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Information technology — Multimedia framework (MPEG-21) —

Part 4: Intellectual Property Management and Protection Components

Technologies de l'information — Cadre multimédia (MPEG-21) — Partie 4: Composants de gestion et de protection de propriété intellectuelle

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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

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

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

ISO/IEC 21000-4 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 21000 consists of the following parts, under the general title *Information technology — Multimedia framework (MPEG-21)*:

— *Part 1: Vision, Technologies and Strategy* [Technical Report]

— *Part 2: Digital Item Declaration*

— *Part 3: Digital Item Identification*

— *Part 4: Intellectual Property Management and Protection Components*

— *Part 5: Rights Expression Language*

— *Part 6: Rights Data Dictionary*

— *Part 7: Digital Item Adaptation*

— *Part 8: Reference Software*

— *Part 9: File Format*

— *Part 10: Digital Item Processing*

— *Part 11: Evaluation Tools for Persistent Association Technologies* [Technical Report]

— *Part 12: Test Bed for MPEG-21 Resource Delivery* [Technical Report]

— *Part 15: Event Reporting*

— *Part 16: Binary Format*

— *Part 17: Fragment Identification of MPEG Resources*

The following parts are under preparation:

— *Part 14: Conformance Testing*

— *Part 18: Digital Item Streaming*

Introduction

The appetite of end users for content and the accessibility of information is growing at an incredible pace. Access devices with a wide range of terminal and network capabilities are becoming an integral part of end users' lives; furthermore, these devices are used in different locations and environments. As yet, users are not sufficiently empowered with the necessary tools to deal efficiently with the intricacies of this new multimedia usage environment.

The enabling of "ease of use" is becoming increasingly important as individuals produce more and more digital media for personal use and for sharing among family and friends (as is evidenced by the large number of amateur music, photo and media sharing web sites). These amateur "content providers" have many of the same concerns as commercial content providers, including management of content, re-purposing of content based on consumer/device capabilities, protection of rights, protection from unauthorized access/modification, privacy protection for providers and consumers, etc.

Such developments provide new models for distributing and trading digital content electronically in addition to existing business models for trading physical goods. Such new business models mean that the boundaries between the delivery of audio sound (music and spoken word), accompanying artwork (graphics), text (lyrics), video (visual) and synthetic spaces will become increasingly blurred. Indeed, it is becoming more and more difficult to identify the different intellectual property rights that are associated with multimedia content. New solutions are required to manage the access and delivery process of these different content types in an integrated and harmonized way, entirely transparent to the user of multimedia services.

With this motivation, the ISO/IEC 21000 MPEG-21 Multimedia Framework aims to enable the transparent and augmented use of multimedia resources across a wide range of networks and devices. This fourth part of ISO/IEC 21000 aims to address the need for effective management and protection of intellectual property in the Multimedia Framework over heterogeneous access and delivery infrastructures. It specifies components for Intellectual Property Management and Protection (IPMP) applied to Digital Items (see ISO/IEC 21000-2) to facilitate the exchange of governed content between peers.

Information technology — Multimedia framework (MPEG-21) —

Part 4:
Intellectual Property Management and Protection Components

1 Scope

This part of ISO/IEC 21000 specifies how to include IPMP information and protected parts of Digital Items in a DIDL document. It purposely does not specify protection measures, keys, key management, trust management, encryption algorithms, certification infrastructures or other components that would also be needed as part of a complete IPMP solution.

The IPMP DIDL encapsulates and protects a part of the hierarchy of a Digital Item, and associates appropriate identification and protection information with it. The description of IPMP governance and tools is required to satisfy IPMP for a Digital Item or its parts to be accessed.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 21000 (all parts), *Information technology — Multimedia framework (MPEG-21)*

W3C REC-xml-20040204, *Extensible Markup Language (XML) 1.0 (Third Edition)*, W3C Recommendation 4 February 2004, available at <http://www.w3.org/TR/2004/REC-xml-20040204>.

W3C REC-xmlschema-1-20041028, *XML Schema Part 1: Structures Second Edition*, W3C Recommendation 28 October 2004

W3C REC-xmlschema-2-20041028, *XML Schema Part 2: Datatypes Second Edition*, W3C Recommendation 28 October 2004

Canonical XML Version 1.0, W3C Recommendation, 15 March 2001

IETF RFC 3986, Uniform Resource Identifiers (URI): Generic Syntax, January 2005

IETF RFC 2616, *Hypertext Transfer Protocol — HTTP/1.1*, IETF Request for Comments: 2616, June 1999

XMLDSIG, XML-Signature Syntax and Processing, W3C Recommendation, 12 February 2002, available at <http://www.w3.org/TR/2002/REC-xmldsig-core-20020212>.

3 Terms and definitions, symbols, abbreviated terms

3.1 Terms and definitions

For the purposes of this part of ISO/IEC 21000, the following terms and definitions apply.

3.1.1
contents
part of the hierarchy of a Digital Item, which may be an embedded resource or a section of the DIDL structure itself, which may be governed and subject to protection

3.1.2
protection
technical measures for the preservation of confidentiality, integrity and/or availability

3.1.3
governance
specification of and compliance with constraints imposed by a user on creation, distribution, processing and other actions on Digital Items (including its parts: DID, resources and metadata)

3.1.4
representation
specification of normative syntax and semantics of XML elements and attributes representing the entities of the DID Model, providing for the expression of a Digital Item in XML

3.1.5
peer
device or application that compliantly process SPS a Digital Item

[ISO/IEC 21000-1:2004]

NOTE A peer is a device or application that compliantly processes a Digital Item.

3.1.6
license rights expression
expression that is created by principals to conditionally or unconditionally permit the same or other principals to perform rights upon resources

[ISO/IEC 21000-5:2004]

3.1.7
principal
system entity defined by an r: principal

[ISO/IEC 21000-5:2004]

3.1.8
conditionally
in a manner subject to a condition

[ISO/IEC 21000-5:2004]

3.1.9
unconditionally
unconditionally as defined in ISO/IEC 21000-5 in a manner not subject to a condition

[ISO/IEC 21000-5:2004]

3.1.10
clear
in an unprotected form (see 3.1.13)

3.1.11
governed
subject to governance (see 3.1.3)

3.1.12
protected
subject to protection (see 3.1.2)

3.1.13
ungoverned
not subject to governance (see 3.1.3)

3.1.14
unprotect
the authorized removal of protection (see 3.1.2)

3.1.15
unprotected
not subject to protection (see 3.1.2)

3.2 Symbols and abbreviated terms

For the purposes of this part of ISO/IEC 21000, the following symbols and abbreviated terms apply.

3.2.1
DI
Digital Item

3.2.2
DID
Digital Item Declaration [ISO/IEC 21000-2]

3.2.3
DIDL
Digital Item Declaration Language [ISO/IEC 21000-2]

3.2.4
DII
Digital Item Identification [ISO/IEC 21000-3]

3.2.5
IPMP
Intellectual Property Management and Protection

3.2.6
MPEG
Moving Picture Experts Group

3.2.7
MIME
Multipurpose Internet Mail Extensions

3.2.8
RDD
Rights Data Dictionary [ISO/IEC 21000-6]

3.2.9
REL
Rights Expression Language [ISO/IEC 21000-5]

3.2.10
URI
Uniform Resource Identifier [IETF RFC 3986]

3.2.11
URL
Uniform Resource Locator [IETF RFC 3986]

3.2.12
XML
Extensible Markup Language [W3C REC-xml-20040204]

4 IPMP Components Overview

4.1 Organization of the specification

This part of ISO/IEC 21000 describes the IPMP Components of the ISO/IEC 21000 standard. In sequence, each component is described by the following subclauses:

— Syntax: Normative XML specification of the tool.

— Semantic: Normative definition of the semantics of all the components of the corresponding tool.

— Informative examples: Optionally, an informative subclause giving examples of description.

4.2 Overview of IPMP Components

The aim of ISO/IEC 21000-4 Intellectual Property Management and Protection (IPMP) Components is to allow controls on the flow and usage of Digital Items throughout their lifecycle.

It exists in two parts:

— IPMP Digital Item Declaration Language, which provides for a protected Representation of the DID model, allowing DID hierarchy which is encrypted, digitally signed or otherwise governed to be included in a DID document in a schematically valid manner.

These are covered in clauses;

- IPMP Digital Item Declaration Language Overview (clause 5),
- IPMP Digital Item Declaration Representation (clause 6), and
- **(informative)**

  Processing IPMP DIDL Elements (Annex D)

of this part of ISO/IEC 21000.

— IPMP Information schemas, defining structures for expressing information relating to the protection of content, including tools, mechanisms and licenses. The IPMP information part specified in ISO/IEC 21000-4 is flexible enough to signal protection information for the digital media which is NOT declared by DIDL model as well.

These are covered in clauses;

- IPMP Information Descriptor (clause 7), and
- IPMP General Information Descriptor (clause 8)

of this part of ISO/IEC 21000.

4.3 Relationship between IPMP Components and other parts of ISO/IEC 21000

4.3.1 Introduction

The fundamental unit of transfer in the MPEG-21 Multimedia Framework is the Digital Item. The parts of ISO/IEC 21000 deal with different aspects of Digital Items, and together facilitate the complete MPEG-21 Multimedia Framework. It is therefore crucial to understand the relationship between the parts to be able to achieve an interoperable framework. The following subclauses describe the relation between IPMP Components and the other parts of ISO/IEC 21000.

4.3.2 Relationship between IPMP Components and ISO/IEC 21000-2 Digital Item Declaration

The Digital Item Declaration (DID) specification (ISO/IEC 21000-2) defines entities in the DID model, which are used to unambiguously express the structure and content of a Digital Item in the MPEG-21 Multimedia Framework. The Digital Item Declaration Language (DIDL) provides a normative Representation for Digital Items using XML, defined by DIDL elements and attributes which correspond to entities in the DID model.

As a Digital Item expressed in DIDL is a clear XML document, the Contents of a Digital Item represented entirely in DIDL are exposed. IPMP Components provides an alternative normative Representation for parts of Digital Items that require protection through IPMP governance. This Representation is termed the IPMP Digital Item Declaration Language (IPMP DIDL), and defines governed XML elements corresponding to entities in the DID model. Each of these IPMP DIDL elements is intended to link a corresponding DIDL element (which may be encrypted) with information about the governance, so that the Digital Item or part of Digital Item thus represented is used in accordance with the Digital Item author's wishes.

4.3.3 Relationship between IPMP Components and ISO/IEC 21000-3 Digital Item Identification

ISO/IEC 21000-3 (DII) specifies the syntax and semantics of identifiers that can be associated with Digital Items and parts thereof, by inclusion in a specific place within the Digital Item structure. Since the use of IPMP DIDL to govern parts of Digital Item may hide, or prevent access to identifiers located within that hierarchy, IPMP DIDL specifies a location for such DII identifiers to be placed when the IPMP-governed hierarchy itself must be identifiable (for example, from an REL License that references the governed content).

4.3.4 Relationship between IPMP Components and ISO/IEC 21000-5 Rights Expression Language

ISO/IEC 21000-5 (REL) specifies the syntax and semantics of a Rights Expression Language, which expresses the rights a User may have to act on assets, such as Digital Items or parts thereof. One important concept in REL is the License. A License is defined as an expression that is created by Principals to Conditionally or Unconditionally permit the same or other Principals to perform Rights upon resources.

IPMP defines how rights expressions, protected or unprotected, can be unambiguously associated with their target. In particular, rights expressions can be associated to Digital Items in four different ways. They can:

- Be included in a Digital Item
- Be referenced from within a Digital Item
- Be referenced from within a Digital Item via a license service
- Reference the Digital Item from the rights expression

IPMP also defines how to specify the location from which applicable licenses can be retrieved and the method or process for acquiring them.

4.3.5 Relationship between IPMP Components and ISO/IEC 21000-7 Digital Item Adaptation

The Digital Item Adaptation specification (ISO/IEC 21000-7) specifies metadata that is used to guide the adaptation of Digital Items and their component resources. While ISO/IEC 21000-5 and ISO/IEC 21000-6 provide tools to permit playing, modifying, and adapting Digital Items and their component resources with coarse control, ISO/IEC 21000-7 provides tools for use with ISO/IEC 21000-5 to enable finer-grained control over the changes that can occur. Since it is the aim of IPMP Components to allow control on the flow and usage of Digital Items throughout their lifecycle, it is important to maintain the integrity of this metadata and ensure that it is not tampered with. Furthermore, ISO/IEC 21000-7 also specifies potentially sensitive metadata that is used to personalize Digital Items for particular Users, including end-user information and preferences. The protection of such metadata contained within a Digital Item is also achieved by the IPMP Components specification.

4.4 Namespaces and conventions

4.4.1 Namespaces

The IPMP DIDL namespace shall be `urn:mpeg:mpeg21:2004:01-IPMPDIDL-NS`. The IPMP Information Descriptor and General Information Descriptor namespace shall be `urn:mpeg:mpeg21:2004:01-IPMPINFO-NS`.

4.4.2 Namespace conventions

Throughout this part of ISO/IEC 21000, Qualified Names are written with a namespace prefix followed by a colon followed by the local part of the Qualified Name.

For clarity, throughout this part of ISO/IEC 21000, consistent namespace prefixes are used. Table 1 gives these prefixes and the corresponding namespace.

Table 1 — Mapping of prefixes to namespaces in examples and text

Prefix	Corresponding namespace
ipmpdidl	urn:mpeg:mpeg21:2004:01-IPMPDIDL-NS
ipmpinfo	urn:mpeg:mpeg21:2004:01-IPMPINFO-NS
didl	urn:mpeg:mpeg21:2002:02-DIDL-NS
didmodel	urn:mpeg:mpeg21:2002:02-DIDMODEL-NS
dii	urn:mpeg:mpeg21:2002:01-DII-NS
r	urn:mpeg:mpeg21:2003:01-REL-R-NS
xsd	http://www.w3.org/2001/XMLSchema
xsi	http://www.w3.org/2001/XMLSchema-instance
dsig	http://www.w3.org/2000/09/xmldsig#

5 IPMP Digital Item Declaration Language Overview

5.1 Introduction

As defined in ISO/IEC 21000-2, Digital Item Declarations are XML 1.0 documents. The reader is assumed to be familiar with the terms and concepts of XML 1.0.

The communication of IPMP governance on a part of the hierarchy of a Digital Item (including the entirety of it) is achieved by the use of IPMP Digital Item Description Language (IPMP DIDL), a Representation of the Digital Item Description (DID) model defined in ISO/IEC 21000-2. The purpose of this clause is to describe the

syntax and semantics of the W3C XML representation for declaring governed Digital Items. The IPMP DIDL encapsulates and protects a part of the hierarchy of a Digital Item, and associates appropriate identification and protection information with it. The syntax is defined using XML schema (as specified in W3C XMLSCHEMA). For the purposes of this document, the XML schema syntax descriptions are also collectively referred to as IPMP DIDL schema.

IPMP DIDL elements are part of the namespace URI defined as "`urn:mpeg:mpeg21:2004:01-IPMPDIDL-NS`". The "01" represents a serial number that is expected to change as the IPMP DIDL schema evolves along with this part of ISO/IEC 21000.

Note: In this part of ISO/IEC 21000, `ipmpdidl` is used as the namespace prefix associated with the IPMP DIDL namespace.

5.2 Schema wrapper

The syntax of description tools specified in clause 6 is provided as a collection of schema components, consisting notably in type definitions and element declarations. In order to form a valid schema document, these schema components should be gathered in a schema document with the following declaration defining in particular the target namespace and the namespaces prefixes.

```
<?xml version="1.0"?>
<!--=========================================-->
<!--=====Schema for IPMP DIDL Types========-->
<!--=========================================-->
<schema targetNamespace="urn:mpeg:mpeg21:2004:01-IPMPDIDL-NS" elementFormDefault="qualified"
    attributeFormDefault="unqualified" version="0.01" xmlns="http://www.w3.org/2001/XMLSchema"
    xmlns:didmodel="urn:mpeg:mpeg21:2002:02-DIDMODEL-NS" xmlns:ipmpdidl="urn:mpeg:mpeg21:2004:01-
IPMPDIDL-NS">
    <import schemaLocation="didmodel.xsd" namespace="urn:mpeg:mpeg21:2002:02-DIDMODEL-NS"/>
    <import schemaLocation="didl.xsd" namespace="urn:mpeg:mpeg21:2002:02-DIDL-NS"/>
```


Additionally, the following line should be appended to the resulting schema document in order to obtain a well-formed XML document.

```
</schema>
```

6 IPMP Digital Item Declaration Representation

6.1 Introduction

For each entity in the DID model, an IPMP DIDL element is provided as a protected Representation of that entity, derived from the abstract DID model types as defined in the DID model schema in ISO/IEC 21000-2. The relationship between the schemas for IPMP DIDL, DIDL and the DID model is shown below.