CCITT SGXV
Working Party XV/1
Experts Group for ATM Video Coding

Document AVC-28
April 22, 1991

SOURCE : TG CMTT/2
TITLE : LIAISON STATEMENT TO CCITT STUDY GROUP XV
PURPOSE: Report

The following documents of the TG CMTT/2 meeting in Tokyo (March 25-28, 1991) are attached for consideration of the Experts Group;

1. Letter of Dr. Stenger, Chairman of TG CMTT/2, to S. Okubo: p.2

2. CMTT-2/TEMP/7: pp.6-13

Common areas of interest between CCIR/CMTT Task Group CMTT/2 and CCITT Study Group XV

3. CMTT-2/TEMP/6: pp.14-23

Appointment of a Special Rapporteur and work plan for studies on digital TV and HDTV secondary distribution

4. CMTT/2-8 (CCITT Experts Group): pp.24-27

Report on activities of the Experts Group

5. CMTT/2-18 (Royal PTT Nederland NV)

Compatibility methods for video coding systems

END

Deutsche Bundespost TELEKOM
FORSCHUNGSINSTITUT
BEIM FERNMELDETECHNISCHEN ZENTRALAMT

Deutsche Bundespost TELEKOM
Forschungsinstitut beim FTZ · Postfach 10 00 03 · D-6100 Darmstadt

Mr. Sakae Okubo
Chairman of the Experts Group
for ATM Video Coding
Visual Media Laboratory (Room 922A)
NTT Human Interface Laboratories
I-2356 Take, Yokosuka-shi
238-03 Japan

Ihr Zeichen, Ihre Nachricht vom *Votre référence, Votre lettre du* Your reference, Your letter of	Unser Zeichen, unsere Nachricht vom *Notre référence, notre lettre du* Our reference, our letter of	☎ + 49 61 51	Datum/*Date*/Date
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Dear Mr. Okubo,

As a result of our previous meeting in Tokyo I was asked by the members of Task Group CMTT/2, responsible for standards for digital TV transmission, to sent to you the attached liaison statements. You are kindly asked to take note of these texts and to bring them to the attention of your Expert Group.

Mr. M. Barbero, the Rapporteur of CMTT/2 for secondary distribution, will contact you in order to find out possibilities for joint studies in areas of common iterest.

With kind regards and hoping for a good cooperation between our Groups.

Yours sincerely

L. Stenger

Dr. L. Stenger
Chairman TG CMTT/2

Copy:
Mr. Barbero, RAI/Torino
Mr. Zedler, FTZ/Darmstadt

Enclosure
Doc. CMTT-2/Temp/7
Doc. CMTT-2/Temp/6

Dienstgebäude/*Bureau*/Office: Am Kavalleriesand 3, D-6100 Darmstadt
Telex/*Télex*/Telex: 419511 ftz d
Telefax/*Téléfax*/Telefax: 49 61 51 89 48 45
Teletex/*Télétex*/Teletex: 2627-6151914=FTZ
Btx/*Btx*/Btx: 061 5183-1
Telegrammanschrift/*Adresse Télégraphique*/Telegrams: telcentr darmstadt

Documents
CCIR Study Groups
Period 1990-1994

Revision 1 to
Document CMTT-2/TEMP/7-E only
Tokyo, 28 March 1991

TG CMTT/2

LIAISON STATEMENT TO CCITT STUDY GROUP XV

Common areas of interest between CCIR/CCITT Task Group CMTT/2 and CCITT Study Group XV

1. Introduction

In order to comply with the terms of reference defined by CCIR Decision 67-3 (Question 25/CMTT) which includes the drafting of Reports and Recommendations on the methods to encode TV and HDTV for secondary distribution, Task Group CMTT/2 has established a workplan during its meeting in Kingswood Warren, UK (October 1990). At the TG CMTT/2 Tokyo meeting (March 1991), a Special Rapporteur has been nominated, the terms of reference of whom are defined in Document (see attached Document CMTT-2/TEMP/6).

Task Group CMTT/2 recognizes that there are a lot of commonalities between the objectives of CCITT Study Group XV (as reported in Doc. TG CMTT-2/8) and the CMTT. This was already mentioned in Report 1239 (Doc. CMTT/1020); however, the specificities of delivering television signals to the end user lead CMTT to consider jointly conventional TV and HDTV (including narrow-band HDTV).

2. Resolution standards being considered

- 625/525 line conventional definition TV (CDTV)
- HDTV
- EDTV

In the present state of the HDTV Recommendations by Study Group 11, the complete specifications of HDTV are not available. However, it is important to note that, compared with conventional TV, it may differ by the scanning mode (see Doc. TG 11-1/1 (USA)). Attention must also be paid to systems such as progressive 625 or 525 lines (EDTV) that could be used as an intermediate step between conventional definition and HDTV.

It is very desirable that a unified coding method makes it possible to cover these applications. Therefore performance of the coding algorithm must be considered not only on interlaced but also on progressive scanned signals.

3. Bit-rate range under consideration

Conventional definition TV codecs at 34/45 Mbit/s and 140 Mbit/s have been recommended by CCIR (Recommendations 721 and 723); however, for secondary distribution purposes, lowest possible bit rates taking into account a reasonable complexity at the decoder are desirable. Bit rates are determined by the quality

obtained (see Section 4). Considering the state-of-the-art, the expected bit-rate range is from a few Mbit/s (625/525 line systems) to some tens of Mbit/s (HDTV). It is intended that the algorithms may work for various bit rates (including VBR) resulting in a range of qualities and resolutions.

4. Quality

It is a big concern of CMTT that digital TV/HDTV distribution be of a sufficient quality in order to be supported by both broadcasters and consumers. As current (analogue) systems already provide good quality, digital TV/HDTV distributions must result in a significant improvement in terms of service.

5. Usable lifetime of the distribution standard

The lifetime of a TV distribution standard is expected to be some tens of years. During this time, the technology of TV receivers and of storage media will evolve. The TV distribution standard must then not be bound to the present state-of-the-art in receivers and recorders but, conversely, allow for harmonized evolution of the functionalities and the technologies of these terminals.

6. Compatibility

Compatibility is the main issue that leads CMTT to consider jointly conventional TV and HDTV signals. An extensive definition of what is meant by compatibility is given in Doc. CMTT-2/18 (see Annex).

It is clear that, in the future, programmes will have to be displayed on receivers of various resolutions. This requires a certain amount of compatibility between HDTV and conventional TV digitally encoded signals. There are several ways to solve this problem technically as mentioned in Document CMTT-2/18.

It is stressed that digital distribution of television is a virgin field and that under these conditions backward compatibility has no meaning for digital TV distribution. Although for other video applications it may be desirable to have a video coding standard for CCIR-601 signals that is compatible with the H.261 or MPEG1 standards, such compatibility is not considered as a requirement for TV and HDTV distribution, but some commonalities may be fruitful for joint developments.

What is far more important for TV and HDTV distribution is compatibility between conventional TV and HDTV (and EDTV) digital distribution from the beginning of TV distribution coding algorithm studies, in such a way that further extensions to HDTV may be achieved in a consistent and compatible way.

7. Guidelines for the evaluation of candidate algorithms

Taking into account the previous considerations, the following specific CMTT guidelines are formulated with regards to selection of the coding algorithm for TV distribution:

- the selected algorithm(s) must be effective on both interlace- and progressive-scanned pictures in order to enable (efficiently) extension to these formats of the unified (or generic) video compression algorithm;

- the capabilities of the algorithm(s) to provide upward and downward compatibility between a range of TV and HDTV formats have to be taken into account

8. Practical aspects of collaboration

The aspects of practical collaboration with Study Group XV are addressed through the Special Rapporteur. It is expected that a delegation of TG CMTT/2 will attend common meetings of Study Group XV and ISO/MPEG which does not prevent delegates to have separate meetings or meetings with Study Group XV or ISO/MPEG only. The work plan and the milestones of TG CMTT/2 are reported in Doc. TG CMTT-2/TEMP/6 (Rev.1) (see Annex).

Annex: Document TG CMTT-2/TEMP/6(Rev.1)
Document TG CMTT-2/18

Documents
CCIR Study Groups
Period 1990-1994

Revision 1 to
Document CMTT-2/TEMP/6-E only
Tokyo, 28 March 1991

TG CMTT/2

APPOINTMENT OF A SPECIAL RAPPORTEUR AND WORK PLAN FOR STUDIES ON DIGITAL TV AND HDTV SECONDARY DISTRIBUTION*

1. Introduction

As an important progress of its work in digital TV and HDTV transmission, into the new Study Period, Task Group CMTT/2 will develop systems for secondary distribution of these signals. This document describes the work plan established by CMTT/2 to pursue these objectives actively during the present Study Period.

Task Group CMTT/2 decides to appoint a Special Rapporteur to speed up the necessary studies on secondary distribution and to coordinate this activity with other standardization bodies. Members of CMTT/2 are urged to actively cooperate in the mission of the Special Rapporteur.

2. General objectives

According to CCIR Decision 67-3 the responsibility for defining standards for primary and secondary distribution of TV and HDTV signals lies with Task Group CMTT/2. The quality and user requirements for such systems are specified by CCIR Study Groups 10 and 11. CMTT Questions 25, 34 and 72 have been assigned to CMTT/2.

In order to come to a Recommendation of video codecs to be used for secondary distribution, the following items to be studied have been listed:

- to identify the functional requirements of such a codec with regards to resolution standards to be considered, potential applications of these standards, and interworking needs between their applications;
- to identify the user requirements attached to the various services foreseen, mainly picture qualities; but some other points such as sound/video synchronization, encryption, etc. have to be considered;
- to develop a network reference model in order to identify some further requirements that could influence the draft of the video codec;
- to develop a terminal model in order to distribute the various functions to be studied into functional groupings (video coding, display presentation, service multiplexing, synchronization, network adaptation, scrambling, conditional access, etc.);

* This Document should be brought to the attention of Study Group 11.

- to develop a scenario of introduction of digital services, taking into account the availability of various scenarios for the introduction of future broadband networks.

3. Work plan

3.1 Specific tasks for CMTT/2

Among the various items listed above, some can only be addressed through a close cooperation with the relevant groups of the CCIR/CCITT, namely CCIR Study Group 11, CCITT Study Groups XV and XVIII, etc.

Some other tasks are clearly under the responsibility of the CMTT which has already prepared Report 1239 (AO/CMTT) (Standards for digital secondary distribution systems).

Particular emphasis should be given to the compatibility between TV and HDTV distribution. On the other hand, coding algorithms to be defined by CMTT/2 should provide the greatest possible commonality with those developed by other standardization bodies.

In order to speed up the very technical process of information gathering and codec Recommendation drafting, CMTT/2 has appointed a Special Rapporteur to deal with secondary distribution of digital TV and HDTV. His terms of reference are annexed.

Members of CMTT/2 are urged to actively cooperate in the Special Rapporteur work. Progress toward a coding algorithm shall be based on the definition and improvement of successive reference models. Milestones for CMTT/2 are:

- by May 1992: an outline specification including the definition of the coding algorithm architecture for TV and HDTV;
- by March 1993: a complete specification of the coding algorithm for TV and HDTV, still with some parameters to be defined;
- by the end of the present Study Period (1990-94): a draft Recommendation has to be completed for TV distribution and hardware feasibility should be demonstrated;
- by the end of 1996: a draft Recommendation for HDTV distribution, including hardware tests should be completed.

3.2 Specific tasks for CCIR Study Group 11

To support their development of systems for the secondary distribution of digital TV and HDTV, CMTT/2 request that Study Group 11 advise them on several aspects of the requirements for such a system. As far as possible, Study Group 11 is requested to take into account practical criteria which might influence the commercial acceptability of their advice.

Applications - considerations are sought on the variety of applications which should be taken into account for the development of secondary distribution systems, and advice sought on any special requirements which such applications may have.

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Source standards - considerations are sought on the most appropriate video source standards for the applications and bit-rates which may be chosen for secondary distribution.

Basic quality - considerations are sought on the subjective quality required by the user, with respect to the source standard chosen for secondary distribution. If it is thought that some perceptible distortion could be tolerated on a very small proportion of typical television content, then advice is sought on how large this proportion can be. It is envisaged that in order to define these basic quality requirements, Study Group 11 will have to specify subjective testing methodologies, test picture material and appropriate statistical analysis procedures.

Channel-error performance - considerations are sought on the subjective impairment which may be tolerated in received pictures at bit-error ratios typical of the secondary distribution reference network chosen. The statistics of these errors should be taken to be typical of those experienced on practical channels. In the event that the error behaviour of the secondary distribution channel is subject to medium term variation (due, for example, to interference from other channels or radio fading), the worst case performance requirement should be advised if possible.

Auxiliary services - considerations are sought on the data requirements (including capacity, statistics and time - urgency) for all services which comprise the television package, including video, audio, teletext, still pictures, conditional access data and any additional components identified.

3.3 Liaison aspects with other bodies

According to CCIR Decision 67-3, the responsibility for defining standards for secondary and primary distribution systems for TV signals lies with Task Group CMTT/2. The quality and user requirements for such systems are specified by CCIR Study Groups 10 and 11.

Within CCITT Study Group XV work is carried out in the field of variable bit-rate coding for ATM networks, mainly for applications in the area of conversational services. This work is done by the Study Group XV Expert Group for ATM video coding. The group has in its terms of reference the study of "the feasibility of a unified coding standard for various applications in all service classes using the ATM network for which different hardware versions (codecs) can be realized."

Because the tasks of the CCITT SG XV Experts Group interact with the task of TG CMTT/2, as defined in § 3.1, a direct coordination between these groups is required. To ensure this close coordination, Study Group XV has already appointed a liaison officer to the CMTT, who will participate in the CMTT and in Study Group XV.

In ISO/IEC, a Working Group (ISO/IEC JTC1/SC2/WG11-MPEG) has been established. The working area of this group is to develop standards for storage and retrieval of moving pictures and sound for Digital Storage Media (DSM). The present target is the development of a standard for the coding of moving pictures for digital Storage Media having a throughput of up to 10 Mbit/s.

The MPEG has stated in its documents its wish to study the transmission of broadcast TV signals. This will lead not only to a duplication of efforts, but also to a situation, where different standards will be developed for the same service or application. Taking into account that there will be an

increasing need for the compatibility between various services on future networks for distribution to the home, this would be a very undesirable situation. It is therefore the wish of TG CMTT/2 that these studies should be coordinated. This coordination should be one of the tasks of the Special Rapporteur.

TERMS OF REFERENCE FOR THE CMTT/2 SPECIAL RAPPORTEUR
FOR SECONDARY DISTRIBUTION
OF DIGITAL TV AND HDTV SIGNALS

1. To define the functional requirements for secondary distribution of TV and HDTV signals, taking into account the wide variety of transmission channels (STM and ATM, wired and radio) likely to be available for such services. Definition of quality objectives will be carried out in close collaboration with CCIR Study Group 11.

2. To draft specifications on the secondary distribution of digital TV and HDTV signals in component form and of related signals. Special emphasis is put on the compatibility aspects between TV and HDTV.

3. To take into account the CCIR Recommendations on transmission of television signals for contribution and distribution applications.

4. To take into account the work performed in other standardization bodies, to coordinate the collaboration of CMTT/2 members with the Experts Groups of CCITT Study Group XV WG1 and ISO/IEC JTC1/SC2/WG11 (MPEG) and to lead the CMTT/2 participation during joint meetings with these groups.

5. To check the adequacy of the proposed algorithms with above mentioned objectives.

6. To report to TG CMTT/2.

7. The Special Rapporteur is:

Mr. M. BARBERO
RAI Radiotelevisione Italiana
Centro Ricerche
Corso Giambone, 68
I-10135 TORINO
Italy
Telephone : +39 11 810 3184
Telefax : +39 11 6193779
Telex : 221035 rai to

Annex

ANNEX

The following participants in the TG CMTT/2 meeting (Tokyo, March 1990) will assist the Special Rapporteur:*

Special Rapporteur:

Mr. M. BARBERO
RAI Radiotelevisione Italiana
Centro Ricerche
Corso Giambone, 68
I-10135 TORINO
Italy
Telephone : +39 11 810 3184
Telefax : +39 11 6193779
Telex : 221035 rai to

Belgium

Mr. P. DELOGNE
Régie des Télégraphes et Téléphones
Université Catholique de Louvain
Lab. de Télécommunications et
d'Hyperfréquences
Bâtiment Maxwell, Place du Levant 3
B-1348 LOUVAIN-LA-NEUVE
Belgium
Telephone : +32 10 47 23 00
Telefax : +32 10 45 22 72
Telex : 59315 telhy b

Spain

Mr. Juan OEST
Subdirección de TVAD
ENTE PUBLICO RETEVISION
Paseo de la Castellana 83-85
28046 MADRID
Spain
Telephone : +34 1 5552000
Telefax : +34 1 5555892
Telex : 22989 or 47317

France

Mr. V. THOMAS
CCETT/TAV
4, rue du Clos Courtel
Bp 59
F-35512 CESSON SEVIGNE Cédex
France
Telephone : +33 99 024 038
Telefax : +33 99 024 098
Telex : 740 284 F

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* All present and future participants in the work of CMTT/2 may at any time notify the Special Rapporteur of their intent to assist him in this work.

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Japan

Mr. S. MATSUMOTO
Senior Research Engineer
Visual Communications Group
KDD R & D Laboratories
2-1-15 Ohara Kamifukuoka-shi
SAITAMA 356
Japan
Telephone : +81 492 66 7424
Telefax : +81 492 66 7510
Telex : KDDTOKYO J22500

Mr. Y. OHTSUKA
Senior Research Engineer
Advance TV Systems Research Div.
NHK Science & Technical Research Lab.
1-10-11, Kinuta, Setagaya-ku
TOKYO 157
Japan
Telephone : +81 3 5494-2224
Telefax : +81 3 5494 2238

Mr. K. SAWADA
Senior Research Engineer, Supervisor
Visual Media Laboratory
NTT Human Interface Laboratories
Nippone Telegraph and Telephone Corp.
1-2356 Take Yokosuka-shi
KANAGAWA 238-03
Japan
Telephone : +81 468 59 2830
Telefax : +81 468 59 2829

Sweden

Mr. Bo SJOEBERG
§wedish Telecom Radio
S-136 80 HANINGE
Sweden
Telephone : +46 8 7074625
Telefax : +46 8 7074684
Telex : 54 12386

Royal PTT Nederland NV

Mr. Roel TER HORST
Royal PTT Nederland NV
PTT Research
Dr. Neher Laboratories
P.O. Box 421
2260 AK LEIDSCHENDAM
Netherlands
Telephone : + 31 70 332 3440
Telefax : + 31 70 332 6477
Telex : 31 236 RNL NL

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Thomson-CSF

Mr. Yves-Marie LE PANNERER
Assistant Technical Manager
Thomson-CSF
Laboratoires Electroniques de Rennes
Avenue de Belle-Fontaine
F-35510- CESSON-SEVIGNE
France
Telephone : +33 99 254368
Telefax : +33 99 254334
Telex : 616 780 f

European Broadcasting Union (EBU)

Mr. L. Cheveau
Case postale 67
CH-1218 Grand-Saconnex
GENEVA
Switzerland
Telephone : +41 22 717 27 41
Telefax : +41 22 788 10 21
Telex : 41 50 00 ebu ch

Documents
CCIR Study Groups
Period 1991-1994

Doc. TG CMTT/2- 8
25 March 1991
Original: English

Received:
Subject :

SOURCE: CHAIRMAN OF THE EXPERTS GROUP FOR ATM VIDEO CODING IN CCITT SGXV
TITLE : REPORT ON ACTIVITIES OF THE EXPERTS GROUP

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1. General
2. Group organization
3. Scope of the study
4. Work plan and work method
5. Harmonization with other groups
6. Specific item for the consideration of TG CMTT/2

1. General

The Experts Group for ATM Video Coding was established to develop video coding standards for ATM environments at the Study Group XV meeting in July 1990. See the liaison statement from SGXV (July 1990).

The group met first from 13 to 16 November in The Hague at the kind invitation of PTT-RNL. This document reports major achievements and a particular item on coordination among related standardization bodies for consideration of TG CMTT/2.

2. Group organization

Chairman	Mr. S. Okubo	NTT, Japan

Coordinating Members

FRG	Mr. F. May	Daimler-Benz
	Mr. G. Zedler	FTZ
Australia	Mr. M. Biggar	Telecom Australia
Belgium	Mr. W. Verbiest	Bell Telephone
Canada	Mr. S. Sabri	BNR
Denmark	Mr. E. Nielsen	Telecom Denmark
USA	Mr. R.A. Schaphorst	DIS
	Mr. A.J. Tabatabai	Bellcore
France	Mr. J. Guichard	CNET(PAA/TPA)
Italy	Mr. M. Guglielmo	CSELT
Japan	Mr. T. Tanaka	NTT
	Mr. M. Wada	KDD
Norway	Mr. H. Sandgrind	Norwegian Telecom
Netherlands	Mr. D.A. Schinkel	PTT-RNL
UK	Mr. D.G. Morrison	BTRL
Sweden	Mr. H. Brusewitz	STA
Switzerland	Mr. H. Keller	Ascom Tech

Liaison Representatives

CMTT	Mr. H. Carbiere	PTT-RNL, Netherlands
ISO	Mr. M. Anderson	Bellcore, USA

14
AVC-28

3. Scope of the study

3.1 Applications

Possible applications for ATM video coding in B-ISDN are summarized in general term as;

- conversational services,
- distributive services,
- retrieval services,

with stress on their multimedia nature. During the discussion, the group recognized that our objective is to define a unified coding method which can cover the above mentioned services, rather than to confine to a specific service.

3.2 Boundary conditions for video coding

3.2.1 Target networks

We focus on B-ISDN as networks to which the new video codec is connected but do not preclude such networks as LAN and MAN as far as they are ATM based.

3.2.2 Network characteristics

ATM network characteristics to which our new video coding should adapt were overviewed by listing up opportunities as well as limitations. The group identified a number of questions which should be answered by the network people. A liaison statement containing these questions was addressed to SGXVIII which met at the end of November 1990.

3.2.3 Technical requirements for ATM video coding

1) Video signals to be handled

Initially we will concentrate on video coding of source signals in standard television formats but at the same time will try to accommodate extension to EDTV and HDTV sources.

2) Picture quality target

The target is defined as a range between conversational service quality and distribution service quality, awaiting quantification in the future.

3) Processing delay target

Processing delay of the new video coding should be less than that of the current systems.

4) Average bit rate

It should cover a range from 64 kbit/s to several tens of Mbit/s.

3.2.4 Compatibility issues

There was some discussion on the balance of achieving compatibility (between H.26X and H.261, see Figure 1) and highest coding performance. The group agreed on a guideline that compatibility between the new coding system and existing systems should be highly respected. Exact ways to implement this property requires further study.

Audio coding	G.722 etc.	G.72X (G.722 etc.)
Video coding	H.261	H.26X (H.261)
Multimedia mux	H.221	H.22X (H.221)
Communication procedures	H.242	H.24X (H.242)

Figure 1 Interworking between H.32X and H.320 terminals

3.2.5 System aspects other than video coding

The group discussed how to handle such system aspects as multimedia multiplexing. Though it is obvious that this Experts Group is responsible for video coding aspects, we are in a position to raise requirements to WPXV/1 which is responsible for systems aspects of audiovisual services in B-ISDN. We confirmed that the group will study these system aspects to the extent that it facilitates video coding study.

3.3 Video coding problems to be worked out

3.3.1 Coding architecture

The group aims at a universal coding algorithm in terms of services, quality, resolution, application and bit rate each of which is given as a range.

3.3.2 Variable bit rate coding vs constant bit rate coding

Since VBR (variable bit rate) for constant quality is considered as one of the outstanding features of ATM, the group recognized it as an urgent study item to clarify the advantages of VBR video coding against CBR (constant bit rate) video coding in terms of statistical multiplexing gain and picture quality.

In the course of discussion, the group felt it would assist progress toward the next meeting to agree on a common network model, even if simple and crude. The first network model was developed as in Annex 1, relating network loading to cell loss probability. Comparison of video coding efficiency (e.g. one layer coding vs two layer coding) based on this model as well as proposals for improvement of this model are encouraged.

3.3.3 Layered coding

The intention of layered coding is to obtain compatibility among different service classes (e.g. different picture resolutions) or to cope with cell loss

(equivalently to make use of statistical multiplexing). How the layering should be implemented requires further study.

3.3.4 Picture formats

For simulation purpose, we will initially deal with QCIF/CIF and CCIR-601 formats. The group recognized the idea of a single coding format for CCIR-601 level pictures, but the details await further study. Contributions are requested to clarify advantages and disadvantages of that idea for making a decision.

3.4 AAL and multimedia multiplex suitable for video services

Extensive information was presented to understand the relation between AAL (ATM Adaptation Layer) and multimedia communications including video. The group confirmed that we should concentrate on Type 2 (see I.363) and provide our study results for SGXVIII.

4. Work plan and work method

4.1 Work plan

There was consensus on the following work plan of the group;

- Final Recommendation be made official in 1994, taking into account the completion of the B-ISDN Recommendations in 1992 and subsequent service provision.
- Outline Recommendation be produced at the end of the current study period, which includes scope, list of contents, such parameters as picture formats, framework of coding scheme, etc. to be agreed by that time.

4.2 Work method

The following methods practiced in the previous Specialists Group for H.261 were supported;

- Study is phased as "divergence" and "convergence",
- Step by step using Reference Models, and
- Hardware verification at the final stage.

As to the reference model, it was clarified that this time we need two kinds of model; one for network aspects study and the other for video coding aspects study. It was also clarified that the latter includes source coding as well as channel coding.

The group considered when the first Reference Model for video coding should be defined, and over what period various types of candidate algorithm should be tried, concluding that both should coincide with the demarcation between the "divergence phase" and the "convergence phase".

4.3 Time table

As a summary of the discussion for the work plan and method, the time table as shown in Annex 2 was agreed.

5. Harmonization with other groups

5.1 CMTT and MPEG plans

The group reviewed the organization and relevant work plan of CMTT and ISO/IEC JTC1/SC2 (MPEG) phase 2 to form a background of discussion.

5.2 Guideline

A basic question was whether this group should work aligned with CMTT and ISO. After having a free discussion, the group agreed in principle to carry out joint work in order to avoid different standards in the same or similar areas and to avoid duplication of standardization work as well.

5.3 Specific ways of collaboration

After having heard suggestions on several possible ways of collaboration, the group produced a liaison statement to MPEG as contained in Annex 3.

This statement was discussed at the MPEG Berlin meeting of December 4-7, 1990. They concluded in response to our liaison statement that the ongoing phase of work on audiovisual coding at bit rates up to about 10 Mbit/s be carried out in collaboration with CCITT, by holding joint meetings on matters of common interest such as video, systems, implementation. It was confirmed there that both groups have a common target date of freezing draft specifications as end of 1992. It was also confirmed that a "Test Model" would be defined after subjective tests of candidate algorithms for further collaborative elaboration.

A similar liaison statement to CMTT was felt needed. It will be discussed and decided at the next meeting of the Experts Group.

Note: This should have been discussed in the second meeting in March 1991, which was postponed to a later date due to the unfortunate world situation.

6. Specific item for the consideration of TG CMTT/2

The Experts Group for ATM Video Coding is seriously concerned with a B-ISDN terminal which is accessible to any of remote audiovisual communication terminal, moving picture data base or distributive television program source. For the benefit of standards users, coding algorithms for these three applications should desirably be identical, or otherwise they should have commonality to the maximum extent.

TG CMTT/2 is requested to consider how to materialize the "close coordination" among related standardization bodies, taking into account the approach which the CCITT Experts Group is trying against MPEG. In finalizing its workplan for studies on the secondary digital TV distribution, the following items could be considered:

- to identify common working areas to cooperate,
- to identify common working methods,
- to define a workplan with common targets and mile stones,
- to specify a list of requirements specific for digital TV distribution to be used as a guidance for the evaluation of candidate algorithms.

END

Annex 1

First Simplified Network Model

A small group meeting was held and the following approach was agreed:

1) A single stage multiplex is assumed.

2) The network is assumed to exhibit a cell loss/network load characteristics as shown in Appendix 1. An example of this characteristics is shown in Appendix 2.

3) The multiplex is assumed to have a maximum available bandwidth (CAP) of 100 Mbit/s.

4) Cell loss is assumed to be random.

5) Each cell loss corresponds to 48 consecutive bytes of information being lost.

END

Appendix 1 to Annex 1

$CLR = \exp(-n*K)$ where CLR is the cell loss ratio.

$K = \{a*\ln(a/p)\} + [(1-a)*\ln\{(1-a)/(1-p)\}]$

$a = CAP/(n*Peak)$ Note: $0 < a < 1$

CAP = Maximum capacity of the multiplexer output in Mbit/s

n = percentage of network loading

Note: n is the number of sources, $0 < n \leqq 100$. The illustration corresponds to the case of Mean = 1 Mbit/s.

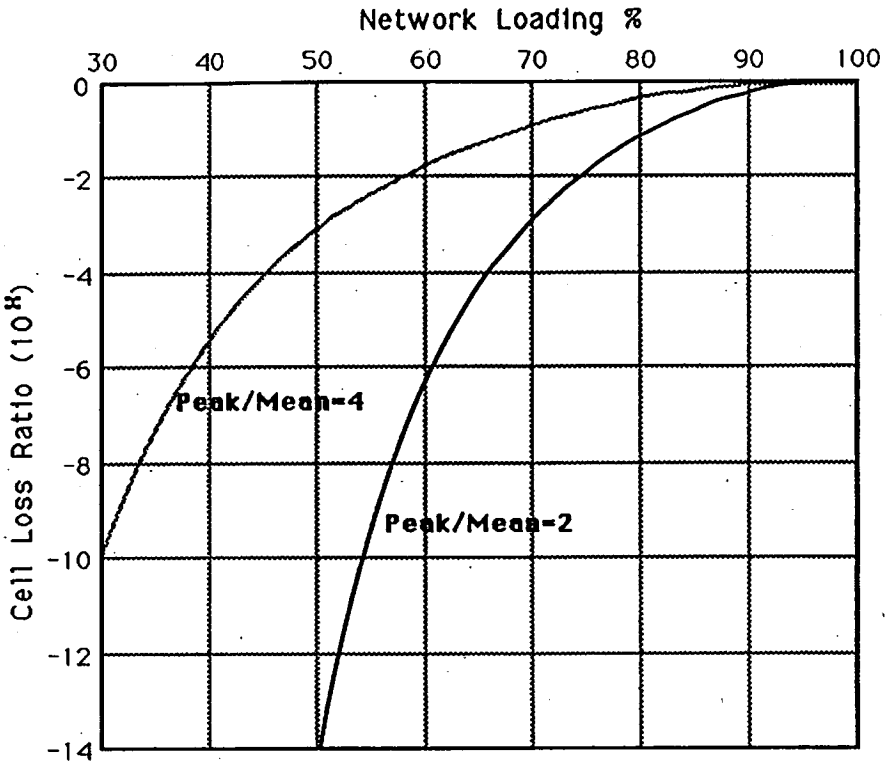
Peak = The maximum bit rate over simulation interval (measured on a per frame basis)

$p = Mean/Peak$ Note: $0 < p \leqq 1$

Mean = The average bit rate over simulation interval

ln = log to basis "e"

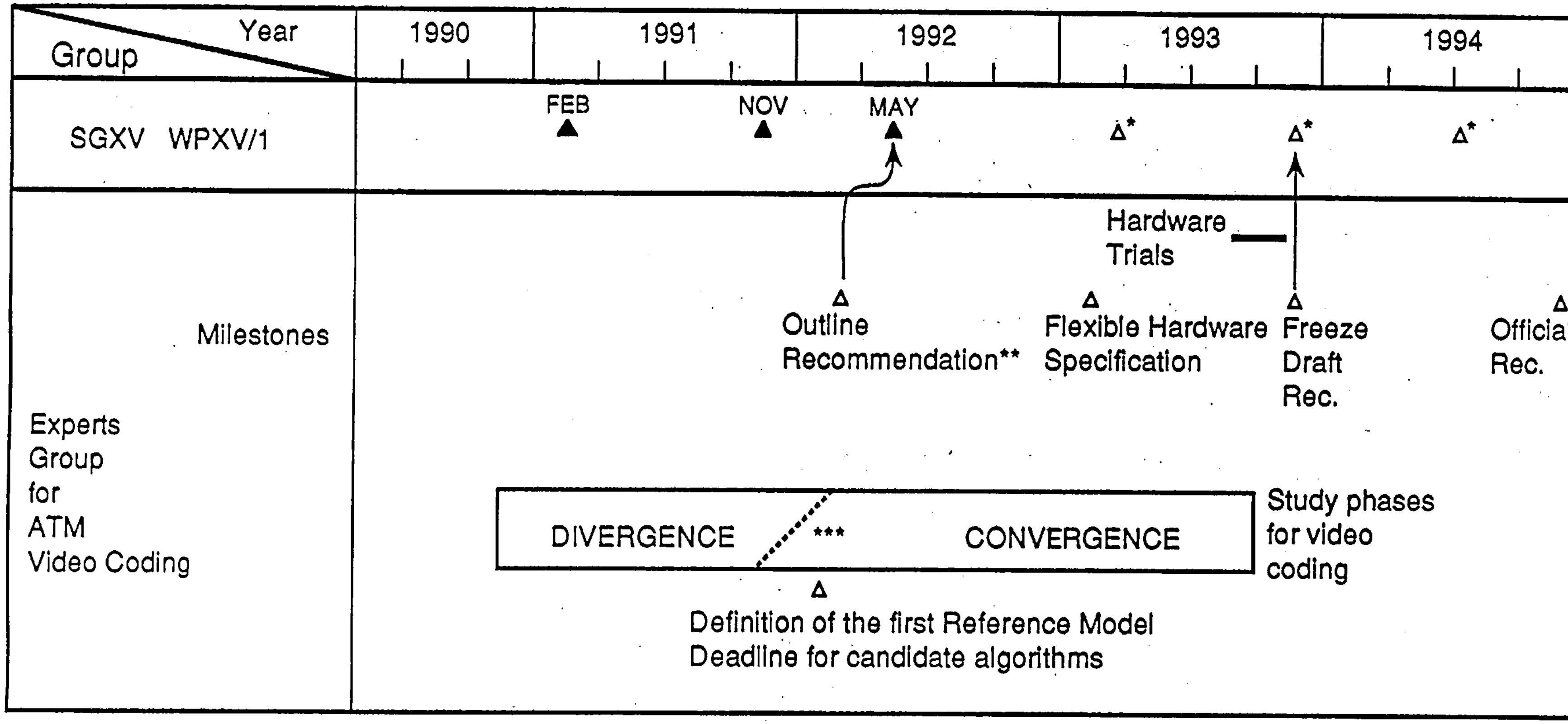
END



Cell Loss Ratio vs. Network Loading (Example)

Annex 2

Work Plan of the Experts Group



* Meeting schedules for the next sutdy period (1993-1996) are not yet decided. These are copied from those of the current study period.

** This outline Recommendation includes scope, list of contents, such parameters as picture formats, framework of coding scheme, etc. which are agreed by that time.

*** This demarcation may vary according to the progress of the coming year.

Annex 3

SOURCE : CCITT SGXV Experts Group for ATM Video Coding
TITLE : Letter to Dr. L. Chiariglione, Convenor ISO/IEC JTC1/SC2/WG11
PURPOSE: Liaison statement

In its liaison letter to ISO/IEC JTC1/SC2/WG11, CCITT SGXV Working Party XV/1 has stated its recognition of the importance of close collaboration between the two groups as invited in the liaison letter of July 1990 from the WG11 convenor.

At its first meeting, 13 - 16 November 1990, the CCITT Experts Group for ATM Video Coding discussed this further, in particular the exact manner in which this collaboration could be best achieved.

The scope of work of the Experts Group will initially cover video coding at bit rates between 64 kbit/s and several tens of Mbit/s, for transmission over Asynchronous Transfer Mode networks. This range encompasses that of the next phase of ISO/MPEG. Furthermore as already envisaged by MPEG in its preliminary requirements documents, the transmission of MPEG-2 encoded signals over telecommunications networks, especially ATM based ones will be very important. Consequently it would indeed be of great mutual benefit if commonality of standards or parts of standards could be achieved.

To this end the CCITT group proposes that joint meeting sessions be arranged in the areas of overlapping interest and responsibility, namely:

- source video coding algorithm and video multiplexing,
- system issues concerning multimedia multiplexing and synchronization,
- implementation considerations.

The aim would be to maximize the effort applied to common areas while recognizing that other aspects will remain the sole responsibility of the individual organizations, for example matters relating solely to storage media or telecommunications networks.

The exact nature of the joint meetings will require joint consultation and it is suggested that this be accomplished so that the first joint meeting would occur at the beginning of March 1991. Both MPEG and CCITT have meetings scheduled at this time.

The CCITT work plan is attached and it shows a high degree of consistency with the MPEG work plan. As an early input to the joint effort, a document is also appended listing some provisional recommended requirements for the proposed joint activity.

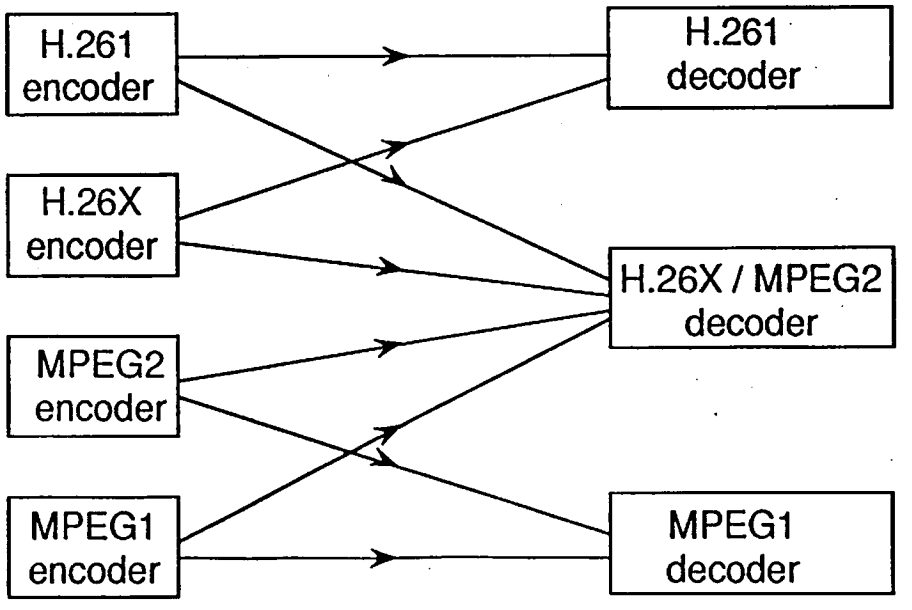
END

Appendix to Annex 3

Provisional List of H.26x Requirements

- Interconnectability on equipment level
- Bit rate range: 64 kbit/s - several tens Mbit/s
- CCIR 601 capability
- Various picture materials
- ATM network capability
    * cell loss resilience
    * variable/constant bit rate
- Consideration of conversational services
    * end-to-end delay ≦ 150 ms
    * Multipoint
- Hardware verification

END



Documents
CCIR Study Groups
Period 1990-1994

Doc. CMTT/2-18
21 March 1991
Original: English

Ref.: Documents CMTT/309, CMTT/1020

Source : Royal PTT Nederland NV

~~IWP CMTT/2~~

Compatibility methods for video coding systems

1. Introduction

In report AO/CMTT, 'Standards for digital secondary distribution systems', the importance of compatibility is stressed. Compatibility is required for secondary distribution standards for TV and HDTV, to meet the need for interconnection between services using different picture formats.

As compatibility may be obtained according several methods, it is useful to discern between these methods. In this document definitions of several methods of compatibility are proposed.

First, definitions of upward, downward, forward and backward compatibility are given, then several methods of compatibility are presented.

A. Upward and downward compatibility

Compatibility here refers to a transmission system, where different picture formats are used for the video encoder and video decoder. The system is:

- **upward compatible** if a higher resolution receiver is able to decode pictures from the signal transmitted by a lower resolution encoder.

- **downward compatible** if a lower resolution receiver is able to decode pictures from the signal or part of the signal transmitted by a higher resolution encoder. Two ways of downward compatibility can be discerned:

  - o The decoder reconstructs the entire picture at lower resolution
  - o The decoder reconstructs a window of the input

picture

When no further notice is made, it is assumed the decoder reconstructs the entire picture at lower spatial resolution. The framerate is not necessarily equal.

B. **Forward and backward compatibility**

Here, compatibility refers to a transmission system where different standards are used for video encoder and video decoder, i.e. an existing standard and a new standard. The system is:

- **forward compatible** if the new standard decoder is able to decode pictures from the signal or part of the signal of an existing standard encoder.

- **backward compatible** if an existing standard decoder is able to decode pictures from the signal or part of the signal of a new standard encoder.

It is assumed the entire input picture is reconstructed by the decoder, possibly at different spatial or temporal resolutions.

In the following definition of the methods of compatibility the terms forward and backward are used, as they refer to a general system with a new standard and an existing standard, where the picture formats are not necessarily different.

2. Compatibility by simulcasting

In this case the new standard encoder is characterized as follows. The new standard encoder typically operates in parallel with an existing standard encoder:

a - It transmits N (with N > 1) multiplexed streams of data, which may be separated at the decoder.
b - One of these data streams is decodable by an existing standard decoder after demultiplexing.
c - In the new standard decoder pictures are decoded from a set of one or more data streams K..N without making reference to data streams 1..K-1.

Backward compatibility is achieved by feature b, whereas forward compatibility is not guaranteed. A new standard

decoder will discard the existing standard data streams 1..K-1. Decoding of the existing standard may or may not be included as a special option.

In principle, this compatibility method is wasteful of bandwidth as the same picture information is transferred twice in different multiplexed data streams.

3. Compatibility by the embedded bitstream method

In this case the new standard encoder is characterized as follows:

a - It transmits N (with N > 1) multiplexed streams of data, which may be separated at the decoder.
b - One of these data streams is decodable by an existing standard decoder after demultiplexing.
c - From data stream 1 pictures may be decoded without reference to the other data streams, but decoding pictures from data stream M is not possible without making reference to data streams 1..M-1. Data stream M carries information additional to data streams 1..M-1.

Backward compatibility is achieved by feature b. Forward compatibility is achieved as the new standard decoder can decode pictures of existing standard quality from data stream 1 only.

In principle there is no waste of bandwidth since the N multiplexed data streams carry complementary information only. In practice however, the constraint of an existing standard for one of the datastreams limits the achievable coding efficiency when comparing with an equivalent stand-alone system.

4. Compatibility by a syntactic extension

In this case the data stream produced by the new standard encoder has a syntax which is an extension of the existing standard. This allows for forward compatibility, as the new standard decoder is equipped for the syntax of the existing standard and may decode the existing standard when little adaptations in the decoding process are made.

Backward compatibility is not achieved by this method.

5. Compatibility by a switchable encoder

This method of compatibility is mainly intended for services where the type of receiver(s) can be identified by the transmitter, e.g. for conversational services.

The new standard encoder is characterized as follows:

a - It transmits one stream of data only.
b - The new standard encoder is capable to operate in new standard or existing standard mode.
c - Encoder and decoder(s) negotiate to determine which standard will be used for the connection.

If these constraints are fulfilled, forward and backward compatibility is obtained.

6. Standard families

This is not a compatibility method, but allows for joint developments for several standards. A new standard having many commonalities with an existing standard may reduce efforts for development and optionally facilitate development of dual-standard equipment. This may be beneficial for introduction of a new service.

Conclusion

Several definitions of compatibility methods have been proposed.

In report AO/CMTT is reported that coding methods for secondary distribution should be designed with the objective of the greatest compatibility with primary distribution and contribution, and also with the codecs defined for other communicative applications.

The proposed definitions may be a guideline for discussion on the greatest achievable compatibility between the future and existing standards.