeration value="OriginalSoundQuality"/>
    <enumeration value="RealAudioLossless"/>
    <enumeration value="Shorten"/>
    <enumeration value="TrueAudioLossless"/>
    <enumeration value="WavPackLossless"/>
    <enumeration value="WindowsMediaAudioLossless"/>
    <enumeration value="Others"/>
  </restriction>
</simpleType>
<simpleType name="LossyAudioFormatType">
  <restriction base="NMTOKEN">
    <enumeration value="CELT"/>
    <enumeration value="AAC"/>
    <enumeration value="MP3"/>
    <enumeration value="OGG"/>
    <enumeration value="AMR"/>
    <enumeration value="WMA"/>
    <enumeration value="AC3"/>
    <enumeration value="Speex"/>
    <enumeration value="TwinVQ"/>
    <enumeration value="Others"/>
  </restriction>
</simpleType>
<simpleType name="AudioFileSizeType">
  <restriction base="nonNegativeInteger"/>
</simpleType>
<simpleType name="AudioMusicPreferenceType"> <restriction base="NMTOKEN">
  <enumeration value="Rock"/>
  <enumeration value="Blues"/>
  <enumeration value="ChildrenMusic"/>
  <enumeration value="Classical"/>
  <enumeration value="Country"/>
  <enumeration value="Dance"/>
  <enumeration value="EasyListening"/>
  <enumeration value="Electric"/>
  <enumeration value="Rap"/>
  <enumeration value="Gospel"/>
  <enumeration value="Instrumental"/>
  <enumeration value="Jazz"/>
  <enumeration value="RockandRoll"/>
  <enumeration value="Others"/>
</restriction>
</simpleType>
</complexType>

```

5.19.2 Semantics

Name	Definition
CreationInfo	Describes user's preference on the creating information for audio.
LosslessAudioFormat	Describes user's preference on the format type for lossless audio.
LossyAudioFormat	Describes user's preference on the format type for lossy audio
AudioFileSize	Describes user's preference on the actual file size for audio.
AudioMusicPreference	Describes user's preference on the preference of music for audio.

5.19.3 Examples

```

<ud:CreationInfo>
<cd:RecordingEnvironment>
  <cd:HowlingLevel>3.4</cd:HowlingLevel>
  <cd:NumberOfMic>1</cd:NumberOfMic>
</cd:RecordingEnvironment>
</ud:CreationInfo>
<ud:LosslessAudioFormat>FreeLosslessAudioCodec</ud:LosslessAudioFormat>
<ud:LossyAudioFormat>AAC</ud:LossyAudioFormat>
<ud:LosslessAudioFileSizeType>5000000</ud:LosslessAudioFileSizeType>
<ud:AudioMusicPreference>Dance</ud:AudioMusicPreference>
...

```

5.20 AudioPresentationPreferencesType

5.20.1 Syntax

```

<complexType name="AudioPresentationPreferencesType">
  <complexContent>
    <extension base="mpeg21:AudioPresentationPreferencesType">
      <sequence>
        <element name="GeneralAudioPresentationPreference" type="ud:GeneralAudioPreferenceType" minOccurs="0"/>
        <element name="AudioPresentationEnvironmentPreference" type="ud:AudioPresentationEnvironmentPreferenceType" minOccurs="0"/>
      </sequence>
    </extension>
  </complexContent>
</complexType>

```

5.20.2 Semantics

Name	Definition
GeneralAudioPresentationPreference	Describes the preference for lossless and lossy audio services
AudioPresentationEnvironmentPreference	Describes more precise information for audio services. The element references AudioPresentationEnvironmentPreferenceTyp.

5.21 AudioPresentationEnvironmentPreferenceType

5.21.1 Syntax

```
<complexType name="AudioPresentationEnvironmentPreferenceType">
  <sequence>
    <element name="RootMeanSquareValueRange" minOccurs="0" maxOccurs="unbounded">
      <complexType>
        <sequence>
          <element name="MinRMS" type="float" minOccurs="0"/>
          <element name="MaxRMS" type="float" minOccurs="0"/>
        </sequence>
        <attribute name="unit" type="mpeg7:termReferenceType" use="optional"/>
      </complexType>
    </element>
    <element name="ImpedanceRange" minOccurs="0" maxOccurs="unbounded"> <complexType>
      <sequence>
        <element name="Min" type="float" minOccurs="0"/>
        <element name="Max" type="float" minOccurs="0"/>
      </sequence>
      <attribute name="unit" type="mpeg7:termReferenceType" use="optional"/> </
complexType>
    </element>
    <element name="SpeakerLayoutPreferences" type="SpeakerLayoutType" minOccurs="0"
maxOccurs="unbounded"/>
  </sequence>
</complexType>
<complexType name="SpeakerLayoutType">
  <sequence>
    <element name="Brand" type="string" minOccurs="0"/>
    <element name="Channel" type="string" minOccurs="0"/>
  </sequence>
</complexType>
```

5.21.2 Semantics

Name	Definition
RootMeanSquareValueRange	Describes more precise information for audio services. This element references <code>ExtendedAudioPresentationPreferencesType</code> .
MinRMS	Describes the minimum value for RMS. The type of this element is <code>float</code> .
MaxRMS	Describes the maximum value for RMS. The type of this element is <code>float</code> .
unit	Specifies the unit of the sensed value, if a unit other than the default unit is used, as a reference to a classification scheme term that shall be using the <code>mpeg7:termReferenceType</code> defined in ISO/IEC 15938-5:2003, 7.6. The CS that may be used for this purpose is the <code>UnitTypeCS</code> defined in ISO/IEC 23005-6. The binary representation of the <code>UnitTypeCS</code> is also defined in ISO/IEC 23005-6.
ImpedanceRange	Specifies preferred range of impedance value. The range of impedance is represented with <code>Min</code> and <code>Max</code> elements.
Min	Describes the minimum value for impedance. The type of this element is <code>float</code> .
Max	Describes the maximum value for impedance. The type of this element is <code>float</code> .

Name	Definition
SpeakerLayoutPreferences	Describes more precise information about speaker layout. This element references SpeakerLayoutType.

Semantics of the SpeakerLayoutType:

Name	Definition
SpeakerLayoutType	Describes more precise information about speaker layout. This element references SpeakerLayoutType.
Brand	Describes specific brand name of a particular speaker layout for specifying speaker layout. The value of this element shall follow the pattern of original naming. Ex) 'Dolby' (O), 'dolby' (X), 'DTX' (O), 'dtx' (X).
Channel	Describes channel layout for speakers. The value of this element is constructed with "channel number.woofer number" ex) '5.1', '22.2'.

5.21.3 Examples

The following description elements represent the audio related preferences of the user whose id is expressed with "keti001". They can be used either by the server or the terminal to adapt the presentation to the preferences of the user.

VolumeControl: In the example below, the user has the preference to hear music very loud. As a result, 0.85 is designated.

FrequencyEqualizer: This information represents the preference of a user to specific frequencies. This information consists of a set of frequency bands and its associated of attenuation values for the 31 ISO centre frequencies. In the example below, the first and the second value of period specify a frequency range, i.e. the start and the end frequency values of a frequency band, and the following frequency, the values represent the associated user equalizer preference values. The user preference value can be controlled in range [-15 dB, 15 dB] period.

AudibleFrequencyRange: This information represents the preferred audible frequency range in Hz. In the example below, the person's preferred an audible frequency range is from 20 Hz to 20 kHz.

Soundfield: The information represents the preference of a user for a specific soundfield. This information consists of the URI and its associated parameters to designate a room impulse response. As an example, the adaptation engine can process its soundfield function convolving input audio resource with impulse response signal in the remote storage on the basis of this information.

SoniferousSpeed: It is usually very difficult for User's with an auditory impairment to listen to fast speech. The SoniferousSpeed is specified as a ratio, where 1 indicates the original speed; values other than 1 indicate multiplicative time-scaling by the given ratio (i.e. 0.5 specifies twice as fast and 2.0 indicates half the original speed). In the example below, the soniferous speed preference is indicated as twice as fast.

ExtendedSoundfieldPreferences: The information represents the preference of RMS value and impedance ranges. In this example, the range of RMS value is from 100W to 200W, the preferred impedance range for "keti001" is from 6 Ω to 8 Ω .

SpeakerLayoutPreferences: The information specifies the preferred loudspeaker layouts. In this example, the user of "keti001" are usually preferred 'Dolby 5.1' channel sound.

```
<ud:UD>
  <ud:UserID>keti</ud:UserID>
  <ud:Preference>
    <ud:AudioPresentationPreferences>
      <mpeg21:VolumeControl>0.85</mpeg21:VolumeControl>
```

```

    <mpeg21:FrequencyEqualizer>-10 -10 -10 -10 -10 -10 -10 -10 -10 -10 -10 -10 0 0 0
0 10 10 10 10 -10 -10 -10 -10 -10 -10 -10 -10 -10 -10 -10 -10</mpeg21:FrequencyEqualizer>
    <mpeg21:AudibleFrequencyRange>
      <mpeg21:StartFrequency>20</mpeg21:StartFrequency>
      <mpeg21:EndFrequency>20000</mpeg21:EndFrequency>
    </mpeg21:AudibleFrequencyRange>
    <mpeg21:AudioOutputDevice>Loudspeaker</mpeg21:AudioOutputDevice>
    <mpeg21:Soundfield>
      <mpeg21:ImpulseResponse
href="https://www.sac.or.kr/concertHall/hallImp.wav">
      <mpeg21:SamplingFrequency>44100</mpeg21:SamplingFrequency>
        <mpeg21:BitsPerSample>16</mpeg21:BitsPerSample>
        <mpeg21:NumOfChannels>1</mpeg21:NumOfChannels>
      </mpeg21:ImpulseResponse>
    </mpeg21:Soundfield>
    <mpeg21:SoniferousSpeed>0.5</mpeg21:SoniferousSpeed>
  <ud:AudioPresentationEnvironmentPreference>
    <ud:RootMeanSquareValueRange>
      <ud:MinRMS>100</ud:MinRMS>
      <ud:MaxRMS>200</ud:MaxRMS>
    </ud:RootMeanSquareValueRange>
    <ud:ImpedanceRange>
      <ud:Min>6</ud:Min>
      <ud:Max>8</ud:Max>
    </ud:ImpedanceRange>
    <ud:SpeakerLayoutPreferences>
      <ud:Brand>Dolby</ud:Brand>
      <ud:Channel>5.1</ud:Channel>
    </ud:SpeakerLayoutPreferences>
  </ud:AudioPresentationEnvironmentPreference>
</ud:AudioPresentationPreferences>
</ud:Preference>
</ud:UD>

```

5.22 TranslationPreferencesType

The `TranslationPreferencesType` describes the preferences for translation services.

5.22.1 Syntax

```

<complexType name="TranslationPreferenceType">
  <sequence>
    <element name="SourceLanguagePreference" type="language" minOccurs="0"/>
    <element name="TargetLanguagePreference" type="language" minOccurs="0"/>
    <element name="SpeechStylePreference" type="ud:SpeechStylePreferenceType"/>
    <element name="VoiceGenderPreference" type="ud:GenderType"
default="unspecified" minOccurs="0"/>
  </sequence>
  <attribute name="VoicePitch" type="mpeg7:nonNegativeReal" use="optional"/>
  <attribute name="VoiceSpeed" type="mpeg7:nonNegativeReal" use="optional"/>
  <attribute name="RequestVariants" type="boolean" use="optional" default="false"/>
</complexType>

```

5.22.2 Semantics

Name	Definition
SourceLanguagePreference	Describes user's preference on the source language for translation.
TargetLanguagePreference	Describes user's preference on the target language for translation.
SpeechStylePreference	Describes user's preference on the style of the translated output speech.
VoiceGenderPreference	Describes user's preference on the gender of the translated output speech.
VoicePitch	Describes user's preference on the pitch of the translated output speech.
VoiceSpeed	Describes user's preference on the speed of the translated output speech.
RequestVariants	Describes user's preference on multiple translation outputs so that the user can choose one of the possible translations

5.22.3 Examples

```

<ud:Preference>
  <ud:TranslationPreference    VoicePitch="5"    VoiceSpeed="3"
RequestVariants="false">
    <ud:SourceLanguagePreference>en-us</ud:SourceLanguagePreference>
    <ud:TargetLanguagePreference>kr</ud:TargetLanguagePreference>
    <ud:SpeechStylePreference>informal</ud:SpeechStylePreference>
    <ud:VoiceGenderPreference>unspecified</ud:VoiceGenderPreference>
  </ud:TranslationPreference>
<ud:PreferenceDescription>
  <ud:UserID>
    <mpeg7:Name>Jake</mpeg7:Name>
  </ud:UserID>
</ud:PreferenceDescription>
</ud:Preference>

```

5.23 SpeechStylePreferenceType

5.23.1 Syntax

```

<simpleType name="SpeechStylePreferenceType">
  <restriction base="NMTOKEN">
    <enumeration value="formal"/>
    <enumeration value="informal"/>
  </restriction>
</simpleType>

```

5.23.2 Semantics

Name	Definition
SpeechStylePreferenceType	Describes user preference on the speech style. The speech style can be formal for official usage of a language or informal used in everyday, personal conversations.

5.24 GenderType

GenderType indicates the gender of the user.

5.24.1 Syntax

```
<simpleType name="GenderType">
  <restriction base="NMTOKEN">
    <enumeration value="female"/>
    <enumeration value="male"/>
    <enumeration value="neuter"/>
    <enumeration value="unspecified"/>
  </restriction>
</simpleType>
```

5.24.2 Semantics

Name	Definition
GenderType	Describes the gender of the user in terms of: female, male neuter, unspecified. Neuter refers to neither male neither female and unspecified refers to the gender, which is intentionally not provided.

5.24.3 Examples

```
<ud:UserProfile xsi:type="ud:PersonProfileType">
  <ud:Gender>female</ud:Gender>
</ud:UserProfile>
```

5.25 EmotionType

The `EmotionType` can be used to represents user's subjective notion and feeling. The user's emotion can be described including its changes over time. The emotion can be acquired by some direct input of user or inference results from sensor data.

5.25.1 Syntax

```
<complexType name="EmotionType">
  <complexContent>
    <extension base="ud:BaseUserType">
      <sequence>
        <element name="EmotionGroup" minOccurs="0" maxOccurs="unbounded"><complexType>
          <sequence>
            <element name="PeriodOfOccurrence" type="ct:TimeType"/>
            <element name="EmotionDescription" type="ud:EmotionDescriptionType"
              maxOccurs="unbounded"/>
          </sequence>
          <attribute name="ref-id" type="anyURI" use="required"/>
        </complexType>
      </element>
      <element name="DynamicEmotionVocabulary" minOccurs="0" maxOccurs="unbounded">
        <complexType>
          <sequence>
            <element name="DynamicEmotion" maxOccurs="unbounded">
              <complexType>
                <attribute name="name" type="string" use="required"/>
              </complexType>
            </element>
          </sequence>
          <attribute name="id" type="anyURI" use="required"/>
        </complexType>
      </element>
    </extension>
  </complexContent>
</complexType>
```

```

        </element>
      </sequence>
    </complexType>

    <complexType name="EmotionDescriptionType">
      <sequence>
        <element name="emotionName" type="token"/>
        <element name="value" type="ct:normalizedRatioValueType"/>
      </sequence>
      <attribute name="triggeredBy" type="anyURI"/>
      <attribute name="aspect" type="token" use="optional"/>
      <attribute name="detectedFrom" type="anyURI"/>
      <attribute name="reliability" type="ct:ZeroToOneRatioType"/>
    </extension>
  </complexContent>
</complexType>

```

5.25.2 Semantics

Name	Definition
EmotionType	Describes user's subjective notion and feeling. The user's emotion can be described including its changes over time. The emotion can be acquired by some direct input of user or inference results from sensor data.
EmotionGroup	Describes an emotion with some related information. The emotion is described by several <code>EmotionDescription</code> elements, each being present with different values of <code>reliability</code> .
PeriodOfOccurrence	Describes the starting and ending time of an emotion group using absolute times. This <code>ct:TimeType</code> denotes the absolute time at which an emotion group with some related information happened.
EmotionDescription	Describes a specific emotional state.
ref-id	Provides a reference id which is used for identifying an emotion vocabulary in <code>DynamicEmotionVocabulary</code> or existing classification scheme.
DynamicEmotionVocabulary	Describes an emotion vocabulary defined by the user.
DynamicEmotion	Describes a word specifying a single emotion defined by the user.
Name	Describes the name of an emotion defined by the user.
Id	Provides an id of a <code>DynamicEmotionVocabulary</code> instance to be referenced by the <code>EmotionGroup</code> .
emotionName	Denotes the name of an emotion as the result of measuring a user's emotional state. The value should match one of the <code>name</code> attribute value of the <code>DynamicEmotionVocabulary</code> instance referenced by <code>ref-id</code> attribute or the name of a term of a classification scheme referenced by <code>ref-id</code> attribute.
Value	Describes the level of emotion on the result of measuring a user's emotional state. This value can be described based on <code>normalizedRatioValueType</code> .
triggeredBy	Describes who and what caused this emotion. The emotion can be triggered by various sources such as persons, animals and media. It may reference a user description's identifier for describing this information in the case of triggered by persons or animals, etc. In the case of media, it may reference a resource identifier.
Aspect	Describes the specific occasion of the triggered emotion, e.g. battery duration of the smartphone or speech of the spokesman.
detectedFrom	Describes the modality through which an emotion is detected. Specific user emotion is usually detected through human's action and appearances such as face, gesture, voice, word, posture or EEG (electroencephalography).