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

Document AVC-707R
11 November 1994

Source: RAPPORTEUR (Sakae OKUBO)
Title: REPORT OF THE SEVENTEENTH EXPERTS GROUP MEETING IN SINGAPORE (1-11 July 1994) - Part I and Part II
Purpose: Report

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Part I General
Part II Sole sessions
Part III Joint sessions (see AVC-708R)

## Part I General

The seventeenth meeting of the Experts Group was held in Singapore as follows;

- ITU-T sole sessions on 1, 3 and 4 November at the kind invitation of Singapore Telecommunications Limited,
- Joint sessions with ISO/IEC JTC1/SC29/WG11 (MPEG) during 7-11 November at the kind invitation of Singapore Institute of Standards and Industrial Research (SISIR).

## Part II Sole Sessions

*Contents*



### 1. General

The ITU-T sole sessions were held at Comcentre on 1, 3 and 4 November 1994 at the kind invitation of Singapore Telecommunications Limited. At the end of the sessions, Chairman thanked the hosting organization for providing an opportunity to meet in Singapore, excellent meeting facilities and secretarial support.

We had also a closing session on 11 November to review both sole and joint sessions.

It is noted that the discussion session for H.222.1, H.32X, H.32Y, H.32Z and related matters was co-chaired by Rapporteur and each Editor; Mr. Stuart Dunstan, Mr. Chia-Chang Li, Mr. Hayder Radha and Mr. Geoff Morrison.

### 2. Documentation (TD-2)

For the sole sessions, 34 AVC-numbered documents and 18 temporary documents have been made available as listed in Annex 1.

## 3. Review of the previous meetings

3.1 Experts Group July meeting in Grimstad (AVC-673R, 674R)

The previous meeting in Grimstad meeting was very briefly reviewed. Mr. S. Dunstan announced that Table 1 (AAL primitives and their parameters) in Annex 3 to AVC-673R should be corrected as in Annex 1 to AVC-704. Mr. C-C. Li presented a report on the DSM-CC extension work as in Annex 2 to AVC-674R

3.2 Correspondence to Rapporteurs of SG13 and SG11 (AVC-704)

Rapporteur reported that the correspondence to SG13 and SG11 has been sent out, but the one to SG8 is yet to be drafted.

3.3 List of open issues (AVC-676)

Rapporteur provided a list of open issues which were identified after the Grimstad meeting.

3.4 Fora/Consortia (AVC-706)

Mr. O. Poncin presented a summary of the DAVIC activities, focusing on the area of work and the time schedule.

Mr. J. Lynch presented AVC-706 which summarizes the current status of SA&A in The ATM Forum.

## 4. Completion of the common text Recommendations

4.1 H.262|ISO/IEC 13818-2 Video (AVC-687; TD-4, 5, 9, 17)

Technical comments with T numbers have been reviewed.

T3 **bit_rate** definition
T4 VBV for VBR

After reviewing TD-4 and TD-5, the meeting concluded that these comments can be superseded by that "we agree to fix the problem based on the Morris proposal (TD-5)".

4.2 H.222.0|ISO/IEC 13818-1 Systems (AVC-688, 691, 693; TD-5, 10)

4.2.1 Review of the technical comments with T numbers (AVC-688)

T6, T7 system clock accuracy specification

This should be presented with a clearer rationale at the joint sessions.

T9 PAT transmission
T29 PSI transmission

It has been noted that the timing of PSI transmission should be specified in either of H.222.1 or H.24X as part of the call set-up procedures if it is left to the application standard.

T29 needs clarification; assistance of the originator of the comment should be sought.

T13 R/P problem

This comment can be superseded by that "we agree to fix the problem based on the Morris proposal (TD-5)".

T17 PTS/DTS confusion

This should be presented at the joint sessions with the last sentence modified as "We strongly suggest, on grounds of interoperability, that a definition consistent with MPEG-1 be used."

T22, T23, T24, T36 ITU-T auxiliary

See §4.2.3 below.

T44 RTI

The comment should read "An agreed specification should be included ...." We support the inclusion of an RTI specification in the current H.222.0, and we suggest 1 ms jitter tolerance based on the average case scenario of the ATM network performance assumption (AVC-635). See Annex 3 to this report for some more discussion details. The meeting agreed to send this conclusion to the joint sessions with MPEG as contained in Annex 4 to this report.

4.2.2 Descriptor usage (AVC-691)

The meeting supports the clarification of the descriptor usage proposed in AVC-691. Mr. Y. Nakaya stated that the specification in Notes 1 and 2 may have an alternative; either solution is acceptable, it is more important to clarify the specification.

4.2.3 ITU-T auxiliary (AVC-693; AVC-694)

AVC-693 proposed to confirm the necessity of ITU-T Auxiliary channel. The following comments and information were given:

- DSM-CC should support time related signals and C&I signals can be accommodated there.
- Standardization timing should be counted; H.222.0|ISO/IEC 13818-1 is to be finalized next week.
- The outcome of the Grimstad meeting should be maintained unless there are strong reasons.
- The integration of C&I and DSM-CC should target the DSM-CC Extension, not the existing DSM-CC.
- DSM-CC Extension is focusing on VOD systems. The time relationship between DSM-CC and audiovisual signal is not so critical, requiring precision in the order of one second.

After having heard them and the outcome of the small group discussion coordinated by Mr. S. Dunstan, the meeting agreed to this proposal in the context of end-to-end signalling which covers video frame synchronous signals, capability exchange signals and mode change signals. See Annex 2 to this report for more details.

4.3 Ongoing studies (TD-4, 5, 6)

A summary of systems and video buffering issues related to VBR is given in TD-4 and TD-5. The RTI work was reported to be under discussion at the MPEG ad hoc group.

## 5. Video coding matters and VBR (AVC-690)

AVC-690 presented simulation results of a rate-based feedback mechanism for congestion control with real-time ABR (Available Bit Rate) video traffic. D1 tape demonstration will be given at the joint sessions with MPEG.

## 6. Network adaptation

6.1 Function allocation (TD-3, AVC-678, 679; AVC-699)

TD-3 is an update of the H.32X network adaptation protocol reference model. It is noted that allocation of each function to an appropriate layer is awaited, particularly "jitter removal" and "error correction" functions.

AVC-678 presented an infrastructure of computer based AMS terminal and its impacts on the jitter removal function allocation, while AVC-679 presented a generic configuration of video distribution with function allocation and signalling requirements.

Through questions and answers, the following were clarified:

- VOD is a subset of the "video distribution" mentioned in AVC-679.
- Additional card-to-card jitter is in the order of microseconds to milliseconds depending on load of the system when packets are transferred through the bus or the CPU in the figure of AVC-678.
- Some of the items listed as "Q.2931 signalling requirements" seem to belong more properly to the end-to-end control (DSM-CC), not end-to-network signalling; e.g. content (movie) and service selection request correlation ID.

More details of the protocol reference model were discussed in a small group coordinated by Mr. S. Dunstan. Its report, which was approved by the meeting at large, is contained in Annex 2 to this report.

6.2 AAL for CBR

6.2.1 Solution for Video on Demand service (AVC-705; AVC-679; TD-15)

AVC-705 proposed use of AAL5 to carry CBR coded MPEG-2 Transport Streams for VOD applications in the end-to-end ATM environments. There were some questions and answers regarding the background of this proposal:

- ATM jitter has been estimated to be less than 2 ms for CBR. Benefits of VBR statistical multiplex gain may be obtained only by allowing CDV of the order of 10 ms.
- It has been found feasible by experiments that PCR can be recovered with 3 ppm accuracy under CDV of 2 ms.
- Transmission errors are assumed to be maintained sufficiently low at the physical layer, thus error correction is not necessary at the AAL or higher layer. There was a comment that this assumption is not in line with AVC-635 (ATM network performance assumptions) where bit error may occur once every 2.5 minutes for a 6 Mbit/s channel even in the best case scenario. Furthermore bit error correction was concluded not to match with AAL5 at the Grimstad meeting.
- The background of the proposal was summarized as pragmatically AAL5 chips being available and it appearing to work.

Mr. Beaumont informed the meeting that SG9 Rapporteur's group recently decided to recommend AAL1 for video distribution services as in TD-15.

Related to the network performance scenario, Mr. Radha pointed out that CDV and end-to-end delay figures are dependent on the cell transmission rate, thus AVC-635 should be modified accordingly.

6.2.2 Generic solution (AVC-685; AVC-704)

Mr. Beaumont presented the ETSI study results on the AALs for Class A and B services, stressing that priority be given to the AAL1 and its extension to AAL2. The following comments were obtained in the discussion:

- As to the question that the AAL2 solution of AAL1 embedded functionality loses some functionalities of AAL1, the intention was clarified to facilitate development of the AAL1/2 switchable device.

- There was a question whether the 3 bit cell sequence number is sufficient for VBR traffic which AAL2 should support. There may occur longer bursts for VBR, but they are hard to recover even if their occurrence is known by the sequence numbering.

6.2.3 Error correction (AVC-700)

As a preliminary conclusion, the meeting supported the case 2 (FEC is mandatory at the encoder, but optional at the decoder), requesting further consideration by the next meeting. A specific way of forward error correction is yet to be selected.

Location of FEC in the protocol stack is yet to be worked out.

6.2.4 Position of the Experts Group for the AAL issue (TD-9)

For further discussion and establishment of the Experts Group position, Mr. ter Horst coordinated a small group discussion and his outcome is contained in Annex 3 to this report. It addresses applicability of AAL1 and AAL5 in the matrix of the transmission system (End-to-end ATM / Hybrid ATM + circuit emulation) and services (Conversational / Distribution / Interactive video retrieval), allocation of error correction and jitter removal, profiling of the network adaptation, and RTI specifications. A preliminary set of profiles are provided as a basis for further consideration; "main profile" for symmetrical terminals containing both AAL1 and AAL5, "simple profile" for asymmetrical terminals which contain AAL5 in one configuration and AAL1 in another configuration. The objective of profiling is to limit the combination to a small number and allow maximum interworking. This report was approved by the meeting at large.

Contributions are requested for settling the issue at the next meeting.

6.3 AAL for VBR (AVC-686)

AVC-686 provided requirements and a proposal for AAL2 as extension of AAL1. The meeting welcomed this first input on this topic as a good starting point. Through the Q&A session, the following comments and clarification were obtained:

- Availability of the 10**(-11) accuracy of the clock in every ATM switch should be checked.
- Clarification is needed to what reference point the "piecewise constant" rate applies. Multiplexing changes the byte delivery schedule.
- A single buffer in the terminal is a better choice for implementation.
- SRTS mentioned in the context of common use of the AAL header field
- AAL1 based AAL2 is sought to facilitate interworking with N-ISDN terminals.

After the discussion, the meeting identified that there are two different approaches for the VBR AAL reflecting the discussion on the CBR AAL:

- to define a new AAL2 for VBR,
- to use the existing AAL5.

If we take the first approach, it is recognized that

- it is possible to develop AAL2 for VBR as a superset of AAL1 for CBR,
- the progress of AAL2 is deemed to owe largely to the work of this Experts Group as a potential user (see §9.3/AVC-673R) though final responsibility is in SG13,
- requirements for functionalities and performance should be well defined.

The meeting concluded that the members are encouraged to provide their views on the possible two approaches and improvements of AVC-686 proposal or counter proposals.

6.4 Multiple VCs (AVC-675, 697; AVC-677)

AVC-675 provided an SG8 view to run the T.120 protocol on a separate VC, and AVC-697 analyzed the advantages and disadvantages of the multiple VC use. The meeting 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.

## 7. H.24X and signalling

7.1 H.24X and its transport (AVC-677, 699; AVC-704; TD-12)

AVC-677 made a proposal, for further consideration, on the audiovisual communication procedures in the packet based transmission environments. The meeting supported this proposal as H.24X framework, requesting thorough review by the members.

AVC-699 discussed alternatives for the channel which carries the control information, and proposed to construct a control protocol based on the bi-directional channel and a protocol layering model. These are reflected in the protocol reference model as contained in Annex 2 to this report.

AVC-699 also proposed use of ASN.1 for representation of the control protocol. The meeting supported this proposal. Mr. C-C. Li provided a H.32X capability structure using ASN.1 in TD-12.

7.2 Integration of C&I and DSM-CC (AVC-694, 699; AVC-693; TD-13, 18)

The meeting identified the following three different C&I signals for audiovisual communication terminals and their channels:

- video frame synchronous control signals in the ITU-T auxiliary PES with PTS,
- video frame asynchronous control signals (capability messages) in the ITU-T auxiliary PES, or other channels in case of asymmetrical communications,
- mode change control signals in PSI/PSM.

DSM-CC is understood as video frame asynchronous control signals, and may have some commonality with capability messages in functionality. They may be multiplexed in the same channel, but this needs further study. Mr. C-C. Li proposed TD-13 as an input to the joint sessions with MPEG and the meeting supported this proposal with a small modification. The resulting input document is contained in Annex 5 to this report.

Based on this discussion, the meeting decided to have a joint session with the DSM sub-group in addition to Requirements, Video and Systems sub-groups at this meeting.

7.3 Requirements to user-network signalling (AVC-679, 702)

AVC-679 provided VOD service related requirements to signalling and AVC-702 provided those for AAL parameters. Work should be done to make an extensive list.

## 8. H.222.1

8.1 ITU-T stream descriptors (AVC-692)

AVC-692 proposed ITU-T specific descriptors for inclusion in H.222.1. The meeting agreed to create a new section in H.222.1 and finalize the content by refining this proposal.

8.2 Case study for applying TS to videoconferencing (AVC-695)

AVC-695 provided a case study where H.222.0 Transport Stream is used as multimedia multiplexing method for a high quality videoconferencing service. The meeting responded to the discussion items raised in this document as follows:

| | | |
|---|---|---|
| 1) | Program descriptor | H.24X capability exchange plays the role of this descriptor in H.32X. |
| 2) | Data elementary stream descriptor | This should be defined since we are going to prepare for both separate VC and H.222.0 multiplex approaches for the T.120 data (see §6.4 of this report). |
| 3) | Synchronization between audiovisual signal and control signal | The PES with PTS solution (the Grimstad outcome) is maintained. |
| 4) | Control data protocol | Error free transport service is to be used. See Annex 2 to this report. |
| 5) | Audio coding laws | This was left to the discussion on Draft H.32X. See §10 of this report. |

8.3 Terminal to terminal signalling (AVC-702; TD-10)

AVC-702 proposed to use acknowledgment procedures for setup and release of H.222.1 subchannels. The meeting supported this direction and use of the PSI/PSM syntax for the acknowledgment. Definition of new descriptors is required for this purpose. The meeting also supported the proposal to describe a unified procedure for call control and inband signalling in Recommendation H.32X. The discussion outcome on the procedure is found in Annex 2 to this report. It is noted that the communication starts with the capability exchange through a VC, including the choice of PS or TS, and then the bandwidth of the VC may be expanded or a separate VC may be established. The choice of the two alternatives needs further study.

The meeting confirmed that H.222.1 should describe the two procedures with and without acknowledgment.

During the discussion, the following issues have been identified awaiting contributions:

- choice of AAL for the capability exchange at the start of the call; AAL negotiation through the user-to-network signalling may be useful.
- identification of H.32X and H.32Y (H.320) terminals; an explicit or implicit mechanism is required.

8.4 Draft H.222.1 (AVC-680)

The meeting reviewed the draft H.222.1 updated after the Grimstad meeting. Mr. Dunstan indicated that the specifications will be aligned with the ISO/IEC 13818-4 Conformance and that §6 "Interaction with AAL" will describe multiple scenarios.

There was some discussion on §10 "Multiple ATM Layer Virtual Channels":

- T.120 data accommodation in a separate VC should be included.
- Hierarchical video may use multiple VCs as discussed at the previous meeting (AVC-664). There are two ways; one is to split a H.222.0 multiplexed stream into separate VCs by H.222.1, the other is to use H.222.1 multiple instances with an external association mechanism. In both cases, concern was expressed for legality of split and combined streams to the standard, particularly when cell losses are involved in one stream.

Editor (Mr. S. Dunstan) will revise the text reflecting the outcome of this meeting and post it at the reflector by November 27 (Tokyo time) for further consideration of the members towards the January meeting.

## 9. H.32X

9.1 Interworking with H.320 (AVC-698)

AVC-698 requested reconsideration for the mandatory requirement of H.32X compatibility with H.320. The meeting agreed to the proposal that viewing only terminals (H.32X Type A1 and B1) need not mandatorily receive H.320 streams. For the proposal restricting the mandatory modes of operation of the symmetrical terminals (Type A2 and B2) to 1B audio or 2B audiovisual, opposing views were expressed on the ground that customers would expect higher quality for the H.32X terminal and that inclusion of H.320 processing in the more powerful H.32X device would not cause significant hardware burden. The meeting decided to maintain the Grimstad resolution until justification for the hardware burden is obtained.

9.2 Support of TS and PS (AVC-703)

In response to the request of contributions on narrowing down TS/PS alternatives, AVC-703 proposed that the PS alternative should not be excluded. As a typical area of PS use, audiovisual applications in LAN and WS environments were indicated. The meeting concluded that both TS and PS should be mandatory at the decoder and that either of PS or TS can be used at the encoder in the H.32X terminal. Dependency of this conclusion on the terminal type is yet to be clarified.

There was a comment on the implementation discussion in AVC-703 (PS is by software and TS by hardware) that it is bitrate dependent.

9.3 Hardware trial specifications (AVC-701)

AVC-701 proposed specifications for the hardware trial planned to be carried out before the SG15 meeting in November 1995. Mr. Takishima informed the meeting that currently three organizations are building hardware, they try to test both AAL1 and AAL5, and the tests will be through the NTT experimental network.

The meeting agreed to fixing the "mandatory" parts of the specification at this meeting and confirmed that the hardware trials are for verifying core technologies of the projected Recommendations. The specifications are contained in Annex 6 to this report.

Participation of other members are encouraged as described in AVC-701.

9.4 Draft Recommendation (AVC-681)

The meeting reviewed the draft H.32X updated after the Grimstad meeting, obtaining the following results:

- H.320 compatibility related elements, such as H.261, should be indicated in Figure 1.
- "End-to-end signalling" in Figure 1 takes into account video frame synchronous signals and capability exchange messages.
- Proposals for data capability codepoints are invited before the submission of the next version.
- SP@ML encoder and MP@H14 codec is to be considered for Video Codec Capability and the terminal type definition.
- G.728 is to be included in Audio Codec Capability in the context of H.320 compatibility.
- VBR is to be mentioned in 4.2.3.
- According to the Systems conformance specifications, such capabilities as scrambling and trick mode should be considered in §4.2.3.1.
- Transfer rate should be specified with some quantization, for which proposals are invited, otherwise Editor will distribute his strawman proposal.
- H.24X capability should have no option in the set of terminal capabilities. It is noted that H.24X and DSM-CC may potentially have common part.
- H.261 is taken out from Type A1 and Type B1 capabilities according to the agreement in §9.1 of this report. However, G-series audio is left with consideration that they may have telephone capabilities.
- "Equipment" in the title and audiovisual I/O description should be removed. However, some items which relate to interworking, such as audio level setting, should remain. The text in H.320 may be usable.

- §6 "Error resilience" is a placeholder for informative text; advice on the content is welcome.

There was a general comment that if optional capabilities are included, then H.32X should indicate whether they are mandatory or optional. Mr. Ueno raised a question whether H.222.0 capabilities should parameterize number of channels and bit rates to be handled. This needs clarification.

Related to "error resilience", Mr. B. Haskell informed the meeting that AT&T experiments showed effectiveness of duplicated transmission of important information, such as headers, in a separate VC against cell loss in the TCP/IP environments.

Editor (Mr. C-C. Li) will revise the text reflecting the outcome of this meeting and post it at the reflector by November 27 (Tokyo time) for further consideration of the members towards the January meeting.

## 10. H.32Y

10.1 Hardware trial (AVC-684)

AVC-684 presented successful experiments of connecting two different H.320 terminals between BT Labs in Martlesham and CNET in Lannion through an ATM Virtual Circuit.

10.2 Draft Recommendation (AVC-682)

The meeting reviewed the draft H.32Y updated after the Grimstad meeting, obtaining the following results:

- "Definitions" coordination is suggested to take place among Editors. The idea is to share a common set of definitions and selecting relevant items in each Recommendation.
- In Figure 1, "R" point should have interface specifications, but the reference point should not be marked with "R". If a terminal whose configuration looks like (b) in Figure 1 does not conform to the interface specifications, it is classified as configuration (a).
- Note 6 in Table 1 is deleted due to lack of clarity.
- Figure 3 should indicate a 2B case which involves two VCs.
- In the "AAL Subtype identifier" of Table 2, "Video signal transport" should be swapped with "Circuit transport" in Note 4.
- In the "AAL Error correction method", "short interleaver" should be removed.
- Q.939 should be referred to, and it should be stated which specifications dominate if discrepancies are found.

The following were found to require confirmation of SG13:

- whether IWF can invoke "Structured Data" by observing LLC,
- whether "partially filled cells" are usable in the circuit transport.

Editor (Mr. H. Radha) will revise the text reflecting the outcome of this meeting and post it at the reflector by November 27 (Tokyo time) for further consideration of the members towards the January meeting.

## 11. H.32Z

11.1 Call setup procedures (AVC-696)

In response to the request of information, AVC-696 presented an example of call setup procedures between a LAN audiovisual communication terminal and an ISDN H.320 terminal.

Mr. D. Beaumont advised that terminal numbering issues for Iso-Ethernet are being addressed in IEEE802.9b. The plan regarding E164 address locations on the LAN is to support static address tables within the Access Unit (hub).

11.2 Hardware experiments

Mr. D. Beaumont mentioned that BT now has some Iso-Ethernet equipment and is preparing for hardware experiments.

11.3 Gateway video processing (AVC-689)

AVC-689 presented a technique, operating on the coded data, for further reducing the bit rate of video already compressed with a predictive coding algorithm. The meeting observed that this technique is applicable to gateways, MCUs etc. where rate conversion is required.

11.4 Draft Recommendation (AVC-663; TD-14)

Mr. Skran expressed his concern that if H.32Z restricts itself to "guaranteed bandwidth" networks, there is a danger that proprietary solutions prevail in "non guaranteed bandwidth" networks and interworking with existing H.320 has to be through transcoding, thus customers' benefit is lost. He also suggested to recommend two systems in the Recommendation or phasing the specifications. There were some other voices to respect existence of Legacy LANs. Rapporteur expressed his difficulty to reopen the issue after the conclusion of the previous two meetings (in Paris and Grimstad). It was also pointed out that longer delay and echo is a potential problem in the "non guaranteed bandwidth" systems. Mr. Skran further suggested to list identified technical problems in the "non guaranteed bandwidth" systems. Rapporteur distributed a chronicle of H.32Z discussion (TD-14) to facilitate this work.

After the discussion, Rapporteur proposed to take the following actions to make a progress:

- to list guaranteed bandwidth networks and their technical characteristics to clarify the notion of "guaranteed bandwidth" currently used in Draft H.32Z,
- to invite proposals for moving forward when addressing "non guaranteed bandwidth" systems as well. These should be posted by Christmas so that we can discuss the matterat the January meeting.

The meeting accepted this proposal.

Editor (Mr. G. Morrison) will revise the text reflecting the outcome of this meeting and post it at the reflector by November 27 (Tokyo time) for further consideration of the members towards the January meeting.

## 12. Joint sessions with MPEG

12.1 Documents

AVC-687, 688, 691, 693 and TD-17, 18 are input as proposal documents, while AVC-694 is input as a discussion document.

12.2 Representatives

| | |
|---|---|
| ITU-T EG | S. Okubo |
| Requirements | S. Okubo |
| Video | G. Bjoentegaard |
| Systems | S. Dunstan |
| DSM | C-C. Li |

## 13. Others

13.1 Future meetings till February 1995

| Meeting | Date | Place | Sole sessions | Joint sessions with MPEG |
|---|---|---|---|---|
| 18th | Jan. 1995 | Japan | Jan. 24-27 | - |

13.2 Future meetings after February 1995

At the closing session, the meeting considered whether joint sessions with MPEG should be continued after this meeting. Two areas of the future MPEG work were identified to be relevant to the ITU-T standardization; RTI (ISO/IEC 13818-9) and DSM-CC (ISO/IEC 13818-6). Possibility of applying the common text to RTI was discussed, but the meeting could not reach a definite conclusion; some members stressed its necessity, but some others indicated that the matter should be carefully considered.

Closely related to the above discussion, the future meeting schedule has two alternatives;

- synchronized with MPEG meetings - March, July, October,
- independent of MPEG meetings - May or June, October.

Due to lack of discussion time at the closing session, the meeting concluded that these matters be further studied through correspondence and finalized at the next meeting.

END

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## Annexes

Annex 1 Documents for the Singapore meeting
Annex 2 Group discussion on H.32X call phases and H.222.1 signalling
Annex 3 Report of the discussion on AAL issues
Annex 4 Specification for RTI
Annex 5 Harmonization of ITU-T C&I and DSM-CC
Annex 6 Specifications of H.32X hardware for the interconnection experiment

**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 |

## Documents for the Singapore meeting (1-11 November 1994)

### Normal Documents

| AVC number | MPEG number | Pur-pose | Title (Source) |
|---|---|---|---|
| AVC-673R | - | R | Report of the sixteenth Experts Group meeting in Grimstad(13-22 July 1994) - Part I and Part II (Rapporteur) |
| AVC-674R | - | R | Report of the sixteenth Experts Group meeting in Grimstad(13-22 July 1994) - Part III (Rapporteur) |
| AVC-675 | - | R | Liaison statement to Study Group 15 (Q2/15) on B-ISDN audiographic and audiovisual conferencing on ATM (SG8 - Q.10/8) |
| AVC-676 | - | R | List of open issues - 16 September 1994 (Rapporteur) |
| AVC-677 | - | P | Multimedia System Control: a proposal for H.24P and H.24X (Rapporteur for Q.3/15) |
| AVC-678 | - | I&D | Computer Infrastructure Implications on AVC Function Placement (IBM) |
| AVC-679 | - | I | Video distribution using CBR MPEG-2 over AAL5 (IBM) |
| AVC-680 | - | P | Draft H.222.1 (Editor, Stuart Dunstan) |
| AVC-681 | - | P | Draft H.32X (Editor, Chia-Chang Li) |
| AVC-682 | - | P | Draft H.32Y (Editor, Hayder Radha) |
| AVC-683 | - | P | Draft H.32Z (Editor, Geoff Morrison) |
| AVC-684 | - | I | Report on BT/France Telecom H.320 codec test over ATM networks (UK) |
| AVC-685 | - | I | Report on European progress on AALs for Class A and B services (UK) |
| AVC-686 | - | P | An AAL for Class B services (BT) |
| AVC-687 | 94/332 | P | Comments on Draft ITU-T Rec. H.262\|ISO/IEC 13818-2 (Rapporteur) |
| AVC-688 | 94/331 | P | Comments on Draft ITU-T Rec. H.222.0\|ISO/IEC 13818-1 (Rapporteur) |
| AVC-689 | - | I | Reduction of the bit-rate of compressed video while in its coded form (BT Labs) |
| AVC-690 | - | I | Packet video transport in ATM networks with single-bit feedback (AT&T) |
| AVC-691 | 94/348 | P | Clarification of descriptor usage (Japan) |
| AVC-692 | - | P | Proposal for ITU-T_stream_descriptors (Japan) |
| AVC-693 | 94/346 | P | Request for ITU-T specific stream_id in MPEG2 System (Japan) |
| AVC-694 | 94/347 | D | Integration of video frame synchronous C&I in DSM-CC (Japan) |
| AVC-695 | - | D | Consideration of H.222.0 Transport Stream as multimedia multiplexing for audiovisual communications (Japan) |
| AVC-696 | - | I | An example of call setup procedure in an H.32Z terminal (Japan) |
| AVC-697 | - | D | A study on use of multiple VCs (Japan) |
| AVC-698 | - | D&P | Mandatory H.320 interworking modes of operation for H.32X (Japan) |
| AVC-699 | - | D&P | Protocol model for H.32X terminal (Japan) |
| AVC-700 | - | D | Consideration on the optional use of AAL error correcting function at H.32X decoder (Japan) |
| AVC-701 | - | P | Specification of H.32X hardware for the interconnection experiment (Japan) |
| AVC-702 | - | D | Terminal to terminal signalling in H.32X (Siemens) |
| AVC-703 | - | P | Multiplexing protocols for H.222.1 (Siemens) |
| AVC-704 | - | R | Correspondence with Rapporteurs of SG13 and SG11 (Rapporteur) |
| AVC-705 | - | P | Use of AAL 5 for Carrying CBR MPEG-2 TS for video-on-demand applications (AT&T, Bellcore, IBM, MCI) |
| AVC-706 | - | I | ATM Forum Audiovisual and Multimedia Services (IBM) |

## Abstract

[94/nnn] indicates MPEG Document Number.

AVC-673R [-] Report of the sixteenth Experts Group meeting in Grimstad(13-22 July 1994) - Part I and Part II (Rapporteur)

This document records the outcome of the Grimstad sole sessions held in July 1994, summarizing the discussion and identifying action items.

AVC-674R [-] Report of the sixteenth Experts Group meeting in Grimstad(13-22 July 1994) - Part III (Rapporteur)

This document records the outcome of the Grimstad joint sessions held in July 1994, covering Requirements, Video and Systems sub-groups. DSM sub-group discussions are also included.

AVC-675 [-] Liaison statement to Study Group 15 (Q2/15) on B-ISDN audiographic and audiovisual conferencing on ATM (SG8 - Q.10/8)

This document provides an SG8 view regarding the transmission of audiographic conferencing signals that the T.120 series protocols should run on a dedicated VC bypassing the H.222.1 module. Use of AAL5, which is common with the signalling, is advocated.

AVC-676 [-] List of open issues - 16 September 1994 (Rapporteur)

This document lists open issues which were identified until after the Grimstad meeting. They are classified into categories of "network adaptation", "video coding and VBR", "AV terminals and systems", "miscellaneous". Relevant projected H-series Recommendations are also listed in respective items.

AVC-677 [-] Multimedia System Control: a proposal for H.24P and H.24X (Rapporteur for Q.3/15)

This paper makes a proposal, for further consideration, on the audiovisual communication procedures in the packet based transmission environments. It draws on the experience of H.242, but seeks to avoid the deficiencies thereof: there are transmit-capabilities as well as receive-caps (H.242 had only the latter); multiple audio and video streams and other data can be declared, and the capsets are shorter. There are no commands (on the assumption that audio, video and data have their own headers), but there are content indicators, and one end-point can control what is sent to it by means of "mode requests". The proposal is based on variable-length (ILC) messages. Call control procedures for ATM are also provided.

AVC-678 [-] Computer Infrastructure Implications on AVC Function Placement (IBM)

After examining four system configuration alternatives for a typical computer system which serves for audiovisual multimedia services, it is discussed that the end-to-end QOS that must be maintained for multimedia communication is from codec-to-codec, hence jitter removal should be done only once and must accommodate all sources of jitter between the source of the MPEG-2 stream and the target codec. As a conclusion, it is proposed that jitter removal should be identified as an H.222.1 specific function and performed by the codec.

AVC-679 [-] Video distribution using CBR MPEG-2 over AAL5 (IBM)

This document provides a reference configuration for the stored CBR MPEG-2 video distribution over ATM. It identifies H.222.1 specific functions as 1) mapping of several TS packets onto an AAL5 SDU, 2) jitter removal and timebase recovery which are implementation specific, thus need not standardization. The document also identifies Q.2931 signalling requirements as 1) asymmetrical QOS and bandwidth, 2) H.222.1 profile, 3) new multimedia information elements such as CBR/VBR, mapping between TS packets and AAL SDU, content

and service selection request correlation ID. It is also mentioned that the acceptable UNI-UNI end-to-end delay can be several hundred milliseconds for video distribution.

AVC-680 [-] Draft H.222.1 (Editor, Stuart Dunstan)
AVC-681 [-] Draft H.32X (Editor, Chia-Chang Li)
AVC-682 [-] Draft H.32Y (Editor, Hayder Radha)
AVC-683 [-] Draft H.32Z (Editor, Geoff Morrison)

These documents contain updated drafts which reflect discussion at the Grimstad meeting and subsequent correspondence. Many open issues are indicated in form of editor's comments.

AVC-684 [-] Report on BT/France Telecom H.320 codec test over ATM networks (UK)

This document reports on the success of connecting two different H.320 terminals between BT Labs in Martlesham and CNET in Lannion through an ATM Virtual Circuit. AAL1 adaptation is carried out between G.703 2048 kbit/s connection through five cross connects and adaptive clock method is employed. It is concluded that the quality of link and coded pictures is very good.

AVC-685 [-] Report on European progress on AALs for Class A and B services (UK)

This document reports on the progress within Europe on the development of AALs for Class A and Class B services in the context of support for Audio-visual and Multimedia Services (AMS). ETSI NA5's priorities and preferences are AAL Type 1 for Class A CBR AMS and AAL Type 2 (derived from AAL Type 1) for Class B VBR AMS. The document concludes that the SG15 Experts Group should take account of the ETSI decision to give priority to the development of such AAL Type 1 and Type 2.

AVC-686 [-] An AAL for Class B services (BT)

This document describes the requirements for an AAL for class B services, that is, ones that have Variable Bit Rate (VBR) and are delay sensitive; and offers a proposal for such AAL2. The proposal is an extension of the existing AAL1 by replacing the SRTS fields with timestamp of about 1 MHz clock and cell rate indication fields to reduce Cell Delay Variation. VBR is assumed to be piecewise constant here. Possible use of FEC and interleaving is also discussed.

AVC-687 [94/332] Comments on Draft ITU-T Rec. H.262|ISO/IEC 13818-2 (Rapporteur)
AVC-688 [94/331] Comments on Draft ITU-T Rec. H.222.0|ISO/IEC 13818-1 (Rapporteur)

These two documents summarize the comments on the Draft Recommendation H.262 | ISO/IEC 13818-2 (DIS text dated 10 May 1994) and H.222.0|ISO/IEC 13818-1 (DIS text dated 10 June 1994) which have been collected from the members of the Experts Group and the ITU-TSB translator for the French text. Two types of comments are listed; those with some possible normative change or clarification and those requiring only editorial change.

AVC-689 [-] Reduction of the bit-rate of compressed video while in its coded form (BT Labs)

This document presents a technique, operating on the coded data, for further reducing the bit rate of video already compressed with a predictive coding algorithm. Though illustrated with a motion compensated interframe hybrid DPCM/DCT algorithm, it is also generally applicable to other predictive coding schemes, the key elements being the discarding of some coded data, the calculation of the distortion introduced and the later inclusion of correction signals as a normal part of the lower rate data. Low additional delay and no new constraints on the originating coder are noteworthy characteristics of the method.

AVC-690 [-] Packet video transport in ATM networks with single-bit feedback (AT&T)

This contribution describes simulation results of a rate-based feedback mechanism for congestion control with real-time ABR (Available Bit Rate) video traffic. The results show that the rate-based mechanism is very useful for the transport of ABR video streams. It is shown that the visual quality of the video sequences degrades gracefully when network congestion occurs, due either to increases in the bandwidth requirements of existing video streams or because of new video streams switching on. It is also shown that efficient use of network resources such as buffers and link capacities can be achieved with a rate-based traffic management scheme.

AVC-691 [94/348] Clarification of descriptor usage (Japan)

This document proposes an additional table with associated notes for ITU-T Rec. H.222.0 | ISO/IEC DIS 13818-1 to clarify the usage of descriptors. Each descriptor is marked against program in TS/PS, Elementary Stream in TS/PS and CA,

AVC-692 [-] Proposal for ITU-T_stream_descriptors (Japan)

This document proposes ITU-T specific descriptors for inclusion in H.222.1; descriptor tag values, ITU-T video stream descriptor, ITU-T audio stream descriptor, and ITU-T control stream descriptor.

AVC-693 [94/346] Request for ITU-T specific stream_id in MPEG2 System (Japan)

This document confirms the Grimstad outcome that a stream_id is required for "ITU-T auxiliary" at least to accommodate video frame synchronous C&I signals. This is independent of possible integration of ITU-T C&I (video frame asynchronous) and DSM-CC.

AVC-694 [94/347] Integration of video frame synchronous C&I in DSM-CC (Japan)

This document discusses the possibility to integrate video frame asynchronous C&I signals (e.g. for negotiating a common mode of operation at the start of the communication) and DSM-CC protocol in terms of standardization schedule (8 months different), flexibility in the choice of transport layer protocol and transmission efficiency.

AVC-695 [-] Consideration of H.222.0 Transport Stream as multimedia multiplexing for audiovisual communications (Japan)

This document describes a case study when H.222.0 Transport Stream is used as a possible multimedia multiplexing method for high quality videoconferencing service, presenting coding of TS packets and PES packets. It is reported that transmission efficiency of 94 % and packetization delay of 10 ms have been obtained. Several discussion points have also been raised;

AVC-696 [-] An example of call setup procedure in an H.32Z terminal (Japan)

This document presents an example of call setup procedures between a LAN audiovisual communication terminal and an ISDN H.320 terminal, where the combination of the LAN terminal and the gateway works as if an H.320 terminal.

AVC-697 [-] A study on use of multiple VCs (Japan)

This document discusses multiple VC configuration for audiovisual communication with respect to network resource reduction and system flexibility. It is concluded that the multiple VC is not effective in resource saving except for some particular cases, but is advantageous in the flexibility. Use of a separate VC for the system control, DSM-CC and T.120 data is suggested.

AVC-698 [-] Mandatory H.320 interworking modes of operation for H.32X (Japan)

This document proposes reconsideration of the Grimstad outcome "A minimum set of interworking modes of operation which H.32X terminals should support includes 2B, H0, H11 and H.12" by discussing that the receiving only type of the H.32X terminal is not required of this compatibility and that there are differing views for the symmetrical type of H.32X for conversational services.

AVC-699 [-] Protocol model for H.32X terminal (Japan)

This document firs discusses the three alternatives for the channel which carries the control information; multiplex in the H.222.0 stream, separate VC, use of user-network signalling. Then it proposes; 1) to construct a control protocol based in the bi-directional channel to cover both symmetrical and asymmetrical audiovisual communications, 2) protocol layering consisting of AAL5, X.224, T.125 (MCS) if relevant, application (common and service specific), 3) use of ASN.1 for representation of the control protocol.

AVC-700 [-] Consideration on the optional use of AAL error correcting function at H.32X decoder (Japan)

This document discusses three levels of support for the forward error correction; 1) mandatory at both the encoder and the decoder, 2) mandatory at the encoder but optional at the decoder, 3) optional at both the encoder and the decoder. The second alternative is suggested. It also compares three FEC methods in implementation and cell loss impact; 1) diagonal interleaving (I.363 short interleaver), 2) orthogonal interleaving (I.363 long interleaver), 3) parallel writing and reading (AVC-617). The third method is suggested for the above decoder option solution.

AVC-701 [-] Specification of H.32X hardware for the interconnection experiment (Japan)

This document proposes mandatory and optional specifications for the H.32X hardware interconnection trials. Participation is solicited for not only bi-directional equipment but also transmit or receive only terminals, servers, test signal generators.

AVC-702 [-] Terminal to terminal signalling in H.32X (Siemens)

This document recommends to provide a unified description of H.32X signalling procedures covering both end-to-network and end-to-end signalling, and to consider use of acknowledgment procedures for sub channel establishment and release in H.222.1. Appropriate H.222.0 syntax for "request establishment", "confirm establishment" and "confirm release" need be investigated. It is also pointed out that AAL parameters can be included in the Q.2931 SETUP message.

AVC-703 [-] Multiplexing protocols for H.222.1 (Siemens)

After comparing Program Stream and Transport Stream in functions, multiplexing capacity, protocol structure and implementation, and also reviewing the relationship between TS and ATM/AAL, this document proposes that the H.32X terminal should always be able to decode the Program Stream and that the TS should not be mandatory in a H.32X send terminal.

AVC-704 [-] Correspondence with Rapporteurs of SG13 and SG11 (Rapporteur)

This document includes five correspondences to Rapporteurs of SG13 and SG11, which have been generated according to the discussion at the Grimstad meeting: 1) priority and error indication primitive parameters at ALL-SAP, 2) network performance assumptions, 3) audiovisual services between the two terminals accommodated in B-ISDN and N-ISDN, 4) AAL1 short interleaver, circuit transport and support of SDT, 5) negotiation and signalling of an operational mode of multimedia multiplex and synchronization.

AVC-705 [-] Use of AAL 5 for Carrying CBR MPEG-2 TS for video-on-demand applications (AT&T, Bellcore, IBM, MCI)

This document proposes that AAL5 be used as the AAL to transport MPEG-2 TS in CBR video-on-demand applications and provides a rationale for this choice.

AVC-706 [-] ATM Forum Audiovisual and Multimedia Services (IBM)

This document gives an overview of the SA&A activities covering SA&A framework, AMS system structure, summary of the September meeting highlighting CBR VOD systems, and the next meeting.

## Temporary Documents

| Number | Source | Title |
|---|---|---|
| TD-1 | Rapporteur | Agenda for the sole sessions |
| TD-2 | Rapporteur | Available documents for the Singapore meeting |
| TD-3 | Rapporteur | H.32X network adaptation protocol reference model |
| TD-4 | John Morris | Report of ad hoc group on Systems-related Video issues |
| TD-5 | John Morris | DIS modification to accommodate Systems-related Video issues |
| TD-6 | M. Nilsson, J. Rosengren | Proposal for a Real-Time Interface Specifications |
| TD-7 | Rapporteur | Draft summary of the Tuesday discussion |
| TD-8 | Rapporteur | Comparison of the protocol configuration for audiovisual communication terminals |
| TD-9 (rev) | R. ter Horst | Report of the discussion on AAL issues |
| TD-10 (rev) | S. Dunstan | Group discussion on H.32X call phase and H.222.1 signalling |
| TD-11 | Rapporteur | Draft summary of the Thursday discussion |
| TD-12 | C-C. Li | H.32X terminal capability structure |
| TD-13 | C-C. Li | Harmonization with DSM-CC |
| TD-14 | Rapporteur | Chronicle of H.32Z discussion |
| TD-15 | WG B of WP1/9 | Draft ITU-T Recommendation - Transport of MPEG2 constant bit rate television signals in B-ISDN |
| TD-16 | Rapporteur | Draft report of the sole sessions in Singapore |
| TD-17 | ITU-T EG | Specification for RTI |
| TD-18 | ITU-T EG | Harmonization of ITU-T C&I and DSM-CC |

END

SOURCE : Small group coordinated by Mr. S. Dunstan

TITLE : Group discussion on H.32X call phases and H.222.1 signalling

PURPOSE : Report

## 1. H.24X

A proposal for H.24X was presented in AVC-677. The outline presented was reasonable, and was a good basis for progress. A variation on the description of capability sets was presented using ASN.1 notation in AVC-699. ASN.1 notation was agreed to be an acceptable method of specification. The nested structure described in AVC-699 is to be considered.

H.24X should be restricted to describe the H.32X terminal capabilities, and procedures for determination of the capabilities at the remote terminal. Other H.32X terminal to terminal signalling should be described elsewhere.

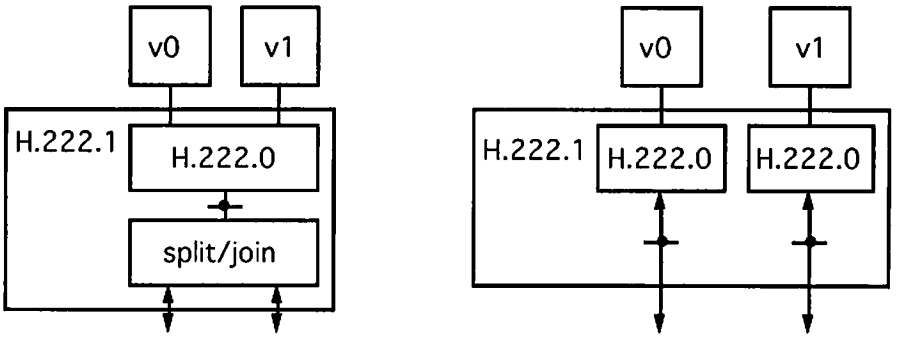
While AVC-677 presented common syntax for H.24X and H.24P, this approach needs careful consideration because of the different requirements; e.g. H.24P may be critical in the field length but H.24X is not.

## 2. T.120 PROTOCOLS.

AVC-675 expressed SG8's concern regarding multiplexing of the T.120 signals in H.222.1. T.120 signals may be very bursty. H.222.1 could provide a transparent service for T.120 signals, but this would be at the expense of audio and video bandwidth. The meeting confirmed that T.120 signals may be handled through use of a separate VC, or through H.222.1. Both cases will be supported.

## 3. LAYERED VIDEO AND MULTIPLE VIRTUAL CHANNELS

Two possibilities exist for placing elementary streams, such as layered video signals, into multiple VCs, as shown in Figure 1. The first, as outlined in AVC-664, is shown in Figure 1a) and employs one instance of H.222.0. A compliant H.222.0 bitstream is formed and split in a suitable manner for ATM transmission. In the second case, shown in Figure 1b), multiple instances of H.222.0 are used. H.222.1 includes signalling to associate H.222.0 bitstreams carried within the two VCs.




a) Single instance of H.222.0 b) Multiple instances of H.222.0

Figure 1. Choices in handling layered video in multiple Virtual Channels.

A comment made during the meeting was that VCs carrying enhancement video may not need to be H.222.0 compliant i.e. PCR/SCRs may only need to be carried in the VC carrying baseband video.

## 4. PS/TS SELECTION

Two methods for determining the H.222.1 mode of operation i.e. Program Stream or Transport Stream were considered. They were,

- out of band signalling using Q.2931 information elements at initial VC set up
- H.24X capability exchange

In the former case the information could be conveyed in a new AV information element, or lower layer information element. It was noted that delivery of the user-to-user information element is not guaranteed. The specification of this method would require coordination with other study groups.

In the second method the H.222.1 protocol would remain inactive until after a first capability exchange has been completed. H.222.1 might then become active on the same initial VC, resulting in establishment of a H.222.1 sub channel for conveyance of further H.24X information exchanges. Alternatively, H.222.1 might become active on a second VC, allowing H.24X exchanges to continue in the initial VC, without use of H.222.1. A H.24X protocol stack, and these events, are shown in Figure 2.

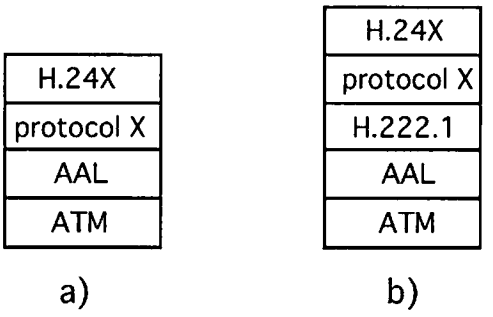



Figure 2. H.24X protocol stack. a) before H.222.1 becomes active in initial VC, b) after H.222.1 becomes active in initial VC.

The meeting agreed upon the second method.

In Figure 2 "protocol X" is a protocol which provides a reliable transport service for H.24X. Possibly protocols include X.224, or SSCOP. In the case of AAL type 1 a CRC32 and a framing function may be required. Commonality with the T.120 protocol stack should be considered.

## 5. TYPES OF C&I

Three types of C&I information were recognised. The three types, and their proposed methods of transport, are shown in table 1.

| C&I signal | transport | described in |
|---|---|---|
| frame synchronous | ITU-T auxiliary | H.32X |
| mode switching | PSI/PSM | H.222.1 |
| capabilities exchange | ITU-T auxiliary | H.24X |

Table 1. Types of C&I signals

H.222.1 will describe the method of achieving frame synchronous signalling.

## 6. CALL PHASES

Possible H.32X call phases, and possible H.222.1 sub channel set up and release acknowledgment procedures, were examined in AVC-702. Following the outcomes described above, a modified call phase diagram is as shown in Figure 3.

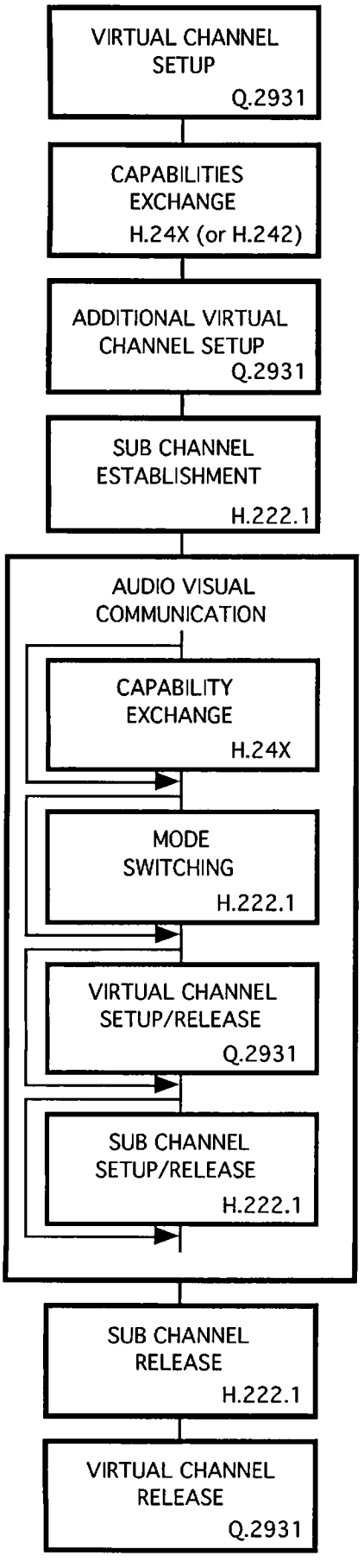
## 7. SUB CHANNEL SETUP/RELEASE.

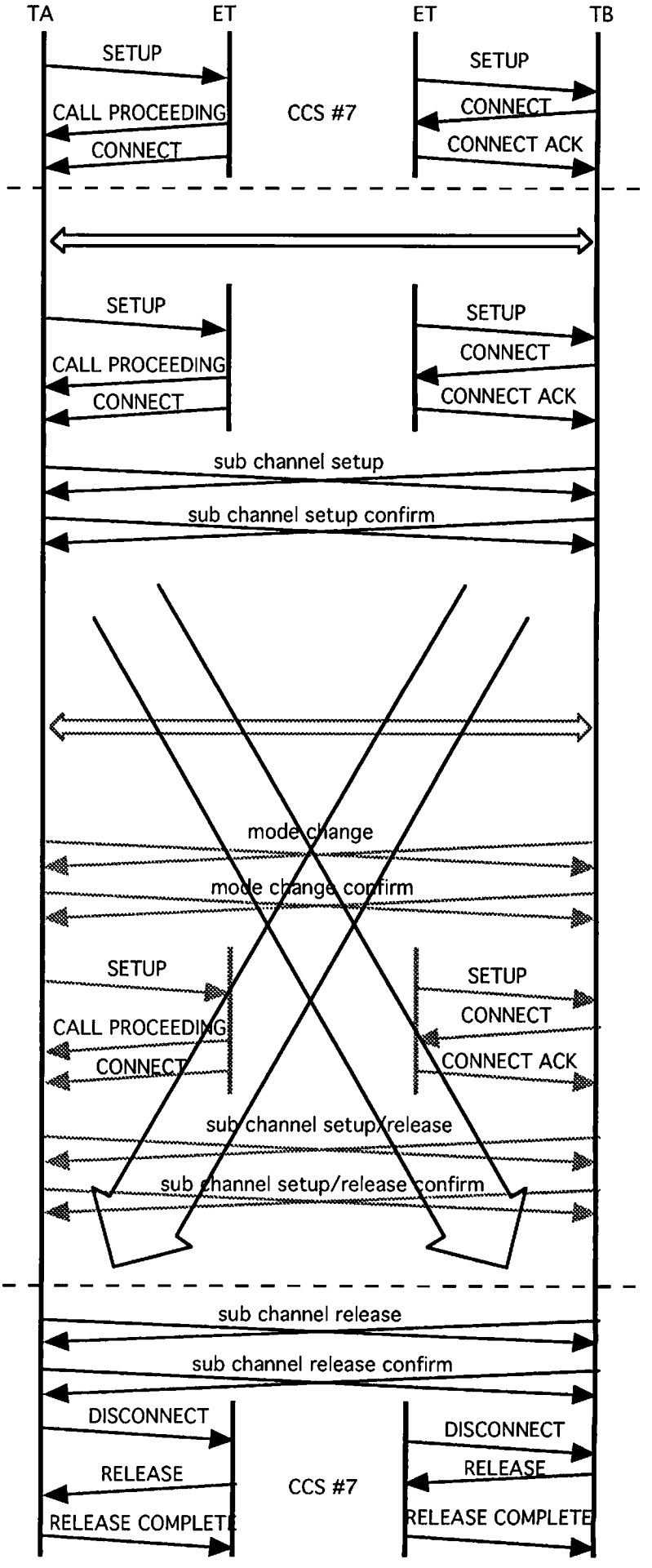
H.222.1 sub channel acknowledge procedures may be appropriate in the case of a bi-directional service. This may be advantageous for the following reasons,

- error conditions can be defined e.g. undefined multiplexing identifier.
- synchronisation especially in the case where the remote user is not a human i.e. a computer. Transmission cannot begin on a sub channel until it has been correctly established.

The following presents an incomplete description of possible sub channel setup and release procedures.

Figure 3. Call phases in H.32X.



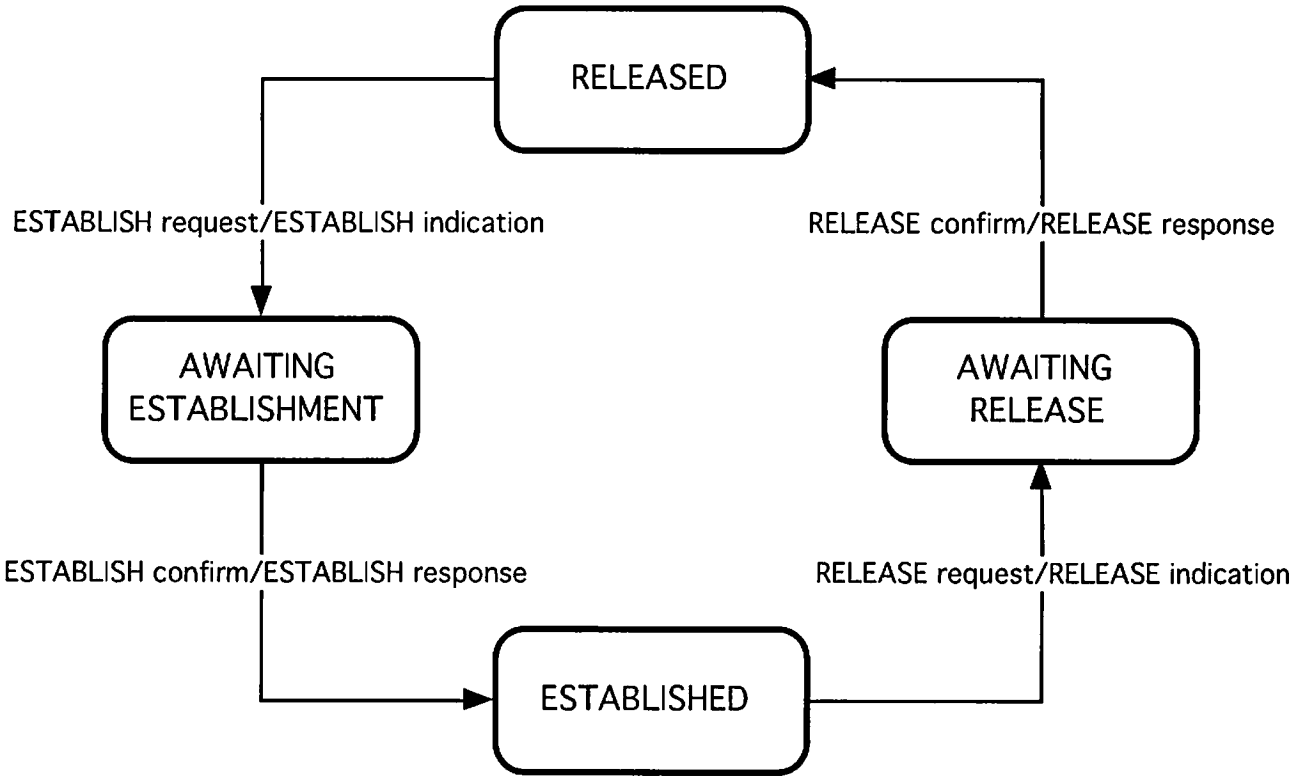
### 7.1. Interface states

RELEASED - the sub channel is idle
AWAITING ESTABLISHMENT - a transitory state
ESTABLISHED - data may be transmitted/received in this sub channel
AWAITING RELEASE - a transitory state

### 7.2. Interface signals

ESTABLISH request - request to establish a sub channel
RE ESTABLISH request - request to perform mode change on an existing sub channel
ESTABLISH response - response to a sub channel establish request
ESTABLISH confirm - the remote terminal has acknowledged the establishment/re establishment request
ESTABLISH indication - a remote terminal has requested establishment of a new sub channel
RELEASE request - request to release an existing sub channel
RELEASE confirm - the remote terminal has acknowledged the release request
RELEASE indication - a remote terminal has requested release of an existing sub channel

### 7.3. State transition diagram




*Interface signal notation: send side signal/receive side signal*

Figure 4. Proposed state transition diagram for H.222.1 sub channel establishment and release

### 7.4. Protocol Data Units

| peer to peer action | Program Stream | Transport Stream |
|---|---|---|
| request establishment | PMT req | PSI req |
| confirm establishment | PMT ack | PSI ack |
| release connection | PMT req | PSI req |
| confirm release | PMT ack | PSI ack |

Table 2. H.222.1 syntax to support indicated peer to peer action

### 7.5. Examples

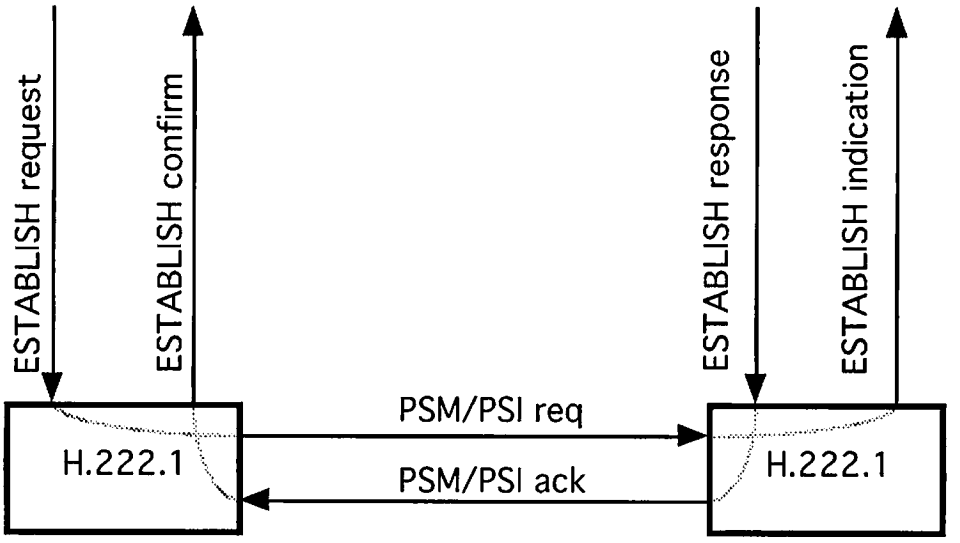



Figure 5. Normal procedure.

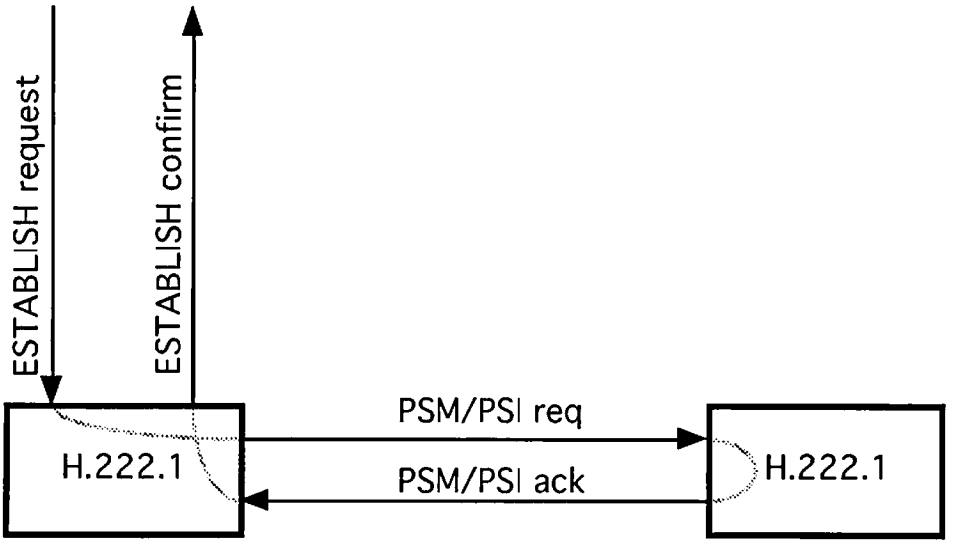



Figure 6. PSM/PSI CRC32 error detected.

## 8. H.32X SCENARIOS

### 8.1. Symmetrical

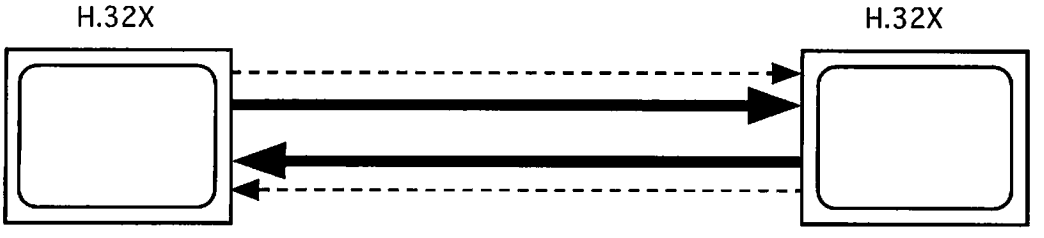



Figure 7

## 8.2. Server

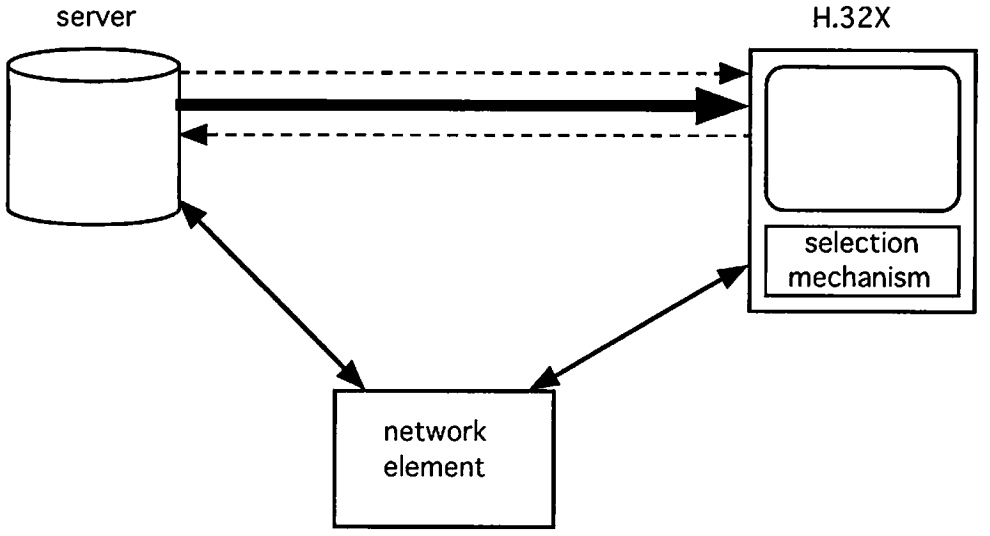



Figure 8

## 8.3. Broadcast

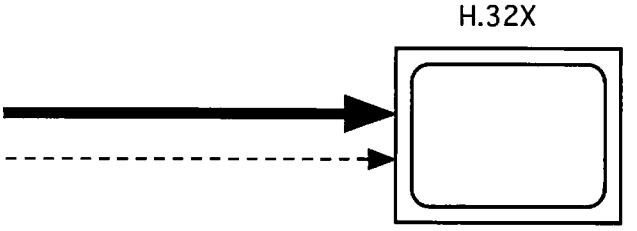



Figure 9

## 8.4. Pay per view

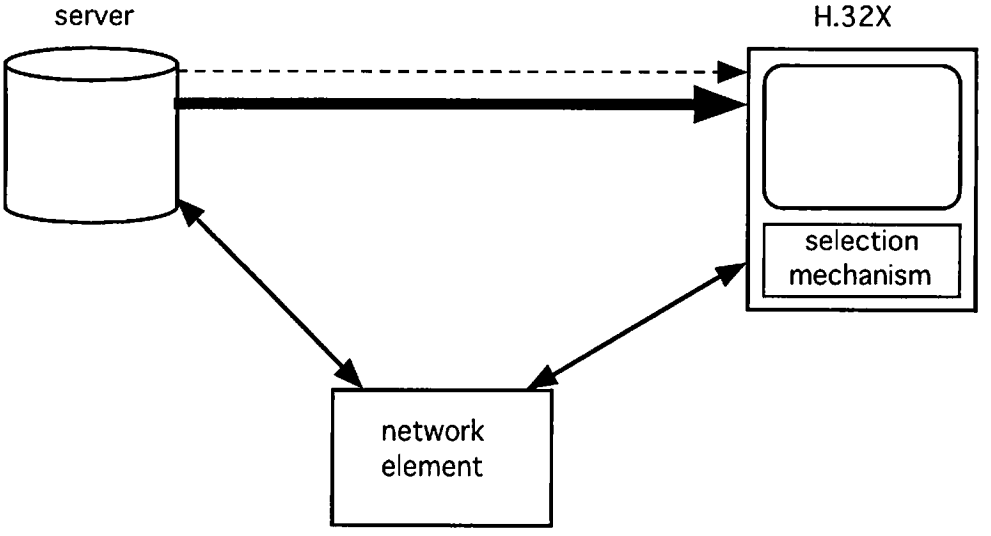



Figure 10

- end -

*Annex 3 to AVC-707R*

SOURCE: ITU-T SG15 Experts group for video coding and systems in ATM and other network environments

TITLE: Report of the discussion on AAL issues

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## 1. Introduction

In the Grimstad meeting the H.32X Network Adaptation Protocol Reference Model (NA-PRM) used in the experts group has been revised as represented in TD-3 (Singapore).

The NA-PRM presents AAL1, AAL2 and AAL5 as candidate AAL types for the Audiovisual and Multimedia Services (AMS) supported by H.32X. In the Singapore meeting the experts group addressed the candidate AAL types in relation with the NA-PRM.

The most relevant input documents include AVC-685, AVC-706 and TD-15 (ITU-T SG9 document DT/93). AVC-685 presents the preferred solutions in ETSI: AAL1 for CBR AMS servces and a new AAL2 (to be developed) based on AAL1 for VBR AMS services. AVC-706 presents the ATM-forum choice for their phase 1 workscope: video-on-demand with MPEG2-TS in CBR over AAL5. The ITU-T SG9 document DT/93 is a draft ITU-T recommendation for transport of MPEG2 CBR television signals in B-ISDN. It recommends the use of AAL type 1 including the convergence sublayer (CS) for video signals. This CS includes the so-called long interleaver error correction.

## 2. Candidate solutions

With these inputs, the SG15 experts group discussed:

1. the necessity of the reduction of cell delay variation (CDV) before delivery to H.222.0 and error correction,
2. the candidate solutions for these functions, and
3. their allocation to the layers of the NA-PRM as in TD-3,

We concentrated on AAL1 and AAL5 based possibilities. AAL2 remains as action item.

For item 3 we refined the layer structure of TD-3: H.222.0, H.222.1 specific part and:

in AAL1: CS and SAR sublayers
in AAL5: SSCS and CPCS sublayers. (as shown in Figure 1)

<table>
<tr><td colspan="2">H.222.0<br>========== RTI ==========</td></tr>
<tr><td>H.222.1 specific, for AAL1<br>error correction</td><td>H.222.1 specific, AAL5<br>CDV reduction<br>error correction (?)</td></tr>
<tr><td>AAL1 CS<br>CDV reduction<br>(long interleaver FEC)</td><td>AAL5 SSCS</td></tr>
<tr><td>AAL1 SAR 1+47 byte<br>SN 4bit: CSi(1) + SCF(3)<br>SNP 4 bit</td><td>AAL5 CPCS N+8 byte<br>8 Byte trailer:<br>reserved(2B), length(2B), CRC(4B)</td></tr>
</table>

*Figure 1 Function allocation in (sub)layers of NA-PRM*

No agreement for adopting a single solution for these (sub)layers was achieved. Therefore we have defined multiple service scenarios, with the objective to identify the candidate solutions and to minimize the number of different solutions. Table 1 shows the defined service scenarios, each for two network scenarios: End-to-end ATM and Hybrid ATM/circuit (circuit emulation). Figure 1 shows the agreed possibilities for allocation of the CDV reduction and the error correction functions.

*Table 1 AAL options in service and network scenarios*

| | End-to-End ATM | Hybrid ATM/circuit (circuit emulation) |
|---|---|---|
| | | |
| **Conversational** | | |
| CBR MPEG2 | * | AAL1 |
| VBR MPEG2 | ** | *** |
| H.320 and H.32Y | AAL1 | AAL1 |
| | | |
| **Distribution** | | |
| CBR MPEG2 | ITU-T SG9 (Broadcast): AAL1 with long interleaver | **** |
| CBR MPEG2 | ATM-Forum (VoD): AAL5 without SSCS | |
| VBR MPEG2 | ** | *** / **** |
| | | |
| **Interact. video retrieval** | | |
| CBR MPEG2 | * | **** |
| VBR MPEG2 | ** | *** |

| | | | |
|---|---|---|---|
| * | AAL1 and AAL5 proposed | *** | VBR over circuits to be discussed |
| ** | To be studied (AAL2 proposed) | **** | Scenario for sending H.32X terminal source signals with CBR circuit in the hybrid transmission link. |

After discussion on the options for AAL1 and AAL5 we had the following conclusions:

1 - Cell loss recovery with short or long interleaver would not be required by the listed service scenarios except for the distribution scenarios as addressed by SG9.
The main reasons for this view were that the mean time between cell loss events in the expected network scenarios is considered to be large enough for the listed services (AVC-635, $10^{-6}$ worst case, $10^{-9}$ average, $10^{-11}$ best case) and that the impact of cell loss to the H.222.0 and higher layers is considered to be acceptable for the listed services. Contributions are invited for verification of these statements.

2 - In most cases there is a need for bit error correction capabilities. It was agreed that this capability should be part of the H.222.1 layer as it is an H.32X specific function (mandatory for encoders, optional for decoders).

3 - We will have a relatively simple low delay forward bit error correction mechanism. One possibility was to consider the BCH (511,493) code of H.261. An advantage of using the H.261 based FEC method is that it will facilitate interworking with existing H.320 and H.32Y terminals. Other FEC options have been suggested, including a mechanism which will allow alignment with the ATM cell payload. Further contributions are invited.

In Figure 1 the long interleaver FEC for AAL1 is shown between brackets. For the general H.32X terminal we prefer to have just bit error correction in the H.222.1 specific layer. It has been suggested that even this may be not needed if the transmission channel performs very well. This needs further consideration. Cell loss detection is provided by the AAL1-CS, detection of bit errors and cell losses in the AAL5 CPCS payload is provided by the CRC of AAL5.

## 3. Reduction of CDV and the H.222.0 RTI

Reduction of the cell delay variation in the AAL1 can be included, to bring the jitter in the byte delivery times with respect to the intended arrival times within the range of the real time interface (RTI) of H.222.0 as shown in Figure 1. In this case no CDV reduction is required in the H.222.1 specific part.

In the AAL5 scenario the CDV reduction will not be part of the AAL, but it will be incorporated in the H.222 layer (either H.222.1 specific or H.222.0 across RTI).

Concerning the question whether to specify the expected CDV across the RTI, the meeting expressed a preference to extend the jitter tolerance of the RTI interface to a value that would eliminate the need for the CDV reduction function in the AAL or H.222.1 layers in the expected ATM network configurations.

The target value mentioned in the group was 1ms. This value is based on CDV studies as reported in AVC-635. Concern was expressed within the group that this value might not be sufficient for the currently unknown network configurations. An ATM pilot network configuration available today was reported to show 5 ms of jitter. CDV reduction below the RTI might therefore still be needed, but could be simpler with a higher jitter tolerance in the RTI interface. The conclusion was to keep 1 ms as target value.

## 4. Convergence of the AAL options to H.32X NA-PRM profiles

The candidate solutions for the NA-PRM as presented in Figure 1 don't show a major functional difference. The major arguments to include an AAL1 based solution in H.32X are the interworking capabilities for transmission over CBR circuits in a hybrid ATM + CBR circuit connection and in particular the interworking with H.320 terminals connected via N-ISDN. The arguments in favour of an AAL5 based solution are the simplicity of an AAL5 without SSCS and its early availability in hardware.

As different terminal capabilities will already exist in H.222.1, the group adopted a profile approach for the NA-PRM in H.32X. The purpose of definition of a limited number of profiles is to provide a limited number of well defined interworking capability sets for the NA-PRM. A single main profile and two simple profiles cover the current NA-PRM proposals for CBR.

The proposed H.32X main profile NA-PRM is a fully bi-directional terminal with both AAL1 and AAL5 based network adaptation as shown in Figure 2. This corresponds to terminal types A2 / B2. In case VBR also an AAL2 may become part of the main profile NA-PRM, resulting in a NA-PRM as in TD-3. The simple profiles are unidirectional for the audiovisual signals, receiving only, terminal type A1. Figures 3 and 4 show the simple profile 1 and the simple profile 5, based on AAL1 and AAL5 respectively.

Please note that Figures 2, 3 and 4 focus on the audio and video signals and on the AAL types. The arrows show the flow direction of the audiovisual information. The functions inside the layers are as in section 2 and 3, Figure 1.

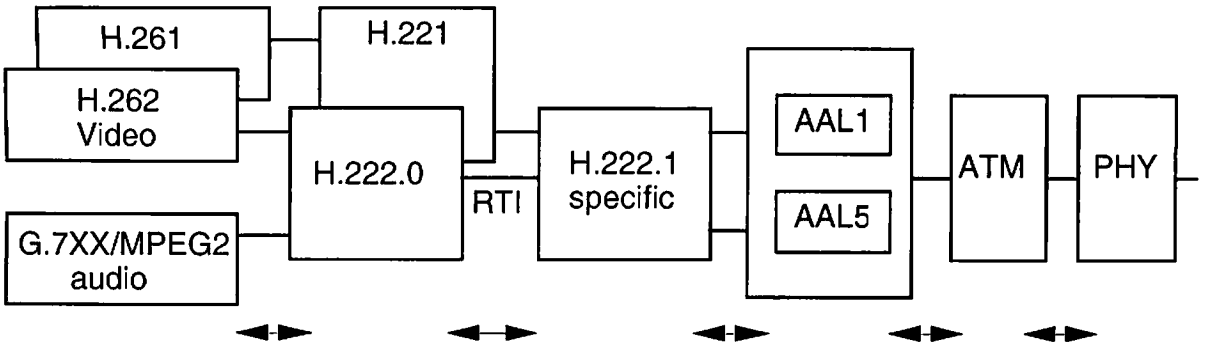


*Figure 2 H.32X main profile NA-PRM (terminal type A2/B2)*

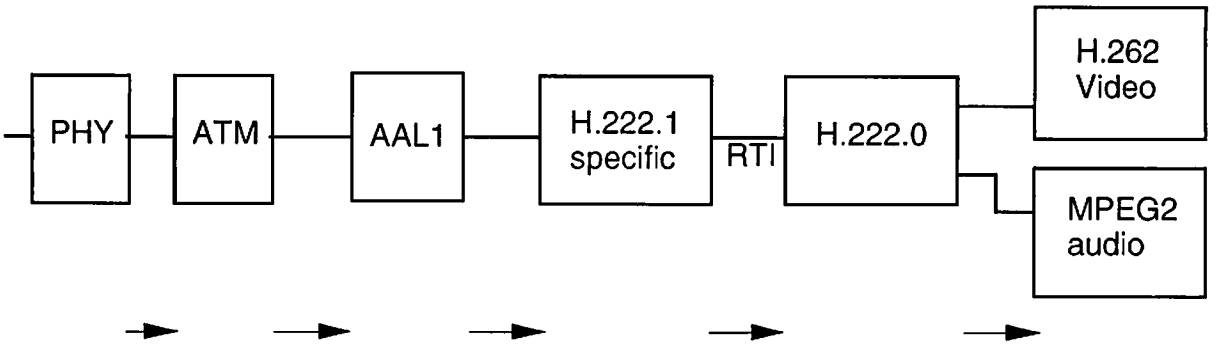


*Figure 3 H.32X simple profile 1 NA-PRM (terminal type A1)*

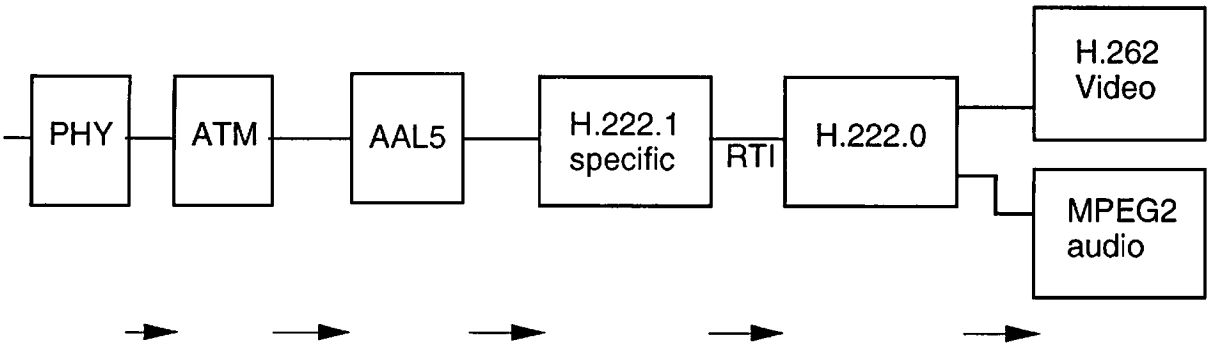


*Figure 4 H.32X simple profile 5 NA-PRM (terminal type A1)*

END

**ITU-T SG15 Experts Group** **ISO/IEC JTC1/SC29/WG11**
**TD No. 17 (Singapore)** **MPEG94/429**
**November 4, 1994** **November 4, 1994**

Source: ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments
Title: Specification for RTI
Purpose: Proposal
Relevant sub-group: Systems

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At the ITU-T Experts Group sole sessions held on November 1, 3 and 4 in Singapore, we discussed the RTI (Real Time Interface) of the H.222.0IISO/IEC 13818-1 decoder in the context of network adaptation of the H.32X audiovisual terminal. One of the issues is where to allocate jitter removal functionality in the network adaptation.

The following is the outcome of the meeting:

1) We propose to specify the RTI in ITU-T Rec. H.222.0IISO/IEC 13818-1 to facilitate the equipment designing.

2) We suggest 1 ms for the jitter tolerance specification. This is based on our ATM network performance assumption [1] where the average case scenario indicates 0.5 - 1 ms Cell Delay Variation for CBR services.

It is noted that the above is to amplify the comment T44 in MPEG94/331 I AVC-688.

Reference

[1] AVC-635 ATM Performance Assumptions (AVC Experts Group), July 1994.

**ITU-T SG15 Experts Group** **ISO/IEC JTC1/SC29/WG11**
**TD No. 18 (Singapore)** **MPEG94/430**
**November 4, 1994** **November 4, 1994**

Source: ITU-T SG15 Experts Group for Video Coding and Systems in ATM and Other Network Environments
Title: Harmonization of ITU-T C&I and DSM-CC
Purpose: Proposal
Relevant sub-group: DSM

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At the ITU-T Experts Group sole sessions held on November 1, 3 and 4 in Singapore, we discussed the C&I (Control and Indication) signalling in the context of protocol reference model of the H.32X audiovisual terminal and its relevance to DSM-CC Extension. One of the issues is through what channel these signals are transported and with what protocol stack. The following is the outcome of the meeting.

We will provide the commands and procedures for:

- Terminal capability exchange,
- Mode setting (initiation and switching),
- Video frame synchronous and asynchronous signalling, particularly for conversational services.

We wish to collaborate in:

- ATM specific procedures for distributive/retrieval services,
- Video frame synchronous/asynchronous signalling for distributive/retrieval services.

END

**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<br>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.

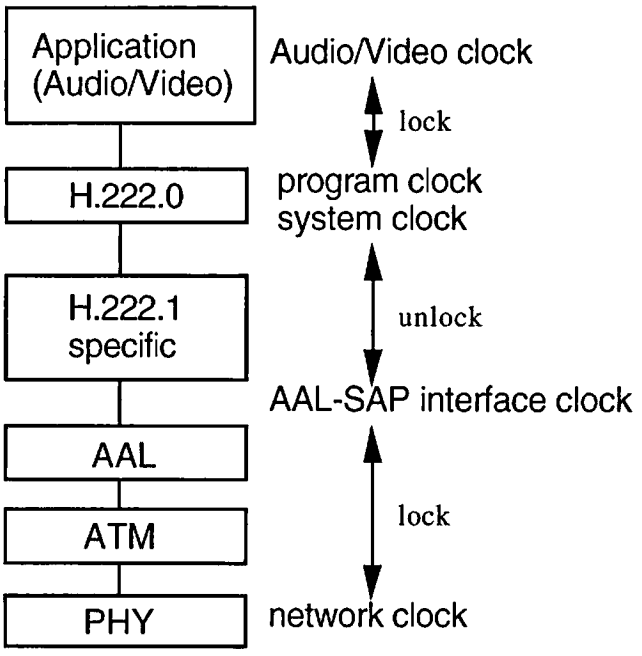


Fig.1 Clock relation in the H.32X protocol stack