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Information technology — Coding of audio-visual objects —

Part 4: Conformance testing

AMENDMENT 4: IPMPX conformance extensions

Technologies de l'information — Codage des objets audiovisuels —

Partie 4: Essai de conformité

AMENDEMENT 4: Extensions de conformité IPMPX

Reference number
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Foreword

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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.

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Amendment 4 to ISO/IEC 14496-4:2004 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 — Coding of audio-visual objects —

Part 4: Conformance testing

AMENDMENT 4: IPMPX conformance extensions

Add the following clauses at the end of SNHC section:

9 Conformance for MPEG-4 IPMP Extension

9.1 Introduction

This clause is specified for the conformance test of ISO/IEC 14496-1. In this clause, except where stated otherwise, the following terms are used for practical purposes:

The term “System bitstream” means the multiplexed MPEG-4 system stream which has at least IOD and OD stream as specified in ISO/IEC 14496-1.

The term ‘IPMP bitstream’ means an MPEG-4 system bitstream with information of IPMP Extension protection, including IPMP Descriptor, IPMP Stream, IPMP Tool List.

The term ‘IPMP Information’ means IPMP Descriptor, IPMP Tool List, and IPMP Stream that come from the 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-4 terminal with IPMP Extension capability as specified in ISO/IEC 14496-1.

If any statement stated in this sub-clause accidentally contradicts a statement or requirement defined in , the text of ISO/IEC 14496-1 prevails.

The following sub-clauses 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 14496-5:2001/AMD4 (MPEG-4 IPMPX reference software) with source code available in electronic format.

9.2 Specification of test IPMP bitstreams

9.2.1 Conformance Requirements

IPMP bitstreams shall comply with the specifications in ISO/IEC 14496-1.

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9.2.2 Tolerance

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

9.2.3 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.

9.2.4 Tool conformance

Not applicable.

9.2.5 Test IPMP Bitstream

9.2.5.1 #IPMPBS1

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, and one G.723.1 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List, containing one IPMP Tool ID.
- IPMP Descriptor. The IPMP Tool specified therein is to be loaded before H.263 video decoder.

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure all required tools are present before attempting to play the MPEG-4 system stream.
- Verify that the IPMP terminal handles IPMP Descriptor and IPMP Descriptor pointer, and launches the IPMP Tool according to information given in the IPMP Descriptor.

9.2.5.2 #IPMPBS2

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, and one G.723.1 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List, containing two IPMP Tool IDs.
- Two IPMP Descriptors, one for each IPMP Tool. The IPMP Tools are to be loaded before H.263 video decoder and after G.723.1 audio decoder respectively.

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure all required tools are present before attempting to play the MPEG-4 system stream.
- Verify that the IPMP terminal handles IPMP Descriptor and IPMP Descriptor pointer, and launches the two IPMP Tools according to information given in the IPMP Descriptor.

9.2.5.3 #IPMPBS3

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, and one G.723.1 audio stream and IPMP information.

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Specification: The IPMP information includes:

- Tool List, containing two IPMP Tool IDs.
- IPMP Tool ES, containing one binary tool.
- Two IPMP Descriptors, one for each IPMP Tool. The IPMP Tools are to be loaded before H.263 video decoder and after G.723.1 audio decoder respectively.

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure all required tools are present before attempting to play the MPEG-4 system stream.
- Verify that the IPMP terminal handles IPMP Tool ES, makes sure the carried tool can be assembled and launched correctly.
- Verify that the IPMP terminal handles IPMP Descriptor and IPMP Descriptor pointer, and launches the two IPMP Tools according to information given in the IPMP Descriptor.

9.2.5.4 #IPMPBS4

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, and one G.723.1 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List, containing one IPMP Tool ID.
- IPMP Descriptor. The IPMP Tool specified therein is to be loaded at a global scope (control point=0). The IPMP Descriptor contains IPMP_RightsData.

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure all required tools are present before attempting to play the MPEG-4 system stream.
- Verify that the IPMP terminal handles IPMP Descriptor and IPMP Descriptor pointer, and launches the IPMP Tool according to information given in the IPMP Descriptor. The launched IPMP Tool gets its IPMP Descriptor, and processes the contained IPMP_RightsData.

9.2.5.5 #IPMPBS5

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, and one G.723.1 audio stream and IPMP information.

Specification: The IPMP information includes:

- Tool List, containing two IPMP Tool IDs.
- Two IPMP Descriptors, one for each IPMP Tool.
- An IPMP Stream carrying IPMP information (In the form of IPMP_Message) for the above two IPMP Tools.

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure all required tools are present before attempting to play the MPEG-4 system stream.
- Verify that the IPMP terminal handles IPMP Descriptor and IPMP Descriptor pointer, and launches the two IPMP Tools according to information given in the IPMP Descriptor.
- Verify that the IPMP terminal can route the information carried in IPMP Stream to the targeted IPMP Tool in a timely manner.

9.2.5.6 #IPMPBS6

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, and one G.723.1 audio stream and IPMP information.

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Specification: The IPMP information includes,

- Tool List, containing two IPMP Tool IDs.
- IPMP Descriptors. The IPMP Tools specified therein are to be loaded at a global scope (control point=0). The IPMP Descriptor of IPMP_MasterTool contains IPMP_ConnectTool which refers to IPMP_RELTool, and The IPMP Descriptor of IPMP_RELTool contains IPMP_RightsData.

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List
- Verify that the IPMP terminal handles IPMP Descriptors and IPMP Descriptor pointers, and launches the IPMP Tools according to information given in the IPMP Descriptors. The launched IPMP_RELTool gets its IPMP Descriptor, and processes the contained IPMP_RightsData.

9.2.5.7 #IPMPBS7

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, and one G.723.1 audio stream and IPMP information.

Specification: The IPMP information includes,

- Tool List. containing three IPMP Tool IDs
- Three IPMP Descriptors, one for each IPMP Tool. One IPMP Tool specified therein is to be loaded at t=0 before the video decoder, and the rest two tools containing IPMP_RightsData are to be loaded at t=5sec with a global scope. The IPMP Descriptor of REL Tool contains IPMP_RightsData.

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List
- Verify that the IPMP terminal handles IPMP Descriptors and IPMP Descriptor pointers, and launches different IPMP Tools at different time according to information given in the IPMP Descriptors. The launched IPMP_RELTool gets its IPMP Descriptor, and processes the contained IPMP_RightsData.

9.2.5.8 #IPMPBS8

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, one G.723.1 audio stream, one IPMP Tool Elementary Stream and IPMP information.

Specification: The IPMP information includes,

- Tool List. containing one IPMP Tool ID
- IPMP Tool ES, containing one binary tool.
- One IPMP Descriptors. The IPMP Tool is to be loaded before H.263 video decoder

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure all required tools are present before attempting to play the MPEG-4 system stream.
- Verify that the IPMP terminal handles IPMP Tool ES, makes sure the carried tool can be assembled and launched correctly.

9.2.5.9 #IPMPBS9

BitStream: MPEG-4 system stream with IOD, BIFS, OD stream, one H.263 visual stream, and one G.723.1 audio stream and IPMP information.

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Specification: The IPMP information includes:

- Tool List, containing one IPMP Tool ID.
- One IPMP Descriptor. The IPMP Tool is to be loaded before G.723 audio decoder
- An IPMP Stream carrying IPMP information (In the form of IPMP_Message) for the above IPMP Tool

Purpose:

- Verify that the IPMP terminal handles IPMP Tool List, makes sure all required tools are present before attempting to play the MPEG-4 system stream.
- Verify that the IPMP terminal handles IPMP Descriptor and IPMP Descriptor pointer, and launches the IPMP Tool according to information given in the IPMP Descriptor.
- Verify that the IPMP terminal can route the information carried in IPMP Stream to the targeted IPMP Tool in a timely manner.

9.3 Specification of test IPMP data

9.3.1 Conformance Requirements

IPMP Data shall comply with the specifications in ISO/IEC 14496-1.

9.3.2 Tolerance

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

9.3.3 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.

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.

9.3.4 Tool conformance

A compliant IPMP Tool is not required to be able to parse all IPMP data, as some IPMP data are meant to be carried in the IPMP bitstream and to let IPMP terminal parse. The IPMP Data that is meant for IPMP Tool is marked as “TO”. However, depending on the functionalities, a compliant IPMP Tool does NOT need to able to parse and process all IPMP Data marked as “TO”. For example, a decryption tool does not need to understand IPMP_VideoWatermarkingInit.

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

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9.3.5 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_SecureContainer	TM/TO	This message forms a secure container for any message extending the IPMP_Data_BaseClass
	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
IPMPToolES_DecoderConfig	TM	This class carries information for IPMP tool Elementary Stream decoders
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

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IPMP Data	Terminal/Tool Conformance	Specification and purpose
IPMP_DisconnectTool	TM/TO	This message allows a tool to disconnect a tool it has previously connected at a control point
IPMP_GetToolContext	TM/TO	This message is sent from a Tool to the Terminal to find a particular tool context within a specified scope
IPMP_GetToolContextResponse	TM/TO	Sent from the Terminal to a tool that has required to find a particular tool context within a specified scope
	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
IPMP_SendAudioWatermark	TM/TO	An audio watermarking tool that has been required to perform payload extraction will construct this IPMP data

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IPMP Data	Terminal/Tool Conformance	Specification and purpose
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_DescriptorPointer	TM	The IPMP_DescriptorPointer appears in the ipmpDescPtr section of an OD or ESD structures
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.
IPMP_ResponseToContentRequest	TM	The response to IPMP_RequestContent

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IPMP Data	Terminal/Tool Conformance	Specification and purpose
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.

9.4 Specification of test IPMP Message

9.4.1 Conformance Requirements

IPMP Messages shall comply with the specifications in ISO/IEC 14496-1.

9.4.2 Tolerance

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

9.4.3 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.

9.4.4 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.

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9.4.5 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
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_ToolAPI_Config	This class defines syntax and semantics for the carriage of IPMP Tools' instantiation and messaging API information.
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.

9.5 Normative Test Suites

The test bitstreams are attached to this Amendment.

All IPMP Data and IPMP Messages can be generated and tested using a regression test program which is provided as an example application under the MPEG CVS server's IM1 directory. It can also be found in ISO/IEC 14496-5:2001/Amd.4 (MPEG-4 IPMPX reference software) with source code available in electronic format. 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.trif	Yes
	#IPMPBS2	IPMPBS2.trif	Yes
	#IPMPBS3	IPMPBS3.trif	Yes
	#IPMPBS4	IPMPBS4.trif	Yes
	#IPMPBS5	IPMPBS5.trif	Yes
	#IPMPBS6	IPMPBS6.trif	Yes
	#IPMPBS7	IPMPBS7.trif	Yes
	#IPMPBS8	IPMPBS8.trif	Yes
	#IPMPBS9	IPMPBS9.trif	Yes
IPMP Data	All IPMP Data listed	***.bin	Yes
IPMP Messages	All IPMP Messages	***.bin	Yes

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