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

Contents

1. General

We met three times since we had presented the sixth progress report (Annex 3 to COM 15-R 16-E) at the previous Working Party 1/15 meeting in May 1994.

Meeting	Sole Sessions	Joint sessions with MPEG
16th meeting in Norway	13-15 July 1994 at the kind invitation of Norwegian Telecom Research	18-22 July 1994 at the kind invitation of Norwegian Standards Association (NSF)
17th meeting in Singapore	1, 3 and 4 November 1994 at the kind invitation of Singapore Telecommunications Limited	7-11 November 1994 at the kind invitation of Singapore Institute of Standards and Industrial Research (SISIR)
18th meeting in Japan	24-27 January 1995 at the kind invitation of Ministry of Posts and Telecommunications	-

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 three meetings appear in Annex 1 to this report. At the three sole sessions, we reviewed 42, 34 and 36 contributions, respectively.

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

H.262	Generic video coding for ATM environments
H.222.0	Generic multimedia multiplex and synchronization
H.222.1	Multimedia multiplex and synchronization for ATM environments
H.24X	Multimedia system control
H.32X	Broadband audiovisual communication systems and terminals
H.32Y	Adaptation of H.320 terminals to B-ISDN
H.32Z.1	Visual telephone systems and terminal equipment for Local Area Networks which provide a guaranteed quality of service

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

2. Summary of the progress

As planned in September 1993, the two common text Recommendations H.262, H.222.0 which have been produced collaboratively with MPEG are put into the Resolution No. 1 procedure at this meeting, and the remaining set of Recommendations for broadband audiovisual communication systems are intended to reach that status in November 1995.

3. H.262|ISO/IEC 13818-2 for video and H.222.0|ISO/IEC 13818-2 for systems

3.1 Draft Recommendations

Draft H.262|ISO/IEC 13818-2 for video coding and H.222.0|ISO/IEC 13818-2 for systems coding have been worked out as common text Recommendations | International Standards between ITU-T SG15 and ISO/IEC JTC1/SC29. At the joint meeting sessions between ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments and ISO/IEC JTC1/SC29/WG11 (MPEG) which were held in November 1994 in Singapore, all of the comments to the draft specifications in COM 15 -R18-E and COM 15 -100-E from both of ITU-T members and ISO/IEC JTC1 National Bodies were reviewed and modifications were made (see separate TDs). In the ISO/IEC JTC1 side, the revised texts were elevated to International Standard in November 1994.

3.2 Patent statements and information

Those organizations which indicated to possibly hold patents relevant to H.262 and H.222.0 have been requested to submit their patent licensing policy statements and provide patent information. The outcome is summarized in a separate document (TD-46).

4. Network adaptation

4.1 Protocol model of the network adaptation

Network adaptation is a part of the terminal which connects between the elementary stream (such as audio, video) layer and the ATM layer as illustrated in Figure 1. Functions provided by the network adaptation includes the following:

- multiplexing
- timebase recovery
- jitter removal
- media synchronization
- buffer management
- security and access control
- inband signalling
- bit error correction
- cell loss detection
- data structure preservation
- transmission clock recovery

Major issues are appropriate distribution of these functions to each layer in Figure 1 and use of different tools in each layer.

4.2 Profiles of the network adaptation

Considering different requirements to the network adaptation from applications and different network performance in different environments, we decided to take a profile approach for the network adaptation. The objective is to provide a limited number of well defined interworking capability sets. A single main profile and two simple profiles shown in Figure 2 cover the current proposals for delivery of CBR audiovisual signals.

4.3 Cell loss and bit error correction

In the absence of firm data on the network performance, we made some scenarios based on the educated guess; worst case, average case and best case. As far as CBR services are concerned, our conclusion is that cell loss has subjectively negligible impacts on the reproduced signal, whereas the bit error needs some protection.

We therefore need a service specific forward error correction for bit errors. The lowest layer in the model where it can be placed is either the AAL-CS or the H.222.1 specific layer. As the AAL-SAR and AAL-CPCS should be generic, we concluded that the H.222.1 specific layer is the appropriate one. It should be noticed that the name giving of this layer is arbitrary: it may be indicated as H.222.1 specific layer (H.222.1 SL) or the Service Specific part of an AAL-CS (AAL-SSCS). In this document we will further indicate it as H.222.1 SL/SSCS.

The FEC and FEC framing are conditional: they are mandatory in the case of transmit and receive terminals (conversational), H.32X terminal types A2 and B2. For receive only terminals A1 and B1 and interworking mode between A2/B2 and A1/B1 further study is needed.

We concluded that in our model also the compensation for cell delay variation (CDV) is appropriate in the H.222.1 SL/SSCS. The purpose of the CDV compensation function in the receiving terminal is to deliver the user information - MPEG transports stream (TS) or program stream (PS) - to the MPEG/H.222.0 decoder, conforming to the MPEG/H.222.0 real time interface (RTI) specification. In the constant bit rate (CBR) case, this may be achieved by an adaptive clock method once the bit rate of delivery is known.

A detailed configuration is shown in Figure 3 for AAL1 and AAL5 solutions, addressing bit error correction and removal of cell delay variation.

4.4 AAL matters

Choice of AAL for broadband audiovisual services have been discussed with respect to whether AAL1 or AAL5 for CBR is appropriate and what should be AAL2 for VBR. This has been also stimulated by the recent ATM Forum decision to use AAL5 for CBR MPEG coded VoD services. Our position is to cover these two in form of network adaptation profile as mentioned in §4.2 above.

Mapping between TS packet and AAL was discussed based on the ATM Forum solution. We agreed to reflect this solution in H.222.1, noting that this particular mapping is for VoD services.

4.5 Error free transport for H.24X signalling

We need an error free transport mechanism for secure H.24X capability exchanges. A suitable protocol stack has been investigated and the current conclusion is to use X.214 services by the support of X.224 class 0 on top of LAPF (Q.922). We are seeking alignment with PSTN videophone H.24P and T.120. One of the proposed action is to seek SG8 advice.

4.6 Multiple VCs

The issue is whether we embed T.120 data in a subchannel of the H.222.1 multiplex or use a separate VC for this purpose. SG8 advocates the separate VC solution. In the absence of information on the future tariff structure, we decided to make provisions for both the single VC and separate VC solutions to handle T.120 data. The choice should be negotiated at the start of the call.

5. Terminal control and identification

5.1 C&I signals

We identify the following categories of C&I signals in the broadband audiovisual communication:

- Video frame synchronous signals
- H.24X capability exchange signals
- H.230 like signals
- DSM-CC signals
- Mode change control signals

The issue is through what channels these signals be transported. We will provide H.222.1 multiplex subchannels as a default means. Some of the C&I signals may be transported through a separate channel other than the H.222.1 multiplex in asymmetrical communication.

Since the exact relationship between DSM-CC and H.24X is unclear, the development of H.24X will proceed independently of DSM-CC at this stage.

5.2 Channel for H.24X capability signals

There was a proposal for the a separate VC for use by H.24X. We discussed whether H.24X signalling be inside or outside the H.222.1 multiplex and relevance to user-network signalling. The current consensus is:

- H.32X must support the use of one VC.
- H.32X should also support the use of multiple VCs, as required by the user or application.

It is also supported that speech should be made available as soon as the called user responds to the incoming call in conversational services, as occurs in H.320.

5.3 Requirements to the user-network signalling

There was a specific proposal for VoD services that indications of PS or TS selection, profile and selection request correlation ID should be placed in the Q.2931 B_LLI information element.

A guiding rule for this signalling was discussed and concluded that only essential elements should be indicated in Q.2931 which were determined to be terminal type and the start up options as shown in Table 1.

Table 1. Terminal type indication and start up indications in Q.2931

Terminal type	Start up options2
H.32X A1 & B11	PS TS
H.32X A2 & B2	no multiplex3 PS TS
H.32Y	-4
H.320	-4

Notes:

1) The H.32X receive only terminal does not use H.24X. This may not always be true.
2) If the FEC is used with the PS or TS, then it is assured that it is always used at the transmitter. It may of course be another option to be indicated.
3) "no multiplex" implies that only the H.24X protocol stack uses the VC.
4) H.32Y and H.320 use H.221 by default.

This item should be further considered in the context of general terminal identification at the start of the communication.

6. Draft Recommendations

The following members are acting as editor for each target Recommendation;

H.222.1	S. Dunstan	Siemens	Australia
H.24X	M. Nilsson	BT	UK
H.32X	C-C. Li	AT&T	USA
H.32Y	H. Radha	AT&T	USA
H.32Z.1	G. Morrison	BT	UK

6.1 H.222.1

Draft text is in a separate document (TD-48). H.222.1 includes definition of stream id and descriptors which are beyond the scope of H.222.0, namely those specific to ITU-T applications.

6.2 H.24X

Draft text is in a separate document (TD-49). ASN.1 representation is used. Alignment with H.23P should be sought since both address capability exchanges in packet based multiplex system.

6.3 H.32X

Draft text is in a separate document (TD-50). It is noted that transfer rate is represented in nx64 kbit/s. This is due to the wide freedom of transfer rate choice in B-ISDN. Mandatory mode of interworking with existing H.320 terminals are being discussed; currently all of B, 2xB, H0, H11, H12 must be supported.

6.4 H.32Y

Draft text is in a separate document (TD-51). Currently the H.32Y terminal uses AAL1, but possibility of adaptation by use of AAL5 has been raised. This needs be further considered.

6.5 H.32Z.1

Draft text is in a separate document (TD-52). There was extensive discussion whether H.32Z address only LANs with guaranteed bandwidth or include other LANs. We reached the following conclusion:

- H.32Z is split into H.32Z.1 for GBW (guaranteed QoS) LANs and H.32Z.2 for NGBW (other than guaranteed QoS) LANs.
- H.32Z.1 indicates examples of guaranteed QoS LANs; Iso-Ethernet, FDDI, etc.
- We freeze H.32Z.1 in February, indicating the plan to subsequently generate H.32Z.2 in the scope.

Further commitments are solicited for producing H.32Z.2 and possibly H.22Z.

7. Work plan and work method

7.1 Hardware trials

Four organizations (GCL, KDD, NTT, Sharp) in Japan are preparing for the field trial before November 1995. New volunteers are encouraged to participate. The specifications of this trial are contained in Annex 2.

7.2 Harmonization with other group activities

We discussed how to collaborate with MPEG on DSM-CC and RTI.

We identified that DSM-CC will constitute an essential element of H.32X A1 and B1 terminals and need alignment with H.24X signalling. Though some members expressed concern for lack of expertise in the current Experts Group regarding application protocols, we concluded that ITU-T SG15 should make commitments in the development of DSM-CC specifications. We will request advice of SG15 in this respect, suggesting tentatively to seek the common text approach.

As to RTI, we concluded it appropriate for us to seek another common text Recommendation which complements H.222.0.

Since it is not practical to have synchronized meetings this year, we decided to collaborate with MPEG by sending delegates to the MPEG meetings.

7.3 Future activities

The following is planned;

Meeting	Date	Place
19th	15-18 May 1995	Telia Research, Stockholm
20th	week of 23 or 30 October 1995	to be determined

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

1) Alignment among H-series Recommendations

The work of audiovisual communication systems for B-ISDN and PSTN have some similarities in the technical elements such as inband signalling and error free protocol stack. Guidance is sought to what extent we should seek commonality.

2) Terminal identification

To promote interworking among different type of terminals in the same or different networks, we need a mechanism to identify the remote terminal at the start of the call. This may be through outband signalling or inband signalling. Appropriate function allocation should be studied.

3) Interworking modes between H.32X and H.320

Advice is sought on the choice of mandatory interworking modes.

4) Commitment in the hardware trials

We need further commitments of the member organizations.

5) Cooperation with MPEG

Guidance for the work of DSM-CC and RTI is requested. If common text is appropriate, the indication to ISO/IEC JTC1/SC29 is requested.

6) Guidance for the interaction with CFBs

The activities of The ATM Forum and DAVIC are closely related to our work in WP1/15. Currently the participants in both parties are acting to substantial liaise. Some correspondence is also being exchanged. We seek advice of higher bodies on the proper way of cooperation.

END

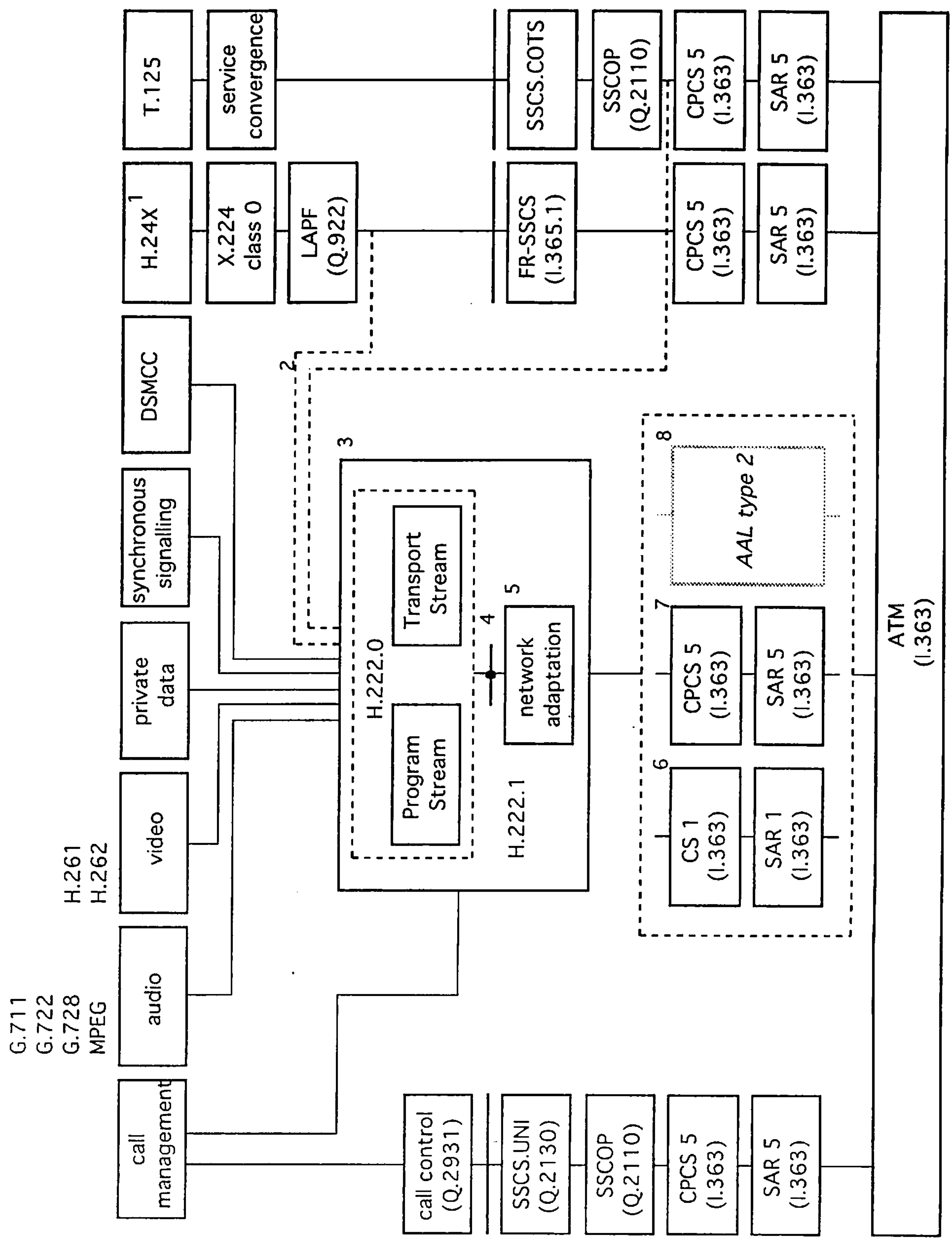

Figure 1. H.32X network adaptation protocol reference model.

Notes to Figure 1.

1) Video frame asynchronous signals are not shown explicitly in this Figure. Whether or not there are included in H.24X, a similar protocol stack will be applicable.

2) The H.24X and the T.120 protocol stacks may use H.222.1. The Figure shows the anticipated points of connection.

3) H.222.1/H.222.0 functions:
- multiplexing
- timebase recovery
- media synchronization
- jitter removal
- buffer management
- security and access control
- inband signalling
  - unacknowledged
  - acknowledged
- trick modes

4) This point represents the point at which the ISO/IEC 13818-9: Real Time Interface applies, if it is applicable. This point may not always be physically realised.

5) H.222.1 network adaptation functions:
- jitter removal
- bit error correction

6) Although AAL type 1 currently addresses constant bit rate operation, it is anticipated that the AAL type 1 SAR sublayer, and perhaps some of the AAL type 1 CS toolkit, will be used for variable bit rate operation. In the case of variable bit rate operation not all of the following AAL type 1 CS sublayer functions are applicable.

AAL type 1 CS functions:
- transmission clock recovery
- jitter removal
- bit error correction
- cell loss correction
- data structure preservation

7) AAL type 5 (CPCS) functions:
- bit error detection
- cell loss detection
- data structure preservation

8) There are no proposals for a new AAL type 2.

- end -

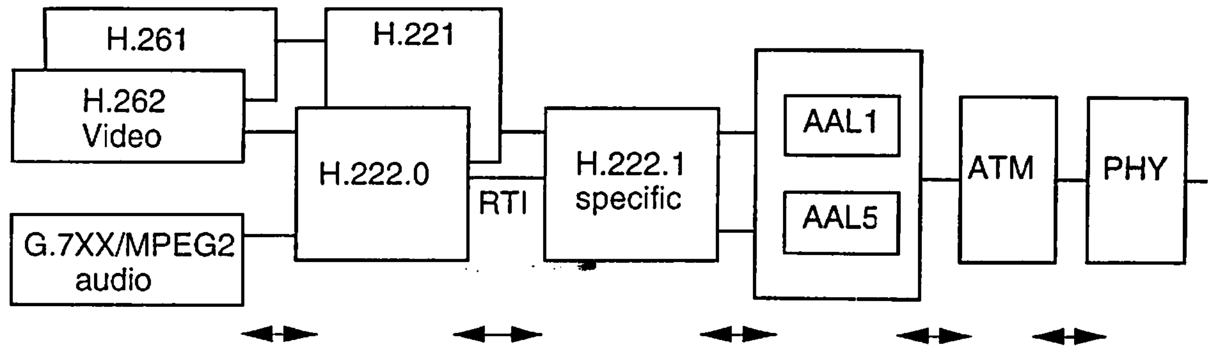

Figure 2 a) H.32X main profile NA-PRM (terminal type A2/B2)

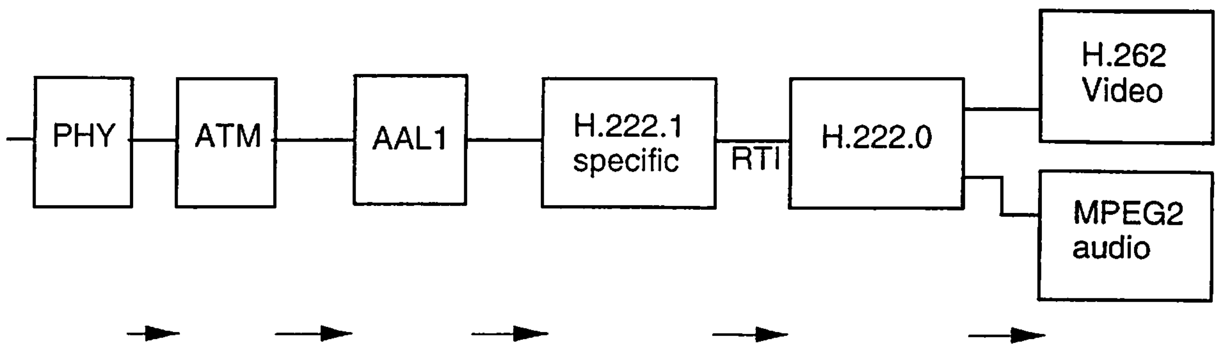

Figure 2 b) H.32X simple profile 1 NA-PRM (terminal type A1)

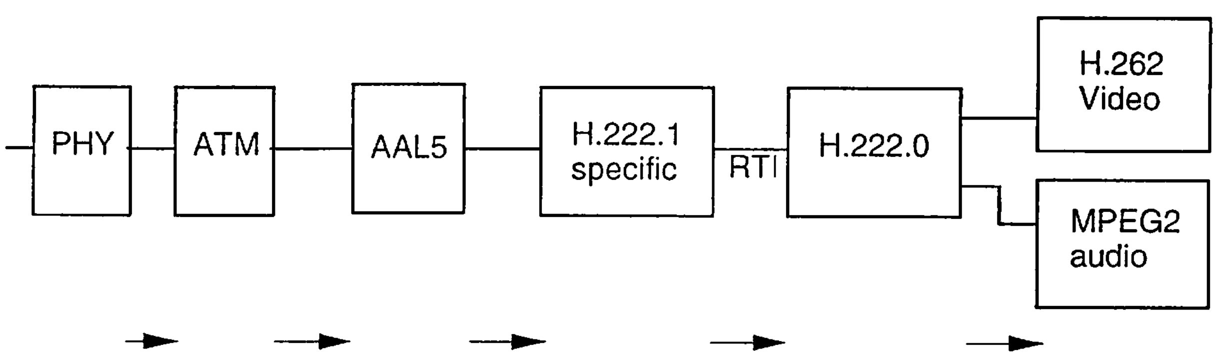

Figure 2 c) H.32X simple profile 5 NA-PRM (terminal type A1)

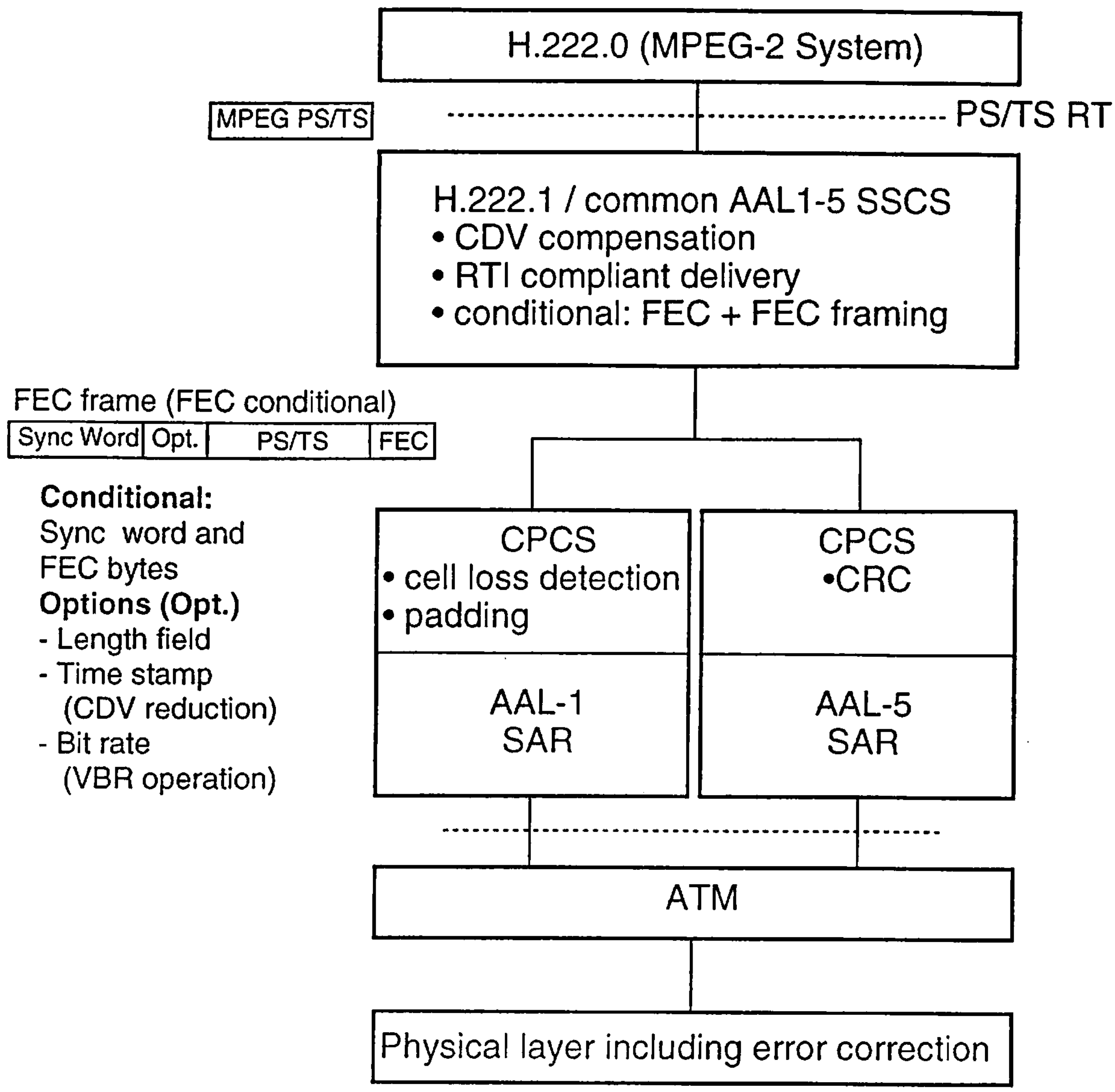
H.222.0 (MPEG-2 System)
MPEG PS/TS
PS/TS RTI
H.222.1 / common AAL1-5 SSCS
• CDV compensation
• RTI compliant delivery
• conditional: FEC + FEC framing
FEC frame (FEC conditional)
Sync Word
Opt.
PS/TS
FEC
Conditional:
Sync word and
FEC bytes
Options (Opt.)
- Length field
- Time stamp
(CDV reduction)
- Bit rate
(VBR operation)
CPCS
• cell loss detection
• padding
CPCS
•CRC
AAL-1
SAR
AAL-5
SAR
ATM
Physical layer including error correction

Figure 3

Annex 1 to the sixth progress report - List of participants

Participants of the sixteenth meeting of the Experts Group for Video Coding and Systems in ATM and Other Network Environments held in Grimstad, Norway

Sole sessions 13-15 July
Joints sessions with MPEG 18-22 July

Country	*Name*	*Organization*	*Sole*	*Joint*
Germany	Mr. Bernard Hammer	Siemens	X	X
Australia	Mr. Stuart Dunstan	Siemens	X	X
Belgium	Mr. Olivier Poncin	BELGACOM	X	X
USA	Mr. Bahman Amin-Salehi	Bell Atlantic	X	X
	Mr. Richard Grinnell	PictureTel	X	X
	Mr. Barry Haskell	AT&T	X	X
	Mr. Paul Haskell	CLI	X	X
	Mr. Chia-Chang Li	AT&T	X	X
	Mr. Hayder Radha	AT&T	X	X
	Mr. Gary Rekstad	NCS	X	X
	Mr. Tony Wasilewski	Scientific Atlanta	X	X
	Ms. Andria Wong	Bellcore	X	X
Finland	Mr. Roy Mickos	Tampere University	X	X
	Mr. Juha Pihlaja	Nokia	X	
France	Mr. Philippe Boucheron	CNET	X	
	Mr. Stephane Lemaire	CNET	X	
	Mr. Bruno Loret	CNET		X
Japan	Mr. Kazuhiro Matsuzaki	Mitsubishi	X	X
	Mr. Sakae Okubo	GCL	X	X
	Mr. Tomoaki Tanaka	NTT	X	
	Mr. Hideyuki Ueno	Toshiba	X	X
Norway	Mr. Gisle Bjoentegaard	NTR	X	X
	Mr. Robert Danielsen	NTR	X	X
	Mr. Karl Olav Lillevild	NTR	X	X
Nethrelands	Mr. Roel ter Horst	KPN-PTT	X	X
UK	Mr. David Beaumont	BT	X	
	Mr. Geoff Morrison	BT	X	
	Mr. Mike Nilsson	BT		X
Sweden	Mr. Per Tholin	Telia Research	X	
	Ms. Christel Verreth	Telia Research		X

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

Sole sessions 1, 3, 4 November 1994
Joints sessions with MPEG 7-11 November 1994

Country	*Name*	*Organization*	*Sole*	*Joint*
Germany	Mr. Bernard Hammer	Siemens	X	X
Australia	Mr. Stuart Dunstan	Siemens	X	X
	Mr. King N. Ngan	Univ. of Western Australia		X
Belgium	Mr. Olivier Poncin	BELGACOM	X	X
Canada	Mr. Vahe Balabanian	BNR		X
Korea	Mr. Ki-Jin Kim	KAIST	X	X
USA	Mr. CT Chen	Bellcore	X	X
	Mr. Barry Haskell	AT&T	X (3,4)	X
	Mr. Chia-Chang Li	AT&T	X	X
	Mr. Jeffrey J. Lynch	IBM	X	X
	Mr. Hayder Radha	AT&T	X	X
	Mr. Richard Schaphorst	DIS	X (4)	X
	Mr. Dale Skran	AT&T	X	
	Mr. Ali Tabatabai	Tektronix	X	
	Ms. Andria Wong	Bellcore	X	X
Finland	Mr. Roy Mickos	Tampere University of Technology	X	X
	Mr. Juha Pihlaja	Nokia	X	
France	Mr. Eric Gonfia	CNET	X	
Israel	Mr. Zeev Lichtenstein	ECI Telecom	X	X
Japan	Mr. Kohtaro Asai	Mitsubishi	X	X
	Mr. Keiichi Hibi	Sharp	X	X
	Mr. Yuichiro Nakaya	Hitachi	X	X
	Mr. Sakae Okubo	GCL	X	X
	Mr. Yasuhiro Takishima	KDD	X	
	Mr. Tomoaki Tanaka	NTT	X	
	Mr. Hideyuki Ueno	Toshiba	X	X
Norway	Mr. Gisle Bjoentegaard	NTR		X
Netherlands	Mr. Roel ter Horst	KPN-PTT	X	X
UK	Mr. David Beaumont	BT	X	
	Mr. Geoff Morrison	BT	X	
	Mr. Mike Nilsson	BT		X
Singapore	Mr. Wong Liang Chun	Singapore Telecom	X	X
	Mr. Vien-Chang M. Kan	Singapore Telecom	X	X
	Mr. Kuan Choon Shiong	Singapore Telecom	X	X
	Mr. Jason Tan	Singapore Telecom	X	X
Sweden	Ms. Christel Verreth	Telia Research	X	X

Participants of the eighteenth meeting of the Experts Group for Video Coding and Systems in ATM and Other Network Environments held in Kamifukuoka, Japan

Country	*Name*	*Organization*
Australia	Mr. Stuart Dunstan	Siemens
Belgium	Mr. Olivier Poncin	BELGACOM
Canada	Mr. Vahe Balabanian	BNR
Korea	Mr. Jin-Soo Kim	KAIST
USA	Mr. Chia-Chang Li	AT&T
	Mr. Jeffrey J. Lynch	IBM
	Mr. Hayder Radha	AT&T
	Mr. Dale Skran	AT&T
	Mr. Gary A. Thom	DIS
	Ms. Andria Wong	Bellcore
Finland	Mr. Ron Brown	Nokia
France	Mr. Eric Gonfia	CNET
Japan	Mr. Keiichi Hibi	Sharp
	Mr. Takao Kasahara	GCL
	Mr. Masahisa Kawashima	NTT
	Mr. Takayuki Kobayashi	GCL
	Mr. Yasuhiro Kosugi	Tokyo Electric Power Company
	Mr. Shin-ichi Kuribayshi	NTT
	Mr. Takayuki Kushida	IBM Japan
	Mr. Kazuhiro Matsuzaki	Mitsubishi
	Mr. Yuichiro Nakaya	Hitachi
	Mr. Sakae Okubo	GCL
	Mr. Kiyoshi Sakai	Fujitsu
	Mr. Shigeyuki Sakazawa	KDD
	Mr. Yasuhiro Takishima	KDD
	Mr. Tomoaki Tanaka	NTT
	Mr. Hideyuki Ueno	Toshiba
	Mr. Masahiro Wada	KDD
	Mr. Tsutomu Washida	NITUAJ
	Mr. katsuyuki Yamazaki	KDD
Netherlands	Mr. Roel ter Horst	KPN-PTT
UK	Mr. David Beaumont	BT
	Mr. Geoff Morrison	BT
Sweden	Mr. Sven O. Akerlund	Ericsson Business Networks

Annex 2 to the seventh progress report

Specifications of H.32X hardware for the interconnection experiment

Items	Mandatory spec.	Optional spec.
Video codec		
Coding scheme	H.262	
Picture format (ENC)	525/60 720(pixel) x 240(line) x 60(field)	625/50
Profile/Level (ENC)	SP@ML(field or frame structure)	MP@ML
Picture format (DEC)	525/60	625/50
Profile/Level (DEC)	SP@ML(field and frame structure)	MP@ML
Coding rate	CBR	VBR
Audio codec		
Coding scheme	MPEG-1 Layer-2	
The number of channel	2 channel (stereo)	
Coding rate	384 kbps (192kbps x 2channel)	192, 224, 256, 320 kbps
Sampling rate	48.0 kHz	44.1 kHz
Multimedia MUX		
MUX scheme	H.222.0 TS	H.222.0 PS
Information rate at AAL-SAP (*1)	n/m of network clock (n,m)=(47,1215) [6.016Mbps]	(n,m)=(47,2430), (47,810), (94,1215) [3,9,12Mbps]
CSPS	-	On/Off
System clock/Network clock synchronism(*2)	none	sync.
The number of program	single	multiple
AAL		
Type (*3)	Type 1 or Type 5	Type 1 and Type 5
Timing recovery	none	Adaptive clock (*4)
Error correction	none	Long interleave /Short interleave (I.363) (*4)
Others		
Physical interface point	none	AAL-SAP, ATM-SAP
Data channel	none	multiple
C&I	none	sync. to video
Communication procedure, protocol	none	H.24X
Interconnection to the different type terminal	none	H.32Y (H.320)

notes

*1 : The values of n, m are specified to offer 6.144 Mbps after the AAL1 PDU header (1 byte) is added. These values remain for further study in case that AAL type 5 is employed and/or FEC is employed.

*2 : Clock relation is shown in Figure 1.

*3 : The mapping from TS packet to ATM cell in AAL5 is for further study.

*4 : These can be selected for AAL type1.

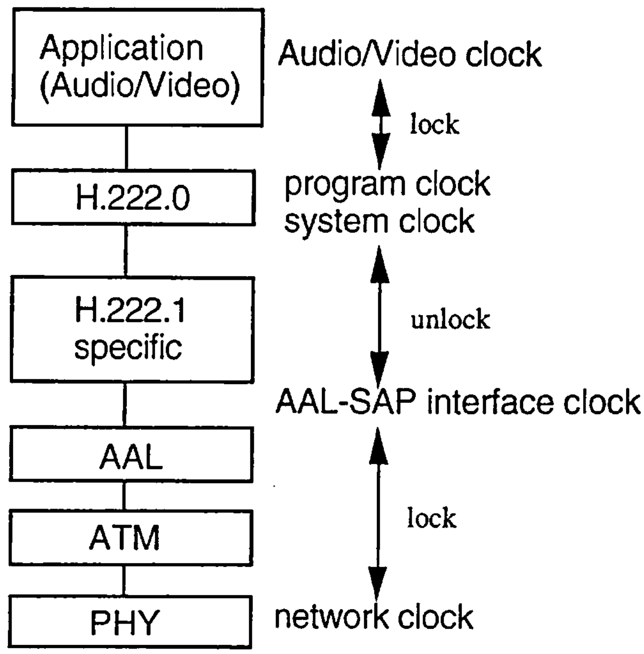

Fig.1 Clock relation in the H.32X protocol stack

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