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LINE TRANSMISSION OF NON-TELEPHONE SIGNALS

MULTIPOINT CONTROL UNITS FOR AUDIOVISUAL SYSTEMS USING DIGITAL CHANNELS UP TO 2 Mbit/s

ITU-T Recommendation H.231

(Previously "CCITT Recommendation")

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation H.231 was prepared by the ITU-T Study Group XV (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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MULTIPOINT CONTROL UNITS FOR AUDIOVISUAL SYSTEMS USING DIGITAL CHANNELS UP TO 2 Mbit/s

(Helsinki, 1993)

1 Scope and definitions

1.1 Scope

This Recommendation describes the means by which three or more audiovisual terminals conforming to Recommendations H.221, H.230, H.242 may communicate simultaneously over constant bit-rate digital paths, such communication being designated a "multipoint call". The terminals do not in general need any modification for multipoint working, though some optional enhancements (see 4.2) may require additional software; in particular, considerably enhanced functionality is attained the multilayer protocol (MLP) to be defined in the H.200/AV.270-Series Recommendations. The interconnection is effected by one or more MCUs (see below), which may reside in the network or at one of the terminals.

This Recommendation covers both mandatory requirements and optional enhancements for multipoint working. The optional enhancements are:

- numbering of terminals;
- chair control;
- data broadcast.

Terminals having no such enhancements may take part in an enhanced multipoint call without misoperation, but moving picture reception may be frozen during data broadcast.

1.2 Definitions

For the purpose of this Recommendation the following definitions apply.

multipoint control unit (MCU): A multi-port device, by means of which three or more audiovisual terminals may intercommunicate in a conference call; a "listed MCU" has the properties defined in 5. Master and slave MCUs: A "master MCU" has been assigned a superior controlling function in a call where two or more MCUs are interconnected, while the other MCUs in that call are termed "slave MCUs".

NOTE – The physical realisation of an MCU may be such that two or more independent conferences may be set up within the same unit; logically, however, there is no relationship between these conferences; the text herein refers to an MCU only as a logical entity pertinent to the particular call of concern.

chair-control terminal: An enhanced terminal possessing a token conveying a certain measure of authority over the operation of the MCU; the token may be assigned by prearrangement, by an operator, or by protocol during the call. The person controlling need not be the actual chairman of the meeting.

chair-control port: That port of the MCU serving the terminal to which chair-control has been assigned (this port is not physically different from the others).

primary and secondary ports: While all ports of an MCU may be physically the same, distinctions may be made by the internal software, on the basis of declared terminal capabilities, such that the ports are not all treated on an equal basis. In general, a multipoint call will involve two or more terminals intercommunicating on an equal basis, at their highest common capability; the MCU would designate as "primary" those ports to which these terminals are connected, and for simplicity these terminals can be referred to as "primary terminals" for the purposes of this one call. The selection of an appropriate common level for primary communication is described in 2/H.243.

One or more additional terminals may take part in the multipoint call, even though they do not have sufficient capability to communicate on an equal basis with primary terminals; these may be designated "secondary terminals", communicating with the others only by such compatible signals as can be made available (e.g. speech only), the MCU having designated the appropriate port accordingly. Note that if this provision were not made, then the addition of a telephony terminal to a videophone conference would cause all picture transmission to be discontinued.

It is not mandatory that an MCU be able to handle secondary terminals; in such a case the MCU may either

a) disconnect a terminal not declaring capabilities adequate to participate as a primary; or

b) lower its definition of "primary" to include the said terminal.

The provider of the MCU should make clear which procedure is followed.

Definition of abbreviations to be added: MLP, APU, VPU, DPU, CPU; BAS (see Recommendation H.221); VCF, VCU, MCC, MCS, MCN (see Recommendation H.230)

Directly-connected terminal: Where reference is made to "directly" connected terminals, this should not be taken to mean that the terminal in question is colocated with the MCU, but rather that it is not connected to a different MCU.

Local MCU: That to which the terminal in question is directly connected.

Adding and dropping terminals from a conference [refers to connection to the APU, VPU and DPU (see 2), not to network (dis-)connection which is outside the scope of this Recommendation]

2 Functional representation

2.1 General representation

A multipoint call may be represented as in Figure 1, wherein are shown a number of terminals T, not necessarily identical, linked individually into a network by symmetrical bidirectional digital connections, not necessarily all of the same capacity. There is no particular limit set by the system to the number N of terminals connected in the call, though in practice, depending on implementation, the difficulties and cost will rise as N increases, while performance tends to fall.

In the representation of Figure 1, the network need only be described by the signal flows at its ports, and their interdependencies. The hardware realisation need not be of concern: there may be a single MCU at one location; alternatively the functions may be distributed to two or more locations, but in practical terms we then refer to a series of single MCUs linked together. In this Recommendation, the text applies in general to both single-location and distributed MCUs, and the linking of MCUs is only treated specifically where there is a particular need to do so.

The MCU is represented in more detail in Figure 2.

Each port of the MCU has a network interface unit, with associated call control if appropriate; on the MCU side of the network interface unit, the signal flows are contained in one or more bidirectional channels normally of equal capacity, according to the transfer rates listed in Annex A/H.221. The incoming flow is passed to the Demultiplexer, which extracts the several types of information (audio, video, data, and control) and passes them to their respective processors. The processors are controlled in such a way that an appropriate output from each is made available for transmission to every terminal; the latter are brought together in the Multiplexer to be combined into the outgoing channels.

The "call-control" and "call-control processor units" are outside the scope of this Recommendation (see Recommendation H.200/AV.440); the other units are described in the following subclauses.

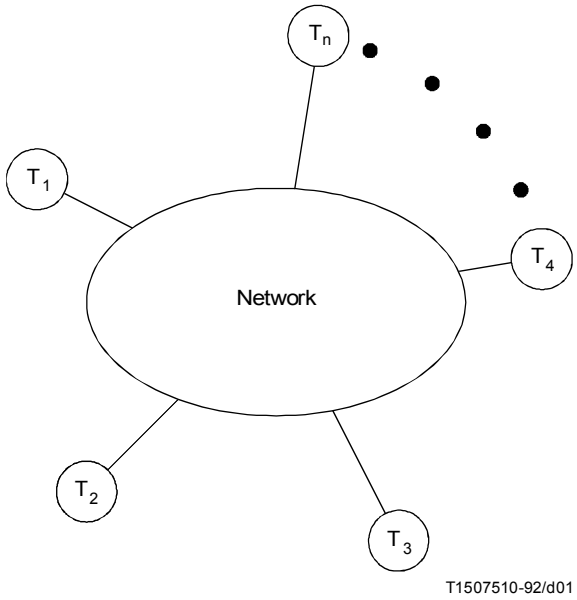

FIGURE 1/H.231

Representation of a multipoint call

2.2 Description of functional units

2.2.1 Network interface unit

A physical entity that converts to/from line code the signals of 64 kbit/s (56 kbit/s) or multiples thereof which enter the demultiplexer and leave the multiplexer. Although in Figure 2 such a unit is shown for each multiplexer/demultiplexer pair, in practice a network interface might support a number of logical ports (see below).

2.2.2 Port

A port is a logical entity which may support one audio or audiovisual terminals; it is associated with a single multiplexer and demultiplexer.

2.2.3 Demultiplexer

The signal entering the demultiplexer is that transmitted by a terminal fully conforming to Recommendation H.221, so the operation is analogous to that of the receiving side of a terminal, namely:

- recovery of frame and multiframe alignment;
- buffering, synchronization and ordering of multiple channels if relevant;
- extraction of BAS codes and forwarding some of them to the control processor;
- extraction of encryption vectors and decryption if relevant;
- extraction of audio and forwarding to the audio processor;
- extraction of video and forwarding to the video processor;
- extraction of data and forwarding to the data processor.

Correct timing relationships must be maintained between mode-control BAS and the related audio, video and data.

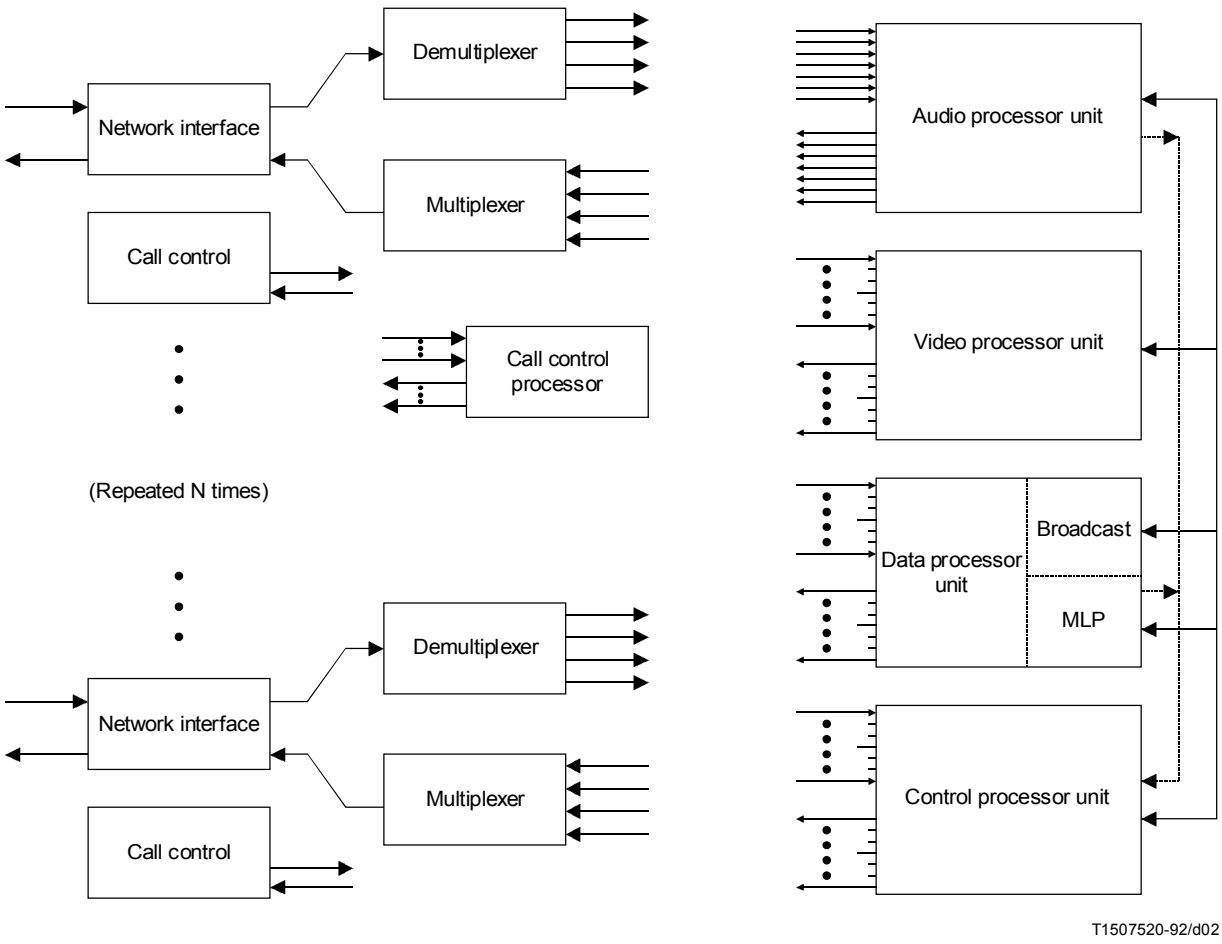

FIGURE 2/H.231

Schematic of multipoint control unit

2.2.4 Audio processor unit (APU)

The audio processor prepares N audio outputs r_j from N audio inputs s_i , by switching, mixing, or a combination of these. Mixing requires the addition of linear signals S_i obtained by decoding s_i to linear (PCM or analogue), and the recoding of the responses R_j to appropriate transmission formats r_j .

An audio-mixing MCU generally results in sending to each terminal the sum of the signals from all other terminals. However, as the number of audio signals involved in the summation increases there can be a cumulation of unwanted signals (e.g. acoustic returns and noise) which eventually result in unacceptable degradation of the service to the user if additional precautions are not taken. The methods of dealing with these problems are for further study.

Some MCUs may allow terminals to be removed from the mixing function and interconnected separately, for private consultation.

If in either of the above cases the number is limited to one, the MCU becomes audio-switching instead of audio mixing. The audio unit may also contain a voice synthesiser or recorded message store, able to be connected into the mixing unit or separately to any terminal.

If the video signal is switched while the audio is mixed the audio may be delayed relative to the video: by buffering the video if necessary this delay should be made less than 30ms.

Note that all MCUs must, in conformance with Recommendation H.242 (see 4), be able to receive PCM audio.

2.2.5 Video processor unit (VPU)

The video processor can operate in ways entirely analogous to those described above for the audio processor: to each terminal may be transmitted a single video signal from another terminal, selected at a video switch; or a "mix" of some or all of the other video signals may be transmitted. In this case "mixing" takes the form of spatially multiplexing the images into a single composite image in "split-screen" format. Since the video mixing function is a complex process, the alternative of video switching may be preferred. As for audio switching, the choice of video may be automatic, such that the current speaker (largest value of s_i) receives the picture of the previous speaker, while all other terminals receive the picture of the current speaker; a time delay is incorporated into the switching (typical value 2s) to avoid excessively frequent image changes, caused by spurious sounds such as coughing, knocking a microphone, and so on.

Again, the video switching may be controlled directly by the chair-control, if any, making his own decisions as to which picture is most appropriate. The symbol MCV (see Recommendation H.230) may be sent from a terminal to force an MCU to broadcast its video signal, overriding the automatic mechanism until "Cancel-MCV" is sent; the MLP (Recommendation H.200/AV.270) provides for more complex control procedures. (See note in 2.2.4 concerning differential delay).

2.2.6 Data processor unit (DPU)

This unit is optional; when present it contains one or both of the functions depicted as "broadcast" and "MLP" in Figure 2 and further explained below.

2.2.6.1 Data broadcast function

In this case, only one LSD and/or one HSD input can be accepted at any one time, any data subsequently arriving at another input being ignored. The data is broadcast to other outputs as determined by the control processor, according to the capability of the connected terminals to receive such data (see 6.2/H.243). Data is not echoed to the transmitter.

2.2.6.2 MLP data handling function

In this case the data processor is equipped to process the multilayer protocol defined in the H.200/AV.270-Series Recommendations, and performs one or more of the following functions.

- handling of telematic information;
- transmission of conference control signals (request/grant floor, chairman token control, audio/video switching).

2.2.7 Control processor unit (CPU)

The control processor is responsible for determining the correct routing, mixing/switching, format and timing of the audio, video, data and control signals passed to each multiplexer for outward transmission; it also deals with the processing of conference-control functions.

2.2.7.1 Incoming BAS commands

According to the incoming BAS commands the CPU ensures the correct distribution of bits to the audio, video and data processors; that the correct audio decoding algorithm is used on each input to the audio mixer; and that any incoming data is sent to the broadcast unit or MLP Processor as appropriate.

2.2.7.2 Outgoing BAS commands

The CPU ensures that the correct audio encoding algorithm is used on each output from the audio mixer, and that the desired switching or summation has been performed in each case; that the desired switching (or mixing of video signals) has been made to each output of the VPU. It transmits VCF (see Recommendation H.230) to all relevant terminals at a set time before switching the video sent to them, and VCU to a terminal whose video is about to be sent to another terminal; the procedure for this is set out in 4/H.243.

The CPU switches mode on outgoing streams to accommodate the appropriate combination of audio, video, and data, according to the declared capabilities of the connected terminals (see Recommendation H.243). Commands MCC, MCS, MCN are transmitted to effect the appropriate mode transmissions from connected primary terminals, so that audio, video and data occupy the same capacity on all primary ports. See also 6.1/H.243.

2.2.7.3 Incoming BAS capabilities

The capability codes from all N terminals are stored; whenever a new set is sent by a terminal, it replaces completely the previous set (exception: as a protective measure, encryption capability cannot be negated by sending a new capset with that value omitted).

2.2.7.4 Outgoing BAS capabilities

The values to be sent to each of the N ports are determined according to Recommendation AV.243.

2.2.7.5 Conference control processing

The conference control functions include selection of video signals to be transmitted (other than by voice activation), selection of audio likewise, management of data tokens and the data transmission, assignment of terminal and MCU numbers, management of identity information, adding and dropping of terminals, and so on.

2.2.8 Multiplexer

The multiplexer sets up a frame structure on the outgoing channel(s) according to Recommendation H.221, and loads into this the BAS values from the CPU and the outputs of the APU, VPU and DPU.

3 Multipoint configurations

a) *Star* – All terminals connected to a single MCU; all primary terminals are connected at the same effective bit rate, being 64 kbit/s or a multiple up to 1920 kbit/s (rates defined in Annex A/H.221); secondary terminals may be connected at a lower rate.

b) *Dumb-bell* – Terminals are connected to one of two MCUs, which are themselves interconnected at the same effective rate as the primary terminals.

c) *MCU star* – Three or more MCUs may be connected in star configuration with terminals connected to each, the MCUs being interconnected at such a bitrate that the transfer rate can be at the same level as that between each MCU and the primary terminals. A chain of three MCUs is a degenerate case of the MCU star, and so is included in the definition thereof.

d) *Hierarchical configurations* – The MCU star is a second-order hierarchy; higher-order configurations may be formed by adding more MCUs at the periphery of the star, as exemplified in Figure 3.

e) *Call set-up configurations* – Out-of-band arrangements for setting up multipoint calls are described in Recommendation H.200/AV.420. Some in-band provisions are described in 5/H.243.

4 Multipoint control unit characteristics and classification

4.1 Conformance

MCUs intended for use with terminals conforming with Recommendations H.221/H.230 and H.242 must themselves conform to these recommendations, and with the procedures set out in Recommendation H.243.

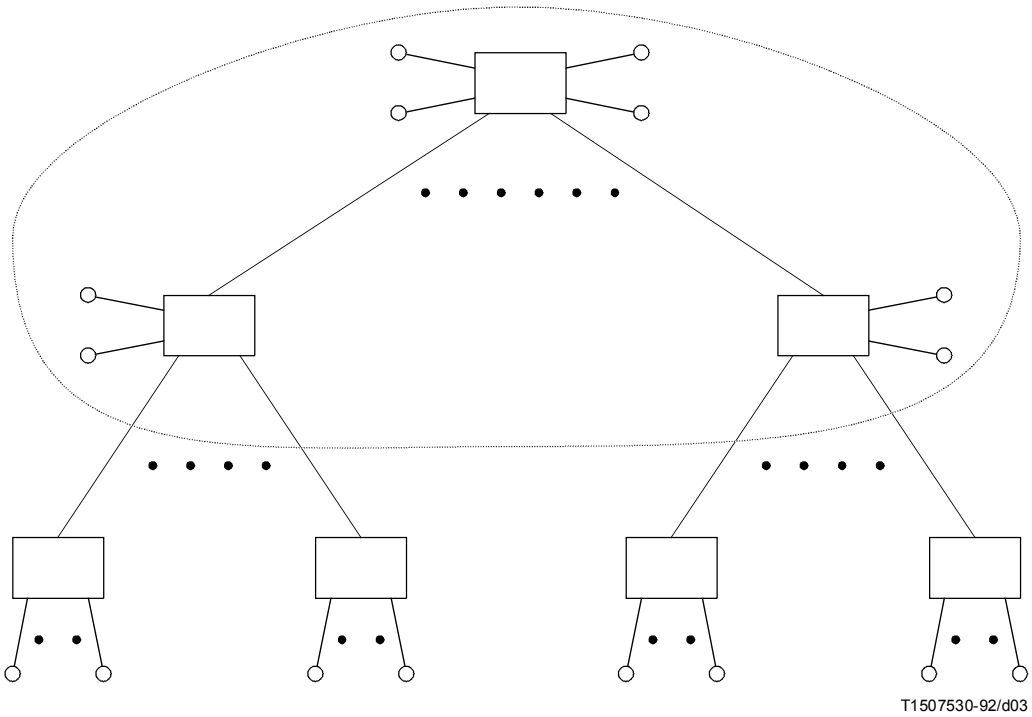

FIGURE 3/H.231

MCU hierarchical configuration

4.2 Classification of MCUs

A wide variety of MCUs can be envisaged, according to the many different options available within the provisions of this Recommendation. Table 1 lists the various attributes and parameters which an MCU may possess, and by means of which it may be classified; the manufacturer should specify all of the properties which the unit possesses and the conditions under which they may be activated. Most of the attributes values are not themselves mandatory, but where they are provided it is mandatory that the procedures of Recommendation H.243 be adhered to. These attributes, numbered in the left-hand column of Table 1, are elaborated in 4.3 and 4.4, cross-referenced as [1], etc. The MCU attributes must be such as to handle the signals of the terminals with which it is intended to be used.

4.3 Summary of MCU BAS-capabilities

NOTE – This subclause is concerned with the internal capabilities of the MCU (the BAS-capabilities declared at any time towards a particular terminal should normally take into account those of the terminals connected – see Recommen-dation H.243); these are a function of the physical properties of the MCU and any software selections (made automatically or by human intervention).

a) *Audio* – An audio-mixing MCU intended for inter-regional operation must be able to encode and decode G.711 A-law and μ-law, and may also optionally handle G.722-64, G.722-48, G.728 – see Table A.l/H.221. An audio-switching MCU does not decode any audio signals; internally generated messages may be transmitted as PCM or by G.722 or G.728 if appropriate [6, 6.1, 6.2].

NOTE – If an MCU is not equipped with both A- and μ-law decoding it may be impossible for terminals in another region to access it.

b) *Video* – An MCU may or may not be able to handle video. If it does so by switching, the different video capabilities defined in Recommendation H.221 declared by the terminals must be taken into account in determining those to be declared by the MCU, though it has no inherent video-mode capabilities of its own; however in a video-mixing MCU the situation is more complex [7, 7.1].

c) *Transfer rate* – An MCU may have any of the capability values defined in Recommendation H.221 [5].

d) *Restricted-network capability* – An MCU connected to a network whose B-channels are effectively restricted to $p \times 56$ kbit/s (p = 1 to 6), or whose channels at H_0 or higher are restricted by ones-density considerations, must declare the capability value (100) [22] as given in Recommendation H.221. All MCUs intended for interworking with terminals or MCUs on such restricted networks must have the capability to respond to this code according to Annex B/H.221 [4.2].

e) *Data* (except MLP) – The MCU may or may not be capable of broadcasting data at rates up to the highest transfer rate, and may so indicate by means of the appropriate capability codes defined in Recommendation H.221; however the codes declared at any point in the call are likely to be determined more by the need to govern transmissions from terminals (see Recommendation H.243) [9.1].

f) *MLP* – The MCU may or may not be capable of handling MLP at rates up to the highest transfer rate, and may so indicate by means of the appropriate capability codes defined in Recommendation H.221 [9.2, 14.2].

g) *Encryption* – For further study.

h) *MBE capability* – This is required for some multipoint functions (see Recommendation H.243) [16].

i) *Non-MLP chair-control capability* – The MCU may or may not be able to provide terminal numbering and the means for one terminal to control video switching, connection-dropping, etc. (see Recommendation 7/H.243) [14.1].

Examples

i) A simple ISDN MCU might well possess the following capabilities: [G.722-48 + A/μ-16 kbit/s, switched video, transfer-rate 1B and 2B and 128, LSD up to 6.4 kbit/s].

ii) An audiographic MCU might be: [G.722-48, transfer-rate 1B, LSD up to 14.4kbit/s, MLP, MBE].

iii) A videoconference MCU might be: [G.722-48, switched video, transfer-rate 2B and H_0, HSD 64 kbit/s].

4.4 Other Attributes

a) *Ports and configurability* – A physical MCU equipment may be capable of handling several simultaneous independent conferences, with limitations as to number of possible connections to terminals and to other MCUs [1, 2, 3].

b) *Network aspect* – An MCU may be designed for connection to various types of digital network, with various call-control arrangements, including the possibility of using the same network address for all incoming connections to a given conference [4.1, 13].

c) *Communication mode Selection* – Various possibilities exist for the method of selection of "selected communication mode" (see Recommendation H.243) and the resultant treatment of connected terminals as "primary" or "secondary" [11, 12].

d) *Terminal identification* – An MCU may or may not be able to request, accept and process alphanumeric strings from connected terminals for identification purposes (see 5.6/H.243) [15].

TABLE 1/H.231

MCU Classification

Ref.	Attribute	Possible values
1	Maximum number of terminals that can be connected to a single MCU	3, 4, 5...
2	Maximum number of concurrent (independent) conferences that can be supported in a single MCU	1, 2, 3...
3	Maximum number of ports that can be connected to other MCUs [if non-zero, state whether item (1) above is dependent]	0, 1, 2...
4.1	Network interfaces at each port (if not all the same, give details)	Basic ISDN, primary E1/T1, other ....
4.2	Restricted network capability	Restricted, unrestricted, both
5	Transfer rates available at each port (if not all identical, give details)	Any capability values from Recommendation H.221
6	Audio processor	Mandatory
6.1	Mixed/switched (give details)	Mixed; auto- or user-switched (see 14.2)
	Noise/echo suppression on "silent" ports	Give details
6.2	Audio algorithm at each port	i) G.711 (A and/or μ); ii) G.722 + G.711; iii) G.728 + G.711
7	Video processor (moving pictures)	No/Yes (details below)
7.1	Switched/mixed (give details)	Switched automatically (speech power basis) / user-control (see 14.2), mixed split-screen-H.261
9	Data processor	
9.1	Data broadcast facility, LSD	No/Yes + rates from H.221
	Data broadcast facility, HSD	No/Yes + rates from H.221
9.2	MLP processor	No/Yes + rates from H.221
10	Encryption	Not supported, supported (details, algorithm etc.)
11	Method of choosing selected common mode – SCM	Preset by manufacturer (give values)
		Set by operator input (give range)
		Set by user (give range) (see 14.2)
		Auto-set according to conn. terminals (details)
12	Can deal with secondary terminals	Yes/No + details
13	Call set-up provision(s)	Non-reservation/reservation (+ details)
		Auto-answer at all ports (give numbering system)
		Operator set-up
		Dial out
14	Control capabilities	
14.1	Numbering of terminals	Yes/No
	Master/slave	No/Yes + details
	Simple chair control using BAS	Yes/No
14.2	MLP facilities	No/Yes (details below)
	– Chair control (incl audio/video switching)	Yes/No
	– Selection of primary and normal comm.	Yes/No
	– Control of telematic terminal equipment	Yes/No
	– Storage/retrieval at MCU	Yes/No
15	Terminal identification	No/TCI/TCS
16	MBE capability	Yes/No

TABLE 1/H.231 (*end*)

Ref.	Attribute	MCU Type and values				
		A	B(d*)	C	C2	C(d*)
1	Maximum number of terminals that can be connected to a single MCU					
2	Maximum number of concurrent (independent) conferences that can be supported in a single MCU					
3	Maximum number of ports that can be connected to other MCUs (if non-zero, state whether item (1) above is dependent)					
4.1	Network interfaces at each port (if not all the same, give details)					
4.2	Restricted network capability					
5	Transfer rates available at each port	64k	64k	2B	2B	2B
6	Audio processor					
6.1	Mixed/switched (give details)	Mixed	Mixed	Mixed	Mixed	Mixed
	Noise/echo suppression on "silent" ports					
6.2	Audio algorithm at each port	G.728 + G.711	G.722 + G.711	G.722 + G.728 + G.711	G.728 + G.711	G.722 + G.728 + G.711
7	Video processor (moving pictures)	Yes	*	Yes	Yes	Yes
7.1	Switched/mixed (give details)	Switch		Switch	Switch	Switch
9	Data processor	*	Yes	*	*	Yes
9.1	Data broadcast facility, LSD		up to 14.4k			up to 14.4k
	Data broadcast facility, HSD		*		*	
9.2	MLP processor	*	*	*	*	*
10	Encryption	*	*	*	*	*
11	Method of choosing selected common mode – SCM					
12	Can deal with secondary terminals as audio only	Yes	Yes	Yes	Yes	Yes
13	Call set-up provision(s)					
14	Control capabilities					
14.1	Numbering of terminals	*	*	*	*	*
	Master/slave	*	*	*	*	*
	Simple chair control using BAS	*	*	*	*	*
14.2	MLP facilities	*	*	*	*	*
	– Chair control (incl audio/video switching)					
	– Selection of primary and normal comm.					
	– Control of telematic terminal equipment					
	– Storage/retrieval at MCU					
15	Terminal identification	*	*	*	*	*
16	MBE capability	*	*	*	*	*

* Means that when set to work as the listed type, such facilities, if present, are disabled.
Where there is no entry, implementers are free to use appropriate options..

5 "Listed" multipoint control units

Given the very wide range of possible MCU properties and capabilities, it is appropriate to identify a rather narrower range which can be referred to for clarity and convenience, without any implication that other conformant MCUs are in any way non-standard. This narrower range is more exactly defined and understood, and applicable to fairly common service implementations using terminals which may be widely available and not highly specialised. The listed MCUs are presented in Table 2.

The listed MCUs have relatively few options. Manufacturers may include in a given product one (or more) of the listed types, thus assuring a customer of a known range of behaviour when used with equipment from other manufacturers; "enhancements" of various types could also be included and would themselves be conformant with available Recommendations, but the behaviour when used with other equipment might be less predictable or give problems of complexity at the man-machine interface.

6 Terminal requirements and options

All terminals must conform to the provisions of Recommendations H.221, H.230 and H.242.

A terminal intended for chair-control operation (see Recommendation H.243) must be able to transmit CCA, CIS and to recognise CIC, CIT, CIR, TIA, TIN, TID, TIL (which involves MDE messages), TIF... If video is involved, the chair-control terminal must further be able to transmit VCB, VCE and to recognise VCR and VIN. Other functionality may be desirable, according to the provisions of 7/H.243.

TABLE 2/H.231

Listed MCU capabilities

Ref.	Attribute	MCU Type and values				
		D	D(d**)			
1	Maximum number of terminals that can be connected to a single MCU					
2	Maximum number of concurrent (independent) conferences that can be supported in a single MCU					
3	Maximum number of ports that can be connected to other MCUs [if non-zero, state whether item (1) above is dependent]					
4.1	Network interfaces at each port (if not all the same, give details)					
4.2	Restricted network capability					
5	Transferr rates available at each port	H_0	H_0			
6	Audio processor					
6.1	Mixed/switched (give details)	Mixed	Mixed			
	Noise/echo suppression on "silent" ports					
6.2	Audio algorithm at each port	G.722 + G.711	G.722 + G.711			
7	Video processor (moving pictures)	Yes	Yes			
7.1	Switched/mixed (give details)	Switch	Switch			
9	Data processor	*	Yes			
9.1	Data broadcast facility, LSD		**			
	Data broadcast facility, HSD		**			
9.2	MLP processor	*	*			
10	Encryption	*	*			
11	Method of choosing selected common mode – SCM					
12	Can deal with secondary terminals as audio only	Yes?	Yes?			
13	Call set-up provision(s)					
14	Control capabilities					
14.1	Numbering of terminals	*	*			
	Master/slave	*	*			
	Simple chair control using BAS	*	*			
14.2	MLP facilities	*	*			
	– Chair control (incl audio/video switching)					
	– Selection of primary and normal comm.					
	– Control of telematic terminal equipment					
	– Storage/retrieval at MCU					
15	Terminal identification	*	*			
16	MBE capability	*	*			

* Means that when set to work as the listed type, such facilities, if present, are disabled.
Where there is no entry, implementers are free to use appropriate options.

** LSD and HSD maximum rates are for further study.

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