Recommendation T/N 34-02 E (Edinburgh 1988)

MESSAGE CHANNEL SPECIFICATION, LAYERS 1-6 FOR USE IN AUDIOVISUAL COMMUNICATION

Recommendation proposed by Working Group T/WG 14 "Network Aspects" (NA)

Text of the Recommendation adopted by "Telecommunications" Commission:

"The European Conference of Postal and Telecommunications Administrations,

considering that

there is an increasing demand for audiovisual services, and especially national and international multipoint conferencing; such services consisting of basic audiovisual facilities and a variety of optional enhancements, and

recognising

the need for flexible controls and indications (C&I) for both basic facilities and enhancements,

recommends

to members of the CEPT that they adhere to the specification for a control and indications channel, termed the 'Message Channel', as contained in this Recommendation."

1. SCOPE

This document presents the method agreed in Europe for transmission of control and indications information between terminals and Multipoint Control Units (MCUs) in both audio and video applications. Layers 1 to 6 are common to audio and video applications and are specified in this document.

2. MESSAGE CHANNEL

The message channel data rate is 4 kbit/s.

In the audio application, the message channel information is carried in the bits 41 to 80 of the service channel (the eighth bit of each octet of the 64 kbit/s channel) as specified in draft CEPT Recommendation T/TR 01-03: "Frame Structure at 64 kbit/s for Multimedia Applications".

In the video applicaiton, using A law speech in accordance with CCITT H.130, the message channel information is carried in Timeslot 2 odd bit 5.

3. GENERAL MESSAGE STRUCTURE

Four layers within the message structure are defined in this document:

- Layer 1: The physical layer as specified in CCITT X.21 (1984).
- Layer 2: The link control layer which uses a HDLC technique as spedified for LAB-B in layer 2 of CCITT Recommendation X.25 (1984).
- Layer 3: This layer is responsible for routing of messages.
- Layer 6: The presentation layer describing the format and coding of messages, according to CCITT Recommendation X.409 (1984).

For audiovisual communication, layers 4 and 5 are not needed for the time being.

4. LAYER 2

4.1. General Aspects

The link Access Procedure B as described in CCITT Recommendation X.25, section 2, is chosen for the layer 2 protocol of the Message Channel.

The basic mode (modulo 8) is used.

4.2. Parameters of LAP-B

The following parameters will be used:

Information lenght (max): N1 = 128 bytes (for further study, see *Note 1*)

Window size: K = 7

Retransmission Timeout: T1 = 2 s

Number of retransmissions: N2 = 10

Parameters T2, T3:
If a silicon implementation of X.25 layer 2 is used, e.g. WD 2511, MC68605, parameters T2 and T3 need not be specified
Otherwise,
$T2 < T1 - (\text{max transmission delay} + \text{max layer 2 frame processing time})$
$T3 > T1 * N2$

Note 1. The needs of some layer 7 facilities, not part of this Recommendation, may require a longer frame length than 128 bytes.

4.3. Use of XID frames

XID frames will be used by terminals and Multipoint Control Units (MCUs) for layer 2 address negotiation, prior to layer 2 X.25 initialisation. The format of XID frames is defined in ISO 8885.

The need for XID layer 2 address negotiation is explained thus:
Correct operation of an X.25 link requires that the two ends of the link adopt complementary roles, i.e. DTE-DCE. In this specification the default conditions are:
Terminal = DTE, Address 01
MCU = DCE, Address 03
However, under some configurations, e.g. Terminal to Terminal and MCU to MCU, the above constraint of DTE-DCE is violated.

The situation is resolved in the following manner:
1. A default assignment is assumed, Terminal = DTE, MCU = DCE.
2. In those cases where the two ends of the link are detected as having identical role at initialisation, then one end must adopt the complementary role for the duration of the connection.

Such a mechanism is described below, where both ends of the link assume their default assignments, DTE or DCE, initially.

Both sides will start this procedure immediately the physical link becomes active.

XID frames are transmitted at 5-s intervals, continuoulsy, until an XID frame is received from the distant end.

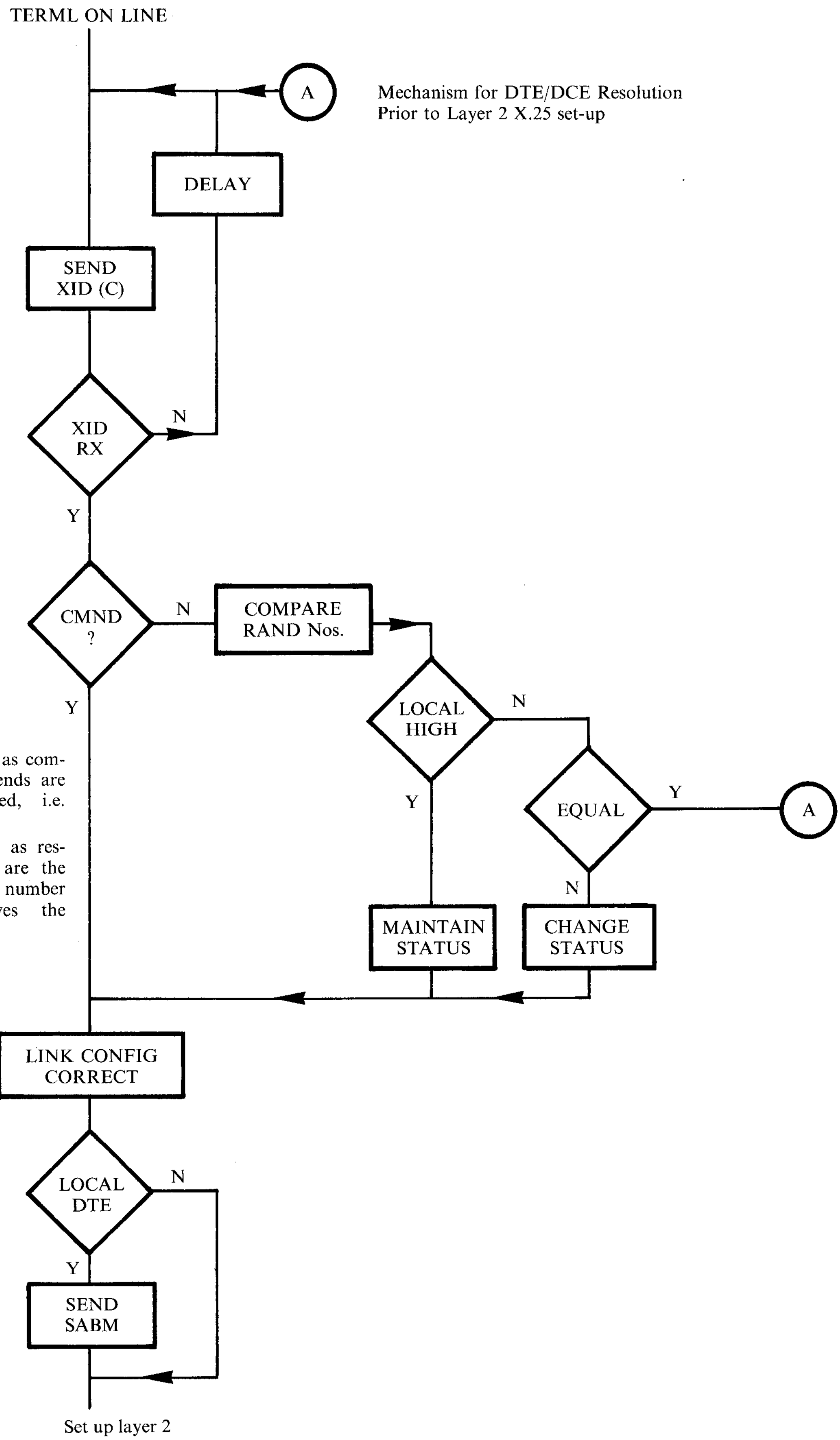
The XID frame is always transmitted as a command. If the other end of the link interprets the received XID frame as a command, then the link must be correctly configured. If not, then the situation is resolved by comparing local and remote random numbers that are transmitted in the XID frames. Should the XID random numbers be the same, then the procedure is repeated.

The frame structure of the XID frame, according to ISO 8885, is shown below:

Addr	Cntrl	FI	GI	GL	PI	PL	PAR	FCS

Addr	Address:	01 (Cmnd from DTE) 03 (Cmnd from DCE)
Cntrl	Control:	AF (XID control code)
FI	Format Ident:	82 (XID frame format identifier)
GI	Group Ident:	41 (Address Resolution)
GL	Group Length:	0004 (Length of PI + PL + PAR)
PI	Param Ident:	01 (Parameter Ident for Unique Identifier)
PL	Param Length:	02 (Length of Parameter value) 1 byte
PAR	Parameter:	Random Number (2 bytes)
FCS:		Frame Check Sequence

Figure 1 (T/N 34-02) shows the Layer 2 Address Negotiation procedure.



If XID interpreted as command, then both ends are correctly configured, i.e. DTE-DCE.

If XID interpreted as response, both ends are the same. The random number mechanism resolves the situation.

Figure 1 (T/N 34-02). Layer 2 Address Negotiation procedure.

5. LAYER 3

5.1. Routing

Messages are transferred on a point-to-point basis between terminals and/or Multipoint Control Units (MCUs). The MCU acts as a message switch. The following routings are possible:

— terminal to terminal directly connected
— terminal to terminal via MCU or MCUs
— terminal to MCU
— MCU to terminal
— MCU to MCUs
— broadcast terminal to terminals
— broadcast terminal to terminals plus MCUs
— broadcast MCU to terminals

5.2. Format

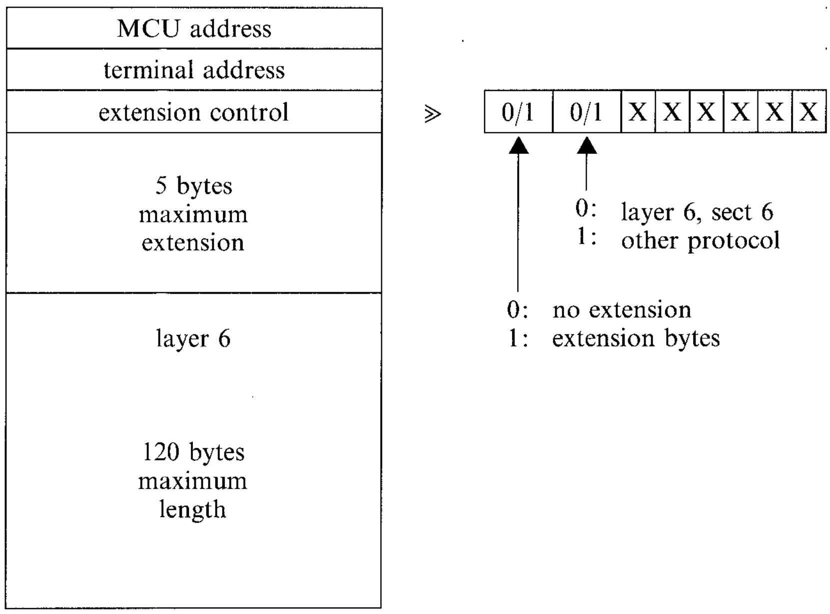


Figure 2 (T/N 34-02). Layer 3 format.

The first two bytes at layer 3 are allocated as follows:

1st byte (MCU)	2nd byte (Terminal)	Destination
00	— (*Note 1*)	(point-to-point operation) *Note 2*
<MCU>	00	Specific MCU *Note 4*
<MCU>	<TML>	Specific Terminal
FF	—	All Terminals
FE	—	All Terminals plus MCUs
FD	—	All MCUs
FC	—	All local Terminals (i.e. TMLs connected to MCU where message originated, *Note 3*)

Note 1. "—" means that the content of this byte is irrelevant. A "00" codeword can be used.

Note 2. Used in point-to-point conferences, or by a terminal which does not know its own number yet, during the address allocation phase.

Note 3. Used, for instance, during a double MCU conference when a MCU informs its locally connected TMLs that the inter-MCU link is restored, after failure.

Note 4. <MCU> may take values from 01 upwards, e.g. 01 and 02 in a double MCU conference. <TML> : Terminals are numberd from 01 upwards, according to the MCU port number.

Byte 3:
The first bit is an extension bit, set to 0 if no extension. Five bytes maximum can be added for future use.

The second bit is a "protocol discriminator" (PD).

When using layer 6 as defined in chapter 6, PD = 0 and the third byte has the following structure:
0 0 X X X X X X where X is "don't care"

Other codes may be used in future for further extension of layer 3, if needed.

Note. If no layer 6 content (e.g. Address Allocation Procedure as in 5.3.), PD = 0.

5.3. Address Allocation Procedure

The MCU number is pre-allocated by prior agreement, e.g. in the reservation phase. The goal of this address allocation procedure is to let each Terminal know its own address, and to let each MCU know whether its ports are connected to a Terminal, or another MCU.

A) from the MCU side, the procedure takes place in three steps:

Step 1: Sent to each port a layer 3 message, i.e. 3-byte containing its own MCU number, the port number, the extension byte (no information field, at this stage).

Step 2: Three possible messages may then be received:
- i) 00/00/00: message sent by a Terminal which has not yet received the message sent in step 1.
- ii) MCU/00/00: message sent by a Terminal which received the message sent in step 1, and which acknowledges it.
- iii) (Other MCU)/(other port)/00: message sent by another MCU as described in step 1. In this case, step 3 must be activated.

Step 3: The MCU re-sends a layer 3 message with the content MCU'/00/00, acknowledging the other MCU. (MCU' = other MCU number.)

B) from the Terminal side, the procedure takes place in three steps:

Step 1: The Terminal continuously sends a layer 3 message consisting of 00/00/00.

Step 2: Two possible messages may then be received:
- i) 00/00/00: message sent by another Terminal, implying a point-to-point configuration.
- ii) MCU/port/00: message sent by a MCU. In this case, step 3 is activated.

Step 3: The Terminal replies with a message with MCU/00/00.

Figure 3 (T/N 34-02) illustrates the procedure as described.

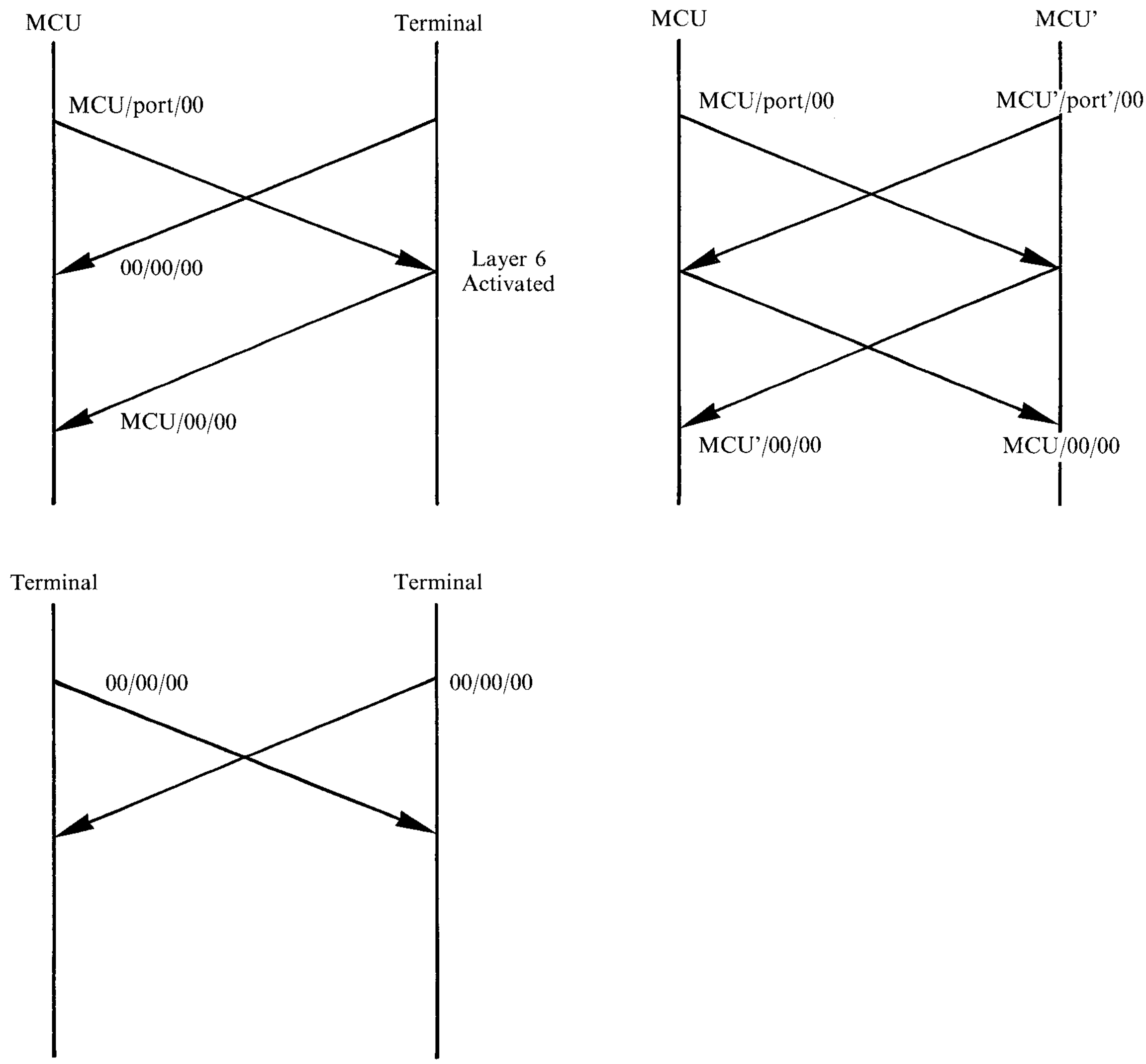


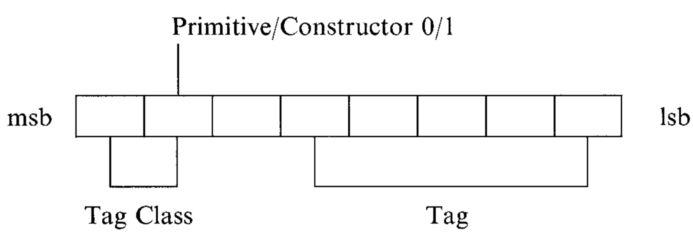
Figure 3 (T/N 34-02). Address Allocation Procedure.

6. LAYER 6

6.1. Coding of messages

At layer 6, the messages are encoded, according to CCITT specification X.409, in the ILC (Identifier, Length,Content) form.

An X.409 Identifier byte is of the form:



In the above diagram the bits are allocated as follows:

Tag class: defines the type of identifier
01 Application wide, e.g. unique to audio/video conferencing message repertoire.
10 Context specific, e.g. unique within a part of a message.

Primitive: single ILC.

Constructor: nested ILCs e.g. IL{(ILC)(ILC)}.

Note. Maximum of 2 levels of nesting are recommended.

Tag: uniquely defines the identifier (according to its class).

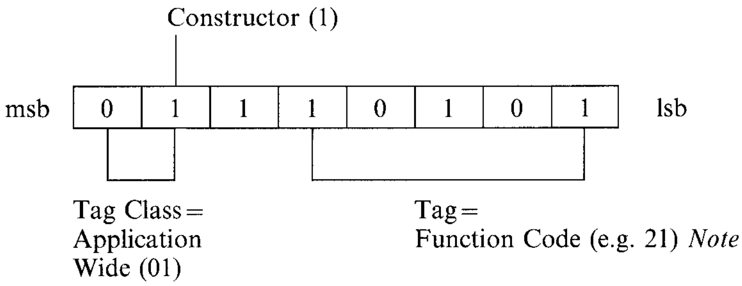
Note. The 5 bits available for tagging allow 30 unique values. Values higher than 30 require the use of the "extended form" of tagging.

All messages contain the following: Function Code, Destination Address, Source Address.

Those messages which include data will also have an Information field.

6.2. Function Code

The X.409 facility of "tagging" an Identifier allows the Function Code of each message to be placed in the tag of the overall message Identifier, i.e. in the first byte, as shown in the following example:



Note. For Function codes greater than 30, the Tag above is set to 11111 which indicates that an extension byte(s) follows. An extension byte(s) caters for Tags greater than 30. The last extension byte must have msb bit 8 set to zero.

6.3. Address Fields

The Contents of the Layer 6 Destination and Source fields are 3 octets long and are encoded as shown below:

Destination: identical to the layer 3, octets 1 and 2.

Note. Destination has no routing function but is retained in layer 6 for possible future use.

Source:

1st Byte (MCU)	2nd Byte (TML)	Source
00	00	Point to point
<MCU>	<TML>	Specific TML
<MCU>	00	Specific MCU

Byte 3: The third byte allows sub-addressing, e.g. Participant number or Microphone number. Set to zero when not used.

The Identifier bytes for Destination and Source can be defined uniquely since, from 6.1., both are of class: Context Specific, and both are always of type: Primitive.

X.409 Tags are allocated as shown, giving Identifier bytes for each field as follows:

Destination (tag 0) Identifier has value 80H
Source (tag 1) Identifier has value 81H