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AMENDMENT 2
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Information technology — Multimedia framework (MPEG-21)

Part 3: Digital Item Identification

AMENDMENT 2: Digital item semantic relationships

Technologies de l'information — Cadre multimédia (MPEG-21)

Partie 3: Identification des éléments numériques

AMENDEMENT 2: Relations sémantiques des éléments numériques

Reference number
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Foreword

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

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

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

Amendment 2 to ISO/IEC 21000-3:2003 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

This Amendment provides MPEG-21 DII with the ability to explicitly and unambiguously describe existing relationships between different MPEG-21 Digital Items. It also conveys the base inter-DI relationship taxonomy in the form of an RDF/OWL ontology.

Information technology — Multimedia framework (MPEG-21)

Part 3:
Digital Item Identification

AMENDMENT 2: Digital item semantic relationships

In Clause 1 insert a new bullet containing the following text:

— How to express the relationship between two Digital Items

In 3.1, insert the definition for the term "Inter-DI Relationship" as follows:

Inter-DI Relationship
any form of logical connection or association between two Digital Items, pertaining to the semantics of the role that one DI plays towards another DI

Move 4.3 and all following 4.x one point up (for instance, 4.3 becomes 4.4, etc).

After 4.2, insert 4.3:

4.3 `Relationships` Element

The **`Relationships`** element is intended to enable the description of one, or more, relationships between properly identified Digital Items. Each such relationship logically connects two DIs (referring them through their DII identifiers), to each other through a specific, directional logical connection of the *subject-predicate-object* type. One of the DIs plays the role of the *subject*, the other DI plays the role of the *object* and the relationship itself plays the role of the logical *predicate* that relates *subject* to *object*.

One example of such a relationship is that which exists between a "Book DI" and its corresponding "Errata DI". The "Errata DI" is the *subject* in a "correction" relationship (or *predicate*) where the "Book DI" is the *object*.

4.3.1 Syntax

```
<xs:element name="Relationships">
   <xs:complexType mixed="true">
      <xs:sequence>
         <xs:element
            xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax- ns#"
            ref="rdf:RDF" minOccurs="1" maxOccurs="1"/>
      </xs:sequence>
   </xs:complexType>
</xs:element>
```

A **`Relationship`** element has to appear as a child of a **`Statement`** element (defined in MPEG-21 DID on ISO/IEC 21000-2).

4.3.2 Semantics

The **Relationships** element allows the semantically precise definition of any number of inter-DI relationships. Together, these relationships form the relational context of the Digital Item that this information is associated to.

The content of the **Relationships** element is RDF/OWL metadata, which performs the actual description of inter-DI relationships.

To be in accordance with this clause, this metadata must conform to a universal (MPEG-21 wide) ontology, termed, **MPEG-21 Core Ontology for DI Relationships** (MPEG-21 CODIR), defined in 4.3.3.

4.3.3 MPEG-21 Core Ontology for DI Relationships

```
<?xml version="1.0"?>
<!DOCTYPE rdf:RDF [
   <!ENTITY owl "http://www.w3.org/2002/07/owl#" >
   <!ENTITY xsd "http://www.w3.org/2001/XMLSchema#" >
   <!ENTITY owl2xml "http://www.w3.org/2006/12/owl2-xml#" >
   <!ENTITY rdfs "http://www.w3.org/2000/01/rdf-schema#" >
   <!ENTITY rdf "http://www.w3.org/1999/02/22-rdf-syntax-ns#" >
   <!ENTITY mpeg21coreRelOnt "mpeg21:corerelationalontology" >
]>

<rdf:RDF xmlns="mpeg21:corerelationalontology"
   xml:base="mpeg21:corerelationalontology"
   xmlns:owl2xml="http://www.w3.org/2006/12/owl2-xml#"
   xmlns:mpeg21coreRelOnt="mpeg21:corerelationalontology"
   xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
   xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
   xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
   xmlns:owl="http://www.w3.org/2002/07/owl#">
   <owl:Ontology rdf:about="mpeg21:corerelationalontology"/>

   <!-- Classes -->
   <owl:Class rdf:about="mpeg21:corerelationalontology;DigitalItem"/>
   <owl:Class rdf:about="&owl;Thing"/>

   <!-- Object Properties -->
   <owl:ObjectProperty rdf:about="&mpeg21coreRelOnt;interDIRelationship">
      <rdfs:domain rdf:resource="&mpeg21coreRelOnt;DigitalItem"/>
      <rdfs:range rdf:resource="&mpeg21coreRelOnt;DigitalItem"/>
   </owl:ObjectProperty>
</rdf:RDF>
```


The **MPEG-21 Core Ontology for DI Relationships** (textually presented above and graphically depicted in Figure AMD2.1) only defines the fundamental taxonomy of possible inter-DI relationships. It may and should be extended by other domain-specific ontologies, which will add the taxonomic definition for their domain specific inter-DI relationships.

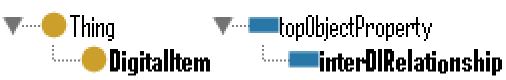

Figure AMD2.1 — MPEG-21 CODIR's Graphical Depiction

In 4.4, replace the existing schema definition with the following:

```
<?xml version="1.0"?>
<!--##############################################################-->
<!--                                                              -->
<!--                XML Schema for ISO/IEC 21000-3                -->
<!--                                                              -->
<!--##############################################################-->

<xsd:schema xmlns:xsd="http://www.w3.org/2001/XMLSchema"
   xmlns="urn:mpeg:mpeg21:2002:01-DII-NS"
   targetNamespace="urn:mpeg:mpeg21:2002:01-DII-NS"
   version="0.02">

   <!--########################################
       ISO/IEC 21000-3 Identifier Element
       ########################################-->

   <xsd:element name="Identifier" type="xsd:anyURI"/>

   <!--##############################################
       ISO/IEC 21000-3 Related Identifier Element
       ##############################################-->

   <xsd:element name="RelatedIdentifier">
      <xsd:complexType>
         <xsd:simpleContent>
            <xsd:extension base="xsd:anyURI">
               <xsd:attribute name="relationshipType" type="xsd:anyURI"/>
            </xsd:extension>
         </xsd:simpleContent>
      </xsd:complexType>
   </xsd:element>

   <!-- ############################################### -->
       ISO/IEC 21000-3 Relationships Element
       ############################################### -->

   <xsd:element name="Relationships">
      <xsd:complexType mixed="true">
         <xsd:sequence>
          <xsd:element
                xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
                ref="rdf:RDF" minOccurs="1" maxOccurs="1"/>
         </xsd:sequence>
      </xsd:complexType>
   </xsd:element>


   <!--##########################################
       ISO/IEC 21000-3 Type Element
       ##########################################-->

   <xsd:element name="Type" type="xsd:anyURI"/>
</xsd:schema>
```

Add a new informative Annex E between current Annexes D and E as follows. Renumber Annex E as Annex F and change all references accordingly:

Annex E
(informative)

`Relationships` Element Employment Example

E.1 Overview

The present Annex provides an example of a typical employment of the `Relationships` element, and associated provisions.

E.2 presents a sample ontology which extends the CODIR ontology and E.3 depicts the expression of a DI's relational context through the employment of the defined sample ontology and the `Relationships` element.

E.2 Sample Extending Ontology

The core taxonomy of inter-DI relationships defined in MPEG-21 CODIR may be extended to support any set of relationships. Figure E.1 depicts an ontology defining such a possible set.

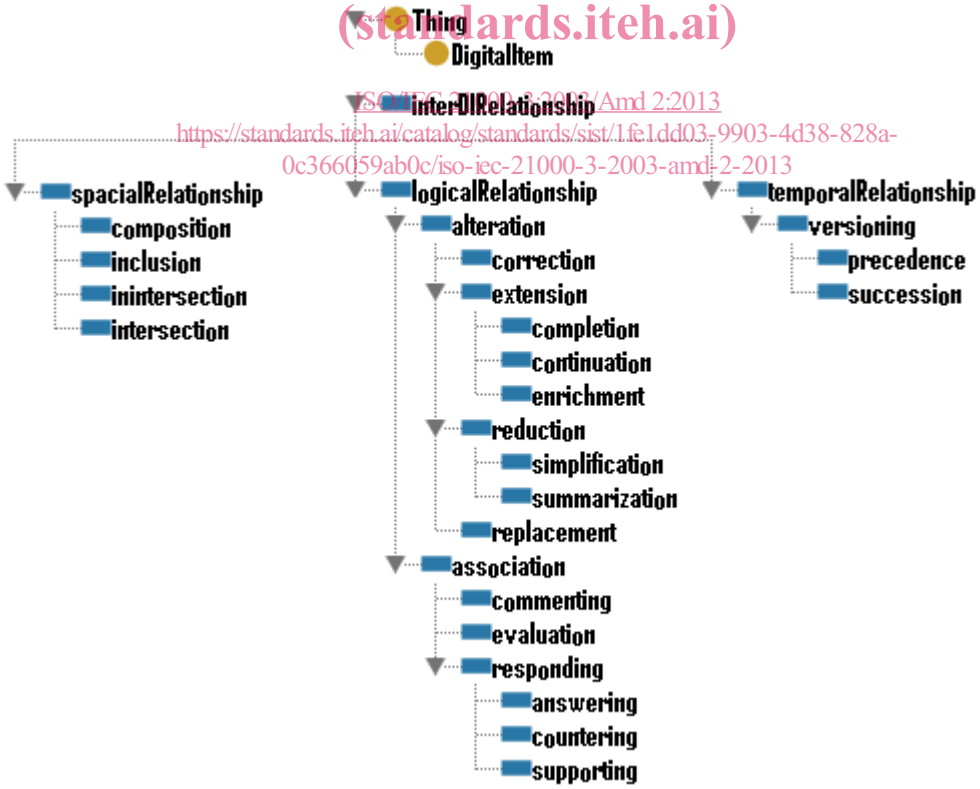

Figure E.1 — Relationship Ontology extending MPEG-21 CODIR

Within the ontology presented in Figure E.1, the **`interDIRelationship`** property, from MPEG-21 CODIR, is extended by three base types of inter-DI relationships, each of which further contains a number of relationship sub-types.

The rationale behind the mentioned ontology, and its base types, is the following:

- DIs have no physical body, and thus, occupy no physical space. Still, they do exist, and as such, must have a body of some type. It is a virtual body composed by all the abstract pieces of information (not to confuse with concrete files), that make up the DI. The DI's space consists of the portion of the space of all-possible-information that is occupied by the DI's constituting information. The DI's time consists of the time span through which the DIs existence lasts. In light of this, the following base inter-DI relationships may be defined:
    - spacialRelationship – a relationship pertaining to the spatial dimension of DIs. For instance, the "body" (set of all the pieces of information that compose a DI) of a Musical Album DI contains the "bodies" of all of its Musical Track DIs. Given that their bodies exist in a space (even if an abstract one), intersection, composition, etc, relationships between DI bodies are actually relationships between those bodies' spaces.
    - temporalRelationship – a relationship pertaining to the temporal dimension of DIs. A DI *A* which begun its existence prior to a DI *B*, may be said to maintain a relationship of precedence towards DI *B*.
    - logicalRelationship – a relationship pertaining to the logical dimension of DIs. These are not relationships between the abstract "physical" bodies of DI, but are conceptual relationships between DIs, that inter-relate them in regards to their meaning.

The textual (RDF/OWL) definition of the above introduced ontology is presented below.

```
<?xml version="1.0"?>
<!DOCTYPE rdf:RDF [
    <!ENTITY owl "http://www.w3.org/2002/07/owl#" >
    <!ENTITY xsd "http://www.w3.org/2001/XMLSchema#" >
    <!ENTITY rdfs "http://www.w3.org/2000/01/rdf-schema#" >
    <!ENTITY rdf "http://www.w3.org/1999/02/22-rdf-syntax-ns#" >
    <!ENTITY mpeg21coreRelOnt "mpeg21:corerelationalontology#" >
    <!ENTITY samplExtOnt "sample:extension:ontology#" >
]>

<rdf:RDF xmlns="sample:extension:ontology#"
     xml:base="sample:extension:ontology"
     xmlns:samplExtOnt="sample:extension:ontology#"
     xmlns:mpeg21coreRelOnt="mpeg21:corerelationalontology#"
     xmlns:xsd="http://www.w3.org/2001/XMLSchema#"
     xmlns:rdfs="http://www.w3.org/2000/01/rdf-schema#"
     xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
     xmlns:owl="http://www.w3.org/2002/07/owl#">
    <owl:Ontology rdf:about="sample:extension:ontology">
        <owl:imports rdf:resource="mpeg21:corerelationalontology"/>
    </owl:Ontology>

    <owl:ObjectProperty rdf:about="&mpeg21coreRelOnt;interDIRelationship"/>

    <owl:ObjectProperty rdf:about="&samplExtOnt;alteration">
        <rdfs:subPropertyOf
           rdf:resource="&samplExtOnt;logicalRelationship"/>
    </owl:ObjectProperty>

    <owl:ObjectProperty rdf:about="&samplExtOnt;answering">
        <rdfs:subPropertyOf rdf:resource="&samplExtOnt;responding"/>
    </owl:ObjectProperty>

    <owl:ObjectProperty rdf:about="&samplExtOnt;association">
        <rdfs:subPropertyOf
           rdf:resource="&samplExtOnt;logicalRelationship"/>
    </owl:ObjectProperty>
```


