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Series Q
Supplement 11
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SERIES Q: SWITCHING AND SIGNALLING

Technical Report TRQ.2010: B-ISDN signalling interworking requirements

ITU-T Q-series Recommendations – Supplement 11

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SUPPLEMENT 11 TO ITU-T Q-SERIES RECOMMENDATIONS

TECHNICAL REPORT TRQ.2010: B-ISDN SIGNALLING INTERWORKING REQUIREMENTS

Summary

This Supplement specifies the B-ISDN signalling interworking requirements.

FOREWORD

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

The approval of Recommendations by the Members of the ITU-T is covered by the procedure laid down in WTSC Resolution No. 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

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

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Supplement 11 to ITU-T Q-Series Recommendations

**TECHNICAL REPORT TRQ.2010: B-ISDN SIGNALLING
INTERWORKING REQUIREMENTS**

1 Scope

This Supplement specifies the general aspects for the development of B-ISDN signalling requirements. The general aspects are defined in terms of signalling interworking requirements.

2 References

The following Technical Reports and other references contain provisions which, through reference in this text, constitute provisions of this Supplement. At the time of publication, the editions indicated were valid. All supplements and other references are subject to revision; all users of this Supplement are therefore encouraged to investigate the possibility of applying the most recent edition of the supplements and other references listed below. A list of the currently valid ITU-T Recommendations and supplements is regularly published.

[1]   ITU-T Q-series Recommendations – Supplement 7 (1999), *Technical Report TRQ.2001: General aspects for the development of unified signalling requirements*.

[2]   ITU-T Q-series Recommendations – Supplement 10 (1999): *Technical Report TRQ.2002: Information Flow Elements*.

[3]   ITU-T Recommendation F.811 (1996), *Broadband connection-oriented bearer service*.

[4]   ITU-T Recommendation Q.921 (1997), *ISDN user-network interface – Data link layer specification*.

[5]   ITU-T Recommendation Q.931 (1998), *ISDN user-network interface layer 3 specification for basic call control*.

[6]   ITU-T Recommendation I.431 (1993), *Primary rate user-network interface – Layer 1 specification*.

[7]   ITU-T Recommendation I.430 (1995), *Basic user-network interface – Layer 1 specification*.

[8]   CCITT Recommendation Q.767 (1991), *Application of the ISDN user part of CCITT Signalling System No. 7 for international ISDN interconnections*.

3 Definitions

This Supplement defines the following term:

3.1   call: An end-to-end communications service between two or more call party end points, or between one call party end point and its serving node.

4 Abbreviations

This Supplement uses the following abbreviations:

AAL   ATM Adaptation Layer

ATM   Asynchronous Transfer Mode

BC   Bearer Control

B-ISDN	Broadband Integrated Services Digital Network
B-NT2	Broadband Network Termination type 2
B-TE	Broadband Terminal Equipment
CC	Call Control
ET	Exchange Termination
ISDN	Integrated Services Digital Network
ISUP	Integrated Services User Part
IWU	InterWorking Unit
MTP	Message Transfer Part
NA	Network Adaptor
NNI	Network node interface
NT2	Network Termination Type 2
N-TE	Narrowband Terminal Equipment
PSTN	Public Switched Telephone Network
QOS	Quality Of Service
TE	Terminal Equipment
TEI	Terminal Equipment Identifier
TEX	Transit EXchange
UNI	User-Network Interface

5   Introduction

When a new or enhanced signalling protocol is introduced into a network, it is important that existing operations are not impaired. It is important that any signalling requirements for B-ISDN should take into account the need to maintain the stability of existing standards.

5.1   Possible solutions

Since the target solution is longer term, the probability is that a completely stand-alone network will support B-ISDN. However, two possible options can be applied (the selection will depend on the needs of a network operator), as follows:

i)   integration with the existing networks; or

ii)   a stand-alone overlay network.

With the second option, contact with the existing network(s) will be through clearly identified interworking nodes and there will be a requirement to clearly specify the interworking mechanism to be employed. Impact on existing operations will be minimal and policing at those nodes common to both networks to ensure no "overflowing" of signalling should suffice. The solution itself being new should not impact on the existing standard.

The first option, however, will present greater problems in minimising the impact of an enhanced protocol. To avoid abortive processing and signalling, "signalling route" policing will be required, i.e. B-ISDN signalling will only be allowed on to the appropriate routes. In addition, the enhancements to the existing protocol and procedures should be in accordance with the rules for compatibility contained in current Recommendations.

In the last case, not only should existing operations be protected but the standards will also need to be secured form any possible destabilisation, as a result of enhancement. This can be achieved by using a similar approach to producing the enhancement as that employed for the existing standard. As stated above, any enhancement produced should align with the specified compatibility requirements for procedures, messages, etc. for the standard being enhanced.

Protection of existing standards, compatibility and ease of interworking are important requirements of any signalling solution produced for B-ISDN.

5.2 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 5-1. These scenarios also apply to any two networks with different signalling protocols, and are as follows:

• scenario I is an inter-exchange 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; and

• in scenario IV, end-to-end access has broadband capabilities and can provide the services currently provided by 64 kbit/s based ISDN. The 64 kbit/s based ISDN services provided by this scenario are similar to those provided by scenario I and III.
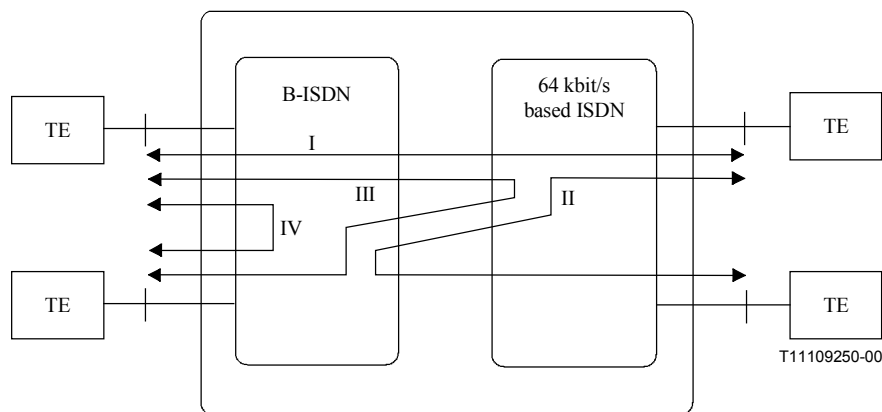

Figure 5-1 – Communication scenarios between B-ISDN and 64 kbit/s based ISDN

6 N-ISDN (64 kbit/s based) interface requirements

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

Scenario A: To provide access to 64 kbit/s based ISDN through a B-ISDN (Figure 6-1); or

Scenario B: To integrate all 64 kbit/s based ISDN services in B-ISDN with a broadband signalling protocol (see Figure 6-4).

6.1 Scenario A

6.1.1 Introduction

In this scenario a transparent ATM connection, either permanent, semi-permanent or on-demand is used. The corresponding bearer service is broadband connection-oriented bearer service-A as described in Recommendation F.811 [3].

The introduction of ATM in B-ISDN should allow the functionalities operated in the existing ISDN to be re-used.

It should be possible to allow the N-TEs via B-ISDN premises to get access to ISDN services. One possible arrangement may require the B-ISDN to provide transparent connections to connect these N-TEs to an IWU.

This scenario may have two possible cases:

Case 1: Emulation of the B and D channels of basic and primary rate access.

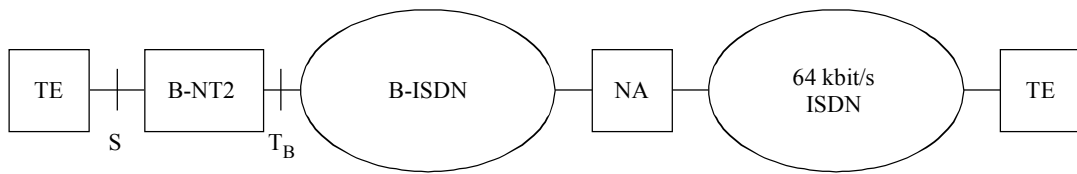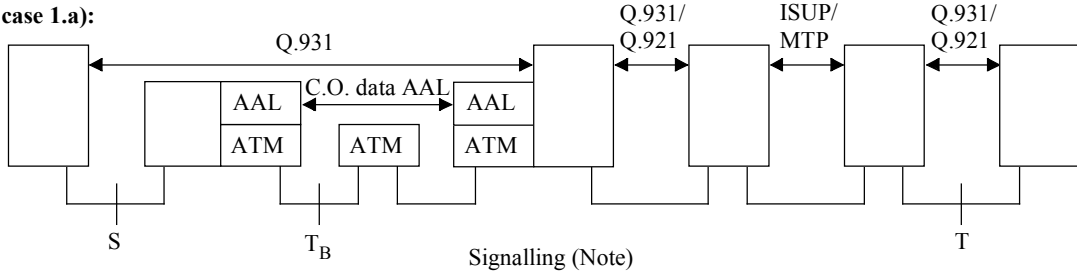Case 2: Emulation of the basic and primary rate access.
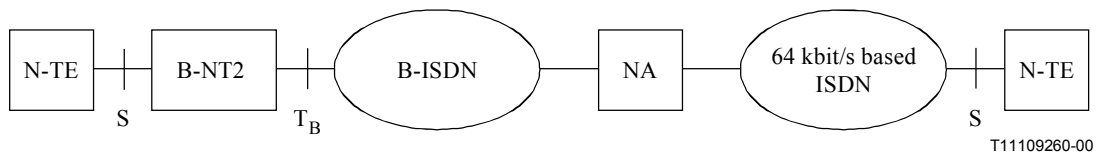
Figure 6-1 – Scenario A

This scenario, as depicted in Figures 6-2 and 6-3, may have two possible cases.
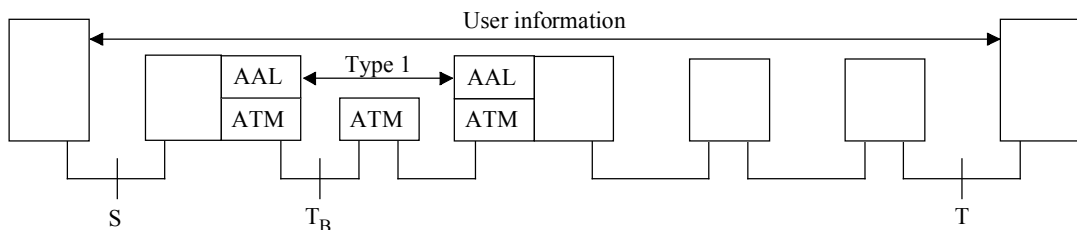
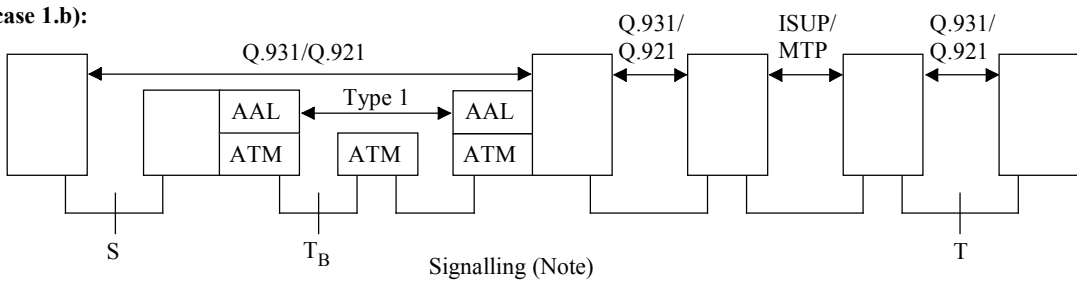Interworking configuration

case 1.a):
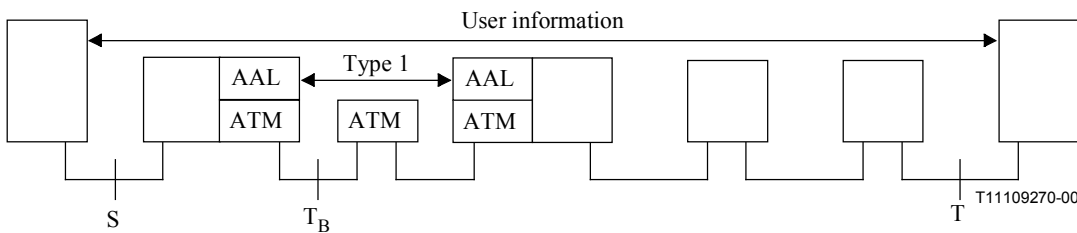

Signalling (Note)

User information transfer (interworking in the U-plane)

case 1.b):

Signalling (Note)

User information transfer (interworking in the U-plane)

NOTE – In this scenario C-Plane is not used for signalling for call establishment within BISDN.
The signalling protocol will be transferred through ATM connection as user information.

Figure 6-2 – Example of interworking Scenario A

6.1.2 Emulation of the B and D channels

a)   B-channels supported by AAL type 1;

      D-channel supported by "connection-oriented data AAL".

b)   B-channels supported by AAL type 1;

   D-channel supported by AAL type 1.

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 (semi-permanent or on-demand ATM connection) will link the TEs to the NA. The B-NT2 will packetize/depacketize information from/to D channel in an ATM cell flow. The data link connection will be established between the TEs and the NA and the Recommendation Q.921 [4] TEI procedures may then take place under the control of the NA. The NA may then play the role of the NT2 or ET. Following that step the circuit connection control protocol of Recommendation Q.931 [5] 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.

6.1.3 Emulation of the basic and primary rate access

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

Two subcases may be distinguished:

a)   ITU-T Recommendation I.431 [6] emulation: in this case the whole physical layer I.431 [6] is emulated by the AAL connection class A; and

b)   ITU-T Recommendation I.430 [7] 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.
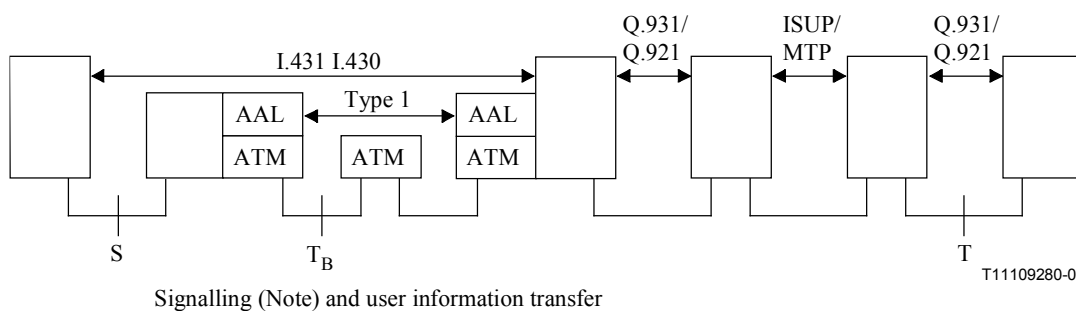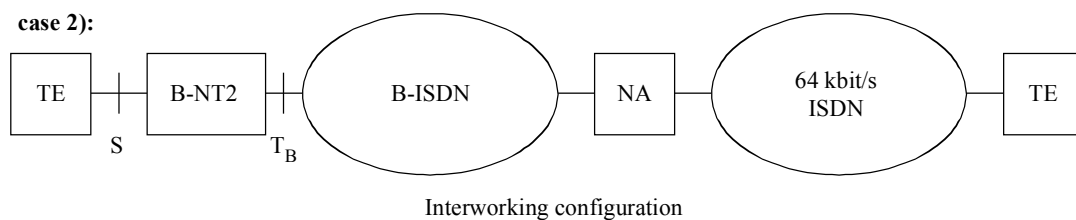
Figure 6-3 – Example of interworking Scenario A

6.2   Scenario B

In this scenario, network interworking takes place by interconnecting trunk line with broadband signalling protocol.

As a basis for interworking with N-ISDN, the support of N-ISDN services as defined in Recommendation Q.767 [8] according to the most recent stages 1 and 2 Recommendations will be supported. The number of interworking units for one connection should be minimized to prevent degradation of QOS.
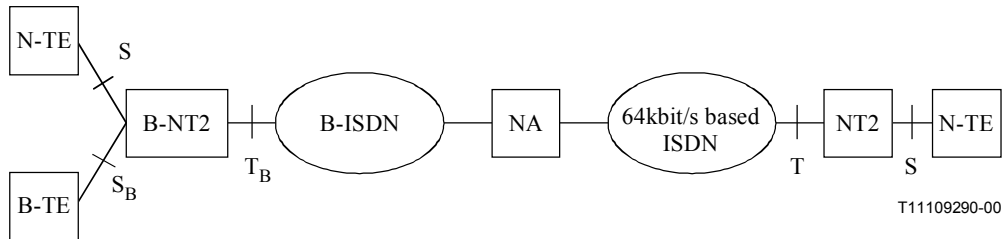

Figure 6-4 – Scenario B

This scenario is depicted in Figure 6-5. In this scenario, B-ISDN shall support not only broadband capabilities but also 64 kbit/s based ISDN capabilities.
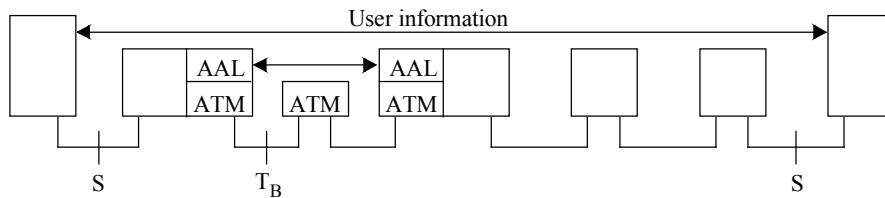
Interworking functions must take into account the mapping of protocols with respect to coding, sequencing, timing, etc. These mapping functions employed for interworking between broadband services and 64 kbit/s ISDN services require further study.
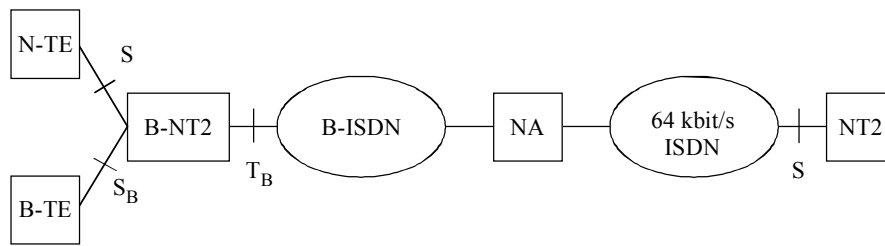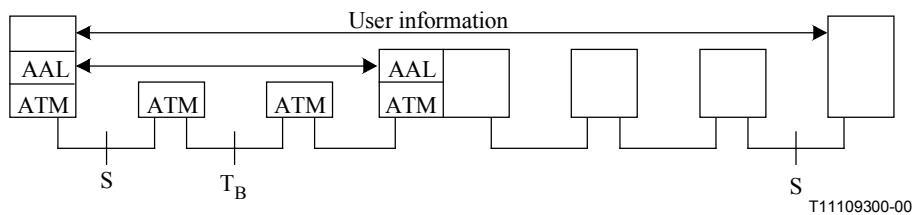
a) Interworking configuration
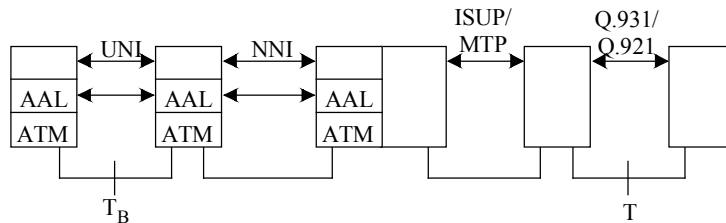
b) Signalling (interworking in the C-plane)

c-1) User information transfer (interworking in the U-plane)
64 kbit/s based ISDN TE connected to B-ISDN

c-2) User information transfer (interworking in the U-plane)
B-TE supporting 64 kbit/s based ISDN services

Figure 6-5 – Example of interworking Scenario B

6.3 Interworking requirements for access signalling

In B-ISDN *en-bloc* sending and receiving is recommended. For access signalling in the case of narrowband ISDN and PSTN interworking overlap sending and receiving may be applied.

6.4 Interworking requirements for network signalling

Network signalling will support both overlap (sending and receiving) and *en-bloc* sending and receiving.

7 Interworking of release 1 and release 2

7.1 Requirements for B-ISDN signalling protocol evolution

Taking into account the investment made for release 1 equipment, the requirements for B-ISDN signalling protocol evolution are:

a) release 1 protocols applicable across the UNI and NNI are based on the corresponding narrowband ISDN protocols, i.e. the existing Q.931 and ISUP protocols respectively;

b) release 1 terminals must be able to be connected to a release 2 networks and retain the release 1 services;

c) the network will allow release 1 and release 2 terminals simultaneously to be used on the same access in release 2 networks; and

d) future B-ISDN signalling protocols shall support the use of release 1 terminals which use the release 1 UNI protocol.

7.2 Scenarios for interworking

It is desirable that peer-to-peer compatibility between protocols for release 1 and future releases is achieved (for release 1 services).

It is required that release 1 call/bearer control has sufficient functionality to provide the minimum set of release 2/3 bearer control functionality.

Several scenarios of peer-to-peer communication are envisaged of how protocol evolution from release 1 protocol to release 2 protocol could take place by fully reusing the release 1 protocol in a context sensitive manner controlled by the service.

7.2.1 Scenario A – Communication between a release 1 exchange/terminal and a release 2/3 exchange/terminal
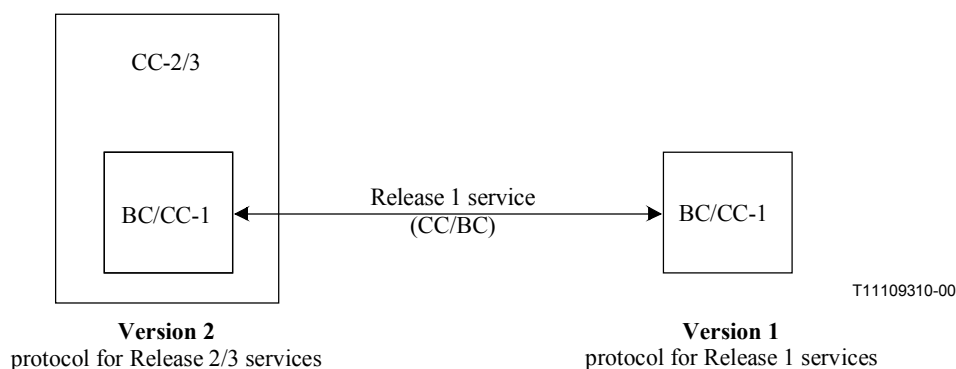
Scenario A is represented in Figure 7-1.

Figure 7-1 – Scenario A

To provide release 1 services, the call control function CC-2/3 is not used and would not be addressed by a call set-up from a "version 1 exchange". For a call set-up from a "version 2 exchange" to a "version 1 exchange" requesting a release 2/3 service, the forward compatibility rules, which have to be included in release 1 protocol, will result in normal unsuccessful case.

7.2.2 Scenario B – Communication between two release 2 exchange/terminal in case of a release 1 service request
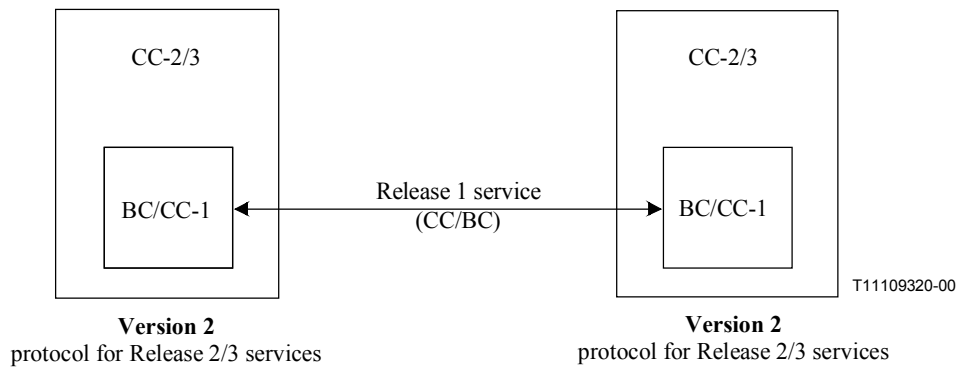
Scenario B is represented in Figure 7-2.

Figure 7-2 – Scenario B

7.2.3 Scenario C – Communication between two release 2 exchange/terminal in case of a release 2/3 service request

Scenario C is represented in Figure 7-3.

In this case from a context sensitive manner controlled by the service, the CC-2/3 function (supported by CC-2/3 protocol) is used instead of the CC-1 function. However, the bearer control protocol remains the same as in the previous cases shown above.
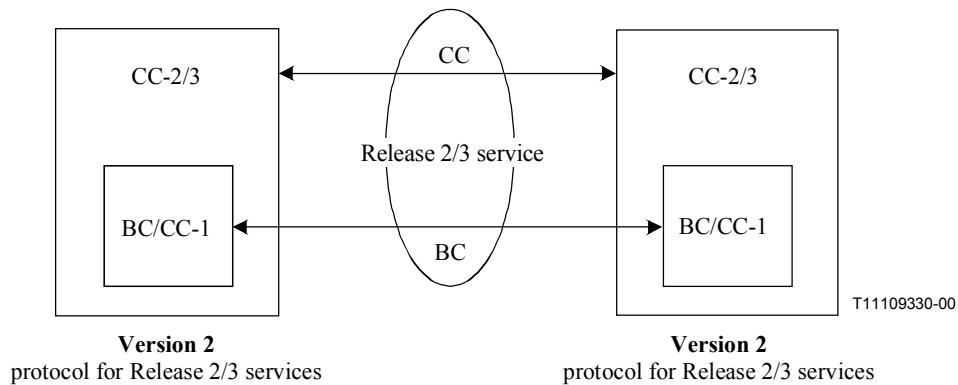

Figure 7-3 – Scenario C

7.2.4 Scenario D – Communication via a version 1 transit node for release 2/3 services.

Scenario D is represented in Figure 7-4.

A "version 1 exchange" can serve as transit node for the bearer connection. It was agreed that there is the requirement for a release 1 protocol to transfer information which is not understood transparently, or instruct appropriately.
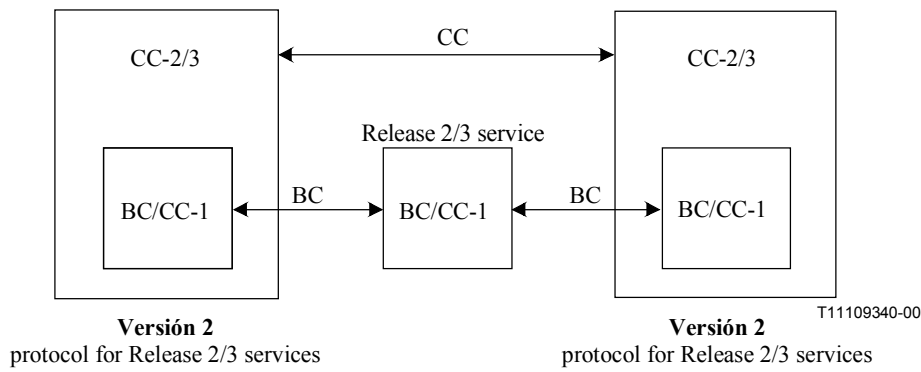
Figure 7-4 – Scenario D

7.3 Support of release 2 services by using release 1 equipment

For a number of release 2 specific services, no specific release 2 bearer control is needed – e.g. bandwidth modification. Therefore, in principle, it is possible to use release 1 TEXs to establish the bearers for these services. This allows a smooth introduction of release 2. This is depicted in Figure 7-5.
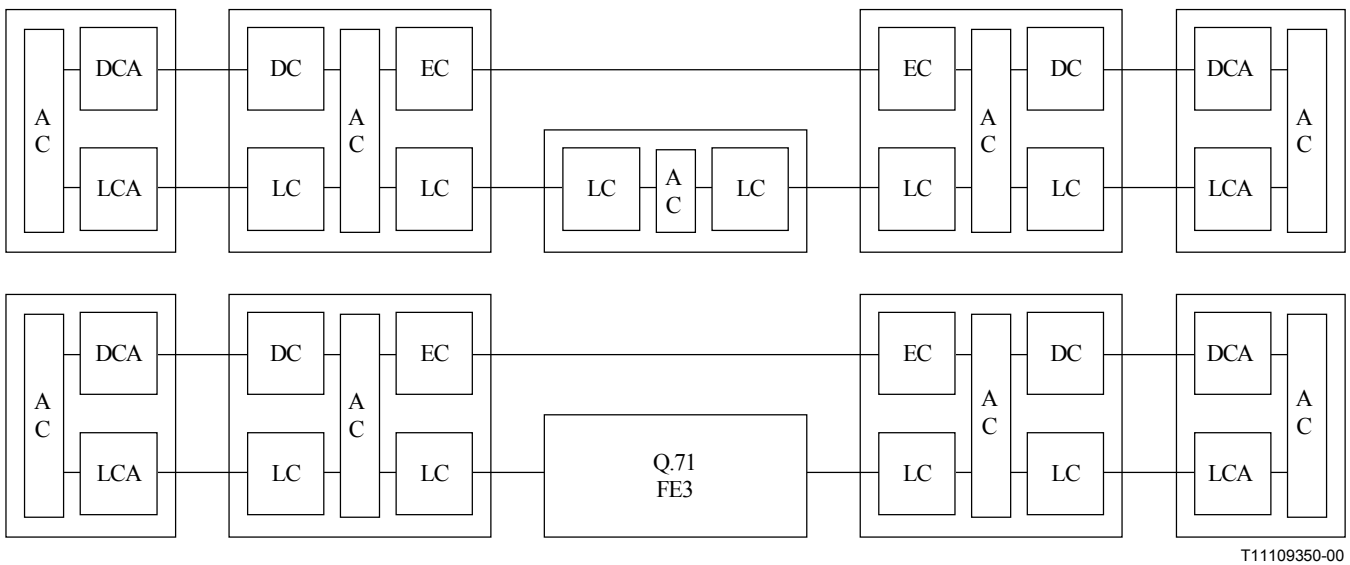

Figure 7-5 – For some release 2 specific services both release 1 and 2 TEXs may be used

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