**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.

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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 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 ÒsubnetworksÓ 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 suport 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 - T0705660-88

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 - T0705650-88

## 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:

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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 ÒMessageÓ in this Recommendation is not to be confused with other uses of the same term ÒMessageÓ 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 ÒType I subnetworkÓ 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 ÒType I subnetworkÓ 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 - T0705930-88

5.5 The arrangements at the interface between both ÒType I subnetworkÓ 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 Òmessage typeÓ parameter, on CCSN (SCCP) side;
- the Òpacket typeÓ 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 Òproposed protocol classÓ 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 Òselected protocol classÓ 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.

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Figure 4/X.326 - CCITT 86420

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:<br><br>- Connect request<br>- Connect indication | MESSAGES:<br><br>- Connection request<br>- Connection request | PACKETS:<br><br>- Call request<br>- Incoming call |
| PARAMETERS:<br><br>- (a) Called address<br>- (b) Calling address<br>- (c) Receipt confirmation selection<br>- (d) Expedited data selection<br>- (e) QOS parameter set<br>- (f) NS user data | PARAMETERS:<br><br>- (a) Called party address<br>- (b) Calling party address<br>- (c) (for further study)<br>- (d) (see Note)<br>- (e) Credit, protocol class<br>- (f) User-data | PARAMETERS (INCLUDING FACILITIES):<br><br>- (a) Called DTE address<br>Called address extension<br>- (b) Calling DTE address<br>Calling address extension<br>- (c) General format identifier field<br>- (d) Expedited data negotiation facility<br>- (e) Throughput class negotiation facilities<br>Transit delay negotiation facilities<br>- (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:<br><br>- Connect response<br>- Connect confirm | MESSAGES:<br><br>- Connection confirm<br>- Connection confirm | PAQUETS:<br><br>- Call accepted<br>- Call connected |
| PARAMETERS:<br><br>- (a) Responding address<br>- (b) Receipt confirmation selection<br>- (c) Expedited data selection<br>- (d) QOS parameter set<br>- (e) NS user-data | PARAMETERS:<br><br>- (a) Called party address<br>- (b) (for further study)<br>- (c) (for further study)<br>- (d) Credit, protocol class<br>- (e) User-data | PARAMETERS (INCLUDING FACILITY):<br><br>- (a) Called DTE address<br>Called address extension<br>- (b) General format identifier field<br>- (c) Expedited data negotiation facility<br>- (d) Throughput class negotiation facilities<br>Transit delay negotiation facilities<br>- (e) User-data<br>(fast select facility) |

TABLE 3/X.326

| OSI network layer service | SCCP | X.25/X.75 |
|---|---|---|
| PRIMITIVES:<br><br>- Disconnect request<br>- Disconnect indication | MESSAGES:<br><br>- Connection refused/released<br>- Connection refused/released | PACKETS:<br><br>- Clear request<br>- Clear indication |
| PARAMETERS: | PARAMETERS: | PARAMETERS (INCLUDING FACILITIES): |
| - (a) Originator<br>- (b) Reason<br>- (c) NS user-data<br>- (d) Responding address | - (a) Refusal/release cause<br>- (b) + Diagnostic<br>(for further study)<br>- (c) User data<br>- (d) Called party address | - (a) Cause code and<br>- (b) diagnostic code<br>- (c) Clear user data<br>- (d) Called DTE address<br>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:<br><br>- Data request<br>- Data indication | MESSAGES:<br><br>- Data form<br>- Data form | PACKETS:<br><br>- Data<br>- Data |
| PARAMETERS:<br><br>- (a) NS user-data<br>- (b) Confirmation request | PARAMETERS:<br><br>- (a) User data<br>- (b) Sequencing/segmenting (see Note) | PARAMETERS (INCLUDING FACILITIES):<br><br>- (a) User data<br>M-bit<br>- (b) D-bit<br>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:<br><br>- Reset request<br>- Reset indication | MESSAGES:<br><br>- Reset request<br>- Reset request | PACKETS:<br><br>- Reset request<br>- Reset indication |
| PARAMETERS:<br><br>- (a) Originator<br>- (b) Reason | PARAMéTRES:<br><br>- (a) Reset cause and diagnostic<br>- (b) (for further study) | PARAMETERS (INCLUDING FACILITIES):<br><br>- (a) Cause code and<br>- (b) diagnostic code |
| PRIMITIVE:<br><br>- Reset response | MESSAGE:<br><br>- Reset confirmation | PACKET:<br><br>- Reset confirmation |
| PARAMETERS: No | - | - |

TABLE 6/X.326

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