

SOURCE: JAPAN

TITLE : COMMUNICATIONS CONTROL PROCEDURES FOR $m \times 64$ KBIT/S
VIDEOPHONE

1. INTRODUCTION

This paper proposes a communications control procedure for videophone with considerations on interconnection with other audiovisual (AV) terminals. The procedure expands the concept of G.72y. In order to minimize the complexity in other AV terminals, the procedure has been divided into 2 parts, namely a part common to all AV terminals, and a part which is specific to videophone terminals.

Details of this communications procedure may be modified according to the progress of the study on Audiographic terminals.

2. TYPES OF VIDEOPHONE TERMINALS

Videophone terminals may be classified into the following types according to the used channel rate. For each type, terminals which have a certain number of options are designated as enhanced terminals, while terminals without options are designated as basic terminals.

1B Standard Terminal (Type A)

This terminal has a video and audio (1B) videophone standard codec, and implements the videophone standard communications procedure. The frame structure used is the optimized videophone frame structure proposed in the companion document (Doc.#251). Data transmission, still picture transmission, facsimile and telewriter functions etc. are optional.

2B Standard Terminal (Type B)

This terminal has a videophone standard video codec, and a G.722 audio codec. It implements the videophone standard communications procedure, and it has a function to interwork with Type A terminals.

For communication between Type B terminals, one B channel is used for transmission of G.722 audio, data signals and C&I (control and indication) signals with the Y.221 frame structure while the other B channel is used for transmitting video signals. This is because this arrangement can provide high quality voice which forms the essential part of communication even in videophone, and because it makes for easier

interconnection with other AV terminals.

When interworking with Type A terminals, the frame structure to be used is 'videophone optimized', while the 1B videophone standard is used for audio. In effect, when interconnected with a 1B terminal, the 2B terminal provides the necessary interworking functions. This is based on various considerations, i.e., the 1B terminal user may only have 1B circuit capacity, so he can handle only 1B communication; secondly, even when communicating with 2B terminal, one of the B channels may already be engaged for communicating with another device, so the terminal effectively has only 1B communications functions; and the price of the 1B terminal has to be kept low (in practice, it may be made cheaper in view of the required processing speed).

Data transmission, still picture transmission, facsimile and telewriter functions etc. are optional for Type B as well.

Table 1 shows the functions of different AV terminals including videophone.

(Note 1) With Type B terminals, there are two possibilities when more than 64 kbit/s is required for video coding, viz:

- (1) 1B videophone standard audio is used instead of G.722 audio, /6
- (2) A part of the data signals in G.72y is used for video signals.

(Note 2) In view of wideband voice interconnection with other AV terminals, some terminals may have functions for sending and receiving G.722 voice in addition to Type A terminal's functions.

3. INTERCONNECTIONS

All videophone terminals must be interworkable with each other as basic videophones. In the case of interconnection with other AV terminals, G.711 voice is a minimum requirement. Type B terminals are capable of interconnection using Y.221 frame structure. Table 2 shows typical interconnection modes.

4. COMMUNICATIONS PHASES

A videophone communication is divided into the following five phases.

Call Set-up Phase (Phase A)

This phase sets the transmission path between terminals.

Communications Mode Setting Phase (Phase B)

This phase selects the maximum common mode in which the two terminal can operate, and sets subsequent common modes.

Information Transfer Phase (Phase C) *actual data transmission*

This phase performs the actual communication, including reallocation of bit rates during the call.

Communications Mode Closing Phase (Phase D)

This phase is opposite to Phase B, and returns the terminal to the state which immediately follows the call set-up.

Call Release Phase (Phase E)

This phase disconnects the transmission path between terminals.

5. PHASE B

Part of Phase B must be a common procedure for all AV terminals. The frame structure used must therefore be simple, i.e., Y.221, and be in line with G.72y for which a draft recommendation has already been prepared. As videophones are multimedia terminals, negotiation may become complex, but it is not desirable that this procedure is shared by all AV terminals. Phase B is therefore divided into 2 parts, viz. B1 which is common to all AV terminals and embodies the concept of G.72y, and B2 which is a specific procedure for videophones.

AV Negotiation Phase (Phase B1)

All AV terminals exchange their own capabilities and functions, calculate the maximum common mode from their own capability and that of the other terminal, and then enter that mode. Table 2 gives an example of this calculation. In this procedure, the originating terminal begins the process. Though the originating terminal has the right to decide the common mode, it can also be determined beforehand as shown in Table 2.

According to G.72y, the terminal starts to send a signal with Y.221 framing (the frame structure alone - mode 0 with framing). At the same time, the terminal initiates frame synchronization process, following which it enters the capability exchange sequence and sets the timer.

In the capability exchange sequence, the terminal transmits a BAS code which denotes its own capability as shown in Table 3. This table is in fact an addition to and revision of Fig.3 in G.72y. In this state, if a multiframe alignment is gained with an indication of A bit = 0 (A bit = 0 signifies to the distant terminal that receiver frame synchronization is correct) and one of the BAS codes in Table 3 is received before the timer has expired, the sequence is completed successfully. If however the timer expires before the multiframe alignment is established, the terminal switches to the unframed mode (mode 0 without framing). If a multiframe alignment is established with A bit = 1 or a code different to the BAS codes in Table 3 is received, and the timer then expires, the timer is reset and the capability exchange sequence repeated.

(Even during an actual communication, a terminal which

receives one of the BAS codes in Table 3 immediately returns a BAS code indicating its own capability. In other words, these BAS codes have the functions of indicating capability, and at the same time enquiring for the distant terminal's capability).

After the capability exchange sequence is completed, the terminal calculates a common mode from its own capability and the other terminal's capability, and switches to the following mode via the mode switching procedure. Table 4 shows BAS codes which switch the communication mode to videophone.

Once Phase B1 is terminated, the terminal shifts to the negotiation procedure for each class of terminal (Audio Terminal / Videophone / Videoconferencing / etc.).

Videophone Negotiation Phase (Phase B2: for videophones only)

As videophones are multifunctional terminals, the normal Phase B1 alone is insufficient for videophone negotiation. However, it is undesirable to render Phase B1 more complex when considering other AV terminals. For this reason, a videophone negotiation phase is introduced after completion of Phase B1. In this latter phase, a check is made as to whether there are common optional functions such as data transmission, still picture transmission, facsimile, telewriter and non-standard modes as well, and the functions that can be used in that videophone session are determined. In the case of basic terminals without optional functions, this phase can be omitted. An enhanced terminal decides that the distant terminal is a basic terminal if the timer expires, or if it receives a BAS code which switches the communication phase to Phase C from the distant terminal without going through negotiation.

If one of the BAS codes in Table 4 is received thereby indicating videophone, the existence of optional and/or non-standard functions is notified to the distant terminal by means of the Indication (standard) code in Table 5 using the AC channel* (6.4 kbit/s). If both terminals have non-standard functions, more details are notified by means of Indication (non-standard) code using AC channel*.

After the distant terminal's optional and non-standard functions have been identified, an acknowledgement code as in Table 5 is sent together with a list of recognized functions using AC channel*. In this state, if such an acknowledgement is received from the distant terminal, Phase B2 is completed, and the terminal proceeds to the videophone information transfer phase.

If an acknowledgement is not received or the acknowledgement was incorrect, Phase B2 is repeated.

* Use of AC channel for these purposes needs further study.

6. CORRESPONDING RECOMMENDATIONS

Phase B1 in this proposal should be specified in Recommendation Y.240 (64 kbit/s interworking), while Phase B2 should be specified in the Y.320 series (corresponds to G.72y for G.722 terminals). The frame structures and communications procedures proposed for AV terminals in this contribution are summarized in Table 6.

7. CONCLUSIONS

In this contribution, we have proposed a communications procedure for videophone taking interconnection with other AV terminals into consideration. This procedure is an extension of the concept in G.72y. In order to minimize the complexity in other AV terminals, it is divided into a part common to all AV terminals (Phase B1), and a part specific to videophones (Phase B2).

Table 1 Audiovisual service terminals

Terminal		Abbr	Audio	Video	Data	C&I
Audio Terminal	Type 0	AT-0	G.711 (64k)	-	-	-
	Type 1	AT-1	G.722 (64k)	-	-	-
	Type 2	AT-2	G.722 (56/48k)	-	incl.	incl.
Videophone	Type A	VP-A	(16k) ^{2024*1}	incl.	incl.	incl.
	Type B	VP-B	G.722 (56/48k)	incl. (64 k)	incl.	incl.
Videoconferencing nx384 kbit/s		VC	G.722 (56/48K)	incl.	incl.	incl.

Table 2 Interworking among audiovisual terminals

	AT-0	AT-1	AT-2	VP-A	VP-B	VC
AT-0	AT-0	AT-0	AT-0	AT-0	AT-0	AT-0
AT-1		AT-1	AT-1	AT-0	AT-1	AT-1
AT-2			AT-2	AT-0	AT-2	AT-2
VP-A				VP-A	VP-A* ¹	VP-A* ²
VP-B					VP-B	VP-B* ³
VC						VC

*1 Operating mode for interworking between VP-A(1B) and VP-B(2B) is based on the assumption that the channel capacity of VP-A is restricted to 1B, thus VP-B must adapt to VP-A.

*2 VC is assumed to be able to operate as VP-A, otherwise operating mode should be AT-0.

*3 VC is assumed to be able to operate as VP-B, otherwise operating mode should be AT-2.

TABLE 3 BAS Codes used in the Capability Exchange Sequence

100 00000	neutral
100 00001	assigned for audio terminal
}	
100 00100	not yet assigned
100 00101	
}	1B Videophone (typeA)
100 00111	
100 01000	2B Videophone (typeB)
100 01001	reserved for Videophone
100 01010	
}	reserved for Videoconference
100 01111	
100 10000	not yet assigned
}	
100 10111	not yet assigned
100 11000	
}	not yet assigned
100 11111	

Type 0 1
0 2
Type 1
2

* This table shows an example. Detailed code assignment needs further study.

TABLE 4 BAS Codes for Switching to the Videophone Mode

011 00000	1B Videophone(typeA) mode
011 00001	2B Videophone(typeB) mode

TABLE 5 BAS Codes used in the Videophone Negotiation Phase

011 01000	Indication(standard)
011 01001	Indication(non-standard)
011 01010	Acknowledgment(standard)
011 01011	Acknowledgment(non-standard)
011 01100	Transfer to phase C(1B typeA)
011 01101	Transfer to phase C(2B typeB)
011 01110	Transfer to non-standard mode

Table 6 Frame structures and communication procedures for AV terminals

Communication Phase		Audio Terminal (AT)			Videophone (VP)		Videocon- ference (VC)
		Type 0	Type 1	Type 2	A (1B)	B (2B)	
Phase B -Mode setting	B1	Not defined	AV Procedure Y.240 ----- Y.221				
	B2	Not defined	AT Procedure G.72y -----	VP Procedure Y.320 -----		VC Proc. ----- Y.221	
Phase C -Information transfer, -Mode switching		----- with octet sync	AT Procedure G.72y ----- Y.221	VP-A Pro Y.320 ----- Y.221mod /packet	VP-B Pro Y.320 ----- Y.221	VC Pro cedure ----- Y.222	
Phase D -Mode recovery		Not defined	AV Procedure Y.240 ----- Y.221				

Communication Procedure

Note 1: -----

Frame structure

Note 2: Current draft Recommendation G.72y covers Phase B, C, D procedures for Audio Terminals. It should be noted that G.72y may need amendments if this framework is agreed.