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Technical Specification

**3rd Generation Partnership Project;
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Core Network Nb Data Transport and Transport Signalling
(Release 4)**

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Contents

1 Scope

The present document specifies the bearer data transport and bearer control protocols used between MGWs within the CS core network across the Nb Interface. The present document assumes that the implementation of the split of the call control and the bearer transport and control, as specified in 3GPP TS 23.205 [1], see figure 1. The User Plane protocol that uses this bearer data transport (Nb UP) is described in 3GPP TS 29.415 [3].
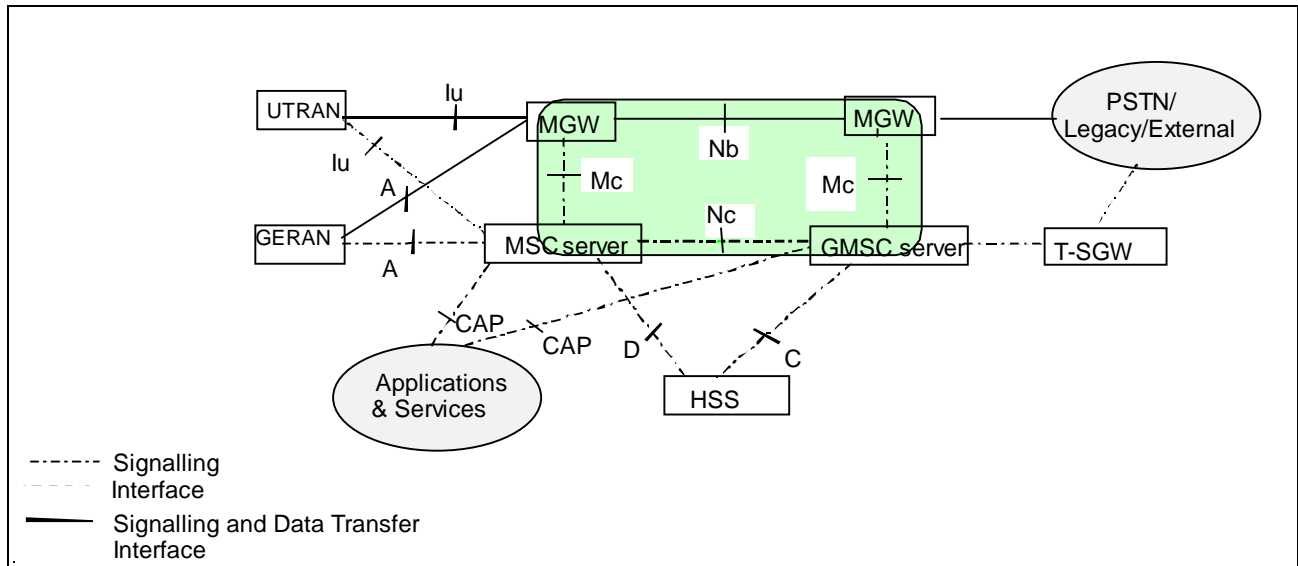
Figure 1: CS core network logical architecture

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, edition number, version number, etc.) or non-specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies.

This specification may contain references to pre-Release-4 GSM specifications. These references shall be taken to refer to the Release 4 version where that version exists. Conversion from the pre-Release-4 number to the Release 4 (onwards) number is given in subclause 6.1 of 3GPP TR 41.001.

[1]   3GPP TS 23.205: "Bearer Independent CS Core Network; Stage 2"

[2]   3GPP TS 25.414: "UTRAN Iu Interface Data Transport and Transport Signalling"

[3]   3GPP TS 29.415: "Core Network Nb Interface User Plane Protocols"

[4]   3GPP TS 29.232: "Media Gateway Controller (MGC) – Media Gateway (MGW) Interface; Stage 3"

[5]   ITU-T Recommendation E.164 (5/1997): "Numbering Plan for the ISDN Era"

[6]   ITU-T Recommendation I.361 (2/1999): "B-ISDN ATM Layer Specification"

[7]   ITU-T Recommendation I.363.2 (9/1997): "B-ISDN ATM Adaptation Layer Type 2 Specification"

[8]   ITU-T Recommendation I.363.5 (8/1996): "B-ISDN ATM Adaptation Layer Type 5 Specification"

[9]   ITU-T Recommendation I.366.1 (6/1998): "Segmentation and Reassembly Service Specific Convergence Sublayer for the AAL Type 2"

[10]   ITU-T Recommendation H.248 "Media Gateway Control Protocol"

[11]   Reference 6 (ITU-T draft Recommendation Q.765.5) in 3GPP TS 29.205: "Application of Q.1900 Series to Bearer Independent CS Core Network Architecture".

[12]   Reference 15 (ITU-T draft Recommendation Q.1970) in 3GPP TS 29.205: "Application of Q.1900 Series to Bearer Independent CS Core Network Architecture".

[13]   Reference 14 (ITU-T draft Recommendation Q.1990) in 3GPP TS 29.205: "Application of Q.1900 Series to Bearer Independent CS Core Network Architecture".

[14]   ITU-T Recommendation Q.2110 (7/1994): "B-ISDN ATM Adaptation Layer-Service Specific Connection Oriented Protocol (SSCOP)"

[15]   ITU-T Recommendation Q.2140 (2/1995): "B-ISDN ATM Adaptation Layer-Service Specific Coordination Function for Support of Signalling at the Network Node Interface (SSCF-NNI)"

[16]   ITU-T Recommendation Q.2150.1 (1999): "B-ISDN ATM Adaptation Layer-Signalling Transport Converter for the MTP3b"

[17]   ITU-T Recommendation Q.2210 (7/1996): "Message Transfer Part level 3 functions and messages using the services of ITU-T Recommendation Q.2140"

[18]   ITU-T Implementor's guide (12/99) for recommendation Q.2210 (07/96)

[19]   ITU-T Recommendation Q.2630.2 (12/2000): "AAL type 2 Signalling Protocol (Capability Set 2)"

[20]   ITU-T Recommendation Q.2931 (2/1995): "Digital Subscriber Signalling System No. 2 (DSS 2) – User-Network Interface (UNI) layer 3 specification for basic call/connection control"

[21]   ITU-T Recommendation X.213 (8/1997): "Information Technology-Open Systems Interconnection-Network Service Definitions"

[22]   IETF RFC 768: "User Datagram Protocol. (UDP)"

[23]   IETF RFC 791: "Internet Protocol (IP)"

[24]   IETF RFC 1889: "RTP: A Transport Protocol for Real Time Applications"

[25]   IETF RFC 1890: "RTP Profile for Audio and Video Conferences with Minimal Control"

[26]   IETF RFC 2327: "SDP: Session Description Protocol"

[27]   IETF RFC 2460: "Internet Protocol, Version 6 (IPv6)"

3   Definitions and abbreviations

3.1   Definitions

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

3.2 Abbreviations

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

AAL	ATM Adaptation Layer
AAL2	AAL Type 2
AESA	ATM End System Address
ARP	Address Resolution Protocol
ATM	Asynchronous Transfer Mode
BICC	Bearer Independent Call Control
CN	Core Network
CSRC	Contributing Source
DS	Differentiated Services
FIFO	First in first out
IP	Internet Protocol
IPBCP	IP Bearer Control Protocol
MGW	Media GateWay
MTP3b	Message Transfer Part level 3 for Q.2140 [15]
NNI	Network Node Interface
NSAP	Network Service Access Point
PDU	Protocol Data Unit
PVC	Permanent Virtual Circuit
RFC	Request For Comment
RTP	Real-Time Transport Protocol
RTCP	Real-Time Transport Control Protocol
SAR	Segmentation and Reassembly
SCCF-NNI	Service Specific Coordination Function-Network Node Interface
SDP	Session Description Protocol
SDU	Service Data Unit
SPVC	Switched PVC
SSCOP	Service Specific Connection Oriented Protocol
SSCS	Service Specific Convergence Sublayer
SSRC	Synchronisation Source
SVC	Switched Virtual Circuit
UDP	User Datagram Protocol
UNI	User Network Interface
UP	User Plane
VC	Virtual Circuit

4 General

The Nb UP shall be transported either over an ATM or IP bearer.

5 Transport over ATM

5.1 General

ATM shall be used in the transport network user plane and the transport network control plane according to ITU-T Recommendation I.361 [6]. The structure of the ATM cell header used across the Nb interface shall be the cell header format and encoding at the NNI (see Figure 3 in I.361 [6]).

5.2 Transport network user plane

5.2.1 General

Figure 2 shows the ATM protocol stack used for the transport network user plane on the Nb interface.

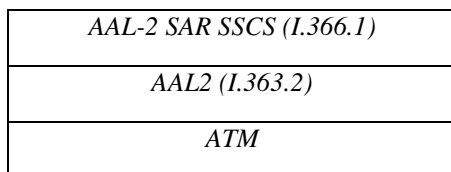| |
|---|
| *AAL-2 SAR SSCS (I.366.1)* |
| *AAL2 (I.363.2)* |
| *ATM* |

Figure 2: ATM protocol stack used for the transport network user plane

ATM AAL2 connections shall be transported over a VC which may either be a PVC, an SPVC or an SVC. For every ATM implementation of the Nb interface, a PVC shall be supported. The support of an SPVC or an SVC is optional. An ATM implementation may either support SPVCs only, SVCs only, or both.

If SPVCs or SVCs are supported, DSS2 signalling [20] shall be used for the establishment and tear down of these VCs. The network element that generated a given switched VC shall be the only network element that is allowed to tear down this VC.

5.2.2 ATM Adaptation Layer 2

5.2.2.1 AAL2-Segmentation and Reassembly Service Specific Convergence Sublayer

Service Specific Segmentation and Reassembly (SSSAR) sublayer of ITU-T Recommendation I.366.1 [9] shall be used for the segmentation and reassembly of AAL2 SDUs (i.e. only SSSAR is used from I.366.1 [9]).

5.2.2.2 AAL2-specification

AAL2 shall be used according to ITU-T Recommendation I.363.2 [7].

5.3 Transport network control plane

5.3.1 General

Figure 3 shows the protocol stack for the transport network control plane on the Nb interface.

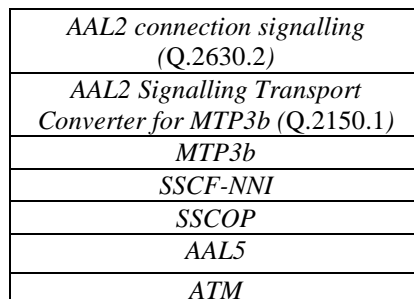| |
|---|
| *AAL2 connection signalling (Q.2630.2)* |
| *AAL2 Signalling Transport Converter for MTP3b (Q.2150.1)* |
| *MTP3b* |
| *SSCF-NNI* |
| *SSCOP* |
| *AAL5* |
| *ATM* |

Figure 3: ATM protocol stack for the transport network control plane

Tunnelling, as described in 3GPP TS 23.205 [1], is currently not specified to transport the ATM transport network control plane.

5.3.2 Signalling protocol

5.3.2.1 AAL2 Signalling Protocol

ITU-T Q.2630.2 [19] shall be used for the establishment of AAL2 connections. The AAL2 transport layer uses the embedded E.164 [5] or AESA variants of the NSAP addressing formats [21]. Native E.164 addressing shall not be used.

The MGW which issues a given ESTABLISH request [19] provides a Binding Reference (see 3GPP TS 23.205 [1]), This binding reference shall be copied into the SUGR parameter of the corresponding ESTABLISH request primitive [19].

If there is an AAL2 switching function in the transport network layer of the Nb interface, the AAL2 Link Characteristics parameter (ALC) in the Establish Request message of the AAL2 signalling protocol shall be used.

5.3.3 Signalling transport converter

5.3.3.1 AAL2 MTP3B Signalling Transport Converter

The AAL2 MTP3b Signalling Transport Converter shall be used according to ITU-T Recommendation Q.2150.1 [16].

5.3.4 MTP3b

MTP3b shall be used according to ITU-T Recommendation Q.2210 [17 & 18].

5.3.5 SSCF-NNI

SSCF-NNI shall be used according to ITU-T Recommendation Q.2140 [15].

5.3.6 SSCOP

SSCOP shall be used according to ITU-T Recommendation Q.2110 [14].

5.3.7 ATM Adaptation Layer Type 5

AAL5 shall be used according to ITU-T Recommendation I.363.5 [8]

6 Transport over IP

6.1 General

RTP (RFC 1889 [24]) over UDP (RFC 768 [22]) over either IPv4 (RFC 791 [23]) or IPv6 (RFC 2460 [27]) shall be used in the transport network user plane. The present specification takes the role of an RTP profile in describing the transport of the Nb UP protocol by RTP. Figure 4 shows the protocol stack for the transport network user plane on the Nb interface.
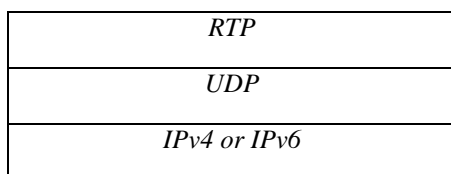
RTP
UDP
IPv4 or IPv6

Figure 4: IP Protocol stack for the transport network user plane

Tunnelling, as described in 3GPP TS 23.205 [1], shall be used to transport the IP bearer control protocol IPBCP [12].

6.2 Bearer Transport

6.2.1 IP

Either IPv4 (RFC 791 [23]) or IPv6 (RFC 2460 [27]) shall be used.

One MGW may have several IP interfaces with different IP addresses.

6.2.2 UDP

The UDP Protocol (see RFC 768 [22]) shall be applied.

Two consecutive port numbers shall be used at each MGW for the RTP bearer and for the optional RTCP connection that transport a single Nb UP connection. Two such consecutive port numbers are termed "port number block" in what follows. The first port number shall be even and shall be assigned to the RTP protocol. At a given MGW, the same port shall be used to send and to receive RTP PDUs. The next port number shall be assigned to the RTCP protocol. This port shall be reserved even if the optional RTCP protocol is not used.

Each MGW shall administer the port numbers it intends to use for RTP/RTCP port number blocks.

6.2.3 RTP

RTP (see RFC 1889 [24]) shall be applied.

6.2.3.1 RTP Header

The RTP Header Fields shall be used as described in the following subclauses:

6.2.3.1.1 Version

RTP Version 2 shall be used.

6.2.3.1.2 Padding

Padding shall not be used.

6.2.3.1.3 Extension

The RTP Header shall not have an extension.

6.2.3.1.4 Contributing Source (CSRC) count

There are zero CSRCs.

6.2.3.1.5 Marker Bit

The marker bit is ignored.

6.2.3.1.6 Payload Type

A dynamic Payload Type (see RFC 1890 [25]) shall be used. Values between 96 and 127 shall be used. The value shall be negotiated by means of the bearer control protocol.

6.2.3.1.7 Sequence Number

The sequence number shall be supplied by the source MGW of a RTP PDU. The sink MGW of a RTP PDU may ignore the sequence number or it may use it to obtain statistics about the link quality and / or to correct out-of-sequence delivery, e.g. by dropping out-of-sequence packets.

6.2.3.1.8 Timestamp

The timestamp shall be supplied by the source MGW of a RTP PDU. A clock frequency of 16000 Hz or multiples of this value shall be used. The sink MGW of a RTP PDU may ignore the timestamp or it may use it to obtain statistics about the link quality and / or to correct jitter.

6.2.3.1.9 Synchronisation Source (SSRC)

The source MGW of a RTP PDU shall supply a SSRC. The sink MGW of a RTP PDU may ignore the SSRC if it does not use RTCP.

6.2.3.1.10 CSRC list

This list is empty.

6.2.3.2 RTP Payload

A single UP PDU, as described in 3GPP TS 29.415 [3], shall be transported as a RTP payload.

6.2.4 RTCP

RTCP (see RFC 1889 [24]) may be applied. The use of the RTCP protocol is optional.

A MGW may ignore incoming RTCP PDUs.

Figure 5 shows the protocol stack for the transport of RTCP. The above Sections about IP and UDP shall also apply for the transport of RTCP.
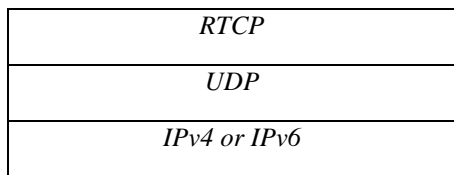
RTCP
UDP
IPv4 or IPv6

Figure 5: RTCP Protocol stack for the transport network user plane

6.3 Bearer Control Protocol

The ITU-T Recommendation Q.1970 "BICC IP Bearer Control Protocol" (IPBCP) [12] shall be applied.

6.3.1 Transport

IPBCP shall be transported over the Mc and Nc interface by means of the ITU-T Recommendation Q.1990 **"BICC Bearer Control Tunnelling Protocol"** [13]. The transport of the Q.1990 **"BICC Bearer Control Tunnelling Protocol"** on the Mc interface is described in 3GPP TS 29.232 [4]. The transport of the **"BICC Bearer Control Tunnelling Protocol"** on the Nc interface is described in ITU-T Recommendation Q.765.5 [11].
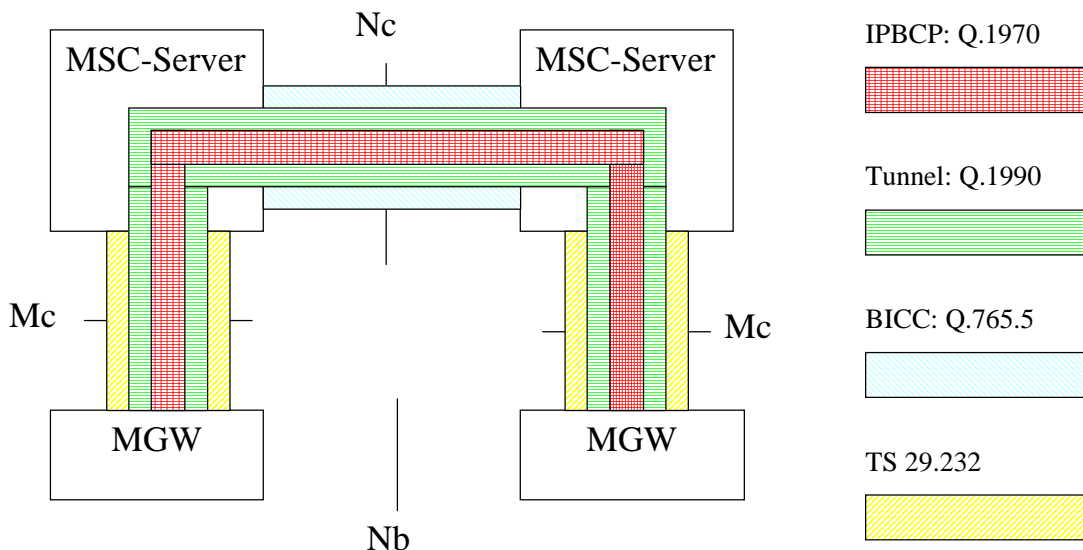
Figure 6: Transport of IPBCP

6.3.2 Procedures

The IPBCP procedures shall be used as described in [12].

6.3.2.1 Bearer Establishment

The forward and backward RTP bearers used to transport one Nb UP connection shall be set up together after an IPBCP handshake with a Request message and an Accepted message has succeeded.

Each MGW shall signal its peer MGW with the RTP port number. The RTCP port number shall be the next higher number.

6.3.2.2 Bearer Modification

A modification of existing RTP bearers is not permitted. The IPBCP Request message shall not be used to modify bearers.

6.3.2.3 Bearer Release

When the H.248 Termination [10] of an Nb UP connection on a MGW is deleted by means of signalling over the Mc interface, which are outside the scope of IPBCP (see 3GPP TS 29.232 [4]), the used resources shall be freed as follows:

The MGW shall discard any packets arriving at the port pair used for the old Nb UP connection until it sets up a new Nb UP connection on these ports. The MGW shall only reuse these ports after a time that is long enough to avoid that packets from the old connection still arrive.

6.3.3 Use of IPBCP message fields

The IPBCP message fields shall be used as described in [12] and SDP (RFC 2327 [26]). Moreover, the following subclauses shall be applied:

6.3.3.1 Origin

<address> shall be the IP address assigned to the IP interface of the MGW used for the RTP bearer that is described.

6.3.3.2 Session Name

The source MGW shall supply an arbitrary string as *<session name>*. The sink MGW shall ignore this string.

6.3.3.3 Connection Data

The *<connection address>* shall be identical to the above origin *<address>*

6.3.3.4 Media Announcement

<media> shall be set to "audio"

<port> shall be set to the port number assigned to the RTP bearer on the source MGW of the present IPBCP message

<transport> shall be set to "RTP/AVP".

<fmt list> shall be set to the chosen dynamic payload number. The MGW that initiates the bearer establishment may choose any value between 96 and 127. The peer MGW shall echo this value.

6.3.3.5 Media Attributes

The following media attribute shall be supplied: "a=rtpmap*:<dynamic payload number>* 3GPP-IuFP/16000", where *:<dynamic payload number>* is the same dynamic payload type number as in the above media announcement *<fmt list>*.

Other media attributes shall not be used. They shall be ignored in the MGW receiving an IPBCP message.

Annex A (informative):
Change history

Change history							
Date	**TSG #**	**TSG Doc.**	**CR**	**Rev**	**Subject/Comment**	**Old**	**New**
17/1/01	CN3/CN4 #1 Beijing			0.1.	New Document approved	-	0.1.0
1/3/01	CN3 #16				IP Transport Added		2.0.0

Source:	**TSG_CN WG3**
Title:	**TS 29.414 v2.0.0**
Agenda item:	**8.3**
Document for:	**APPROVAL**

3GPP TS 29.414 specifies the transport of the user plane protocol and the transport signalling used between two Media Gateways in a bearer independent CS core network.

The attached specification has been agreed in CN3#16 and is to be presented for approval at the CN#11 plenary.

3GPP TS 29.414 is specific for the Release-4 Bearer Independent Architecture work item

It is suggested to raise 29.414 to Version 2.0.0 and to present it to the CN plenary for approval.