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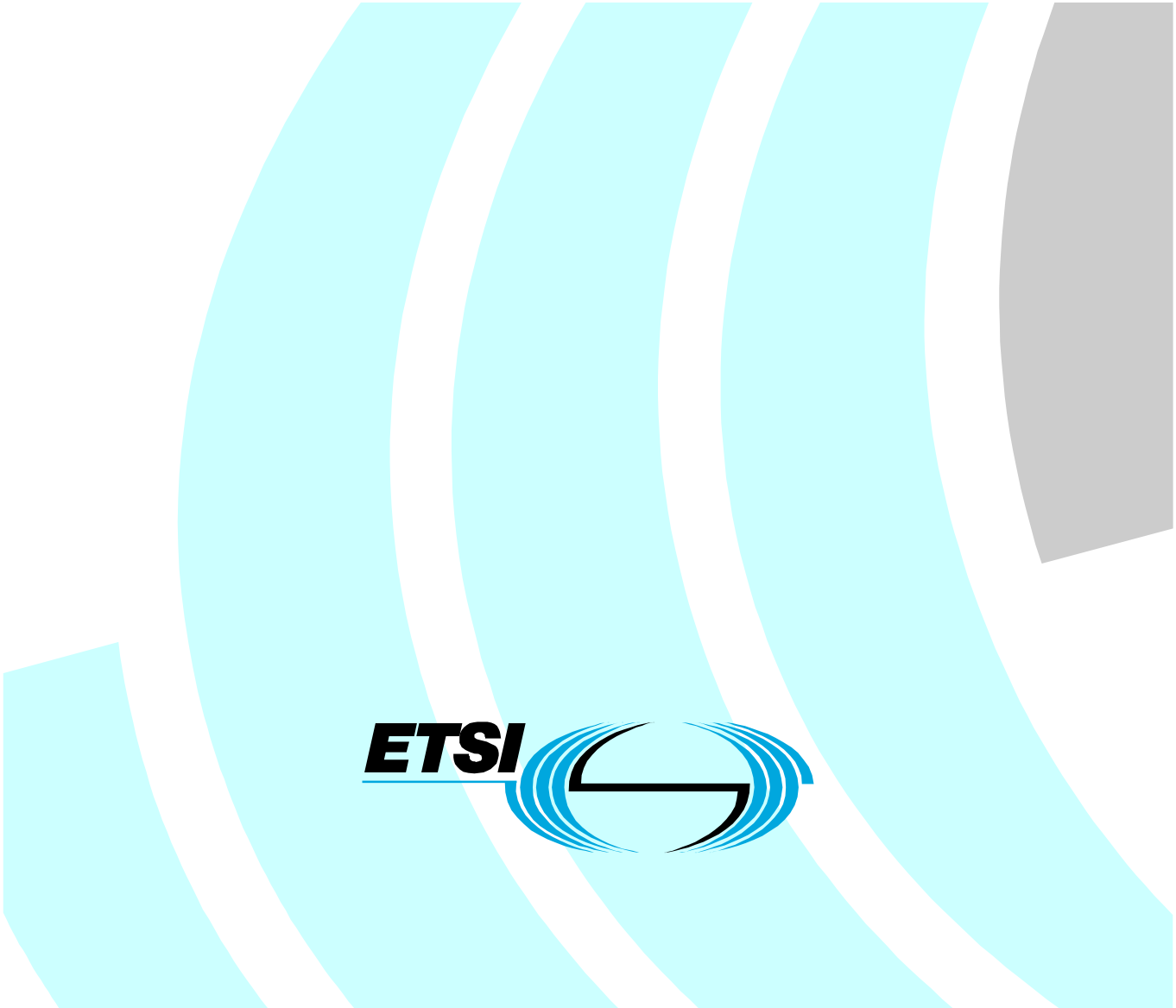
Technical Specification

Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 4; Technology Mapping; Implementation of TIPHON architecture using BICC



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Foreword

This Technical Specification (TS) has been produced by ETSI Project Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON).

1 Scope

The present document defines the mapping to the BICC CS2 protocols necessary to implement the TIPHON protocol framework as described in TS 101 882 [2].

The present document is applicable to equipment performing the roles of terminal, and Gateway, and also to entities within the IP network that are necessary to support the four scenarios of TIPHON Release 3. Where the text indicates the status of a requirement (i.e. as strict command or prohibition, as authorizations leaving freedom, or as a capability or possibility), this may modify the nature of a requirement within a referenced standard used to provide the capability.

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication and/or edition number or version number) or non-specific.
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Referenced documents which are not found to be publicly available in the expected location might be found at http://docbox.etsi.org/Reference.

[1] ETSI TS 101 878 (V4.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 4; Service Capability Definition; Service Capabilities for TIPHON Release 4".

[2] ETSI TS 101 882 (V1.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 3; Protocol Framework Definition; General (meta-protocol)".

[3] ETSI TS 101 314 (V4.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 4; Abstract Architecture and Reference Points Definition; Network Architecture and Reference Points".

[4] ITU-T Recommendations Q.1902.1 until Q.1902.6: "Bearer Independent Call Control Capability Set 2 (BICC CS2) protocol".

[5] ITU-T Recommendations Q.1950: "Bearer independent call bearer control protocol".

[6] ITU-T Recommendation H.248: "Gateway control protocol".

[7] ITU-T Recommendation Q.1990: "BICC Bearer Control Tunnelling Protocol".

[8] ITU-T Recommendation Q.1970: "BICC IP Bearer control protocol".

[9] ITU-T Recommendation Q.761 until Q.764: "Specifications of the ISDN user part of Signalling System No. 7".

[10] ITU-T Recommendation H.245: "Control protocol for multimedia communication".

[11] ITU-T Recommendation H.225.0: "Call signalling protocols and media stream packetization for packet-based multimedia communication systems".

[12] ITU-T Recommendation Q.850: "Usage of cause and location in the Digital Subscriber Signalling System No.1 and the Signalling System No.7 ISDN User Part".

[13] ITU-T Recommendation Q.850/Amendment 1: "Usage of cause and location in the Digital Subscriber Signalling System No. 1 (DSS1) and the Signalling System No. 7 ISDN user part (ISUP)".

[14] ITU-T Recommendation Q.765: "Signalling System No. 7 - Application transport mechanism".

[15] ITU-T Recommendation Q.765.1: "Signalling system No. 7 - Application transport mechanism: Support of VPN applications with PSS1 information flows".

[16] ITU-T Recommendation Q.769.1: "Signalling system No. 7 - ISDN user part enhancements for the support of number portability".

[17] ITU-T Recommendation Q.2150.0: "Generic signalling transport service".

[18] ITU-T Recommendation Q.2150.1: "Signalling transport converter on MTP3 and MTP3b".

[19] ITU-T Recommendation Q.2150.2: "Signalling transport converter on SSCOP and SSCOPMCE".

[20] ITU-T Recommendation Q.2150.3: ".Signalling transport converter on SCTP".

[21] IETF RFC 3261: "SIP: Session Initiation Protocol".

[22] IETF RFC 2327: "SDP: Session Description Protocol".

[23] ITU Recommendations Q.1902.1/Amendment 1: "Support for the international emergency preference scheme".

[24] ETSI TR 101 311 (V1.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 3; Service Independent requirements definition; Transport Plane".

[25] ETSI TR 101 877 (V1.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON); Requirements Definition Study; Scope and Requirements for a Simple call".

[26] ETSI TS 101 315 (V4.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 4; Information flow and reference point definitions; Implementation of service capabilities".

[27] ETSI TS 101 883 (V1.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 3; Technology Mapping; Implementation of TIPHON architecture using H.323".

[28] ETSI TS 101 884 (V1.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 3; Technology Mapping; Implementation of TIPHON architecture using SIP".

[29] ETSI TS 101 885 (V4.1.1): "Telecommunications and Internet Protocol Harmonization Over Networks (TIPHON) Release 4; Interface Protocol Requirements Definition; Implementation of TIPHON using H.248/MEGACO".

3 Definitions and abbreviations

3.1 Definitions

For the purposes of the present document, the following terms and definitions apply:

Bearer Control Function (BCF): five types of BCFs are defined; BCF-G, BCF-J, BCF-N, BCF-R and BCF-T:

- 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.
- Bearer Control Gateway Function (BCF-G) 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.

- 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).

- 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.

- 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.

Bearer Inter-Working Function (BIWF): functional entity which provides bearer control and media mapping/switching functions within the scope of a Serving Node (ISN, TSN or GSN)

NOTE: A BIWF contains one Bearer Control Nodal Function (BCF-N, BCF-T or BCF-G) and one or more MCF and MMSF, and is functionally equivalent to a Media Gateway (MG) that incorporates bearer control.

Bearer and Media Control (BMC) interface: interface between the BCF and the MCF

NOTE: The precise functionality of this interface is outside the scope of BICC.

Call and Bearer Control (CBC) interface: interface between the CSF and the BCF

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

Call Service Function (CSF): four types of CSFs are defined; CSF-N, CSF-T, CSF-G, and CSF-C:

- Call Service Nodal Function (CSF-N) provides the service control nodal actions associated with the narrowband service by inter-working 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 broadband backbone network.

- Call Service Transit Function (CSF-T) provides the service transit 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 Nodal Functions (BCF-T) necessary to transport the narrowband bearer service across the broadband backbone network.

- 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 Nodal Functions (BCF-N) necessary to transport the narrowband bearer service between broadband backbone networks.

- 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.

gateway: endpoint on a network which provides for real time, two way communication between an IP based network and an Switched Circuit Network (SCN)

Gateway Serving Node (GSN): functional entity which provides gateway functionality between two network domains

NOTE: This functional entity contains one or more call service gateway functions (CSF-G), and one or more Bearer inter-Working Functions (BIWF). GSNs interact with other GSNs, in other broadband backbone network domains and other ISNs and TSNs within its own broadband backbone network domain. . The network signalling flows for a GSN are equivalent as those for a TSN.

Interface Serving Node (ISN): functional entity which provides the interface with non-BICC networks and terminal equipment

NOTE: This functional entity contains one or more Call Service Nodal Functions (CSF-N), and one or more Bearer inter-Working Functions (BIWF) which interact with the non-BICC networks and terminal equipment and its peers within the broadband backbone network.

IP network: managed transport network supporting IP

Media Mapping/Switching Function (MMSF): 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

protocol: set of rules and formats which govern exchange of information across an interface between two functional entities for purposes of information transfer

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

Switched Circuit Network (SCN): telecommunications network, e.g. Public Switched Telephone Network (PSTN), Integrated Services Digital Network (ISDN) and General System for Mobile communications (GSM), that uses circuit-switched technologies for the support of voice calls

NOTE: The SCN may be a public network or a private network.

Switching Node (SWN): functional entity which provides the switching functions within the broadband backbone network

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

telephone call: two-way speech communication between two users by means of terminals connected via network infrastructure

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

TIPHON compliant system: system that complies with the mandatory requirements identified in the TIPHON requirements documents together with compliance to the parts of the TIPHON specifications in which these requirements are embodied

Transit Serving Node (TSN): functional entity which provides transit functionality between ISNs and GSNs

NOTE: This functional entity contains one or more call service transit functions (CSF-T), and one or more Bearer inter-Working Functions (BIWF). TSNs interact with other TSNs, GSNs and ISNs within their own broadband backbone network domain.

3.2 Abbreviations

For the purposes of the present document, the following abbreviations apply:

AAL1	ATM Adaptation Layer 1
AAL2	ATM Adaptation Layer 2
ACM	Address Complete Message
ACN	Access Control Node
ANM	ANswer Message
APM	APplication transport Message
ATM	Asynchronous Transfer Mode
BC	Bearer Control
BCF	Bearer Control Function
BCTP	Bearer Control Tunnelling Protocol
BCU	Bearer Control Unit
BICC	Bearer Independent Call Control
B-ISUP	Broadband - ISDN User Part
BIWF	Bearer Inter-Working Function
BMC	Bearer and Media Control
BNC	Bearer Network Characteristics
CBC	Call and Bearer Control
CC	Call Control
CCA-ID	Call Control Association - ID
CCU	Call Control Unit
CIC	Call Instance Code

CMN	Call Mediation Node
CPG	Call ProGress message
CS	Capability Set
CSF	Call Service Function
DSS2	Digital Subscriber System No.2
GSM	General System for Mobile communications
GSN	Gateway Serving Node
IAM	Initial Address Message
IN	Intelligent Network
IP BCP	IP Bearer Control Protocol
IP	Internet Protocol
ISDN	Integrated Services Digital Network
ISN	Interface Serving Node
ISUP	ISDN User Part
M3UA	SS7 MTP3 - User Adaptation layer
MC	Media Control
MG	Media Gateway
MGC	Media Gateway Controller
MGU	Media Gateway Unit
MLPP	Multi-Level Precedence and Preemption
MMSF	Media Mapping / Switching Function
MPLS	MultiProtocol Label Switching
MSC	Message Sequence Charts
MTP3	SS7 Message Transfer Part level 3
MTP3b	SS7 Message Transfer Part level 3 broadband
PSTN	Public Switched Telephony Network
REL	RELease message
RLC	ReLease Complete message
RM	Resource Manager
SC	Service Control
SCN	Switched Circuit Network
SCTP	Stream Control Transport Protocol
SDP	Session Description Protocol
SIP	Session Initiation Protocol
SN	Serving Node
SSCOP	Service Specific Connection Oriented Protocol
SSCOPMCE	Service Specific Connection Oriented Protocol in a Multi-link and Connectionless Environment
STC	Signalling Transport Converter
SWN	SWitching Node
TE	Terminal Equipment
TSN	Transit Serving Node
UNI	User Network Interface
VCC	Virtual Channel Connection
VPC	Virtual Path Connection

4 Introduction

The protocol mapping contained in the present document are derived from examination of the TIPHON protocol framework as described in TS 101 882 [2].

Figure 1 shows the relationship of the present document with other TIPHON deliverables.

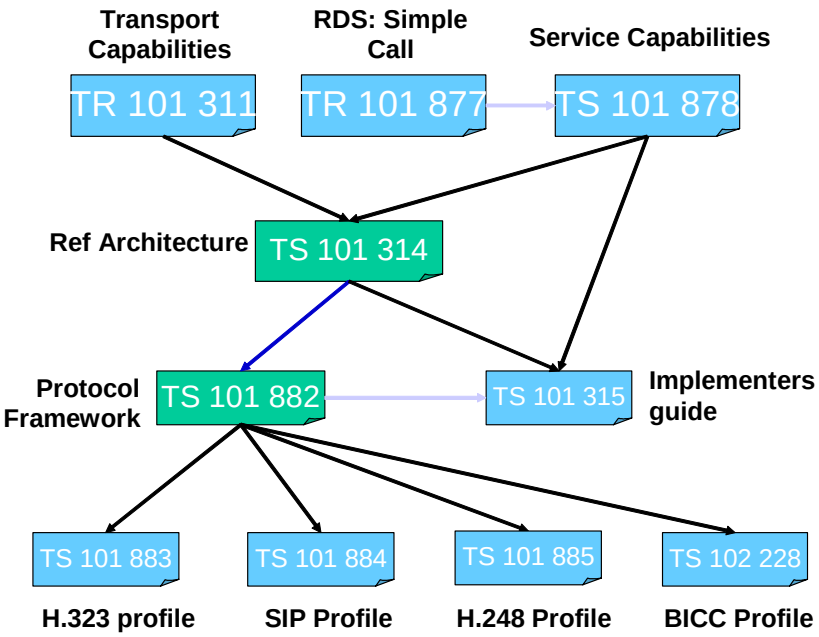


Figure 1: Relationship with other TIPHON documents

5 BICC implementation of TIPHON functional architecture

The BICC CS2 protocol set is an evolution of the ISUP protocol (ITU-T Recommendation Q.761 to Q.764 [9]) towards packet networks (ATM and IP). BICC CS2 supports narrowband PSTN / ISDN services transparently over packet networks. Annex A provides the set of services supported by BICC CS2. Please note that BICC is designed as a capability set which implies that the services actually supported may vary per service provider.

BICC as call control protocol is designed to be independent of the medium (i.e. bi-directional voice stream or data stream). The carrier is separated out (ATM (Sup31) AAL1 (Sup24), ATM AAL2 (Sup23) and IP (Sup36) - see bibliography). This implies that while in TIPHON the bearer is the abstract representation of the media flow, in BICC the term bearer is used for the physical representation.

The BICC CS2 protocol set includes two protocols of particular interest to TIPHON.

- BICC: As defined in ITU-T Recommendations Q.1902.1 until Q.1902.6 [4], this is referred as the call control protocol.
- CBC: As defined in ITU-T Recommendations Q.1950 [5], this is referred as the call bearer control protocol.

In order to define the example implementation, functional elements of each protocol are identified, and the functions within each element are described.

5.1 The BICC CS2 architecture

Figure 2 (lifted from ITU-T Recommendation Q.Sup31 - see bibliography) presents the Composite Functional Reference Model for the Bearer Independent Call Control protocol Capability Set 2 (BICC CS2). This architecture defines a number of functions that are explained in clause 3.1 (lifted from ITU-T Recommendation Q.Sup31 - see bibliography).

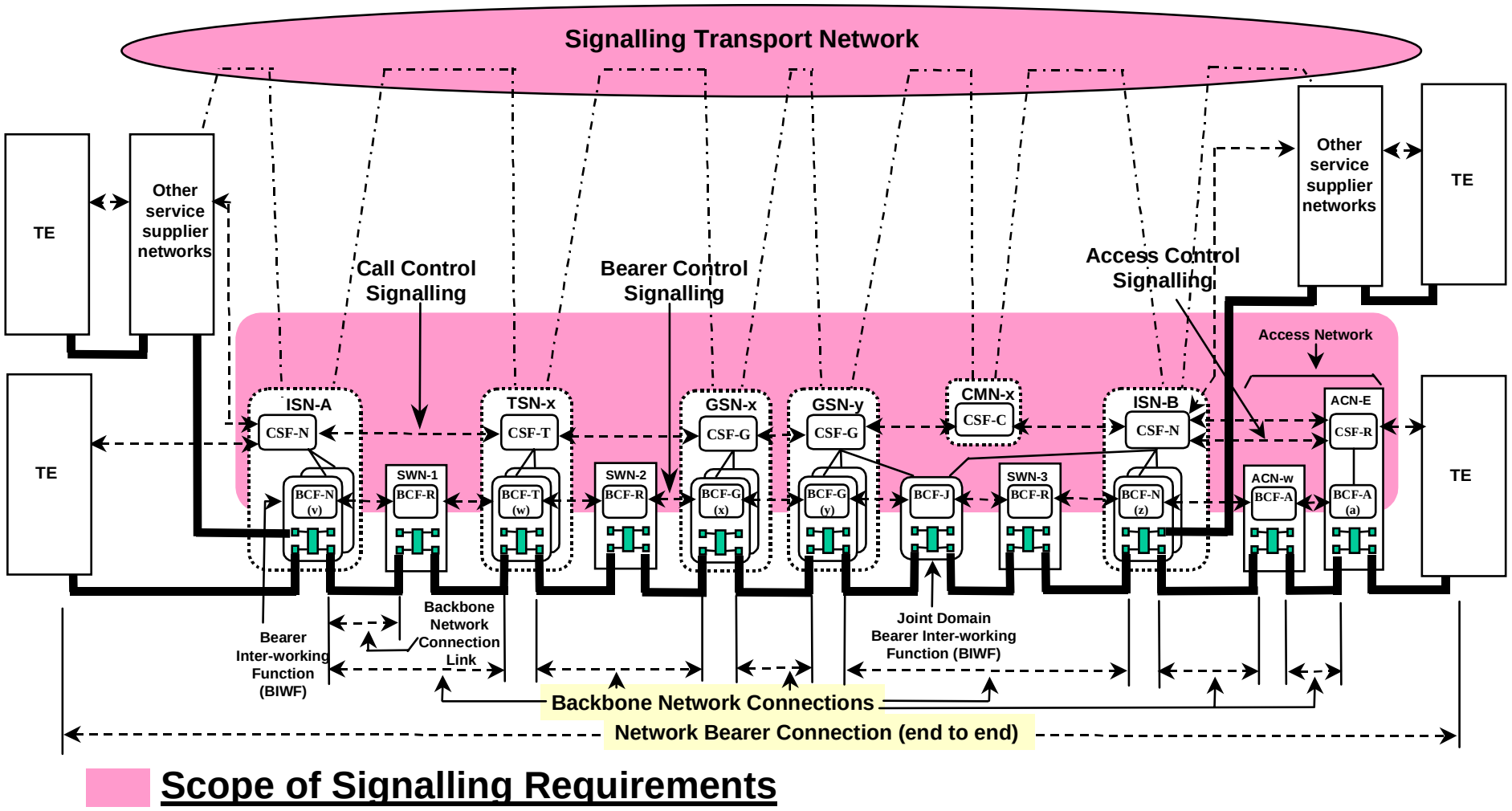


Figure 2: Composite Functional Reference Model for BICC CS2

5.2 The BICC CS2 vertical separation

As part of BICC CS2 a vertical separation is specified based on a ITU-T Recommendation H.248 [6] (MEGACO) package for the CBC interface (ITU-T Recommendation Q.1950 [5]). The H.248 (MEGACO) package for the BMC interface was concluded outside the scope of the BICC CS2 activity. Figures 3 and 4 (lifted from ITU-T Recommendation Q.Sup31 - see bibliography) provides the resulting vertical separation for BICC CS2 and table 1 (lifted from ITU-T Recommendation Q.Sup31 - see bibliography) gives a classification of the CBC interface and BMC interface, respectively.

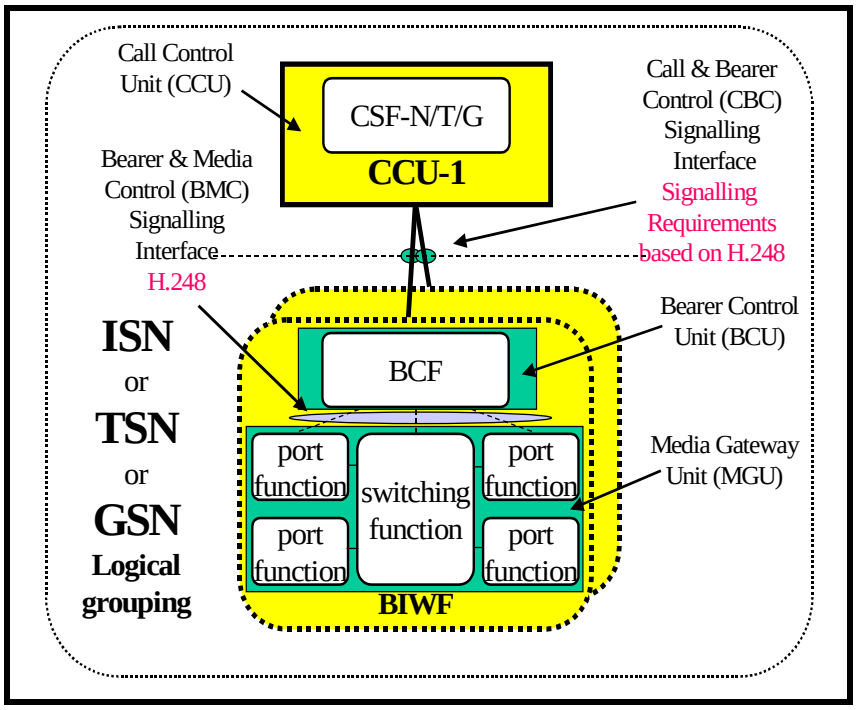


Figure 3: Logical grouping of functional entities for the SN decomposition with BICC CS2

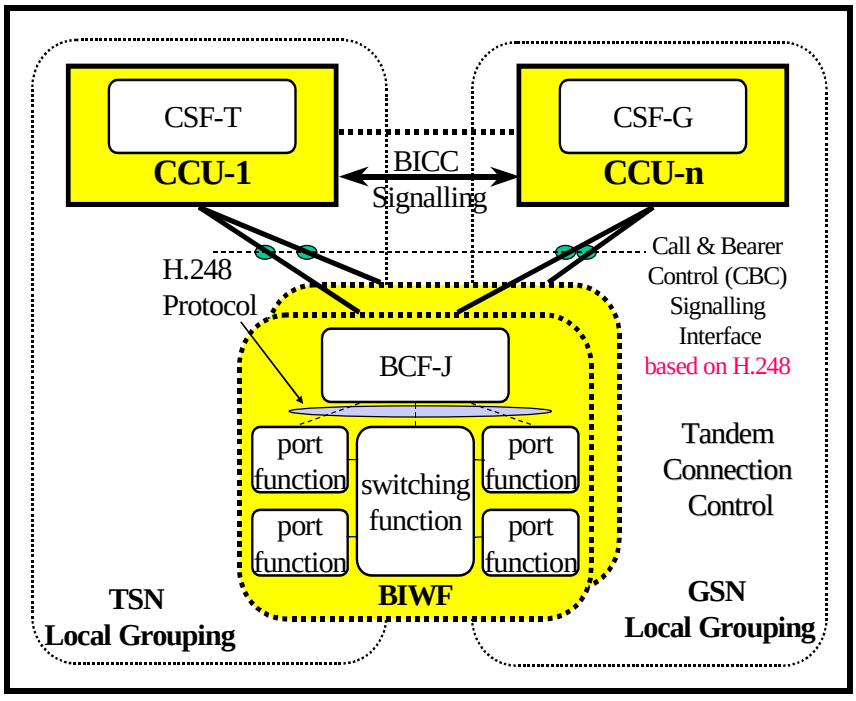


Figure 4: Logical representation of control configurations for the SN decomposition with BICC CS2

Table 1: Classification of the CBC interface and BMC interface

CBC Interface	BMC Interface
A BCU can have a control association with one or more CCUs in different SN groupings. When multiple CCUs are controlling a BCU, the control configuration will be in a tandem configuration. A CCU can have a control association with multiple BCUs in the same SN logical grouping or in a shared logical BIWF grouping Signalling between CCUs and BCUs shall be bearer transport technology independent.	A MGU can have a control association with one or more BCUs. When multiple BCUs are controlling a MGU, each BCU is controlling separate termination - connector - termination sectors. A BCU can have a control association with multiple MGUs in the same BIWF grouping or in a shared MGU grouping Signalling between BCUs and MGUs is bearer transport technology specific.

5.3 BICC CS2 bearer type operation

5.3.1 Connection oriented ATM versus connectionless IP

The BICC protocol design is defined independent of the type of bearer being ATM or IP (or else in future). However a different type of operation applies to the connection oriented ATM bearer type versus the connectionless IP bearer type:

- For the connection oriented ATM bearer type the basic switching capability for the establishment of the bearers in the underlying ATM core network is used. All other bearer control signalling is traversed via the BICC call control signalling path. This type of operation is further clarified in clause 5.3.2.

- For the connectionless oriented IP bearer type all bearer control signalling (e.g. IP port addresses) is traversed via the BICC call control signalling path. This type of operation is further clarified in clause 5.3.3.

NOTE: The IP bearer type operation clarified in clause 5.3.3 assumes a native IP core network. In case MPLS is used the IP sessions may become connection oriented. The operation of MPLS with BICC is further investigated as part of BICC CS3.

5.3.2 BICC operation for an ATM bearer

Figure 5 shows the physical grouping of the functions and protocols for an ATM bearer. In this case the bearer control protocol of the ATM bearer is grouped together with the Media Gateway functions. The control of the ATM bearer is defined as an open interface based on the DSS2 (ITU-T Recommendation Q.Sup22 - see bibliography), AAL Type 2 Signalling protocol (ITU-T Recommendation Q.Sup23 - see bibliography), B-ISUP (ITU-T Recommendation Q.Sup24 - see bibliography) or ATM Forum's SIG 4.0, PNNI 1.0 and AINI (AF-CS-VMOA-0146.000 - see bibliography) protocol from the BCF function to the ATM switches in the underlying ATM core network. The CBC interface is defined as an open interface with the ITU-T Recommendation H.248 [6] (MEGACO) package defined in BICC CS2.

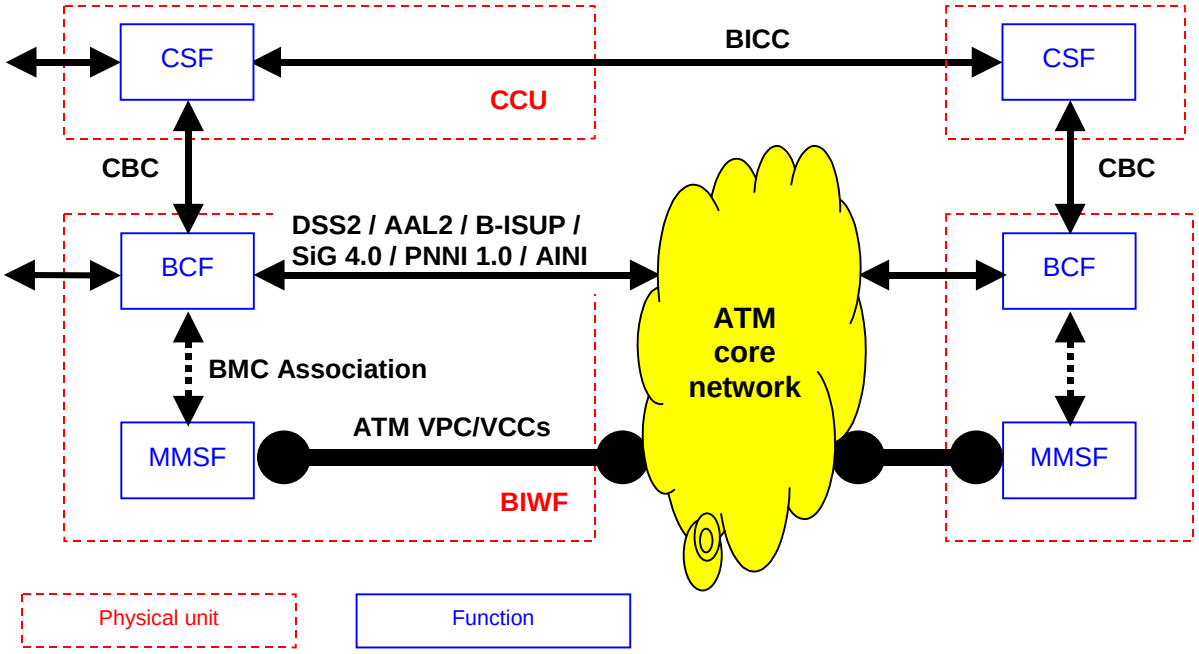


Figure 5: Physical grouping and protocols in case of an ATM bearer

5.3.3 BICC operation for an IP bearer

Figure 6 shows the physical grouping of the functions and protocols for an IP bearer. Also in this case the bearer control protocol of the IP bearer is grouped together with the Media Gateway functions. The control of the IP bearer is defined via tunnelling of the IP BCP protocol (ITU-T Recommendation Q.1970 [8]) between adjacent CSFs. I.e. the IP BCP protocol is tunnelled via the BCTP protocol (ITU-T Recommendation Q.1990 [7] across the CBC (ITU-T Recommendation Q.1950 [5]) protocol, the BICC protocol (ITU-T Recommendations Q.1902.1 to Q.1902.6 [4]) and the CBC protocol to the remote BCF. The BCFs are interconnected to the IP routers in the underlying IP core network. The CBC interface is defined as an open interface with the ITU-T Recommendation H.248 [6] (MEGACO) package defined in BICC CS2.

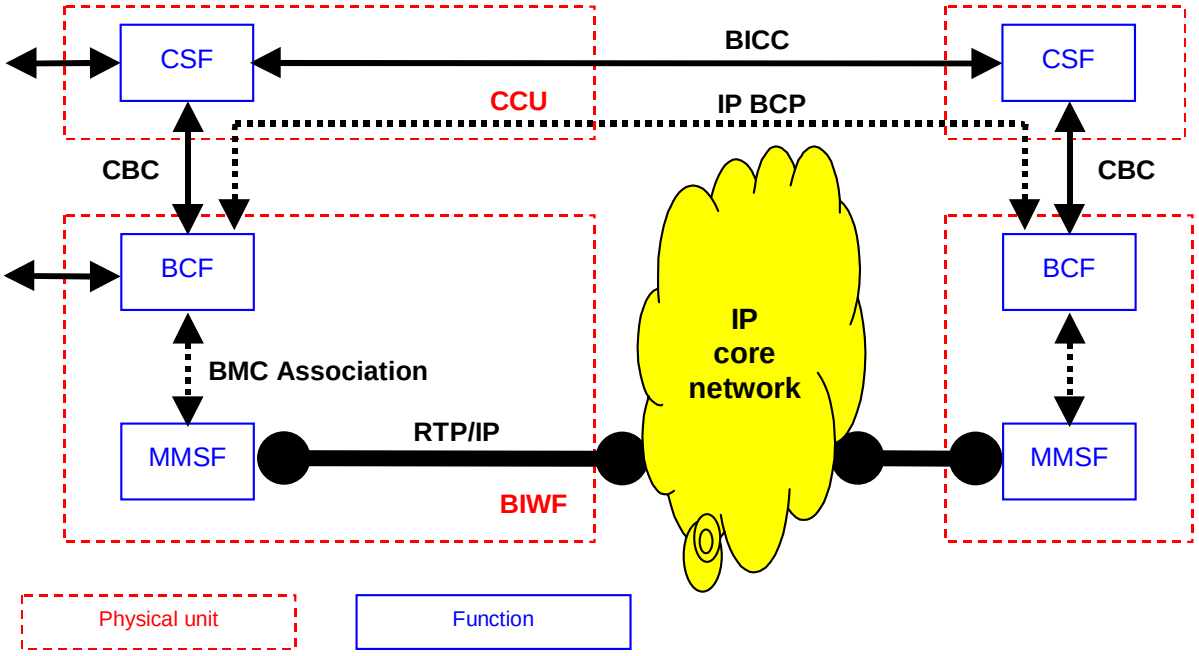


Figure 6: Physical grouping and protocols in case of an IP bearer

5.4 Mapping TIPHON and BICC CS2 functional architectures

Figure 7 shows the mapping between the TIPHON functional architecture and the BICC CS2 functional architecture.

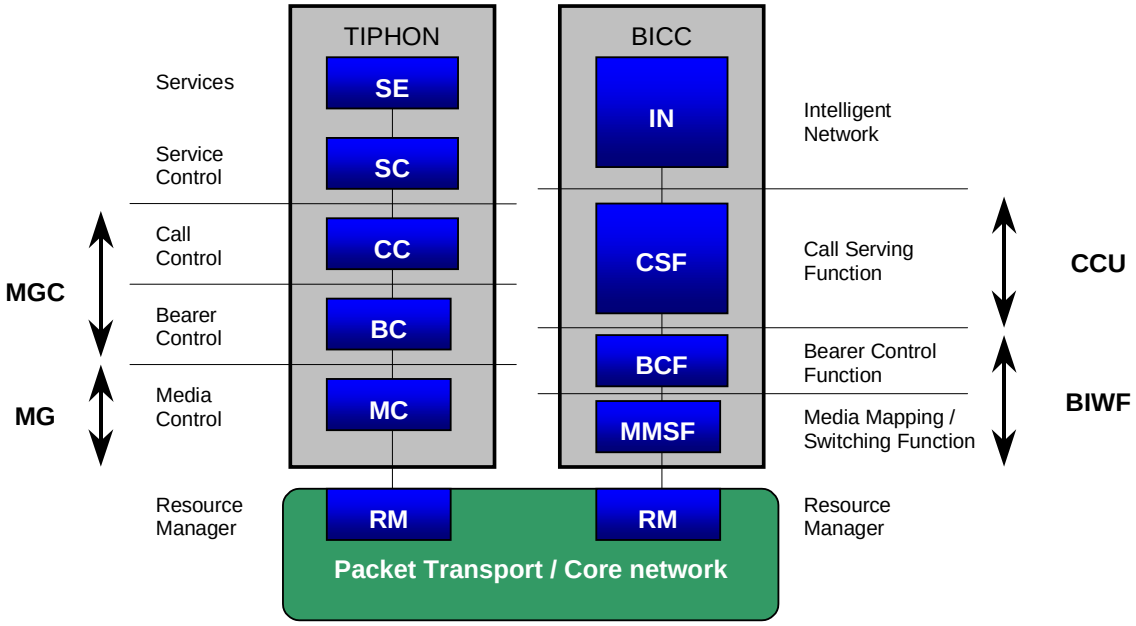


Figure 7: Mapping between the TIPHON functional architecture and the BICC CS2 functional architecture

The following observations can be drawn from this mapping between both functional architectures:

- The BICC services may be implemented through the Intelligent Network (IN) following the SC and SE layers in the TIPHON architecture.
- The CSF entity in BICC performs the call control functions as the CC layer in the TIPHON architecture (ITU-T Recommendation H.225.0 [11] / SIP - RFC 3261 [21]) and in addition supports call routing (a service function in the TIPHON architecture), and end-to-end control procedures like codec negotiation that are specified as part of the BC layer in the TIPHON architecture (ITU-T Recommendation H.245 [10] / SDP - RFC 2327 [22]).
- The BCF entity in BICC performs similar functions as the BC layer (except codec negotiation) and part of the MC layer in the TIPHON architecture. This refers to the MC actions for the transport signalling like address allocation, codec selection and QoS control (delay, bandwidth, etc.).
- The MMSF entity in BICC performs the media mapping and switching actions as part of the MC layer in the TIPHON architecture.
- The physical grouping of functions in the TIPHON architecture and the BICC architecture mainly differs with regard to the positioning of the bearer control functionality.

5.5 Functional elements supported

5.5.1 Intelligent Network (IN)

The BICC CS2 services may be implemented through IN (or distributed across the SNs as internal functionality). So it covers the following functionality:

- Services and Service Control:
  - Number portability.
  - Called user location.
  - Name to Name translation (in this case "names" as E.164 numbers).
  - Name to address translation.
  - Authentication.
  - User profile.

5.5.2 Call Service Function (CSF)

- Services and Service Control:
  - Call routing.
- Call Control:
  - Signalling with call control peers.
  - Call state.
  - Access to service control entities.
  - Initiate request of resources.
- Bearer Control:
  - Bearer negotiation.

5.5.3 Bearer Control Function (BCF)

- Bearer Control:
  - Admission control.
  - Media resource acquisition.
- Media Control:
  - Media channel address resolution.
  - Media resource management.
  - ATM / IP transport signalling.
  - Usage recording.

5.5.4 Media Mapping / Switching Function (MMSF)

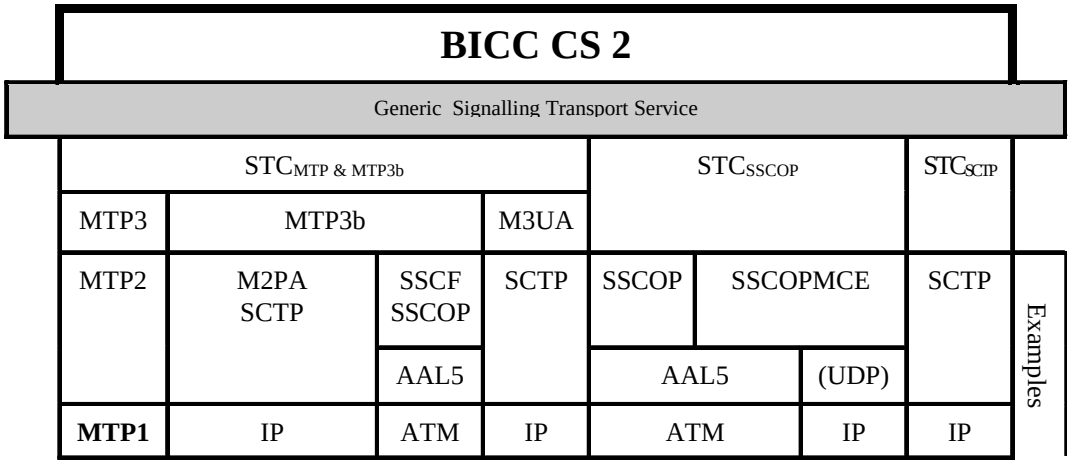
- Media Control:
  - Circuit network media termination.
  - Media processing.
  - Packet media termination.

5.5.5 Resource Manager (RM)

- Transport signalling acceptance.
- Quality of Service (QoS) connectivity provisioning.

5.6 BICC CS2 signalling transport options

The BICC protocol design is defined independent of the underlying transport protocols by specifying Signalling Transport Converters (STCs) for the specific underlying transport protocol type. Protocol type in this context refers to the underlying protocol directly interfacing with the STC (e.g. MTP) and does not include the protocol options below that protocol. Using the STC for MTP (ITU-T Recommendations Q.2150.0 [17] and Q.2150.1 [18]) BICC CS2 could be deployed over MTP3, MTP3b or M3UA. Using the STC for SSCOP (ITU-T Recommendations Q.2150.0 [17] and Q.2150.2 [19]), BICC CS2 could be deployed over SSCOP or SSCOPMCE. A STC for BICC deployment directly over SCTP is specified (ITU-T Recommendations Q.2150.0 [17] and Q.2150.3 [20]). Figure 8 (lifted from ITU-T Recommendation Sup38 - see bibliography) illustrates the STCs for BICC CS2 deployment and also provides examples of some complete transport protocol options.



NOTE: M2PA and M3UA adaptation layers under development by the IETF Signalling Transport (SIGTRAN) Working Group.

Figure 8: Signalling Transport Options for BICC CS2

NOTE: All protocol stacks shown below the various STCs are examples - other stacks are possible beneath the MTP3, MTP3B, M3UA, SSCOP, SSCOPMCE and SCTP protocol layers. The set of examples shown is not intended to be exhaustive. Which lower layer protocols to be used depends on the Network Operator's application. Figure 8 does not preclude use of CS2 example lower layers in CS1 implementations where this would be transparent to the STCs defined in CS1.

6 Mapping of codepoints

Table 2 provides the mapping between the parameter names in the TIPHON protocol framework (TS 101 882 [2] and the parameter names in the BICC protocol (ITU-T Recommendations Q.1902.1 to Q.1902.4 [4]) and the CBC protocol (ITU-T Recommendation Q.1950 [5]), respectively.

Table 2: Mapping of code points between TIPHON and BICC protocols

TIPHON parameter's name	BICC parameter	CBC parameter	Comments
Additional called party address information	Subsequent Number		Additional digits if digits are sent in overlap
Address of Home Service ID	SCF id		
Address|DomainID	network ID		
Allowed service {audio, video, data, other}	Transmission Medium Used		Assumption that this information is sent in backward direction
Bearer Descriptor	- Codec list - IP BCP bearer set-up PDU (tunnelled) - QoS info (BICC CS3)		
Bearer ID	BNC ID	BNC ID	
Call ID	Call Instance Code		For an end-to-end Call ID requires use of the Global Call Reference
Called address	Called Party Number		
Called party address (Address, Screening, etc)	Called Party Number		
Caller ID	Calling Party Number		
Caller location ID	Calling Geodetic Location		
Calling number presentation restriction indications	Calling Party Number		
Calling party address (Address, Screening, etc)	Calling Party Number		
Circuit ID	Not Applicable		Only applicable on C3
Number of digits required	Not supported		
Number presentation restrictions	Calling Party Number		
Presentation number and restrictions	Additional Calling Party Number		
Priority	- Calling Party's Category - MLPP Precedence		
Reason	Cause Indicators (ITU-T Recommendation Q.850 [12] and ITU-T Recommendation Q.850/Amendment 1 [13])		
Receiving Transport Descriptor	IP BCP bearer set-up PDU (tunnelled)	IP BCP bearer set-up PDU (tunnelled)	
Registration ID	Not Applicable		Not Applicable
Requested service {audio, video, data, other}	- Transmission Medium Requirement - User Service Information - User Service Information Prime		
Routing information (address where to route the call)	Called Party Number		If an internal number is used for routeing, then the User ID (i.e. dialled number) may be sent in e.g. Called Directory Number

TIPHON parameter's name	BICC parameter	CBC parameter	Comments
Sending complete indication	(1) Called Party Number (2) Subsequent Number		(1) End of selection digit is added if digits are sent en-bloc. (2) End of selection digit may be sent to indicate complete number if digits are sent in overlap
Sending Transport Descriptor	BNC Characteristics	BNC Characteristics	
Service (e.g. voice 3.1 kHz audio)	- Transmission Medium Requirement - User Service Information		
Service class	Not indicated		Only 1 QoS class
Service Details {QoS class, etc}	- Transmission Medium Requirement - QoS info (BICC CS3)		
Service Provider Address	Transit Network Selection		
Service Provider ID	Transit Network Selection		
Terminal details{ID, type of terminal, other details}	Access Transport		BC, LLC, HLC
Terminal ID	Access Transport		Subaddress
Terminating domain ID		BIWF address	
Ticket	Not Applicable (implicit)		
Transport ID		BCU ID	
User location details	Calling Geodetic Location		
UserID	Calling/Called party address		

7 Support for TIPHON service capabilities with BICC CS2

Table 3 identifies the support for the TIPHON service capabilities as described in TS 101 878 [1] with BICC CS2.

Table 3: Support of TIPHON service capabilities with BICC CS2

TS 101 878 clause	Service Capability	Supported by BICC	Comments
7.0	Registration Service Capabilities	Not applicable	
7.1	Simple Terminal Registration	Not applicable	
7.2	Simple Proxy Registration	Not applicable	
7.3	User profile	Not applicable	
8.0	Application Related Service Capabilities	Not applicable	
8.1	Simple Connectivity Control	Supported	
8.2	Event Recording	Supported	
8.3	Lawful Interception access	Not applicable	
8.4	Calling User Identity Generation	Supported	Received from an originating access or the generation of a default number.
8.5	Calling User Identity Conveyance	Supported	
8.6	Calling User Identity Delivery	Supported	Delivered to the destination access or withheld in case of a restricted number.
8.7	Anonymous Call Rejection	Supported	
8.8	Number Portability - All Call Query	Supported	
8.9	Number Portability - Query on Release (QoR)	Supported	
8.10	Number Portability - Pivot Routing (Dropback)	Supported	
8.11	Carrier Selection	Supported	
8.12	Emergency Calls	Supported	
8.13	Handling of Priority Calls	Supported	
8.14	Bearer creation	Supported	
8.15	Bearer negotiation	Supported	
8.16	Bearer re-negotiation	Supported	
8.17	QoS Bearer support	Supported	Potential QoS enhancements supported with BICC CS3
8.18	Per bearer QoS Bearer selection	Supported	Potential QoS enhancements supported with BICC CS3
8.19	Shorter Media Path	Supported	
8.20	Third party Authorization	Not applicable	

Annex A (informative): Services and functions BICC CS2

Please find in table A.1 the set of services and functions supported by BICC Capability Set 2 (lifted from ITU-T Recommendation Q.Sup31 - see bibliography with the removal of "not required" items and BICC specific information).

Table A.1: N-ISUP Services and Functions supported in BICC Capability Set 2

ITU-T ISUP 2000 Function / Service
Basic call
Speech/3,1 kHz audio
64 kbit/s unrestricted
Multirate connection types
N × 64 kbit/s connection types
En bloc address signalling
Overlap address signalling
Transit network selection
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 of circuits and circuit groups (in Q.BICC, circuits = CIC which is equal to the CCA-ID)
CIC group query (in Q.BICC, CIC = CCA-ID)
Dual seizure (in Q.BICC, dual seizure applies to CIC = CCA-ID and does not refer to circuits)
Reset of circuits and circuit groups (in Q.BICC, circuits = CIC which is equal to the CCA-ID)
Receipt of unreasonable signalling information
Compatibility procedure
ISDN User Part signalling congestion control
Automatic congestion control
Interaction between N-ISDN and INAP
Unequipped circuit identification code (in Q.BICC, CIC = CCA-ID)
MTP pause and resume
Overlength messages
Temporary Alternative Routing (TAR)
Hop counter procedure
Collect call request procedure
Hard-to-Reach
Calling Geodetic location procedure
Generic signalling procedures
End-to-end signalling - Pass along method
End-to-end signalling - SCCP Connection Orientated
End-to-end signalling - SCCP Connectionless
Generic number transfer
Generic digit transfer
Generic notification procedure
Service activation
Remote Operations Service (ROSE) capability
Network specific facilities
Pre-release information transport
Application Transport Mechanism (APM), see ITU-T Recommendation Q.765 [14]

ITU-T ISUP 2000 Function / Service
Redirection
Pivot Routing
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) (see 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, see ITU-T Recommendation Q.765.1 [15]. Support of Number Portability (NP), see ITU-T Recommendation Q.769.1 [16].

Annex B (normative): Mapping of reference points

B.1 Reference points applicable to BICC

This Annex describes the mapping of the primitives at the TIPHON reference points as defined in the Network architecture and reference configurations (TS 101 314 [3]) to the appropriate protocol actions in the BICC protocol (ITU-T Recommendations Q.1902.1 to Q1902.6 [4] and the CBC protocol (ITU-T Recommendation Q.1950 [5]), respectively. Figure B.1 identifies that the reference point C2 applies to BICC and N2 applies to CBC.

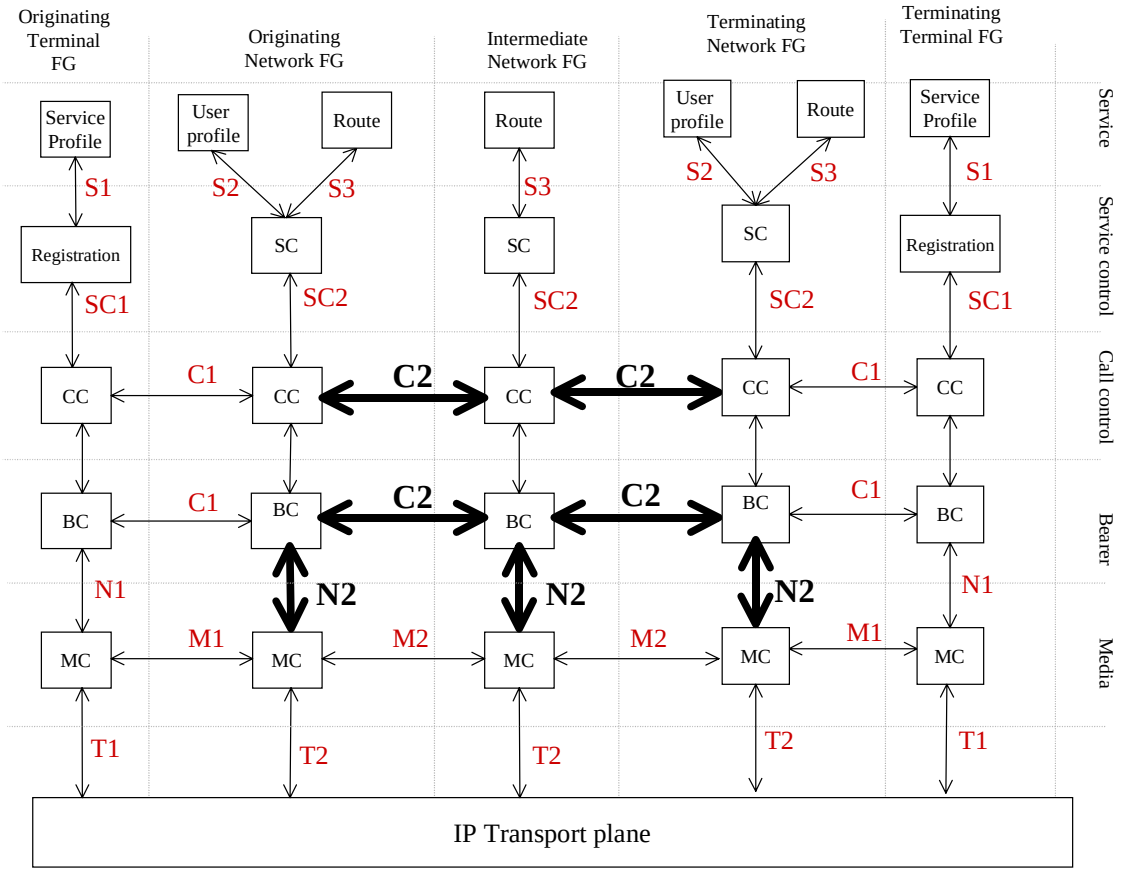


Figure B.1: Identification of BICC related reference points in TIPHON architecture and reference configurations

B.2 Reference point C2

B.2.1 Primitives for reference point C2

Information flows at C2 provide the capability to establish, modify and terminate both calls and bearers between network functional groupings or gateway functional groupings. The reference point C2 is placed between two network functional groupings, between a network functional grouping and a gateway functional grouping, or between two gateway functional groupings.

The mapping between BICC protocol messages and their primitives at reference point C2 are defined in table B.1 based on the ASN.1 description of the TIPHON meta-protocol (TS 101 882 [2]).

Table B.1: Mapping between C2 primitive names and BICC protocol messages

C2 primitive name	BICC protocol message
C2.CallRequest	IAM
C2.AdditionalInfoIndication	SAM (only in case digits are sent in overlap)
C2.CallConfirm	ANM or CON
C2.CallReject	REL
C2.CallReleaseRequest	REL
C2.CallReleaseConfirm	RLC
C2.CallReport	ACM or CPG
C2.BearerRequest	IAM (same message as for C2.CallRequest, alternatively same message as for C2.CallRequest plus APM message(s))
C2.BearerConfirm	APM
C2.BearerReject	REL (same message as for CallReject)
C2.BearerReleaseRequest	REL (same message as for CallReleaseRequest)
C2.BearerReleaseConfirm	RLC (same message as for CallReleaseConfirm)

In the subsequent subclauses the parameter mapping is described between the parameters of these C2 primitives and the parameters of these BICC protocol messages based on the ASN.1 description of the TIPHON meta-protocol (TS 101 882 [2]).

B.2.1.1 Parameter mapping for C2.CallRequest

The CallRequest flow maps to a BICC IAM message.

Table B.2: Parameter mapping for C2.CallRequest

TIPHON parameter		Status	BICC parameter	Status
calleId		M	Call Instance Code, Global Call Reference	M O
callingPartyID	UserID	M	Calling Party Number - digits	O
	presentationRestriction	M	Calling Party Number - APRI	O
	screeningIndicator	M	Calling Party Number - SI	O
	aliases	O	Note 1	O
calledPartyID	UserID	M	Called Party Number - digits	M
locationInfo		O	Calling Geodetic Location	O
ticket		O	no mapping (implicit)	O
priority		O	MLPP Precedence, Calling Party Category	O M
NOTE 1: Zero or more aliases may be present. Each alias consists of UserID, presentationRestriction and screeningIndicator elements. The TIPHON definition of alias is unclear, may be equivalent to a BICC Additional Calling Party Number. NOTE 2: The CPC value for priority used in BICC is 00001110 (ITU-T Recommendation Q.1902.1/Amendment 1 [23].				

B.2.1.2 Parameter mapping for C2.AdditionalInfoIndication

Not described in the ASN.1 description of the TIPHON meta- protocol (TS 101 882 [2]).

B.2.1.3 Parameter mapping for C2.CallConfirm

The CallConfirm flow maps to a BICC ANM or CON message.

Table B.3: Parameter mapping for C2.CallConfirm

TIPHON parameter	Status	BICC parameter	Status
called	M	Call Instance Code	M

B.2.1.4 Parameter mapping for C2.CallReject

The CallReject flow maps to a BICC REL message.

Table B.4: Parameter mapping for C2.CallReject

TIPHON parameter		Status	BICC parameter	Status
called		M	Call Instance Code	M
reason	causeClass	M	Location,	M
	causeId	M	Cause value, see tables B.13 and B.14	M
	causeText	M	(see note)	
	diagnostics	O	Diagnostics	O
NOTE: Text not supported (what language would it be in?).				

B.2.1.5 Parameter mapping for C2.CallReleaseRequest

The CallReleaseRequest flow maps to a BICC REL message.

Table B.5: Parameter mapping for C2.CallReleaseRequest

TIPHON parameter		Status	BICC parameter	Status
Called		M	Call Instance Code	M
reason	causeClass	M	Location, Cause value, see tables B.13 and B.14	M
	causeId	M		M
	causeText	M	(see note)	
	diagnostics	O	Diagnostics	O
NOTE: Text not supported.				

B.2.1.6 Parameter mapping for C2.CallReleaseConfirm

The CallReleaseConfirm flow maps to a BICC RLC message.

Table B.6: Parameter mapping for C2.CallReleaseConfirm

TIPHON parameter		Status	BICC parameter	Status
called		M	Call Instance Code	M
reason	CauseClass	M	Location, Cause value, see tables B.13 and B.14	O
	CauseId	M		O
	CauseText	M	(see note)	
	Diagnostics	O	Diagnostics	O
NOTE: Text not supported.				

B.2.1.7 Parameter mapping for C2.CallReport

The CallReport flow maps to a BICC ACM or CPG message.

Table B.7: Parameter mapping for C2.CallReport

TIPHON parameter		Status	BICC parameter	Status
called		M	Call Instance Code	M
reportReason	AddressIncomplete	M	(see note)	M
	AddressComplete		ACM "no indication" message	
	Alerting		ACM "no indication" message, or CPG "alerting"	
NOTE: Inclusion of this value in CallReport implies a compelled method of requesting additional called address digits. BICC (and most other signalling systems) use a non-compelled system thus this value is not applicable.				

B.2.1.8 Parameter mapping for C2.BearerRequest

The BearerRequest flow maps to a BICC IAM message, or an IAM followed by an APM message:

Table B.8: Parameter mapping for C2.BearerRequest

TIPHON parameter		Status	BICC parameter	Status
called		M	Call Instance Code	M
BearerID		M	BNC-ID	M
QosClass		M	Implicit in CS2. Explicit indication to be added in CS3	
outgoingBearer	CodecID	M	Codec (see note 2)	O
	FramesPerPacket	M	Tunnelled IPBCP	M
	QosParameters	M	Implicit in CS2. Explicit indication to be added in CS3	
	TransportDescriptor	M	Tunnelled IPBCP	M
incomingBearer	CodecID	M	Codec (see note 2)	O
	FramesPerPacket	M	Tunnelled IPBCP	M
	QosParameters	M	Implicit in CS2. Explicit indication to be added in CS3	
	TransportDescriptor	M	Tunnelled IPBCP	M
NOTE 1: The meta-protocol allows repetition of the outgoingBearer and incomingBearer parameters to indicate alternatives. BICC only allows multiple codecs to be indicated - to allow for codec negotiation. NOTE 2: Inclusion of codec is optional in BICC, G.711 is implied if absent.				

B.2.1.9 Parameter mapping for C2.BearerConfirm

The BearerConfirm flow maps to a BICC APM message.

Table B.9: Parameter mapping for C2.BearerConfirm

TIPHON parameter		Status	BICC parameter	Status
called		M	Call Instance Code	M
BearerID		M	BNC-ID	M
outgoingBearer	CodecID	M	Codec (see note)	O
	FramesPerPacket	M	Tunnelled IPBCP	M
	QosParameters	M	Implicit in CS2. Explicit indication to be added in CS3	
	TransportDescriptor	M	Tunnelled IPBCP	M
incomingBearer	CodecID	M	Codec (see note)	O
	FramesPerPacket	M	Tunnelled IPBCP	M
	QosParameters	M	Implicit in CS2. Explicit indication to be added in CS3	
	TransportDescriptor	M	Tunnelled IPBCP	M
NOTE: Inclusion of codec is optional in BICC, G.711 is implied if absent.				

B.2.1.10 Parameter mapping for C2.BearerReject

The BearerReject flow maps to a BICC REL message (same message as for CallReject).

Table B.10: Parameter mapping for C2.BearerReject

TIPHON parameter		Status	BICC parameter	Status
BearerId		M	Implicit (see note 1)	
Reason	CauseClass	M	Location, Cause value, see tables B.13 and B.14	M
	CauseId	M		M
	CauseText	M	(see note 2)	
	Diagnostics	O	Diagnostics	O
NOTE 1: BICC CS2 only supports one bearer per call. NOTE 2: Text not supported.				

B.2.1.11 Parameter mapping for C2.BearerReleaseRequest

The BearerReleaseRequest flow maps to a BICC REL message (same message as for CallReleaseRequest).

Table B.11: Parameter mapping for C2.BearerReleaseRequest

TIPHON parameter		Status	BICC parameter	Status
BearerId		M	Implicit (see note 1)	
Reason	CauseClass	M	Location, Cause value, see tables B.13 and B.14	M
	CauseId	M		M
	CauseText	M	(see note 2)	
	Diagnostics	O	Diagnostics	O
Ticket		O	no mapping (implicit)	
NOTE 1: BICC CS2 only supports one bearer per call. NOTE 2: Text not supported.				

B.2.1.12 Parameter mapping for C2.BearerReleaseConfirm

The BearerReleaseConfirm flow maps to a BICC RLC message (same message as for CallReleaseConfirm).

Table B.12: Parameter mapping for C2.BearerReleaseConfirm

TIPHON parameter		Status	BICC parameter	Status
BearerId		M	Implicit (see note 1)	
reason	CauseClass	M	Location, Cause value, see tables B.13 and B.14	O
	CauseId	M		O
	CauseText	M	(see note 2)	
	Diagnostics	O	Diagnostics	O
NOTE 1: BICC CS2 only supports one bearer per call. NOTE 2: Text not supported.				

B.2.1.13 Common mappings

Table B.13: Mapping between TIPHON "ErrorSeverityType" and BICC "Cause Class"

TIPHON	BICC
ErrorSeverityType	**Cause Class**
Information	000 001
Warning	010 011 100
FatalError	101 110 111

Table B.14: Mapping between TIPHON "ErrorReasonType" and BICC "Cause Value"

TIPHON	BICC
ErrorReasonType	**Cause Value**
Called user busy	User busy
Called user unknown	Not supported
Invalid ticket	Not supported
Media resource not available	No circuit/Channel available (closest mapping)
Media resource not supported	Not supported
No compatible codec available	Not supported
Policy Rejection	Not supported
Requested QoS not available	Not supported
Resource no longer available	Not supported
Service currently not available	Not supported
Service not subscribed to	Not supported
Transport not available	Not Supported
Unable to allocate resource	Not supported

B.3 Reference point N2

Information flows at N2 provide the capability to establish, modify and terminate media flows between bearer control and media control. The reference point N2 is placed between two network functional groupings, between a network functional grouping and a gateway functional grouping, or between two gateway functional groupings. The mapping of SDP is done in TS 101 885 [29], and will not be repeated here.

Annex C (informative): MSC for TIPHON mapping to BICC

C.1 MSC for call setup and release at reference point C2

Figure C.1 shows the TIPHON information flow and the resulting BICC signalling flow for a call setup and a call release between Network Functional Groupings at the Reference Point C2.

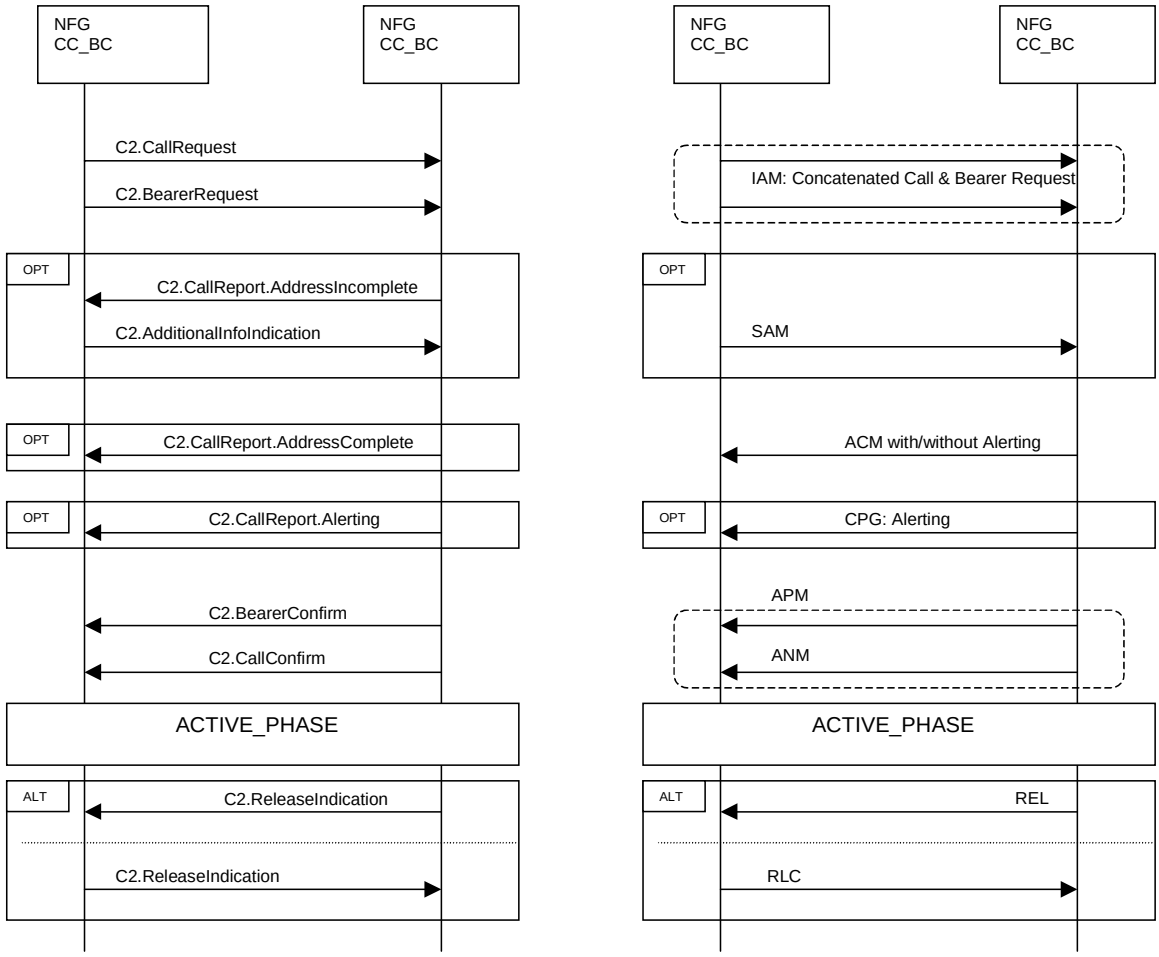


Figure C.1: Network-Network call setup and release information flow at Reference Point C2

Annex D (informative): Capabilities missing in BICC

The following is the list of enhancements required in BICC to support the TIPHON protocol framework as defined in TS 101 882 [2].

Table 3 in clause 7 identifies a list of service capabilities not supported by BICC. The list of missing capabilities is given below.

Registration Service Capabilities
Simple Terminal Registration
Simple Proxy Registration
User profile
Application Related Service Capabilities
Third party Authorization

Most of these service capabilities are related to registration. BICC is a NNI protocol that has not been designed to provide the above services. In addition, table B.14 provides a list of reject reason required by TIPHON and not supported by BICC reject causes.

Annex E (informative): Bibliography

- ITU-T Recommendation Q.Sup31: "Technical report TRQ.2141.0: Signalling requirements for the support of narrowband services over broadband transport technologies - Capability set 2 (CS-2)".
- ITU-T Recommendation Sup32: "Technical Report TRQ.2141.1: Signalling requirements for the support of narrow-band services via broadband transport technologies - CS-2 signalling flows".
- ITU-T Recommendation Sup38: "Technical Report TRQ.2600: BICC signalling transport requirements - Capability set 1".
- ITU-T Recommendation Sup22: "Technical Report TRQ.3000: Operation of the bearer independant call control (BICC) protocol with digital subscriber signalling system No. 2 (DSS2)".
- ITU-T Recommendation Sup23: "Supplement to ITU-T Q.1901 Recommendation – Technical Report TRQ.3010: Operation of the bearer independant call control (BICC) protocol with AAL type 2 signalling protocol (CS-1)".
- ITU-T Recommendation Sup24: "Technical Report TRQ.3020: Operation of the bearer independant call control (BICC) protocol with broadband integrated services digital network user part (B-ISUP) for AAL Type 1 adaptation".
- ITU-T Recommendation Sup36: "Technical report TRQ.3030: Operation of the bearer independent call control (BICC) protocol (CS?2) with IP bearer control protocol (IPBCP)".
- AF-CS-VMOA-0146.000 - "Operation of BICC with SIG 4.0 / PNNI 1.0 / AINI".

List of figures

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History

Document history		
V4.1.1	November 2003	Publication