CCITT SGXV
Working Party XV/1
Specialists Group on Coding for Visual Telephony

Document #347
May 2, 1988

SOURCE: CHAIRMAN OF THE SPECIALISTS GROUP
TITLE : SUMMARY OF FINAL MEETINGS OF WP XV/1 AND SGXV

The final meetings (for the 1985-1988 study period) of our higher bodies, Working Party XV/1 and Study Group XV, were held during April 11-22, 1988 in Geneva. This document reports major results on the topics of our direct concern, which were dealt with under Questions 4/XV and 5/XV. Main bodies of Part B.4 (for Question 4/XV) and Part B.5 (for Question 5/XV) of the Working Party XV/1 meeting report are in Attachment 1.

1. Specialists Group Activities

1) The sixth progress report was approved with some addition in the text. Approved progress report is in Attachment 2. In response to our request, advice of Study Group XVIII is sought on the network availability for 384 kbit/s channels by means of a liaison statement contained in p. 6 of Attachment 1.

2) Korean participation in the Specialists Group was approved.

3) Continuation of the Specialists Group activities in the interregnum and the next study period was approved with the following terms of reference;

a) To determine what rates should be considered for future study of codecs for audiovisual services, taking into account the state of the art of low bit rate coding, and transmission bit rates likely to be available in the future ISDN.

b) To obtain future agreement on (a) common algorithm(s) and coding parameters for video codecs operating at rates lower than the primary rate.

c) To consider intercommunication between codecs capable of operation with different rates, picture formats or algorithms.

2. New Recommendations - Recommendation numbers are based on Draft H.200.

1) H.140 A MULTIPOINT INTERNATIONAL VIDEOCONFERENCE SYSTEM (using Part 1/H.120, 130 codecs)

2) H.200 FRAMEWORK FOR RECOMMENDATIONS FOR AUDIOVISUAL SERVICES (list of harmonized set of recommendations, see Attachment 3)

3) H.221 FRAME STRUCTURE FOR A 64 KBIT/S CHANNEL IN AUDIOVISUAL TELESERVICES (formerly called as AV221 or Y221, see Attachment 4)

4) H.222 FRAME STRUCTURE FOR 384-1920 KBIT/S CHANNELS IN AUDIOVISUAL TELESERVICES (proposed by the Specialists Group, formerly H.13x, see Attachment 5; bit rate digits in the title changed from 2048 to 1920)

5) H.261 CODEC FOR AUDIOVISUAL SERVICES AT NX384 KBIT/S (proposed by the Specialists Group, formerly H.12x, see Attachment 6; Note 3 in the preamble modified)

3. Revised Existing Recommendations

1) H.100 VISUAL TELEPHONE SYSTEMS (split-screen specification elaborated)

2) H.120 CODECS FOR VIDEOCONFERENCING USING PRIMARY DIGITAL GROUP TRANSMISSION (Parts 1 and 2a amended, Part 3 filled in)

3) H.130 FRAME STRUCTURES FOR USE IN THE INTERNATIONAL INTERCONNECTION OF DIGITAL CODECS FOR VIDEOCONFERENCE OR VISUAL TELEPHONY (Parts 1 and 2a amended, Part 3 filled in)

4. New Questions

Current Questions 4/XV and 5/XV will be extended as follows (see Attachment 7);

Question C/XV Visual telephone systems including videoconferencing and videophone

Question D/XV Harmonisation of audiovisual systems

Draft outline Recommendation H.200/AV262 (=H.12y) is annexed to Question C/XV.

Attachments

Attachment 1: Main bodies for Question 4/XV and 5/XV of WP XV/1 Meeting Report
Attachment 2: Sixth progress report of the Specialists Group
Attachment 3: Draft Recommendation H.200
Attachment 4: Draft Recommendation H.221
Attachment 5: Draft Recommendation H.222
Attachment 6: Draft Recommendation H.261
Attachment 7: New Questions C/XV and D/XV

Attachment 1 to Doc. #347

PARTS B.4 (QUESTION 4/XV) AND B.5 (QUESTION 5/XV) OF WORKING PARTY XV/1 MEETING REPORT

Attachment 1

CCITT
STUDY GROUP XV

Temporary Document No. 30 (XV/1)

Geneva, 11-22 April 1988

Question : 4/XV

SOURCE: SPECIAL RAPPORTEUR FOR QUESTION 4/XV
TITLE : DRAFT MEETING REPORT (PART B.4)

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1. Documentation

1.1 COM XV-185* (BT) proposes a draft Recommendation for a multipoint videoconferencing system using H.120 codecs.

1.2 COM XV-210* (Specialists Group) proposes draft recommendations for nx384kbit/s codec and frame structure applied to this codec.

1.3 D.336/XV (FRG) discusses the three modes of narrowband videophone from terminal/codec, network/service and tariff points of view; 64 kbit/s, 64 kbit/s + 64 kbit/s, and 128 kbit/s. It is concluded that the three modes should be considered for standardization due to different customer demands which are foreseeable even at present.

1.4 D.346/XV (BT) proposes that the mandated objective of the Specialists Group in 1989-1992 should be a single sub-primary rate video codec Recommendation which covers operation at video-channel rates of 40 kbit/s to 1856 kbit/s. The consideration is that SG XV should avoid any future circumstances in which two video codecs, capable of operation at a common bit rate but covered by different Recommendations, will not decode each other's pictures. How to handle future algorithm improvements are also discussed.

1.5 D.339/XV (Finland) proposes items to be studied under the new question on 64 kbit/s videophone, stressing the importance of finding an optimum solution for the 1B videophone.

1.6 WD2-XV/1 (France) proposes a draft new question about synchronization of independent switched circuits in order to provide N x 64 kbit/s channels.

1.7 TD1/XV (Special Rapporteur for New Questions) provides a revised text for Question C/XV, continuation of current Question 4/XV.

1.8 TD5-XV/1 (WP XII/3) gives advice on the need for echo control device when the processing delay is significant, pointing out that a delay of 25 ms or more may require use of a echo control equipment and warning that embedding of echo suppression schemes in the coding algorithm may significantly impairs quality and intelligibility of speech in multipoint communications.

1.9 TD10-XV/1 (Special Rapporteur for Q.4/XV) provides a draft reply to Question 4/XV by reviewing the progress during this study period.

1.10 TD11-XV/1 (Specialists Group) proposes an updated version of Draft Recommendation H.13x based on the most recent work.

1.11 TD12-XV/1 (Specialists Group) presents the sixth progress report of the group activities with major conclusions and the present status of the study.

1.12 TD13-XV/1 (Specialists Group) proposes an outline draft Recommendation

for the mx64 kbit/s codec, describing the list of items and some agreed contents.

1.13 TD25-XV/1 (Special Rapporteur for Q.4/XV) provides editorial amendments to the latest texts for Recommendations H/120 and H.130.

2 . Discussion and Agreements

2.1 Report of the Activities of Specialists Group on Coding for Visual Telephony (TD12-XV/1)

Chairman of the Specialists Group (Mr. Okubo - Japan) reported on their activities covering the two meetings held in January 1988 and March 1988. The group has drafted Recommendations H.12x and H.13x for the nx384 kbit/s codec, and agreed on picture formats and frame structure for the mx64 kbit/s codec. Mr. Schiano (USA) requested to include the two notes concerning the mx64 kbit/s picture format discussion which appears in the original meeting report of the Specialists Group.

The meeting approved this progress report with those two notes added. The revised text is contained in Annex 1 to this Working Party XV/1 meeting report.

As to the availability of networks for 384 kbit/s, the meeting decided to ask advice of Study Group XVIII by sending a correspondence drafted by Mr. Robin-Champigneul (France) which is contained in Annex 2 to this Working Party XV/1 meeting report.

2.2 Continuation of the Specialists Group (TD12-XV/1, D.346/XV)

The meeting agreed on the continuation of the Specialists Group activities during the next study period as well as during the interregnum according to the request of the Specialists Group (see Section 2.1 of COM XV-R26(B)). This will be put forward to the final Study Group XV meeting for an official approval.

At the same time, the meeting considered the terms of reference for the activities of this group during the next study period, taking into account the comments provided in D.346/XV(BT). After some discussion, Mr. Schiano undertook to coordinate a small group meeting for finalizing the terms of reference. The outcome which Working Party XV/1 subsequently approved is as follows;

a) To determine what rates should be considered for future study of codecs for audiovisual services, taking into account the state of the art of low bit rate coding, and transmission bit rates likely to be available in the future ISDN.

b) To obtain future agreement on (a) common algorithm(s) and coding parameters for video codecs operating at rates lower than the primary rate.

c) To consider intercommunication between codecs capable of operation with different rates, picture formats or algorithms.

2.3 New Recommendations

2.3.1 H.14x for multipoint videoconferencing (COM XV-185*)

The meeting agreed on to include this Recommendation in the Blue Book with reflection of the following comments obtained during the presentation and discussion;

- "Scope" should be added to clarify the objective and codecs to be applied.
- Codec to codec signalling bits should be aligned with the current text of Recommendation H.130.
- Relation between 2 Mbit/s interface for MCU and Part 2a codec should be clarified.
- Revision of "Bit 3.15: Loop Detection".
- Deletion of the parts referring to non-CCITT standards.

The finalized text is contained in Part C.5 of this meeting report of Working Party XV/1.

2.3.2 H.12x and H.13x for nx384 kbit/s codec (COM XV-210*, TD11-XV/1)

The meeting agreed on to include these two Recommendations in the Blue Book with the following modifications;

- Note 3 on p. 3 of TD11-XV/1: Considering a comment that this note may give prejudge to Recommendation H.12y yet to be worked out and a comment that the objective should be a single sub-primary rate codec Recommendation covering operation at video channel rates of 40 to 1856 kbit/s (D.346/XV), the meeting decided to modify it as follows;

  "It is recognised that the objective is to provide interworking between nx384 kbit/s codecs and mx64 kbit/s codecs as defined in the H series Recommendations. Interworking will be on the basis of mx64 kbit/s, where the values of m are under study."

- Title of H.13x: The channel rate for n=5 should be 1920 kbit/s, not 2048 kbit/s.

The finalized texts for H.12x and H.13x are contained in Part C.3 and Part C.4 of this meeting report of Working Party XV/1, respectively.

2.3.3 Outline draft Recommendation H.12y (TD13-XV/1)

It was agreed to annex this material to the new Question C/XV as a starting point of the study during the next study period. The text is contained in Annex 3 of this meeting report of Working Party XV/1.

2.4 Revision of H.120 and H.130 (TD25-XV/1)

Text revisions to the version in COM XV-R16 was approved, almost of which are editorial, but some are due to the change of reference to frame structure Recommendations, from G.732/733 to G.704. Parts requiring modifications are indicated in Annex 4 of this meeting report of Working Party XV/1.

It was also pointed out that there is some discrepancy (Table 2 of H.130) between current French texts and English texts.

2.5 Modes of narrowband videophone service (D.336/XV, TD5-XV/1)

The three different modes (64 kbit/s, 64 kbit/s + 64 kbit/s, 128 kbit/s) are compared in D.336/XV from terminal/codec, network/services and tariff points of view. After some questions and answers, the meeting recognized that it

shares a common view that all presented modes have to be regarded and interconnection has to be achieved by means of a fall back function and decided to include this point in the text of the new Question C/XV.

Delegate of FRG stated that this contribution would be resubmitted as a white contribution for the first meeting of the next study period in order to make further discussion.

2.6 Reply to Question 4/XV (TD10-XV/1)

Special Rapporteur's draft reply was approved, which is attached as Annex 5 of this meeting report of Working Party XV/1.

2.7 Text of the new Question C/XV (TD1/XV, TD5-XV/1, D.339/XV, WD2-XV/1)

After reviewing D.339/XV which proposes some study items for 64 kbit/s videophone, the meeting decided to draw attention of the Specialists Group to this contribution.

As to the correspondence from SG XII in response to our request of advice (Annex 4 to Part B.4 of COM XV-R26(B)) on the need for echo control in the environment with significant speech processing delay, the meeting took note of this correspondence and reflected the contents in the text of new Question C/XV.

Synchronization of N x 64 kbit/s circuits are discussed in WD2-XV/1. It was decided that study items 2 and 4 be incorporated in the new Question. For the audiovisual service call establish aspects of N x 64 kbit/s, it was decided to raise problems and seek advice of SGXVIII by sending a correspondence, which was drafted by Mr. Robin-Champigneul and contained in Annex 2 of this meeting report of Working Party XV/1.

Taking into account these comments and other considerations, the final text of new Question C/XV was drafted as in Annex 6 of this meeting report of Working Party XV/1.

Annexes

Annex 1: Sixth progress report on the activities of the Specialists Group (TD12-XV/1 revised) — Attachment 2
Annex 2: Correspondence to SGXVIII on network aspects of N x 64 kbit/s circuits
Annex 3: Outline draft Recommendation H.12y (TD13-XV/1) — Omitted
Annex 4: Revision of H.120 and H.130 (TD25-XV/1 revised) — Omitted
Annex 5: Reply to Question 4/XV (TD10-XV/1 revised) — Omitted
Annex 6: New Question C/XV (corresponding part of TD1/XV revised) — Attachment 7

Annex 2 CORRESPONDENCE TO STUDY GROUP XVIII

CHANNELS FOR THE TRANSMISSION OF AUDIOVISUAL SERVICES

Audiovisual services will require bit rates of nx384 kbit/s or mx64 kbit/s. Some of the first ISDN networks, however, will deal with only 64 kbit/s B channels. Several of these B channels will then have to be used jointly to obtain the desired bit rate, which raises the question how to switch them and when necessary how to synchronize them.

Three cases can be considered;

1) The network is capable of connecting and disconnecting several synchronized B channels without changing their order (time slot sequence integrity).
2) The network is capable of connecting and disconnecting jointly several B channels, but without any synchronization among them. The terminal then will have to use H.221 framing in each channel in order to synchronize and to reorder them.
3) The network can only deal with individual B channels. The terminal will then have to set up and disconnect the required number of separate B channels, and then to use H.221 framing to synchronize and reorder them.

The complexity of the terminal increases from case 1 to case 3 (while it decreases conversely for the network). In case 3, the risk arises that only part of the calls will get through, which means that the user would have to cancel the call because of an insufficient total bit rate, but would still be charged for part of it. It is then highly desirable that the network be able to deal with at least case 2.

Another useful feature would be that some of the B channels might be dropped or conversely one or more B channels added during the course of communication. This could happen for instance if a 2B channel is used for speech and image, and the image is needed only at the beginning of the call or at some later time during the communication.

A similar case will arise for interworking or fallback. When a call is made, it will not always be known what type of terminal will answer (for instance, a 2B videophone might call and a telephone answer). Either the call will be at the highest bit rate, and the unused channels dropped in case of fallback, or the call will be made on one B channel only, and the remaining B channels connected if and when it is recognized that the called terminal is able to use them.

The presently considered values for the number of B channels is m=2 and m=6, but other values may come up during further studies.

The last point is concerned with interworking between a network providing the case 1 service and another network providing only case 3 service. For instance, 384 kbit/s videoconferencing may be provided by a H0 channel in some country and by 6x64 kbit/s channels in another country. The question is how these two networks interwork for 384 kbit/s international videoconferencing.

This annex will be submitted to SG XVIII and its advice requested as to the projected facilities offered by the network in this respect.

Part B.5 – QUESTION 5/XV, MULTI-FACILITY SERVICES

1. Documents Considered

COM XV-183(UK) proposes modifications to Draft Rec. H.221 to include further BAS attributes and to re-structure the capability BAS.

COM XV-184(UK) proposes a draft H.200/AV.242, extending the principles of G.72Y to include moving pictures, 16/32 kb/s audio, and two or more 64 kb/s channels.

COM XV-195 (Bellcore) proposes a new approach to the assignment of BAS command and capability ~~values~~ attributes and values in H.221.

D.328 (Japan) comments on COM XV-183 and -195, relevant to drafting H.221.

D.329 (Japan) reports on practical implementation of the H.221 frame alignment method provisionally adopted in COM XV-R26, Part C§4, and proposed further modifications to the draft.

TD.1 (Rapp.) is a draft Reply to Q5/XV for the study period 1985-88.

TD.2 (Rapp.) gives examples of the application of ~~Rec.~~ H.200/AV.242 to various types of videophone service.

TD.3 (Rapp.) is a progress report on Q5/XV.

TD.4 (Rapp.) is a new draft Rec. H.200, Framework for Recommendations for Audiovisual Services.

TD.6,7 are liaison communications from SG VIII concerning H.200 and interregnum activity respectively.

TD.8,9 are liaison communications from SG XVIII concerning ISDN services and broadband ISDN service definitions respectively.

TD.23 is a liaison statement from COM 'S' concerning coordination of audiovisual service/system studies.

WD.1 (France) provides further comments on H.221.

WD.2 (France) proposes study items for the next period.

WD.4 (Sweden) proposes modifications to Question D/XV.

2. Draft Recommendation H.200

The final draft of H.200, "Framework for Recommendations for Audiovisual Services", was adopted as Part C.5 of this report. The list of Recommendations annexed thereto shall include definitively only those Recs. approved for inclusion in the Blue Book. Other Recs. forming part of the Framework but requiring further study are listed as in Annex ____ to this report;

this list will be re-issued periodically as the development work progresses during the study period, each issue being dated and indicating clearly the changes from the previous issue. Each provisional member of the set of draft Recs. shall be given an appropriate number in the framework (AVxxx), title, an outline (contents list), and the WP and Rapporteur responsible for progressing it; the current status should also be indicated, and the target date for completion.

3. Draft Rec. H.221

Further amendments to previous draft H.221 (see COM XV-R26, Part C.4) were considered by a working group under the chairmanship of Mr. M. Anderson (USA). The final draft was adopted as Part C.6 of this Report. The aspects left for further study are listed in Annex ____ to this report.

4. Draft Rec. H.200/AV.242

The proposal contained in COM XV-~~R~~184 was adopted as a basis for further study, and was appended to { this report, Annex ____ / Question D/XV } TD.2 gives examples of the application of AV.242 to various forms of videophone services, drawing on the provisions of H.221: however in view of the amendments made to H.221, TD.2 will be revised and re-submitted to the next appropriate meeting.

5. Interregnum activities

The meeting agreed with the proposal of TD.7 to hold an Ad Hoc joint meeting on Audiovisual Services during the interregnum period; the meeting should be attended by rapporteurs and associate rapporteurs nominated by Study Groups on a provisional basis to cover anticipated Questions for the next study period. If an appropriate convenor is not

available from SG I or II, then the meeting will be organised by Rapp. Q5/XV in anticipation of the revised Q D/XV : Harmonisation of Audiovisual ~~Services~~ Systems.

6. Approval of Reply to Q5/XV for 1985-88

The Reply was approved as Annex ____ to this report.

7. Text of New Question D/XV

Further amendments were proposed to the text previously adopted as COM XV-R26, Part B.5, Annex 8. The final version is given as ____

~~(Temporary note: TD 1(XV), plus additions : see WD2, 4 ; also add SG VIII to Note 1.)~~

8. Other Matters

WP XV/1 took note of the information from WP XVIII/1 in TD.8 concerning ISDN service Recs., and of the response from WP XVIII/BOTG in TD.9 Concerning teleshopping, teleadvertising, and videoconferencing.

WP XV/1 took note of the response in TD.23 from COM 'S' concerning the method of coordinating studies in 1989-92. Proposed action of interregnum activities is in line with the guideline in TD 23.

Attachment 2 to Doc. #347

SIXTH PROGRESS REPORT OF THE SPECIALISTS GROUP

Attachment 2

TD 31 (XV/1)

TITLE : SIXTH PROGRESS REPORT ON THE ACTIVITIES OF THE SPECIALISTS GROUP

CONTENTS

1. General

The Specialists Group on Coding for Visual Telephony started its activities in December 1984 and presented the following five progress reports to the Working Party XV/1;

1) July 1985, see Annex 1 to COM XV-R4,
2) February 1986, see Annex 1 to Q.4/XV of COM XV-R9,
3) October 1986, see Annex 1 to Q.4/XV of COM XV-R16,
4) April 1987, see Annex 1 to Part V of COM XV-R22.
5) November 1987, see Annex 1 to Part B.4 of COM XV-R26(B).

The group is charged to make draft Recommendations on the sub-primary rate video codecs which have the following two categories;

- nx384 kbit/s (n=1-5),
- mx64 kbit/s (m=1,2).

Since November 1987, we met twice, from 26 to 29 January 1987 in Tokyo (Japan, hosted by NEC and FUJITSU) and from 22 to 25 March 1988 in The Hague (The Netherlands, hosted by The Netherlands PTT), and reviewed 71 documents including two meeting reports. The list of participants at the two meetings appears in Appendix 1.

This document reports major conclusions and the present status of the study.

2. nx384 kbit/s Codec

2.1 Flexible Hardware development

Flexible Hardware, which is a programmable equipment enabling to carry out parameter optimization and improvements, is being developed by five projects in several countries (FRG/Netherlands, France, Japan, UK). DIS test signal which provides a 4.6 second synthetic moving pattern in accordance with the Flexible Hardware specification was correctly decoded by four Flexible Hardwares. Four connections between independently designed hardwares were made between the following projects;

- UK and Japan (back to back in UK),
- Two projects in Japan (back to back),
- France and UK (via satellite),
- France and Japan (via satellite, Japanese hardware placed in UK),

and basic compatibility was confirmed.

2.2 Source and video multiplex coding

Experimental results obtained by using the Flexible Hardware as well as computer simulation were presented at the two meetings toward defining the details of the final Recommendation (see Figures 1 and 3 in TD 11 for configuration of the codec);

1) Quantizer

- Number of quantizers
- Unit quantizer characteristics, in particular methods to overcome the clipping effect
- Adaptive quantization for luminance and chrominance

2) Loop filter

- On/off control method
- Range of blocks to be filtered
- Filtering area, processing at the block boundary

3) Transform coefficient coding

- One-dimensional vs two-dimensional coding

4) Motion vector coding

- Tracking range of motion compensation
- Encoding method
- VLCs

5) Block address coding

- Use of a combination of absolute and relative addressing

6) Block attribute coding

- Signalling of loop filter, classification index and quantizer

7) Picture headers of dropped pictures

- Transmitted or not
- Extension of Temporal Reference

8) Macro block approach

- Reducing the overhead bits for extending the operation down to 64 kbit/s

9) Transmission buffer

- Buffer size
- Control to cope with the mixture of pre-coding and post-coding buffers

The items receiving a unified view were incorporated in the Draft Recommendation H.12x. Other items are left for further study.

2.3 Transmission coding

2.3.1 Available networks for 384 kbit/s

It was pointed out that there is no immediate plan to provide H0 channel in some countries, thus we need some schemes to obtain TSSI for 6 x B channels at the terminal if a 384 kbit/s channel is required (the original contribution is

attached as Appendix 2 of this report). Two solutions are conceivable; use of H.221 framing in each 64 kbit/s channel or use of training at the start of the call. A problem was also raised on what would happen in interworking if a network provides 6xB channels for 384 kbit/s transmission and the other network provides a H0 channel.

The group decided to raise the problem to related CCITT Groups and seek their advice through Study Group XV.

2.3.2 Forward error correction

Information on two error correcting codes, BCH and Reed-Solomon, was given for possible inclusion in Draft Recommendation H.12x. The group recognized that experimental results on whether error resilience approach be practical with the current motion compensated hybrid coding at 384 kbit/s were awaited. A suggestion was also made that we need careful consideration from system aspects point of view. Further study is required.

2.3.3 Transmission clock frequency

A technique was presented to theoretically overcome the problems which arise from mixed synchronous and asynchronous environments when X.21 64 kbit/s interface is involved, with the intention that the codec need not distinguish whether the network is synchronous or asynchronous. Experimental results are awaited to establish if the idea is practical.

2.3.4 One's density restriction in North American networks

A zero byte replacement method had been proposed. Further considerations on the possibility of network gateway solution and the relation with other transmission coding aspects such as FEC and encryption are required before reaching a conclusion.

2.3.5 Value of n

A question was discussed for clarification on whether the codec conforming to Recommendation H.12x should operate for all values of n. The group has the following common understanding;

- Recommendation covers the whole range of n.
- The values of n which each codec implements is not the matter of Recommendation.

- A specific operational value of n for a session is determined by the communication procedure, e.g., AV.242.
- It is expected that the codec having the maximum value of n1 can operate for all the values from 1 to n1.

2.4 Draft Recommendation H.12x

2.4.1 Transform part specification

In response to the solicitation for the DCT chip design, 10 organizations provided the group with information on their chips. Based on these information and the study results concerning the relation between the inverse DCT mismatch error and required refresh rate, the group agreed to-seek the approach of defining a baseline transform together with allowable mismatch error (see Table 1 for comparison of various approaches).

Table 1

APPROACH / REQUIREMENTS	BASELINE IDCT E > 0		CHOOSE A CHIP E = 0	LOWER RESOLUTION MATRIX E = 0	OTHER FAST ALGORITHM
	E ≃ 0	E > 0			
LOW COST CODEC EQUIPMENT	?	OK	OK	NOT NECESSARILY	?
DSP IMPLEMENTATION	OK	OK	?	OK	OK
ENSURE GOOD PERFORMANCE	OK	?	OK	OK	OK
AVOID TROUBLES IN SG XV	OK	OK	NO	OK	?
	PREFERRED APPROACH				

A provisional specification for the mismatch error was formulated for further consideration by the group as well as by chip manufacturers. It is expected that several existing chip designs may meet this specification.

Since it is more desirable that a unified design is adopted in all the chips to avoid the mismatch error problem, the group takes actions to stimulate the development of industry standard; a meeting is planned in May 1988 among DCT chip manufacturers and contact has already been got with the IEEE Circuit and System Society.

2.4.2 Scope of Recommendation H.12x

A proposal was made at the Tokyo meeting (January 1988) that the Specialists Group should regard operation down to 64 kbit/s as an essential requirement when drafting Recommendation H.12x for the Blue Book so that it would cover px64 kbit/s (p=1-30). Considerations for this proposal were customer's need, service and equipment provider's concern and network availability. After an extensive discussion on the pros & cons for this proposal, the group reached the following agreements;

1) nx384 Recommendation H.12x is put into Blue Book as much as possible at the final Study Group meeting in April. Remaining part awaiting hardware experiments should be put into the accelerated procedure in Spring 1989.

2) Full specification of H.12y for mx64 should be sought toward summer 1990, through steps of "divergence", "convergence" and "verification and optimization".

3) Considering the concerns expressed in the above proposal that Recommendation H.12x should not prevent its expandability to bit rates lower than 384 kbit/s, some specification of current draft H.12x may be modified during 1988, provided that the Recommendation H.12x is completed in spring of 1989 through the accelerated procedure. For the time being the scope of H.12x will remain as nx384 kbit/s but it is the opinion of 5 European countries that the scope should be extended to include lower bit rates than 384 kbit/s at point X in Fig. 1.

4) Specific items which have been identified to be requiring such considerations are as follows at the moment;

- Macro block approach in video multiplex,
- Transform specification if mismatch error is allowed.

If there are any other items, they should be identified at the meeting in March 1988.

Agreed time table for nx384 and mx64 is shown in Fig. 1.

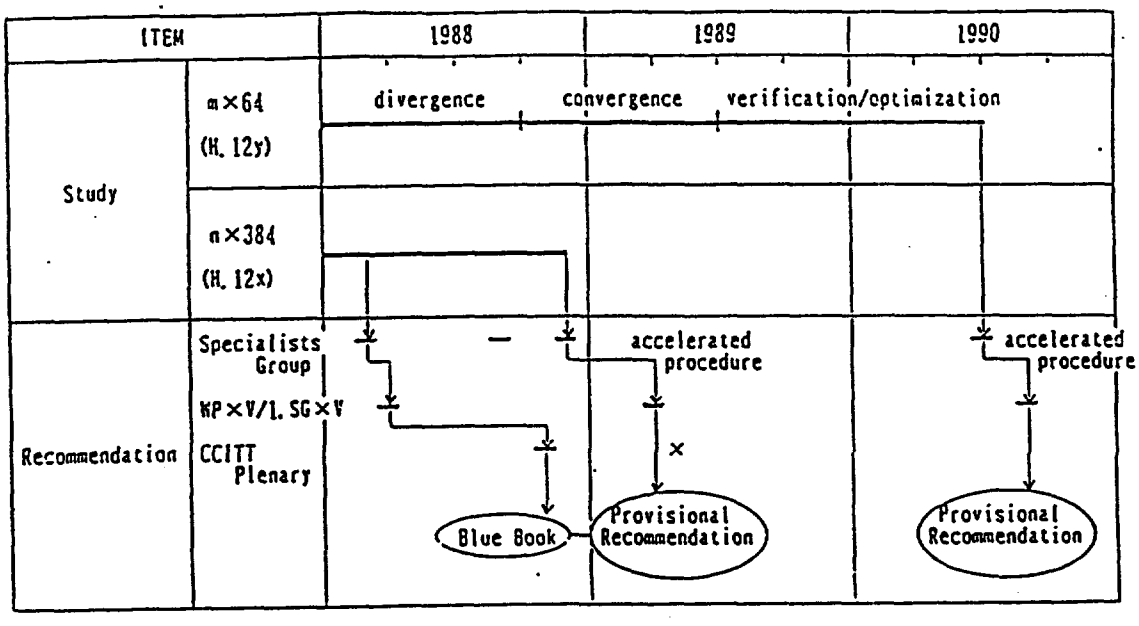

Fig. 1

This issue was further dealt with at the Hague meeting (March 1988).

Extensively discussed point was whether the concept of 'px64 kbit/s (p=1-30)' could be judged as practical at this stage. European members thought yes, while American and Japanese members thought no. After discussion, the group decided to accelerate the study for mx64 kbit/s, recognizing that we lack supporting study results for coding performance. One round of 'divergence' phase activities (cf Fig. 1) are requested before the next meeting in September 1988 so that we will be able to share a common view on this issue at that time.

2.4.3 Updating Draft Recommendation H.12x

In addition to those items which were confirmed through hardware experiments or other studies, the group considered inclusion of some items which allow operation at bit rates lower than 384 kbit/s (see §2.4.3 above) when updating the draft (COM XV-210-E*).

The outcome is submitted as a separate document (TD 11).

2.4.4 Some items under study but with only a limited number of alternatives

Such items are shown in Appendix 3 of this report.

2.5 Intellectual property

Statements from participating organizations were collected concerning the time of patent information disclosure. Based on these statements, the group reached an agreement that participating organizations advise the Group of information concerning their patents relevant to nx384 kbit/s and mx64 kbit/s codec standardization as soon as those patents are applied. In case that new members join the group, they are requested to follow the same policy and provide statements.

3. mx64 kbit/s Codec

3.1 Frame structure

The meeting confirmed that the frame structure to be used in mx64 kbit/s codec conforms to recommendation H.221, based on the discussion results at the Working Party XV/1 meeting in November 1987.

3.2 Picture format

After discussing the need of multiple formats, the group reached the following conclusion at the Tokyo meeting (January 1988);

Considering that;

1) Realization of full CIF at mx64 kbit/s is the long term performance target,
2) Nevertheless full CIF operation is not envisaged easy to achieve at the nearest future with reasonable cost,
3) We are charged to provide timely standards to meet the short/middle term demand of ISDN users,

the group agreed;

1) To specify the following two formats (Note 1) in Recommendation H.12y.

   a. Full CIF : 288lines x 360pels x 29.97Hz*
   b. Format smaller than full CIF: 1/4 CIF,
      144lines x 180pels x 29.97Hz* (Note 2),

   * This temporal aspect is for further consideration.

and

2) To provide a mechanism to allow simple best interworking arrangement between the two formats in order to promote evolution toward the long term target. Interconnection between different formats is on the basis of format b.

Notes: 1. The United States expressed the view that they would like to consider the use of three formats for Recommendation H.12y.
2. Japan stated the need to confirm this point at the next national committee.

At the Hague meeting (March 1988), Japan and USA proposed that a medium resolution (4/9CIF) picture format should be added to the above two formats based on the reservation made in Tokyo (see Notes 1 and 2 above). The consideration was that it provides the minimum acceptable spatial resolution for three persons seated side by side and a good spatio-temporal trade-off. Europe expressed the opinion that this addition of the third format is not necessary.

After discussion, it was recognized that the crucial question is which of full CIF or medium resolution format provides more acceptable coding performance for mx64 kbit/s in the coming few years. This point should be clarified by carrying out the study.

Consequently the group decided to defer concluding until more simulation works would be obtained. Members are requested to include this study item in speeding up the mx64 kbit/s study described in §2.4.2 of this report.

3.3 Coding algorithm study

3.3.1 Test sequences

Inclusion of "Swing" sequence for interactive graphics was agreed in addition to "Claire", "Salesman" and "Blue Jacket".

3.3.2 Latest achievements

The following achievements were presented as information for the Specialists Group;

- Eyes, nose and mouth identification,
- Motion compensated prediction with fractional-pel-accuracy,
- Transmission of low pass image in pel domain, estimation of motion vector, transmission of motion field by transform coding, etc.,
- Macro block,
- Adaptive zonal scanning,
- Reference Model 5 (see §3.3.3).

3.3.3 Study plan

As a study result in Europe, Reference Model 5 was presented in a complete document. The group recognized this model forms a good yardstick for the coming six months study.

The group accepted the Chairman's proposal that coding schemes to be presented at the next meeting be accompanied by detailed description of the algorithm so that other parties can verify them.
In order to make the achievements directly comparable at the next meeting and

to make "convergence" in Fig. 1 easier, rules and action points for the simulation work were set up.

3.3.4 Outline Draft Recommendation H.12y

The text is submitted as a separate document (TD 13).

4. Liaison with ISO

The group recognized the necessity of close liaison with ISO/TC97/SC2/WG8 in the following two respects;

- Still picture coding to obtain commonality with the motion video coding for which CCITT SGXV is responsible, since the ISDN users will wish to communicate both motion imagery and still pictures and hardware costs can be reduced if as many components as possible are shared by the various functions of the imaging terminal.

- Motion picture coding to avoid the situation that these two video coding related groups will deal with the same field and produce different Recommendations.

5. Items to be considered by WPXV/1

1) Approval of Draft Recommendations H.12x and H.13x

- H.12x as in TD 11 .
- H.13x as in Annex 2 to COM XV-210-E*.

2) Outline Draft Recommendation H.12y as in TD 13 .

3) Advice for the network availability for the 384 kbit/s channel

- As described in §2.3.1 and Appendix 2.

END

Appendix 1

LIST OF PARTICIPANTS
(Tokyo; January 26-29, 1988)

Chairman	S. Okubo	- NTT, Japan
Core Members		
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LIST OF PARTICIPANTS
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TD 31/1

Appendix 2

CCITT
Specialists Group on Coding for
Visual Telephony

Doc. No. #311
Tokyo, Jan. 1988

Title: Transmission of 384 kbit/s audio-visual signals in the ISDN

Source: FRG, NL, UK

In this paper, the problem of transmission of 384 kbit/s signals in the ISDN is raised and principal solutions are discussed.

The ISDN is designed for switching of signals with 64 kbit/s bit rate. To operate at 6 x 64 = 384 kbit/s, special means are required.

1. The switching unit itself is capable of handling a sequence of six 64 kbit/s channels in a predetermined order without changing the order from call to call or during a call (time slot sequence integrity). At present most switches in ISDN do not obey this requirement. But new switching units with this capability are available and announced.

2. The right order of the time slot sequence is managed by the terminals. This solution puts no requirements onto the network. Two variants can be distinguished:

2.1 Every 64 kbit/s signal is equipped with a framing structure, e.g. according to rec. Y221, where special indication bits allow for arranging the proper order of time slots at the receiving terminals.

2.2 After call set up, a training sequence is sent to the receiver, and the order of time slots is adjusted during this time. Afterwards transmission of audio-visual information starts. With the assumption that the switching unit does not rearrange the sequence during the call, this scheme can operate properly. It has to be checked whether this is true or not for all switching units from various manufacturers.

Conclusions

Three methods, their advantages and drawbacks have been presented to transmit and switch 384 kbit/s signals in the ISDN. Further consideration of this subject is encouraged and proposed.

Appendix 3

SECTIONS OF H.12x WHERE A COMMON VIEW HAS NOT BEEN REACHED

3.2.2 Motion compensation

On the subject of the range of the motion vectors:

European countries proposed that the range of horizontal and vertical vectors should be +/- 16.

Japan proposed +/- 15 for horizontal components and +/- 7 for vertical.

On the subject of applicability of motion vectors:

Japan proposed that motion compensation be applied only to luminance blocks.

The European countries proposed that the possibility of using vectors on the colour signals in addition to the luminance be kept under study.

Attachment 3 to Doc. #347

DRAFT RECOMMENDATION H.200

FRAMEWORK FOR RECOMMENDATIONS FOR AUDIOVISUAL SERVICES

Attachment 3

CCITT

STUDY GROUP XV

Geneva, 11-22 April 1988

TD (XV/4)

Temporary Document 44 (XV/1)

TD 24

TD 28

TD 33 (XV)

Question 5/XV

Source: WP XV/1

Title: DRAFT RECOMMENDATION H.200: FRAMEWORK FOR RECOMMENDATIONS FOR AUDIOVISUAL SERVICES (PART C6 OF THE WP XV/1 REPORT)

1. AUDIOVISUAL SERVICES

A number of services are, or will be, defined in CCITT having as their common characteristic the transmission of speech together with other information reaching the eventual user in visual form. This Recommendation concerns a set of such services which should be treated in a harmonised way; it is convenient to refer to the members of this set as "audiovisual services" (abbreviated to AV services). However it is not proposed to monopolise this term for the exclusive use of members of the set: that is to say, there may well be other services meriting the designation "audiovisual" which are not to be harmonised with those covered by Rec. H.200/. Where necessary, therefore, reference may be made more specifically to "real-time audiovisual services" or "H.200/AV services".

2. HARMONISATION OF AUDIOVISUAL SERVICES

While the various audiovisual services may easily be distinguished in terms of their user-application, common methods are used for the transport of signals representing speech, moving or still pictures, and associated controls/indications, and also telematic auxiliary facilities. The standardisation process seeks the greatest possible harmonisation of these common features, confining the distinction to the application layers wherever possible, in order to:

(a) Maximise the possibilities for intercommunication between terminals intended for different applications;

(b) Maximise the commonality of hardware and software in the interests of economies of scale. The scope for commonality includes: audio and video input/output parameters, audio and video codecs, the control/indication set, frame structures and multiplexing, call control procedures (including multipoint).

The embodiment of this harmonisation policy will be a consistent set of Recommendations, consistent in the sense that all members of the set take into account all other members.

3. PURPOSE OF THIS RECOMMENDATION

The purpose of this Recommendation H.200 is to define the set that shall be consistent. In fulfilling this function it is important to distinguish, at a given time, between Recommendations and draft Recommendations.

Recommendations are members of the set by virtue of their consistency with other adopted members of the set: these are listed in Annex 1 to this Recommendation. It is of course necessary to ensure continued consistency when amendments are introduced.

Draft Recommendations range from mere titles or outline contents through varying stages of maturity to a stable final draft. As many different intended members of the H.200 set are developed in parallel to ensure consistency they should be treated as "provisional" members of the set. (A)

~~It follows that Rec H.200 shall have a stable part (Annex 1) and a less-than-stable extended set for planning purposes (Annex 2). Annex 2 will be re-issued periodically as the development work progresses during the study period, each issue being dated and indicating clearly the changes from the previous issue. Each "provisional member" (draft Recommendation) shall be given an appropriate number in the framework (AVxxx), title, an outline (contents list), and the WP and Rapporteur responsible for progressing it; the current status should also be indicated, and the target date for completion.~~

4. FRAMEWORK

Recommendations in the H.200 set are arranged in three main sections:

Service Definitions - these specify the service as seen by the user, including basic service, optional enhancements, quality, and intercommunication requirements, together with operational aspects; technical implementation methods are taken into account but not defined herein.

Infrastructure - this section includes all the Recommendations which are applicable to two or more distinct services: these encompass network configuration, frame structures, control/indications, communication/intercommunication, and audio/video coding. The "infrastructure" includes this generality of signals which flow on unrestricted digital bearers on established network connections - it does not include the methods of call establishment and control, orchestrated by signals outside these bearers.

Systems and Terminal Equipment - this section deals with the technical implementation of specific services: it therefore includes service-specific equipment for the application layer, and draws upon the infrastructure recommendations to identify the detailed processes required for the particular service.

A network aspects section is also proposed, to cover those matters which are particular to AV services but, involving out-of-band signals, do not come within the scope of the infrastructure section above.

(A) The list of ~~proposed~~ set members including provisional items does not form part of H.200, but H.200 should be updated in the future to include new members of the set formally adopted.

5. LIST OF AUDIOVISUAL SERVICES COVERED

The following audiovisual services shall be included in the harmonised set:

- Narrowband videophone (1 and 2 x 64 kbit/s under study)
- Broadband videophone (a teleservice for broadband ISDN)
- Narrowband videoconferencing (n x 384 kbit/s and m x 64 kbit/s under study)
- Broadband videoconferencing (a teleservice for broadband ISDN)
- Audiographic teleconferencing
- Telephony (a degenerate case of an AV service, included for intercommunication purposes)
- Telesurveillance

The following audiovisual services are in the process of being defined, and consideration should be given to their inclusion in the set for either of the reasons given in section 2 above.

- Video mail
- Videotex (including pictures and sound)
- Video retrieval
- High resolution image retrieval
- Distribution services.

ANNEX 1

DRAFT RECOMMENDATION H.200 - FRAMEWORK FOR RECOMMENDATIONS FOR AUDIOVISUAL SERVICES

CCITT Rec. No. F700

I. SERVICE DEFINITION

AV100 General Recommendation for AV Services

- AV110 Teleconference Services — F700 T10
  - AV111
  - AV112
- AV120 (Videophone Services)
  - AV121 Basic Narrowband Videophone Service in the ISDN — F...
- ~~AV130 ... (Other AV Services)~~

II. INFRASTRUCTURE

AV200 (General Recommendation for AV Service Infrastructure)

- AV210 (Reference Network Configuration)
- AV220 (General Recommendation for Frame Structures) — 1920
  - AV221 Frame Structure for a 64 kbit/s Channel in Audiovisual Teleservices — H221
  - AV222 Frame Structure for 384 ~~1536~~ kbit/s Channels Audiovisual Teleservices — H222
  - ~~AV223 ... (Frame Structures for Higher Bit Rates)~~
- AV230 (AV System Control & Indications)
  - ~~AV231~~
  - ~~AV232~~
  - ~~AV233~~
- AV240 (Principles for Communication Between AV Terminals)
  - AV241 System Aspects for the Use of the 7kHz Audio Codec Within 64 kbit/s — G72Y
  - AV242
- AV250 (Audio Coding)
  - AV251 Narrowband Audio coding at 64 kbit/s — G711
  - AV252 Wideband Audio Coding in 64 kbit/s — G722
  - AV253
  - AV254
- AV260 (Video Coding)
  - ~~AV261~~
  - AV262 n x 384 kbit/s Video Codec — ~~H12X~~ H261
  - AV263

III. SYSTEMS AND TERMINAL EQUIPMENT

AV300 (General Recommendations for AV Systems and Terminals)

- AV310 (Requirements for Teleconferencing)
  - AV311
  - AV312
  - AV313 (Teleconference Protocol)
- AV320 (Requirements for Videophone Services)

IV. NETWORK ASPECTS

AV400

- AV410 (Reservation Systems)
- AV420 (HLC for Use in Audiovisual Calls)
- AV430 (Call Control C&I)
- AV440 (Multipoint Call Set-up)

NOTE 1: Items in Section IV are outside the scope of Infrastructure considerations but nevertheless require harmonisation for satisfactory provision of AV services.

NOTE 2: It is intended to merge the substance of existing Rec H.100, 110 into this framework in the next study period.

NOTE 2: Entries in parentheses are indicative of the purpose of the various positions in the framework.

NOTE 3: Further Recs. will be added to the list as they are formally adopted.

Delete Note 1 ?

1 27 - 28

- 4 - TD 33

Attachment 4 to Doc. #347

DRAFT RECOMMENDATION H.221

FRAME STRUCTURE FOR A 64 KBIT/S CHANNEL IN AUDIOVISUAL TELESERVICES

Attachment 4

PART C.4 - DRAFT RECOMMENDATION H.221

FRAME STRUCTURE FOR A 64 KBIT/S CHANNEL IN AUDIOVISUAL TELESERVICES

Introduction

The purpose of this Recommendation is to define a frame structure for audiovisual teleservices in a single 64 kbit/s channel which makes the best use of the characteristics and properties of the audio/video encoding algorithms, of the transmission framing structure and of the existing CCITT Recommendations. It offers several advantages:

- It takes into account CCITT Recommendations such as G.704, X.30/I.461, etc. It may allow the use of existing hardware or software.
- It is simple, economic and flexible. It may be implemented on a simple microprocessor, using well known hardware principles.
- It is a synchronous procedure. The exact time of a configuration change is the same in the transmitter and the receiver. Configurations can be changed at 20 ms intervals.
- It needs no return link, since a configuration is signalled by a repeatedly transmitted codeword.
- It is very secure in case of transmission errors, since the BAS is protected by a double error correcting code.
- It allows the control of a higher multiplex configuration in the, into which the basic 64 kbit/s channel is inserted (case of n x 64 kbit/s multimedia services such as videoconference).
- It can be used to derive octet synchronization in networks where this is not provided by other means.
- It can be used in multipoint configurations, where no dialogue is needed to negotiate the use of a data channel.
- It provides a variety of data bit-rates (from 6.25 bit/s up to 64 kbit/s) to the user.

1. Basic principle

The 64 kbit/s channel is structured into octets transmitted at 8 kHz. The eighth bit of each octet conveys a sub-channel of 8 kbit/s. This sub-channel, called Service Channel (SC), provides end-to-end signalling and consists of three parts (see Figure 1):

- Frame Alignment Signal (FAS). This signal structures the 64 kbit/s channel into frames of 80 octets each and multiframes (MF) of 16 frames each. Each multiframe is divided into eight 2-frame submultiframes (SMF). In addition to framing and multiframing information, control and alarm information may be inserted, as well as error check information to control end-to-end error performance and to check frame alignment validity.

The FAS can be used to derive octet timing when it is not provided by the network.

- Bit-rate allocation signal (BAS).

This signal allows the transmission of codewords to describe the capability of a terminal to structure the residual 62.4 kbit/s capacity in various ways, and to command a receiver to demultiplex and make use of the constituent signals in such structures; if other 64 kbit/s channels are associated, as in the case of n x 64 kbit/s services (eg, videoconference, videophone), this association may also be defined."

Note - For some countries having 56 kbit/s channels, the net available bit rates will be 8 kbit/s less.

- Application channel (AC). This channel allows transmission of binary information or the insertion of message type data channel(s) (e.g. for Telematic information) at up to 6400 bit/s. A minimum required Command and Indication (C&I) channel should be provided and defined as part of the application channel (for further study). The remaining bit rate for the application channel may be added to the sound data or video channel. In this context, compatibility problems among audio/visual services should be considered.

The remaining 56 kbit/s capacity (with fully reserved application channel), carried in bits 1-7 of each octet, may convey a variety of signals within the framework of a multimedia service, under the control of the BAS and possibly the AC. Some examples follow:

- voice, encoded at 56 kbit/s using a truncated form of the PCM of CCITT Recommendation G.711 (A-law or mu-law);
- voice, encoded at 32 kbit/s and data at 24 kbit/s or less;
- voice, encoded at 56 kbit/s with a bandwidth 50 - 7 000 Hz (sub-band ADPCM according to CCITT draft Recommendation G.722). The coding algorithm is also able to work at 48 kbit/s. Data can then be dynamically inserted at up to 14.4 kbit/s;
- still pictures coded at 56 kbit/s;
- data at 56 kbit/s inside an audiovisual session (e.g. file transfer for communicating between personal computers);
- sound and video sharing the 56 kbit/s capacity.

2. Frame alignment

2.1 General

An 80-octet frame length produces an 80-bit word in the Service Channel. These 80 bits are numbered 1-80. Bits 2-8 of the Service Channel in every even frame contain the frame alignment word (FAW) 0011011. These bits are completed by bit 2 in the succeeding odd frame to form the complete Frame Alignment Signal (FAS).

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So a pattern similar to the one in CCITT Recommendation G.704 is used (see Figure 2).

2.2 Multiframe structure

Each multiframe contains 16 consecutive frames numbered 0 to 15 divided into eight submultiframes of 2 frames each (Figure 3). The multiframe alignment signal is located in bit 1 of frames 1-3-5-7-9-11 and has the form 001011. Bits 1 of frames 8-10-12-13-14-15 are reserved for future use. Their value is provisionally fixed at 0.

Bits 1 of frames 0-2-4-6 may be used for a modulo 16 counter to number multiframes in descending order. The least significant bit is transmitted in frame 0, and the most significant bit in frame 6. The receiver may use the multiframe numbering to determine the differential delay of separate 64 kbit/s connections, and to synchronize the received signals. The use of an additional reserved bit in frame 8 to turn on and off the counting procedure is for further study.

2.3 Loss and recovery of frame alignment

Frame alignment is defined to have been lost when three consecutive frame alignment signals have been received with an error.

Frame alignment is defined to have been recovered when the following sequence is detected:

- for the first time, the presence of the correct frame alignment word;
- the absence of the frame alignment signal in the following frame detected by verifying that bit 2 is a 1;
- for the second time, the presence of the correct frame alignment word in the next frame.

When the frame alignment is lost, bit 3 (A) of the next odd frame is set to 1 in the transmit direction.

2.4 Loss and recovery of multiframe alignment

Multiframe alignment is needed ~~used~~ to validate the Bit-rate Allocation Signal (see § 3). The criteria for loss and recovery of multiframe alignment described below are provisional.

Multiframe alignment is defined to have been lost when three consecutive multiframe alignment signals have been received with an error. It is defined to have been recovered when the multiframe alignment signal has been received with no error in the next multiframe. When multiframe alignment is lost, even when an unframed mode is received, bit 3 (A) of the next odd frame is set to 1 in the transmit direction. It is reset to 0 when multiframe alignment is regained again.

2.5 Procedure to recover octet timing from frame alignment

When the network does not provide octet timing, the terminal may recover octet timing in the receive direction from bit timing and from the frame alignment. The octet timing in the transmit direction may be derived from the network bit timing and an internal octet timing.

(2767) If frame alignment is achieved, but multiframe alignment cannot be achieved, then frame alignment should be sought at another position.

2.5.1 General rule

The receive octet timing is normally determined from the FAS position. But at the start of the call and before the frame alignment is gained, the receive octet timing may be taken to be the same as the internal transmit octet timing. As soon as a first frame alignment is gained, the receive octet timing is intitialized at the new bit position, but it is not yet validated. It will be validated only when frame alignment is not lost during the next 16 frames.

2.5.2 Particular cases

a) When, at the initiation of a call, the terminal is in a forced reception mode, or when the frame alignment has not yet been gained, the terminal may temporarily use the transmit octet timing.

b) When frame alignment is lost after being gained, the receive octet timing should not change until frame alignment is recovered.

c) As soon as frame and multiframe alignment have been gained once, the octet timing is considered as valid for the rest of the call, unless frame alignment is lost and a new frame alignment is gained at another bit position.

d) When the terminal switches from a framed mode to an unframed mode (by means of the BAS), the octet timing, previously gained, must be kept.

e) When a new frame alignment is gained on a new position, different from that previously validated, the receive octet timing is reinitialized to the new position but not yet validated and the previous bit position is stored. If no loss of frame alignment occurs in the next 16 frames, the new position is validated; otherwise the stored old bit position is reutilized.

2.5.3 Search for frame alignment signal (FAS)

Two methods may be used: sequential or parallel. In the sequential method, each of the eight possible bit positions for the FAS is tried. When FAS is lost after being validated, the search must resume starting from the previously validated bit position. In the parallel method, a sliding window, shifting one bit for each bit period, may be used. In that case, when frame alignment is lost, the search must resume starting from the bit position next to the previously validated one.

2.6 Description of the CRC4 procedure

In order to provide an end-to-end quality monitoring of the 64 kbit/s connection, a CRC4 procedure may be used and the four bits C1, C2, C3 and C4 computed at the source location are inserted in bit positions 5 to 8 of the odd frames. In addition, bit 4 of the odd frames, noted E, is used to transmit an indication about the received signal in the opposite direction whether the most recent CRC block has been received with errors or not.

When the CRC4 procedure is not used, bit E shall be set to 0, and bits C1, C2, C3 and C4 shall be set to 1 by the transmitter. Provisionally, the

receiver may disable reporting of CRC errors after receiving eight consecutive CRCs set to all 1s, and it may enable reporting of CRC errors after receiving two consecutive CRCs each containing a 0 bit. (This method of enabling and disabling CRC error reporting must be verified and is for further study.)

2.6.1 Computation of the CRC4 bits

The CRC4 bits C1, C2, C3 and C4 are computed from the whole 64 kbit/s channel, for a block made of two frames: one even frame (containing the FAW) followed by one odd frame (not containing the FAW). The CRC4 block size is then 160 octets, i.e. 1280 bits, and the computation is performed 50 times per second.

2.6.1.1 Multiplication-division process

A given C1-C4 word located in block N is the remainder after multiplication by x^4 and then division (modulo 2) by the generator polynominal $x^4 + x - 1$ of the polynominal representation of block (N-1).

When representing contents of a block as a polynominal the first bit in the block should be taken as being the most significant bit. Similarly C1 is defined to be the most significant bit of the remainder and C4 the least significant bit of the remainder.

This process can be realized with a four stage register and two exclusive-ors.

2.6.1.2 Encoding procedure

i) The CRC bit positions in the odd frame are initially set at zero, i.e. C1 = C2 = C3 = C4 = 0.

ii) The block is then acted upon by the multiplication-division process referred to above in 2.6.1.1.

iii) The remainder resulting from the multiplication-division process is stored ready for insertion into the respective CRC locations of the next odd frame.

Note - These CRC bits do not affect the computation of the CRC bits of the next block, since the corresponding locations are set at zero before the computation.

2.6.1.3 Decoding procedure

i) A received block is acted upon by the multiplication division process, referred to above in 2.6.1.1, after having its CRC bits extracted and replaced by zeros.

ii) The remainder resulting from this multiplication-division process is then stored and subsequently compared on a bit-by-bit basis with the CRC bits received in the next block.

iii) If the decoded calculated remainder exactly corresponds to the CRC bits sent from the encoder, it is assumed that the checked block is error-free.

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2.6.2 Consequent actions

2.6.2.1 Action on bit E

Bit E of block N is set to 1 in the transmitting direction if bits C1-C4 detected in the most recent block in the opposite direction have been found in error (at least one bit in error). In the opposite case, it is at zero.

2.6.2.2 Monitoring for incorrect frame alignment

In case of a long simulation of the FAW, the CRC4 information can be used to re-invite a search for frame alignment. For such a purpose, it is possible to count the number of blocks CRC in error within 2 s (100 blocks) and to compare this number with 89. If the number of CRC blocks in error is greater than or equal to 89, a search for frame alignment should be re-initiated.

These values of 100 and 89 have been chosen in order that:

- for a random transmission error rate of 10^{-3}, the probability of incorrectly re-initiating a search for frame alignment because of 89 or more blocks in error, should be less that 10^{-4}.
- In case of simulation of frame alignment, the probability of not re-initiating a search of frame alignment after a two second period should be less than 2.5%.

2.6.2.3 Monitoring for error performance

The quality of the 64 kbit/s connection can be monitored by counting the number of CRC blocks in error within a period of one second (50 blocks). For instance, a good evaluation of the proportion of seconds without errors as defined in CCITT Recommendation G.821 can be provided.

For information purposes, the following propositions of CRC block in error can be computed for randomly distributed errors of error rate Pe:

Pe	10^{-3}	10^{-4}	10^{-5}	10^{-6}	10^{-7}
Proportion of CRC blocks in error	70%	12%	1.2%	0.12%	0.012%

By counting the received E bits, it is possible to monitor the quality of the connection in the opposite direction.

3. Bit-rate allocation signal (BAS) and switching between configurations

The bit-rate allocation signal (BAS) occupies bits 9-16 of the Service Channel in every frame. An eight bit BAS code (b_0, b_1, b_2, b_3, b_4, b_5, b_6, b_7) is ~~accompanied~~ complemented by eight ~~parity~~ error correction bits (p_0, p_1, p_2, p_3, p_4, p_5, p_6, p_7) ~~where the~~ to implement a

(16,8) double error correcting code, ~~is applied~~. This error correcting code is obtained by shortening the (17,9) cyclic code with generator polynominal:

$$g(x) = x^8 + x^7 + x^6 + x^4 + x^2 + x + 1.$$

The ~~parity~~ (error correction) bits are calculated as coefficients of the remainder polynominal in the following equation:

$$p_0x^7 + p_1x^6 + p_2x^5 + p_3x^4 + p_4x^3 + p_5x^2 + p_6x + p_7$$

$$= RES_{g(x)}[b_0x^{15} + b_1x^{14} + b_2x^{13} + b_3x^{12} + b_4x^{11} + b_5x^{10} +$$

$$b_6x^9 + b_7x^8]$$

where $RES_{g(x)}[f(x)]$ represents the residue obtained by dividing f(x) by g(x).

The BAS code is ~~allocated~~ (sent) in the even numbered frame, while the associated ~~parity~~ (error correction) bits are ~~allocated~~ (sent) in the subsequent odd numbered frame. Each bit of BAS code or the ~~parity~~ (error correction) is transmitted in the following order to avoid emulation of the frame alignment signal;

Bit position	Even frame	Odd frame
9	b_0	P_2
10	b_3	P_1
11	b_2	P_0
12	b_1	P_4
13	b_5	P_3
14	b_4	P_5
15	b_6	P_6
16	b_7	P_7

The decoded BAS value is valid if ;

- the receiver is in frame and multiframe alignment, and
- the FAS in the same submultiframe was received with 2 or fewer bits in error.

Otherwise, the decoded BAS value is ignored. When the receiver actually looses frame alignment, it should undo any changes caused by the three previously decoded BAS values and revert back to the state determined by the fourth previously decoded BAS value.

The encoding of BAS is made in accordance with the attribute method.

The first three bits (b_0, b_1, b_2) represent the attribute number, which describes the general command or capability, and the next five bits (b_3, b_4, b_5, b_6, b_7) identify the specific command or capability. The following attributes are defined :

000 Audio Coding Command : values defined in Annex 1.

001 Transfer Rate Command : values defined in Annex 2.

010 Video and Other Command : values defined in Annex 4.

011 Data Command : values defined in Annex 5.

100 Terminal Capability : values defined in Annex 3.

Annex 1 defines a number of Modes, according to the audio coding type and bit rate. Since a validated value of BAS command code applies to the next submultiframe, a change in configuration can occur ~~at a submultiframe rate; that is~~ every 20ms. This applies equally to the use of video and data command BAS, controlling sub-modes of various configurations of the remaining capacity.

When the incoming bit A (see section 2.3) is set to 1, the distant receiver is not in multiframe alignment and will not immediately validate a new BAS value.

Capability BAS require a response from the distant terminal and should not be sent unnecessarily when the incoming signal is unframed.

See draft Recommendations G.72Y ~~and AV.242~~ for further information on signalling procedures.

4. Application channel (AC)

It occupies bits 17-80 of the Service Channel in each frame, providing a user available bit rate of 6.4 kbit/s. According to the application, different kinds of information may be inserted herein. In particular, information concerning forward error correction or end-to-end encryption which both depend on the application, could take place in the Application Channel.

The AC may be used to convey a message channel conforming to the OSI protocols where appropriate. With this message channel, a transport and a session protocol may be used to control the use of audio and data channels. For example, once the command/response procedure has agreed to open a connection, if necessary the BAS is used to adjust the capability available for data.

Examples for the use of AC are given in Appendix 1.

Section 5: "Access to Non-Audio Information Within Bits 1-7"

Use of attribute (000) according to Annex 1 provides for the static or dynamic allocation of "data channels" of up to 56 kbit/s capacity; in some applications, it may be desirable to combine the Application Channel with the data channel in order to have a single user-data path, of capacity up to 62.4 kbit/s.

Unless BAS codes (010), (011) are used to direct otherwise, the "data channel" is treated as a single stream of non-video information; in this case access may be realised according to standardised procedures (eg, I461, I462, I463). ~~BCH: FAXX ...~~ Data is transmitted in the order received from the Data Terminal Equipment or Data Terminal Adapator.

In the presence of a non-zero video command BAS (010) the data channel is assigned to moving picture information, except that some part may be subtracted for other data purposes by application of a non-zero data command BAS (011).

Text

Figures

Bit number 1	2	3	4	5	6	7	8	Octet number
Sub-Channel #1	Sub-Channel #2	Sub-Channel #3	Sub-Channel #4	Sub-Channel #5	Sub-Channel #6	Sub-Channel #7	FAS	1 . 8
							BAS	9 . 16
							AC	17 80

FIGURE 1

Frame structure

FAS: Frame Alignment Signal (Note 1)
BAS: Bit-rate Allocation Signal
AC: Application Channel

Note 1: The block termed as FAS also contains information other than that used for frame alignment.

SUCCESSIVE FRAMES	Bit #	1	2	3	4	5	6	7	8
Even frames (those containing FAW)		Note 1	0	0	1	1	0	1	1
				Frame Alignment Word					
Odd frames		Note 1	1 Note 2	A Note 3	E	C1	C2	C3	C4
					Note 4				

FIGURE 2

Assignment of bits 1-8 of the Service Channel in each frame

Note 1 - See section 2.2 and Figure 3

Note 2 - Bit used to avoid simulation of FAW by a frame-repetitive pattern

Note 3 - A - Loss of either frame or multiframe alignment indication (0 = alignment 1 = loss)

Note 4 - The use of bits E and C1-C4 is described in section 2.6.

	Sub-Multi-Frame	Frame	Bits 1 to 8 of the Service Channel in every frame 1	2	3	4	5	6	7	8
Multiframe	SMF 1	0	N1	0	0	1	1	0	1	1
		1	0	1	A	E	C1	C2	C3	C4
	SMF 2	2	N2	0	0	1	1	0	1	1
		3	0	1	A	E	C1	C2	C3	C4
	SMF 3	4	N3	0	0	1	1	0	1	1
		5	1	1	A	E	C1	C2	C3	C4
	SMF 4	6	N4	0	0	1	1	0	1	1
		7	0	1	A	E	C1	C2	C3	C4
	SMF 5	8	NS	0	0	1	1	0	1	1
		9	1	1	A	E	C1	C2	C3	C4
	SMF 6	10	R1	0	0	1	1	0	1	1
		11	1	1	A	E	C1	C2	C3	C4
	SMF 7	12	R2	0	0	1	1	0	1	1
		13	R3	1	A	E	C1	C2	C3	C4
	SMF 8	14	TEA	0	0	1	1	0	1	1
		15	R4	1	A	E	C1	C2	C3	C4

FIGURE 3

Assignment of bits 1-8 of the Service Channel in each frame in a multiframe

R1-R~~10~~4: Reserved for future use - Provisionally set to 0

A, E, C1-C4: As in Figure 2.

N1-N4: Used for multiframe numbering as described in section 2.2. Set to 0 while numbering is inactive.

NS: Reserved for an indicator of whether multiframe numbering is active or inactive. Currently set to 0.

TEA: The terminal equipment alarm is set to 1 while an internal terminal equipment fault exists such that it cannot receive and act on the incoming signal. Otherwise it is set to 0.

Annexes: 3

ANNEX 1

(to draft Recommendation H.221)

Attribute 000 used for BAS encoding ~~for defined services~~

$b_0 - b_2$ — $b_3 - b_7$

Attribute Bits ~~9-11~~	Attrib. value Bits ~~12-16~~	Meaning
000 Audio coding	00000	"Neutralised channel"(the 62.4 kbit/s user data are unused)
Command	~~00001~~	PCM G.711 (truncated to 7 bits) (Note 1) (Note 2)
	S0010	A law; data at 0 or 6.4 kbit/s Mode 0F
	S0011	u law; data at 0 or 6.4 kbit/s Mode 0F
	S0001	32 kbit/s ADPCM 24 30.4 data at ~~0~~ or ~~6.4~~ kbit/s (Note 3)
	~~001~~	64 kbit/s unframed mode (Note 4)
	00100	PCM Alaw Mode 0
	00101	PCM u law Mode 0
	00110	SB-ADPCM G.722. Mode 1 (Note 5)
	00111	0 kbit/s; data at 64 kbit/s Mode 10
	~~S1~~	Variable bitrate audio coding
	S1000	G.722 56 kbit/s; data at 0 or 6.4 kbit/s Mode 2
	S1001	G.722 48kbit/s; data at 8 or 14.4 kbit/s Mode 3
	S1010 ... S1110	Reserved for audio coding at bit rates less than 48 kbit/s (Note 6)
	S1111	0 kbit/s; data at 56 or 62.4 kbit/s Mode 9 (Note 7)
	10000	Free
	101xx	Free

Note 1 - The 8th bit is fixed to 0 in the audio PCM decoder.

Note 2 - The S bit set to 1 indicates that the Application Channel is merged with the data channel to form a single user-data path. The method for merging the two channels is shown in Figure A1 for the 14.4 kbit/s case.

Note 3 - The coding law and respective place of data and audio in each byte of the 64 kbit/s channel is under study.

Note 4 - Attribute values 001xx imply the switching to an unframed mode. In the receive direction, reverting to a framed mode can only be achieved by recovering frame and multiframe alignment, which might take up to 2 multiframes (i.e. 320 ms).

Note 5 - The allocation of bits in each byte of the 64 kbit/s channel is as follows:

Audio bit-rate	1	2	3	4	5	6	7	8
64 kbit/s	H	H	L	L	L	L	L	L
56 kbit/s	H	H	L	L	L	L	L	S
48 kbit/s	H	H	L	L	L	L	D	S

S - Service channel
H - High band audio
L - Low band audio
D - Data channel

Bit-rates of 56 and 48 kbit/s are respectively modes 2 and 3 of Recommendation G.722.

Note 6 - Audio coding bit-rates of ~~40~~-32-24-~~16~~-8 kbit/s require further study.

Note 7 - The whole of the 56 (or 62.4) kbit/s is used for data and the audio channel is not available.

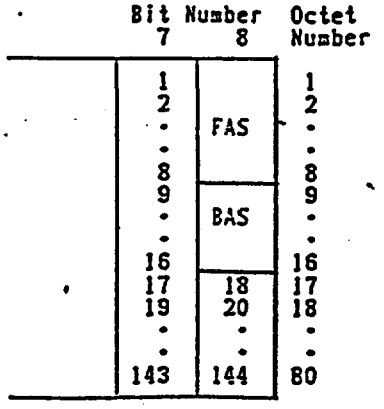

FIGURE A1

Bit number for a merged 14.4 kbit/s data

ANNEX 2

(to draft Recommendation H.221)

Attribute 001 used for BAS encoding ~~(provisional values)~~

~~The following list gives a possible assignment of codes for attribute 001 and requires further study~~.

Attribute Bits ~~9-11~~ $b_0 - b_2$	Attribute value Bits ~~12-16~~ $b_3 - b_7$	Meaning
001 Transfer Rate Command	00000	64 kbit/s
	00001	64 kbit/s (audio) + 64 kbit/s (data/video)
	01010	384 kbit/s: 64 (audio) + 320 (video)
	01011	64 (audio) + 256 (video) + 64 (data)
	01100	768 kbit/s: 64 (audio) + 704 (video)
	01101	64 (audio) + 640 (video) + 64 (data)
	01110	1152 kbit/s: 64 (audio) + 1088 (video)
	01111	64 (audio) + 1024 (video) + 64 (data)
	10000	1536 kbit/s: 64 (audio) + 1472 (video)
	10001	64 (audio) + 1408 (video) + 64 (data)
	10010	1920 kbit/s: 64 (audio) + 1856 (video)
	10011	64 (audio) + 1792 (video) + 64 (data)
	00010	64 kbit/s (audio) + 64 kbit/s (data/video) treated as a single 128 kbit/s channel.

ANNEX 3

(to draft Recommendation H.721)

Attribute 100 used for BAS encoding

$b_0 - b_2$ — $b_3 - b_7$

Attribute Bits ~~9–11~~	Attribute value Bits ~~12–16~~	Meaning
100 Terminal Capability	00000	Neutral (Note 1)
	00001	G.72y Type 0 - A law (Note 2)
	00010	G.72y Type 0 - mu law
	00011	G.72y Type 1 - G.722
	00100	G.72y Type 2 - G.722 + data
	00101	)
		) Reserved for audio capabilities
	00110	)
	00111	Reserved for national use
	01000	Non-standard video capability (Note 3)
	01001	} Reserved for video capabilities
	...	
	01110	
	01111	Reserved for national use
	10000	Non-standard system capability (Note 3)
	10001	2B transfer rate capability (Note 4)
	10010	3B " " " "
	10011	4B " " " "
	10100	5B " " " "
	10101	6B " " " "
	10110	Reserved for transfer rate capability
	10111	Reserved for national use
	11000	300 bit/s data capability (Note 5)
	11001	1200 " " " "
	11010	2400 " " " "
	11011	4800 " " " "
	11100	6400 " " " "
	11101	8000 " " " "
	11110	9600 " " " "
	11111	14400 " " " "

Note 1 - The neutral value indicates no change in the current capabilities of the terminal.

Note 2 - Types 0, 1 and 2 are defined according to Recommendation G.72y section 2.

Type 0 terminal can work in mode 0 (PCM) only.

Type 1 terminal preferably works in mode 1 (G.722) but is able to work in mode 0.

Type 2 terminal preferably works in mode 2 (G.722 + H.221) but is able to work in modes 1 and 0.

Note 3 - If sent (additional), an improved video algorithm decoding or whole system capability is indicated; it is specified elsewhere.

Note 4 - A capability to use several B channels implies the capability to use fewer channels.

Note 5 - A data capability specified only one rate; if multiple rates are possible the capabilities are sent individually.

ANNEX 4

(to draft Recommendation H.221)

Attribute 010 used for BAS encoding

Attribute Bits b_0-b_2	Attribute value Bits b_3 - b_7	Meaning
010 Video and Other Command	00000	No video; video switched OFF
	00001	Standard video for mx64 kbit/s ~~to Rec. H.120~~
	00010	Video ON, using improved algorithm
	00011	Standard video to Rec. H. ~~120~~ 261
	...	
	11111	Transfer to non-standard system mode.

ANNEX 5

(to draft Recommendation H.221)

Attribute 011 used for BAS encoding

Attribute Bits $b_0 - b_2$	Attribute value Bits $b_3 - b_7$	Meaning
011 Data Command	00000	No Data; Data switched OFF
	00001	300b/s in AC assigned to Data *(Bit 8 of last three octets in each frame)*
	00010	1200b/s in AC assigned to Data *(Bit 8 of last 12 octets in each frame)*
	00011	4800b/s in AC assigned to Data *(Bit 8 of last 48 octets in each frame)*
	00100	6400b/s in AC assigned to Data *(whole of AC)*
	00101	8000b/s assigned to Data *(Bit 7)*
	00110	9600 b/s assigned to Data (Bit 7 + Bit 8 of last 16 octets in each frame)
	00111	14.4kb/s assigned to Data *(Bit 7+ AC)*
	...	
	10000 to 10111	Reserved for communicating the status of the data terminal equipment interfaces
	...	
	11111	Variable rate data; Data switched ON (Note 1)

Note 1. When video is switched on, the entire variable data capacity is used for video.

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TD 23/1

APPENDIX 1

(to draft H.221)

Examples for the use of the application channel

1. Binary information

Each bit of the application channel may be used to convey the information of a 100 bit/s channel, repeated 100 times per second. If odd and even frames are identified, each bit may carry the 150 Hz bit/s channels. If multiframing is used, each bit may carry the information of 16 channels, each at 6.25 bit/s.

An example of this kind of information is, in teleconference, the use of a bit to synchronize the encoder clock on the receive clock, or to indicate the microphone number, or to signal the use of the graphics mode, etc...

2. Synchronous message-type channel

As each bit of the application channel represents a bit-rate of 100 bit/s, any synchronous channel working at n x 100 bit/s may be inserted in the application channel. An example is, in videoconference, the message channel at 4 kbit/s which is used for multipoint management.

Another possibility is the insertion of data channels at one of the bit rates defined in CCITT Recommendation X.1, according to CCITT Recommendation X.30/I.461: "Support of X.21 and X.21bis based DTEs by an ISDN". The present frame structure is consistent with the X.30/I.461 frame structure in a double way:

- it has the same length (80 bits by bearer channel at 8 kbit/s);
- it needs 63 bits per frame (17 bits are used for framing information not to be transmitted), which fits into the 64 bits available in this frame structure.

3. Asynchronous message-type channel

In case of asynchronous terminals, X.1 bit-rates are relevant, too. The applicable standard is the ECMA standard ECMA-TAxx "Bit-rate adaption for the support of synchronous and asynchronous terminal equipment using the V-Series interfaces on a PSTN". This standard also uses the same 80-bit frame structure as X.30/I.461 mentioned above. The application channel will therefore allow adoption of this ECMA standard if needed.

4. Error correction and encryption

When needed, forward error correction and encryption information may be transmitted in the application channel. The bit-rate and the protocol to be used will depend on the application.

Attachment 5 to Doc. #347

DRAFT RECOMMENDATION H.222

FRAME STRUCTURE FOR 384-1920 KBIT/S CHANNELS IN AUDIOVISUAL TELESERVICES

Part C.4 Attachment 5 TD 37 (XV/1)

222

Draft Recommendation H.~~13x~~

Frame Structure for 384-1920 kbit/s Channels in Audiovisual Teleservices

1. Scope

This recommendation provides a mechanism to multiplex multimedia signals such as audio, video, data, Control & Indication etc. for audiovisual teleservices using an nx384 kbit/s (n=1-5) channel.

2. Basic Structure

The multiplex structure is based upon multiple octets transmitted at 8 kHz as in Recommendation I.431.

An nx384 kbit/s channel consists of 6xn timeslots of 64 kbit/s (see Fig. 1). The first 64 kbit/s timeslot has a frame structure conforming to Recommendation H.221, containing Frame Alignment signal (FAS), Bit rate Allocation Signal (BAS) and Application Channel (AC).

3. BAS Codes

Particular codes for allocating audio, video and data signals in an nx384 kbit/s channel are given in ~~Table --/Annex 1~~ Annex 2 to Recommendation H.221 for Attribute '001'.

4. Data Transmission

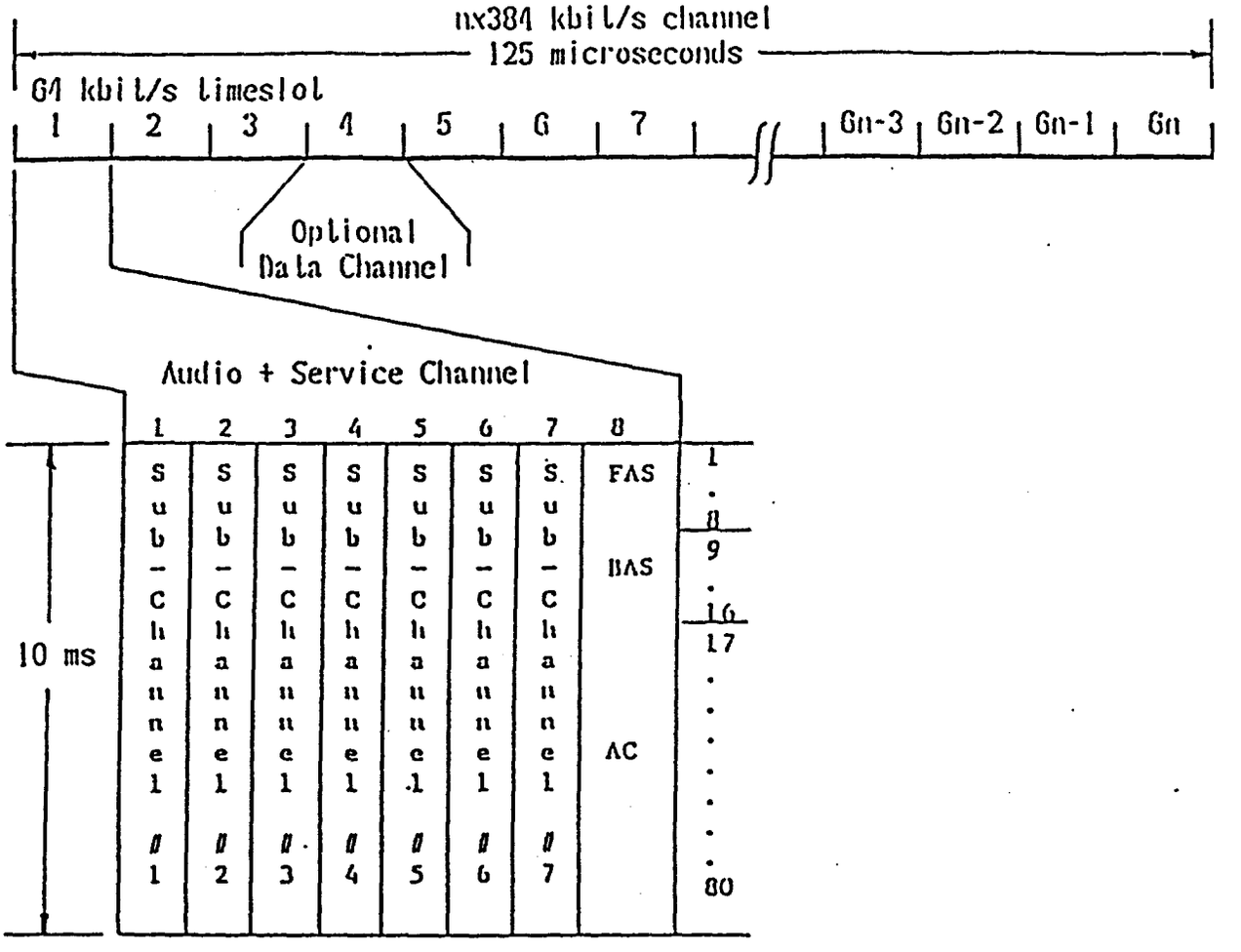
A 64 kbit/s data channel can be allocated to the fourth timeslot in the nx384 kbit/s channel if controlled by the corresponding BAS code.

Provision of more than one 64 kbit/s data channels is for further study.

5. Bit Assignment in Application Channel

Application Channel conveys Control & Indication Signals, message channel, etc. for audiovisual teleservices using nx384 kbit/s transmission. Bit assignment is under study.

END



FAS: Frame Alignment Signal (note)
BAS: Bitrate Allocation Signal
AC: Applicaion Channel

Note: The block termed as FAS also contains information other than for frame alignment purposes.

Figure 1/H.~~13~~ 222 Frame structure for nx384 kbit/s audiovisual teleservices

Attachment 6 to Doc. #347

DRAFT RECOMMENDATION H.261

CODEC FOR AUDIOVISUAL SERVICES AT NX384 KBIT/S

Part C.3 Attachment 6 TD 36 (XV/1)

261

DRAFT RECOMMENDATION H.~~12x~~

CODEC FOR AUDIOVISUAL SERVICES AT nx384 kbit/s

Contents

The CCITT,

considering

that there is significant customer demand for videoconference service;

that circuits to meet this demand can be provided by digital transmission using the H0 rate or its multiples up to the primary rate;

that ISDNs are likely to be available in some countries that provide a switched transmission service at the H0 rate;

that the existence of different digital hierarchies and different television standards in different parts of the world complicates the problems of specifying coding and transmission standards for international connections;

that videophone services are likely to appear using basic ISDN access and that some means of interconnection of videophone and videoconference terminals should be possible;

that Recommendation H.120 for videoconferencing using primary digital group transmission was the first in an evolving series of recommendations;

appreciating

that advances are being made in research and development of video coding and bit rate reduction techniques which will lead to further recommendations for videophone and videoconferencing at multiples of 64kbit/s during subsequent study periods, so that this may be considered as the second in the evolving series of recommendations;

and noting

that it is the basic objective of CCITT to recommend unique solutions for international connections;

recommends

that in addition to those codecs complying to Recommendation H.120, codecs having signal processing and interface characteristics described below should

be used for international videoconference connections.

Note 1: Codecs of this type are also suitable for some television services where full broadcast quality is not required.
Note 2: Equipment for transcoding from and to codecs according to Recommendation H.120 is under study.
Note 3: It is recognised that ~~it is essential~~ the objective is to provide interworking between nx384 kbit/s codecs and mx64 kbit/s codecs as defined in the H series Recommendations. Interworking will be on the basis of mx64 kbit/s, where the values of m are under study.

1. Scope

This Recommendation describes the coding and decoding methods for audiovisual services at the rates of nx384 kbit/s, where n is 1 to 5. Possible extension of this scope to meet the objective in Note 3 above is under study.

2. Brief Specification

An outline block diagram of the codec is given in Figure 1.

2.1 Video input and output

To permit a single recommendation to cover use in and between 625 and 525 line regions, pictures are coded in one common intermediate format. The standards of the input and output television signals, which may, for example, be composite or component, analogue or digital and the methods of performing any necessary conversion to and from the intermediate coding format are not subject to recommendation.

2.2 Digital output and input

Digital access at the primary rate of 1544 or 2048 kbit/s is with vacated timeslots in accordance with Recommendation I.431.

Interfaces using ISDN basic accesses are under study. (Recommendation I.420)

2.3 Sampling frequency

Pictures are sampled at an integer multiple of the video line rate. This sampling clock and the digital network clock are asynchronous.

2.4 Source coding algorithm

A hybrid of inter-picture prediction to utilize temporal redundancy and transform coding of the remaining signal to reduce spatial redundancy is adopted. The decoder has motion compensation capability, allowing optional incorporation of this technique in the coder.

2.5 Audio channel

Audio is coded according to mode 2 of Recommendation G.722. This is combined with control and indication information and conveyed in one 64 kbit/s timeslot which conforms to Recommendation H.221.

2.6 Data channels

Recommendation H.221 permits part of the 64 kbit/s timeslot carrying the audio to be used for auxiliary data transmission.

Additionally, one of the timeslots normally used for video may be reassigned as a 64 kbit/s data channel. The possibility of further such channels is under study.

2.7 Symmetry of transmission

The codec may be used for bidirectional or unidirectional audiovisual communication.

2.8 Error handling

Under study.

2.9 Propagation delay

Under study.

2.10 Additional facilities

Under study.

3. Source Coder

3.1 Source format

The source coder operates on non-interlaced pictures occurring 30000/1001 (approximately 29.97) times per second. The tolerance on picture frequency is +/-50ppm.

Pictures are coded as luminance and two colour difference components (Y, C_R and C_B). These components and the codes representing their sampled values are as defined in CCIR Recommendation 601.

Black = 16
White = 235
Zero colour difference = 128
Peak colour difference = 16 and 240

These values are nominal ones and the coding algorithm functions with input values of 0 through to 255.

For coding, the luminance sampling structure is 288 lines per picture, 352 pels per line in an orthogonal arrangement. Sampling of each of the two colour difference components is at 144 lines, 176 pels per line, orthogonal. Colour difference samples are sited such that their block boundaries coincide with luminance block boundaries as shown in Figure 2. The picture area covered by these numbers of pels and lines has an aspect ratio of 4:3 and corresponds to the active portion of the local standard video input.

Note: The number of pels per line is compatible with sampling the active portions of the luminance and colour difference signals from 525 or 625

line sources at 6.75 and 3.375 MHz, respectively. These frequencies have a simple relationship to those in CCIR Recommendation 601.

3.2 Video source coding algorithm

The video coding algorithm is shown in generalised form in Figure 3. The main elements are prediction, block transformation, quantisation and classification.

The prediction error (INTER mode) or the input picture (INTRA mode) is subdivided into 8 pel by 8 line blocks which are segmented as transmitted or non-transmitted. The criteria for choice of mode and transmitting a block are not subject to recommendation and may be varied dynamically as part of the data rate control strategy. Transmitted blocks are transformed and resulting coefficients are quantised and variable length coded.

3.2.1 Prediction

The prediction is inter-picture and may be augmented by motion compensation (§3.2.2) and a spatial filter (§3.2.3).

3.2.2 Motion compensation

Motion compensation is optional in the encoder. The decoder will accept one vector for each block of 8 pels by 8 lines. The range of permitted vectors is under study.

A positive value of the horizontal or vertical component of the motion vector signifies that the prediction is formed from pels in the previous picture which are spatially to the right or below the pels being predicted.

Motion vectors are restricted such that all pels referenced by them are within the coded picture area.

3.2.3 Loop filter

The prediction process may be modified by a two-dimensional spatial filter which operates on pels within a predicted block.

The filter is separable into one dimensional horizontal and vertical functions. Both are non-recursive with coefficients of 1/4, 1/2, 1/4. At block edges, where one of the taps would fall outside the block, the peripheral pel is used for two taps. Full arithmetic precision is retained with rounding to 8 bit integer values at the 2-D filter output. Values whose fractional part is one half are rounded up.

The filter may be switched on or off on a block by block basis. The method of signalling this is under study.

3.2.4 Transformer

Transmitted blocks are coded with a separable 2-dimensional Discrete Cosine Transform of size 8 by 8. The input to the forward transform and output from the inverse transform have 9 bits. The arithmetic procedures for computing the transforms are under study.

Note: The output from the forward and input to the inverse are likely to be 12 bits.

3.2.5 Quantisation

The number of quantisers, their characteristics and their assignment are under study.

3.2.6 Clipping

To prevent quantisation distortion of transform coefficient amplitudes causing arithmetic overflow in the encoder and decoder loops, clipping functions are inserted. In addition to those in the inverse transform, a clipping function is applied at both encoder and decoder to the reconstructed picture which is formed by summing the prediction and the prediction error as modified by the coding process. This clipper operates on resulting pel values less than 0 or greater than 255, changing them to 0 and 255 respectively.

3.3 Data rate control

Sections where parameters which may be varied to control the rate of generation of coded video data include processing prior to the source coder, the quantiser, block significance criterion and temporal subsampling. The proportions of such measures in the overall control strategy are not subject to recommendation.

When invoked, temporal subsampling is performed by discarding complete pictures. Interpolated pictures are not placed in the picture memory.

3.4 Forced updating

This function is achieved by forcing the use of the INTRA mode of the coding algorithm. The update interval and pattern are under study.

4. Video Multiplex Coder

4.1 Data Structure

Note 1: Unless specified otherwise the most significant bit is transmitted first.
Note 2: Unless specified otherwise Bit 1 is transmitted first.
Note 3: Unless specified otherwise all unused or spare bits are set to '1'.

4.2 Video Multiplex arrangement

4.2.1 Picture Header

The structure of the Picture Header is shown in Figure 4. Picture Headers for dropped pictures are not transmitted.

Figure 4/H.12x Structure of Picture Header

Picture Start Code (PSC)

A unique word of 21 bits which cannot be emulated by error free data. Its value is under study.

Temporal Reference (TR)

A five bit number derived using modulo-32 counting of pictures at 29.97 Hz.

Type Information (TYPE1)

Information about the complete picture;

Bit 1 Split screen indicator. '0' off, '1' on.
Bit 2 Document camera. '0' off, '1' on.
Bit 3 Freeze Picture Release. Under study.
Bit 4 Under study. Possible uses include signalling of the use of motion compensation and the method of switching the loop filter.
Bit 5 Number of classes. '0' one, '1' four.
Bits 6 to 12 Under study.

Extra Insertion Information (PEI)

Two bits which signal the presence of the following two optional data fields.

Parity Information (PARITY)

For optional use and present only if the first PEI bit is set to '1'. Eight parity bits each representing odd parity of the aggregate of the corresponding bit planes of the locally decoded PCM values of Y, C_R and C_B in the previous picture period.

Spare Information (PSPARE)

Sixteen bits are present when the second PEI bit is set to '1'. The use of these bits is under study.

4.2.2 Group of Blocks Header

A group of blocks consists of 2k lines of 44 luminance blocks each, k lines of 22 C_R blocks and k lines of 22 C_B blocks. The value of k is under study.

The structure of the Group of Blocks Header is shown in Figure 5. All GOB Headers are transmitted except those in dropped pictures.

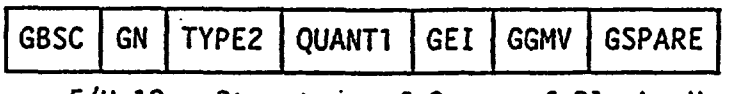


Figure 5/H.12x Structure of Group of Blocks Header

Group of Blocks Start Code (GBSC)

A word of 16 bits, 0000 0000 0000 0001.

Group Number (GN)

A m bit number indicating the vertical position of the group of blocks. The value of m is the smallest integer greater than or equal to $\log_2(18/k)$. GN is 1 at the top of the picture.

Note: GBSC plus the following GN is not emulated by error-free video data.

Type Information (TYPE2)

TYPE2 is p bits which give information about all the transmitted blocks in a group of blocks. The value of p is under study.

Bit 1 When set to '1' indicates that all the transmitted blocks in the GOB are coded in INTRA mode and without block addressing data.
Bits 2 to p Spare, under study.

Quantiser Information (QUANT1)

A j bit codeword which indicates the blocks in the group of blocks where QUANT2 codewords are present. These blocks, their codewords and the value of j are under study.

Whether QUANT1 is in the GOB Header or the Picture Header is under study.

Extra Insertion Information (GEI)

Under study.

Group of Blocks Global Motion Vector (GGMV)

Under study.

Spare Information (GSPARE)

Under study.

4.2.3 Block data alignment

The structure of the data for n transmitted blocks is shown in Figure 6. The values of n and the order are under study. Elements are omitted when not required.

BA	TYPE3	QUANT2	CLASS	MVD	TCOEFF1	EOB	—	TCOEFFn	EOB

Figure 6/H.12x Data structure of transmitted block

Block Address (BA)

A Variable Length Code-word indicating the position of n blocks within a group of blocks. VLC codewords using a combination of relative and absolute addressing are under study.

The transmission order and addressing of blocks are under study.

When bit 1 of TYPE2 is '1' BA is not included and up to 132k blocks beginning with and continuing in the above transmission order are transmitted before the next GOB Header.

Block Type Information (TYPE3)

Variable length codewords indicating the types of blocks and which data elements are present. Block types and VLC codewords are under study.

Quantiser (QUANT2)

A codeword of up to q bits signifying the table(s) used to quantise transform coefficients. The value of q and the codewords are under study. QUANT2 is present in the first transmitted block after the position indicated by QUANT1.

Classification Index (CLASS)

CLASS is present if bit 5 of TYPE1 is set to '1' and indicates which of the four available transmission sequence orders is used for luminance block coefficients. If bit 5 of TYPE1 is set to '0' then luminance block coefficients are transmitted in the default sequence order.

Chrominance block coefficients are transmitted in one sequence order.

The CLASS codewords and sequence orders are under study.

Motion Vector Data (MVD)

Calculation of the vector data is under study.

When the vector data is zero, this is signalled by TYPE3 and MVD is not present.

When the vector data is non-zero, MVD is present consisting of a variable length codeword for the horizontal component followed by a variable length codeword for the vertical component.

Variable length coding of the vector components is under study.

Transform Coefficients (TCOEFF)

The quantised transform coefficients are sequentially transmitted according to the sequence defined by CLASS. The DC component is always first. Coefficients after the last non-zero one are not transmitted.

The coding method and tables are under study.

End of Block Marker (EOB)

Use of and codeword for EOB are under study. An EOB without any transform coefficients for a block is allowed.

4.3 Multipoint considerations

4.3.1 Freeze picture request

Causes the decoder to freeze its received picture until a picture freeze

release signal is received. The transmission method for this control signal is under study.

4.3.2 Fast update request

Causes the encoder to empty its transmission buffer and encode its next picture in INTRA mode with coding parameters such as to avoid buffer overflow. The transmission method for this control signal is under study.

4.3.3 Data continuity

The protocol adopted for ensuring continuity of data channels in a switched multipoint connection is handled by the message channel. Under study.

5. Video Data Buffering

The size of the transmission buffer at the encoder and its relationship to the transmission rate are under study.

Transmission buffer overflow and underflow are not permitted. Measures to prevent underflow are under study.

6. Transmission coder

6.1 Bit rate

The net bit rate including audio and optional data channels is an integer multiple of 384 kbit/s up to and including 1920 kbit/s.

The source and stability of the encoder output clock are under study.

6.2 Video clock justification

Video clock justification is not provided.

6.3 Frame structure

6.3.1 Frame structure for 384-1920 kbit/s channels

The frame structure is defined in Recommendation H.222.

6.3.2 Bit assignment in application channel

Under study.

6.3.3 Timeslot positioning

According to Recommendation I.431.

6.4 Audio coding

Recommendation G.722 56/48 kbit/s audio, 0/8 kbit/s data and 8 kbit/s service channel in the first timeslot.

The delay of the encoded audio relative to the encoded video at the channel output is under study.

6.5 Data transmission

One or more timeslots may be allocated as data channels of 64 kbit/s each. The first channel uses the fourth timeslot.

Positioning of the other channels, and possible restrictions on availability at lower overall bit rates are under study. The BAS codes used to signal that these data channels are in use are specified in Recommendation H.221.

6.6 Error handling

Under study.

6.7 Encryption

Under study.

6.8 Bit Sequence Independence Restrictions

Under study.

6.9 Network interface

Access at the primary rate is with vacated timeslots as per Recommendation I.431.

For 1544 kbit/s interfaces the default H0 channel is timeslots 1 to 6.

For 2048 kbit/s interfaces the default H0 channel is timeslots 1-2-3-17-18-19.

Interfaces using ISDN basic accesses are under study. (Recommendation I.420)

END

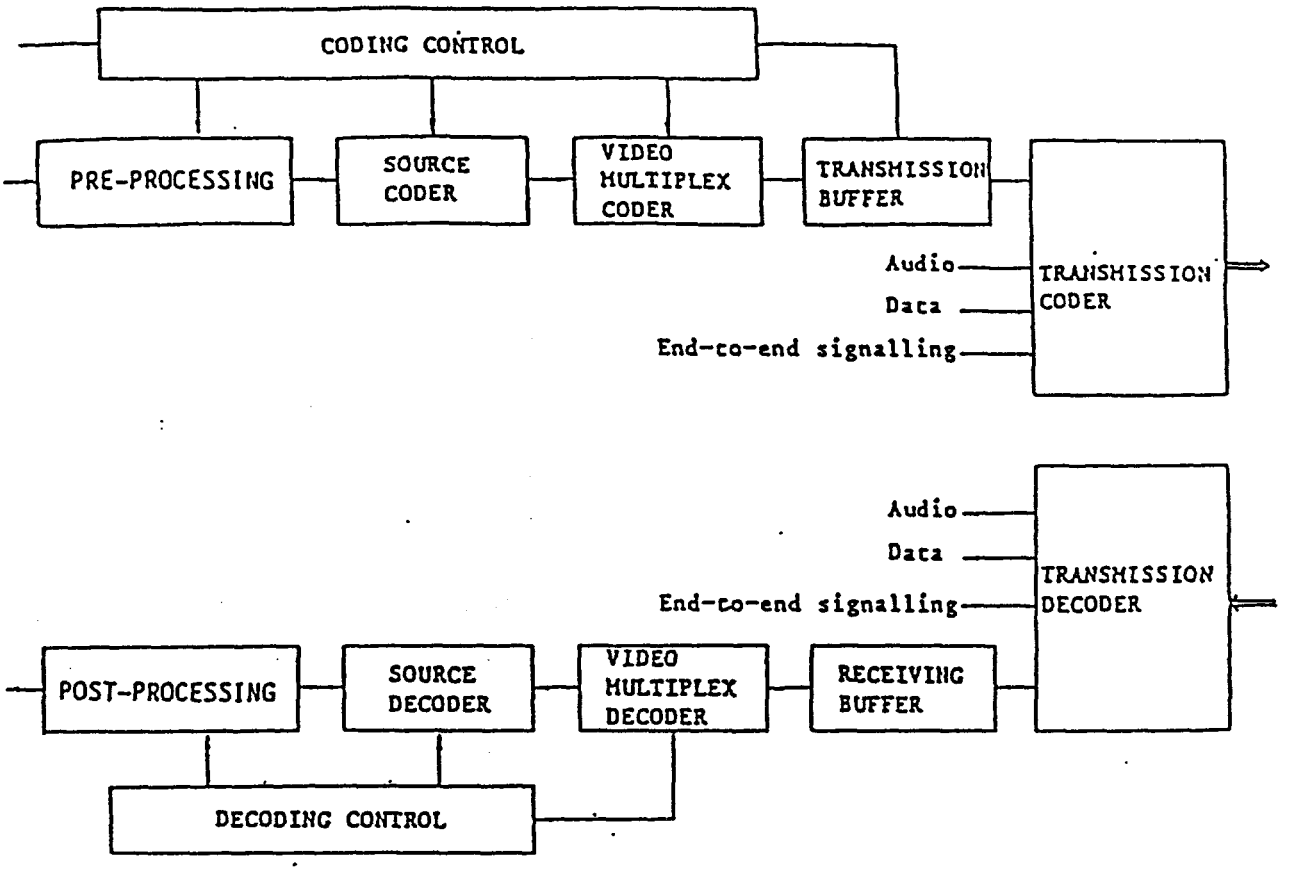


Figure 1/H.~~12~~ 261 Outline of block diagram of the codec

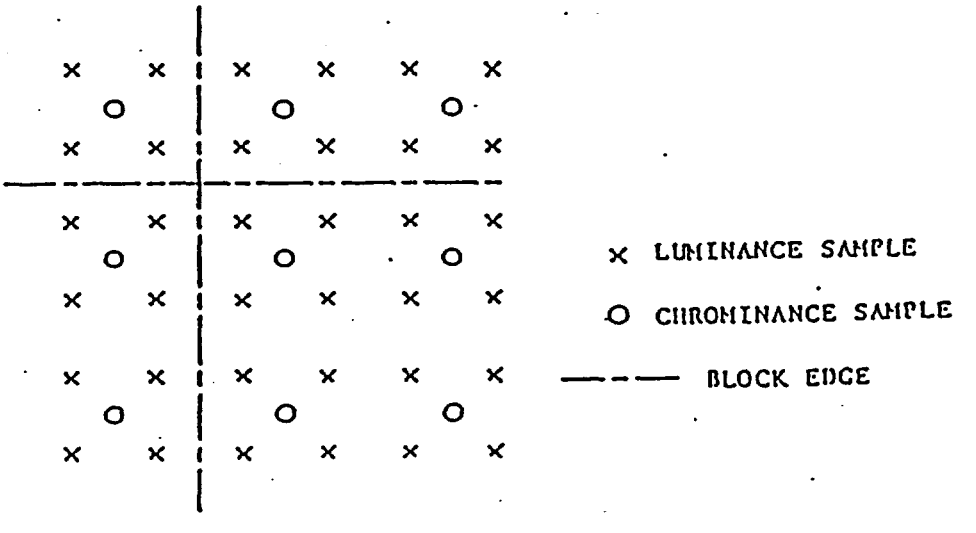
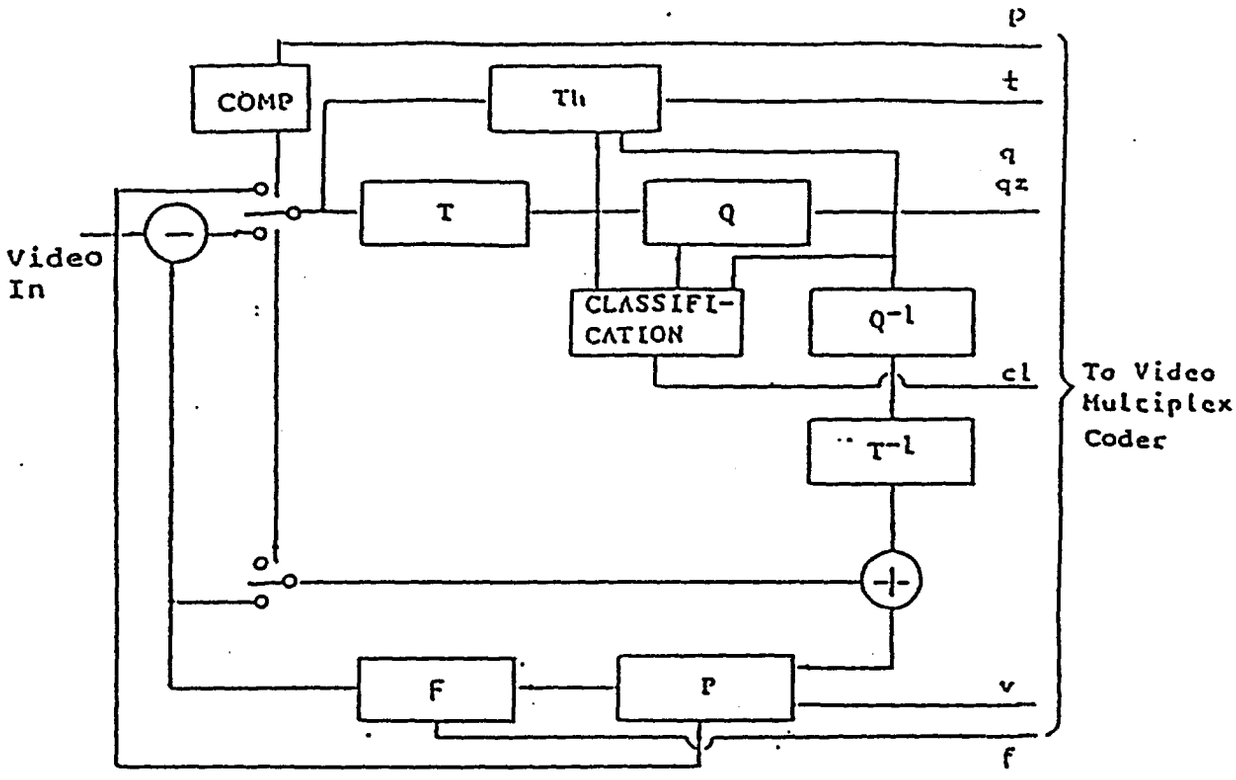


Figure 2/H.~~12~~ 261 Positioning of luminance and chrominance samples



COMP Comparator for intra/inter
Th Threshold
T Transform
Q Quantizer
P Picture memory with motion compensated variable delay
F Loop filter

p Flag for intra/inter
t Flag for transmitted or not
q Quantizing index for transform coefficietns
qz Quantizer indication
v Motion vector.
cl Classification index
f Switching on/off of the loop filter

Figure 3/H.~~12~~ 261 Video coding algorithm

Attachment 7 to Doc. #347

NEW QUESTIONS C/XV AND D/XV

Attachment 7

Annex 6

and associated speech (monophonic/stereophonic)

QUESTION C/XV - Visual telephone systems including videoconferencing and videophone. (continuation of Question 4/XV 1985-88)

Considering

1. that recommendation H.100 provides a generic definition of services involving the transmission of visual information on networks used for telephony and other telecommunications applications,

mod 2. that such services include videoconferencing and videophone as defined in H.200/AV100 series Recommendations ~~(see Annex 1 and 2)~~;

3. that a number of videoconferencing systems are already in operation and interworking of these systems is required,

4. that a number of Administrations are examining the introduction of a video phone service through ISDN and that experiments and trials of such services are in progress in a number of countries,

5. that the scale of the demand has not yet been established,

6. that differing facilities may be required by different classes of subscriber but these have not yet been clearly identified and defined,

7. that the problems of international working will be easier to resolve if they are studied while national plans are still in a preliminary and formative stage,

8. that since digital transmission is economical and suitable for long-distance visual communications it will, therefore, be used for long-distance transmission in the visual telephone service; moreover, Narrowband ISDN and future Broadband ISDN will also be used for providing the visual telephone service,

add 9. that N times 64 kbit/s bit rates are requested for videoconferencing and videophone services, and that such services could be provided on a switched mode basis if synchronization from end to end is available,

10 8. that in addition to videoconferencing and videophone it is expected that other various services (eg. video lecturing, video transmission, surveillance and video information retrieval) will be required and that intercommunication between audiovisual terminals for those services is essential,

11 10. that, for videoconferencing, a reservation system for booking calls is required to ensure connection at the time of actual usage,

12 11. that both moving and still picture systems are necessary.

Question

part 1. for the moving picture system:-

mod 1.1 what system architecture should be recommended, particularly respecting the use of different modes applying one or two B-channels of the ISDN-basic access?

1.2 what system parameters (SPACE) and transmission standards should be recommended ?

1.3 what should be recommended for equipment characteristics ?

1.4 what characteristics should be recommended for the subscriber terminals and their environments ?

1.5 what should be recommended for multipoint visual telephony ?

mod 1.6 what recommendations should be made concerning picture quality and assessment, particularly respecting the use of different modes applying one or two B-channels of the ISDN-basic access?

1.7 what recommendations should be made specifically for videoconferencing ?

1.8 what revision of the existing H.100 series Recommendations is necessary ?

part 2. what system parameters should be recommended for the transmission of still pictures or sequences of still pictures ?

Points for Study

1. System architecture for moving picture system:
   - 1.1 Structure of system using ISDN or other networks for different services.
   - 1.2 Hypothetical reference connections and circuits.
   - 1.3 National extensions.
   - 1.4 User interfaces with network.
   - 1.5 Synchronisation and timing aspects.
   - 1.6 Requirements for signalling and switching.
   - 1.7 Definitions of setup and disconnect procedures for N x 64 kbit/s channels. (add)

2. System parameters and transmission standards for the moving picture sytem:
   - 2.1 Performance objectives for the HRC's.
   - 2.2 Bit rates to be used on the connection.
   - 2.3 Frame structure for different bit rates.
   - 2.4 Communication procedures and channels for system control signals.
   - 2.5 Characteristics of interfaces with the local network and with subscriber terminals.
   - 2.6 Methods for the separate and combined transmission of sound and picture.
   - 2.7 Characteristics of audio channels.

3. Specifications for equipment in the moving picture system:
   - 3.1 Specification of worldwide video coding algorithm(s), (mod) parameters and equipment in various bit rates such as nx384 kbit/s and mx64 kbit/s for Narrouband ISDN. (see Annex 1)
   - 3.2 Video coding algorithm, parameters and equipment for Asynchronous Transfer Mode (ATM) in Broadband ISDN; in particular:-
     - 3.2.1 use of static banduidth flexibility offered by ATM,
     - 3.2.2 variable bit rate video coding techniques,
     - 3.2.3 influence of cell loss on image quality,
     - 3.2.4 coder/decoder sychronisation in presence of cell delay jitter,
     - 3.2.5 harmonisation of ditributive and communicative video services,
   - 3.3 Transmission equipment specially designed for visual telephony such as remultiplexers, television standards convertors, transcoders etc.,

4. Characteristics for subscriber terminals and their environments in the moving picture system; (see Annex 2)
   - 4.1 Terminal functions desired for various services.
   - 4.2 Requirements for the lighting and acoustic environment where terminal equipments are placed.
   - 4.3 Interfaces between users and termials, eg for Video, speech, (monophonic/stereophonic) data, etc..
   - 4.4 Functional specifications for interuorking - particularly Control and Indication (C&I) signals.

5. Specification of multipoint videoconferencing and videophone systems using standardised video codecs, particularly for:-
   - 5.1 system architecture,
   - 5.2 communication control protocol,
   - 5.3 picture processing method,

mod

5.4 speech processing method, taking into account of speech quality impairments due to embedded echo suppression schemes in coders,

5.5 data signal handling.

6. Quality aspects for the moving picture system;
   - 6.1 Methods of subjective testing including the development of test tapes containing standardised sequences of moving pictures with different degrees of motion.
   - 6.2 Evaluation of pictures containing distortion in both spatial and temporal domains.
   - 6.3 Effects of large signal delay.
   - 6.4 Quality aspects of the tandem connection of codecs.

add

6.5 Quality of service for the applications concerned.

7. Video conferencing specifications for the moving picture system;
   - 7.1 Specification of control and data signals for the split screen system and their transmission method.
   - 7.2 Specification of communication reservation system - particularly on:-
     - 7.2.1 necessary information,
     - 7.2.2 parameter definition and values,
     - 7.2.3 service capabilities,
     - 7.2.4 protocol for international working.

Notes

1. The study of this Question should be coordinated with:-
   - 1.1 Study Group I for service definition,
   - 1.2 Study Group II for network operation issues,
   - 1.3 Study Group XVIII for ISDN issues.

add

2. A moving picture system always includes associated speech.

mod

3. The study of this question should be coordinated with the study of Question U/XV (~~16 kbit/s and 32 kbit/s encoding~~).

~~16 kbit/s speech encoding and extension to wideband speech~~

ANNEXES

Annex 1 : H.200/AV262 (see TD 39/XV-1) (=H.13y)

Annex 2 : H.200/AV320 (see ~~Ann~~COM XV-R26(B), Annex 2 to Part B.4

TD 29

QUESTION D/XV - Harmonisation of audiovisual systems.

Considering

1. that audiovisual services are to be offered in which different combinations of facilities (speech, pictures, telematics, etc.) may be used during a connection,
2. that such services include videoconferencing, audiographic and telematic teleconferencing and videophone as studied in other questions,
3. that other related sevices may be defined in the future for special applications,
4. that such services should be offered for the simultaneous interconnection of two, three or more terminals in different locations as necessary
5. that frequently interconnection may be between terminals which are not identical in the facilities which they have available and that in general intending callers will not be aware of the capabilities of the distant terminal,
6. that, in the case of three or more terminals, one or more multipoint control units (MCU) will be required within the network to distribute appropriately the signals representing the various facilities,
7. that, under some circumstances, connections will be required between terminals on networks operating at different bit rates; in particular, services such as videophone and videoconferencing may be offered both on broadband and narrowband networks requiring gateways between these for interconnection,
8. that in addition to the facilities perceived by the user other signals will be required for the proper organisation and control of the system, especially in a multipoint environment,
9. that Recommendation H.200 sets out a framework for recommendations covering the defined services and the necessary technical conditions for implementing them in a harmonised and interworkable way (see Annexes 1 to 5)

Question

part 1. what basic signal structure should be recommended for utilisation on interconnections of various bit rates corresponding to the bearer services defined in Recommendation.... ?

part 2. What modifications should be [illegible] mode 1 to Recommendation H 221, in particular to take into account synchronisation aspects when several independant B channels are used ?

part 3. how should recommended coding methods for audio and still or moving television images and telematics facilities be incorporated into the basic signal structures such that optimal interworking conditions are secured ?

part 4. what equipments and procedures should be recommended to establish correct interworking between similar and dissimilar terminals taking into account the facilities available at each ?

part 5. what harmonised set of control and indication should be recommended to be available within the technical implementation to facilitate correct operation and provide information required by user-friendly terminals ?

part 6. what should be recommended for the specification of multipoint control units for the various types of interconnection and for the procedures required for establishing multipoint calls on digital networks ?

part 7. what should be recommended for the specification that should be applied to equipment required at gateways between different networks and/or interconnection bit rates ?

Notes

1. The study of this question should be coordinated with:-
   1.1 Study Group I for service definition,
   1.2 Study Group II for network operation issues,
   1.3 Study Group VIII for telematic issues,
   1.4 Study Group XVIII for ISDN issues.
2. The study of this Question should be coordinated with the study of Question U/XV ~~/16 kbit/s speech signal encoding and extensions to wideband speech/~~.

ANNEXES

ANNEX 1 : H.200 ... enhanced - (attached)

ANNEX 2 : H.200/AV200 (COM XV-R26(B), annex 1, Post B.5

ANNEX 3 : H.200/AV230 (COM XV-R26(B), annex 1, Post B.5

ANNEX 4 : H.200/AV240 (COM XV-R26(B), annex 3, Post B.

ANNEX 5 : H.200/AV242 (COM XV-184)

ANNEX-2
Issue: April 1988

DRAFT RECOMMENDATION H.200 - FRAMEWORK FOR RECOMMENDATIONS FOR AUDIOVISUAL SERVICES

	CCITT Rec.No.
I. SERVICE DEFINITION	
AV100 General Recommendation for AV Services	F700
AV110 Teleconference Services	F700?D
AV111 Audiographic Conference Service	
AV112 Videoconference Service	
AV120 Videophone Services	
AV121 Basic Narrowband Videophone Service in the ISDN	F...
AV130 ... (Other AV Services)	
II. INFRASTRUCTURE	
AV200 General Recommendation for AV Service Infrastructure	
AV210 Reference Network Configuration	
AV220 General Recommendation for Frame Structures	
AV221 Frame Structure for a 64 kbit/s Channel in Audiovisual Teleservices	H221
AV222 Frame Structure for 384-2048 kbit/s Channels Audiovisual Teleservices	H222
AV223 ... (Frame Structures for Higher Bit-Rates)	
AV230 General Recommendation for AV System Control & Indications	
AV231 Multipoint Control Unit for 64 kbit/s AV	
AV232 Multipoint Control for 384-2048 kbit/s	
AV233	
AV240 Principles for Communication Between AV Terminals	
AV241 System Aspects for the Use of the 7kHz Audio Codec Within 64 kbit/s	G72Y
AV242 System for Establishing Communication Between AV Terminals Using One or Two 64 kbit/s Channels	
AV250 Audio Coding	
AV251 Narrowband Audio coding at 64 kbit/s	G711
AV252 Wideband Audio Coding in 64 kbit/s	G722
AV253 Audio Coding at 40/32 kbit/s (Using G721/728 or extending G722 down)	
AV254 Narrowband Speech Coding at 16 kbit/s	
AV260 Video Coding	
~~AV261~~	H261
AV26?n x 384 kbit/s Video Codec	H12XY
AV26?m x 64 kbit/s Video Codec	

III. SYSTEMS AND TERMINAL EQUIPMENT

AV300 General Recommendations for AV Systems and Terminals

AV310 (Requirements for Teleconferencing)
- AV311 Audiographic System and Terminal Requirements
- AV312 Videoconference System and Terminal Requirements
- AV313 Teleconference Protocol

AV320 Requirements for Videophone Services

IV. NETWORK ASPECTS

AV400

AV410 Reservation Systems
AV420 HLC for Use in Audiovisual Calls
AV430 Call Control C&I
AV440 Multipoint Call Set-up

NOTE 1: Items in Section IV are outside the scope of infrastructure considerations but nevertheless require harmonisation for satisfactory provision of AV services.

NOTE 2: It is intended to merge the substance of existing Rec H100, 110 into this framework in the next study period.

Source-Note to Annex 1 except "Further Rec. will be added ...."

NOTE 2: Entries in parentheses are indicative of the purpose of the various positions in the framework.

APPENDIX TO REC H.200, ANNEX 2
Issue: April 1988

PRESENT STATUS AND CONTENTS OF PROPOSED RECOMMENDATIONS IN H.200

I. SERVICE DEFINITIONS

AV100 General Recommendation for Audiovisual Services (SG I, MM, 1988)

List of specific services included in the general set
List of facilities (or "media") included in the general set
Call-control requirements, including multipoint
Interworking between various AV services

AV110 Teleconference Services (SG I, MM, 1988)

Draft Rec F700 (COM I-R23 Part III.7)

AV111 Audiographic Conference Service (SG I/II, MM, 1992)

Description of service; basic facilities
Optional facilities
Terminal configuration and accommodation
Control and indications
Perceived performance on international calls
Network accesses applicable to the service
Availability and conditions of international service
Supplementary services (call forwarding/transfer, interconnection to other types of audiovisual service terminal).
Use of telematic facilities
Quality description for audio, taking into account transducer and room performance, options as to the particular coding used from the infrastructure set, and the effect of transmission errors.

AV112 Videoconference Service (SG I/II, MM, 1989)

As for AV111 above with the following additions:
Video system (see also AV100, AV110 and AV313)
Terminal configuration and accommodation includes video aspects
Quality description for video including effect of terminal transducers and room conditions, video coding options from the infrastructure set, and the effect of transmission errors (the description must take into account the fact that video coding may be changed within the network, for example from high bit rate to low bit rate coding).

AV120 Videophone Service (SG I/II, MM, 1992)

As for the videoconference service AV112 above, though of course the details will differ in many respects, see also AV320.

AV121 Basic Narrowband Videophone Service in the ISDN (SG I, MM, 1988)

Draft Rec F... (COM I-R22 Part IV.3)

AV130 Other Audiovisual Services

Such recommendations should cover audiovisual services not already covered by teleconferencing or videophone. Known applications are telemedicine and remote lecturing.

II. INFRASTRUCTURE RECOMMENDATIONS

AV200 General Recommendation for Audiovisual Service Infrastructure (SG XV, NDK, 1992)

Outline proposed in COM XV R26 (Annex 1 to Part B.5)

AV210 Reference Network Configuration for AV Services (SG XV, NDK, 1992)

Description/explanation
Definitions
Reference Configuration
Interfaces
Functional specification for multipoint working (refer to AV230)
Interconnections between "broadband" and lower bit-rate networks
Inter-regional interconnections

AV220 General Recommendations for Frame Structure (SG XV, NDK, 1992)

Short umbrella recommendation for the AV220 series

AV221 Frame Structure for 64 kbit/s Channel in Audiovisual Teleservices (SG XV, NDK, 1988)

Draft Rec H221 (COM XV R-26 Part C.4) R-___ C.7 - April 1988.

AV222 Frame Structures for 384-2048 kbit/s Channels in AV Teleservices (SG XV, NDK, 1988)

Utilisation of Rec H221 with additional 64 kbit/s channels for video, etc
Utilisation of frame structures for 1544 and 2048 kbit/s to Rec G704

AV230 General Recommendation for AV System Control and Indications (SG XV, NDK, 1992)

Outline proposed in COM XV R26 (Annex 1 to Part B.5)

AV231 Multipoint Control of 64 kbit/s AV Services (SG VIII, LD, 1992)

Implementation of AV230 in the case of calls using single 64 kbit/s paths only
Ditto, using two 64 kbit/s paths
Ditto, using ISDN to Rec I-series

AV232 Multipoint Control of 384-2048 kbit/s AV Services (SG XV, NDK, 1992)

Implementation of AV230 in the case of 384 kbit/s paths
Ditto, using 1544 and 2048 kbit/s paths

AV240 Principles for Communication Between AV Terminals (SG XV, NDK, 1989)

Text proposed in COM XV R26 (Annex 2 to Part B.5)

AV241 System Aspects for the Use of the 7kHz Audio Codec Within 64 kbit/s (SG XVIII, XM, 1988)

Draft Rec G72Y

AV242 System for Establishing Communication Between AV Terminals Using One or Two 64 kbit/s Channels (SG XV, NDK, 1989)

Preliminary text proposed in COM XV R26 (Annex 6 to Part B.5)

AV250 Audio Coding

AV251 Narrowband Audio Coding at 64 kbit/s G711

AV252 Wideband Audio Coding in 64 kbit/s G722

AV253 Audio Coding at 40/32 kbit/s (SG XV, XX, 1989)

(Using G721/728 or extending G722 down, or extending AV254 up)

AV254 Narrowband Speech Coding at 16 kbit/s (SG XV, XX, 1989)

AV260 Video Coding

AV261

AV262 n x 384 kbit/s Video Codec (SG XV, SO, 1989) H12X

AV263 m x 64 kbit/s Video Codec (SG XV, SO, 1989) H12Y

III. SYSTEMS AND TERMINAL EQUIPMENT

AV300 General Recommendation for AV Systems and Terminals

AV301 General Recommendations on AV Terminal Equipment

AV313 Teleconference Protocol (SG VIII, LD, 1992)

AV310 Requirements for Teleconferencing (SG VIII, LD, 1992)

AV311 Audiographic System and Terminal Requirements (SG VIII, LD, 1992)

Transducers
Room disposition (mainly left to customer choice)
Processing (mixing, echo cancellation, voice switching, etc)
Noise specification
Audio alignment (level-setting)
Subjective quality (in association with infrastructure coding options as given in AV250 series)

AV312 Videoconference System and Terminal Requirements (SG XV, SO, 1992)

Transducers
Room disposition and lighting
Noise specification
Processing (mixing/split-screen, switching, etc)
Video alignment
Subjective quality (including video coding options according to AV260 series)

AV320 Requirements for Videophone Service (SG XV, SO, 1992)

Generally as for videoconference, AV312 above (differences of detail)

IV. NETWORK ASPECTS

AV400 Multipoint Call Set-up (SG XVIII, XX, 1992)

Purely from the network point of view, and nothing specifically to do with audiovisual services, there will be a need to ensure that multipoint calls can be set up in a suitable way from the human factor point of view. Clearly this must be closely co-ordinated with the requirements of teleconferencing, and of conference calls as a supplementary service to videophone and other audiovisual services (see AV230).

Charging aspects must also be taken into account.

AV410 Reservation Systems (SG XVIII, XX, 1992)

Rapporteurs (at April 1988)

MM: MATSUMOTO Mitsuji
NDK: KENYON Norman
LD: DIJKSTRA Lokke
XM: MAITRE Xavier
SO: OKUBO Sakae
XX: to be appointed