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SOURCE : JAPAN
TITLE : H.261 COMPATIBILITY REQUIREMENT
Purpose: Discussion

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1. Introduction

H.261 compatibility of H.26X has been recognized as "preferable" in the requirement listing (see Annex 5 to AVC-106R). This document endeavors to clarify in what situations the compatibility is needed and what provisions are necessary in the H.26X coder/decoder.

2. Interworking situations

We analyze the interworking situations according to the following communication patterns (see Figure 1);

1) Point to point: one terminal is connected to another terminal through a channel
2) Multipoint: multiple terminals are connected to an MCU (Multipoint Control Unit) which processes audiovisual signals for distribution, or they may be interconnected in a mesh
3) Multicast: one source signal is broadcast using a distribution function in the network
4) Database access: the same information material may be provided to multiple terminals

For simplicity we mention only video coding in the following discussion on interworking, though actual interworking needs support of all layers of protocols including call control, AAL, multimedia multiplexing, etc. A typical, but not yet discussed, essential function is to support 2xB circuit emulation in the broadband terminal.

We also assume that H.26X (operating at e.g. 4 Mbit/s) is connected to the broadband user-network interface and H.261 (operating at e.g. 100 kbit/s for 2xB connections) to the narrowband user-network interface. Though there may be such a case that H.261 is connected to the broadband interface through a terminal adaptor, the simplification will not affect the video coding algorithm consideration.

3. Point to point communications (Case 1)

Case 1a

Two H.26X's are interconnected through B-ISDN interfaces. This is the fundamental configuration where best coding performance and simplest implementation are required. H.26X video coding algorithm can be quite independent of H.261 unless benefits in coding efficiency and/or hardware implementation can be obtained by keeping some relation between the two.

Case 1b

H.26X in the B-ISDN environment interworks with H.261 in the N-ISDN environment. An only way for interworking is that the H.26X terminals emulates H.261 in operation. Independent H.261 hardware may be included in the H.26X terminal and be switched as necessary. This approach may be practical if H.261 hardware be available e.g. as a single chip. The same argument as mentioned above for Case 1a will be applicable.

Alternatively, H.26X hardware may work in H.261 mode since H.26X requires much higher processing power and speed than those of H.261. Use of a part of processing power will become more practical if the same coding algorithm is used for both H.261 and H.26X. Such an example is found in the current H.261 architecture which provides both of QCIF operation for one B-channel and CIF operation for two B-channels. Its extension to e.g. SCIF operation at 4 Mbit/s will be the most straightforward. Even if the two coding algorithms are not the same, implementation of H.26X which can emulate H.261 will receive benefits if many of constituent elements are common.

As a conclusion, B-ISDN terminals must have capabilities of coding and decoding both H.26X and H.261 bitstreams.

4. Multipoint communications (Case 2)

Case 2a

An MCU terminates the connection to each participating terminal. In the switched video system, the signal of selected terminal is distributed by MCU to other terminals. When both N-ISDN terminals and B-ISDN terminals participate in a multipoint conferencing, N-ISDN terminals may be dealt with as secondary status which allows only audio communication, or alternatively B-ISDN terminals may fall back to H.261 operation ("mode down" in AVC-229). In either case, coder and decoder should operate in either of H.26X or H.261 throughout the multipoint conferencing. This is the same situation as Case 1 above.

If the MCU supports transcoding between H.26X and H.261, situations become very simple; B-ISDN coder and decoder need work only in H.26X mode. Transcoding between H.26X and H.261 may give minimal degradation of performance (picture quality and delay) compared to pure H.261 operation if the bit rates are largely different between H.26X and H.261, such as 4 Mbit/s and 100 kbit/s.

In the continuous presence system, a picture containing multiple sites is composed, formatted and sent to each terminal. The composed signal should conform to H.26X or H.261 according to the destination terminal. Since no technology to edit coded signals will be available in the near future, we have to rely on transcoding to a large extent.

If the MCU supports demultiplexing of two bitstreams (H.26X and H.261) from B-ISDN terminal, H.261 signal must be extracted by the MCU and formatted appropriately for transmission toward H.261 decoders. This can be achieved by embedded coding or simulcast in the H.26X coding. In order to reduce the H.26X coding/decoding delay, the embedded coder should encode H.261 base layer signal quickly and transmit it in a bursty fashion (see AVC-229).

Case 2b

Multiple terminals are connected in a mesh. If an H.261 terminal is involved, the same situation as Case 1b happens for H.26X decoders. The H.261 transmitter can simply distribute its encoded video, while the H.26X transmitter should distribute the coded video signal in two forms simultaneously; H.26X bitstream toward H.26X terminals and H.261 bitstream toward H.261 terminals. This dual transmission can be achieved by embedded coding, accompanied by a function to pick up H.261 bitstream, or simulcast.

5. Multicast communications (Case 3)

A coded video signal from the transmitter is distributed inside the network to multiple receivers. If H.261 receivers are involved, a network node should extract H.261 signal from the H.26X bitstream and format it into appropriate signal such as circuit emulation signal (see also AVC-221) as in Case 2a where MCU distributes H.26X signal to both H.26X and H.261 receivers.

6. Database access (Case 4)

Different terminals may get access to a database. The same picture material should be sent out in two forms; H.26X and H.261 (or more likely MPEG-2 and MPEG-1?). Reduction of the database storage capacity will be a major concern in this communication system. If we assume the database stores the picture material as H.26X bitstream, demultiplexing (in case of embedded or simulcast coding) or decoding and recoding (in case of transcoding) of H.26X bitstream is necessary in the database to serve H.261 terminals. If simulcast coding is used for the storage, more design freedom of the database may be obtained at the risk of increased storage capacity.

7. Requirements to H.261 coder and decoder

H.261 compatibility requirements are summarized in Figure 2 for various communications patterns.

8. Conclusion

Several interworking scenarios have been analyzed. Requirements to the H.26X decoder and encoder are concluded as follows;

- The decoder in B-ISDN should be able to receive both of H.26X bitstream and H.261 stream, but one at a time, in all the situations including point-to-point, multipoint, multicast and database access.

- H.26X encoder should be able to transmit either of H.26X bitstream or H.261 stream at a time for point-to-point communications or multipoint communications where a common operating mode is used or where MCU carries out transcoding. It should also be able to transmit two bit streams simultaneously for multipoint communications where MCU does not provide transcoding or where a mesh connection is employed, multicast communications and in the database.

END

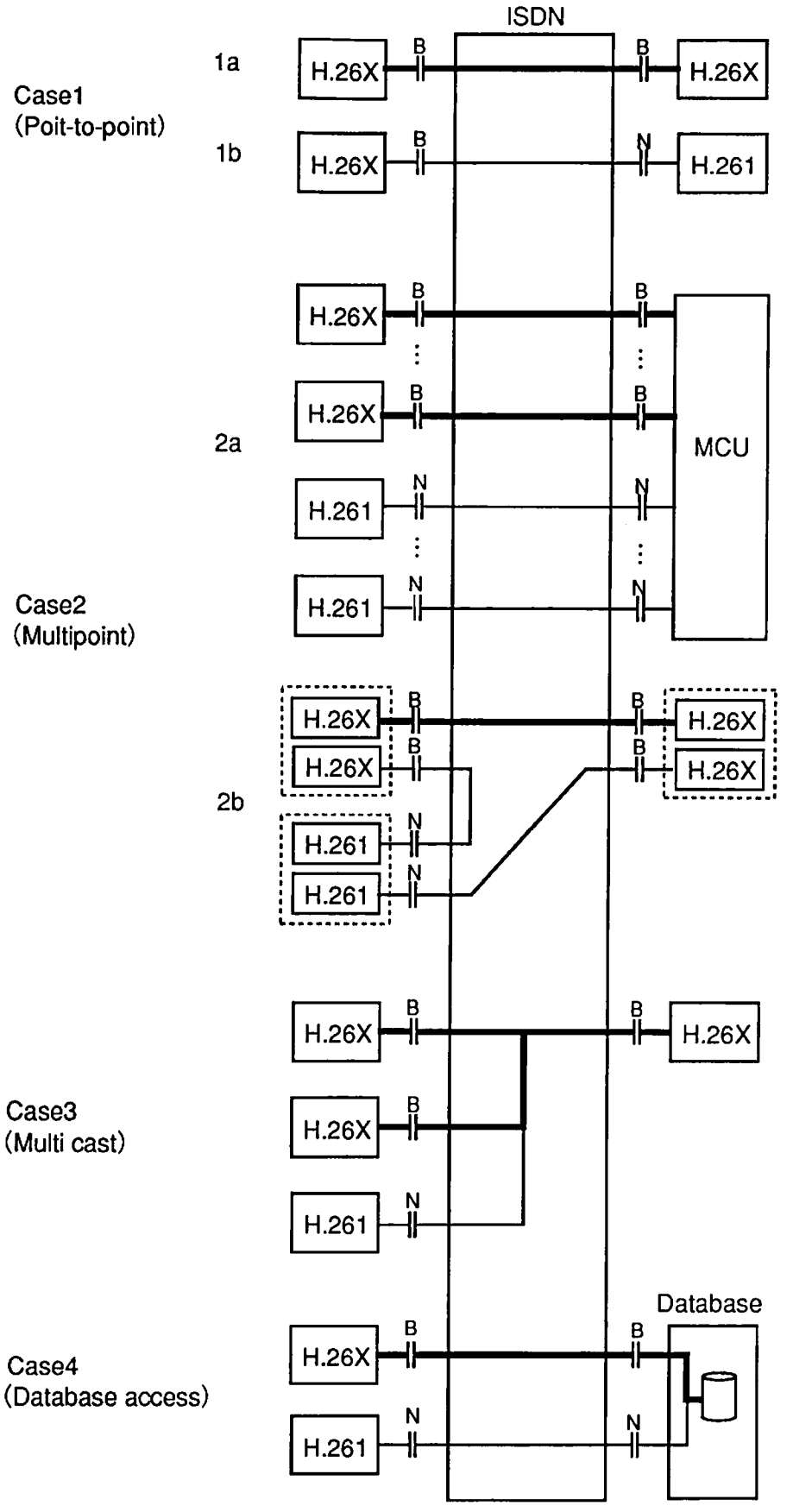
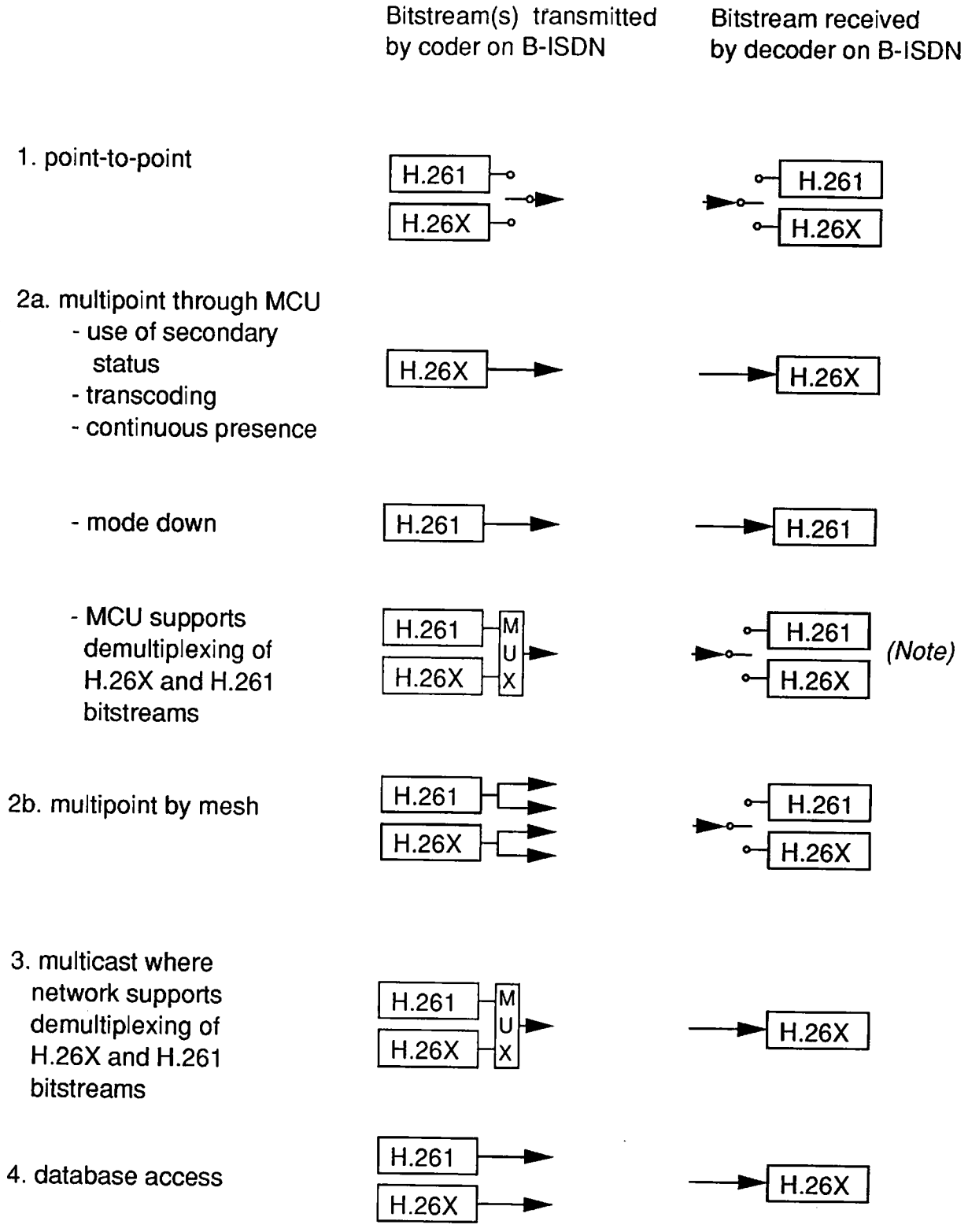


Figure1 Interworking between H.26X and H.261



Note : Fast switching may be required to respond to the cahnge of senders.

Figure 2 Summary of H.261 compatibility requirements to the coder and decoder on B-ISDN