AVC-639

INTERNATIONAL TELECOMMUNICATION UNION
TELECOMMUNICATION STANDARDIZATION SECTOR
STUDY PERIOD 1993-1996

Temporary Document 36 (1/15)
Revised at the WP1/15 meeting

Geneva, 16-27 May 1994

Questions: 2/15, 3/15

SOURCE: RAPPORTEUR FOR Q.2/15 (Sakae OKUBO)
TITLE : SIXTH PROGRESS REPORT OF THE EXPERTS GROUP FOR VIDEO CODING AND SYSTEMS IN ATM AND OTHER NETWORK ENVIRONMENTS

Contentes

1. General

We met twice since we had presented the fifth progress report (Annex 1 to COM 15-R 3-E) at the previous Working Party 1/15 meeting in September 1993;

Meeting	Sole Sessions	Joint sessions with MPEG
14th meeting in Korea	27-29 October 1993 in Daejeon at the kind invitation of ETRI	1-5 November 1993 in Seoul at the kind invitation of KBS
15th meeting in France (Note)	16-18 March at the kind invitation of France Telecom - CNET	21-25 March at the kind invitation of AFNOR

Note - In conjunction with this, we had a joint meeting with the SG13 AAL 1&2 Group on March 14 in Geneva. Its report is contained in a separate document TD-2 (1/15).

Our meetings have been synchronized with those of ISO/IEC JTC1/SC29/WG11 (MPEG) since May 1991. We have held joint sessions with MPEG as well as ITU-T sole sessions. Lists of participants of the two meetings appear in Annex to this report.

This document reports major achievements toward defining the following Recommendations of which we are in charge;

H.262	Video coding for ATM environments
H.22X	Multimedia multiplex and synchronization for ATM environments
H.32X	Broadband audiovisual communication systems and terminal equipment
H.32Y	Adaptation of H.320 terminals to B-ISDN
H.32Z	Adaptation of H.320 terminals to LANs

It also lists particular items which need consideration of Working Party 1/15.

2. Summary of the progress

We started with the video coding Recommendation H.262 and are now concentrating on the system aspects Recommendations as decided at the previous SG15 meeting (see Annex 3 to COM 15-R 3-E).

The current work is proceeding as planned in September 1993 (Annex 2 to COM 15-R 3-E); at this meeting we provide the solid draft for H.262 and initial drafts for H.22X, H.32X, H.32Y and H.32Z.

3. H.262 for video coding

3.1 Technical specifications

In November 1993, the specifications were finalized based on the bitstream exchange and other study results. In March 1994, some editorial refinements were made. The ITU-T Experts Group were particularly concerned with the following items;

- Handling of "big pictures" which may cause subsequent picture skipping

  Picture skipping is a tool to achieve low delay in the steady state which is useful for conversational applications. This is now clarified in the final specifications; picture skipping is supported in the single layer scheme, however it is disallowed in the scalable scheme. This implies that we need additional specifications beyond the current standard if H.261 is to be the base layer of the scalable coding.

- VBR operation

  Such parameters as vbv_delay, bitr_rate, STD_buffer_size have been clarified for VBR operations of the coding scheme.

3.2 Profiles and Levels

Definition of the subsets was slightly modified as follows, maintaining the total number of eleven conformance points ;

High Level		√			√
High-1440 Level		√		√	√
Main Level	√	√	√		√
Low Level		√	√		
	Simple Profile	Main Profile	SNR Scalable Profile	Spatially Scalable Profile	High Profile

Further profiles and levels, if necessity is identified, may be added in the future through the amendment procedures.

3.3 Text of Draft Recommendation

The current text of Draft Recommendation H.262|ISO/IEC 13818-2 is found in a separate document TD-29 (1/15) which is an update of COM 15-R 4-E.

ISO/IEC JTC1/SC29 put the outcome of the November 1993 meeting into CD ballot and made DIS at the March 1994 meeting. This will be put forward to the DIS ballot in June and IS will be made in November 1994.

3.4 Patent statement and patent information

In accordance with the decision made at the previous meeting (§4.2.1 i)/COM15 R 3-E), Rapporteur collected patent statements and information as detailed in a separate document TD-41 (1/15). Further efforts are required to complete this collection.

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4. Network adaptation

4.1 Protocol model of the network adaptation

We are now going to have video coding standard H.262 while ATM layer specifications have already been fixed. To connect these two layers, we need network adaptation (multimedia multiplex and AAL)

It should have such functions as;

- transfer of variable length data units. Interval between data units may be fixed or variable.
- multiplexing and synchronization of elementary streams
- capability to synchronize source and receiver clocks
- error detection and/or correction capability

In the audiovisual terminal these functions are to be distributed between;

- H.22X - multimedia multiplexing and synchronization (including common use of MPEG-2 Systems)
- I.363 - the ATM Adaptation Layer

taking into account the generic nature of AAL. As to the multimedia multiplex and synchronization, MPEG-2 "system coding" (projected International Standard ISO/IEC 13818-1) provides a packet and time-stamp based method.

Their relationship is shown as a protocol model in Figure 1 which is outcome of extensive discussions in the two meetings. This model has received wide support, but taking into account of some members concern for other general network adaptation and in the interest of quick convergence, we decided to reconsider the basic structure of the current protocol model only if contributions with sufficient technical consideration be provided by the next meeting in July 1994. Further notes and discussion summary for the protocol model are found in Annex 2 to this report.

4.2 Requirements to the network adaptation

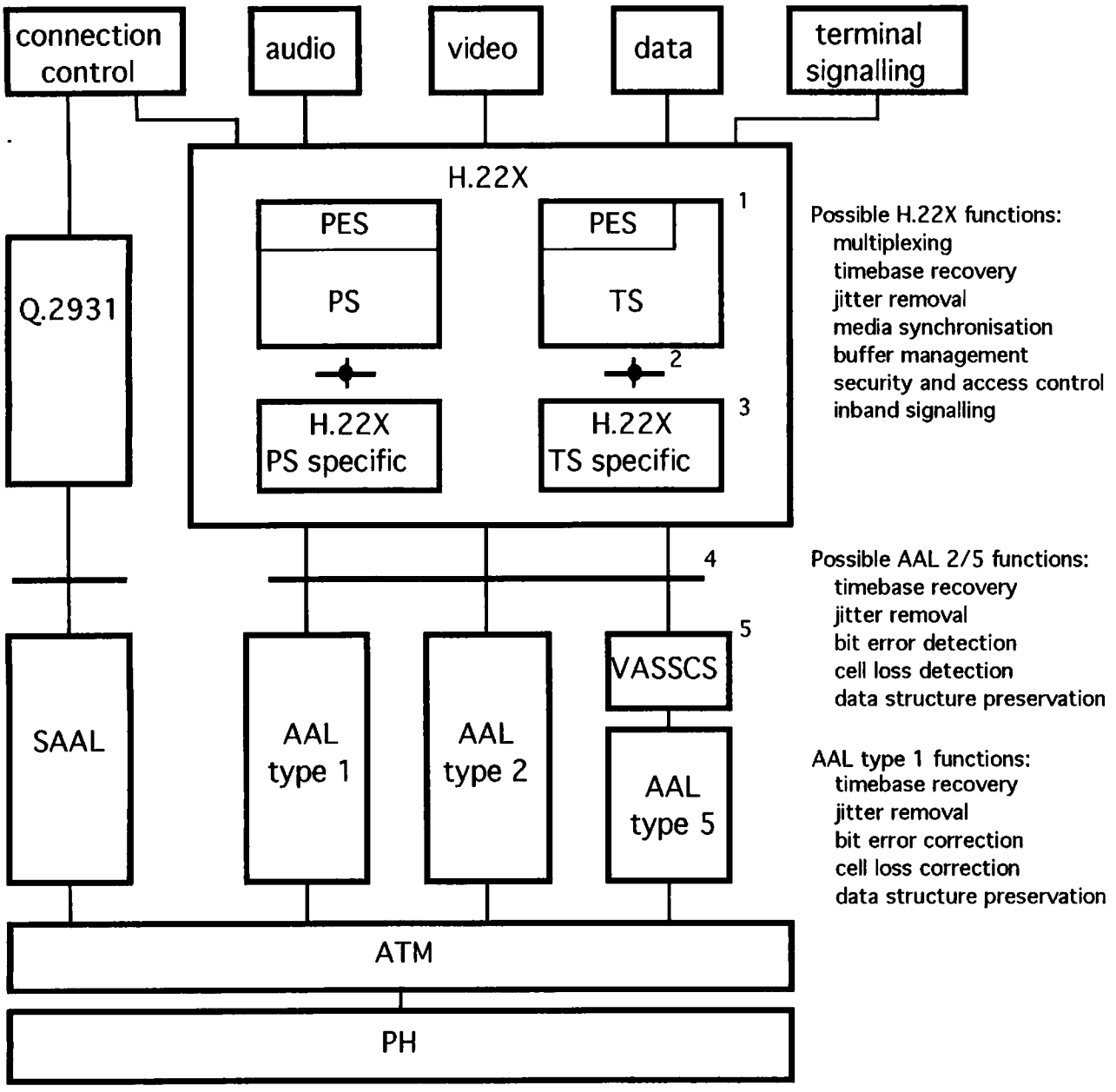
A set of contributions presented three case studies on appropriate network adaptation for typical applications; high quality videoconferencing, AV communications using WS and TV program distribution. They indicated that the choice is dependent on application requirements.

We 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,

we decided to take a profile approach for the network adaptation. Here "profile" is as defined in ISO/IEC 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.

Each profile of the network adaptation may be evaluated in terms of delay, packing efficiency, error resilience, timing recovery, implementation and functionalities.



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.

4.3 Network performance

Though one of the decisive factors for the choice of a profile as mentioned above 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 (worst, average, best cases) and evaluate the network adaptation profile based on them.

4.4 Relation with MPEG Systems

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 in the above definition of "profile".

With this clarification, we recommend SG15 to take the common text approach also for MPEG-2 Systems (ISO/IEC 13818-1). 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. The current version of specifications is provided as a separate document TD30 (1/15) which is going to be further edited at the June 1994 meeting of MPEG and subsequently put forward to the DIS ballot.

If so decided, the corresponding ITU-T Recommendation will have a different number from H.22X, such as H.22W.

4.5 Timebase recovery

The issue here is to synchronize STC (System Time Clock, 27 MHz) between encoder and decoder through the time stamp SCR/PCR (System Clock Reference / Program Clock Reference) in the ATM environments with cell delay variation. One critical question is whether practical designs can reduce jitter in the reproduced clock to a sufficient level within a reasonable time period. Another open issue is how timebase can be recovered in VBR operation.

4.6 Delivery of MPEG-2 Transport Stream packets

Given that it is required to deliver a Transport Stream across a number of systems, one part of which may be ATM/B-ISDN, an issue is what is the best way to adapt Transport Stream (TS) packets to the ATM/B-ISDN part of the link.

Specific AAL(s) for the TS delivery should be worked out in the context of general audiovisual support as discussed in §4.1 of this report.

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 yet to be clarified. We 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 work.

4.7 AAL matters

See the current study status in the separate report of the joint meeting with the SG13 AAL 1&2 Group.

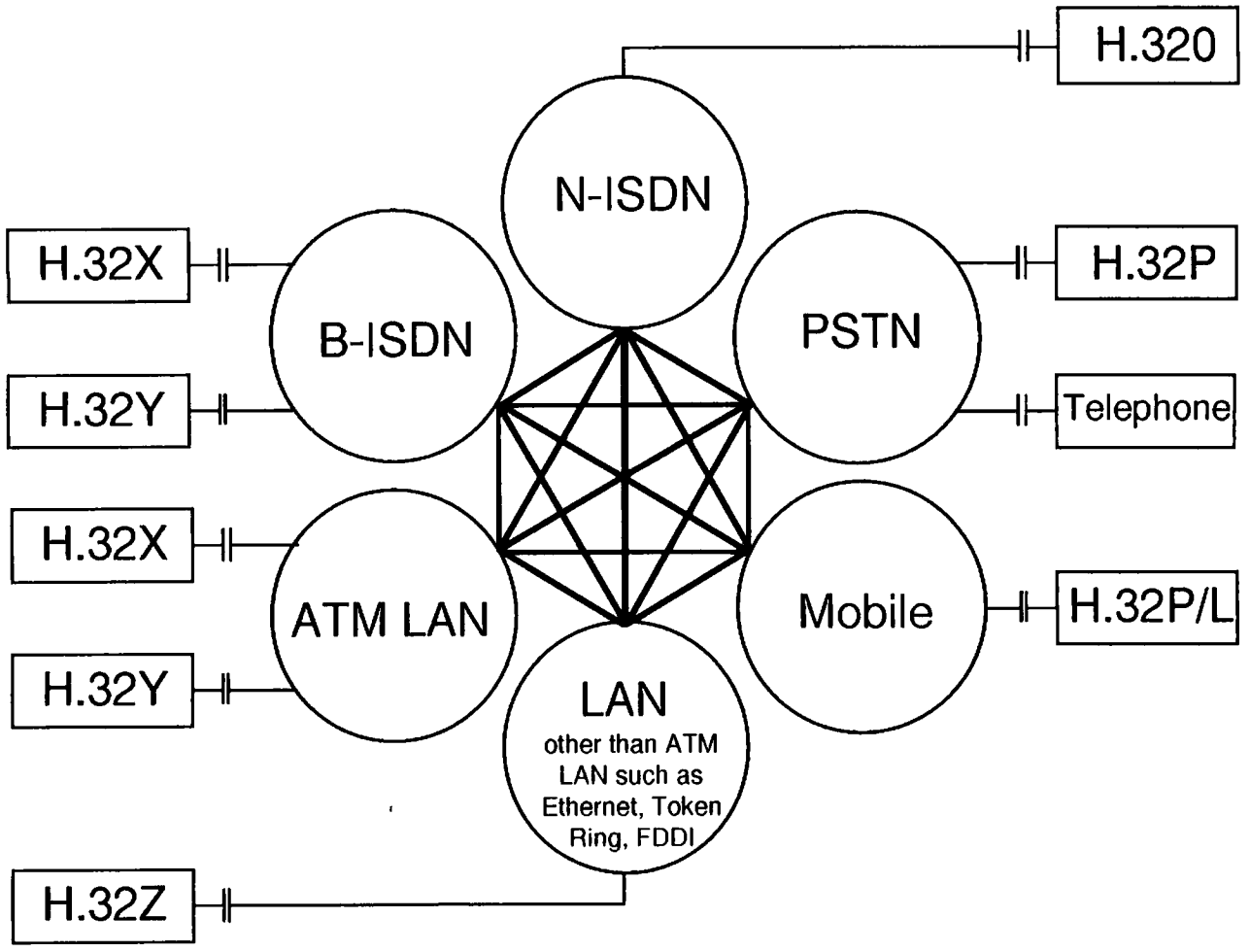
4.8 Draft Recommendation H.22X

The initial draft is submitted for the consideration of Working Party 1/15 as in a separate document TD37 (1/15).

5. Audiovisual communication terminals and systems

5.1 AV terminals in different network environments

Figure 2 indicates several networks and audiovisual communication terminals connected to them. Its complication suggests our work to establish interworking principles. In the point-to-point communication, there is only one solution that new terminals must emulate the existing ones. There may be difficulty, however, if systems of different generation are not arranged in hierarchy (e.g. lower bit rate H.32P is coming after N-ISDN H.320). In the multi-point case where different networks and different terminals are involved, we need careful consideration on the cost/performance of interworking.



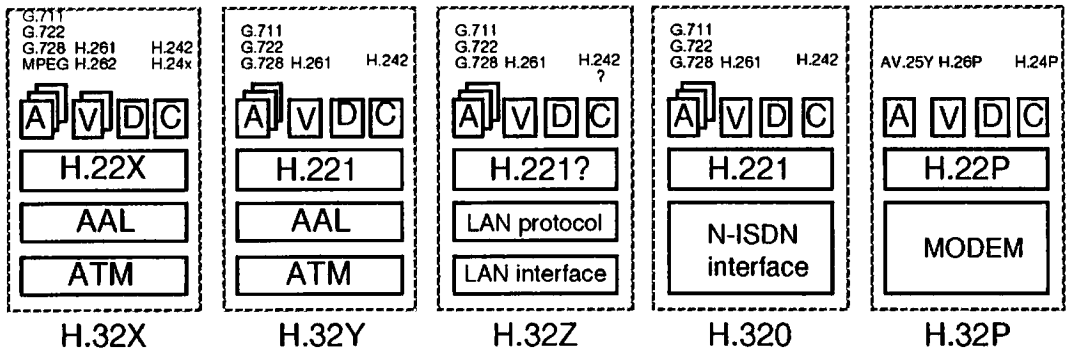


Figure 2 H-series audiovisual terminals in different network environments

Note 1 - All possibilities of interworking are indicated; some combinations might not be practical.
Note 2 - Interworking between different networks are through Interworking Functions and/or Gateways which are not included in this diagram.
Note 3 - 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.
Note 4 - "Guaranteed bandwidth" aspects are under consideration for LANs other than ATM.

5.2 H.32X for B-ISDN

The initial draft is submitted as a separate document TD38 (1/15). Editor's notes are contained to facilitate further development. Advice of Working Party 1/15 is sought on these open issues.

5.3 H.32Y for adaptation of H.320 terminals to B-ISDN

One of the open issues for H.32Y is 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.

Relevance to the "circuit emulation" services of the network need clarification. If the service provided at an interface point is identical to that of the N-ISDN with respect to inband as well as outband characteristics, no further work is necessary for H.320 terminal adaptation to B-ISDN.

The initial draft is submitted as a separate document TD39 (1/15). Editor's notes are contained to facilitate further development. Advice of Working Party 1/15 is sought on these open issues.

5.4 H.32Z for visual telephone systems and terminal equipment for LANs

At the October 1993 meeting, it was discussed whether H.221 be used for H.32Z. One solution is to use packet based multimedia multiplexing (may be new H.22Z) while the other solution is to encapsulate H.221 multiplexed signals into LAN packets. At that time, information on an implementation of audiovisual terminal for LAN application was provided with accompanied tape demonstration, covering protocol stack, congestion control techniques and interworking with H.320 terminals accommodated in N-ISDN.

At the March 1994 meeting, a view was presented 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 if the system robustness is taken into account, 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. After the discussion, we reached a provisional conclusion that the target for ITU-T Recommendatioon H.32Z be bandwidth guaranteed networks. This conclusion will be reconsidered only if differing views are presented with contributions by the next meeting in July 1994.

The initial draft is submitted as a separate document TD-40 (1/15). Editor's notes are contained to facilitate further development. Advice of Working Party 1/15 is sought on these open issues.

6. Work plan and work method

6.1 Hardware trials

We intend hardware verification trials which should take place in the final stage of standardization work to secure our Recommendations. Since video coding/decoding specifications are verified mostly through the bitstream exchange currently ongoing, our major task is to test a total system between two or more independently designed equipment. The date should be by the middle of 1995 so that the trial results be reflected in the final text. Interested organizations are requested to commit and contribute to materializing the plan.

6.2 Document and information distribution

We confirmed the effectiveness of document and information distribution through the e-mail reflector "sg15.avc@research.ptt.nl" which KPN-PTT Research had kindly installed for our activities after the October 1993 meeting; we will continue to rely on this communication method even it is not complete for distributing drawings.

For distribution of thick documents etc. which are not appropriate for e-mail distribution, a person per country is acting as her distribution point.

6.3 Editor for each target Recommendation

The following members volunteered to act as editor for each target Recommendation;

H.26X	S. Okubo*	GCL, Japan
H.22X	S. Dunstan	Siemens, Australia
H.32X	C-C. Li	AT&T, USA
H.32Y	S. Okubo*	GCL, Japan
H.32Z	G. Morrison	BT, UK

* provisional until a volunteer is found

Editor's tasks are as follows;

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

7. Future activities (ITU-T sole sessions / Joint sessions with MPEG)

The following is planned;

Meeting	Date	Sole sessions	Joint sessions with MPEG
16th	July 1994	13-15 in Norway	18-22 in Norway
17th	November 1994	2-4 in Singapore	7-11 in Singapore
18th	January 1995	in Japan	-

8. Specific items requiring the consideration of Working Party 1/15

8.1 Intellectual property processing for H.262

Though Rapporteur has made efforts to collect all the statements, some are still missing. Study Group 15 is requested to take appropriate actions to secure this statements collection.

8.2 Commitment in the hardware trials

We need commitment of the member organizations.

8.3 Advice on open issues for Draft Recommendations

There remain several points which are fundamental for further elaborating the texts as indicated in the initial drafts.

8.4 Common text approach to the ISO/IEC 13818-2 (MPEG-2 Systems)

Decision of Study Group 15 is requested. If so decided, a specific number should be allocated to H.22W, and a liaison statement to SC29 should be sent.

8.5 DSM-CC activities in MPEG

The Digital Storage Media Command and Control (DSM-CC) protocol is a specific application protocol intended to provide the basic control functions and operations specific to managing an ISO/IEC 13818 (MPEG-2) bitstream on digital storage media. This is to perform such operations as set up connection, selection of non-multiplexed bitstreams, playback, storage, edit, information request. Extension of the current specifications included

in the MPEG-2 Systems (ISO/IEC 13818-1) are planned. Further details are in Annex 4 to this report.

DSM-CC is a kind of C&I signals in the SG15 language. To achieve the maximum interworking of the audiovisual systems, SG15 should take into account of this MPEG activity in its work plan. A possible way is to take another common text approach for this standard.

8.6 Editorial corrections to Draft H.262

ITU-T members are requested to review the text of H.262|ISO/IEC 13818-2. Since ISO/IEC work is going to be finished in November before the next SG15 meeting in March 1995, the ITU-T review results should be properly reflected in the text. We seek advice on the procedure to implement this.

8.7 Guidance for the interaction with the ATM Forum

The ATM Forum is now working in the area of Service Aspects and Applications which has close relevance to the work of the Experts Group. We seek advice of SG15 for proper ways of interaction.

8.8 Initiation of H.24X work

Communication procedures similar to H.242 for the N-ISDN terminals are to be developed concurrently with other Recommendations. A framework should first be established covering such items as; physical channel (bit rate, message format, etc.), timing relationship with audiovisual signals, negotiation principles, message contents. Relevance to the above mentioned DSM-CC should also be considered.

END

Annex 1 to the sixth progress report - List of participants

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

Country	*Name*	*Organization*	*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

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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 Guichard	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
Netherlands	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	

Annex 2 to the sixth progress report

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

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).

Annex 3 to the sixth progress report - DSM-CC documents

INTERNATIONAL ORGANISATION FOR STANDARDISATION
ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC1/SC29/WG11
CODING OF MOVING PICTURES AND ASSOCIATED AUDIO

ISO/IEC JTC1/SC29/WG11 N0683
MPEG 94/150
March 1994

Source: Leonardo Chiariglione - Convenor
Title: Call for contributions for DSM-CC Extension
Status: Approved at 26th meeting

The Digital Storage Media Command and Control (DSM-CC) protocol is a specific application protocol intended to provide the basic control functions and operations specific to managing an ISO/IEC 13818 (MPEG-2) bitstream on digital storage media. The current specification is included in MPEG-2 Systems as a normative annex and only covers syntax and semantics for single user to DSM applications. With the technical achievements of MPEG, there is an increasing interest in applying MPEG in a more diverse network environment for many different applications. Examples of applications include

Video player/server
Digital editing
Conversational video
Games
Collaborative multimedia
Video shopping
Business applications
Server-to-server communications
Multimedia database browsing
Education
Audio-only (digital radio)

An extension of the current DSM-CC protocol for supporting these appl ications in heterogeneous network environments has been authorized and is current ly planned to attain Working Draft (WD) status by November, 1994, and Committee Draft (CD) status by July, 1995. The results of this work will be combined with other parts of I SO/IEC JTC1/SC29/WG11 (MPEG) standards. A requirements document (ISO/IEC MPEG 94/151) has been produced to provide the guidelines for this work. The most constructive contribu tions will comply with all the requirements. However, it is also highly encouraged to submit con tributions that meet only part of the requirements. Comments on the requirements document itse lf are also welcome.

Invitation is extended to all interested parties to submit their cont ributions. The contributions must be received before 7 July 1994, to be considered at the 27th mee ting of ISO/IEC JTC1/SC29/WG11, which will be held on 18-22 July 1994, at Grimstad, N orway.

Please submit contributions to:

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ORGANISATION INTERNATIONALE DE NORMALISATION
ISO/IEC JTC1/SC29/WG11
CODING OF MOVING PICTURES AND ASSOCIATED AUDIO

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The Digital Storage Media Command and Control (DSM-CC) extension must satisfy the requirements listed below. Although many of the requirements are sta ted using client-server terminology, this is not a requirement of the extension.

1. Control of MPEG streams in both standalone and distributed envir onments with the following characteristics:

- Multi-server

A DSM-CC client may request service from multiple servers. The envir onment also contains servers communicating with other servers.

- Multi-session

A DSM-CC client has the ability to have multiple simultaneous calls i n progress.

- Multi-client

A single piece of material may be accessed concurrently or sequential ly by multiple clients.

- Connectivity

- Broadcast =09- Point-to-point
- Multicast
- Multi-point to multi-point

- Multiprotocol

A client may request service of multiple servers, where each communic ation path may cross multiple diverse network protocols. These underlying netwo rk protocols must be transparent to the DSM-CC extension.

2. The extension must provide support for:

- Assembly and editing

Ability to request an MPEG stream composed of multiple segments distr ibuted across both servers and time. For example, sequential play of indivi dual segments or simultaneous play of multiple segments may be requested by DSM-CC clients. Assembly functions must include the ability to store segments on DSM -CC servers which support it.

- Service setup, including call setup.

Preferably, the extension should be able to exist in environments wit h existing network call/connection setup and control protocols, such as Q.2931.

- Inquiry, request or negotiation of service

The extension must be able to communicate with the distributed enviro nment. Examples of service characteristics include but are not limited to:

Quality of service :
- Network delay
- Network jitter
- Bandwidth available in support of both CBR and VBR
- Error characteristics

Capabilities:
- remuxing
- audio/video (resolution, number of audio channels)
- security controls
- storage

- Naming and addressing

Both elements of the distributed environment and material (e.g. compr essed audio-video) transmitted in that environment must be able to be named in a generic manner. This includes purely opaque naming (the ability to t ake a binary handle from an external source for both the storage and retrieval of material)

- Authentication and authorization

Though authentication and authorization are not provided by the exten sion, it should provide the ability to use external facilities and standards.

3. The extension must itself be extensible:

- Private added-value

DSM-CC implementors must be able to enhance chosen parts of the funct ionality of the extension while still using all other parts of the extension u nchanged.

- Future standards extensions

Changes to the DSM-CC or the underlying protocols (e.g. compression o r network) should be reasonably accomodated.

4. The extension must be applicable to low and high cost levels, e. g.:

- Decoders

The extension must be able to be implemented on consumer devices with limited memory (e.g. <2 MB total system memory), cpu capability (e.g. <20 Mip s) and no local persistent storage (e.g. no magnetic disk).

- Workstations

Features may be present which are only applicable to full featured sy stems with large amounts of memory or cpu processing power (e.g. real-time strea m re-multiplexing). Features in the DSM-CC extension may also be present which require local persistent storage. Any features provided beyond the b ase mandatory functionality must be clearly delineated.

5. The extension itself must be robust, suitable for deployment of production applications:

- Error handling

The system must report and take approriate action in all cases, inclu ding network failure, server failure, and data or command corruption.

- Delay independence

The extension must allow for applications to function in latency sens itive and latency insensitive networks. For example, applications which requir e very short response times (e.g. highly interactive games) should be able to use the extension as well as applications running on large distributed networks (e.g. t he Internet).

- Flow control

There should be flow control for DSM-CC commands, either provided exp licitly or implicitly through the underlying network protocol. For example, if the DSM-CC extension resides on a network protocol which does not provide flo w control, it must ensure that an acknowledgement be received before the next me ssage is sent. However, this overhead should not be incurred on network proto cols which support flow control.

- Deadlock detection and avoidance

6. The extension should both use and not conflict with existing sta ndards to the largest degree possible. Example standards which exist for distributed environments include:

- Naming (e.g., X.500)

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- Authorization and authentication standards (e.g., DCE)

- Remote procedure call (RPC) (e.g., DCE, ONC, ISO RPC 11578 DIS)

- Multimedia information storage, retrieval and exchange (e.g., MHEG, IMA)

- Collaborative multimedia (e.g., ITU-T recommendations)

If a deviation from a standard is proposed, a justification for that deviation must be supplied.

7. The extension must support all MPEG stream types:

- MPEG 1 and 2
- Program, transport and elementary streams

8. It is desirable but not required that the extension be forwards and backwards compatible with the existing DSM-CC in MPEG-2 specification.