INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

H.223

Annex B
(02/98)

SERIES H: AUDIOVISUAL AND MULTIMEDIA SYSTEMS

Infrastructure of audiovisual services – Transmission multiplexing and synchronization

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Multiplexing protocol for low bit rate multimedia communication

Annex B: Multiplexing protocol for low bit rate multimedia mobile communication over moderate error-prone channels

ITU-T Recommendation H.223 – Annex B

(Previously CCITT Recommendation)

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ITU-T RECOMMENDATION H.223

MULTIPLEXING PROTOCOL FOR LOW BIT RATE MULTIMEDIA COMMUNICATION

ANNEX B

Multiplexing protocol for low bit rate multimedia mobile communication over moderate error-prone channels

Summary

This Annex specifies an error robust framing scheme for the multiplexing protocol H.223. The protocol provides against transmission errors occurring in error-prone environments like mobile channels. This Annex includes the basic features of Annex A/H.223. In addition, the header describing the MUX-PDU contents includes error protection. Finally, the packet marker bit is replaced by the use of a one's complemented synchronization flag.

Source

Annex B to ITU-T Recommendation H.223 was prepared by ITU-T Study Group 16 (1997-2000) and was approved under the WTSC Resolution No. 1 procedure on the 6th of February 1998.

FOREWORD

ITU (International Telecommunication Union) is the United Nations Specialized Agency in the field of telecommunications. The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the ITU. 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, establishes the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

INTELLECTUAL PROPERTY RIGHTS

The ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. The ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, the ITU had received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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MULTIPLEXING PROTOCOL FOR LOW BIT RATE MULTIMEDIA COMMUNICATION

ANNEX B

Multiplexing protocol for low bit rate multimedia mobile communication over moderate error-prone channel

(Geneva, 1998)

B.1 General

This Annex specifies the level 2 protocol of the mobile H.223 extensions as described in Annex C/H.324. This Annex only changes MUX-PDU framing of the multiplex layer; however, the adaptation layer of Recommendation H.223 stays unchanged.

B.2 Abbreviations

For the purpose of this Annex, the following abbreviation is added to clause 4/H.223.

MPL Multiplex Payload Length

B.3 Multiplex (MUX) layer specification

The MUX-PDU framing of Recommendation H.223 is changed. Instead of using 6.3/H.223 to 6.6/H.223, Level 2 shall use the following procedures and definitions.

B.3.1 MUX-PDU framing

See A.2.1.1/H.223 for basic mode. Consecutive synchronization flags shall not be used in level 2. This Annex shall also not support double-flag mode. If the transmitter has no information to send, the stuffing-mode procedure of B.3.2.3 shall be used.

B.3.1.1 Flag detection

One fundamental property of the synchronization flag used in this Annex is that it has an auto-correlation offering good detection properties, and the cross correlation between the flag and its one's complement exhibits the same strong detection property in the negative direction. Given a correlator which performs a synchronization search at specified positions, the output of that correlator can be used to signal additional information by detecting a one's complement flag for specific information. This is used within Recommendation H.223 for signalling the PM information, and for signalling transitions between levels.

The detection of the start of a MUX-PDU by the receiver should be done by correlation of the incoming bit stream with the MUX-PDU flag described in this subclause. In determining the correlation sum, the correlator should interpret the zeros of the MUX-PDU flag to be "–1". The output of the correlator should then be compared with both a Correlation Threshold (CT) and its negative (–CT). The receiver should decide that a flag has been detected when the output of the correlator is either equal to or greater than CT, or if the output is less than or equal to –CT. The value of CT is not specified in this Annex, but is instead left to the discretion of the implementor. The octet-aligned structure of the MUX-PDUs should be used to reduce the emulation of sync flags.

B.3.2 MUX-PDU format and coding/decoding

All MUX-PDUs shall conform to the format shown in Figure B.1.

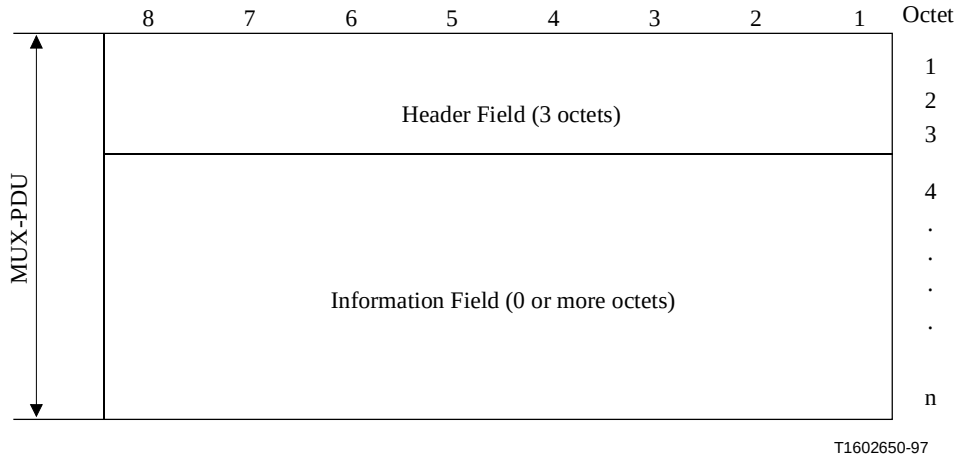

Figure B.1/H.223 – MUX-PDU format

B.3.2.1 Header Field

The format of the header shall conform to the format shown in Figure B.2.

8	7	6	5	4	3	2	1	Octet
MPL4	MPL3	MPL2	MPL1	MC4	MC3	MC2	MC1	1
P4	P3	P2	P1	MPL8	MPL7	MPL6	MPL5	2
P12	P11	P10	P9	P8	P7	P6	P5	3

Figure B.2/H.223 – Header format of the MUX-PDU

The MC4 and MPL8 are the MSB of the MC and MPL fields, respectively. The P-bits are defined in B.3.2.1.3.

NOTE – The bit order of the fields in Figures B.2 and B.4 is not in accordance to the general convention of Recommendation H.223.

An optional header for this Annex provides the capability to use the previous MUX-PDU whose header is corrupted due to channel errors. Figure B.3 shows the format of the MUX-PDU when using this option, and Figure B.4 shows the format of the optional header. The optional header contains the packed master signalling and multiplex code of the previous MUX-PDU.

The values of MC' and PM' are as indicated by MC and PM, respectively, in H.223/Level 0. The HEC' field shall be calculated from MC' according to the procedure described in 6.4.1.2/H.223. The use of this optional field shall be signalled by an H.245 "h223MultiplexReconfiguration.h223ModeChange.toLevel2withOptionalHeader" message, and started using the procedure defined in C.6/H.324.

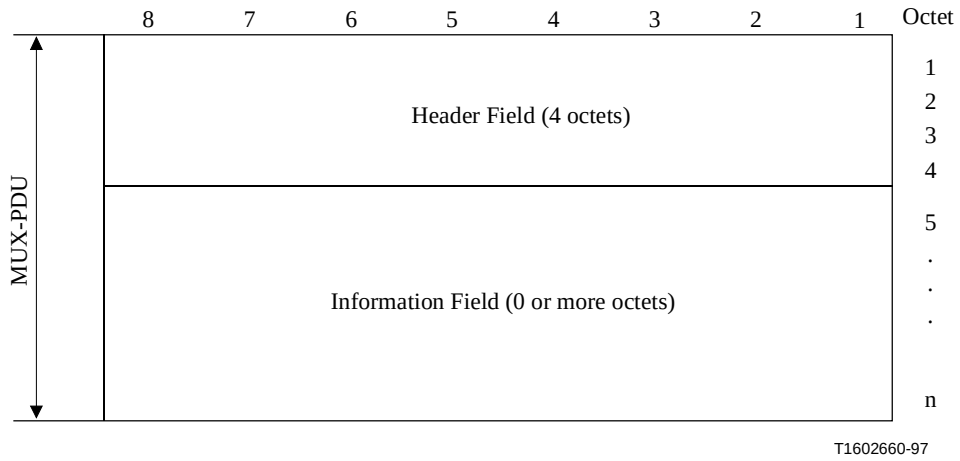

Figure B.3/H.223 – Optional MUX-PDU format

8	7	6	5	4	3	2	1	Octet
MPL4	MPL3	MPL2	MPL1	MC4	MC3	MC2	MC1	1
P4	P3	P2	P1	MPL8	MPL7	MPL6	MPL5	2
P12	P11	P10	P9	P8	P7	P6	P5	3
HEC' 3	HEC' 2	HEC' 1	MC' 4	MC' 3	MC' 2	MC' 1	PM'	4

Figure B.4/H.223 – Header format of the MUX-PDU

B.3.2.1.1 Multiplex Code (MC) field

See 6.4.1.1/H.223.

B.3.2.1.2 Multiplex Payload Length (MPL) field

The 8-bit MPL field describes the length of the information field in octets (see Figure B.2). The value of MPL shall be between 0 and 254. The value 255 shall not be used and is left for future use.

B.3.2.1.3 Parity bits field

The Extended Golay (24,12,8) code:

The Golay (23,12,7) code is a perfect code and in its conventional form shall be generated by the following generator polynomial:

$$G = 1 + X^2 + X^4 + X^5 + X^6 + X^{10} + X^{11}$$

The code shall be extended by adding an overall parity (even overall parity) check bit to produce a rate 1/2 code. The parity bits P shall be derived from the equation below.

$$\begin{bmatrix} P1 \\ P2 \\ P3 \\ P4 \\ P5 \\ P6 \\ P7 \\ P8 \\ P9 \\ P10 \\ P11 \\ P12 \end{bmatrix} = \begin{bmatrix} 1\,0\,1\,0\,1\,1\,1\,0\,0\,0\,1\,1 \\ 1\,1\,1\,1\,1\,0\,0\,1\,0\,0\,1\,0 \\ 1\,1\,0\,1\,0\,0\,1\,0\,1\,0\,1\,1 \\ 1\,1\,0\,0\,0\,1\,1\,1\,0\,1\,1\,0 \\ 1\,1\,0\,0\,1\,1\,0\,1\,1\,0\,0\,1 \\ 0\,1\,1\,0\,0\,1\,1\,0\,1\,1\,0\,1 \\ 0\,0\,1\,1\,0\,0\,1\,1\,0\,1\,1\,1 \\ 1\,0\,1\,1\,0\,1\,1\,1\,1\,0\,0\,0 \\ 0\,1\,0\,1\,1\,0\,1\,1\,1\,1\,0\,0 \\ 0\,0\,1\,0\,1\,1\,0\,1\,1\,1\,1\,0 \\ 1\,0\,1\,1\,1\,0\,0\,0\,1\,1\,0\,1 \\ 0\,1\,0\,1\,1\,1\,0\,0\,0\,1\,1\,1 \end{bmatrix}^{T} \bullet \begin{bmatrix} MC1 \\ MC2 \\ MC3 \\ MC4 \\ MPL1 \\ MPL2 \\ MPL3 \\ MPL4 \\ MPL5 \\ MPL6 \\ MPL7 \\ MPL8 \end{bmatrix}$$

NOTE – The symbol T denotes matrix transposition.

This code has a systematic structure. In the event of no channel errors, it is possible to extract the data without the need for complex decoding of the code word.

B.3.2.2 Information Field

See 6.4.2/H.223.

B.3.2.3 Stuffing mode

If no information is available, the stuffing mode shall be used. The multiplexer shall indicate a Level 2 stuffing mode by inserting a Level 2 synchronization flag followed by a Level 2 header (either the normal Level 2 header or the optional header in B.3.2.1, depending on the mode of operation). The MPL field shall be "00000000" and the MC shall be "0000". This stuffing mode may be inserted consecutively an arbitrary number of times.

B.3.3 Marking of MUX-SDU boundaries

This subclause replaces 6.5/H.223.

It is necessary to detect the boundaries of MUX-SDUs in the receiver in order to identify the location of all fields which the receiver must interpret in the AL and/or in a frame-oriented higher layer. This shall be accomplished as follows.

For non-segmentable logical channels, each MUX-SDU shall begin coincident with a slot specified in a single MultiplexElement structure whose type is logicalChannelNumber (see Recommendation H.245), and shall end after the specified repeatCount, or at the closing flag of the current MUX-PDU, whichever occurs first. The actual length of the MUX-SDU may be smaller than the length of the slot, provided that the current MUX-PDU is terminated by a closing flag immediately after the MUX-SDU. Since the size of each MUX-SDU may vary, multiple multiplex table entries may be defined to match the possible lengths of MUX-SDUs, in order to mix these MUX-SDUs with octets from other logical channels. It should be noted that the definitions given here together with the conditions given in Recommendation H.245 imply that it is allowed to place more than one MUX-SDU from a non-segmentable logical channel in one MUX-PDU, but only when the remote receiver has indicated the enhanced multiplex capability.

For segmentable logical channels, each MUX-SDU may be broken into segments and these segments may be transferred in one or more MUX-PDUs. A one's complemented closing flag shall be used to indicate that the last octet of the previous MUX-PDU was the final octet of the terminating MUX-SDU. As a result of this procedure, only one segmentable MUX-SDU is permitted to terminate within a MUX-PDU; as soon as the end of any MUX-SDU from a segmentable logical channel is reached, the MUX-PDU shall be terminated with a one's complemented closing flag. In all other circumstances the one's complemented flag shall not be used. Another result of this procedure is that a MUX-PDU will never contain octets from two different MUX-SDUs of the same segmentable logical channel.

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