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INTERWORKING BETWEEN NETWORKS

GENERAL

GENERAL ARRANGEMENTS FOR INTERWORKING BETWEEN PACKET SWITCHED PUBLIC DATA NETWORKS (PSPDNs) AND COMMON CHANNEL SIGNALLING NETWORK (CCSN)

ITU-T Recommendation X.326

(Extract from the *Blue Book*)

NOTES

1   ITU-T Recommendation X.326 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.326

GENERAL ARRANGEMENTS FOR INTERWORKING BETWEEN PACKET SWITCHED PUBLIC DATA NETWORKS (PSPDNs) AND COMMON CHANNEL SIGNALLING NETWORK (CCSN)

(Melbourne, 1988)

The CCITT,

considering

(a)   that Recommendation X.300 defines the general principles for interworking between public networks, and between public data 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 PDNs of the same type;

(e)   that Recommendation X.10 describes categories of access to PSPDNs and ISDNs 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.305 describes functionalities of subnetworks relating to the support of the OSI connection-mode network service;

(h)   that Recommendations Q.711 to 716 describe the signalling connection control part (SCCP) for common channel signalling;

(i)   the need to operate operations, administration and maintenance (OA and M) applications over a variety of networks, including CCSN and PSPDNs; and consequently the need for CCSN and PSPDNs to be able to interwork,

unanimously recommends

that arrangements for the interworking between PSPDNs and CCSN be in accordance with the principles and arrangements specified in this Recommendation.

CONTENTS

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 data networks, and between public data networks and other networks. 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 CCSN. 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

1.1   Network operations, administration and maintenance (OA and M) applications need to be able to operate over a variety of networks, including public data networks.

1.2   This Recommendation describes the interworking between CCSN and packet switched public data networks (PSPDNs), which may be needed for the transmission of operational information between Administrations, as a means of data transmission between operational centres and/or terminals for those Administrations. This is illustrated in the following Figure 1/X.326.
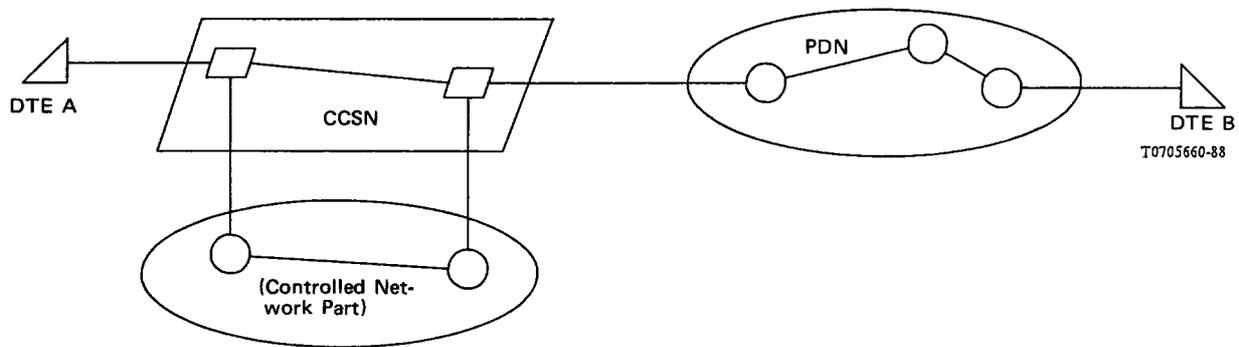

FIGURE 1/X.326

Interworking between PDN and CCSN

1.3   It should be noted that, when dealing with OA and M protocols, a great confusion may appear between:

-    the network which is used to convey the OA and M information (e.g. CCSN or PDN in Figure 1/X.326 above);
-    the network which is controlled by the CCSN, with the support of the OA and M applications.

It may furthermore happen that the controlled network interwork with a PDN, as illustrated in the following Figure 2/X.326. Such an interworking is not considered as interworking between CCSN and PDN; consequently it is not described in the present Recommendation.
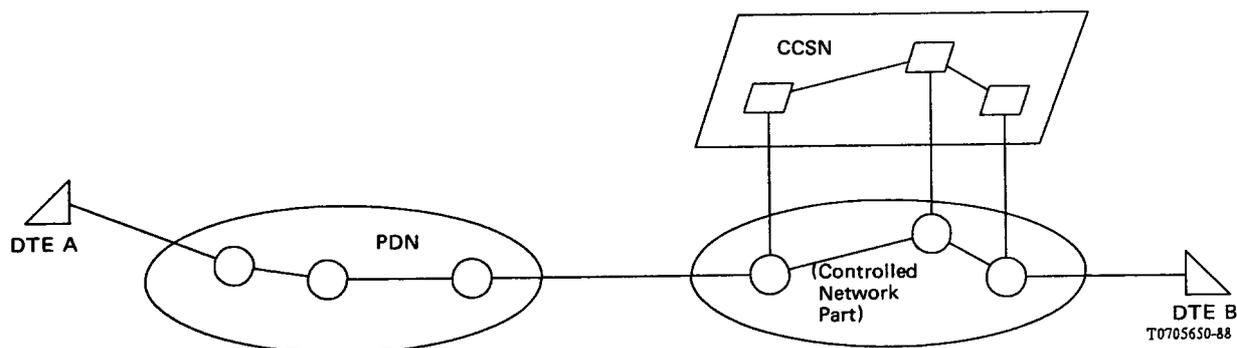
FIGURE 2/X.326

Interworking between PDN and a network controlled by a CCSN
(not between PDN and CCSN)

2 References

[1] Recommendation X.200   Reference model of open systems interconnection for CCITT applications.

[2] Recommendation X.213   Network layer service definition for open systems interconnection (OSI) for CCITT applications.

[3] Recommendation X.300   General principles for interworking between public networks, and between public networks and other networks for the provision of data transmission services.

[4] Recommendation X.305 - Functionalities of subnetworks relating to the support of the OSI connection-mode network layer service.

[5] Recommendation Q.711 - Functional description of the SCCP.

[6] Recommendation Q.712 - Definitions and functions of SCCP messages.

[7] Recommendation Q.713 - SCCP formats and codes.

[8] Recommendation Q.714 - SCCP procedures.

[9] Recommendation Q.716 - SCCP performances.

3 Definitions

3.1   This Recommendation makes use of the following terms defined in Recommendations X.300 and X.305:

   a)   Type I subnetwork

   b)   Subnetwork

   c)   Interworking function (IWF)

   d)   OSI Network-connection

   e)   (OSI) Network layer

   f)   OSI) Network layer service

3.2   This Recommendation makes use of the following terms defined in Recommendations Q.711, Q.712, Q.713 and Q.714:

   a)   (SCCP) Message (see Note)

   b)   Message type

   c)   Local reference

Note - The use of the concept of "Message" in this Recommendation is not to be confused with other uses of the same term "Message" in different areas (e.g., in the context of Message Handling Systems-MHS developed in the X.400-series Recommendations).

4 Abbreviations

CCSN	Common channel signalling network
PDN	Public data network
PSPDN	Packet switched public data network
IWF	Interworking function
OSI	Open systems interconnection
OA&M	Operations, administration and maintenance
DTE	Data terminal equipment
SCCP	Signalling connection control part
NC	Network connection
NS	Network layer service
NL	Network layer
QOS	Quality of service

5 General aspects of CCSN/PSPDN interworking

5.1   Interworking between CCSN and PSPDN, which is required for the transmission of operational information between Administrations, should provide the end systems with the connection-oriented network layer service defined in the context of the open systems interconnection (OSI).

5.2   For such interworking, the PSPDN should offer the full capability of the OSI network layer service, and could be considered globally as an abstract OSI relay system (or "Type I subnetwork" as described in Recommendation X.300).

5.3   For the interworking with PSPDN, the CCSN should, in association with any appropriate interworking function whenever it is necessary, offer the full capability of the OSI connection-oriented network layer service. In the context of the OSI, CCSN and associated interworking function(s) could be considered globally as an abstract OSI relay system (or "Type I subnetwork" as described in Recommendation X.300). Protocol class 3 of SCCP applies.

5.4   Consequently, the interworking between CCSN and PSPDN could be considered in the context of OSI as the interworking between two subnetworks, each one of them being fully capable of providing the OSI connection-oriented network layer service. The following Figure 3/X.326 illustrates such an OSI representation of the interworking.
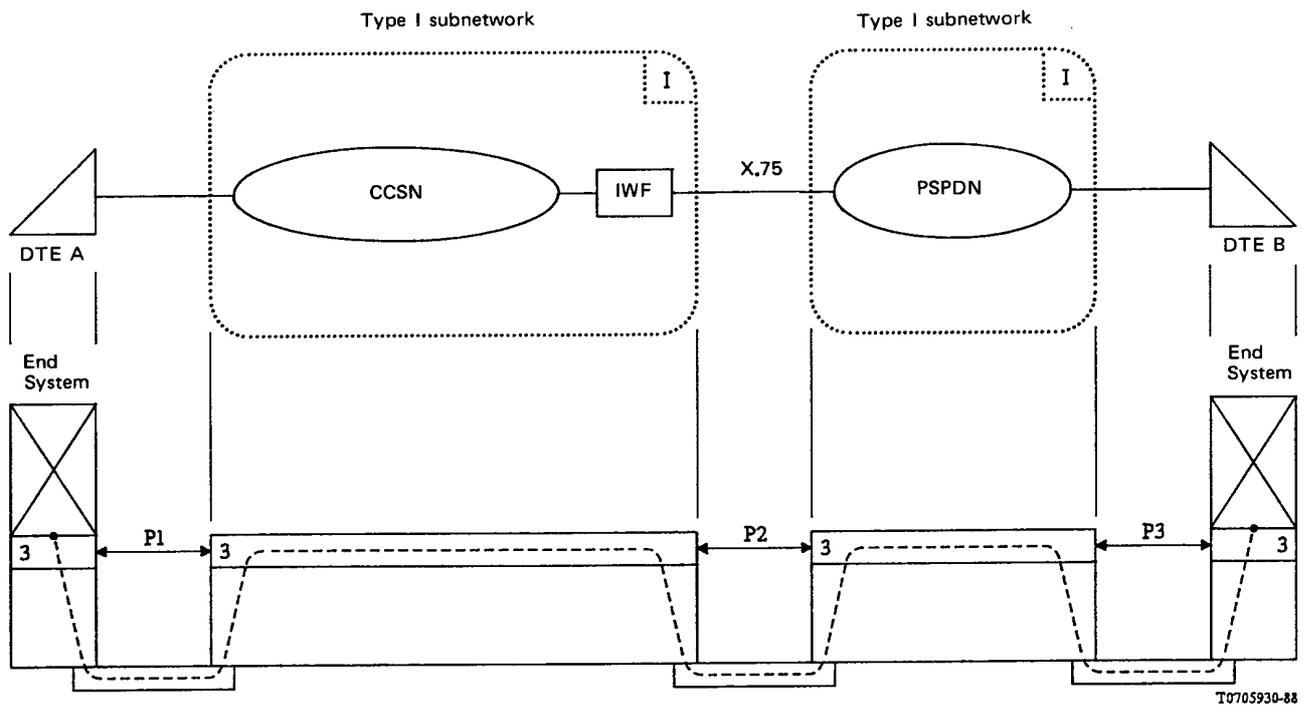
FIGURE 3/X.326

Interworking at the Network Layer between CCSN and PSPDN

5.5   The arrangements at the interface between both "Type I subnetwork" should be based on Recommendation X.75.

5.6   At that interface, a mapping needs to be done between SCCP messages used on the CCSN side, and X.25/X.75 packets used on PSPDN side. The following §§ 6 to 8 detail 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.

5.7   To each type of primitives of the OSI network layer service corresponds:

-     a type of SCCP message, on CCSN side;
-     a type of packet, on PSPDN side.

Each type is recognized by:

-     the "message type" parameter, on CCSN (SCCP) side;
-     the "packet type" parameter, on PSPDN side.

5.8   Each disconnection is identified by:

-     Source and destination local reference number, on CCSN (SCCP) side;
-     a logical channel number, on PSPDN side.

Note - On PSPDN side, a logical channel number is usually local to an X.25 or X.75 interface. On the same connection, its value usually changes between two interfaces.

6   Connection establishment phase

6.1   The following Tables 1/X.326 and 2/X.326 show the relationships between the primitives used during the establishment of an OSI network connection through interconnection CCSN (SCCP) and PSPDN, and the SCCP messages and X.25/X.75 packets associated with that connection establishment.

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

6.3   In the context of interworking between CCSN (SCCP) and PSPDN, Tables 1/X.326 and 2/X.326 describe a mapping to be performed between SCCP messages and X.25/X.75 packets in relation with the OSI network layer service.

6.4   Since protocol class 3 of SCCP applies to the interworking, any connection request SCCP message sent or received by the interworking function (IWF) should contain a "proposed protocol class" set to 3. The action to be taken by the interworking function (IWF) if receiving a connection request SCCP message which proposes a protocol class different from 3, is for further study.

Any connection confirm (SCCP) message should contain a "selected protocol class" set to 3. The action to be taken by the interworking function (IWF) if receiving a connection confirm SCCP message selecting a protocol class less than 3 is for further study.

6.5   A connection request SCCP message sent or received by the interworking function (IWF) should convey OSI network layer addresses, as needed to identify the called and calling parties involved in the connection.

Note 1 - The extent of the requirement to support part or all of OSI network layer addresses is for further study in relation to the interworking between CCSN and PSPDNs.

Note 2 - The exact mapping of the OSI network layer addresses used at the interworking between CCSN and PSPDNs, into SCCP messages on one side, and into X.25/X.75 packets on the other side, is for further study.

6.6   Since several simultaneous connections may be required, it is necessary to identify each of these connections at the interworking between CCSN and PSPDN (see also § 5.8). In order to map the logical channel numbering schemes on both sides, the interworking function (IWF) should connect a logical circuit on one side to a logical circuit on the other side, as illustrated in Figure 4/X.326.
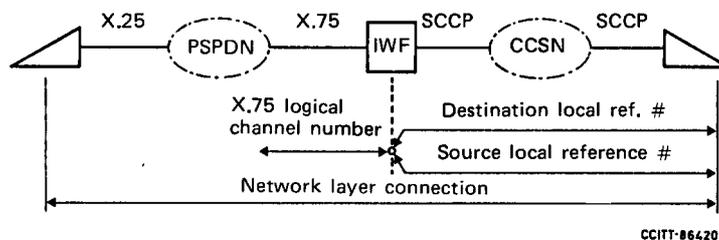
Note − Alternative mechanisms for mapping logical channel numbering, are for further study.

FIGURE 4/X.326

Interworking at the Network Layer between PSPDN and CCSN

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

Note - The exact mapping between the mechanisms used to adjust QOS, in SCCP on one side, and in X.27/X.75 on the other side, is for further study.

7 Connection release phase

7.1 Tables 1/X.326 to 3/X.326 show the relationships between the primitives used during the release of an OSI network connection through the interconnected CCSN (SCCP) and PSPDN, and the SCCP messages and X.25/X.75 packets associated with that connection release.

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

7.3 In the context of interworking between CCSN (SCCP) and PSPDN, Table 3/X.326 describes a mapping to be performed between SCCP messages and X.25/X.75 packets in relation with the OSI network layer service.

Note - The exact mapping of OSI disconnect originators and reasons used at the interworking between CCSN and PSPDNs, into SCCP messages on one side, and into X.25/X.75 packets on the other side, is for further study.

TABLE 1/X.326

OSI network layer service	SCCP	X.25/X.75
PRIMITIVES : - Connect request - Connect indication	MESSAGES : - Connection request - Connection request	PACKETS : - Call request - Incoming call

PARAMETERS:
- (a) Called address
- (b) Calling address
- (c) Receipt confirmation
    selection
- (d) Expedited data selection
- (e) QOS parameter set
- (f) NS user data
	PARAMETERS:
	- (a) Called party address
	- (b) Calling party address
	- (c) (for further study)
	- (d) (see Note)
	- (e) Credit, protocol class
	- (f) User-data
		PARAMETERS (INCLUDING FACILITIES):
		- (a) Called DTE address
		    Called address extension
		- (b) Calling DTE address
		    Calling address extension
		- (c) General format identifier field
		- (d) Expedited data negotiation
		    facility
		- (e) Throughput class negotiation
		    facilities
		    Transit delay negotiation
		    facilities
		- (f) Call and called user data
		    (fast select facility)

Note - Expedited data is an intrinsic capability for all class 3 connections; therefore there is no need to explicitly indicate it in the messages.

TABLE 2/X.326

OSI network layer service	SCCP	X.25/X.75
PRIMITIVES : - Connect response - Connect confirm	MESSAGES : - Connection confirm - Connection confirm	PACKETS : - Call accepted - Call connected

PARAMETERS:
- (a) Responding address
- (b) Receipt confirmation
    selection
- (c) Expedited data selection
- (d) QOS parameter set
- (e) NS user data
	PARAMETERS:
	- (a) Called party address
	- (b) (for further study)
	- (c) (for further study)
	- (d) Credit, protocol class
	- (e) User-data
		PARAMETERS (INCLUDING
		FACILITIES):
		- (a) Called DTE address
		    Called address extension
		- (b) General format identifier field
		- (c) Expedited data negotiation
		    facility
		- (d) Throughput class negotiation
		    facilities
		    Transit delay negotiation
		    facilities
		- (e) User data
		    (fast select facility)

TABLE 3/X.326

OSI network layer service	SCCP	X.25/X.75
PRIMITIVES : - Disconnect request - Disconnect indication	MESSAGES : - Connection refused/released - Connection refused/released	PACKETS : - Clear request - Clear indication

PARAMETERS:
 	
- (a) Originator
- (b) Reason
- (c) NS user-data
- (d) Responding address
	PARAMETERS:
	
	- (a)⎤ Refusal / release cause
	- (b)⎦ + Diagnostic
	    (for further study)
	- (c) User data
	- (d) Called party address
		PARAMETERS (INCLUDING
		FACILITIES):
		- (a)⎤ Cause code and
		- (b)⎦ diagnostic code
		- (c) Clear user data
		- (d) Called DTE address
		    Called address extension

8 Data transfer phase

8.1   Tables 4/X.326 to 6/X.326 show the relationships between the primitives used for the transfer of data on an OSI network connection through interconnected CCSN (SCCP) and PSPDN, and the SCCP messages and X.25/X.75 packets associated with that data transfer.

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

8.3 In the context of interworking between CCSN (SCCP) and PSPDN, Tables 4/X.326 to 6/X.326 describe a mapping to be performed between SCCP messages and X.25/X.75 packets in relation to the OSI network layer service.

TABLE 4/X.326

OSI network layer service	SCCP	X.25/X.75
PRIMITIVES : - Data request - Data indication	MESSAGES : - Data form - Data form	PACKETS : - Data - Data

PARAMETERS:
- (a) NS user-data
- (b) Confirmation request
	PARAMETERS:
	- (a) User data
	- (b) Sequencing/segmenting
	    (see Note)
		PARAMETERS (INCLUDING FACILITIES):
		- (a) User data
		    M-bit
		- (b) D-bit
		    P(S)

Note - Since delivery confirmation is not provided, D-bit functions are not present in the parameter

TABLE 5/X.326

OSI network layer service	SCCP	X.25/X.75
PRIMITIVES : - Reset request - Reset indication	MESSAGES : - Reset request - Reset request	PACKETS : - Reset request - Reset indication
PARAMETERS: - (a) Originator - (b) Reason	PARAMETERS: − (a) ⌉ Reset cause and diagnostic − (b) ⌡ (for further study)	PARAMETERS (INCLUDING FACILITIES): - (a) ⌉ Cause code and - (b) ⌡ diagnostic code
PRIMITIVES : - Reset response	MESSAGES : - Reset confirmation	PACKETS : - Reset confirmation
PARAMETERS: No	-	-

TABLE 6/X.326

OSI network layer service	SCCP	X.25/X.75
PRIMITIVES : - Expedited data request - Expedited data indication	MESSAGES : - Expedited data - Expedited data	PACKETS : - Interrupt - Interrupt
PARAMETERS: - (a) NS-user data	PARAMETERS: - (a) User data	PARAMETERS (INCLUDING FACILITIES): - (a) Interrupt user data

8.4   On an OSI network layer connection established through the interworking between CCSN and PSPDNs, network service data units (NSDUs) or any size may need to be conveyed. Consequently, segmenting and reassembling is needed.

The mechanism used to perform such segmenting and reassembling are:

-     the more data bit (M bit) on PSPDN side;
-     the more data indicator (M bit) on CCSN (SCCP) side.

8.5   On an OSI network layer connection established through the interworking between CCSN and PSPDNs, a data flow control is exercised.

Note - The exact mapping between the flow control mechanisms used in SCCP protocol class 3 on one side, and X.25/X.75 on the other side, requires further study.

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

Note - The exact mappings of the OSI reset originators and reasons used at the interworking between CCSN and PSPDNs, into SCCP messages on one side, and into X.25/X.75 packets on the other side, is for further study.