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Experts Group for ATM Video Coding

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TITLE : **CONSIDERATIONS CONCERNING THE STANDARDISATION OF AAL(S) FOR VIDEO SERVICES.**

PURPOSE : Discussion

I. INTRODUCTION

In this contribution some considerations concerning the standardisation of an ATM Adaptation Layer (AAL) for video services are given. It is stated that a distinction must be made between existing video codecs to be used in an ATM environment on one hand, and ATM video codecs with dedicated coding core matched to ATM on the other hand. In the first case, AAL standardisation can be accomplished on a short term basis. In the second case, ATM video coding algorithms and AAL are strongly correlated, and the definition of both subjects cannot be defined separately.

II. AAL DEFINITION

CCITT SGXVIII draft rec. I.321 describes the B-ISDN protocol reference model. In this model the ATM Adaptation Layer is defined as the protocol layer above the ATM layer. The latter provides cell transfer for all services while the AAL provides service-dependent functions to the layer above the AAL. Examples of services provided by the AAL include handling of transmission errors, handling of lost and misinserted cells and timing control such as source clock frequency recovery at the receiver.

III. STANDARDISATION STRATEGY

STATUS WITHIN CCITT SGXVIII:

In order to minimize the number of AAL protocols, SGXVIII draft rec. I.362 provides a service classification based on: the timing relation between source and destination of the service (required or not), the bit rate (constant or variable) and the connection mode (connection oriented or connectionless). Four classes are distinguished, from which class A (required timing relation, constant bit rate, connection oriented) and class B (idem but variable bit rate) are the most relevant for real time audiovisual services.
In addition, draft rec. I.363 describes AAL protocols which consist of 2 AAL logical sublayer combinations (called Segmentation And Reassembly - SAR - and Convergence Sublayer - CS -), to support higher layer services belonging to the 4 defined classes (A to D). Other combinations of the desired SARs and CSs may be used to support specific services.

Concerning video services however, it is not clear whether:

- is the current AAL service classification applicable/sufficient for video services?
- which AAL functionality is needed for video services?
- can existing SARs and CSs be used?
- how to partition adaptation layer functions between SAR and CS?
- can video AAL definition and video coding algorithm standardisation be separated?

These questions need urgent further study.

RELATION WITH RELEVANT VIDEO CODING BODIES:

- Existing video standards:

Compatibility issues of already existing standards such as H.261 have to be handled properly. In H.261, a forward error corrector (FEC) is specified for the protection of a video bit stream against bit errors. This FEC is an integral part of the service and should be used for transmission over STM as well as ATM networks. This for compatibility and interworking of H.261 codecs over STM & ATM networks. Additional functions need to be placed in the AAL in order to cope with transmission impairments of the ATM network.
The relevant standardisation body (i.e. the one which established the video standard) must investigate if current AAL structures (especially AAL type 1 structures) are usable and compliant with the requirements of the service. If not, modifications and/or additions to the AAL recommendations need to be drafted by the relevant standardisation body. This can be done on a short term base, since the characteristics and behaviour of this specific video service are well known.

- New ATM video standard(s):

Before introducing an adaptation layer for ATM video, one needs to know:
- the characteristics and impairments of the ATM network.
- whether/how it can be coped for by using dedicated ATM video coding algorithms (e.g. layered coding for cell loss concealment)?
- which additional functions in the AAL are needed in order to guarantee a given quality of service (e.g. bit error correction on the transmission links)?
- what are the requirements for a video AAL? Some of the AAL requirements are summarized in ANNEX I.

The definition of an AAL may have major impact on the available service bandwidth. Defining an AAL without interaction with the video coding definition could, in the limit, impose severe constraints on the future new video services.
It is clear that the standardisation of the AAL for video and the definition of video coding algorithms are strongly correlated. Therefore it seems appropriate that both topics should be discussed and further developed in coorperation between the CCITT SGXV/1 Experts Group and CCITT SGXVIII. This seems to be the suitable way in achieving an efficient AAL standard for ATM video.

IV. CONCLUSION

When defining an ATM Adaptation Layer standard for ATM video based services, two different aspects must be considered. On one hand, for existing video coding standards (services), an AAL can be standardised in a relatively short term, taking into account compatibility issues. Future video coding standards on the other hand, require an AAL matched to the coding algorithm. Therefore the AAL definition can only be done efficiently together with the definition of the new video coding algorithms, adopted to ATM.

ANNEX I: REQUIREMENTS FOR A VIDEO AAL

When defining an AAL for video, the following general requirements should be met:

Minimal overhead: the AAL overhead reduces the bandwidth that can be used freely by the higher layers above the AAL (i.e. the video service). Therefore the overhead should be minimized.

Minimum implementation complexity.

Low channel coding delay: this is mandatory to avoid long delays in interactive video services, especially when the bit rate is low.

The following requirements apply only for new ATM video standards:

Flexible AAL: the AAL contains a minimum set of common functionality among the range of interactive and distribution video services. It may not impose constraints on future new video services and coding algorithms. A compromize between a common adaptation layer for all video services with all possible functions and an optimized adaptation layer for each service should be the target.

Video related AAL: taking into account that some video coding equipment can work in both variable bit rate and fixed bit rate mode, it could be envisaged to use the same AAL in both modes.