ISMA SPECIFICATION DISCLAIMER

Internet Streaming Media Alliance Corrigenda to Implementation Specification

Version 0.10

May 2004

Modification history

Version	Date	Editor	Changes
	February 2004		Publication of corrigenda
v.10	May 2004	G. Francheschini	Several editorial notes removed
v.10	May 2004	G. Francheschini	Numbering of last sections fixed (section 11&12 instead of 12&13)
v.10	May 2004	G. Francheschini	Technical change regarding the field "profile" in 2. Incorrect/ non-compliant values in the Audio format parameter 2.1 Overview, Appendix D

Table of Contents

1 Technical Specification

1.1 Document Status

This document is currently an input document to the December, 2003 ISMA quarterly meeting, awaiting comment.

1.2 Corrigenda Format

The corrigenda contains a series of changes to the ISMA technical specification, Version 1.0. Each change has the following format:

- Overview
- Existing Specification Reference
- Replacement Specification

A corrigenda change item may contain references to more than 1 section of the Technical specification. If this is the case, each Existing Reference will be followed by the Replacement reference.

The Overview will contain a complete description of the problem in the specification.

The Existing Specification will contain the version of the Technical specification being modified, the section and page number, plus the text of the incorrect item.

The Replacement Specification will contain the replacement text.

1.3 Known items not yet covered by this version

There are a few additional items, technically irrelevant, that will have to be considered in the Corrigenda, but that are not available in this version:
- The item concerning the reference to the approved RTP Payload Format for AAC and CELP is still waiting the official RFC number (although informally known).
- The MPEG references are incomplete (no Video and Audio reference, old references to part 8).

2   Incorrect/non-compliant values in the Audio format parameter

2.1   Overview

Appendix D: RTSP and SDP Examples shows a sample RTSP session. The format parameters for audio are not compliant with the RTP payload format for CELP and AAC specifications (now RFC 3640). The "a=rtpmap" encoding name is incorrect; mpeg4-simple-A2 should be mpeg4-generic, and the "a=fmtp" line is missing a required field, while the profile field is not valid anymore.

2.2   Existing Specification Reference

ISMA specification 1.0, dated 28 August 2001
Appendix D: RTSP and SDP Examples page 28/67 in the middle of the page, the line following -

```
m=audio 0 RTP/AVP 96
a=rtpmap:96 mpeg4-simple-A2/44100/2
a=control:trackID=5
a=fmtp:96 streamtype=5; profile-level-id=15; bitrate=64000;
config=9122620000; sizelength=13; indexlength=3;
indexdeltalength=3; profile=1
```

2.3   Replacement Specification

```
m=audio 0 RTP/AVP 96
a=rtpmap:96 mpeg4-generic/44100/2
a=control:trackID=5
a=fmtp:96 streamtype=5; profile-level-id=15; mode=AAC-hbr;
config=9122620000; sizelength=13; indexlength=3;
indexdeltalength=3;
```

3   New reference to RFC3640

3.1   Overview

Appendix G: RTP Payload Format for AAC and CELP can be now replaced by the reference to the RFC3640. Appendix G was inserted while waiting for the Internet Draft on the transport of MPEG-4 media on RTP (at its version 4) to be consolidated in a formal RFC, which is now the case.

3.2   Existing Specification Reference

ISMA specification 1.0, dated 28 August 2001

1) Section 2.7.1 All profile Requirements

> […]
> RTP Payloads
> REQUIRED (Video) - RFC 3016 RTP Payload Format for MPEG-4 Audio/Visual
> Streams

Replace this entry:
> REQUIRED (Audio) - Appendix G

2) Delete: Appendix G: RTP Payload Format for AAC and CELP

3.3   Replacement Specification

1) Section 2.7.1 All profile Requirements

> […]
> RTP Payloads
> REQUIRED (Video) - RFC 3016 RTP Payload Format for MPEG-4 Audio/Visual
> Streams

Insert this entry:
> REQUIRED (Audio) - RFC 3460 RTP Payload Format for MPEG-4 Streams

3) Section 5 References

[...]

Insert this entry:

J. Van Der Meer et al., "RTP Payload Payload Format for MPEG-4 Streams." RFC 3640,
Nov 2003.

4   MP4 File Format references and restriction

4.1   Overview

ISMA1.0 refers the spec of MP4V1. This spec is "old-fashioned". The new specs are part
12 (ISO FF) and part 14 (MP4 FF) of MPEG-4. Referring both of them however implies
also introducing the new features of MP4V2. Thus, the modern references are adopted,
but the MP4V2 added features are also explicitly disallowed, to keep the technical
content consistent.
One relevant effect of this change is that 1 new box (the File Type box 'ftyp') would be
included: this is indeed a true and essential corrigendum item.
ISMA1.0 is also too silent on a few uncommon features, never tested during the
plugfests, thus leading to ambiguity or at least to potential interoperability problems.
Some unneeded and potentially problematic feature is therefore explicitly disallowed,
just as for MP4V2 features.

Finally, the Appendix B on the Hint Track Format is now redundant with ISO/IEC 14496-12, clause 10, and is therefore deleted. Note that such Appendix B was not correctly assigned to a section number in the original specification, and somehow appended to Appendix A in section 8.

4.2 Existing Specification Reference

ISMA specification 1.0, dated 28 August 2001. Three changes.

1) Section 2.7.1 All profile Requirements

> The following lists those requirements common to all profiles.

> […]

> Content Distribution

Replace this entry:

> REQUIRED **–** MPEG-4 MP4 Format - ISO/IEC 14496-1:2000(E)

2) Section 5 References

[…]

Replace this entry:

ISO/IEC JTC1/SC 29/WG11 N2501 **+** COR 1 **+** AMD 1, ISO/IEC 14496-1:2000(E), "Information technology – Coding of audio-visual objects – Part 1: Systems"

3) Delete sections 8.1 – 8.4 (supposed to be Appendix B), as well as the last line of section 8 ("Appendix B: Hint Track Format (Normative)")

4.3 Replacement Specification

1) Section 2.7.1 All profile Requirements

> The following lists those requirements common to all profiles.

> […]

> Content Distribution

Insert these entries:

> REQUIRED **–** ISO base media file format - ISO/IEC 14496-12:2003 | 15444-12:2003
> REQUIRED **–** MP4 file format - ISO/IEC 14496-12:2003

[…]

ISMA compliant content, when stored in files, will contain the minimal BIFS and OD streams as described in Appendix E. The BIFS and OD streams MUST be stored in their own tracks. The usage of "data:" URLs to carry these streams (as described in Appendix F) is limited to transmission sessions. Of course, files may contain hint tracks to assist the preparation of the IOD for transmission. This restriction is required in order to avoid multiple flavors of same content.

Insert this text:

ISMA compliant content shall also adhere to the following limitations to the ISO base media file format:
- compact sample sizes ('stz2') shall not be used;
- padding bits boxes ('padb') shall not be used;
- movie fragments shall not be used;
- In the Data Reference atom of MP4 files which are to be placed on servers (hinted or un-hinted), the data sources are restricted to being from the following set:
  o the same file as the movie atom meta-data ('self-contained')
  o a relative URL (interpreted as relative to the file containing the movie atom meta-data)
  o an absolute URL using the "file:" 'protocol'.

Note also that ISO/IEC 14496-14, section 5.6, constraints the number of sample entries to be one for video, audio, bifs and OD tracks.

2) Section 5 References

[…]

Insert these entries:

ISO/IEC JTC1/SC 29/WG11 ISO/IEC 14496-1:2003, "Information technology – Coding of audio-visual objects – Part 1: Systems"
ISO/IEC JTC1/SC 29/WG11 ISO/IEC 14496-12:2003 | 15444-12:2003, "Information technology – Coding of audio-visual objects – Part 12: ISO base media file format" & "Information technology – JPEG 2000 image coding system – Part 12: ISO base media file format"
ISO/IEC JTC1/SC 29/WG11 ISO/IEC 14496-14:2003, "Information technology – Coding of audio-visual objects – Part 14: MP4 file format"

5   MP4 Hint Tracks bytesperblock and samplesperblock

5.1   *Overview*

The fields bytesperblock and samplesperblock shall be set to 1 according to 14496-Part 12, but they are set to 0 in the ISMA1.0 specification.

5.2 Existing Specification Reference

ISMA specification 1.0, dated 28 August 2001. Two changes.

1) Section 9 Appendix C: Hint Track Example (Informative)

Replace these entries in the 6 occurrences at pages 25-26:

```
bytes per block:                0
samples per block:              0
```

2) Section 8.3.2 (Appendix B)

Remove this entry (actually: this is already gone due to section 4 in this document):

The bytesperblock and samplesperblock concern compressed audio, using a scheme prior to MP4, in which the audio framing was not evident in the file. These fields have the fixed values of 0 for MP4 files.

5.3 Replacement Specification

1) Section 9 Appendix C: Hint Track Example (Informative)

Insert these entries in the 6 occurrences at pages 25-26:

```
bytes per block:                1
samples per block:              1
```

6   Full revision of the minimum MPEG-4 Systems support

6.1 Overview

ISMA 1.0 specification documents in Appendixes E and F the minimal MPEG-4 Systems support. However, various bugs have been identified in that text, and the overall editorial format is also not very effective. This document provides a new editorial style for the Appendixes E and F, and integrates all technical fixes. The following classes of changes are incorporated:

1) Technical fixes:

   a. The Sound2D node, used in the BIFS scenes containing Audio, has spatialize set TRUE by default, which means that inlined content will be spatialized (meaning its balance will depend on where the content is inlined in a parent scene). The BIFS is corrected to set spatialize FALSE as part of the Sound2D node.
   b. The Bitmap node, used in the BIFS scenes containing Video, has default scale -1 -1, which doesn't allow content to be rescaled. This is a serious impediment to reusing ISMA 1.0 content. The BIFS is corrected to set scale 1 1 in the Bitmap node.

c. pixelMetric is set to 1 in Table 1, Appendix E and it is set to 0 in Table 2, Appendix E (of the ISMA spec). This is not consistent. They should be set to the same value, which was decided to be 1.

d. SL configuration of audio/video streams was originally set to predefined=3/4; this is changed so that a full SL configuration descriptor is used. Note that the length of timestamp and clockreference fields is set by default to 32 bits.

2) Appendix F has been rewritten. The aim of this Appendix is to provide content creators that do not implement MPEG-4 Systems with a complete set of valid IODs to be inserted in the SDP. The new structure achieves this goal by separately providing the description (and binary format, and base64 equivalent string) of the various possible BIFS and OD streams, and of the 6 resulting possible IODs. The format of the tables providing the OD and IOD description has been revised as well so as to facilitate their reading (different grayscales are used to highlight the different indentation of the various structures) and their future editing (fields are numbered using an x.y notation instead of a single x notation). Moreover, field values that are not constrained to be fixed are indicated as *<value>*; field values that differ between streaming and file reading scenarios are indicated with reference to the streaming scenario, and in parenthesis for the file reading scenario.

3) Additional clarification to the specification (editorial or not purely editorial, when the clarification removes alternative interpretations):
    a. The usage of decoderSpecificInfo for Audio and Video was not specified accurately. Additional text in section 11.3 intends to clarify the usage of decoderSpecificInfo.
    b. New explanatory text concerning synchronization, in section 11.5.
    c. The timescale is set both in SDP and OD, leading to duplicate information that might be inconsistent. New text in section 11.6 specifies that the SDP value is the only one to be considered for the bits-on-the-wire representation.
    d. ProfileLevelIndications in the IOD were left undefined or set to incorrect values: the values inserted in Table E-8, lines 1.7 – 1.11, have been corrected.
    e. Buffersize values for BIFS and OD were not consistent throughout the old text. The new text proposes 100 and 200 bytes respectively, and uses these values consistently in the tables now named Table E-6 and Table E-8. Moreover it indicates that these are only reasonable values that can be used, not fixed values.
    f. In Table E-5 the Buffersize values for Audio and Video have been removed. It is thought to be more consistent to omit one more field (just as many other fields that are omitted) than to set it to an arbitrary value.

6.2 Existing Specification Reference

ISMA specification 1.0, dated 28 August 2001, Appendixes E and F (sections 11, 12 and 13).
Sections 11, 12 and 13 should be replaced in their entirety.

6.3   Replacement Text

Editors note: Please note that the numbering from here on is consistent with the numbering in the ISMA 1.0 specification.

11   Appendix E: Minimal MPEG-4 Systems Support in ISMA (Normative)

11.1 Introduction

ISMA requires the support of MPEG-4 Systems. This occurs at two different places:

- in the MP4 file, in the IOD atom and BIFS and OD tracks, strictly following ISO/IEC 14496-12 and ISO/IEC 14496-14.
- in streaming, in the SDP.

11.2 MPEG-4 Systems content

11.2.1 The IOD

ISO/IEC 14496-1 (MPEG-4 Systems) requires the presence of an Initial Object Descriptor describing the BIFS and OD streams (when present). ISMA 1.0 content will therefore include the IOD.

Table E-1 shows the IOD of an ISMA 1.0 scene using the XMT format (XML-based format standardized by MPEG for authoring purposes).

Note: the values indicated in italic can be different as far as they respect the MPEG-4 systems specifications. Reasonable values are indicated in the table. Not all parameters are shown.

Table E-1 – IOD of an ISMA 1.0 scene

```
<InitialObjectDescriptor
        ODProfileLevelIndication= the proper profile indication
        SceneProfileLevelIndication= the proper profile indication
        AudioProfileLevelIndication= the proper profile indication
        VisualProfileLevelIndication= the proper profile indication
        graphicsProfileLevelIndication= the proper profile indication
>
        <esDescr>
                <ES_Descriptor ES_ID="1">
                        <decConfigDescr>
                                <DecoderConfigDescriptor
                                        objectTypeIndication="1"
                                        streamType="1"
                                >
                        </decConfigDescr>
                        <slConfigDescr>
                                <SLConfigDescriptor as appropriate />
                        </slConfigDescr>
                </ES_Descriptor>
                <ES_Descriptor ES_ID="2">
                        <decConfigDescr>
```

```
                          <DecoderConfigDescriptor
                              objectTypeIndication="2"
                              streamType="3"
                    >
                              <decSpecificInfo>
                                    <BIFSv2Config as appropriate />
                              </decSpecificInfo>
                        /DecoderConfigDescriptor>
                </decConfigDescr>
                <slConfigDescr>
                        <SLConfigDescriptor as appropriate />
                </slConfigDescr>
            </ES_Descriptor>
        </esDescr>
</InitialObjectDescriptor>
```

11.2.2 The BIFS stream

ISMA 1.0 content is a presentation with a simple scene that includes at most one audio stream and one video stream. In BIFS terms, the scene contains a node for the audio object, and a rectangle node, whose texture is the video. In case the presentation includes only video or only audio, only one of these nodes would be present.
The following tables show (using VRML format for readability) the BIFS for the three possible scenes.

Note: the values indicated in italic can be different as far as they respect the MPEG-4 systems specifications. Reasonable values are indicated in the tables.

Table E-2 shows the description of an audio + video scene:

Table E-2 – BIFS representation of an ISMA 1.0 audi o + video scene

```
OrderedGroup {
    children [
        Sound2D {
                spatialize FALSE
                source AudioSource {url 10}}
        Shape {
                geometry Bitmap { scale 1 1}
                appearance Appearance {texture MovieTexture {url 20}}
        }
    ]
}
```

Table E-3 shows the description of a video-only scene:

Table E-3 – BIFS representation of an ISMA 1.0 video-only scene

```
OrderedGroup {
    children [
        Shape {
                geometry Bitmap {scale 1 1}
                appearance Appearance {texture MovieTexture {url 20}}
```

```
        }
    ]
}
```

Table E-4 shows the description of an audio-only scene:

Table E-4 – BIFS representation of an ISMA 1.0 audio-only scene

```
OrderedGroup {
    children [
        Sound2D {
            spatialize FALSE
            source AudioSource {url 10}}
    ]
}
```

11.2.3 The OD stream
Given the simple BIFS scene of ISMA 1.0, the corresponding OD stream is made of just
one *ObjectDescriptorUpdate* command that contains either one or two
ObjectDescriptors; one for audio, one for video. Each of the ODs contains one ESD.

Table E-5 shows the OD stream of an ISMA 1.0 audio and video scene using the XMT
format (XML-based format standardized by MPEG for authoring purposes).

Note: the values indicated in bold-italic can be different as far as they respect the
MPEG-4 systems specifications. Reasonable values are indicated in the table. Not all
parameters are shown.

Table E-5 – OD stream for ISMA 1.0 audio + video scene

```
< ObjectDescriptorUpdate>
      <OD>
              <ObjectDescriptor objectDescriptorID="10">
                      <esDescr>
                              <ES_Descriptor ES_ID="101">
                                      <decConfigDescr>
                                              <DecoderConfigDescriptor
                                                      objectTypeIndication="64"
                                                      streamType="5"
                                      >
                                              <decSpecificInfo>
                                                      <AudioSpecificInfo audio
decoder config info goes here />
                                              </decSpecificInfo>
                                      /DecoderConfigDescriptor>
                              </decConfigDescr>
                              <slConfigDescr>
                                      <SLConfigDescriptor as appropriate />
                              </slConfigDescr>
                      </ES_Descriptor>
                      </esDescr>
              </ObjectDescriptor>
```

```
                    <ObjectDescriptor objectDescriptorID="20">
                        <esDescr>
                            <ES_Descriptor ES_ID="201">
                                <decConfigDescr>
                                    <DecoderConfigDescriptor
                                        objectTypeIndication="32"
                                        streamType="4"
                                    >
                                        <decSpecificInfo>
                                            <VideoSpecificInfo video
decoder config info goes here />
                                        </decSpecificInfo>
                                    </DecoderConfigDescriptor>
                                </decConfigDescr>
                                <slConfigDescr>
                                    <SLConfigDescriptor as appropriate />
                                </slConfigDescr>
                            </ES_Descriptor>
                        </esDescr>
                    </ObjectDescriptor>
            </OD>
< /ObjectDescriptorUpdate>
```

Explanation: There is one *ObjectDescriptorUpdate* command that contains two *ObjectDescriptors*, one for audio and one for video, with ID *10* and *20* respectively. Each of the ODs contains one ESD, with ID *101* and *201* respectively.

The value of *objectTypeIndication* is, according to the standard, 64 for MPEG-4 audio and 32 for MPEG-4 video. Likewise *streamType* is 4 for video and 5 for audio.

The *decSpecificInfo* field within the OD structures might contain decoder specific info. See clause 11.3 for details.

For the *SLConfigDescriptor* refer to clause 11.4.

11.3 Notes on the Decoder Specific Information

The *decSpecificInfo* field within the OD structures contains decoder specific info. There is Video specific info and audio specific info as defined in ISO/IEC 14496-2 and ISO/IEC 14496-3 respectively. E.g. for video, this contains the video headers – VOSH, VOL, etc. However in the streaming scenario the decSpecificInfo for video and audio streams need not be embedded in the OD stream, since it has to be in anycase exposed at the SDP level (in the config attribute of the format parameter). This implies that MPEG-4 Systems enabled receivers MUST be prepared to accept empty decSpecificInfo in the OD stream and retrieve the actual decSpecificInfo from the SDP. Moreover, in case the decSpecificInfo is also made available within the OD stream, it MUST coincide with that exposed at the SDP level.

11.4 Notes on the Sync Layer Config Descriptor

The *SLConfigDescriptor* contains parameters that are used to interpret the SL packet headers of the data. SL packets are described in ISO/IEC 14496-1, and provide a

delivery-agnostic mechanism to associate meta-information such as timestamp, random access flags and so on, to the individual portions of the media payload. SL packets can be virtually obtained in both file-reading and streaming scenarios, by applying appropriate mapping rules from the corresponding meta-information within the MP4 file or in the RTP packet headers. This descriptor contains several fields whose value varies between file-reading and streaming scenarios. Within MP4 files predefined=2 is used for all streams, implying certain values for the various individual fields, whereas in the streaming scenario ISMA has defined the individual field values which are appropriate for audio and video, and adopted predefined=1 for BIFS and OD – which represent a trivial case. For a detailed description of all fields refer to ISO/IEC 14496-1, clause 10.2.3 and 10.2.4.

11.5   Notes on Synchronization

11.5.1 The MPEG-4 Systems model for synchronization

MPEG-4 Systems provides a sophisticated synchronization model, in which multiple timelines can be run concurrently each synchronizing a subset of elementary streams within the presentation. This model requires that each elementary stream is explicitly assigned to a particular timeline, and the OD stream, by means of the ES_Id, OCRstreamFlag, OCR_ES_Id fields in the ESDescriptor and the OCRlength and OCRresolution fields in the SLconfigDescriptor, provide the necessary information. The OCRstreamFlag indicates whether an elementary stream uses the clock of another stream (indicated in the OCR_ES_Id field) or its own. The clock itself is obtained by conveying samples of the OCR (Object Clock Reference), whose resolution and length are provided in the OCRresolution and OCRlength fields of the SlconfigDescriptor of the elementary stream to which the clock is associated. In case OCRlength is 0, no actual samples of the OCR are carried, and the timeline is locally generated: this is the case for the file-reading scenario. Still, even in this case, the OCRstreamFlag and OCR_ES_Id fields allow syncing elementary stream, as well as running multiple timelines. In the case of ISMA1.0 content this model is overkill, since all streams shall be tight to a single timeline. This is true for both the file-reading and the streaming scenarios.

11.5.2 File-reading scenario

In the file-reading scenario, all tracks in the MP4 file must be synchronized (including BIFS & OD tracks). The simplest way to indicate this is to not place any 'sync' track reference atom in the file (this means that all tracks are synchronized by default). Also, the SlconfigDescriptor will have predefined=2, which implies OCRlength=0.

11.5.3 Streaming scenario

In the streaming scenario the RTP mechanism for synchronization is used. Players that depend on the MPEG-4 Systems model for synchronization, shall be able to map the RTP mechanism to the OCR model. Specifically, the server time reported through Sender Report commands in RTCP will be translated into OCRs when the player performs SL mapping. In presentations that include video and audio, it is recommended to assume that the OCRs are conveyed with one stream, preferably audio, with the other stream depending on it synchronization. Table E-7 follows this model, and assumes that the audio stream is the one that carries the OCRs, while the video stream clock depends on the audio stream. If this pattern does not apply, for instance, if the video stream plays continuously and the audio stream is sometime muted, the values in the table should be changed accordingly. Specifically, OCRstreamFlag should be set to 1 if the stream clock depends on another stream, and, in this case, and only in this case, the

ES_Descriptor of the stream shall include an OCR_ES_Id field that contains the ES_id of the stream that carries the OCRs.

11.6 Notes on Timescales

OD and SDP both provide the description of the timescale by which the values of timestamps (and clock references) are measured. This might generate some confusion. There is no reason for setting the two timescales to different values: a discrepancy would not prevent interoperability, however it is recommended to set both timescales identically. In any case the bits-on-the-wire only reflect the timescale value as indicated in SDP.

11.7 MPEG-4 Systems support in MP4 files

ISMA 1.0 strictly adheres to the ISO/IEC 14496-12 (ISO Base Media File Format) and ISO/IEC 14496-14 (MP4 File Format).
In particular the "iod" box, the BIFS track, the OD track, the "esds" boxes for the Audio and Video tracks, are fully conformant to those specifications.
Note that the SLConfigDescriptor for all streams are set to "predefined=2".

11.8 MPEG-4 Systems support in SDP

11.8.1 The self-contained IOD

MPEG-4 Systems requires that the scene description and the object description are conveyed in separate BIFS and OD streams. However, in order to avoid the consumption of additional resources in the streaming scenario, ISMA 1.0 requires that these streams be embedded within the IOD that is then conveyed as part of the SDP description.

This mechanism is based on the following points:
- MPEG-4 allows using URLs in ESDs
- A URL can be of type "data:", i.e. the content pointed to by the URL can be embedded in the URL itself.

Using these principles, Table E-6 shows the self-contained IOD of an ISMA 1.0 presentation using the XMT format: the only difference with respect to the IOD shown in Table E-1 is given by the URLString fields containing the "data:" URLs.

Note: the values indicated in bold-italic can be different as far as they respect the MPEG-4 systems specifications. Reasonable values are indicated in the table. Not all parameters are shown.

Table E-6 – A self-contained IOD for the simple scene

```
<InitialObjectDescriptor
        ODProfileLevelIndication= the proper profile indication
        SceneProfileLevelIndication= the proper profile indication
        AudioProfileLevelIndication= the proper profile indication
        VisualProfileLevelIndication= the proper profile indication
        graphicsProfileLevelIndication= the proper profile indication
>
        <esDescr>
                <ES_Descriptor ES_ID="1"
                        URLString="data:application/mpeg4-od-au;base64,<Base64 encoded OD
```

```
stream >"
                >
                        <decConfigDescr>
                                <DecoderConfigDescriptor
                                        objectTypeIndication="1"
                                        streamType="1"
                                >
                        </decConfigDescr>
                        <slConfigDescr>
                                <SLConfigDescriptor predefined="1" />
                        </slConfigDescr>
                </ES_Descriptor>
                <ES_Descriptor ES_ID="2"
                        URLString="data:application/mpeg4-bifs-au;base64,<Base64 encoded BIFS
stream >"
                >
                        <decConfigDescr>
                                <DecoderConfigDescriptor
                                        objectTypeIndication="2"
                                        streamType="3"
                                >
                                        <decSpecificInfo>
                                                <BIFSv2Config as appropriate />
                                        </decSpecificInfo>
                                /DecoderConfigDescriptor>
                        </decConfigDescr>
                        <slConfigDescr>
                                <SLConfigDescriptor predefined="1" />
                        </slConfigDescr>
                </ES_Descriptor>
        </esDescr>
</InitialObjectDescriptor>
```

The code in Table E-6 assumes that "data:" URLs contain one access unit with null SL packet header.

11.8.2 MPEG-4 Systems Information in SDP
The IOD shall be included in the SDP description, using the *mpeg4-iod* parameter described in ISO/IEC 14496-8 as:

   *a=mpeg4-iod [<*location*>]*
The *location* shall be a URL enclosed in double-quotes, which will supply the IOD in its standard binary format. The IOD may be embedded in a "data:" URL and Base64 encoding of binary data (described in RFC 1341).

The media streams shall be described in the SDP using the usual parameters. In addition, there is a need to associate ESIDs with the corresponding stream description. This is done as described in ISO/IEC 14496-8, i.e. a stream-specific attribute shall be present for each MPEG-4 stream. The attribute will take the following form:

   a=mpeg4-esid esid
where *esid* is the ESID.

12 Appendix F: Example of Minimal MPEG-4 Systems Support in ISMA (Informative)

The examples below are based on the Tables of Appendix E, with specific values assigned to variable fields. The examples specifically address the streaming scenario and show:

- the binary representation of BIFS bitstreams for Audio+Video, VideoOnly and AudioOnly scenes;
- the binary representation of the corresponding OD bitstreams, for both ISMA profile0 and profile1;
- the binary representation of IODs, embedding BIFS and OD bitstreams by means of "data:" URLs, for both ISMA profile0 and profile1.

These are examples and by no means restrict the set of valid BIFS/OD/IOD that can be used. An MPEG-4 Systems unaware content producer / streamer can however safely pick from these examples in order to generate the IOD corresponding to the appropriate ISMA Profile and scene type.

Note that the DecoderSpecificInfo descriptors of the audio and video streams are omitted, following the rule specified in Appendix E that DecoderSpecificInfo may be omitted if provided in other means.

Note also that the tables below refer to the OD and IOD used in the streaming context, not to those stored in the file and used for local playback. More specifically the SLConfigDescriptor when stored in the file contains the value predefined=2 and no other fields. Also, several other IOD/OD structures are mapped into specific structures of the MP4 file, e.g. the Elementary Stream Descriptor is stored as part of the Sample Description Box.

12.1 BIFS bitstreams

12.1.1 ISMA1.0 audio+video BIFS
The binary representation of the scene in Table E-2 is the following:

```
TOTAL OF 24 BYTES
C0 10 12 81 93 02 A0 57 26 10 41 FC 00 00 01 FC 00 00 04 42 82 28
29 F8
```

Which in base64 becomes:

wBASgZMCoFcmEEH8AAAB/AAABEKCKCn4

12.1.2 ISMA1.0 video-only BIFS
The binary representation of the scene in Table E-3 is the following:

```
TOTAL OF 19 BYTES
C0 10 12 61 04 1F C0 00 00 1F C0 00 00 44 28 22 82 9F 80
```

Which in base64 becomes:

wBASYQQfwAAAH8AAAEQoIoKfgA==

12.1.3 ISMA1.0 audio-only BIFS

The binary representation of the scene in Table E-4 is the following:

```
TOTAL OF 9 BYTES
C0 10 12 81 93 02 A0 57 C0
```

Which in base64 becomes:

```
wBASgZMCoFfA
```

12.2 OD bitstreams

12.2.1 The complete representation of the OD

The OD bitstreams for the various combinations of ISMA profiles and scene types differ for just a very few elements:

- the presence of the Audio and/or Video Object Descriptor
- the fields related to the clock reference stream (in case of Audio+Video scene, the Video depends on the Audio, otherwise no dependency exists)
- the values in the decoder config descriptor (wrt: profile 0 and profile 1)
- the values in the SL config descriptor (timestamp/OCRResolution, timestamp/OCRLength)
- the overall descriptor sizes

Table E-7 provides in its 6 parallel columns the actual values for the 6 possible combinations, namely Audio+Video, Video-only and Audio-only scenes for both ISMA Profiles 0 and 1.

This table specifically represents the OD bitstream for the streaming scenario, however, given the similarity with the OD representation within the MP4 file, the few field values (but for the descriptor size values) that would vary in this second case are indicated in parenthesis (e.g. field 5.3). Therefore, if the field contains a value in parenthesis '(' and ')', the value in parenthesis is the value for the file representation: if the value in parenthesis is a '-', it is not present in the file representation.

Note: the values indicated in italic between '<' and '>' can be different as far as they respect the MPEG-4 systems specifications (e.g. field 2.3). Reasonable values are indicated in the table. Some descriptor sizes too are indicated between '<' and '>', since their values may be affected by the presence/absence of certain fields, specifically the OCR_ES_Id fields (3.8 and 7.8: either one or the other must be present for the AV scene in the streaming scenario).

Table E-7 – Full representation of OD bitstreams for ISMA 1.0 presentations

Field No.	Size in Bits	Field Name	Values for Audio and/or Video scenes, profiles 0 or 1					
			AV 0	V 0	A 0	AV 1	V 1	A 1
ObjectDescriptor Access Unit								
1.1	8	ObjectDescriptorUpdate tag	1					
1.2	8	Descriptor size	86	42	42	86	42	42
ObjectDescriptor (of Video stream)								

#	bits	Field						
2.1	8	ObjectDescriptor tag	1					
2.2	8	Descriptor size	*<42>*	40	-	*<42>*	40	-
2.3	10	ObjectDescriptorID	*<20>*					
2.4	1	URL_Flag	0					
2.5	5	Reserved	31					
ES_Descriptor (of Video stream)								
3.1	8	ES_Descriptor tag	3					
3.2	8	Descriptor size	*<38>*	36	-	*<38>*	36	-
3.3	16	ES_ID	*<201>*					
3.4	1	StreamDependenceFlag	0					
3.5	1	URL_Flag	0					
3.6	1	OCRstreamFlag	*<1>*	0	-	*<1>*	0	-
3.7	5	StreamPriority	*<0>*					
3.8	16	OCR_ES_Id	*<101>*	-	-	*<101>*	-	-
DecoderConfigDescriptor (of Video stream)								
4.1	8	DecoderConfigDescriptor tag	4					
4.2	8	Descriptor size	13					
4.3	8	ObjectTypeIndication	32					
4.4	6	StreamType	4					
4.5	1	upstream	0					
4.6	1	Reserved	1					
4.7	24	bufferSizeDB [1]	*<20480>*	*<20480>*	-	*<133120>*	*<133120>*	-
4.8	32	maxBitrate [1]	*<64000>*	*<64000>*	-	*<1500000>*	*<1500000>*	-
4.9	32	avgBitrate [1]	*<64000>*	*<64000>*	-	*<1500000>*	*<1500000>*	-
SLConfigDescriptor (of Video stream)								
5.1	8	SLConfigDescriptor tag	6					
5.2	8	Descriptor size	16					
5.3	8	predefined	0 (2)					
5.4	1	useAccessUnitStartFlag	0 (-)					
5.5	1	useAccessUnitEndFlag	1 (-)					
5.6	1	useRandomAccessPointFlag	0 (-)					
5.7	1	hasRandomAccessUnitsOnlyFlag	0 (-)					
5.8	1	usePaddingFlag	0 (-)					
5.9	1	useTimeStampsFlag	1 (-)					
5.10	1	useIdleFlag	0 (-)					
5.11	1	durationFlag	0 (-)					
5.12	32	timeStampResolution	*see note* [2]					
5.13	32	OCRResolution	*<0>*(-)					
5.14	8	timeStampLength	*<32>* (-)					
5.15	8	OCRLength	*<0>* (-)					
5.16	8	AU_Length	0 (-)					
5.17	8	instantBitrateLength	0 (-)					

[1] The values indicated as default are the maximum values allowed for the profile. Note that implementations might benefit from more accurate computations.

[2] For the streaming scenario, it is recommended to use the same value as provided in the corresponding rtpmap line of the SDP description. For the file-reading scenario, this is the timescale value as indicated in the corresponding 'mdhd' (Media Header) box. Note that there is no reason for having discrepancies among these values.

5.18	4	degradationPriorityLength	0 (-)					
5.19	5	AU_seqNumLength	0 (-)					
5.20	5	packetSeqNumLength	0 (-)					
5.21	2	reserved	3					
ObjectDescriptor (of Audio stream)								
6.1	8	ObjectDescriptor tag	1					
6.2	8	Descriptor size	*<40>*	-	40	*<40>*	-	40
6.3	10	ObjectDescriptorID	*<10>*					
6.4	1	URL_Flag	0					
6.5	5	Reserved	31					
ES_Descriptor (of Audio stream)								
7.1	8	ES_Descriptor tag	3					
7.2	8	Descriptor size	<36>	-	36	<36>	-	36
7.3	16	ES_ID	*<101>*					
7.4	1	streamDependenceFlag	0					
7.5	1	URL_Flag	0					
7.6	1	OCRstreamFlag	*<0>*	0	-	*<0>*	0	-
7.7	5	streamPriority	*<0>*					
7.8	16	OCR_ES_Id	<->	-	-	<->	-	-
DecoderConfigDescriptor (of Audio stream)								
8.1	8	DecoderConfigDescriptor tag	4					
8.2	8	Descriptor size	13					
8.3	8	objectTypeIndication	64					
8.4	6	streamType	5					
8.5	1	upStream	0					
8.6	1	Reserved	1					
8.7	24	bufferSizeDB [1]	*<8000>*	-	*<8000>*	*<8000>*	-	*<8000>*
8.8	32	maxBitrate [1]	*<128000>*	-	*<128000>*	*<128000>*	-	*<128000>*
8.9	32	avgBitrate [1]	*<128000>*	-	*<128000>*	*<128000>*	-	*<128000>*
SLConfigDescriptor (of Audio stream)								
9.1	8	SLConfigDescriptor tag	6					
9.2	8	Descriptor size	16					
9.3	8	predefined	0 (2)					
9.4	1	useAccessUnitStartFlag	0 (-)					
9.5	1	useAccessUnitEndFlag	1 (-)					
9.6	1	useRandomAccessPointFlag	0 (-)					
9.7	1	hasRandomAccessUnitsOnlyFlag	0 (-)					
9.8	1	usePaddingFlag	0 (-)					
9.9	1	useTimeStampsFlag	1 (-)					
9.10	1	useIdleFlag	0 (-)					
9.11	1	durationFlag	0 (-)					
9.12	32	timeStampResolution	*see note [2]*					
9.13	32	OCRResolution	*<1000>(-)*					
9.14	8	timeStampLength	*<32>* (-)					
9.15	8	OCRLength	*<32>* (-)					
9.16	8	AU_Length	0 (-)					
9.17	8	instantBitrateLength	0 (-)					
9.18	4	degradationPriorityLength	0 (-)					

9.19	5 AU_seqNumLength	0 (-)
9.20	5 packetSeqNumLength	0 (-)
9.21	2 reserved	3

12.2.2 ISMA1.0 audio+video OD, profile 0
The binary representation of this bitstream is the following (assuming timeStampResolution=1000 and timeStampLength=32 for the audio and video ESDs):

```
TOTAL OF 88 BYTES
01 56 01 2a 05 1f 03 26 00 c9 20 00 65 04 0d 20 11 00 50 00 00 00
fa 00 00 00 fa 00 06 10 00 44 00 00 03 e8 00 00 00 00 20 00 00 00
00 03 01 28 02 9f 03 24 00 65 00 04 0d 40 15 00 1f 40 00 01 f4 00
00 01 f4 00 06 10 00 44 00 00 03 e8 00 00 03 e8 20 20 00 00 00 03
```

Which in base64 becomes:

AVYBKgUfAyYAySAAZQQNIBEAUAAAAPoAAAD6AAYQAEQAAAPoAAAACAAAAAAwEoA
p8DJABlAAQNQBUAH0AAAfQAAAH0AAYQAEQAAAPoAAAD6CAgAAAAAw==

12.2.3 ISMA1.0 video-only OD, profile 0
The binary representation of this bitstream is the following (assuming timeStampResolution=1000 and timeStampLength=32 for the video ESD):

```
TOTAL OF 44 BYTES
01 2a 01 28 05 1f 03 24 00 c9 00 04 0d 20 11 00 50 00 00 00 fa 00
00 00 fa 00 06 10 00 44 00 00 03 e8 00 00 00 00 20 00 00 00 00 03
```

Which in base64 becomes:

ASoBKAUfAyQAyQAEDSARAFAAAAD6AAAA+gAGEABEAAAD6AAAAAgAAAAAM=

12.2.4 ISMA1.0 audio-only OD, profile 0
The binary representation of this bitstream is the following (assuming timeStampResolution=1000 and timeStampLength=32 for the audio ESD):

```
TOTAL OF 44 BYTES
01 2a 01 28 02 9f 03 24 00 65 00 04 0d 40 15 00 1f 40 00 01 f4 00
00 01 f4 00 06 10 00 44 00 00 03 e8 00 00 03 e8 20 20 00 00 00 03
```

Which in base64 becomes:

ASoBKAKfAyQAZQAEDUAVAB9AAAH0AAAB9AAGEABEAAAD6AAAA+ggIAAAAAM=

12.2.5 ISMA1.0 audio+video OD, profile 1
The binary representation of this bitstream is the following (assuming timeStampResolution=1000 and timeStampLength=32 for the audio and video ESDs):

```
TOTAL OF 88 BYTES
01 56 01 2a 05 1f 03 26 00 c9 20 00 65 04 0d 20 11 02 08 00 00 16
e3 60 00 16 e3 60 06 10 00 44 00 00 03 e8 00 00 00 00 20 00 00 00
```

```
00 03 01 28 02 9f 03 24 00 65 00 04 0d 40 15 00 1f 40 00 01 f4 00
00 01 f4 00 06 10 00 44 00 00 03 e8 00 00 03 e8 20 20 00 00 00 03
```

Which in base64 becomes:

```
AVYBKgUfAyYAySAAZQQNIBECCAAAFuNgABbjYAYQAEQAAAPoAAAAACAAAAAAwEoA
p8DJABlAAQNQBUAH0AAAfQAAAH0AAYQAEQAAAPoAAAD6CAgAAAAAw==
```

12.2.6 ISMA1.0 video-only OD, profile 1
The binary representation of this bitstream is the following (assuming timeStampResolution=1000 and timeStampLength=32 for the video ESD):

```
TOTAL OF 44 BYTES
01 2a 01 28 05 1f 03 24 00 c9 00 04 0d 20 11 02 08 00 00 16 e3 60
00 16 e3 60 06 10 00 44 00 00 03 e8 00 00 00 00 20 00 00 00 00 03
```

Which in base64 becomes:

```
ASoBKAUfAyQAyQAEDSARAggAABbjYAAW42AGEABEAAAD6AAAAAgAAAAAM=
```

12.2.7 ISMA1.0 audio-only OD, profile 1
The binary representation of this bitstream is identical to that of profile 0

12.3 IODs

12.3.1 The complete representation of the IOD
The IODs for the various combinations of ISMA profiles and scene types differ for just a very few elements:
- the profileLevelIndications
- the embedded BIFS and OD "data:" URLs
- the overall descriptor sizes

Table E-8 provides in its 6 parallel columns the actual values for the 6 possible combinations, namely Audio+Video, Video-only and Audio-only scenes for both ISMA Profiles 0 and 1.

This table specifically represents the IOD for the streaming scenario, however, given the similarity with the IOD representation within the MP4 file, the few field values (but for the descriptor size values) that would vary in this second case are indicated in parenthesis (e.g. field 2.5). Therefore, if the field contains a value in parenthesis '(' and ')', the value in parenthesis is the value for the file representation: if the value in parenthesis is a '-', it is not present in the file representation.

Note: the values indicated in italic between '<' and '>' can be different as far as they respect the MPEG-4 systems specifications (e.g. field 1.3). Reasonable values are indicated in the table.

Table E-8 – Full representation of IODs for ISMA 1.0 presentations

Field	Size in	Field Name	Values for Audio and/or Video scenes, profiles 0 or 1

No.	Bits		AV 0	V 0	A 0	AV 1	V 1	A 1
		InitialObjectDescriptor						
1.1	8	InitialObjectDescriptor tag	2					
1.2	16	Descriptor size						
1.3	10	ObjectDescriptorID	*<1>*					
1.4	1	URL_Flag	0					
1.5	1	includeInlineProfilesFlag	0					
1.6	4	Reserved	15					
1.7	8	ODProfileLevelIndication	255					
1.8	8	sceneProfileLevelIndication	255					
1.9	8	audioProfileLevelIndication	*<15>*	255	*<15>*	*<15>*	255	*<15>*
1.10	8	visualProfileLevelIndication	*<1>*	*<1>*	255	*<247>*	*<247>*	255
1.11	8	graphicsProfileLevelIndication	255					
		ES_Descriptor (of OD stream)						
2.1	8	ES_Descriptor tag	3					
2.2	8	Descriptor size						
2.3	16	ES_ID	*<1>*					
2.4	1	streamDependenceFlag	0					
2.5	1	URL_Flag	1 (0)					
2.6	1	OCRstreamFlag	0					
2.7	5	streamPriority	*<0>*					
2.8	8	string-size						
2.9	36*8	URLstring (common part)	"data:application/mpeg4-od-au;base64," (-)					
2.10	n*8	URLstring (specific part)	Based on the specific OD AU (-)					
		DecoderConfigDescriptor (of OD stream)						
3.1	8	DecoderConfigDescriptor tag	4					
3.2	8	Descriptor size	13					
3.3	8	objectTypeIndication	1					
3.4	6	streamType	1					
3.5	1	upStream	0					
3.6	1	Reserved	1					
3.7	24	bufferSizeDB	*<200>*					
3.8	32	maxBitrate	*<0>*					
3.9	32	avgBitrate	*<0>*					
		SLConfigDescriptor (of OD stream)						
4.1	8	SLConfigDescriptor tag	6					
4.2	8	Descriptor size	9					
4.3	8	predefined	1 (2)					
4.4	32	startDecodingTimeStamp	0 (-)					
4.5	32	startCompositionTimeStamp	0 (-)					
		ES_Descriptor (of BIFS stream)						
5.1	8	ES_Descriptor tag	3					
5.2	8	Descriptor size						
5.3	16	ES_ID	*<2>*					
5.4	1	StreamDependenceFlag	0					
5.5	1	URL_Flag	1 (0)					
5.6	1	OCRstreamFlag	0					
5.7	5	StreamPriority	*<0>*					

5.8	8	string-size	
5.9	38*8	URLstring (common part)	"data:application/mpeg4-bifs-au;base64," (-)
5.10	n*8	URLstring (specific part)	Based on the specific BIFS AU (-)
DecoderConfigDescriptor (of BIFS)			
6.1	8	DecoderConfigDescriptor tag	4
6.2	8	Descriptor size	18
6.3	8	ObjectTypeIndication	2
6.4	6	StreamType	3
6.5	1	Upstream	0
6.6	1	Reserved	1
6.7	24	BufferSizeDB	*<100>*
6.8	32	MaxBitrate	*<0>*
6.9	32	AvgBitrate	*<0>*
BIFSv2Config			
7.1	8	BIFSv2Config tag	5
7.2	8	Descriptor size	3
7.3	1	use3DmeshCoding	0
7.4	1	UsePredictiveMFField	0
7.5	5	NodeIDbits	0
7.6	5	RouteIDbits	0
7.7	5	ProtoIDbits	0
7.8	1	IsCommandStream	1
7.9	1	PixelMetric	1
7.10	1	HasSize	0
7.11	4	byte align	0
SLConfigDescriptor (of BIFS)			
8.1	8	SLConfigDescriptor tag	6
8.2	8	descriptor size	9
8.3	8	Predefined	1 (2)
8.4	32	startDecodingTimeStamp	0 (-)
8.5	32	startCompositionTimeStamp	0 (-)

12.3.2 ISMA1.0 audio+video IOD, profile 0
The binary representation of the IOD comprising the BIFS and OD bitstreams as
provided in 12.1.1 and 12.2.2 is the following:

```
TOTAL OF 306 BYTES
02 82 2f 00 4f ff ff 0f 01 ff 03 81 3a 00 01 40 9c 64 61 74 61 3a
61 70 70 6c 69 63 61 74 69 6f 6e 2f 6d 70 65 67 34 2d 6f 64 2d 61
75 3b 62 61 73 65 36 34 2c 41 56 59 42 4b 67 55 66 41 79 59 41 79
53 41 41 5a 51 51 4e 49 42 45 41 55 41 41 41 41 50 6f 41 41 41 44
36 41 41 59 51 41 45 51 41 41 41 50 6f 41 41 41 41 41 43 41 41 41
41 41 41 41 77 45 6f 41 70 38 44 4a 41 42 6c 41 41 51 4e 51 42 55
41 48 30 41 41 41 66 51 41 41 41 48 30 41 41 59 51 41 45 51 41 41
41 50 6f 41 41 41 44 36 43 41 67 41 41 41 41 41 77 3d 3d 04 0d 01
05 00 00 c8 00 00 00 00 00 00 00 00 06 09 01 00 00 00 00 00 00 00
00 03 69 00 02 40 46 64 61 74 61 3a 61 70 70 6c 69 63 61 74 69 6f
6e 2f 6d 70 65 67 34 2d 62 69 66 73 2d 61 75 3b 62 61 73 65 36 34
2c 77 42 41 53 67 5a 4d 43 6f 46 63 6d 45 45 48 38 41 41 41 42 2f
```

```
41 41 41 42 45 4b 43 4b 43 6e 34 04 12 02 0d 00 00 64 00 00 00 00
00 00 00 00 05 03 00 00 60 06 09 01 00 00 00 00 00 00 00 00
```

Which in base64 becomes:

AoIvAE///w8B/wOBOgABQJxkYXRhOmFwcGxpY2F0aW9uL21wZWc0LW9kLWF1O2Jhc
2U2NCxBVllCS2dVZkF5UUF5U0FBlFRTklCRUFVQUFBQVBvQUFBRDZBQVlRRUVRU
FBUG9BQUFBQUNBQUFBQUFBd0VvVQXA4REpBQmxBQVFFOUUJVQUgwQUFBZlFBQUFIMEF
BWVFBRVFBQUFQb0FBQUQ2Q0FnQUFBQUF3PT0EDQEFAADIAAAAAAAAAAAGCQEAAAA
AAAAANpAAJARmRhdGE6YXBwbGljYXRpb24vbXBlZzQtYmlmcy1hdTtiYXNlNjQsd
0JBU2daTUNvRmNtRUVIOEFBQUIvQUFBQkVLQ0tDbjjQEEgINAABkAAAAAAAAAAFAw
AAYAYJAQAAAAAAAAA

12.3.3 ISMA1.0 video-only IOD, profile 0

The binary representation of the IOD comprising the BIFS and OD bitstreams as provided in 12.1.2 and 12.2.3 is the following:

```
TOTAL OF 241 BYTES
02 81 6e 00 4f ff ff ff 01 ff 03 7e 00 01 40 60 64 61 74 61 3a 61
70 70 6c 69 63 61 74 69 6f 6e 2f 6d 70 65 67 34 2d 6f 64 2d 61 75
3b 62 61 73 65 36 34 2c 41 53 6f 42 4b 41 55 66 41 79 51 41 79 51
41 45 44 53 41 52 41 46 41 41 41 41 44 36 41 41 41 41 2b 67 41 47
45 41 42 45 41 41 41 44 36 41 41 41 41 41 41 67 41 41 41 41 41 41
4d 3d 04 0d 01 05 00 00 c8 00 00 00 00 00 00 00 00 06 09 01 00 00
00 00 00 00 00 00 03 65 00 02 40 42 64 61 74 61 3a 61 70 70 6c 69
63 61 74 69 6f 6e 2f 6d 70 65 67 34 2d 62 69 66 73 2d 61 75 3b 62
61 73 65 36 34 2c 77 42 41 53 59 51 51 66 77 41 41 41 48 38 41 41
41 45 51 6f 49 6f 4b 66 67 41 3d 3d 04 12 02 0d 00 00 64 00 00 00
00 00 00 00 00 05 03 00 00 60 06 09 01 00 00 00 00 00 00 00 00
```

Which in base64 becomes:

AoFuAE////8B/wN+AAFAYGRhdGE6YXBwbGljYXRpb24vbXBlZzQtb2QtYXU7YmFzZ
TY0LEFTb0JLQVVmQXlRQXlRQUVEU0FSQUZBQUFBRDZBQUFBK2dBR0VBQkVBQUFENk
FBQUFBQWdBQUFBQUFNPQQNAQUAAMgAAAAAAAAAYJAQAAAAAAAAA2UAAkBCZGF
0YTphcHBsaWNhdGlvbi9tcGVnNC1iaWZzLWF1O2Jhc2U2NCx3QkFTWVFRZndBQUFI
OEFBQUVRb0lvS2ZnQT09BBICDQAAZAAAAAAAAAABQMAAGAGCQEAAAAAAAAAA==

12.3.4 ISMA1.0 audio-only IOD, profile 0

The binary representation of the IOD comprising the BIFS and OD bitstreams as provided in 12.1.3 and 12.2.4 is the following:

```
TOTAL OF 225 BYTES
02 81 5e 00 4f ff ff 0f ff ff 03 7e 00 01 40 60 64 61 74 61 3a 61
70 70 6c 69 63 61 74 69 6f 6e 2f 6d 70 65 67 34 2d 6f 64 2d 61 75
3b 62 61 73 65 36 34 2c 41 53 6f 42 4b 41 4b 66 41 79 51 41 5a 51
41 45 44 55 41 56 41 42 39 41 41 41 48 30 41 41 41 42 39 41 41 47
45 41 42 45 41 41 41 44 36 41 41 41 41 2b 67 67 49 41 41 41 41 41
4d 3d 04 0d 01 05 00 00 c8 00 00 00 00 00 00 00 00 06 09 01 00 00
00 00 00 00 00 00 03 55 00 02 40 32 64 61 74 61 3a 61 70 70 6c 69
63 61 74 69 6f 6e 2f 6d 70 65 67 34 2d 62 69 66 73 2d 61 75 3b 62
```

```
61 73 65 36 34 2c 77 42 41 53 67 5a 4d 43 6f 46 66 41 04 12 02 0d
00 00 64 00 00 00 00 00 00 00 00 05 03 00 00 60 06 09 01 00 00 00
00 00 00 00 00
```

Which in base64 becomes:

```
AoFeAE///w///wN+AAFAYGRhdGE6YXBwbGljYXRpb24vbXBlZzQtb2QtYXU7YmFzZ
TY0LEFTb0JLQUtmQXlRVpRQUVEVUFWQUI5QUFBSDBBQUFCOUFBR0VBQkVBQUFENk
FBQUErZ2dJQUFBQUFNPQQNAQUAAMgAAAAAAAAAAYJAQAAAAAAAAAA1UAAkAyZGF
0YTphcHBsaWNhdGlvbi9tcGVnNC1iaWZzLWF1O2Jhc2U2NCx3QkFTZ1pNQ29GZkEE
EgINAABkAAAAAAAAAAFAwAAYAYJAQAAAAAAAAAA
```

12.3.5 ISMA1.0 audio+video IOD, profile 1
The binary representation of the IOD comprising the BIFS and OD bitstreams as provided in 12.1.1 and 12.2.2 is the following:

```
TOTAL OF 306 BYTES
02 82 2f 00 4f ff ff 0f f7 ff 03 81 3a 00 01 40 9c 64 61 74 61 3a
61 70 70 6c 69 63 61 74 69 6f 6e 2f 6d 70 65 67 34 2d 6f 64 2d 61
75 3b 62 61 73 65 36 34 2c 41 56 59 42 4b 67 55 66 41 79 59 41 79
53 41 41 5a 51 51 4e 49 42 45 43 43 41 41 41 46 75 4e 67 41 42 62
6a 59 41 59 51 41 45 51 41 41 41 50 6f 41 41 41 41 41 43 41 41 41
41 41 41 41 77 45 6f 41 70 38 44 4a 41 42 6c 41 41 51 4e 51 42 55
41 48 30 41 41 41 66 51 41 41 41 48 30 41 41 59 51 41 45 51 41 41
41 50 6f 41 41 41 44 36 43 41 67 41 41 41 41 41 77 3d 3d 04 0d 01
05 00 00 c8 00 00 00 00 00 00 00 00 06 09 01 00 00 00 00 00 00 00
00 03 69 00 02 40 46 64 61 74 61 3a 61 70 70 6c 69 63 61 74 69 6f
6e 2f 6d 70 65 67 34 2d 62 69 66 73 2d 61 75 3b 62 61 73 65 36 34
2c 77 42 41 53 67 5a 4d 43 6f 46 63 6d 45 45 48 38 41 41 41 42 2f
41 41 41 42 45 4b 43 4b 43 6e 34 04 12 02 0d 00 00 64 00 00 00 00
00 00 00 00 05 03 00 00 60 06 09 01 00 00 00 00 00 00 00 00
```

Which in base64 becomes:

```
AoIvAE///w/3/wOBOgABQJxkYXRhOmFwcGxpY2F0aW9uL21wZWc0LW9kLWF1O2Jhc
2U2NCxBVllCS2dVZkF5WUF5U0FBWlFRTklCRUNDQUFBRnVOZ0FCYmpZQVlRQUVRQU
FBUG9BQUFBQUNBQUFBQUFBd0VvQXA4REpBQmxBQVFOUUJVQUgwQUFBZlFBQUFIMEF
BWVFBRVFBQUFQb0FBQUQ2Q0FnQUFBQUF3PT0EDQEFAADIAAAAAAAAAAAGCQEAAAAA
AAAAANpAAJARmRhdGE6YXBwbGljYXRpb24vbXBlZzQtYmlmcy1hdTtiYXNlNjQsd
0JBU2daTUNvRmNtRUVIOEFBQUIvQUFBQkVLQ0tDbjQEEgINAABkAAAAAAAAAAFAw
AAYAYJAQAAAAAAAAAA
```

12.3.6 ISMA1.0 video-only IOD, profile 1
The binary representation of the IOD comprising the BIFS and OD bitstreams as provided in 12.1.2 and 12.2.3 is the following:

```
TOTAL OF 241 BYTES
02 81 6e 00 4f ff ff ff f7 ff 03 7e 00 01 40 60 64 61 74 61 3a 61
70 70 6c 69 63 61 74 69 6f 6e 2f 6d 70 65 67 34 2d 6f 64 2d 61 75
3b 62 61 73 65 36 34 2c 41 53 6f 42 4b 41 55 66 41 79 51 41 79 51
41 45 44 53 41 52 41 67 67 41 41 42 62 6a 59 41 41 57 34 32 41 47
```

```
45 41 42 45 41 41 41 44 36 41 41 41 41 41 41 67 41 41 41 41 41 41
4d 3d 04 0d 01 05 00 00 c8 00 00 00 00 00 00 00 00 06 09 01 00 00
00 00 00 00 00 00 03 65 00 02 40 42 64 61 74 61 3a 61 70 70 6c 69
63 61 74 69 6f 6e 2f 6d 70 65 67 34 2d 62 69 66 73 2d 61 75 3b 62
61 73 65 36 34 2c 77 42 41 53 59 51 51 66 77 41 41 41 48 38 41 41
41 45 51 6f 49 6f 4b 66 67 41 3d 3d 04 12 02 0d 00 00 64 00 00 00
00 00 00 00 00 05 03 00 00 60 06 09 01 00 00 00 00 00 00 00 00 00
```

Which in base64 becomes:

```
AoFuAE/////3/wN+AAFAYGRhdGE6YXBwbGljYXRpb24vbXBlZzQtb2QtYXU7YmFzZ
TY0LEFTb0JLQVVmQXlRXlRQUVU0FSQWdnQUFCYmpZQUFXNDJBR0VBQkVBQUFENk
FBQUFBQWdBQUFBQUFNPQQNAQUAAMgAAAAAAAAAYJAQAAAAAAAAAA2UAAkBCZGF
0YTphcHBsaWNhdGlvbi9tcGVnNC1iaWZzLWF1O2Jhc2U2NCx3QkFTWVFRZndBQUFI
OEFBQUVRb0lvS2ZnQT09BBICDQAAZAAAAAAAAAABQMAAGAGCQEAAAAAAAAAA==
```

12.3.7 ISMA1.0 audio-only IOD, profile 1
The binary representation of this IOD is identical to that of profile 0.