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**ISO/IEC JTC 1/SC 29/WG 03 MPEG SYSTEMS**

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| **Title** | **Text of ISO/IEC 23008-1:2023 CDAM 1 Signalling of Adaptive FEC Scheme** |
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*Add the following row which has been highlighted to Table C.8 Valid values for fec\_coding\_structure in Chapter C.6.3 Semantics*

**Table C.8 - Valid values for fec\_coding\_structure**

|  |  |
| --- | --- |
| **Value** | **Description** |
| b0000 | AL-FEC is not applied |
| b0001 | One-stage FEC coding structure |
| b0010 | Two-stage FEC coding structure |
| b0011 | Layer-aware FEC coding structure |
| b0100 | Adaptive FEC coding structure |
| b0101 ~ b1111 | Reserved |

*Add the following text after C.2.3 Layer-aware FEC (LA-FEC) coding structure*

* + 1. Adaptive FEC coding structure

Adaptive FEC specified the structure that could be applied with any FEC code and is specific for protecting a source packet block which consists of different priorities MMT packets.

The MMTP packets from one MMTP flow are divided into different classes based on the different priorities defined in the DU header. When Adaptive FEC structure is used, the sequence of original MMTP packets may be changed according to the class order in generation of source symbols. The highest priority source symbols are presented before lower priority. Then these symbols are grouped into a source symbol sub-block and the source sub-symbols can be indexed by the repair FEC payload ID. After the FEC encoding, a FEC repair symbol block will be generated from the source symbol block combining the different sub-blocks of symbols.

Figure 1 shows an example of source symbol block generation for media data with two classes for Adaptive FEC. The source symbol block can be divided into the source symbol sub-block. The number of source symbol sub-block can be determined based on the number of the class. The FEC code matrix will be generated based on the number of source symbols and repair symbols in different sub-blocks.

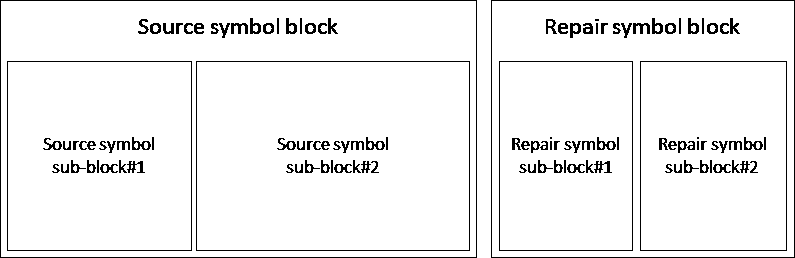


Figure C.4. Adaptive FEC coding structure

*Add the following code which has been highlighted after “*if (fec\_coding\_structure == 0010){}*” in Table C.3 in C.6.2 Syntax*

Table C.3 — AL-FEC message

|  |  |  |  |
| --- | --- | --- | --- |
| **Syntax** | **Values** | **No. of bits** | **Mnemonic** |
| **AL\_FEC ( ){** |  |  |  |
| message\_id |  | 16 |  |
| version |  | 8 |  |
| length |  | 16 |  |
| message\_payload{ |  |  |  |
| **fec\_flag** |  | 1 | **bslbf** |
| **private\_fec\_flag** |  | 1 | **bslbf** |
| reserved | “111111” | 6 | **bslbf** |
| if (fec\_flag==1) { |  |  |  |
| **length\_of\_fec\_flow\_descriptor** |  | 16 | **uimsbf** |
| fec\_flow\_descriptor() { |  |  |  |
| **number\_of\_fec\_flows** | N1 | 8 | **uimbsf** |
| for ( i=0; i<N1 ; i++) { |  |  |  |
| **fec\_flow\_id** |  | 8 | **uimbsf** |
| **source\_flow\_id** |  | 8 | **uimbsf** |
| **number\_of\_assets** | N2 | 8 | **uimbsf** |
| for ( j=0; j<N2 ;j++) { |  |  |  |
| **packet\_id** |  | 16 | **uimbsf** |
| } |  |  |  |
| **fec\_coding\_structure** |  | 4 | **uimbsf** |
| **ssbg\_mode** |  | 2 | **uimbsf** |
| **ffsrpts\_flag** |  | 1 | **bslbf** |
| ***fec\_payload\_id\_mode*** |  | 1 | **bslbf** |
| **length\_of\_repair\_symbol** |  | 16 | **uimbsf** |
| if (ssbg\_mode == 10) { |  |  |  |
| **num\_of\_repair\_symbol\_per\_packet** |  | 16 | **uimbsf** |
| **num\_of\_symbol\_element\_per\_source\_symbol** |  | 16 | **uimbsf** |
| } |  |  |  |
| if (fec\_coding\_structure == 0001) { |  |  |  |
| **repair\_flow\_id** |  | 16 | **uimbsf** |
| **fec\_code\_id\_for\_repair\_flow** |  | 8 | **uimbsf** |
| if (private\_fec\_flag == 1) { |  |  |  |
| **private\_flag** |  | 1 | **bslbf** |
| **private\_field\_length** | N3 | 7 | **bslbf** |
| **private\_field** |  | N3\*8 | **uimbsf** |
| } |  |  |  |
| **maximum\_k\_for\_repair\_flow** |  | 24 | **uimbsf** |
| **maximum\_p\_for\_repair\_flow** |  | 24 | **uimbsf** |
| **protection\_window\_time** |  | 32 | **uimbsf** |
| **protection\_window\_size** |  | 32 | **uimbsf** |
| } |  |  |  |
| if (fec\_coding\_structure == 0010) { |  |  |  |
| **num\_of\_sub\_block\_per\_source\_block** |  | 8 | **uimbsf** |
| **number\_of\_parity\_flows** | N3 | 8 | **uimbsf** |
| for ( k=0; k<N3 ;k++){ |  |  |  |
| **repair\_flow\_id** |  | 16 | **uimbsf** |
| **fec\_code\_id\_for\_repair\_flow** |  | 8 | **uimbsf** |
| if (private\_fec\_flag == 1) { |  |  |  |
| **private\_flag** |  | 1 | **bslbf** |
| **private\_field\_length** | N5 | 7 | **bslbf** |
| **private\_field** |  | N5\*8 | **uimbsf** |
| } |  |  |  |
| **maximum\_k\_for\_repair\_flow** |  | 24 | **uimbsf** |
| **maximum\_p\_for\_repair\_flow** |  | 24 | **uimbsf** |
| **protection\_window\_time** |  | 32 | **uimbsf** |
| **protection\_window\_size** |  | 32 | **uimbsf** |
| } |  |  |  |
| } |  |  |  |
| if (fec\_coding\_structure == 0011) { |  |  |  |
| **num\_of\_layer\_for\_LAFEC** | N4 | 8 | **uimbsf** |
| **fec\_code\_id\_for\_repair\_flow** |  | 8 | **uimbsf** |
| if (private\_fec\_flag == 1) { |  |  |  |
| **private\_flag** |  | 1 | **bslbf** |
| **private\_field\_length** | N7 | 7 | **bslbf** |
| **private\_field** |  | N7\*8 | **uimbsf** |
| } |  |  |  |
| for ( l=0;l<N4 ;l++){ |  |  |  |
| **repair\_flow\_id** |  | 16 | **uimbsf** |
| **maximum\_k\_for\_repair\_flow** |  | 24 | **uimbsf** |
| **maximum\_p\_for\_repair\_flow** |  | 24 | **uimbsf** |
| **protection\_window\_time** |  | 32 | **uimbsf** |
| **protection\_window\_size** |  | 32 | **uimbsf** |
| } |  |  |  |
| } |  |  |  |
| if (fec\_coding\_structure == 0100) { |  |  |  |
| **number\_of\_\_class** | N8 |  | **uimbsf** |
| if (private\_fec\_flag == 1) { |  |  |  |
| **private\_flag** | N9 | 1 | **bslbf** |
| **private\_field\_length** |  | 7 | **bslbf** |
| **private\_field** |  | N9\*8 | **uimbsf** |
| } |  |  |  |
| **repair\_flow\_id** |  | 8 | **uimbsf** |
| **fec\_code\_id\_for\_repair\_flow** |  | 8 | **uimbsf** |
| **maximum\_k\_for\_repair\_flow** |  | 24 | **uimbsf** |
| **maximum\_p\_for\_repair\_flow** |  | 24 | **uimbsf** |
| **protection\_window\_time** |  | 32 | **uimbsf** |
| **protection\_window\_size** |  | 32 | **uimbsf** |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |
| } |  |  |  |

*Add the following text after the last line of C.6.3 Semantics*

number\_of\_class – this field indicates the priority number of media data to proceed FEC protection.

*Add the following text after C.5.3 Repair FEC payload IDC*

### **C.5.4 Repair FEC payload ID for Adaptive FEC scheme**

The repair FEC payload ID for adaptive FEC scheme is defined as shown in Figure C.13.

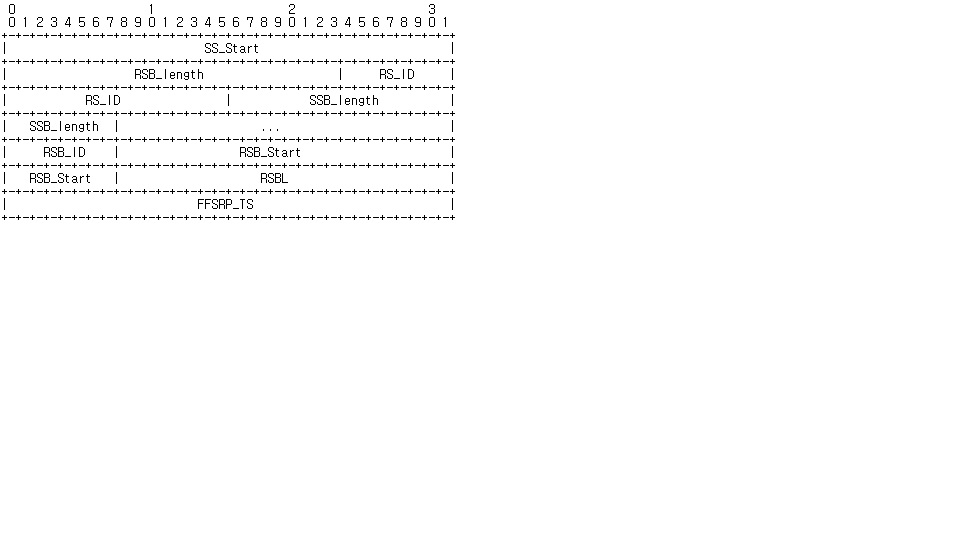
****

Figure C.13 – Repair FEC payload ID for Adaptive FEC scheme

SS\_Start (32 bits) – indicates the boundary of the source symbol block. If ssbg\_mode == 00 or ssbg\_mode == 01, it is set to the SS\_ID of the first source symbol in its associated source symbol block.

NOTE The boundary of source symbol block is aligned with the boundary of FEC source packet block as SS\_ID is delivered per FEC source packet.

RSB\_length (24 bits) – is the number of repair symbols generated in its associated repair symbol block.

RS\_ID (24 bits) – an integer number for identifying the first repair symbol in the FEC repair packet. The RS\_IDs of subsequent repair symbols in the FEC repair packet are incremented by 1 with each repair symbol following the first repair symbol. It starts with 0 and is incremented by 1 with each repair symbol in its associated repair symbol block.

SSB\_length[N] (N\*24 bits) –If fec\_coding\_structure = 0100, N shall equal to the number of class and if ssbg\_mode == 00 or ssbg\_mode == 01, SSB\_length[i] indicates the number of source symbols from the i-th flow of the source symbol sub-block in its associated symbol symbol block.

RSB\_ID (8bits) – is the sequence number identifying repair symbol sub-block within the repair symbol block. It starts with 0 and is incremented by 1 with each repair symbol sub-block in its associated repair symbol block.

RSB\_start (24bits) – indicates the identifier of the first repair symbol (RS\_ID) belonging to the i-th repair symbol sub-block within the repair symbol block. It indicates the sum of the repair symbols belonging to the previous repair symbol sub-blocks within the repair symbol block.

RSBL (24bits) – is the number of repair symbols in i-th repair symbol sub block.

FFSRP\_TS (4 bytes) – it is composed of TS\_Indicator (1 bit) and followed by FP\_TS (31 bits).

TS\_Indicator (1 bit) – it indicates the timestamp in FEC (see Table C.3). For one-stage FEC coding structure and LA-FEC, this field shall be set to “0”. For the two-stage FEC coding structure (M > 1), when set to “1”, it indicates the following FP\_TS (31 bits) is for the FEC source or repair packet block. When set to “0”, it indicates the following FP\_TS (31 bits) is for the i-th FEC source or repair packet block of two-stage FEC coding structure (M > 1 and i = 1, 2, …, M).

For the two-stage FEC coding structure (M > 1), this field shall be set to “0” for the odd-numbered sending FEC source packets of i-th FEC source packet block and shall be set to “1” for the even-numbered sending FEC source packets of i-th FEC source packet block (i = 1, 2, …, M).

Table C.3 – Value of TS\_Indicator

|  |  |
| --- | --- |
| **Value** | **Description** |
| b0 | The following FP\_TS (31 bits) is for the FEC source or repair packet block for one-stage FEC and LA-FEC coding structures or for the ith FEC source or repair packet block of two-stage FEC coding structure (M > 1 and i = 1, 2, ..., M). |
| b1 | The following FP\_TS (31 bits) is for the FEC source or repair packet block of two-stage FEC coding structure (M > 1 and i = 1, 2, ..., M). |

FP\_TS (31 bits) – indicates the value for 31 bits which except MSB 1 bit of the timestamp in the MMTP packet header of the first sending FEC source or repair packet of its associated FEC source or repair packet block.