3GPP TSG-RAN3
Meeting #7
Sophia Antipolis, France
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R3-99c81

Liaison statement: Requirements on Iu User Plane for CS data.

Source: **TSG-N3**

To: **R3**

N3 thanks R3 for their LS: "LS on the Iu User Plane (UP) specification status in RAN WG3". (N3-99175).

Attached is Tdoc N3-99221 which shows the current status in N3 on its work with specifying CS data services in UMTS. The text below (Section 3),extracted from this document, describes the handling by the Iu UP. N3 hopes that this section clarifies the requirements on the Iu UP.

It is N3's understanding that contributions on frame alignment (Section 3.2.1) are presented directly in R3.

3 Iu User Plane

3.1 NT services

The Iu user plane is used in transparent mode, see 25.415. Each SDU corresponds to one RLP frame and, consequently, is 576 bits long.The Iu UP primitive Iu-UP-UNIT-DATA-REQUEST is invoked each time an RLP frame is ready to be sent from the CN towards the Terminal. DTX indication is not used.

3.2 T services

The Iu user plane is used in support mode, see 25.415. The following frame structure is suggested:

Bits								Octets	Number of	
7	6	5	4	3	2	1	0			
PDU Type				Frame Number					1	Frame Control Part
PCP	Spare	RFCI							1	
Payload Fields									n	Frame Payload part

Figure 1: Iu CS UP Frame Format

RAB sub-Flow Combination Indicator (RFCI) is used according to Annex B of 25.415.
The payload of the Iu frame will consist of user data bits. It may also contain some control bits that are transparent to the radio access stratum (TBD):

- one bit to indicate to the terminal that data phase has been entered (corresponding to the SB bit in GSM)

The payload (SDU) size is fixed, determined by the bit rate.. The SDU size is FFS. It is assumed that AAL2 is used. The AAL2 SCCP layer must be supported for segmentation and reassembly.
The primitive Iu-UP_DATA-REQUEST is invoked at regular intervals in order to have a constant bit rate (every 10 ms? FFS!) .

3.2.1 Frame alignement

<Input from DoCoMo>

Circuit Switched Data Concept Paper

General

CS data services in UMTS (UMTS Bearer Services) are build on services provided by the Access Network. These Radio Access Bearer Services are invoked through the RNL-SAP provided by the Iu User Plane to the Non-access stratum on the Core Network side, and the corresponding SAP provided by the RLC to the Non-access stratum on the Terminal side. Transport within the CN (the CN Bearer services) is outside the scope of this document. Interworking with External Bearer services is within the scope of this document. See Figure 1.

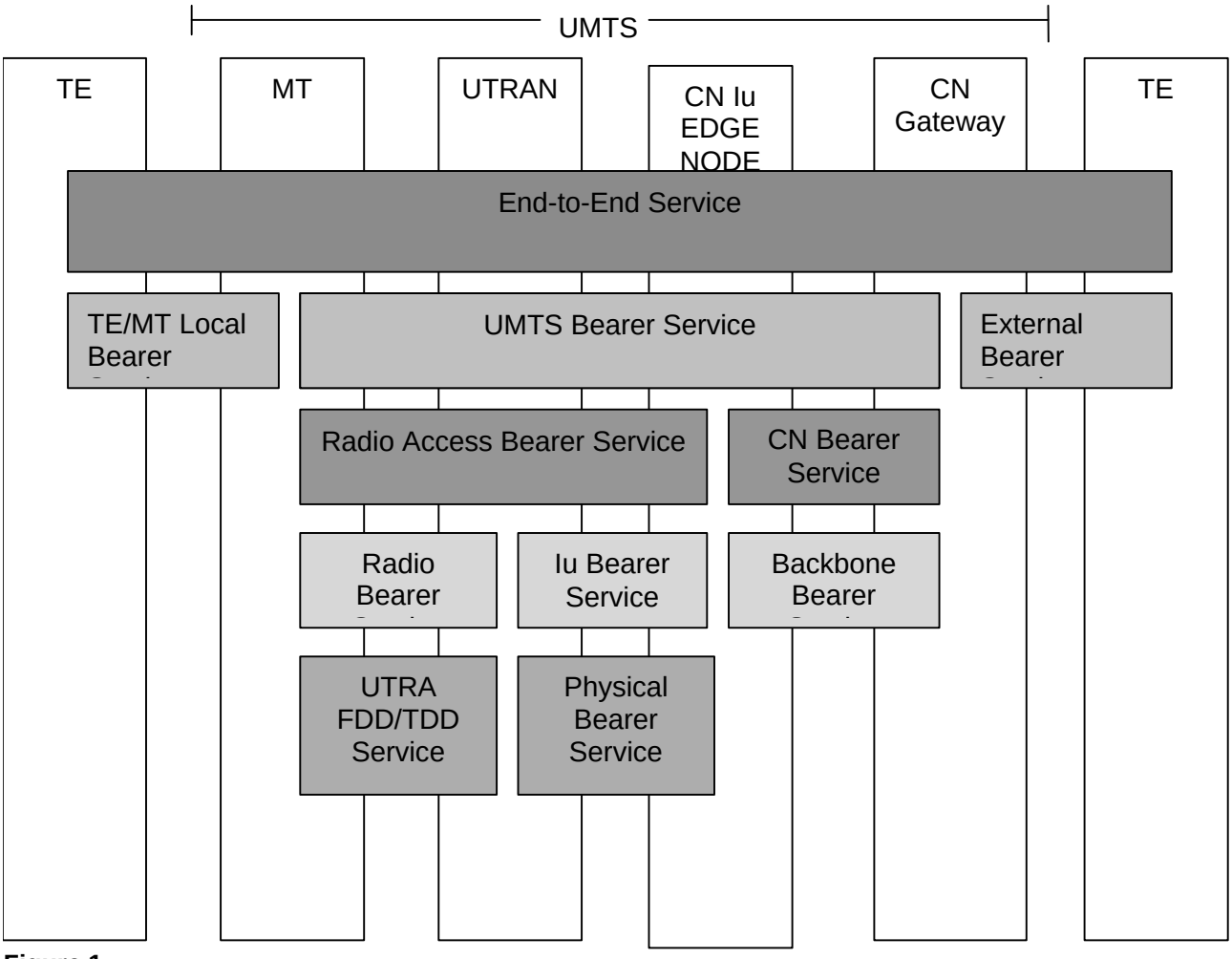

Figure 1

UMTS Bearer Services

The UMTS bearer services are described by the UMTS BC-IE. Five services (or services categories) are currently distinguishable from the UMTS BC-IE:

- Speech
- Transparent Data for support of Multimedia
- Transparent Data
- Non-transparent Fax
- NT data

Speech is currently not in the scope of this document.

Each UMTS bearer service is supported by a Radio Access Bearers (RAB). The RABs in turn are described by the QoS parameters. There may be one or several RAB candidates for supporting a UMTS bearer service. The possible candidates are described by a mapping of the BC-IE to RAB QoS described in Section 2.2.

UMTS Bearer Services in Release 99

Transparent Data for the Support of Multimedia

This service is distinguished by the following BC-IE parameters:

- ITC = UDI or 3.1 kHz audio or Other ITC = RDI
- CE = transparent
- Other Rate Adaption = H.223 and H.245

For this service the FNUR is restricted to:

- 64 kbit/s, in case ITC = UDI
- 56 kbit/s in case Other ITC = RDI
- 28.8 kbit/s or 33.6 kbit/s, in case ITC = 3.1 kHz audio

Transparent Data

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- ITC = UDI or 3.1 kHz audio or Other ITC = RDI
- CE = transparent

For this service the FNUR is restricted to:

- 64 kbit/s, in case ITC = UDI
- 56 kbit/s in case Other ITC = RDI
- 33.6 kbit/s, in case ITC = 3.1 kHz audio
- 28.8 kbit/s, in case ITC = 3.1 kHz audio
- *FFS: 32 kbit/s, in case ITC=UDI*

Note: V.90 is not supported in transparent mode, because asymmetric user rates are not supported in transparent mode.

Non-Transparent Fax

This service is distinguished by the following BC-IE parameters:

- ITC = Fax Group 3

For this service the WAIUR is restricted to 14.4, 28.8, 43.2 or 57.6 kbit/s

NT Data

This service is distinguished by the following BC-IE parameters:

- ITC = UDI or 3.1 kHz audio or Other ITC = RDI
- CE = non-transparent

For this service the WAIUR is restricted to 14.4, 28.8, 43.2 or 57.6 kbit/s

BC-IE to RAB QoS Mapping

Since UMTS bearer services are described by BC-IEs and RABs by QoS parameters, this section provides implicitly a mapping between the UMTS bearer services and the possible RABs that support them. The QoS mapping is based on TR 23.907.

Non-transparent services, including Fax

Identified service / QoS attributes	**NT Facsimile and NT data**	**Comments**
Traffic Class	Streaming	
Delivery of erroneous SDUs	no	
Delivery Order	yes	
Transfer Delay (1)	<250 ms	R2 to investigate a possible lower bound
SDU loss ratio (1)	< 10%	RLP provides FCS check. CRC on RLC level is redundant
SDU format information	0 or 576 bits	
Residual bit error ratio (1)	1 *(this item is FFS)*	BER not interesting as long as SDU loss ratio is kept within requested limits.

Guaranteed bit rate	14.4 ≤GBR ≤WAIUR	GBR = N x 14.4 kbit/s; where N=1,..,4. For fax GBR must be more than 14.4 kbit/s
Source statistics descriptor	unknown	
Maximum bit rate	57.6 kbps	
Traffic handling priority	-	Operator setting.

Note 1: In case the WAIUR is less than 14.4, the GBR is set to 14.4. The GBR is always a multiple of 14.4.

Transparent Data, including Multimedia

Service identified by the BC IE	**Data transparent and BS for support of multimedia service**	**Comments**
Traffic Class	Conversational	
Delivery of erroneous SDUs	yes	
Delivery Order	yes	
Transfer Delay (1)	as for speech service	R2 to investigate feasible value range
SDU loss ratio (1)		Only Residual bit error rate is relevant for these bearer services.
SDU format information	641 .. 289 bits (depending on the guaranteed bit rate) *(this item is FFS)*	
Residual bit error ratio (1)	Recommended value: $< 10^{-4}$	R2 to investigate feasible value range
Guaranteed bit rate	FNUR = 64 .. 28.8 kbit/s	GBR when FNUR=56 kbit/s is 64 kbit/s
Source statistics descriptor	unknown	
Maximum bit rate	= guaranteed bit rate	
Traffic handling priority	-	Operator setting

Note 1: In case the FNUR = 56 kbit/s, the GBR is set to 64 kbit/s. Last bit in each data octet is set to 1.Also, if the FNUR =28.8 or 33.6 kbit/s, the GBR may be slightly higher due to control bits that are transparent to the RAB. The exact value of the GBR in these case is FFS, see Section 3.2.

Iu User Plane

NT services

The Iu user plane is used in transparent mode, see 25.415. Each SDU corresponds to one RLP frame and, consequently, is 576 bits long.The Iu UP primitive Iu-UP-UNIT-DATA-REQUEST is invoked each time an RLP frame is ready to be sent from the CN towards the Terminal. DTX indication is not used.

T services

The Iu user plane is used in support mode, see 25.415. The following frame structure is suggested:

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Figure 1: Iu CS UP Frame Format

RAB sub-Flow Combination Indicator (RFCI) is used according to Annex B of 25.415.

The payload of the Iu frame will consist of user data bits. It may also contain some control bits that are transparent to the radio access stratum (TBD):

- one bit to indicate to the terminal that data phase has been entered (corresponding to the SB bit in GSM)

The payload (SDU) size is fixed, determined by the bit rate.. The SDU size is FFS. It is assumed that AAL2 is used. The AAL2 SCCP layer must be supported for segmentation and reassembly.
The primitive Iu-UP_DATA-REQUEST is invoked at regular intervals in order to have a constant bit rate (every 10 ms? FFS!) .

Frame alignement

<Input from DoCoMo>
RLC
The RLC shall be used in transparent mode for T services. Whether to use RLC in transparent or unacknowledged mode is FFS.
Initial Synchronisation and resynchronisation
The initial synchronisation and resynchronisation shall follow the principles defined in GSM. Timer values are TBD. These procedures are transparent to the radio access network.
Call Control
BC-IE negotiation procedures and mapping to ISDN are as for GSM for those parameters and vaues that are defined in GSM. BC-IE parameter values shall be restricted as indicated in Section 2.1. Minor adaptations may be necessary due to new parameters or parameter values.
Handover Issues

BC Information Lost during Handover.

In the case of inter-MSC handover from GSM to UMTS, the serving GSM MSC/VLR sends a MAP message Prepare Handover carrying the BSSMAP message Handover Request. This message includes the parameter Channel Type, indicating whether radio resources are to be allocated for speech or data (parameter ‘Speech or data indicator’) and, among other data, the type of data service (transparent/non transparent) and the user rates (both included in the parameter ‘Channel rate and type’).
As no other bearer capability related parameters are received, it is not possible to distinguish between any other services than ‘speech’, ‘data transparent’ and ‘data non-transparent’.
The mapping into QoS radio access parameters would be done as described in Section 0, limited to the services ‘speech’, ‘data, non-transparent’ and ‘data, transparent’.

Protocol Conversion between Anchor MSC and Serving MSC

S2 needs to provide guidelines. Meanwhile this issue is FFS.
The handover scenarios from 2G to 3G PLMNs is discussed based on a GSM TCH/F14.4 multislot environment. Such an environment provides the highest user rates possible in GSM, on the other hand it has the highest complexity.
The figures show both the transparent and the non-transparent services. In case of transparent services the RLP function is not used.
At call setup standard GSM procedures are executed. Before the handover the protocols supported by 2G MSC are the standard A-i/f protocols (i.e. A-TRAU, RLP), the configuration is shown in the following figure.

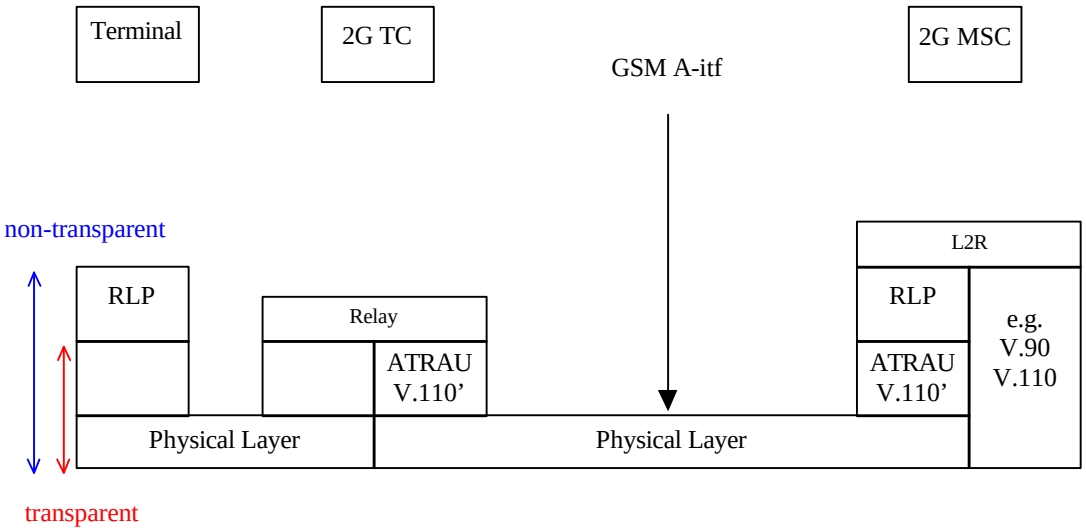

Figure 2: Configuration before the handover

Configuration after handover:
N3 assumes that for Inter-MSC HO from 2G to 3G the anchor MSC concept is used, i.e. the IWF remains in the anchor 2G MSC. This means that 2G MSC/IWF expects to receive the GSM A-itf protocols, the configuration is shown in the following figure.

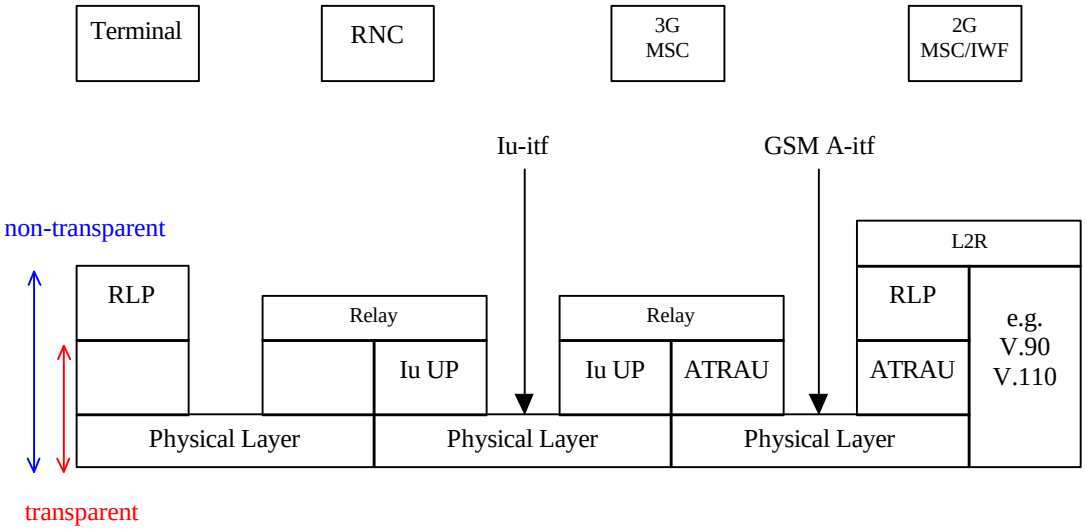

Figure 3: Configuration after the handover from 2G to 3G MSC

The relay function in 3G MSC has to convert the Iu UP protocols to the GSM A-interface protocols. In uplink direction this results in the following requirements on the relay function in 3G MSC:

1) termination of Iu UP (AAL2) and conversion into A-TRAU or modified V.110 frames (as defined in 04.21 and 08.20)
2) Split/Combine function (as defined in 04.21) has to be applied, the Split/Combine function distributes the A-TRAU/V.110' frames in 16kbit/s substreams. Eventually Padding has to be applied. In case of a non-transparent service complete RLP frames (each consisting of two A-TRAU or four V.110' frames) have to be distributed.
3) 16kbit/s substreams (up to four) have to be multiplexed in one 64kbit/s channel (Multiplexing function as defined in 08.20)

For each user rate another combination of the above mentioned functions has to be applied.

Such a functionality is very complex, complicated to control and not at all flexible as for every user rate another combination has to be applied

Possible simplification:
Another possibility would be to change the 2G MSC and to define a suitable protocol between 3G and 2G MSC that should fulfil the following requirements:

1) an unique frame format should be used for all user rates
2) a plain 64kbit/s channel without substreams should be used
3) the overhead for synchronisation etc. should be kept small
4) to limit the changes to 2G MSC/IWFs it should be easy to implement the protocol in 2G MSC/IWF