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SERIES X: DATA COMMUNICATION NETWORKS:
INTERWORKING BETWEEN NETWORKS,
MOBILE DATA TRANSMISSION SYSTEMS,
INTERNETWORK MANAGEMENT

Interworking between Networks

**GENERAL ARRANGEMENTS FOR
INTERWORKING BETWEEN PACKET
SWITCHED PUBLIC DATA NETWORKS
(PSPDNs) AND PRIVATE DATA NETWORKS
FOR THE PROVISION OF DATA TRANSMISSION
SERVICES**

Reedition of CCITT Recommendation X.327 published in
the Blue Book, Fascicle VIII.6 (1988)

NOTES

- 1 CCITT Recommendation X.327 was published in Fascicle VIII.6 of the *Blue Book*. This file is an extract from the *Blue Book*. While the presentation and layout of the text might be slightly different from the *Blue Book* version, the contents of the file are identical to the *Blue Book* version and copyright conditions remain unchanged (see below).
- 2 In this Recommendation, the expression “Administration” is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Recommendation X.327

GENERAL ARRANGEMENTS FOR INTERWORKING BETWEEN PACKET SWITCHED PUBLIC DATA NETWORKS (PSPDNs) AND PRIVATE DATA NETWORKS FOR THE PROVISION OF DATA TRANSMISSION SERVICES

(Melbourne, 1988)

The CCITT,

considering

- (a) that Recommendation X.300 defines the general principles for interworking between public networks, and between public networks and other networks for the provision of data transmission services;
- (b) that Recommendation X.301 defines the general arrangements for call control within a subnetwork and between subnetworks for the provision of data transmission services;
- (c) that Recommendation X.302 defines the general arrangements for internal network utilities within a subnetwork and between subnetworks for the provision of data transmission services;
- (d) that Recommendation X.75 already specifies detailed procedures applicable to call control between two PSPDNs;
- (e) that Recommendation X.10 describes categories of access to PSPDNs for the provision of data transmission services;
- (f) that Recommendation X.213 describes the Network Service Definition for Open Systems Interconnection for CCITT applications;
- (g) that Recommendation X.223 describes a mapping between X.213 and the X.25 Packet level protocol;
- (h) that Recommendation X.305 describes functionalities of subnetworks relating to the support of the OSI Network Service;
- (i) the need for arrangements when interworking between PSPDNs and Private Data Networks for the provision of data transmission services,

unanimously recommends

that arrangements for the interworking between PSPDNs and Private Data Networks for the provision of data transmission services be in accordance with the principles and arrangements specified in this Recommendation.

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0 Introduction

This Recommendation is one of a set of Recommendations produced to facilitate considerations of interworking between networks. It is based on Recommendation X.300 which defines the general principles for interworking between public networks, and between public networks and other networks for the provision of data transmission services. Recommendation X.300 indicates in particular how collections of physical equipment can be represented as “subnetworks” for consideration in interworking situations.

This Recommendation describes the interworking arrangements between PSPDNs and and Private Data Networks for the provision of data transmission services. These interworking arrangements should include all the capabilities required to support the Network Service for open systems interconnection for CCITT Applications as described in Recommendation X.213.

1 Scope and field of application

The purpose of this Recommendation is to describe the general arrangements for the interworking between PSPDNs for the provision of data transmission services. These arrangements are applicable only to the interworking involving transmission capabilities and not to interworking involving communication capabilities as described in Recommendation X.300.

2 References

- [1] Recommendation X.300
- [2] Recommendation X.301
- [3] Recommendation X.302
- [4] Recommendation X.305
- [5] Recommendation X.1
- [6] Recommendation X.2
- [7] Recommendation X.10
- [8] Recommendation X.121
- [9] Recommendation X.223

3 Definitions

This Recommendation makes use of the following terms defined in Recommendation X.300:

- a) transmission capability,
- b) subnetwork,
- c) data transmission service.

4 Abbreviations

CONS	Connection-mode Network Service
CSPDN	Circuit Switched Public Data Network
DTE	Data Terminal Equipment
ISDN	Integrated Services Digital Network
IWF	Interworking Function
PSPDN	Packet Switched Public Data Network
PSTN	Public Switched Telephone Network
PvtDN	Private Data Network

5 General aspects

This Recommendation, in describing interworking arrangements between two subnetworks (a PSPDN and a PvtDN) for the provision of data transmission services, adheres to the general principles of Recommendation X.300. The environments of these two subnetworks are described in the following sections. Interworking should provide the connection-mode network layer service, as defined in Recommendation X.213.

5.1 *PSPDN*

The PSPDN provides packet switched data transmission services as defined in Recommendations X.1 and X.2 for the provision of data transmission services. The PSPDN may be accessed by DTEs by the categories of access C and D as defined in Recommendation X.10.

In addition, the PSPDN may also be accessed via other networks, i.e., PSTN (X.10 category L, P), CSPDN (X.10 category K, O), PSPDN (Recommendation X.75), Mobile systems (Recommendation X.324) or ISDN (Recommendation X.325), or Private data networks (this Recommendation).

The PSPDN could be considered globally as an abstract OSI relay system (or “Type I subnetwork” as described in Recommendation X.300).

5.2 *Private Data Network*

The Private Data Network provides data transmission services. In the context of this Recommendation, the Private Data Network may be one of the following:

- a) a subnetwork providing packet switched data transmission services as defined in Recommendations X.1 and X.2 for the provision of data transmission services. The Private Data Network may be accessed by DTEs by the categories of access D as defined in Recommendation X.10;
- b) a subnetwork providing circuit switched data transmission services as defined in Recommendations X.1 and X.2 for the provision of data transmission services. The Private Data Network may be accessed by DTEs by the category of access B as defined in Recommendation X.10;
- c) a point-to-point subnetwork providing leased circuit data transmission services as defined in Recommendation X.1;
- d) a subnetwork conforming to ISO 8802.

Furthermore, in the context of this Recommendation, DTEs accessing the Private Data Network make use at the Network Layer of the protocol defined in ISO 8208.

In the context of OSI, the PvtDN and associated IWF could be considered as an abstract OSI relay system (or “Type I subnetwork” as described in Recommendation X.300).

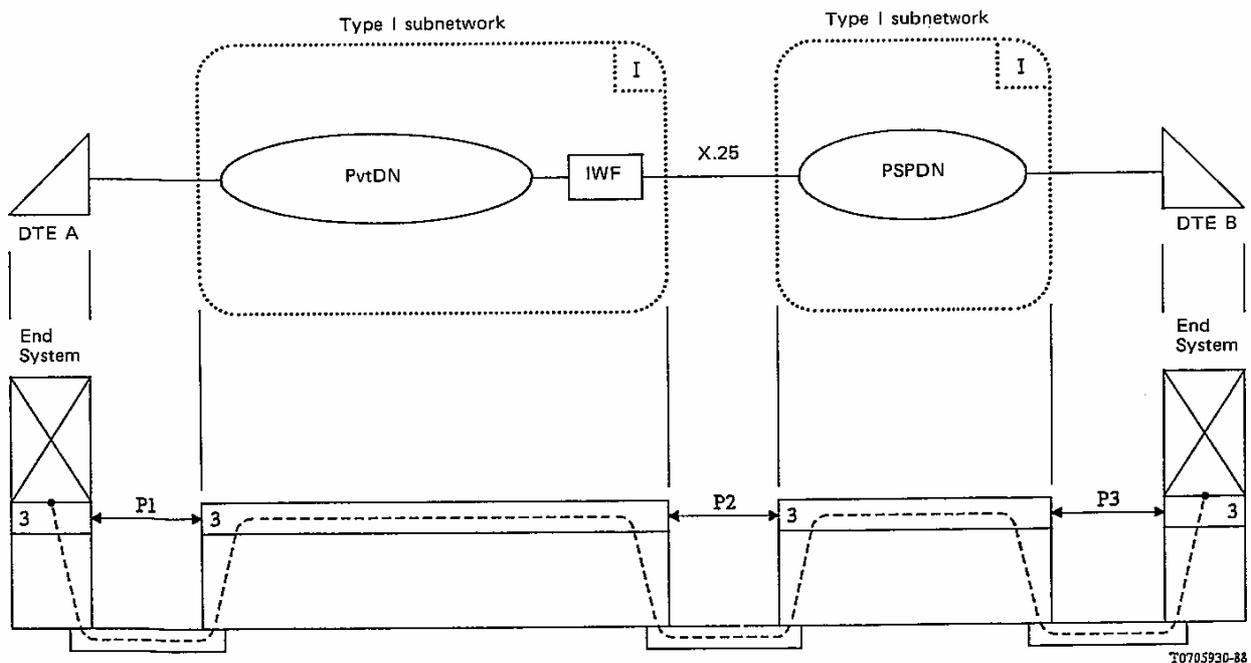


FIGURE 1/X.327

Interworking at the network layer between PvtDN and PSPDN

5.3 General interworking arrangements

The arrangements at the interface between both “Type I subnetworks” should be based on Recommendation X.25.

At that interface, a mapping needs to be done between X.25 packets used on each side of the IWF. § 6 deals such a mapping for each phase of the connection: connection establishment, connection release, data transfer. This mapping is related to the corresponding primitives of the OSI Network Layer Service.

In general, each type of primitive of the OSI Network Layer Service, corresponds to a type of packet on the PSPDN or the PvtDN side. Each type is recognized by the “packet type” parameter.

Each connection is identified by:

- a Logical Channel number, on the PvtDN;
- a Logical Channel number, on PSPDN side.

Note – A Logical Channel number is usually local to an X.25 interface. On the same connections, its value usually changes between two interfaces.

6 Specific interworking arrangements

6.1 Connection establishment phase

6.1.1 Table 1/X.327 shows the relationships between the primitives used during the establishment of an OSI Network Connection through interconnected PvtDN and PSPDN, and the X.25 packets associated with that connection establishment (see also Recommendation X.223).

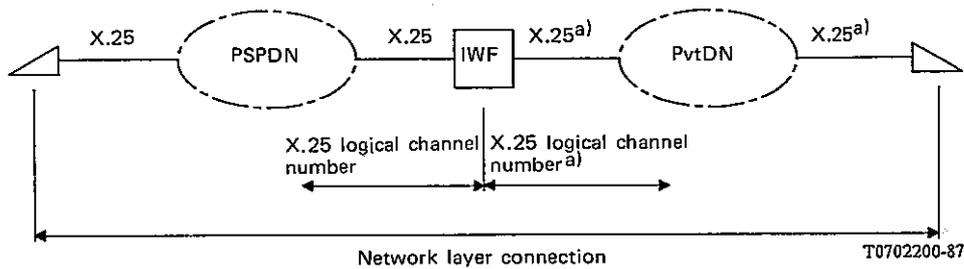
6.1.2 The actions and events at the interfaces to PvtDN or PSPDN which correspond to those primitives are also described in § 6 of Recommendation X.305.

6.1.3 In the context of interworking between PvtDN and PSPDN, Table 1/X.327 describes a mapping to be performed between X.25 packets on each interface in relation with the OSI Network Layer service. In particular, the following mapping takes place:

- a) a received incoming call packet results in a transmitted call request packet; and
- b) a received call accepted packet results in a transmitted call connected packet.

6.1.4 Any call set-up packet sent or received by the IWF should convey OSI Network Layer addresses, as needed to identify the called and calling parties involved in the connection.

6.1.5 Since several simultaneous connections may be required, it is necessary to identify each of those connections at the interworking between PvtDN and PSPDN (see also § 5.3). In order to map the logical channel numbering schemes on both sides, the interworking function (IWF) should connect a logical channel on one side to a logical channel on the other side, as illustrated in Figure 2/X.327.



a) Depending on the type of PvtDN, the two X.25 interfaces shown to the PvtDN may actually be one X.25 interface.

FIGURE 2/X.327

6.1.6 During the establishment of a connection, quality of service (QOS) parameters are used to adjust the quality of the connection.

6.2 Connection release phase

6.2.1 Table 2/X.327 shows the relationships between the primitives used during the release of an OSI Network Connection through interconnected PvtDN and PSPDN, and the X.25 packets associated with that connection release (see also Recommendation X.223).

6.2.2 The actions and events at the interfaces to PvtDN or PSPDN which correspond to those primitives are also described in § 7 of Recommendation X.305.

6.2.3 In the context of interworking between PvtDN and PSPDN, Table 2/X.327 describes a mapping to be performed between X.25 packet on each interface in relation with the OSI Network Layer service. In particular, the following mapping takes place:

A received Clear Indication packet results in a transmitted Clear Request packet (see also § 6.4.1) and confirmation of the Clear Indication packet.

6.3 Data transfer phase

6.3.1 The following Tables 3/X.327 to 5/X.327 show the relationships between the primitives used for the transfer of data on an OSI Network Connection through interconnected PvtDN and PSPDN, and the packets associated with that data transfer (see also Recommendation X.223).

6.3.2 The actions and events at the interfaces to PvtDN and PSPDN which correspond to those primitives are also described in § 8 of Recommendation X.305.

6.3.3 In the context of interworking between PvtDN and PSPDN, Tables 3/X.327 to 5/X.327 describe a mapping to be performed between X.25 packets in relation with the OSI Network Layer service. In particular, the following mappings take place:

- a) a Received Data packet results in a transmitted Data packet (but see § 6.4.2);
- b) a received Interrupt packet results in a transmitted packet;
- c) a received Interrupt Confirmation packet results in a transmitted Interrupt Confirmation packet;
- d) a received Reset Indication packet results in a transmitted Reset Request packet and confirmation of the Reset Indicated packet.

6.3.4 Resets may occur during the data transfer phase of a connection.

6.4 *Additional considerations*

6.4.1 *Restart*

In the context of interworking between a PvtDN and a PSPDN, the receipt of a Restart Indication packet on an interface:

- a) is confirmed by a Restart Confirmation packet on that interface; and
- b) results in clearing of each Virtual Call on the other interface.

6.4.2 *Packet sizes and window sizes*

There is no requirement that the packet sizes and window sizes used at one interface be the same as those used at the other interface. However, the integrity of complete packet sequences must be maintained through proper settings of the M-bit and D-bit.

6.4.3 *Flow control*

There is no requirement, in general, that flow control procedures on the two interfaces be coupled. However, receipt of a data packet with D-bit set to 1 shall not result in window rotation on one interface until rotation of the window on the other interface for all user data in the originally received Data packet.

TABLE 1/X.327

CONS: X.25/PLP mapping for the network connection establishment phase

CONS	X.25/PLP
<p>Primitives :</p> <p>N-CONNECT request N-CONNECT indication N-CONNECT response N-CONNECT confirm</p>	<p>Packets :</p> <p>CALL REQUEST INCOMING CALL CALL ACCEPTED CALL CONNECTED</p>
<p>Parameters :</p> <p>Called address</p> <p>Calling address</p> <p>Responding address</p> <p>Receipt confirmation selection</p> <p>Expedited data selection</p> <p>QOS-Parameter set</p> <p>NS-User-data</p>	<p>Fields (including facilities)</p> <p>Called DTE address field Called address extension facility</p> <p>Calling DTE address field Calling address extension facility</p> <p>Called DTE address field Called address extension facility</p> <p>General format identifier</p> <p>Expedited data negotiation facility</p> <p>Throughput class negotiation facility ^{a)} Minimum throughput class negotiation facility Transit delay selection and indication facility End-to-end transit delay negotiation facility</p> <p>Call and called user data field Fast select facility ^{b)}</p>

a) For proper operation, this optional user facility shall also be agreed to for use on the interface.

b) For proper operation, the Fast Select Acceptance Facility shall also be agreed to for use on the interface.

TABLE 2/X.327

CONS: X.25 /PLP mapping for the network connection release phase

CONS	X.25/PLP
Primitives: N-DISCONNECT request N-DISCONNECT indication	Packets: CLEAR REQUEST CLEAR INDICATION
Parameters: Originator and reason NS-User-data Responding address	Fields (including facilities): Cause code and diagnostic code fields Clear user data Called DTE address field Called address extension facility

TABLE 3/X.327

CONS: X.25/PLP mapping for the data transfer service

CONS	X.25/PLP
Primitives: N-DATA request N-DATA indication	Packets: DATA DATA
Parameters: NS-User-data Confirmation request	Fields: User data, M-bit D-bit, P(S)

TABLE 4/X.327

CONS: X.25/PLP mapping for the expedited data transfer service

CONS	X.25/PLP
Primitives: N-EXPEDITED DATA request N-EXPEDITED DATA indication	Packets: INTERRUPT INTERRUPT
Parameters: NS-User data	Fields: Interrupt user data

TABLE 5/X.327

CONS: X.25/PLP mapping for the reset service

CONS	X.25/PLP
Primitives: N-RESET request N-RESET indication N-RESET response N-RESET confirm	Packets: RESET REQUEST RESET INDICATION None None
Parameters: Originator and reason	Fields: Cause code and diagnostic code fields

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