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Telecommunication Standardisation Sector
Study Group 15
Experts Group for ATM Video Coding
(Rapporteur's Group on Part of Q.2/15)

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SOURCE : Stuart Dunstan, Siemens Ltd, (Australian UVC consortium)

TITLE : PES packet length semantics

PURPOSE : Proposal

1. Introduction

This document addresses the semantics associated with the MPEG-2 PES *PES_packet_length* field, where the packet length is undefined. The MPEG-2 Systems Working Draft from the New York meeting states

> **PES_packet_length**: The PES packet length is a 16 bit field specifying the number of bytes in the PES packet. A value of zero (0) indicates that the PES packet length is not specified.

However the MPEG-2 Systems New York meeting report states that the length may be undefined only when the following conditions are true,

- the elementary stream in the PES packet is MPEG Video
- the PES packet is part of a Transport Stream

Both of these conditions may be unsatisfactory to the SG15 Experts Group for ATM Video Coding.

2. H.32X low delay requirement

The H.32X audio-visual terminal standard aims to have an end to end service delay of less than 150 ms [1]. This figure comes from the earlier H.261 video coding standard in which delay was mainly due to the coder bit rate buffer. This buffer was 4 times the CIF picture period in length.

For the H.32X terminal, media multiplexing, error control, and other functions should not substantially increase end to end delay beyond that due to buffering for rate control.

The SG15 Experts Group has an interest in using the PES stream in the H.32X terminal [2], possibly without support of either the Program Stream or the Transport Stream. The MPEG-2 Systems Working Draft states that PES streams may be used in this manner.

In such applications, fields in the PES packet header that support preservation of the PES packet i.e. *packet_start_code_prefix* and *PES_packet_length*, may be redundant. Preservation of the PES packet would be provided by lower protocol layers.

3. Example

The following example, using ATM, illustrates the difficulty in achieving low delay with a valid length field in the PES header.

Let a coded video frame be carried in one slice. One slice is mapped to one PES packet.

PES packet length must be specified

> The *PES_packet_length* field value is not available until coding of the whole frame is completed. Hence the ATM cell carrying the first segment of the coded frame is not available for transmission until then. The delay is one frame.

PES packet length is unspecified

> The ATM cell carrying the first segment of the coded frame is available for transmission when there are enough coded bits to fill the segment. The delay is the time required to fill one ATM cell payload, or shorter if partially filled cells are allowed.

The above is true for any media, not just MPEG-2 video.

4. Proposal

To satisfy low delay applications the semantics of the *PES_packet_length* field should be modified so that the packet length may be unspecified in the case where the PES packet is used without support from either the Program Stream or Transport Stream. This should be true independent of the nature of the elementary stream.

References

[1] CCITT SGXV Experts Group for ATM Video Coding, "Status Report on ATM Video Coding Standardisation, Issue 3", Document AVC-357, October 16, 1992

[2] ISO MPEG 93/698, "Report of discussion on ATM/AAL and MPEG-2 Systems", ITU-TS SG15 Experts Group on ATM Video Coding.