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 ÒsubnetworksÓ 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 ÒType I subnetworkÓ 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 ÒType I subnetworkÓ as described in Recommendation X.300).

Figure 1/X.327 - T0705930-88

5.3 *General* interworking arrangements

The arrangements at the interface between both ÒType I subnetworksÓ 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 Òpacket typeÓ 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.

Figure 2/X.327 - T0702200-87

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 inferfaces 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:

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a) in 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
Primitives:	**Packets:**
N-CONNECT request	CALL REQUEST
INCOMING CALL	N-CONNECT indication
N-CONNECT response	CALL ACCEPTED
N-CONNECT confirm	CALL CONNECTED
Parameters:	**Fields (including facilities)**
Called address	Called DTE address field
	Called address extension facility
Calling address	Calling DTE address field
	Calling address extension facility
Responding address	Called DTE address field
	Called address extension facility
Receipt confirmation selection	General format identifier
Expedited data selection	Expedited data negotiation facility
QOS-Parameter set	Throughput class negotiation facility [a)]
	Minimum throughput class negotiation facility
	Transit delay selection and indication facility
	End-to-end transit delay negotiation facility
NS-User-data	Call and called user data field
	Fast select facility [b)]

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:	**Packets:**
N-DISCONNECT request	CLEAR REQUEST
N-DISCONNECT indication	CLEAR INDICATION
Parameters:	**Fields (including facilities):**
Originator and reason	Cause code and diagnostic code fields
NS-User-data	Clear user data
Responding address	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:	**Packets:**
N-DATA request	DATA
N-DATA indication	DATA
Parameters:	**Fields:**
NS-User-data	User data, M-bit
Confirmation request	D-bit, P(S)

TABLE 4/X.327

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

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

TABLE 5/X.327

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

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