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Information technology — Multimedia framework (MPEG-21) —

Part 8:
Reference software

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

Partie 8: Logiciel de référence

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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 21000-8 was prepared by Joint 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 21000-8:2006), which has been technically revised.

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 14: Conformance Testing*

— *Part 15: Event Reporting*

— *Part 16: Binary Format*

— *Part 17: Fragment Identification of MPEG Resources*

— *Part 18: Digital Item Streaming*

Introduction

The multimedia industry is increasing at a rapid pace. For this industry, the term "content" is widely used across different segments and applied in many different ways. For this reason the term is deliberately avoided within the context of ISO/IEC 21000 International Standards, where it has been replaced by the defined terms "Digital Item", "media resource" and "resource". Of equal importance for the specifications of the multimedia framework is the notation of the User. A User of a system includes all members of the value chain (i.e. creator, rights holders, distributors and consumers of Digital Items).

This eighth part of ISO/IEC 21000 describes the reference software. The reference software of ISO/IEC 21000 serves three main purposes:

— validation of the written specification of the several parts of ISO/IEC 21000;

— clarification of the written specification of the several parts of ISO/IEC 21000; and

— conformance testing for checking interoperability for the various applications against the reference software which aims to be compliant with ISO/IEC 21000.

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Information technology — Multimedia framework (MPEG-21) —

Part 8:
Reference software

1   Scope

This International Standard describes reference software implementing the normative clauses of the other parts of ISO/IEC 21000. The information provided is applicable for determining the reference software modules available for parts of ISO/IEC 21000, understanding the functionality of the available reference software modules, and utilizing the available reference software modules.

In addition to the reference software, available (integrated) utility software that utilizes the reference software is also described. This utility software can assist in understanding how to utilize the reference software, as well as providing further insight into the applicable parts of ISO/IEC 21000, e.g. informative clauses of the other parts of ISO/IEC 21000.

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/corrigenda) applies.

ISO/IEC 15938-5, *Information technology — Multimedia content description interface — Part 5: Multimedia description schemes*

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

3   Terms, definitions and abbreviated terms

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

3.1   Terms and definitions

3.1.1
module
software component implementing **reference software** or **utility software**

3.1.2
reference software
one or more **module**s utilizing normative parts of ISO/IEC 21000

3.1.3
utility software
one or more **module**s utilizing informative parts of ISO/IEC 21000 and/or the usage of **reference software** within real-world applications

3.2 Abbreviated terms

API   Application Programming Interface
DI   Digital Item
DIA   Digital Item Adaptation
DID   Digital Item Declaration
DII   Digital Item Identifier
DIP   Digital Item Processing
IS   International Standard
FDIS   Final Draft International Standard
MPEG   Moving Pictures Expert Group
RDD   Rights Data Dictionary
REL   Rights Expression Language

4   Overview and conventions

4.1   Organization of the document

In the remainder of this part of ISO/IEC 21000, each reference and utility software module is described following the convention as below:

Module Name: *Name of the ZIP file with the following structure: /<directory>/<part>-<module_name>-<implementation>-<version>.zip*

<directory>: directory name in which the module can be found, i.e., 21000-2_DID, 21000-3_DII, 21000-5_REL, 21000-6_RDD, 21000-7_DIA.

<part>: abbreviation of the ISO/IEC 21000 part, i.e., DID, DII, REL, RDD, DIA.

<module_name>: name of the module, e.g., Parser, Validator, etc.

<implementation>: letter A, B, C, etc. for different implementations.

<version>: version number, i.e., n_n_n | n_n | n

Description
Describes the functionality the module provides.

Input
Describes the input of the module.

Output
Describes the output of the module.

Programming Language(s)
Lists the programming language(s) in which the module is written.

Platform(s)
Lists the platforms the module has been tested on and is supposed to run on.

Dependencies
Lists the required libraries and code with version information.

Details
Lists any implementation details, such as architecture diagrams and data flows.

4.2 Overview of ISO/IEC 21000 reference software

This part of ISO/IEC 21000 comprises reference software modules for the following ISO/IEC 21000 parts that have advanced to FDIS or IS status respectively:

— ISO/IEC 21000-2:2005, Information technology — Multimedia framework (MPEG-21) — Part 2: Digital Item Declaration (DID): The corresponding reference software module provides means for parsing DIDs into an internal data structure and checking the validation rules as specified within ISO/IEC 21000-2 Second Edition. The reference software for ISO/IEC 21000-2 Second Edition is described in subclause 5.2.

— ISO/IEC 21000-3:2003, Information technology — Multimedia framework (MPEG-21) — Part 3: Digital Item Identification (DII): The corresponding reference software module provides means for parsing DII information into an internal data structure. The reference software for ISO/IEC 21000-3:2003 is described in subclause 5.3. Furthermore, a reference software module for ISO/IEC 21000-3:2003/Amd.1:2007 is described in subclause 5.4.

— ISO/IEC 21000-4:2006, Information technology — Multimedia framework (MPEG-21) — Part 4: Intellectual Property Management and Protection Components (IPMP Components): The corresponding reference software module provides means for parsing IPMP information into an internal data structure. The reference software for ISO/IEC 21000-4:2006 is described in subclause 5.5. Furthermore, reference software modules for ISO/IEC 21000-4:2006/Amd.1:2007 is described in subclause 5.6.

— ISO/IEC 21000-5:2004, Information technology — Multimedia framework (MPEG-21) — Part 5: Rights Expression Language (REL): The corresponding reference software modules provide means for checking the validity of a REL license as well as the validity of an authorization request according to ISO/IEC 21000-5:2004. Furthermore, they allow for checking if an authorization story is an authorization proof for an authorization request. The reference software for ISO/IEC 21000-5:2004 is described in subclause 5.5.1. Furthermore, reference software modules for ISO/IEC 21000-5:2004/Amd.1:2007 and ISO/IEC 21000-5:2004/Amd.2:2007 are described in subclause 5.8 and 5.9.

— ISO/IEC 21000-6:2004, Information technology — Multimedia framework (MPEG-21) — Part 6: Rights Data Dictionary (RDD): The corresponding reference software module provides means for querying the RDD database for a given input RDD term. It provides the genealogy and the IsTypeOf hierarchy of the term. The reference software for ISO/IEC 21000-6:2004 is described in subclause 5.10.

— ISO/IEC 21000-7:2007, Information technology — Multimedia framework (MPEG-21) — Part 7: Digital Item Adaptation (DIA): The corresponding reference software module provides means for parsing and serializing DIA descriptions as well as retrieving and modifying information within DIA descriptions. Additionally, the reference software modules for ISO/IEC 21000-7:2007 implement the normative behavior of the processes as specified within ISO/IEC 21000-7:2007. The reference software for ISO/IEC 21000-7:2007 is described in subclause 5.11.

— ISO/IEC 21000-9:2005, Information technology — Multimedia framework (MPEG-21) — Part 9: File Format: The corresponding reference software module enables both the creation and reading of MPEG-21 files. The reference software for ISO/IEC 21000-9:2005 is described in subclause 5.12.

— ISO/IEC 21000-10:2006, Information technology — Multimedia framework (MPEG-21) — Part 10: Digital Item Processing (DIP): The corresponding reference software module provides means for parsing DIP information into an internal data structure. The reference software for ISO/IEC 21000-10:2006 is described in subclause 5.13. Additionally, reference software for ISO/IEC 21000-10:2006/Amd.1:2006 provides C++ bindings software in subclause 5.14.

— ISO/IEC 21000-12:2005, Information technology — Multimedia framework (MPEG-21) — Part 12: Test Bed for MPEG-21 Resource Delivery: The corresponding reference software module provides a flexible and fair test environment for evaluating streaming technologies for MPEG-4 contents over IP networks. This test bed has capabilities of simulating different channel characteristics of various networks, therefore, various codec technologies, packetization methods, file formats, multimedia streaming rate control and error control mechanisms could be evaluated. The reference software for ISO/IEC 21000-12:2005 is described in subclause 5.15.

— ISO/IEC 21000-14:2007, Information technology — Multimedia framework (MPEG-21) — Part 14: Conformance Testing: The corresponding reference software modules provide means for testing conformance of ISO/IEC 21000-10:2006 and ISO/IEC 21000-10:2006/Amd.1:2006 information. The reference software for ISO/IEC 21000-14:2007 is described in subclause 5.16.

— ISO/IEC 21000-15:2006, Information technology — Multimedia framework (MPEG-21) — Part 15: Event Reporting (ER): The corresponding reference software modules provide means to support Event Reporting. Furthermore, the reference software schema checker checks a DI against the ER schema and the core experiment software adds ERR processing, ER creation and a new JMF-based video Renderer. The reference software for ISO/IEC 21000-15:2006 is described in subclause 5.17.

— ISO/IEC 21000-16:2005, Information technology — Multimedia framework (MPEG-21) — Part 16: Binary Format. A reference to the reference software for ISO/IEC 21000-16:2005 is described in subclause 5.18.

— ISO/IEC 21000-17:2006, Information technology — Multimedia framework (MPEG-21) — Part 17: Fragment Identification of MPEG resources (FID): The corresponding reference software modules provide means to support Fragment Identification. The reference software for ISO/IEC 21000-17:2006 is described in subclause 5.19.

4.3   Overview of ISO/IEC 21000 utility software

This part of ISO/IEC 21000 comprises utility software modules for the following ISO/IEC 21000 parts that have advanced to FDIS or IS status respectively:

— ISO/IEC 21000-2:2005, Information technology — Multimedia framework (MPEG-21) — Part 2: Digital Item Declaration (DID): The corresponding utility software module provides means for invoking the reference software module for ISO/IEC 21000-2:2005 and presenting results to the user. The utility software for ISO/IEC 21000-2:2005 is described in Annex A.2.

— ISO/IEC 21000-3:2003, Information technology — Multimedia framework (MPEG-21) — Part 3: Digital Item Identification (DII): The corresponding utility software module provides means for invoking the reference software module for ISO/IEC 21000-3:2003 and presenting results to the user. The utility software for ISO/IEC 21000-3:2003 is described in Annex A.3.

— ISO/IEC 21000-5:2004, Information technology — Multimedia framework (MPEG-21) — Part 5: Rights Expression Language (REL): The corresponding utility software module provides a simple license interpreter module, a simple license creator module and a lightweight REL based DRM module implementing a lightweight REL parser system suitable for the use on mobile phones. The utility software for ISO/IEC 21000-5:2004 is described in Annex A.4. Furthermore, utility software modules for ISO/IEC 21000-5:2004/Amd.1:2007 are described in Annex A.5.

— ISO/IEC 21000-6:2004, Information technology — Multimedia framework (MPEG-21) — Part 6: Rights Data Dictionary (RDD): The corresponding utility software modules provide means for browsing terms specified within ISO/IEC 21000-6:2004 and a multilingual registry for the ISO/IEC 21000-6:2004 in five different languages. The utility software for ISO/IEC 21000-6:2004 is described in Annex A.6.

— ISO/IEC 21000-7:2007, Information technology — Multimedia framework (MPEG-21) — Part 7: Digital Item Adaptation (DIA): The corresponding utility software modules provide means for demonstrating informative clauses and Annexes as described in ISO/IEC 21000-7:2007 such as resource and description adaptation engines. The utility software for ISO/IEC 21000-7:2007 is described in Annex A.7.

— ISO/IEC 21000-10:2006/Amd.1:2006, Information technology — Multimedia framework (MPEG-21) — Part 10/Amd 1 Digital Item Processing, Amendment 1: Additional C++ Bindings: The corresponding utility software modules provide means to execute C++ functions on a Java based DIP engine, making use of DIP C++ Bindings and the Java Native Interface. The utility software for ISO/IEC 21000-10:2006/Amd.1:2006 is described in Annex A.8.

4.4 Overview of integrated utility software across the individual ISO/IEC 21000 parts

This part of ISO/IEC 21000 comprises integrated utility software across the individual ISO/IEC 21000 parts that have advanced to FDIS or IS status respectively:

— Two integrated utility software modules utilizing ISO/IEC 21000-5:2004 and ISO/IEC 21000-6:2004 reference and utility software modules are described in Annex B.2.

— One integrated utility software module utilizing ISO/IEC 21000-2:2005 and ISO/IEC 21000-5:2004 reference and utility software modules is described in Annex B.3.

— One integrated utility software module utilizing ISO/IEC 21000-2:2005, ISO/IEC 21000-5:2004, and ISO/IEC 21000-6:2004 reference and utility software modules is described in Annex B.4.

— One integrated utility software module utilizing ISO/IEC 21000-2:2005, ISO/IEC 21000-5:2004, and ISO/IEC 21000-7:2007 reference and utility software modules is described in Annex B.5.

— One integrated utility software module utilizing ISO/IEC 21000-2:2005, ISO/IEC 21000-7:2007, and ISO/IEC 21000-10:2006 reference and utility software modules is described in Annex B.6.

5 Reference software for the ISO/IEC 21000 parts

5.1 Introduction

This clause describes the ISO/IEC 21000 reference software for the parts as listed in subclause 4.2. The ISO/IEC 21000 reference software is written in Java and follows the following package structure:

Name	Description
org	Java package name for reference software provided by organizations such as ISO/IEC, W3C, or similar.
org.iso	Java package name for reference software provided by ISO/IEC.
org.iso.mpeg	Java package name for reference software provided by ISO/IEC JTC 1/SC 29/WG 11.
org.iso.mpeg.mpeg21	Java package name for reference software provided in the course of the development of ISO/IEC 21000. Note: Subsequent packages for the individual ISO/IEC 21000 parts use the uncapitalized abbreviations as defined in subclause 3.2, e.g., — org.iso.mpeg.mpeg21.did for ISO/IEC 21000-2 or — org.iso.mpeg.mpeg21.dia for ISO/IEC 21000-7.

5.2 ISO/IEC 21000-2:2005

5.2.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 2 of ISO/IEC 21000. In order to allow building applications on top of the ISO/IEC 21000-2:2005 reference software an API is provided. In particular, the API exercises or represents all normative features, specified in the ISO/IEC 21000-2:2005 Second Edition specification.

5.2.2 DID Parser Second edition

Module Name: /21000-2_DID/DID-Parser_2nd_Edition-2_0_0.zip
Description
The DID parser checks whether an incoming DID document is valid against the ISO/IEC 21000 DID schema; it also checks whether all validation rules that are defined within the ISO/IEC 21000 DID specification are fulfilled. Prior to schema validation XInclude processing is performed (this can be disabled by setting the system property `dontPreProcessXInclude` to a value of `true`, which can be done by passing a `–DdontPreProcessXInclude=true` argument to the Java JVM when running the software).
Input
A DIDL document
Output
Valid, not valid, reasons why, according to the XInclude processing, XML schema and the additional validation rules of ISO/IEC 21000-2:2005.
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE, XOM and Xerces XML parser.
Dependencies
XOM XML object model library (http://www.cafeconleche.org/XOM/) Apache XercesJ Xerces-2_9_0+ (http://xml.apache.org/xerces2-j/)

5.3 ISO/IEC 21000-3:2003

5.3.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 3 of ISO/IEC 21000. In order to allow building applications on top of the ISO/IEC 21000-3:2003 reference software an API is provided. In particular, the API exercises or represents all normative features, specified in the ISO/IEC 21000-3:2003 specification.

5.3.2   DII Parser

Module Name: **/21000-3_DII/DII-Parser-1_0_0.zip**
Description
The DII reference software demonstrates how DII information can be included in DIDs and how this information can be used to extract relevant DID information based on a DII Identifier, DII RelatedIdentifier or DII Type.
Input
A DIDL document with DII information.
Output
Java objects in memory providing access to the information in the input DII description
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE, Xerces, and kXML parser.
Dependencies
— Java version "1.4.1_02" or later, which can be downloaded from http://java.sun.com/j2se/1.4.2/. — Xerces2 Java Parser 2.6.2 or later, which can be downloaded from http://xml.apache.org/. — kXML 2 release 2.1.9 or later, which can be downloaded from http://www.kxml.org/. — Log4j version 1.2.8 or later, which can be downloaded from http://logging.apache.org/log4j/docs/.
Details

5.4   ISO/IEC 21000-3:2003/Amd.1:2007

Module Name: **/21000-3_DII_Amd1/DII_Amd1-Parser-1_0_0.zip**
Description
The DII reference software demonstrates how DII information can be included in DIDs and how this information can be used to extract relevant DID information based on a DII Identifier, DII RelatedIdentifier or DII Type.
Input
A DIDL document with DII information.

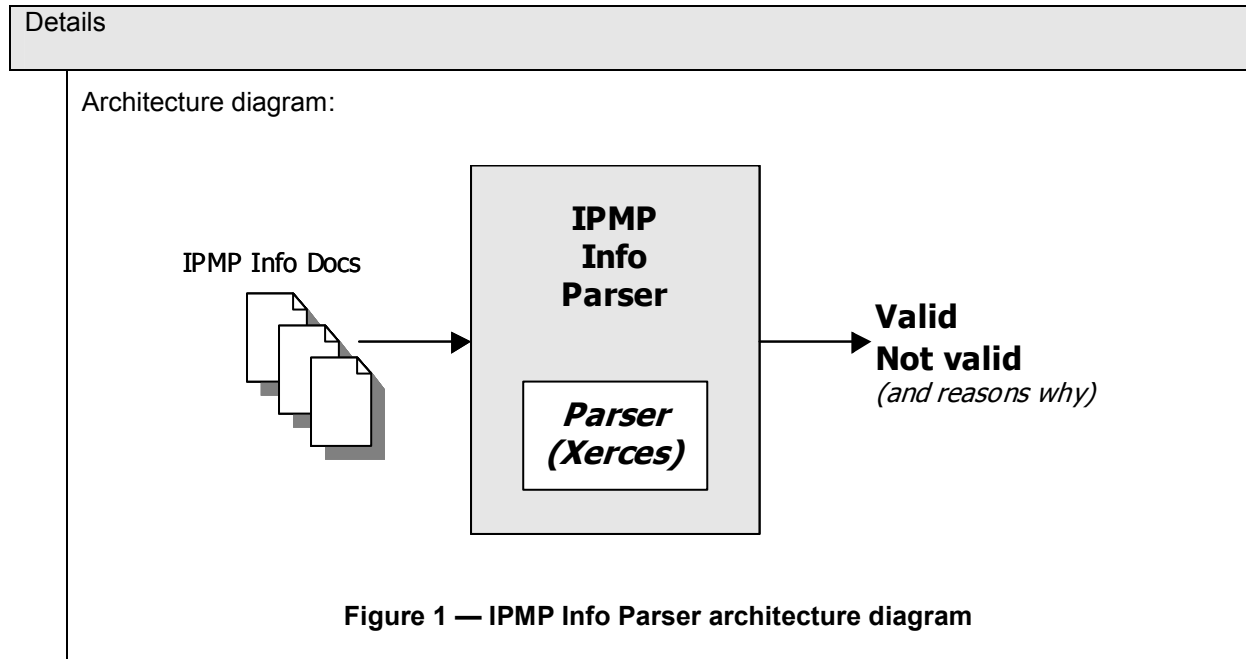| Output	
	Java objects in memory providing access to the information in the input DII description.
Programming Language(s)	
	Java
Platform(s)	
	Any platform supported by the Java J2SE and Xerces XML parser.
Dependencies	
	Apache XercesJ Xerces-2_8_0+ (http://xml.apache.org/xerces2-j/)

5.5 ISO/IEC 21000-4:2006

5.5.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 4 of ISO/IEC 21000. In order to allow building applications on top of the ISO/IEC 21000-4:2006 reference software an API is provided. In particular, the API exercises or represents all normative features, specified in the ISO/IEC 21000-4:2006 specification.

5.5.2 IPMP Info Parser

Module Name: /21000-4_IPMP_Components/IPMP_Info_Parser-1_0_0.zip	
Description	
	The IPMP Info parser module parses and validates an IPMP info documents against the schemas specified within these documents.
Input	
	A list of IPMP info documents and/or directories that contain IPMP info documents.
Output	
	Valid, not valid and reasons why according to the XML schemas specified within the documents.
Programming Language(s)	
	Java
Platform(s)	
	Any platform supported by the Java J2SE and Xerces XML parser.
Dependencies	
	The Xerces XML Java Parser 2.6.2 or later which can be downloaded at http://xml.apache.org.
	The Java J2SE SDK 1.3.1 or later which can be downloaded at http://java.sun.com/j2se/.

Details

Architecture diagram:

Figure 1 — IPMP Info Parser architecture diagram

5.5.3 IPMP Info Extractor

Module Name: /21000-4_IPMP_Components/IPMP_Info_Extractor-1_0_0.zip
Description
The IPMP Info extractor module obtains the IPMP information related to the IPMP DIDL elements within a DIDL document.
Input
DIDL document.
Output
IPMP DIDL elements within the DIDL and related IPMP information.
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE and Xerces XML parser.
Dependencies
The Xerces XML Java Parser 2.6.2 or later which can be downloaded at http://xml.apache.org.
The Java J2SE SDK 1.3.1 or later which can be downloaded at http://java.sun.com/j2se/.