



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

I.580

(11/95)

INTEGRATED SERVICES DIGITAL NETWORK (ISDN) INTERNETWORK INTERFACES

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

ITU-T Recommendation I.580

(Previously "CCITT Recommendation")

FOREWORD

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The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1 (Helsinki, March 1-12, 1993).

ITU-T Recommendation I.580 was revised by ITU-T Study Group 13 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 2nd of November 1995.

NOTE

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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SUMMARY

During the evolution to B-ISDN implementations, arrangements must be determined for interworking B-ISDN services and networks with existing services and networks. This Recommendation identifies the arrangements and principles for interworking between B-ISDN and 64 kbit/s based ISDN. Interworking with other than 64 kbit/s based ISDN is beyond the scope of this Recommendation.

Recommendation I.580**GENERAL ARRANGEMENTS FOR INTERWORKING BETWEEN B-ISDN
AND 64 kbit/s BASED ISDN***(Helsinki, 1993; revised in 1995)***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 terminals and services. That is, many terminals developed for 64 kbit/s based ISDN should be able to be connected to B-ISDN. 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. Interworking with other networks than 64 kbit/s based ISDN is beyond the scope of 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.

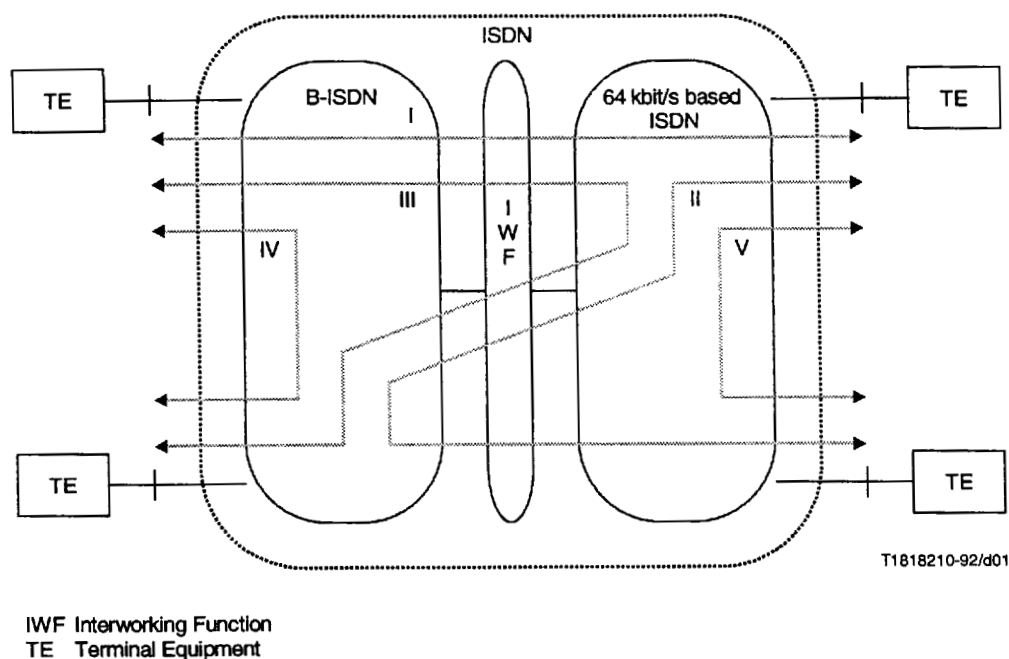


FIGURE 1/I.580

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 towards B-ISDN. With this interworking configuration, the services provided by end-to-end telecommunication are those that are currently provided by 64 kbit/s based ISDN.

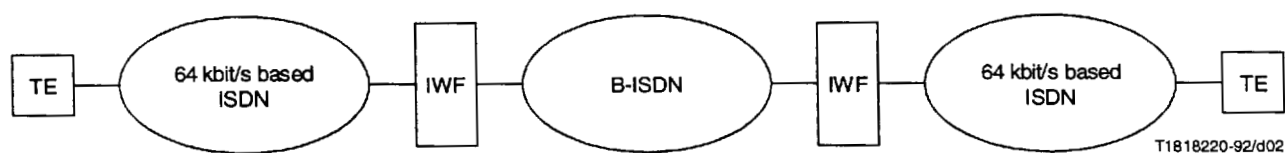


FIGURE 2/I.580

Reference configuration of concatenation of 64 kbit/s based ISDNs via B-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 Interworking Function (IWF) should be defined.

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.



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.

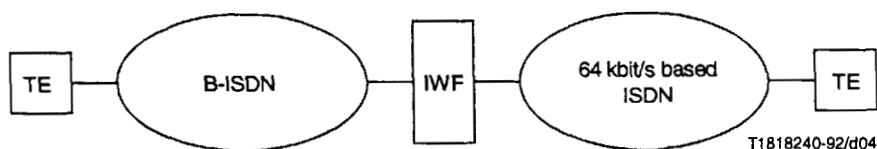


FIGURE 4/I.580

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

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

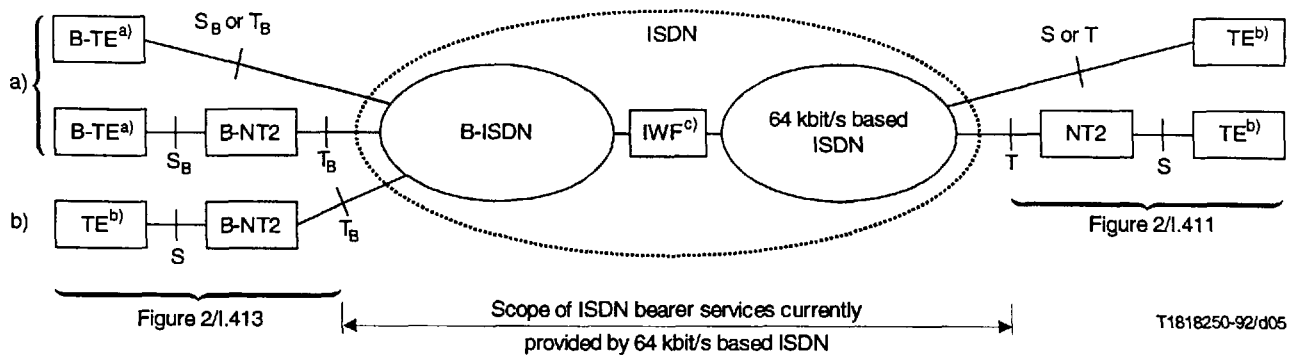
- a) where B-TEs support 64 kbit/s based ISDN services; and
- b) where 64 kbit/s based ISDN TEs are connected to B-ISDN.

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 IWF can be provided in an inter-exchange as well as in an intra-exchange environment.

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

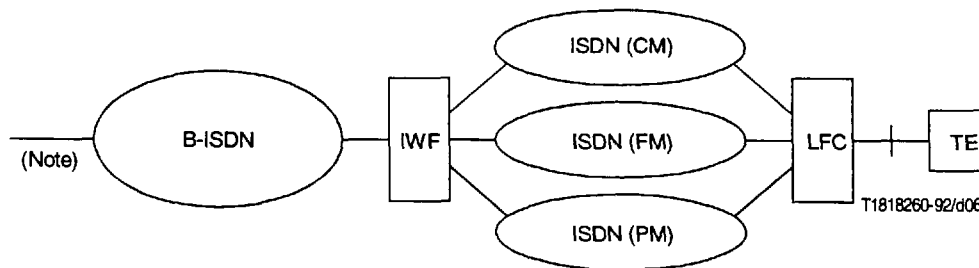
This describes decomposition of the 64 kbit/s based ISDN portion of the reference configuration model of 4.1, 4.2 and 4.3. The configuration model below is based on Recommendations X.300 and I.324 concepts. This model reflects a decomposition of 64 kbit/s based ISDN into ISDN (PM), ISDN (CM) and ISDN (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. See Figure 6.



- a) B-TE B-TE1 or B-TA + B-TE2/TE2.
 b) TE TE1 or TA + TE2.
 c) IWF Interworking Function.

FIGURE 5/I.580

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



LFC Local Functional Capabilities
 CM Circuit Mode
 FM Frame Mode
 PM Packet Mode

NOTE – This point could be connected to a TE, or to another IWF 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 of connections between 64 kbit/s based ISDN and B-ISDN

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:

Switched, 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
Multirate $n \times 64$ 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.

- 64 kbit/s based ISDN connection types:

64 kbit/s based ISDN connections have an N-to-one correspondence ($N \geq 1$) to broadband connections. The case might arise where different 64 kbit/s based ISDN 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 64 kbit/s based ISDN connection type is bundled:

Speech	Class A
3.1 kHz audio	Class A
64 kbit/s unrestricted	Class A (Note)
384, 1536, 1920 kbit/s unrestricted	Class A (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 64 kbit/s based ISDN 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 Interworking functional requirements

6.1 Interworking functional requirements for 64 kbit/s 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.

6.1.1 Interworking functions for circuit mode bearer service

Figure 7 shows an example of a circuit mode bearer service interworking model in the configuration of B-ISDN to 64 kbit/s based ISDN interconnection.

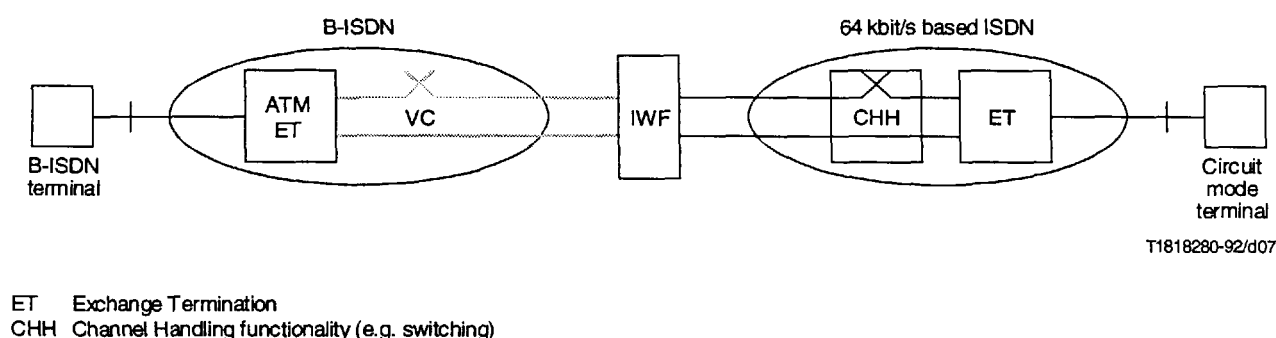
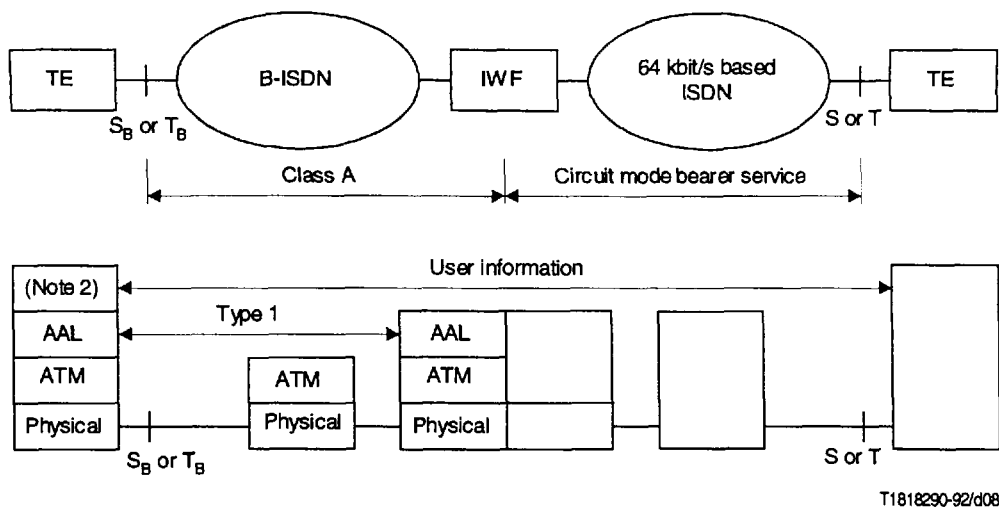


FIGURE 7/I.580

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

Figure 8 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 (see Annex B).

Interworking functions are required to provide the mapping between BCOBS-A and circuit mode bearer services. More detailed study is needed.



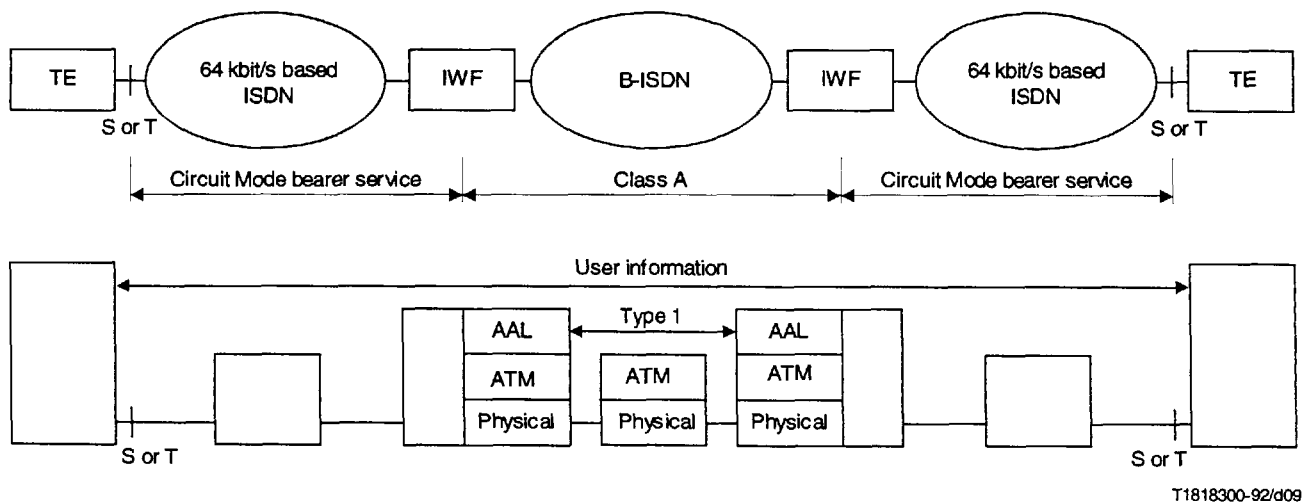
NOTES

- 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 IWF, the 64 kbit/s ISDN connected to it are left unlabelled.
- 2 Application dependent.

FIGURE 8/I.580

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

Figure 9 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.



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 IWF, the 64 kbit/s ISDN and the TE connected to it are left unlabelled.

FIGURE 9/I.580

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