
**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).

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

This document was prepared by 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 21000-22:2016), which has been technically revised. It also incorporates the Amendment ISO/IEC 21000-22:2016/Amd. 1:2018.

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

— addition of technologies related to loudness control and visual expression.

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

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

Information technology — Multimedia framework (MPEG-21) —

Part 22:

User description

1 Scope

This document standardizes four data formats: User Description (UD), Context Description (CD), Service Description (SD), and Recommendation Description (RD). This document also specifies technologies related to loudness control and visual expression.

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 terminological databases for use in standardization at the following addresses:

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

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 programmes on a smart TV.

3.10 manager

<UD/C/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

Chapters 5, 6, 7, 8 and 9 present the specification of the general description, and of the UD, CD, SD and RD, respectively. Annex A provides the schemes for all these descriptions while Annex B provides related classification schemes.

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 UD, CD, SD and RD.
<code>generatedTime</code>	Specifies generated time of description.
<code>descriptionID</code>	Indicates the ID of the description. This information can be a combination of numbers, alphabets, etc. All description need to have the unique <code>descriptionID</code> .

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

These 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"/>
  </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.

Name	Definition
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 W3C Recommendation XML Schema Part 2 ^[13] . When neither endTime nor duration is defined, the startTime denotes a specific time point.

Name	Definition
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.

Name	Definition
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 (W3C Recommendation XML Schema Part 2^[13]) 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
LocationType	This data type represents geographical and semantic location of the user.
GeographicLocation	Describes a geographical location.
SemanticLocation	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>
  </ct:GeographicLocation>
</cd:Location>
```

```

    <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
ClassificationSchemeAliasType	Describes an alias for a ClassificationScheme referenced by a URI.
alias	Describes the alias assigned to the classification scheme. The scope of the alias assigned shall be the entire description regardless of where the ClassificationSchemeAlias appears in the description.
href	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 uri attribute of the ClassificationScheme.

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.

Name	Definition
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:ClassificationSchemeAliasType" 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"/>
        <element name="ServiceUsagePattern"
type="ud:UsagePatternType" minOccurs="0"/>
        <element name="LoudnessPreferences"
type="ud:LoudnessPreferencesType"/>
        <element name="VisualExpressionPreference" type="ud:
VisualExpressionPreferenceType"/>
    </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, UserProfile, Preference, Emotion, Schedule or Activity element shall be instantiated.
InformationAccessGroup	Describes the group of other users who can access private information.
ClassificationScheme Alias	Specifies an alias for a ClassificationScheme to be referenced within the UserDescriptionType by a simplified URI.
UserID	Describes the unique identifier of a user.
UserProfile	Describes user profile based on UserProfileType
UsageHistory	Describes usage history based on UsageHistoryType. This element can represent user's history for a given service, such as searching or movie recommendations.

Name	Definition
Preference	Describes preference based on PreferenceType.
Emotion	Describes emotion based on EmotionType. This type represents user's emotion, including its changes over time.
Schedule	Describes schedule based on ScheduleType.
Activity	Describes user activity based on ActivityType.
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 UsagePatternType. Users use a lot of applications and services for a variety of reasons. UsagePattern might be used to figure out user's characteristics.
commonAttributes	Describes a group of attributes for the CommonAttributes. The syntax and semantics of commonAttributes 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.
VisualExpressionPreference	A set of data edited by user's intention/emotion or created by recognizing user's situation/condition.

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
UserProfileType	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.
Specialty	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:Specia
lty>
</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"/>
        <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>
</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.
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>

```

```

    </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>
    </complexContent>
  </extension>
</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 helps 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.
SeiviceID	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 name="Time" type="ct:TimeType" minOccurs="0"
maxOccurs="unbounded"/>
        </sequence>
      </complexType>
    </element>
  </sequence>
</complexType>
```

5.8.2 Semantics

Name	Definition
eventType	An abstract representation of a generic real event.

Name	Definition
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 MultimediaExperience. 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.

Name	Definition
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 MultimediaExperience. 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 MultimediaExperience. 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 (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"?>
<UDxmlns="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>
  ...
</UD>
```

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:AudioPresentationPreferencesType" minOccurs="0"/>
        <element name="DisplayPresentationPreferences"
type="mpeg21:DisplayPresentationPreferencesType" minOccurs="0"/>
        <element name="GraphicsPresentationPreferences"
type="mpeg21:GraphicsPresentationPreferencesType" minOccurs="0"/>
        <element name="TextPresentationPreferences"
type="ud:TextPresentationPreferencesType" 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.
UserPreferences	Describes the user's preferences pertaining to consumption of multimedia content, in particular, filtering, searching and browsing of multimedia content. The mpeg7:UserPreferencesType contains filtering and search preferences, browsing preferences and recording preferences, 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 AudioPresentationPreferencesType.

Name	Definition
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.

Name	Definition
<code>underline</code>	Specifies whether underline style is used or not. The default value is "false".
<code>overline</code>	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>
```

5.16.2 Semantics

Name	Definition
<code>WebLinkPreferenceType</code>	Describes the preference related to the specific weblink.

Name	Definition
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
ServiceGeneralInform ation	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"/>
  </sequence>
</complexType>
```

```

    <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"/>
</complexType>
<simpleType name="LosslessAudioFormatType">
  <restriction base="NMTOKEN">
    <enumeration value="AppleLossless"/>
    <enumeration value="AdaptiveTransformAcousticCoding"/>
    <enumeration value="aptXLossless"/>
    <enumeration value="AudioLosslessCoding"/>
    <enumeration value="DirectStreamTransfer"/>
    <enumeration value="DolbyTrueHD"/>
    <enumeration value="DTSHDMasterAudio"/>
    <enumeration value="FreeLosslessAudioCodec"/>
    <enumeration value="MeridianLosslessPacking"/>
    <enumeration value="MonkeyAudio"/>
    <enumeration value="MPEG4SLS"/>
    <enumeration value="OptimFR0G"/>
    <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"/>

```