INTERNATIONAL TELECOMMUNICATION UNION

ITU-T Q.2761

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

(02/95)

B-ISDN APPLICATION PROTOCOLS OF THE NETWORK

BROADBAND INTEGRATED SERVICES DIGITAL NETWORK (B-ISDN) – FUNCTIONAL DESCRIPTION OF THE B-ISDN USER PART (B-ISUP) OF SIGNALLING SYSTEM No. 7

ITU-T Recommendation Q.2761

Superseded by a more recent version

(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.

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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 Q.2761 was prepared by ITU-T Study Group 11 (1993-1996) and was approved under the WTSC Resolution No. 1 procedure on the 7th of Febuary 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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Superseded by a more recent version

Summary

This Recommendation is one of a set of Recommendations that describe the Broadband ISDN User Part. It specifies an overview of the signalling capabilities and functions required to support basic bearer services and supplementary services for Capability Set 1 B-ISDN applications.

The scope of the B-ISDN User Part covers international B-ISDN networks. However, the B-ISDN User Part is suitable for national applications. Most signalling procedures, information elements and message types specified for international use are also required in typical national applications.

Other ITU-T Recommendations in this group include:

- ITU-T Recommendation Q.2762 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – General Functions of messages and signals of the B-ISDN User Part (B-ISUP) of Signalling System No. 7.*
- ITU-T Recommendation Q.2763 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Signalling System No. 7 B-ISDN User Part (B-ISDN) – User Part (B-ISUP) – Formats and codes.*
- ITU-T Recommendation Q.2764 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Signalling System No. 7 ISDN User Part (B-ISUP) – Basic all procedures.*
- ITU-T Recommendation Q.2730 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Signalling System No. 7 B-ISDN User Part (B-ISUP) – Supplementary services.*
- ITU-T Recommendation Q.2660 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Interworking between Signalling System No. 7 – Broadband ISDN User Part (B-ISUP) and narrow-band ISDN User Part (N-ISUP).*
- ITU-T Recommendation Q.2650 (1995), *Broadband ISDN, Interworking between Signalling System No. 7 Broadband ISDN User Part (B-ISUP) and Digital Subscriber Signalling System No. 2 (DSS 2).*
- ITU-T Recommendation Q.2610 (1995), *Broadband Integrated Services Digital network (B-ISDN) – Usage of cause and location in B-ISDN User Part and DSS 2.*

BROADBAND INTEGRATED SERVICES DIGITAL NETWORK (B-ISDN) – FUNCTIONAL DESCRIPTION OF THE B-ISDN USER PART (B-ISUP) OF SIGNALLING SYSTEM No. 7

(Geneva, 1995)

1 Scope

This Recommendation specifies an overview of the signalling capabilities and functions required to support basic bearer services and supplementary services for Capability Set 1 B-ISDN applications. The B-ISDN User Part protocol will form the basis for future capability sets of B-ISDN signalling protocols.

The B-ISDN User Part is applicable to international B-ISDN networks. At transit nodes the B-ISDN User Part supports the N-ISUP services depicted in ISUP 1992 Recommendations.

Furthermore, the B-ISDN User Part is suitable for national applications. Most signalling procedures, information elements and message types specified for international use are also required in typical national applications. Moreover, coding space has been reserved in order to allow national Administrations and recognized operating agencies to introduce network specific signalling messages and elements of information within the internationally standardized protocol structure.

Architecturally, the B-ISDN User Part can be viewed as a set of functional blocks each representative of a particular type of protocol function. This architectural separation can be seen in Figure 1. The B-ISDN User Part makes use of the services provided by the Message Transfer Part (MTP) level 3.

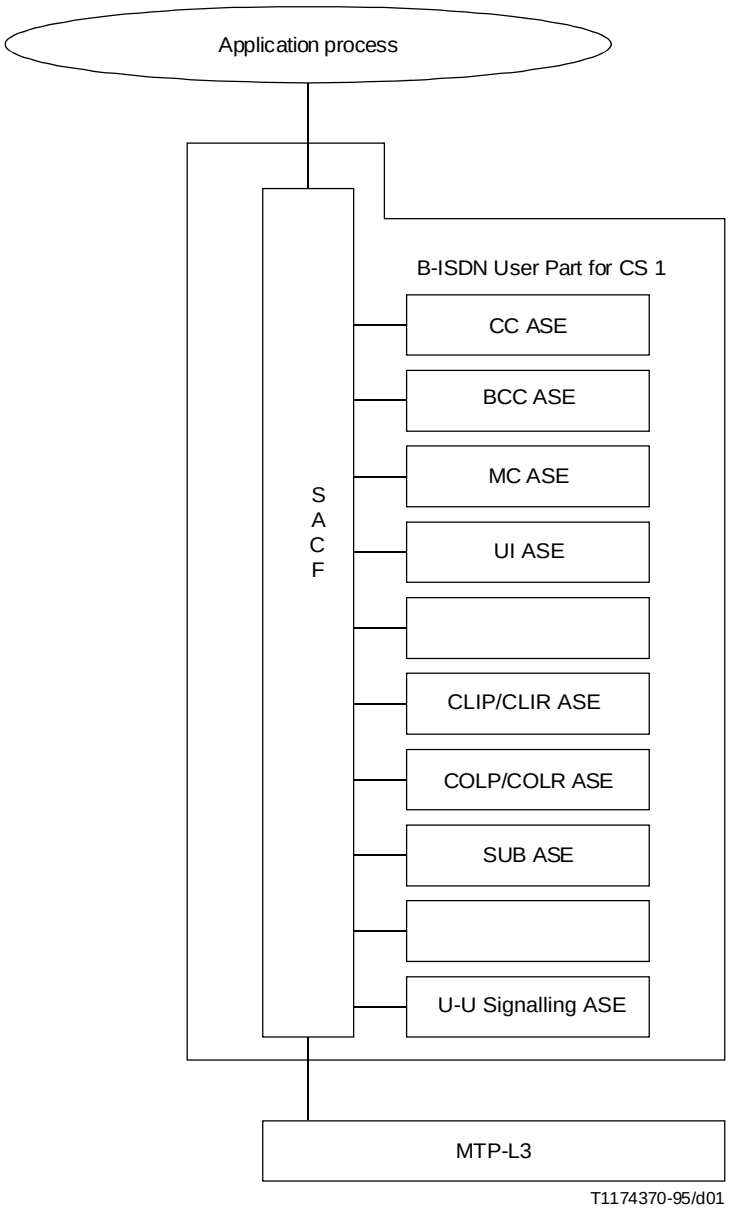
1.1 Relationships to other Recommendations

The B-ISDN User Part protocol which supports the Capability Set 1 ATM bearer services is described in Recommendations Q.2761 to Q.2764. A general description of B-ISDN User Part signals and messages is provided in Recommendation Q.2762. Message formats and message field codings are defined in Recommendation Q.2763, while the signalling procedures are described in Recommendation Q.2764. Exceptions against Recommendations Q.730, Q.731, Q.733, Q.735 and Q.737 are provided in Recommendation Q.2730 to provide for supplementary services. Requirements for interworking between N-ISDN User part and the B-ISDN User Part are provided in Recommendation Q.2660.

Numbering requirements are described in Recommendation E.164. It is assumed that the B-ISDN follows the international numbering plan defined for the ISDN and provides a switched service between B-ISDN terminals or between B-ISDN terminals and terminals being connected to the public switched telephone network, or the ISDN network.

Requirements on exchange capabilities for the support of the B-ISDN User part are described in the Q.2500 – Series of Recommendations.

Requirements or functions for interworking between the B-ISDN User Part and Recommendation Q.2931 are included in Recommendation Q.2650. Use of the cause parameter is described in Recommendations Q.850 and Q.2610.



CC ASE Call Control Application Service Element
BCC ASE Bearer Connection Control Application Service Element
MC ASE Maintenance Control Application Service Element
UI ASE Unrecognized Information Application Service Element
SACF Single Association Control Function

FIGURE 1/Q.2761

Overview functional architecture for Capability Set 1

2 References

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

[1] ITU-T Recommendation I.413 (1993), "*B-ISDN user-network Interface*".

[2] ITU-T Recommendation Q.2931 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Digital Subscriber Signalling System No. 2 (DSS 2) – User-Network Interface (UNI) layer 3 specification for basic call/connection control.*

[3] ITU-T Recommendation Q.2762 (1995), *Broadband Integrated Services Digital network (B-ISDN) – General Functions of messages and signals of the B-ISDN User Part (B-ISUP) of Signalling System No. 7.*

[4] ITU-T Recommendation Q.2763 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Signalling System No. 7 B-ISDN User Part (B-ISUP) – Formats and codes.*

[5] ITU-T Recommendation Q.2764 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Signalling System No. 7 B-ISDN User Part (B-ISUP) – Basic call procedures.*

[6] ITU-T Recommendation Q.2730 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Signalling System No. 7 B-ISDN User Part (B-ISUP) – Supplementary services.*

[7] ITU-T Recommendation Q.2660 (1995) *Broadband Integrated Services Digital Network (B-ISDN) – Interworking between Signalling System No. 7 – Broadband ISDN User Part (B-ISUP) and Narrow – band ISDN User Part (B-ISUP).*

[8] ITU-T Recommendation Q.2650 (1995), *Broadband ISDN, interworking between Signalling System No. 7 Broadband ISDN User Part (B-ISUP) and Digital Subscriber Signalling System No. 2 (DSS 2).*

[9] ITU-T Recommendation Q.2610 (1995), *Broadband Integrated Services Digital Network (B-ISDN) – Usage of course and location in B-ISDN User Part and DSS 2.*

[10] ITU-T Recommendation Q.761 (1993), *Functional description of ISDN user part of Signalling System No. 7*

[11] ITU-T Recommendation Q.762 (1993), *General function of messages and signals of the ISDN user Part of Signalling System No. 7.*

[12] ITU-T Recommendation Q.763 (1993), *Formats and codes of the ISDN user part of Signalling System No. 7.*

[13] ITU-T Recommendation Q.764 (1993), *Signalling System No. 7 – ISDN user part signalling procedures.*

[14] ITU-T Recommendation Q.701 (1993), *Functional description of the Message Transfer Part (MTP) of Signalling System No. 7.*

[15] CCITT Recommendation Q.702 (1988), *Signalling data link.*

[16] ITU-T Recommendation Q.703 (1993), *Signalling System No. 7 – Signalling link.*

[17] ITU-T Recommendation Q.704 (1993), *Signalling System No. 7 – Signalling network functions and messages.*

[18] ITU-T Recommendation Q.2100 (1994), *B-ISDN ATM adaptation layer (SAAL) overview description.*

[19] ITU-T Recommendation Q.2110 (1994), *B-ISDN ATM adaptation layer – Service Specific Connection Oriented Protocol (SSCOP) specification.*

[20] ITU-T Recommendation Q.2140 (1995), *B-ISDN ATM adaptation layer – Service Specific Coordination Function for signalling at the network Node Interface (SSCF at NNI).*

[21] ITU-T Recommendation Q.1400 (1993), *Architecture framework for the development of signalling and OADM protocols using OSI concepts.*

[22] ITU-T Recommendation I.150 (1993), *B-ISDN asynchronous transfer mode functional characteristics.*

[23] ITU-T Recommendation I.361 (1993), *B-ISDN ATM layer specification.*

[24] ITU-T Recommendation I.362 (1993), *B-ISDN ATM Adaptation Layer (AAL) functional description.*

[25] ITU-T Recommendation I.363 (1993), *B-ISDN ATM Adaptation Layer (AAL) specification.*

[26] ITU-T Recommendation I.371 (1993), *Traffic control and congestion in B-ISDN.*

[27] ITU-T Recommendation I.610 (1993), *B-ISDN operation and maintenance principles and functions.*

[28] CCITT Recommendation E.164 (1991), "Numbering plan for the ISDN era".

[29] ITU-T Recommendation Q.2010 (1995), *Broadband integrated services digital network overview signalling capacity set 1, release 1.*

3 Abbreviations

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

3PTY	Three-Party Service
ASE	Application Service Element
ATM	Asynchronous Transfer Mode
B-ISDN	Broadband Integrated Services Digital Network
B-ISUP	Broadband Integrated Services Digital Network User Part
BC	Bearer Control
BCOB-A	Broadband Connection Oriented Bearer – Sub-category A
BCOB-X	Broadband Connection Oriented Bearer – Sub-category X
CC	Call Control
CD	Call Deflection
CF	Call Forwarding
COLP/COLR	Connected Line Identification Presentation/Restriction
CONF	Conference Calling
CUG	Closed User Group
CW	Call Waiting
DDI	Direct-Dialling-In
DPC	Destination Point Code
HOLD	Call Hold
ITU-T	International Telecommunication Union – Telecommunication Standardization Sector
MC	Maintenance Control
MLPP	Multi-level Precedence and Preemption
MSN	Multiple Subscriber Number
MTP	Message Transfer Part
OPC	Originating Point Code
SACF	Single Association Control Function

SIO	Service Information Octet
SLS	Signalling Link Selection Code
SUB	Sub-addressing
TC	Transaction Capability
UI	Unrecognized Information
UUS	User-to-User Signalling

4 Introduction to B-ISDN User Part signalling procedures

4.1 Address signalling

In general, the call set-up procedure described is standard for both broadband connection oriented sub-category A and broadband connection oriented sub-category X connections using *en bloc* address signalling for calls between B-ISDN terminals. Overlap address signalling is also specified.

4.2 Basic procedures

The basic call control procedure is divided into three phases; call set-up, the data/conversation phase and call cleardown. Messages on the signalling link are used to establish and terminate the different phases of a call. Standard in-band supervisory tones and/or recorded announcements are returned to the caller on appropriate connection types to provide information on call progress. Calls originating from B-ISDN terminals may be supplied with more detailed call progress information by means of additional messages in the access protocol supported by a range of messages in the network.

4.3 B-ISDN User Part interworking

In-call control interworking between two B-ISUP protocols, the application process provides the interworking logic. Supplementary services interworking will be accomplished in the application process.

Peer-to-peer interworking takes place between two exchanges that support different implementations of the same protocol.

Interworking is realized following interpretation of the protocol information received by either exchange.

Forward compatibility is ensured by the guidelines given for future protocol enhancements and the compatibility procedure as outlined in clause 7.

5 Capabilities supported by the B-ISDN User Part

Table 1 lists the signalling capabilities supported by the B-ISDN User Part.

TABLE 1/Q.2761

Function/Service	Origination/ Destination nodes	Transit nodes
Basic Call		
Speech/3.1 kHz audio	/	/
BCOB – A	/	/
BCOB – X	/	/
N-ISDN bearer and teleservice with fallback	/	/

TABLE 1/Q.2761 (*end*)

Function/Service	Origination/ Destination nodes	Transit nodes
Basic Call		
N-ISDN 64 kbps unrestricted	/	/
N-ISDN multirate connection types (Note 1)	/	/
Compatibility procedure	/	/
Simple segmentation	(Note 2)	(Note 2)
User part availability control	/	/
Propagation delay determination procedure	/	/
Tones and announcements	/	/
MTP pause and resume	/	/
Signalling procedures for connection type allowing fallback	–	/
Confusion procedure	–	/
Access delivery information	/–	/
Transportation of User teleservice information	–	/
Supplementary Services		
DDI	/	/
MSN	/	/
CLIP/CLIR	/	/
COLP/COLR	/	/
SUB	/	/
TP	–	/
CUG	–	/
UUS service 1 (implicit)	/	/
CF	–	/
CD	–	/
CW	–	/
HOLD	–	/
CONF	–	/
3PTY	–	/
MLPP	–	/
USS service 1 (explicit)	–	/
UUS service 2	–	/
UUS service 3	–	/

/ represents ITU-T support.
– represents ITU-T non-support.

NOTES

1 The current N-ISDN Multirate connection types are 2 × 64, 384, 1536 and 1920 kbit/s.

2 The simple segmentation procedure is included in the B-ISDN User Part as a national option only, so that it can use an MTP that imposes a 272 octet transfer limit.

6 Services assumed from the MTP

6.1 General

This subclause describes the functional interface presented by the Message Transfer Part to the B-ISDN User Part. In accordance with the description techniques defined by the OSI model, information is transferred to and from the MTP in the form of parameters carried by primitives.

The general syntax of a primitive is as follows:

X	Generic name	Specific name	Parameter

where:

- X designates the function providing the service (the MTP in this case);
- the Generic name describes an action by X;
- the Specific name indicates the purpose of the primitive, i.e. whether it conveys a request for a service, an indication that service-related information has been received, a response to a service request, or a confirmation that the requested service has been performed; and
- the parameters contain the elements of supporting information transferred by the primitive.

6.2 Description of primitives

The following subclauses describe the primitives used across the B-ISDN User Part – MTP interface. The primitives together with the parameters carried by each primitive are shown in Table 2/Q.2761.

6.2.1 Transfer

The MTP_TRANSFER primitive is used either by the B-ISDN User Part to access the signalling message handling functions of the MTP or by the latter to deliver signalling message information to the B-ISDN User Part.

6.2.2 Pause

The MTP_PAUSE primitive is sent by the MTP to indicate its inability to transfer messages to the destination specified as a parameter.

6.2.3 Resume

The MTP_RESUME primitive is sent by the MTP to indicate its ability to resume unrestricted transfer of messages to the destination specified as a parameter.

6.2.4 Status

The MTP_STATUS primitive is sent by the MTP to indicate that the signalling route to a specific destination is congested or the B-ISDN User Part at the destination is unavailable. Unavailability causes can be unequipped inaccessible or unknown. The affected destination and the congestion indication are carried as parameters (see Table 2) in the primitive.

TABLE 2/Q.2761

MTP Service Primitives

Primitives					
Generic name	Specific name				
	Req.	Ind.	Resp.	Conf.	Parameter
MTP_TRANSFER	X	X			OPC, DPC, SLS, SIO, signalling information
MTP_PAUSE		X			Affected DPC
MTP_RESUME		X			Affected DPC
MTP_STATUS		X			Affected DPC, Cause (Note)

OPC Originating point code

DPC Destination point code

SLS Signalling link selection code

SIO Service information octet

NOTE – The cause parameter can assume four values:

1) signalling network congestion level, where level is included only if national options with congestion priorities and multiple signalling states without congestion priorities (see Recommendation Q.704) are implemented;
2) user part unavailability – unequipped remote user;
3) user part unavailability – inaccessible remote user;
4) user part unavailability – unknown.

7 Future enhancements

Requirements for additional protocol capabilities will result from time to time in the need to add to or modify existing protocol elements and thus to create a new protocol version. In order to ensure adequate service continuity, the insertion of a new protocol version into one part of a network should be transparent to the remainder of the network. Compatible interworking between B-ISDN User Part protocol versions should be optimized by adhering to the following guidelines when specifying a new version (release):

1) Existing protocol elements, i.e. procedures, messages, parameters and codes, should not be changed unless a protocol error needs to be corrected or it becomes necessary to change the operation of the service that is being supported by the protocol.

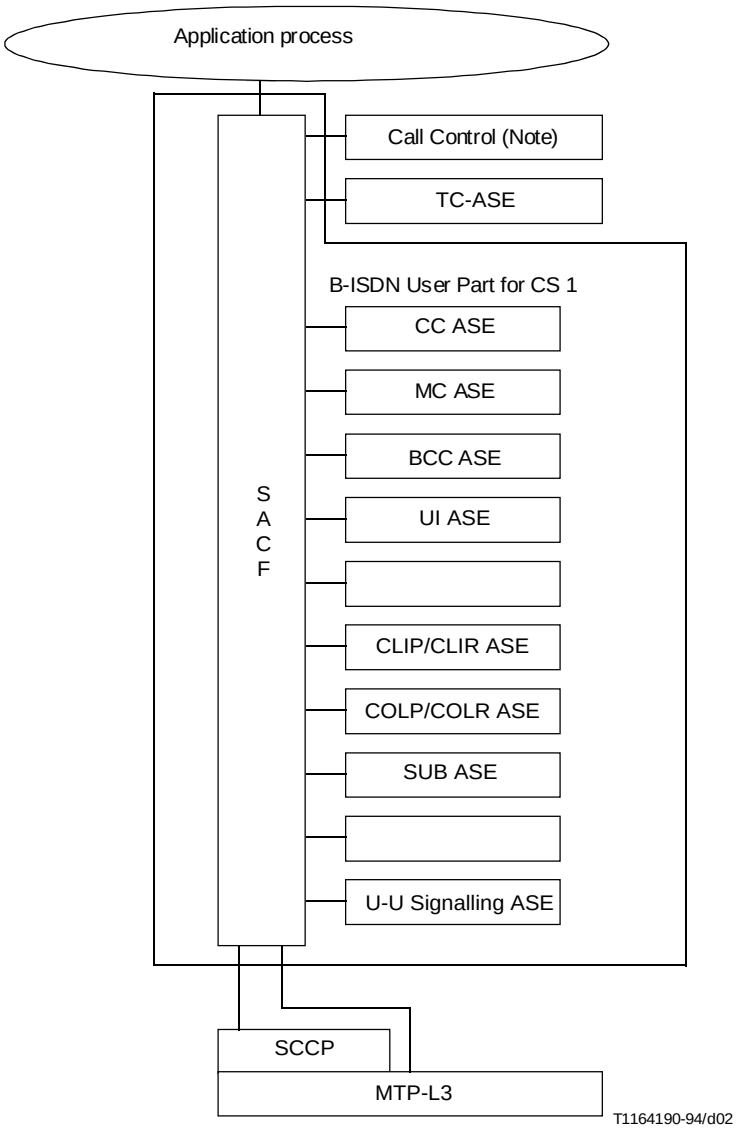
2) The semantics of a message, a parameter, or of a field within a parameter should not be changed.

3) Established rules for formatting and encoding messages and parameters should not be modified.

4) The all zero code point should be used exclusively to indicate an unallocated (spare) or insignificant value of a parameter field. This avoids an all zeros code, sent by one protocol version as a spare value, to be interpreted as a significant value in another version.

5) The compatibility mechanism described in 7.1 applies to this and future versions of the ITU-T B-ISDN User Part Recommendations.

Furthermore, compatibility between capability set 1 and future capability sets of the B-ISDN signalling protocols can be achieved by conforming to the protocol model illustrated in Figure 2.



CC ASE Call Control Application Service Element
BCC ASE Bearer Connection Control Application Service Element
MC ASE Maintenance Control Application Service Element
UI ASE Unrecognized Information Application Service Element

NOTE – The Call Control information relevant to end-to-end communication can either be transported using Transaction Capability (TC) or imbedded in the Bearer Control protocol. The Signalling Application Control Function (SACF) will coordinate this action.

With respect to the Capability Set 1 figure (Figure 1), two functional blocks [Application Service Elements (ASEs)] have been added to provide additional Call Control functions for future Capability Sets. Other functional blocks will be added as required to satisfy other services. Adopting this approach, if new services are required, a new ASE should be specified. This ASE could be provided in one of two ways:

– enhancing an existing ASE with new required functionality;
– adding a new ASE which only contains the new required functionalities.

FIGURE 2/Q.2761

A possible evolution for future capability sets

7.1 Version compatibility

Compatibility between this and future versions will be guaranteed, in the sense that any two versions can be interconnected directly with each other, and the following requirements are fulfilled:

i) *Protocol compatibility*

Connections between any two B-ISDN User Parts do not fail for the reason of not satisfying protocol requirements.

ii) *Service and functional compatibility*

This feature may be considered as compatibility typically between originating and destination exchanges. Services and functions available at these exchanges, but possibly not yet taken into account in the intermediate exchanges, are supported, provided they require only transparency of the intermediate exchanges. If this is not the case, a controlled call rejection or service rejection is required.

iii) *Resource control and management compatibility*

For these functions, occurring only link-by-link, at least a backward notification is needed, if correct handling is not possible.

The compatibility mechanism is common for all B-ISDN User Parts. It is based on forward compatibility information associated with all signalling information.

The compatibility method eases the network operation, e.g. for the typical case of a B-ISDN User Part mismatch during a network upgrading, to interconnect two networks on a different functional level, for networks using a different subset of the same B-ISDN User Part, etc.

7.2 Coding guidelines for compatibility of B-ISDN User Parts supporting different releases of B-ISDN services

7.2.1 Messages

All B-ISUP messages will contain compatibility handling directives. This information will be contained in the "Instruction Indicator" of the message compatibility information.

7.2.2 Parameters

Mixing information for different application associations (requiring different functional entity actions) inside a B-ISUP parameter is not permitted so that the behaviour of cooperating nodes can be defined using the compatibility mechanism.

All B-ISUP parameters will contain compatibility handling directives. This information will be conveyed in the "Instruction Indicator" of the parameter compatibility information within each parameter.

Appendix I

Guidelines for use of instruction indicators

(This appendix does not form an integral part of this Recommendation)

I.1 Introduction

Instruction indicators are used to indicate to an exchange receiving unrecognized information what action the exchange should take due to this information being unrecognized. Unrecognized information may be a message or one or more parameters within a message, unrecognized values within a parameter cause the parameter itself to be treated as unrecognized. Instruction indicators are only examined once the message or parameter has been detected as unrecognized.

I.2 Priority or execution

When processing instruction indicators, a certain order is implied by the type of actions which can be specified, the following list indicates a decreasing order of processing priority:

- Transit at intermediate exchange indicator;
- Broadband/Narrow-band interworking indicator;
- Release call indicator;
- Discard message, with or without notification, based on the notification indicator;
- Discard parameter, with or without notification, based on the notification indicator;
- Pass on not possible indicator.

Only Broadband/Narrow-band interworking exchanges examine the Broadband/Narrow-band interworking indicator, if present, in place of the conventional Release call, Discard message or Discard Parameter indicators.

I.3 Notification

The notification indicator is not strictly tied to the order of processing of the other indicators. It is recommended that notification is only required when information is discarded, this minimizes the amount of Confusion messages which may be generated along the call path for a particular piece of unrecognized information (this would not be the case if each exchange passing information on, also generated Confusion messages).

The notification (Confusion message) contains a cause code parameter with a cause value indicating if the unrecognized information was a message or parameter(s), the diagnostic field contains the message or parameter name code(s).

I.4 Considerations

I.4.1 Discarding unrecognized messages

Message compatibility information may indicate “discard message”, for those messages which do not affect the basic state of the protocol, such as the NRM message, otherwise there would be a misalignment between the states of the two protocol machines. This would normally result in the release of the call due to timer expiry.

This would also be the case if an exchange generates parameter compatibility information indicating “discard message”. Particular care must be taken in this case because it becomes possible that messages such as Answer may be treated as unrecognized.

I.4.2 Essential services

If a service is essential to a call and the information related to that service is unrecognized, then the call should be released. An example of this type of service is the User-to-user essential services.

I.4.3 Non-essential services

If the service is not essential to a call and the information related to that service is unrecognized, then the information should be discarded. A notification should be requested if an explicit indication needs to be generated when the service is not provided; this notification can then result in the explicit service rejection/notification being generated by the exchange which recognizes the contents of the diagnostic field of the Cause parameter contained in the Confusion message (this is an exchange which was capable of generating the information which is notified as being unrecognized). An example of this type of service is the User-to-user non-essential services.

I.4.4 Broadband/Narrow-band interworking

Services such as many of the supplementary services are developed to operate in both the Broadband and the Narrow-band networks; these services should have the Broadband/Narrow-band interworking indicator set to “pass on”.

However, some information which may relate more to the nature of the networks such as the Broadband bearer capability should not be passed from the broadband to the narrow-band network, hence the Broadband/Narrow-band interworking indicator should be set to “Release call” if the bearer service is one which cannot be supported in the narrow-band; in other cases it may be set to “discard” or “pass on” dependent on whether the ability of broadband services transiting the narrow-band is supported.

I.4.5 Pass on

Pass on allows unrecognized information to be passed through an exchange which is acting as an end node.

The pass on not possible indicator must be examined when pass on has been requested but it is not possible to pass on the information. Pass on is not possible when the protocol on the other side of the exchange has a different syntax (message and parameter structure) to the ISUP (B-ISUP or N-ISUP), or the policing actions performed in the exchange prohibit the passing of unrecognized information. When it has been determined that pass on is not possible, another action must be performed such as release of the call or discarding of the information.