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TRANSMISSION OF NON-TELEPHONE SIGNALS

SYNCHRONIZED AGGREGATION OF MULTIPLE 64 OR 56 kbit/s CHANNELS

ITU-T Recommendation H.244

(Previously "CCITT Recommendation")

FOREWORD

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NOTE

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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Recommendation H.244

SYNCHRONIZED AGGREGATION OF MULTIPLE 64 OR 56 kbit/s CHANNELS

(Geneva, 1995)

1 Scope

This Recommendation provides for synchronisation and aggregation of multiple channels of 64 kbit/s or 56 kbit/s, each being with or without octet integrity and relative transmission delay in the range ± 1 second. It is applicable to a wide range of user data transport up to 63 channels using ISO/IEC standard 13871, but special provision is made for audiovisual systems according to Recommendation H.221 [1], up to 24 channels; the aggregation may be network-based or associated with Customer-Premises Equipment. The available operating modes (B1, B2, B3, H2) provide options with/without transmission-management overhead and user-data rates at/less-than the exact multiples of 64/56 kbit/s.

The number of aggregated channels may be varied dynamically during a session. Procedures are given for dealing with faults, including loss of channels and slip.

Call control is not covered in this Recommendation.

2 Normative references

The following Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; all users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published.

- [1] ITU Recommendation H.221 (1993), *Frame structure for a 64 to 1920 kbit/s channel in audiovisual teleservices*.
- [2] ITU Recommendation H.242 (1993), *System for establishing communication between audiovisual terminals using digital channels up to 2 Mbit/s*.
- [3] ITU Recommendation H.320 (1993), *Narrow-band visual telephone systems and terminal equipment*.
- [4] ISO/IEC CD 13871, *Digital Channel Aggregation*.
- [5] ITU Recommendation H.230 (1995), *Frame-synchronous control and indication signals for audiovisual systems*.

3 Definitions and symbols

3.1 Definitions

For the purposes of this Recommendation, the following definitions apply:

- 3.1.1 H.244 aggregation:** Channel aggregation by the process described in clauses 7 and 8.
- 3.1.2 ISO aggregation:** Channel aggregation by the process described in [4].
- 3.1.3 single channel equipment (SCE):** A terminal or other unit (such as a LAN interface) having an interface for a single bidirectional digital connection.
- 3.1.4 multiple channel equipment (MCE):** A terminal or other unit (such as a LAN interface) having interface(s) for multiple bidirectional digital connections at 64 kbit/s each.

3.1.5 channel aggregation unit (CAU): A device having both multiple 64 kbit/s accesses and a single access at a higher bit rate. Reference in this Recommendation to “CAU” or “aggregator” shall mean equipment conforming to this Recommendation.

3.1.6 H.221 frame structure, H.221 framing: Frame structure according to Recommendation H.221, as set out in [1].

3.1.7 Capset: Abbreviation for “Capability set” – see [2].

3.1.8 user information: The application data streams passing (in both directions) between CAU and SCE. (See Note 1.)

3.1.9 calling end: The CAU or MCE which requests the first 64/56-channel connection of the whole session, resulting in the establishment of the “initial channel”. If during fault-recovery procedures the initial channel is transferred to another connection, this does not affect the definition. (See Note 2.)

3.1.10 called end: The CAU or MCE which accepts the first 64/56-channel connection request of the whole session, resulting in the establishment of the “initial channel”. If during fault-recovery procedures the initial channel is transferred to another connection, this does not affect the definition. (See Note 2.)

3.1.11 TAC case: In-band communication between SCE and CAU takes place using H.221 BAS codes – see clauses 7-8.

3.1.12 NoTAC case: No in-band management communication between SCE and CAU takes place – the single channel is only a clear path for the data which will be wholly transmitted to the remote party; any communication between the terminal and the CAU is by means not specified in this Recommendation.

3.1.13 modes B1, B2, B3: Modes of aggregation by the method of [4] – see 5.2.

3.1.14 mode H2: Modes of aggregation by the method of clauses 7-8.

3.1.15 redundant command: A BAS command which repeats, unchanged, a previously transmitted mode value which is still in force.

3.1.16 compatibility bits: Bit 8 of the first sixteen octets in every time-slot of a single channel except Time-slot 1.

3.1.17 external setting: This term is used to express operations outside the scope of this Recommendation which determine the behaviour of a CAU as to choice of option or timing of its action.

NOTES

- 1 In the audiovisual cases, the application data stream includes the H.221 frame structure.
- 2 The significance of “calling” and “called” end-points is mentioned in 8.1.3.

3.2 Symbols

NOTE – For readability, the capability and command values listed in References [1] and [5] are referred to in this Recommendation by their names rather than codepoint byte values; the use of {*name*} for capabilities and [*name*] for commands serves to distinguish between these.

N	An integer, applied to 64/56-channels to define a parallel (un-aggregated) bitstream of rate $N \times 64$ kbit/s.
n	An integer, applied to 64 kbit/s to define a serial (or otherwise aggregated) bitstream of rate $n \times 64$ kbit/s.
N_a	The number of active 64/56-channels between CAU and MCE or between two CAUs.
N_m	The maximum number of 64/56-channels which can be accepted by a CAU transmitting the value $\{N_m \times B\}$.
N'_m	Used to denote the incoming value of N_m from the remote CAU, or equivalent from an MCE.

N_d	The number of connections requested by the calling end, the lower of N_m and N'_m .
$\{N \times 64k\}$	Capabilities in the series $\{1B\}$, $\{2B\}$, $\{3B\}$ corresponding to $N = 1, 2, 3 \dots$ (applies to Mode H2 only).
$\{n*64k\}$	Capabilities in the series $\{64k\}$, $\{128k\}$, $\{192k\}$ corresponding to $n = 1, 2, 3, \dots$
n_m	Such that $\{n_m*64k\}$ is the highest transfer-rate capability incoming from the SCE for which the continuous series of rate capabilities $\{(n_m - 1)*64k\}$, $\{(n_m - 2)*64k\}$,..... $\{2*64k\}$ is also present in the capset.
$[N \times 64]$	Multiple-channel commands defined in [1].
$[n*64k]$	Single-channel commands defined in [1].
$[capex]$	Command issued by a CAU (see 7.3.6.3) to an SCE to stimulate a capability exchange.
$[AggIN]^*$	A double SBE symbol indicating the number n as determined by the process of 7.3.4.2; see the procedure described in clause 8 – see [5].
$\{null\}$	Capability having no significance other than as a filler; only ever transmitted by a CAU, and therefore it identifies the capset as having last come from, or been forwarded by, a CAU; SCE must ignore any number of these in an incoming capset – see [1].
$\{SM-comp\}$	Capability to transmit and receive user information without using any compatibility bits, setting these to 1 – see [1].
$[SM-comp]$	User information is not contained in the compatibility bits (and shall not be sent in the compatibility bits in the reverse direction either) – see [1].
S	Audible signal (to be defined), which would be recognised by a human user as a call progress tone (he would not hang up).

4 Abbreviations

For the purposes of the Recommendation, the following abbreviations are used:

BAS	Bit-rate Allocation Signal – see [1]
CAU	Channel Aggregation Unit
FAS	Frame Alignment Signal – see [1]
H.221	See 3.1
MC (side)	Multiple Channel (side, of a CAU)
MCE	Multiple-Channel Equipment
NCA, NIA, NIC, NID, NIS	See [5]
NoTAC	No Terminal-Aggregator Communication
SC (side)	Single Channel (side, of a CAU)
SCE	Single-Channel Equipment
SM-comp	Single-Multiple compatibility
TAC	Terminal-Aggregator Communication
UD	Unspecified Data

5 General

5.1 Application of this Recommendation

On the single-channel connections, which may be very short if the terminal and CAU are colocated, or much longer if a telecommunications link is involved, two options are provided for in this Recommendation:

- no in-band management communication on the single channel, this being only a clear path for the data which will be wholly transmitted to the remote party; any communication between the terminal and the CAU is by means not specified in this Recommendation; this is referred to as the “NoTAC” case – No Terminal-Aggregator Communication and applies when “ISO aggregation” is used (see [4]);
- in-band communication as specified in this Recommendation, using the BAS codes defined in [1] and the procedures of [2]; this is referred to as the “TAC” case – Terminal-Aggregator Communication, and applies when “H.244 aggregation” is used (see clauses 7 and 8).

5.1.1 Intercommunication of Audiovisual equipments

For audiovisual terminals conforming to [1] and [2], this Recommendation provides for synchronisation and aggregation of up to 24 channels of 64 kbit/s or 56 kbit/s, each being with or without octet integrity and relative transmission delay in the range ± 1 second.

Provision is made for the following intercommunication Cases A-C.

5.1.1.1 Case A

For interconnection of a single-channel (SCE) and a multiple-channel audiovisual end-point (MCE), both conforming to [1] and [2], only H.244 aggregation is permissible (see Figure 1); this involves only one CAU, which may be within the network or close to the single-channel end-point.

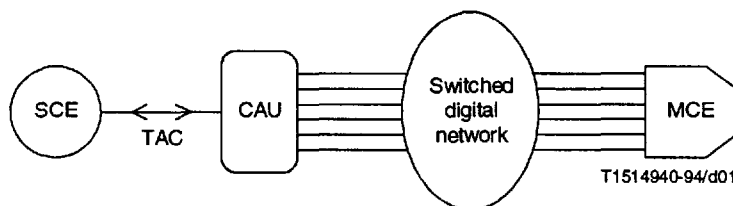


FIGURE 1/H.244

5.1.1.2 Case B

This case provides for interconnection between two single-channel audiovisual end-points which see the aggregated link purely as a clear data channel; each has a CAU associated with it, but there is no in-band control communication between the end-point and its associated CAU (see Figure 2); this is the NoTAC approach. The system is exactly the same as for unspecified data applications (see 5.1.2); the CAU-ISDN-CAU combination provides a clear channel at one of the transfer rates specified in [1], and therefore shall use ISO aggregation, Mode B1 or B3 (see 5.2).

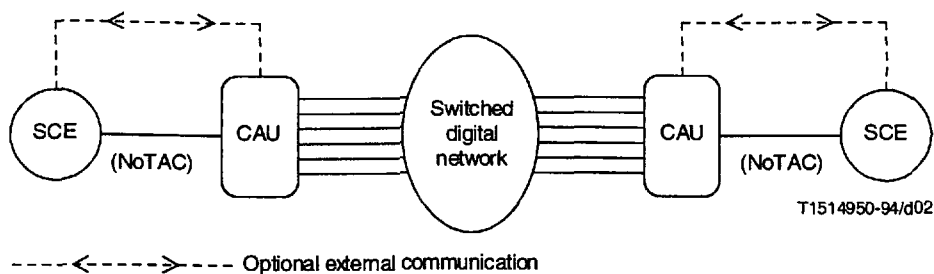


FIGURE 2/H.244

5.1.1.3 Case C

This provides for interconnection of two single-channel end-points both conforming to [1] and [2] and capable of the H.244 aggregation operation described in clauses 7-8 (see Figure 3); this involves two CAUs, which may be within the network or close to the single-channel end-points.

NOTE – It is not possible to use TAC at one end and NoTAC at the other – see clause 6.

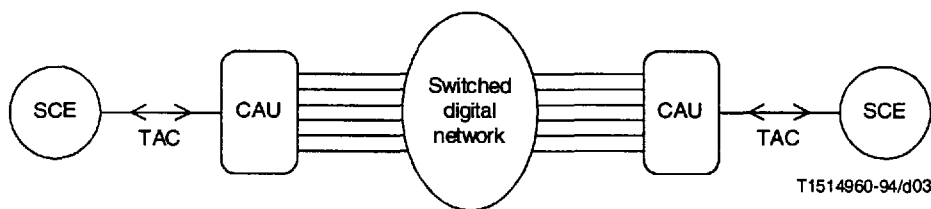


FIGURE 3/H.244

5.1.2 Intercommunication of non-audiovisual equipments – Case D

This Recommendation provides for synchronisation and aggregation of up to 63 channels of 64 kbit/s or 56 kbit/s, each being with or without octet integrity and relative transmission delay in the range ± 1 second. It is applicable to a wide range of user information transport, including LAN-LAN interconnect, private circuit back-up, and other “unspecified data” applications. No in-band control communication takes place on the single-channel side. The equipments see the aggregated link purely as a clear data channel, and the structure or content of the data streams is of no concern to the aggregating equipment.

ISO aggregation is appropriate (see Figure 2); the CAU-ISDN-CAU combination provides a clear channel at one of the transfer rates specified in [4] using Mode B1, B2 or B3 (see 5.2).

5.2 Definition of the Modes of transmission on the MC side

The four modes of transmission are defined below, the accompanying figures being given by way of example for the case of about 192 kbit/s on the SC side.

Mode B1 – The user information occupies an integral number of 64/56k channels (usually the N available and aligned channels); only unframed signals are transmitted (see Figure 4), alignment of the channels has previously been achieved using a framed mode, and it is assumed that no slip or other network fault has occurred since then. There are no management bits multiplexed into the stream on either MC or SC sides, and the total bit rates are equal; the Mode is therefore confined to NoTAC cases, and rate change is not possible.

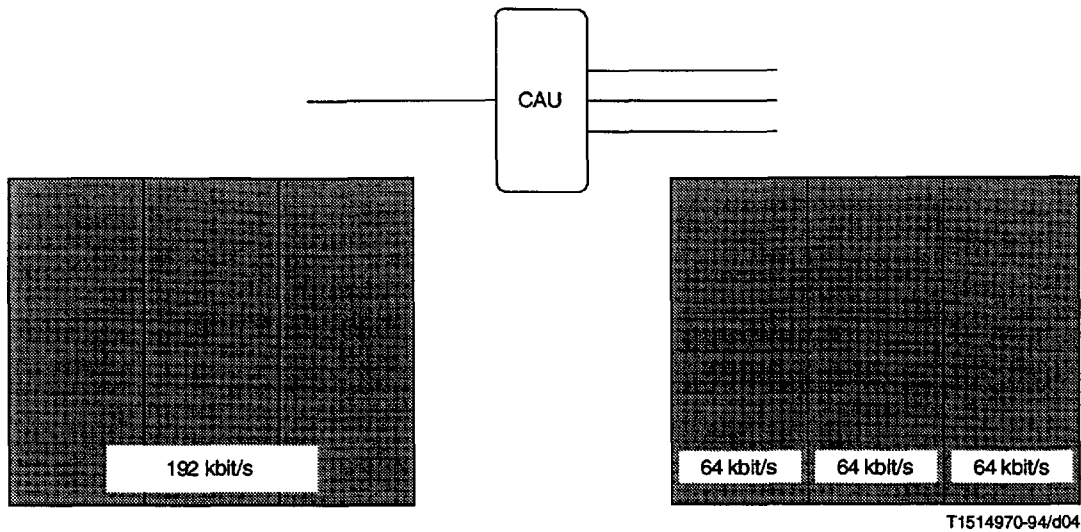


FIGURE 4/H.244

Audiovisual signals according to [1] can be transmitted, but the H.221 framing plays no part in the aggregation process, and will appear at a random position within one of the B-channels as shown in black in Figure 5.

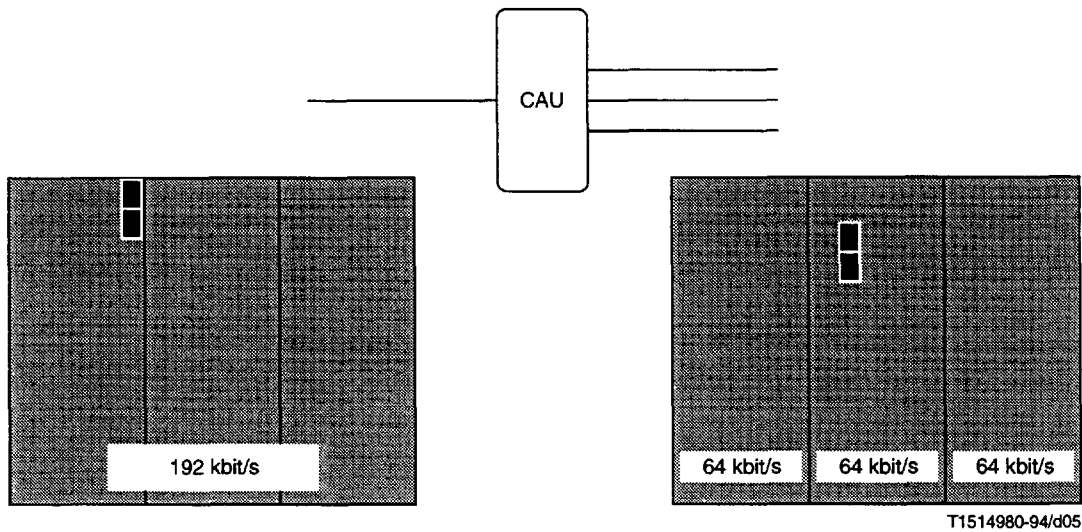


FIGURE 5/H.244

Mode B2 – Signals are transmitted with framing according to [4] (depicted as white in Figure 6), the user information rate being about 1.5% less than an integral multiple of 64/56 kbit/s due to the overhead of the frame structure. There is no provision for management bits on the SC side, so the use of this Mode is confined to the NoTAC case.