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OF ITU

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INTERNETWORK INTERFACES

GENERAL ARRANGEMENTS FOR INTERWORKING BETWEEN B-ISDN AND 64 kbit/s BASED ISDN

ITU-T Recommendation I.580

(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.580 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 Similarly, in this reform process, the CCIR and the IFRB have been replaced by the Radiocommunication Sector.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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Recommendation I.580

GENERAL ARRANGEMENTS FOR INTERWORKING BETWEEN B-ISDN AND 64 kbit/s BASED ISDN

(Helsinki, 1993)

1 Introduction

It is recognized that B-ISDN may be implemented in a variety of ways according to specific national situations. In these evolutionary phases, appropriate arrangements must be developed for the interworking of services on B-ISDN and services on other networks, and in particular, between B-ISDN and 64 kbit/s based ISDN services. The evolution to B-ISDN should ensure the continued support of existing interfaces and services. That is, many terminals developed for 64 kbit/s based ISDN should be able to be connected to B-ISDN interfaces. Also, services currently provided by 64 kbit/s based ISDN should be provided through B-ISDN interworking configurations.

2 Scope

The purpose of this Recommendation is to identify the general arrangements and principles for the interworking between B-ISDN and 64 kbit/s based ISDN. The functions and other requirements for the interworking between B-ISDN and 64 kbit/s based ISDN for the provision of ISDN bearer services are also defined in this Recommendation.

Teleservices and supplementary services to be supported by B-ISDN interworking configurations require further study.

The case where broadband capabilities are available end-to-end is outside the scope of this Recommendation and should be described in other Recommendations.

3 Communication scenarios

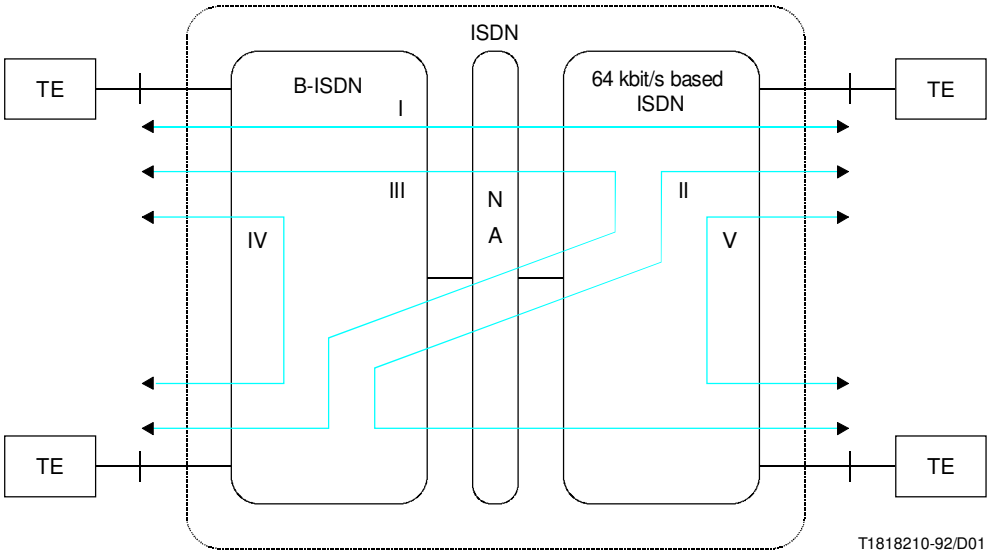
Considering the interworking configuration of ISDN having both 64 kbit/s based ISDN capabilities and broadband capabilities, the communication scenarios are identified as shown in Figure 1:

- scenario I is an interconnection scenario between B-ISDN and 64 kbit/s based ISDN;
- scenario II is a network concatenation interworking scenario, but the interfaces and services are the same as those which are currently provided by 64 kbit/s based ISDN;
- in scenario III the service capabilities provided between broadband user access points are restricted to 64 kbit/s based ISDN capabilities;
- in scenario IV, broadband capabilities are available end-to-end and services currently provided by 64 kbit/s based ISDN are also supported. The 64 kbit/s based ISDN services provided by this scenario are similar to those provided by scenarios I and III. The 64 kbit/s based services are provided on B-ISDN interfaces;
- in scenario V, end-to-end communication is entirely within the 64 kbit/s based ISDN. The services available are the services provided by the 64 kbit/s based ISDN. The services provided by scenario V will be similar to those provided by scenarios I and II.

Scenarios IV and V are outside the scope of this Recommendation.

4 Interworking configurations

Reference configurations described in this clause are purely functional representations of possible interworking configurations.



NA Network adaptor
TE Terminal equipment

FIGURE 1/I.580

Communication scenarios applicable to B-ISDN and 64 kbit/s based ISDN

4.1 Concatenation of 64 kbit/s based ISDNs via B-ISDN

Figure 2 shows a reference configuration of concatenation of 64 kbit/s based ISDNs via B-ISDN. This configuration may appear in the evolutionary process toward B-ISDN. With this interworking configuration, the services provided by end-to-end communication are those that are currently provided by 64 kbit/s based ISDN.

For interworking between B-ISDN (the ATM part of the network) and 64 kbit/s based ISDN (the non-ATM part of the network), the network adaptor (NA) which provides interworking functions should be defined.

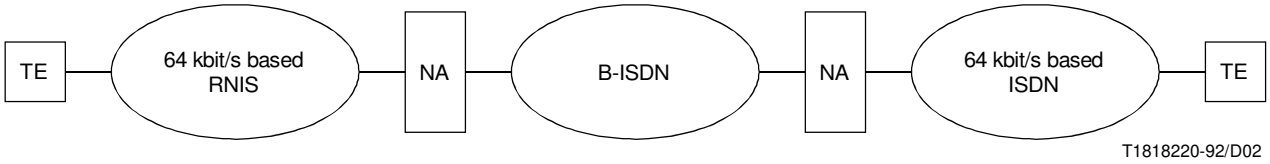


FIGURE 2/I.580

Reference configuration of concatenation of 64 kbit/s based ISDNs via a B-ISDN

4.2 Concatenation of B-ISDNs via 64 kbit/s based ISDN

Figure 3 shows a reference configuration of concatenation of B-ISDNs via 64 kbit/s based ISDN. This configuration may be present in the initial phases of evolution towards B-ISDN wherein B-ISDN islands are interconnected via 64 kbit/s based ISDN. The end-to-end services available with this configuration will be limited to B-ISDN services

which have a 64 kbit/s based ISDN equivalent. Interworking functions between the B-ISDN and 64 kbit/s based ISDN will be provided via a network adaptor (NA).

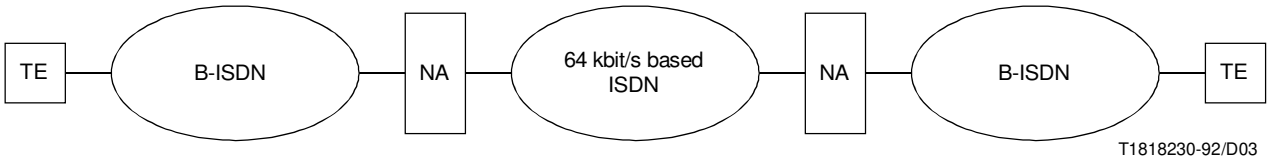


FIGURE 3/I.580

Reference configuration of concatenation of B-ISDNs via 64 kbit/s based ISDN

4.3 B-ISDN to 64 kbit/s based ISDN interconnection

Figure 4 shows a reference configuration of B-ISDN to 64 kbit/s based ISDN interconnection. This configuration where B-ISDN is interconnected to 64 kbit/s based ISDN will also provide the services that are currently provided by 64 kbit/s based ISDN. This is intended to provide connectivity between B-ISDN and 64 kbit/s based ISDN users.

This configuration can be further classified to the following two cases:

a) where 64 kbit/s based ISDN TEs are connected to B-ISDN; and

b) where B-TEs support 64 kbit/s based ISDN services.

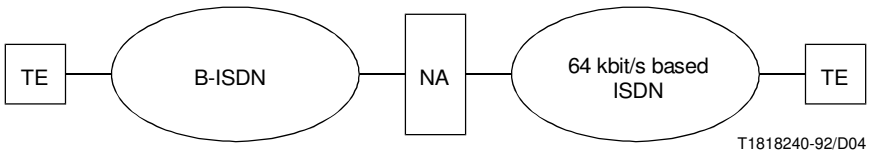


FIGURE 4/I.580

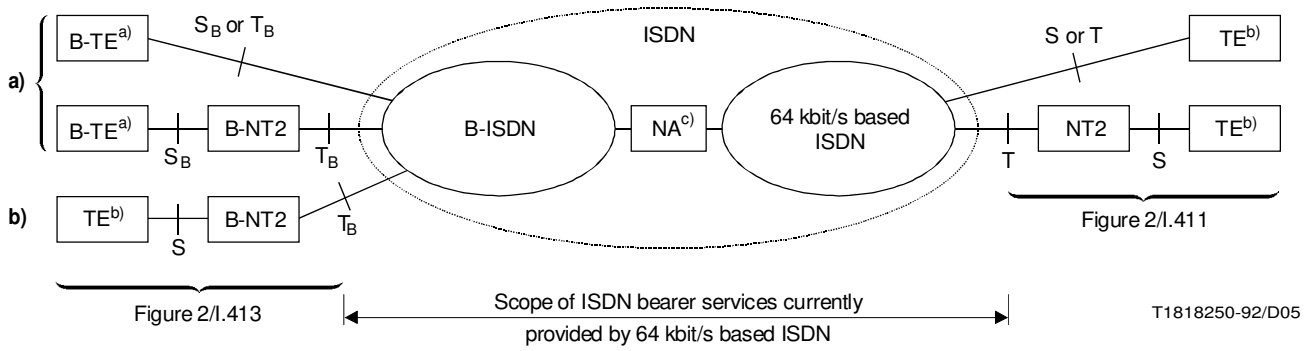
Reference configuration of B-ISDN to 64 kbit/s based ISDN interconnection

Figure 5 shows these cases and the scope of ISDN bearer services currently provided by 64 kbit/s based ISDN:

– The physical configurations for 64 kbit/s based access are defined in Recommendation I.411, and those for broadband access are defined in Recommendation I.413.

– B-ISDN shall include functions of both broadband capabilities and 64 kbit/s based ISDN capabilities.

– Since the figures are purely functional representations, the NA can be provided in an interexchange as well as in an intra-exchange environment.



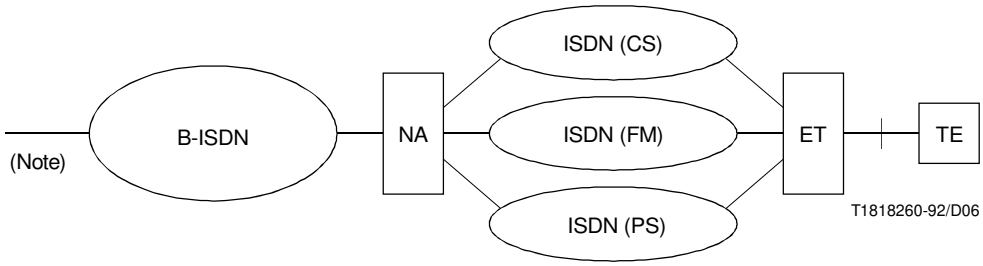
a) B-TE B-TE1 or B-TA + B-TE2/TE2.
b) TE TE1 or TA + TE2.
c) NA Network adaptor.

FIGURE 5/I.580

Scope of 64 kbit/s based ISDN bearer services through interworking B-ISDN

4.4 Decomposition of 64 kbit/s based ISDN into component parts

This section describes decomposition of the 64 kbit/s based ISDN portion of the reference configuration model of 4.1, 4.2 and 4.3. The configuration model below is based on Recommendations X.300 and I.324 concepts. This model reflects a decomposition of 64 kbit/s based ISDN into ISDN (PS), ISDN (CS) and ISDN (FM) portions. A similar decomposition of the B-ISDN is not applicable. This model is used to assist in identification of interworking functions and requirements.



CS Circuit switched
PS Packet switched
FM Frame mode

NOTE – This point could be connected to a TE, or to another NA and a second 64 kbit/s based ISDN, consistent with 4.1, 4.2 and 4.3 interworking reference configurations.

FIGURE 6/I.580

Reference configuration decomposition

5 Relationship between 64 kbit/s based ISDN and B-ISDN services and connection types

Broadband connection types are defined in Recommendation I.327. 64 kbit/s based ISDN connection types are defined in Recommendation I.340.

In the case of interworking between B-ISDN and 64 kbit/s based ISDN) 64 kbit/s based connections are related to broadband connections with appropriate AAL connections.

The relationship between 64 kbit/s based connections and broadband connections is categorized into the following two patterns:

i) *One-to-one correspondence*

Each 64 kbit/s connection has a one-to-one correspondence to a broadband VP/VC connection with an appropriate AAL service class.

– Establishment of connections

On-demand, semi-permanent, permanent

– Quality of service (QOS) classes

64 kbit/s based ISDN connection types are related to appropriate broadband QOS classes. Specific QOS class assignment is for further study.

– Applied broadband bearer service classes:

Speech.....	Class A
3.1 kHz audio.....	Class A
Multi-use.....	Class A
64 kbit/s unrestricted	Class A
Multi-rate $n \times 64$ kbit/s ($n \leq 30$)	Class A
384, 1536, 1920 kbit/s unrestricted....	Class A
Packet mode	Class C
Frame mode	Class C

ii) *N-to-one correspondence ($N \geq 1$)*

Multiple 64 kbit/s based ISDN connections are bundled without distinguishing constituent connections and the bundle corresponds to one broadband VP/VC connection with an appropriate AAL service class.

– Connection types

64 kbit/s based ISDN connections have a N-to-one correspondence ($N \geq 1$) to broadband connections, The case might arise where different connection types are mixed in the same bundle corresponding to one broadband connection.

– Establishment of connections

Semi-permanent, permanent

– QOS classes

In general, each QOS of a 64 kbit/s based ISDN connection does not correspond to the QOS of the corresponding broadband connection. An appropriate broadband QOS is offered for the unit bundling multiple 64 kbit/s based ISDN connections.

– Applied AAL services classes

One AAL service class is associated with one broadband connection. The following categories are identified.

– In the case where a unique connection type is bundled:

Speech	Class A
3.1 kHz audio	Class A
64 kbit/s unrestricted	Class A (see Note)
384,1536,1920 kbit/s unrestricted	Class A (see Note)
Packet mode	Class C
Frame mode	Class C

NOTE – This may be used for frame mode or packet mode bit streams multiplexed in a 64, 384, 1536 or 1920 kbit/s connection.

– In the case where various connection types are bundled:

  – a typical example of this case is where a link is emulated by a broadband connection. This is for further study.

6 Emulation of 64 kbit/s based ISDN network components

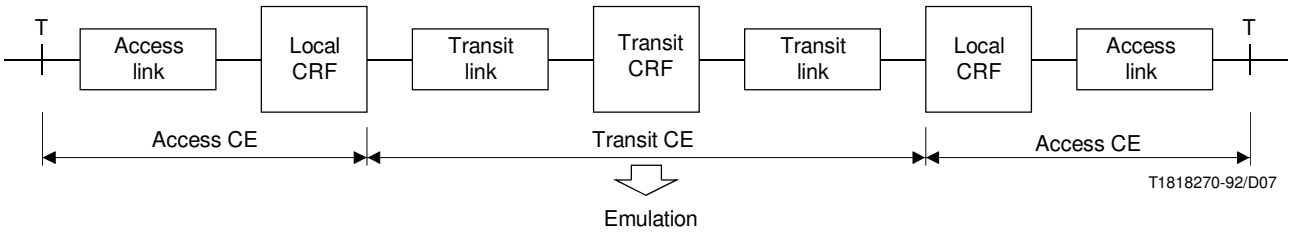
In the process of B-ISDN evolution, ISDN network components may be replaced by broadband techniques. In which case, the 64 kbit/s based ISDN connection elements or components are emulated in such a manner that the original services supported by 64 kbit/s based ISDN are unaffected.

– Emulation of connection elements

  64 kbit/s based ISDN connection elements are emulated by broadband connection elements and NAs. Figure 7 illustrates one example of how this kind of emulation might work, Detailed methods of emulation are for further study.

– Emulation of links

  Links are emulated by broadband connection elements and NAs. Detailed methods of emulation are for further study,



CE Connection element
CRF Connection related function

FIGURE 7/I.580

Example of emulation of 64 kbit/s based ISDN network components

7 Interworking functional requirements

7.1 Network interworking and service interworking

Recommendation I.501 provides the general principles of service interworking.

Considering the interworking configuration between B-ISDN and 64 kbit/s based ISDN, both bearer service interworking and network interworking would take place in the configuration of B-ISDN to 64 kbit/s based ISDN interconnection. On the other hand network interworking would take place in the configuration of concatenation of 64 kbit/s based ISDN.

7.2 Interworking functional requirements for 64 kbits based ISDN services

ISDN bearer services supported by B-ISDN are classified into the following two categories:

1) Broadband specific ISDN bearer services

   – The services which can only be provided by a network providing end-to-end broadband capabilities.

2) 64 kbit/s based ISDN bearer services

   – The services which are equivalent to the bearer services currently provided by 64 kbit/s based ISDN, for example speech, 3.1 kHz audio and 64 kbit/s unrestricted bearer service.

Based on bearer services supported in the configuration of interworking between B-ISDN and 64 kbit/s based ISDN, services can be classified-into three categories:

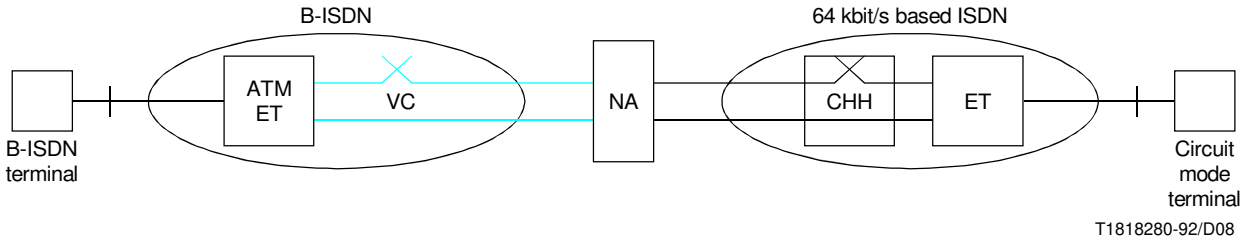
i) circuit mode bearer service;

ii) packet mode bearer service; and

iii) frame mode bearer service.

7.2.1 Interworking functions for circuit mode bearer service

Figure 8 shows an example of a circuit mode bearer service interworking model in the configuration of B-ISDN to 64 kbit/s based ISDN interconnection.



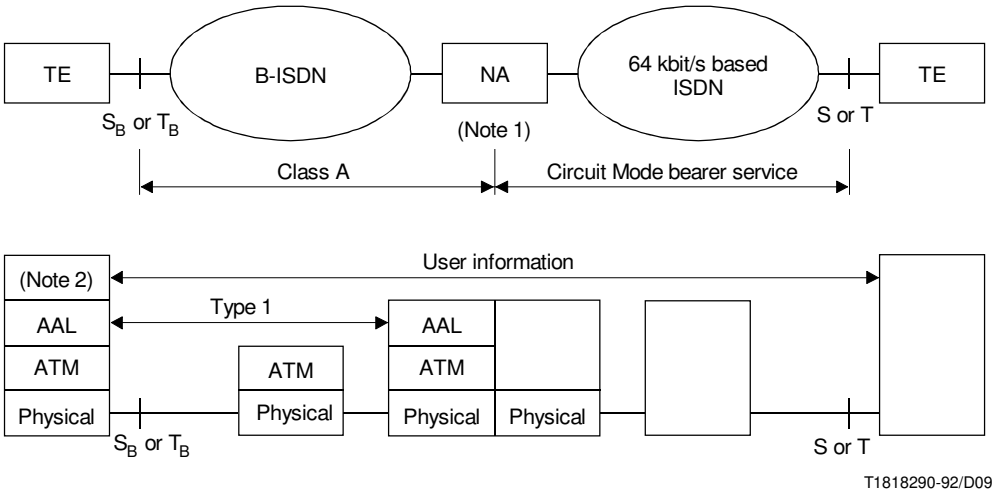
ET Exchange termination
CHH Channel handling functionality (e.g. switching)

FIGURE 8/I.580

Example of interworking model between circuit mode terminal and B-ISDN terminal

Figure 9 shows circuit mode bearer service interworking in the U-plane for the reference configuration of B-ISDN to 64 kbit/s based ISDN interconnection. In this case, broadband connection oriented bearer service-A (BCOBS-A defined in Recommendation F.811) for circuit emulation in B-ISDN and circuit mode bearer service in 64 kbit/s based ISDN are interworked. The values of each bearer service attribute are specified in Recommendations I.231 and F.811 (Annex B).

Interworking functions which will be implemented in NA are required to provide the mapping between BCOBS-A and circuit mode bearer services. More detailed study is needed.



NOTES

1 In the U-plane, the 64 kbit/s based ISDN provides a circuit mode connection over which any user information protocols may be transferred. For this reason, the boxes relating to the 64 kbit/s ISDN side of the NA, the 64 kbit/s ISDN and the TE connected to it are left unlabeled.

2 Application dependent.

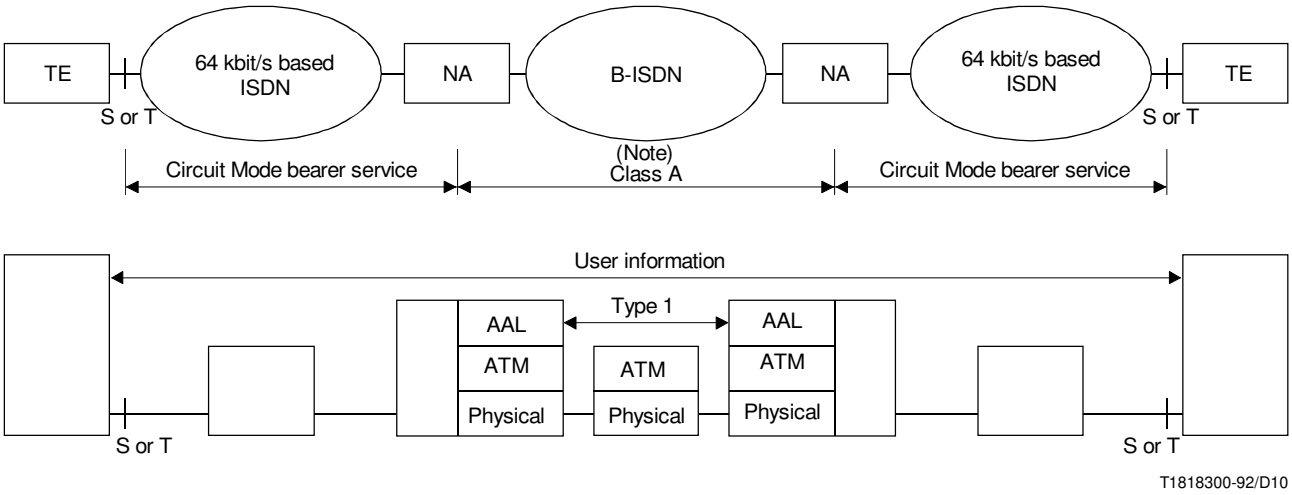
FIGURE 9/I.580

Circuit mode interworking based on the reference configuration of B-ISDN to 64 kbit/s based ISDN interconnection

Figure 10 shows circuit mode bearer service interworking in the U-plane for the reference configuration of concatenation of 64 kbit/s based ISDNs via B-ISDN. The 64 kbit/s circuit mode bearer service offered by the 64 kbit/s based ISDN is interworked via B-ISDN circuit emulation (BCOBS-A) to another 64 kbit/s based ISDN. The service perceived by the users in the 64 kbit/s based ISDNs is that of a 64 kbit/s based ISDN circuit mode bearer service.

Interworking functions between the B-ISDN and 64 kbit/s based ISDN should be provided via a network adaptor (NA).

Figure 11 shows circuit mode bearer service interworking in the U-plane for the reference configuration of concatenation of B-ISDNs via 64 kbit/s based ISDN. The BCOBS-A bearer service offered by the B-ISDN is interworked via 64 kbit/s ISDN circuit mode bearer service to another B-ISDN. The service perceived by the users on the B-ISDNs is that of a 64 kbit/s ISDN circuit mode bearer service. An interworking indication may be provided to the B-ISDN users to indicate that interworking with the 64 kbit/s based ISDN has been encountered and that the service will be limited to that available from the 64 kbit/s based ISDN.

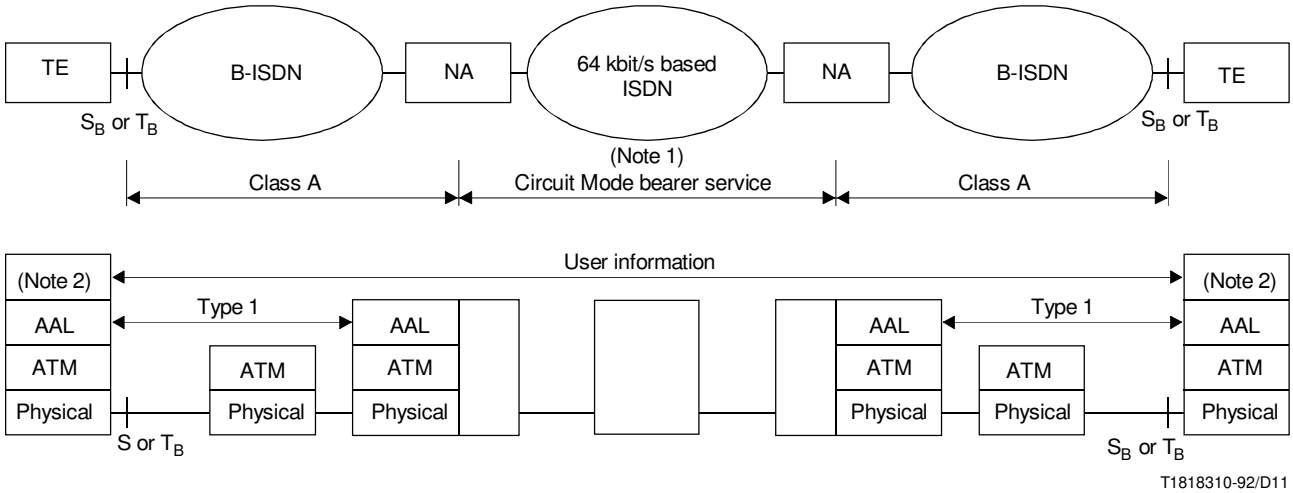


NOTE – In the U-plane, the 64 kbit/s based ISDN provides a circuit mode connection over which any user information protocols may be transferred. For this reason, the boxes relating to the 64 kbit/s ISDN side of the NA, the 64 kbit/s ISDN and the TE connected to it are left unlabeled.

FIGURE 10/I.580

Circuit mode interworking based on the reference configuration of concatenation of 64 kbit/s based ISDNs via B-ISDN

Interworking functions between the B-ISDN and 64 kbit/s based ISDN should be provided via a network adaptor (NA).



NOTES

1 In the U-plane, the 64 kbit/s based ISDN provides a circuit mode connection over which any user information protocols may be transferred. For this reason, the boxes relating to the 64 kbit/s ISDN side of the NA and the 64 kbit/s ISDN are left unlabeled.

2 Application dependent.

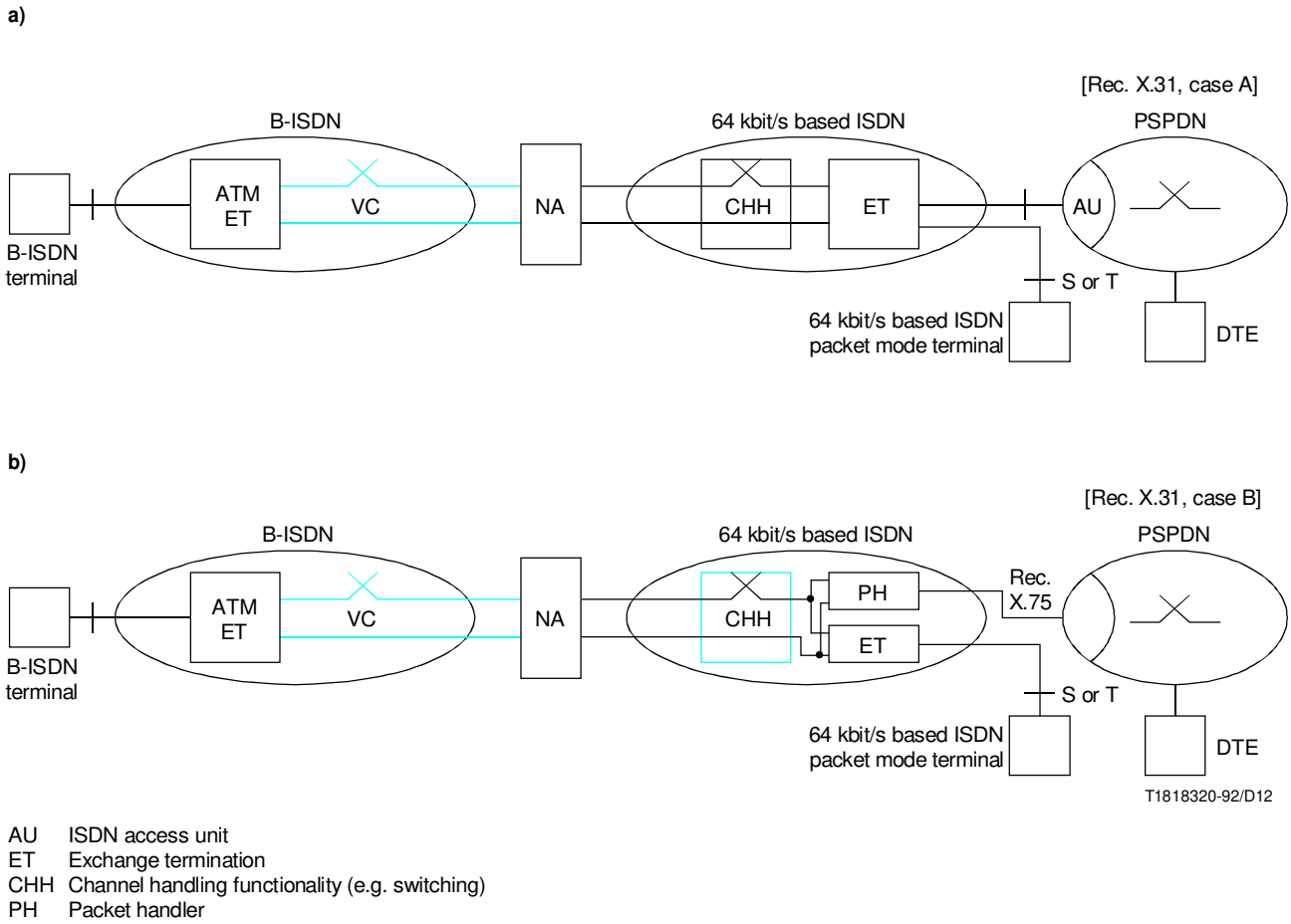
FIGURE 11/I.580

Circuit mode interworking based on the reference configuration of concatenation of B-ISDNs via 64 kbit/s based ISDN

7.2.2 Interworking functions for packet mode bearer service

Diagrams a) and b) of Figure 12 provide two examples of a packet mode bearer service interworking model in the configuration of B-ISDN to 64 kbit/s based ISDN interconnection based on Recommendation X.31 case A and case B, respectively.

In case A, an ISDN transparent circuit connection, either permanent (i.e. non-switched) or demand (i.e. switched), is used. The corresponding ISDN bearer service is 64 kbit/s, as described in Recommendation I.231.1. The service available to the user is that of the PSPDN described in Recommendations X.25 (permanent access) and X.32 (demand access), as well as in the other X-Series Recommendations (e.g. X.2 or X.121). In case B, an ISDN virtual circuit service is used, which is described in Recommendation I.232.1.



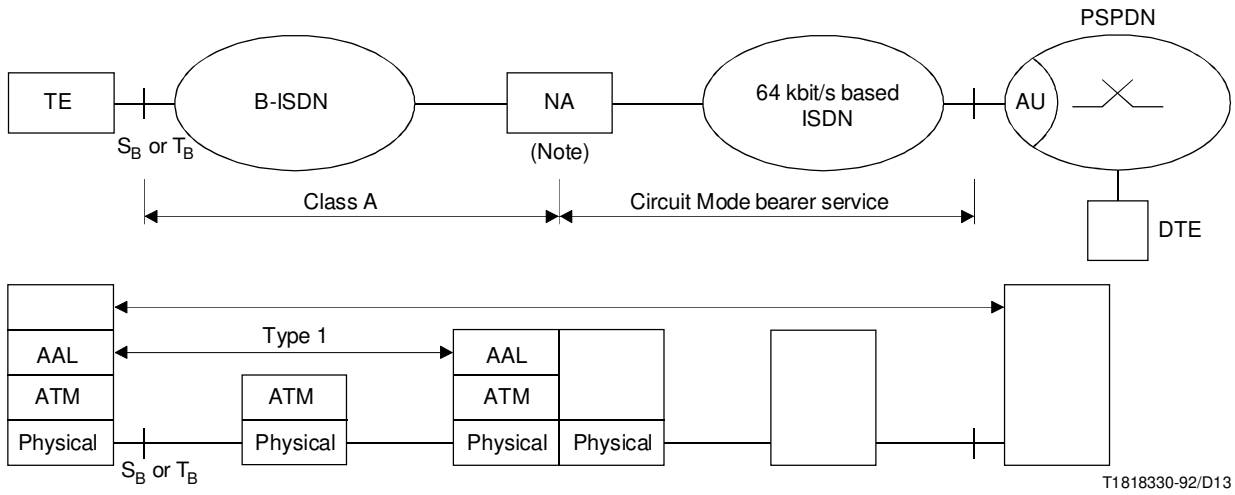
AU ISDN access unit
ET Exchange termination
CHH Channel handling functionality (e.g. switching)
PH Packet handler

FIGURE 12/I.580

Examples of interworking model between X.31 terminal and B-ISDN terminal

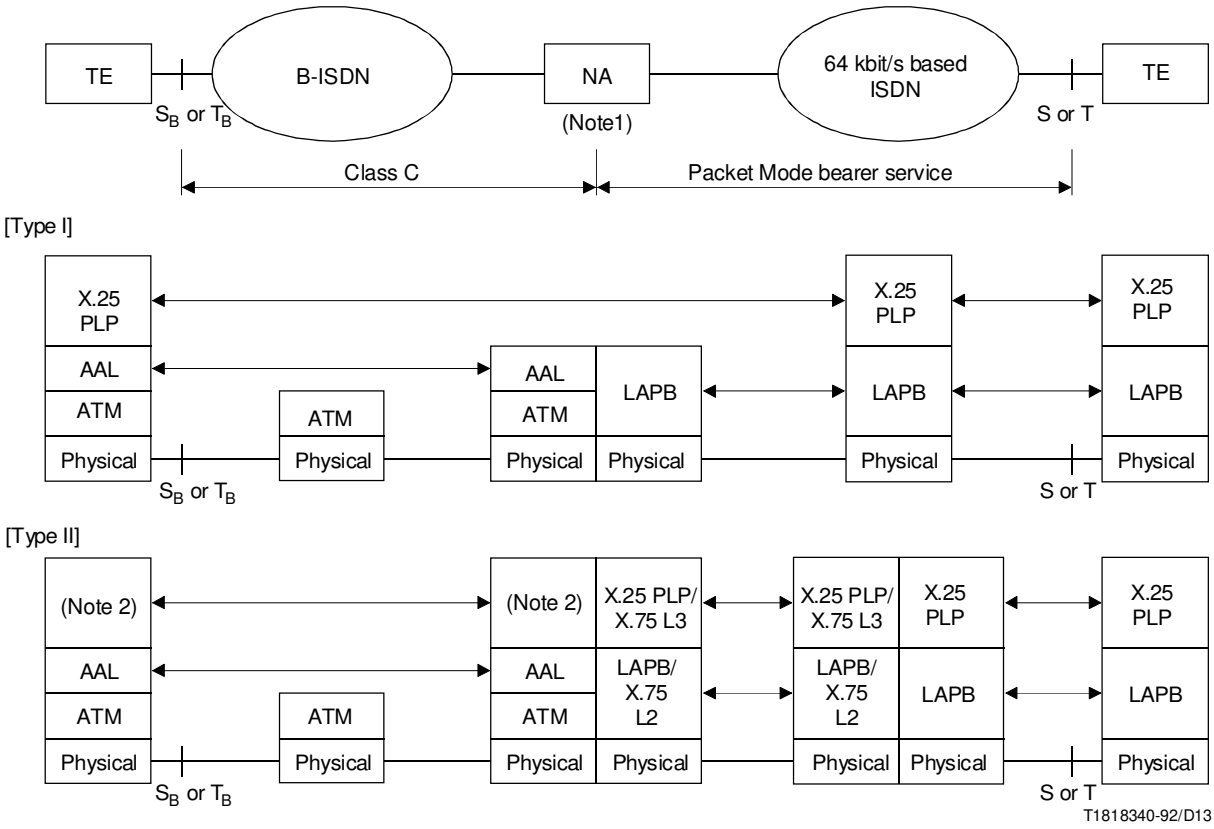
Diagrams a) and b) of Figure 13 show Packet Mode bearer service interworking for the reference configuration of B-ISDN to 64 kbit/s based ISDN interconnection. In diagram b) of figure 13 protocol stacks are categorized into two types. One (Type-I) is to encapsulate X.25 layer 3 packets and carry them into PH. This method may be applied to the port access to PH via B-ISDN or the access similar to Recommendation X.31, case B via B-ISDN. The other (Type-II) is protocol mapping, in which type X.25 layer 3 packets are converted to the appropriate packet through IWF according to predetermined mapping by subscription or signalling.

a)



NOTE – In the U-plane, the 64 kbit/s based ISDN provides a circuit mode connection over which any user information protocols may be transferred. For this reason, the boxes relating to the 64 kbit/s ISDN side of the NA and the 64 kbit/s ISDN are left unlabeled.

b)



NOTES

1 Only U-plane is depicted in B-ISDN side.

2 The connection oriented protocols are for further study.

FIGURE 13/I.580

Packet mode interworking based on the reference configuration of B-ISDN to 64 kbit/s based ISDN interconnection

Interworking functions which will be implemented in NA are required to provide the mapping between BCOBS-C for emulation of packet mode and packet mode bearer service. More detailed study is needed, for example, on the mapping of virtual circuit throughput as defined in Recommendation X.25 and X.135 to appropriate B-ISDN traffic parameters (see Recommendation I.371).

Concatenation of 64 kbit/s based ISDN via B-ISDN is for further study.

7.2.3 Interworking functions for Frame Mode bearer service

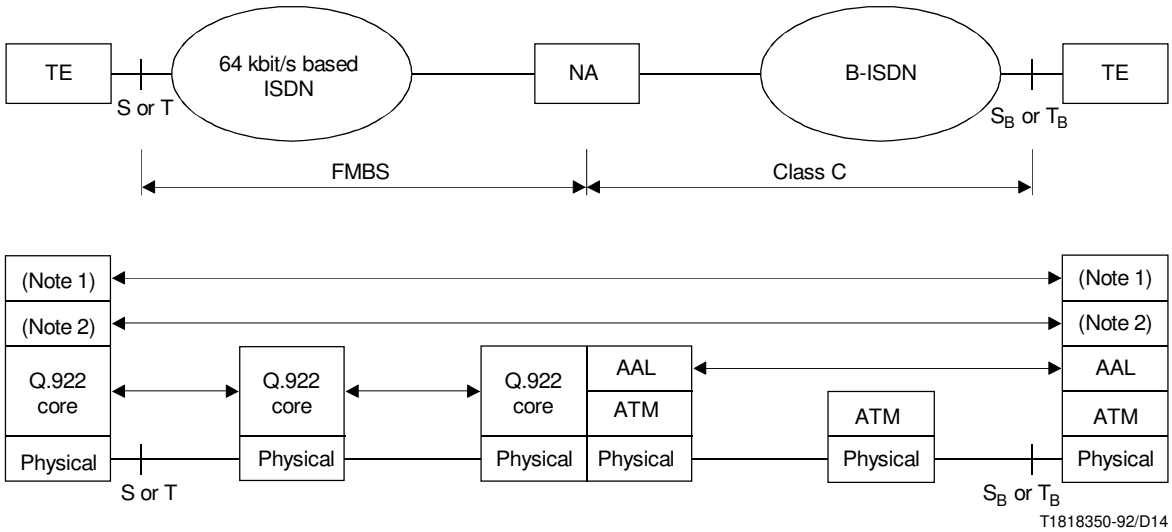
A brief description of interworking functions for Frame Mode bearer services (FMBS) is given here. Detailed description will be subject of future Recommendations.

The two interworking scenarios are illustrated in Figures 14 and 15.

Figure 14 shows B-ISDN to 64 kbit/s based ISDN interconnection, i.e. both services and network interworking. The access network is based on 64 kbit/s based ISDN and the core network is based on ATM. In this case, the FMBS interwork with B-ISDN class C services (message mode, unassured option without flow control).

Figure 15 shows concatenation of 64 kbit/s based ISDN via B-ISDN, i.e. network interworking. The access network is based on 64 kbit/s based ISDN and the core network in based on ATM. This is expected to be the first application of network interworking as applied to B-ISDN. The equivalent B-ISDN service for interworking with FMBS is class C (message mode, unassured option without flow control.

More detailed study is needed, for example, on the mapping of FMBS throughput parameters (CIR, Bc and Be) to appropriate B-ISDN traffic parameters (see Recommendation I.371).



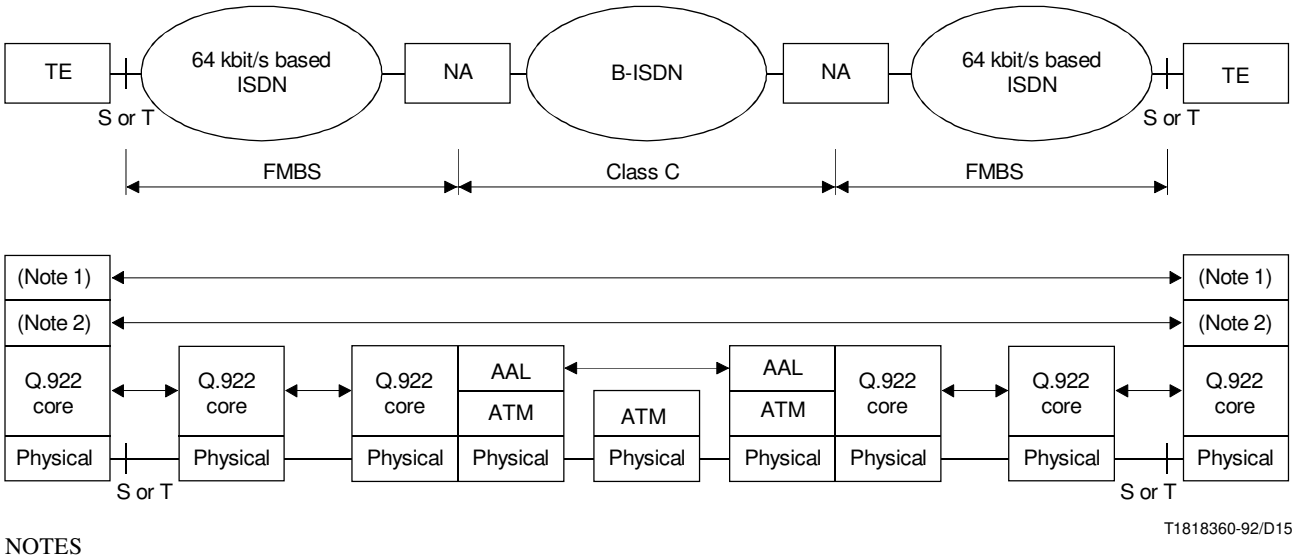
NOTES

1 User specified upper layers.

2 User specified additional layer 2 protocols.

FIGURE 14/I.580

Frame mode interworking based on the reference configuration of B-ISDN to 64 kbit/s based ISDN interconnection



NOTES

1 User specified upper layers.

2 User specified additional layer 2 protocols.

FIGURE 15/I.580

Frame mode interworking based on the reference configuration of concatenation 64 kbit/s based ISDNs via B-ISDN

Annex A

Interworking scenarios to provide 64 kbit/s based ISDN services to a B-ISDN user

(This annex forms an integral part of this Recommendation)

This annex describes two possible interworking scenarios to provide 64 kbit/s based ISDN services to a B-ISDN user. Further study is required.

From the B-ISDN user point of view, 64 kbit/s based ISDN services are accessible to them without any restriction. In order to fulfill this requirement, two possible interworking scenarios may be considered:

- *scenario A:* To provide access to 64 kbit/s based ISDN through a B-ISDN; or
- *scenario B:* To integrate all 64 kbit/s based ISDN services in B-ISDN with a broadband signalling protocol.

1) *Scenario A*

In this scenario a transparent ATM connection, either permanent, semipermanent or demand is used. The corresponding bearer service is Broadband Connection Oriented Bearer Service-A as described in Recommendation F.811. This scenario may be employed for a B-ISDN which does not fully support 64 kbit/s based ISDN services yet.

2) *Scenario B*

In this scenario network interworking takes place using broadband signalling protocol.

The first scenario may operate in the interim period in which the broadband overlay network will coexist with 64 kbit/s based network. On the other hand the second scenario is considered as a long term solution.

A.1 Scenario A

The scenario may have three possible cases:

- case l – Emulation of the B- and D-channels;
- case 2 – Emulation of the basic and primary rate accesses;
- case 3 – Emulation of the basic and primary rate access line transmission interfaces.

1) *Case 1 – Emulating the B/D channels of basic and primary rate access*

   A B-NT2 is used to connect the TEs (64 kbit/s TEs) to the B-ISDN. At the physical layer activation of the TEs, one permanent connection (semipermanent or demand ATM connection) will link the TEs to the NA. The B NT2 will packetize/ depacketize information from/to the D-channel in ATM cell flow. The data link connection will be established between the TEs and the NA and the Q.921 TEI procedures may then take place under the control of the NA. The NA may then play the role of the NT2 or the ET. Following that step the circuit connection control protocol of Recommendation Q.931 may take place. During the circuit connection establishment phase, the allocation of the B-channels will result in dynamic establishment and allocation of ATM connections between the B-NT2 and the NA.

2) *Case 2 – Emulating the basic and primary rate access*

   In this scheme the B-NT2 will have a generic function which is reduced to the circuit emulation function foreseen in AAL class A. The interface at the S-reference point will be extended from the B-NT2 to the NA. In this scenario the B-ISDN is transparent to the 64 kbit/s based ISDN circuit switched call control. The NA is seen from the B-ISDN as a specialized service provider (server for 64 kbit/s based ISDN services access). It is viewed as the NT2 or the ET from the 64 kbit/s based ISDN network.

   Two cases may be distinguished:

   a) *I.431 emulation* – In this case the whole physical layer I.431 is emulated by the AAL connection class A;

   b) *I.430 emulation* – In this case only the 2B + D (144 kbit/s) is emulated by the AAL connection class A. The echo channel E handling will be taken over by the B-NT2 device.

   For cases 1 and 2 see Figure A.1.

3) *Case 3 – Emulating the basic and primary rate access line, transmission interface*

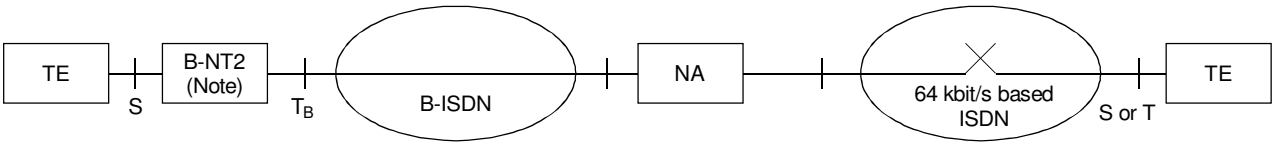
   In this scenario a permanent or semi-permanent connection through the B-ISDN is used. The B-NT2 emulates the line transmission interface of the 64 kbit/s based ISDN. The line interface is extended from the B-NT2 via the B-ISDN to the NA using AAL class A functions. The NA performs the emulation of the line interface. The B-ISDN and the NA are transparent for the 64 kbit/s based circuit switched call control.

   For case 3 see Figure A.2.

Emulation of the B- and D-channel or the basic and primary rate accesses through a B-ISDN to 64 kbit/s based ISDN requires consideration of a number of management, timing and synchronization issues as follows:

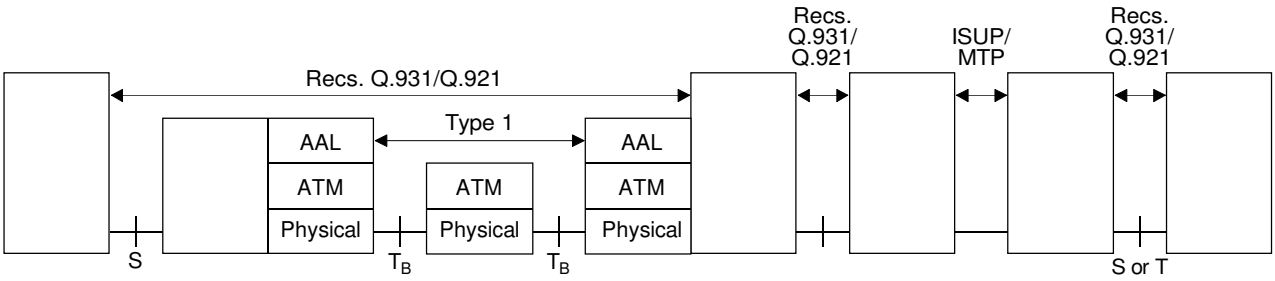
For the I.430 basic rate interface the following functions, conveyed over the layer 1 at the S- or T-reference points, should be considered:

- activation/ deactivation;
- optional loop tests provided by use of layer 1 signalling;
- Monitoring of the transmission quality according to the requirements of the line system used (see Recommendation G.961).



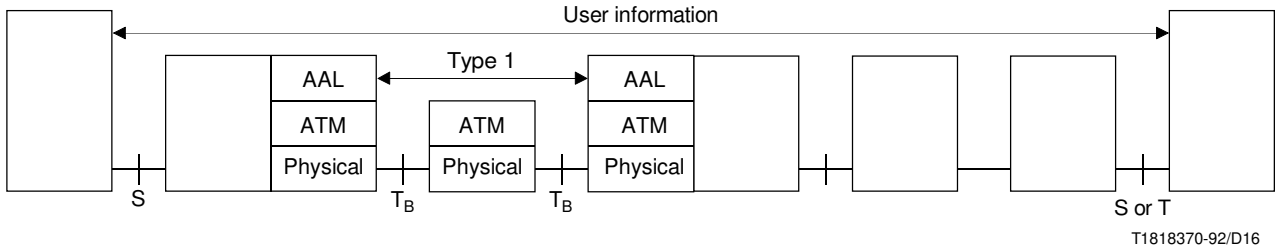
NOTE – Including adaptation functions for the interface at the S-reference point.

a) Interworking configuration



b) Signalling (Note)

NOTE – In this Scenario C-plane is not used for signalling for call establishment within B-ISDN. The signalling protocol will be transferred through B-ISDN as user information.



c) User information

FIGURE A.1/I.580

Example of interworking scenario A, cases 1 and 2

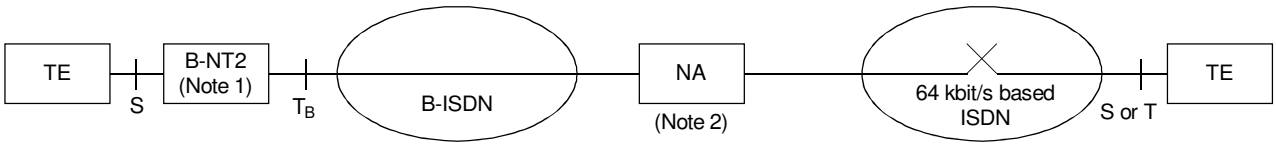
Conveyance of this information across the B-ISDN will typically require a bit rate higher than the corresponding data rate of 2B + D (144 kbit/s) through the B-ISDN. The functional requirements may also require a more stringent quality of service from the B-ISDN than required for the transfer of data information in the B- and D-channels only.

For the I.431 primary rate interface the following maintenance functions should be considered:

- Supervision of layer 1 capability and reporting across the interface, which includes, on the user side, reporting loss of incoming signal or loss of frame alignment from the user side;

- On the network side, reporting loss of layer 1 capability and loss of incoming signal or frame alignment from the user side;

- CRC performance monitoring and reporting across the interface.

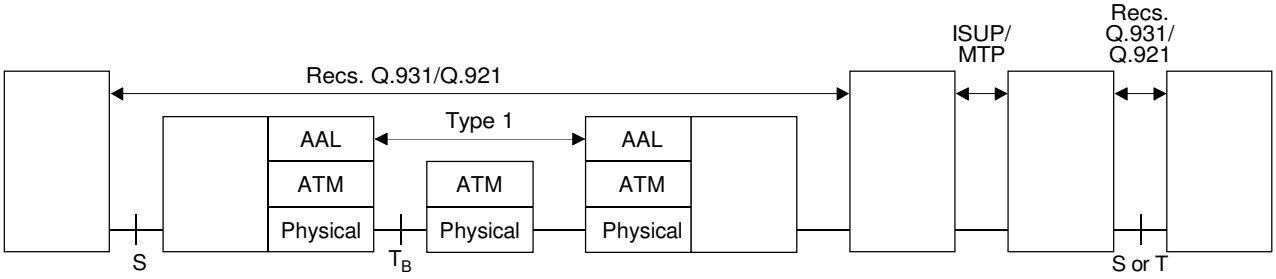


NOTES

1 Including adaptation functions for the interface at the S-reference point.

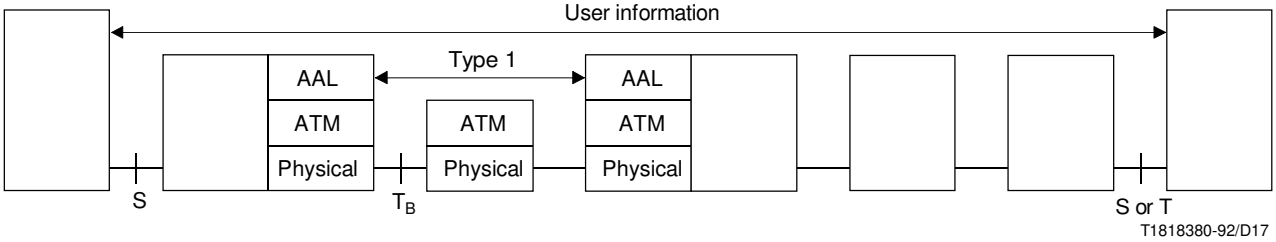
2 The NA is seen as a part of line transmission equipment (NT1) from the 64 kbit/s based ISDN.

a) Interworking configuration



b) Signalling (Note)

NOTE – In this Scenario C-plane is not used for signalling for call establishment within B-ISDN. The signalling protocol will be transferred through B-ISDN as user information.



c) User information

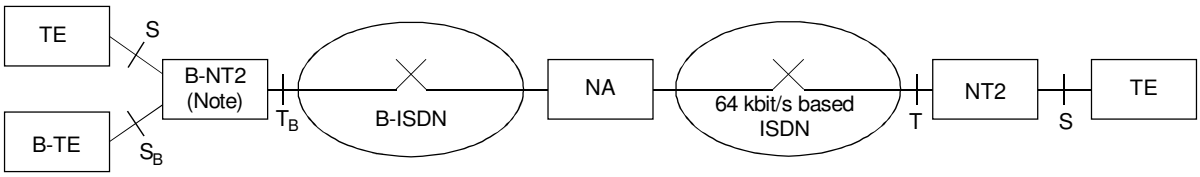
FIGURE A.2/I.580

Example of interworking scenario A, case 3

A.2 Scenario B

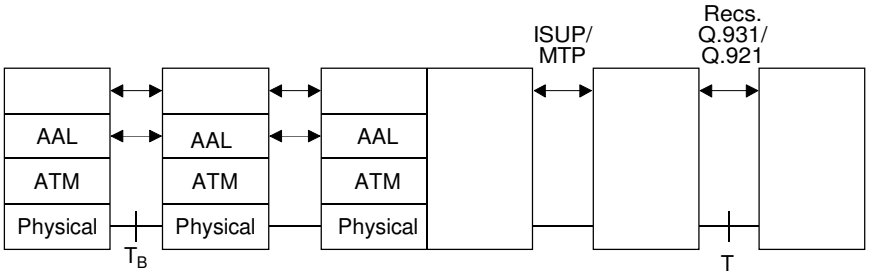
This scenario is depicted in Figure A.3. In this scenario B-ISDN shall support not only broadband capabilities but also 64 kbit/s based ISDN capabilities.

Interworking functions must take into account the interworking both C-plane and U-plane. Interworking between broadband service and 64 kbit/s based ISDN services is performed by call control mapping. C-plane procedures must provide for the negotiation of U-plane parameters. These mapping functions require further study.

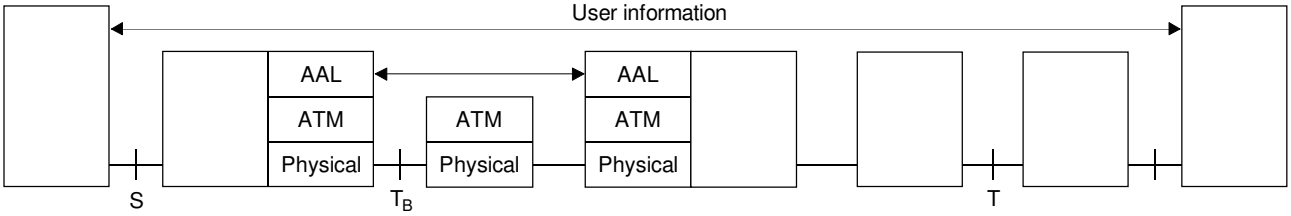


NOTE – Including adaptation functions for the interface at the S-reference point.

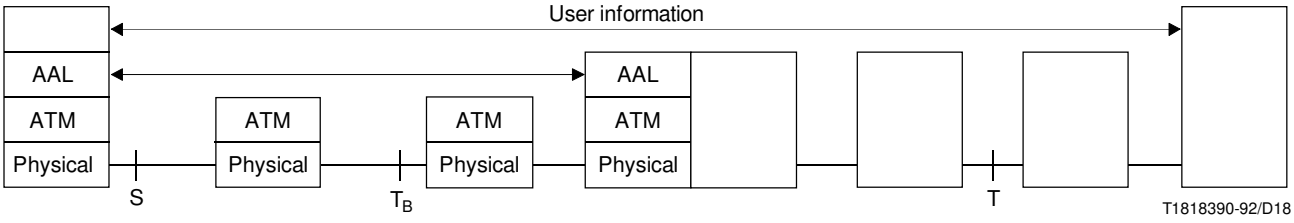
a) Interworking configuration



b) Signalling



c.1) User information: 64 kbit/s based ISDN TE connected to B-ISDN



c.2) User information: B-TE supporting 64 kbit/s based ISDN services

FIGURE A.3/I.580

Example of interworking scenario B

Annex B

Comparison of Broadband Connection Oriented and 64 kbit/s based ISDN bearer services

(This annex forms an integral part of this Recommendation)

This annex contains Tables B.1 and B.2 which compare Broadband Connection Oriented bearer service as defined in Recommendation F.811, and 64 kbit/s based ISDN bearer services as defined in Recommendations I.231 and I.232 for further consideration of the interworking functions.

TABLE B.l/I.580

Comparison with circuit mode bearer service

Category	Broadband Connection Oriented bearer service	Circuit Mode bearer service
Sub-categories	A	
Bearer service attributes	Value of attributes	
Information transfer attribute 1 Information transfer mode 1.1 Connection mode 1.2 Traffic type 1.3 Timing end-to-end 1.4 VCI transparency	 ATM Connection oriented (CO) Constant bit rate (CBR) Required Transparent for virtual path	 Circuit
2 Information transfer rate (kbit/s) 2.1 Peak bit rate 2.2 Others for further study	 64, 2 × 64, *n* × 64, 384, 1536,1920 (Note)	64,2 × 64, *n* × 64($n \leq 30$), 384, 1536,1920
3 Information transfer capability	Unrestricted/Speech/3.1 kHz audio/Unrestricted with tones and announcements	unrestricted/Speech/3.1 kHz audio/Unrestricted with tones and announcements
4 Structure	8 kHz integrity/Unstructured/ Others for further study	8 kHz integrity/Unstructured/ Others for further study
5 Establishment of communication	Demand/Reserved/Permanent	Demand/Reserved/Permanent
6 Symmetry	Bidirectional symmetric/ Bidirectional asymmetric/ Unidirectional	Bidirectional symmetric/ Unidirectional
7 Communication configuration	Point-to-point/Multipoint/ Broadcast	Point-to-point Multipoint
Access attributes 8 Access channel and rate (kbit/s) 8.1 User information 8.2 Signalling	 Virtual channel connection or virtual path connection via the 155.52 Mbit/s interface. The maximum service bit rate is for further study. Signalling virtual channel for signalling.	 B (64), H_0 (384), H_{11} (1536), H_{12}(1920) for user information D (16 or 64) for signalling

TABLE B.l/I.580 *(concluded)*

Comparison with circuit mode bearer service

Category	Broadband Connection Oriented Bearer Service	Circuit mode Bearer Service
Bearer service attributes	Value of attributes	
9 Access protocols 9.1 Signalling access protocol physical layer	Rec. I.432	I-Series Rec. for D-channel Rec. I.430, I.431
9.2 Signalling access protocol ATM layer	Recs. I.150, I.361	
9.3 Signalling access protocol ATM adaptation layer (AAL)	For further study	
9.4 Signalling access protocol layer 3 (above AAL) (Here "layer 3" corresponds to signalling terminology, not B-ISDN PRM)	Recs. Q.930, Q.931 (to be amended for broadband or others for further study)	Recs.Q.930, Q.931
9.5 Information access protocol physical layer	Rec. I.432	Recs. I.431, I.430
9.6 Information access protocol ATM layer	Recs. I.150, I.361	
9.7 Information access protocol ATM adaptation layer (AAL)	Recs. I.362, I.363 (Type 1, others for furtherstudy)	
9.8 Information access protocol layers above AAL	User defined	User defined
General attributes 10 Supplementary services provided	Existing supplementary services when supporting 64 kbit/s ISDN services.Supplementary services for other services are for further study	Refer to Rec. I.250
11 Quality of Service	For further study	For further study
12 Interworking possibilities	Interworking with other connection oriented services in ISDN and other networks.	For further study
13 Operational and commercial aspects	For further study	For further study
NOTE – Other specific bit rates are for further study.		

TABLE B.2/I.580

Comparison with packet mode bearer service

Category	Broadband Connection Oriented bearer service	Circuit Mode bearer service
Sub-categories	C	
Bearer service attributes	Value of attributes	
Information *transfer attribute* 1 Information transfer mode 1.1 Connection mode 1.2 Traffic type 1.3 Timing end-to-end 1.4 VCI transparency	 ATM Connection oriented (CO) Variable bit rate (VBR) Not required Transparent for virtual path	 Packet
2 Information transfer rate (kbit/s) 2.1 Peak bit rate 2.2 Others for further study	Peak cell rate – see Rec. I.371	Maximum throughput of a given virtual circuit is less than, or equal to, the maximum bit rate of the user information access channel and the throughput class of the virtual circuit (Note).
3 Information transfer capability	Unrestricted	unrestricted
4 Structure	AAL-SDU integrity	Service data integrity
5 Establishment of communication	Demand/Reserved/Permanent	Demand (virtual call)/Permanent (permanent virtual call
6 Symmetry	Bidirectional symmetric/Bidirectional asymmetric/Unidirectional	Bidirectional symmetric/Unidirectional
7. Communication configuration	Point-to-point/Multipoint/Broadcast	Point-to-point
Access attributes 8 Access channel and rate (kbit/s) 8.1 User information 8.2 Signalling	 Virtual channel connection or virtual path connection via the 155.52 Mbit/s interface. The maximum service bit rate is for further study. Signalling virtual channel for signalling.	 User information over virtual circuit within B- or D-channel.
9 Access protocols 9.1 Signalling access protocol physical layer	Rec. I.432	As specified in Rec. I.440, I.450, I.451, I 462 and X.25 (layer 2 and 3)
9.2 Signalling access protocol ATM layer	Recs. I.150, I.361	
9.3 Signalling access protocol ATM adaptation layer (AAL)	For further study	
9.4 Signalling access protocol layer 3 (above AAL) (Here "layer 3" corresponds to signalling terminology, not B-ISDN PRM)	Recs. Q.930, Q.931 (to be amended for broadband or others for further study)	Recs. Q.930, Q.931

TABLE B.2/I.580 *(concluded)*

Comparison with packet mode bearer service

Category	Broadband Connection Oriented bearer service	Circuit Mode bearer service
Bearer service attributes	Value of attributes	
9.5 Information access protocol physical layer	Rec. I.432	Recs. I.431, I.430
9.6 Information access protocol ATM layer	Recs. I.150, I.361	
9.7 Information access protocol ATM adaptation layer (AAL)	Recs. I.362, I.363	
9.8 Information access protocol Layers above AAL	User defined	User defined
General attributes 10 Supplementary services provided	Existing supplementary services when supporting 64 kbit/s ISDN services. Supplementary services for other services are for further study	As listed in Rec. X.2. Others are for further study.
11 Quality of Service	For further study	For further study
12 Interworking possibilities	Interworking with other connection oriented services in ISDN and other networks.	For further study
13 Operational and commercial aspects	For further study	For further study
NOTE – The exact value of information transfer rate for the switched virtual circuit and permanent virtual circuit are for further study.		