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

**Part 1:
MXM architecture and technologies**

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

Partie 1: Technologies et architecture MXM

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member 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 shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 23006-1 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 23006-1:2011](https://standards.iteh.ai/catalog/standards/sist/5606227f-a644-43b2-8866-b9e420e0ba72/iso-iec-23006-1-2011)
- *Part 2: MXM API* <https://standards.iteh.ai/catalog/standards/sist/5606227f-a644-43b2-8866-b9e420e0ba72/iso-iec-23006-1-2011>
- *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 executing MXM applications thanks to the existence of a standard MXM architecture,
- MXM engines thanks to the existence of standard MXM architecture and standard APIs, and
- 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.

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Information technology — MPEG extensible middleware (MXM) —

Part 1: MXM architecture and technologies

1 Scope

This part of ISO/IEC 23006 specifies the MXM architecture and references the technologies that are made accessible through the set of MXM APIs specified in ISO/IEC 23006-2.

The elements of the MXM Architecture are as follows:

- a) MXM Engines – collections of specific technologies that it is meaningful to bundle together;
- b) MXM Engine APIs – APIs that can be used to access MXM Engine functionality;
- c) Orchestrator Engine – a special MXM Engine capable of creating chains of MXM Engines to execute a high-level application call such as “Play”;
- d) MXM Orchestrator Engine APIs; [ISO/IEC 23006-1:2011](https://standards.iteh.ai/catalog/standards/sist/5606227f-a644-43b2-8866-b9e420e0ba72/iso-iec-23006-1-2011)
- e) MXM Device – a device equipped with MXM;
- f) MXM Application – an application that runs on an MXM Device and makes calls to the MXM Application API and MXM Engine APIs;
- g) MXM Protocols for enabling MXM to MXM communications.

2 Terms and definitions

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

2.1

content creation device

CCD

device enabling the creation of content

NOTE Content can include audio-visual resources, rights information, metadata, etc.

2.2

content identification device

CID

device providing content identification and authentication services to another device

2.3

content provider device

CPD

device on which content may be stored and which delivers content to another device

2.4

content search device

CSD

device providing responses to queries made by other devices about content items satisfying some criteria

2.5

device

combination of hardware and software or just an instance of software that allows a user to perform actions

2.6

domain

set of devices sharing a set of common properties such as ownership

2.7

domain management device

DMD

device managing the lifecycle of a domain and the membership of devices and users that are part of it

2.8

Event Report

representation of an Event(s) as specified by the related Event Report Request

[ISO/IEC 21000-15]

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2.9

event report collection device

ECD

device collecting Event Reports generated by other devices

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2.10

Inter-MXM Protocol

protocol that enables communication between MXM Devices

2.11

IPMP Tool

module performing one or more IPMP functions such as authentication, decryption, watermarking, etc.

2.12

IPMP Tool Body

executable code implementing an IPMP Tool

2.13

IPMP Tool provider device

ITD

device delivering IPMP Tools to another device

2.14

licence provider device

LPD

device delivering licences to another device according to a previously stored Licence Template

2.15

Licence Template

licence granting rights to issue licences to a device

2.16**MXM Application**

application that runs on an MXM Device and makes calls to the MXM Application API and MXM Engine APIs

2.17**MXM Device**

device equipped with a selected assembly of MXM Engines

2.18**MXM Engine**

collection of specific technologies that it is meaningful to bundle together

2.19**MXM Engine API**

API of a single MXM Engine

2.20**MXM Orchestrator API**

API of the MXM Orchestrator Engine

2.21**MXM Orchestrator Engine**

special MXM Engine capable of creating chains of MXM Engines, i.e. to set up a sequence of connected MXM Engines for the purpose of executing a high-level application call such as play

2.22**MXM Technology**

technology that is supported by (a profile of) MXM

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2.23**user**

any entity making use of an MXM Device

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3 Abbreviated terms

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
ER	Event Report
ERR	Event Report Request
IPMP	Intellectual Property Management and Protection
MSAF	Media Streaming Application Format (ISO/IEC 23000-5)
REL	Rights Expression Language
URI	Uniform Resource Identifier

4 System overview

4.1 Introduction

The MPEG extensible Middleware is an architecture containing MPEG standard multimedia technologies whose purpose is to enable the easy design and implementation of media-handling value chains whose devices interoperate because they are all based on the same set of technologies exposed through standard APIs.

4.2 MXM Device

An MXM Device is a combination of hardware and software or just an instance of software implementing this International Standard.

Figure 1 depicts an MXM Device.

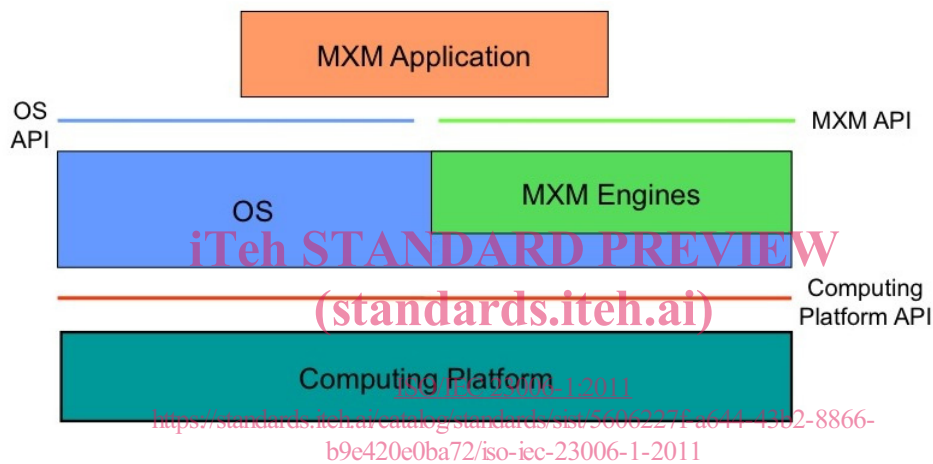


Figure 1 — An MXM Device

4.3 MXM Architecture

The elements of the MXM Architecture are

- MXM Engines, collections of specific technologies that it is meaningful to bundle together
- MXM Engine APIs, APIs that can be used to access MXM Engine functionality
- Orchestrator Engine, a special MXM Engine capable of creating chains of MXM Engines to execute a high-level application call such as “Play”
- MXM Application API, the API of the MXM Orchestrator Engine
- MXM Device, a device equipped with MXM
- MXM Application, an application that runs on an MXM Device and makes calls to the MXM Application API and MXM Engine APIs

Figure 2 shows a general model of an MXM device

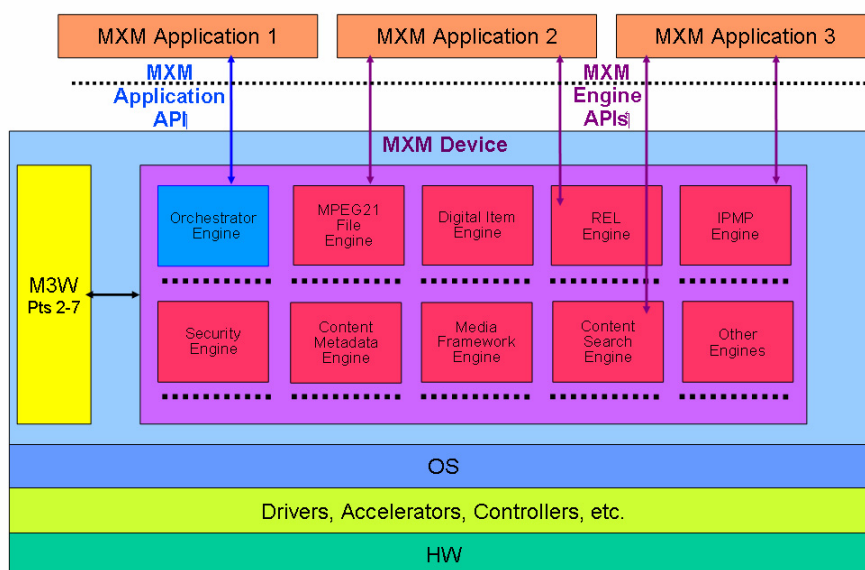


Figure 2 — The MXM architecture

As shown in Figure 2 above, MXM comprises a framework hosting a number of Engines. These are containers of a specific set of MXM Technologies accessible by the MXM API specific of that Engine. As is typical of most MPEG standards, the MXM standard will only define the interfaces of the MXM Engines, named MXM Engine APIs and the MXM Orchestrator API.

In general an MXM Device can have several MXM Applications running on it (there may be other applications but these are not relevant here). Some may be “resident”, i.e. they have been loaded by the MXM manufacturer and some may be temporary, i.e. they have been downloaded for a specific purpose.

When an MXM Application is executed, there may be “low-level” calls directly to some MXM Engines using the MXM Engine APIs of each specific Engines, and “high-level” calls like, say, “Play (GovernedContent)” which will be handled by the Orchestrator Engine. The MXM Orchestrator, by calling the MXM Engine APIs of specific engines, is capable of setting up a chain of MXM engines for handling complex operations, orchestrating the intervention and send/receive data to/from the particular chain of Engines that a given high-level call will trigger, thus relieving MXM Applications from the logic of handling them. Each MXM Engine will contain a specific set of MXM Technologies accessible by an MXM Application, the MXM Orchestrator and any other MXM Component in MXM, by means of its own MXM Engine API.

For instance, in the case of “Play (GovernedContent)” the Orchestrator engine could set-up the following chain:

- a) MP21 File engine (e.g. open the file and extract the Digital item);
- b) DI engine (e.g. extract metadata and rights information);
- c) REL engine (e.g. verify if the right to play is granted);
- d) IPMP engine (e.g. set up IPMP Tools to decrypt protected resources);
- e) Security engine (e.g. initialise the IPMP Tools with decryption keys);
- f) Content Metadata engine (e.g. present content metadata to the user);
- g) Media Framework engine (e.g. demux, decode and render audio-visual resources).

... and possibly others.