Technical Specification Group Services and System Aspects ***TSGS#19(03)0117***

Meeting #19, Birmingham, U.K., 17~20 March 2003

Source: **TSG SA WG2**
Title: **CRs on 23.107**
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 #19.
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.

Tdoc #	**Title**	**Spec**	**CR #**	**cat**	**Version in**	**REL**	**WI**	**S2 meeting**
S2-030416	Signalling PDP context indication	23.107	134r2	F	5.7.0	5	IMS-CCR	S2-29

3GPP TSG-SA2 #29
San Francisco, USA, 20-24/1/03

Tdoc ⌘S2-030416
rev of S2-030318

CR-Form-v7

CHANGE REQUEST

⌘ **23.107** **CR** 134 ⌘**rev** **2** ⌘ Current version: **5.7.0** ⌘

*For **HELP** on using this form, see bottom of this page or look at the pop-up text over the ⌘ symbols.*

Proposed change affects: UICC apps⌘ [ ] ME [X] Radio Access Network [X] Core Network [X]

Title:	⌘	Signalling PDP context indication to RAN
Source:	⌘	Vodafone
Work item code:	⌘	IMS-CCR
Date:	⌘	24/1/03
Category:	⌘	**F**
Release:	⌘	Rel-5

Use one of the following categories:
F *(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)*
Rel-6	*(Release 6)*

Reason for change:	⌘	Currently the RAN cannot determine the difference between Interactive traffic and IMS signalling traffic. This may limit the reliability/speed of IMS signalling and have other negative effects.
Summary of change:	⌘	A flag is added to the CN to RAN signalling. It is controlled a new flag added to the QoS IE in 24.008.
Consequences if not approved:	⌘	IMS signalling may be handled poorly leading to a poor customer perception of IMS.

Clauses affected:	⌘	6.4.3.1, 6.4.3.2, 6.4.3.3, 6.4.4.1, 6.4.4.3, 6.5.1, 6.5.2

	Y	N			
Other specs affected:	Y		Other core specifications	⌘	25.413, 24.008
		N	Test specifications		
		N	O&M Specifications		

Other comments:	⌘	

How to create CRs using this form:
Comprehensive information and tips about how to create CRs can be found at http://www.3gpp.org/specs/CR.htm. Below is a brief summary:

1) Fill out the above form. The symbols above marked ⌘ contain pop-up help information about the field that they are closest to.

2) Obtain the latest version for the release of the specification to which the change is proposed. Use the MS Word "revision marks" feature (also known as "track changes") when making the changes. All 3GPP specifications can be downloaded from the 3GPP server under ftp://ftp.3gpp.org/specs/ For the latest version, look for the directory name with the latest date e.g. 2001-03 contains the specifications resulting from the March 2001 TSG meetings.

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 UMTS Bearer Service Attributes

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.

The Maximum bitrate is the upper limit a user or application can accept or provide. All UMTS bearer service attributes may be fulfilled for traffic up to the Maximum bitrate depending on the network conditions.

[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. applications with adapting codecs).]

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 Maximum SDU size.

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

UMTS bearer service attributes, e.g. delay and reliability attributes, are guaranteed for traffic up to the Guaranteed bitrate. For the traffic exceeding the Guaranteed bitrate the UMTS bearer service attributes are not guaranteed.

[Purpose: Describes the bitrate the UMTS bearer service shall guarantee to the user or application. Guaranteed bitrate may be used to facilitate admission control based on available resources, and for resource allocation within UMTS.]

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.]

Signalling Indication (Yes/No)

Definition: Indicates the signalling nature of the submitted SDUs. This attribute is additional to the other QoS attributes and does not over-ride them.

[Purpose: IMS signalling traffic has different characteristics to other interactive traffic, eg higher priority, lower delay and increased peakiness. This attribute permits enhanced RAN operation.]

Note: this indication is sent by the UE in the QoS IE.

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, 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, 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.

If the **Signalling Indication** is set, a statistical multiplexing gain and/or improvements in signalling speed may be obtained within the UTRAN.

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		
Signalling indication			X	

6.4.4 Radio Access Bearer Service Attributes

Radio Access Bearer Service Attributes shall be applied to both CS and PS domains.

6.4.4.1 List of attributes

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

Definition: type of application for which the Radio Access Bearer service is optimised.

[Purpose: By including the traffic class itself as an attribute, UTRAN can make assumptions about the traffic source and optimise the transport for that traffic type. In particular, buffer allocation may be based on traffic class.]

Maximum bitrate (kbps)

Definition: maximum number of bits delivered by UTRAN and to UTRAN at a SAP within a period of time, divided by the duration of the period. The traffic is conformant with the 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.

The Maximum bitrate is the upper limit a user or application can accept or provide. All RAB attributes may be fulfilled for traffic up to the Maximum bitrate depending on the network conditions.

[Purpose: 1) to limit the delivered bitrate to applications or external networks with such limitations, 2) to allow maximum wanted RAB bitrate to be defined for applications able to operate with different rates (e.g. applications with adapting codecs.)]

Guaranteed bitrate (kbps)

Definition: guaranteed number of bits delivered 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 Maximum SDU size.

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

RAB attributes, e.g. delay and reliability attributes, are guaranteed for traffic up to the Guaranteed bitrate. For the traffic exceeding the Guaranteed bitrate the RAB attributes are not guaranteed.

[Purpose: Describes the bitrate the RAB shall guarantee to the user or application. Guaranteed bitrate may be used to facilitate admission control based on available resources, and for resource allocation within UTRAN.. The guaranteed bitrate at the RAB level may be different from that on UMTS bearer level, for example due to header compression.]

Delivery order (y/n)

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

[Purpose: 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. If unequal error protection shall be used by a Radio Access Bearer service, SDU format information defines the exact subflow format of the SDU payload. SDU format information also supports definition of allowed subflow bitrates.

NOTE 1: SDU format information is used by UTRAN to define which bits of the payload that belongs to each subflow. Exact syntax of SDU format information attribute is the task of RAN WG3.

[Purpose: UTRAN needs SDU format 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. Moreover, in case of unequal error protection, UTRAN needs to know the exact format of SDU payload to be able to demultiplex the SDU onto different radio bearer services. When rate control is applied to services having a constant SDU size, e.g. CS data, the subflow bitrate is used to calculate the allowed inter PDU transmission interval (IPTI).]

SDU error ratio

Definition: Indicates the fraction of SDUs lost or detected as erroneous. SDU error ratio is defined only for conforming traffic. In case of unequal error protection., SDU error ratio is set per subflow and represents the error ratio in each subflow. SDU error ratio is only set for subflows for which error detection is requested.

NOTE 2: 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 protocols, algorithms and error detection schemes, primarily within UTRAN.]

Residual bit error ratio

Definition: Indicates the undetected bit error ratio for each subflow in the delivered SDUs. For equal error protection, only one value is needed. If no error detection is requested for a subflow, Residual bit error ratio indicates the bit error ratio in that subflow of the delivered SDUs.

[Purpose: Used to configure radio interface protocols, algorithms and error detection coding. For services requiring unequal error protection, residual bit error ratio is given for each subflow.]

Delivery of erroneous SDUs (y/n/-)

Definition: Indicates whether SDUs with detected errors shall be delivered or not. In case of unequal error protection, the attribute is set per subflow.

NOTE 3: '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.

In case of unequal protection, different subflows may have different settings. Whenever there is a detected error in a subflow with 'no', the SDU is discarded, irrespective of settings in other subflows. For an SDU with multiple subflows with a 'yes' setting, there may be one error indication per subflow, or, if there is only one error indication per SDU, it indicates that an error was detected in at least one of these subflows. Exact definitions are the task of RAN3.

[Purpose: Used to decide whether error detection is needed and whether frames with detected errors shall be forwarded or discarded.]

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: specifies the UTRAN part of the total transfer delay for the UMTS bearer. It allows UTRAN to set transport formats and ARQ parameters.]

Traffic handling priority

Definition: specifies the relative importance for handling of all SDUs belonging to the radio access 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 UTRAN 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 Radio access bearers for allocation and retention of the Radio access bearer. The Allocation/Retention Priority attribute is a subscription parameter 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.

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

Signalling Indication (Yes/No)

Definition: Indicates the signalling nature of the submitted SDUs. This attribute is additional to the other QoS attributes and does not over-ride them.

[Purpose: IMS signalling traffic has different characteristics to other interactive traffic, eg higher priority, lower delay and increased peakiness. This attribute permits enhanced RAN operation.]

6.4.4.2 Attributes discussed per traffic class

Conversational class

If the RAB carries a speech service, **Source statistics descriptor** can be set, which allows UTRAN to calculate a statistical multiplexing gain on radio and Iu interfaces and use that for admission control.

Unequal error protection can be supported in conversational class. In case unequal error protection is requested for a given RAB, the attributes Delivery of erroneous SDUs, Residual bit error ratio and SDU error ratio are specified per

subflow**. Delivery of erroneous SDUs** determines whether error detection shall be used and, if so, whether SDUs with error in a certain subflow shall be delivered or not. **Residual bit error ratio** specifies the bit error ratio for undetected delivered bits. **SDU error ratio** specifies the fraction of SDUs with detected error in each subflow. It is only set for subflows for which error detection is requested.

In case of unequal error protection the payload of the user data SDU, transported by the Radio Access Bearer Service, shall conform to a SDU format defined with possible exact sizes. The payload bits are statically structured into subflows. The **SDU format information** attribute defines the exact subflow format of SDU payload.

UTRAN includes a rate control protocol, making it able of controlling the rate of sources requesting this, provided that they are periodic and that **SDU format information** is specified. UTRAN is allowed to control the rate between **Guaranteed bitrate** and **Maximum bitrate**. Each of these two rates shall correspond to an SDU format specified in **SDU format information**. For the case the SDU size is constant, as is the case for CS data, SDU format information may include a list of possible bitrates per subflow, to allow rate control of the subflows by change of inter PDU transmission interval (IPTI).

Streaming class

If the RAB carries streaming speech, **Source statistics descriptor** can be set, which allows UTRAN to calculate a statistical multiplexing gain on radio and Iu interfaces and use that for admission control.

Unequal error protection can be supported in streaming class. In case unequal error protection is requested for a given RAB, the attributes Delivery of erroneous SDUs, Residual bit error ratio and SDU error ratio are specified per subflow**. Delivery of erroneous SDUs** determines whether error detection shall be used and, if so, whether SDUs with error in a certain subflow shall be delivered or not. **Residual bit error ratio** specifies the bit error ratio for undetected delivered bits. **SDU error ratio** specifies the fraction of SDUs with detected error in each subflow. It is only set for subflows for which error detection is requested.

In case of unequal error protection the payload of the user data SDU, transported by the Radio Access Bearer Service, shall conform to a SDU format defined with possible exact sizes. The payload bits are statically structured into subflows. The **SDU format information** attribute defines the exact subflow format of SDU payload.

UTRAN includes a rate control protocol, making it able of controlling the rate of sources requesting this, provided that they are periodic and that **SDU format information** is specified. UTRAN is allowed to control the rate between **Guaranteed bitrate** and **Maximum bitrate**. Each of these two rates shall correspond to an SDU format specified in **SDU format information**. For the case the SDU size is constant, as is the case for CS data, SDU format information may include a list of possible bitrates per subflow, to allow rate control of the subflows by change of inter PDU transmission interval (IPTI).

Other classes

The RAB attribute sets and their use in, interactive and background classes are identical to those of UMTS bearer services (clause 6.4.2.2).

6.4.4.3 Radio Access Bearer attributes: summary

In table 3, the defined Radio Access Bearer attributes and their relevancy for each bearer traffic class are summarised. Observe that traffic class is an attribute itself.

Table 3: Radio Access 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		
Signalling Indication			X	

6.4.5 Radio Bearer Service Attributes

NOTE: Defining the radio bearer service attributes is a task for RAN WG2.

6.4.6 Iu Bearer Service Attributes

The Iu-Bearer Service together with the Physical Bearer Service provides the transport between UTRAN and CN. Iu bearer services for packet traffic shall provide different bearer services for variety of QoS. It is operators' option which of QoS capabilities in IP layer or QoS capabilities in ATM layer is used. For IP based Iu bearer services, Differentiated Services defined by IETF shall be used. If operator choose ATM-SVC as an internal dedicated transport bearer, inter operation with IP based networks will be based on Differentiated Services. The mapping from UMTS QoS classes to Diffserv codepoints will be controlled by the operator. The mapping depends on bandwidth and provisioning of resources among the different Diffserv classes which the operators control to satisfy their cost and performance requirements. Interoperability between operators will be based on the use of service level agreements (SLAs) which are an integral part of the Diffserv Architecture.

6.4.7 Core Network Bearer Service Attributes

The UMTS packet core network shall support different backbone bearer services for variety of QoS. It is operators' option which of QoS capabilities in IP layer or QoS capabilities in ATM layer is used. For the IP based backbone, Differentiated Services defined by IETF shall be used. If operator choose ATM-SVC as an internal dedicated transport bearer, interoperation with IP based backbone networks will be based on Differentiated Services. The mapping from UMTS QoS classes to Diffserv codepoints will be controlled by the operator. The mapping depends on bandwidth and provisioning of resources among the different Diffserv classes which the operators control to satisfy their cost and performance requirements. Interoperability between operators will be based on the use of service level agreements (SLAs) which are an integral part of the Diffserv Architecture.

6.5 Attribute Value Ranges

For UMTS Bearer service and Radio Access Bearer services a list of finite attribute values or the allowed value range is defined for each attribute. The value list/value range defines the values that are possible to be used for an attribute considering every possible service condition for release 1999. When a service is defined as a combination of attributes, further limitations may apply; for example the shortest possible delay may not be possible to use together with the lowest possible SDU error ratio. Service requirements, i.e. required QoS and performance for a given UMTS service is defined in the service requirement specifications 3GPP TS 22.105[5]. The aspect of future proof coding (beyond release 1999) of attributes in protocol specifications is not considered in the defined value list/value range tables.

6.5.1 Ranges of UMTS Bearer Service Attributes

The following table lists the value ranges of the UMTS bearer service attributes. The value ranges reflect the capability of UMTS network.

Table 4: Value ranges for UMTS Bearer Service Attributes

Traffic class	Conversational class	Streaming class	Interactive class	Background class
Maximum bitrate (kbps)	<= 2 048 (1) (2)	<= 2 048 (1) (2)	<= 2 048 - overhead (2) (3)	<= 2 048 - overhead (2) (3)
Delivery order	Yes/No	Yes/No	Yes/No	Yes/No
Maximum SDU size (octets)	<=1 500 or 1 502 (4)	<=1 500 or 1 502 (4)	<=1 500 or 1 502 (4)	<=1 500 or 1 502 (4)
SDU format information	(5)	(5)		
Delivery of erroneous SDUs	Yes/No/- (6)	Yes/No/- (6)	Yes/No/- (6)	Yes/No/- (6)
Residual BER	$5*10^{-2}$, 10^{-2}, $5*10^{-3}$, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}	$5*10^{-2}$, 10^{-2}, $5*10^{-3}$, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}	$4*10^{-3}$, 10^{-5}, $6*10^{-8}$ (7)	$4*10^{-3}$, 10^{-5}, $6*10^{-8}$ (7)
SDU error ratio	10^{-2}, $7*10^{-3}$, 10^{-3}, 10^{-4}, 10^{-5}	10^{-1}, 10^{-2}, $7*10^{-3}$, 10^{-3}, 10^{-4}, 10^{-5}	10^{-3}, 10^{-4}, 10^{-6}	10^{-3}, 10^{-4}, 10^{-6}
Transfer delay (ms)	100 – maximum value	280 (8) – maximum value		
Guaranteed bit rate (kbps)	<= 2 048 (1) (2)	<= 2 048 (1) (2)		
Traffic handling priority			1,2,3	
Allocation/Retention priority	1,2,3	1,2,3	1,2,3	1,2,3
Source statistic descriptor	Speech/unknown	Speech/unknown		
Signalling Indication			Yes/No	

1) Bitrate of 2 048 kbps requires that UTRAN operates in transparent RLC protocol mode, in this case the overhead from layer 2 protocols is negligible.

2) The granularity of the bit rate attributes shall be studied. Although the UMTS network has capability to support a large number of different bitrate values, the number of possible values shall be limited not to unnecessarily increase the complexity of for example terminals, charging and interworking functions. Exact list of supported values shall be defined together with S1, N1, N3 and R2.

3) Impact from layer 2 protocols on maximum bitrate in non-transparent RLC protocol mode shall be estimated.

4) In case of PDP type = PPP, maximum SDU size is 1502 octets. In other cases, maximum SDU size is 1 500 octets.

5) Definition of possible values of exact SDU sizes for which UTRAN can support transparent RLC protocol mode, is the task of RAN WG3.

6) If *Delivery of erroneous SDUs* is set to 'Yes' error indications can only be provided on the MT/TE side of the UMTS bearer. On the CN Gateway side error indications can not be signalled outside of UMTS network in release 1999.

7) Values are derived from CRC lengths of 8, 16 and 24 bits on layer 1.

8) If the UE requests a transfer delay value lower than the minimum value, this shall not cause the network (SGSN and GGSN) to reject the request from the UE. The network may negotiate the value for the transfer delay.

6.5.2 Ranges of Radio Access Bearer Service Attributes

The following table lists the value ranges of the radio access bearer service attributes. The value ranges reflect the capability of UTRAN.

Table 5: Value ranges for Radio Access Bearer Service Attributes

Traffic class	Conversational class	Streaming class	Interactive class	Background class
Maximum bitrate (kbps)	<= 2 048 (1) (2)	<= 2 048 (1) (2)	<= 2 048 - overhead (2) (3)	<= 2 048 - overhead (2) (3)
Delivery order	Yes/No	Yes/No	Yes/No	Yes/No
Maximum SDU size (octets)	<=1 500 or 1 502 (4)	<=1 500 or 1 502 (4)	<=1 500 or 1 502 (4)	<=1 500 or 1 502 (4)
SDU format information	(5)	(5)		
Delivery of erroneous SDUs	Yes/No/-	Yes/No/-	Yes/No/-	Yes/No/-
Residual BER	$5*10^{-2}$, 10^{-2}, $5*10^{-3}$, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}	$5*10^{-2}$, 10^{-2}, $5*10^{-3}$, 10^{-3}, 10^{-4}, 10^{-5}, 10^{-6}	$4*10^{-3}$, 10^{-5}, $6*10^{-8}$ (6)	$4*10^{-3}$, 10^{-5}, $6*10^{-8}$ (6)
SDU error ratio	10^{-2}, $7*10^{-3}$, 10^{-3}, 10^{-4}, 10^{-5}	10^{-1}, 10^{-2}, $7*10^{-3}$, 10^{-3}, 10^{-4}, 10^{-5}	10^{-3}, 10^{-4}, 10^{-6}	10^{-3}, 10^{-4}, 10^{-6}
Transfer delay (ms)	80 – maximum value	250 – maximum value		
Guaranteed bit rate (kbps)	<= 2 048 (1) (2)	<= 2 048 (1) (2)		
Traffic handling priority			1,2,3	
Allocation/Retention priority	1,2,3	1,2,3	1,2,3	1,2,3
Source statistic descriptor	Speech/unknown	Speech/unknown		
Signalling Indication			Yes/No	

1) Bitrate of 2 048 kbps requires that UTRAN operates in transparent RLC protocol mode, in this case the overhead from layer 2 protocols is negligible.

2) The granularity of the bit rate attributes shall be studied. Although the UMTS network has capability to support a large number of different bitrate values, the number of possible values shall be limited not to unnecessarily increase the complexity of for example terminals, charging and interworking functions. Exact list of supported values shall be defined together with S1, N1, N3 and R2.

3) Impact from layer 2 protocols on maximum bitrate in non-transparent RLC protocol mode shall be estimated.

4) In case of PDP type = PPP, maximum SDU size is 1502 octets. In other cases, maximum SDU size is 1 500 octets.

5) Definition of possible values of exact SDU sizes for which UTRAN can support transparent RLC protocol mode, is the task of RAN WG3.

6) Values are derived from CRC lengths of 8, 16 and 24 bits on layer 1.