

SOURCE: Australia

TITLE: The SAR Sublayer of AAL2 for Video Service Support

PURPOSE: Proposal

## Abstract

This document considers issues associated with the functionality of the SAR sublayer of the AAL used for the support of both variable and constant bit rate video. It is proposed that the objective of a common SAR capable of supporting both CBR and VBR video within AAL Type 2 be pursued.

## 1. Introduction

Recommendation I.362 defines four classes of services. Class B services are connection oriented, variable bit rate (VBR) services with a timing relationship between source and destination. Variable bit rate video will be a major Class B service, and therefore a major influence in determining the functionality required of the SAR sublayer of AAL Type 2. Class A services are constant bit rate, but share other features with those of Class B.

## 2. The SAR Sublayer for the Support of Class B Services

### 2.1 AAL Type 2 as described in Recommendation I.363

Recommendation I.363 describes the AAL Type 2 SAR functionality for the support of service Class B in terms of an example to be used for further study. The example is shown in Figure AVC-77/1 and comprises the following fields :

SN : Sequence Number to detect lost or misinserted cells

IT : Information Type to indicate : beginning, continuation or end of a message, timing information, and a component of an audio or video signal

LI : Length Indicator of the number of octets of the CS-PDU included in the SAR-PDU field.

CRC: Cyclic Redundancy Code to correct up to two correlated bit errors.

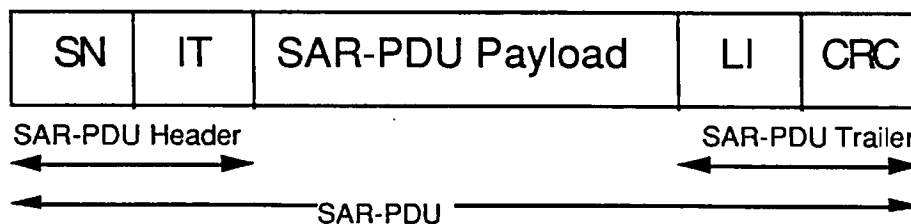


Figure AVC -77/1. The example AAL Type 2 SAR, from Rec. I.363.

### 2.2 Issues in Defining the Functionality of a SAR Sublayer for Video

#### *Sequence Number*

The need for, and size of, this field is dependent upon the cell loss rates of the network and the nature of the information stream carried. For example, low cell loss rates and low service bit rates make cell loss detection an unnecessary function. For higher bit rate services and modest cell loss rates (e.g.  $10^{-8}$  or better) it may be more appropriate to compensate at a higher layer. In such cases it is possible that the error concealment characteristics of the video compression algorithm may provide acceptable protection from cell loss. Cell loss rates worse than, for example,  $10^{-8}$  may require cell loss detection and this function can be performed using the Sequence Number located in the SAR-PDU. The length of the Sequence Number field, if it is to be used, must be matched to the needs of video services.

### *Information Type*

VBR video signals may use functionality such as that provided by the beginning, continuation or end of message to indicate the start of picture frames or blocks. It is also possible that this field could be considered null for real time continuous bit streams. Framing alignment could also be considered as a higher level function, in which case the ability to indicate alignment at the SAR may not be required.

The information type field could convey information required for timing recovery, however such information can also be made available from higher layers. Therefore the need to use the IT field of the SAR for timing recovery requires further examination.

Identification of the video and audio signal components is of value in a multimedia service, however this function can be provided in a more general form in the ATM layer. Media multiplexing in the ATM layer involves the use of separate virtual channels for each of the media required by the service. VC-based multiplexing was favoured by the Experts Group at the Paris meeting, in which case there is no need for this function using the IT field of the SAR.

### *Length Indicator*

The length indicator describes how much of a cell is filled. In this respect there is no fundamental difference between VBR and CBR, since both may provide partially filled cells. If most cells are filled, then the length indicator is not required (e.g. there is no length indicator provided within AAL Type 1, since it is assumed that all cells are filled).

### *Cyclic Redundancy Code*

The need for this field, and the nature of its contents, is dependent on the performance of the physical network and the coding used. Selecting an appropriate detection/correction scheme requires the establishment of performance criteria relevant to individual services.

The characteristics of the coding scheme must be taken into account in determining the impact of bit errors. In the case of VBR video on an ATM network, which has an SDH physical layer (BER  $10^{-9}$ ), the interval between bit errors may be of the order of minutes.

The underlying assumption in defining other AALs has been that single error protection and double error detection is sufficient. This assumption must be examined to determine its validity and relevance for variable bit rate video streams.

It must also be decided whether to provide protection only for the SAR-PDU header (as per AAL Type 1) or across the entire contents, including the payload, of the SAR-PDU (as per AAL Type 3 and AAL Type 4).

## **3. Commonality of the SAR Sublayer for CBR and VBR Video**

At the Paris meeting it was suggested that it should be possible to use the same decoder for both VBR and CBR video. The issues described in relation to the SAR functionality to support VBR video using AAL Type 2 apply equally to the support of CBR video. It is proposed that a common SAR be defined to support both CBR and VBR video over ATM networks.

## **4. Conclusion**

To encourage consideration of the functionality required of AAL Type 2 for video services support, a discussion has been provided of the fields in the current example contained in Recommendation I.363.

Given the necessity to support a wide range of video services, with different requirements, rates, etc, it appears that the proposed fields could be highly restrictive. For example, an AAL Type 2 with minimum functionality may offer the flexibility to accommodate a wide and diverse range of video services. It is proposed that the ATM Experts Group undertake the study of requirements for AAL Type 2 as a priority issue to enable the work of SGXVIII on the definition of the structure and coding of AAL Type 2 to proceed.

It is further proposed that in establishing requirements for AAL Type 2, consideration should be given to a single SAR sublayer for both VBR and CBR video services and, subject to agreement by the Experts Group, a liaison be made to SGXVIII advising that this is the current thinking of the Group.