INTERNATIONAL STANDARD

ISO/IEC 21000-8

Second edition
2008-03-01

Information technology — Multimedia framework (MPEG-21) —

Part 8: Reference software

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

Partie 8: Logiciel de référence

Reference number
ISO/IEC 21000-8:2008(E)

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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*

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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

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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.

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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.

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— 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.

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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.

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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.

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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.

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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/.

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Details
Architecture diagram:

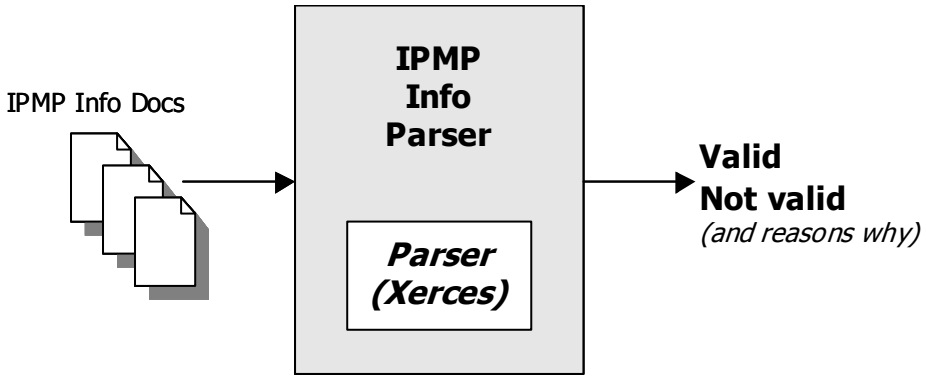

Figure 1 — IPMP Info Parser architecture diagram

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/.

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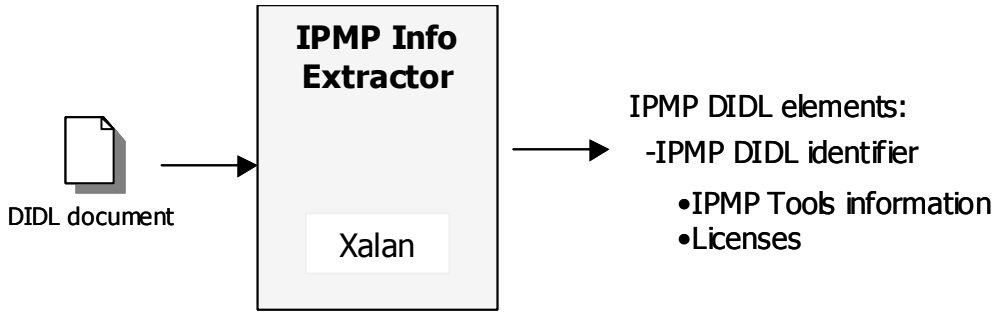
Details
Architecture diagram:  **Figure 2 — IPMP Info Extractor architecture diagram**

5.5.4 IPMP License Extractor

Module Name: /21000-4_IPMP_Components/IPMP_License_Extractor-1_0_0.zip
Description
The License extractor module obtains the license(s) that govern the IPMP DIDL element specified.
Input
— DIDL document — Unique identifier of the element
Output
License(s) that govern the element
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/.

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Details

Architecture diagram:

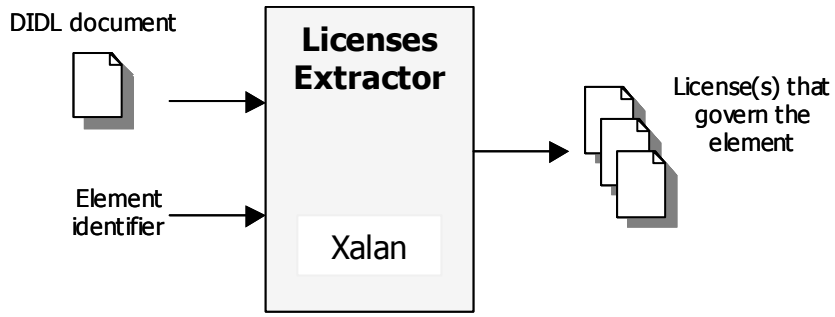

Figure 3 — IPMP License Extractor architecture diagram

5.6 ISO/IEC 21000-4:2006/Amd.1:2007

Module Name: `/21000-4_IPMP_Components_Amd1/IPMP_Amd1-Parser-1_0_0.zip`

Description

Java source code for parsing MPEG-21 IPMP Components Base Profile. The parser checks for:

- all resource expressions
- whether resource is protected or not
- if resource is protected, search the protection tool description
- additionally, any license related to the resource

Input

IPMP base profile instance document

Output

- List of resources
- List of tools associated with the protected resource(s)
- List of licenses (MPEG-21 REL) associated with the resource(s)

Programming Language(s)

Java

Platform(s)

Any platform supported by the Java J2SE.

Dependencies

xercesImpl.jar KXML2.jar xmlParserAPIs.jar

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5.7 ISO/IEC 21000-5:2005

5.7.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 5 of ISO/IEC 21000.

5.7.2 REL schema checker

Module Name: /21000-5_REL/REL-SchemaChecker-A-1_0_0.zip
Description
The schema checker module validates a set of REL Licenses against the XML Schemas specified in the Licenses. It validates syntactically the REL Licenses files and/or the REL Licenses contained in the directory specified by the user.
Input
A list of licenses and/or directories that contain licenses.
Output
Valid, not valid, reasons why, according to the XML schemas specified within the licenses.
Programming Language(s)
C++
Platform(s)
Any platform supported by Microsoft .Net framework (e.g., Windows 98, 2000, NT, ME, XP).
Dependencies
Microsoft .Net Framework, which can be obtained at: http://msdn.microsoft.com/netframework/downloads/howtoget.asp
Details

Module Name: /21000-5_REL/REL-SchemaChecker-B-1_1_0.zip
Description
The schema checker module validates a set of REL Licenses against the XML Schemas specified in the Licenses. It validates syntactically the REL Licenses files and/or the REL Licenses contained in the directory specified by the user.
Input
A list of licenses and/or directories that contain licenses.

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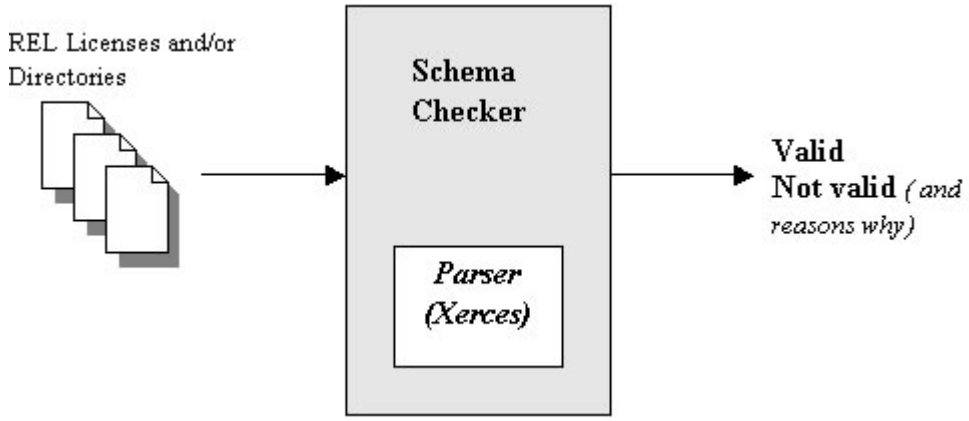
Output
Valid, not-valid, and reasons why, according to the XML schemas specified within the licenses.
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE and Xerces XML parser.
Dependencies
— The Xerces XML Java Parser 2.6.2 or later which can be downloaded at http://xml.apache.org. — The Java J2SE SDK 1.3.1 or later which can be downloaded at http://java.sun.com/j2se/.
Details
Architecture diagram:  **Figure 4 — REL-SchemaChecker-B-1_1_0 architecture diagram**

5.7.3 REL license validation rules checker

Module Name: /21000-5_REL/REL-ValidationRuleChecker-A-1_1_1.zip
Description
The validation rules checker module validates if a schema valid REL license is a valid REL License according to the MPEG-21 REL standard specification. A license will be REL syntactic conformant if it complies with all the rules specified in the REL standard specification.
Input
A schema valid REL license.

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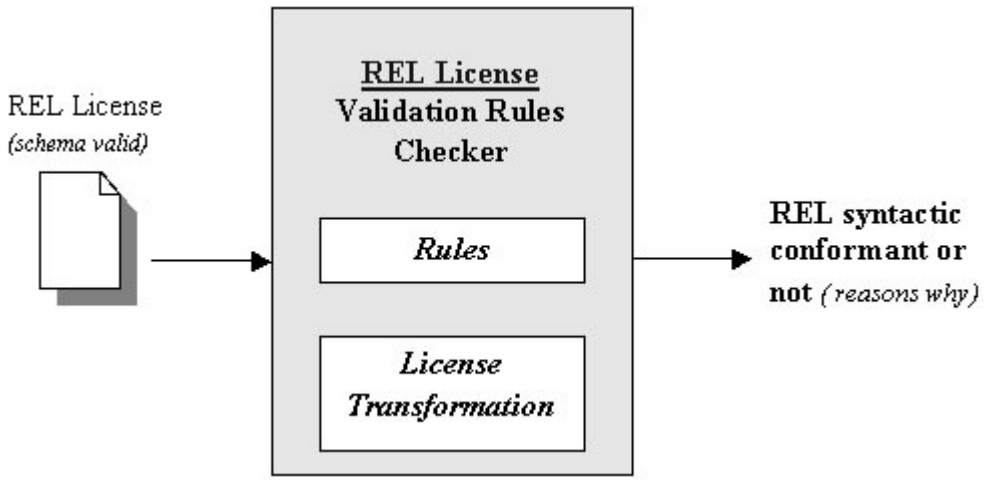
Output
REL syntactic conformant or not, reasons why.
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE and Xerces XML parser.
Dependencies
— The Xerces XML Java Parser 2.6.2 or later which can be downloaded at http://xml.apache.org. — The Java J2SE SDK 1.3.1 or later which can be downloaded at http://java.sun.com/j2se/.
Details
Architecture diagram:  **Figure 5 — REL-ValidationRuleChecker-A-1_1_1 architecture diagram**

5.7.4 REL authorization request validation rules checker

Module Name: /21000-5_REL/REL-AuthorizationRequestValidationRulesChecker-1_0_0.zip
Description
The authorization request validation rules checker module checks if an authorization request is syntactically valid according to the MPEG-21 REL standard specification.
Input
An XML schema valid authorization request.

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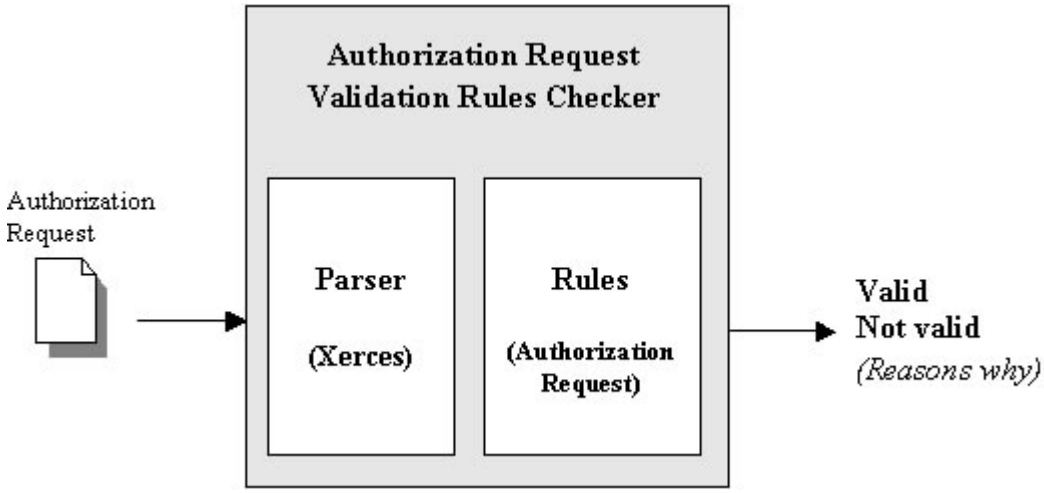
Output
REL validation rule conformant or not, reasons why.
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE and Xerces XML parser.
Dependencies
— The Xerces XML Java Parser 2.6.2 or later which can be downloaded at http://xml.apache.org. — The Java J2SE SDK 1.3.1 or later, which can be downloaded at http://java.sun.com/j2se/.
Details
Architecture diagram:  **Figure 6 — REL-AuthorizationRequestValidationRulesChecker-1_0_0 architecture diagram**

5.7.5 REL interpretation

Module Name: /21000-5_REL/REL-Interpretation-A-1_0_0.zip
Description
The interpretation module checks if the Authorization Story is an Authorization Proof for the Authorization Request. This module implements the authorization proof algorithm in the MPEG-21 REL standard specification.
Input
— Any valid authorization request. — Any valid authorization story.

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Output
Authorization story IS/IS NOT authorization proof for the authorization request.
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:

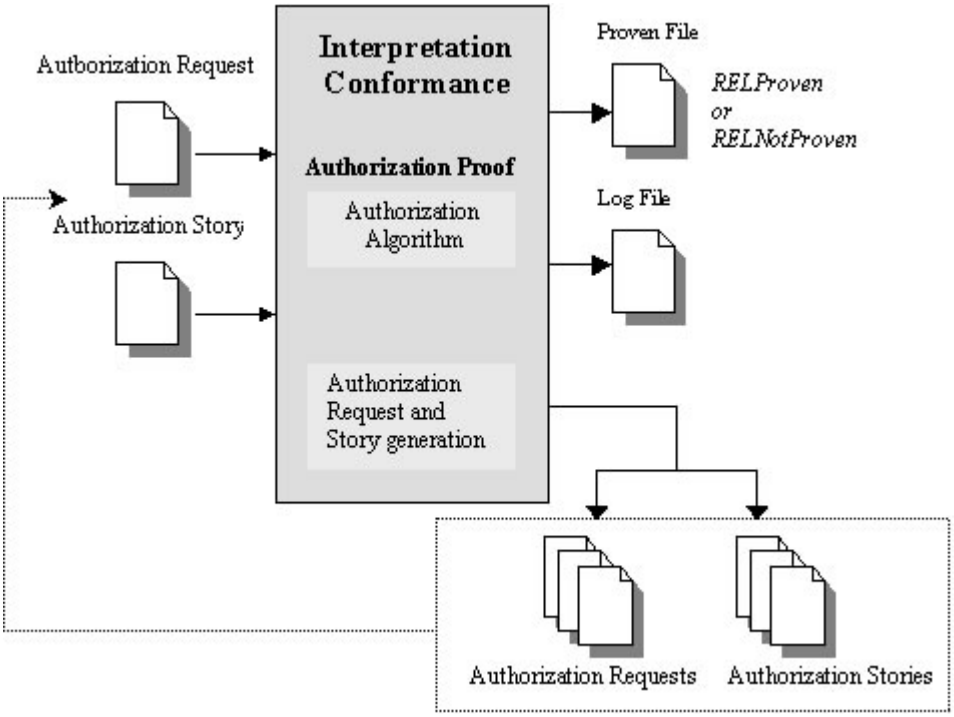

Figure 7 — REL-InterpretationConformance-A-1_0_0 architecture diagram

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Module Name: /21000-5_REL/REL-Interpretation-B-1_0_0.zip
Description
The REL interpretation module implements the MPEG-21 REL standard specification. It checks if the input Authorization Request is proven within the input authorization search space (described by the other four input parameters), and returns the Authorization Result.
Input
— an RELAuthorizationRequest, — a set of RELAuthorizationStories, — a set of RELAuthorizers, — a set of `r:Grant` and `r:GrantGroup` RELNodes, and — a set of `r:ToConstraint` RELNodes
Output
an RELAuthorizationResult
Programming Language(s)
C#
Platform(s)
Any platform that supports the .NET Framework.
Dependencies
— The .NET Framework version 1.1. The Microsoft version of it can be downloaded at http://www.microsoft.com/.
Details
1. Architecture diagram

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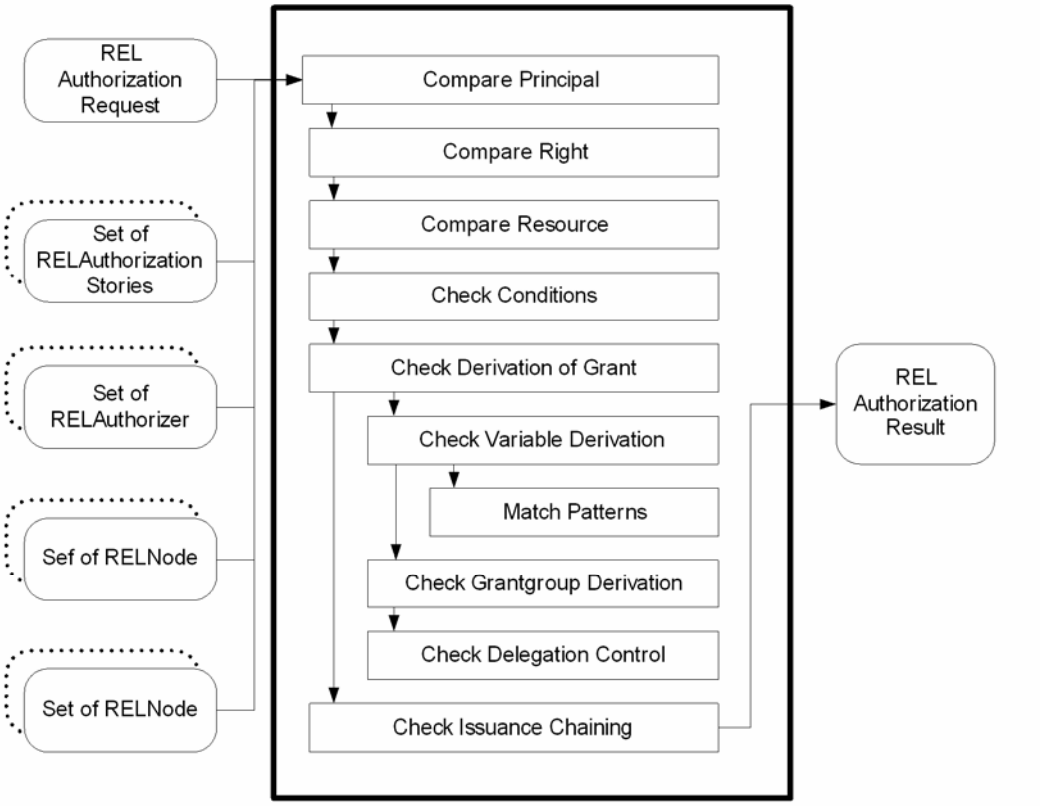

Figure 8 — REL Interpretation Reference Software Architecture Diagram

Function Performed	Corresponding API	Corresponding Source File
Compare Principal	Surpasses( )	RELInterpreter.cs
Compare Right	IsEqual( )	RELUtils.cs
Compare Resource	IsEqual( )	RELUtils.cs
Check Conditions	IsSatisfied( )	RELConditionManager.cs
Check Derivation of Grant	IsDerived( )	RELInterpreter.cs
Check Variable Derivation	IsOneStepDerived6922( )	RELInterpreter.cs
Match Patterns	NodeMatches( )	RELInterpreter.cs
Check GrantGroup Derivation	IsOneStepDerived6923( )	RELInterpreter.cs
Check Delegation Control	IsOneStepDerived6924( )	RELInterpreter.cs
Check Issuance Chaining	IsAuthorizationProof( )	RELInterpreter.cs

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2. Data Types

The following points should be kept in mind when reading this section:

— Unless specified otherwise below, NULL values and encrypted things are not allowed.

— It is assumed that the constructors and modifiers for each data type will ensure that all of the "allowed values" constraints for each data type will be enforced.

— When it says "Any prefix:Type", it means any prefix:Type that is

  — Well formed,

  — Schema-valid, *and*

  — Valid according to any provisions in the specification applying to prefix:Type.

2.1 RELAuthorizationRequest (see 5.2 of ISO/IEC 21000-5:2004)

Member	**Data type**	**Allowed values**
Principal	RELNode	Any r:Principal or NULL Note: A NULL value here corresponds to the case where the Principal Member of the authorization request is absent as described in the REL.
Right	RELNode	Any r:Right
Resource	RELNode	Any r:Resource or NULL Note: A NULL value here corresponds to the case where the Resource Member of the authorization request is absent as described in the REL.
Interval	RELInterval	Any
Context	RELAuthorizationContext	Any
Licenses	Set<RELNode>	Any r:License elements each with one r:issuer child
Roots	Set<RELNode>	Any r:Grant elements

2.2 RELAuthorizationContext (see 5.3 of ISO/IEC 21000-5:2004)

Member	**Data type**	**Allowed values**
Properties	Map<RELPropertyName, Object>	Any

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2.3 RELAuthorizationStory (see 5.4 of ISO/IEC 21000-5:2004)

Member	Data type	Allowed values
primGrant	RELNode	Any primitive grant
grantOrGrantGroup	RELNode	Any r:Grant or r:GrantGroup
authE	RELAuthorizer	Any or NULL Note: A NULL value here corresponds to the case where the authorizer member of the authorization story is absent as described in the REL.

2.4 RELAuthorizer (see 5.5 of ISO/IEC 21000-5:2004)

Member	Data type	Allowed values
License	RELNode	Any r:License with one r:issuer child
Principal	RELNode	Any r:Principal
Instant	RELDateTime	Any
Context	RELAuthorizationContext	Any
Story	RELAuthorizationStory	Any

2.5 RELAuthorizationResult

Member	Data type	Allowed values
Result	Enumeration	"RELProven" or "RELNotProven" Note: If the RELAuthorizationContext in the input does not contain all the needed properties, the RELAuthorizationResult will be RELNotProven. If there are other exceptions such as "out of memory," "can not read input file," *etc.*, these should be handled as exceptions and shouldn't have any normative implications within the Reference Software part.

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2.6 RELInterval

Member	Data type	Allowed values
Start	RELDateTime	Any
End	RELDateTime	Any

2.7 RELPropertyName (see 5.3 of ISO/IEC 21000-5:2004)

Member	Data type	Allowed values
Qname	RELQName	Any
Parameters	Vector<Object>	Any

2.8 RELQName

Member	Data type	Allowed values
Ns	String	Any URI
Local	String	Any xsd:NCName

2.9 RELNode

Used for XML nodes.

2.10 RELDateTime

Used for xsd:dateTime values.

2.11 RELResourceAttribute

Member	Data type	Allowed values
Identifier	String	Any URI

2.12 RELResourceAttributeSet

Member	Data type	Allowed values
Complement	Boolean	Any
List	Set<RELResourceAttribute>	Any

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2.13 Set

Used for any sets that do not have their own specific type.

2.14 Vector

Used for any ordered tuples that do not have their own specific type.

5.8 ISO/IEC 21000-5:2004/Amd.1:2007

5.8.1 Schema checker for the MAM profile

Module Name: /21000-5_REL_Amd1/REL_Amd1-SchemaChecker-1_0_0.zip
Description
The Schema Checker validates if a license or a list of licenses are syntactically valid according to the schema of the MPEG-21 MAM Profile standard specification.
Input
A list of licenses and/or directories that contain licenses.
Output
Valid, not valid, reasons why, according to the XML schemas specified within the licenses.
Programming Language(s)
Java
Platform(s)
Any platform supported by Microsoft .Net framework. (e.g., Windows 98, 2000, NT, ME, XP).
Dependencies
Details
Architecture diagram:

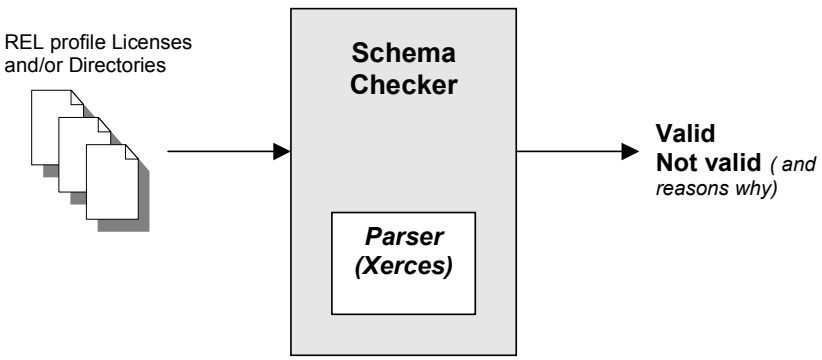

Figure 9 — Schema checker for the MAM profile diagram

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5.8.2 Validation rules checker for the MAM profile

Module Name: /21000-5_REL_Amd1/REL_Amd1-ValidationRuleChecker-1_0_0.zip
Description
The Validation Rules Checker validates if an schema valid REL license is a valid REL License according to the MPEG-21 MAM Profile standard specification. A license will be REL syntactic conformant if it complies all the rules specified in MPEG-21 Conformance.
Input
Schema valid license
Output
REL syntactic conformant or not, reasons why.
Programming Language(s)
Java
Platform(s)
Windows and Linux
Dependencies
Details
Architecture diagram:

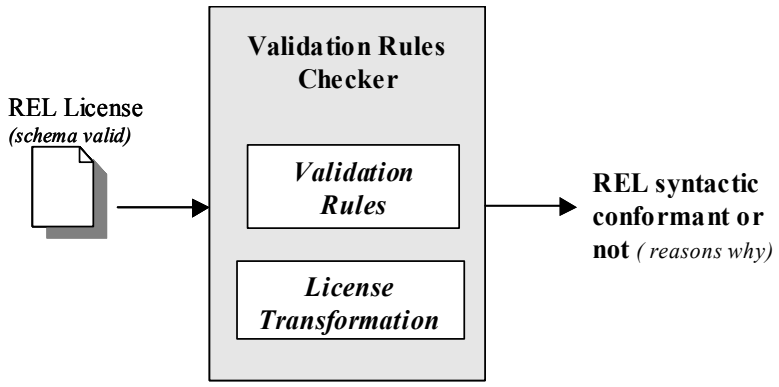

Figure 10 — Validation rules checker for the MAM profile diagram

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5.8.3 Interpreter for the MAM profile

Module Name: /21000-5_REL_Amd1/REL_Amd1-Interpreter-1_0_0.zip
Description
The Interpreter produces an authorization result for a query according to a given collection of REL licenses in the MPEG-21 REL MAM profile.
Input
— REL license files. — Query file consisting of a principal, right, resource, trusted issuers, and context information.
Output

— Authorization result:
  — YES – Authorized but need to verify if issuers in the list of IssuersToBeVerified are trusted.
  — NO – Not authorized.
  — MAYBE – Could not determine authorization because one or more conditions could not be verified. Need to verify conditions in ConditionList and issuers in list of IssuersToBeVerified.
— IssuersToBeVerified - Issuers that need to be verified (i.e. when input trusted issuers list is empty, issuers are returned to verify for trustworthiness).
— ConditionList - Conditions that could not be verified (i.e. they could not be checked so they did not fail or succeed).

Programming Language(s)
Java
Platform(s)
Windows XP and Linux.
Dependencies
Details
Architecture diagram:

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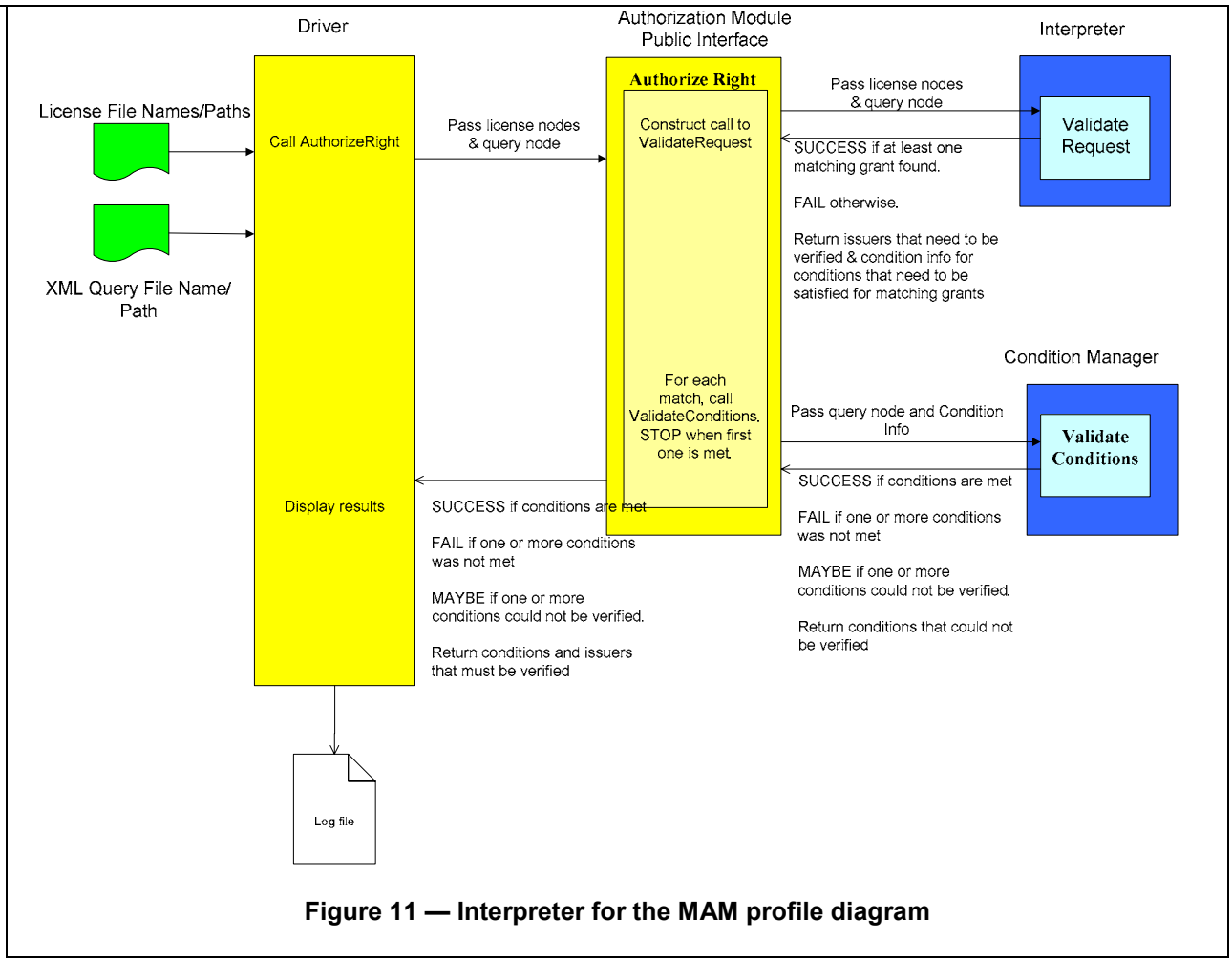

Figure 11 — Interpreter for the MAM profile diagram

5.9 ISO/IEC 21000-5:2004/Amd.2:2007

5.9.1 Schema checker for the DAC profile

Module Name: /21000-5_REL_Amd2/REL_Amd2-SchemaChecker-1_0_0.zip
Description
The Schema Checker validates if a license or a list of licenses are syntactically valid according to the schema of the MPEG-21 DAC Profile standard specification.
Input
A list of licenses and/or directories that contain licenses.
Output
Valid, not valid, reasons why, according to the XML schemas specified within the licenses.
Programming Language(s)
Java

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Platform(s)
Any platform supported by Microsoft .Net framework. (e.g., Windows 98, 2000, NT, ME, XP).
Dependencies
Details
Architecture diagram:

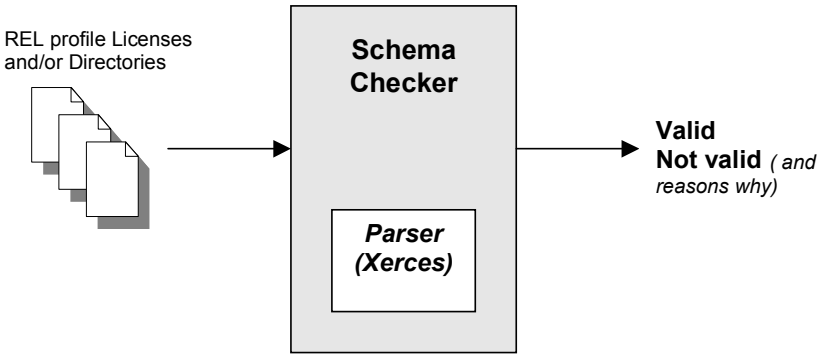

Figure 12 — Schema checker for the DAC profile diagram

5.9.2 Validation rules checker for the DAC profile

Module Name: /21000-5_REL_Amd2/REL_Amd2-ValidationRulesChecker-1_0_0.zip
Description
The Validation Rules Checker validates if an schema valid REL license is a valid REL License according to the MPEG-21 DAC Profile standard specification. A license will be REL syntactic conformant if it complies all the rules specified in MPEG-21 Conformance.
Input
Valid license against the schemas.
Output
REL syntactic conformant or not, reasons why.
Programming Language(s)
Java
Platform(s)
Windows and Linux.
Dependencies

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Details

Architecture diagram:

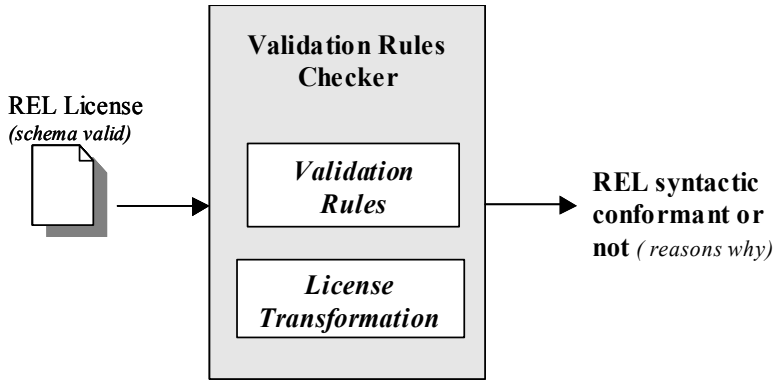

Figure 13 — Validation rules checker for the DAC profile diagram

5.9.3 Interpreter for the DAC profile

Module Name: /21000-5_REL_Amd2/REL_Amd2-Interpreter-1_0_0.zip

Description

The Interpreter produces an authorization result for a query according to a given collection of REL licenses in the MPEG-21 REL DAC profile.

Input

— REL license files.

— Query file consisting of a principal, right, resource, trusted issuers, and context information.

Output

— Authorization result:

  — YES – Authorized but need to verify if issuers in the list of IssuersToBeVerified are trusted.

  — NO – Not authorized and why.

Programming Language(s)

Java

Platform(s)

Windows XP and Linux.

Dependencies

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Details

Architecture diagram:

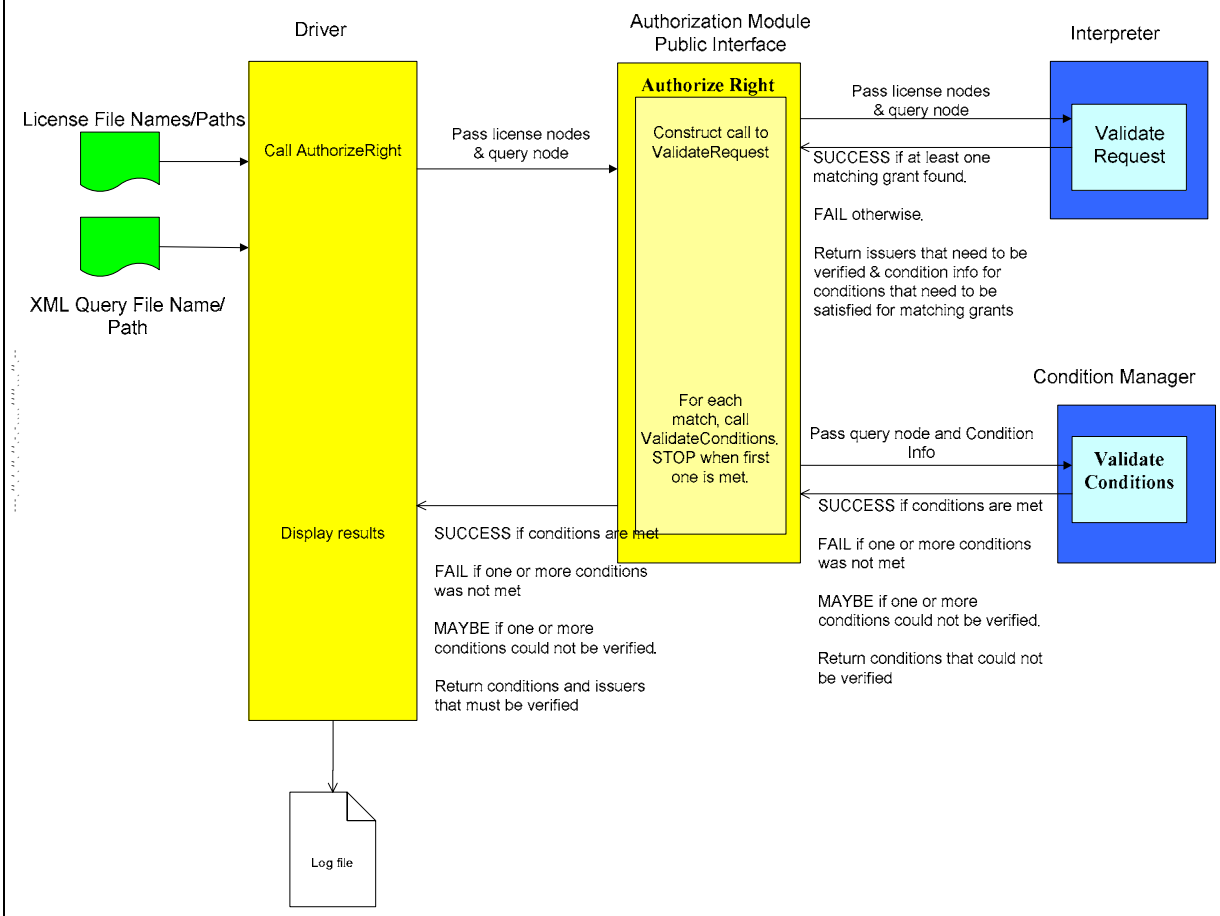

Figure 14 — Interpreter for the DAC profile diagram

5.10 ISO/IEC 21000-6:2004

5.10.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 6 of ISO/IEC 21000.

5.10.2 RDD database query

Module Name: /21000-6_RDD/RDD-DatabaseQuery-A-1_2_0.zip
Description
The database query module creates and queries an MPEG-21 Rights Data Dictionary (RDD) database.
Input
An RDD Term.

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Output
— The genealogy as a Vector of relationships. — The IsTypeOf hierarchy of the Term as a tree.
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java.
Dependencies
— Java version "1.4.1". — The HSQL database, which can be found at http://hsqldb.sourceforge.net.
Details

5.11 ISO/IEC 21000-7:2007

5.11.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 7 of ISO/IEC 21000. In order to allow building applications on top of the ISO/IEC 21000-7:2007 reference software an API is provided. In particular, the API exercises or represents all normative features specified in the ISO/IEC 21000-7:2007 Second Edition specification.

5.11.2 DIA reference software

The DIA reference software module provides access to information in the DIA description tools (e.g.: getAvailableBandwidth) as well as methods for their normative processes (e.g.: BintoBSD or gBSDtoBin). The structure of this API is shown in Table 1.

Table 1 — Common structure of MPEG-21 DIA API

Java package name	*Description*
org.iso.mpeg.mpeg21.dia	Defines the API of the DIA root elements.
org.iso.mpeg.mpeg21.dia.ued	Defines the API to the Usage Environment Description tool.
org.iso.mpeg.mpeg21.dia.ued.uc	Defines the API to the User Characteristics.
org.iso.mpeg.mpeg21.dia.ued.tc	Defines the API to the Terminal Characteristics tool.
org.iso.mpeg.mpeg21.dia.ued.nc	Defines the API to the Network Characteristics tool.
org.iso.mpeg.mpeg21.dia.ued.nec	Defines the API to the Natural Environment Characteristics tool.
org.iso.mpeg.mpeg21.dia.gbsd	Defines the API to the gBSDtoBin process.
org.iso.mpeg.mpeg21.dia.aqos	Defines the API to the AdaptationQoS tool.

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org.iso.mpeg.mpeg21.dia.ccqos	Defines the API to the CrossConversionQoS tool.
org.iso.mpeg.mpeg21.dia.bsdlink	Defines the API to the BSDLink tool.
org.iso.mpeg.mpeg21.dia.conversionlink	Defines the API to the ConversionLink tool.
org.iso.mpeg.mpeg21.dia.mda	Defines the API to the MetadataAdaptation tool.
org.iso.mpeg.mpeg21.dia.sm	Defines the API to the Session Mobility tool.
org.iso.mpeg.mpeg21.dia.diac	Defines the API to the DIA Configuration tool.
org.iso.mpeg.mpeg21.dia.datatypes	Defines the API to the low-level datatypes.
org.iso.mpeg.mpeg21.dia.utils	Defines the API to various auxiliary classes.
org.iso.mpeg.mpeg21.dia.demo	Defines the API to the demo programs which makes use of several reference software packages.

Module Name: `/21000-7_DIA/DIA-RefSW-A.zip`

Description

This module provides an API as shown in Table 1 with the following functionality:

— `org.iso.mpeg.mpeg21.dia`: entry point for modules as defined in `org.iso.mpeg.mpeg21.dia.{ued|aqos|ccqos|bsdlink|conversionlink|mda|sm|diac}` packages.

  — Parsing the DIA description into its internal data structure.

  — Serializing the internal data structure to a valid DIA description.

  — Read and write access to information contained in the input DIA description.

— `org.iso.mpeg.mpeg21.dia.gbsd`: provides an implementation of the normative behavior of the gBSDtoBin processor as specified in ISO/IEC 21000-7:2007.

Input

— `org.iso.mpeg.mpeg21.dia.{ued|aqos|ccqos|gBSD|bsdlink|conversionlink|mda|sm|diac}`: a valid DIA description.

Output

— `org.iso.mpeg.mpeg21.dia.{ued|aqos|ccqos|gBSD|bsdlink|conversionlink|mda|sm|diac}`: a valid, possibly modified, DIA description.

— `org.iso.mpeg.mpeg21.dia.{ued|aqos|ccqos|bsdlink|conversionlink|mda|sm|diac}`: Java objects in memory providing access to the information in the input DIA description.

— `org.iso.mpeg.mpeg21.dia.gbsd.gBSDtoBin`: the (adapted) bitstream according to the (transformed) input BS Description.

NOTE Optionally, the updated DIA description (i.e. BSD or gBSD respectively) is provided.

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Programming Language(s)
Java
Platform(s)
Any platform supported by the Java.
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/. — Base64 encoding which can be downloaded from http://marlowe.dtro.e-technik.tu-darmstadt.de/mnl/. — ant 1.6.2 or later, which can be downloaded from http://ant.apache.org/.
Details

5.11.3 Fragmenter

Module Name: /21000-7_DIA/DIA-Fragmenter-A-1_1.zip
Description
This module provides an implementation of the simple mode streaming instructions according to ISO/IEC 21000-7:2007.
Input
XML document to be fragmented + XML streaming Instructions provided as attributes embedded in the document.
Output
List of Process Units together with their timing information
Programming Language(s)
C++
Platform(s)
Windows XP, Visual C++ project
Dependencies
Libxml2 (http://xmlsoft.org/downloads.html)
Details
Currently, not the full extend of the PU modes are supported, please refer to the documentation included in the reference software package.

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5.12 ISO/IEC 21000-9:2005

This subclause describes the ISO/IEC 21000 reference software for part 9 of ISO/IEC 21000. Reference software for ISO/IEC 21000-9:2005 (MPEG-21 File Format) is integrated into the reference software for the ISO Base Media File Format (insert reference to ISO/IEC 14496-12, technically identical to ISO/IEC 15444-12). The reference software is available as part of MPEG-4 reference software (insert reference to ISO/IEC 14496-5) or upon request from the MP4 registration authority (http://www.mp4ra.org).

The reference software enables both the creation and reading of MPEG-21 files.

5.13 ISO/IEC 21000-10:2006

5.13.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 10 of ISO/IEC 21000. In order to allow building applications on top of the ISO/IEC 21000-10:2006 reference software an API is provided. In particular, the API exercises or represents all normative features, specified in the ISO/IEC 21000-10:2006 specification.

5.13.2 DIP reference software

Module Name: /21000-10_DIP/DIP-Reference_Software-1_1_2.zip
Description
The DIP reference software demonstrates how DIP information can be included in DIDs and how this information can be used to interact with a Digital Item in a predefined manner. This contribution is implements: • DIP Engine • DIBOs • DIXOs
Input
A DIDL document with DIP information.
Output
N/A
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE, Xerces, Quicktime and Rhino
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 2.7.0 or later, which can be downloaded from http://xml.apache.org/.

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— Mozilla Rhino 1.6R1 or later, which can be downloaded from http://www.mozilla.org/rhino/download.html. — QuickTime 7 or later, which can be downloaded from http://www.apple.com/quicktime.
Details

5.14 ISO/IEC 21000-10:2006/Amd.1:2006

Module Name: 21000-10_DIP_Amd1\DIP_Amd1-Reference_Software-1_1.zip
Description
The DIP C++ Bindings reference software demonstrates how DIP C++ Bindings can be used to interact with a Digital Item in a pre-defined manner. This contribution implements: • C++ data type bindings for DIML object types; • C++ DIBO factory interface; • C++ global environment interface; • C++ interface bindings for DIBOs.
Input
N/A
Output
N/A
Programming Language(s)
C++
Platform(s)
Dependencies
Xerces-C++ Version 2.7.0

5.15 ISO/IEC 21000-12:2005

5.15.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 12 of ISO/IEC 21000. ISO/IEC 21000-12:2005 is a technical report describing a test bed for MPEG-21 resource delivery as well as proving utility software. The reference software can be found on the project website and is not explicitly included in this version of ISO/IEC 21000-8.

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5.15.2 ISO/IEC 21000-12:2005 Test Bed

The reference software is uploaded to the project website: http://clabprj.ee.nctu.edu.tw/~mpeg21tb/.

Description
The main purpose of this reference platform is to provide 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 (audio, video, scene composition) technologies could be evaluated. • Various packetization methods and file formats can be evaluated. • Various multimedia streaming rate control and error control mechanisms can be easily plugged into the test bed and evaluated.
Input
Output
Programming Language(s)
Platform(s)
— Client/Server — Windows 2000/XP — Visual C++ run-time libraries (including MFC) — Network Emulator — Linux with RTC (real-time clock) built as kernel module — NISTnet kernel modules — Java2 run-time environment
Dependencies
Details

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5.16 ISO/IEC 21000-14:2007

5.16.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 14 of ISO/IEC 21000.

5.16.2 Reference Software for Conformance to ISO/IEC 21000-10:2006

Module Name: /21000-14_Conformance/Conformance-DIP-1_2.zip
Description
The DIP conformance reference software demonstrates how DIP conformance testing can be done by utilizing conformance tests DIDs. This contribution implements tests for the following conformance points: • DIP schema conformance; • DIP processor conformance; • DIML syntax conformance; • DIM processor conformance; • JDIXO language conformance; and • C++ binding conformance.
Input
A DIDL document with DIP information (called xx-xxxConformanceTest.xml).
Output
A XML document (in results/xxx/xxxConformanceTest-xx-result.xml) or N/A
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE, Xerces, Quicktime, and Rhino
Dependencies
— DIP reference software; — Java version "1.4.1_02" or later, which can be downloaded from http://java.sun.com/j2se/1.4.2/; — Xerces2 Java Parser 2.7.0 or later, which can be downloaded from http://xml.apache.org/; — Mozilla Rhino 1.6R1 or later, which can be downloaded from http://www.mozilla.org/rhino/download.html; — QuickTime 7 or later, which can be downloaded from http://www.apple.com/quicktime.

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Details
This reference software automatically runs most of the DIP conformance tests in the main class of DIPConformance.java, provided that the end-user follows the pre-defined user interactions specified in this document. All conformance tests can also be tested on their own as well (run DIPConformanceTest.java with as argument the conformance test DID to be tested).

5.16.3 Reference Software for Conformance to ISO/IEC 21000-10:2006/Amd.1:2006

Module Name: /21000-14_Conformance/Conformance-DIP_Amd1-1_2.zip
Description
The DIP Amd 1 conformance reference software demonstrates how DIP C++ Bindings conformance testing can be done by utilizing conformance tests C++ functions that interact with a Digital Item in a pre-defined manner. This contribution implements tests for the following conformance points: • C++ data type bindings for DIML object types; • C++ DIBO factory interface; • C++ global environment interface; • C++ interface bindings for DIBOs.
Input
• A DIDL document with DIP information (called xx-xxxConformanceTest.xml) • A C++ function implementation, compliant to the DIP Amd 1 specification (xx-xxxConformanceTest.txt)
Output
A XML document (called results/xxx/xxxConformanceTest-xx-result.xml) or N/A
Programming Language(s)
C++
Platform(s)
Dependencies
• DIP FDIS reference software • Xerces-C++ Version 2.7.0

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5.17 ISO/IEC 21000-15:2006

5.17.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 15 of ISO/IEC 21000.

5.17.2 ISO/IEC 21000-15:2006 Event Reporting

Module Name: /21000-15_ER/ER-Reference_Software.zip
Description
This software provides an example of an implementation of an ER Engine that traps and handles events from a DIP Engine. It then processes the events based upon a sample ER-R that it has read in as part of the DI being processed. Finally, it creates an ER as a result of the ER-R processing.
Input
Valid DID that contains an embedded ER-R - An sample DI is provided for testing the embedding of ER-R's.
Output
Resulting trace to the CMD prompt.
Programming Language(s)
Java
Platform(s)
Dependencies
— Ant (tested with v1.6.5 under Windows) — Optional: Eclipse 3.1.x
Details
Independent/Integrated modules: • jug.jar - provides UUID • jep-2.3.0.jar - Java Math Expression Processor (GNU) • xerces - XML parsing • rhino - Javascript support for DIP • xalan - for creating the resulting ER's Build: to compile you require a Java 1.4 or later (tested with 1.5.0_08-b03 under Windows) and Ant.

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Run: in a command prompt type

- "ant clean" - clean up the build
- "ant compile" - create the test code and also the beans
- "ant run" - create and run the test code
- the sample program will present a GUI to the user. The user can then select the DIM that should be run.

Limitations/Notes:

- This version uses a modified version of the ER Spec as there are a number of errors that have been fixed. They are: missing references to ExternalOperatorType and also invalid references to dii:Identifier.
- Embedded ER-R's have not been fully implemented.

5.17.3 Event Reporting Schema Checker

Module Name: /21000-15_ER/ER-Schema_Checker-0_1_0.zip
Description
The ER schema checker reference software checks a DI against the ER schema for conformance. This software takes the ER Schema and builds a set of beans from it. These beans can then be used to automatically check an instance document. To see whether it conforms to the Schema or not.
Input
Valid DID that contains an embedded ER-R - An sample DI is provided for testing the embedding of ER-R's.
Output
Resulting trace to the CMD prompt.
Programming Language(s)
Java
Platform(s)
Dependencies
• XMLBeans v2.1.0 (http://xmlbeans.apache.org/) • Ant (tested with v1.6.5 under Windows) • Optional: Eclipse 3.1.x
Details
Utilises XMLBeans 2.1.0 (http://xmlbeans.apache.org/).

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5.17.4 Event Reporting Object Map Technology

Module Name: /21000-15_ER/ER-ObjectMap.zip
Description
Java source code that builds upon Ghent University's DIP Core Experiment on Object Map Technology (N5942, M10386) - it adds ERR processing, ER creation and a new JMF-based video Renderer.
Input
Valid DID conformant to DIP CD - Some sample DI's are provided. Resources: MPEG video (any JMF API supported media).
Output
Resulting trace to the CMD prompt and also output ER is dumped to a file (ERDI.xml) in the working directory.
Programming Language(s)
Java
Platform(s)
Dependencies
kXML2 ScriptEase ISDK JMF Wireless Toolkit Independent/Integrated modules: Integrated with lightweight Java DID parser.
Details
For installing and running the Demo program, proceed to the following instructions: — Unzip the archive file FID_1.1. — Install dependencies detailed in section 2. — Build the application and run the Demo program using the class au.com.cisra.demo.FIDProcessor.

5.18 ISO/IEC 21000-16:2005

Part 16 of ISO/IEC 21000 is handled in ISO/IEC 23000 MPEG-B.

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5.19 ISO/IEC 21000-17:2006

5.19.1 Introduction

This subclause describes the ISO/IEC 21000 reference software for part 17 of ISO/IEC 21000.

5.19.2 ISO/IEC 21000-17:2006 Fragment Identification

Module Name: /21000-17_FID/FID-evaluator-1_1.zip
Description
The mpegFID processor is able to parse and evaluate URI Fragment Identifiers compliant with the fragment identifier syntax defined in ISO/IEC 21000-17:2006. In particular, the processor supports the following features. • Addressing time points and ranges of an Audio CD. • Addressing spatial locations in an image file or in a 3D data. • Addressing spatiotemporal locations in a video sequence. • Addressing the Logical Model of a resource.
Input
Valid DID conformant to DIP CD - Some sample DI's are provided. Resources: MPEG video (any JMF API supported media).
Output
Resulting trace to the CMD prompt and also output ER is dumped to a file (ERDI.xml) in the working directory.
Programming Language(s)
Java
Platform(s)
Dependencies
kXML2 ScriptEase ISDK JMF Wireless Toolkit Independent/Integrated modules: Integrated with lightweight Java DID parser.

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Annex A
(informative)

Utility software for the ISO/IEC 21000 parts

A.1 Introduction

This Annex describes utility software of the individual ISO/IEC 21000 parts as listed in subclause 4.3. It contains software that was developed for testing and demonstrating some of the non-normative parts of MPEG-21.

A.2 ISO/IEC 21000-2:2005

A.2.1 Introduction

Annex A.2 describes the utility software for part 2 of ISO/IEC 21000.

A.2.2 DIDLTest

Module Name: /21000-2_DID/DID-Parser_2nd_Edition-2_0_0.zip
Description
A demonstration program, called `DIDLTest`, is included in the DID reference software package (subclause 5.2). This program can be used to test the reference software. It takes a DID document as input and writes a tree of the (parsed and validated) DID document to the screen. In case of validation errors, the program reports this error, together with the validation rule that is not met by the DID under consideration. This DID utility software can be started with the following command (from within the `classes` directory): java -classpath .; ../lib/xmlParserAPIs.jar; ../lib/xercesImpl.jar; ../lib/log4j.jar DIDLTest Alternatively, when working under Windows, it can be run by double-clicking the `DIDLTest.bat` file.
Input
See subclause 5.2.2.
Output

Below, two example outputs are given: a first one corresponding to the validation of a valid DID document; a second one that corresponds to the validation of an invalid DID document.
 	
Example output (without a validation error):
 	
`Parsed URL: file:/Y:/example_01.xml`
 	
`DIDL available = true`
`  Item available = true`
`    Descriptor available = true`
`      Statement available = true`
`    Choice available = true`
`      Selection available = true`

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```
        predicate = UNDECIDED
    Item available = false
      Condition available = true
      Component available = true
        Resource available = true
    Item available = false
      Condition available = true
      Component available = true
        Resource available = true
    Item available = true
      Component available = true
        Resource available = true

Press any key to continue...
```

Example output (with a validation error):

```
Invalid DID:

****** Validation Error ******
Validation rule: <Annotation>: An ANNOTATION that does not contain a REFERENCE
child element must have a TARGET attribute.

<?xml version="1.0" encoding="UTF-8"?>
<Annotation xmlns="urn:mpeg:mpeg21:2002:01-DIDL-NS">
    <Assertion target="#choice_01" true="choice_01_select_id_01"/>
</Annotation>
```

Programming Language(s)
See subclause 5.2.2.

Platform(s)
See subclause 5.2.2.

Dependencies
See subclause 5.2.2.

Details
See subclause 5.2.2.

A.3 ISO/IEC 21000-3:2003

A.3.1 Introduction

Annex A.3 describes the utility software for part 3 of ISO/IEC 21000.

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A.3.2 DIIParserDemo

Module Name: /21000-3_DII/DII-Parser-1_0_0.zip
Description
This utility 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
See 5.3.2.
Output
See 5.3.2.
Programming Language(s)
See 5.3.2.
Platform(s)
See 5.3.2.
Dependencies
See 5.3.2.
Details
See 5.3.2.

A.4 ISO/IEC 21000-5:2004

A.4.1 Introduction

Annex A.4 describes the utility software for part 5 of ISO/IEC 21000.

A.4.2 REL simple license interpreter

Module Name: /21000_Utility/21000-5_REL/REL-SimpleLicenseInterpreter-A-2_2_0.zip
Description
The simple license interpreter module makes an authorization decision for an authorization query by checking it against a simple REL license. A simple REL license only supports the keyHolder principal, play right, diReference resource, and validityInterval and exerciseLimit conditions.
Input
— REL license — Query consisting of a principal, one right, resource, time, exercise count (optional)

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Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
C++
Platform(s)
Windows XP, Windows 2000 Server, Windows ME, Windows NT 4.0 Workstation, Windows 98 SE.
Dependencies
Microsoft MSXML 4.0 Parser, which can be obtained at: http://www.microsoft.com/downloads/details.aspx?FamilyId=3144B72B-B4F2-46DA-B4B6-C5D7485F2B42&displaylang=en
Details
Architecture diagram:

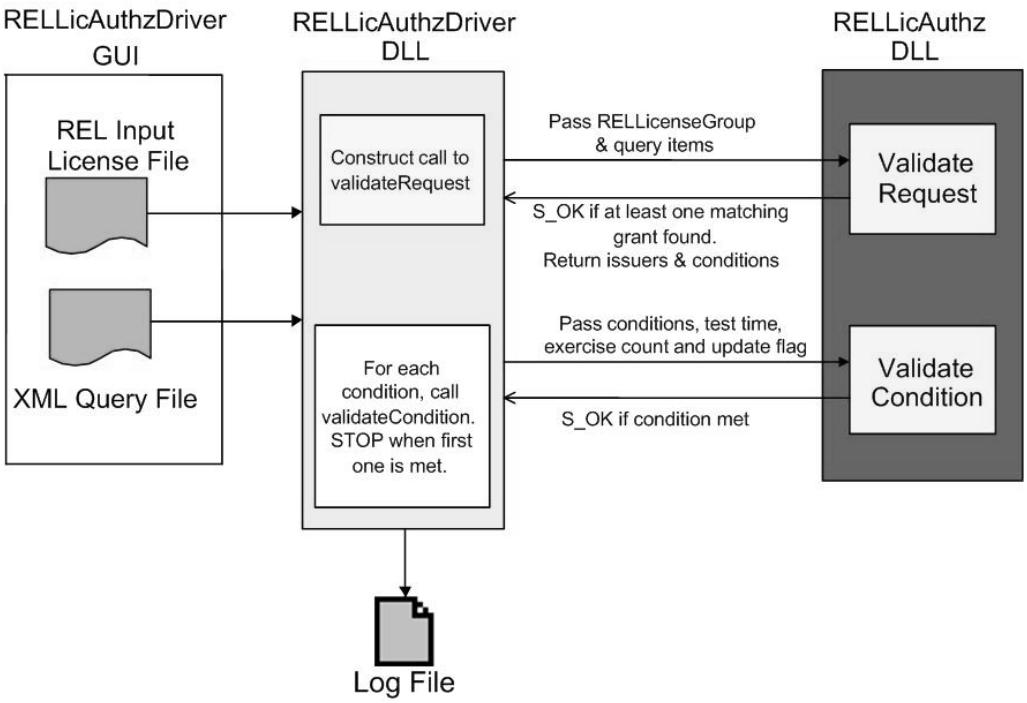

Figure A.1 — REL-SimpleLicenseInterpreter-A-2_2_0 architecture diagram

Module Name: /21000_Utility/21000-5_REL/REL-SimpleLicenseInterpreter-B-2_2_0.zip
Description
The simple license interpreter module makes an authorization decision for an authorization query by checking it against a simple REL license. A simple REL license only supports the keyHolder principal, play right, diReference resource, and validityInterval and exerciseLimit conditions.

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Input
— REL license — Query consisting of a principal, one right, resource, time, exercise count (optional)
Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
C++
Platform(s)
Microsoft Pocket PC 2002 system.
Dependencies
Microsoft Pocket IE installed.
Details
Architecture diagram:

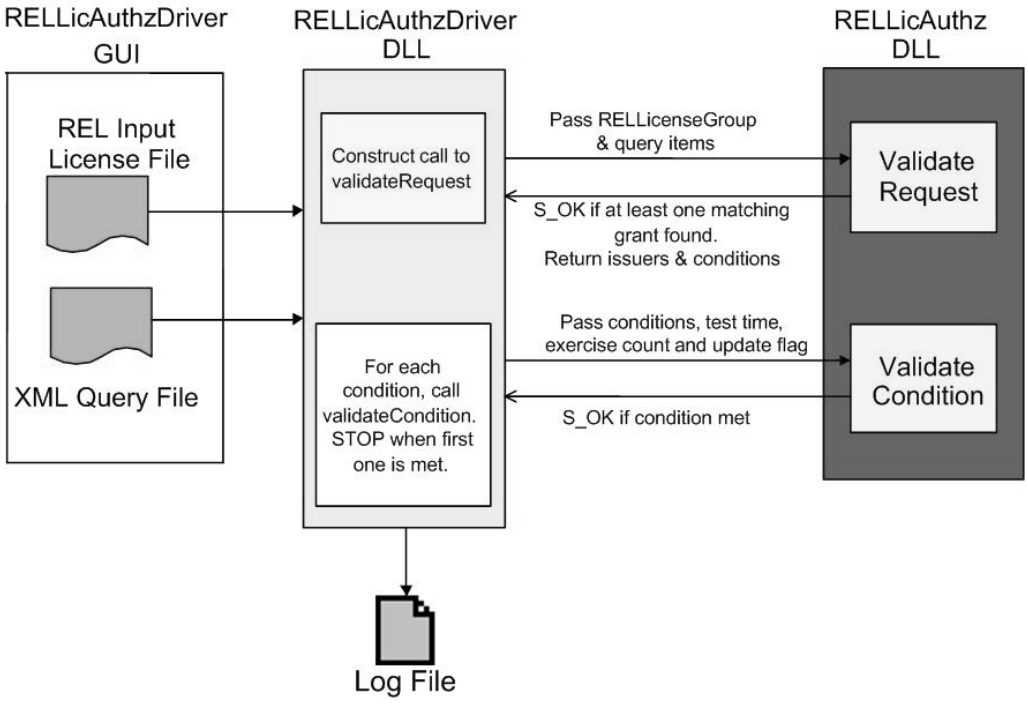

Figure A.2 — REL-SimpleLicenseInterpreter-B-2_2_0 architecture diagram

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Module Name: /21000_Utility/21000-5_REL/REL-SimpleLicenseInterpreter-C-1_0_0.zip
Description
The simple license interpreter module makes an authorization decision for an authorization query by checking it against a simple REL license. A simple REL license only supports the keyHolder principal, play right, diReference resource, and validityInterval and exerciseLimit conditions.
Input
— REL license — Query consisting of a principal, one right, resource, time, exercise count (optional)
Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
C++
Platform(s)
Linux; tested on Red Hat Linux 9.
Dependencies
— APACHE XML XERCES Parser in C++ version 2.3. — APACHE XML XALAN Parser in C++ version 1.6. — g++ 3.2
Details
Architecture diagram:

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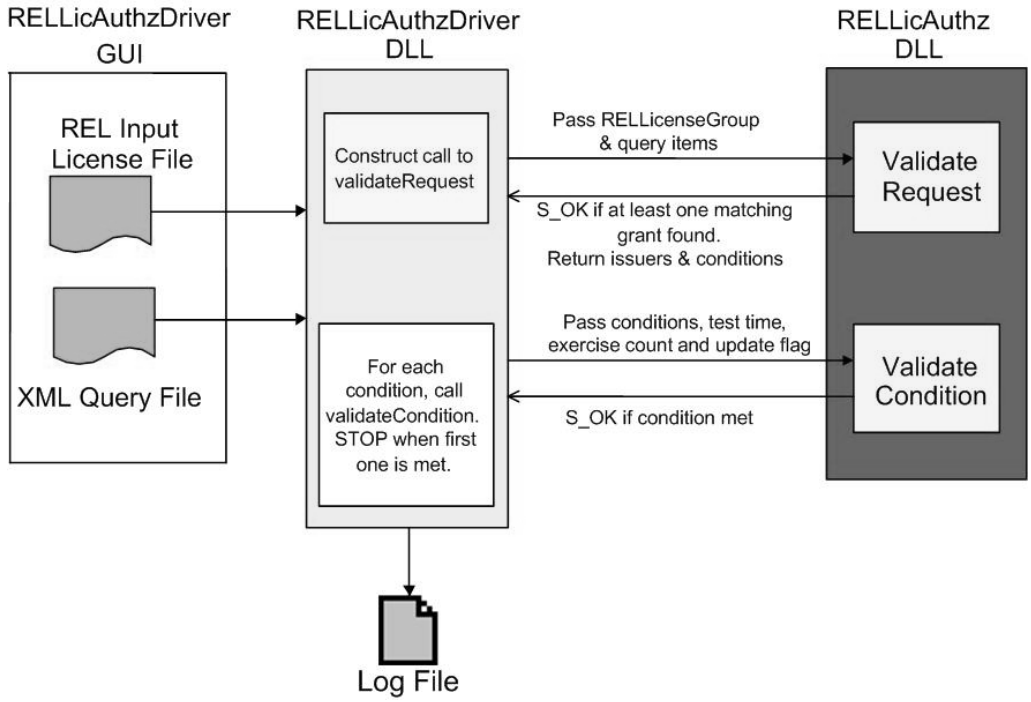

Figure A.3 — REL-SimpleLicenseInterpreter-C-1_1_0 architecture diagram

Module Name: /21000_Utility/21000-5_REL/REL-SimpleLicenseInterpreter-D-1_0_0.zip
Description
The simple license interpreter module makes an authorization decision for an authorization query by checking it against a simple REL license. A simple REL license only supports the keyHolder principal, play right, diReference resource, and validityInterval and exerciseLimit conditions.
Input
— REL license — Query consisting of a principal, one right, resource, time, exercise count (optional)
Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
C++
Platform(s)
Linux; tested on Red Hat Linux 7.3.
Dependencies
— APACHE XML XERCES Parser in C++ version 2.2. — APACHE XML XALAN Parser in C++ version 1.5. — g++ 3.1

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Details

Architecture diagram:

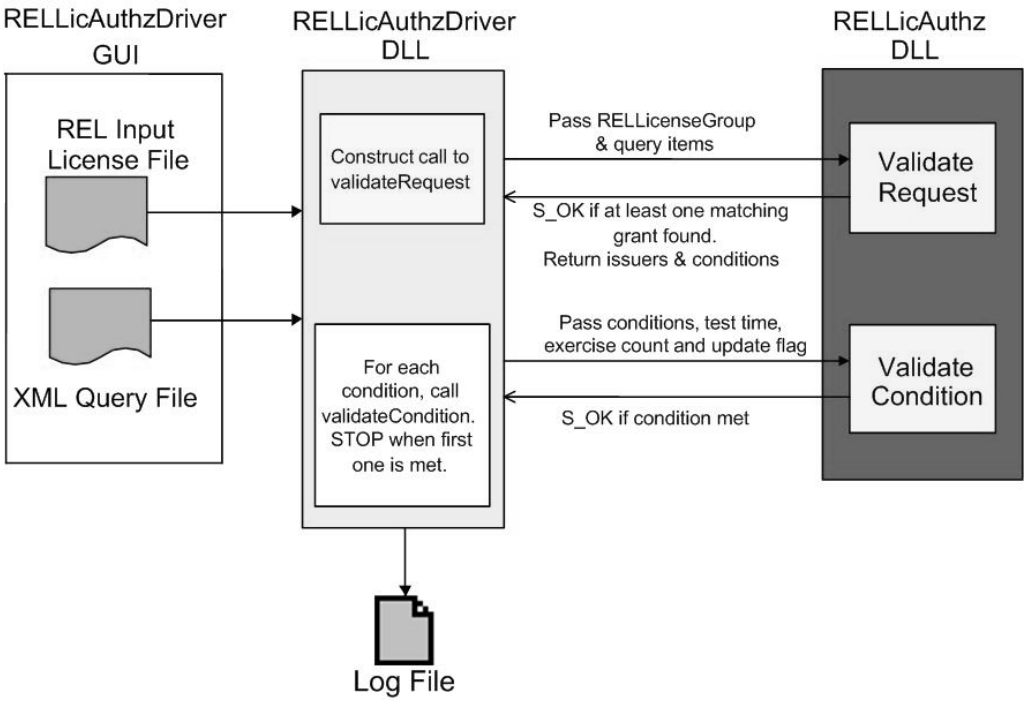

Figure A.4 — REL-SimpleLicenseInterpreter-D-1_0_0 architecture diagram

Module Name: /21000_Utility/21000-5_REL/REL-SimpleLicenseInterpreter-E-1_2_0.zip

Description

The simple license interpreter module makes an authorization decision for an authorization query by checking it against a simple REL license. A simple REL license only supports the keyHolder principal, play right, dereference resource, and validityInterval and exerciseLimit conditions.

Input

— REL license

— Query consisting of a principal, one right, resource, time, exercise count (optional)

Output

Authorization result: YES, or NO with reasons why in a log file.

Programming Language(s)

Java

Platform(s)

Any platform supported by the Java J2SE and Xerces XML parser.

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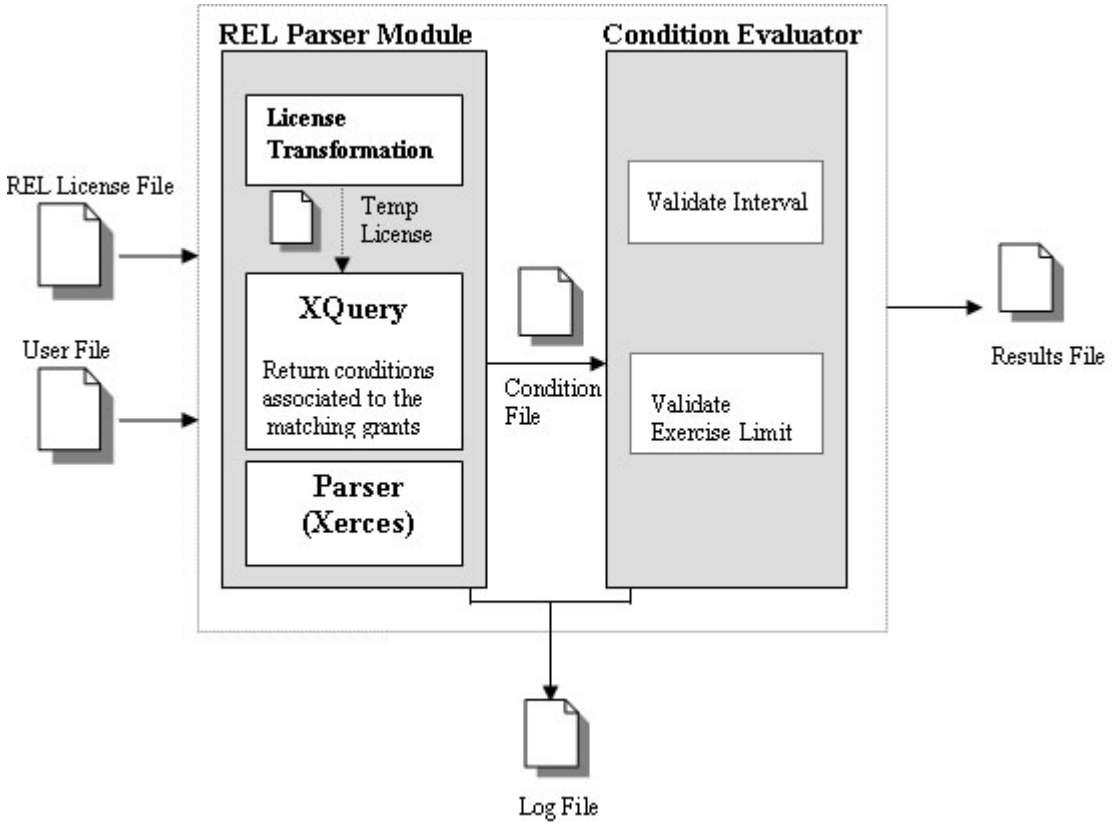
Dependencies
— The Xerces XML parser. — The Java J2SE SDK 1.3.1 or later, which can be downloaded at http://java.sun.com/j2se/.
Details
Architecture diagram:  **Figure A.5 — REL-SimpleLicenseInterpreter-E-1_2_0 architecture diagram**

A.4.3 REL simple license creator

Module Name: /21000_Utility/21000-5_REL/REL-LicenseCreator-1_1.zip
Description
The simple license creator module is a web application, formed by a web page containing an HTML form, a servlet for processing the input information to generate an REL license.
Input
— Target principal — Resource — Right — Conditions — Issuer

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Output
REL license
Programming Language(s)
Java, DOM.
Platform(s)
Any platform supported by the Java J2SE and Xerces XML parser, including Windows and Linux.
Dependencies
— The Xerces XML parser. — The Java J2SE SDK 1.3.1 or later, which can be downloaded at http://java.sun.com/j2se/.
Details
Architecture diagram:

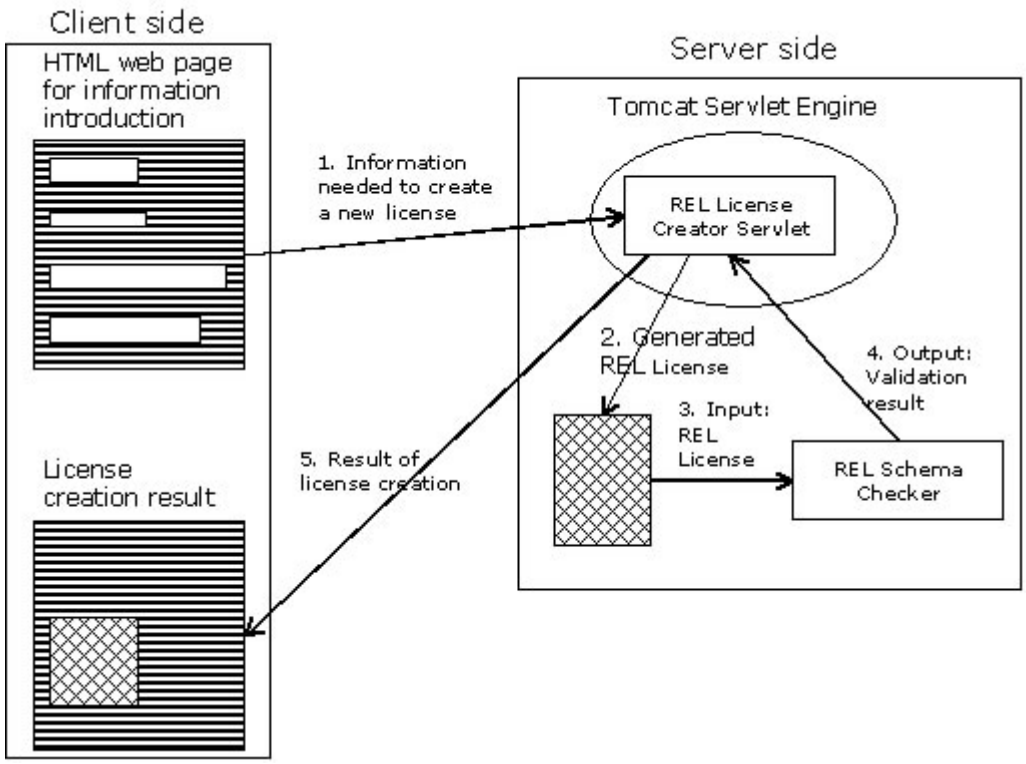

Figure A.6 — REL-SimpleLicenseCreator-A-1_1_0 architecture diagram

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A.4.4 Very lightweight REL based DRM system for streaming to mobile devices

Module Name: /21000_Utility/21000-5_REL/REL-MobileLightweightInterpreter-A-1_0.zip
Description
The lightweight REL based DRM module implements a lightweight REL parser system suitable for the use on mobile phones. Licenses only support the minimal required functions for the use on mobile phones for streaming content (e.g. play, play right). Minimal authorization request validation rules to check authorization request syntax shall be performed. Simple query support required for streaming tasks to mobiles shall be included into the implementation.
Input
— REL license — Query consisting of a principal, one right, resource, time, exercise count (optional)
Output
Authorization result: YES, or NO with reasons why in a log file and video player playing the related video files
Programming Language(s)
Java
Platform(s)
J2ME, Midlet
Dependencies
Simple XML Processing Library, XParseJ: http://www.webreference.com/xml/tools/xparse-j.html
Details
Architecture diagram:

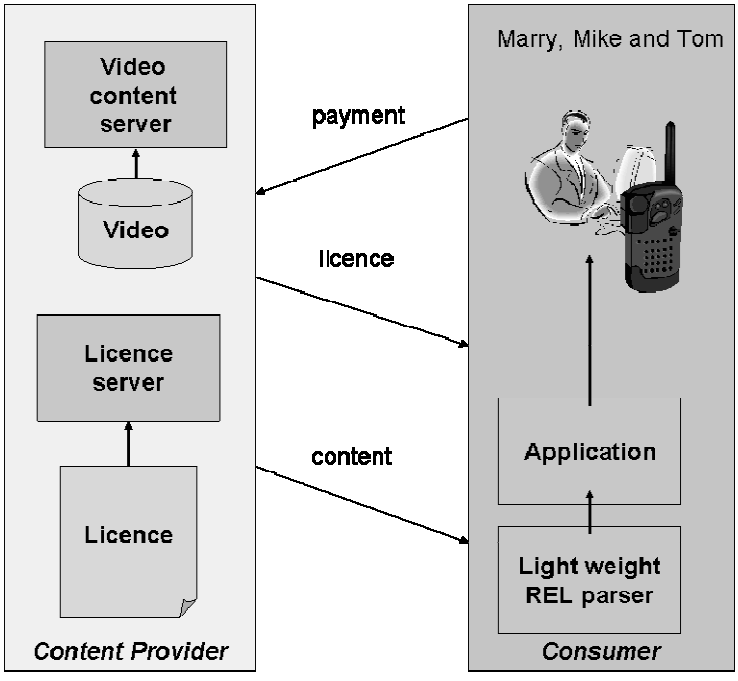

Figure A.7 — REL-Mobile-Lightweight-Interpreter-A_1_0 architecture diagram

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A.5 ISO/IEC 21000-5:2004/Amd.1:2007

Module Name: /21000_Utility/21000-5_REL_Amd1/REL_Amd1-SimpleLicenseCreator-1_0_0.zip
Description
Simple REL license creator for the MAM profile
Input
— Target principal — What resource — Time interval — Issuer — Right
Output
REL license.
Programming Language(s)
Java
Platform(s)
Windows and Linux
Dependencies
Details
Architecture diagram:

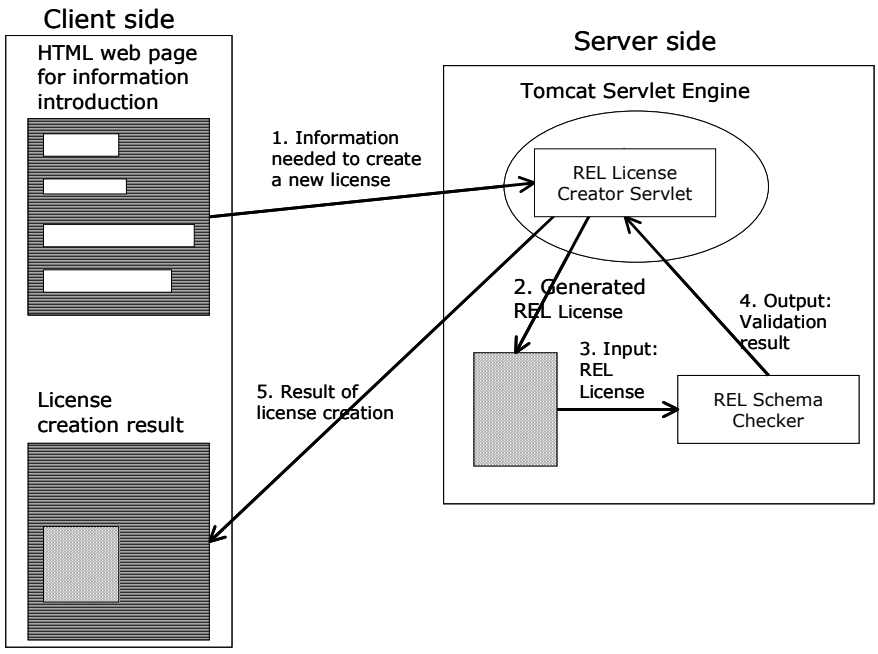

Figure A.8 —Simple REL license creator for the MAM profile diagram

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A.6 ISO/IEC 21000-6:2004

A.6.1 Introduction

Annex A.6 describes the utility software for part 6 of ISO/IEC 21000.

A.6.2 RDD browser interface

Module Name: /21000_Utility/21000-6_RDD/RDD-BrowserInterface-A-1_0_0.zip
Description
Input
A Term.
Output
Term Definition, Genealogy.
Programming Language(s)
HTML
Platform(s)
Windows with any Web browser.
Dependencies
Details

A.6.3 Multilingual registry

Module Name: /21000_Utility/21000-6_RDD/RDD-MultilingualRegistry-A-1_0_0.zip
Description
The multilingual registry module provides a multilingual registry for the Rights Data Dictionary using 5 different exemplary languages.
Input
Query on RDD term.
Output
— RDD Terms in user preferred translated languages (TermDescription, ActionFamily, ContextFamily, Synonym, etc). — XML format RDD term attribute description.

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Programming Language(s)
Visual Basic
Platform(s)
Any platform supported by Microsoft .Net framework. (e.g., Windows 98, 2000, NT, ME, XP).
Dependencies
— Web Server: Windows Server 2000 + IIS 5.0 — DB Server: Windows Server 2000 + MS-SQL Server 2000
Details

A.7 ISO/IEC 21000-7:2007

A.7.1 Introduction

Annex A.7 describes the utility software for part 7 of ISO/IEC 21000.

NOTE Each module description comprises only an overview and further details can be found in the respective module package.

Figure A.9 illustrates that ISO/IEC 21000-7:2007 utility software modules consist of data

— Digital Item A (input),

— Digital Item B_1, …, B_n (input),

— Digital Item A' (output),

and methods

— Adaptation Engine: A' = f(A, B).

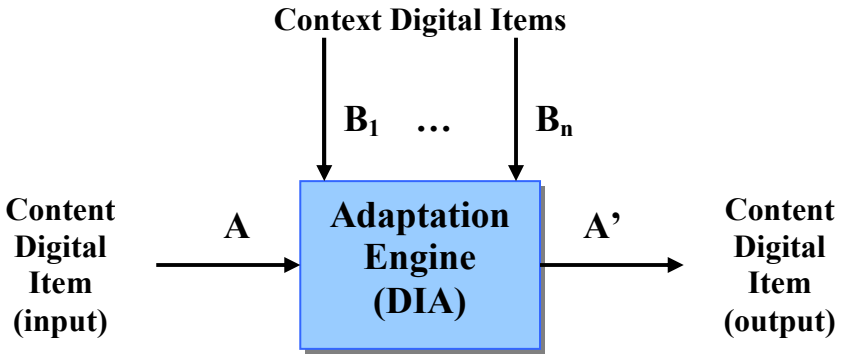

Figure A.9 — ISO/IEC 21000-7:2007 processing

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A.7.2 Audio presentation preferences

Module Name: /21000_Utility/21000-7_DIA/DIA-AudioPreferences-A-2_1_0.zip
Description
This module adapts audio resources by means of an AudioPresentationPreferences description.
Input
— Resources: Audio MP3 — DS: AudioPresentationPreferences Description
Output
— Resource: Audio MP3 — An adapted CDI
Programming Language(s)
Java, Java Native Interface (JNI), (Visual) C++
Platform(s)
Win32.
Dependencies
Details

A.7.3 Audio sound field

Module Name: /21000_Utility/21000-7_DIA/DIA-Soundfield-A-2_1_0.zip
Description
This module adapts audio sound field of the resources by means of an AudioPresentationPreferences description.
Input
— Resources: Audio MP3 — DS: AudioPresentationPreference (audio soundfield) description
Output
— Resource: Audio MP3 — An adapted CDI

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Programming Language(s)
Java, Java Native Interface (JNI), (Visual) C++
Platform(s)
Win32.
Dependencies
Details

A.7.4 Display presentation preferences

Module Name: /21000_Utility/21000-7_DIA/DIA_DisplayPreferencesDemo-A-2_0_0.zip
Description
This module adapts BMP/JPEG image resources by means of a DisplayPresentationPreferences description. It comprises two independent modules: one for generating XDI and one for the actual adaptation.
Input
— Resources: Images (BMP and JPEG) — DS: DisplayPresentationPreferences description
Output
Resource: Selected images (BMP and JPEG)
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java.
Dependencies
Details

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A.7.5 Stereoscopic video conversion

Module Name: /21000_Utility/21000-7_DIA/DIA-StereoscopicVideoConversion-A-2_1_0.zip
Description
This module adapts MPEG-1 video resources by means of a StereoscopicVideoConversion description and generates stereoscopic image sequences.
Input
— Resources: Video MPEG-1 — DS: StereoscopicVideoConversion description
Output
— Resource: Adapted Image Sequences in BMP — An adapted CDI
Programming Language(s)
Java, Java Native Interface (JNI), (Visual) C++
Platform(s)
Win32.
Dependencies
- Apache XercesJ 2.2.0+ - KXML2
Details

A.7.6 Graphics presentation preference

Module Name: /21000_Utility/21000-7_DIA/DIA-GraphicsAdaptation-A-2_0_0.zip
Description
This module adapts a CDI containing 3D graphics resources according to an XDI containing a GraphicsPresentationPreference description resulting in an adapted CDI
Input
— Resource: 3D Graphics In VRML — DS: GraphicsPresentationPreference description

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Output
— Resource: Adapted 3D Graphics in VRML — An adapted CDI
Programming Language(s)
Java, Java Native Interface (JNI), (Visual) C++
Platform(s)
Win32.
Dependencies
Details

A.7.7 Modality conversion preference and presentation priority preference

Module Name: /21000_Utility/21000-7_DIA/DIA-PresentationPriorityConverisonPreferences-A-1_1_0.zip
Description
This module adapts various resources by means of ModalityConversionPreference, PresentationPriority, and Transmoding descriptions.
Input
— Resources: Video, Image, Audio, Text, Graphics — DS: ModalityConversionPreference, PresentationPriority, Transmoding
Output
Resources: Video, Image, Audio, Text, Graphics
Programming Language(s)
C++, Java
Platform(s)
Win32; Any platform supported by the Java.
Dependencies
Details

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A.7.8 Focus of attention and soniferous speed

Module Name: /21000_Utility/21000-7_DIA/DIA-FocusOfAttentionSoniferousSpeed-A-1_0_3.zip
Description
This module adapts various resources by means of FocusOfAttention and SoniferousSpeedPreference descriptions.
Input
— Resource: Video (MPEG-1), Text, Audio (WAV) — DS: FocusOfAttention, SoniferousSpeedPreference descriptions
Output
Resources: Video (MPEG-1), Text, Audio (WAV)
Programming Language(s)
C++
Platform(s)
Win32.
Dependencies
Details

A.7.9 Audio impairment

Module Name: /21000_Utility/21000-7_DIA/DIA-AudioImpairment-A-2_1_0.zip
Description
This module adapts audio MP3 resources by means of AudioImpairment descriptions.
Input
— Resources: Audio MP3 — DS: AudioImpairment description
Output
— Resource: Adapted Audio — An adapted CDI

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Programming Language(s)
Java, Java Native Interface (JNI), (Visual) C++
Platform(s)
Win32.
Dependencies
Details

A.7.10 Visual impairment and color vision deficiency

Module Name: /21000_Utility/21000-7_DIA/DIA-LowVision-A-2_1_0.zip **and** /21000_Utility/21000-7_DIA/DIA-ColorVisionDeficiency-A-2_1_0.zip
Description
This module adapts image resources by means of ColorVisionDeficiency and VisionImpairment descriptions.
Input
— Resources: Image (BMP) — DS: ColorVisionDeficiency, VisionImpairment descriptions
Output
— Resource: Adapted image (BMP) — An adapted CDI
Programming Language(s)
Java,
Platform(s)
Win32.
Dependencies
Details

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A.7.11 Mobility characteristics

Module Name: /21000_Utility/21000-7_DIA/DIA-MobilityCharacteristics-A-1_0_1.zip
Description
Classify the User as pedestrian, urban vehicle or highway vehicle. Adapt Digital Item by deleting fragments of the Digital Item that are not relevant to this particular User
Input
— Resources: Contains multiple references to resources — DS: Instantiated description of mobility characteristics (as text file at present)
Output
Contains a single reference to a resource and a textual description (statement) that is relevant to the User based on the input mobility characteristics description.
Programming Language(s)
C++, simple software easily portable to other languages.
Platform(s)
Win32.
Dependencies
Details
This utility software module contains several modules: — Classification and adaptation process. — Software to generate mobility trajectories based on a modified 2D fractional Brownian motion model outside the adaptation engine (optional). — Software to extract mobility characteristics description from the input trajectories outside the adaptation engine (optional).

A.7.12 Display capabilities

Module Name: /21000_Utility/21000-7_DIA/DIA-DisplayCapabilities_AQoS_gBSD_BSDL-A-1_0_0.zip
Description
This module adapts JPEG2000 in a device and format-independent according to the display capabilities (color capabilities and resolution) by using the BSDLink description which references the AQoS description for the adaptation decision-taking process and the BSD or gBSD. BSD or gBSD is used for the actual adaptation. This adaptation module implements Annex B of ISO/IEC 21000-7:2007.

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Input
— Resources: JPEG2000 images — DS: DisplayCapabilities, BSDLink, and AdaptationQoS descriptions as well as BSD and/or gBSD packaged in DIDs.
Output
— Resources: adapted JPEG2000 images — DS: updated BSD and/or gBSD packaged in DIDs.
Programming Language(s)
Java
Platform(s)
Any platform supported by Java.
Dependencies
— ISO/IEC 21000-7:2007 reference software — ISO/IEC 21000-2:2005 reference software — Xerces2 Java Parser 2.6.2 or later, which can be downloaded from http://xml.apache.org/.
Details
For further information see Annex B of ISO/IEC 21000-7:2007 or the description within the module. Integrated module using complete ISO/IEC 21000-2:2005 reference software as well as ISO/IEC 21000-7:2007 reference software packages, in particular, BSDLink, BSDtoBin and gBSDtoBin.

A.7.13 Codec capabilities

Module Name: /21000_Utility/21000-7_DIA/DIA-CodecTerminalCapabilities-A-1_0_0.zip
Description
This module provides the adaptation of variously coded Digital Items with CodecCapabilities (parser).
Input
— Resources: different media resources which are coded in different formats. — DS: CodecCapabilities description
Output
Resources: "adapted" media resources which are re-coded but will fit into User's terminal codec capabilities.

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Programming Language(s)
C++
Platform(s)
Win32.
Dependencies
Details

A.7.14 IPMP tools

Module Name: /21000_Utility/21000-7_DIA/DIA-IPMPTools-A-1_0_0.zip
Description
This module provides the adaptation of the protected Digital Items (parser and generator).
Input
— Resources: DI (AES Encrypted MPEG-4 Video Clip) — DS: IPMPTools description of terminal
Output
Resources: DI (DES Re-Encrypted MPEG-4 Video Clip)
Programming Language(s)
C++
Platform(s)
Win32.
Dependencies
Details

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A.7.15 Destination, location, and time

Module Name: /21000_Utility/21000-7_DIA/DIA-UserDestination-A-1_3_1.zip
Description
This module provides filtering and searching capabilities of MPEG-1 videos based on the User destination.
Input
— Resources: MPEG-1 video — DS: UserDestination description
Output
Resources: Filtered MPEG-1 video and JPEG images
Programming Language(s)
C++
Platform(s)
Win32.
Dependencies
Details

A.7.16 Audio environment

Module Name: /21000_Utility/21000-7_DIA/DIA-AudioEnvironment-A-2_1_1.zip
Description
This module adapts audio MP3 resources based on AudioEnvironment descriptions.
Input
— Resources: Audio MP3 — DS: AudioEnvironment characteristics description
Output
— Resource: Audio MP3 — An adapted CDI

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Programming Language(s)
Java, Java Native Interface (JNI), (Visual) C++
Platform(s)
Win32.
Dependencies
Details

A.7.17 Illumination characteristics

Module Name: /21000_Utility/21000-7_DIA/DIA-IlluminationDemo-A-2_0_0.zip
Description
This module adapts BMP image resources based on IlluminationCharacteristics descriptions.
Input
— Resources: Images (BMP) — DS: IlluminationCharacteristics description
Output
Resources: Selected image (BMP)
Programming Language(s)
C++/Java
Platform(s)
Win32.
Dependencies
Details

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A.7.18 gBSD

Module Name: /21000_Utility/21000-7_DIA/DIA-gBSDUtilitySW-A-3_2_1.zip
Description
This module adapts various resources by means of its (transformed) gBS Description using the gBSDtoBin processor. The gBS Descriptions are transformed using XSLT style sheets.
Input
— Resources: any kind of resource described by the corresponding gBS Description, e.g., MPEG-4 Elementary Stream, JPEG2000 image — DS: (transformed) gBS Description; XSLT style sheet (optional and for the web-based utility software only)
Output
— Resources: Adapted resources — DS: (transformed and updated) gBS Description
Programming Language(s)
Java/XSLT
Platform(s)
Any platform supported by the Java.
Dependencies
The utility software modules use compiled versions of the gBSD reference software API, i.e., compiled versions for Java 1.4.2 and Java 1.5.0 are available. For the web-based utility software a Java Server Pages (JSP) engine is required, e.g., Apache Jakarta Tomcat.
Details
XSLT style sheets are available for gBS Descriptions describing MPEG-4 Visual Elementary Streams and JPEG2000 images.

A.7.19 AdaptationQoS

Module Name: /21000_Utility/21000-7_DIA/DIA-AdaptationQoS-A-1_0_3.zip
Description
This module adapts various resources by means of the AdaptationQoS description.
Input
— Resources: MPEG-4 Video ES, MPEG-4 VTC — DS: AdaptationQoS description

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Output
Resources: Adapted MPEG-4 Video ES, MPEG-4 VTC
Programming Language(s)
(Visual) C++ / Java
Platform(s)
Win32; Any platform supported by the Java.
Dependencies
Details

A.7.20 AdaptationQoS for audio resources

Module Name: /21000_Utility/21000-7_DIA/DIA-AudioAdaptationQoS-A-1_0_2.zip
Description
This module adapts audio resources (channel dropping, audio FGS, spectral band reduction) by means of the AdaptationQoS description.
Input
— Resources: MPEG-4 Audio BSAC & AAC — DS: AdaptationQoS
Output
Resources: MPEG-4 Audio BSAC & AAC (adapted)
Programming Language(s)
C
Platform(s)
Win32.
Dependencies
Details

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A.7.21 UCD

Module Name: /21000_Utility/21000-7_DIA/DIA-FormatIndependentADTE-A-3_1_0.zip
Description
This module provides fully format independent decision-taking based on constraints for a variety of use cases involving several formats.
Input
DS: UCD and AdaptationQoS, UED referenced through UCD.
Output
Decisions for multiple adaptation units in non-normative form in terms of IOPin values
Programming Language(s)
(Visual) C++
Platform(s)
Win32.
Dependencies
Details

A.7.22 BSDLink

Module Name: cf. /21000_Utility/21000-7_DIA/DIA-FormatIndependentADTE-A-3_1_0.zip
Description
This module passes parameter in BSDLink from decisions to transformation style sheet (BSDTrl), followed by processing of the BSDTrl to obtained adapted resource and adapted bit-stream.
Input
— Resources: JPEG2000, MPEG4-VES, MPEG4-VTC, MC-EZBC (fully scalable video proposal for Scalable Video) — DS: BSDTrl, gBS Description, BSDLink, decisions for multiple adaptation units in non-normative form obtained as output of UCD module.
Output
— Resources: Adapted JPEG2000, MPEG4-VES, MPEG4-VTC, MC-EZBC (fully scalable video proposal for Scalable Video) — DS: Adapted gBS Description

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Programming Language(s)
(Visual) C++
Platform(s)
Win32.
Dependencies
Details

A.7.23 Metadata adaptation

Module Name: /21000_Utility/21000-7_DIA/DIA-MetadataAdaptation-A-2_1_0.zip
Description
This module adapts metadata (describing MPEG videos) based on the MetadataAdaptation descriptions.
Input
— Resources: MPEG video — DS: VideoSegment Visual Descriptor, MetadataAdaptation description
Output
— Resources: MPEG video — DS: VideoSegment Visual Descriptor
Programming Language(s)
(Visual) C++
Platform(s)
Win32
Dependencies
Details

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A.7.24 Metadata adaptation integration

Module Name: /21000_Utility/21000-7_DIA/DIA-MetadataAdaptationIntegration-A-2_0_1.zip
Description
This module integrates multiple metadata resources based on the MetadataAdaptation descriptions.
Input
— Resources: MPEG-7 Metadata (two or more instances) — DS: MetadataAdaptation description
Output
Resources: MPEG-7 Metadata (one instance)
Programming Language(s)
(Visual) C++
Platform(s)
Win32
Dependencies
Details

A.7.25 Session mobility

Module Name: /21000_Utility/21000-7_DIA/DIA-SessionMobility-A-1_0_1.zip
Description
This module includes an implementation of MPEG-21 Session Mobility. It supports session transfer between PC and PDA.
Input
Session Mobility DI and Content DI.
Output
Reconstructed session.
Programming Language(s)
C#

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Platform(s)
See below.
Dependencies
PC version: — Windows 98SE/ME/2000/XP or better — .NET Framework 1.1 or better — Windows Media Player 9 or better PDA version: — Windows Mobile 2003 or better — .NET Compact Framework 1.0 or better — Windows Media Player Control for Pocket Internet Explorer
Details

Module Name: /21000_Utility/21000-7_DIA/DIA-RefSW-A.zip
Description
This module generates a context Digital Item containing session mobility information.
Input
— Resources: audio MP3 — DS: auditory impairment descriptor
Output
Context Digital Items for Session Mobility.
Programming Language(s)
Java
Platform(s)
Any platform supported by Java.
Dependencies
Details

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A.7.26 DIA configuration

Module Name: /21000_Utility/21000-7_DIA/DIA-RefSW-A.zip21000_Utility/21000-7_DIA/DIA-RefSW-A-1_0_4.zip
Description
This module demonstrates on-the-fly adaptive media streaming using DIA descriptions.
Input
— Resources: DI — DS: TerminalCapabilities description
Output
— Resources: adapted streaming resources — DS: DIADMs
Programming Language(s)
Java
Platform(s)
Any platform supported by Java.
Dependencies
Details

A.7.27 ConversionLink

Module Name: /21000_Utility/21000-7_DIA/DIA-ConversionLink-A-1_0_0.zip
Description
This module converts Digital Items according to usage environment constraints such as: - NetworkCharacteristics (AvailableBandwidth) - DisplayCapabiltilies (Resolution) - CodecCapabilities (Decoding Format) A GUI is also available to define Usage Environment constraints and to visualize the adapted content.
Input
Content Digitial Item: DID which references media resources and provides conversion suggestions. Context Digitial Item: DID which provides usage environment constraints.

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Output
Adapted Content Digital Item: DID with adapted references to converted media resources that fit into User's Usage Environment. NOTE: Resources that are not supported by available conversion tools will not be adapted.
Programming Language(s)
C++
Platform(s)
Win32.
Dependencies
Details
This ConversionLink Utility Software is a C/C++ implementation that is completely different from the ConversionLinkReference software (in Java). Therefore, no integration between the ConversionLink Reference and Utility software is necessary to demonstrate this Utility Software.

A.7.28 CrossConversionQoS

Module Name: /21000_Utility/21000-7_DIA/DIA-CrossConversionQoS-A-1_0_0.zip
Description
This module adapts Digital Items according to UCD, CrossConversionQoS, AdaptationQoS, ConversionLink descriptions. The modality/format of Resources is converted.
Input
– Resource: a Video content – DS: UCD, CrossConversionQoS, AdaptationQoS, ConversionLink
Output
Resources: Video, Image, Text.
Programming Language(s)
C++, Java
Platform(s)
Win32, Any platform supported by the Java.
Dependencies
Details

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A.7.29 Test content for BSD-based adaptation

Module Name: /21000_Utility/21000-7_DIA/DIA-BSDTestContent-A-0_0_2.zip
Description
This utility software module comprises test content for the BSD-based adaptation. In particular, it provides BS Schemas, BSD (including gBSD), and various XSLT style sheet. Furthermore, reference software modules, other software modules, and batch (or ant build) scripts are provided as well.
Input
— Resource: various (scalable) multimedia coding formats — DS: BS Schemas and/or BSD
Output
— Resources: (adapted) resource — DS: BSD or possibly transformed and updated BSD
Programming Language(s)
Java, XSLT, STX, …
Platform(s)
Win32, any platform supported by the Java.
Dependencies
Various XML parsing and transformation APIs
Details
The structure of the utility software module is as follows: — `0_lib`: directory containing libraries such as reference software modules and other – third party – software; — `1_xsd`: directory containing XML schema documents such as DIA schema documents (but not BS Schemas); — `x_yyy`: directory containing test content where `x={2,3,…,n}` and `yyy` is a three-letter acronym of the test content (e.g., jp2 for JPEG2000, m4v for MPEG-4 visual, or m4a for MPEG-4 audio); — `build.xml`: ant build script for executing the test cases (type `ant -p` for listing all available targets); — `test.bat`: batch script for executing the text cases (type `test /?` for usage);

A.8 ISO/IEC 21000-10:2006/Amd.1:2006

A.8.1 Introduction

Annex A.8 describes the utility software for part 10/Amd 1 of ISO/IEC 21000:2006.

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A.8.2 Execution of C++ functions on a Java based DIP engine

Module Name: /21000_Utility/21000-8_DIP_Amd1/DIP_Amd1-Utility_Software-1_0_0.zip
Description
• This software demonstrates how DIP C++ Bindings and JNI can be used to execute C++ functions on a Java based DIP engine. The software contains the following: o A J-DIXO (called RunCPP.java), which executes, through a wrapper, a C++ program. o Source code for the creation of a library, Wrapper.dll, which incorporates JNI specific code. o Source code for the creation of a C++ program, executable from within a J-DIXO. The C++ program has access to and utilizes the DIP environment available in a Java based DIP engine. o A dynamic link library (called DIBOClasses.dll), which implements JNI constructs regarding the C++ bindings. o An example DI (called cppDI.xml), which uses a J-DIXO to execute a C++ program (called CppProgram.dll).
Input
N/A
Output
N/A
Programming Language(s)
C++, Java
Platform(s)
Dependencies
• DIP FDIS reference software • DIP Amd 1 reference software

A.9 ISO/IEC 21000-12:2005

ISO/IEC 21000-12:2005 is a technical report describing a test bed for MPEG-21 resource delivery as well as proving utility software. The utility software can be found in ISO/IEC 21000-12:2005 and is not explicitly included in this version of ISO/IEC 21000-8.

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Annex B
(informative)

Integrated utility software across the individual ISO/IEC 21000 parts

B.1 Introduction

This Annex describes utility software across the individual ISO/IEC 21000 parts as listed in subclause 4.4.

B.2 REL-RDD integration

Module Name: /21000_Integrated_Utility/REL_RDD-Integration-A-1_1_0.zip
Description
The REL-RDD integration module is an integration of the REL simple license interpreter module with the RDD database query module. It interprets REL expressions based on querying act terms available from RDD term genealogy.
Input
– REL license – Query consisting of a principal, one right, resource, time, exercise count (optional)
Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
Java
Platform(s)
Any platform supported by the Java J2SE and Xerces XML parser, including Windows and Linux.
Dependencies
– The Xerces XML parser. – The Java J2SE SDK 1.3.1 or later, which can be downloaded at http://java.sun.com/j2se/.
Details
Architecture diagram:

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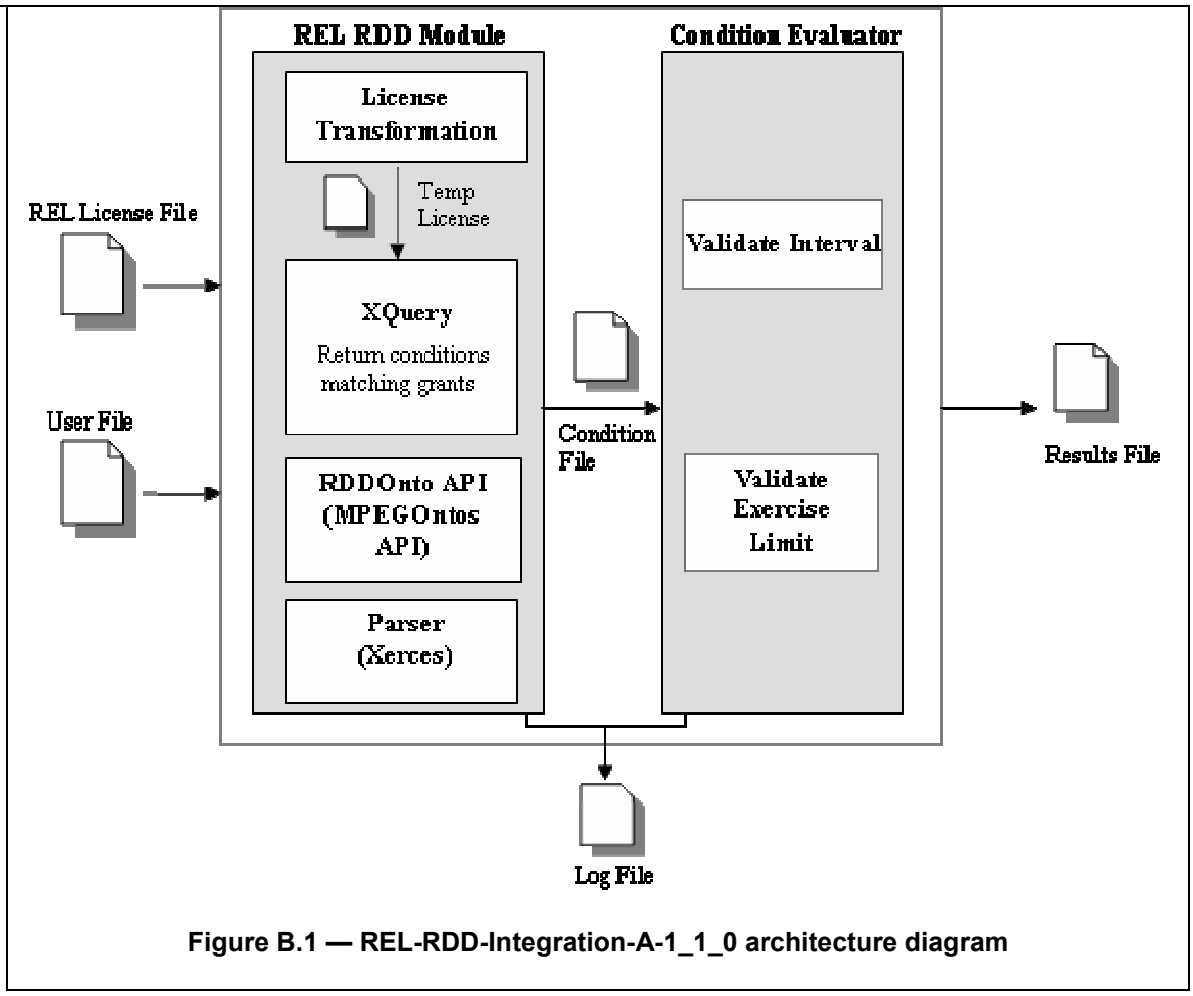

Figure B.1 — REL-RDD-Integration-A-1_1_0 architecture diagram

B.3 DID-REL integration

Module Name: /21000_Integrated_Utility/DID_REL-Integration-A-1_0_0.zip
Description
The DID-REL integration module is an integration of the REL simple license interpreter module with the DID parser module. It extracts the license information from a DIDL expression and uses the REL simple license interpreter to interpret it.
Input
– DIDL document – Query consisting of a principal, one right, resource, time, exercise count (optional)
Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
Java

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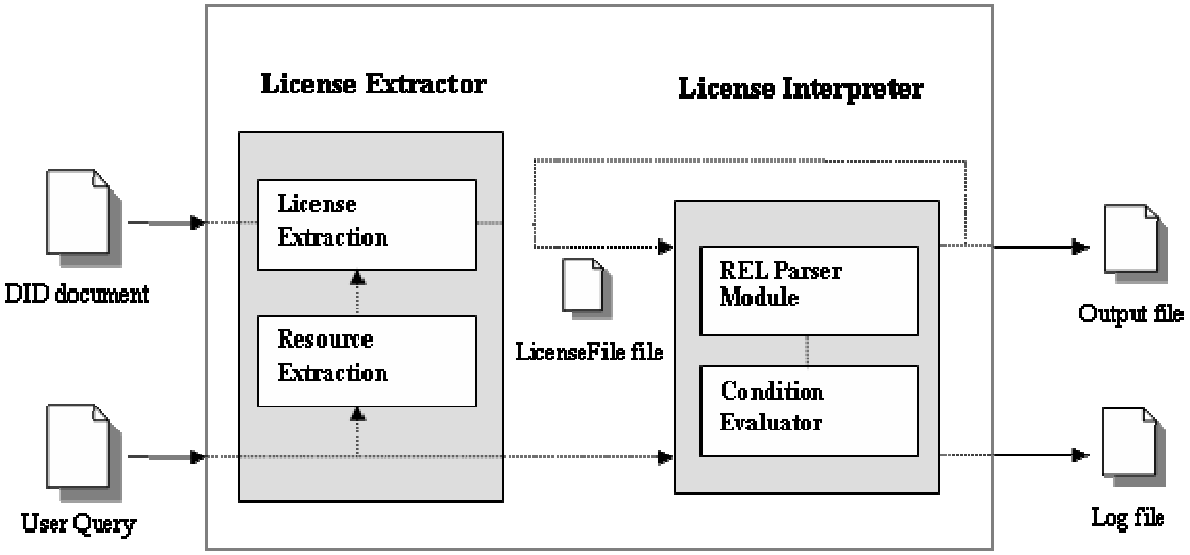
Platform(s)
Any platform supported by the Java J2SE and Xerces XML parser, including Windows and Linux.
Dependencies
– The Xerces XML parser. – The Java J2SE SDK 1.3.1 or later, which can be downloaded at http://java.sun.com/j2se/.
Details
Architecture diagram:  **Figure B.2 — DID-REL-Integration-A-1_0_0 architecture diagram**

Module Name: /21000-Integrated_Utility/DID_REL-Integration-B-1_0_0.zip
Description
The DID-REL integration module is an integration of the REL simple license interpreter module with the DID parser module. It extracts the license information from a DIDL expression and uses the REL simple license interpreter to interpret it.
Input
– DIDL document – Query consisting of a principal, one right, resource, time, exercise count (optional)
Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
Java

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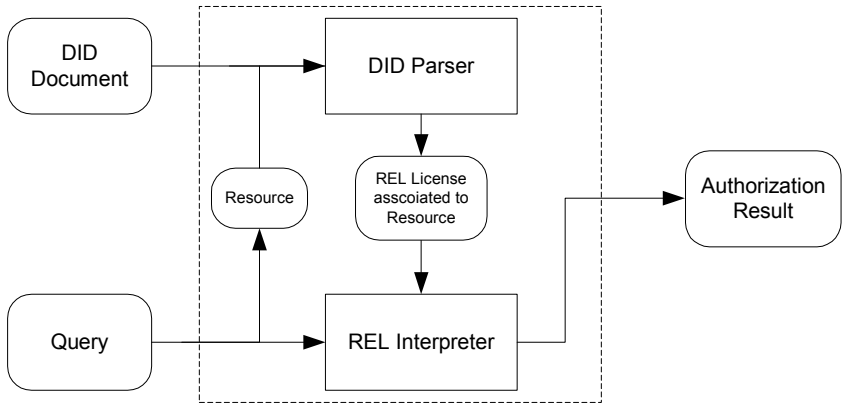
Platform(s)
Windows XP, Windows 2000 Server, Windows ME.
Dependencies
– Microsoft MSXML 4.0 Parser, available at: http://www.microsoft.com/downloads/details.aspx?FamilyId=3144B72B-B4F2-46DA-B4B6-C5D7485F2B42&displaylang=en – J2SE 1.4.1 or higher, available at: http://java.sun.com/j2se/1.4.1/download.html – Xerces-J version 2.4 or later, available at: http://www.apache.org/dist/xml/xerces-j/ – Xalan-J version 2.5 or later, available at: http://apache.intissite.com/xml/xalan-j/
Details
Architecture diagram:  **Figure B.3 — DID-REL-Integration-B-1_0_0 architecture diagram**

B.4 DID-REL-RDD integration

Module Name: /21000_Integrated_Utility/DID_REL_RDD-Integration-A-1_0_0.zip
Description
The DID-REL-RDD integration module is an integration of the REL-RDD integration module with the DID parser module. It interprets REL expressions carried within a DIDL expression based on querying act terms available from RDD term genealogy.
Input
– DIDL document – Query consisting of a principal, one right, resource, time, exercise count (optional)
Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
Java

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Platform(s)
Any platform supported by the Java J2SE and Xerces XML parser, including Windows and Linux.
Dependencies
– The Xerces XML parser. – The Java J2SE SDK 1.3.1 or later, which can be downloaded at http://java.sun.com/j2se/.
Details
Architecture diagram:

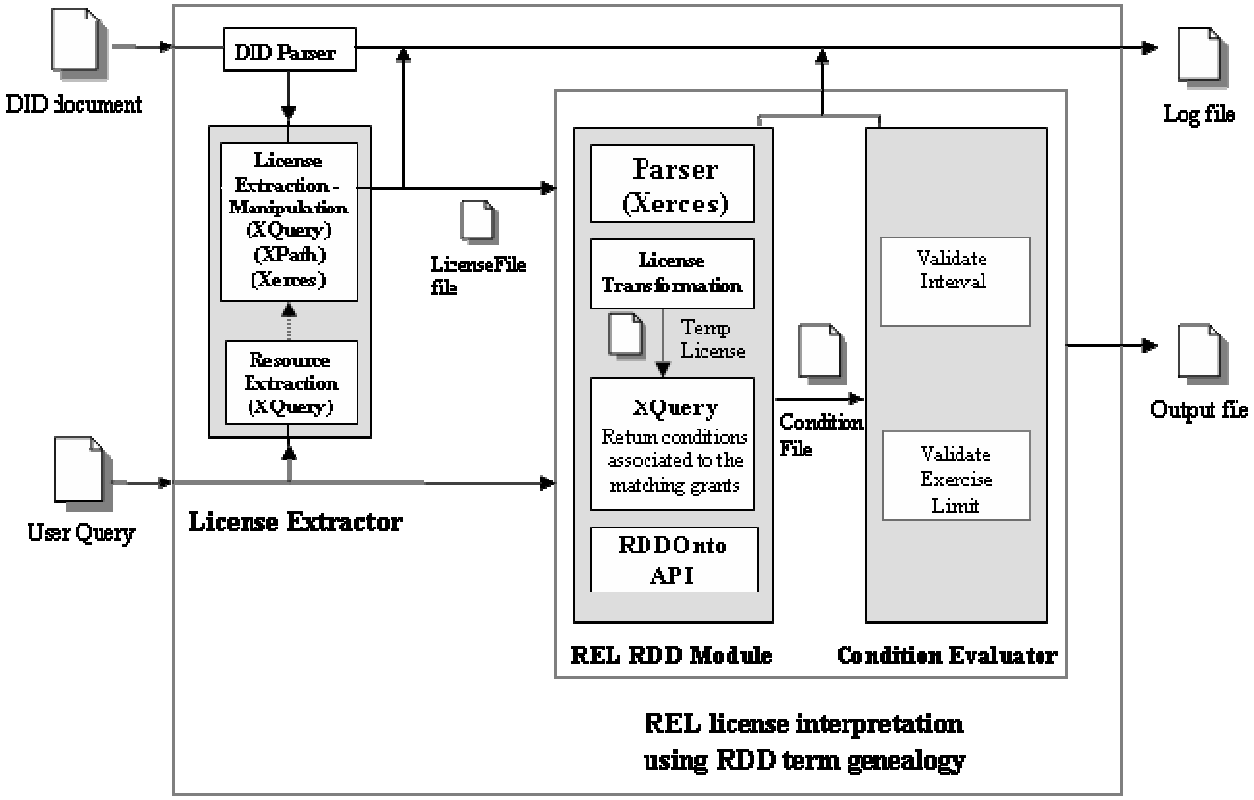

Figure B.4 — DID-REL-RDD-Integration-A-1_0_0 architecture diagram

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B.5 DID-REL-DIA Integration

Module Name: /21000_Integrated_Utility/DID_REL_DIA-Integration-A-1_0_0.zip
Description
The DID-REL-DIA integration module is an integration of the DID-REL integration module with the DIA utility module. It interprets REL expressions carried within a DIDL expression in order to grant the right to play a Digital Item in an adapted form.
Input
– DIDL document – Query consisting of a principal, one right, resource, time, exercise count (optional) – DIA user environnent description (UED)
Output
Authorization result: YES, or NO with reasons why in a log file.
Programming Language(s)
Java
Platform(s)
Windows XP, Windows 2000 Server, Windows ME.
Dependencies
– Microsoft MSXML 4.0 Parser, available at: http://www.microsoft.com/downloads/details.aspx?FamilyId=3144B72B-B4F2-46DA-B4B6-C5D7485F2B42&displaylang=en – J2SE 1.4.1 or higher, available at: http://java.sun.com/j2se/1.4.1/download.html – Xerces-J version 2.4 or later, available at: http://www.apache.org/dist/xml/xerces-j/ – Xalan-J version 2.5 or later, available at: http://apache.intissite.com/xml/xalan-j/
Details
Architecture diagram:

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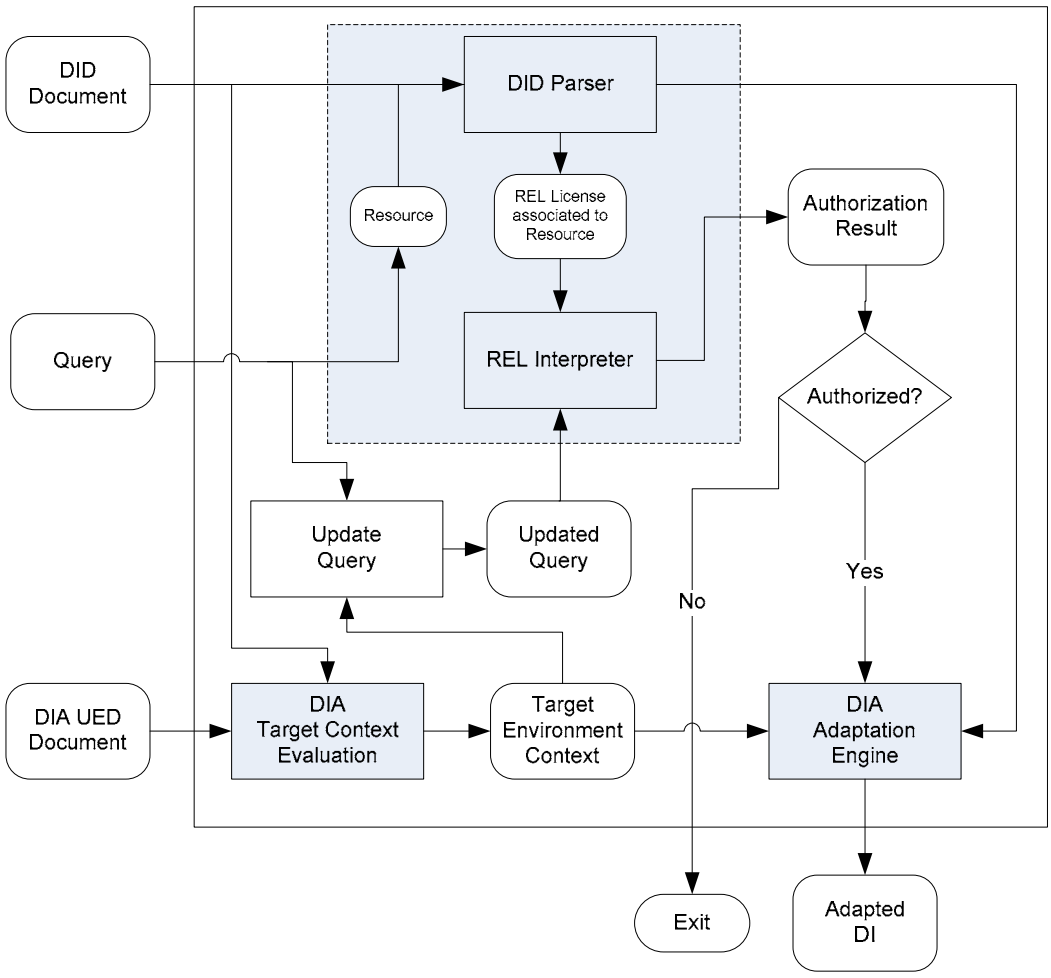

Figure B.5 — DID-REL-DIA-Integration-A-1_0_0 architecture diagram

B.6 DID-DIP-DIA Integration

B.6.1 Introduction

This contribution provides utility software integrating ISO/IEC 21000-2:2005, ISO/IEC 21000-7:2007 and ISO/IEC 21000-10:2006. This integrated utility software demonstrates how enhanced interoperability for session mobility can be achieved by combining those three part of the MPEG-21 standard.

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B.6.2 Session Mobility

Module Name: /21000_Integrated_Utility/DID_DIP_DIA-Session_Mobility.zip
Description
The integrated utility software demonstrates how enhanced interoperability for session mobility can be achieved by combining those three part of the MPEG-21 standard. By using the DIP approach, session mobility can be realized in an interoperable manner. Using DIP interoperability is achieved at different levels: • Using DIP for session mobility makes sure that the DIP-enabled session mobility DI is usable on all DIP-enabled terminals. Therefore, interoperability at the session mobility application level is achieved. • The standardized format for session mobility context DIs is used by the DIP solution. Hence, interoperability of the context data format is achieved. • Since the application-specific data is inserted by the DIMs, interoperability of the application-specific data is achieved. This is a result of the fact that reading and writing of the data is under the control of the content author and not the application developer. • The content author knows exactly how possible reconfiguration of the DI will be done because the behaviour of the J-DIXO, performing the reconfiguration, is known beforehand. Therefore, he is able to fine-tune the reconfiguration process that specific content DI to make optimal use of the content. Since the author also provides the J-DIXO performing the dynamic reconfiguration, the reconfiguration will behave exactly the same on each terminal. And thus, interoperability at the level of reconfiguration is achieved.
Input
Session Mobility DI, Session Mobility DIP DI, and Content DI.
Output
Reconstructed session.
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/)

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