

SOURCE : JAPAN
TITLE : Cell loss correction method with low processing delay
PURPOSE : Discussion

1. Introduction

The cell loss correction methods in AAL Type 1 which use Forward Error Correction and cell interleaving have been studied both in SG 15 ATM Video group and SG13 AAL1/2 group. For low bit-rate conversational application (e.g. support of H.320 terminals in B-ISDN), SG13 has produced the forward error correction method which uses RS(94,88) with diagonal interleaving. For constant bit-rate services, this method can be realized using ring buffer, however, it is not suitable for variable bit-rate transmission. Therefore, the double buffer method which has the closed form of error correction matrix, was proposed in AVC-569 for variable bit-rate services.

This document compares the SG13's method and the closed form of interleaving in AVC-569 from the point of view of the adaptation to VBR.

2. Assumption of VBR operation

To provide the variable bit-rate services, the study of the AAL type 2 protocol is started in SG 13. In this document, we assume that the length of transmission data is variable and AAL type 2 has the same SAR-PDU format as AAL type 1. In this case, the similar error correction method (i.e. cell interleaving) of the AAL type 1 can be applied to AAL type 2. For variable bit-rate operation, the interval time between the cell interleaving matrices is not constant and the upper layer of AAL (e.g. H.22X) fills the cell interleaver with padding bytes[1]. The AAL receives the unit of 704 bytes data at variable interval and makes the interleaving.

3. Comparison between open form and closed form

For the open form operation, 322 bytes of dummy should be transmitted at the start and 336 bytes of dummy need to be transmitted at the end of data transmission (See Figure 1). In other words, 658 bytes (i.e. 14 cells) of the dummy data need to be transmitted at every transmission, therefore this overhead of this dummy data is not negligible.

In the case of the closed form, no dummy data needs to be transmitted at the data transmission.

The comparison results are listed on Table 1.

4. Conclusion

In this document, we compared the SG13's method and the close form of interleaving in AVC-569 from the point of view of the adaptation to VBR.

In addition to the agreed open form, the closed form might be better than the open form in variable bit-rate transmission.

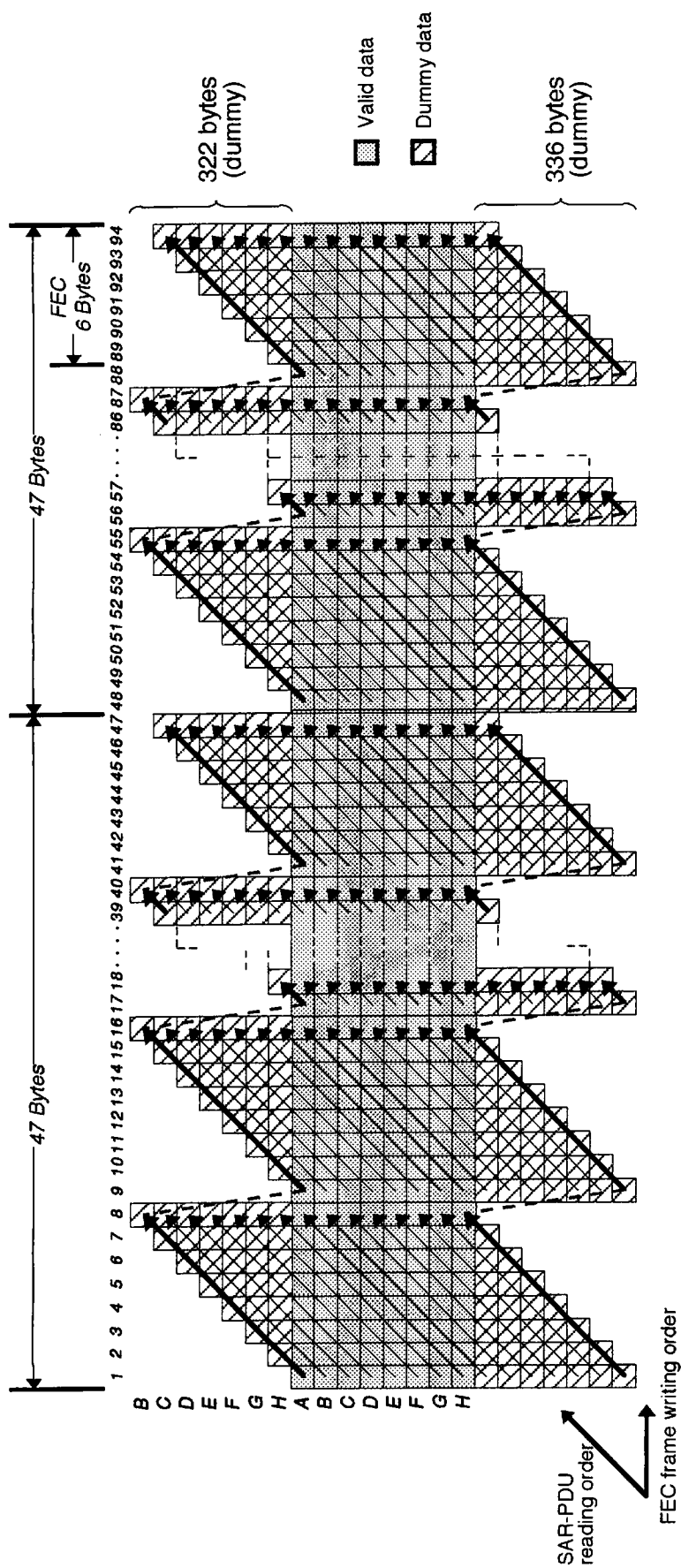
END.

Reference

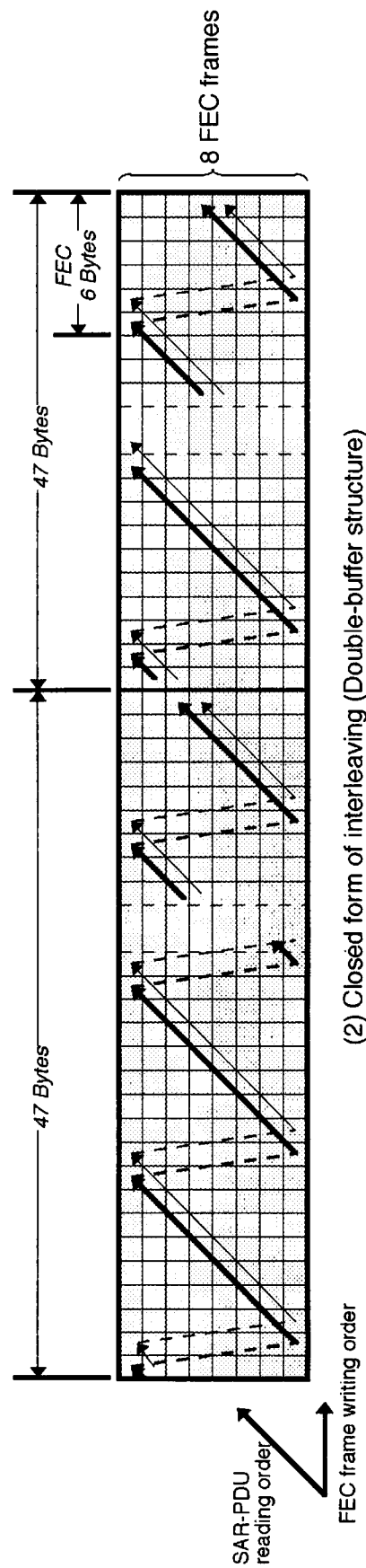
- [1] AVC-609 Multimedia multiplex and AAL for high quality videoconferencing (Japan), Mar. 1994, Paris.

Table 1. Comparison between open form and closed form

		Open form (Ring-buffer structure)	Closed form (Double-buffer structure)
AAL Type		Type 1 and/or Type 2	
FEC Framing		FEC frame length : 94 bytes Information field : 88 bytes Error correction code : 6 bytes ; RS(94,88) code	
Interleaver size		752 bytes (= 8 FEC frames)	
Interleaver synchronization		CSI bit	
Cell loss detection		SN count	
Correction capabilities	for cell loss	1 cell loss / 16 cells	
	for random byte error	3 bytes error / 94 bytes	
Overhead for error correction		6.4% (= 6/94)	
Processing delay in bytes		704 bytes (14.7 ms at 384kbit/s)	1408 bytes (29.4 ms at 384kbit/s)
dummy data transmission	At communication start	322 bytes	0 byte
	At communication end	336 bytes	0 bytes
	total	658 bytes	0 bytes
Adaptation to VBR		Overhead of dummy data : open form > closed form	
Multiplexing for multi-media data		no	In unit of 704 bytes



(1) Open form of interleaving (Ring-buffer structure)



(2) Closed form of interleaving (Double-buffer structure)

Figure 1. Diagonal interleaving structures

Annex 1 to AVC-616 (Figures from AVC-569)

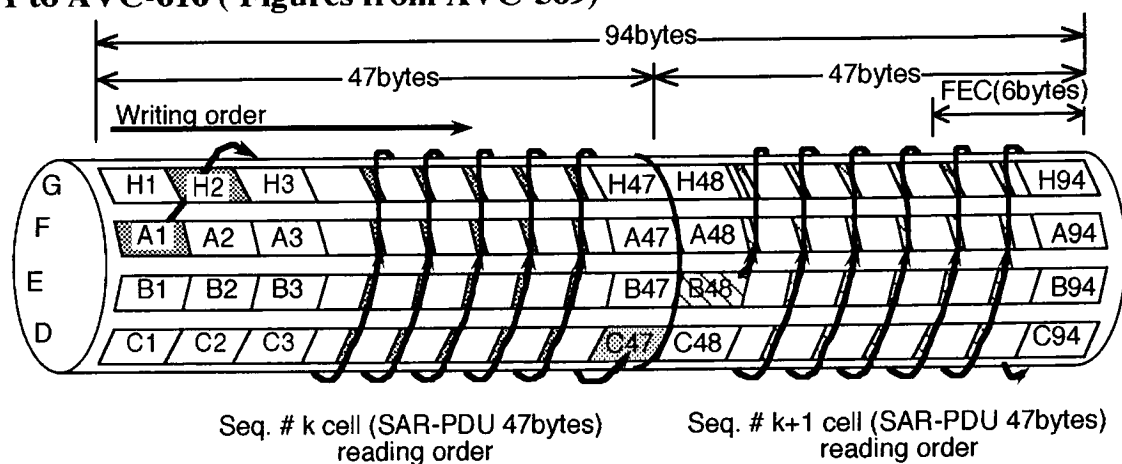


Figure 1 / Annex 1. Diagonal interleaving method with ring buffer

(Reading of the cell begins as soon as the first row has been written in the buffer.
Processing delay at 384k, 10M bit/sec

$$88(\text{bytes}) \times 8(\text{frames}) \times 1(\text{receiving side}) \times 8(\text{bit/byte}) / 384(\text{kbit/sec}) = 14.7 \text{ msec}$$

$$88(\text{bytes}) \times 8(\text{frames}) \times 1(\text{receiving side}) \times 8(\text{bit/byte}) / 10 (\text{Mbit/sec}) = 0.54 \text{ msec}$$

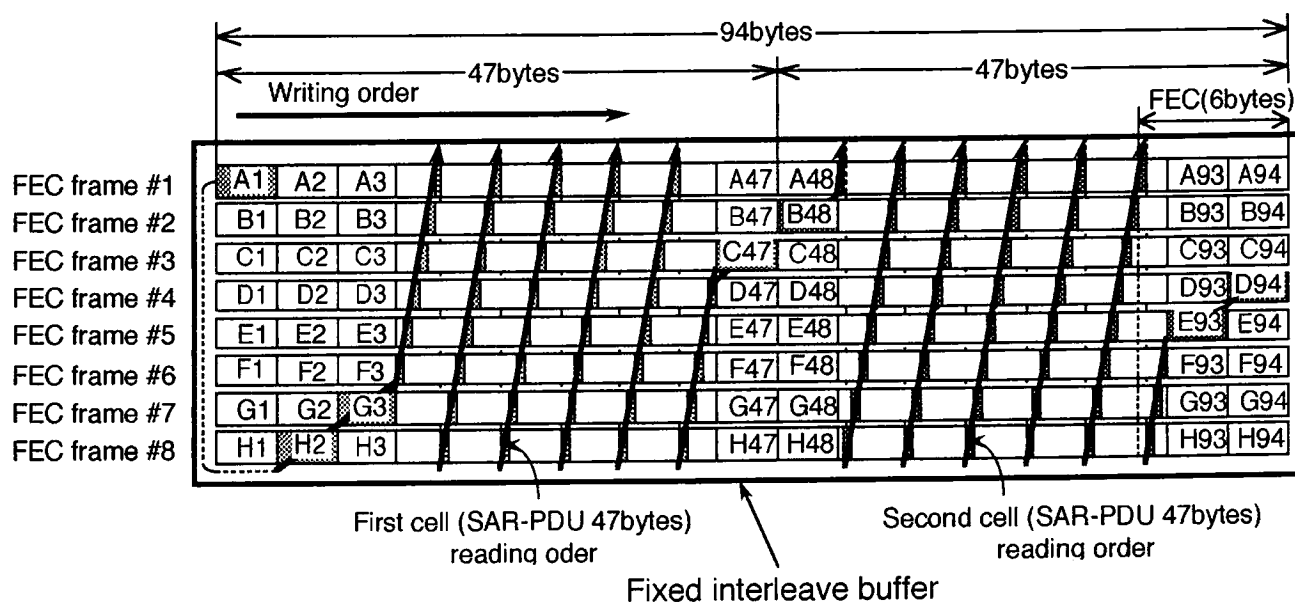


Figure 2 / Annex 1. Diagonal interleaving method with double-buffer

(Reading of the first cell begins after a whole data has been written in the buffer.)

Processing delay at 384k, 10M bit/sec

$$88(\text{bytes}) \times 8(\text{frames}) \times 2(\text{both sides}) \times 8(\text{bit/byte}) / 384(\text{kbit/sec}) = 29.4 \text{ msec}$$

$$88(\text{bytes}) \times 8(\text{frames}) \times 2(\text{both sides}) \times 8(\text{bit/byte}) / 10 (\text{Mbit/sec}) = 1.1 \text{ msec}$$