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AMENDMENT 1
2017-03

Information technology — Coding of audio-visual objects —

Part 12: ISO base media file format

AMENDMENT 1: DRC Extensions

Technologies de l'information — Codage des objets audiovisuels —
Partie 12: Format ISO de base pour les fichiers médias
AMENDEMENT 1: Extensions DRC

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Amendment 1 to ISO/IEC 14496-12:2015 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 29, *Coding of audio, picture, multimedia and hypermedia information*.

Information technology — Coding of audio-visual objects —

Part 12:
ISO base media file format

AMENDMENT 1: DRC Extensions

Page 1, Normative references

Add the following new reference:

ISO/IEC 23003-4:2015/Amd.1, *Information technology — MPEG audio technologies — Part 4: Dynamic range control, AMENDMENT 1: Parametric DRC, gain mapping and equalization tools.*

Replace the normative reference:

ITU-R, Recommendation ITU-R BS.1770-3. *Algorithm to measure audio programme loudness and true-peak audio level,* August 2012.

with:

ITU-R, Recommendation ITU-R BS.1770-4. *Algorithms to measure audio programme loudness and true-peak audio level,* October 2015.

Page 2, Terms and definitions

Add the following new definition after 3.1.8 and adjust subsequent term numbers:

3.1.9

mod

modulo operator: (x mod y) = x-y floor (x/y)

Page 160, 12.2.3.1

Add the following paragraph at the end of the subclause:

Encoders should encode the DRC-related boxes in the `AudioSampleEntry` in the order given in 12.2.3.2. Decoders may ignore and discard the DRC-related boxes if they are not in that order. DRC-related boxes include `ChannelLayout`, `DownMixInstructions`, `DRCCoefficientsBasic`, `DRCInstructionsBasic`, `DRCCoefficientsUniDrc`, `DRCInstructionsUniDrc`, and `UniDrcConfigExtension`. The `DownMixInstructions` and `DRCInstructionsUniDrc` box cannot occur more than once if the box has `version==1`, but it can occur multiple times if `version==0`.

Page 161, 12.2.3.2

Replace the definition of AudioSampleEntry and AudioSampleEntryV1 with:

```
class AudioSampleEntry(codingname) extends SampleEntry (codingname){
    const unsigned int(32)[2] reserved = 0;
    template unsigned int(16) channelcount = 2;
    template unsigned int(16) samplesize = 16;
    unsigned int(16) pre_defined = 0;
    const unsigned int(16) reserved = 0 ;
    template unsigned int(32) samplerate = { default samplerate of media}<<16;
    // optional boxes follow
    Box ();        // further boxes as needed
    ChannelLayout();
    DownMixInstructions() [];
    DRCCoefficientsBasic() [];
    DRCInstructionsBasic() [];
    DRCCoefficientsUniDRC() [];
    DRCInstructionsUniDRC() [];
    // we permit only one DRC Extension box:
    UniDrcConfigExtension();
    Box ();        // further boxes as needed
}
aligned(8) class SamplingRateBox extends FullBox('srat') {
    unsigned int(32) sampling_rate;
}
class AudioSampleEntryV1(codingname) extends SampleEntry (codingname){
    unsigned int(16) entry_version;    // must be 1,
                        // and must be in an stsd with version ==1
    const unsigned int(16)[3] reserved = 0;
    template unsigned int(16) channelcount;    // must be correct
    template unsigned int(16) samplesize = 16;
    unsigned int(16) pre_defined = 0;
    const unsigned int(16) reserved = 0 ;
    template unsigned int(32) samplerate = 1<<16;
    // optional boxes follow
    SamplingRateBox();
    Box ();        // further boxes as needed
    ChannelLayout();
    DownMixInstructions() [];
    DRCCoefficientsBasic() [];
    DRCInstructionsBasic() [];
    DRCCoefficientsUniDRC() [];
    DRCInstructionsUniDRC() [];
    // we permit only one DRC Extension box:
    UniDrcConfigExtension();
    Box ();        // further boxes as needed
}
```

Page 163, 12.2.5.2

Replace the definition of DownMixInstructions with:

```
aligned(8) class DownMixInstructions extends FullBox('dmix', version, flags=0) {
    if (version >= 1) {        bit(1) reserved = 0;
        bit(7) downmix_instructions_count;
    } else {
        int downmix_instructions_count = 1;
    }
    for (a=1; a<=downmix_instructions_count; a++) {
        unsigned int(8) targetLayout;
        unsigned int(1) reserved = 0;
        unsigned int(7) targetChannelCount;
        bit(1) in_stream;
        unsigned int(7) downmix_ID;
        if (in_stream==0)
        {    // downmix coefficients are out of stream and supplied here
            int i, j;
            if (version >= 1) {
```

```
                bit(4) bs_downmix_offset;
                int size = 4;
                for (i=1; i <= targetChannelCount; i++){
                    for (j=1; j <= baseChannelCount; j++) {
                    bit(5) bs_downmix_coefficient_v1;
                    size += 5;
                  }
                }
                bit(size mod 8) reserved = 0;
        } else {
                for (i=1; i <= targetChannelCount; i++){
                    for (j=1; j <= baseChannelCount; j++) {
                        bit(4) bs_downmix_coefficient;
                    }
                }
            }
        }
    }
}
```

Page 163, 12.2.5.3

Add the following two new definitions after the definition of downmix_ID:

`version` is an integer that specifies the version of this box (0 or 1)

`bs_downmix_offset` is an offset in dB for all downmix coefficients that are defined in the `bs_downmix_coefficient_v1 field`. It is encoded as defined in the following table using the following expression for a:

$$a = 20\log_{10}\left(\frac{\text{targetChannelCount}}{\text{baseChannelCount}}\right)$$

Table 5 — Downmix Offset Encoding

Value [dB]	Hex Encoding (3 bits)
0,0	0x0
$0{,}5\,\text{round}\left(a\right)$	0x1
$0{,}5\,\text{round}\left(2a\right)$	0x2
reserved	other

Add the following new definition and table at the end of the subclause (after Table 7):

`bs_downmix_coefficient_v1` is encoded as defined in the following table:

Table 8 — Downmix Coefficient Encoding for version>=1 (bs_downmix_coefficient_v1)

Value	Hex Encoding (5 bits)
10,00 dB	0x00
6,00 dB	0x01
4,50 dB	0x02
3,00 dB	0x03
1,50 dB	0x04
0,00 dB	0x05
-0,50 dB	0x06

Table 8 *(continued)*

Value	Hex Encoding (5 bits)
-1,00 dB	0x07
-1,50 dB	0x08
-2,00 dB	0x09
-2,50 dB	0x0A
-3,00 dB	0x0B
-3,50 dB	0x0C
-4,00 dB	0x0D
-4,50 dB	0x0E
-5,00 dB	0x0F
-5,50 dB	0x10
-6,00 dB	0x11
-6,50 dB	0x12
-7,00 dB	0x13
-7,50 dB	0x14
-8,00 dB	0x15
-9,00 dB	0x16
-10,00 dB	0x17
-11,00 dB	0x18
-12,00 dB	0x19
-15,00 dB	0x1A
-20,00 dB	0x1B
-25,00 dB	0x1C
-30,00 dB	0x1D
-40,00 dB	0x1E
-∞ dB	0x1F

Page 164, Table 5

Replace the table number and title with:

Table 6 — Downmix Coefficient Encoding for non-LFE Channel and version==0 (bs_downmix_coefficient)

Page 164, Table 6

Replace the table number and title with:

Table 7 — Downmix Coefficient Encoding for LFE Channel and version==0 (bs_downmix_coefficient)

Page 165, 12.2.6

Replace the first paragraph with:

A DRC is used in the encoder to generate gain values using one of the pre-defined DRC characteristics as defined in ISO/IEC 23001-8 or a characteristic defined in ISO/IEC 23003-4:2015/Amd.1. The coefficients

are placed either in-stream or in an associated meta-data track. Alternatively, coefficients are generated at the decoder based on transmitted parametric DRC configurations.

Replace the last paragraph with:

The boxes `DRCCoefficientsBasic`, `DRCCoefficientsUniDRC`, `DRCInstructionsBasic`, `DRCInstructionsUniDRC` and `UniDrcConfigExtension` may occur in an AudioSampleEntry and are defined in ISO/IEC 23003-4:2015 and ISO/IEC 23003-4:2015/Amd.1.

Page 165, 12.2.7.1

Replace the last paragraph with:

The program loudness is measured using ITU-R BS.1770-4 over the associated content; the 'anchor loudness' is the loudness of the anchor content, where what that content is, is determined by the content author; one suitable value (especially for content for which the main content is speech) is 'dialog normal level' or DialNorm as defined in ATSC Doc. A/52:2012. ISO/IEC 23003-4 specifies the measurement systems, measurement methods and the coding of all loudness and peak-related values.

Page 166, 12.2.7.2

Replace the definition of Syntax with:

```
aligned(8) class LoudnessBaseBox extends FullBox(loudnessType, version, flags=0) {
    if (version >= 1) {
    unsigned int(2) reserved = 0;
    unsigned int(6) loudness_base_count;
    } else {
    int loudness_base_count = 1;
    }
    for (a=1; a<=loudness_base_count; a++) {
    if (version >= 1) {
    unsigned int(2) reserved = 0;
    unsigned int(6) EQ_set_ID;    // to match an EQ box
    }
    unsigned int(3) reserved = 0;
    unsigned int(7) downmix_ID;    // matching downmix
    unsigned int(6) DRC_set_ID;    // to match a DRC box
    signed int(12) bs_sample_peak_level;
    signed int(12) bs_true_peak_level;
    unsigned int(4) measurement_system_for_TP;
    unsigned int(4) reliability_for_TP;
    unsigned int(8) measurement_count;
    int i;
    for (i = 1 ; i <= measurement_count; i++){
    unsigned int(8) method_definition;
    unsigned int(8) method_value;
    unsigned int(4) measurement_system;
    unsigned int(4) reliability;
    }
    }
}
aligned(8) class TrackLoudnessInfo extends LoudnessBaseBox('tlou') { }
aligned(8) class AlbumLoudnessInfo extends LoudnessBaseBox ('alou') { }
aligned(8) class LoudnessBox extends Box('ludt') {
    // not more than one TrackLoudnessInfo box with version>=1 is allowed
    Loudness    TrackLoudnessInfo[];
    // not more than one AlbumLoudnessInfo box with version>=1 is allowed
    albumLoudness    AlbumLoudnessInfo[];
}
```

Page 167, 12.2.7.3

Add the following new definition as the first entry:

`version` is an integer that specifies the version of this box (0 or 1)

Add the following definition after the definition of DRC_set_ID:

`EQ_set_ID` when zero, declares the characteristics without applying EQ. If non-zero, this box declares the loudness after applying the EQ with the matching `EQ_set_ID` and must match a value in exactly one box in the `UniDrcConfigExtension` of this track

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