
**Information technology — MPEG
extensible middleware (MXM) —**

**Part 3:
MXM reference software**

Technologies de l'information — Intergiciel MPEG extensible (MXM) —

Partie 3: Logiciel de référence MXM

**iTeh STANDARD PREVIEW
(standards.iteh.ai)**

ISO/IEC 23006-3:2011

<https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011>

PDF disclaimer

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 23006-3:2011](https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011)

<https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011>



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2011

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	iv
Introduction.....	v
1 Scope	1
2 Normative references	1
3 Terms and definitions	1
4 Abbreviated terms	1
5 MXM software overview	2
5.1 The MXM software repository	2
6 MXM Java software implementation.....	3
6.1 Introduction.....	3
6.2 Java MXM Engines	4
6.3 Java MXM Applications.....	8
7 MXM C++ software implementation.....	9
7.1 MediaFramework Engine.....	9
Annex A (informative) Check out the MXM source code from the MXM svn repository	11
Annex B (informative) Building the MXM Java implementation.....	12
Bibliography.....	14

[ISO/IEC 23006-3:2011](https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011)

<https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011>

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 23006-3 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

ISO/IEC 23006 consists of the following parts, under the general title *Information technology — MPEG extensible middleware (MXM)*:

- *Part 1: MXM architecture and technologies* [ISO/IEC 23006-3:2011](https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011)
- *Part 2: MXM API*
- *Part 3: MXM reference software*
- *Part 4: MXM protocols*

Introduction

ISO/IEC 23006 is a suite of standards that has been developed for the purpose of enabling the easy design and implementation of media-handling value chains whose devices interoperate because they are all based on the same set of technologies accessible from the MXM middleware.

This will enable the development of a global market of

- MXM applications that can run on MXM devices thanks to the existence of a standard MXM application API,
- MXM devices hosting MXM applications thanks to the existence of a standard MXM architecture,
- MXM components thanks to the existence of standard MXM components APIs,
- innovative business models because of the ease to design and implement media-handling value chains whose devices interoperate because they are all based on the same set of technologies.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[ISO/IEC 23006-3:2011](https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011)

<https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011>

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 23006-3:2011](https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011)

<https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011>

Information technology — MPEG extensible middleware (MXM) —

Part 3: MXM reference software

1 Scope

This part of ISO/IEC 23006 describes the reference software implementing the normative clauses of ISO/IEC 23006-1. The information provided is applicable for determining the reference software modules available for ISO/IEC 23006-1, understanding the functionality of the available reference software modules, and utilizing the available reference software modules.

2 Normative references

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

ISO/IEC 23006-1, *Information technology — MPEG extensible middleware (MXM) — Part 1: MXM architecture and technologies*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 23006-1 apply.

4 Abbreviated terms

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

BBL	Bitstream Binding Language
DIA	Digital Item Adaptation
DID	Digital Item Declaration
DIDL	Digital Item Declaration Language
DII	Digital Item Identification
DIS	Digital Item Streaming
IPMP	Intellectual Property Management and Protection
LPD	License Provider Device
REL	Rights Expression Language
URI	Uniform Resource Identifier

5 MXM software overview

5.1 The MXM software repository

The figure below shows a graphical representation of the MXM software.

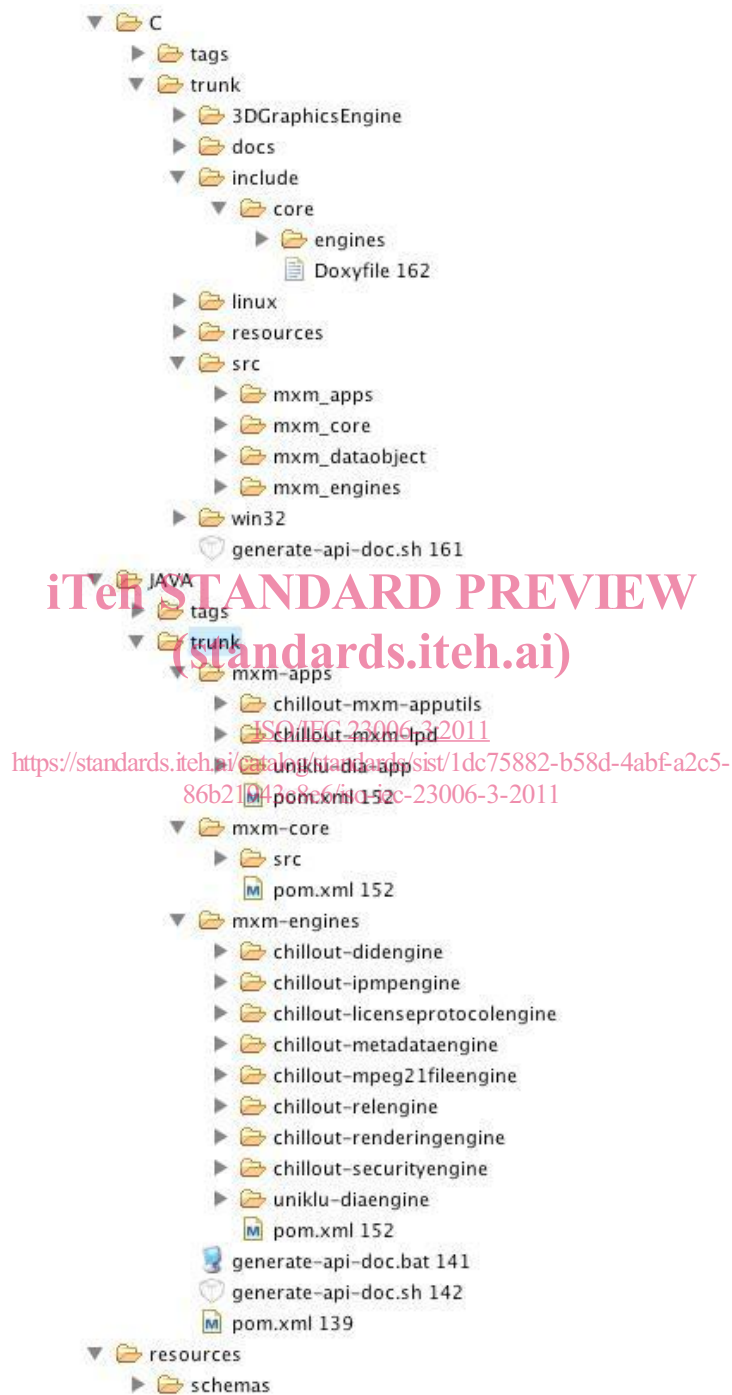


Figure 1 — The MPEG-M software structure

NOTE The MPEG-M remote folder contains two main sub-folders: C and Java, containing the MXM API definition:

- In C++: C/include/core/engines/
- In Java: JAVA/mxm-core/src/main/java

The reference software also contains preliminary MXM software implementations in both programming languages, as well as all the schemas referred in ISO/IEC 23006-1, ISO/IEC 23006-2 and ISO/IEC 23006-4.

6 MXM Java software implementation

6.1 Introduction

The Java MXM software is available in source code under the terms of the BSD License [4]. The software is organised in a number of projects, whose build is managed by Maven [7]. All projects have a common structure:

- `src/main/java` --> Containing the main classes and/or interfaces organised in packages
- `src/main/resources` --> Containing the resources (e.g. xml files, properties files, etc.) used by the engine or the application at runtime
- `src/test/java` --> Containing the unit test classes used to test the main classes
- `src/test/resources` --> Containing those resources which are used by the tests when being executed.

The Java MXM software is divided in the following modules:

- **mxm-core**: the core MXM project. It defines the MXM APIs and it provides a thin layer of code implementing MXM as a factory of MXM Engines based on the contents of the MXMConfiguration file passed over to MXM when instantiated. Summarising, mxm-core contains the following categories of classes:
 - all interfaces defining the MXM API
 - a number of classes for:
 - parsing the MXM configuration file (conforming to the MXM configuration schema) defining which MXM Engines shall be loaded.
 - loading MXM Engines. MXM Core acts as a factory providing MXM applications one or more instances of the MXM Engines listed in the MXM configuration file.
- **mxm-engines**: containing the software implementation of MXM engines. Currently a preliminary version of the following MXM Engines has been developed:
 - DIDEngine
 - DIAEngine
 - MPEG21FileEngine
 - MetadataEngine
 - REEngine
 - IPMPEngine
 - SecurityEngine
 - LicenseProtocolEngine
 - ContentProtocolEngine
 - DISEngine
 - EREngine

- **mxm-applications**: containing examples of MXM applications which can be customised or used for conformance test purposes. The following MXM applications have been provided:
 - chillout-mxm-lpd
 - uniklu-dia-app

6.2 Java MXM Engines

6.2.1 The DIDEngine

A preliminary implementation of the DID Engine has been provided by the Chillout project [10]. The DIDEngine is used to generate and conversely to parse a Digital Item. By means of this engine it is possible to add to or retrieve from a Digital Item the following Content and Content element information:

- identifiers
- related identifiers
- item IDs
- MPEG-7 (MDS) metadata
- IPMPGeneralInfoDescriptors
- protectedAssets
- laserObjects
- signatures
- resource information (mimeType, ref, encoding)

iTech STANDARD PREVIEW
(standards.iteh.ai)

[ISO/IEC 23006-3:2011](https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011)

<https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011>

6.2.2 The DIA Engine

This Subclause describes a portion of the MXM reference software related to `adaptResByDescr`, `setUseEnvDescr`, and `parseUseEnvDescr` as defined in ISO/IEC 21000-7.

The software is structured as follows:

- `org.iso.mpeg.mxm` provides general classes for the MPEG MXM API.
- `org.iso.mpeg.mxm.demo` provides a simple demo application utilizing the actual reference software.
- `org.iso.mpeg.mxm.dia` provides the MXM API related to MPEG-21 Digital Item Adaptation.
- `org.iso.mpeg.mxm.exception` provides the MXM API Exceptions.

The software assumes that an `MXMResource` implements the `MXMResAdaptDescrI` which defines the `adaptResByDescr`. That is, the `MXMResource`¹ is adapted according to the Usage Environment Description (UED) which is parsed using `MXMDIAUED`. `MXMDIAUED` implements both `setUseEnvDescr` and `parseUseEnvDescr` methods.

¹ The `MXMResource` contains an URI that identifies the actual media resource to be adapted.

NOTE `parseUseEnvDescr` has been modified and now returns an `Object` instead of a `String`. It is recommended to change this in the WD1.0 of MXM APIs accordingly.

In the following, the main steps of the `adaptResByDescr` method are described:

- 1) Read/parse the `UsageEnvironmentType` from the `String:ued` using the DIA reference software via the MXM API.
- 2) Create a new `MXMDIAEngine` and adapt the resource.

The MPEG-21 DIA reference software is used to parse the UED into its internal representation and is then available as `DIA` object. The actual adaptation extracts the relevant information from the `DIA UsageEnvironmentProperty` objects (e.g., codec capabilities, display capabilities, etc.) and triggers the adaptation process based on these parameters. The adaptation is performed using the `mencoder` which is executed through Java's `Runtime.exec()` environment. Thus, the execution of this reference software requires a proper installation of the `mencoder` including `libavcodec`.

For further documentation – specifically, caveats and obstructions of the `MXMDIAEngine` – the interested reader is referred to the Java documentation.

6.2.3 The MPEG21FileEngine

The Chillout MPEG21 File Engine is used to generate and conversely to parse ISO/IEC 21000-9 (MPEG-21 File Format) files. By means of this engine it is possible to create or to extract from an MPEG-21 file the following information:

- A Digital Item (to/from the XML Box)
- A number of resources (to/from the `MediaData Box`):
<https://standards.iteh.ai/catalog/standards/sist/1dc75882-b58d-4abf-a2c5-86b21943c8e6/iso-iec-23006-3-2011>

6.2.4 The MetadataEngine

A preliminary implementation of the Metadata Engine has been provided by the Chillout project [10]. The Chillout `ContentMetadata Engine` is used to generate and conversely to parse MPEG-7 (MDS) metadata structures. By means of this engine it is possible to add to or retrieve from an MPEG-7 description the following `Content` and `Content element` information:

- `CreationDescription` containing
 - `titles`
 - `titleMedia`
 - `abstracts`
 - `creators`
 - `creationCoordinates`
 - `copyrightStrings`
 - `genres`
 - `parentalGuidances`