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INTEGRATED SERVICES DIGITAL NETWORK (ISDN)

INTERNETWORK INTERFACES

PUBLIC/PRIVATE ISDN INTERWORKING

ITU-T Recommendation I.570

(Previously “CCITT Recommendation”)

FOREWORD

The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of the International Telecommunication Union. The ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Conference (WTSC), which meets every four years, established the topics for study by the ITU-T Study Groups which, in their turn, produce Recommendations on these topics.

ITU-T Recommendation I.570 was prepared by the ITU-T Study Group XVIII (1988-1993) and was approved by the WTSC (Helsinki, March 1-12, 1993).

NOTES

1 As a consequence of a reform process within the International Telecommunication Union (ITU), the CCITT ceased to exist as of 28 February 1993. In its place, the ITU Telecommunication Standardization Sector (ITU-T) was created as of 1 March 1993. Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.

In order not to delay publication of this Recommendation, no change has been made in the text to references containing the acronyms "CCITT, CCIR or IFRB" or their associated entities such as Plenary Assembly, Secretariat, etc. Future editions of this Recommendation will contain the proper terminology related to the new ITU structure.

2 In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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PUBLIC/PRIVATE ISDN INTERWORKING

(Helsinki, 1993)

1 Scope and objectives

Recognizing that the CCITT Recommendations on ISDN apply to public ISDNs and may apply to private ISDNs, there is a need to ensure smooth service interworking across public and private ISDNs such that the services provided are transparent to the user across the public and private network components. This Recommendation aims to provide general principles and guidelines for the interworking of public and private ISDNs.

The following objectives are envisaged in the development of Recommendations on public/private ISDN interworking:

1) the provision of common compatible functionality to provide common ISDN services;

2) the provision of end-to-end (TE1-type) ISDN terminal connectivity as well as terminal interchangeability;

3) a common overall ISDN transmission plan.

2 Definitions

public network: A network which provides services to the general public.

private network: A network which provides services to a specific set of users only.

mixed public/private ISDN: An overall ISDN which consists of any concatenation of public and private networks. The user perspective of the services offered by a mixed public/private ISDN is common and consistent across the public and private network components of the mixed network.

customer network: A network connected at the user side to the public ISDN and operated based on the subscription to public ISDN services offered at the T reference point (i.e. the so-called customer access point 1 according to Recommendation I.210).

NOTE – The above definitions do not include legal or regulatory aspects and do not indicate any aspect of ownership.

Network – see Recommendation I.112, item 305.

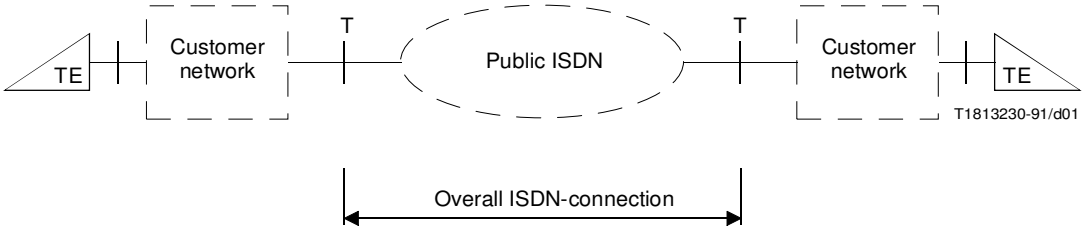
User – see Recommendation I.112, item 401.

Customer equipment – see Recommendation I.112 item 480.

3 Reference configurations

Recommendation I.411 describes the functional groups and reference configurations for the customer network, while Recommendation I.412 describes the interface structures to be used at reference points S and T.

Figure 1 illustrates this overall division of functions involved in a communication across the ISDN.



NOTES

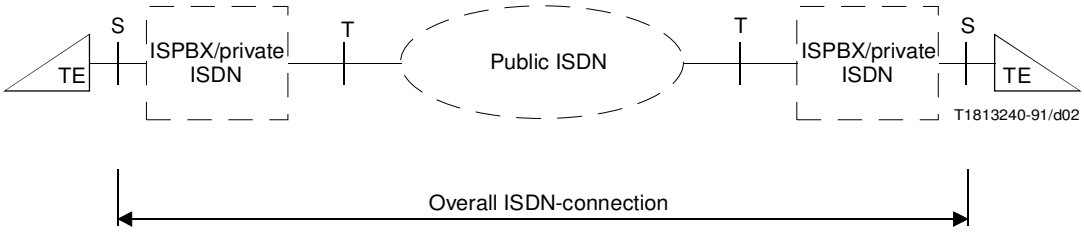
1 The functional group customer network is described in Recommendation I.411.

2 If the customer network is null (i.e. null NT2) the ISDN connection can be considered to end at coincident S and T reference points.

3 If the customer network is an ISPBX-based network, providing the same ISDN connection types according to Recommendation I.430 as the public ISDN does, the ISDN connection ends at the S reference point as shown in Figure 2.

FIGURE 1/I.570

General ISDN reference configuration



NOTES

1 This reference configuration applies to the case where the customer network consists only of ISPBXs. The case in which "IS-CENTREXs" are included is for further study.

2 Other configurations are possible where the call is asymmetrical, or terminates in or involves high layer functions.

3 The terms "customer equipment" and "public ISDN" do not presuppose a particular regulatory situation in any country and are used purely for technical reasons. The connection type concept is defined in Recommendation I.340.

FIGURE 2/I.570

Overall ISDN reference configuration for a mixed ISPBX/public ISDN scenario

4 Scenarios for public/private ISDN interworking

In the overlay scenario, the connection, which is established through the public ISDN, is treated as a private ISDN-to-private ISDN link (link B in Figure 3). Signalling and/or user information which is carried on link B is transparent to the public ISDN.

In this case, the services available to a TE are those offered by the private ISDN, as if they were provided via link A.

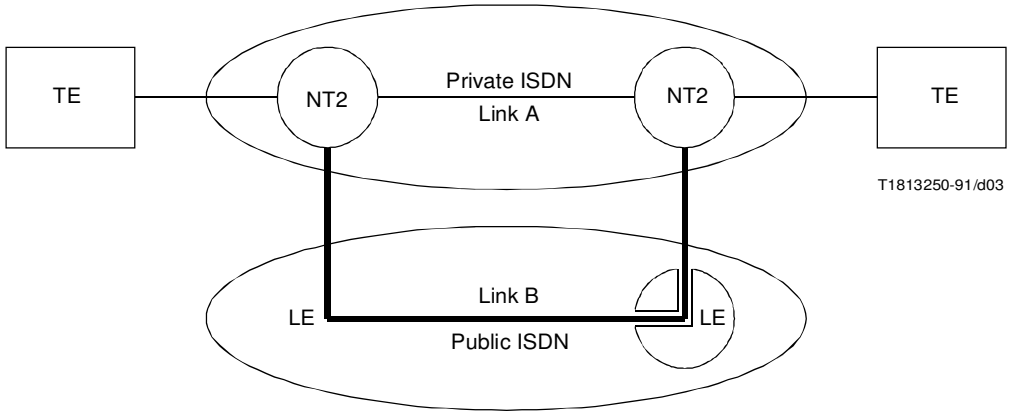


FIGURE 3/I.570

Overlay scenario

For the concatenated case (see Figure 4) interworking is required at the user-network access of the public ISDN, i.e. at links 1 and 3. In this case, the services provided to a TE are realized by the cooperation of functions and capabilities provided by both the public and private network.

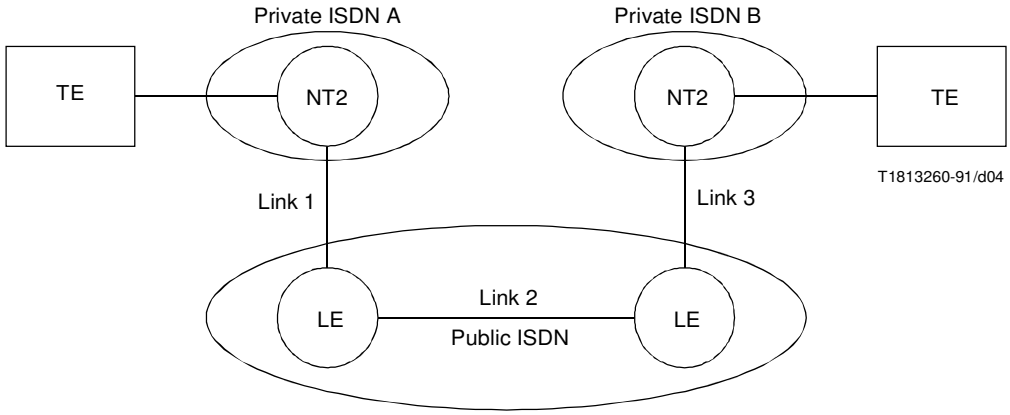


FIGURE 4/I.570

Concatenation scenario

The functionality of an overlay scenario may be achieved by upgrading a concatenation scenario by means of virtual private network (VPN) features. Virtual private ISDNs may support features such as uniform numbering plan, specialized routing, account codes, and extension dialling. Also the efficiency of user information transfer may be improved e.g. by the provision of A-law/μ-law conversion, echo cancellation, etc. The VPN concept and its relationship to the overlay and concatenation scenarios require further study.

NOTE – The overlay scenario (Figure 3) is not currently addressed in 5 and 6 of this Recommendation.

5 Service interworking

5.1 Introduction

The following public/private ISDN interworking principles are identified :

i) In a mixed public/private ISDN, the stage 1 service descriptions should provide views of the service for both the S and T reference points, and these views may be different. Where S and T reference points are coincident, one view of the service applies. Additional requirements for the service definition at the T reference point, if any, should be separately identified.

ii) For each service, several scenarios may be possible for the actual physical location of logical functionality to the public ISDN. The range of scenarios supported by the public ISDN needs to be identified (by stage 2 service descriptions).

iii) For some services and a particular private ISDN, the specific scenarios that are applicable with respect to physical allocation of functionality should be negotiated and agreed to between the public ISDN and the private ISDN at subscription time. For other services, additional signalling capabilities shall provide the necessary information.

Service-specific requirements are defined and described in the I.200-Series of Recommendations.

5.2 Service provision concept

Service interworking aspects between public ISDNs and private ISDNs shall be specified at the T reference point. Basic bearer services and bearer capabilities as used in the context of teleservices and supplementary services may be supported independently by the private and public ISDN.

Where calls pass through a public and a private ISDN:

– both networks will be involved in the provision of basic services,

– both networks will share their involvement in the provision of supplementary services.

The degree of involvement for each ISDN varies, depending on the basic or supplementary service concerned.

The involvement of public and private ISDNs shall be indicated in each service description by one of the following categories:

– *Local*, if only one ISDN is involved. This can be with or without notification to the remote party, and both ISDNs shall be capable of conveying such notifications.

  A local involvement can also occur in both networks simultaneously. For example, the invocation of the public ISDN service by the private ISDN at the T reference point can enable the private ISDN to offer the service at the S reference point. This is classified "double".

– *Cooperative*, if both ISDNs are involved. This case requires cooperation between both ISDNs, whose functions will be complementing each other.

Depending on the actual routing of a call, some services need to be classified in both categories.

As a consequence of the cooperation between the public and private ISDN in providing common services in mixed private/public calls, the information exchanged at the T reference point between two ISDNs may be different from what is exchanged between terminals and either ISDN at the S, and S and T coincident reference points.

Therefore, the service descriptions of the public ISDN shall, where appropriate, take into account these two types of customer configurations.

5.3 Public/Private ISDN configurations

Conceptually, there is a single connection at the T reference point between a public and a private ISDN. However, in practice, there can be more than one instance of a T reference point (see Figure 5) because:

- a private ISDN can be connected to more than one public ISDN;
- a private ISDN exchange can be connected to more than one public ISDN exchange;
- a public ISDN exchange can be connected to more than one private ISDN exchange.

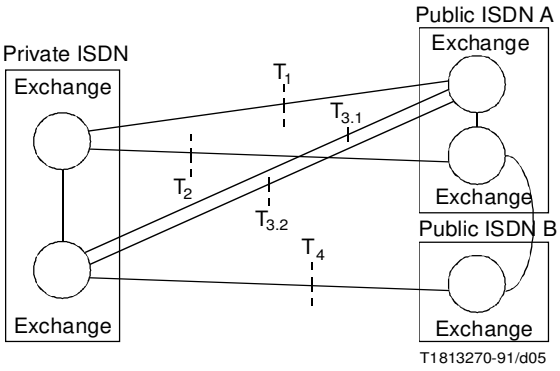


FIGURE 5/I.570

Example of a public/private ISDN configuration

NOTE 1 – Unless explicitly stated otherwise, the termination of the accesses of one private ISDN exchange on different local exchanges of the public ISDN shall not be assumed.

If the grade of service for intercommunication between a public and a private ISDN requires more than one basic and/or primary rate access to be provided, public ISDNs shall offer the possibility to combine the B- and D-channels of these accesses to one or more trunk group(s)[1)] , see $T_{3.1}$ and $T_{3.2}$ in Figure 5.

NOTE 2 – The possibility of more than one trunk group between two exchanges is useful for a number of operational and management purposes, e.g. to reserve certain accesses for particular purposes. The description of these purposes is outside the scope of this Recommendation.

As a subscription option, single or multiple collective number(s) shall be assigned to a trunk group. From a numbering point of view all B- and D-channels of an entire trunk group may form one or multiple bundles.

5.4 Interworking requirements

5.4.1 Numbering

5.4.1.1 Use of numbering plans

The public ISDN shall employ the ISDN numbering plan for ISDN era (see Recommendation E.164). The private ISDN can employ either an E.164 format plan or a private numbering plan or both numbering plans.

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1) The term “trunk group” refers to trunks of private ISDN exchanges, not local exchanges of the public ISDN.

For calls to/from a public ISDN, numbers of the E.164 plan are normally used (Note). In addition, numbers of other CCITT specified numbering plans, e.g. X.121, may appear in certain interworking situations. Interworking between numbering plans is defined in Recommendation E.166/X.122. Arrangements other than those defined therein will be subject to subscription arrangements supported by the public ISDN.

NOTE – Numbers in an "unknown" numbering plan may also be used, in particular when a prefix or an escape code is present (see Recommendation Q.931 for definition and use if "unknown" numbering plan). In this case the number must be organized according to the public network dialling plan.

If the public ISDN supports private numbering plans and the private ISDN subscribes to a service that makes use of such plans, numbers of a private ISDN's numbering plan may appear at the T reference point.

5.4.1.2 Screening and non-screening arrangement

Public and private ISDN shall be responsible for the correctness of identification numbers, i.e. they shall determine identities within their respective domains, or at least, verify identity numbers offered them by their terminals. Any interchange of identification numbers, which might be used in the context of supplementary services, will be subject to applicable screening arrangements between the public and private ISDN.

If identification numbers (e.g. calling line, connected line, forwarding numbers, etc.) are offered by a private ISDN to a public ISDN, one of the following two arrangements applies:

a) *Screening arrangement*

As a standard connection arrangement, the public ISDN may apply screening of identification numbers offered by a private ISDN. If the identification number provided by the private ISDN is valid and the check is successful, this number is used by the network. If the check is unsuccessful, the public ISDN will assign the default E.164 number for the private ISDN.

b) *Non-creening arrangement*

Based on subscription to a special connection arrangement, the public ISDN will not apply screening of identification numbers offered by a private ISDN. The public ISDN shall then only accept national or international ISDN numbers. If a national ISDN number is received, the public ISDN shall, if so applicable, alter it according to a possibly different hierarchical numbering range, e.g. to an international number (addition of country code). If an international ISDN number is received, the public ISDN shall not alter it.

5.4.2 Access between public and private ISDNs

For the purpose of this Recommendation, only access aspects relating to interworking between public and private ISDNs are discussed. Any other usage, e.g. for private networking over tie-lines via semi-permanent connections, is outside the scope of this Recommendation.

5.4.2.1 Access types

Basic and/or primary rate access shall be used for the interconnection of public with private ISDNs.

NOTE – In the case of a private ISDN node being "IS-CENTREX" the interconnection may be implemented differently.

5.4.2.2 Activation/deactivation

It shall be possible to arrange that the public ISDN does not deactivate basic rate accesses when no calls are in progress.

NOTE – Continuous operation of the access allows maintenance of synchronization in the private network (where internal calls might still be going on) and avoids time delays for resynchronization when mixed private/public calls are to be established.

5.4.2.3 Supply of reference clock

It shall be up to the private network operator to define which of the individual accesses shall be used as a reference access for providing the public ISDN clock to the private ISDN. This definition can also include which other accesses are to be used for this purpose in the case that the reference access fails.

5.4.3 Channel selection principle

For both directions of call setup (see Figure 5), the selection of a distinct B- or D-channel of a trunk group for user information transfer shall be based on the requested bearer capabilities (i.e. the acceptance of a call request by the requested ISDN does not imply that terminal characteristics like high layer compatibilities are met).

If in either direction of call setup no resources are available for further progressing the call, the setup request shall be rejected and an indication of congestion shall be given to the requesting party.

5.4.4 Transfer of call control information

Call control information relating to user information transfer over the B- or D-channels of a given access shall be conveyed on the D-channel belonging to the same access (access associated signalling). Within that D-channel call control information can be conveyed in a point-to-point or point-to-multipoint mode of operation. In the case of point-to-point mode of operation, a single, predetermined layer 2 connection shall carry all call control information, including requests for the establishment of calls. At least, the point-to-point mode of operation shall be supported by all ISDNs.

NOTE – This does not preclude that for non-signalling applications, e.g. the transfer of packet data, connections need to be established on a D-channel which uses non-predetermined data links, and that consequently signalling procedures for the determination of data link identifiers are needed.

6 Interworking requirements at point of interconnection

Private ISDNs can connect to the public ISDN at reference point T. The procedures and protocols applicable at reference point T are as defined in the Q.920- and Q.930-Series Recommendations.

In order that LAPD can be applicable for communication in a mixed public/private network situation, the user side and network side must be designated to the adjacent link entities. In a mixed public/private network situation, the public network assumes the network side, and the private network assumes the user side.

Other points of interconnection to the public ISDN from private ISDNs are for further study.