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

Document #246R
June 5, 1987

SOURCE: CHAIRMAN OF THE SPECIALISTS GROUP ON CODING FOR VISUAL TELEPHONY
TITLE : REPORT OF THE NINTH MEETING IN STOCKHOLM (JUNE 2-5, 1987)

CONTENTS

1. General

The Specialist Group met in Stockholm from June 2 to 5, 1987 at the kind invitation of ELLEMTEL in Sweden.

Before the session, Chairman introduced Mr. Jong Soo Lee, Korea, attending this meeting as observer, waiting for the approval of WP XV/1 to formally participate as core member.

The list of participants appears at the end of this report.

At the closing session, Mr. F. Booman announced that Mr. R. Plompen would replace him as core member of the Netherlands. Furthermore, Chairman thanked the hosting organization for the meeting facilities provided and the excellent organization.

2. Documents for the Meeting

For this meeting, 30 normal documents and 4 temporary documents have been available. Annex 1 shows the outline of each document.

3. Report of Working Party XV/1 Meeting (TD 14-XV/1, TD 16-XV/1)

Chairman reported the outcome of the WP XV/1 meeting held in April 1987 in Geneva, picking up the following items:

- Progress report from the Specialists Group
- Application of the accelerated procedure to the revision of existing Recommendations H.120 and H.130.
- Videophone service requirements
- CCITT patent policy
- Service interworking
- Comments on the draft Recommendation Y. 221

4. n x 384 kbits/s Codec

4.1 Correspondence work report (#217)

Mr. Morrison reported the outcome of a correspondence work on the preliminary values for the 14 programmable items on the Flexible Hardware, and the meeting approved this report.

4.2 Video source coding

4.2.1 Tape demonstration

Along with the presentation of the documents, the following tape demonstrations of the simulated pictures and hardware processed pictures were also given:

a. Reference Model 4	(Japan; #219)
b. Quantizer optimization	(Japan; #221)
c. DCT calculation accuracy	(Japan; #222)
d. Flexible Hardware processed pictures	(Japan; #227)
e. Reference Model 4 and adaptive quantization	(Netherlands; #229)
f. Reference Model 4	(UK; #230)
g. Hardware processed pictures	(UK)

4.2.2 Reference Model no. 4 (#219, #229, #230)

Japan and Europe reported that several laboratories carried out the simulation on RM4 according to Annex 2 to Document #216 and obtained comparable data.

For further simulation works on parameter optimization, etc, the meeting decided to use RM4 as it is.

4.2.3 Transform (#222, #223)

Experimental results on the required accuracy of DCT calculation were given in Document #222 as information toward the final Recommendation. As to the comparison between truncation and rounding-off, Mr. Liou pointed out that this is the matter of hardware trade-off between:

- more bit length with less transistors to handle fractions
- less bit length with more transistors to handle fractions

In response to a question, Mr. Koga indicated that no difference is observed down to k(number of bits for 1-D transformer elements) = 10, l(output of the first 1-D transformer) = 10.

A trial on the comparison between DCT and KLT was reported in Doc. #223 with the aim to clarify whether DCT is appropriate for MC prediction error pictures. Mr. Guichard gave a comment that the increase in the number of filtered blocks for KLT may imply that KLT is not effective in higher frequencies.

Since the transform is programmable in the Flexible Hardware, proposals are expected on such transforms as being best suited to (MC) prediction error pictures or being more easily implementable than DCT but with comparable performance.

4.2.4 Quantization (#221, #229)

Information has been given on the quantizer optimization with reduced represented values for the first quantizer output and on the adaptive quantization with reduced step size for lower sequencies as well as non-linear threshold for small step sizes. The meeting recognized these matters should better be further investigated through hardware experiments.

4.2.5 Loop filter (#226, #233)

Effect of including the "equal" in the loop filter switching criterion has been discussed in Doc. #226. It was confirmed that the number of filtered blocks significantly increases if the "equal" is included. A question was expressed why it makes such a big difference in the calculation of 14 bits. Mr. Weiss suggested to compare the filtered version block and the non-filtered version block on a pel-by-pel basis.

In the Doc. #223, the vector control of loop filter was reported to give better performance than the side information control. Since motion compensation is optional at the coder, Mr. Speidel expressed an opinion that if we do not want block-by-block side information control of the loop filter because of bit consumption and hardware economy, then we have to choose one of the following two alternatives:

- To make motion compensation mandatory at 384 kbit/s.
- To define side information in Picture Header or GOB Header.

During the discussion, the following opinions were expressed.

- MC is more than optional at n = 1.
- MC increases hardware complexity.
- Loop signalling can be transmitted implicitly if the filter is switched on for updated blocks.
- Since the problem is in the case that the loop filter is employed whereas optional MC is not used, we can distinguish which of side information control or motion vector control is operated by sending a flag in Picture Header or GOB Header.

As a conclusion, it is understood that we will continue the work until more firm results are obtained with hardware under the agreement reached in San Jose (See Section 3.3 3)/Doc. #216R).

4.2.6 Scanning class (#220)

An experimental result was presented as information showing that adaptive scanning (4 scanning classes) is not effective compared to single scanning (zigzag only) in RM4.

4.2.7 Forced updating (#225)

Information was provided on the relationship between the step size and the number of bits required for forced updating.

4.3 Video multiplex coding

4.3.1 Two-dimensional VLC (#224)

A restriction to the code set for transform coefficients was proposed for the case of introducing two-dimensional VLC. Since the use of

one-dimensional VLC has already been agreed upon for the initial compatibility check, Chairman raised a question whether two-dimensional VLC will be used in the later stage of compatibility check and/or employed in the final Recommendation. Some countries expressed their Flexible Hardware will implement two-dimensional VLC. After some discussion, Mr. Speidel undertook to coordinate a small group concerned with hardware provision. The outcome is attached as Annex 2.

4.3.2 Block attribute coding (#231)

Discussion on the use of multiple VLCs for encoding block attributes (block addressing, block type, scanning class, and motion vectors) was presented to suggest two code sets with first words of 1 and 2 bits respectively. This matter will be further investigated through hardware experiments.

4.4 Transmission coding (#243)

Examples were given for including in the Y.221 frame structure a subset of codec to codec information which are necessary for compatibility and a part of service and operating signalling. Further study is needed (see also Section 5.2/Doc. #216R).

4.5 Hardware progress, test equipment and future plan

4.5.1 Hardware progress (#227)

FRG/Netherlands, France, Japan and UK reported their progress of the Flexible Hardware provision. All of the hardware under making will be completed in the range of July to November 1987.

4.5.2 Test equipment (#245)

Progress of the test signal generator was given to report that it would be supplied at the end of June. Mr. Randall presented detailed information on this test signal generator to a small group concerned with hardware.

4.5.3 Future plan

In order to clarify the hardware trial plan toward making a final Recommendation, a small group consisting of members from FRG, USA, France, Japan and UK assembled. Taking into account the current status of Flexible Hardware developments, the following plan was made. This will be updated at future meetings according to the progress.

1) Flexible hardware compatibility tests using international transmission links (UK, France, FRG, NL)

   - November 1987 to January 1988

2) Back-to-back compatibility tests of Flexible Hardware (UK and Japan)

   - January to February 1988

3) Flexible Hardware optimization

   - September 1987 to March 1988

4) First draft of framework of recommendation

- October 1987

5) Second draft of recommendation to include fundamental structure of coding algorithm

- January 1988

6) Third draft of recommendation for presentation to Working Party XV/1 and adoption at the 1988 CCITT plenary will fix parameters but may include some for further study.

- March 1988

Full support of the concerned organizations are requested to the above mentioned hardware trials.

4.6 Intellectual property

4.6.1 Signed document proforma (Annex 3 to TD 14-XV/1; #235,#236,#238)

Wording and legality of the possible statement (Annex 4 to Doc. #216R) was investigated. During the discussion, the following points were recognized.

- 'Fair and reasonable' terms may mean different things from country to country.
- Not only patents but also other industrial and intellectual property rights such as software should also be regulated.
- We should identify which patents are relevant to our specification to which extent.

As conclusion, considering that;

- it is not clear that the statement would be legally enforceable,
- not all of the organizations in the world are participating in the Specialists Group,
- some patents may be in the pipeline, thus are not disclosed,
- the spirit of the planned proforma has already been covered to some extent by the contributions submitted in the previous meetings,

the meeting agreed on the following actions;

a) The signed document collection is left pending for a while to wait for consultation with the CCITT Secretariat by conveying the problems identified in this meeting, in particular a proposal of setting up a special CCITT group involving legal experts to draw up a legally binding intellectual property agreement.
b) We will continue to search for patents relevant to the Flexible Hardware specification and the possible Recommendation.
c) All members are requested to disclose their relevant patents as soon as they are made available.

4.6.2 Disclosed patents (#238)

A Japanese patent relevant to loop filter was informed to the meeting.

5. m x 64 kbit/s Codec

5.1 Tape demonstration (#232, #234, #239, #242, #244; #240; #218)

Along with the presentation of the documents, the following video tape demonstrations were given to facilitate having common understanding on the state of the art for the m x 64 kbit/s coding:

a. Hardware at 64/48 kbit/s (#239: NTT)
b. Simulation but equivalent to hardware at 56 kbit/s (CLI)
c. Hardware at 64 kbit/s (BT)
d. Hardware at 64 kbit/s (CNET)
e. Simulation at 48/64/96 kbit/s (PictureTel)
f. Simulation at 64 kbit/s (#242: CNET)
g. Simulation at 64 kbit/s (CNET)
h. Simulation at 64 kbit/s (#234: PKI/ESPRI)
i. Simulation at 64 kbit/s (#232: DNL)
j. Simulation at 64 kbit/s (#244, #232: FTZ)
k. Simulation at 120/112 kbit/s (BELLCORE)
l. Object analysis (#232: BT)

In addition to these, the following tapes on the picture format and test pictures were also demonstrated.

Picture format

a) CIF/256x240/224x192 (#240: PictureTel)
b) CIF/256x240 (#240: CLI)
c) CCIR 601/CIF/Quarter CIF (FTZ)

Test pictures

a. Analog (#218, DIS)
b. Analog (FTZ)
c. Analog (Japan)

5.2 General aspects

5.2.1 Videophone service (#237)

On the question of 2B or 1B for narrow band videophone services, Doc. #237 presented a view (reproduced as Annex 3 to this report) which the meeting recognized as reasonable.

5.2.2 Framework for m x 64 kbit/s codec standardization (#240)

Since Doc. #240 was understood as a useful input for establishing a framework for the future activities, it was discussed paragraph by paragraph leaving 'frame structure' (Section 6) and 'picture format' (Section 7) for later discussion. The agreed results are summarized in Annex 4 to this report.

5.2.3 Framework for the recommendation (#244)

A list of items was presented which should be filled with agreed contents in the future.

5.3 Frame structure (#237, Section 6/#240, #241)

Requirements for frame structure and the two approaches to meet them, Y.221 approach and packet based approach, were presented. The two approaches were compared in advantages and disadvantages on various aspects. Particular attention was paid to;

- microprocessor implementation,
- multipoint communication,
- transmission delay,
- interworking with other services.

Chairman will later produce a paper to sort out the problems included in this discussion for further investigation.

5.4 Picture format (Section 7/Doc. #240, #244)

CIF and the reduced format (e.g. 240 lines x 256 pels) were discussed on the following aspects;

- required resolution for face-to-face,
- required resolution for graphics,
- capabilities and compatibilities of camera and monitor,
- coding efficiency to be obtained in the coming 2 to 3 years,
- hardware dependency on the number of pels per frame,
- cost burden of CIF conversion, its reduction with the DSP usage,
- temporal distortion due to the use of both fields to make CIF and its effect on coding efficiency,
- effect of standards leading to mass production,
- relative merits of freeze frame graphics vs live graphics.

Chairman will later produce a paper to sort out the problems included in this discussion for further investigation.

5.5 Algorithm study

5.5.1 Recent achievements (#232, #234, #242)

A knowledge based 'object analysis' technique as well as coding results based on RM4 with some modifications were presented for information.

5.5.2 Guidelines for simulation activities (#228)

The meeting agreed to have a common basis for simulation activities as we did in the n x 384 kbit/s coding. The 'reference scheme' and simulation conditions proposed in Doc. #228 will be elaborated into a 'reference model' in the future. For the test sequences, it was stressed that they should be longer than 8 seconds to make encoding converge sufficiently.

It was also pointed out that we need a critical sequence to check the capability of proposed algorithm.

The following new sequences will be produced in CIF and distributed.

- Claire (one person) by Europe
- (Critical material) by USA
- Blue Jacket (three persons) by Japan

Though distribution of sequences in local television standards was suggested during the discussion, the meeting agreed that these test tapes are distributed in CIF for the purpose of source picture provision, dealing with the picture format discussion as an independent issue.

6. Next Meetings

1) 10th meeting

- Time : October 13 (Tue) - 16 (Fri), 1987
- Place: USA
- Host : BELLCORE

2) 11th meeting (tentative)

- Time : January 1988
- Place: Japan

3) 12th meeting (tentative)

- Time : March 1988
- Place: Netherlands

Annexes

Annex 1: Documentation of the Stockholm meeting
Annex 2: Implementation aspects of 2D-VLC
Annex 3: A view on narrowband videophone services
Annex 4: Framework for m x 64 kbit/s codec standardization

LIST OF PARTICIPANTS
(Stockholm; June 2 - 5, 1987)

Chairman	S. Okubo	- NTT
Core Members		
F. R. of Germany	J. Speidel	- PKI
	G. Zedler	- FTZ
U.S.A	H. Gharavi	- BELLCORE
	B. G. Haskell	- AT&T Bell Labs
	R. A. Schaphorst	- DIS
France	G. Eude	- CNET
	J. Guichard	- CNET
Japan	M. Kaneko	- KDD (actong for Y. Hatori)
	N. Mukawa	- NTT
Norway	G. Björntegaard	- Norwegian Telecom
Netherlands	F. Booman	- DNL
United Kingdom	R. Nicol	- BT
	N. Shilston	- GEC
Sweden	R. Campenhausen	- ELLEMTEL
	P. Weiss	- Swedish Telecom Admin.
Assisting Experts		
F. R. of Germany	W. Geuen	- FTZ-FI
U.S.A.	W. Chen	- CLI
	S. Ericsson	- PictureTel Corp.
	M.L. Liou	- BELLCORE
	N. Randall	- DIS
	L. Rennick	- CLI
France	J. David	- Alcatel
Japan	T. Koga	- NEC
	K. Matsuda	- FUJITSU
United Kingdom	D.G. Morrison	- BT
Sweden	G. Roth	- ELLEMTEL
	B. Wirén	- ELLEMTEL
Observer		
Korea	J.S. Lee	- ETRI

Annex 1 DOCUMENTATION OF THE STOCKHOLM MEETING

Normal Documents

#216R REPORT OF THE EIGHTH MEETING IN SAN JOSE (CHAIRMAN)

Points agreed upon and/or for further study are recorded on various aspects in order to provide backgrounds for the discussion in this meeting.

#217 VALUES OF PROGRAMMABLE ITEMS TO BE USED IN INITIAL FLEXIBLE HARDWARE (UK, FRANCE, NETHRLANDS, FRG, JAPAN)

Preliminary values for 14 programmable items in the Flexible Hardware are provided for incorporation in the Test Pattern Generator and for use in initial compatibility checks.

#218 TEST SEQUENCES FOR THE EVALUATION OF m x 64 kbit/s VIDEO CODECS (DIS)

An analog video tape consisting of a number of candidate sequences is described. It includes four categories of teleconferencing scenes; face-to-face, still graphics, changing graphics and instruction/briefing.

#219 REFERENCE MODEL SIMULATION (NTT, KDD, NEC, FUJITSU)

Numerical data for RM4 are presented. SNR of RM4 is found 0.2 to 0.7 dB higher than that of RM3. It is also confirmed that the threshold of 1.0g gives better or equal performance compared to 1.5g.

#220 EFFECT OF ADAPTIVE SCANNING IN RM4 (NTT, KDD, NEC, FUJITSU)

After comparing the following two methods in RM4;
- four scanning classes,
- only zig-zag scanning,

it is concluded that adaptive scanning is not effective if 2-dimensional VLC is employed. This comes from the fact that the 2-dimensional VLC expresses zero-level coefficients with less than 1 bit per coefficient.

#221 AN OPTIMIZATION OF QUANTIZER (NTT, KDD, NEC, FUJITSU)

Taking into account that the DCTed coefficients have Laplacian distribution, lower represented values for the first quantizer output is tried. It is concluded that they show better performance in SNR than 1.5g which is used in RM4, and that further optimizations should be sought through hardware experiments.

#222 PRECISION OF DCT CALCULATION (NTT, KDD, NEC, FUJITSU)

Required accuracies for DCT calculation is investigated using an artificial edge pattern and Split-screen sequence. Number of bits for 1-D transformer elements (k) and the output of the first 1-D transformer (l) are varied, both of which ae stipulated as 16 in the Flexible Hardware specification. It is concluded that an appropriate value for k, l seems to be 12, though awaiting further close investigation. It is also concluded that the output of the first transform should not be truncated but rounded off for lower accuracies.

#223 COMAPRISON BETWEEN DCT AND KLT (NTT, KDD, NEC, FUJITSU)

DCT and KLT are compared on RM4. KLT basis vectors are obtained form the statistics of all the MC prediction error blocks in each coded picture. Simulation results suggest that DCT may be close to KLT in coding performance even for the MC prediction error signals.

#224 CONSIDERATION ON 2-D VLC (NTT, KDD, NEC, FUJITSU)

VLC code set minimizing the hardware burden is discussed for the case of introducing two-dimensional VLC. It is proposed to restrict the code set such that the code-length for any twe successive coefficients does not exceed 32 bits. An example of such code set is given by slightly modifying the one in Annex 2/Doc. #216R.

#225 CONSIDERATION ON FORCED UPDATING (NTT, KDD, NEC, FUJITSU)

SNR and data generation rate are provided for several step sizes in the condition of open loop and intra mode to facilitate the study of forced updating. Based on these data, an example for the set of forced updating parameters are given. It is pointed out that further study tied up with the coding control method is needed.

#226 FILTER IN THE COIDNG LOOP (NTT, KDD, NEC, FUJITSU)

Two criteria to switch on the loop filter are compared on RM4;

- non-filtered prediction error is less than filtered one,
- non-filtered prediction error is less than or equal to fitered one.

SNR for the second criterion is 0.5 dB worse than that for the first criterion due to the increase of filtered blocks, whcih causes the increase of block type coding information in spite of the prediction error being not reduced. It is concluded that 'equal' criterion should not be used.

#227 PROGRESS IN IMPLEMENTATION OF FLEXIBLE HARDWARE (NTT, KDD, NEC, FUJITSU)

Hardware progress in Japan is reported. Some information is provided on the items which are not relevant to compatibility, hence are left to each hardware designing. Local decoder output pictures processed by the hardware are demonstrated.

#228 GUIDELINES FOR SIMULATION ACTIVITIES AT 64 kbit/s (NETHERLANDS, NORWAY, FRANCE, FRG, SWEDEN, UK, ITALY)

A common basis for the 64 kbit/s simulation activities is discussed toward guaranteeing an appropriate comparison and evaluation of source coding results. As reference scheme, hybrid coding based scheme is proposed which allows inclusion of such novel methods as 'object analysis' technique. Picture material, initial conditions, coding loop operation rate and other items are also proposed.

#229 ADAPTIVE QUANTIZATION (NETHERLANDS, UK, FRANCE, FRG)

Two adaptive quantization schemes are tried; smaller step size for lower sequencies and non-linear threshold for low step sizes. Subjective evaluation showed these adaptive quantizations make no difference. It is suggested that there is little to be gained from adaptive quantization within a block. Harware experiments are proposed for further investigation of this matter.

#230 RM4 STATISTICS (UK, NETHERLANDS, FRANCE)

Representative RM4 statistics generated in Europe are presented.

#231 SINGLE AND MULTIPLE VLCs IN REFERENCE MODEL 4 (UK, FRANCE, NETHERLADS, FRANCE)

The coding of block addressing, block type, scanning classes and motion vectors was investigated to quantify the loss of coding efficiency resulting from the use of a reduced number of VLC sets and to study the robustness of code sets when applied to data from which they had not been arrived. The results show that the single VLC is about 1500 bit/picture worse than the five optimal VLCs for each sequence, and that this reduces to 500 when compared to the five optimal ones derived from the wrong sequence. As a conclusion, use of two code sets with first words of 1 and 2 bits respectively is suggested, though awaiting hardware experiments.

#232 OBJECT ANALYSIS TECHNIQUES APPLIED TO A HYBRID DPCM/TRANSFORM CODER (UK, NETHERLAND, FRG)

Object analysis which uses 'scene content' information or 'knowlwdge' of the scene are discussed as possible means to significantly improve the hybrid coder performance. The following two examples are demonstrated;

- Head and shoulder identification against the background,
- Object identification and motion estimation to make motion compensated interpolation and assigning more bits to the eyes and mouth.

#233 MOTION VECTOR CONTROL OF LOOP FILTER (FRG)

Three methods of loop filter control are compared;

A: prediction error control,
B: motion vector control - Y and C blocks,
C: motion vector control - Y blocks only.

Simulation results show that B and C give better performance than A, and that the performance difference between B and C is negligible. As conclusion, method C is preferred becuase of simple implementation.

#234 HYBRID CODING AT 64 kbit/s AND ITS COMPATIBILITY WITH 384 kbit/s (FRG, FRANCE, GEC, UK, SEPA)

Simulation results on the 64 kbit/s hybrid coding is presented, where CIF, 10Hz picture rate and 8x8 DCT are used as in RM2, but a macro attribute defined for the group of four 8x8 blocks, a motion vector per four Y-blocks and DPCM for intra DC components are newly introduced to reduce side information. SNR of 37.9 dB for the Miss America sequence has been obtained. As conclusion, the results show that this 64 kbit/s coding scheme gives reasonable performance with compatibility with nx384 kbit/s coding maintained. Coding simulations with reduced format from CIF are also touched upon.

#235 COMMENTS ON PATENT STATEMENT CONCERNING LICENSING POLICY BY THE CCITT FOR A PREFERRED ALGORITHM FOR THE n x 384 kbit/s VIDEO CODING FOR VISUAL TELEPHONY (NETHERLANDS PTT)

Some comments for clarification are given on the patent licensing policy statement. Furthermore it is pointed out that other intellectual property rights such as software should also be regulated.

#236 INTELLECTUAL PROPERTY MATTERS (BT)

Some comments on the legality of the proposed signed document proforma (annex 4 to Doc. #216R) are presented. To draw up a legally binding intellectual property agreement, it is suggested that the Specialists Group propose so to the main Study Group.

#237 FRAME STRUCTURE FOR m x 64 kbit/s CODECS (FRANCE, UK, SWEDEN, ITALY, NORWAY, FRG, NETHERLANDS)

Frame structure and system aspects of the m x 64 kbit/s codec are discussed on the following items.

1) List of requirements for the frame strucutre
2) Y.221 supporting rebuttal to the comments raised by US and KDD documents which supprot packet based frame structure
3) Service proposals to allow at least two videophone arrangement, 1B or 2B, with interworking maintained
4) Comparison of four cases of videophone frame structure

As consequence, 2B type 'Y.221 audio / video' with a possible extension towards 'Y.221 audio + video / video' is proposed, where both of them have a fall back capability towards 1B type 'Y.221 audio +video'. It is concluded that the frame strucutre for videophone should be based on Y.221.

#238 INTELLECTUAL PROPERTY (NTT, KDD, NEC, FUJITSU)

It is reported that the four Japanese organizations are ready to submit signed documents to the CCITT secretariat according to the proforma in Annex 4 to Doc. #216R. A disclosed patent relevant to the loop filter is also reported.

#239 DEMONSTRATION OF 64 kbit/s CODED PICTURE (NTT)

Information is provided on a 64 kbt/s prototype hardware, where motion compensated prediction error is vector quantized using the picture format of 384/192 pels x 240 lines. Tape demonstration is accompanied.

#240 PROPOSED FRAMEWORK FOR m x 56/64 kbps VIDEOPHONE STANDARD (USA)

The following items are discussed with proposals for the m x 64 kbit/s videophone standared.

1) Standardization work structure
2) Applications
3) Bit rate
4) Performance goals
5) Communication procedure
6) Frame structure
7) Picture format

#241 FRAME STRUCTURE AND COMMUNICATION PROCEDURE FOR m x 64 kbps VIDEO TELEPHONY (PICTURETEL, DIS)

A communication procedure is proposed for m x 64 kbit/s video telephony operating on a circuit switched network. The lower layer performs error correction and synchronization between multiple 64 kbit/s channels using a fixed length packet format. The higher layer provides a flexible bit allocation between video, audio, and data using a variable length packet format. A procedure to negotiate parameters for a video session is also defined.

#242 EXAMPLE OF CODING SCHEME AT 64 kbit/s BASED ON RM4 (FRANCE)

RM4 is modified in scanning class, motion compensation, intra DC, and buffer control to simulate 64 kbit/s coding. It is concluded that compatibility with 384 kbit/s seems to be achievable with several modifications, particularly in the block attribute coding.

#243 PROPOSAL FOR CODEC TO CODEC INFORMATION IN THE FRAME (FRANCE)

Examples of the sound channel configuration and service and operating signalling in the Y.221 frame structure. Encryption and network aspects are also taken into account. A list of possible items to be conveyed through the Application Channel is also provided.

#244 DRAFT RECOMMENDATION FOR A VIDEOPHONE CODEC AT m x 64 kbit/s (FRANCE, FRG, ITALY, NETHERLANDS, SWEDEN, UK)

A framework of Recommendation for the m x 64 kbit/s codec is proposed with some description in several items.

#245 A SIGNAL GENERATOR TO TEST n x 384 kbps DECODERS (DIS)

Progress is reported on the test signal generator for the Flexible Hardware. A complete specification is attached.

Temporary Documents

No. 1 Agenda (Chairman)
No. 2 Available documents (Chairman)
No. 3 Implementation aspcets of 2D-VLC (Small group on 2D-VLC)
No. 4 Draft report of the ninth meeting in Stockholm (Chairman)

Annex 2

Implementation aspects of 2D-VLC

A small group consisting of members from Japan, France, United Kingdom and F. R. of Germany met to discuss implementation aspects of 2D-VLC in the Flexible Hardware. In Doc. #224 certain restrictions are proposed, which can simplify one of the Flexible Hardware codecs built in Japan. The solutions in France, United Kingdom, Netherlands and F. R. of Germany will not have such limitations.

The group came to the following conclusions:

Doc. #224 is a good starting point for the optimization phase and compatibility tests with the flexible Hardware codecs. But it should be considered as an example which could be changed in the course of codec and system optimization. It was pointed out that the word length of 15 and 21 bits may have to be increased to avoid coefficient clipping at higher bit rates 1.5 and 2 Mbit/s. (The Japanese Flexible Hardware can handle up to 16 and 32 bits respectively.)

The group also discussed Doc. #220 which is related to the matter above. There was consensus, that one scanning class seems to be sufficient at 384 kbit/s. But if the 2D-VLC is optimized to that bit rate and one class, a loss of coding performance is expected at the higher bit rates 1.5 and 2 Mbit/s.

Thus it was concluded that the specification of Flexible Hardware should be unchanged in this respect allowing a maximum of 8 scanning classes.

End

Annex 3

A VIEW ON NARROWBAND VIDEOPHONE SERVICES (Extract from Doc. #237)

Interworking of all narrow band videophone services is highly desirable. Until coding costs and qualities are clearer, it is not possible to define the service as either 2B or 1B, so the following is proposed:

At least two videophone services arrangements are allowed, the first 2B, the second 1B. The 2B service will use one channel for coded video, the other for Y.221 audio (G.722). The 1B service will use, for example, 48 kbit/s for video and 16 kbit/s audio (narrowband, perhaps based on mobile telephony standards). The 2B service shall fall back to the 1B service in the event of:

a) One B channel already in use at called subscriber.
b) The called subscriber only has a 1B videophone terminal.

Both terminal types will also fully interwork with standard telephony (G.711).

With the 2B arrangement, the possibility of improving the video performance by using part of the second B channel for coded video should also be considered.

It will be up to administrations which service or services to introduce, as long as full international interworking is provided.

End

Annex 4

FRAMEWORK FOR m x 64 kbit/s CODEC STANDARDIZATION

1. STUDY PRIORITY

The standardization work on m x 56/64 kbit/s can be structured into three parts:

1. Communication procedure and frame structure.
2. Hardware related parameters, such as picture format.
3. Complete specification of standard algorithm.

The goal should be to agree on the first two items within the current study period, such that manufacturers can develop products to the standard as soon as possible. A complete algorithm specification should be finalized during the next study period (1989-92), possibly through an accelerated procedure by 1990.

2. APPLICATIONS

The applications for m x 56/64 kbit/s video coding can be divided into videophone and videoconferencing. The videophone application is characterized by head-and-shoulders pictures shown on a monitor that is typically smaller than 12 inches. The videoconferencing application has the need to transmit scenes containing small groups of people, typically up to three people seated side by side, or six people with a split-screen arrangement.

Both applications have the need for still picture and/or interactive graphics capabilities. It is noted that high resolution pictures are transmitted using a separate algorithm.

It is also important to be able to connect external equipment to the system via data ports. The external equipment can be a facsimile machine, a data terminal, or some other equipment.

3. BIT RATE

In public networks, the bit rates of primary interest are m x 56/64 kbit/s, where m=1 or m=2. In private networks, higher values of m are also of interest.

The main focus is to study integrated video, audio, and data at rates between 56 and 128 kbit/s. Assuming an audio bit rate of 16 kbit/s for m=1 and between 16 and 64 kbit/s for m=2, the video coding algorithm should be able to operate from 40 to 112 kbit/s.

4. PERFORMANCE GOALS

The video resolution should be sufficient to handle a conference scene with three people seated side by side.

Interactive graphics should also be taken into account.

The goal for the frame rate should be 10-15 frames per second. Among other things, this will allow lip synchronization to be maintained.

A maximum one-way processing delay of 250 ms should be strived for.

5. COMMUNICATION PROCEDURE

A communication procedure makes it possible to negotiate parameters between the communicating terminals. By knowing the capabilities of the other party, a set of parameters for the session can be agreed upon. The procedure should also involve a decision on the algorithm to be used. This makes it possible to upgrade the standard as the state of the art is advanced.

It also makes it possible to use proprietary algorithms if both parties are suitably equipped; the standard algorithm can be used as a fallback.

6. INTERWORKING

It is desirable that the videophone and videoconferencing services are compatible with all other audiovisual services.

End