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GENERAL ASPECTS OF B-ISDN

BROADBAND INTEGRATED SERVICES DIGITAL NETWORK OVERVIEW – SIGNALLING CAPABILITY SET 1, RELEASE 1

ITU-T Recommendation Q.2010

(Previously "CCITT Recommendation")

FOREWORD

The ITU-T (Telecommunication Standardization Sector) is a permanent organ of the International Telecommunication Union (ITU). 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, 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 (Helsinki, March 1-12, 1993).

ITU-T Recommendation Q.2010 was prepared by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 7th February 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

This Recommendation provides an introduction to signalling in the broadband integrated services digital network. Included is a presentation of the signalling reference configurations, possible signalling relationships between network entities, the signalling protocol stacks used in these configurations and pointers to Recommendations which provide the detailed protocol descriptions. Also included is a brief introduction to the principles of ATM.

BROADBAND INTEGRATED SERVICES DIGITAL NETWORK OVERVIEW – SIGNALLING CAPABILITY SET 1, RELEASE 1

(Geneva, 1995)

1 Scope

This Recommendation covers an overview of the basic concepts, reference configurations and protocols related to the provision of signalling capabilities in a Broadband Integrated Services Digital Network (B-ISDN).

2 B-ISDN signalling reference configuration

The overall B-ISDN signalling reference configuration is shown in Figure 1. It includes broadband terminal or terminal adaptation equipment (B-TE1, B-TA), the access distribution function by which terminal equipment access the access switching network, the transit switching network and the signalling network.

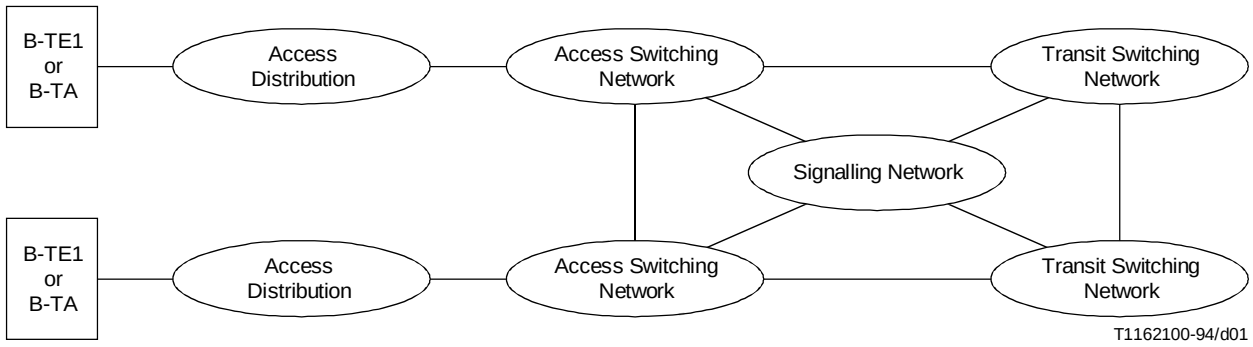


FIGURE 1/Q.2010

B-ISDN signalling reference configuration

3 Signalling relations

Figure 2 depicts the signalling relations in two access distribution configurations, one in which the terminal equipment accesses the access switching network via Broadband Network Termination Equipment (B-NT2) and one in which the terminal equipment accesses the access switching network directly.

The point-to-point signalling relation Pu is used for call establishment. For point-to-point access at the User-Network Interface (UNI) the point-to-point signalling relation Pu is established permanently and used for call offering, call establishment and call release. The protocol stacks associated with Pu are identified in clause 5.

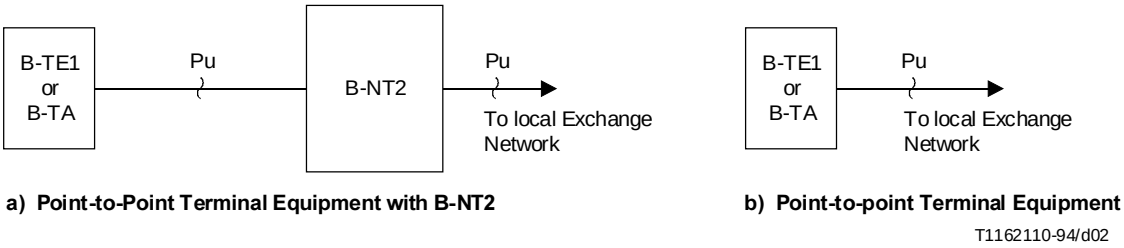


FIGURE 2/Q.2010

Local distribution (including terminal equipment)

Figures 3 and 4 show the signalling relations in the access switching and transit switching networks, respectively.

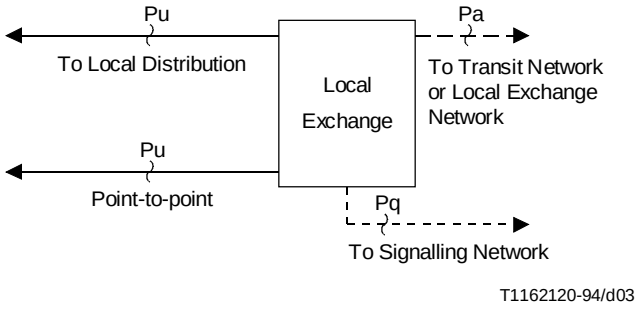


FIGURE 3/Q.2010

Access switching network

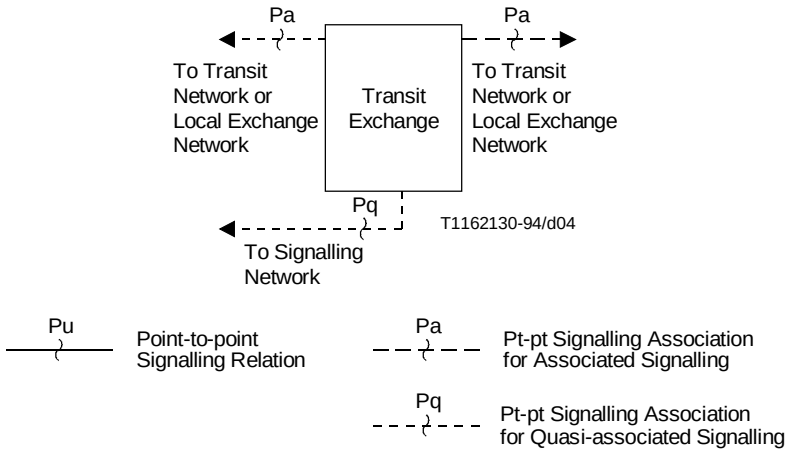


FIGURE 4/Q.2010

Transit switching network

4 Abbreviations

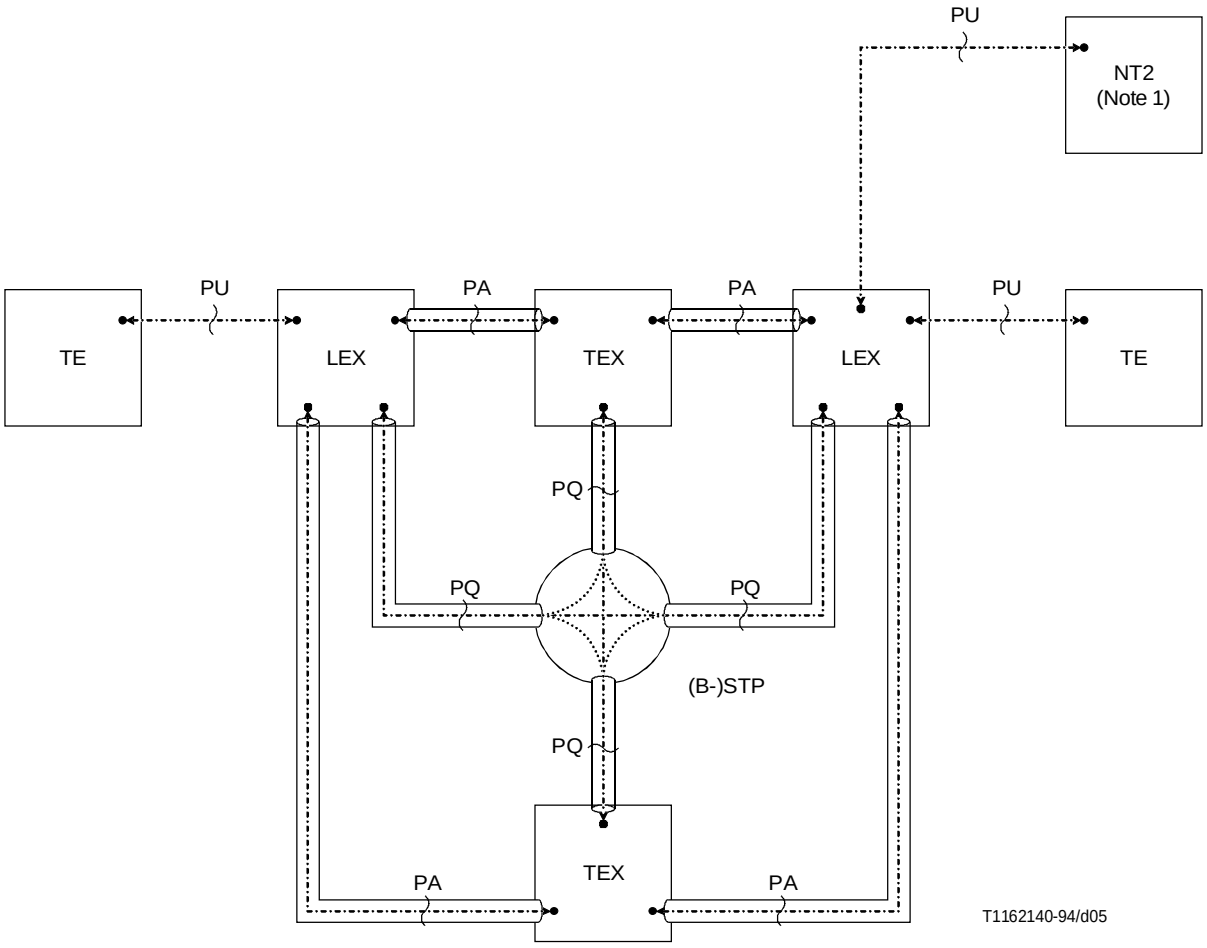
For the purposes of this Recommendation, the following abbreviations are used:

ATM	Asynchronous Transfer Mode
CP	Common Part
DSS 1	Digital Subscriber Signalling System No. 1
MTP	Message Transfer Part
PH	Physical
SCS-1	Signalling Capability Set 1
SSP-AAL	Service Specific Part for the ATM Adaptation Layer
VCC	Virtual Channel Connections

5 Signalling transfer modes

At the NNI, two different modes of signalling transfer can be found. The first is called associated mode. This mode of signalling transfer is used to exchange signalling information directly between signalling nodes, without the assistance of any other signalling node. The second mode of operation is the quasi-associated mode. In this case, messages are exchanged via one or more intermediate signalling nodes. In Figure 5, these associations are shown as PA and PQ respectively.

Figure 5 presents a composite picture of the signalling relationships and the signalling modes that may exist in broadband networks.



Facilities used to transfer signalling information at NNI

Signalling Relation

PU	Pt-pt Signalling Relation at UNI
PA	Pt-pt Signalling Association for associated Signalling Transfer at NNI
PQ	Pt-pt Signalling Association for Quasi-associated Signalling Transfer at NNI
LEX	Local Exchange
TEX	Transit Exchange
STP	Signal Transfer Point

NOTES

1 It is for further study whether this should be NT2/TE.

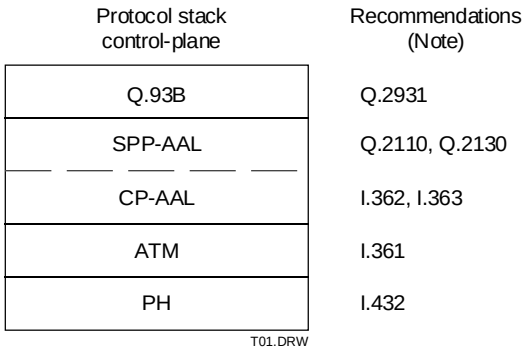
2 For the UNI, the facilities to transfer the signalling information are not show.

FIGURE 5/Q.2010

Signalling relations in B-ISDN

6 Signalling protocol stacks

Figure 6 shows the protocol stack used at the User-Network Interface (UNI) and the applicable Recommendations which cover the detailed protocol descriptions.

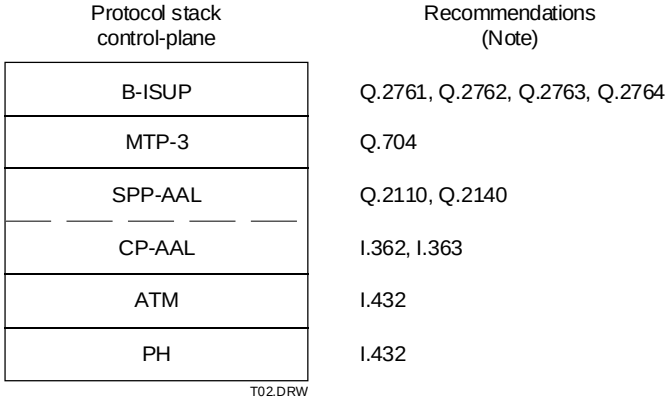


NOTE – For the PU, the SSP-AAL operates in the assured mode.

FIGURE 6/Q.2010

Signalling protocol stack at the UNI

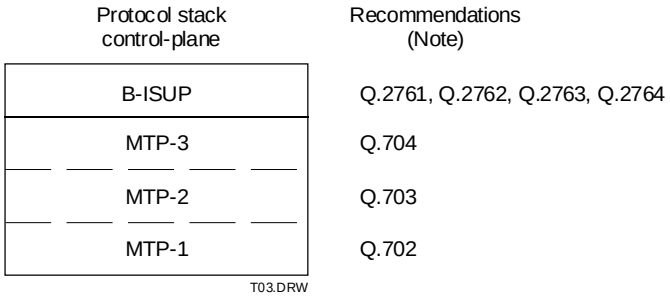
At the NNI either the ATM network or, as a national option, the existing Signalling System No. 7 network can be used for signalling information transfer. Figures 7 and 8 show the protocol stacks used in the two options.



NOTE – The B-ISUP is only terminated at the endpoints of the signalling relation.

FIGURE 7/Q.2010

Signalling protocol stack if the ATM network is used (PA and PQ)



NOTE – The B-ISUP is only terminated at the endpoints of the signalling relation.

FIGURE 8/Q.2010

Signalling protocol stack if the existing SS No. 7 network interface is used (PA and PQ)

7 Basic principles of the Asynchronous Transfer Mode (ATM)

ATM is the transfer mode solution for implementing a B-ISDN. It influences the standardization of digital hierarchies, multiplexing structures, switching and interfaces for broadband signals.

ATM is used in this Recommendation for addressing a specific packet-oriented transfer mode which uses asynchronous time-division multiplexing techniques. The multiplexed information flow is organized into blocks of fixed size cells. A cell consists of an information field header. The primary role of the header is to identify cells belonging to the same virtual channel within the asynchronous time-division multiplex. Cell sequence integrity on a virtual channel connection is preserved by the ATM layer.

ATM is a connection-oriented technique. Connection identifiers are assigned to each link of a connection when required and released when no longer needed. In general, signalling and user information are carried on separate ATM layer connections.

ATM offers a flexible transfer capability common to all services, including connectionless services. Additional functionalities on top of the ATM layer [e.g. in the ATM Adaptation Layer (AAL)] are provided to accommodate various services. The boundary between the ATM layer and the AAL corresponds to the boundary between functions supported by the AAL-specific information. The AAL-specific information is contained in the information field of the ATM cell.

The information field is transported transparently by the ATM layer. No processing, e.g. error control, is performed on the information field at the ATM layer.

The header and information field each consists of a fixed integer number of octets. The header size (5 octets) and the information fields (48 octets) remain constant at all reference points, including the User Network Interface (UNI) and the Network Node Interface (NNI), where the ATM technique is applied. Additional details are provided in Recommendations I.150, B-ISDN ATM functional characteristics, and I.361, B-ISDN ATM layer specifications.

8 ATM Adaptation Layer (AAL) functions

This clause will describe briefly the services that the ATM Adaptation Layer (AAL) must provide to the higher layers in order to support B-ISDN signalling.

The AAL performs functions required by the control plane and supports the mapping between the ATM layer and the next higher. The functions performed in the AAL depend upon the higher layer requirements for signalling.

Architecturally, the AAL is a layer between the ATM layer and the next higher layer in the control plane. The B-ISDN protocol reference model is given in Recommendation I.321.

The signalling AAL is functionally divided into a Common Part (CP) and a Service Specific Part (SSP) as shown in Figure 9. The CP can be used in different SSPs; the SSP is specific to the needs of the service application. The following understanding about the CP and SSP exists at the UNI and NNI respectively.

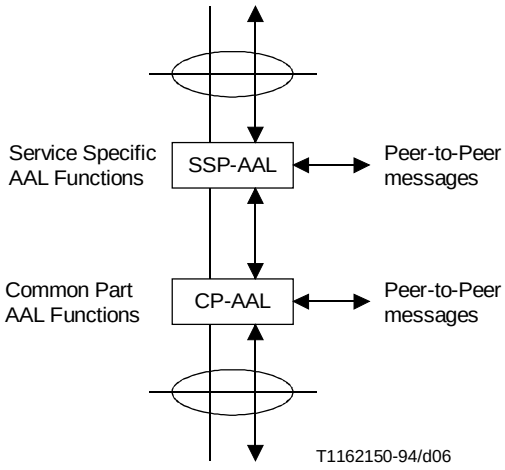


FIGURE 9/Q.2010

Functional division of the signalling AAL

8.1 Signalling AAL at the UNI

The protocol stacks showing the AAL functionality at the UNI for point-to-point are illustrated in Figure 6.

8.2 Signalling AAL at the NNI

The protocol stack showing the AAL functionality at the NNI for point-to-point application in the associated mode and quasi-associated mode is illustrated in Figures 7 and 8.

9 Signalling higher layer functions

A stage 2 service description is provided in Recommendation Q.71. The higher layer protocols for signalling are, in general, responsible for call and bearer control. As these functions differ somewhat at UNI and at the NNI, different protocols are used.

9.1 UNI

The call/connection control functions are:

- call establishment and release[1];
- bearer establishment and release, for point-to-point VCCs[2] ;
- compatibility checking;
- support of N-ISDN services and signalling interworking between N-ISDN and B-ISDN;
- support of some supplementary services (see Recommendations Q.2951 and Q.2957).

9.2 NNI

The call/bearer connection control functions are:

- call establishment and release[1];
- bearer connection establishment and release, for point-to-point VCCs[2];
- transfer of access transport information;
- support of some supplementary services (see Recommendation Q.2730);
- interworking with N-ISDN services.

Signalling network functions are according to Recommendation Q.704. For SCS-1 (Release 1), the signalling protocols are based on the Signalling System No. 7 Recommendation.

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1) For SCS-1 (Release 1), calls and bearer connections are established and released simultaneously.

2) Other communication configurations will be studied during the 1993-1996 study period. For SCS-1 (Release 1), the signalling protocols are based on the DSS 1 and ISUP Recommendations.