
Information technology — Coding of
audio-visual objects —

Part 4:
Conformance testing

AMENDMENT 7: AFX conformance
extensions

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Technologies de l'information — Codage des objets audiovisuels —

Partie 4: Essai de conformité

AMENDEMENT 7: Extensions de conformité AFX

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Part 4: Conformance testing

AMENDMENT 7: AFX conformance extensions

Add the following table at the end of Table 4 in subclause 4.4.3.1 and renumber the first column.

N°	Feature	Reference of Test sequence and associated method
1.	SFVec4f	Nurbs_curve_anim
2.	CoordinateInterpolator4D	Nurbs_curve_anim
3.	PositionInterpolator4D	Quadric_anim_st
4.	extendedUpdate : PROTOlistInsertion	proto_list_insertion_1, proto_list_insertion_2
5.	extendedUpdate : PROTOlistDeletion	proto_list_deletion_1, proto_list_deletion_2
6.	extendedUpdate : PROTODeletion	proto_deletion_1, proto_deletion_2
7.	extendedUpdate : MultipleFieldReplacement	multiple_replacement_1, multiple_replacement_2
8.	extendedUpdate : MultipleIndexedFieldReplacement	multiple_indexed_replacement_1, multiple_indexed_replacement_2
9.	extendedUpdate : GlobalQuantizationConfiguration	global_quant_1, global_quant_2
10.	extendedUpdate : NodeDeletionEx	node_deletion_ext_1, node_deletion_ext_2

Add the following table at the end of Table 6 in subclause 4.4.3.3.

Name	Provider	Content
Quadric_anim_st	SGDL / MINDEGO	Algebraic shape of the 2 nd degree, through Quadric node, defined by 6 geometric control point in the projective space (4D). Deformation of the shape by moving the control points.
Nurbs_curve_anim	Mindego	A NURBS curve is animated by changing its control points over time.
proto_list_insertion_1	ENST	First sample of proto list insertion: simple
proto_list_insertion_2	ENST	Second sample of proto list insertion: complex
proto_list_deletion_1	ENST	First sample of proto list deletion: simple
proto_list_deletion_2	ENST	Second sample of proto list deletion: complex
proto_deletion_1	ENST	First sample of proto deletion: simple
proto_deletion_2	ENST	Second sample of proto deletion: complex
multiple_replacement_1	ENST	First sample of multiple replacement: simple
multiple_replacement_2	ENST	Second sample of multiple replacement: complex
multiple_indexed_replacement_1	ENST	First sample of multiple indexed replacement: simple
multiple_indexed_replacement_2	ENST	Second sample of multiple indexed replacement: complex
global_quant_1	ENST	First sample of global quantization configuration: adding global quantization
global_quant_2	ENST	Second sample of global quantization configuration: removing global quantization
node_deletion_ext_1	ENST	First sample of extended node deletion: simple
node_deletion_ext_2	ENST	Second sample of extended node deletion: complex

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4.13 Conformance on SL Extensions

4.13.1 Extended SL - Synchronization Layer Conformance

4.13.1.1 Bitstream Conformance

4.13.1.1.1 Conformance Requirements

SL-packetized bitstreams shall comply with the specifications in subclause 7.3.2 of ISO/IEC 14496-1:2004.

4.13.1.1.2 Measurement procedure

Syntax of the SL Packets shall meet the requirements of subclause 7.3.2 of ISO/IEC 14496-1:2004.

4.13.1.1.3 Tolerance

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

4.13.1.2 Terminal Conformance

4.13.1.2.1 Conformance requirement

This subclause extends the conformance requirements set by the Synchronisation Layer conformance requirements. As such, the latter are implied here.

Each bitstream shall meet the syntactic and semantic requirements specified in ISO/IEC 14496-1:2004. The following subclauses describe a set of semantic tests to be performed on bitstreams.

Syntax of the BIFS stream shall meet the requirements in Clause 8 of ISO/IEC 14496-11:2004.

In the description of the semantic tests, it is assumed that the bitstreams contains no errors due to transmission or other causes. Note that packet losses can occur.

The SL layer shall recover the Access Units in the appropriate Decoding Buffer.

For each test the condition or conditions that must be satisfied are given, as well as the prerequisites or conditions in which the test can be applied.

Note that the application of these tests requires parsing of the bitstream at the appropriate levels, which in some cases may go as far as the slice level for video. In some cases of scrambled data, descrambling is required before performing the test. Parsing and interpretation of the configuration of the SL-packetized stream is also required.

4.13.1.2.2 Measurement procedure

4.13.1.2.2.1 Test of the coherence between ODProfile and SL extension.

When parsing the SLConfigDescriptor, an extension of SLConfigDescriptor is allowed only if ODProfileLevelIndication is different from 0x01.

Note that SLExtensionDescriptor is an abstract class specified so as to be the base class of sl extensions.

4.13.1.2.2.2 Coherence of the SLExtension.

Configuration	Conformance condition
DependencyPointer	
Mode==1	hasESID==0 In other words hasESID!=0 implies mode==0
hasESID==1	ESID is a valid Elementary Stream Identification. In other words an ESDDescriptor with a corresponding ESID exists.
Mode==0 && hasESID==0	The ESDDescriptor containing this ExtendedSLConfigDescriptor shall have a streamDependenceFlag==1. Additionally dependsOn_ES_ID should be a valide Elementary Stream Identification. In other words an ESDDescriptor with a corresponding ESID exists. Moreover dependencyLength shall be greater than or equal to timeStampLength Refer to section 10.2.3 entitled “SL Packet Header Configuration” for the definition of the following terms : streamDependenceFlag, dependsOn_ES_ID, timeStampLength
MarkerDescriptor	
All configurations	markerLength==1

4.13.1.2.3 Tolerance

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

4.13.1.2.4 Syntax of the TRIF file.

Since M4Mux and Extension of SL require signalling of data not included in the MP4 file format. It is necessary to use the TRIF file format defined in ISO/IEC 14496-5:2001 (definition of TRIF file format).

The syntax of the TRIF file is the following :

File structure
InitialObjectDescriptor StreamMapTable while (hasMorePacket) { SLPacketHeader SLPayloadLength Payload }
StreamMapTable
While (hasMoreESIDs) { bit(8) ESID_HIBYTE bit(8) ESID_LOWBYTE }

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4.13.2 M4Mux tool Conformance

4.13.2.1 Bitstream Conformance

4.13.2.1.1 Conformance Requirements

M4Mux-ed streams shall comply with the specifications in subclause 7.4.2 of ISO/IEC 14496-1:2004.

4.13.2.1.2 Measurement procedure

Syntax of the bitstream shall meet the requirements of subclause 7.4.2 of ISO/IEC 14496-1:2004.

4.13.2.1.3 Tolerance

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

4.13.2.2 Terminal Conformance

4.13.2.2.1 Conformance Requirements

Each bitstream shall meet the syntactic and semantic requirements specified in ISO/IEC 14496-1:2004. This subclause describes a set of semantic tests to be performed on bitstreams. To verify whether the syntax is correct is straight forward and therefore not required in this subclause. In the description of the semantic tests, it is assumed that the testbed bitstream contains no errors due to transmission or other causes.

The FlexDemux shall recover the SL Packets in the appropriate Decoding Buffer bit-exact as presented to the multiplex, and this for every Elementary Stream present in the M4Mux-ed stream under test.

For each test the condition or conditions that must be satisfied are given, as well as the prerequisites or conditions in which the test can be applied. Note that the application of these tests requires parsing of the bitstream at the appropriate levels, which in some cases may go as far as the slice level for video. In some cases of scrambled data, descrambling is required before performing the test. Parsing and interpretation of the configuration of the M4Mux stream is also required.

When a maximum bitrate is specified for an Elementary Stream, see subclause 7.2.6.5 of ISO/IEC 14496-1:2004. Conformant bitstreams shall obey this constraint.

4.13.2.2.2 Measurement procedure

4.13.2.2.2.1 Test of the M4Mux packet header:

A M4Mux stream is a succession of M4Mux packets. Each M4Mux packet is built from an **index** (the M4Mux Channel number) followed by the **length** of the M4Mux packet payload, followed by the M4Mux **payload** itself.

The **index** is on one byte.

The **length** field is on:

⇒ One byte, if

- there is no M4Mux ident descriptor,
- or if the M4Mux Ident descriptor indicates the use of the first M4Mux tool (type==0).

⇒ On one byte or on several bytes. If the M4Mux Ident descriptor indicates the use of the second M4Mux tool (type==1).

Index- test if the **index**

⇒ **is smaller than 238**, that it corresponds to one M4Mux Channel declared in the M4Mux Channel descriptor.

length If the length is

- non zero, this the Simple mode. Test if the length of the M4Mux packet, corresponds to the size of the M4Mux packet payload, i.e. if it addresses the beginning of the next M4Mux packet. In this Simple Mode this is equal to the length of the single encapsulated SL packet.
- zero, test if it is followed by one byte, where the five most significant bits are the `FMC_version_number`, and where the three least significant bits are equal to 1. Such M4Mux packets with a length equal to zero can be duplicated, with identical `FMC_version_number` values. If this `FMC_version_number` does not match the version of the referenced `M4MuxChannelDescriptor` that has most recently been received, the following M4Mux packets belonging to the same M4Mux Channel cannot be parsed. The test can either wait until the required `FMC_version_number` becomes available or discard the M4Mux packet.

⇒ **is equal to 238**, which indicates a M4Mux packet with possible `fmxClockReference` samples and `fmxRate`, the M4Mux stream bitrate.

length Test if the first following field is an `fmxClockReference` sample, if the second following field is a `fmxRate` field, as they are defined in the M4Mux Timing descriptor. If the length is greater than the sum of the lengths of the `fmxClockReference` sample and of the `fmxRate` field defined in the M4Mux Timing descriptor, test if the remaining part of the M4Mux packet payload is composed of M4Mux descriptors (see the section about tests for M4Mux descriptors). Test if the length of the M4Mux packet, corresponds to the size of the M4Mux packet payload, i.e. if it addresses the beginning of the next M4Mux packet.

fmxClockReference – The sequence of `fmxClockReference` time stamps in a M4Mux stream constitutes a clock reference stream. In successive M4Mux packets of that clock reference stream, the `fmxClockReference` field contains encoded values which are samples of a system clock, the resolution of which is given by the `FCRResolution` field within the M4Mux Timing descriptor. The constraints on the accuracy of the successive `fmxClockReference` samples, allowing the reconstruction of the original system clock from the `fmxClockReference` samples are defined by the application.

fmRate – test that the value encoded in the `fmRate` field is sufficiently large that, if all bytes between this M4Mux packet and the next M4Mux packet of the clock reference stream are transmitted at that rate, they are delivered to the System Decoder Model before the time the first byte of the next M4Mux packet is delivered.

⇒ **Is equal to 239**, which indicates a M4Mux packet with stuffing.

length: Test if the length field addresses a number of stuffing bytes and the beginning of the next M4Mux packet.

⇒ **Is in the range of 240 to 255 (inclusive)**. This is the MuxCode Mode. Test if the `MuxCode` referenced as (`MuxCode = index - 240`) corresponds to one MuxCode declared in one `MuxCodeTableEntry` of the M4Mux Codetable descriptor.

length Test if it is followed by one byte, where the

- four most significant bits are the `version` field.
- four least significant bits are equal to 1.

Test if the length of the M4Mux packet, corresponds to the size of the M4Mux packet payload, i.e. if it addresses the beginning of the next M4Mux packet. This is equal to total length of the first byte (with the four least significant bits are equal to 1) plus the length of the multiple encapsulated SL packets.

version – If this version does not match the version of the referenced `MuxCodeTableEntry` that has most recently been received, the M4Mux packet payload cannot be parsed. The test can either wait until the required version of `MuxCodeTableEntry` becomes available or discard the M4Mux packet.

4.13.2.2.2 Test of the configuration of the M4Mux streams:

The global tests defined within the ISO/IEC 14496-1:2004 standard for the system descriptors, in terms of descriptor' tags and lengths, apply to each M4Mux descriptors.

Five different M4Mux descriptors define the possible configuration of a M4Mux stream:

- ⇒ The M4Mux Timing [ISO/IEC 14496-4:2004/Amd 7:2005](https://standards.iteh.ai/catalog/standards/sist/b8172ad7-f388-401a-a0a5-c70b89d53c62/iso-iec-14496-4-2004-amd-7-2005)
- ⇒ The M4Mux Identifier standards.iteh.ai/catalog/standards/sist/b8172ad7-f388-401a-a0a5-c70b89d53c62/iso-iec-14496-4-2004-amd-7-2005
- ⇒ The M4Mux Channel
- ⇒ the M4MuxCodetable
- ⇒ The M4Mux BufferSize

Such descriptors may be provided by out of band means or by in-band means.

◆ tests for the M4MuxTimingDescriptor

FCR_ES_ID: Test that there is one Elementary Stream with the same ES_ID declared as an OCR_ES_ID. The test on the **FCRResolution**, **FCRLength** and **FmxRateLength** fields depend on the application.

◆ tests for the M4MuxIDent descriptor

The test on the MuxID field depends on the application.

Muxtype – the encoded value shall comply with the possible values defined in the Multiplexing type table defined within the ISO/IEC 14496 standard.

Muxmanagement – the encoded value shall comply with the possible values defined in the Multiplexing management mode table defined within the ISO/IEC 14496 standard.

◆ Tests for the M4MuxChannel Descriptor

Tests on the first byte:

Test that the values of the **version_number** field are incremented by one

Test that the validity period of each M4MuxChannel Descriptor identified by its **version_number** is defined:

- First by a 'non empty' M4MuxChannel Descriptor sent as a 'current' M4MuxChannel Descriptor
- Second by an 'empty' M4MuxChannel Descriptor sent as a 'current' M4MuxChannel Descriptor

Test if the two least significant bits are equal to 1.

Tests on the remaining bytes, when present:

Test that their number is a multiple of three bytes.

For each couple (ES_ID, M4MuxChannel):

- Test if the declared ES_ID corresponds to an existing ES_ID.
- Test that each ES_ID is only used once.
- Test that each M4MuxChannel is only used once.

◆ Tests for the M4MuxCodeTable Descriptor

Test that there is an integer number of **MuxCodeTableEntry**.

Test for all **MuxCodeTableEntry**, with an assigned version value, that there is only one **MuxCodeTableEntry** defined

Test that a **M4MuxChannel** is only used once in a Slot definition in each **MuxCodeTableEntry** and among the last versions of the different **MuxCodeTableEntry** defined.

Test for each **MuxCodeTableEntry**

- That there is an integer number of **substructures**.
- That there is an integer number of **slots**.

◆ Tests for the M4MuxBufferSize Descriptor

Test that there is an integer number of **M4MuxBufferDescriptor**.

Test that each **M4MuxChannel** referenced in a **M4MuxBufferDescriptor** is declared within the **M4MuxChannel Descriptor**.

Test that a **M4MuxChannel** is only used once in a **M4MuxBufferDescriptor** definition.

4.13.2.2.3 Tolerance

There is no tolerance. The diagnosis is pass or fail.

4.13.3 Test Suites

4.13.3.1 SL Extension Feature list

The test suite shall verify the features in Table AMD 7-1

The following shall be tested:

- Presence in the bitstream.
- Appropriate value of the fields after decoding

Table AMD 7-1 – SL Extension Test Suite Information

N°	Feature	Reference of Test sequence and associated method
1.	SLExtensionDescriptor	SLExtension00
2.	DependencyPointer	SLExtension00
3.	MarkerDescriptor	SLExtension00
4.	ODProfileLevelIndication	SLExtension00

4.13.3.2 M4Mux Feature List

The following shall be tested:

- Presence in the bitstream.
- Appropriate value of the fields after decoding

Table AMD 7-2 – M4Mux Test Suite Information

N°	Feature	Reference of Test sequence and associated method
1.	MuxManagement	FMX_DYN dynamic management of M4Mux channel descriptors
2.	MuxType	FMX_DYN dynamic management of M4Mux channel descriptors
3.	MuxCodeTableEntry	FMX_DYN dynamic management of M4Mux channel descriptors

4.13.3.3 Bitstreams

Table AMD 7-3 – Bitstreams

Name	Provider	Content
FMX_DYN	France Telecom R&D	M4Mux file with dynamic management of M4Mux channel descriptors
SLExtension00	France Telecom R&D	SL extension file with DependencyPointer, Marker Descriptor

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4.14 Conformance on Amendment to XMT

4.14.1 M4Mux descriptor tags in XMT

4.14.1.1 Conformance Requirements

The global tests defined within the ISO/IEC 14496-1:2004 standard for the system descriptors, in terms of descriptor' tags and lengths, apply to each M4Mux descriptors.

The five different M4Mux descriptors that define the possible configuration of a M4Mux stream:

- ⇒ The M4Mux Timing
- ⇒ The M4Mux Ident
- ⇒ The M4Mux Channel
- ⇒ The M4MuxCodetable
- ⇒ The M4Mux BufferSize

Can be sent and described using the XMT syntax.

4.14.1.2 Measurement procedure

4.14.1.2.1 tests for the M4MuxTimingDescriptor

FCR_ES_ID: Test that there is one Elementary Stream with the same ES_ID. Test that this Elementary stream is declared as an OCR_ES_ID.

4.14.1.2.2 tests for the M4MuxIDent descriptor

Further test may be conducted to confirm that the **Muxtype** and the **Muxmanagement** are in-line with associated M4Mux stream.

4.14.1.2.3 Tests for the M4MuxChannel Descriptor

4.14.1.2.3.1 Tests for each M4MuxChannel Descriptor

Tests on the first byte, that the validity period of each M4MuxChannel Descriptor identified by its **version_number** is correctly defined.

Tests on the remaining bytes, when present:

- Test if the declared ES_IDs correspond to an existing ES_ID.
- Test that each ES_ID is only used once.
- Test that each M4MuxChannel is only used once.

4.14.1.2.3.2 Tests for successive M4MuxChannel Descriptor

- ⇒ Test that the values of the **version_number** field are incremented by one at each descriptor

4.14.1.2.4 Tests for the M4MuxCodeTable Descriptor

- ⇒ Test for all **MuxCodeTableEntry**, with an assigned version value, that there is only one **MuxCodeTableEntry** defined
- ⇒ Test that a **M4MuxChannel** is only used once in a Slot definition in each **MuxCodeTableEntry** and among the last versions of the different **MuxCodeTableEntry** defined.

4.14.1.2.5 Tests for the M4MuxBufferSize Descriptor

- ⇒ Test that each **M4MuxChannel** referenced in a **M4MuxBufferDescriptor** is declared within the **M4MuxChannel Descriptor**
- ⇒ Test that a **M4MuxChannel** is only used once in a **M4MuxBufferDescriptor** definition.

4.14.1.3 Tolerance

There is no tolerance for syntax and semantic checking. The diagnosis is pass or fail.

Add the following subclause after 8.3.2.

8.4 AFX (Animation Framework eXtension)

8.4.1 Bitstream conformance

8.4.1.1 Conformance Requirements

BIFS streams shall comply with the specifications in Clause 8 of ISO/IEC 14496-11:2004 and Clause 4 of ISO/IEC 14496-16:2004.

8.4.1.2 Measurement procedure

Syntax of the BIFS stream shall meet the requirements of Clause 8 of ISO/IEC 14496-11:2004 and Clause 4 of ISO/IEC 14496-16:2004.

8.4.1.3 Tolerance

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

8.4.2 Terminal conformance

8.4.2.1 Conformance Requirements

The terminal shall comply with the specifications in Clause 8 of ISO/IEC 14496-11:2004 and Clause 4 of ISO/IEC 14496-16:2004.

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8.4.2.2 Measurement Procedure

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The terminal shall decode successfully all the test suites listed below. A test suite is a suite of material and measurement algorithms and associated reference algorithms.

8.4.2.2.1 AFX Feature List

The test suite shall verify the features in Table AMD 7-4. For nodes, the following shall be tested:

- Presence in the scene tree after decoding.
- Appropriate value of the fields after decoding.

Table AMD 7-4 — AFX Test Suite Information

N°	Feature	Reference of Test sequence and associated method
1	BitWrapper	This node shall be tested together with the AFX bitstreams in subclause 8.5. Both url and buffer shall be tested for each bitstream.
2	DepthImage	This node shall be tested together with OctreelImage, PointTexture, and SimpleTexture nodes.
3	FFD	FFD
4	MeshGrid	Torus_C_LA_BIFS, Torus_C_OA_BIFS, Humanoid_LA_BIFS, Humanoid_OA_BIFS, Sphere_GA_BIFS, Quad_LA_BIFS, Quad_OA_BIFS, Quad_GA_BIFS, Cyclic_LA_BIFS, Cyclic_OA_BIFS, Cyclic_GA_BIFS
5	NonLinearDeformer	Bend, taper, twist, shell
6	NurbsCurve	NurbsCurve, NurbsCurve_anim
7	NurbsCurve2D	NurbsCurve2D, NurbsCurve2D_anim

8	NurbsSurface	NurbsSurface
9	OctreeImage	OI_BVO_Still OI_BVO_Anim OI_TBVO_Still OI_TBVO_Anim
10	PointTexture	DI_Ortho-PT_8, DI_Ortho-PT_32, DI_Persp-PT_8, DI_Persp-PT_32
11	PositionAnimator	PositionAnimator, PositionAnimator_discrete, PositionAnimator_linear, PositionAnimator_NURBS_interp, PositionAnimator_paced, PositionAnimator_spline
12	PositionAnimator2D	PositionAnimator2D, PositionAnimator2D_discrete, PositionAnimator2D_linear, PositionAnimator2D_NURBS_interp, PositionAnimator2D_paced, PositionAnimator2D_spline
13	ProceduralTexture	PT_Default, PT_Gradient1, PT_Gradient2, PT_Gradient3, PT_Gradient4, PT_Gradient5, PT_Horizon, PT_Marble, PT_PinkGranite, PT_Brickwork, PT_Fabric
14	SBBone	SkinnedModel
15	SBMuscle	SkinnedModel
16	SBSegment	SkinnedModel
17	SBSite	SkinnedModel
18	SBSkinnedModel	SkinnedModel
19	SBVCAnimation	SkinnedModel
20	ScalarAnimator	ScalarAnimator_discrete ScalarAnimator_linear ScalarAnimator_paced ScalarAnimator_spline
21	SimpleTexture	DI_Ortho-ST_Still DI_Ortho-ST_Anim DI_Persp-ST_Still DI_Persp-ST_Anim
22	SubdivisionSurface	Ss, SS_Goldfish, SS_Britney, SS_BritneyDance, SS_RooDance, SS_RooFlip, SS_Shark
23	SubdivSurfaceSector	ss_img, tagpipes, tagpipes_anim, icoso_normal, icoso_concave
24	WaveletSubdivisionSurface	This node shall be tested according to subclause 8.5.5.2

8.4.2.3 Bitstreams

Name	Provider	Content	Original wrf file
Bend	Mindego	NonLinearDeformer that bends a rectangular object	Bend.wrf
Cyclic_GA_BIFS	V.U.B.	Multi-resolution cyclic quadrilateral mesh (uniformSplit = 1). Animation of the gridCoord field.	Cyclic_MG, Cyclic_Lev0, Cyclic_Lev1, Cyclic_Lev2