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Foreword

This draft European Telecommunication Standard (ETS) has been produced by the Network Aspects (NA) Technical Committee of the European Telecommunications Standards Institute (ETSI), and is now submitted for the Public Enquiry phase of the ETSI standards approval procedure.

Proposed transposition dates	
Date of latest announcement of this ETS (doa):	3 months after ETSI publication
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1 Scope

This ETS describes the protocol to support the Connectionless Broadband Data Service (CBDS) at the Network Node Interface (NNI) of Broadband Integrated Services Digital Network (B-ISDN) in accordance with:

- ETS 300 217 [1], which details the stage 1 aspects for the CBDS;

- ETS 300 478 [4], which provides the general framework to provide CBDS over Asynchronous Transfer Mode (ATM) and the protocol specification to support the service at the UNI.

2 Normative references

This ETS incorporates by dated and undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this ETS only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

[1]   ETS 300 217 (1992): "Network Aspects (NA); Connectionless Broadband Data Service".

[2]   CCITT Recommendation E.164 (1991): "Numbering plan for the ISDN era".

[3]   ETS 300 349: "Broadband Integrated Services Digital Network (B-ISDN); Asynchronous Transfer Mode (ATM) Adaptation Layer (AAL) specification - type 3/4".

[4]   prETS 300 478: "Network Aspects (NA); Connectionless Broadband Data Service (CBDS) over Asynchronous Transfer Mode (ATM); Framework and protocol specification at the UNI".

3 Abbreviations

For the purposes of this ETS, the following abbreviations apply:

AAL	ATM Adaptation Layer
ATF	Access Termination Functions
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
BAsize	Buffer Allocation size
BOM	Beginning Of Message
BTag	Beginning Tag
CBDS	Connectionless Broadband Data Service
CIB	CRC Indication Bit
CLAI	Connectionless Access Interface
CLL	Connectionless Layer
CLLR&R	Connectionless Layer Routeing & Relaying
CLNAP	Connectionless Network Access Protocol
CLNI	Connectionless Network Interface
CLNIP	Connectionless Network Interface Protocol
CLS	Connectionless Server
CLSF	Connectionless Service Function
CPCS	Common Part Convergence Sublayer
CPI	Common Part Indicator
CRC	Cyclic Redundancy Check
DA	Destination Address
EOM	End Of Message
ETag	End Tag
HE	Header Extension
HEL	Header Extension Length
IWU	Interworking Unit

MID	Multiplexing Identification
NNI	Network Node Interface
NTF	Network Termination Functions
OAM	Operation Administration and Maintenance
PDU	Protocol Data Unit
PI	Protocol Identifier
QoS	Quality of Service
SA	Source Address
SAP	Service Access Point
SAR	Segmentation And Reassembly
SDU	Service Data Unit
SSCS	Service Specific Convergence Sublayer
SSM	Single Segment Message
UNI	User Network Interface

4 Framework for the provision of CBDS

See ETS 300 478 [4], clause 4.

5 Layer service and functions provided by the Connectionless Layer (CLL)

See ETS 300 478 [4], clause 5.

6 Protocol for the support of the CBDS on B-ISDN at the NNI

6.1 Overview

The Connectionless Network Interface Protocol (CLNIP) supports the CBDS as specified in ETS 300 217 [1] between Connectionless Servers (CLSs) inside a network operator's domain and between two network operators' domains.

> NOTE: It is assumed that this protocol applies to all cases. Additional functionalities may be needed for the support of this service within a network operator domain.

The CLNIP provides two modes of operation: encapsulation and non-encapsulation. For the conditions for the selection of the mode of operation and the mechanisms to be applied in either mode see clause 7.

The CLNIP shall be applied at the Connectionless Network Interface (CLNI), as shown in figure 1.
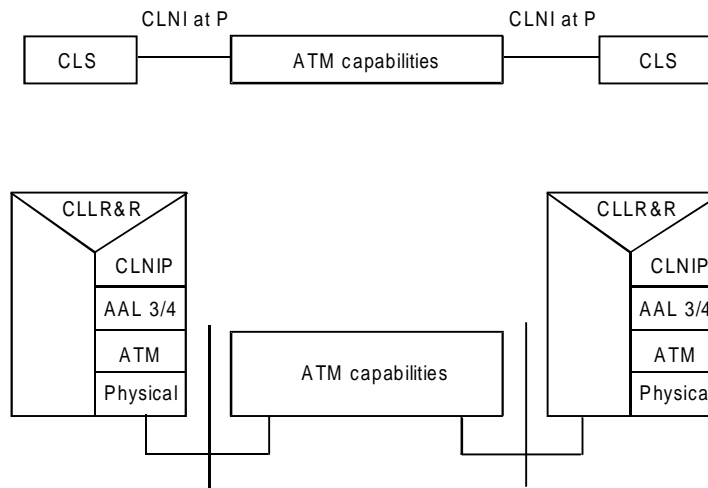
NOTE: A null (empty) SSCS is used.

Figure 1: Network and protocol architecture

6.2 Protocol stack

The protocol stack for supporting the transfer of connectionless data between CLSs is depicted in figure 2. The CLNIP uses the ATM Adaptation Layer (AAL) type 3/4 unassured service (using null SSCS) and includes the necessary functionality to provide the CLL service. For structure and encoding of AAL type 3/4 (Segmentation And Reassembly (SAR) sublayer and Common Part Convergence Sublayer (CPCS)) see ETS 300 349 [3].
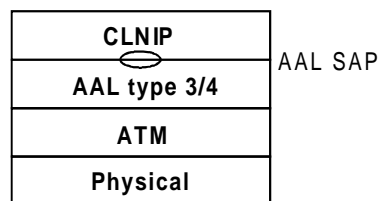
NOTE: A null (empty) SSCS is used.

Figure 2: Protocol stack for CLNIP

6.3 Layer service expected from the AAL

The CLNIP expects the AAL connection to provide for the transparent and sequence-preserving transfer of CLNIP Protocol Data Units (CLNIP-PDUs) between two CLNIP entities when accessing a point-to-point AAL connection. This transfer is operated in an unassured manner, i.e. lost or corrupted data units are not retransmitted (Unassured Operation).

The information transfer between the CLNIP entity and the AAL entity can be performed in a message mode or streaming mode.

The information exchanged between the AAL entities and the CLNIP entities across the AAL-Service Access Point (AAL-SAP) uses the following primitives:

a) AAL-UNITDATA-request (Interface Data, More (note), Maximum Length (note));
b) AAL-UNITDATA-indication (Interface Data, More (note), Maximum Length (note), Reception Status);
c) AAL-U-Abort-request (note);
d) AAL-U-Abort-indication (note);
e) AAL-P-Abort-indication (note).

NOTE: This primitive/parameter is used in streaming mode only.

The CLNIP shall not make use of the Corrupted Data delivery option which may be supported by the AAL type 3/4 protocol i.e. the optional Reception Status parameter in the AAL-UNIT-DATA -indication primitive is not used.

A detailed description of the primitives and parameters is provided in ETS 300 349 [3].

6.4 CLNIP-PDU structure and encoding

The detailed structure of the CLNIP-PDU is illustrated in figure 3.
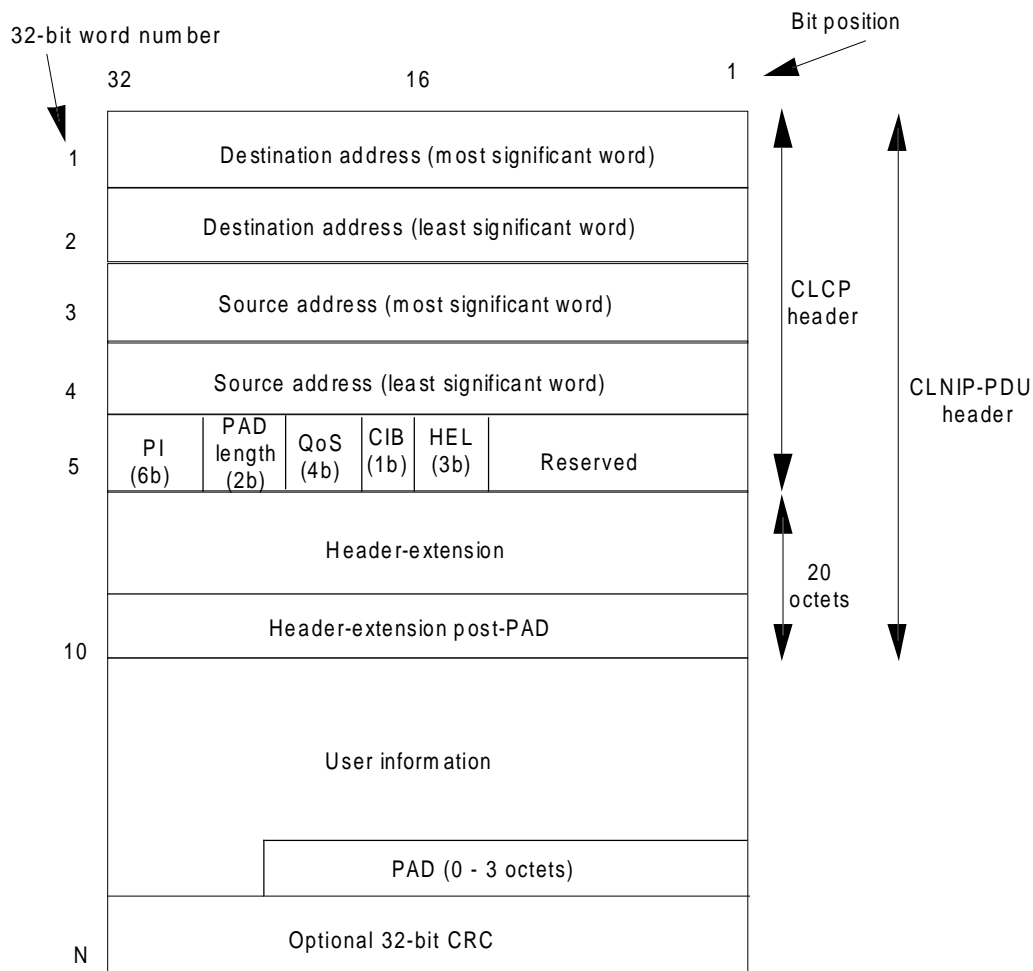
(nb): length of field (n) in bits.

CLCP header: Connectionless Convergence Protocol Header

NOTE 1: The Header Extension (HE) Post-PAD is only present when encapsulation applies.

NOTE 2: The order of transmission is from left to right and from top to bottom.

Figure 3: Structure of the CLNIP-PDU

The CLNIP-PDU contains the following fields:

6.4.1 Destination Address (DA)

This 8-octet field contains a 4-bit 'address-type' subfield, followed by the 60-bit 'address' subfield. The 'address-type' subfield indicates whether the 'address' subfield contains a publicly administered 60-bit individual address or a publicly administered 60-bit group address. Encoding of the 'address-type' subfield is described in ETS 300 478 [4], annex A.

The information included in the 'address' subfield indicates to which CLNIP entity(ies) the CLNIP-PDU is destined. The structure of the 'address' subfield is modelled according to CCITT Recommendation E.164 [2]. Encoding of the 'address' subfield is described in ETS 300 478 [4], annex A.

6.4.2 Source Address (SA)

This 8-octet field contains a 4-bit 'address-type' subfield, followed by the 60-bit 'address' subfield. The 'address-type' subfield indicates that the 'address' subfield contains a publicly administered 60-bit individual address. Encoding of the 'address-type' subfield is described in ETS 300 478 [4], annex A.

The 'address' subfield indicates the Connectionless Network Access Protocol (CLNAP) entity that originated the CLL user data packet included in the CLNIP-PDU. The structure of the 'address' subfield is modelled according to CCITT Recommendation E.164 [2]. Encoding of the 'address' subfield is described in ETS 300 478 [4], annex A.

6.4.3 Protocol Identifier (PI)

If encapsulation is performed, this 6-bit field takes one of the values [44-47] and is used to indicate that the CLNIP-PDU is an encapsulating one. If the encapsulating CLNIP-PDU carries CLL user data the value 44 shall be used. The values [45-47] are reserved (note).

> NOTE: In the future these values may also be used to identify encapsulated user data transfer associated with additional functions.

If encapsulation is not performed, the field has the same coding and meaning as in the CLNAP-PDU sent by the originating CLNAP entity.

At an inter-operator domain NNI the sender is responsible for the encoding of the PI field of PDUs carrying user data with a value that is appropriate for the network directly across the interface. On the basis of bilateral operator's agreement, the PI values outside the range [44-47] may be used by the sending CLS. Currently identified values are 50 and 51.

6.4.4 PAD length

This 2-bit field indicates the length of the PAD field (0-3 octets). The number of PAD octets is such that the total length of the 'User Information' field and the PAD field together is an integral multiple of 4 octets. This field is always coded to 0 in case encapsulation is performed.

6.4.5 Quality of Service (QoS)

This 4-bit field is used to indicate the QoS requested for the CLNIP-PDU. In case of non-encapsulation this field has the same coding and meaning as in the CLNAP-PDU sent by the originating service user. In case of encapsulation the value shall be coded to 0.

6.4.6 Cyclic Redundancy Check (CRC) Indication Bit (CIB)

This 1-bit field indicates the presence (CIB = 1) or absence (CIB = 0) of a 32-bit CRC. In case encapsulation is performed, this field shall always be coded to '0' as it is not necessary to use the CRC for the encapsulating PDU.

6.4.7 Header Extension Length (HEL)

This 3-bit field indicates the number of 32-bit words in the HE field.

In case encapsulation is performed this field shall be set to '3'. In case of non-encapsulation this field shall be set in the range [0-5].

6.4.8 Reserved

This 16-bit field is reserved for future use. Its default value is '0'. At least 8 bits will be used for enhanced multicasting which is outside the scope of this document.

6.4.9 Header extension

This content of this field is not constrained by this ETS.

In case encapsulation is performed its length shall be 12 octets. In case of non-encapsulation its length is in the range [0-20] octets and is indicated by the value of the HEL field.

6.4.10 HE Post-PAD

In case encapsulation is performed, this field has a length of 8 octets. The first octet is dedicated to the transfer of the protocol version number and shall be set to '1' for the equipment implementing this release of this ETS. The content of the remaining 7 octets is not constrained by this ETS.

This HE Post-PAD field shall always be absent if encapsulation is not performed.

6.4.11 User Information

This field is of variable length, in the range of [20 - 9 236] (note) octets when encapsulating and in the range of [0 - 9 188] octets when non-encapsulating.

> NOTE: 9 188 (SDU) + 40 (HDR) + 4 (CRC) + 4 (Alignment Header).

In case encapsulation is performed, this field carries the encapsulated CLNAP-PDU + Alignment Header (see figure 8) (4 octets long). The user information field length shall be an integer multiple of 4 octets. The content of the Alignment Header shall not be checked.

In case of non-encapsulation, the field carries the source SDU.

6.5 Error conditions

6.5.1 In the case of encapsulation

This subclause applies to CLNIP-PDUs which are identified as encapsulating PDUs only.

Various errors may occur in receiving CLNIP-PDUs. Whenever one of the following conditions is encountered at the receiver, the respective CLNIP-PDU shall be discarded:

- Invalid address format;
- CLNIP SA different to CLNAP-PDU SA;
- CLNIP DA different to CLNAP-PDU DA in the case that the latter is an individual address;
- PAD length different from 0;
- QoS field other than 0;
- CLNIP CIB = 1;
- Value of HEL field not in the range of 0 to 5 inclusive;
- PI field content different from the allowed range (see subclause 6.4.3).

6.5.2   In the case of non-encapsulation

This subclause applies to CLNIP-PDUs which are identified as non-encapsulating by means of the PI field.

Various error conditions may occur in receiving CLNIP-PDUs. Whenever one of the following conditions is encountered at the receiver, the respective CLNIP-PDU shall be discarded:

-        Invalid address format;
-        PAD length such that the total length of user information and PAD fields is not a integral multiple of 4 octets;
-        Value of HEL field not in the range of 0 to 5 inclusive.

7   Mapping

7.1   Mapping between CLNAP and CLNIP

A CLS includes one or more of the following general types of functions.

For a given CLNAP/CLNIP-PDU, each CLS involved performs one of these types of functions.

a)   Originating functions
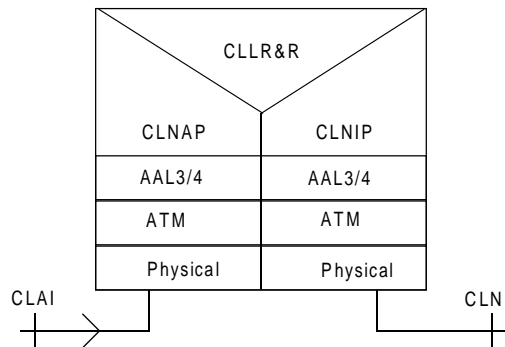
Figure 4

Originating functions get CLNAP-PDUs from customer equipment via a Connectionless Access Interface (CLAI) and forward corresponding CLNIP-PDUs (either encapsulating or non-encapsulating ones) to another CLS via a CLNI.

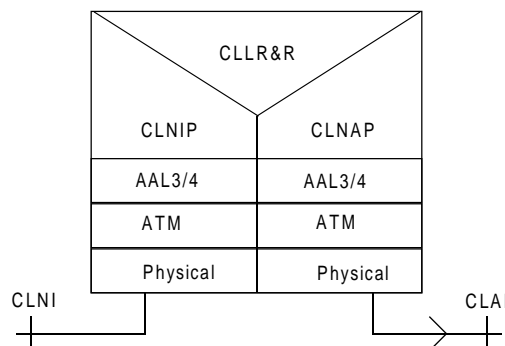**b)   Terminating functions**

Figure 5

Terminating functions get (encapsulating and/or non-encapsulating) CLNIP-PDUs from another CLS via a CLNI and forward corresponding CLNAP-PDUs to customer equipment via a CLAI.

c)   Transit functions

```
              ┌─────────────────────────┐
              │\          CLLR&R        /│
              │ \                      / │
              │  \                    /  │
              │   \                  /   │
              ├────────────┬────────────┤
              │   CLNIP     │   CLNIP    │
              ├────────────┼────────────┤
              │   AAL3/4    │   AAL3/4   │
              ├────────────┼────────────┤
              │    ATM      │    ATM     │
              ├────────────┼────────────┤
              │  Physical   │  Physical  │
              └──────┬──────┴──────┬─────┘
    CLNI             │             │           CLNI
              ───────┴───          └───────────
                  ─┴─                      ─┴─
```
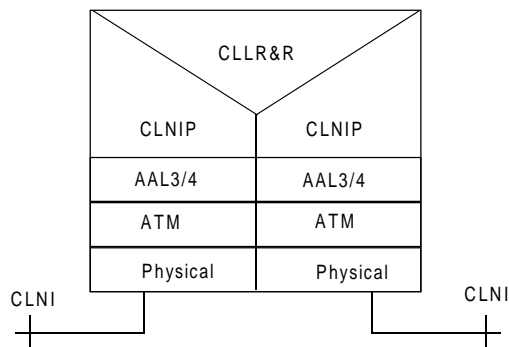
Figure 6

Transit functions get encapsulating and/or non-encapsulating CLNIP-PDUs from another CLS via a CLNI and forward corresponding CLNIP-PDUs to another CLS via another CLNI. If the next CLS belongs to another operator's domain, non-encapsulating CLNIP-PDUs are encapsulated before they are forwarded.

d)   Access-only functions

```
              ┌─────────────────────────┐
              │\          CLLR&R        /│
              │ \                      / │
              │  \                    /  │
              │   \                  /   │
              ├────────────┬────────────┤
              │   CLNAP     │   CLNAP    │
              ├────────────┼────────────┤
              │   AAL3/4    │   AAL3/4   │
              ├────────────┼────────────┤
              │    ATM      │    ATM     │
              ├────────────┼────────────┤
              │  Physical   │  Physical  │
              └──────┬──────┴──────┬─────┘
    CLAI             │             │           CLAI
              ───────┴───          └───────────
                  ─┴─                      ─┴─
```
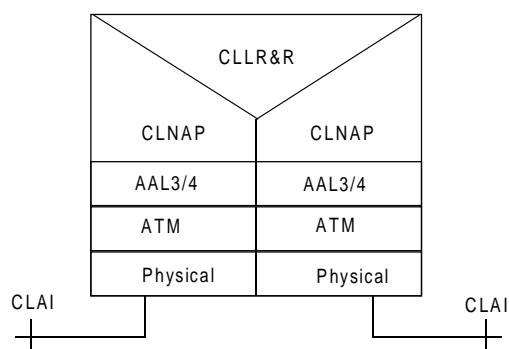
Figure 7

Access-only functions get CLNAP-PDUs from customer equipment via a CLAI and forward them to other customer equipment via another CLAI.

Additional definitions:

-       access functions: Common name for originating, terminating and access-only functions;

-       originating CLAI: CLAI over which incoming CLNAP-PDUs are received;

-       terminating CLAI: CLAI over which outgoing CLNAP-PDUs are transmitted;

-       originating CLNI: CLNI over which incoming CLNIP-PDUs are received;

-       terminating CLNI: CLNI over which outgoing CLNIP-PDUs are transmitted.

7.2 CLNIP procedures

7.2.1 Application rules for encapsulation and non-encapsulation

a)   At CLNIs between network operators, encapsulation is always used for both group and individually addressed PDUs.

b)   At CLNIs within a single operator's network, encapsulation and/or non-encapsulation may be used by the network operator.

Depending on the mechanism used within the operator's domain to which a CLS belongs, one or both mechanisms shall be supported by a certain type of functions:

1)   if encapsulation is used within the operator's domain, the originating functions encapsulate every CLNAP-PDU.
In case of an intra operator CLNI, the non-encapsulation mechanism may alternatively be used by the originating functions;

2)   if encapsulation is used within the operator's domain, the terminating functions shall decapsulate every CLNIP-PDU.
Terminating functions in an operator's domain where the non-encapsulation mechanism is used shall differentiate between encapsulating and non-encapsulating CLNIP-PDUs and to appropriately handle them;

3)   if encapsulation is used within the operator's domain, the transit functions forward CLNIP-PDUs without being actively involved in the encapsulation mechanism.
If the originating CLNI is an intra domain CLNI and the terminating CLNI is an inter domain CLNI, the transit functions shall differentiate between encapsulating and non-encapsulating CLNIP-PDUs: non-encapsulating CLNIP-PDUs shall be mapped to encapsulating CLNIP-PDUs before they are forwarded;

4)   access-only functions forward CLNAP-PDUs without applying either mechanism.

7.2.2 Encapsulation/decapsulation and non-encapsulation mechanisms

When encapsulation is performed, the CLS functions add a CLNIP-PDU header plus a 4-octet Alignment Header to the beginning of the CLNAP-PDU or the non-encapsulated CLNIP-PDU. The values of the fields of the CLNIP-PDU header are either derived by the CLS functions or fixed due to protocol specifications.

The decapsulation mechanism strips the header plus the Alignment Header from the CLNIP-PDU in order to recover the CLNAP-PDU.

When non-encapsulation is performed inside the operator's domain, the CLNAP-PDU is regarded as a CLNIP-PDU and transparently transmitted within the network. Therefore, no special mechanism is required. Since the encapsulation mechanism is not performed, the CLNIP-PDU is equal to the CLNAP-PDU.
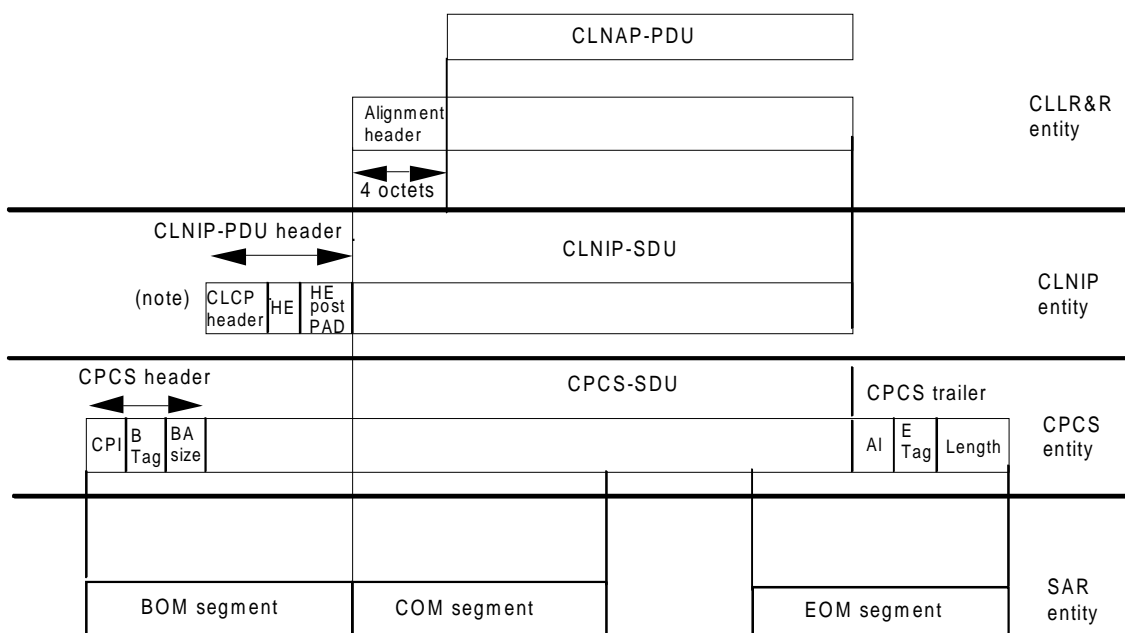
BAsize: Buffer Allocation size.   BTag: Beginning Tag.
CPI: Common Part Indicator   EOM: End Of Message

NOTE: CLCP header: Connectionless Convergence Protocol Header.

Figure 8: Encapsulation of a CLNAP-PDU within a CLNIP-PDU

7.2.3   Derivation of the encapsulating CLNIP-PDU fields

The encapsulating CLNIP-PDU fields are derived from the CLNAP-PDU fields content, from the information (network configuration, management, subscription contract, etc.) available in the Connectionless Service Function (CLSF) and the protocol specification.

Destination Address

The content of this field may be different from the DA received in the CLNAP-PDU (e.g. due to address resolution).

Source Address

This field is copied from the SA of the CLNAP-PDU.

Protocol identifier

This field shall be set according to subclause 6.4.3.

Header extension

The content of this field is derived by the information available in the CLSF.

Data

This field is derived by concatenating the content of the CLNAP-PDU and the Alignment Header.

QoS

It is set to 0.

7.2.4 Derivation of the non-encapsulating CLNIP-PDU fields

All the fields of the non-encapsulating CLNIP-PDU are kept equal to the corresponding fields of the CLNAP-PDU (transparent translation).

7.2.5 Interaction between CLNIP entity and Connectionless Layer Routeing & Relaying (CLLR&R) entity

The function of the CLLR&R entity is described in ETS 300 478 [4], subclause 4.3.

It is assumed that the CLNIP entity checks the validity of any CLNIP-PDU it receives over a CLNI; these checks are reflected in subclause 6.5. The PDU received by the CLLR&R is assumed to be correct in relation to encapsulation/non-encapsulation.
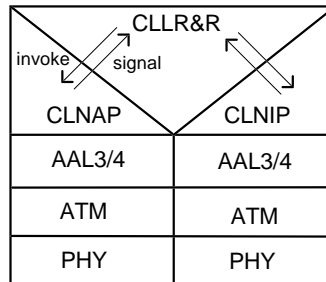
NOTE: A null (empty) SSCS is used.

Figure 9

It is assumed as well that the CLNIP functions belonging to the functional blocks Access Termination Functions (ATF) and Network Termination Functions (NTF) (see subclause 4.3 of ETS 300 478 [4]) perform formatting of the PDUs, i.e. encapsulation or decapsulation.

A receiving CLNIP entity forwards each CLNIP-PDU with the EI parameter to the CLLR&R entity. The EI (encapsulating indicator) indicates whether or not the CLNIP-PDU is an encapsulating one.

A transmitting CLNIP entity receives from the CLLR&R entity a data parameter and the EI parameter indicating if the data parameter is a CLNIP-PDU to be kept as it is or has to be encapsulated.

If the data parameter has to be encapsulated, the CLNIP entity gets, in addition, DA, SA, PI, QoS, HE parameters to be used in the encapsulating header of the CLNIP-PDU. The CLNIP entity adds a CLNIP-PDU header and an Alignment Header at the beginning of the data parameter value. The values in the added CLNIP-PDU header are derived from the additional parameters and the data parameter.

A CLLR&R entity derives the EI parameter from the DA in the PDU and from the knowledge about the mechanism used in the domain for encapsulation/non-encapsulation.

7.2.6 primitives between CLNIP and CLLR&R entities

The description of the interaction is made in terms of primitives between the CLLR&R entity and the protocol entity but these primitives are named invoke (when initiated by the CLLR&R) and signal (when initiated by the protocol entity) to differentiate from layer interface primitives. These primitives does not imply any specific implementation:

- CLNIPI-UNITDATA.invoke and CLNIPI-UNITDATA.signa apply interdomain;

- CLNIPN-UNITDATA.invoke and CLNIPN-UNITDATA.signal apply inter domain.

Signals to/from CLNIP:

- CLNIPI-UNITDATA.invoke (data, EI, DA, SA, PI, QoS, HE):
  - data is the CLNAP-PDU or CLNIP-PDU to be forwarded;
  - EI is equal to true when encapsulation has to be performed, EI is equal to false when encapsulation has not to be performed which does not preclude PI to be adjusted when needed;

  Other parameters are only present when EI is equal to true:
  - DA specifies the destination address to be used in the encapsulating CLNIP-PDU. It may be different from the DA in the PDU contained in the data parameter (e.g. due to group address resolution);
  - SA specifies the source address to be used in the encapsulating CLNIP-PDU;
  - QoS specifies the value to be transmitted in the QoS field of the encapsulating CLNIP-PDU;
  - HE specifies the value to be transmitted in the HE field of the encapsulating CLNIP-PDU;

- CLNIPN-UNITDATA.signal (data, EI):
  - data is the CLNIP-PDU received;
  - EI is equal to true when the CLNIP-PDU is encapsulating, EI is equal to false when the CLNIP-PDU is not encapsulating;

- CLNIPI-UNITDATA.signal (data, EI):
  - data is the CLNIP-PDU received;
  - EI is equal to true when the CLNIP-PDU is encapsulating, EI is equal to false when the CLNIP-PDU is not encapsulating;

- CLNIPN-UNITDATA.invoke (data, EI, DA, SA, PI, QoS, HE):
  - data is the CLNAP-PDU or CLNIP-PDU to be forwarded;
  - EI is equal to true when encapsulation has to be performed, EI is equal to false when encapsulation has not to be performed which does not preclude PI to be adjusted when needed;

  Other parameters are only present when EI is equal to true:
  - DA specifies the destination address to be used in the encapsulating CLNIP-PDU. It may be different from the DA in the PDU contained in the data parameter (e.g. due to group address resolution);
  - SA specifies the source address to be used in the encapsulating CLNIP-PDU;
  - QoS specifies the value to be transmitted in the QoS field of the encapsulating CLNIP-PDU;
  - HE specifies the value to be transmitted in the HE field of the encapsulating CLNIP-PDU.

8 Group addressed PDU handling

The administrative aspects of GA handling are outside the scope of this ETS. The data necessary to resolve a GA can be centralised in a network or distributed among networks. When receiving a Group Addressed PDU across a CLAI, the originating network needs to route the packet to the resolution function which is identified by the destination GA.

8.1 Definitions

For the definition of GA and NGA see ETS 300 478 [4], subclause 4.7.

8.1.1 Group address agent (GAA)

The administrative aspects of a GA may be undertaken by a one and only one GAA. The GAA is responsible for assigning, deleting, amending group addresses and for inclusion, addition and deletion of individual addresses to the group according to the instructions of the user/client.

From the numbering point of view, the GAA assigns to a group a globally unique group address which pertains to the GAA's domain.

The GAA performs a complete or partial address resolution function. In the case of a partial resolution by the GAA (e.g. use of NGA) the complete resolution is accomplished with the support of other networks.

8.1.2 Nested group address agent (NGAA)

The Nested Group Address (NGA) concept is applicable to encapsulating networks or non-encapsulating network able to carry encapsulated PDUs.

The administrative aspects of a NGA may be undertaken by one and only one NGAA. The NGAA is responsible for assigning, deleting, amending individual addresses associated with the NGA in cooperation with the GAA which is responsible for the group, and according to the instructions of the user/client. The NGAA enables a stepwise and distributed GA resolution. It ensures the delivery of a group addressed CLNAP-PDU (GAP, see ETS 300 478 [4], subclause 4.1.1) to all members of the GA pertaining to this NGAA.

From the numbering point of view, the NGA belongs to the address domain of the network to which the NGAA pertains and is globally unique. A NGA is of the type 'group address'.

> NOTE: No requirement for a special address type has been yet identified.

8.1.3 Architectural configurations for Group Addressing

The architectural configurations for transport of Group Addressed PDUs may include GAAs only or GAAs and NGAAs on a group address basis depending on inter-domain agreements. In the following, the two approaches (GAAs only and GAAs plus NGAAs) are described as respectively "centralised database approach" and "centralized database approach in conjunction with NGA".

It has to be noted that both approaches may have to be supported simultaneously by the network.

> NOTE: The specific procedure described in subclauses 8.2 and 8.3 are not applicable for non-encapsulated CLNIP-PDUs.

8.2 Centralised database approach

In this approach, all the functions related to group address resolution for a specific GA are performed by the appointed GAA.

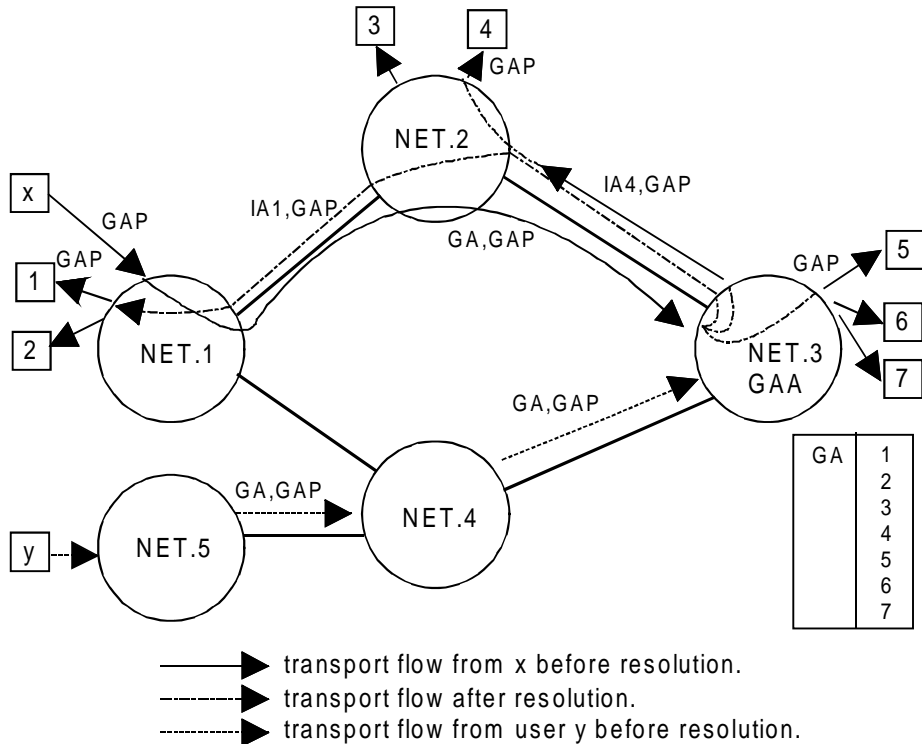A typical centralised scheme is shown in figure 10.

Figure 10

8.2.1 Transport

The GA identifies members 1 to 7; network 3 contains the GAA for the GA.

The transport operates as follows:

User x connected to network 1 originates a CLNAP_PDU with DA = GA (GAP). This PDU is routed to network 3 which contains the GAA for GA. Network 3 resolves the GA into the individual addresses of all the members (i.e. 1 to 7). Network 3 delivers the GAP directly to its own members (5, 6, 7) and sends to each of the external members a CLNIP_PDU carrying the individual DA of the member (e.g. member 4 notation IA4,GAP).

No packet is sent back to originator x.

A CLNAP_PDU addressed to GA from user y connected to network 5 which has no member of this group is routed normally on the DA. A PDU, with GA as DA, will be sent via network 4 to network 3 where resolution will take place. The transport mechanism after resolution works in the same way as above.
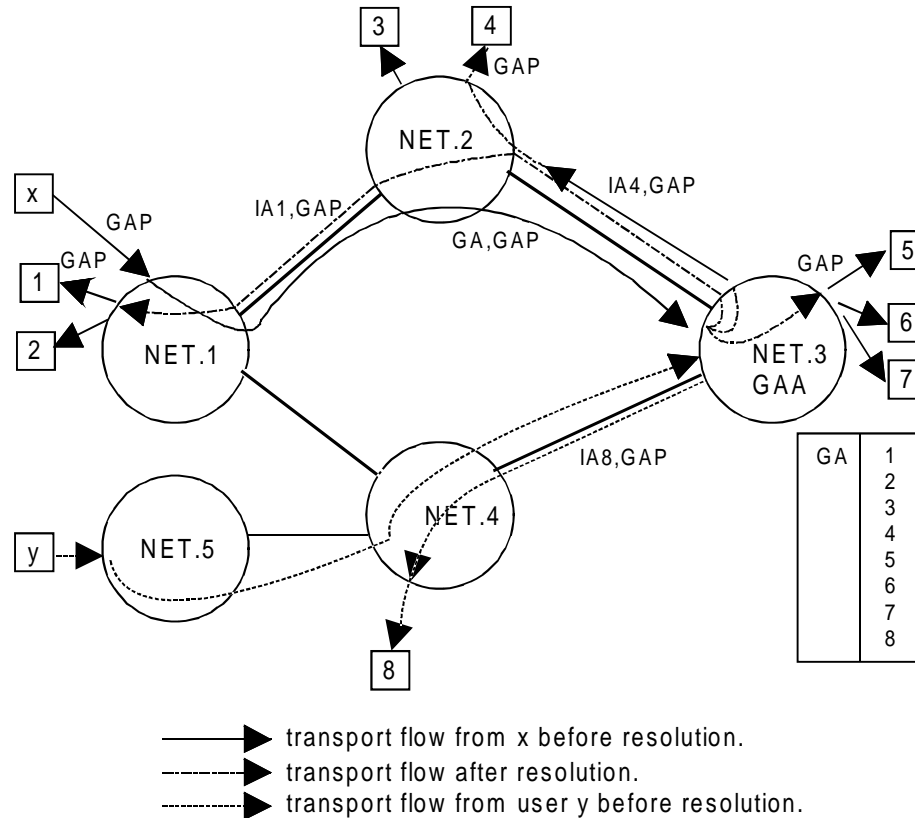
8.2.2 Adding a new member to the group

Figure 11

User 8 on network 4 is added to the group GA. The GA database in network 3 is updated.

In addition to what is described in 8.2.1, network 3 sends an encapsulated PDU (notation IA8,GAP) to network 4 which will send the GAP to member 8.

8.3 Centralised database in conjunction with one level of NGAs

In this approach some of the functions related to group address resolution of a specific GA are devolved to NGAAs, which may be located in different domains than the appointed GAA. This approach prevents to avoid sending multiple copies of a group addressed PDU to another network.

Each network having one or more members of the GA may have the NGAA functionality.

8.3.1 Definition

The GAA has set up arrangements with some of the networks which serve members of the group to share the resolution task between the GAA and these networks which will operate as NGAAs. Each NGAA is identified by a NGA with a group address type. For the transport, it is sufficient for the GAA, once resolution took place, to send only a PDU addressed with NGA (notation NGA, GAP) as a DA to each NGAA associated to the GA. Each of the NGAAs receiving a PDU with a DA NGA which belongs to its network will complete GA resolution for its own network. A network which receives an encapsulated PDU with a NGA as the DA will route this PDU towards the network identified by the NGA.

Upon creation or extension of the GA, the GAA decides whether or not to distribute the resolution function. Criteria to create NGAA are operator dependent (e.g. topology of the group among different networks, number of members per network, ease and speed of Operation Administration and Maintenance (OAM) relations between networks, etc.) and are not specified here.

8.3.2 Transport

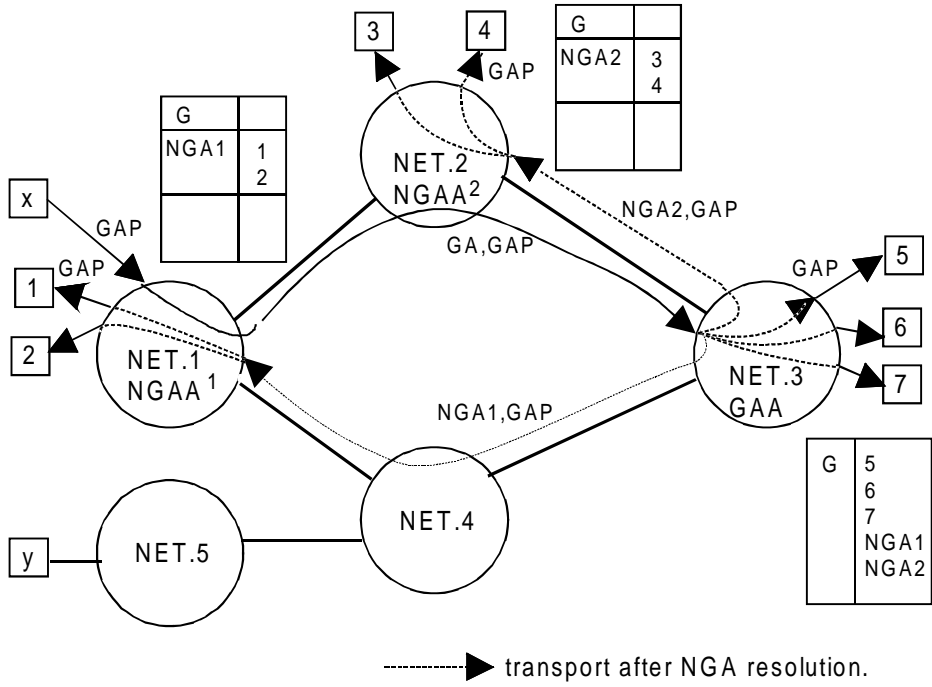

------------▶ transport after NGA resolution.

Figure 12

From the point of view of the GAA, the GA identifies members 5,6,7 and NGA1, NGA2.

The transport operates as follows:

user x connected to network 1 originates a CLNAP_PDU with DA = GA (GAP).

The GAP is passed encapsulated (notation GA,GAP) to network 3 as above:

- group address resolution takes place in network 3;

- GAPs are copied to local members 5,6,7 in network 3;

- only one PDU carrying a nested group address NGA2 as a DA is passed between the GAA and network 2 which is a nominated nested group address agent, this is for all members recognised as part of that nested group address 2 (NGA2);

- resolution of the NGA2 takes place at network 2, resulting in the PDU being copied to each individual user who forms part of the nested group address, in the case shown members 3 and 4.

The same considerations apply for NGA1 and network 1.

8.3.3 Adding a new member to the group

If the GA passed to the GAA for resolution also included members in network 4, then the group address resolution could result in them being associated with the use of another NGA (NGA3) and network 4 being another nominated NGAA. However individually addressed PDUs (e.g. IA8,GAP) would be sent to network 4, if no NGAA is created for this network.
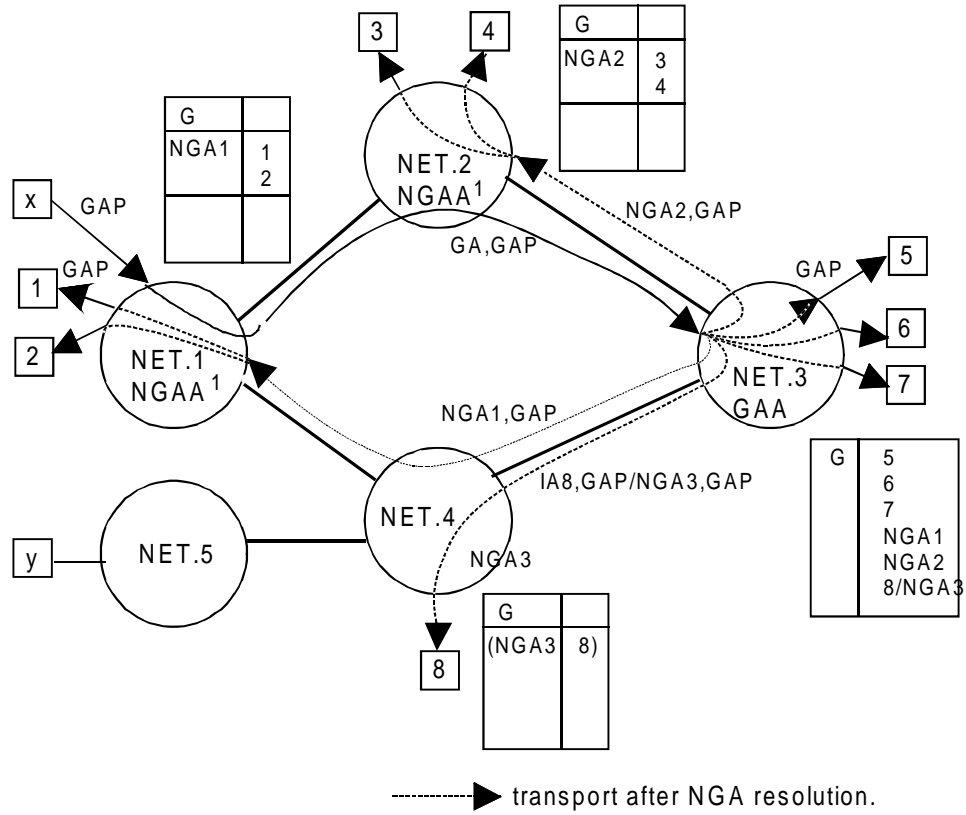

Figure 13

Annex A (informative): Interworking conditions with Switched Multi-megabit Data Service (SMDS): network aspects

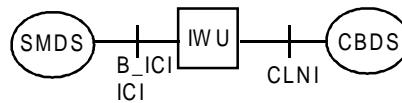The reference configuration is illustrated in figure A.1.

Figure A.1

Identifying the owner of the Interworking Unit (IWU) is a matter of agreement between the two domains.

Encapsulation always is used between a CBDS and an SMDS network. Encapsulation is always performed by the CBDS network in the direction CBDS to SMDS, and vice versa, SMDS always encapsulates at the ICI/B_ICI. It is not the task of the IWU to perform encapsulation, but merely assures that it is done on both interfaces according to the specific rules for each type of interface. The elements to be checked are mainly Multiplexing Identification (MID), PI, HE.

For interworking of the CBDS and Switched Multi-megabit Data Service (SMDS) services over ATM the following issues have to be considered.

NOTE: The terminology used in the case of SMDS can be found in the bibliography (annex C), references 1) and 2).

A.1 MID

This problem does not arise in the European environment.

The IWU, since the ICI interprets MID value 0 as being a Single Segment Message (SSM), needs to convert a null MID from a CLNIP-PDU received on the CLNI interface into a non null MID on the ICI side. Conversely, any MID non null from a ICIP-PDU received on the ICI side can be converted into a null MID if appropriate, on the CLNI side.

NOTE: The encapsulation mechanism does not allow reception of SSM over the ICI: any SSM received over a ICI should be discarded.

A.2 PI

For user data transport, the IWU will generate:

- in the direction CBDS to SMDS, PI = 50 (originating) if it is not the value found in the PI received from the CBDS network, for the ICIP-PDU carrying user data (or 60 for OAM information);

- in the direction SMDS to CBDS, PI according to subclause 6.4.3, for the CLNIP-PDU to forward over the CLNI.

A.3 HE

The HE generated in the SMDS network is only relevant to a SMDS network (at least for the carrier selection). In order to find a solution to this issue, it is necessary to have an agreed ETSI definition of carrier selection and means to designate carriers.

A.4 Streaming mode

Some SMDS networks may not support the AAL type 3/4 streaming mode and, therefore, the IWU may have to convert from streaming mode to message mode.

Annex B (informative): Procedures

B.1 Receiving procedure

Functions performed on the CLNIP-PDU assume that the underlying CPCS-PDU is correct. To avoid complete PDU assembly at the CLL, checks on the CPCS-PDU can take place on a cell by cell basis. This enables most of the service checks required at the CLL to be performed on the Beginning Of Message/Single Segment Message (BOM/SSM) of the CLNAP-PDU which contains the complete CLNIP header as described in clause 7.

Some logical ordering of the checks is possible. However, to avoid influencing potential implementation, only the following sequence is suggested:

a)   number of concurrent PDUs according to the interface requirement (note);

b)   CLNIP-PDU format (e.g. HE and HEL).

    NOTE: The maximum number of concurrent PDUs is defined by bilateral agreement.

Failures lead to the discard the of CLNIP-PDU except when by operator option they are only counted (excess in the number of concurrent PDUs).

B.2 Sending procedures

When it receives a CLNIPI-UNITDATA.invoke or a CLNIPN.UNITDATA.invoke (see subclause 7.2.5.1), the CLNIP entity shall generate a CLNIP-PDU according to subclauses 6.4, 7.2.1, 7.2.2, 7.2.3 and 7.2.4.

The following check shall be performed before sending across a CLNI the CLNIP-PDU:

-    number of maximum concurrent PDUs according to the interface requirement (note).

    NOTE: The maximum number of concurrent PDUs is defined by bilateral agreement.

If the CLNIP-PDU fails the check, it shall be discarded.

Annex C (informative):   Bibliography

1)   TR-TSV-000772 (1991): "Generic System Requirements in Support of Switched Multi-Megabit Data Service".

2)   TR-TSV-001060 (1991): "Switched Multi-megabit Data Service Generic Requirements for Exchange Access and Intercompany Serving Arrangement".

3)   DTR/NA-021206: "Network Aspects (NA); Addressing principles and related aspects for the Connectionless Broadband Data Service (CBDS)".

4)   ITU-T Recommendation I.364 (1993): "Support of broadband connectionless data service on B-ISDN".

5)   CCITT Recommendation F.812 (1992): "Broadband connectionless data bearer service".

History

Document history		
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