CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding
(Rapporteur's Group on Part of Q.3/XV)

Document AVC-435
January 18, 1993

Source : Chairman of the Experts Group for ATM Video Coding
Title : Liaison statements sent to SGXVIII
Purpose : Report

The following three liaison statements have been sent to CCITT Secretariat for consideration of the SGXVIII meeting during January 19-29, 1993;

- Support of H.320 terminals in B-ISDN,
- VBR video coding advantage vs UPC time constant,
- Update of the multimedia multiplex summary table in IVS Baseline Document.

END

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STUDY GROUP XVIII
Geneva, 19-29 January 1993

Temporary Document

Questions: 2,13,22/XVIII; 3,4/XV

SOURCE: SGXV EXPERTS GROUP FOR ATM VIDEO CODING
(Rapporteur's Group on Part of Q.3/XV)
TITLE: LIAISON RESPONSE TO WPXVIII/8

Subject: Support of H.320 terminals in B-ISDN
Purpose: for action
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SGXV Experts Group for ATM Video Coding reviewed the SGXVIII's liaison statement titled "Considerations on support of H.320 in B-ISDN (Question to SGXV ATM Video Coding Experts Group, June 1992)" at our meeting in July 1992. We appreciate SGXVIII's recognition of the problem we raised in our previous liaison statement (dated August 23, 1991). The question at that time was as follows;

> "How does B-ISDN intend to provide transparent N-ISDN circuit emulation especially those for cell loss sensitive and time delay critical services such as visual telephone using H.261, H.221 etc.?"

Your statement is describing the nature of the problem, but once a cell loss happens, the problem is more serious as detailed in Annex. We agree to your summary;

i) for H.320 terminals cell loss correction capability may be mandatory depending on network performances;
ii) no capability is currently defined in Rec. I.363 for interactive low bit rate signals.

Considering that existing H.320 terminals have been designed without expecting any cell loss, the solution must be prepared inside the AAL-SAP. If there is no practical solution, the network performance for N-ISDN circuit emulation should be such as providing sufficiently long mean time between two cell losses.

END

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ANNEX to Liaison Satement to SGXVIII on H.320 Terminal Support

The liaison states:

> 'Because inter-frame coding is highly used in H.261 coders, a proper recovery of the video signal may take some picture durations (maximum 132, ie 4.4 s, according to Rec H.261 para 3.4) until forced updating will "clean up" the picture.'

This statement is untrue in several respects and the real situation is more serious.

1. H.261 does indeed mention the number 132 but this is not 33 millisecond picture durations. It refers to the number of times a macroblock is updated and therefore also depends on the coded picture rate which may be fractions of 30 Hz. This makes the recovery time proportionally longer than the claimed 4.4 seconds. For example the figure for a low bit rate coder working at 7.5 pictures per second would be 17.6 seconds.

2. The point above assumes that coders refresh every part of the image at least once every 132 coded pictures. Many coders do this, but H.261 does not demand this. H.261 refers to the number of times a macroblock is updated. It is possible to maintain a separate counter for every macroblock of the image and update this counter when a macroblock is updated with information transmitted about it. With this method the refresh for stationary parts of the image will be considerably longer. It is conceivable that part of the scene will change, data be transmitted about it and be corrupted by cell loss, and because that part of the scene never changes again, the 132 count is never reached and the errored image at the decoder never cleaned up. While this may be unusual it should be mentioned that at least one product implements the refresh mechanism in this way and is perfectly valid.

3. H.261 permits motion compensation to be employed and all known products incorporate this to some degree as it reduces the bit rate to about one half for equivalent quality. A consequence of motion compensation is that errors in one part of the decoded image can be moved to an adjacent part. Thus it is possible that an area of the image which has just been "cleaned up" by the forced updating will immediately be corrupted again by motion compensated prediction from a neighbouring corrupt region which has not yet been "cleaned up". It is entirely possible that certain combinations of refresh pattern and motion in the scene will defeat the "clean up" mechanism for extended periods.

The above three points mean that the 4.4 seconds mentioned in the liaison from SGXVIII is extremely misleading. In practical cases corrupted regions will remain for significantly longer periods. In theory the period is infinitely long. In practice there is high probability that 30 seconds or more will be encountered frequently.

END

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STUDY GROUP XVIII
Geneva, 19-29 January 1993

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Questions: 2,13/XVIII; 3,4/XV

SOURCE: SGXV EXPERTS GROUP FOR ATM VIDEO CODING
(Rapporteur's Group on Part of Q.3/XV)
TITLE: LIAISON STATEMENT TO WPXVIII/8

Subject: VBR video coding advantage vs UPC time constant
Purpose: for action
Contact: Chairman of the Experts Group for ATM Video Coding
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The liaison statement from SGXVIII on traffic control and resource management (WPXVIII/8; issued in June 1992) indicated that the traffic parameter for the average is likely to be defined in terms of a reference algorithm as currently done for the peak rate in I.371. The Experts Group is greatly concerned with the time constant of the reference algorithm. If it is short in the order of e.g. 1 ms, the coder should regulate the coding rate much more tightly than the current CBR system where a transmission buffer of several tens of ms is used.

This statement reports a hardware experiment on the relationship between the advantage of VBR video coding and UPC time constant. The average rate is controlled by a leaky bucket with its time constant varied from zero to thirty seconds.

As is more fully described in Annex, we conclude from the experiment that:

1. concerning the two possible advantages of VBR coding, namely,

   1) realization of constant picture quality, and
   2) reduction of end-to-end delay by eliminating encoder output buffer,

   the first advantage increases only gradually and there is no definite saturation point as the UPC time constant increases up to as large as 30 seconds,

2. the second advantage can be obtained with relatively short UPC time constant and that there is no significant performance difference with the UPC time constant between 0.1 second to 1 second.

As part of SGXVIII's ongoing studies of UPC techniques, the SGXV Experts Group seeks reaction to the possibility of average rate measurement over a period of 10 seconds or more.

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2. Experiment Parameters

- Coding Algorithm
  - H.261
- Picture Format and Picture Sequence Length
  - CIF and 10 minutes (18,000 frames)
- UPC method
  - Peak rate control: 6Mbps
  - Average rate control: 1.5Mbps with Leaky Bucket Control
  - Bucket Size: max 24bit, 16.38M Octet
  - Max duration for Peak rate: 30 sec (=16.38M Octet x 8 / (6Mbps-1.5Mbps))
- Coding parameters control method
  - VBR mode (if Leaky Bucket Occupancy $\leq$ 90% of Leaky Bucket Size) $\Longrightarrow$ Constant Quantizer Stepsize and Constant Picture Quality.
  - CBR mode (otherwise)

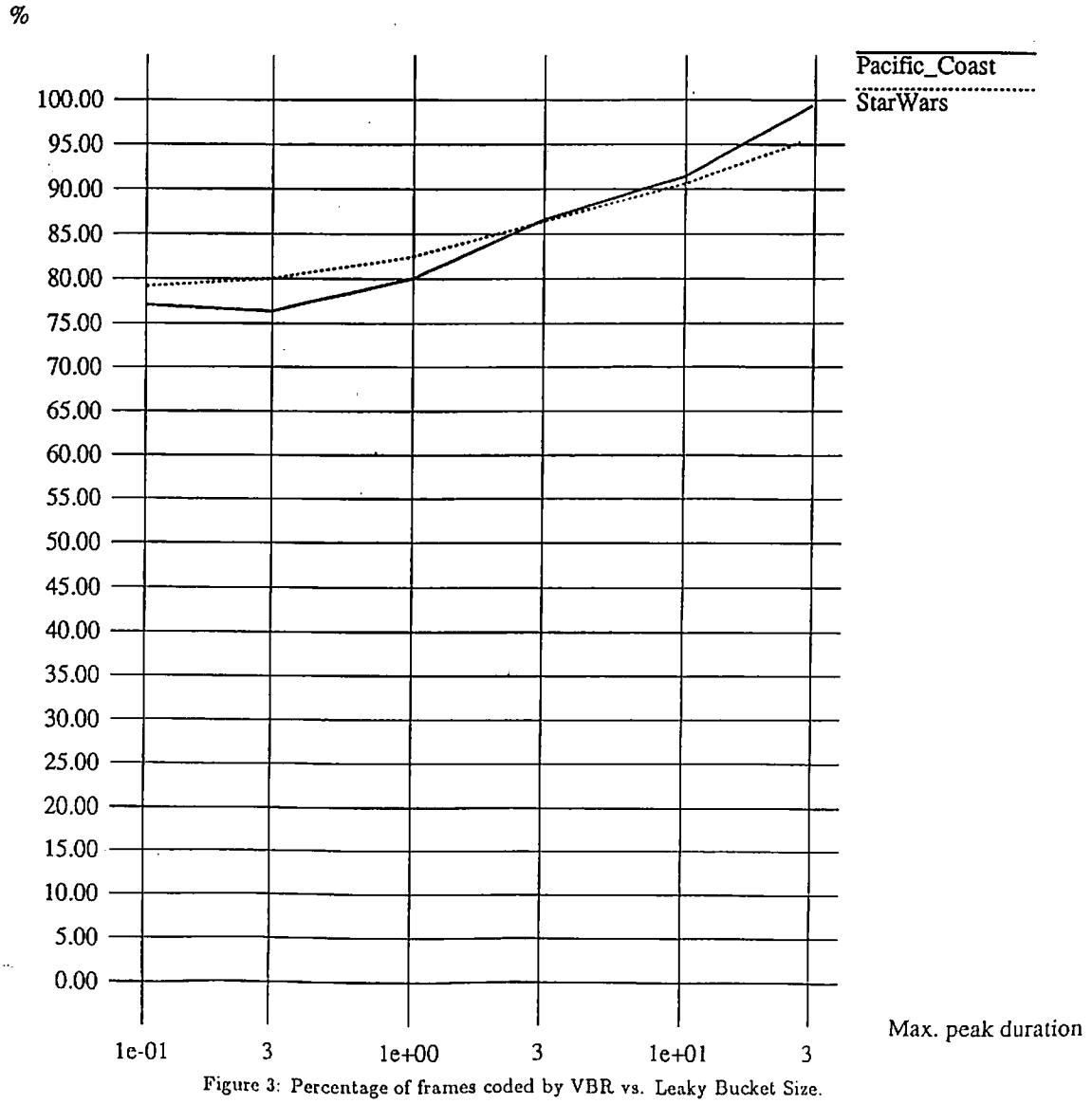

Figure 3: Percentage of frames coded by VBR vs. Leaky Bucket Size.

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Questions: 22/XVIII; 3,4/XV

SOURCE: SGXV EXPERTS GROUP FOR ATM VIDEO CODING
(Rapporteur's Group on Part of Q.3/XV)
TITLE: LIAISON STATEMENT TO WPXVIII/8

Subject: Update of the multimedia multiplex summary table in IVS Baseline Document
Purpose: for action
Contact: Chairman of the Experts Group for ATM Video Coding
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At our meeting of 28-30 October 1992 in Ipswich, we reviewed the summary table for the multimedia multiplex method contained in Annex 6 of the IVS Baseline Document, and updated it as attached. In addition to some modifications in the entry description, we split the "user multiplex method" into two alternative solutions; packet multiplex method and bit multiplex methods.

We request the attached table be included in the next version of the IVS Baseline Document.

END

	Cell (VC) Multiplex	SAR Multiplex	CS Multiplex	User Multiplex - MPEG system (packet multiplex) approach	User Multiplex - H.221 at higher rate (bit multiplex) approach
Transmission overhead (for multiplex indication)	0	≥ 4/384[1]	≥ 4/(Packet size)[1]	≥ 4 bytes per packet	16/(p*640)
Multiplexing delay				Depends on packet interval	No delay due to multiplexing
H.320 compatibility	Switch/simulcast			Switch/simulcast (Different multiplexing components)	Switch/simulcast (Common multiplexing components)
MPEG1 Compatibility	Not at system level			Switch/simulcast (Common multiplexing components)	Switch/simulcast (Different multiplexing components)
Multimedia identification	HLC or user-user signalling	Identifier in each cell (IT?)	Identifier in each AAL-SDU	Packet header (Stream ID)	User-user signalling (BAS)
Bit rate identification	Call signalling	User-user signalling		Packet header (rate bound)	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		Difficult, but possible with MCU (easier than H.221 approach)	Difficult, but possible with MCU
Transmission of low bit rate	Trade-off between delay and transmission efficiency			Low rates accommodated in multiplex (400 bit/s minimum)	Low rates accommodated in multiplex (minimum?)
Influence of one cell loss	Restricted to one medium			One or multiple media may be affected (Depends on AAL)	Multiple media may be affected
Ease of implementation	Uses existing network functionality	Additional terminal functions		Requires additional terminal functionality, but easy.	Requires additional terminal functionality. H.221 has been implemented in LSI. Extension to higher rate requires study.
Quality of Service (QOS)	Option of matching QOS to requirements of each medium (not available in B-ISDN Release 1).	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].