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

Document AVC-632R
25 March 1994

Source: RAPPORTEUR (Sakae OKUBO)
Title: REPORT OF THE FIFTEENTH EXPERTS GROUP MEETING IN PARIS (16-25 March 1994) - Part I and Part II
Purpose: Report

Part I General
Part II Sole sessions
Part III Joint sessions (see AVC-633R)

Part I General

The fifteenth meeting of the Experts Group was held in Paris, France, as follows;

- ITU-T sole sessions during 16-18 March at the kind invitation of France Telecom - CNET,
- Joint sessions with ISO/IEC JTC1/SC29/WG11 (MPEG) during 21-25 March at the kind invitation of AFNOR.

In addition to these, a joint meeting with the SG13 AAL 1&2 Group was held on March 14 in Geneva. 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 CNET during 16-18 March 1994 at the kind invitation of France Telecom - CNET. At the opening session, Mr. Jacques Guichard 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 closing session on 25 March to review both sole and joint sessions.

2. Documentation (TD-2)

For the sole sessions, 33 AVC-numbered documents and 20 Temporary Documents have been made available as listed in Annex 1.

3. Review of the previous meetings

3.1 Sole sessions in Daejeon (AVC-598R)

Rapporteur briefly presented the outcome of the sole sessions in Daejeon, noting the following;

- restart of the Experts Group toward system aspects Recommendations,
- VBR operation,
- action items for the network adaptation study.

3.2 Joint sessions with MPEG in Seoul (AVC-599R)

Representatives of the Experts Group reported the outcome of the sub-groups of our interest; Requirements (S. Okubo), Video (K. Sakai), Systems (D. Schinkel) and Implementation (G. Morrison).

3.3 Joint meeting with the SG13 AAL1&2 experts (AVC-625,629; TD-6,11)

Rapporteur and other participants gave a review of the joint meeting with the SG13 AAL 1&2 group, which was held on March 14 in Geneva. The following topics were covered;

- AAL 1; short interleaver for FEC and closed form of interleaver matrix
- CBR vs VBR
- audiovisual support AAL 2 and underlying network performance
- AAL for MPEG TS packets delivery

A detailed report is published separately as AVC-631R.

4. Review of the CD texts (AVC-600,601,605,615,626)

The meeting shortly reviewed the comments to the CD texts for Video and Systems and found no conflicts in requested modifications.

5. VBR operation (AVC-614)

AVC-614 addressed clarification of **bit_rate** field values which are allowed for VBR operation of H.262. It was felt that 15 Mbit/s upper limit (for MP@ML) may be relaxed, but the extent of relaxation is highly dependent on implementation, thus difficult to specify. The meeting concluded that the proposed specification of applying the same values with CBR is practical.

As to the breaking of the transport buffer size limitation, some members also informed that relevant contributions have been submitted to MPEG.

6. ATM terminal and system - H.32X, H.32Y

6.1 AV terminals in different network environments (TD-3)

Rapporteur provided a diagram indicating interworking possibilities to assist drafting H.32X, Y, Z. During the discussion, the following comments were obtained;

- There are some missing links. We should first take all possibilities into account, and drop some if sufficient ground is found.
- Currently H.32X is accommodated both in B-ISDN and ATM-LAN based on the assumption that their UNIs are very similar. This assumption should be deliberated.

A revised diagram is contained in Annex 2 with the above comments reflected.

6.2 Case study for specifications (AVC-607, 608, 610, 612)

Case study results were reported where a dedicated design for each of the following applications was attempted; high quality videoconferencing, AV communications using WS and TV program distribution.

Due to lack of time, we could not discuss these materials in detail. Mr. C-C. Li was requested to incorporate them in his initial draft of H.32X toward submitting it to SG15.

6.3 Buffer location (§5/AVC-619)

Location of the rate buffer for video encoding was questioned in AVC-619 because the UPC is performed against the traffic at the user-network interface. The location, however, is deemed as part of the design freedom as far as the traffic at UNI is kept as contracted.

6.4 Draft Recommendations (AVC-623, 624)

Skeletons for H.32X and H.32Y were provided in AVC-623 and AVC-624, respectively, with some items to be clarified before generating texts.

Mr. Radha raised a question whether inband characteristics of the H.32Y terminal be the same as those of the H.320 terminal or can include extra functionalities such as negotiation for use of SRTS. This question also applies to H.32Z.

It was recognized that "circuit emulation" should be clarified whether the service provided at an interface point is identical to that of the N-ISDN with respect to inband as well as outband characteristics. If that is the case no further work is necessary for H.320 terminal adaptation to B-ISDN. There was a comment that this can be represented in terms of user plane, control plane and management plane.

See §9.3 of this report for the input to SG15.

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

7.1 Visual telephony over INTERNET (AVC-603)

Mr. P. De La Motte, INRIA, informed the meeting of a tele-teaching and videoconferencing system using workstation and computer networks including INTERNET, which is now used for tele-seminars and collaborative working. During the questions and answers, the following was clarified;

- Natural synchronization between audio and video is used; no problem has been found. Direction to powerful network is preferred to complex audiovisual synchronization mechanisms.
- The CIFx4 format is required to transmit not well prepared slides in tele-seminars.
- User feeling is that the system is useful for integrated applications such as collaborative working which are more than videophony.
- Interoperability with ISDN H.320 terminals has not been concerned, but it is intended to study and to participate in the set up of a gateway (supported by a workstation connected to both Ethernet and ISDN) that will allow exchanges between Internet videoconferencing stations and H.320 terminal. Such a device will be used to propagate the Internet supported tele-seminar toward ISDN-PCs world.
- Interest in other algorithms than H.261 is for general multimedia applications.

7.2 General approach (AVC-627)

Mr. G. Morrison presented BT's view that the best approach for H.320 terminal adaptation to LAN environments is to provide the equivalence of ISDN transmission over the LANs and

make the minimum of modifications to H.320, leaving the use of "legacy LAN" to be a private solution beyond the gateway. Some opinions were expressed that installed basis networks should not be ignored and that network evolution may take time. Several ways to improve LAN characteristics other than Iso-Ethernet were also pointed out; e.g. activities of IEEE 802.1, ATM Forum and HP 100VG for bandwidth management.

After the discussion, the meeting reached a provisional conclusion that the target for H.32Z be bandwidth guaranteed networks. This conclusion will be reconsidered only if differing views are presented with contributions by the next meeting. Particularly, rebuttals against the "robustness" discussion in AVC-627 are awaited. Mr. S. Okubo orally informed the meeting of the current status of the product which had previously been introduced in AVC-595 and reactions of its initial users. A written contribution is invited by the next meeting.

7.3 Draft Recommendation

See §9.3 of this report for the input to SG15.

8. Network adaptation

8.1 AAL 1 (AVC-616, 619, 625, 629)

AVC-616 summarized characteristics of the closed form interleaving matrix which might be useful for VBR. This was also presented at the joint meeting with SG13 AAL 1&2 meeting. As a conclusion, the idea was recognized but no immediate applications were identified.

The meeting also recognized that we need first a framework for AAL(s) for VBR support.

As to the clock recovery by AAL 1 SRTS, benefits to use a common network clock is clarified as follows;

- It reduces low frequency jitter in the reproduced clock.
- It does not require exact arrival of the time stamp at the receiver.

Mr. S. Quinn clarified that the SRTS technique can be applied to timing recovery in systems other than AAL 1 as far as a common reference clock is available at both ends and a channel to send residual time stamps is available.

AVC-619 raised a question of PES multiplexing capacity of up to 16 video and 32 audio steams. It was felt that this capacity is sufficient for ordinary audiovisual communication use and that even if it is not the case there are several solutions such as multiple VCs, use of TS, multiprograms, dedicated H.22X, AAL functions.

8.2 H.22X/AAL 2

8.2.1 Protocol model of the network adaptation
(AVC-606,618,619,620,622,625; TD-5,7,8,9,16)

Input documents discussing this topic are classified as follows;

• protocol model of network adaptation	AVC-606,619,622,625; TD-8
• required functions of the network adaptation	TD-5,7
• interface points - SAP and physical interface	AVC-606,618,620

The protocol model of network adaptation consists of MPEG multimedia multiplex and synchronization layer, H.22X specific layer whose functions are yet to be clarified, AAL, and others. The meeting recognized it as a prime objective of this week to produce a protocol model with indication of function allocation to each constituent layer.

As to the interface points, it was recognized necessary to distinguish between SAP (Service Access Point) which has rigorous definition in the OSI and the "common access point" discussed in AVC-618 which is of somewhat physical nature. Mr. Mr. J. Pihlaja drew attention to the fact that only UNI is physical and all others are logical in the network adaptation protocol model such as in Figure 1/AVC-606. The notion of "common access point", as claimed to be TS in AVC-628, was explained as the point where a multiplexed audiovisual signal can be interfaced with different transmission/storage media such as ATM, satellite, DSM. Mr. R. ter Horst informed the meeting of a European project which is going to define a physical interface for TS as part of its activities. The meeting recognized it desirable to standardize such an interface to facilitate service integration on B-ISDN once the configuration of network adaptation is established.

There was some discussion on the use of TS for audiovisual communication terminals. Some opposing views are based on that TS packet size is inefficient if cell boundaries of a TS packet and an ATM cell are to be aligned (a PES for a slice corresponds to about 3 TS packets at 4 Mbit/s on an average) and that two stage segmentation consisting of similarly sized TS packet and ATM cell is involved. On the other hand, supporting views are based on that implementation of TS packets from coded stream can be a direct process without PES processing, thus not complex, that PS has limitation in multiplexing capability of user data, and that commonality with existing services is most important.

As to the function listing, the following corrections to TD-5 were pointed out;

- CLP can not be supported in AAL 1.
- Start of the AAL 5 CPCS-PDU payload is always aligned with the start of a cell.

After document presentation and the above discussion, the meeting asked Mr. S. Dunstan to coordinate a small group to further discuss and produce a protocol model. The outcome is contained in Annex 3 in form of a protocol diagram with several notes and discussion summary description.

The meeting agreed on this protocol model encompassing MPEG PES/PS/TS and to accelerate its elaboration. However, TD-8 from AT&T proposed to leave room for incorporating other general network adaptation. One example presented was to accommodate 64 kbit/s audio for interactive services. In the interest of quick convergence, the meeting decided that it would reconsider the basic structure of the current protocol model only if contributions with sufficient technical consideration be provided by the next meeting.

At the closing session, Mr. Y. Kato stressed the necessity of study on cell loss correction for VBR taking into account the problems pointed out in §7/Annex 3. It was also discussed that the provisional "+/- 0.25 microsecond" jitter tolerance for T-STD obtained in the systems sub-group corresponds to the reference point with note 2 in Figure 1/Annex 3. Clarification was made that this value had been derived from remultiplexing characteristics assuming perfect transmission media.

8.2.2 Requirements to the network adaptation (AVC-607,609,611,613,625,629,630; TD-6,10,17,19)

AVC-607,609,611,613 presented three case studies on appropriate network adaptation for typical applications; high quality videoconferencing, AV communications using WS and TV program distribution. They indicated that the choice is dependent on application requirements.

The meeting discussed whether one solution for all AV services should be defined or multiple solutions instead depending on applications. Considering,

- that requirements to the network adaptation from applications are different, and
- that network performance may differ in different environments,

the meeting decided to take a profile approach for the network adaptation. Here "profile" is as defined in DTR 10000; a set of one or more base standards, and, where applicable, the identification of chosen classes, subsets, options and parameters of those base standards, necessary for accomplishing a particular function. At the closing session, it was raised whether performance (e.g. delay) be part of the parameters to define a profile. This should be studied.

AVC-630 and TD-19 raised the necessity of specifying jitter tolerance in the MPEG Systems. The meeting discussed where this should be stipulated and reached a conclusion that application standards are the place, H.22X (or H.32X) in our case.

Though one of the decisive factors for the choice of a profile is network performance, we could not obtain sufficient advice at the joint meeting with SG13 nor foresee its possibility in the near future. One way for proceeding is to make a couple of network scenarios and evaluate the network adaptation profile based on them. The meeting asked Mr. H. Radha and other collaborators to draft such scenarios by educated guess. The intermediate outcome is contained in Annex 4. This will be completed by the end of April 1994 through correspondence. These network scenarios are intended for internal use, but it is also expected that its exposure to the outside may induce comments from the network people.

Related to this modeling, Mr. J. Lynch informed the meeting of an ATM Forum project to test ATM switches and a simulation model for the network is available for this purpose.

8.2.3 Relation with MPEG Systems (AVC-621,622)

Relationship between H.22X and MPEG Systems is shown in the protocol model. Necessary parts of MPEG Systems, PES, PS and TS, are included in the model as constituent elements. MPEG Systems is interpreted as one of the base standards as in the above definition of "profile".

With this clarification, Rapporteur raised to take the common text approach also for MPEG-2 Systems. Its effect is to promote interworking among different applications in the deeper level of protocol stack by indicating wider support of the standard. Another rationale is that VBR video can not work correctly without support of MPEG Systems DTS/PTS.

After some discussion, the meeting agreed to recommend SG15 to decide application of the common text approach to MPEG Systems as well. If so decided, the corresponding ITU-T Recommendation will have a different number from H.22X, such as H.22W.

8.2.4 Draft Recommendation H.22X (AVC-620)

Draft Recommendation H.22X should be generated by enhancing the skeleton in AVC-620 for input to the May 1994 SG15 meeting; see §9.3 of this report.

AVC-620 raised some items to be clarified before generating texts;

- definition of SAP at the application/H.22X boundary
- inclusion of encryption function in H.22X
- use of PES or PS as protocol, necessity of acknowledgment in H.22X procedures

These should be further studied through correspondence before the next meeting.

8.3 TS delivery AAL (AVC-604,617,618,625,629)

AVC-617 provided a bit error/cell loss detection and correction method for a group of 47 TS packets. Mr. Y. Kato clarified that advantages of this method compared to the use of interleaver are in achieving shorter delay and detecting errors in each TS packet so that **transport_error_indicator** can be set.

During the discussion, there was a question if AAL 5 is applicable to real-time services. It was clarified that though AAL 5 was originally designed for high speed data transfer, it is also applicable to real-time services with the support of higher layers etc.

Specific AAL(s) for the TS delivery should be worked out in the context of general audiovisual support as discussed in §8.2.1.

If TS packets are delivered as a CBR bitstream, it is obvious that we can use AAL1 with or without optional cell loss correction FEC. AAL 2 is reserved for VBR, thus the delivery of VBR TS should also be by AAL 2, but the signal structure of TS in VBR is not clear. The meeting discussed this matter and reached a thought that the interval between consecutive TS packets determines whether a stream is CBR or VBR; it is CBR if the interval is uniform while it is VBR if the interval changes as time passes. On the other hand, it was clarified that MPEG Systems always assume a byte serial stream which is piecewise regular and linear. Definition of VBR TS needs further clarification.

Mr. R. ter Horst stressed that asynchronous byte streams be accommodated in the interface where bit clock and data valid signal are provided. The meeting was of the opinion that the logical specifications should first be settled.

The meeting noted the SG9's high interest in transmitting MPEG-2 CBR signals over ATM and necessary AAL(s). It recognized the necessity to have coordination between SG9 and SG15 in formulating requirements to AAL specifications.

8.4 Timebase recovery (AVC-618, 619, 628; TD-4,12)

The issue here is to synchronize STC between encoder and decoder through the time stamp SCR/PCR. The meeting decided to use the wording "timebase recovery" for this functionality.

Rapporteur presented a framework to understand the impact of jitter introduced by ATM networks (cell delay variation) in TD-12. A comment was given that audio decoding is much more sensitive to the sampling clock jitter. Requirements from the audio sampling clock and the color subcarrier are thought decisive for the timebase recovery performance. An update of TD-12 is contained in Annex 5, which was decided to be an input from this group to the joint sessions. It was also reminded that AVC-230 for the Stockholm meeting addressed jitter impact on color subcarrier recovery

AVC-628 provided simulation experiment results for the timebase recovery when 10 time stamps are sent per second. Mr. B. Haskell supplemented that a fast change of timebase during the transient period may give objectionable artifacts. The meeting appreciated this helpful work.

Though the experimental results in AVC-628 and estimations in TD-4 gave a clearer view to the issue, more quantitative evaluation works are required toward specifying jitter tolerance in an H-series Recommendation (see §8.2.2). It is also needed to quantify the network jitter performance. Contributions are solicited.

The meeting considered an open issue; how timebase can be recovered in VBR operation. Mr. G. Franceschini presented his idea extending the adaptive clock method to VBR; the timing relationships of a stream of variable length packets at variable intervals could be recovered by means of a 1 bit wide FIFO, similarly to the analogous method defined for CBR. No assumption of a common network clock is made in this method. Mr. B. Haskell pointed out that some constant rate information is necessary for timebase recovery, that it can be through a separate CBR channel, and that audio is usually of constant rate, hence it can be used for timebase recovery for VBR. He also reminded the meeting of AVC-315 for the New Jersey meeting which had discussed timing recovery in VBR.

9. Work plan and work method

9.1 Hardware trials (§8/AVC-553R, §8.2/AVC-578R, §8.1/AVC-598R)

Rapporteur reiterated that at least two independent hardware are necessary for the verification test, which is planned by mid-1995, and requested consideration of laboratories to commit.

9.2 Work method (TD-19)

The meeting confirmed the effectiveness of document and information distribution through the e-mail reflector which KPN-PTT Research had kindly installed for our activities; we will continue to rely on this communication method.

Mr. D. Schinkel has been kindly managing the e-mail reflector "sg15.avc@research.ptt.nl". He requested every registered member to consider dropping of those members who are not working in this field any more. Rapporteur requested members to install domestic reflectors in their countries to reduce the load of the mail server host.

It has been found that uuencoded Microsoft Word documents are not always reproducible due to conversion between Windows and Mac formats, drawings and other reasons. Members are requested to send a plain text version as well as a formatted version so that at least texts can be secured. It should be noted that for the plain text version, number of characters should be no more than 80 to avoid overflowing in some systems.

9.3 Preparation for the May 1994 meeting of SG15

A solid draft of H.262 should be input for the application of Resolution No. 1. The DIS version is used for this purpose.

Initial drafts of H.22X, H.32X, H.32Y and H.32Z should also be submitted. The meeting agreed on the following plan;

1) Each Editor circulates the first draft for comments by April 15.
2) Each Editor circulates the second draft for comments by April 30.
3) Input documents are completed by May 8 for submission to SG15.

9.4 Coordination with other groups

The meeting shortly discussed how to coordinate our work with that of the SA&A (Service Aspects and Applications) Sub-Working Group of the ATM Forum. It was recognized that information flow should be maintained between two groups to avoid duplicated work. The meeting welcomed an offer of Mr. Jeffrey Lynch, IBM, to participate in both activities of SG15 and ATM Forum and to substantially liaise them. It was also noted that some official aspects may be involved in the liaison, hence the word "substantially" is used here.

Coordination with SG9 on AAL matters should be considered; see §8.3 of this report.

9.5 Intellectual property

Rapporteur drew attention of the Experts Group members to the ITU-T request of filing H.262|MPEG-2 Video related patent statements on licensing policy AND patent information which should reach Rapporteur by the end of April.

10. Joint sessions with MPEG

10.1 Documents

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

TD-16 (revised)	Report of the discussion on network adaptation	MPEG94/134

In addition to these, the following AVC numbered documents are input to the joint sessions with individual sources; AVC-605, 614, 615, 617, 618, 622, 626, 628.

10.2 Representatives

The Experts Group is represented by the following members at the joint sessions with MPEG;

ITU-T EG	Mr. S. Okubo
Requirements	Mr. B. Haskell
Video	Mr. K. Sakai
Systems	Mr. S. Dunstan

10.3 Review of the joint sessions at the closing session

The meeting heard debriefing of each sub-group; Requirements (S. Okubo), Video (K. Sakai), Systems (S. Dunstan), DSM (C-C. Li). Recognizing the relevance of DSM-CC work to the SG15 audiovisual communication standardization such as H.23X, H.24X, the meeting requested Mr. C-C. Li to enlighten the group by providing a protocol model such as the one for network adaptation. The meeting also decided to advise WP1/15 of the MPEG DSM-CC activities with an indication of common text possibility.

11. Future meetings till March 1995

These should be registered at the May 1994 meeting of SG15 which will meet next in March 1995.

Meeting	Date	Place	Sole sessions	Joint sessions with MPEG
16th	July 1994	Norway	13-15 July	18-22 July
17th	Autumn 1994	Singapore?	2-4 November?	7-11 November
18th	Jan. 1995	Japan?	?	-

END

Annexes

Annex 1 Documentation
Annex 2 H-series AV terminals
Annex 3 Report of the discussion on network adaptation
Annex 4 Network performance parameters assumptions
Annex 5 Effects of jitter in timebase recovery

Participants of the fifteenth meeting of the Experts Group for Video Coding and Systems in ATM and Other Network Environments

Joint meeting with SG13 AAL 1&2 Group	14 March	Geneva
Sole sessions	16-18 March	Paris
Joints sessions with MPEG	21-25 march	Paris

Country	*Name*	*Organization*	*Geneva*	*Sole*	*Joint*
FRG	Mr. Bernard Hammer	Siemens		X	X
Australia	Mr. Stuart Dunstan	Siemens	X	X	X
Belgium	Mr. Olivier Poncin	BELGACOM		X	X
Canada	Mr. Methi Methiwalla	Bell Northern	X		X
USA	Mr. Barry Haskell	AT&T Bell Labs		X	X
	Mr. Nicholas S. Huslak	IBM		X	X
	Mr. Chia-Chang Li	AT&T Bell Labs		X	X
	Mr. Jeffrey Lynch	IBM	X	X	
	Mr. Scott Quinn	Bellcore	X	X	
	Mr. Hayder Radha	AT&T Bell Labs	X	X	X
	Mr. Richard Schaphorst	DIS		X	X
	Mr. Ali Tabatabai	Tektronix	X	X	
	Mr. Yi-Tong Tse	CLI		X	X
	Ms. Andria Wong	Bellcore		X	X
Finland	Mr. Risto Helkio	Bitfield Oy		X	
	Mr. Roy Mickos	Tampere Univ. of Technology	X	X	X
	Mr. Juha Pihlaja	Nokia Corporation		X	
France	Mr. Pierre de La Motte	INRIA		X	
	Mr. Jacques Guicahrd	CNET		X	X
	Mr. Bruno Loret	CNET		X	X
Italy	Mr. Guido Franceschini	CSELT		X	X
Japan	Mr. Yoshiaki Kato	Mitsubishi	X	X	X
	Mr. Yasuyuki Nakajima	KDD		X	X
	Mr. Sakae Okubo	NTT	X	X	X
	Mr. Kiyoshi Sakai	Fujitsu		X	X
	Mr. Tomoaki Tanaka	NTT	X		
Norway	Mr. Gisle Bjoentegaard	NTR		X	X
Nethrelands	Mr. Arian Koster	KPN-PTT Research			X
	Mr. Dolf Schinkel	KPN-PTT Research		X	
	Mr. Roel ter Horst	KPN-PTT Research	X		
UK	Mr. David Beaumont	BT	X	X	
	Mr. Geoff Morrison	BT	X	X	X
Sweden	Mr. Per Tholin	Telia Research	X	X	

Documents for the Paris meeting (16-24 March 1994)

Normal Documents

* Inputs to the joint meeting with SG13 as working documents

AVC number	*MPEG number*	*Purpose*	*Title (Source)*
AVC-598R	-	R	Report of the fourteenth Experts Group meeting in Daejeon and Seoul (October 27 - November 5, 1993) - Part I and Part II (Rapporteur)
AVC-599R	-	R	Report of the fourteenth Experts Group meeting in Daejeon and Seoul (October 27 - November 5, 1993) - Part III (Rapporteur)
AVC-600	N0659	R	CD13818-2 - Video (WG11 Editorial Group)
AVC-601	N0658	R	CD13818-1 - Systems (WG11 Editorial Group)
AVC-602	N0660	R	CD13818-3 - Audio (WG11 Editorial Group)
AVC-603	-	I	The teleseminar on workstation and computer networks (INRIA)
AVC-604*	-	I	About the ability of AAL type 1 for the transport of MPEG 2 signals (ITU-T SG9)
AVC-605	SC29 N710	P	Comments on ISO/IEC 13818-1 Systems CD (Australia NB)
AVC-606*	-	D	A layer model for H.22x, multimedia multiplex and synchronization for audiovisual communication in ATM environments (KPN, PTT Research - Netherlands)
AVC-607	-	I	Japanese contributions related to H.32X specifications (Japan)
AVC-608	-	D	Terminal specifications for high quality videoconferencing (Japan)
AVC-609*	-	D	Multimedia multiplex and AAL for high quality videoconferencing (Japan)
AVC-610	-	D	Terminal specifications for audiovisual communication using WS (Japan)
AVC-611*	-	D	Multimedia multiplex/AAL for audiovisual communication using WS (Japan)
AVC-612	-	D	Terminal specifications for broadcasting including CATV (Japan)
AVC-613*	-	D	Multimedia multiplex/AAL for broadcasting including CATV (Japan)
AVC-614	041	D&P	**bit_rate** field in VBR operation (Japan)
AVC-615	044	P	Comments for CD13818-2 I Draft Rec. H.262 (Japan)
AVC-616*	-	D	Cell loss correction method with low processing delay (Japan)
AVC-617*	054	D	Cell loss correction method in AAL for the transmission of MPEG 2 Transport packets (Japan)
AVC-618*	-	I&D	Issues related to the transmission of MPEG bitstreams over ATM (BT - UK)
AVC-619	-	D	Some H.32X audiovisual terminal issues (Australian UVC consortium)
AVC-620	-	D	Draft skeleton text for H.22X (S. Dunstan)
AVC-621	-	P	Recommendations on preparation of H.22x (IBM and AT&T Communications)
AVC-622	039	D&P	Evolution of H.22x - Multimedia multiplex to include MPEG-2 systems (IBM)
AVC-623	-	D	Draft skeleton text for H.32X (C-C. Li)
AVC-624	-	D	Draft skeleton text for H.32Y (S. Okubo)
AVC-625	-	R	Status report on the study of network adaptation (Rapporteur)

AVC number	*MPEG number*	*Pur-pose*	*Title (Source)*
AVC-626	SC29 N710	I	Belgian National Body comments on MPEG-2 CD's (BELGACOM)
AVC-627	-	D	General approach to H.32z (UK)
AVC-628	071	I	Simulation of Phase-Locked Loop for Jittered PCR's (AT&T)
AVC-629	-	R	Status report on AAL1&2 for video signal support (K. Yamazaki, Rapporteur for Q.6/13)
AVC-630*	-	P	Inclusion of MPEG TS-layer with jitter compensation in H.22X (KPN, PTT Research - Netherlands)

Abstract

[nnn] indicates MPEG Document Number MPEG94/nnn.

AVC-598R [-] Report of the fourteenth Experts Group meeting in Daejeon and Seoul (October 27 - November 5, 1993) - Part I and Part II (Rapporteur)

This document records the outcome of the Daejeon sole sessions held in October 1993.

AVC-599R [-] Report of the fourteenth Experts Group meeting in Daejeon and Seoul (October 27 - November 5, 1993) - Part III (Rapporteur)

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

AVC-600 [N0659] CD13818-2 - Video (WG11 Editorial Group)

This document contains Video part of CD which was put forward to the SC29 ballot in December 1994.

AVC-601 [N0658] CD13818-1 - Systems (WG11 Editorial Group)

This document contains Systems part of CD which was put forward to the SC29 ballot in December 1994.

AVC-602 [N0660] CD13818-3 - Audio (WG11 Editorial Group)

This document contains Audio part of CD which was put forward to the SC29 ballot in December 1994.

AVC-603 [-] The teleseminar on workstation and computer networks (INRIA)

This document describes a tele-teaching and videoconferencing system using workstations and computer networks including INTERNET, which is now used for tele-seminars and collaborative working.

AVC-604 [-] About the ability of AAL type 1 for the transport of MPEG 2 signals (ITU-T SG9)

This document provides SG9's opinion that AAL 1 is adequate for the transport of MPEG-2 CBR signals and its workplan that a Rapporteur Group will further examine the relevant contribution attached to this document.

AVC-605 [SC29 N710] Comments on ISO/IEC 13818-1 Systems CD (Australia NB)

A total of 135 comments are given to improve the text; most of them are editorial nature. Two items are requiring modification of semantics for PES packet stuffing_byte and stream_id table. Attention is drawn to the correction on time stamp equations in the STD description.

AVC-606* [-] A layer model for H.22x, multimedia multiplex and synchronization for audiovisual communication in ATM environments (PTT Research)

Two versions of detailed layer model for the network adaptation are presented; one with TS layer, the other without it. Objectives are to clarify the options and choices for H.22X in combination with MPEG Systems, to identify appropriate interface points and to provide a basis for the allocation of functions to layers and the specifications for these layers. Necessity of jitter margin specification in the standard is also pointed out.

AVC-607 [-] Japanese contributions related to H.32X specifications (Japan)

This is a lead paper for the subsequent six documents (AVC-608 to 613) presenting the case study results on typical applications on B-ISDN; high quality videoconferencing, audiovisual communications using work stations and broadcasting including CATV. Terminal specifications and network adaptation are addressed. How to integrate these specifications into a single Recommendation H.32X is pointed out as an issue.

AVC-608 [-] Terminal specifications for high quality videoconferencing (Japan)

This document describes H.32X mandatory and optional specifications covering various aspects such as applications, input/output equipment, number and kind of different media, control channel, video coding, audio coding, network adaptation, multipoint, multimedia synchronization, error handling. It is raised that a hierarchical structure of terminal classes is necessary; CIF/QCIF, ITU-R BT.610 and HDTV.

AVC-609* [-] Multimedia multiplex and AAL for high quality videoconferencing (Japan)

VBR operation for real time audiovisual communication (high quality videoconferencing) is discussed in terms of delay, packing efficiency and error resilience. It is stressed that multiplexing interval time is restricted for low delay operation, leading to a conclusion that the delay is not a decisive factor for the AAL choice. Several AAL solutions based on existing AAL 1, 3/4 and 5 are provided and compared in packing efficiency and error resilience. The choice depends on the network QoS.

AVC-610 [-] Terminal specifications for audiovisual communication using WS (Japan)

This document discusses the configuration of AV communication terminal using work stations. Some functions such as N-ISDN interworking, timebase recovery, FEC are made optional taking into account of network environments and application characteristics.

AVC-611* [-] Multimedia multiplex/AAL for audiovisual communication using WS (Japan)

This document presents a case study outcome for a class of application, audiovisual communication using work stations. Considering the requirements of delay, efficiency, picture quality, it is concluded that a combination of PES and AAL 5 is the most desirable choice.

AVC-612 [-] Terminal specifications for broadcasting including CATV (Japan)

This document discusses terminal specifications for the TV distribution services which are characterized by that the terminals are classified into CTV and HDTV classes, that the video data flow is one directional and that the decoded picture format will be restricted to the local format.

AVC-613* [-] Multimedia multiplex/AAL for broadcasting including CATV (Japan)

This document discusses an appropriate network adaptation for the TV distribution application. Assuming that MPEG Systems TS is used for this type of service, a solution of TS packets mapped on some AAL with FEC is concluded. It is also suggested that the network adaptation specifications may be classified according to the number of programs per TS or the bit rate.

AVC-614 [041] **bit_rate** field in VBR operation (Japan)

This document intends to clarify the VBR operation in H.262|ISO/IEC 13818-2 based on the CD texts, raising the following questions; **bit_rate** values that can be written when **vbv_delay** = FFFF, wording for the **bit_rate** semantics, transport buffer size being not sufficient, and consideration of start-up delay for the multiplex buffer. As to the **bit_rate** values in VBR, it is proposed to apply the same maximum values as those for CBR.

AVC-615 [044] Comments for CD13818-2 | Draft Rec. H.262 (Japan)

Editorial improvements with suggested wording as well as editorial corrections to Video CD (WG11 N0659, AVC-600) are listed.

AVC-616* [-] Cell loss correction method with low processing delay (Japan)

A closed form of cell interleaving matrix is provided for VBR applications. Its feature is that the user data can be transmitted in unit of 704 bytes. Detailed comparison of performance between the agreed open forma and this closed form is tabled.

AVC-617* [054] Cell loss correction method in AAL for the transmission of MPEG 2 Transport packets (Japan)

A cell loss/bit error correction method is provided to facilitate TS packets delivery over ATM. This method assembles 47 TS packets and add 2x47 bytes CRC and 2mx47 bytes RS parity, achieving alignment of TS packets and ATM cells, use of existing AAL 1 protocol and low delay.

AVC-618* [-] Issues related to the transmission of MPEG bitstreams over ATM (BT - UK)

To meet the urgent user requirement that MPEG-2 coded materials be delivered through ATM networks, three issues are raised which need solutions; common access point, support for MPEG timing, and an AAL for MPEG streams. Some candidate solutions are discussed with conclusions that TS packets be the prime interface point and that the support of jitter compensation at each ATM node is impractical and thus a generalized AAL for real-time VBR transmission be pursued.

AVC-619 [-] Some H.32X audiovisual terminal issues (Australian UVC consortium)

This document raises and discusses the following system aspect issues; 1) protocol configuration for the network adaptation, providing "Video and Audio CS", 2) PES multiplexing capacity and its relevance to H.22X functions when AAL is used and jitter compensation capability of AAL 1, 3) allocation of timebase recovery function to the "Video and Audio CS", 4) impacts of buffer location in the terminal on the rate control.

AVC-620 [-] Draft skeleton text for H.22X (S. Dunstan)

A list of sections and key items is given for H.22X. Some discussion items are also listed; definition of SAP at the application/H.22X boundary, inclusion of encryption function in H.22X, use of PES or PS as protocol, necessity of acknowledgment in H.22X procedures.

AVC-621 [-] Recommendations on preparation of H.22x (IBM and AT&T Communications)

This document presents the T1A1 view regarding the relationship between MPEG-2 Systems and the network adaptation, which supports to accelerate the development of the network adaptation of audiovisual signals to ATM transport by possibly adding H.22X specific functions that are not part of MPEG-2 Systems.

AVC-622 [039] Evolution of H.22x - Multimedia multiplex to include MPEG-2 systems (IBM)

After a brief review of H.22x (multimedia multiplex in H.32x terminal equipment) and MPEG-2 status in Study Group 15, this paper suggests that Study Group 15 capitalize on the MPEG-2 Systems Layer as a common enabling technology for both multimedia conferencing and video distribution. It concludes with a specific recommendation of adopting MPEG-2 systems as a fundamental component of H.22x.

AVC-623 [-] Draft skeleton text for H.32X (C-C. Li)

A list of sections and key items is given for H.32X.

AVC-624 [-] Draft skeleton text for H.32Y (S. Okubo)

A list of sections and key items is given for H.32Y including some questions.

AVC-625 [-] Status report on the study of network adaptation (Rapporteur)

This status report summarizes the activities of the SG15 Experts Group on the study of network adaptation (projected Rec. H.22X "multimedia multiplex and synchronization") and audiovisual signal transport AAL.

AVC-626 [SC29 N710] Belgian National Body comments on MPEG-2 CD's (BELGACOM)

This document lists comments to Systems and Video CD from Belgian National Body of SC29.

AVC-627 [-] General approach to H.32z (UK)

After a review of audio coding, video coding, multiplexing, transmission and call set up signalling for LAN environments, it is concluded that the best approach is to provide the equivalence of ISDN transmission over the LANs and make the minimum of modifications to H.320.

AVC-628 [071] Simulation of Phase-Locked Loop for Jittered PCR's (AT&T)

Simulation results are reported for the PCR recovery phase lock loop in terms of frequency error, frequency change step and phase error with parameters of initial frequency offset, initial phase offset, and peak-to-peak jitter. The PCR rate and oscillator update rate are both set to 10 Hz. The results show that the required extra buffering is 3 ms for timebase recovery plus 1 ms for accommodating the jitter, hence the timebase recovery in ATM environments is encouraging. It is concluded that more contributions on the expected performance of networks and the needed purity of the recovered clock are required to allow design of an optimized PLL.

AVC-629 [-] Status report on AAL1&2 for video signal support (K. Yamazaki, Rapporteur for Q.6/13)

This status report summarizes the activities of SG13 on the study of AAL 1 and AAL 2 (Rec. I.363).

AVC-630 [-] Inclusion of MPEG TS-layer with jitter compensation in H.22X (KPN, PTT Research - Netherlands)

Based on the discussion contained in AVC-606, the following is proposed; 1) to include the MPEG2 TS-layer in H.22X under the condition that the MPEG2 TS-layer shall handle timing jitter introduced by the network on an end-to-end basis, without time stamp correction in the network, 2) to study and specify jitter margins that clock recovery systems of H.22X shall meet and that shall be supported by the network on the User-Network Interface, 3) to liaise with ISO-MPEG to reach a common TS-layer for H.22X and other applications.

Temporary Documents

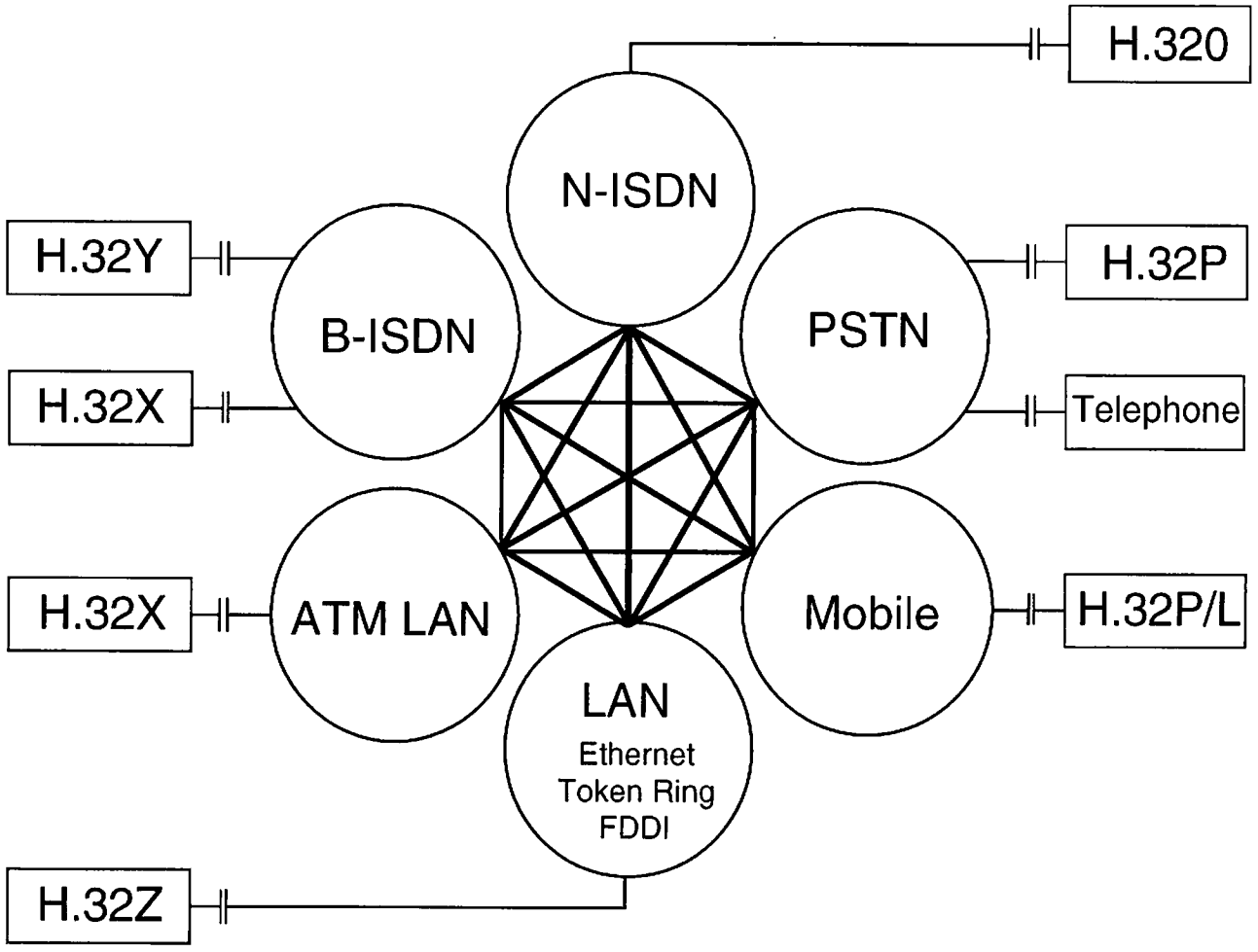
Number	*Source*	*Title*
TD-1	Rapporteur	Agenda for the sole sessions
TD-2	Rapporteur	Available documents for the Geneva/Paris meeting
TD-3	Rapporteur	H-series audiovisual terminals in different network environments
TD-4	Rapporteur	Correspondence on STC recovery in ATM environments
TD-5	Rapporteur	Network adaptation functions and their allocation
TD-6	Rapporteur	Memorandum on the outcome of the Geneva meeting
TD-7	Rapporteur	Functions of network adaptation
TD-8	AT&T	ATM network adaptation for MPEG-based audiovisual communication systems
TD-9	S. Dunstan	Report of discussion on H.22X/AAL
TD-10	Telia Research	Comparison of alternative ATM mappings for MPEG-2
TD-11	S. Okubo, K. Yamazaki	Draft report of the joint meeting of SG13 AAL Type 1&2 Group and SG15 Experts Group for ATM Video Coding
TD-12	Rapporteur	Effects of jitter in recovered timebase
TD-13	Sun Micro.	MPEG System stream encapsulation in AAL5
TD-14	K. Joseph	A rational ATM interface for AMS
TD-15	T. Bruner and M. Schwartz	Proposed requirements for a real time transport service
TD-16	S. Dunstan	Report of second discussion on H.22X/AAL
TD-17	H. Radha	Performance parameter assumptions
TD-18	D. Schinkel	List of correspondents
TD-19	R. ter Horst	Draft input proposal for MPEG meeting
TD-20	Rapporteur	Draft meeting report for the sole sessions in Paris

END

H-series audiovisual terminals in different network environments

Note 1 - All possibilities of interworking are indicated; some combinations might not be practical.

Note 2 - Currently H.32X is accommodated both in B-ISDN and ATM-LAN based on the assumption that their UNIs are very similar. This assumption should be deliberated.



Terminal	Network	Channel bit rate	Interface Protocol	Note
H.32X	B-ISDN ATM-LAN	up to several tens Mbit/s	AAL (I.363) ATM (I.361) Physical Layer	B-ISDN and ATM-LAN have different physical layers?
H.32Y	B-ISDN	64-1920 kbit/s	Circuit emulation AAL (I.363) ATM (I.361) Physical Layer	H.320 adaptation to B-ISDN
H.32Z	LAN	64-1920 kbit/s	TCP/UDP IP Physical Layer	H.320 adaptation to LAN (or LAN optimized terminal?)
H.320	N-ISDN	64-1920 kbit/s	I.451 (Q.931) I.441 (Q.921) I.430/431 Physical Layer	Existing N-ISDN terminals
H.32P	PSTN	up to 28.8 kbit/s	Modem (V.32bis, V.FAST) Analog telephone	Near term standardization
H.32P/L	Mobile Cordless	up to around 64 kbit/s?	?	Long term standardization

ISO/IEC JTC1/SC29/WG11
MPEG 94/134
21 March 1994

SOURCE : ITU-T Study Group 15 Experts Group for Video Coding and Systems in ATM and Other Network Environments

TITLE : Report on ATM Network Adaptation in the H.32X terminal

PURPOSE : Information

1. Introduction

The H.32X ATM network adaptation protocol model [1] has been further developed, and is shown in Figure 1. The model is a reference which identifies service boundaries and likely location of functions. It does not address a number of issues that a real terminal would have to deal with, nor does it constrain terminal implementation.

In Figure 1 a number of ATM Adaptation Layers (AAL) are shown. This indicates possible alternatives. A terminal is not meant to implement all choices. It is supposed that H.22X will be required to work with AAL type 1. For VBR (and CBR) operation AAL type 2 and 5 are proposed. It is anticipated that the two will be distinguished by their actions in the case of errors. Data with errors in unknown locations should not be passed to the video decoder. In this case AAL type 5 can only discard an errored service data unit. It is anticipated that AAL type 2 may be able to pass the unerrored part of an errored service data unit to the video decoder.

Concerning AAL type 5, it is assumed that for audio and video services, a Video and Audio Service Specific Convergence Sublayer (VASSCS) is required to supplement the service provided by the AAL type 5 Common Part Convergence Sublayer. This VASSCS might also be common to AAL type 2.

2. Service boundaries

It will be convenient to define a Service Access Point (SAP) at the H.22X/AAL boundary. However it is not clear at the moment that this will be easy to do at the elementary stream/H.22X boundary due to the interaction between these two parts.

While AAL type 1 provides a bit or byte transport service, an AAL type 2, and a possible AAL type 5, would notionally provide a packet transport service.

3. Reference points

In Figure 1, reference points at which each of the Program Stream and the Transport Stream must be logically valid are shown. At these points the Program Stream and Transport Stream are abstractions: there physical form is not specified.

4. Multiplexing

No multiplexing is required in the AAL as it duplicates one of the main functions of H.22X. Multiplexing at the ATM layer is also available.

5. Timing related issues

Timing recovery at the receiver is concerned with two aspects: one is recovery of the send terminal frequency, while the second deals with recovery of the time of day information. These two aspects may sometimes be achieved simultaneously.

It is not clear at the moment how clock recovery is performed in the case of delay jittered VBR signals. An understanding between the send and receive terminal of something being constant may be required. One proposal is to use a separate CBR VC carrying coded data, or possibly only timing information, for synchronisation of the receiver clock. The audio channel might be suitable for this purpose.

In the case of a network clock common to both the send and receive terminal, the SRTS can provide synchronisation between terminal clocks. The SRTS method is insensitive to delay jitter, and the issue of CBR or VBR is not important.

With respect to VBR, MPEG-2 Systems considers the signal to be stepwise constant: between two clock references the stream rate is considered to be constant. The frequency of clock reference insertion determines the degree to which the variable rate can be preserved. It is not possible to reconstruct the VBR signal beyond this stepwise constant model.

Study is required as to the compatibility of this step wise constant model with UPC mechanisms.

It is not clear as to whether explicit mechanisms to deal with delay jitter removal should be placed in new AALs, or whether jitter removal is performed within H.22X.

6. Rate control buffer

Rate control principally effects the video coder. While it is not certain that H.32X need say anything about the location of the rate control buffer, it seems clear that rate control is logically performed on the aggregate traffic within a VC. This does not restrict the location of the rate control buffer, provided that the terminal uses additional rules to satisfy the traffic contract.

7. Error detection/correction

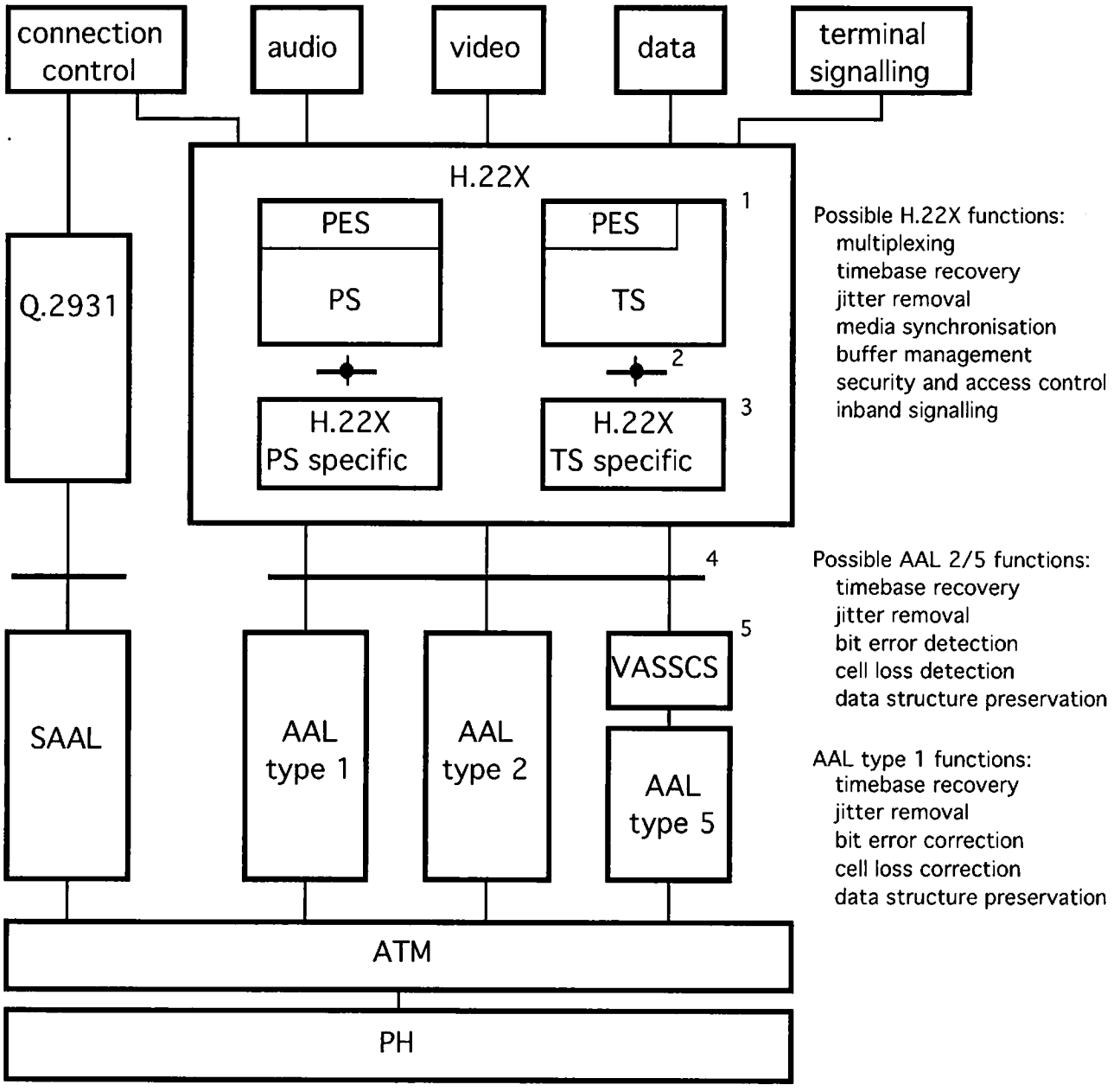
The general principle is that some minimum form of error detection is required. While the video decoder can detect some invalid codes, no guarantees can be made about what will happen in the case of errors. Received data in error should be discarded, or where the position of the error can be determined, passed to the decoder with error position information.

The view was expressed that error detection/correction is best performed at the Physical Layer, where mechanisms can be tailored to the actual medium. Mechanisms might also be applied within the user application, where there is knowledge about what is required. The AAL might be the last place to apply such techniques. Presumably however AAL mechanisms may be selected for a particular call or application.

Known block forward error correction methods may be inappropriate for variable bit rate operation, for two reasons. Firstly such a structure would give variable delay, although this may be tolerable. Secondly it may be that cell loss in a variable bit rate ATM connection occurs in bursts, which makes interleaving for cell loss compensation difficult. Burst lengths my depend upon terminal rate control mechanisms which are determined, perhaps partially, by the network UPC procedures.

Reference

[1] ITU-T Study Group 15 Exerts Group for Video Coding and Systems in ATM and Other Network Environments, Annex 5 to AVC-598R, Daejeon/Seoul meeting report (MPEG93/968).



Notes: 1. The Transport Stream may carry user data in Transport Stream packets, without using the PES packet syntax.

2. The Program Stream and the Transport Stream are logically valid at these respective points in the H.32X terminal (in the absence of channel impairments).

3. The H.22X Program Stream and Transport Stream specific parts represent procedures, parameters, or protocol beyond that specified by MPEG-2 Systems.

4. The H.22X/AAL service boundary.

5. VASSCS - Video and Audio Service Specific Convergence Sublayer. This is currently undefined.

Figure 1. Proposed H.32X network adaptation protocol reference model.

- end -

Performance Parameters Assumptions

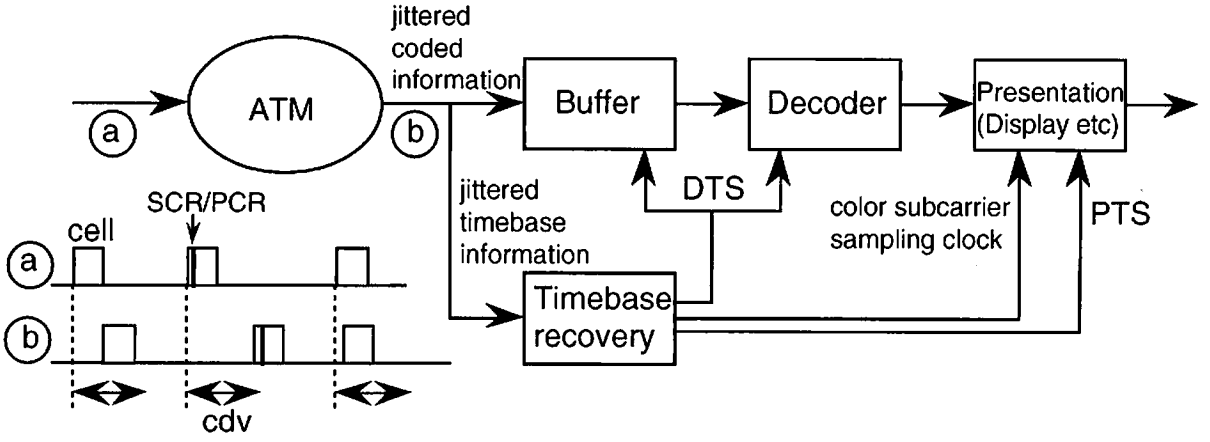
Parameters	CBR		
	Worst Case	Average Case	Best Case
Cell Loss Ratio (Without FEC)	10^{-6}	10^{-9}	10^{-11}
Cell Loss Ratio (With FEC)			
Consecutive Lost Cells			
CLC Event Interval Time			
BER	10^{-5}	10^{-7}	10^{-9}
Burst BER Events			
End-to-End Delay (UNI-UNI)		20 ms + propagation delay	
End-to-End Delay (ATM/AAL SAP)			
End-to-End Delay (ATM/H.22X SAP)			
CDV (UNI-UNI)			
SDU Delay Variation (ATM/AAL SAP)			
SDU Delay Variation (ATM/H.22X SAP)			

ITU-T SG15 Experts Group
Temporary Document No.12 rev (Paris)
March 18, 1994

ISO/IEC JTC1/SC29/WG11
MPEG94/133
March 1994

Source: ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments
Title: Effects of jitter on audiovisual system operation
Purpose: For information
Relevant sub-groups: Systems

This document sets out how the jitter introduced in the network affects the performance of audiovisual system operation. Though ATM is indicated as the source of jitter, the discussion is applicable to other sources of jitter. It is noted that "timebase recovery" is meant here as reproduction of STC at the decoder by use of SCR/PCR.

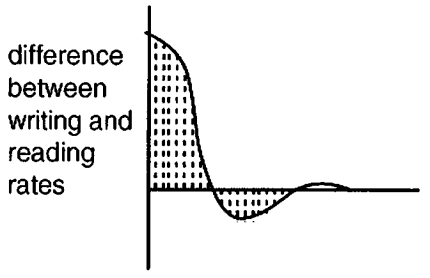


1. Effects of jittered arrival of coded information ==> additional buffer, hence additional delay

2. Effects of jittered arrival of timebase information

1) DTS with jitter

• difference between writing and reading rates of the buffer ==> additional buffer, hence additional delay



2) PTS with jitter

• lip sync ==> visible distortion, largely tolerable
• picture representation on display ==> visible artifacts

3) sampling clock with jitter

• color subcarrier in composite signal ==> visible color changes, stringent
• audio reproduction ==> audible distortion, stringent