Technical Specification Group Services and System Aspects ***TSGS#11(01)0117***

Meeting #11, Palm Springs, USA, 19-22 March 2001

Source: **TSG SA WG2**
Title: **CRs on 23.107 v.4.0.0 and v.5.0.0**
Agenda Item: **7.2.3**

The following Change Requests (CRs) have been approved by TSG SA WG2 and are requested to be approved by TSG SA plenary #11.
Note: the source of all these CRs is now S2, even if the name of the originating company(ies) is still reflected on the cover page of all the attached CRs.

CRs applicable to several Releases

SA2 meeting	S2 Tdoc #	Spec	CR #	Rel	Title	cat	WI
S2-17	S2-010800	23.107	046r1	Rel-4	Clarification of traffic class weights in QoS profile	D	QoS
S2-16	S2-010041	23.107	024	Rel-5	Source Statistics Descriptor	B	QoS

3GPP TSG-SA2 Meeting #16
Los Angeles, 22nd-26th of January 2001

Tdoc S2-010041

CR-Form-v3

CHANGE REQUEST

⌘ **23.107** **CR** **024** ⌘ rev **r2** ⌘ Current version: **4.0.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE **X** Radio Access Network **X** Core Network **X**

Title:	⌘	UMTS Bearer Service Parameters
Source:	⌘	Ericsson
Work item code:	⌘	QoS
Date:	⌘	2001-01-22
Category:	⌘	**B**
Release:	⌘	REL-5

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:

2	*(GSM Phase 2)*
R96	*(Release 1996)*
R97	*(Release 1997)*
R98	*(Release 1998)*
R99	*(Release 1999)*
REL-4	*(Release 4)*
REL-5	*(Release 5)*

Reason for change:	⌘	The agreed extension of the Source Statistics Descriptor for usage also in the UMTS Bearer Service Parameters is to be moved from 23.821v1.0.0 to 23.107. During the Email approval of issues in 23.821 summer 2000 this CR was approved, but was lost when the new TS 23.207 was created.
Summary of change:	⌘	
Consequences if not approved:	⌘	

Clauses affected:	⌘	Section 6.4.3.1, 6.4.3.2, 6.4.3.3		
Other specs affected:	⌘	**X** Other core specifications ☐ Test specifications ☐ O&M Specifications	⌘	TS 29.060
Other comments:	⌘	The table in clause 6.5.1 “Ranges of UMTS Bearer Service Attributes” need also to be updated. A separate CR will be issued when the outstanding question on value ranges are solved for release 1999.		

How to create CRs using this form:
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3) With "track changes" disabled, paste the entire CR form (use CTRL-A to select it) into the specification just in front of the clause containing the first piece of changed text. Delete those parts of the specification which are not relevant to the change request.

6.4.3.1 List of attributes

Traffic class ('conversational', 'streaming', 'interactive', 'background')

Definition: type of application for which the UMTS bearer service is optimised

[Purpose: By including the traffic class itself as an attribute, UMTS can make assumptions about the traffic source and optimise the transport for that traffic type.]

Maximum bitrate (kbps)

Definition: maximum number of bits delivered by UMTS and to UMTS at a SAP within a period of time, divided by the duration of the period. The traffic is conformant with Maximum bitrate as long as it follows a token bucket algorithm where token rate equals Maximum bitrate and bucket size equals Maximum SDU size.

The conformance definition should not be interpreted as a required implementation algorithm. The token bucket algorithm is described in annex B.

[Purpose: Maximum bitrate can be used to make code reservations in the downlink of the radio interface. Its purpose is 1) to limit the delivered bitrate to applications or external networks with such limitations 2) to allow maximum wanted user bitrate to be defined for applications able to operate with different rates (e.g. non transparent circuit switched data)]

Guaranteed bitrate (kbps)

Definition: guaranteed number of bits delivered by UMTS at a SAP within a period of time (provided that there is data to deliver), divided by the duration of the period. The traffic is conformant with the guaranteed bitrate as long as it follows a token bucket algorithm where token rate equals Guaranteed bitrate and bucket size equals k*Maximum SDU size. For release 1999, k=1. A value of k greater than one Maximum SDU size may be specified in future releases to capture burstiness of sources. Signalling to specify the value of k may be provided in future releases.

The conformance definition should not be interpreted as a required implementation algorithm. The token bucket algorithm is described in annex B.

[Purpose: Guaranteed bitrate may be used to facilitate admission control based on available resources, and for resource allocation within UMTS. Quality requirements expressed by e.g. delay and reliability attributes only apply to incoming traffic up to the guaranteed bitrate.]

Delivery order (y/n)

Definition: indicates whether the UMTS bearer shall provide in-sequence SDU delivery or not.

[Purpose: the attribute is derived from the user protocol (PDP type) and specifies if out-of-sequence SDUs are acceptable or not. This information cannot be extracted from the traffic class. Whether out-of-sequence SDUs are dropped or re-ordered depends on the specified reliability]

Maximum SDU size (octets)

Definition: the maximum allowed SDU size

[Purpose: The maximum SDU size is used for admission control and policing.]

SDU format information (bits)

Definition: list of possible exact sizes of SDUs

[Purpose: UTRAN needs SDU size information to be able to operate in transparent RLC protocol mode, which is beneficial to spectral efficiency and delay when RLC re-transmission is not used. Thus, if the application can specify SDU sizes, the bearer is less expensive.]

SDU error ratio

Definition: Indicates the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic.

NOTE 1: By reserving resources, SDU error ratio performance is independent of the loading conditions, whereas without reserved resources, such as in Interactive and Background classes, SDU error ratio is used as target value.

[Purpose: Used to configure the protocols, algorithms and error detection schemes, primarily within UTRAN.]

Residual bit error ratio

Definition: Indicates the undetected bit error ratio in the delivered SDUs. If no error detection is requested, Residual bit error ratio indicates the bit error ratio in the delivered SDUs.

[Purpose: Used to configure radio interface protocols, algorithms and error detection coding.]

Delivery of erroneous SDUs (y/n/-)

Definition: Indicates whether SDUs detected as erroneous shall be delivered or discarded.

NOTE 2: 'yes' implies that error detection is employed and that erroneous SDUs are delivered together with an error indication, 'no' implies that error detection is employed and that erroneous SDUs are discarded, and '-' implies that SDUs are delivered without considering error detection.

[Purpose: Used to decide whether error detection is needed and whether frames with detected errors shall be forwarded or not.]

Transfer delay (ms)

Definition: Indicates maximum delay for 95th percentile of the distribution of delay for all delivered SDUs during the lifetime of a bearer service, where delay for an SDU is defined as the time from a request to transfer an SDU at one SAP to its delivery at the other SAP.

[Purpose: used to specify the delay tolerated by the application. It allows UTRAN to set transport formats and ARQ parameters.]

NOTE 3: Transfer delay of an arbitrary SDU is not meaningful for a bursty source, since the last SDUs of a burst may have long delay due to queuing, whereas the meaningful response delay perceived by the user is the delay of the first SDU of the burst.

Traffic handling priority

Definition: specifies the relative importance for handling of all SDUs belonging to the UMTS bearer compared to the SDUs of other bearers.

[Purpose: Within the interactive class, there is a definite need to differentiate between bearer qualities. This is handled by using the traffic handling priority attribute, to allow UMTS to schedule traffic accordingly. By definition, priority is an alternative to absolute guarantees, and thus these two attribute types cannot be used together for a single bearer.]

Allocation/Retention Priority

Definition: specifies the relative importance compared to other UMTS bearers for allocation and retention of the UMTS bearer. The Allocation/Retention Priority attribute is a subscription attribute which is not negotiated from the mobile terminal.

NOTE 4: The addition of a user-controlled Allocation/Retention Priority attribute is for further study in future releases.

[Purpose: Priority is used for differentiating between bearers when performing allocation and retention of a bearer. In situations where resources are scarce, the relevant network elements can use the Allocation/Retention Priority to prioritize bearers with a high Allocation/Retention Priority over bearers with a low Allocation/Retention Priority when performing admission control.]

Source statistics descriptor ('speech'/'unknown')

Definition: specifies characteristics of the source of submitted SDUs.

[Note: The number of different source statistics descriptors that should be allowed is FFS.]

[Purpose: Conversational speech has a well-known statistical behaviour (or the discontinuous transmission (DTX) factor). By being informed that the SDUs for a UMTS bearer are generated by a speech source, UTRAN, the SGSN and the GGSN and also the UE may, based on experience, calculate a statistical multiplex gain for use in admission control on the relevant interfaces.]

6.4.3.2 Attributes discussed per traffic class

Conversational class

If the UMTS bearer carries speech service, **Source statistics descriptor** can be set, which allows UMTS to calculate a statistical multiplexing gain in core network, ~~and~~ UTRAN and UE and use that for admission control.

Although the bitrate of a conversational source codec may vary, conversational traffic is assumed to be relatively non-bursty. **Maximum bitrate** specifies the upper limit of the bitrate with which the UMTS bearer delivers SDUs at the SAPs. The UMTS bearer is not required to transfer traffic exceeding the **Guaranteed bitrate**. Maximum and guaranteed bitrate attributes are used for resource allocation within UMTS. Minimum resource requirement is determined by guaranteed bitrate (When a conversational source generates less traffic than allocated for the bearer, the unused resources can of course be used by other bearers.)

Since the traffic is non-bursty, it is meaningful to guarantee a **transfer delay** of an arbitrary SDU.

Conversational bearers are likely to be realised in UTRAN without RLC re-transmissions. Hence, UTRAN transport is more efficient and thereby cheaper if RLC PDU size is adapted to UMTS bearer SDU size (RLC transparent mode). This motivates the use of **SDU format information**. The SDU periodicity knowledge needed to operate in RLC transparent mode is obtained through dividing the largest defined SDU format by Maximum bitrate. This shall be considered when setting the attribute values in a service request.

The **Maximum SDU size** is only applicable if **SDU format information** is not specified and is used for admission control and policing. If **Maximum SDU size** is specified the SDU size is variable. If **SDU format information** is specified, with one or several possible sizes, each SDU shall exactly conform to one of the specified sizes. By using the **SDU error ratio**, **Residual bit error ratio** and **Delivery of erroneous SDUs** attribute, the application requirement on error rate can be specified, as well as whether the application wants UMTS to detect and discard SDUs containing errors and an adequate forward error correction means can be selected.

Streaming class

If the UMTS bearer carries streaming speech service, **Source statistics descriptor** can be set, which allows UMTS to calculate a statistical multiplexing gain in core network, ~~and~~ UTRAN and UE and use that for admission control.

As for conversational class, streaming traffic is assumed to be rather non-bursty. **Maximum bitrate** specifies the upper limit of the bitrate the UMTS bearer delivers SDUs at the SAPs. The UMTS bearer is not required to transfer traffic exceeding the Guaranteed bitrate. Maximum and guaranteed bitrate attributes are used for resource allocation within UMTS. Minimum resource requirement is determined by guaranteed bitrate. (When a streaming source generates less traffic than allocated for the bearer, the unused resources can of course be used by other bearers.)

Since the traffic is non-bursty, it is meaningful to guarantee a **transfer delay** of an arbitrary SDU.

The transfer delay requirements for streaming are typically in a range where at least in a part of this range RLC re-transmission may be used. It is assumed that the application's requirement on delay variation is expressed through the transfer delay attribute, which implies that there is no need for an explicit delay variation attribute.

It shall be possible for Streaming bearers to be realised in UTRAN without RLC re-transmissions. Hence, UTRAN transport is more efficient and thereby cheaper if RLC PDU size is adapted to UMTS bearer SDU size (RLC transparent mode). This motivates the use of **SDU format information**. The SDU periodicity knowledge needed to operate in RLC transparent mode is obtained through dividing the largest defined SDU format by Maximum bitrate. This shall be considered when setting the attribute values in a service request.

The **Maximum SDU size** is only applicable if **SDU format information** is not specified and is used for admission control and policing. If **Maximum SDU size** is specified the SDU size is variable. If **SDU format information** is specified, with one or several possible sizes, each SDU shall exactly conform to one of the specified sizes.

By using the **SDU error ratio**, **Residual bit error ratio** and **Delivery of erroneous SDUs** attribute, the application requirement on error rate can be specified, as well as whether the application wants UMTS to detect and discard SDUs containing errors.

Interactive class

This bearer class is optimised for transport of human or machine interaction with remote equipment, such as web browsing. The source characteristics are unknown but may be bursty.

To be able to limit the delivered data rate for applications and external networks by traffic conditioning, **maximum bitrate** is included.

There is a definite need to differentiate between quality for bearers within the interactive class. One alternative would be to set absolute guarantees on delay, bitrate etc, which however at present seems complex to implement within UTRAN/CN. Instead, **traffic handling priority** is used. SDUs of a UMTS bearer with higher traffic handling priority is given priority over SDUs of other bearers within the interactive class, through UMTS-internal scheduling.

It is principally impossible to combine this relative approach with attributes specifying delay, bitrate, packet loss etc, so an interactive bearer gives no quality guarantees, and the actual bearer quality will depend on the load of the system and the admission control policy of the network operator.

The only additional attribute that is reasonable to specify is the bit integrity of the delivered data, which is given by **SDU error ratio**, **Residual bit error ratio** and **Delivery of erroneous SDUs**. Because there are no reserved resources for interactive class, SDU error ratio should be used as a target value. SDU error ratio cannot be guaranteed under abnormal load conditions.

Background class

The background class is optimised for machine-to-machine communication that is not delay sensitive, such as messaging services. Background applications tolerate a higher delay than applications using the interactive class, which is the main difference between the background and interactive classes.

UMTS only transfers background class SDUs when there is definite spare capacity in the network. To be able to limit the delivered data rate for applications and external networks by traffic conditioning, **maximum bitrate** is included.

No other guarantee than bit integrity in the delivered data, given by **SDU error ratio**, **Residual bit error ratio** and **Delivery of erroneous SDUs** , is needed. Because there are no reserved resources for background class, SDU error ratio should be used as a target value. SDU error ratio cannot be guaranteed under abnormal load conditions.

6.4.3.3 UMTS bearer attributes: summary

In table 2, the defined UMTS bearer attributes and their relevancy for each bearer traffic class are summarised. Observe that traffic class is an attribute itself.

Table 2: UMTS bearer attributes defined for each bearer traffic class

Traffic class	Conversational class	Streaming class	Interactive class	Background class
Maximum bitrate	X	X	X	X
Delivery order	X	X	X	X
Maximum SDU size	X	X	X	X
SDU format information	X	X		
SDU error ratio	X	X	X	X
Residual bit error ratio	X	X	X	X
Delivery of erroneous SDUs	X	X	X	X
Transfer delay	X	X		
Guaranteed bit rate	X	X		
Traffic handling priority			X	
Allocation/Retention priority	X	X	X	X
Source statistics descriptor	X	X		

3GPP-SA WG2 Meeting #17 **Tdoc S2- 010800**
Gothenburg, Sweden, 26 February - 02 March 2001

CR-Form-v3

CHANGE REQUEST

⌘ **23.107** **CR** **046** ⌘ rev ⌘ Current version: **3.5.0** ⌘

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Proposed change affects: ⌘ (U)SIM ☐ ME/UE ☐ Radio Access Network ☐ Core Network ☒

Title:	⌘	Clarification of traffic class weights in QoS profile
Source:	⌘	Nortel Networks
Work item code:	⌘	***Date:*** ⌘ February 2001
Category:	⌘	**F** ***Release:*** ⌘ R99

Use one of the following categories:
F *(essential correction)*
A *(corresponds to a correction in an earlier release)*
B *(Addition of feature),*
C *(Functional modification of feature)*
D *(Editorial modification)*
Detailed explanations of the above categories can be found in 3GPP TR 21.900.

Use one of the following releases:
2 (GSM Phase 2)
R96 (Release 1996)
R97 (Release 1997)
R98 (Release 1998)
R99 (Release 1999)
REL-4 (Release 4)
REL-5 (Release 5)

Reason for change:	⌘	To allow sub flows associated with an IP address and APN to have different "Traffic Classes" and hence support traffic of different types e.g. SIP signalling vs. video, it is essential to clarify the interpretation of the Traffic Class usage in any PDP Activation attempts. If the traffic class is rigidly enforced to be the subscribed Traffic Class, then this will likely make the QoS negotiation less flexible.
Summary of change:	⌘	Add a normative annex explaining how traffic classes have different weights in the QoS profile, with the following order: background, interactive, streaming and conversational.
Consequences if not approved:	⌘	Different interpretations may lead to interoperability and roaming issues as different vendors will not use the subscribed QoS profile in the same manner.

Clauses affected:	⌘	Annex X (new)
Other specs affected:	⌘	☐ Other core specifications ⌘ ☐ Test specifications ☐ O&M Specifications
Other comments:	⌘	

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Annex X (normative):
Determine Traffic Class weights in HLR QoS profile

The QoS profile in the subscription record represents the maximum QoS per PDP context to the associated APN. Subsequently, it shall be possible to negotiate all QoS parameters, including an appropriate Traffic Class for each QoS flow. This is valid for the first PDP context that is established as well as subsequent PDP contexts, i.e. this includes primary and secondary PDP contexts activations. The traffic classes have increasing weight according to the order background, interactive, streaming and conversational.