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in ATM and Other Network environments

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Purpose: Information and Discussion

1. Introduction

The attached Liaison Statement from ETSI NA5 was produced at the recent meeting of NA5's Support for Audio-visual and Multimedia (SAM) services rapporteur work group, at Lisbon on 3-7 April 1995.

The statement outlines SAM's current progress on an AAL definition for variable bit rate services which still needs further development. NA5 offers this statement to assist SG15 in its development of an AAL for variable bit rate services and would welcome any comments on the document's content for consideration at future SAM meetings.

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ITU-T SG13/2, Q6 (Mr. Yamazaki)
ATM Forum Technical Committee (Mr. Dobrowski)
ATM Forum SA&A / AMS (Mr. Skidmore)

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Purpose: **FOR INFORMATION**

Subject: **Further clarification on an AAL model for real-time VBR services**

Note:

This contribution has been prepared as a result of discussions and agreement reached at the ETSI NA5 (April 1995) meeting.

1. Introduction

The attached liaison statement from ETSI-NA5 was produced at the recent meeting of NA5's Support for Audio-visual and Multimedia (SAM) services rapporteur work group at Lisbon on 3-7 April 1995.

The statement outlines SAM's current progress on the AAL definitions for broadband audiovisual communications. ETSI-NA5 offers this statement to assist the ITU-T SG13 and 15 and the ATM Forum in their development of AALs for broadband audiovisual communications.

In the liaison statement of ITU-T SG15 Experts Group for video coding adressed to Mr. Dobrowski and Mr. Skidmore, and to ETSI-NA5, a model is introduced that describes the support of H.222.0 (MPEG-2 system) on an ATM network (Figure 1 of the ITU-T liaison statement) by using AAL1 or AAL5. In this model, some functions that are attributes of the Convergence Sublayer (CS) as indicated in I.363 are inserted into the H.222.1 layer.

It is the view of ETSI-NA5 that the protocol modelling to support MPEG-2 and other services should follow the agreed function for the CS as described in I.363. To illustrate our view, in the following sections of this paper, a detailed model is provided for the AAL1 support of different services, including CBR MPEG-2. Furthermore, a proposal for a generic AAL2-model to support Class B VBR-services is given. Examples of implementations of the model on existing services are described.

Concerning the support of MPEG-2 by AAL5, ETSI-NA5 has not made any progress. Therefore, AAL5 is not included in this liaison statement.

It is the intention that this liaison statement will form the baseline text for ETSI I-ETS-DI/NA 052625.

2. The AAL1-model

The AAL1 model, shown in Figure 1, represents the functions of the SAR1 and CS protocols as described in I.363.

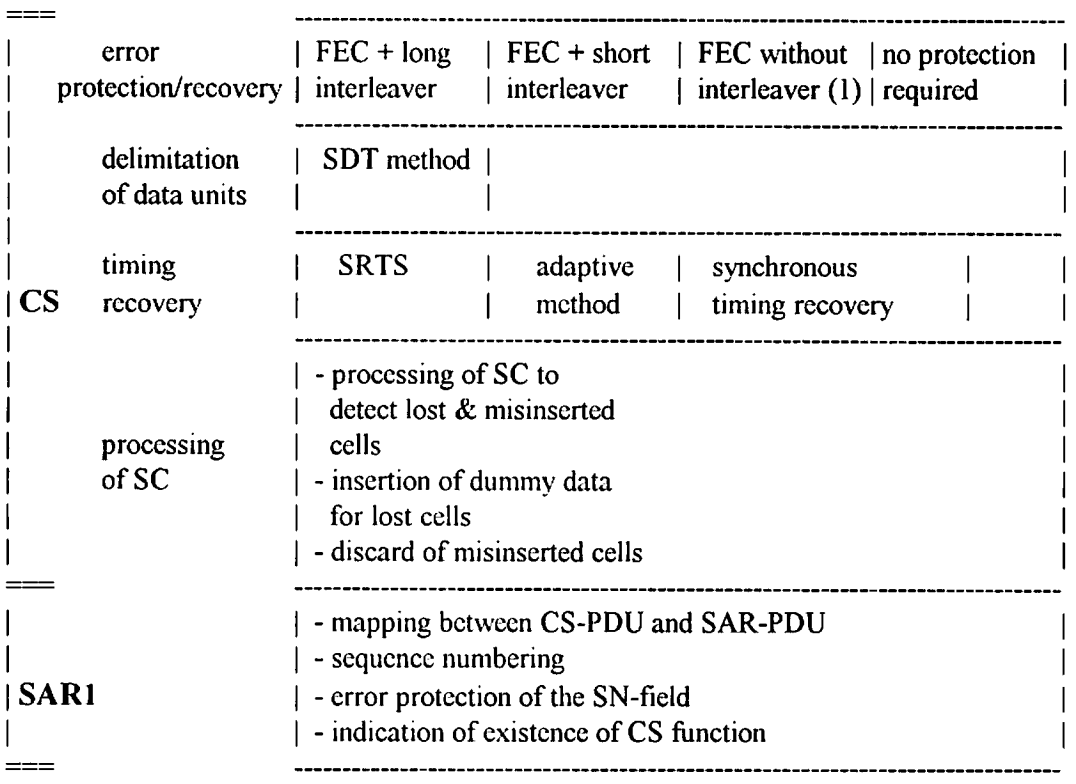

Figure 1: model for AAL1

Note 1: An FEC without interleaver is not yet included in ITU-T Recommendation I.363.x. The appropriateness of this method in an ATM environment with non-negligible cell loss probability was questioned in NA5.

The SAR1 functions are common to all services. Concerning the CS we can distinguish the following types of functions:

- processing of sequence count (SC)
- timing recovery
- delimitation of data units
- error protection and recovery

Different CS protocols can be used depending on the service. For processing the SC, the procedure as described in Annex C of I-ETS 300353 can be used.
For timing recovery, three distrinct methods can be used: SRTS, adaptive or synchronous timing recovery. For the delimitation of the data units the SDT method can be used.

Concerning the error protection and recovery FEC&long interleaver, FEC&short interleaver or FEC without interleaver (as proposed in the liaison statement of the ITU-T SG15) are possible solutions.

Examples of service implementations by using the AAL1-model are:

- circuit emulation (unstructured): SAR1+processing of SC+SRTS/adaptive method
- circuit emulation (structured): SAR1+processing of SC+synchronous time recovery/SRTS/adaptive method+SDT
- CBR unidirectional video (contribution/distribution): SAR1+processing of SC+adaptive method+FEC with long interleaver
- CBR conversational video: SAR1+processing of SC+adaptive method+FEC without/with short interleaver
- CBR video-retrieval (MPEG-2): SAR1+processing of SC+adaptive method+FEC without/with interleaver

3. The AAL2-model

The proposed model for AAL2 supporting Class B VBR-services is shown in Figure 2.

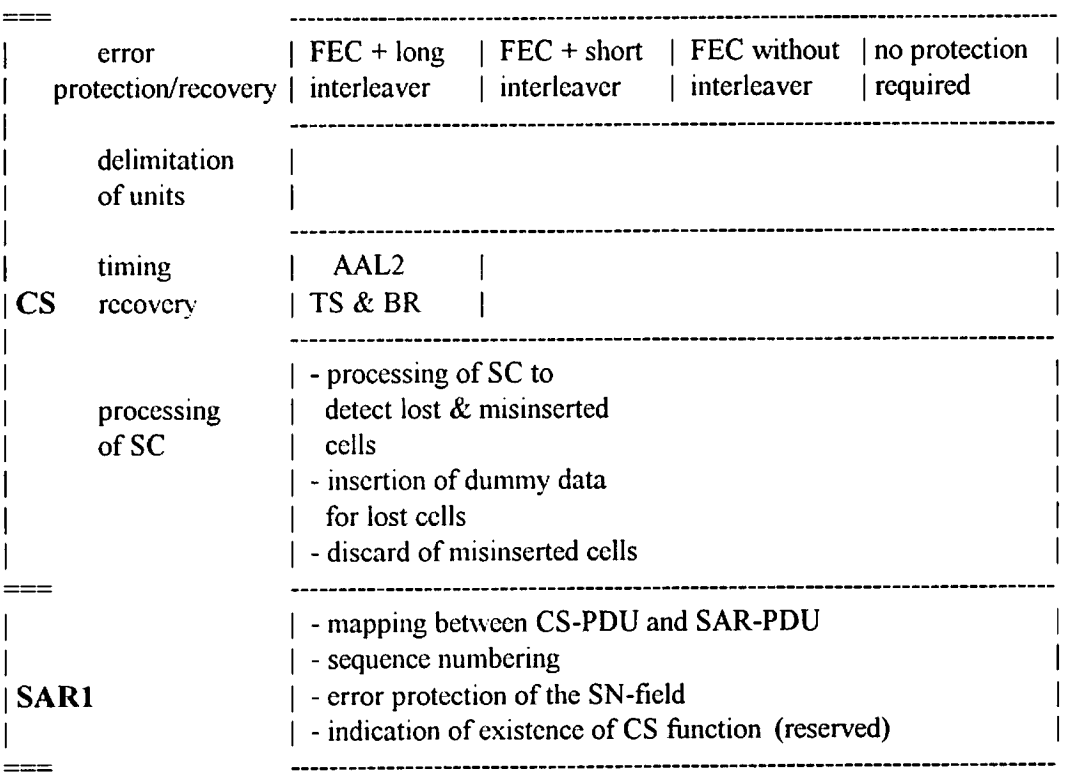

Figure 2: model for AAL2

The SAR-protocol for AAL2 is proposed to be identical to the SAR-protocol for AAL1 except for the use of the CSI for which no specific requirements exist at the

moment. The CSI-bit should be reserved in the SAR-PDU. The processing of the SC is identical to the AAL1-model. Timing recovery may be based on the use of functions for time stamp (TS) and bit rate (BR) recovery. The use of other timing recovery methods is for further study. The SDT-method is not foreseen in the AAL2-model. Error protection and recovery is applied in the same way as in the AAL1-model.

The application of the TS&BR-recovery is explained below. The present status of the CS-PDU format in ETSI-NA5 is indicated in Figure 3 with an alternative format shown in Figure 4.

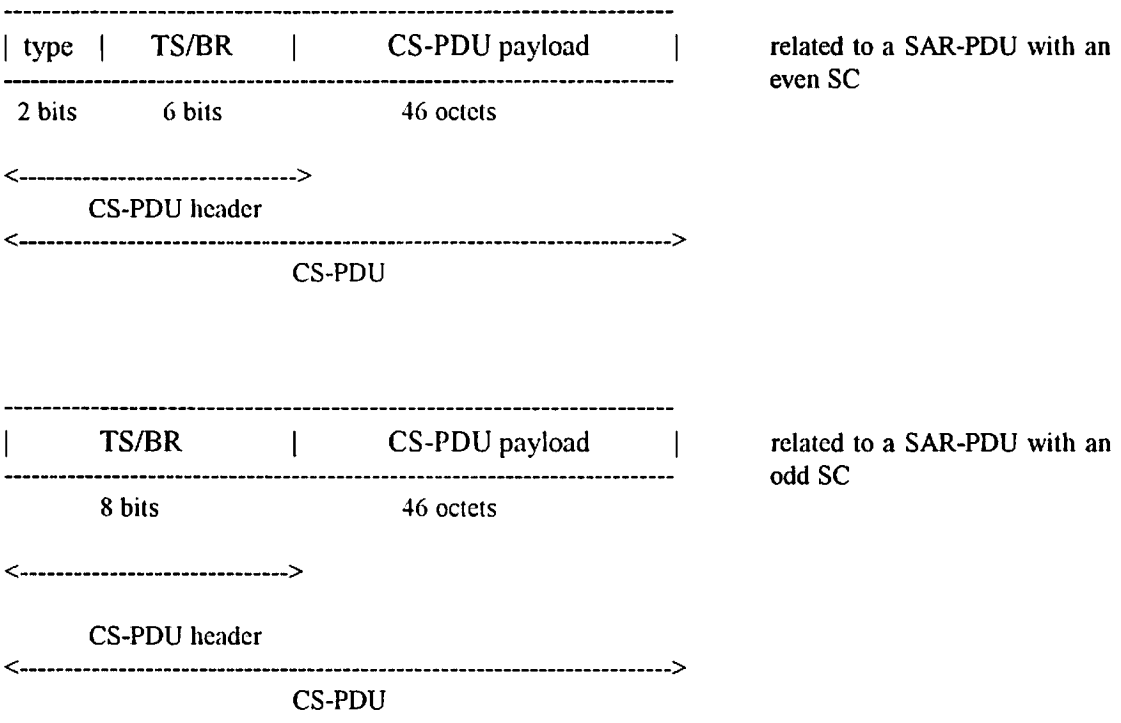

Figure 3: CS-PDU for AAL2

When the SC in the SAR-PDU is even, the CS-PDU header contains two bits to indicate the type of field present in the header and the six most significant bits of that field. When the SC is odd, the CS-PDU header contains the remaining eight bits of the field. The Type is coded with the following meanings for the TS/BR field:

Type	TS/BR
00	Bit Rate (BR)
01	Time Stamp (TS)
10	Reserved
11	Reserved

The time stamp is a 14 bit field that contains a sample of a counter, Ct, driven by a clock, fnx, where fnx = fn / x, and fn is the network clock frequency, e.g. 155.52 MHz, and x is an integer that is a power of two. Note: this is the same mechanism as used for

AAL1 for SRTS, except that in this case the full time stamp is transmitted, while in AAL1 only the residual part is transmitted. When fn = 155.52 MHz, and x = 128, fnx = 1.22 MHz, and the counter will wrap around to zero after 13.48 ms.

The bit rate is a 14 bit field that indicates the current number of bits transmitted per second: the bit rate is assumed to be piecewise constant, as indicated by the values of bit rate. Note: the error on the estimate of the value of the counter, Ct, for a cell without an explicit time stamp is proportional to the percentage error on the encoded value of bit rate and to the time since the last time stamp was received. The coding of the bit rate field should therefore be defined on a logarithmic scale, so that the percentage error due to coding of the actual value into a finite length field is independent of the magnitude of the bit rate. This also allows a large range of bit rates to be encoded in a 14 bit field.

If these field lengths are found to be inadequate for some applications, it will be possible to extend the range of the fields. This is for further study.

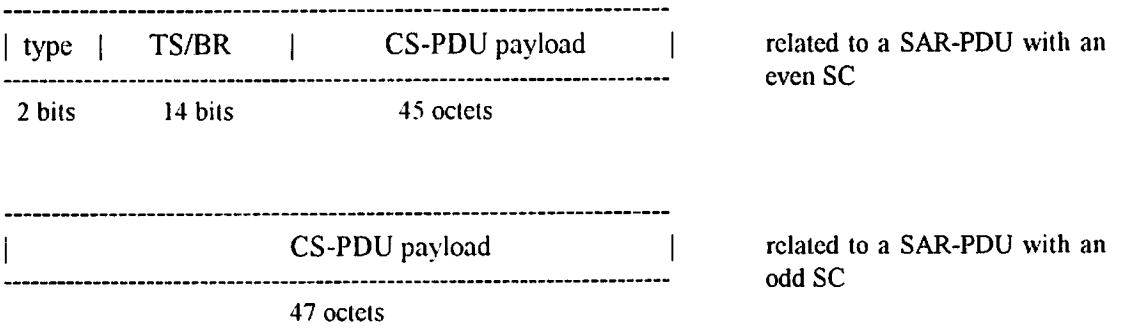

Figure 4: Alternative format for the CS-PDU in AAL2

In this alternative format the length of the CS-PDU payload is not constant: it alternates between 45 and 47 octets, but the complete value of the bit rate or time stamp is transmitted in the same cell, being valid for the next cell too. The type field has the same meaning as before.

Both alternatives as shown in Figures 3 and 4 need to be studied for a final decision on one of them. It is for further study the adequacy of the time stamp and bit rate field lengths for some applications.

4. Conclusions

The following has been concluded in the ETSI-NA5 meeting in Lisbon:

- modelling of AALs according to I.363 has been shown; the functions indicated in the liaison statement from the ITU-T SG15 Experts Group for video coding for H.222.1 should be in the CS
- the effectiveness of the AAL1-model was shown by means of practical examples including the support of CBR MPEG-2
- a model for AAL2 based on AAL1 has been proposed, and the possible format for the CS-PDU in AAL2 has been outlined.

ETSI-NA5 is asking for advice in the definition of the protocols to be used in the CS concerning the error protection and recovery, and timing recovery for MPEG-2 and for Class B VBR services.

END