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Information technology — Generic coding of moving pictures and associated audio information —

Part 4: Conformance testing

AMENDMENT 1: MPEG-2 IPMP conformance testing

Technologies de l'information — Codage générique des images animées et des informations sonores associées —

Partie 4: Essais de conformité

AMENDEMENT 1: Essais de conformité MPEG-2 IPMP

Reference number
ISO/IEC 13818-4:2004/Amd.1:2005(E)

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Foreword

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Amendment 1 to ISO/IEC 13818-4:2004 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia Information*.

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Information technology — Generic coding of moving pictures and associated audio information —

Part 4:
Conformance testing

AMENDMENT 1: MPEG-2 IPMP conformance testing

Add the following clauses at the end of Audio section:

2.6 Conformance for MPEG-2 IPMP

2.6.1 Introduction

In this document, the additional text to ISO/IEC 13818-4:2004 is specified for the conformance test of ISO/IEC 13818-1:2000/Amd.2 & 13818-11 MPEG-2 IPMP. In this clause, except where stated otherwise, the following terms are used for practical purposes:

The term ‘content stream' or ‘system stream’ means ISO/IEC 13818-1:2000 system bitstream possibly with multiplexed ISO/IEC 13818-2:2000 visual streams and ISO/IEC 13818-3:1998 audio streams.

The term ‘IPMP bitstream’ means an MPEG-2 system stream with information of IPMP protection, including IPMP Descriptor, IPMP Stream, IPMP Tool List.

The term ‘IPMP Information’ means “IPMP Control Information” in PSI, “IPMP Descriptor” in PMT, and IPMP Stream that come from IPMP bitstream.

The term ‘IPMP Data’ means these IPMP data extended from IPMP_Data_BaseClass or other specific IPMP data to assist IPMP protection, these IPMP Data can be carried in either IPMP Descriptor, IPMP Stream, or IPMP Messages.

The term “IPMP Message” means the IPMP messages passed between terminal and IPMP tools via a non-normative messaging interface.

The term 'IPMP terminal' means a MPEG-2 terminal with IPMP Extension capability as specified in 13818-1:2000/Amd.2 & 13818-11 MPEG-2 IPMP.

If any statement stated in this sub-clause accidentally contradicts a statement or requirement defined in 13818-1:2000/Amd.2 & 13818-11 MPEG-2 IPMP, the text of 13818-1:2000/Amd.2 & 13818-11 MPEG-2 IPMP prevails.

The following subclauses specify the normative tests for verifying compliance of IPMP bitstream, IPMP Data and IPMP Message. Those normative tests make use of test suites and the reference software decoders specified in ISO/IEC 13818-5:2002/Amd.4 with source code available in electronic format.

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2.6.2 Specification of test IPMP bitstreams

2.6.2.1 Conformance Requirements

IPMP information contained in PSI of MPEG-2 system stream shall comply with the specifications in 5 and 6 of ISO/IEC 13818-1:2000/Amd.2 & ISO/IEC 13818-11 (MPEG-2 IPMP).

2.6.2.2 Tolerance

There is no tolerance for IPMP Bitstream syntax checking. The diagnosis is pass or fail.

2.6.2.3 Terminal conformance

Each compliant IPMP terminal shall be able to parse and process all compliant IPMP bitstreams. As the implementation of IPMP terminals differs from each other depending on the implementers, the bit-wise comparison of the terminal output with a reference output may not work. The judgment should be done from the total behavior of the terminal.

2.6.2.4 Tool conformance

Not applicable.

2.6.2.5 Test IPMP Bitstream

2.6.2.5.1 #IPMPBS1

BitStream: MPEG-2 TS stream with PAT, PMT, one MPEG-2 visual stream, and one MPEG-1 Layer 2 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List in PSI: containing one IPMP Tool ID.
- IPMP Descriptor in PMT. Specifying one IPMP Tool therein is to be loaded before MPEG-2 video decoder (control point is set before decode buffer).

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure the required tool is present.
- Verify that the IPMP terminal handles IPMP Descriptor, and launches the IPMP Tool according to information given in the IPMP Descriptor.

2.6.2.5.2 #IPMPBS2

BitStream: MPEG-2 TS stream with PAT, PMT, one MPEG-2 visual stream, and one MPEG-1 Layer 2 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List: containing two IPMP Tool IDs.
- Two IPMP Descriptors in PMT: the IPMP Tools specified therein are to be loaded before MPEG-2 video render and before MPEG-1 Layer 2 audio decoder, respectively. (The control point is set accordingly).

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure the required tools are present.
- Verify that the IPMP terminal handles IPMP Descriptors, and launches the specified IPMP Tools according to information given in the IPMP Descriptors.

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2.6.2.5.3 #IPMPBS3

BitStream: MPEG-2 TS stream with PAT, PMT, one MPEG-2 visual stream, and one MPEG-1 Layer 2 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List: containing one IPMP Tool ID.
- Tool Container: carrying a tool that is specified by the Tool List.
- IPMP Descriptor in PMT: the IPMP Tool specified therein is to be loaded before MPEG-2 video decoder (the control point is set before decode buffer).

Purpose:

- Verify that the IPMP terminal handles IPMP Tool Container, makes sure the carried tool can be assembled and launched correctly.
- Verify that the IPMP terminal handles IPMP Descriptor, and launches the specified IPMP Tools according to information given in the IPMP Descriptor.

2.6.2.5.4 #IPMPBS4

BitStream: MPEG-2 TS stream with PAT, PMT, one MPEG-2 visual stream, and one MPEG-1 Layer 2 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List: containing one IPMP Tool IDs.
- Rights Container: containing the rights information about the content.
- IPMP Descriptor: the IPMP Tool specified therein is a rights management tool, to be loaded at a global scope (control point=0).

Purpose:

- Verify that the IPMP terminal handles IPMP Rights Container, make sure the rights is either processed by the terminal, or delivered to the Rights Management Tool to process.
- Verify that the IPMP terminal handles IPMP Descriptor, and launches the specified IPMP Tools according to information given in the IPMP Descriptor.

2.6.2.5.5 #IPMPBS5

BitStream: MPEG-2 TS stream with PAT, PMT, one MPEG-2 visual stream, and one MPEG-1 Layer 2 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List: containing two IPMP Tool IDs.
- Two IPMP Descriptors in PMT: the IPMP Tools specified therein are to be loaded before MPEG-2 video render and before MPEG-1 Layer 2 audio decoder, respectively. (The control point is set accordingly).
- IPMP Stream: It carries IPMP_StreamDataUpdate to be delivered to the above mentioned two IPMP Tools.

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Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure the required tools are present.
- Verify that the IPMP terminal handles IPMP Descriptors, and launches the specified IPMP Tools according to information given in the IPMP Descriptors.
- Verify that the IPMP terminal is able to parse the IPMP Stream, and deliver the IPMP_StreamDataUpdate to its designated IPMP Tool at the specified time.

2.6.2.5.6 Summary

The above bitstreams cover IPMP features that extend from MPEG-2 TS system (other IPMP features, e.g., messages, are discussed in next section). Table AMD1-1 summarize the above streams.

Table AMD1-1 — Summary of IPMP bitstreams

Name	Elem Streams	IPMP Descriptors	Tool List	Tool Container	Rights Container
IPMPBS1.ts	Video: 1 Audio: 1	Video: 1 Audio: n/a	One Tool ID is specified	n.a.	n.a.
IPMPBS2.ts	Video: 1 Audio: 1	Video: 1 Audio: 1	Two Tool IDs are specified	n.a.	n.a.
IPMPBS3.ts	Video: 1 Audio: 1	Video: 1 Audio: n.a.	One Tool ID is specified	One Tool is carried	n.a
IPMPBS4.ts	Video: 1 Audio: 1	Video: n.a. Audio: n.a.	One Tool ID is specified	n.a.	Rights data is carried
IPMPBS5.ts	Video: 1 Audio: 1 IPMP Stream: 1	Video: 1 Audio: 1	Two Tool IDs are specified	n.a.	n.a.

2.6.3 Specification of test IPMP data

2.6.3.1 Conformance Requirements

IPMP Data shall comply with the specifications in ISO/IEC 13818-1:2000/Amd.2 & ISO/IEC 13818-11 (MPEG-2 IPMP).

2.6.3.2 Tolerance

There is no tolerance for IPMP Data syntax checking. The diagnosis is pass or fail.

2.6.3.3 Terminal conformance

Some IPMP data is meant to be carried in messages passed between terminal and IPMP Tool, some IPMP data is meant to be carried in IPMP bitstream, while some of them can be carried in both messages between terminal and IPMP Tool, as well as IPMP bitstream.

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Hence a compliant IPMP terminal is not required to be able to parse all IPMP data. The IPMP Data that a compliant IPMP terminal should be able to parse and process is marked as “TM”.

Some IPMP data does not require an output, the judgment should be done from the total behavior of the terminal.

2.6.3.4 Tool conformance

Some IPMP data does not require an output; the judgment should be done from the overall behavior of the IPMP Tool.

2.6.3.5 Test IPMP Data

IPMP Data	Terminal/Tool Conformance	Specification and purpose
		Mutual Authentication Related IPMP Data
AlgorithmDescriptor	TM/TO	This class is for specifying an identifier of an authentication related algorithm
AuthCodes	TM/TO	Authentication codes for IPMP_MutualAuthentication messages
BaseAuthenticationDescriptor	TM/TO	The base for authentication descriptors
Certificate	TM/TO	A generic certificate
DateClass	TM/TO	Contains the audit date of IPMP tool in question, in Universal Time, Co-ordinated (UTC) and Modified Julian Date (MJD)
KeyDescriptor	TM/TO	This class is for specifying a cryptographic algorithm and a key conforming to the algorithm
IPMP_InitAuthentication	TM/TO	Message that initiates a mutual authentication process
IPMP_MutualAuthentication	TM/TO	Messages exchanged during mutual authentication process
TrustSecurityMetadata	TM/TO	Message carrying metadata for the verification of trust between two tools
		IPMP Tool Connection and Disconnection
IPMP_GetTools	TM/TO	This message is sent by a Tool to the Terminal to find all the tools, instantiated or not, that are available on the terminal
IPMP_GetToolsResponse	TM/TO	This message is sent by the Terminal to a Tool in reply of an IPMP_GetTools request

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IPMP_ToolParamCapabilitiesQuery	TM/TO	This message allows a terminal to query a tool as for support for a specific parametric description
IPMP_ToolParamCapabilitiesResponse	TM/TO	This message is the response to the above parametric capabilities query and simply returns a boolean value as to whether or not the parametric description is supported by the tool
IPMP_ConnectTool	TM/TO	This message allows a tool to request the Terminal to create a connection to a tool identified in the toolDescriptor
IPMP_DisconnectTool	TM/TO	This message allows a tool to disconnect a tool it has previously connected at a control point
	IPMP Tool Notification	
IPMP_AddToolNotificationListener	TM/TO	This message is sent from a Tool to the Terminal to request notification of certain events
IPMP_RemoveToolNotificationListener	TM/TO	This message is sent from a Tool to the Terminal to request stop notification of certain events There are five event types defined by the standard, plus a number of user defined events
IPMP_NotifyToolEvent	TM/TO	This message notifies an IPMP Tool of an event for which it had previous registered as a listener
	IPMP Processing	
IPMP_Data_BaseClass	TM/TO	This class is used to carry IPMP data in the bitstream or from one Tool to another
IPMP_ByteArray	TM/TO	This class stores an array of bytes of known size, and converts it into binary format
IPMP_CanProcess	TM/TO	Sent from a Tool to the Terminal to allow or refuse content processing
IPMP_OpaqueData	TM/TO	This class is used for carriage of opaque data
IPMP_KeyData	TO	This message carries key and synchronization information for decryption Tools
IPMP_RightsData	TM/TO	The IPMP_RightsData contains rights information and can be carried in either the IPMP_Descriptor or IPMP_Message's forming an IPMP Stream
IPMP_SelectiveDecryptionInit	TO	This message initialize a decryptor Tool
IPMP_AudioWatermarkingInit	TO	Delivers to an audio watermerking tool all the information about the characteristics of audio content

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IPMP_SendAudioWatermark	TM/TO	An audio watermarking tool that has been required to perform payload extraction will construct this IPMP data
IPMP_VideoWatermarkingInit	TO	This message delivers to a watermarking tool all the information about the characteristics of the video content, the type of action to be performed on it, and possibly other related proprietary data required by the watermarking tool
IPMP_SendVideoWatermark	TM/TO	A video watermarking tool that has been required to perform payload extraction will construct this IPMP data
	User Interaction	
DTArray	TM/TO	Carries text to be displayed to the user
QTArray	TM/TO	Carries a prompt to be displayed to the user
RTArray	TM/TO	Carries an user's answer
OptionArray	TM/TO	Carries an option that may be selected by the user
IPMP_UserQuery	TM/TO	Used to query the user for information
IPMP_UserQueryResponse	TM/TO	Carries an user's answer to an IPMP_UserQuery
	From the bitstream	
IPMP_Descriptor	TM/TO	The IPMP_Descriptor carries IPMP information for one or more IPMP Tool instances
IPMP_DescriptorUpdate	TM	This class conveys a list of new or updated IPMP_Descriptor's
IPMP_Message	TM	Class to convey time-varying IPMP information for associated IPMP Tool instances
IPMP_ParametricDescription	TM/TO	Using a parametric description, it is possible to describe what type of IPMP Tool is required in order to be able to play the content, instead of using fixed Tool IDs
IPMP_Tool	TM	This class identifies one IPMP Tool that is required by the Terminal to consume the content
IPMP_ToolListDescriptor	TM	This message conveys the list of IPMP tools required to access the content associated with the IOD in which it is described
	IPMP Terminal to Terminal	
IPMP_RequestContent	TM	One IPMP Terminal requests a content from the other IPMP terminal.

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IPMP_ResponseToContentRequest	TM	The response to IPMP_RequestContent
IPMP_ContentTransfer	TM	One IPMP terminal transfers the content to another IPMP terminal.
IPMP_RequestTool	TM	One IPMP Terminal requests an IPMP Tool from the other IPMP terminal.
IPMP_ResponseToToolRequest	TM	The response to IPMP_RequestTool, possibly containing the requested IPMP Tool.
IPMP_DeviceID_Notification	TM	One IPMP terminal transfers the content to another IPMP terminal.
	XML Schema	
Schema for Terminal Platform	TM	An XML schema to describe the terminal platform that an IPMP Tool can run on.

2.6.4 Specification of test IPMP Message

2.6.4.1 Conformance Requirements

IPMP Message shall comply with the specifications in ISO/IEC 13818-1:2000/Amd.2 & ISO/IEC 13818-11 (MPEG-2 IPMP).

2.6.4.2 Tolerance

There is no tolerance for IPMP Message syntax checking. The diagnosis is pass or fail.

2.6.4.3 Terminal conformance

Each compliant IPMP terminal shall be able to parse and process all compliant IPMP Messages listed in this clause. No normative output is required from processing the IPMP Messages. The judgment should be done from the total behavior of the IPMP terminal.

2.6.4.4 Tool conformance

Each compliant IPMP tool shall be able to parse and process all compliant IPMP Messages listed in this clause. No normative output is required from processing the IPMP Messages. The judgment should be done from the total behavior of the IPMP Tool.

2.6.4.5 Test IPMP Messages

IPMP_Messages	Specification and Purpose
IPMP_ToolMessageBase	This class is used to carry IPMP messages between terminal and tool. This is the base class for all messages below

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IPMP_MessageFromTool	This class defines a container of multiple messages that can be sent to one IPMP Tool instance, identified by its context Id (recipient)
IPMP_MessageFromBitstream	This message is used to deliver IPMP_Message's received in the Content to the IPMP Tool context specified in the IPMP_DescriptorID of IPMP_Message
IPMP_DescriptorFromBitstream	This message is used to deliver an IPMP_Descriptor received in the bitstream to the IPMP Tool specified in the IPMP_Descriptor
IPMP_DeviceMessageBase	This class is used to carry IPMP messages between devices. This is the base class for all messages exchanged between devices below
IPMP_MessageFromDevice	This class defines a container of multiple messages that can be sent from terminal to terminal, identified by its terminal ID.

2.6.5 Normative Test Suites

The test bitstreams can be downloaded from MPEG CVS server under the directory of “IPMP Test Bitstream” under MPEG-2 IPMP Reference Software directory.

Some samples of MPEG-2 TS stream with IPMP information embedded can be generated by MPEG-2 IPMP Multiplexer tool, located in MPEG CVS server in the directory of “TS-Muxer” under MPEG-2 IPMP Reference Software directory.

All IPMP Data and IPMP Messages can be generated and tested using a regression test program which is provided as an example application under MPEG-2 IPMP Reference Software directory. The test program generates IPMP Data/Messages in binary form and stores them on a list of files, each named with its own name. In the sample application, all classes have methods to read and write their own content in binary form into a memory buffer or into a file. All classes have a constructor, copy constructor and destructor (some classes have no copy constructor just because the default copy constructor works fine). All classes are fully documented in the documentation provided in the /docs subdirectory.

Categories	IPMP Bitstream/IPMP Data/IPMP Messages	File Name	Availability
IPMP Bitstream	#IPMPBS1	IPMPBS1.ts	Yes
	#IPMPBS2	IPMPBS2.ts	Yes
	#IPMPBS3	IPMPBS3.ts	Yes
	#IPMPBS4	IPMPBS4.ts	Yes
	#IPMPBS5	IPMPBS5.ts	Yes
IPMP Data	All IPMP Data listed	***.bin	Yes
IPMP Messages	All IPMP Messages	***.bin	Yes

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