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TITLE : PROPOSAL FOR A DRAFT MULTI-CONFERENCE UNIT (MCU) SPECIFICATION

SOURCE : FRANCE, FRG, ITALY, NETHERLANDS, UK,

ABSTRACT :

For H120 videoconference codecs, the availability of multiconference has been described by the words fruitful and sometimes essential for the service aspects by most of the customers. In the new generation codec the range of video rates is wider ($1<p<30$) and the service can be divided in two major parts : videophony for desk terminals and videoconference using larger terminals in dedicated rooms. In this document the main functions are given even if many implementations for MCU's are possible.

INTRODUCTION

Multiconference can be achieved in two major ways : continuous presence or video switching mode by the means of a dedicated equipment called Multi-Conference Unit (MCU).

In this document, only the second mode is described but further enhancements could provide continuous presence conference. Video switching means that the picture of the speaker is seen by all the other participants on their terminal. When another lecturer takes the floor the MCU broadcasts the new picture.

For the audio the MCU provides sound mixing of n-1 channels for each terminal.

I - GENERAL REQUIREMENTS

A multi-Conference Unit (MCU) is a piece of equipment located in a node of a network (terrestrial or satellite) which receives several channels from ISDN basic accesses or primary rates (each bearer corresponding either to a local or a remote codec or to another MCU) and, according to a certain criterion, causes some of them called selected channels to be distributed towards the connected studios (see figure 1).

This basic functions of the MCU for a terrestrial or a satellite network are identical. The MCU shall have the capability :

- to synchronise the incoming streams to a single 2,048 kHz pilot clock (or k x 64 Khz). For countries using plesiochronous networks, the clock pilot is derived from the main pilot.

- to extract frame alignment from the frame structure H222 in order to synchronise the different streams of the frame clock, to extract submultiframe and multiframe alignments in order to access in each incoming stream the Frame Alignment Signal (FAS), the Bit Allocation Signal (BAS) and the codec-to-codec signalling channel.

- to process FAS, BAS and the signalling channel

- to process the sound channels in order to create an open sound system.

- to decide image switching and broadcasting according to a selection criterion (automatic or on request).

- to signal in advance the switching decision to the codecs such that degradations during the switching period can be avoided.

- to multiplex the selected video channels with the open sound channel and the effective data channels.

- to distribute the switched streams to the corresponding access ports.

For switched networks automatic seizure should be provided by MCU's.

II - SYNCHRONISATION OF BIT STEAMS

II.1. Clock synchronisation

All incoming bit streams must be derived from the same basic 2,048 kHz clock in each country. Between countries using plesiochronous network loss of data occurs sometimes. To avoid loss of alignment the need of skipping multiframes on the incoming signals of other networks is under study. Otherwise the minimum time of resynchronisation should be specified.

II.2. Frame synchronisation

The MCU has the following functions :

a) For primary accesses extract PCM frame alignment. Care should be taken to switched networks which have not generally Time Slot Sequence Integrity (TSSI).

b) Extract frame, submultiframe and multiframe alignments according to H222 recommendation.

c) Synchronise the bit streams at the multiframe rate, such that switching can be performed in the MCU without interrupting the H222 frame structure.

III - USE OF H222 FOR MULTICONFERENCE APPLICATIONS

III.1. Use of FAS and BAS

Frame Alignment Signal (FAS) and Bit Allocation Signal (BAS) are defined in H221 recommendation. Videoconference BAS are under study.

III.2. Fast Update Request (FUR)

When set to 1, the transmitter buffer occupancy is forced to decrease and stabilize to a state of less than .. kbit by preventing coded picture blocks entering the buffer.

III.3. Freeze Frame Request

Used to warn a decoder that its received signal may be interrupted after the start of the next multiframe for a period of no more than 2 seconds. On receipt of FFR a decoder will normally "freeze" the contents of its frame store for 2 seconds or until a field start code is received with bit Freeze Picture Release (FPR) set to 1. The MCU sends FFR to the ports which are going to receive a new picture.

III.4. Data transmission

To allow data broadcasting the MCU sets the codecs in same operating mode by signalling the number of 64 kbit/s data channels which have to be vacated.

III.5. Audio processing

Each terminal connected to an MCU must receive a mix of the audio from all other terminals. The audio signals should be summed at the MCU without normalisation ; ie unity gain on each channel. The introduction of dynamic mixing for the suppression of ambient noise may be included but speakers would still enjoy unity gain.

Indeed the MCU uses H221 recommendation to establish the general operating mode : PCM or ADPCM.

III.6. Loop detection

On leased lines the channels may be looped for network operation to avoid alarms on unused lines. The MCU should inhibit ports which are externally looped to prevent echo in the distant rooms (see par III.5.).

Means of detection use pseudo random sequences or patterns sent continuously. Patterns using a 16 bit word from the subset of 16 bit words which are different by left or right shifts can used. The MCU knows that the port is looped when several successives words are identical on the sending and receiving sides.

IV - SWITCHING DECISION CRITERIA

Any solution, automatic or manual, can be implemented whithout altering the basic arrangement of the MCU.

The minimum working mode or "automatic" mode is as follows: the MCU, by comparison of the incoming sound channels selects the loudest speaker (called New Speaker or NS). A second channel is selected by the MCU, being the previous loudest speaker (called Previous Speaker or PS). The NS is sent the PS channel and the other rooms are sent the NS channel. This mode is always used when the multiconference is established.

Manual operation can be used in order to have a "chairman mode". Means for sending "request for the floor" needs more study : bits in the frame H222 or message channel.

V - MCU PROCEDURE FOR SOURCE SWITCHING

Once the switching decision is taken the MCU must prepare the connected codecs and operate as following :

a) It sends a FFR to all the codecs which will be affected by the switch via the selected transmission channels connected to them.

b) It performs image switching whilst maintening the basic frame structure continuity in the selected channel (1).

c) It waits at least 20 ms to allow sync recovery in all decoders.

d) It sends a FUR to the codec (1) which are about to be used as a new picture source.

VI - TRANSMISSION OF DATA DURING MULTIPOINT

Data or SPTV (ISO TC97/SC2/WG8) can be switched and broadcast by the MCU as soon as all the 64 kbit/s data ports are vacated from video.

CONCLUSION

Among these requirements some references were made to H221/H222 Recommendation for synchronisation and common mode operation. Provisions are made in the current Recommendation but some extensions need more study to find the common operating mode in the MCU for the variable transfer rate or options such as terminal data equipement for SPTV, graphics transmission or stereo sound.

This document gives the general requirements for a switched operating mode Multiconference Unit. Enhancements for a continuous presence mode could be added by a split-screen technique such as four 1/4 CIF pictures transcoded in a full CIF picture providing four channels are used between the MCU and the decoders.

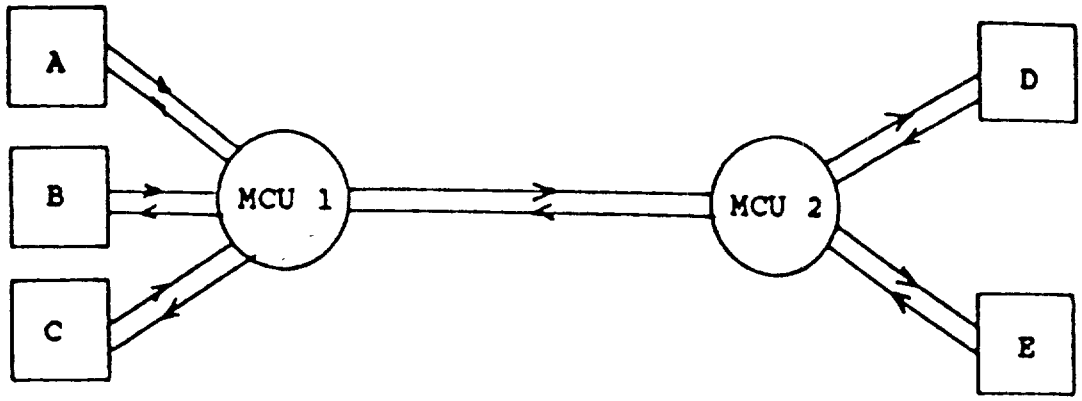

Figure 1: Use of MCU in a terrestrial Network

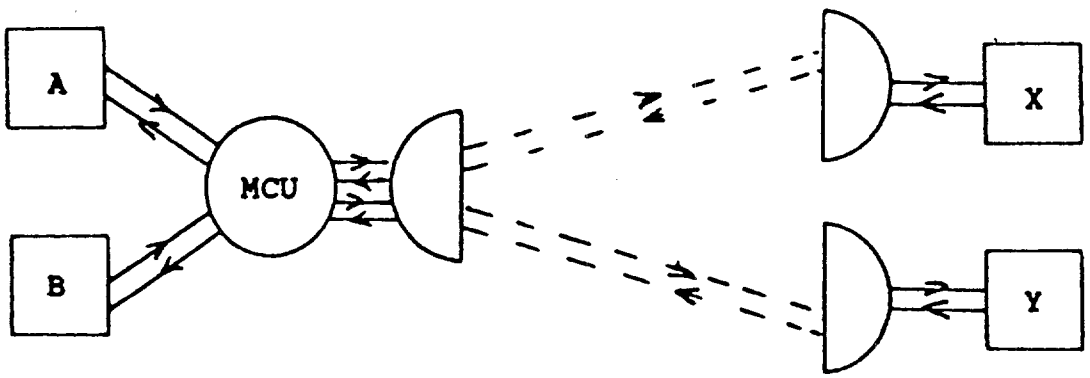

Figure 2: Use of a single MCU in a satellite configuration