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

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TITLE: Summary of Multimedia Multiplexing Systems

PURPOSE: Proposal

Abstract

One of the important issues under discussion is that of the method of multiplexing the several media in a multimedia or audiovisual communication. It is important that we maintain an accurate and clear understanding of the factors influencing a choice between the alternative methods, particularly since our deliberations on this issue are now appearing outside the group in documents such as the WPXV/1 report and IVS Baseline Document.

1. Introduction

To ensure that there is a clear understanding of the factors influencing a choice between the alternative multimedia multiplexing systems, this document reviews the summary table updated from [AVC-129] and produced in SGXV Document COM XV-R 97-E and the IVS Baseline Document.

2. Points of Clarification

I. CS Multiplexing.

A remaining multiplexing option is CS-based, and this should be included in the summary table to enable all options to be considered for informed decision-making.

A. Merit.

The "merit" claimed for user multiplex is currently said to be "Compatibility with H.320". However, compatibility with an H.320 terminal would require use of H.261, not H.26X, coding. Therefore all that can be said is that the multiplexing subsystem could use common components.

B. Efficient Channel Utilisation.

Transmission overhead is relevant to this topic, but not "Sharing with other media". Unless there is some direct channel utilisation advantage from sharing with other media, this item is irrelevant and should be deleted.

C. Compatibility with H.320

Compatibility with H.320 can only be achieved with switchable or simulcast systems, independent of the form of multiplexing for H.32X. This is because the video coding system will be different (H.26X instead of H.261), the audio system may be different and there could be other differences as well. Unless a genuine H.320 compatible bitstream is being transmitted, then "H.320 compatibility" is meaningless.

D. Compatibility with MPEG.

It is assumed that "MPEG" here means "MPEG1", and this should be clarified. The conclusion that the MPEG bitstream must be transmitted as data implicitly assumes that only the MPEG system multiplex is available. MPEG Audio and MPEG Video could be used independently of the System specification and multiplexed by some other means.

E. Multimedia cross media synchronism.

The current table notes that this is "Not guaranteed now", but use of separate VCs in a single VP does guarantee zero differential delay. Furthermore, it is now a B-ISDN signalling requirement in SGXI that a facility will exist by which a bounded delay can be requested [1].

F. QOS.

The phrase "Any QOS for each medium" could be misinterpreted. It may be preferable to say "Possibility of matching QOS to requirements of each medium".

G. Transmission Cost.

The current table implies that there is no transmission cost for SAR multiplex and User multiplex. However, it has been noted that there is an overhead required for each and that connections of greater QOS (and, presumably, cost) than are necessary will have to be used for some media when these methods are used. It might be more useful to relabel this row "Management and set-up costs", in which case the different VC requirements would be an appropriate feature to note. It should be noted that current studies in SGXI on B-ISDN signalling include the facility to establish multiple simultaneous VCs between the same two nodes using a single signalling exchange (i.e. at little, if any) increased cost [1]

H. Flexibility and Interworking.

Among the benefits of a cell-based multiplexing structure are:

- that it allows the potential for relatively easy interworking between terminals of different capability (e.g. audio-only terminal connected to a videophone);
- interworking between participants in a multipoint conference who may not all require the same media (e.g. omit video from the international segment of a conference);
- allow different routing of different media (e.g. audio and video could be treated differently in a multipoint conference;
- permit relatively easy addition and deletion of media components.

3. Revised Table

In view of the above discussion, it is proposed that the multimedia multiplex summary table should be revised. A revision is offered in the Appendix for consideration

4. Conclusion

The multimedia multiplex summary table provided in AVC-129 has provided a good basis for comparison of the alternative systems. The current document proposes clarification and updating of that table.

After discussion and any further revision within the Experts Group, we propose that the updated table be forwarded to SGXVIII to update that included in the IVS Baseline Document.

While VC-based multiplexing is recognised as having benefits in the longer term, there may be some delay before the network and signalling will support it. The urgency of standardisation of these issues for service support should be conveyed to SGXI and SGXVIII.

Since there is still uncertainty about the actual cost of this solution, the Experts Group should continue to keep the decision of a final multimedia multiplexing system open. We note that VC-based multiplexing allows user multiplexing as a subset, but that to choose user multiplexing will demand the development of a multiplexing system.

Reference

[1] CCITT SGXI, "Meeting Report - B-ISDN Req.", TD XI/4-22, Geneva meeting, 21 Sept. - 2 Oct. 1992.

Appendix: Proposed revision of multimedia multiplexing summary.

	Cell (VC) Multiplex	SAR Multiplex	CS Multiplex	User Multiplex
Transmission overhead	0	4/384?[1]	4/(Packet size)?[1]	16/(p*640)
Multiplexing delay	No delay due to multiplexing			
H.320 compatibility	Switch/simulcast			Switch/simulcast (Common multiplexing components)
MPEG1 Compatibility	Not at system level			MPEG System specification could be the user multiplex
Multimedia identification	HLC or user-user signalling	Identifier in each cell (IT?)	Identifier in each AAL-SDU	User-user signalling (BAS?)
Bit rate identification	Call signalling	User-user signalling		User-user signalling (BAS?)
Cross-media synchronisation	Guaranteed on one VP, requirement for B-ISDN signalling	Guaranteed (single VC)		
Separation of audio and video for continuous presence multipoint operation	Easy, but copy function required by network or MCU, otherwise mesh connection is needed	Difficult, but possible with MCU		
Transmission of low bit rate	Trade-off between delay and transmission efficiency			Low rates accommodated in multiplex
Influence of one cell loss	Restricted to one medium			Multiple media may be affected
Ease of implementation	Easy - uses network functionality	Additional terminal functions		Requires additional terminal functionality, but H.221 has been implemented in LSI.
Quality of Service (QOS)	Possibility of matching QOS to requirements of each medium	QOS must be that of the most demanding (sensitive) medium		
Management and setup costs	Cost of multiple VCs is unknown[2]	Single VC used		
Flexibility/interworking	Can interwork terminals with different media capabilities. Flexible and arbitrary addition, control and routing of media	All communicating terminals must use the same fixed multiplex structure		

[1] These figures assume 4 bits as a media identifier - one per cell for SAR and one per packet for CS multiplexing. This is the minimum overhead, assuming streaming mode of transmission. (CS multiplex packets contain an integral number of cells.) Both these schemes could use packet-based transport, which would involve an additional overhead of 192/(Packet size+192) - (UW). Average wasted bits = 192 per packet. UW (Unique Word) is the fraction of overhead due to the GOB start code (or similar) used to indicate the start of the GOB/slice (UW = word length / packet size), assuming one GOB (slice) per packet.

[2] However, SGXI currently has a requirement for multiple VCs (between the same sites) to be established with a single signalling exchange [1].