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*Élément introductif — Élément central — Partie 14: Élément complémentaire*

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Information Technology — MPEG Systems Technologies— Part 7: Common Encryption, AMENDMENT1: AES-256 Support

*Editor's note: the following changes aims at supporting AES-256 and define a brand for Common Encryption*

*1. At MPEG#149 the following options have been considered:*

* *No new protection scheme for the moment*
* *Rather useTrackEncryptionBox to indicate actual CENC features in use in an encrypted file.*

*2. At MPEG#150, restriction about subsample encryption has been removed and MIME types parameters have been proposed.*

*In section 1 Scope, replace*

" The AES-128 symmetric block cipher is incorporated by reference to encrypt elementary stream data contained in media samples. Both AES counter mode (CTR) and Cipher Block Chaining (CBC) are specified in separate protection schemes."

*with*

" The AES-128 or AES-256 symmetric block cipher is incorporated by reference to encrypt elementary stream data contained in media samples. Both AES counter mode (CTR) and Cipher Block Chaining (CBC) are specified in separate protection schemes.”

*In section 3.1.1 block, replace*

"16-byte extent of sample data that may be encrypted or decrypted by the AES-128 block cipher, in which case, a cipher block. "

*with*

"16-byte extent of sample data that may be encrypted or decrypted by the AES-128 or AES-256 block cipher, in which case, a cipher block.

*In section 9.3, replace*

" Counter-mode schemes shall use the Advanced Encryption Standard, specified in Federal Information Processing Standards Publication 197, FIPS-197 published by the United States National Institute of Standards and Technology (NIST) using 128-bit keys in Counter Mode (AES-CTR), as specified in Recommendation of Block Cipher Modes of Operation, NIST, NIST Special Publication 800-38A.

AES-128 CTR mode is a 16 byte block cipher that can encrypt an arbitrary sized byte stream without need for padding or leaving a clear remainder when the last block of sample data is a partial block (1 to 15 bytes in size). "

*with*

" Counter-mode schemes shall use the Advanced Encryption Standard, specified in Federal Information Processing Standards Publication 197, FIPS-197 published by the United States National Institute of Standards and Technology (NIST) using 128-bit or 256-bit keys in Counter Mode (AES-CTR), as specified in Recommendation of Block Cipher Modes of Operation, NIST, NIST Special Publication 800-38A.

AES-128 CTR or AES-256 CTR mode is a 16 byte block cipher that can encrypt an arbitrary sized byte stream without need for padding or leaving a clear remainder when the last block of sample data is a partial block (1 to 15 bytes in size). “

*In section 9.4.1, replace*

“Full sample encryption may be used for all encrypted media types other than NAL structured video, which shall use Subsample encryption.”

*with*

“Full sample encryption or subsample encryption may be used for all encrypted media types. NAL structured video shall use Subsample encryption.”

*In section 9.4.3, replace*

“Full sample AES-CBC mode shall use the Advanced Encryption Standard specified by AES [FIPS197] using 128-bit keys in Cipher Block Chaining mode (AES-CBC-128), as specified in Block Cipher Modes [NIST 800-38A].”

*with*

"Full sample AES-CBC mode shall use the Advanced Encryption Standard specified by AES [FIPS197] using 128-bit or 256-bit keys in Cipher Block Chaining mode (AES-CBC-128 or AES-CBC-256), as specified in Block Cipher Modes [NIST 800-38A].”

*In section 9.5.1, add the following paragraph after the first paragraph:*

“While subsample encryption is mandatory for NAL structured video, it may also be used for other media types”

*Add a new section 9.5.3:*

**9.5.3 Subsample encryption of other tracks and items than NAL structured video tracks**

This specification does not provide subsample definitions for non NAL structured video tracks or items and therefore does not specify subsample encryption for these tracks and items.

NOTE: Derived specifications can provide format specific definitions and thereby enable subsample encryption of such tracks or items.

*In section 8.2.1, add :*

The following flags are defined for TrackEncryptionBox:

AES\_256\_flag: flag mask is 0x000001. This flag indicates, when set, that 256-bit key length is in use and, when not set that 128-bit length is used for the encryption keys. Default value is 0.

full\_sample\_encryption: flag mask is 0x000002. This flag indicates, when set, that full sample encryption is in use and when not set that subsample encryption is in use. Default value is 0.

multi\_key: flag mask is 0x000004. This flag indicates whether there is a single key in use (value 0) of multiple keys (value 1). Default value is 0.

use\_senc: flag mask is 0x000008. This flag indicates, when set, that the ‘senc’ box is used to provide CENC SAI and, when not set, that sample auxiliary information is used to provide CENC SAI. Default value is 0.

allow\_partial\_last\_block: flag mask is 0x000010. This flag indicates, when set, that the last cipher block in a sample may be a partial cipher block (less than 16 bytes). When not set, it indicates that there are no partial cipher blocks (no cipher blocks less than 16 bytes).

pattern\_mode: flag mask is 0x000020. This flag indicates, whether pattern encryption mode is in use (value 1) or not (value 0).

*[Ed. Note: we encourage experts to comment on the above proposed flags: are some relevant features missing?, are some of the proposed ones not so relevant? …]*

*In section 8.2.2, Replace the section with :*

**8.2.2. Syntax**

aligned(8) class TrackEncryptionBox extends FullBox('tenc', version, flags)  
{  
 unsigned int(8) reserved = 0;  
 if (version==0) {  
 unsigned int(8) reserved = 0;  
 }  
 else { // version is 1 or greater  
 unsigned int(4) default\_crypt\_byte\_block;  
 unsigned int(4) default\_skip\_byte\_block;  
 }  
 unsigned int(8) default\_isProtected;  
 unsigned int(8) default\_Per\_Sample\_IV\_Size;  
 unsigned int(8)[16] default\_KID;  
 if (default\_isProtected ==1 && default\_Per\_Sample\_IV\_Size == 0) {  
 unsigned int(8) default\_constant\_IV\_size;  
 unsigned int(8)[default\_constant\_IV\_size] default\_constant\_IV;  
 }  
}

*Add a new Annex B – (normative) Common Encryption Brands*

1. The 'coen' brand
   1. Overview

The requirements for files and readers compliant to the brand 'coen' are defined in the following subclause. It is meant to be independent of the actual protection schemes ('cenc', 'cens', 'cbc1', 'cbcs' …).

* 1. Requirements on files

Files containing the brand 'coen' in the compatible brands array of the FileTypeBox shall conform to the constraints defined in this subclause.

The following boxes are required in a file under the 'coen' brand. The Version column in the following table lists the versions of the boxes allowed by this brand. Other versions of the boxes shall not be present. The Flags column in the following table lists the flags that may be present in files of this brand and are required to be supported by the readers of this brand. If other flags of the boxes have been specified, they may be present but are not required to be supported by the readers of this brand.

NOTE A '-' in the Version and Flags column indicates that the box is a container box or does not support versioning.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Hierarchy of boxes** | | | | **Version** | **Flags** | **Box description** |
| enca  encf  encm  encp  encs  enct  encu encv  enc3 |  |  |  | - | - | Protected Sample Entry. At least one of these entry needs to be present. |
|  | sinf |  |  | - | - |  |
|  |  | frma |  | - | - |  |
|  |  | schm |  | 0 | 0x000001 |  |
|  |  | schi |  | - | - |  |
|  |  |  | tenc | 0,1 | Defined flags |  |

* 1. Requirements on readers

Support for the following boxes is required under the 'coen' brand. The Version column in the following table specifies the versions of the boxes that shall be supported by the readers of the 'coen' brand.

NOTE A '-' in the Version and Flags column indicates that the box is a container box or does not support versioning nor flagging.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Hierarchy of boxes** | | | | **Version** | **Flags** | **Box description** |
| enca  encf  encm  encp  encs  enct  encu encv  enc3 |  |  |  | - | - | Readers may support only some Protected Sample Entry types. Derived specifications may require specific support. |
|  | sinf |  |  | - | - |  |
|  |  | frma |  | - | - |  |
|  |  | schm |  | 0 | 0x000001 |  |
|  |  | schi |  | - | - |  |
|  |  |  | tenc | 0,1 | Defined flags |  |
| moov  moof |  |  |  | - | - |  |
|  | pssh |  |  | 0,1 | 0 |  |
| sbtl  traf |  |  |  | - | - |  |
|  | sbgp |  |  | 0,1 |  |  |
|  | sgpd |  |  | 0,1,2 | 0 |  |
|  |  | seig |  | - | - |  |
|  | saiz |  |  | 0 | 0x000001 |  |
|  | saio |  |  | 0,1 | 0x000001 |  |
| trak  traf |  |  |  | - | - |  |
|  | senc |  |  | 0 | 0x000002 |  |

*[Ed. Note: Open question => Is one brand sufficient to represent today’s support of “old tools”?*

* *For example, some devices only support ‘saio’/’saiz’, others only support ‘senc’. Should we define 2 different brands?*
* *Similarly, use of ‘seig’ is specific to some use cases (e.g. multi-key support). Should this be in a separate brand?*

*]*

*Add a new Annex C – (normative) MIME types for Common Encryption*

The encryption features in use in an encrypted media file can be exposed in the MIME type of the media file according to the key-value pair mechanism defined in ISO/IEC 14496-12 CDAM1 This mechanism defines a ‘desc’ parameter consisting in key-value pairs. It can be part of the “codecs” parameter or distinct from the “codecs” parameter defined in RFC 6381. One key-value pair corresponds to encryption. The attribute key for encryption is “cenc”. The possible values for this attribute key are taken from the flags values of the TrackEncryptionBox. Since they are flags, their presence indicates that the feature is in use, their absence indicates that the feature is not in use.

The Table below proposes a mapping of TrackEncryptionBox’s flags to values to use in MIME type parameters and more particularly in the attribute key for encryption.

|  |  |  |
| --- | --- | --- |
| Flags from TrackEncryptionBox | Value | Default value (when the key is absent) |
| AES\_256\_flag | “k256” | 128 bit key length |
| full\_sample\_encryption | “full” | Not used |
| multi\_key | “mkey” | Single encryption key |
| use\_senc | “senc” | Box is not used |
| allow\_partial\_last\_block | “padd” | Not allowed (no partial cipher block) |
| pattern\_mode | “patt” | Not used |

For example, the value:

codecs=" **desc.cenc=k256.full.senc**+codec=resv.cenc.hvc1.1.6.L93.B0"

indicates an encrypted HEVC file with AES-256, single key, full sample encryption with presence of a ‘senc’ box

Alternatively, the same configuration can be declared as follows:

codecs="resv.cenc.hvc1.1.6.L93.B0”

desc=”cenc**=k256.full.senc**"