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

Document AVC-598R
November 5, 1993

Source: RAPPORTEUR (Sakae OKUBO)
Title: REPORT OF THE FOURTEENTH EXPERTS GROUP MEETING IN DAEJEON AND SEOUL (October 27 - November 5, 1993) - Part I and Part II
Purpose: Report

Part I General
Part II Sole sessions in Daejeon
Part III Joint sessions in Seoul (see AVC-599R)

Part I General

The fourteenth meeting of the Experts Group was held in Daejeon and Seoul, Korea, as follows;

- ITU-T sole sessions in Daejeon during 27-29 October at the kind invitation of ETRI, and
- Joint sessions with ISO/IEC JTC1/SC29/WG11 (MPEG) in Seoul during 1-5 November at the kind invitation of KBS.

The list of participants appears at the end of this document.

Part II Sole Sessions

Contents

1. Introduction

The ITU-T sole sessions were held at ETRI during 27-29 October 1993 at the kind invitation of ETRI. At the opening session, Mr. Jae-Woo Yang, Director of Human Interface Department, ETRI made a welcoming address on behalf of the hosting organization.

At the end of the sessions, Chairman thanked the hosting organization for the meeting facilities provided and the excellent secretarial support.

We had also a short closing session on 5 November to review both sole and joint sessions as well as to prepare for the next meeting in Geneva and Paris.

2. Documentation (TD-2)

For the sole sessions, 20 AVC-numbered documents and 12 Temporary Documents have been made available as listed in Annex 1.

3. Tape demonstration (TD-3)

Two video tape demonstrations in D1 format were given to present experimental results as detailed in Annex 2 .

4. Review of the previous meetings

4.1 Sole sessions in Brussels (AVC-578R)

Rapporteur briefly presented the outcome of the sole sessions in Brussels, noting Annexes 3 and 4 both of which had been presented at the Working Party 1/15 meeting in Geneva.

4.2 Joint sessions in Brussels (AVC-579)

Each representative of the Experts Group presented the outcome of the sub-group in charge; Requirements (B. Haskell), Video (S. Okubo on behalf of G. Bjoentegaard), Systems (D. Schinkel) and Implementation (G. Morrison).

4.3 SG15 meetings (AVC583,584; TD-6)

Rapporteur presented the outcome of the Working Party 1/15 meeting held in Geneva in September, drawing attention of the members to the following items;

- new structure of SG15 (TD-6)
- new rules (Attachments 1,2,3/AVC-584)
- time schedule for audiovisual systems Recommendations (Annex 2/AVC-583)
- reorganization of the Experts Group (AVC-584)
- intellectual property (§4.2.1 i)/AVC-583)

As to the last item, Rapporteur requested support of the Experts Group members for collection of patent information and patent licensing policy statements regarding H.26X|MPEG-2 Video. Rapporteur's letters of request have been sent to the organizations which indicated holding of patents relevant to MPEG-1 and MPEG-2.

5. Video coding - H.26X

5.1 Picture skipping (AVC-596; TD-7)

AVC-596 gave clarification to picture skipping whose purpose is to keep low delay in the steady state and to related VBV operation. The meeting appreciated this clarification so that the feature be maintained in Committee Draft of MPEG-2 Video and Systems.

During the discussion a comment was raised that the picture skipping has still some ambiguity in the spatial scalability. In response to this, a clarification document was produced as in Annex 3, which the meeting agreed for submission to the joint sessions in Seoul. An essential point is that the encoder (Video, Systems, together with network access, such as use of multiple VCs, if relevant) is responsible to deliver base layer picture data prior to the time of decoding its corresponding upper layer coded picture.

It was noted that a term "VBV underflow" is used to describe the situation that the VBV buffer does not contain complete coded picture data at a timing of data removal (i.e. decoding).

The meeting considered shortly whether more restrictions other than **low_delay** = 1 is necessary to the use of picture skipping. As to 3/2 pulldown, the Brussels meeting recognized that use of picture skipping would be very unlikely in practice (see §5.1/AVC-578R).

5.2 VBR

5.2.1 VBR application examples

The meeting listed the following as possible VBR coding applications;

- ATM network services where input traffic can be varied but is to be regulated,
- Local Area Networks where packet retransmission is involved,
- Video servers where peak rate can be high but average rate is restricted,
- Disks where all bits in a picture are read out in a picture time,
- CD ROM where start/stop operation is involved.

Since VBR characteristics look different for respective cases, they should be analyzed and well defined.

5.2.2 Definition of **bit_rate**, **vbv_delay** in CD (AVC-588,591; AVC-396; TD-8)

AVC-588 proposed that since it is impossible to know future transmission rates the current definition is not appropriate for VBR and that correct VBR decoding is possible only with the support of Systems. AVC-591 provided a particular example where the current definition is workable; **vbv_delay** value is set constant as a picture time. It also proposed insertion of the corresponding illustration in CD.

After some discussion, the meeting reached a conclusion that the general solution is to use PTS/DTS for indicating correct decoding timing for VBR (including CBR as a degenerate case), thus **vbv_delay** be reverted back to 'FFFF'. As to **bit_rate**, it is concluded to be 'undefined' since it does not help decoding process but room should be left for its future use. It was also concluded that the illustration in CD can be as it is with necessary editorial modifications according to the above conclusion.

The meeting prepared a clarification and proposal document as in Annex 4 for submission to the joint sessions in Seoul.

5.2.3 Relation between video parameters in the header and the traffic descriptors (AVC-592)

AVC-592 discussed what implications the definition of VBR **bit_rate** and **vbv_delay** has to the traffic descriptors at the user-network interface, concluding that the current definition does not directly correspond to the parameters which the networks require for establishing a VBR connection. We need to continue this study cooperating with SG13 toward clear definition of traffic descriptors.

5.3 Spatial scalability (AVC-597)

AVC-597 proposed some modifications to the spatial scalability parts in WD based on the bitstream exchange experiments. The meeting would rely on the bitstream exchange contributors.

5.4 Video mixing bridge for continuous presence multipoint (AVC-581; Annex 3 to AVC-578R, §4.3.5/AVC-583; TD-9)

AVC-591 provided HRD and delay consideration, experimental results and clarification to the Brussels summary report. The discussion focused on whether delay accumulates at the video mixing bridge. It was clarified that even if the case of p.18/AVC-578R is repeated, the second series do not suffer additional delay because no more stuffing is necessary due to buffering at the video mixing bridge inputs (see Figure 2/TD-9). Namely, the additional delay due to stuffing at the bridge does not exceed a certain bound.

During this discussion, the meeting was drawn attention to the delay measurement method, though a method is described in Annex C of Recommendation H.261.

The meeting agreed to the proposed action that the Experts Group should not recommend either of the video combiner and transcoding approaches if the video mixing approach is technically feasible, but leave the choice to the market since both can co-exist.

6. ATM terminal and system - H.32X

AVC-590 reminded the meeting of an open issue of picture format(s) for the H.32X terminal, proposing mandatory formats of local ITU-R 601 one plus common format(s). The Experts Group suspended the format study at the Ipswich meeting in October 1992 (§5.2/AVC-398R), summarizing that; "in the light of lacking clear application possibilities, H.26X should be a generic coding standard and the 'application profiles' study should be commenced when appropriate which will include picture formats, bit rates and other parameters".

The meeting recognizes that the situation has not changed so much since then, thus we should not restrict the applications to a specific one, rather we should characterize the applications and list desirable format(s) for each 'application profile'.

Me. Haskell introduced a recent e-mail discussion on Pel Aspect Ratio (PAR) and Image Aspect Ratio (IAR), stating that one finding is that conversion of IAR may be rather easy but exact PAR conversion may be expensive, thus restriction of IAR values to ITU-R 601 values plus square pel aspect ratio may help us.

When we discuss the format issue, we should bear in mind the fact that the H.26X|MPEG-2 Video decoders can decode any formats inside the defined upper bound. Mr. Schinkel clarified that the half SCIF (720 pels/line, 576 lines per picture, 29.97 progressive pictures per second), which was considered in the definition of Next profile at Main Level, had been raised for reserving a possibility for communication purpose, not for proposing at the moment.

The meeting also noted an early contribution from Canada (AVC-59) which proposed to use CIF as a common format for interregional conversational services. Possibility of HHR (Half Horizontal Resolution of 4:2:0) was pointed out. For these low resolution formats, Mr. Tabatabai made a comment that full resolution ITU-R 601 format would provide better overall picture quality as AVC-394 (Daimler Benz) had indicated.

7. Network adaptation - H.22X/AAL

7.1 Framework for the network adaptation (AVC-586; TD-5)

Mr. Dunstan reported the correspondence group activities regarding the network adaptation in AVC-586. Rapporteur presented a protocol model, required functions, existing or planned protocol elements in TD-5. Both documents give a framework for our future study of the network adaptation.

Identification of H.22X specific functions await consideration of the participating members. Mr. Schinkel drew attention of the meeting that §2.5.7 of Systems WD specifying Program and Elementary Stream Descriptors, which should cover our audiovisual communication requirements. These descriptors may be sufficient for "assignment of media identification" listed in TD-5.

In response to the action proposed in AVC-586 on clarification of the desirable use of PES as an independent interface point, the meeting produced a document of request as contained in Annex 5 for submission to the joint sessions in Seoul. It points out three places in WD implying possible use of PES for the above mentioned purpose.

7.2 Evaluation of alternative solutions (AVC-585,593)

Both of AVC-585 and 593 attempted comparison of possible network adaptation solutions. Particularly, AVC-585 proposed 'pipelining' for shorter delay and 'alignment between cell and picture structure' for error resilience. It also presented a 'reference system' which was intended as a default solution if improvements in other methods were not outstanding. This reference system idea for network adaptation study is to be considered as a tool to make progress.

The meeting recognized that the performance parameters to be evaluated are;

- delay
- packing efficiency
- error resilience
- timing recovery
- implementation

which should be quantified as tried in AVC-585. It also recognized that the comparison should also be in terms of whether each alternative solution provides required functionalities .

We should study delay budget for the total system so that the network adaptation performance comparison can be practical in delay. This needs action of the members.

As to the error strategy for real time audiovisual systems, the meeting agreed to adopt the one raised in §2.2/AVC-585; "to pass the errored data unit to the decoder along with error indication flags so that the decoder can take necessary actions such as suspending to decode, concealing errors, etc.".

As to implementation, it was thought that ATM demultiplexer and TS packet demultiplexer need hardware while PES packet demultiplexer can be handled by software. {how about AAL? - Rapporteur} Chips for AAL Type 5 are now available, those for AAL Type 3/4 SAR would come earlier than Type 1 chips. Furthermore, AAL hardware quantity is much more small than that for video decoding, thus it would not be a problem in the longer term, but hardware trial of mid 1995 need be worried about in this respect.

A small group discussion for elaborating the comparison and identifying action points took place in the evening of Thursday, October 28 under leadership of Mr. Dunstan. Its outcome is contained in Annex 6.

Rapporteur raised the following points which may affect the choice of alternative solutions for the network adaptation;

- impact of the mandatory B-N interworking requirement for H.32X terminals which requires inclusion of AAL Type 1 circuit emulation,
- utilization of ATM cell characteristics

One of the opportunities of ATM is deemed as variable bit rate operation which can provide low delay characteristics.

7.3 TS packet delivery (AVC-594)

AVC-594 provided elaboration of the cell interleaving scheme presented in Brussels (AVC-569) and another new cell interleaving scheme for TS packet deliver. The issues are;

- required functionalities,
- error correction methods.

We have now four alternatives for the TS packet delivery; three others are listed in AVC-568 (considered in Brussels). Members are requested of the comparison study.

During the discussion, it was questioned how cell interleaving might affect the spectrum distribution of cell arrival jitter after de-interleaving.

Mr. Dunstan gave a comment that AAL should absorb cell delay jitter which is generated inside the ATM network.

The meeting confirmed that the use of cell interleaving with ring buffer for the AAL Type 1 circuit emulation is converging, while the 'closed form' method proposed in Brussels (AVC-569; see Figure 2/Annex 2 to AVC-594) is still awaiting comments. If there will be no more reactions, this will be put forward to the joint meeting with SG13 AAL Type 1/2 experts.

Mr. M-T. Sun gave a brief overview of ATM Forum which recently initiated the study on AAL for the TS packet delivery, expressing a desire that the activities among relevant bodies be coordinated .

7.4 Agenda items for the joint meeting with SG13 AAL Type 1/2 experts

The meeting confirmed that we should make progress for the following items at the joint meeting with SG13 AAL Type 1/2 experts in March 1994;

- cell loss correction method for AAL Type 1
- AAL Type 2 for video services support
- AAL for TS packet delivery

Members are requested to prepare good input materials through correspondence toward this joint meeting.

It was pointed out that clarification of the network restrictions for VBR traffic should also be included, but this item might not be under responsibility of the AAL experts. Rapporteur will consult with Mr. K. Yamazaki on this matter.

7.5 Action items

As summary of the Daejeon/Seoul meeting discussion, a list of action items for the network adaptation study has been made as in Annex 7.

8. Audiovisual communication systems over LANs - H.32Z

8.1 Packetization (AVC-587)

AVC-587 presented a possibility to encapsulate H.221 multiplexed signal into LAN packets, which requires study for packet loss impacts. Its advantage is more use of existing H.320 terminal protocols for LAN adaptation. To use H.221 or not for H.32Z terminals has been recognized as one of the issues which need early decision.

During the discussion, Mr. Hall clarified that the audiovisual part of protocols can be rather independent of the LAN protocols; LAN may be Ethernet, Token Ring, FDDI or ATM LAN.

Mr. C-C. Li informed the meeting that Internet "IETF" has activities relevant to the scope of H.32Z.

8.2 Implementation examples (AVC-595)

AVC-595 provided information on an implementation of audiovisual terminal for LAN application with accompanied tape demonstration, covering protocol stack, congestion control techniques and interworking with H.320 terminals accommodated in N-ISDN.

During the discussion, interest in achieved delay was expressed.

Information of other implementation examples is requested toward the next meeting.

8.3 Items to be standardized

The following is a preliminary list of items which are to be tackled with for drafting H.32Z.

- protocol stack
- interworking with N-ISDN and B-ISDN systems
- whether H.221 be retained or H.22Z be needed
- clock recovery aspects
- congestion control

9. Work plan and work method

9.1 Hardware trials (AVC-589)

AVC-589 requested members to propose experimental H.32X hardware specifications by attaching a straw man. Mr. M-H Chan raised whether error resilience verification extends to layered coding such as DP or simple form of scalability (SNR scalability). This possibility should be sought, but the verification of basic configuration should be given priority.

Rapporteur stressed that at least two independent hardwares are necessary for the verification and requested consideration of laboratories to commit.

9.2 Work method (AVC-584)

9.2.1 Work progress through correspondence

According to the guidance of the ITU-T for making progress between the meetings, we will continue discussion through e-mail among concerned members. PTT Research volunteered to offer an e-mail reflector for this purpose. If technically feasible, this international reflector plus necessary number of national reflectors may be a better solution.

Rapporteur will establish a list of correspondents.

9.2.2 Editor for each target Recommendation

The meeting supported the Rapporteur's proposal to appoint Editor for each target Recommendation. Editor's tasks are as follows;

- to generate draft Recommendation
- to lead the correspondence work
- to lead detailed discussion at the meeting

At this meeting, the following volunteers have been obtained;

Rec.	Title	Editor
H.26X	Video coding for ATM environments	S. Okubo*
H.22X	Multimedia multiplex and synchronization for audiovisual communication in ATM environments	S. Dunstan
H.32X	Broadband audiovisual communication systems and terminal equipment	C-C. Li**
H.32Y	Adaptation of H.320 terminals to B-ISDN	S. Okubo*
H.32Z	Adaptation of H.320 terminals to LANs	G. Morrison

* provisional until volunteers are found
** indication was obtained after the meeting

9.2.3 Information/document distribution

For efficient distribution of the Experts Group information and documents, each country has her point of distribution. The following members undertake this role;

FRG	Mr. B. Hammer	Siemens
Australia	Mr. M. Biggar	Telecom Australia
Belgium	Mr. O. Poncin	BELGACOM
Canada	Mr. S. Sabri	BNR
Korea	Mr. J-Y. Nam	ETRI
Denmark	Mr. E. Nielsen	Telecom Denmark
USA	Mr. C-C. Li	AT&T
France	Mr. G. Eude	CNET
Italy	Ms. L. Conte	CSELT
Japan	Mr. T. Tanaka	NTT
Norway	Mr. G. Bjoentegaard	Norwegian Telecom
Netherlands	Mr. D.A. Schinkel	PTT Research
UK	Mr. D.G. Morrison	BT Labs
Sweden	Ms. C. Verreth	Telia Research
Switzerland	Ms. M.L.M. Pralong	SWISS TELECOM PTT

We used to exchange advance copies of contributions by telefax, but e-mail is a much more convenient means for distribution among concerned members in each country. The meeting agreed to adopt this e-mail distribution from now on using;

- Microsoft Word for Windows 2.0 (US version)
- uuencode only (not compress)
- recommended file naming: "no more than eight characters" + ".doc" extension

or plain text (if drawings or tables are not involved) as interchange format.

9.2.4 Alignment of the meetings with MPEG and LBC ones

According to the new work phase, the collaboration with MPEG can be through Liaison Representative after March 1994. However, if many participants attend both meetings, keeping synchronization will help them. Furthermore, Mr. Schaphorst's LBC Experts Group intends to have its meetings synchronized with MPEG to collaborate in Phase 4. Some members of this Experts Group intend to participate in the LBC meetings. The rule of ITU-T requires that our meeting schedule between May 1994 and March 1995 should be approved by the SG15 meeting in May 1994.

Taking these factors into consideration, we should decide the future meeting plan for after March 1994. This matter will be further discussed through correspondence.

10. Joint sessions with MPEG in Seoul

10.1 Documents

As outcome of the sole session discussion, the following clarification / proposal documents have been forwarded to the joint sessions with MPEG in Seoul;

• TD-7	Spatial scalability when the base layer includes picture skipping (for clarification)	Video, Systems
• TD-8	Decoding start-up algorithm for VBR coded bitstream (for clarification and proposal)	Video, Systems
• TD-11	Use of Packetized Elementary Stream as an interface point (for clarification)	Systems

10.2 Representatives

The Experts Group is represented by the following members at the joints sessions;

ITU-TS EG	S. Okubo
Requirements	B. Haskell
Video	K. Sakai
Systems	S. Dunstan
Implementation	G. Morrison

11. Future meetings

Meeting	Date	Sole sessions	Joint sessions with MPEG	Joint sessions with SG13
15th	March 1994	March 16-18 at CNET in Paris	March 21-25 in Paris	March 14 in Geneva
16th	July 1994?			-

END

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Annexes

Annex 1 Documentation
Annex 2 List of tape demonstrations
Annex 3 Spatial scalability when the base layer includes picture skipping
Annex 4 Decoding start-up algorithm for VBR coded bitstream
Annex 5 Use of Packetized Elementary Stream as an interface point
Annex 6 Report of meeting to discuss ATM Network Adaptation - H.22X/AAL
Annex 7 List of action items for the network adaptation study

Participants of the fourteenth meeting of the Experts Group for Video Coding and Systems in ATM and Other Network Environments 27 October - 5 November 1993 in Daejeon and Seoul

			D	S
FRG	Mr. Bernard Hammer	Siemens	X	X
	Mr. Istvan Sebestyen	Siemens	X	X
Australia	Mr. Ming H. Chan	Telecom Australia	X	X
	Mr. Stuart Dunstan	Siemens Ltd.	X	X
	Mr. Stephen Hall	Monash University	X	X
Belgium	Mr. Olivier Poncin	BELGACOM	X	X
Korea	Mr. Dong-Sok Ha	Korea Telecom	X	-
	Mr. Cheul-Hee Hahm	KAIST	X	-
	Mr. Yo-Sung Ho	ETRI	X	X
	Mr. Dong-Beum Jeong	ETRI	X	-
	Mr. Jae-Dong Kim	Korea Telecom	X	X
	Mr. Yong-Han Kim	ETRI	X	-
	Mr. Young-Sik Kim	ETRI	X	-
	Mr. Jae-Yeal Nam	ETRI	X	X
USA	Mr. Christopher Bennett	Tiernan Communications Inc.	X	X
	Mr. Barry G. Haskell	AT&T Bell Labs	X	X
	Mr. Chia-Chang Li	AT&T Bell Labs	X	X
	Mr. Ming-Ting Sun	Bellcore	X	X
	Mr. Ali Tabatabai	Tektronix	X	X
	Mr. Yi-Tong Tse	CLI	X	X
France	Mr. Gerard Eude	CNET	X	X
Italy	Ms. Luisa Conte	CSELT	-	X
Japan	Mr. Tokumichi Murakami	Mitsubishi	X	X
	Mr. Yasuyuki Nakajima	KDD	X	X
	Mr. Sakae Okubo	NTT	X	X
	Mr. Kiyoshi Sakai	Fujitsu	X	X
	Mr. Tomoaki Tanaka	NTT	X	-
	Mr. Toshiaki Watanabe	Toshiba	X	X
Netherlands	Mr. Dolf Schinkel	PTT Research	X	X
UK	Mr. Geoff Morrison	BT	X	X
Sweden	Mr. Leif Bengtsson	Telia Research	X	X

Documents for the Daejeon/Seoul meeting (27 October - 5 November 1993)

Normal Documents

AVC number	MPEG 93/???	Pur-pose	Title (Source)
AVC-578R	880	R	Report of the thirteenth Experts Group meeting in Brussels (September 2-10, 1993) - Part I and Part II (Rapporteur)
AVC-579R	-	R	Report of the thirteenth Experts Group meeting in Brussels (September 2-10, 1993) - Part III (Rapporteur)
AVC-580	N0532	R	Fourth Working Draft - Video (WD Editing Committee)
AVC-581	-	I/D	Additional comments on video combining from 4QCIFs to CIF (Bellcore)
AVC-582	N0531	R	Fourth Working Draft - Systems (WD Editing Committee)
AVC-583	-	R	Meeting report - Part 1 (Working Party 1/15)
AVC-584	-	R	Guidance to the Rapporteur for the study of video coding and systems in ATM and other network environments (Chairman of Working Party 1/15)
AVC-585	931	D	ATM network adaptation performance parameters (Australian UVC consortium)
AVC-586	-	R	Report of Discussion group on MPEG-2 Systems and ATM (Stuart Dunstan)
AVC-587	-	D	Packetisation of H.221 frames for LANs (Australian UVC consortium)
AVC-588	940	P	Modification to VBV for VBR in WD is incorrect (AT&T)
AVC-589	-	P	Field trial of H.32X ATM video codec interconnection (Japan)
AVC-590	-	P	Picture format for H.32X (Japan)
AVC-591	898	D	Comments on vbv_delay description in variable bitrate operation (Japan)
AVC-592	-	I	Bitrate representation for VBR operation for ATM transmission (Japan)
AVC-593	-	P	AAL for hardware verification (Japan)
AVC-594	958	D	Cell loss correction method for MPEG 2 System Streams transmission (Japan)
AVC-595	-	D	Video and audio communication system for CSMA/CD LAN (NTT)
AVC-596	885	I	Clarification for the use of VBV for low delay applications (BT)
AVC-597	884	P	Proposal for modified syntax, semantics and decoding process for spatial scalability (BT)

Abstract

[???] indicates MPEG Document Number MPEG93/???.

AVC-578R [880] Report of the thirteenth Experts Group meeting in Brussels (September 2-10, 1993) - Part I and Part II (Rapporteur)

This document records the outcome of the Brussels sole sessions held in July 1993.

AVC-579R [-] Report of the thirteenth Experts Group meeting in Brussels (September 2-10, 1993) - Part III (Rapporteur)

This document records the outcome of the Brussels joint sessions held in July 1993, covering Requirements, Video, Implementation Study and Systems sub-groups.

AVC-580 [N0532] Fourth Working Draft - Video (WD Editing Committee)

This document gives frozen specifications for video coding part which were updated at the Brussels meeting.

AVC-581 [-] Additional comments on video combining from 4QCIFs to CIF (Bellcore)

The second approach to achieve asynchronous video channels by reducing the operational transfer rate in a full capacity is described. An implementation example by use of this second approach is reported. Some clarifications are also given to the misunderstanding contained in the Brussels output report on this matter. It is concluded that the Experts Group should not recommend either of the video combiner and transcoding approaches, but leave the choice to the market since both can co-exist.

AVC-582 [N0531] Fourth Working Draft - Systems (WD Editing Committee)

This document gives frozen specifications for systems coding part which were updated at the Brussels meeting.

AVC-583 [-] Meeting report - Part 1 (Working Party 1/15)

This document gives the outcome of the first WP1/15 meeting in this study period which made progress, among other things, in clarifying the standardization plan in the area of audiovisual communication systems. It also gave guidance to the work of this Experts Group which is now in charge of drafting Recommendations for video coding as well as systems aspects.

AVC-584 [-] Guidance to the Rapporteur for the study of video coding and systems in ATM and other network environments (Chairman of Working Party 1/15)

The work area and the work methods of the Experts Group have been redefined eith the following target Recommendations;

- H.26X Video coding for ATM environments
- H.22X Multimedia multiplex and synchronization for ATM environments
- H.32X Broadband audiovisual communication (or visual telephone?) systems and terminal equipment
- H.32Y Adaptation of H.320 terminals to B-ISDN
- H.32Z Adaptation of H.320 terminals to LANs

AVC-585 [931] ATM network adaptation performance parameters (Australian UVC consortium)

This document discusses performance parameters in ATM network adaptation of real time audio and video signals with respect to delay, error performance, and packing efficiency. "Pipelining" and "user data alignment" modes of operation are considered. Two network adaptation modes of operation are discussed; one is based upon AAL type 3/4 SAR and the other is based on MPEG-2 Systems Transport Stream. It is concluded that the former outperfoms the latter, particularly if the bit rate is low.

AVC-586 [-] Report of Discussion group on MPEG-2 Systems and ATM (Stuart Dunstan)

Correspondence work after the Brussels meeting is reported which has addressed identifying a suitable interworking point for MPEG-2 systems on packet oriented networks. It is pointed out that a clear statement is required on the use of PES without support of PS or TS. Functionalities and their allocation in the network adaptation is the issue.

AVC-587 [-] Packetisation of H.221 frames for LANs (Australian UVC consortium)

A means of adapting H.320 terminals for use on packet switched LANs, in which the H.221 frame structure is retained, is discussed with respect to protocol stack, H.221 multiplexed data alignment with the packet, packet size, impact of a packet loss and timing recovery. The advantage of this approach is the maximum use of exiting component/equipment, but the subjective impact of packet loss is unknown, requiring further study.

AVC-588 [940] Modification to VBV for VBR in WD is incorrect (AT&T)

It is proposed that the definition of **vbv_delay** and **bit_rate** for VBR should be reverted back to "3FFFFFFF" and "FFFF", because the current definition can not be satisfied by the encoder. It is reminded that correct operation of a video decoder in the case of VBR can be ensured at the systems layer.

AVC-589 [-] Field trial of H.32X ATM video codec interconnection (Japan)

In order to make effective the field trial which is planned in the middle of 1995, it is proposed that many members in the Experts Group should give their planned specifications of the experimental codecs for the basis of further discussions. An example of codec specifications is provided as a stimulus for further consideration.

AVC-590 [-] Picture format for H.32X (Japan)

It is proposed that H.32X picture formats should include respective local formats for high quality intra-regional services and some mandatory common format(s) for inter-regional communications.

AVC-591 [898] Comments on vbv_delay description in variable bitrate operation (Japan)

It is suggested to add description indicating that the delay needed to start decoding in VBR operation should be calculated from the vbv_delay and bit_rate values and that the illustration should be modified to correspond to a realistic case. It is also raised whether indication to distinguish CBR and VBR is needed, and possible solutions are provided.

AVC-592 [-] Bitrate representation for VBR operation for ATM transmission (Japan)

Implications of the current definition of bit rate for VBR are considered in the light of ATM network VBR services. It is hinted that traffic descriptors at the user/network interface may be rather loosely coupled with this VBR bit rate definition.

AVC-593 [-] AAL for hardware verification (Japan)

This document first discusses error strategy for the H.22X/AAL and indicates a choice for a given network QoS in terms of bit error and cell loss characteristics. Then, several alternative solutions for H.22X/AAL are compared regarding packetizing delay, packing efficiency, implementation, error recovery time. Finally two service classes are assumed; one for higher transmission efficiency and easy implementation and another for high quality. In conclusion, it is suggested to take the first service and employ AAL type 5 or AAL type 1 (cell interleave) for the hardware trial being planned.

AVC-594 [958] Cell loss correction method for MPEG 2 System Streams transmission (Japan)

The following two methods are provided for discussion to deliver TS packets over ATM networks with its alignment with ATM cells;

- AAL Type 1: use of RS(192,190) and CRC for a group of 47 TS packets
- AAL new Type: use of RS(4m+4,4m) and CRC for a group of m TS packets

AVC-595 [-] Video and audio communication system for CSMA/CD LAN (NTT)

Information is provided on an implementation of audiovisual communication system over CSMA/CD LAN which uses H.261 and G.728 source coding but packet multiplex and Internet protocol TCP/IP and UDP/IP. A design of gateway between LAN and N-ISDN is also informed.

AVC-596 [885] Clarification for the use of VBV for low delay applications (BT)

This document provides information on the use and operation of VBV in low delay mode applications and rationales for use of skipped pictures after a "big picture"; to keep low steady state delay by occasionally allowing temporal distortion.

AVC-597 [884] Proposal for modified syntax, semantics and decoding process for spatial scalability (BT)

This document provides the syntax, semantics and decoding process used for bitstream exchange for spatial scalability. It is proposed to replace the current WD text with this description.

Temporary Documents

TD-1	Rapporteur	Agenda for the sole sessions
TD-2	Rapporteur	Available documents for the Daejeon/Seoul meeting
TD-3	Rapporteur	List of tape demonstrations
TD-4	Rapporteur	List of open issues - October 1993
TD-5	Rapporteur	Network adaptation functions and their allocation to different layers
TD-6	S. Okubo	Organization of ITU-T SG15 (1993-1996)
TD-7	ITU-T SG15 EG	Spatial scalability when the base layer includes picture skipping
TD-8	ITU-T SG15 EG	Decoding start-up algorithm for VBR coded bitstream
TD-9	T. Tanaka	Clarification for AVC-581 and a comment
TD-10	S. Dunstan	Report of meeting to discuss ATM Network Adaptation - H.22X/AAL
TD-11	ITU-T SG15 EG	Use of Packetized Elementary Stream as an interface point
TD-12	Rapporteur	Draft report of the Daejeon sole sessions

END

List of Tape Demonstrations
(28 October 1993, Daejeon)

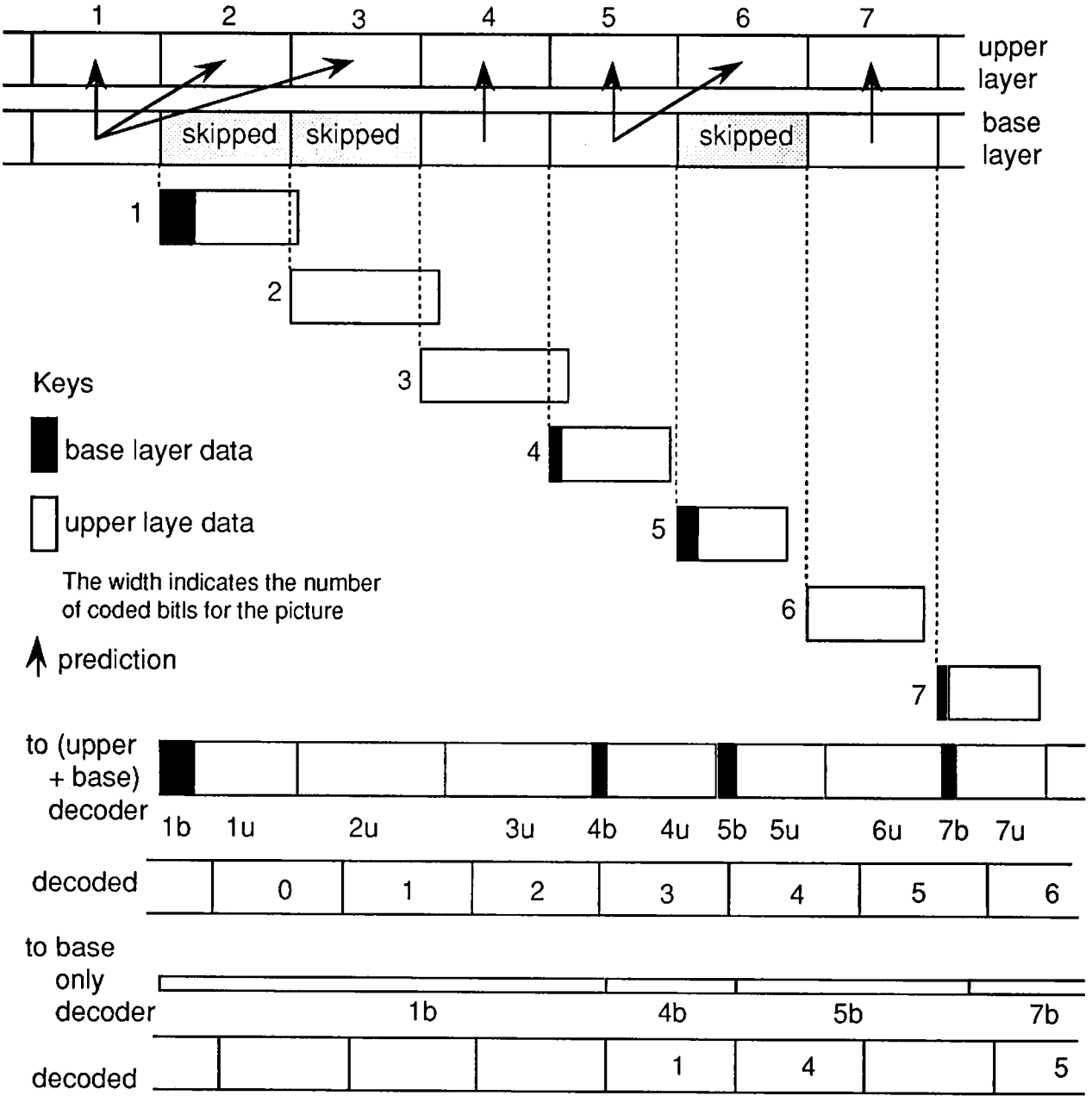
No	Organization	Topics	Tape	Doc.
a	Tektronix	Spatial scalability • Base layer: 0.5 Mbit/s, M=1 • Enhancement layer: 3.5 Mbit/s, M=3 • Both layers in 4:2:2	D-60	-
b	ETRI	HDTV/CTV compatibility	D-60	AVC-534

ISO/IEC JTC1/SC29/WG11
MPEG93/966
November 1993

Temporary Document No.7 rev2 (Daejeon)
October 29, 1993

Source: ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments
Title: Spatial scalability when the base layer includes picture skipping
Relevant sub-groups: Video, Systems

This document describes an example of workable solution for the scalability when picture skipping is involved in the base layer.



The spatial scalable encoding is modeled as follows;

1) An input picture is downsampled to obtain the corresponding base layer picture without delay.
2) After a complete picture is input at time "t_i" to the encoder, the base layer picture is instantaneously encoded, packetized into a PES packet with **stream_id** "base layer video" and stored in the transmission buffer. DTS (or PTS if the two are identical) is set to "t_i+L" where L is a constant delay between the encoder input and the decoder output picture.
3) The locally decoded base layer picture is instantaneously upsampled to the upper layer picture sampling density.
4) The upper layer picture is instantaneously encoded by using the upsampled locally decoded picture as part of prediction, packetized into a PES packet with **stream_id** "upper layer video" and stored in the transmission buffer. DTS (or PTS if the two are identical) is set to "t_i+L".

The encoder (Video and Systems) must ensure that the coded data of the base layer picture, which is necessary for decoding the upper layer pictures, be made available prior to the time the upper layer pictures are decoded. It is noted that if picture skipping is necessary in the base layer the most recently locally decoded base layer picture is used for prediction also for the subsequent upper layer pictures (e.g. Pictures 2 and 3 in the above illustration)

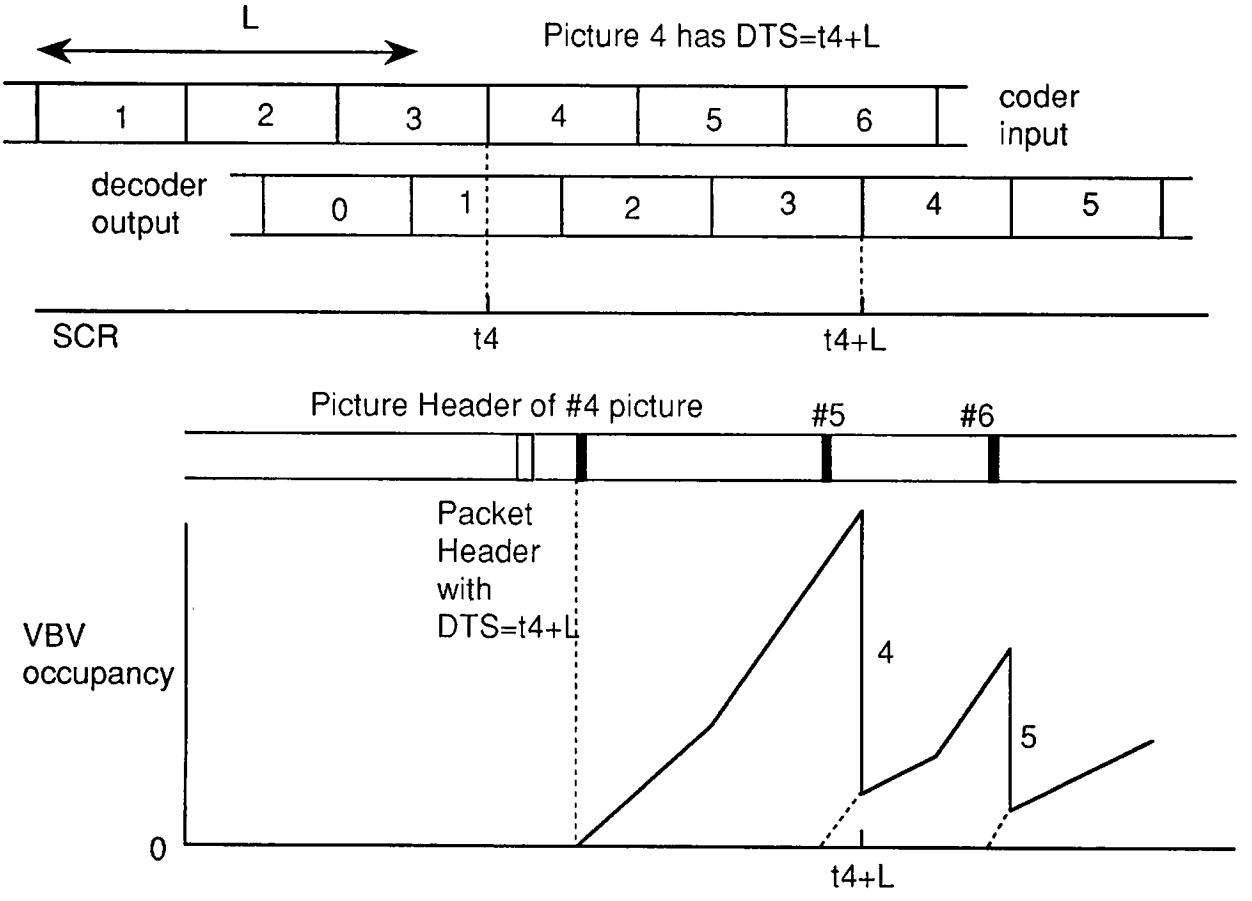
END

ISO/IEC JTC1/SC29/WG11
MPEG93/965
November 1993

Temporary Document No.8 rev (Daejeon)
October 29, 1993

Source: ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments
Title: Decoding start-up algorithm for VBR coded bitstream
Relevant sub-groups: Video, Systems

This document describes an example of workable solution for the VBR decoding start-up. This issue is not specific to the ATM video coding, but common among various applications including digital storage media applications.



When we have first received a picture header, we should decide how much time after that point decoding (i.e. removal of coded data from VBV buffer) be started. The current WD method for CBR operation uses **vbv_delay** to indicate this timing, which is equivalent to indicate the buffer occupancy at that point of time decoding is started.

The current description for VBR operation intends to indicate the buffer occupancy, at which time decoding is started, by using the value of **vbv_delay** and the maximum bit rate in

bit_rate For the encoder to write the vbv_delay value at the start of encoding, it should know the future transmission bit rates for the subsequent L period (L is the constant delay between encoder input picture and the decoder output picture). This is impossible in general except for very few specific cases, e.g. where transmission of any coded data for a picture is completed within a picture time, i.e. the encoder buffer is always empty when it starts to encode a new picture.

A general method for the decoder to correctly determine the timing to start decoding a coded picture is to use PTS/DTS in the system layer. It is noted that this method is applicable not only to VBR but also CBR (because CBR is a subset of VBR).

When the decoder starts to receive a Systems bitstream (PS for explanation), it operates as follows (see Figure);

1) Search a Pack Header, and read the SCR value. Then using their values, phase lock the local STC with the remote STC

2) Search a Video Packet Header and read the PTS/DTS. DTS is the necessary information in this discussion. The encoder puts a DTS as the time to start encoding a picture plus L (second), where L is the constant delay between encoder input picture and the decoder output picture.

3) Search a Picture Header in the video packet. Then start to forward the coded video data to the receiving buffer with discarding all the bits before the picture start code.

4) Start decoding at the time indicated by DTS.

It should be noted that the encoder is responsible to generate coded data so that the decoder buffer never overflows nor underflows within the limits of buffer sizes indicated by **vbv_buffer_size** in video and **STD_buffer_bound_scale/STD_buffer_size_bound** in Systems as well as L value which encoder decides as a design parameter.

In conclusion, the Experts Group propose to define the semantics for **vbv_delay** and **bit_rate** as follows;

vbv_delay	set "FFFF" in case of VBR
bit_rate	"undefined" in case of VBR

Furthermore, we encourage implementers to apply the DTS method described here even for the CBR operation.

END

ISO/IEC JTC1/SC29/WG11
MPEG93/968
November 1993

Temporary Document No.11 (Daejeon)
October 29, 1993

Source: ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments
Title: Use of Packetized Elementary Stream as an interface point
Relevant sub-groups: Systems

We are charged with specifying the "network adaptation" as illustrated below;

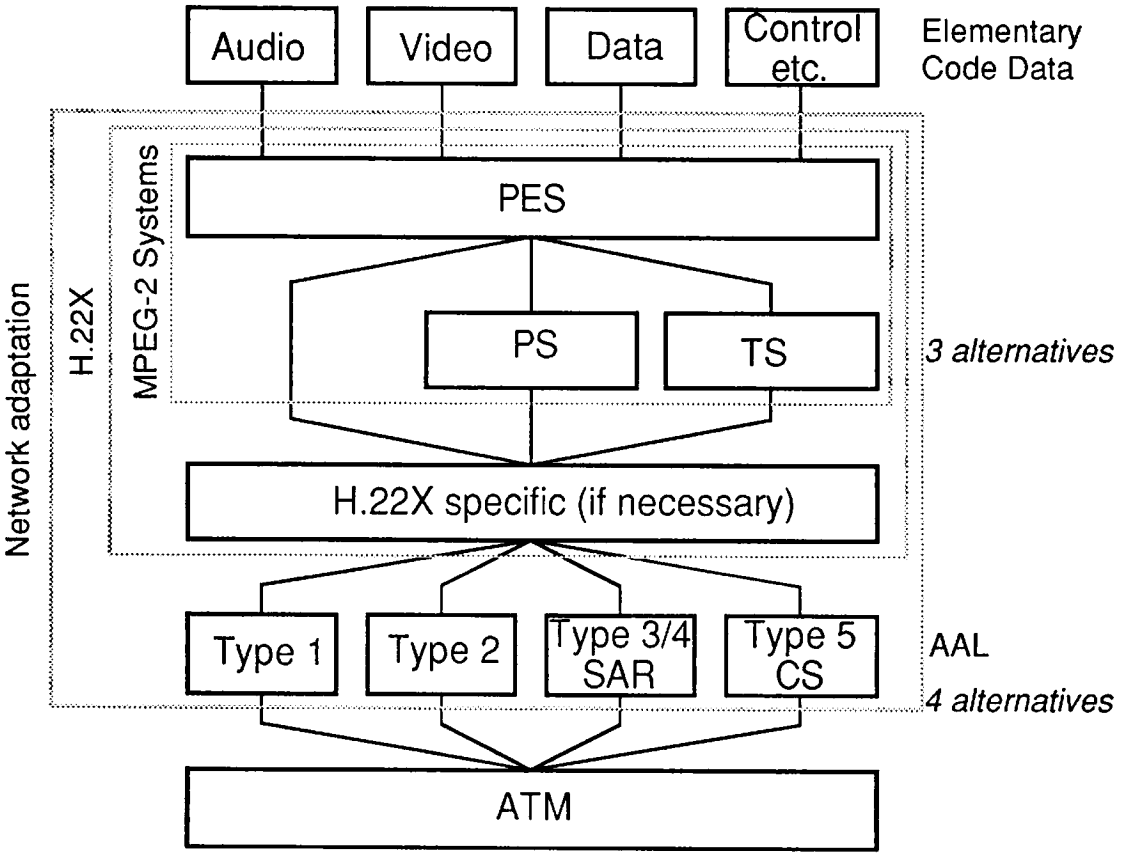


Figure 1 Protocol configuration in the audiovisual communication terminal (use of a single VC)

As one of the possibilities, we have been considering to use PES as a desirable interface point. The current Systems WD (Brussels output N0531) implies this possibility in the following three places;

- §I.4, second paragraph
- §I.10, second paragraph
- 2.4.2.4

A clear statement is requested for our ongoing study whether the MPEG Systems Packetized Elementary Stream could be used without support of either the Program or Transport Stream.

END

SOURCE: Stuart Dunstan
TITLE: Report of meeting to discuss ATM Network Adaptation - H.22X/AAL
DATE: 28 October, 1993.

1. USER DATA ALIGNMENT AND PIPELINING

Figure 1 was offered to illustrate the possible combinations of user data alignment and pipelining.

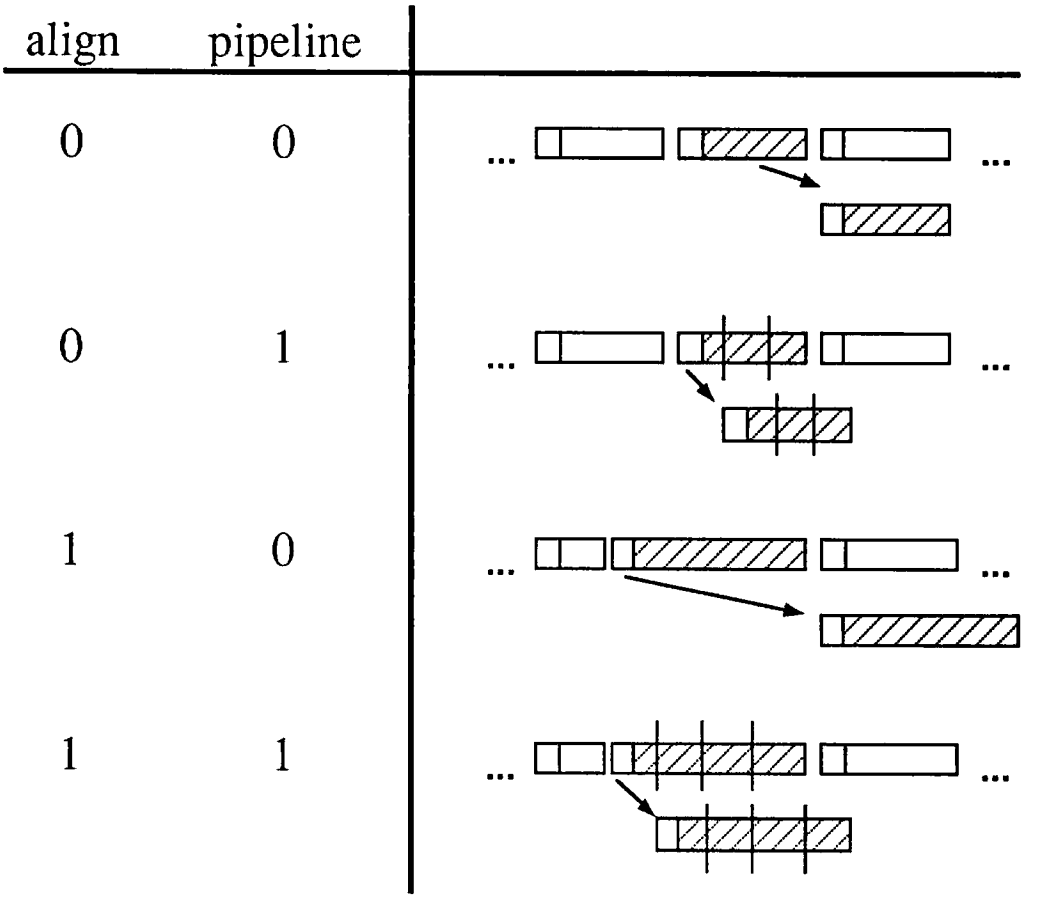


Figure 1. Illustration of possibilities of user data alignment and pipelining.

The difficulties in relation to the **PES_packet_length** field needing to be always valid relates to the last case in Figure 1; the **PES_packet_length** field in the PES packet header is not known before the complete PES packet is available, hence pipelining is not allowed.

It is noted that the current MPEG-2 Systems Working Draft allows this field to be coded as zero, indicating that the PES packet length is unspecified. No further conditions are attached. This definition is desirable. Without it the last case in Figure 1 can not be supported. It is hoped that this definition will not change.

The usefulness of user data and network adaptation structure alignment, which provides spatial error localisation, is questioned. Are there experimental results to indicate that it gives superior performance to the case where the data is unaligned? The conclusion is that if it is not difficult to support then it should be made available, and used if desired.

2. PACKETISED ELEMENTARY STREAM AND H.22X

The view was expressed that the Packetised Elementary Stream (PES) is a convenient interworking point between MPEG-2 Systems on different transport mediums. The Brussels meeting report (AVC-579R) states that it is a convenient mechanism for constructing a Program

Stream (PS) from a Transport Stream (TS) and vice versa. This supports the idea of the PES being a generic (transport medium independent) syntax. Figure 2 illustrates this. In Figure 2 the shaded blocks are alternative transport mediums over which the PES might be carried.

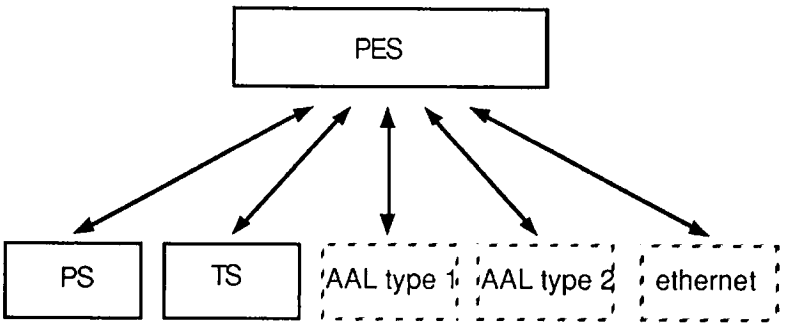


Figure 2. PES as interworking point in MPEG-2 Systems.

3. PROGRAM STREAM AND H.22X

The program stream is a concatenation of PES packets, with the insertion of a pack header. If the PES stream cannot be used as proposed in Figure 2, then the Program Stream might be suitable. The implications of using the Program Stream in the telecommunications application needs to be considered e.g. is the Program Map required in the audio visual terminal?

4. TRANSPORT STREAM AND H.22X

The Transport Stream might be adopted as part of H.22X for reasons of compatibility. However the following reservations about this were raised:

- the Transport Stream requires large PES packets for good packing efficiency (PES packet headers are aligned with Transport Stream packets). This prohibits alignment of user data (slice) with the PES packet.
- the Transport Stream does not appear to be "generic" i.e. top box in Figure 2, since it would not be suitable for carrying coded audio and video on ethernet networks, or on ATM using AAL type 5.

5. TRANSPORT STREAM ON ATM

Quite apart from H.22X/AAL for the audio visual terminal, given a Transport Stream how would one carrying it on ATM? AAL type 1 is one solution. Other considerations involve alignment of Transport Stream packet with ATM cells. Discussions within the ATM Forum have suggested that where alignment is required, removal of redundant Transport Stream packet header fields allows greater capacity for AAL functions.

It is suggested that jitter introduced to the Transport Stream by an ATM connection should be removed by an AAL on that connection. Figure 3 illustrates this. In Figure 3, on the ATM part of the connection it is proposed that the AAL remove ATM cell jitter, rather than allow the jitter to propagate to the MPEG receive terminal. This emphasises the issue that an AAL for the transport packet should have methods to remove cell delay jitter.

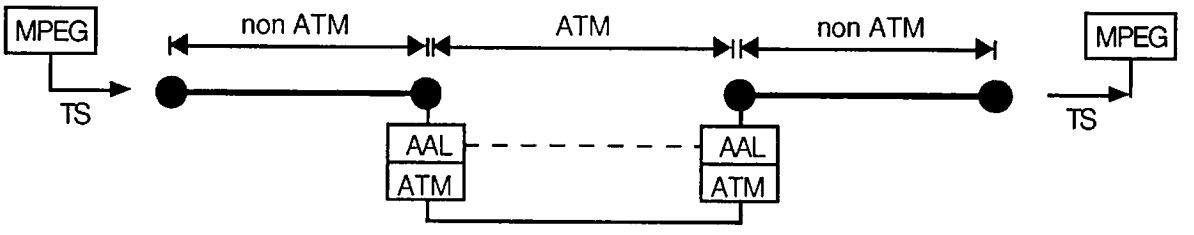


Figure 3. Example of Transport Stream on different networks.

6. APPLICATIONS

Selection of H.22X and AAL mechanisms may be assisted by recognition of applications. It may not be necessary to optimise all network adaptation aspects simultaneously. For example a high quality application may require good source clock synchronisation, but may tolerate some delay.

7. TOWARDS JOINT SG13 MEETING

Proposals towards H.22X and AAL type 2 functionality and mechanisms need to be made in preparation for the joint ITU-TS SG13 meeting in March 1994.

- end -

Action items for the study of network adaptation

1. Clock recovery

    1.1 video source clock recovery method
    1.2 audio source clock recovery method
    1.3 transmission clock recovery method

2. Multimedia multiplexing and synchronization - H.22X

    2.1 analysis of service requirements
    2.2 use of (PES), PS or TS in H.22X
    2.3 appropriate AAL for audiovisual terminals; 4 alternatives
    2.4 delay budget
    2.5 alignment between packet and cell boundary
    2.6 pipelining
    2.7 error strategy; detection and/or correction
    2.8 identification and implementation of H.22X specific functions
    2.9 assignment of media identification; by use of Program and elementary Stream Descriptors?

3. TS packets delivery over ATM

    3.1 appropriate AAL; 4 alternatives
    3.2 ATM cell jitter; quantification of jitter, jitter removal by AAL

4. AAL Type 1

    4.1 cell loss correction in AAL Type 1
    4.2 use of "closed form (double buffer)" for cell interleaving?

END