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**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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

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

For an explanation on 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 the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

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

## Introduction

The use of multimedia is pervading more and more our daily life and services are becoming more and more customized to user needs. Although MPEG has already developed other standards such as MPEG-7, MPEG-21, and MPEG-M that address User Description, the level of specification in those standards cannot cope with the needs of current and upcoming services such as augmented reality and social networks.

In a context of a large number of competing service providers, a user typically relies on a Recommendation Service that suggests choices to Users. Conceivably, the use of more than one Recommendation Service in combination could provide better choices to users. However, comparing different recommendations can be difficult if the users seeking recommendations, the contexts in which they operate and the services they are using are described in incompatible fashions.

The aim of the MPEG-21 User Description standard, referred to as MPEG-21 UD, is to enable Recommendation Services that provide standard, i.e. compatible, recommendations. To achieve this goal, standards for the following input and output formats of a Recommendation Engine are needed:

- a) the input format that includes
  - 1) Description of User (UD) seeking recommendation,
  - 2) Description of Context (CD) in which User operates, and
  - 3) Description of Service (SD) offering content sought by User;
- b) the output format, called Recommendation Description (RD), that includes
  - 1) subsets of UD/CD/SD,
  - 2) additional logical relations,
  - 3) metadata related to the subsets, and
  - 4) recommendation.

The scope of MPEG-21 UD can be exemplified by the following use scenario. A Smart TV manufacturer has included a new type of recommendation functionalities in the TV set to help customers select programmes. The TV set supports standard User Description (UD), Context Description (CD) and Service Description (SD). With these data, User can access different Recommendation Services each of which provides a standard Recommendation Description (RD). The TV set has an application which mashes up the different recommendations and provides customized recommendations to User.

The Description Managers of Figure 1 are in charge of

- a) updating UD, CD and SD, e.g. as a result of a User selection, and
- b) 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.



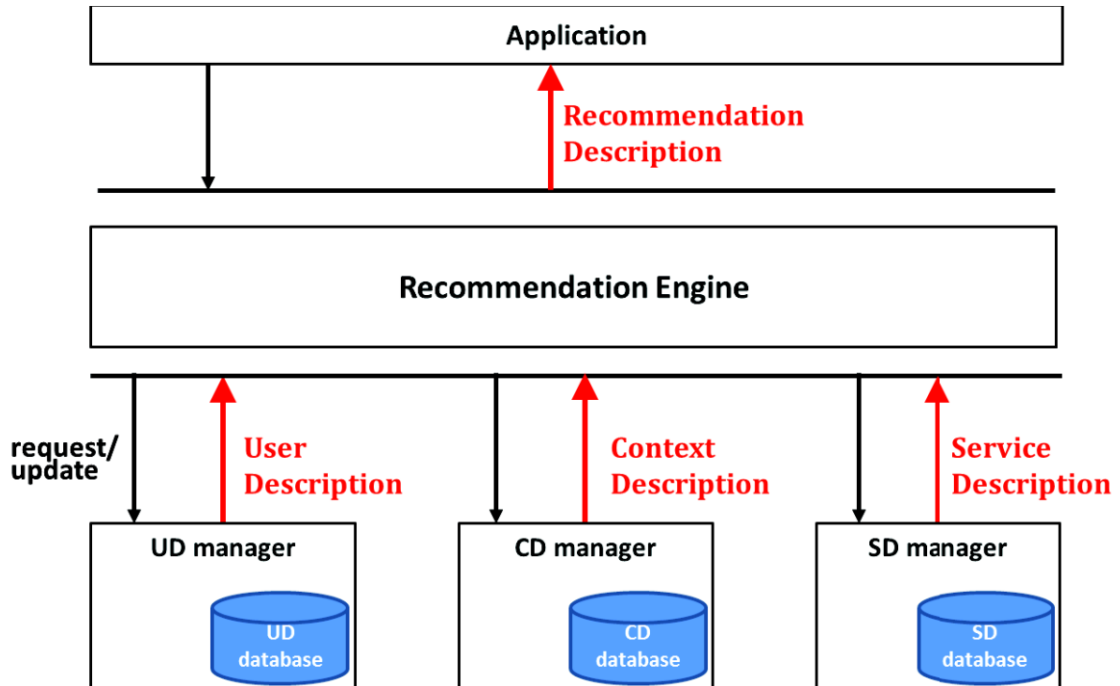


Figure 1 — Conceptual model of MPEG-21 User Description (red elements UD/CD/SD/RD indicate the formats specified by MPEG-21 User Description)

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# Information technology — Multimedia framework (MPEG-21) — Part 22: User Description

## 1 Scope

This document standardizes the four data formats: User Description (UD), Context Description (CD), Service Description (SD), and Recommendation Description (RD).

- User Description (UD): a set of descriptions which may contain static and dynamic information about the user, including some other data like the history of the user's interactions, preferences, security settings regarding these information, etc.
- Context Description (CD): a set of descriptions of the environmental situation in which the user operates, e.g., user's device in use, physical position, environmental variables (temperature, humidity, sound level, etc.), security settings regarding these information, etc.
- Service Description (SD): a set of descriptions containing information (including security settings) about the service (or a set of sub-services), that is offered to the end-user application, e.g. video on demand, maps, etc.
- Recommendation Description (RD): a set of descriptions containing information about recommended items, provided when a customer requests a service in a certain context and in a certain environment. RD may include 1) the recommended content, 2) information extracted from UD, CD, SD, 3) additional logical relations among UD/CD/SD (or their subsets) and 4) metadata from UD/CD/SD.

This document specifies User Description, Context Description, Service Description and Recommendation Description. Description Managers, Recommendation Engine and Application are outside of the scope of this document.

## 2 Normative references

There are no normative references cited 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, e.g. identity, interactions, preferences, security settings regarding these information, etc.

### 3.3

#### **context description**

##### **CD**

set of data that describes the context and environmental situation in which the user is located, e.g. device in use, physical position, environmental variables (temperature, humidity, etc.), traffic conditions, security settings regarding these information, etc.

### 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/CD/SD and additional logical relations and metadata related to the subsets

Note 1 to entry: The application may subsequently process the RD to build final recommendation for the user.

### 3.6

#### **user**

human or a software agent, an industrial process or a 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, e.g. device in use, physical location, etc.

### 3.9

#### **application**

an entity in charge of responding to the user's requests (e.g. an interface allowing users to choose their preferred programs on a Smart TV)

### 3.10

#### **UD/CD/SD managers**

entities that provide functionalities of filtering, accessing, storing, editing, updating and securing UD/CD/SD

### 3.11

#### **recommendation engine**

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

## 4 General description

This clause specifies Common Types (CT). This technology is available as presented in Annex A and the classification schemes are detailed in Annex B.

### 4.1 General description tools

#### 4.1.1 commonAttributes

This `commonAttributes` can be used to describe properties of each sub element for UD, CD, SD and RD.

##### 4.1.1.1 Syntax

```
<attributeGroup name="commonAttributes">
  <attribute name="generatedTime" type="dateTime"/>
</attributeGroup>
```

##### 4.1.1.2 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.

##### 4.1.1.3 Examples

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

#### 4.1.2 Value types

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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.

##### 4.1.2.1 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>
```

```

    </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"/>
    <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>

```

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**4.1.2.2 Semantics**

<i>Name</i>	<i>Definition</i>
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’s place 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 difference 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

Name	Definition
	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, <b>only one of ZeroToOneRatio or ZeroToOnehundredRatio element shall be instantiated.</b>
normalizedOrdinalValueType	Describes the normalized ordinal value. Based on this type, <b>only one of ZeroToTenOrdinal or ZeroToOnehundredOrdinal element shall be instantiated.</b>

#### 4.1.2.3 Examples

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

#### 4.1.3 TimeType

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

##### 4.1.3.1 Syntax

```
<complexType name="TimeType">
  <sequence>
    <element name="startTime" type="dateTime"/>
```