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

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SOURCE : CHAIRMAN
TITLE : REPORT OF THE FIRST MEETING OF THE EXPERTS GROUP FOR ATM VIDEO CODING IN THE HAGUE (November 13 - 16, 1990)
PURPOSE: Report

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1. General

The first meeting of the Experts Group was held in The Hague (The Netherlands) at the kind invitation of PTT-RNL. On behalf of the hosting organization, Mr. Ronald Plompen made a welcome address. The list of participants appears at the end of this report. The meeting started with introduction of each participant.

As to the Coordinating Member of The Netherlands, Mr. Dolf A. Schinkel advised the meeting that he replaced Mr. Plompen.

At the final session, Chairman thanked the hosting organization for the meeting facilities provided and the excellent secretarial support.

2. Documentation (TD2)

For this meeting, 21 normal documents and 13 temporary documents were available as listed in Annex 1.

3. Organization and role of the Experts Group

3.1 CCITT (AVC-2)

The meeting confirmed the terms of reference, the working methods and the work plan which had been guided by Working Party XV/1 at its July 1990 meeting.

3.2 Regional coordination (AVC-7,13)

Mr. Wada and Mr. Schinkel presented regional coordination in Japan (AV&ATM Video Coding Subcommittee) and Europe (NA5/VCM, TE/AVM, COST, RACE, ESPRIT) for this Experts Group using AVC-7 and AVC-13 respectively. Mr. Schaphorst presented North American coordination taking place in T1Y1.1, T1Q1.5 and T1S1. Mr. Biggar presented activities in Australia.

4. State of the art in ATM video coding (AVC-10,13,17,19; TD3)

A number of activities in the field of ATM video coding were briefed by participating organizations with indications of essential results. Some of them were accompanied by video tape demonstrations as listed in Annex 2.

5. Applications where ATM video coding is used (AVC-8,15,16)

Possible applications in B-ISDN and their requirements were provided in AVC-8 and 6, which are summarized in general term as;

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

with stress on their multimedia nature. It was also pointed out that Draft I.211 gives an extensive list of B-ISDN services.

During the discussion, the meeting recognized that our objective is to define a unified coding which can cover the above mentioned services, rather than to confine to a specific service.

6. Boundary conditions for video coding

6.1 Network characteristics (AVC-4,17,20; TD12)

ATM network characteristics to which our new video coding should adapt were overviewed in AVC-4 and AVC-20, listing up opportunities as well as limitations. AVC-17 provided a list of questions concerning ATM network characteristics which affect the design of the video coding. The meeting recognized it necessary to enhance this list for the group's future work, and requested Mr. Biggar to formulate questions addressed to SGXVIII which will meet at the end of November, 1990. The outcome is contained in Annex 3.

The meeting also discussed for a while on the networks to which our codec will be connected, concluding that we focus on B-ISDN but do not preclude such networks as LAN and MAN as far as they are ATM based. During this discussion, it was pointed out that policing is required even in CBR services for safety margin reason.

6.2 Technical requirements for ATM video coding (AVC-8,13,15,16,17)

6.2.1 Video signals to be handled

Initially we concentrate on video coding of standard television signals but at the same time try to take into account its extension to EDTV and HDTV.

6.2.2 Picture quality target

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

6.2.3 Processing delay target

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

6.2.4 Average bit rate

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

6.3 Compatibility issues (AVC-5,9,13,14,15,16)

There was some discussion on the balance of achieving compatibility and

highest coding performance. The meeting agreed on a guideline that the compatibility between the new coding system and existing systems should be highly respected. Exact ways to implement this property requires further study.

6.4 System aspects other than video coding (AVC-4,10,20)

The meeting discussed on how to handle such system aspects as multimedia multiplex. 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 systems using B-ISDN.

The meeting confirmed that we will study these system aspects to the extent that it facilitates video coding study.

7. Video coding problems to be worked out (AVC-10,13,17)

7.1 Coding architecture (AVC-5,10)

An example of video coding architecture to cope with various services and performance was presented in AVC-5, based on layered coding. AVC-10 also required versatile coding without specifying a particular method. The meeting agreed that the Group aims at a universal coding algorithm in terms of services, quality, resolution, applications and bit rates each of which are given as a range.

7.2 Variable bit rate coding vs constant bit rate coding (AVC-4,10,13,15,17,20; TD11)

Since VBR (variable bit rate) for constant quality is considered as one of the outstanding features of ATM, the meeting recognized it as an urgent study item to clarify the advantages of VBR video coding against CBR (constant bit rate) video coding. It is also a common understanding that applications should be clarified where VBR is effective.

In the course of discussion, the meeting felt it would facilitate our making a good progress toward the next meeting to agree on a common network model, even if simple and crude, during this meeting. Mr. Tabatabai undertook to coordinate a small group for this task. The outcome is contained in Annex 4. The meeting agreed to invite comments on this model from SGXVIII (see Annex 3).

Comparison in 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. Elaboration of the model may include cluster type of cell loss pattern, one more model appropriate for another QOS and/or higher bit rates. It was also pointed out that the measuring window will be critical when discussing VBR.

7.3 Layered coding (AVC-5,13,17,20)

Documents were presented, showing that the intention of layered coding is either of to obtain compatibility among different service classes or to cope with cell loss (equivalently to make use of statistical multiplexing). As to the latter aspect, see the discussion in 7.2 above.

7.4 Picture formats (AVC-5,10,16)

For the simulation purpose, we will initially deal with QCIF/CIF and CCIR-601 formats. The meeting 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.

8. AAL and multimedia multiplex suitable for video services (AVC-6,11,18; TD12)

Extensive information was presented to understand the relation between AAL and multimedia including video was presented. Mr. Tabatabai made a comment that;

- SN may or may not be needed.
- VPI/multiple VCIs may be used for multimedia multiplex.
- Instead of using IT, one bit in AAL can be used as a protocol discriminator to indicate whether a pointer for boundary indication will follow.

Mr. Elewaut pointed out parity cells may be inserted for error protection using CS as implemented in the video codec described in AVC-19.

After questions and answers, the meeting confirmed that we should concentrate on Type 2 and provide our study results for SGXVIII (see Annex 3). It is also a common understanding that SAR is service independent while CS is service dependent.

9. Work plan and work method

9.1 Work plan (AVC-9,16)

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.

9.2 Work method (AVC-10,13,16)

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 meeting considered when the first Reference Model for video coding be defined, and until when various types of candidate algorithm be tried, concluding that the both timings coincide with the demarcation between the "divergence phase" and the "convergence phase".

In order to make progress in video coding simulation work as soon as possible, the meeting considered that at least test pictures and assessment methods should be agreed at this meeting. The conclusion is as follows;

a) Test pictures

- Existing CIF test sequences: SALESMAN, CLAIRE, MISS AMERICA, BLUE JACKET, SWING
- MPEG phase-2 sequences: FLOWER GARDEN, SUSIE, POPPIE, TABLE TENNIS, MOBILE & CALENDAR, TEMPETE

  Note: Use of these sequences and distribution among the Experts Group members are subject to negotiation with MPEG.
- A long sequence but with average complexity for testing VBR for conversational services: Belgium kindly offered to try to generate such a sequence in 625/50 and 525/60 formats.

b) Assessment method

Informal observation tests were supported for our current purpose until other more effective methods become of use. Mr. Plompen pointed out that there exists an objective measurement method for higher bit rates to assess coded pictures.

Since we are going to assess CCIR-601 pictures as well as CIF pictures, a D-1 machine is necessary for review of processed pictures in addition to a U-matic machine in future meetings.

9.3 Time table (TD-5,10)

As a summary of the discussion for the work plan and method, the time table as shown in Annex 5 was agreed.

9.4 Status report document

Mr. Plompen proposed to produce a status report document such as AVC-13 including the following items;

- Prose description
- Terminology
- Applications
- Coding models
- Network model
- Assessment
- Reference Model
- Guidelines for simulations
- Outstanding questions
- Action points.

The objective is to form a common ground among participating members and clarify what should be worked out. Due to the lack of time at the meeting, Chairman undertook to draft such a document after the meeting based on the achievements in this meeting and to circulate it for the members' comments.

10. Harmonization with other groups

10.1 MPEG and CMTT plans (AVC-3,12; TD-5)

Chairman and Mr. Carbiere presented the organization and relevant work plan of MPEG phase 2 and CMTT, respectively to form a background of discussion.

10.2 Guideline (TD-6)

Since the decision on how to harmonize with other groups influences discussion on all other items, the meeting dealt with it at the earlier part of the agenda.

A basic question was whether this Group should work aligned with ISO and CMTT. After having a free discussion, the meeting 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.

As to the details for materializing this "joint work", however, there remain many items to be clarified. The followings are such comments obtained during the discussion;

- A simple liaison statement to propose joint work is not sufficient. We should indicate our own technical requirements and scope of service aspects.
- Boundary conditions to the video coding should be debated with ISO.
- We should try to keep our work method.
- It should be distinguished whether the target is to have a common standard or a common coding algorithm. Commonality should be sought to the necessary extent.
- Multimedia multiplex aspects should also be considered for joint work. MPEG has activities in this area to realize editing of multimedia signals, random access, channel switching, etc.
- There is not so much relation between ATM transmission and DSM applications.
- Time schedule should be checked whether compromisable or not. Success of the joint work depends on it.
- Advantages of B-ISDN should be sought as a long term objective. Compatibility with existing standards is a short term objective.
- Video coding aspects may need joint work with ISO, but network aspects are of CCITT's responsibility.
- Initiation of the joint work is the sooner the better.
- Submission of technical contributions from this group will give impacts on ISO decisions.
- We must cope with administrative nightmare.

10.3 Specific ways of collaboration (AVC-14; TD-7,8,9)

After having heard suggestions on several possible ways of collaboration, the meeting asked Mr. Morrison to coordinate a small group to further discuss the matter and draft a liaison statement to MPEG. The outcome is contained in Annex 6. This statement is expected to be discussed at the next MPEG meeting to be held during December 4 - 7, 1990 in Berlin.

During this discussion, Mr. Brusewitz undertook to draft a list of provisional requirements of ATM video coding as contained in Annex 7, which is included in the liaison statement.

A similar liaison statement to CMTT was felt needed. Taking into account that TG CMTT/2 will meet next April, the meeting requested Mr. Carbiere to draft such a statement for discussion and decision at the next meeting of the Experts Group.

11. Others

11.1 Hardware demonstrations

Chairman raised how to manage voluntary hardware demonstrations which may be proposed by participating organizations. The meeting agreed that we would accept such demonstrations as far as they facilitate our deepening understanding of the problems.

11.2 Next meeting

The second meeting of the Experts Group will be held during March 12 - 15, 1991 in Tokyo, but subject to change according to the action taken as described in 10.3 above.

END

Annexes

Annex 1 Available documents
Annex 2 List of tape demonstrations
Annex 3 Liaison statement to SGXVIII
Annex 4 First simplified network model
Annex 5 Time table of the Experts Group work
Annex 6 Liaison statement to MPEG
Annex 7 Provisional list of H.26x requirements

List of Participants of the first meeting
of the Experts Group for ATM Video Coding
(13 - 16 November 1990, The Hague)

FRG	Mr. P. Klein	Siemens AG	
	Mr. G. Zedler	DBP Telecom	CM
Australia	Mr. M. Biggar	Telecom Australia	CM
Belgium	Mr. L. Elewaut	Alcatel Bell Telephone	
	Mr. O. Poncin	University of Louvain	
	Mr. W. Verbiest	Alcatel Bell Telephone	CM
Canada	Mr. D. Lemay	BNR	
USA	Mr. P. Alexander	PictureTel	
	Mr. B.G. Haskell	AT&T Bell Labs	
	Mr. R.A. Schaphorst	DIS	CM
	Mr. A.J. Tabatabai	Bellcore	CM
	Mr. C.L. Yeh	Apple Computer	
	Mr. J. Zdepski	David Sarnoff Research Center	
France	Mr. G. Eude	France Telecom	
	Mr. J. Guichard	France TElecom	CM
Italy	Mr. M. Guglielmo	CSELT	CM
Japan	Mr. Y. Kato	Mitsubishi Electric	
	Mr. S. Okubo	NTT	Chairman
	Mr. T. Tanaka	NTT	CM
	Mr. M. Wada	KDD	CM
	Mr. M. Yano	NEC	
Norway	Mr. G. Bjoentegaard	Norwegian Telecom	
	Mr. H. Sandgrind	Norwegian Telecom	CM
Netherlands	Mr. H. Carbiere	PTT Research	LR (CMTT)
	Mr. A. Koster	PTT Research	
	Mr. R. Plompen	PTT Contest	
	Mr. D. Schinkel	PTT Research	CM
	Mr. B. Schuurink	PTT Research	
UK	Mr. M.D. Carr	BT	
	Mr. D.G. Morrison	BT	CM
Sweden	Mr. H. Brusewitz	Swedish Telecom	CM
	Ms. C. Verreth	Swedish Telecom	
Switzerland	Mr. H. Keller	Ascom Tech	CM

CM: Coordinating Member
LR: Liaison Representative

Documents for the first meeting of the Experts Group

Normal Documents

AVC-1 ADDRESS OF COORDINATING MEMBERS AND LIAISON REPRESENTATIVES (SECRETARIAT)

AVC-2 EXCERPT OF THE WPXV/1 MEETING REPORT - JULY 1990 (CHAIRMAN)

Establishment of the Experts Group for ATM Video Coding was decided at the July 1990 meeting of Study Group XV. Terms of reference of this group, membership and working method, work plan, chairmanship, and liaison statements to relevant standardization bodies are described.

AVC-3 PHASE-2 WORK OF MPEG (CHAIRMAN)

MPEG has initiated its second phase work for "coding of moving pictures for DSM having a throughput of up to 10 Mbit/s". This document presents MPEG organization, its terms of reference, work schedule highlighting the subjective test in July 1991, and requirements for the second phase work.

AVC-4 IMPACT OF ATM NETWORKS ON VIDEO CODING (AUSTRALIA)

Major characteristics of ATM-based B-ISDN and their impacts on video coding are identified as follows;

- Variable rate video coding which provides better picture quality/rate trade-off and less end-to-end delay.
- Cell loss, which may lead to the use of layered coding and cell priority assignment.
- Service integration because of service independent nature of the network, which requires a common video coding method; "universal video coding".
- Network flexibility requiring an appropriate method of handling multimedia or multichannel connections.

As a conclusion, consistency of the target video coding scheme with the direction of B-ISDN standards is emphasized.

AVC-5 UNIVERSAL VIDEO CODING FOR ATM NETWORKS (AUSTRALIA)

A Universal Video Coding approach, which is based on a hierarchical, layered coding with different sets of layers corresponding to different service classes, is proposed for integration of video signal representation and coding. The following study items are identified;

- Practicality of the scheme: range of parameters defining the service classes and appropriate hierarchies.
- Optimum coding of each layer.
- Cost/complexity trade-off.
- Incorporation of or migration form existing coding schemes.
- Flexibility to accommodate future improvements of the algorithm.
- Accommodation of still image coding.

It is proposed that the group should investigate the practicality of the Universal Coding approach and further develop the concept as a target architecture of the ATM video coding.

AVC-6 SIGNALLING FOR AUDIOVISUAL OR MULTIMEDIA CONNECTION ON ATM NETWORKS (AUSTRALIA)

It is pointed out that studies on network and end-to-end signalling appropriate for multiplexing of audio, video, and data are required in the light of virtual channel based connections in ATM networks. Error protection mechanism and encryption aspects are also touched upon.

AVC-7 JAPANESE ACTIVITIES ON ATM VIDEO CODING STANDARDS (JAPAN)

"AV&ATM Video Coding Subcommittee" is introduced as a national experts group in Japan which works tied up with the CCITT's Experts Group.

AVC-8 CONSIDERATION ABOUT ATM CODING APPLICATIONS AND FEATURES (JAPAN)

To facilitate setting objectives of the ATM video coding standard, possible applications and technical requirements to be met are listed up as a summary matrix. Technical requirements are presented in terms of resolution, picture quality and delay. It is stressed that the new standard should cover higher resolution and quality up to the HDTV level.

AVC-9 CONNECTIVITY WITH CURRENT SYSTEM AND RECOMMENDATION SCHEDULE (JAPAN)

As to the connectivity, the opinion is summarized as follows;

- To keep compatibility of ATM video coding with the existing standard is preferable.
- For low bit rate STM networks, the "terminal level" connectivity is indispensable.
- For high bit rate ATM networks, H.261 may be modified to some extent. The extent of modification is to be studied.

As to the schedule toward recommending an ATM video coding standard, it is suggested to make an outline recommendation in 1992 and a final one until 1994.

AVC-10 TECHNICAL PROBLEMS AND PROCEDURES (JAPAN)

Technical problems are picked up which should be worked out or clarified by the Group. Among them, "requirements for network characteristics" is recognized as the most urgent taking into account the SGXVIII activities. For the group's working method, step by step one based on a reference model with verification by hardware is proposed. This document also provides information on activities of participating organizations.

AVC-11 ATM ADAPTATION LAYER - AAL (JAPAN)

The aim of this document is to clarify the AAL problems, particularly from multimedia multiplex point of view. Taking AAL Type 2/I.363 as a basis, discussion points for each of the AAL elements (SN, IT, LI and CRC) are described. As a conclusion, it is stressed that a framework for multimedia multiplex in ATM environments should be established at the earliest stage.

AVC-12 VIDEO CODING ACTIVITIES IN CMTT (LIAISON REPRESENTATIVE FOR CMTT)

The organization of CMTT is presented which has Working Party CMTT/B and Task Groups CMTT/2 and CMTT/3 having close relation to the activity of this Experts Group. CMTT's activities on contribution, HDTV digital transmission and secondary distribution are briefed. Considering that CCITT's Experts Group and MPEG are looking into generic video coding for television signal transmission and storage, close collaboration is emphasized to avoid work duplication and different standards for the same application.

AVC-13 COMPENDIUM ATM - CODING PROCEDURES
(NETHERLANDS,GERMANY, UNITED KINGDOM, FRANCE, NORWAY, SWEDEN, PORTUGAL, ITALY, SPAIN, BELGIUM)

Results of the extensive study which has been carried out in the COST 211 project are reported. The following topics are covered;

- Terminology
- Coding models
- The H.261 capabilities for ATM
- Impact of QOS and preventive policing on coding performance
- Bit rate versus quality
- Guidelines for simulation
- Guidelines for hardware experiments.

AVC-14 INTERCONNECTIVITY OF FUTURE AV-SYSTEMS
(THE ROYAL NETHERLANDS PTT, PTT CONTEST)

Necessity of interworking among existing and future audiovisual systems are discussed from different point of view; technical achievements, applications, standardization and implication of marketing. It is stressed that we should bear in mind the users request and achieve the highest level of compatibility. Analysis of interconnections is tried from several angles; analog connection, digital CCIR 601 connection, digital connection with simple transcoding, and direct digital connection.

AVC-15 ATM VIDEO CODING
(AT&T, DIS, DAVID SARNOFF LABS, PICTURETEL, APPLE COMPUTER)

US views are presented to various aspects of the work to be done by the Experts Group;

- Major effort is needed for performance analysis of ATM video coding systems in terms of coding efficiency and network requirements to clarify the constant quality/variable bit rate concept.
- Efforts should be made to define work areas and their priorities by considering service, coding, and network aspects.
- The primary focus of ATM video coding work should first be shifted toward service applications showing the greatest promise in terms of network utilization.
- As to the picture format, CCIR Rec. 601 should provide the next option to CIF for higher bit rate applications.
- Applications requiring EDTV or HDTV should be given lower priority pending clarification of related TV standards.
- A level of compatibility should exist between the existing and the new coding schemes.
- A realistic network model should be developed.

- AAL should be considered.
- The group should coordinate its activities with SGXVIII.

AVC-16 COMMENTS ON "MEMORANDUM OF TOPICS"
(BELGIUM, FRANCE, FRG, ITALY, NETHERLANDS, NORWAY, UK)

This document summarizes European views concerning the topics and work plan of the new ATM video coding Experts Group. Some of which are listed as follows;

- The Group should initially focus on standard TV signals, taking into account extension to higher resolutions.
- Less delay than that of the current system should be sought.
- Bit rate range: 64 kbit/s to a few tens Mbit/s initially, higher bit rates later.
- Compatibility with existing AV Recommendations should strongly influence the decisions of the Group.
- The Group should finalize a coding standard in 1994, but produce a framework recommendation in 1992.
- A step by step method using Reference Models and hardware trials are supported.
- Collaboration with MPEG and CMTT should be as close as possible.

AVC-17 OUTSTANDING ISSUES ON LOW BIT RATE VIDEO CODING FOR ATM NETWORKS
(BELGIUM, FRANCE, FRG, ITALY, NETHERLANDS, NORWAY, UK)

Current status of European studies is reported which aims near constant quality, shorter delays and more efficient use of network resources. Advantages and disadvantages of "one layer CBR, "one layer VBR", "two layer CBR/VBR" and "two layer VBR/VBR" are compared. Error concealment technique for protecting against bit errors and cell loss is also described. As a conclusion, unresolved issues consisting of ATM network issues and video coding issues are listed up.

AVC-18 CONSIDERATIONS CONCERNING THE STANDARDISATION OF AAL(S) FOR VIDEO SERVICES (BELGIUM, FRANCE, FRG, ITALY, NETHERLANDS, NORWAY, UK)

Problems to obtain AALs suitable for video services are listed up. It is proposed to distinguish between the following two approaches:

- An AAL suitable for existing video services should be standardized in a relatively short term, taking into account compatibility issues.
- An AAL matched with the video coding algorithm should be found.

Requirements for the second category are also listed up. It is stressed that the second category AAL should be defined together with the new video coding algorithm.

AVC-19 VIDEO CODEC DEVELOPED IN THE BELGIAN BROADBAND EXPERIMENT
(RTT BELGIUM)

Information on the sate of art video codec is provided. The hardware has two working modes; variable bit rate mode and adjustable fixed bit rate mode. Hardware configuration, VLSI implementation, and performance in terms of operating bit rates are also described.

AVC-20 IMPACT OF THE ATM TECHNIQUE ON VIDEO CODING (BELL TELEPHONE)

ATM characteristics which have impacts on video coding are overviewed; availability of high bandwidths, high bandwidth flexibility, variable bit rate capability, cell loss, cell jitter and packetization delay. Video coding techniques which adapt to the ATM network characteristics are also listed up; coding at high bit rates, multiplexing of service components, user selectable picture quality and bit rate, layered coding, cell loss correction and concealment, and service synchronization.

AVC-21 TWELFTH MEETING REPORT OF ISO/IEC JTC1/SC2/WG11 (CONVENOR)

This document reports MPEG meeting report held in Santa Clara in September 1990, covering WG11 plenary as well as subgroups consisting of MPEG/Video, MPEG/Audio, MPEG/Systems, MPEG/VLSI, MPEG/Tests and MPEG/DSM.

Temporary Documents

TD-1 Agenda for The Hague meeting (Chairman)
TD-2 Available documents (Chairman)
TD-3 List of tape demonstrations (Chairman)
TD-4 Discussion items in the first meeting of the Experts Group (Chairman)
TD-5 Work plan (Chairman)
TD-6 Draft summary of Tuesday discussion on harmonization with other groups (Chairman)
TD-7 Proposal for possible collaboration between SGXV/1 Experts Group on ATM video coding, ISO/MPEG and CMTT (Belgium)
TD-8 Draft letter to Dr. L. Chiariglione, Convenor of ISO/IEC JTC1/SC2/WG11 (Small group on harmonization)
TD-9 H.26x provisional requirements (Small group on harmonization)
TD-10 Work plan - revised (Small group on harmonization)
TD-11 First simplified network model (Small group on network model)
TD-12 Draft liaison to SGXVIII - requirements for B-ISDN network model as it impacts on video coding (Small group on liaison to SGXVIII)
TD-13 Draft report of the first meeting of the Experts Group for ATM Video Coding (Chairman)

END

List of Tape Demonstrations
(Tuesday, 13 November 1990)

No	Organization	Topics	Doc.
a.	Telecom Australia	VBR vs CBR coding	AVC-4
b.	KDD	ATM coding results by modified H.261	AVC-10
c.	NTT	2 layer (VBR/CBR) coding against cell loss	AVC-10
d.	FUJITSU	HDTV variable bit rate coding against cell loss	AVC-10
e.	Alcatel Bell Tel.	ATM video coding technique on hardware model	AVC-20

Source: Experts Group for ATM Video Coding in SGXV
Title : Liaison statement to SGXVIII on requirements for B-ISDN network model as it impacts on video coding

The Experts Group for ATM Video Coding as established at the July 1990 meeting of Sudy Group XV has initiated its activities by holding the first meeting in The Hague (13 - 16 November 1990).

Since this Group is intending to make Recommendation(s) for video coding in B-ISDN environments, we need correct understanding of the ATM netowrk characteristics. For this purpose, we have formulated a list of questions at the first meeting as attached which are expected to be answered by SGXVIII at the earliest occasion.

The Experts Group would welcome the participation of a liaison representative from SGXVIII to assist in clarification of the B-ISDN definition and performance. This would be particularly valuable at the second meeting (tentatively scheduled for 12 - 15 March 1991), since multiplexing of variable rate sources under certain cell loss conditions, and refinement of our network model, is expected to be discussed in detail.

Liaison to SGXVIII: Requirements for B-ISDN network model as it impacts on video coding

Abstract

The SGXV Experts Group on Video Coding for ATM held its first meeting in The Hague, 13-16 November 1990. An important outcome was the recognised need for a realistic model of the target B-ISDN to permit progress in the definition of suitable video coding methods. This liaison statement outlines the impact of various network parameters on video coding issues, and requests guidance from SGXVIII concerning parameter values. To permit advancement of video coding work, an initial network model is offered for comment by SGXVIII.

Introduction

The Experts Group for ATM Video Coding was established by SGXV to investigate new possibilities for video coding offered by service support on the B-ISDN, and to develop appropriate coding algorithms. There is a significant impact on video coding as a result of ATM transport, and on multimedia system design as a result of virtual connections. The impact of certain network parameters on approaches to video coding and video service provision are outlined below. The intention is to both obtain guidance from SGXVIII regarding suitable parameter values to allow video coding work to progress, and to provide SGXVIII with some input that may influence aspects of network design. The first section briefly itemises the main issues and the addenda will give a more comprehensive explanation.

Issues

1. Cell loss ratio:

   - What will be the expected values, for both priority levels?

2. What is the cell loss burst behaviour?

3. How is the CLP bit used?

   - Will there be seperate negotiations for the two priority levels?
   - When will the service provider set this bit?
   - What are the restrictions for the use of this bit?
   - Is the quality of service selectable?

4. Usage parameters:

   - What parameters will be used for policing and admission control?
   - What policing mechanism will be used?
   - What averaging intervals can be used to measure mean, peak, etc.?

5. Multimedia connections:

   - How will the admission and monitoring of an ensemble of VC's be handled?
   - What is the limit on differential delays between different VC's?

6. Bit Error Rates:

- What is the expected rate?
- What is the impact on the AAL?

7. Cell delay jitter:

- What values are expected?

8. Network model for hardware experiments:

- What will be maturity of the B-ISDN network by mid '93?

9. AAL

The Experts Group for ATM Vide oCoding is willing to collaborate with SGXVIII in defining the AAL for video services, and will forward appropriate input to SGXVIII.

Addenda

Ad.1 Cell lossratio

Various cell-based video coding systems have been developed or simulated, collectively capable of satisfactory performance in the face of a variety of cell loss ratios. However, the actual figure to be expected from the network for a particular video service application and bit rate will determine both the need for cell loss protection or recovery and the method to be used. The Experts Group expects to identify appropriate cell loss ratios for video services on the B-ISDN, and will input this information to SGXVIII when available.

The cell loss ratio has fundamental implications for the video coding strategy and its efficiency. If, for example, layered video coding systems are to be used, exploiting the availability of the cell loss priority indicator, an indication of the cell loss rate for each priority level is necessary. Figures for expected cell insertion rates are also required.

Ad.2 Cell loss burst characteristics

The question of whether cells are lost in isolation or in bursts is fundamental for the video coding approach. Some coding schemes are proposed which provide a means of protecting against bursts of cell loss, but they may not be necessary if cells are lost in isolation (i.e. if cell losses are uncorrelated).

- Will cell loss be dominated by network congestion?
- Will bursts of cell loss result from network congestion?
- Will the cell loss burst length be service rate dependent?
- Will high priority cells be affected by network congestion?

Clarification of these points is sought from SGXVIII, and additional guidance to an appropriate statistical model to characterise bursts of cell loss would be welcome.

Ad.3 Use of CLP indicator

The use of CLP is useful for some coding schemes to provide tolerance to cell loss.

- Under what circumstances would the service provider set the CLP indicator?
- Could the CLP be changed by the service provider after a user has set it?
- Will the usage monitoring structure encourage the use of both high and low priority cells?
- Will the rate of high and low priority cells be negotiated independently with the network?

Other information concerning call admission control and usage monitoring that would impact on the user's choice of a combination of high and low priority cells would be welcome.

Ad.4 Usage parameters

Ad.5 Multimedia connections

The ability of the B-ISDN to perform the multiplexing task provided by the terminal on circuit-switched networks makes it attractive to consider cell-by-cell multiplexing (by use of different Virtual Channels, or possibly on a single VPI/multiple VCI's) for the provision of multimedia connections. However two issues arise here, as discussed below:

- Will the network be capable of providing connection admission and monitoring based on the group of VC's constituting a multimedia connection? If not, would users see a penalty in the use of multiple VC's, and be encouraged to perform multimedia service multiplexing at a higher layer? SGXVIII should be aware of this possibility and consider whether this capability can be accomodated. Previous experience with multimedia services suggest that a group of at least seven VC's may be necessary, but we would like to know if there is an upper limit.

- Differential VC delay. If multimedia connections (video and associated audio in particular) are supported over multiple VCs, there exists the possibility of differential delay. If excessive, this may require end-to-end signalling overheads to add time-stamps and permit resynchronisation. What is the expected limit on differential delay between VCs?

Ad. 6 Bit error rates

We assume that cell payloads are subject to a small probability of transmission bit errors. The statistics of such errors will determine the need for, and type of, error correction mechanism and the overhead necessary to achieve this. It could also influence approaches to, and efficiency of, video coding and choice of code word assignment schemes.

What is the expected probability of transmission bit errors, and are these errors likely to be uncorrelated of bursty? Draft Rec. I.363 notes (section 2.3 and 3.3) that one of the functions of type 1 and 2 AALs is the '...monitoring of user information field or bit errors and possible corrective action...'. The Experts Group wishes to work with SGXVIII to further clarify the functionality of the AAL in this respect.

Ad.7 Cell delay and jitter

The fixed component of end-to-end delay is an important factor for conversational video services. It will impact on the choice of coding method and allowable buffering within the encoder and decoder.

What is the expected maximum B-ISDN delay, including processing and queueing within the B-ISDN switching equipment?

The variation in delay, or jitter, determines the size of receive buffers necessary for its removal, and therefore again influences the total end-to-end delay. What are the expected statistics of cell delay jitter? Is a hypothetical reference connection available or planned, that would assist in these matters?

Ad.8 Network model for hardware experiments

It is the initial intention of this Experts Group to target hardware trial of ATM video codecs for the second half of '93. Success of such trials will depend on the availability of network equipment or simulators. Would these be expected in this timeframe?

Ad.9 AAL

Draft Rec. I.363 describes AAL type 1 & 2 structures which could be used for real-time video services. To make progress, the experts group intends to distinguish between:

- an AAL suitable for existing video services (e.g. H.261), that could be standardised in the relatively short term,
- for future ATM video coding standards, an AAL matched to the specific coding algorithms will be necessary. It is premature to define an AAL for these applications at this time.

Conclusion

Close liaison between the Experts Group for ATM Video Coding and SGXVIII will be necessary to harmonize and optimize B-ISDN network design and video sevice provision. It is the Experts Group's intention to provide input to SGXVIII on requirements for network performance and to assist SGXVIII in the definition of the AAL for type 1 & 2 service catagories.

In the first instance, however, the Experts Group requires guidance to provide bounds for certain network parameters crucial to the development of appropriate video coding methods. The main issues have been highlighted in this document. A model of the network is necessary to permit commencement of video coding studies. The parameters of such a model, along with some estimates of possible parameter values, is provided in the Appendix. This is a first attempt, to initiate studies. Refinements will be made at future meetings. SGXVIII is invited to comment on, or correct this model.

END

Attachment: Annex 4 (netowrk model) of this meeting report

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 4/Doc. AVC-22R

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

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

$a \triangleq CAP/(n*Peak)$ 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.

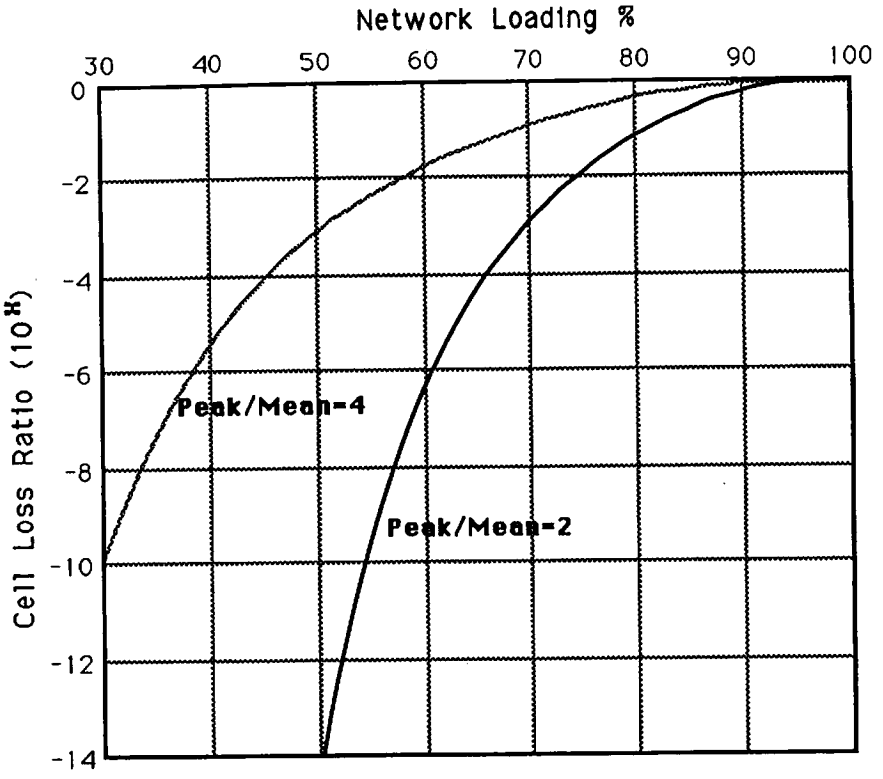
Peak ≙ The maximum bit rate over simulation interval (measured on a per frame basis)

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

Mean ≙ The average bit rate over simulation interval

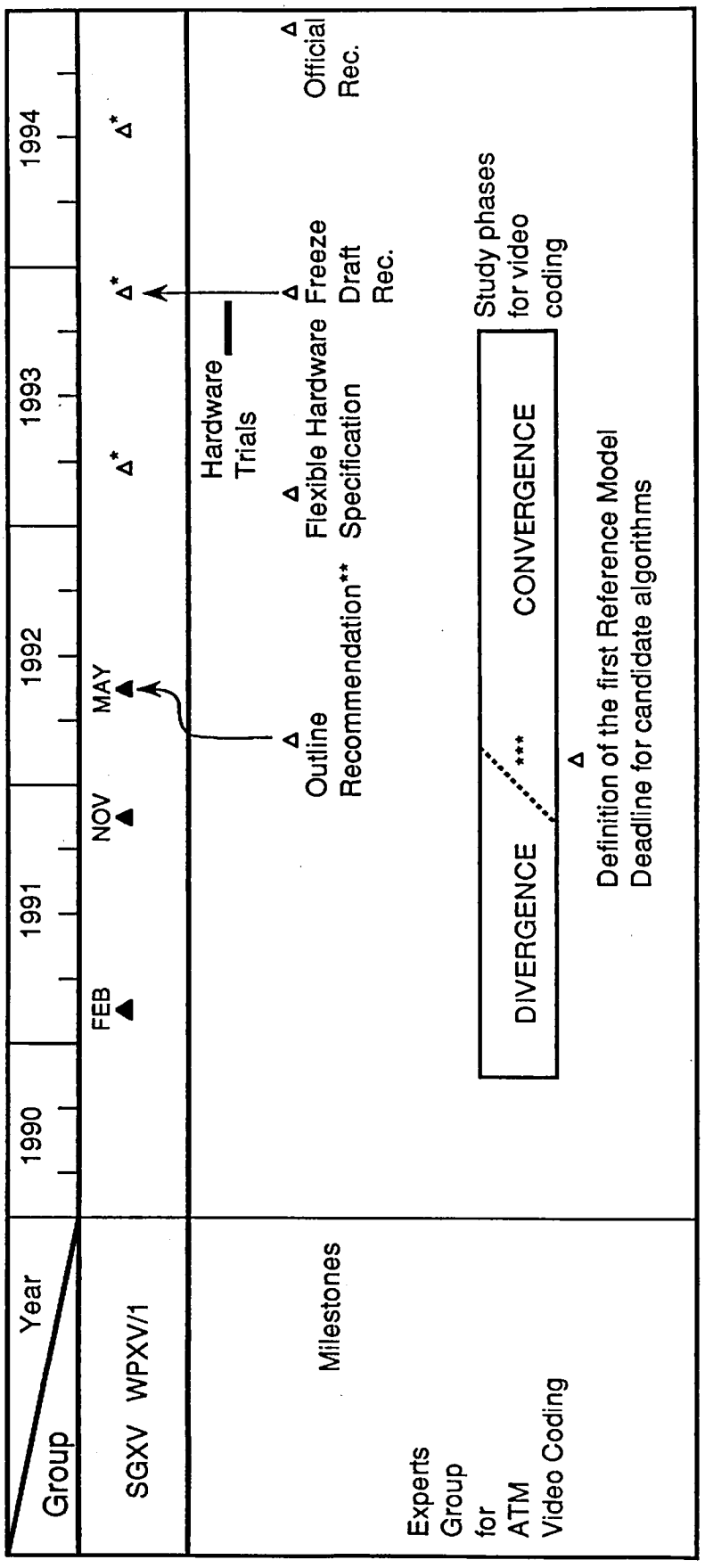
ln ≙ log to basis "e"

END



Cell Loss Ratio vs. Network Loading (Example)

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.

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 synchronisation,
- 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 organisations, 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

Attachments: Annex 5 (work plan) and Annex 9 (provisional requirements) of this meeting report

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