ITU Telecommunication Standardization Sector
Study Group 15
Experts Group for Video Coding and Systems
in ATM and Other Network Environments

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Title: Representation of transfer rate in broadband audiovisual communications
Purpose: Discussion

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1. Introduction

This document discusses the following three issues regarding the bit rate representation for the CBR audiovisual communication in B-ISDN:

1) Relationship between the value declared against the network and the value at AAL-SAP
2) Transfer rate value determined by the end-to-end negotiation
3) Quantization for the transfer rate capability

2. System model

A system model for discussing the transfer rate in broadband audiovisual terminals are shown in Figure 1 [1].

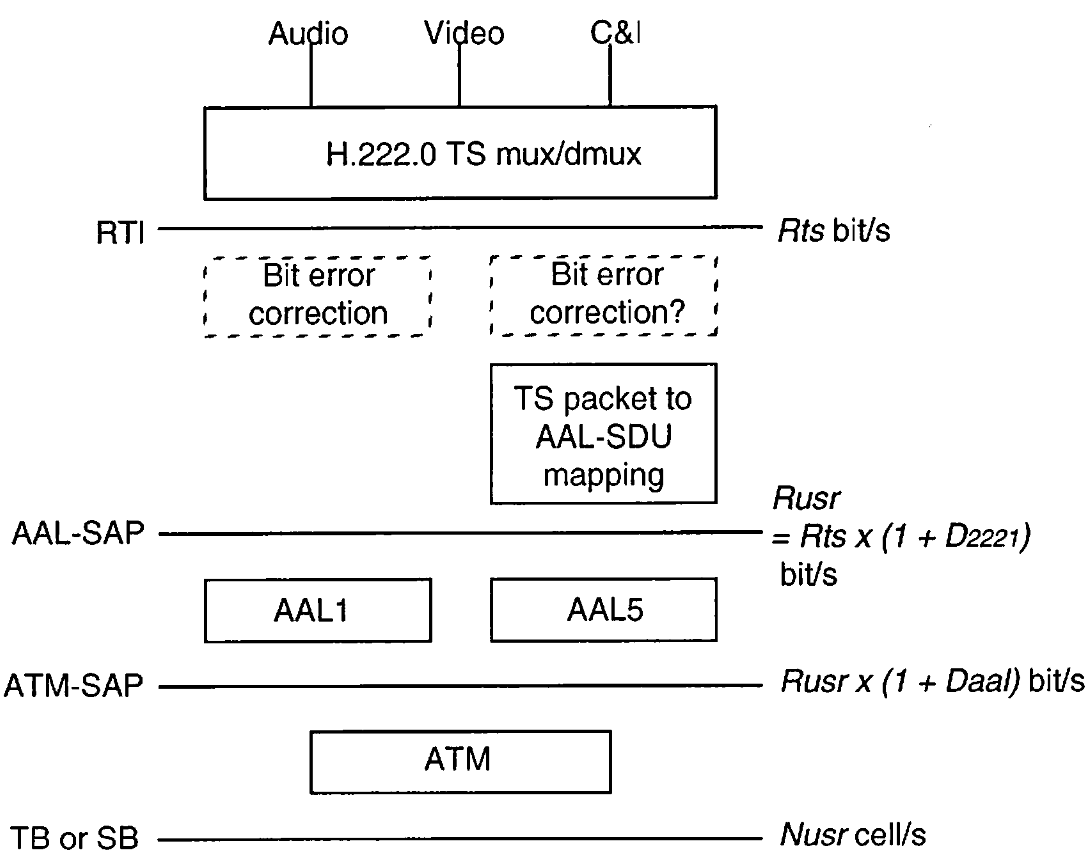

Figure 1 Definition of transfer rate

Since we address here CBR communications, we start from a constant bit rate *Rts* bit/s at the output of H.222.1 TS multiplex. This will increase at AAL-SAP to $Rts \times (1 + D_{2221})$ bit/s = *Rusr* bit/s due to the redundancy D_{2221} for bit error correction and other H.222.1 specific functions if any. For simplicity of discussion we disregard this redundancy here. At ATM-SAP the AAL overhead *Daal* is added, resulting in the rate *Rusr (1 + Daal)* bit/s. Finally at the TB or SB reference point, the rate parameter to be declared against the network is defined as number of cells per second which should count both user cells and OAM cells. Here again for simplicity, only user cell rate *Nusr* cell/s is considered. *Nusr* is represented as a 24 bit integer [2].

Between *Rts* and *Nusr*, the following relationship should be maintained:

$$Rts \times (1 + D_{2221}) \times (1 + Daal) <= Nusr \times 384 \qquad (1)$$

where overheads D_{2221} and *Daal* take the following values in Table 1.

Table 1 Overhead for H.222.1 specific and AAL layers

AAL	D_{2221}	*Daal*
basic AAL1	not considered here	1/47=2.13 %
AAL1 + long interleaver	not considered here	316/5828=5.42 %
AAL1 + short interleaver	not considered here	376/4136=9.09 %
AAL5 (2 TS packets per 8 cells)	not considered here	8/376=2.13 %
AAL5 (1 TS packet per 5 cells)	not considered here	52/188=27.7 %

3. Q.2931 parameters related to the transfer rate [2]

3.1 AAL1

When AAL1 is used, the constant bit rate at AAL-SAP is set as part of the AAL parameters in the Q.2931 call setup message, in addition to the peak cell rate at TB or SB. It takes one of the following:

64 kbit/s
1544 kbit/s
6312 kbit/s
32064 kbit/s
44736 kbit/s
97728 kbit/s
2048 kbit/s
8448 kbit/s
34368 kbit/s
139264 kbit/s
n x 64 kbit/s
n x 8 kbit/s

The two last values are relevant to H.32X proper communications using H.262, H.222.1, etc. Since the value of n is represented as a 16 bit integer, n x 64 kbit/s covers up to 4,194,240 kbit/s while n x 8 kbit/s covers up to 524,280 kbit/s. Hence either of them can be used for H.32X communications. The value corresponds to *Rusr* in Figure 1.

3.2 AAL5

In this case, only peak cell rate at TB or SB is defined in Q.2931; no AAL parameters are provided to indicate a constant bit rate at AAL-SAP. Questions are:

- Transfer rate is necessary for AAL5 parameters in Q.2931 as for AAL1? If yes, this should be communicated with SG11. Another thought is that this transfer rate information is not used by the network, hence the H.24X signalling is sufficient for its indication to the remote terminal.
- If adaptive clock is used for jitter reduction in the AAL5 profile of the network adaptation, the transfer rate should better be quantized like n x 64 kbit/s to facilitate hardware implementation of the PLL?

4. Determination of the transfer rate

At the start of the call, the H.24X signalling allows negotiation of transfer rate by exchange of receiving capabilities and indication of preferred receiving rate to the transmitting side.

- How should these transfer rate capabilities be represented? Should they be quantized like n x 64 kbit/s, quantized in a logarithmic scale, or represented as an integer number of bit/s?

This is open in the H.32X specifications [3]. Once transfer capabilities are known, e.g. as up to 15 Mbit/s, next questions are:

- What value of *Rts* (or *Rusr*?) is taken when an actual call is set up? Any value of an integer number of bit/s? Once this value is determined, a peak cell rate can be chosen according to Equation (1).
- The calling side has the power to determine the rates of both directions; calling side to called side and called side to calling side?
- H.32X should recommend some quantized values? There would be no practical difference between communicating at 10.0 Mbit/s and 10.1 Mbit/s for example. On the other hand, do quantized values bring any benefits if the decoding side can accept any value of bit rate?

In case of the N-ISDN audiovisual communications, a similar situation happens when both sides have 6B capabilities. The calling side will choose one value from 1B, 2B, 3B, 4B, 5B and 6B based on its service logic and places necessary number of additional calls. Widely used 2B, H0, H11/H12 terminals, however, have no such difficulty; saying 2B capability usually indicates preference of 2B communication instead of B. H0 or H11/H12 capability does not allow alternatives for bandwidth selection.

5. Conclusion

Some questions have been raised regarding the definition of transfer rate and its capability in the broadband audiovisual terminal. These should be clarified to establish relevant specifications in H.32X, H.24X, etc. In the absence of firm application requirements, we suggest to represent the transfer rate capability and the operational rate (*Rts* or *Rusr*) in 16 bit integer as the multiplier of 64 kbit/s.

References

[1] AVC-707R "Report of the seventeenth Experts Group meeting in Singapore (1-11 November 1994) - Part I and Part II (Rapporteur)", November 1994

[2] Q.2931 B-ISDN Digital Subscriber Signalling System No. 2 (DSS 2) - User Network Interface Layer 3 Specification for Basic Call/Connection Control, July 1994

[3] AVC-716 "Draft H.32X" (C-C. Li)", November 1994

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