

Agenda Item: 7.4 Circuit Switched Bearers in UMTS

Source: TSG-N3

To: S1, S2

CC: R2, R3

Title: LS on RAB requirements for CS data

1. Introduction

N3 has been studying the requirements on RABs that are needed to provide CS data bearers in UMTS. This work is based on the requirements to provide CS UMTS bearer services (BS) corresponding to the existing Bearer Services in GSM and an appropriate UMTS BS for supporting a multi media service. The RABs have been identified by proposing a mapping of the UMTS Bearer Capability Information Element (BC-IE) to QoS values for the RABs used for corresponding UMTS BS.

2. Current Assumptions

- The specification of the GSM BC IE is used as UMTS BC IE (S2-99523, N1-99770)
- Multimedia bearer is identified by a new point code in the BC IE parameter 'other rate adaptation'.

3. Background

So far, GSM TS 07.01 has been used to determine the traffic channel assignment related parameter 'Channel Mode' from the GSM BC IE received in SETUP/CALL CONFIRMED message.

With UMTS, the concept of traffic channel assignment parameters is replaced by QoS radio access bearer service attributes (TR 23.907), and the valid combinations of BC IE parameter values and traffic channel attributes of TS 07.01 become irrelevant.

A new procedure is therefore needed in order to clarify how UMTS BC IE parameters have to be mapped into UMTS QoS radio access bearer attributes.

One of the QoS attributes is the traffic class, which identifies the type of application for which the UMTS bearer service is optimised. However, the UMTS BC IE does not explicitly identify an application. Different types of applications may have different requirements; it is therefore important to have a definition of the services corresponding to different bearer/teleservices identified by the UMTS BC IE. Otherwise, there is the risk that the quality of e.g. a fax service is different, when roaming between UMSCs, as different traffic classes imply different requirements on the radio access.

Also, once the different services are identified, a definition of the radio access bearer service attribute values per service is needed. Otherwise, allocation of different residual bit error ratios, transfer delays, etc. may influence the quality of a service when roaming between UMSCs.

4. Radio Access Bearer Identification

4.1 Identification of Services

The following services can be identified by the UMTS BC:

- a) speech: from the Information Transfer Capability (ITC) parameter
- b) data, non-transparent: from the ITC and Connection element (CE) parameters
- c) among the non-transparent data, facsimile is identified by the ITC
- d) data, transparent: from the ITC and CE parameters
- e) among the transparent data, multimedia is identified by the Other Rate Adaptation parameter

4.2 Definition of QoS Radio Access Attributes per Service

a) Speech

N3 has not any responsibility related to the speech service and therefor does not propose any requirements on RABs needed to support the service. The mapping in the table below is tentative:

Service identified by the BC IE	Speech
Traffic Class	Conversational
Delivery of erroneous SDUs	no
Delivery Order	yes
Transfer Delay (1)	<i>This item is for FFS.</i>
SDU loss ratio (1)	<i>This item is for FFS.</i>
SDU format information	According to AMR codec <i>This item is for FFS.</i>
Residual bit error ratio (1)	Recommended value: 10^{-2} - 10^{-4}
Guaranteed bit rate	According to AMR codec
Source statistics descriptor	Speech
Maximum bit rate	According to AMR codec
Traffic handling priority	-

Table 1

b) Non-transparent Services

The streaming class shall be used for the NT facsimile service and NT bearer services in general, as the interactive class might not satisfy the transfer delay requirements.

The transfer delay indicated in the following table is a requirement on the RAB that must be satisfied in order to have a delay similar to the delay in GSM. Lower values will provide a better service. Higher values are also applicable, but will result in a poor performance of the Radio Link Protocol (RLP).

The SDU loss ratio indicated in the table is a requirement on the RAB that must be satisfied in order to achieve a similar performance to GSM. Higher values are also applicable, but will result in a poor performance of the Radio Link Protocol (RLP).

Identified service / QoS attributes	NT Facsimile and NT data	Comments
Traffic Class	Streaming	
Delivery of erroneous SDUs	no	
Delivery Order	yes	
Transfer Delay (1)	<250ms	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	$14.4 \leq \text{GBR} \leq \text{WAIUR}$	$\text{GBR} = N \times 14.4 \text{ kbit/s}$; where $N=1, \dots, 4$. 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.

Table 2

c) Transparent Services

The residual bit error rate must be lower than 10^{-4} and the transfer delay must be lower than in GSM in order to get an adequate bearer service for multimedia video telephony. Lower BER will give a better service. The range of possible FNUR values is still under discussion. Agreed FNUR values are 56 and 64 kbit/s. Other identified candidates are: 28.8, 32.0, and 33.6 kbit/s. The SDU format information is still under study but the sizes will be fixed.

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

Table 3

4.3 Handover

a) Handover from GSM to UMTS

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 chapter 4.2, limited to the services 'speech', 'data, non-transparent' and 'data, transparent'.

Intra-MSC handover from GSM to UMTS and subsequent handover from GSM to UMTS shall be handled in the same way.

b) Handover from UMTS to GSM

This item is FFS.

5. Requests to the addressed parties (S1 and S2)

1) S2 is asked to require from TSG-R to specify in R99 RABs that satisfy the QoS values indicated in the tables above.

2) S1 and S2 are asked to clarify whether the exact setting of the attribute values are subject to operator choice. N3 assumes that the attributes marked with a "(1)" in the tables above are subject to operator tuning. Changes of the other values, e.g., SDU format information, will have a destructive effect on the bearer service.

3) S1 and S2 are asked to clarify whether operators can map the BC-IE onto other traffic classes than suggested above. For instance, transparent data could be mapped to a streaming class as suggested below:

Service identified by the BC IE	Data transparent
Traffic Class	Streaming
Delivery of erroneous SDUs	yes
Delivery Order	yes
Transfer Delay (1)	< 2000 ms
SDU loss ratio (1)	at least as good as for non-transparent service
SDU format information	640 / 337 bits (depending on the guaranteed bit rate) <i>(this item is FFS)</i>
Residual bit error ratio (1)	Recommended value: <10 ⁻⁶
Guaranteed bit rate	FNUR = 64 .. 28.8 kbps
Source statistics descriptor	unknown
Maximum bit rate	= guaranteed bit rate
Traffic handling priority	-

Table 4

4) S1 and S2 are asked to approve N3's proposal to upgrade the transparent data BS in UMTS in order to provide a common BS that is adequate for multimedia telephony.

5) S1 is asked to clarify whether the requirement for a 64 kbit/s UDI has to meet the same delay and BER that apply to ISDN. It is N3's assumption that this is not the case and that the values indicated in Table 3 are satisfactory.