CCITT SGXV
Working Party on Visual Telephony
Specialists Group on Coding for Visual Telephony

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-
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SOURCE : NTT and KDD
TITLE : COMMENTS ON SUB-RATE CODEC FRAME STRUCTURE PROPOSED BY FRANCE

At the Tokyo meeting last December, France presented in Document #12 an example of general frame structure for visual telephony proposing that some teleconference control information be transmitted through a part (8 kbit/s) of 64 kbit/s audio channel. This document describes some comments on this proposal to further study the sub-rate codec frame structure.

1. One of the most important items for specification of codec frame structure is to define visual telephone service signals which is transmitted between coder and decoder. This issue should be dealt with by the Working Party in charge of 'Visual Telephone Service' as pointed out in 4. of Document # 5 (Japan). NTT is going to submit a contribution on this matter to the July meeting of SGXV, which is reproduced as Annex in the present document to facilitate the discussion.

2. We agree that a possibility of interconnection between audio conferencing system and video conferencing system through a 1 x B or a 2 x B channel should be taken into consideration. It is envisaged at the moment, however, that high-speed access (including primary rate access) networks will be independent of basic access networks for the time being. Hence, frame structure should be studied considering the network capabilities.

3. Some information seems better to be transmitted through D channel. 'Dynamic Time Slot Allocation' information, for example, belongs to such category since 1 x B in basic access and B in primary rate access H_0 can not be interconnected without the network support.

ANNEX

International Telegraph and Telephone
Consultative Committee
(CCITT)

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Period 1985-1988

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STUDY GROUP XV - CONTRIBUTION No.

SOURCE : NIPPON TELEGRAPH AND TELEPHONE CORPORATION (NTT)

TITLE : CONSIDERATIONS ON INFORMATION AND CHANNELS REQUIRED FOR VIDEOCONFERENCING SERVICE

1. Introduction

Videoconferencing systems using primary digital group transmission were studied during the previous study period (1981-1984) and three new recommendations on hypothetical reference connections, codecs and frame structures were made as H.110, H.120 and H.130. However, various aspects of videoconferencing systems remain to be standardized as formulated in the new Question 4/XV.

This contribution proposes several study items to be specified in order to obtain compatible videoconferencing systems, especially in the environment where codecs are installed inside the network. Additionally, it presents preparatory considerations.

2. Interface Points

Inter-subsystem interfaces in a general videoconferencing connection are shown in Fig. 1 using the hypothetical reference connection defined in Recommendation H.110. The network configuration for providing videoconferencing service includes two approaches. In Approach 1, codecs are installed in customer equipment since the network provides only transparent digital channels. In Approach 2, on the other hand, codecs are installed inside the network and are shared by multiple users.

For example, the former approach is applied to the AT&T high-speed switched digital system[1] and the latter approach is applied to videoconferencing systems in Japan[2], the UK[3] and Canada[4].

Though the existing recommendation H.130 specifies the interface characteristics at Point A in Fig. 1, no study has yet been carried out on the Point B interface. For videoconferencing systems in different countries to be compatible, interface characteristics at Point B should also be standardized. It is required, for that purpose, to clarify the information types with which videoconferencing service is provided and the channels through which this information can be transmitted. This consideration will also form a basis for the study of new generation sub-primary rate codecs.

3. Information Required for Videoconferencing Service

3.1 Classification

Videoconferencing information can be classified into the following five categories.

a. Audio information
   Analog voice with 7 kHz or wider bandwidth.

b. Video information
   Analog television picture in NTSC, PAL/SECAM or their components format.

c. Data information
   Digital information for optional equipment such as facsimile to enhance basic audio-visual videoconferencing. Its bitrate will be 64 kbit/s, or its multiple or submultiple.

d. Control information
   The details are described in 3.2.

e. Subscriber signaling information
   Network access information.

The information flow of each category is also illustrated in Fig. 1 with special attention to the information source and sink.

3.2 Control Information

~~This information seems to be ill-defined. Possible types of control~~ information are listed in Table 1. It is noted that these items can be sub-classified into the following three categories:

d.1 From transmitting customer equipment to receiving customer equipment,
d.2 From transmitting customer equipment, utilized at the coder and decoder for activating specific coding functions and relayed to receiving customer equipment,
d.3 From coder to decoder.

4. Channels for Videoconferencing Information Transmission

4.1 Approach 1

Audio, video and data information is obviously transmitted through H channel, while subscriber signaling information is transmitted through D channel (H and D channels are defined in I.412). Control information is transmitted through a part of H channel, e.g., the codec-to-codec information channel specified in H.130. The other future possibility will be through D channel when end-to-end data transmission be supported.

4.2 Approach 2

Available channels should be newly specified at the interface point B in Fig. 1 and the existing Recommendation H.130 should be refined at the interface point B. In particular, the control information channels should be defined which carry commands and responses from transmitting customer equipment to coder in order to enhance videoconferencing utility.

4.3 Proposal for Control Channels

Considering
- that some types of control information are linked closely with video fields or frames while others are independent of them, and
- that it is desirable for minimum of service enhancing capabilities to be provided through analog audio and video channels only,

the following two control information channels are proposed.

1) VIK (Vertical Interval Keyer) channel

This control channel is composed of dozens of pulses inserted in a vertical blanking interval line. The control information to be transmitted through this channel is coupled with video fields of frames such as d.1-1 to 4 in Table 1 or dc like information such as d.1-5 and d.2-1 to 4. Such information should be transmitted from coder to decoder as commands following the frame start unique word.

The VIK channel should be standardized in terms of
- number of pulses,
- pulse format,
- line number where pulses are inserted,

as well as the control protocol. An example of a VIK channel is described in the Annex, which is now being field tested in NTT's INS Model System[5].

2) Message channel

Since a message such as d.1-6 in Table 1 is a low-speed data stream, this information is best carried through a data channel combined with such information as optional facsimile, etc. at the 'A or D' section. Here the following items should be standardized.
- data rate,
- signal format, and
- protocol including possible switching between optional equipment data transmission and control information transmission.

This message should be transmitted from coder to decoder through a part of data channel or audio channel if an asymmetrical connection is

considered where only the low bitrate channel is established as a backward channel.

4.4 Channel Interconnections

Interconnections of videoconferencing channels in the 'A or D' section and the 'Digital Transmission' section are shown in Fig. 2 based on the above proposed control information channels.

5. Conclusion

The system architecture and necessary information for videoconferencing services have been analyzed and the following study items have been proposed to standardize compatible videoconferencing systems.

1) Interface between the customer premises equipment and the national network for the system with codecs installed inside the network

2) Control information channel signal format and protocol for both the VIK channel and message channel

References

(1) H. S. London and T. S. Giuffrida: High Speed Switched Digital Service, IEEE Communications Magazine, 21, 2, pp.25-29, March 1983
(2) T. Tanaka, Y. Nakatani and T. Doi: NTT New Video Conference System, Proceedings of the International Teleconference Symposium, pp.241-247, 1984
(3) D. G. Morrison: The UK Switched Videoconferencing Network, Proceedings of the International Teleconference Symposium, pp.381-385, 1984
(4) B. R. Halhed and P. M. Hubert: Overview of Telecom Canada's CONFERENCE 600 Video Conferencing System, Proceedings of the International Teleconference Symposium, pp.324-328, 1984
(5) F. Kishino, S. Okubo, S. Murakami and K. Watanabe: Multipoint Video Teleconferencing Service in the NTT's INS Model System, Teleconferencing and Electronic Communications III, pp.306-313, 1984

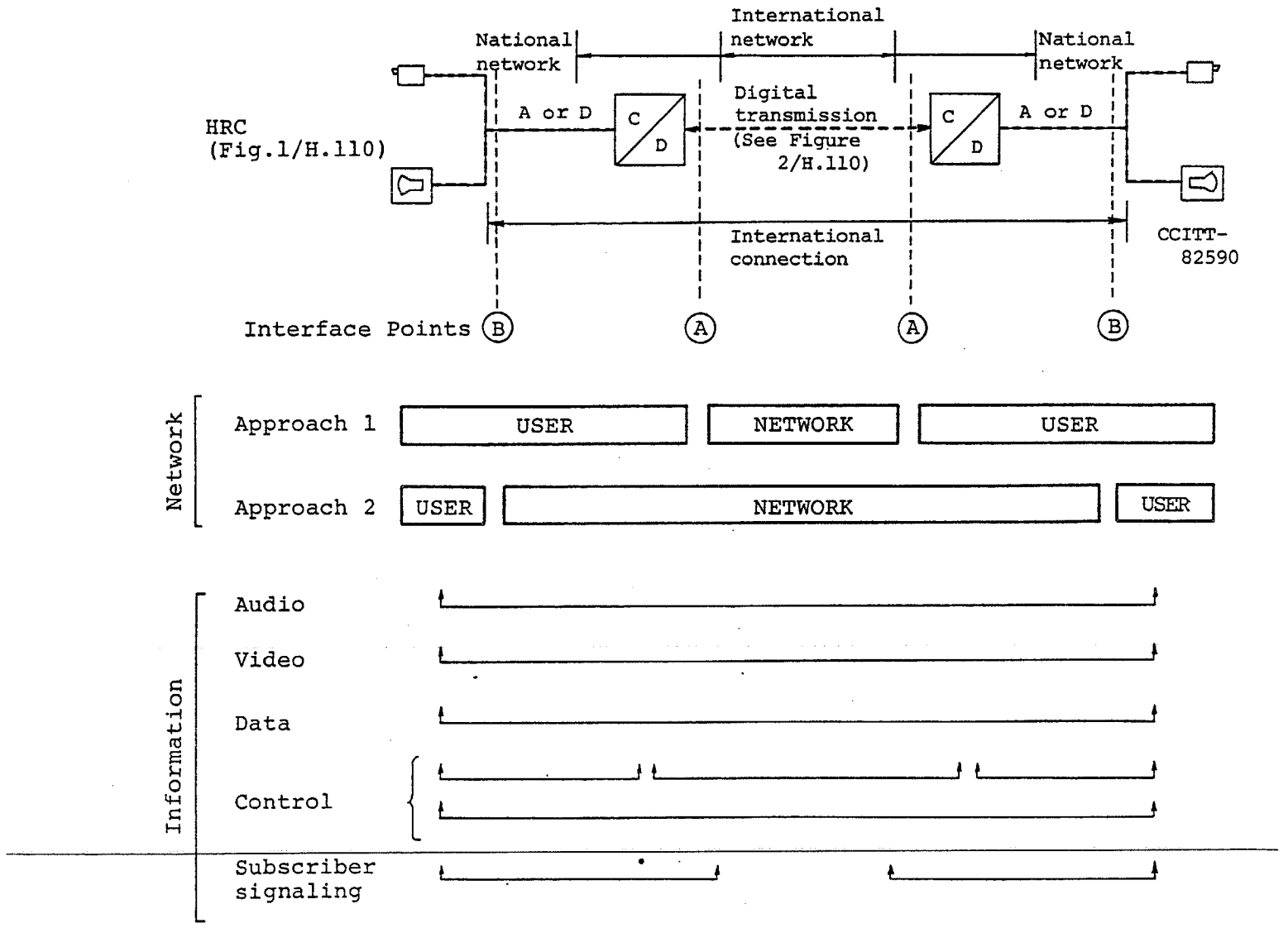


Figure 1 Interface points and necessary information for visual telephone systems

Table 1 Example of Control Information

No.	Infoemation Flow				Content	Part1/ H.130*
	CPE(T)	COD	DEC	CPE(R)		
d.1 - 1					Split - screen indication	(3.5)**
- 2					Field/frame multiplexed state +	
- 3	•	→	→	•	Address of multiplexed field/frame +	
- 4					Document camera indication	
- 5					Audio indication (stereo/bilingual etc.)	
- 6					Message (for multi-point, encryption)	5
- 7					Camera control	
d.2 - 1					Data transmission	4.1 4.3 4.5 4.7
- 2	•	→	→	•	Inter-regional operation	4.9
- 3					Graphics operation	4.11
- 4					Initialisation vector for encryption	(6)**
d.3 - 1					Clock justification	1
- 2					Buffer state	2
- 3					Codec facilities	3.1
- 4					Color transmission	3.3
- 5		• →	→		Fast update request ++	3.7
- 6					Advance warning of interruption ++	3.9
- 7					Sound power signal ++	3.11
- 8					Data distribution ++	3.13
- 9					Multiframe and supermultiframe alignment	8

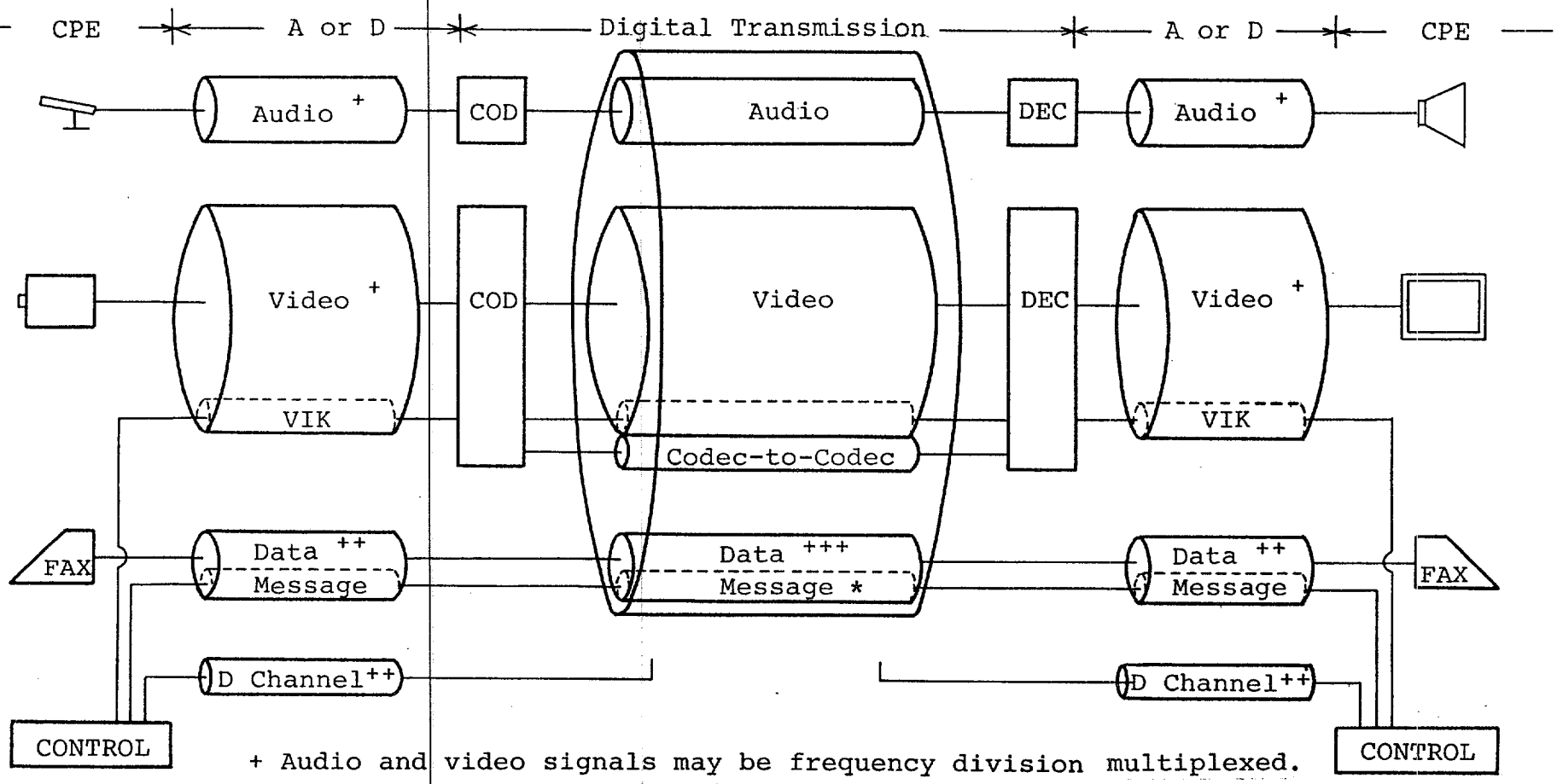
• Information source or sink

* Bit position in TS2 (odd)

** Under study

\+ For field/frame multiplexed video signal

++ For multipoint communication



\+ Audio and video signals may be frequency division multiplexed.

++ Data and D channel signals may be time division multiplexed.

+++ This channel can be used for video when not required.

* Message channel can also be set up as a part of Audio channel.

Figure 2 Channel interconnections for videoconferencing service

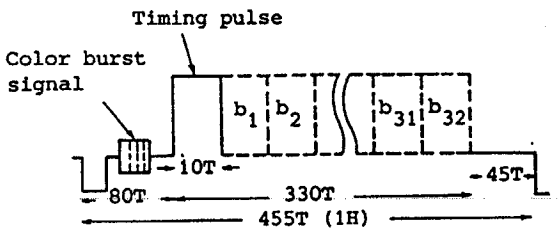
ANNEX

VIK Channel Used in the NTT's INS Model System

VIK signals are composed of 32 bits of NRZ signals inserted in the specific horizontal scanning line. The number of bits inserted as VIK signals is determined by the transmission capability of the network. If the number of bits is less than 32, VIK signals are transmitted with sufficient accuracy, even though 32 Mb/s intraframe codecs or analog transmission lines cause waveform distortion.

VIK signal format is shown in Figure 3. The pulse width is set up as 10 times T(=1/2fsc), with a clock synchronized with the color subcarrier frequency (fsc) so as to be easily derived from a receiver sync generator. A timing pulse is added at the head of the VIK pulses.

The line number where VIK signals are inserted is determined by considering their effect on display image, easiness of their separation and vertical blanking usage for other purposes. VIK signals are inserted on lines 15 and 278, because the lines from 16 to 21 and from 279 to 284 are used as VITS, etc., and VIK signals may be disturbed by the clamping circuit if inserted immediately after the vertical sync pulse.



first field: 15th line
second field: 278th line
$T = \frac{1}{455} H$ (0.14μsec)

Bit position	Kind of VIK signal
b_0	Timing pulse
b_1	Split-screen/full screen
b_2, b_3	Frame/field, odd/even field
$b_4 \sim b_7$	Address
b_8	Document/not document
b_9	Document transmission allowed/not allowed
b_{10}	Switched display/ simultaneous display
b_{15}, b16	Stereo/bilingual/monaural

($b_{11} \sim b_{14}$, $b_{17} \sim b_{32}$ not used)

Figure 3 VIK signal format