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SERIES Q: SWITCHING AND SIGNALLING

Specifications of signalling related to Bearer Independent Call Control (BICC)

Bearer Independent Call Control protocol (Capability Set 2): Functional description

ITU-T Recommendation Q.1902.1

(Formerly CCITT Recommendation)

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For further details, please refer to the list of ITU-T Recommendations.

ITU-T Recommendation Q.1902.1

Bearer Independent Call Control protocol (Capability Set 2): Functional description

Summary

This Recommendation provides a functional description of the Bearer Independent Call Control (BICC) protocol for the support of narrowband ISDN services independent of the bearer technology and signalling message transport technology used.

Source

ITU-T Recommendation Q.1902.1 was prepared by ITU-T Study Group 11 (2001-2004) and approved under the WTSA Resolution 1 procedure on 2 July 2001.

FOREWORD

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The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 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 Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

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As of the date of approval of this Recommendation, ITU had not received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementors are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database.

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ITU-T Recommendation Q.1902.1

Bearer Independent Call Control protocol (Capability Set 2): Functional description

1 Scope

This Recommendation provides a functional description of the Bearer Independent Call Control (BICC) protocol. The BICC protocol provides the signalling functions required to support narrowband ISDN services independent of the bearer technology and signalling transport technology used.

The BICC protocol uses the Signalling Transport Converter (STC) layer for signalling message transport. The Generic Signalling Transport Service is described in ITU-T Q.2150.0 [31]. The STCs are defined in other Recommendations in the Q.2150.x family of Recommendations.

Several arrangements are possible for nodes that support BICC signalling. These nodes may have an associated Bearer Control Function (BCF) in which case they are referred to as Serving Nodes (SN). A node without an associated BCF is referred to as Call Mediation Node (CMN). Between Serving Nodes the control of bearers is provided by other protocols – not specified by this Recommendation.

In a Serving Node (SN), the Call Service Function and the Bearer Control Function (BCF) entities may be physically separated. The Call Bearer Control (CBC) signalling is used between these two entities in case of physical separation. The CBC protocol is specified in ITU-T Q.1950 [61].

Bearer control signalling can be deployed over a separate signalling transport or the Bearer Control Protocol (BCP) can be tunnelled over the "horizontal" BICC protocol between peer CSFs and the "vertical" CBC interface between a CSF and a BCF. The Bearer Control Tunnelling Protocol is specified in ITU-T Q.1990 [62].

Both SNs and CMNs are modelled using the "Half Call" modelling technique. Every call processing scenario is thus divided between an incoming and an outgoing signalling procedure. In the scope of this Recommendation at least one of these procedures is the BICC procedure (see Figures 1 and 2).

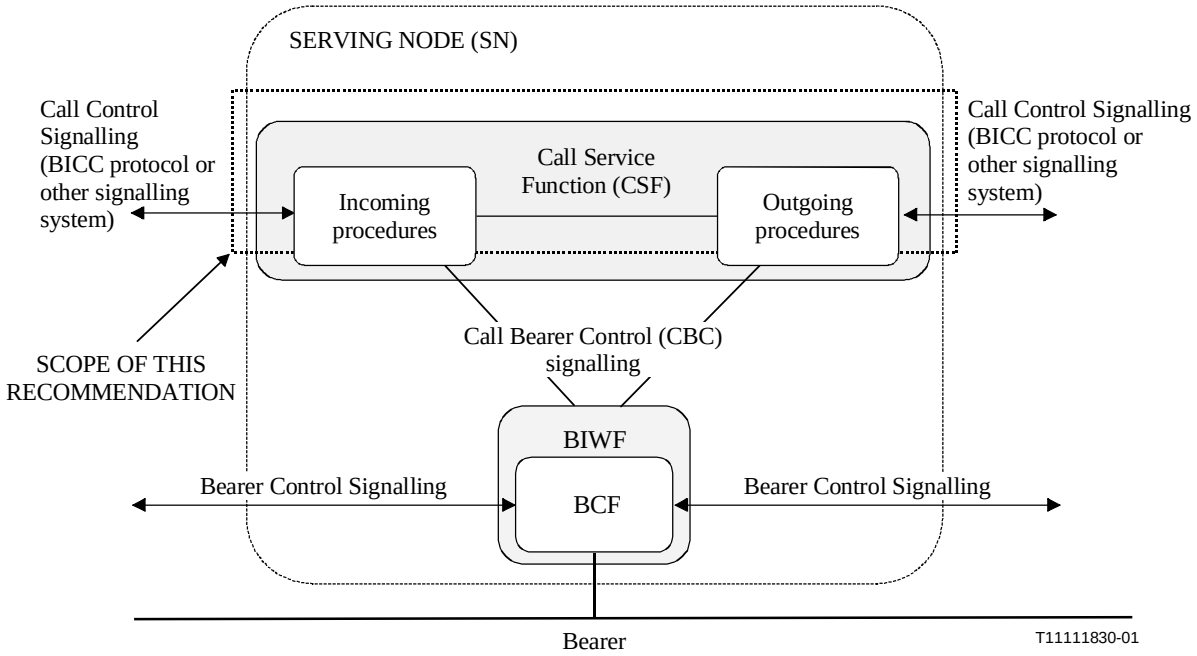

Figure 1/Q.1902.1 – Scope of this Recommendation in case of an SN

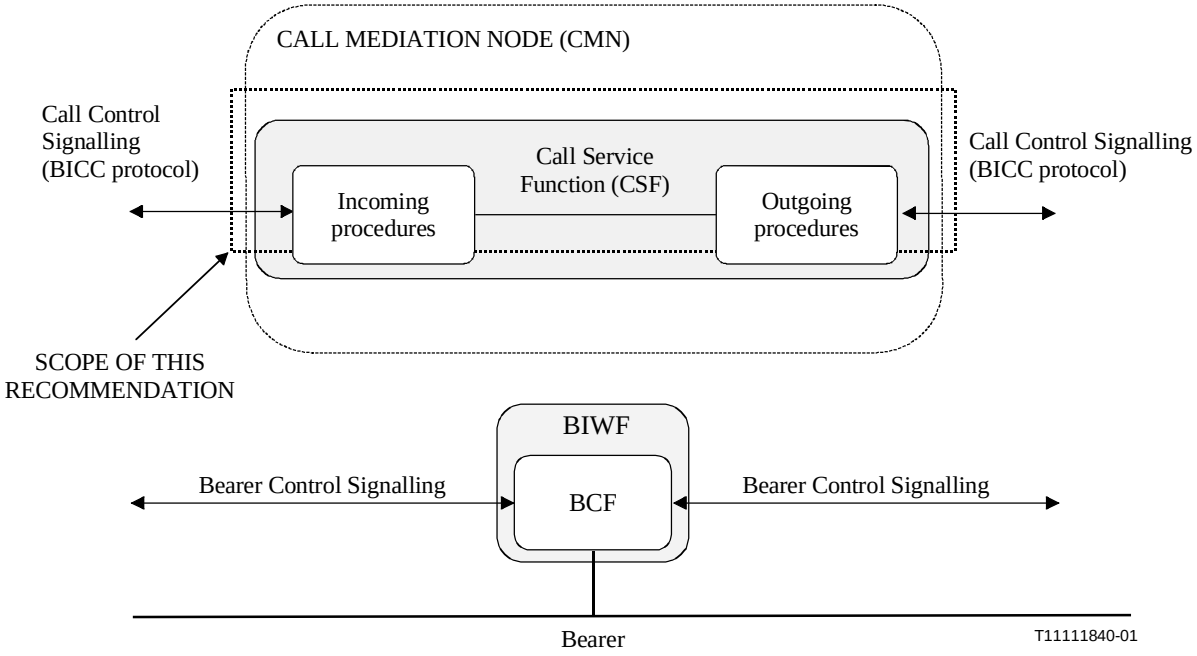

Figure 2/Q.1902.1 – Scope of this Recommendation in case of a CMN

This Recommendation is one of the set of Recommendations that describe the Bearer Independent Call Control protocol. Other Recommendations in this group include:

- ITU-T Q.1902.2 (2001) that describes BICC CS-2 general functions of messages and parameters;
- ITU-T Q.1902.3 (2001) that describes BICC CS-2 formats and codes;
- ITU-T Q.1902.4 (2001) that describes BICC CS-2 basic call procedures;
- ITU-T Q.1902.5 (2001) that describes extensions to the Application Transport Mechanism in the context of the Bearer Independent Call Control;
- ITU-T Q.765.5 (2000) and its Amendment 1 that specifies the APM-user to support the transport of the bearer related information for the BICC protocol.

Interworking between BICC and other signalling systems is described in the Q.1912 series of Recommendations.

Generic signalling procedures and support of ISDN User Part supplementary services by the BICC protocol are described in ITU-T Q.1902.6 [18].

The Bearer Independent Call Control protocol is suitable for both international and national applications. Therefore 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.

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 revisions; 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 E.164 (1997), *The international public telecommunication numbering plan*.

[2] ITU-T I.112 (1993), *Vocabulary of terms for ISDNs*.

[3] ITU-T I.210 (1993), *Principles of telecommunication services supported by an ISDN and the means to describe them*.

[4] ITU-T Q.850 (1998), *Usage of cause and location in the Digital Subscriber Signalling System No. 1 and the Signalling System No. 7 ISDN User Part*.

[5] ITU-T Q.730 (1999), *ISDN User Part supplementary services*.

[6] ITU-T Q.761 (1999), *Signalling System No. 7 – ISDN User Part functional description*.

[7] ITU-T Q.762 (1999), *Signalling System No. 7 – ISDN User Part general functions of messages and signals*.

[8] ITU-T Q.763 (1999), *Signalling System No. 7 – ISDN User Part formats and codes*.

[9] ITU-T Q.764 (1999), *Signalling System No. 7 – ISDN User Part signalling procedures*.

[10] ITU-T Q.766 (1993), *Performance objectives in the integrated services digital network application*.

[11] ITU-T Q.765 (2000), *Signalling System No. 7 – Application transport mechanism*.

[12] ITU-T Q.769.1 (1999), *Signalling System No. 7 – ISDN User Part enhancements for the support of number portability*.

[13] ITU-T Q.1901 (2000), *Bearer Independent call control protocol*.

[14] ITU-T Q.1902.2 (2001), *Bearer independent Call Control protocol (CS-2) and Signalling System No. 7 – ISDN User Part general functions of messages and parameters*.

[15] ITU-T Q.1902.3 (2001), *Bearer independent call control protocol (CS-2) and signalling system No. 7 – ISDN user part formats and codes*.

[16] ITU-T Q.1902.4 (2001), *Bearer independent call control protocol (CS-2) basic call procedures*.

[17] ITU-T Q.1902.5 (2001), *Exceptions to the application transport mechanism in the context of bearer independent call control*.

[18] ITU-T Q.1902.6 (2001), *Generic signalling procedures and support of ISDN user part supplementary services with the bearer independent call control protocol*.

[19] ITU-T Q.1912.1 (2001), *Interworking between signalling system No. 7 ISDN user part and the bearer independent call control protocol*.

[20] ITU-T Q.701 (1993), *Functional description of the message transfer part (MTP) of signalling system No. 7*.

[21] ITU-T Q.704 (1996), *Signalling network functions and messages*.

[22] ITU-T Q.2210 (1996), *Message transfer part level 3 functions and messages using the services of ITU-T Recommendation Q.2140*.

[23] ITU-T Q.2110 (1994), *B-ISDN ATM adaptation layer – Service specific connection oriented protocol (SSCOP)*.

[24] ITU-T Q.2111 (1999), *Service specific connection oriented protocol in a multi-link and connectionless environment (SSCOPMCE).*

[25] ITU-T Q.765.1 (1998), *Signalling system No. 7 – Application transport mechanism: Support of VPN applications with PSS1 information flows*.

[26] ITU-T Q.765.4 (2000), *Signalling system No. 7 – Application transport mechanism: Support of the generic addressing and transport protocol*.

[27] ITU-T Q.765.5 (2000), *Signalling System No. 7 – Application transport mechanism: Bearer Independent Call Control (2000).*

[28] ITU-T Q.765.5 (2000), Amd. 1 (2001), *Bearer Independent Call Control Capability Set 2.*

[29] ITU-T Q.1218 (1995), *Interface Recommendation for intelligent network CS-1*.

[30] ITU-T Q.1228 (1997), *Interface Recommendation for intelligent network Capability Set 2*.

[31] ITU-T Q.2150.0 (2001), *Generic signalling transport service*.

[32] ITU-T Q.28 (1988), *Determination of the moment of the called subscriber's answer in the automatic service.*

[33] ITU-T E.260 (1988), *Basic technical problems concerning the measurement and recording of call durations.*

[34] ITU-T Q.101 (1988), *Facilities provided in international semi-automatic working*.

[35] ITU-T E.412 (1998), *Network management controls*.

[36] ITU-T X.880 (1994) | ISO/IEC 13712-1:1995, *Information technology – Remote Operations: Concepts, model and notation*.

[37] ITU-T X.121 (2000), *International numbering plan for public data networks*.

[38] ITU-T E.212 (1998), *The international identification plan for mobile terminals and mobile users*.

[39] ITU-T Q.703 (1996), *Signalling link.*

[40] ITU-T Q.2763 (1995), *Signalling System No. 7 B-ISDN User Part (B-ISUP) – Format and codes*.

[41] ITU-T E.172 (1992), *ISDN routing plan*.

[42] ITU-T G.711 (1988), *Pulse code modulation (PCM) of voice frequencies*.

[43] ITU-T Q.12 (1988), *Overflow – alternative routing – rerouting – automatic repeat attempt*.

[44] ITU-T Q.107 (1988), *Standard sending sequence of forward address information*.

[45] ITU-T Q.115 (1999), *Logic for the control of echo control devices*.

[46] ITU-T Q.118 (1997), *Abnormal conditions – Special release arrangements*.

[47] ITU-T Q.542 (1993), *Digital exchange design objectives – Operations and maintenance*.

[48] ITU-T Q.706 (1993), *Message transfer part signalling performance.*

[49] ITU-T E.141 (1993), *Instructions for operators on the operator assisted international telephone service*.

[50] ITU-T X.680 (1997) | ISO/IEC 8824-1:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Specification of basic notation.*

[51] ITU-T X.681 (1997) | ISO/IEC 8824-2:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Information object specification*.

[52] ITU-T X.682 (1997) | ISO/IEC 8824-3:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Constraint specification*.

[53] ITU-T X.683 (1997) | ISO/IEC 8824-4:1998, *Information technology – Abstract Syntax Notation One (ASN.1): Parameterization of ASN.1 specifications*.

[54] ITU-T X.690 (1997) | ISO/IEC 8825-1:1998, *Information technology – ASN.1 encoding Rules: Specification of Basic Encoding Rules (BER), Canonical Encoding Rules (CER), and Distinguished Encoding Rules (DER).*

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

[56] ITU-T Q.932 (1998), *Digital Subscriber Signalling System No. 1 – Generic procedures for the control of ISDN supplementary services*.

[57] ITU-T Q.104 (1988), *Language digit or discriminating digit*.

[58] ITU-T F.69 (1994), *The international telex service – Service and operational provisions of telex destination codes and telex network identification codes*.

[59] ITU-T G.732 (1988), *Characteristics of primary PCM multiplex equipment operating at 2048 kbit/s*.

[60] ITU-T G.744 (1988), S*econd order PCM multiplex equipment operating at 8448 kbit/s*.

[61] ITU-T Q.1950 (2001), *Bearer independent call bearer control protocol*.

[62] ITU-T Q.1990 (2001), *BICC bearer control tunnelling protocol.*

[63] ITU-T Q.2150.1 (2001), *Signalling Transport Converter on MTP3 and MTP3b*.

3 Definitions

This Recommendation defines the following terms:

3.1 Backbone Network Connection (BNC): Represents the edge to edge transport connection within the backbone network, consisting of one or more Backbone Network Connection Links (BNCL). The Backbone Network Connection represents a segment of the end to end Network Bearer Connection (NBC).

3.2 Backbone Network Connection Link (BNCL): Represents the transport facility between two adjacent backbone network entities containing a bearer control function.

3.3 Bearer Control Function (BCF): Note that five types of BCFs are illustrated in the composite functional model; BCF-G, BCF-J, BCF-N, BCF-R and BCF-T.

- The Bearer Control Joint Function (BCF-J) provides the control of the bearer switching function, the communication capability with two associated call service functions (CSF), and the signalling capability necessary to establish and release the backbone network connection.
- The Bearer Control Gateway Function (BCF-G) provides the control of the bearer switching function, the communication capability with its associated call service function (CSF-G), and the signalling capability necessary to establish and release of the backbone network connection.
- The Bearer Control Nodal Function (BCF-N) provides the control of the bearer switching function, the communication capability with its associated call service function (CSF), and the signalling capability necessary to establish and release of the backbone network connection to its peer (BCF-N).
- The Bearer Control Relay Function (BCF-R) provides the control of the bearer switching function and relays the bearer control signalling requests to next BCF in order to complete the edge to edge backbone network connection.

- The Bearer Control Transit Function (BCF-T) provides the control of the bearer switching function, the communication capability with its associated call service function (CSF-T), and the signalling capability necessary to establish and release of the backbone network connection.

3.4 Bearer Control Segment (BCS): Represents the signalling relationship between two adjacent Bearer Control Functional entities (BCF).

3.5 Bearer InterWorking Function (BIWF): A functional entity which provides bearer control functions (BCF) and media mapping/switching functions within the scope of a Serving Node (BCF-N, BCF-T or BCF-G) and one or more MCF and MMSF, and is functionally equivalent to a Media Gateway that incorporates bearer control.

3.6 Bearer InterWorking Node (BIWN): A physical unit incorporating functionality similar to a BIWF.

3.7 Call Control Association (CCA): Defines the peer to peer signalling association between Call, and Call & Bearer state machines located in different physical entities.

3.8 Call Mediation Node (CMN): A functional entity that provides CSF-C functions without an associated BCF entity.

3.9 Call Service Function (CSF): Four types of CSF are defined:

- The Call Service Nodal Function (CSF-N) provides the service control nodal actions associated with the narrowband service by interworking with narrowband and Bearer Independent Call Control (BICC) signalling, signalling to its peer (CSF-N) the characteristics of the call, and invoking the Bearer Control Nodal Functions (BCF-N) necessary to transport the narrowband bearer service across the backbone network.
- The Call Service Transit Function (CSF-T) provides the service transit actions necessary to establish and maintain a backbone network call (see Figure 3), and its associated bearer by relaying signalling between CSF-N peers and invoking the Bearer Control Transit Functions (BCF-T) necessary to transport the narrowband bearer service across the backbone network.
- The Call Service Gateway Function (CSF-G) provides the service gateway actions necessary to establish and maintain a backbone network call and its associated bearer by relaying signalling between CSF-N peers and invoking the Bearer Control Gateway Functions (BCF-G) necessary to transport the narrowband bearer service between backbone networks.
- The Call Service Coordination Function (CSF-C) provides the call coordination and mediation actions necessary to establish and maintain a backbone network call by relaying signalling between CSF-N peers. The CSF-C has no association with any BCF. It is only a call control function.

3.10 Gateway Serving Node (GSN): A functional entity which provides gateway functionality between two network domains. This functional entity contains one or more call service gateway functions (CSF-G), and one or more bearer interworking functions (BIWF). GSNs interact with other GSNs, in other backbone network domains and other ISNs and TSNs within its own backbone network domain. The network signalling flows for a GSN are equivalent as those for a TSN.

3.11 Integrated Services Digital Network (ISDN): See definition 308 in 2.1/I.112 [2].

3.12 Interface Serving Node (ISN): A functional entity which provides the interface with non-BICC networks and terminal equipment. This functional entity contains one or more call service nodal functions (CSF-N), and one or more bearer interworking functions (BIWF) which interact with the non-BICC networks and terminal equipment and its peers within the broadband backbone network.

3.13 Media Control Function (MCF): A functional entity that interacts with the BCF to provide the control of the bearer and MMSF. The precise functionality is outside the scope of BICC.

3.14 Media Mapping/Switching Function (MMSF): An entity providing the function of controlled interconnection of two bearers and optionally the conversion of the bearer from one technology and adaptation/encoding technique to another.

3.15 service; telecommunication service: See definition 201 in 2.1/I.112 [2].

3.16 Serving Node (SN): A generic term referring to ISN, GSN or TSN nodes.

3.17 Signalling Transport Layers (STL): Any suite of protocol layers currently specified to provide Transport and/or Network Layer services to the BICC. Their functions, protocol and service primitives are outside the scope of this Recommendation.

3.18 Signalling Transport Converter (STC): A protocol layer between the STL and BICC. This layer enables the BICC protocol to be independent of the STL being used.

3.19 subaddress: See 12.2/E.164 [1].

3.20 supplementary service: See 2.4/I.210 [3].

3.21 Switching Node (SWN): A functional entity which provides the switching functions within the broadband backbone network. This functional entity contains a bearer control state machine (BCF R). SWNs interact with other SWNs, within their own backbone network domain. The SWNs BCF-R also interact with the BCF-N functions contained in BIWF entities.

3.22 Switched Circuit Network (SCN): A generic term for any network that uses circuit switching technology, i.e. ISDN, PSTN, PLMN.

3.23 Terminal Equipment (TE): Represents the customer's access equipment used to request and terminate network associated connectivity services.

3.24 Transit Serving Node (TSN): A functional entity which provides transit functionality between ISNs and GSNs. This functional entity contains one or more call service transit functions (CSF-T), and one or more bearer interworking functions (BIWF). TSNs interact with other TSNs, GSNs and ISNs within their own backbone network domain.

4 Abbreviations

This Recommendation uses the following abbreviations:

ACM	Address Complete Message
AEI	Application Entity Invocation
APM	Application Transport Mechanism
APP	Application Transport Parameter
ASE	Application Service Element
ATII	Application Transport Instruction Indicators
BAT	Bearer Association Transport
BCF	Bearer Control Function
BCF-G	Bearer Control Gateway Function
BCF-N	Bearer Control Nodal Function
BCF-T	Bearer Control Transit Function
BCTP	Bearer Control Tunnelling Protocol
BICC	Bearer Independent Call Control
BIWF	Bearer Interworking Function

BNC-ID	Backbone Network Connection Identifier
CIC	Call Instance Code
CMN	Call Mediation Node
COT	Continuity message
CPG	Call Progress message
CSF	Call Service Function
CSF-C	Call Service Coordination Function
CSF-G	Call Service Gateway Function
CSF-N	Call Service Nodal Function
CSF-T	Call Service Transit Function
DPC	Destination Point Code
EH	Errors Handling
GAT	Generic Addressing and Transport
GRS	Group Reset message
GSN	Gateway Serving Node
IAM	Initial Address Message
ISDN	Integrated Services Digital Network
ISN	Interface Serving Node
ISUP	ISDN User Part
LSB	Least Significant Bit
MCF	Media Control Function
MLPP	Multi-Level Precedence and Pre-emption
MMSF	Media Mapping/Switching Function
MSB	Most Significant Bit
MTP	Message Transfer Part
MTP3	Message Transfer Part level 3 (Narrowband)
MTP3b	Message Transfer Part level 3 (Broadband)
NI	Network Indicator (in SIO), or Network Interface (in specification model)
OPC	Originating Point Code
PLMN	Public Land Mobile Network
PSTN	Public Switched Telephone Network
REL	Release message
RLC	Release Complete message
RSC	Reset CIC message
SACF	Single Association Control Function
SAM	Subsequent Address Message
SAO	Single Association Object

SCN	Switched Circuit Network
SI	Service Indicator
SIO	Service Information Octet
SLS	Signalling Link Selection
SN	Serving Node
STC	Signalling Transport Converter
STL	Signalling Transport Layers
SWN	Switching Node
TE	Terminal Equipment
TSN	Transit Serving Node

5 Conventions

1) The name of each element of the following classes of terms is capitalized:
   - indicators;
   - parameters;
   - information elements;
   - messages.

   Examples: Called Party Number parameter, Initial Address message.

2) The definition of a parameter value is written in *italics* and is put between quotation marks.

   Example: Nature of Address value 0000011 – *"national (significant) number"*.

3) All message names are BICC messages unless explicitly stated otherwise.

   Example: the "IAM message" is the IAM message in BICC, whereas an IAM message in ISUP is referred to as an "ISUP IAM message".

6 Architecture

6.1 Network model

Figure 3 shows the complete functional model of a network using the BICC protocol for call control signalling.

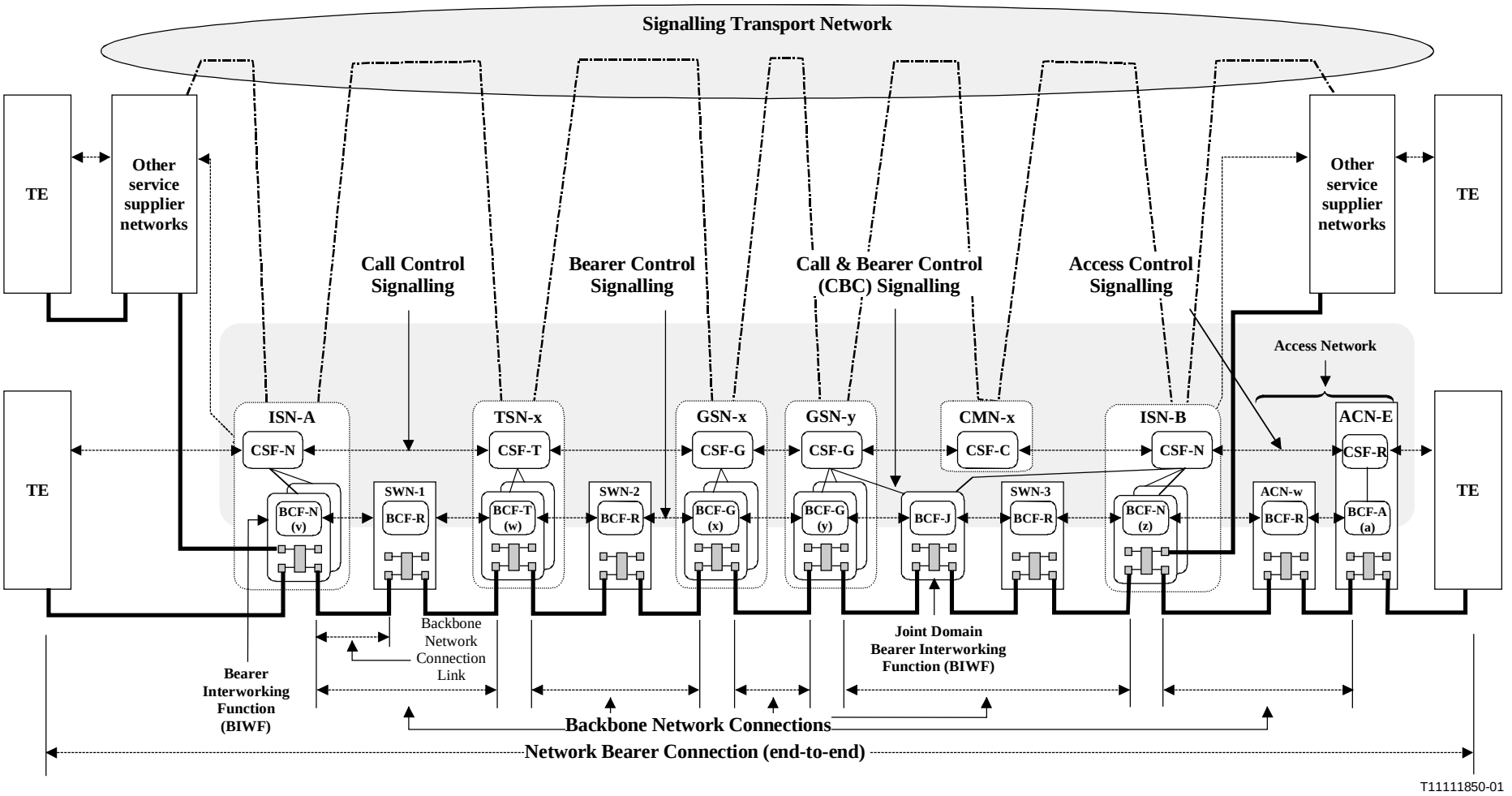

Figure 3/Q.1902.1 – Network Functional model

6.2 Protocol model

Figure 4 shows the protocol model adopted for this Recommendation.

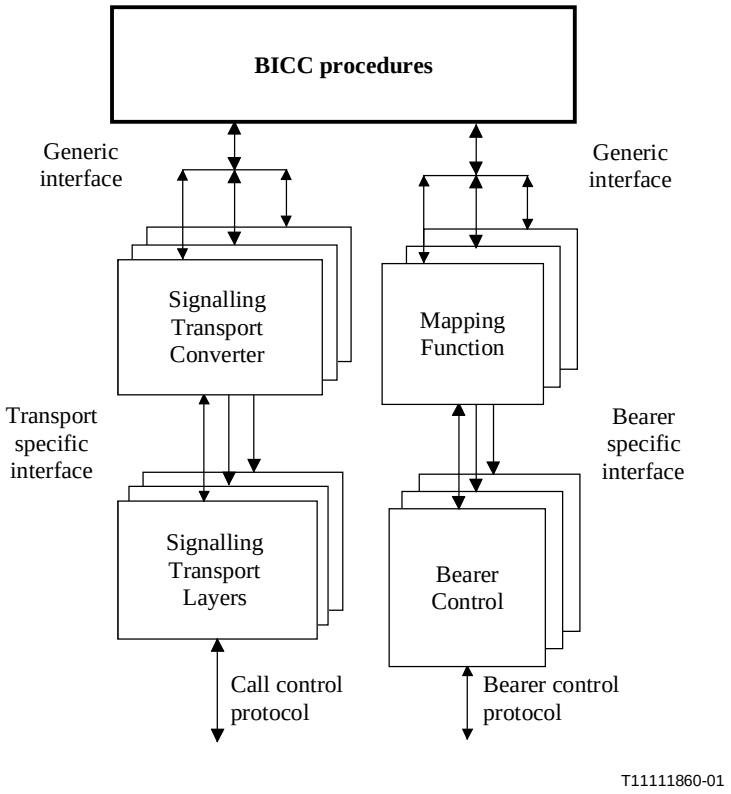

Figure 4/Q.1902.1 – Protocol model

The protocol aspects of the functional model in Figure 3 are provided by the elements of the protocol model in Figure 4.

- The BICC procedures block includes the functions of the CSF element in the functional model.
- The protocol functions of the BCF element of the functional model are distributed between the Mapping Function, and Bearer Control blocks in Figure 4. The other functions included in the BCF element, e.g. control of switching functions, are not shown in Figure 4.
- Where the BICC description refers to sending/receiving bearer signalling events to/from the BCF, this relates to use of the generic interface to the mapping function block in Figure 4.
- Where the BICC description refers to sending/receiving BICC messages, this relates to the use of the generic interface to the Signalling Transport Converter, see ITU-T Q.2150.0 [31].

6.3 Recommendation structure

This Recommendation provides a functional description of the BICC protocol, independent of the bearer technology employed. This is the block labelled BICC procedures in Figure 4. It also uses the generic interface to the blocks labelled Mapping Functions and Signalling Transport Converter.

The blocks in Figure 4 labelled Mapping Function are defined in additional publications[1] that are to be provided for each bearer technology to describe specific adaptation for that technology.

The blocks in Figure 4 labelled Signalling Transport Converter are defined in the Q.2150.x family of Recommendations which describe transport specific issues relating to the signalling transport service [31].

7 Introduction to BICC protocol signalling procedures

7.1 Address signalling

In general, the call setup procedure described is standard for both speech and non-speech applications using *en bloc* address signalling. Overlap address signalling is also specified.

7.2 Basic procedures

The basic call control procedure is divided into three phases: call setup, 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 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.

7.3 Signalling methods

Only link-by-link signalling method is used in this Recommendation.

It is primarily used for messages that need to be examined at each SN/CMN. The link-by-link method may also be used for messages of end point significance.

7.4 Interworking

7.4.1 BICC interworking

In call control interworking between two (BICC) protocols, the call control provides the interworking logic.

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

Interworking is realized following interpretation of the protocol information received by either SN/CMN.

For this purpose only one BICC protocol implementation may be present in an SN/CMN and peer-to-peer compatibility of versions can be assured, as described in clause 9.

7.4.2 Interworking with ISUP

The BICC protocol is an adaptation of the ISUP protocol definition, but it is not peer-to-peer compatible with ISUP (see ITU-T Q.1912.1 [19]).

The goal is to keep the BICC and ISUP protocols as closely aligned as possible. This will avoid extensive call control interworking and provide consistency of end-to-end functionality in mixed BICC/ISUP networks. The compatibility mechanism (see clause 9) provides for independent introduction of new capabilities in either protocol.

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[1] See Bibliography.

7.4.3 Interworking with other signalling systems or user parts

The examples included in this Recommendation are typical only and should not be used as a definitive interworking guide. Interworking between BICC and other signalling systems and user parts is a combination of the BICC-ISUP interworking according to ITU-T Q.1912.1 [19] and the relevant Recommendations specifying the interworking between ISUP and those other signalling systems and user parts (Recommendations in the Q.1912 series).

8 Capabilities supported

Table 1 lists the signalling capabilities supported by BICC for basic call. Table 2 lists the generic signalling procedures, supplementary services and some additional functions/services supported by BICC. These capabilities are categorized into two classes; internationally applicable class and national use class. These classes are defined as follows.

Table 1/ Q.1902.1 – Signalling capabilities for basic call

Function/service	National use	International
Speech/3.1 kHz audio	√	√
64 kbit/s unrestricted	√	√
Multirate connection types (Note 1)	√	√
N × 64 kbit/s connection types	√	√
En bloc address signalling	√	√
Overlap address signalling	√	√
Transit network selection	√	–
Continuity indication	√	√
Forward transfer	–	√
Simple segmentation	√	√
Tones and announcements	√	√
Access delivery information	√	√
Transportation of User teleservice information	√	√
Suspend and resume	√	√
Signalling procedures for connection type allowing fallback capability	√	√
Propagation delay determination procedure	√	√
Simplified echo control signalling procedures	√	√
Automatic repeat attempt	√	√
Blocking and unblocking	√	√
CIC group query	√	–
Dual seizure	√	√
Reset	√	√
Receipt of unreasonable signalling information	√	√
Compatibility procedure (BICC and BAT APM user application)	√	√
ISDN User Part signalling congestion control	Note 2	Note 2
Automatic congestion control	√	√

Table 1/ Q.1902.1 – Signalling capabilities for basic call

Function/service	National use	International
Interaction with INAP	√	√
Unequipped CIC	√	–
ISDN User Part availability control	Note 3	Note 3
MTP pause and resume	Note 2	Note 2
Overlength messages	√	√
Temporary Alternative Routing (TAR)	√	√
Hop counter procedure	√	√
Collect call request procedure	√	√
Hard-to-Reach	√	√
Calling geodetic location procedure	√	√
Carrier selection indication	√	–
Inter-nodal traffic group identification	√	√
Codec negotiation and modification procedures	√	√
Joint BIWF support	√	√
Global Call Reference procedure	√	√
Out of band transport of DTMF tones and information	√	√

√ represents ITU-T support.

– represents ITU-T non-support.

NOTE 1 – Multirate connection types are 2 × 64, 384, 1536 and 1920 kbit/s.

NOTE 2 – If BICC is deployed on an MTP3 or MTP3b signalling transport service, these functions are provided by the STC sublayer as described in ITU-T Q.2150.1 [63].

NOTE 3 – If BICC is deployed on an MTP3 or MTP3b signalling transport service, an equivalent procedure is provided by the STC sublayer as described in ITU-T Q.2150.1 [63].

Table 2/Q.1902.1 – Generic signalling procedures, services and functions

Function/service	National use	International
Generic signalling procedures		
Generic number transfer	√	√
Generic digit transfer	√	–
Generic notification procedure	√	√
Service activation	√	√
Remote Operations Service Element (ROSE) capability	√	–
Network specific facilities	√	–
Pre-release information transport	√	√
Application Transport Mechanism (APM)	√	√
Redirection	√	–
Pivot routeing	√	√

Table 2/Q.1902.1 – Generic signalling procedures, services and functions

Function/service	National use	International
Bearer redirection	√	√
Supplementary services		
Direct-Dialling-In (DDI)	√	√
Multiple Subscriber Number (MSN)	√	√
Calling Line Identification Presentation (CLIP)	√	√
Calling Line Identification Restriction (CLIR)	√	√
Connected Line Identification Presentation (COLP)	√	√
Connected Line Identification Restriction (COLR)	√	√
Malicious Call Identification (MCID)	√	√
Sub-addressing (SUB)	√	√`
Call Forwarding Busy (CFB)	√	√
Call Forwarding No Reply (CFNR)	√	√
Call Forwarding Unconditional (CFU)	√	√
Call Deflection (CD)	√	√
Explicit Call Transfer (ECT)	√	√
Call Waiting (CW)	√	√
Call HOLD (HOLD)	√	√
Completion of Calls to Busy Subscriber (CCBS)	√	√
Completion of Calls on No Reply (CCNR)	√	√
Terminal Portability (TP)	√	√
Conference calling (CONF)	√	√
Three-Party Service (3PTY)	√	√
Closed User Group (CUG)	√	√
Multi-Level Precedence and Preemption (MLPP) (Note)	√	√
Global Virtual Network Service (GVNS)	√	√
International telecommunication charge card (ITCC)	√	√
Reverse charging (REV)	√	–
User-to-User Signalling (UUS)	√	√
Additional functions/services		
Support of VPN applications with PSS1 Information Flows	√	√
Support of GAT protocol	√	√
Support of Number Portability (NP)	√	–

/ represents ITU-T support.

– represents ITU-T non-support.

NOTE – Only transiting of MLPP information is supported.

8.1 Internationally applicable class

The signalling capabilities of this class are to be supported over the international boundary. It is recommended that all international network operators support these capabilities. These capabilities are also applicable nationally except for those specific to the international interface. Any international SN implemented with BICC CS-1 [13] or later versions, however, has to be able to recognize all the messages and parameters defined for the international interface and properly react to them. If a capability of this class is requested internationally, the network operator should provide the capability.

However, if it is not possible to provide the requested capability, the following actions are deemed appropriate:

- release the call with an appropriate cause parameter;
- ignore the request and if necessary inform the preceding network of this fact; or
- provide an appropriate interworking action (e.g. fallback).

8.2 National use class

The signalling capabilities of this class are basically supported only in national networks. However, they may also be applied internationally if a bilateral or multilateral agreement is reached among the network operators concerned. It is up to each Administration or recognized operating agency (ROA) whether or not to support the capabilities of this class.

All the signalling elements qualified as of national use class are marked "national use" in the BICC Recommendations.

9 Future enhancements and compatibility procedure

Requirements for additional protocol capabilities, such as the ability to support new supplementary services, 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 protocol versions is optimized by adhering to the following guidelines when specifying a new version:

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 should not be modified.
4) The addition of parameters to the mandatory part of an existing message should not be allowed.
5) A parameter may be added to an existing message as long as it is allocated to the optional part of the message.
6) The addition of new octets to an existing mandatory fixed length parameter should be avoided. If needed, a new optional parameter should be defined containing the desired set of existing and new information fields.
7) The sequence of fields in an existing variable length parameter should remain unchanged. New fields may be added at the end of the existing sequence of parameter fields. If a change in the sequence of parameter fields is required, a new parameter should be defined.

8) The all-zeros 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.

9) The compatibility mechanism described in 9.1 applies to this and future versions of the BICC Recommendations.

Rules 1) to 8) also apply, and in addition principles, which allow this and future versions of the BICC protocol to directly interwork with each other, maintaining protocol and service compatibility, and including end-to-end transparency. This is further outlined below.

The compatibility mechanism at a Serving Node acts as at an ISUP exchange, and thus the introduction of BICC into a network using ISUP signalling does not degrade the ability to introduce new signalling versions into the network, e.g. an ISN receiving an unrecognized ISUP parameter will handle it according to 2.9.5/Q.764, Compatibility rules, passing it on to BICC if required.

9.1 Version compatibility

From CS-1 version of the BICC onwards, compatibility between 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*

Calls between any two BICC versions 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 SNs. Services and functions available at these SNs, but possibly not yet taken into account in the intermediate SNs/CMNs, are supported, provided they require only transparency of the intermediate SNs/CMNs. 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 BICC protocol versions from CS-1 [13] onwards. It is based on forward compatibility information associated with new signalling information.

The compatibility method eases the network operation, e.g. for the typical case of a BICC protocol mismatch during a network upgrading, to interconnect two networks on a different functional level, for networks using a different subset of the same BICC capability set, etc.

9.2 Additional coding guidelines for compatibility of BICC protocol versions

The following guidelines are mandatory.

9.2.1 Messages

All new messages, not used by BICC CS-1 (see IUT-T Q.1901 [13]), use only parameters coded according to the coding rules for the parameters of the optional part of BICC messages. They always contain a Message Compatibility Information parameter. (Note that tables in clause 7 of ITU-T Q.1902.3 [15] show which of the current messages contain the Message Compatibility Information parameter.)

Messages received and not recognized will be handled as described in ITU-T Q.1902.4 [16].

9.2.2 Parameters

As a general principle, mixing information for different application associations (requiring different functional entity actions) inside a new BICC parameter should be avoided so that the behaviour of cooperating nodes can be defined using the compatibility mechanism.

All parameters not listed in Table 3 shall have associated compatibility information contained in the Parameter Compatibility Information parameter.

Table 3/Q.1902.1 – Parameters not accompanied by compatibility information contained in the Parameter Compatibility Information parameter

1	Access transport
2	Automatic congestion level
3	Backward call indicator
4	Called party number
5	Calling party number
6	Calling party's category
7	Cause indicators
8	CIC group supervision message type indicators
9	CIC state indicator (national use)
10	Closed user group interlock code
11	Connected number
12	Continuity indicators
13	End of optional parameters indicator
14	Event information
15	Facility indicator
16	Forward call indicators
17	Information indicators (national use)
18	Information request indicators (national use)
19	Message compatibility information
20	Nature of connection indicators
21	Optional backward call indicators
22	Optional forward call indicators
23	Original called number
24	Parameter compatibility information
25	Range and status
26	Redirecting number
27	Redirection information
28	Redirection number
29	Subsequent number
30	Suspend/Resume indicators
31	Transit network selection (national use)
32	Transmission medium requirement
33	User service information
34	User-to-user indicators
35	User-to-user information

Unrecognized parameter handling procedures can be found in ITU-T Q.1902.4 [16].

9.3 Forward and backward compatibility for the BICC APM user application

BICC uses an APM user application to transfer signalling information. The Bearer Association Transport (BAT) APM user ASE is used to provide a transport mechanism for this information. In order to provide forward and backward compatibility within BICC, a compatibility mechanism is introduced for the information elements transferred by this mechanism. Compatible interworking between BAT ASE versions is optimized by adhering to the same guidelines when specifying a new version as outlined above for the BICC protocol.

This compatibility mechanism remains unchanged for all capability sets and/or subsets of the BICC protocol defined in this Recommendation. It is based on compatibility information sent with all signalling information related to the BAT APM user application. Formats and codes used by this compatibility mechanism can be found in ITU-T Q.765.5 [27], and relevant procedures are described in ITU-T Q.1902.4 [16].

APPENDIX I

Guidelines for use of instruction indicators

I.1 Introduction

Instruction indicators are used to indicate to an SN/CMN receiving unrecognized information what action should be taken 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 of 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 ISNs where interworking with B-ISUP is performed examine the broadband/narrow-band interworking indicator 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 SN passing information on, also generated Confusion messages).

The notification (Confusion message) contains a Cause indicators 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 SN/CMN 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 discarded.

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 SN/CMN which recognizes the contents of the diagnostic field of the cause parameter contained in the confusion message (this is an SN/CMN 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 SN/CMN 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 SN has a different syntax (message and parameter structure) to BICC (B-ISUP or N-ISUP), or the policing actions performed in the SN 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.

Bibliography

[1] ITU-T Q-series Supplement 31 (2000), TRQ 2141.0: *Signalling Requirements for the Support of Narrowband Services over Broadband Technologies (CS-2).*

[2] ITU-T Q-series Supplement 32 (2000), TRQ 2141.1: *Signalling Requirements for the Support of Narrowband services via Broadband Transport Technologies, CS-2 (Signalling Flows).*

[3] ITU-T Q-series Supplement 34 (2000), TRQ 2410: *Signalling requirements, capability set 1 for support of IP bearer control in BICC networks.*

[4] ITU-T Q-series Supplement 22 (1999), TRQ 3000: *Operation of the Bearer Independent Call Control (BICC) protocol with digital subscriber signalling system No. 2 (DSS2).*

[5] ITU-T Q-series Supplement 23 (1999), TRQ 3010: *Operation of the Bearer Independent Call Control (BICC) protocol with AAL type 2 signalling protocol (CS-1).*

[6] ITU-T Q-series Supplement 24 (1999), TRQ 3020: *Operation of the Bearer Independent Call Control (BICC) protocol with broadband integrated services digital network User Part (B-ISUP) protocol for AAL type 1 adaptation.*

[7] ITU-T Q-series Supplement 36 (2000), TRQ 3030: *Operation of the bearer independent call control (BICC) protocol (CS-2) with IP bearer control protocol (CS-1).*

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