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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 INTEGRATED SERVICES DIGITAL NETWORKS (ISDNs) FOR THE PROVISION OF DATA TRANSMISSION SERVICES

Reedition of CCITT Recommendation X.320 published in the Blue Book, Fascicle VIII.6 (1988)

NOTES

1 CCITT Recommendation X.320 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.320

GENERAL ARRANGEMENTS FOR INTERWORKING BETWEEN INTEGRATED SERVICES DIGITAL NETWORKS (ISDNs) 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 public networks providing data transmission services;

(e) that Recommendation X.10 describes categories of access to 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 network service;

(h) that Recommendation I.520 describes requirements for ISDN-ISDN interworking for both non-data and data transmission services;

(i) the need for arrangements when interworking between ISDNs for the provision of data transmission services,

unanimously declares

that arrangements for the interworking between ISDNs and ISDNs for the provision of data transmission services 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 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 ISDNs and ISDNs for the provision of data transmission services.

1 Scope and field of application

The purpose of this Recommendation is to describe the general arrangements for the interworking between ISDNs and ISDNs 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.

Note – The typing of subnetworks in this Recommendation is based on the support for the OSI connection-mode network service and is therefore only valid in this context.

2 References

[1] Recommendation X.300

[2] Recommendation X.301

[3] Recommendation X.302

[4] Recommendation X.305

[5] Recommendation X.31

[6] Recommendation X.75

[7] Recommendation X.1

[8] Recommendation X.2

[9] Recommendation X.10

[10] I.230 series Recommendations
I.250 series Recommendations

[11] Recommendation I.500

[12] Recommendation X.121

[13] Recommendation X.122

[14] Recommendation E.164

[15] Recommendation E.166

3 Definitions

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

a) transmission capability,

b) communication capability,

c) subnetwork functionality,

d) data transmission service,

e) interworking by call control,

f) interworking by port access.

This Recommendation makes use of the following terms defined in the I.230 Series Recommendations:

a) circuit switched bearer service,

b) packet switched virtual circuit bearer service.

4 Abbreviations

CNIC	Clearing Network Identification Code
CUG	Closed User Group
CUG/OA	Closed User Group with Outgoing Access
DTE	Data Terminal Equipment
ISDN	Integrated Services Digital Network
IWF	Interworking Function
MSS	Mobile Satellite System
PSPDN	Packet Switched Public Data Network
SS No. 7	Signalling System No. 7
TA	Terminal Adaptor
TE	Terminal Equipment
TNIC	Transit Network Identification Code

5 General aspects

This Recommendation, in describing interworking arrangements between two subnetworks 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. See also Table 1/X.320.

5.1 *ISDN*

The ISDN may provide packet switched and/or circuit switched data transmission services/bearer services as defined in Recommendations X.1, the I.230 series, and X.2.

Note – Supplementary services/optional user facilities for the circuit-mode operation on ISDN are in the I.250 series. Recommendation X.2 applies to ISDN packet switched data transmission services/bearer services.

For the provision of data transmission services, the ISDN may be accessed by DTEs/TEs by the categories of access S, T, U as defined in Recommendation X.10 and/or the access methods defined in the I.230 series Recommendations. In addition the ISDN may also be accessed via other networks, i.e., PSTN (Recommendation I.530), CSPDN (Recommendation X.10, category B and Recommendation X.321), PSPDN (Recommendations X.325 and X.10, categories C, D), MSS (Recommendation X.324), or ISDN (SS No. 7, Recommendation X.75, Recommendation X.10, category Y and this Recommendation).

Note – In the context of this Recommendation, and for the purpose of provision of data transmission services only, the following categories of bearer services defined in the I.230 series Recommendations are considered. (Others are for further study.):

a) circuit-mode 64 kbit/s unrestricted, 8 kHz structured;

b) circuit-mode 64 kbit/s, 8 kHz structured, usable for speech information transfer;

c) circuit-mode 64 kbit/s, 8 kHz structured, usable for 3.1 kHz audio information transfer;

d) virtual call and permanent virtual circuit.

5.2 *Call control between the ISDN and ISDN*

The general arrangements for call control between ISDNs are as defined in Recommendation X.301. Network utilities used between the PSPDN and ISDN are as defined in Recommendation X.302 (not visible for users). Supplementary services/optional user facilities for the circuit-mode operation on ISDN are in the I.250 series Recommendations.

5.3 *Functionalities of the ISDN*

The functionalities of different types of subnetworks are described in Recommendation X.305. In the case where one ISDN is used to provide a circuit switched data transmission service/bearer service and another ISDN is used to provide a packet switched data transmission service/bearer service, the functionality of the two ISDNs differs. Therefore, in order to enable interworking, procedures must be operated over the circuit switched bearer to achieve functional compatibility. In the case where both ISDNs are used to provide a packet switched data transmission service/bearer service or both ISDNs are used to provide a circuit switched data transmission service/bearer service, the ISDNs are functionally compatible.

TABLE 1/X.320

General characteristics of ISDN

General characteristics	ISDN
Data transmission service/Bearer service	X.1, I.230 Series
Optional user facilities/Supplementary services	Circuit-Mode I.250 Series, Packet-Mode X.301
Categories of access	X.10 categories S, T, U See also § 5.1 of this Recommendation
Access via other networks	
PSTN	I.530
CSPDN	Recommendations X.321, X.10 category B
PSPDN	Recommendations X.325, X.10 categories C, D
MSS	X.324
ISDN	SS No. 7, X.75, X.10 category Y, this Recommendation

6 Specific interworking arrangements

As described in Recommendation X.300, the following interworking cases should be distinguished:

a) interworking between ISDNs, each using a packet switched bearer;

b) interworking between ISDNs, each using a circuit switched bearer;

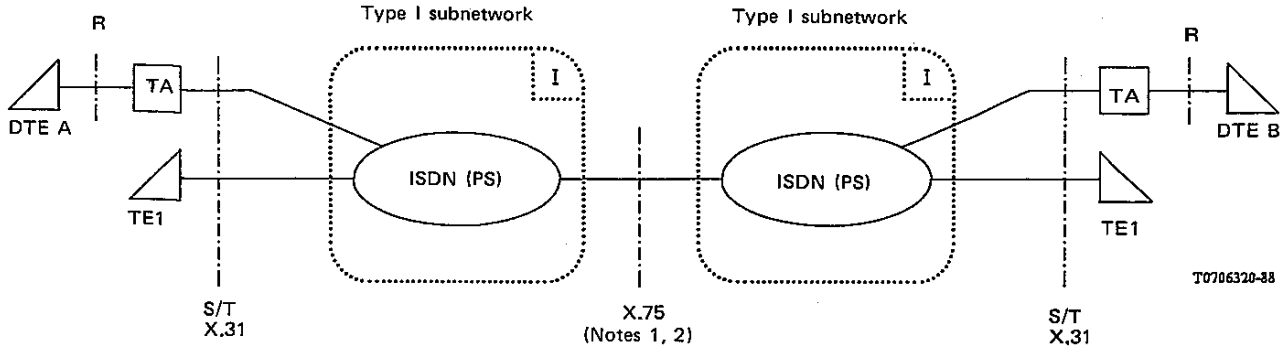
c) interworking between ISDNs, where a packet switched bearer is used on one ISDN, and a circuit switched bearer is used on the other:

   1) interworking by call-control mapping;

   2) interworking by port access.

6.1 *Interworking between ISDNs, where a packet switched bearer is requested on each*

The detailed procedures for interworking by call-control mapping are defined in Recommendation X.75 (see Figure 1/X.320). The use of other Recommendations is for further study. In particular, the following applies:



Note 1 – The use of other Recommendations is for further study.

Note 2 – The use of X.75 applies between the packet handling functions of the ISDNs. These packet handling functions support the ISDN virtual circuit bearer service defined in Recommendation X.31.

FIGURE 1/X.320

ISDN/ISDN packet-mode interworking where both ISDNs support the ISDN virtual circuit bearer service

6.1.1 *Transfer of addressing information*

ISDN typically utilize the E.164 numbering plan. The considerations on the transfer of E.164 addressing information in X.75 are given in Recommendation X.301.

6.1.2 *Arrangements for facilities related to the QOS of the call*

These arrangements are as described in Recommendation X.301.

6.1.3 *Arrangements for facilities related to charging conditions applying to the call*

These arrangements are as described in Recommendation X.301.

6.1.4 *Arrangements for facilities related to specific routing conditions requested by the user of the call*

These arrangements are as described in Recommendation X.301.

6.1.5 *Arrangements for facilities related to protection mechanisms requested by the user of a call*

These arrangements are as described in Recommendation X.301. In particular, for the CUG and CUG/OA facilities the interlock code mechanism described in Recommendation X.180 shall be applied.

6.1.6 *Arrangements for facilities to convey user data in addition to the normal data flow in the data transfer phase*

These arrangements are as described in Recommendation X.301.

6.1.7 *Arrangements for other facilities*

These arrangements are as described in Recommendation X.301.

6.1.8 *Arrangements for internal network utilities (not visible for users)*

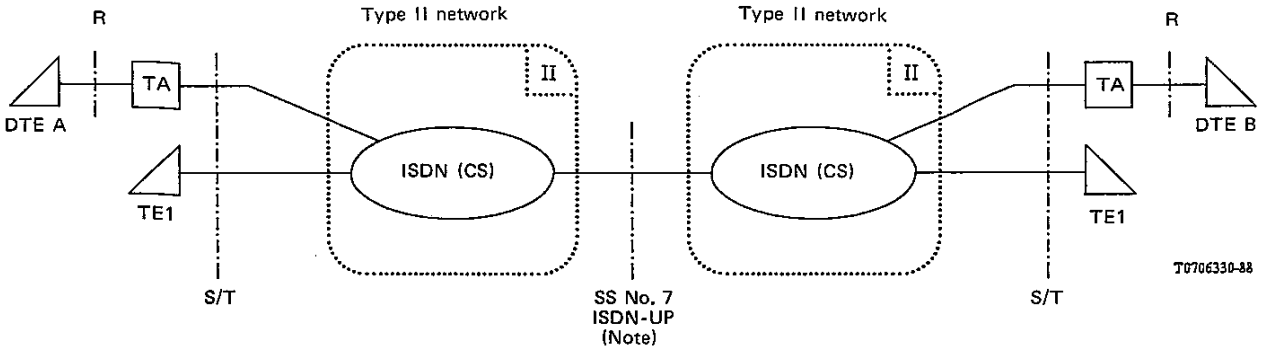
These arrangements are as described in Recommendation X.302. In particular, the mechanisms for network identification are applied as follows:

– the ISDN is identified by the Recommendation X.302 method.

This network identification is then further applied in the TNIC and CNIC utilities of Recommendation X.75.

6.2 *Interworking between ISDNs where a circuit switched bearer is requested on each*

The detailed procedures for interworking are defined in Signalling System No. 7, ISDN-user part (see Figure 2/X.320). In particular, the following applies:



Note – In this case of direct interworking between the two ISDNs, the inter-network interface would be achieved using Signalling System No. 7, ISDN-UP.

FIGURE 2/X.320

ISDN/ISDN circuit-mode interworking

6.2.1 *Transfer of addressing information*

ISDNs typically utilize the E.164 numbering plan. The considerations on the transfer of addressing information are given in Recommendation X.301.

6.2.2 *Arrangements for facilities related to QOS of the call*

These arrangements are as described in Recommendation X.301.

6.2.3 *Arrangements for facilities related to changing conditions applying to the call*

These arrangements are as described in Recommendation X.301.

6.2.4 *Arrangements for facilities related to specific routing conditions requested by the user of the call*

These arrangements are as described in Recommendation X.301.

6.2.5 *Arrangements for facilities related to protection mechanisms requested by the user of a call*

These arrangements are as described in Recommendation X.301.

6.2.6 *Arrangements for facilities to convey user data in addition to the normal data flow in the data transfer phase*

These arrangements are as described in Recommendation X.301.

6.2.7 *Arrangements for other facilities*

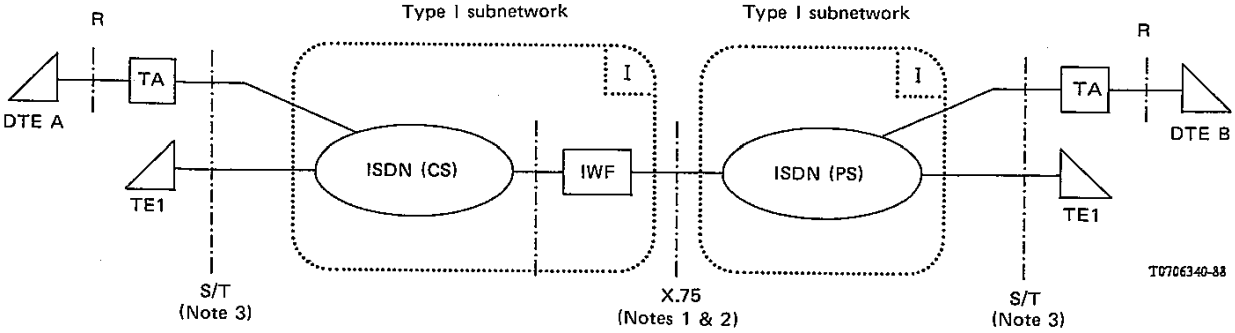
These arrangements are as described in Recommendation X.301.

6.2.8 *Arrangements for internal network utilities*

These arrangements are as described in Recommendation X.302.

6.3 *Interworking between ISDNs where a packet switched bearer is used on one, and a circuit switched bearer is used on the other*

6.3.1 *Interworking by call-control mapping*



Note 1 – The use of other Recommendations is for further study.

Note 2 – Recommendation X.75 applies between the packet handling function in the IWF and the packet handling function in the ISDN, where the ISDN virtual circuit bearer is requested as defined in Recommendation X.31.

Note 3 – The exact protocols to be used for accessing this subnetwork are for further study.

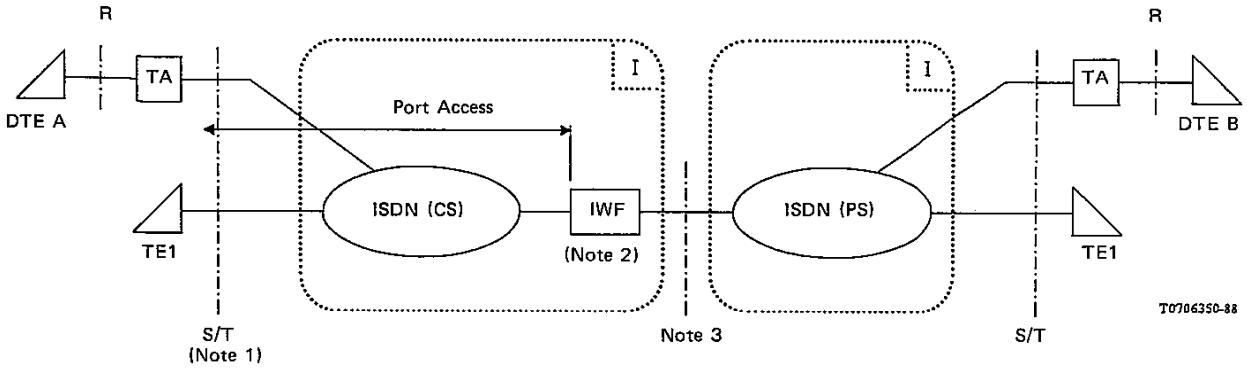
FIGURE 3/X.320

Interworking by call control mapping

In order to enable interworking, procedures must be operated over the ISDN circuit switched bearer to achieve functional capability. However, these procedures are for further study. In general, the following applies:

- Call-control arrangements in the circuit-switched case of ISDN (i.e. I.420 or the functionality identical SS No. 7 protocol or a functionally identical internal network protocol) should be mapped in the IWF to the call-control arrangements in the packet switched case of ISDN (i.e., X.75 or a functionally identical internal network protocol). This mapping is for further study.
- Data transfer arrangements in the packet switched case of ISDN (i.e., X.75 or a functionally identical internal network protocol) should be mapped in the IWF to the procedures operated over the circuit switched bearer between IWF and TE/DTE. This mapping is for further study.

6.3.2 *Interworking by port access*



Note 1 – The ISDN terminal or TA (DTE A) is, in this case, different from a terminal connected to the ISDN supporting the ISDN virtual circuit bearer service as defined in Recommendation X.31.

Note 2 – In this case, the IWF logically belongs to the ISDN providing the ISDN virtual circuit bearer service (ISDN(PS)).

Note 3 – X.75 or a functionally identical internal network protocol.

FIGURE 4/X.320

ISDN/ISDN interworking where a circuit switched bearer is requested to one ISDN and a virtual circuit bearer service is requested to the other ISDN

In order to enable interworking, procedures must be operated over the ISDN circuit switched bearer to achieve functional compatibility. These procedures follow Recommendation X.25 (see Recommendations X.31 and X.10 access category Y). Aspects of X.32 apply as noted in X.31.

In general, the following applies:

– X.75, or a functionally identical internal network protocol is operated between the packet switched case of ISDN and IWF.

– I.420, or ISDN-UP, or a functionally identical internal network protocol is operated between the circuit switched case of ISDN and the IWF, and used to control the circuit switched bearer.

– X.25 is operated between the IWF and the DTE/TE over the ISDN circuit switched bearer.

"Dialling out" considerations:

A circuit switched bearer will be set up through the ISDN upon receipt of a X.75 call request packet, i.e.:

– The Q.931 called party number (and subaddress, if provided) are derived from the X.75 call request packet.

– The Q.931 bearer capability is coded as circuit mode.

– After establishment of the circuit switched bearer, a link connection will be established and the X.75 call request packet will be mapped by the IWF to an X.25 incoming call packet.

– Further procedures are as detailed in Recommendation X.31.

"Dialling in" considerations:

A circuit switched bearer will be set up through the ISDN, i.e.:

– The Q.931 called party number is the address of the IWF (port address).

– The Q.931 bearer capability is coded as circuit mode.

– After establishment of the circuit switched bearer, a link connection will be established.

– An X.25 call request packet will be mapped by the IWF to an X.75 call request packet.

– Further procedures are as detailed in Recommendation X.31.

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