CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding

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Subject: ATM Cell Header Field

Source: Bellcore

Purpose: Discussion

1. Introduction

As a result of some discussions within Bellcore on the ATM cell header field, several questions were raised on its possible applications for video services. In this document, we would like to bring those questions to the Experts Group's attention.

- The first question is: **Is the CLP field available to the receiver end-user?** An affirmative answer is essential if the CLP is to be used for any user function at all.
- Our second question is: **Will "compliant" cell ever be tagged at the edge of the network?** In our opinion, compliant cells should not be tagged at the UPC, nor throughout the network.
- Our third question is: **Are CLP and user information independent concepts ?** In case they are, our next question is: **Can they be supported by the existing ATM cell header field ?**
- Our last question is: **How many cell loss performance objectives are there for the network?**

2. Discussion

In order for the CLP field to be usable for conveying user information (e.g., video layering) to the receiver, it has to be available to the end-user. Also, the CLP should not be tagged anywhere by the UPC or any NPC (Network Policing Control) for compliant cells. For non-compliant cells, we prefer that the UPC discard them rather than convert them from high priority to low priority cells. If all tagged cells are not discarded at the UPC, these tagged cells will convey erroneous information about the video layering if delivered to the receiver. The consequence is worse than if the non-compliant cells are discarded because a tagging will produce a lost cell for one video layer and may produce a misdelivered cell in the other.

Regarding our third question, we would like to emphasize that in general user information and cell loss priority should be treated as two independent concepts. Suppose user information is about video layering with layer 1 representing the more important component of the video signal and layer 2 the less important one. From service perspective it may be desirable to have the following flexibilities:

1. Both layers at high priority

2. Layer 1 at high priority and layer 2 at low priority
3. Both layers at low priority

Therefore, the separation of the layering and the CLP concept can be useful from a video service point of view.

In the above discussion, we have only established the need for the separation of the user information function and the cell loss priority function. In addition to using the CLP for user information, there are other methods for providing this capability. These include:

- Use the SAR layer overhead
- Use multiple VCs
- Use the unused capacity in the ATM header, e.g. payload type

We have not concluded what is the best way of providing the user information capability.

Regarding to the cell loss ratio values, we should consider the particular video bit rate and coding algorithms used. Here we only discuss on lower rate video services since the coding algorithms used are better defined than high rate videos such as HDTV (e.g. MPEG, H.261, etc).

There are, in general, several possibilities to deal with the cell loss problem at both channel and/or video source coding levels. For video bit rates below 10 Mbps, and random CLR of 10^{-9}, cell loss protection capability may not be needed. Here, by the term cell loss protection we refer to various methods that can be used to reduce CLR and/or enhance the subjective perception of visually degraded images. These may include cell loss detection/correction, layered coding, cyclic refresh, and cell loss concealment methods. For layered coding schemes we assume two priority levels can be specified. Accordingly, software simulations exist that show acceptable picture quality in the range of 10^{-4} cell loss ratio at low cell priority level; and CLR of 10^{-9} at high priority levels. We should however emphasize that these results pertain to limited number of sequences with limited duration as well. From our perspective, however, the important issues are:

1. Can the network guarantee the 10^{-9} and 10^{-4} high and low priority cell loss ratios?
2. We assume that 10^{-9} and 10^{-4} are values attributed to random cell loss measures. Since cell losses are more likely to happen in burst (see Liaison statement from SGXVIII to SGXV) a more complex method for error protection may be needed. In that case, can the network specify a maximum number of lost consecutive cells ? Or can the network provide an additional parameter for cell loss burstiness measure ?