

**Source:** Ericsson  
**Title:** Quality of Service

**Document for:** Discussion / Decision

<b>CHANGE REQUEST No :</b>		<b>A009</b>	<i>Please see embedded help file at the bottom of this page for instructions on how to fill in this form correctly.</i>	
Technical Specification / Report UMTS		22.05	Version:	3.4.0
Submitted to TSG_SA	#4	for approval	<input checked="" type="checkbox"/>	without presentation ("non-strategic")
<i>list TSG plenary meeting no. here ↑</i>		for information	<input type="checkbox"/>	with presentation ("strategic")
				<input checked="" type="checkbox"/>

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**Proposed change affects:** USIM  TE  Network   
*(at least one should be marked with an X)*

**Work item:** Quality of service requirements

**Source:** Ericsson **Date:** 1999-04-30

**Subject:** Changes as a consequence of the TSG-SA decision that TSGS1 shall define requirements for end to end QoS, while other groups shall elaborate the network performance parameters of specific communications links within the UMTS system

**Category:** F Correction  **Release:** Phase 2   
 A Corresponds to a correction in an earlier release  Release 96   
 B Addition of feature  Release 97   
 C Functional modification of feature  Release 98   
 D Editorial modification  UMTS 99   
*(one category and one release only shall be marked with an X)*

**Reason for change:** Changes to conform to  
 1) the work split between TSGS1 and TSGS2 decided by TSG-SA, and  
 2) demands from TSG-SA to consider, where appropriate, the methods defined by IETF for QoS in the internet environment.

**Clauses affected:** 4.2, 4.2.1, 5.1 - 5.5

**Other specs affected:** Other releases of same spec  → List of CRs:  
 Other core specifications  → List of CRs:  
 MS test specifications / TBRs  → List of CRs:  
 BSS test specifications  → List of CRs:  
 O&M specifications  → List of CRs:

**Other comments:**



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## 4 Framework for the description of telecommunication services and applications

### 4.1 General

Telecommunication services supported by UMTS are the communication capabilities made available to users by home environment and serving network. A UMTS network provides, in co-operation with other networks, a set of network capabilities which are defined by standardised protocols and functions and enable telecommunication services to be offered to users.

A service provision by a HE/SN to a UMTS user may cover the whole or only part of the means required to fully support the service.

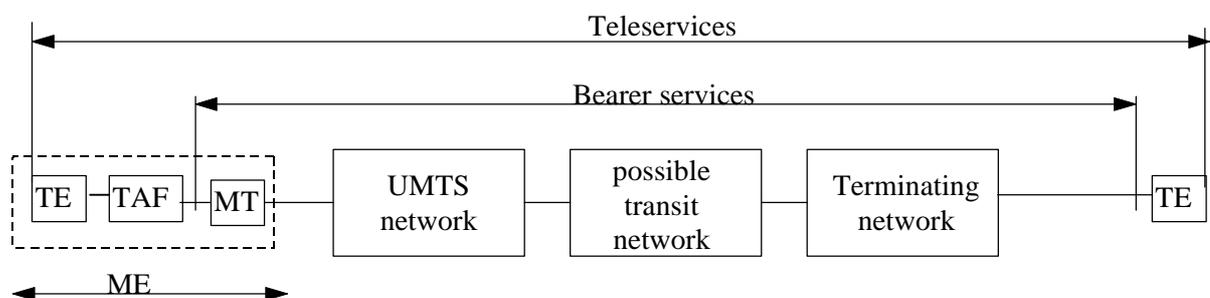
The service classification and description which follow are independent of different possible arrangements for the ownership and provision to the user of the means required to support a service.

### 4.2 Basic telecommunication services

Basic telecommunication services are divided in two broad categories;

- bearer services, which either are telecommunication services providing the capability of transmission of signals between access points or a generic service providing the capability of general message transport between access points. The communication link between the access points consists of UMTS, one or more transit networks and a terminating network. The networks between the two access points typically use different means for bearer control;
- teleservices, which are telecommunication services providing the complete capability, including terminal equipment functions, for communication between users according to protocols established by agreement between network operators.

Figure 1 illustrates these definitions.



ME: Mobile Station  
 MT: Mobile Termination  
 TE: Terminal Equipment  
 TAF: Terminal Adaption Function

NOTE 1: In order to limit the complexity of the figure, only one transit network is shown.

NOTE 2: The terminating network may be a non UMTS network such as: PSTN, N-ISDN, GSM, IP networks/LANs and X.25

NOTE 23: The terminating network type may include a UMTS network, either the originating one or another one.

NOTE 34: The bearer service terminates in the mobile station.

**Figure 1; Basic telecommunication services supported by a UMTS network**

## 4.2.1 Bearer services attributes

If the bearer service is a telecommunication service ~~The characterisation of thea bearer service is~~ can be made by using a set of attributes. A bearer service attribute is a specific characteristic that distinguishes it from other bearer services. Particular values are assigned to each attribute when a given bearer service is described and defined.

The attributes define the service characteristics as they apply at a given reference point where the user accesses the bearer service. The description of a bearer service by the method of attributes is composed of technical attributes.

In the general case, which is one of the typical network scenarios having Internet as the terminating network, the networks between the two access points uses different control mechanisms and attributes. In this case the attributes of each network throughout the communication link have to be translated at the network interfaces. It is thus not feasible to have a common set of attributes throughout the communication link.

The attributes to be used throughout the communication link are not further elaborated in this document. Instead a ~~A~~ list of end-to-end characteristics with requirements on QoS definitions of attributes and values used for bearer services is contained in clause 5.

The bearer services are negotiable and can be used flexibly by applications.

## 4.2.2 Teleservices

Clause 6 defines both standardised and non-standardised teleservices. Some teleservices are standardised because that interworking with other systems have been recognised as a requirement. Other teleservices shall not be standardised. A decoupling between lower layer (i.e. bearer attributes) and higher layer capabilities will be necessary for the development of teleservices.

## 4.3 Supplementary services

A supplementary service modifies or supplements a basic telecommunication service. Consequently, it cannot be offered to a user as a stand alone service. It must be offered together or in association with a basic telecommunication service. The same supplementary service may be applicable to a number of basic telecommunication services.

Two methods are used for the characterisation of supplementary services;

- The first method is used for the description of existing standardised supplementary services. These services are specified through the detailing of each of the operations involved in service provision and service usage (the provision/withdrawal, registration/erasure, activation/deactivation, invocation and interrogation operations). Clause 7 lists these services.
- The second method enables the provision of HE/SN specific supplementary services. To make this possible, standardised building blocks referred to as service features are specified in clause 8. The combination and parametrisation of these service features allow the creation of supplementary services.

UMTS shall be able to handle multiple supplementary services within a call. Interactions shall be handled when several supplementary services are activated in the same call.. When multiple supplementary services can be activated concurrently, some prioritisation of the services will be necessary. Certain services may override or deactivate other services.

Interactions between operator specific supplementary services are not defined.

The following issues need consideration when interactions between services occur;

- Different phases of a call.
- A service spanning on more than one network.

- Service interactions that may occur between services offered to a single user, as well as between services offered to different interacting users.

NOTE: The methods defined for characterisation of services are description methods. They do not imply or restrict different implementations.

## 4.4 Service features

UMTS service features are based on functionality and mechanisms such as provided by SAT, MExE, IN and CAMEL. These toolkits are the basic building blocks for the VHE. These features can be used both by standardised and non-standardised services through the UMTS Application Programming Interface. The UMTS services and applications get access to UMTS service capabilities (bearers) for transport of user data through the UMTS adaptation layer. This lowest layer of the VHE is responsible for the selection of appropriate service capabilities according to the requirements of services and applications.

High level service features requirements :

- . support of wide range of user applications,
- . support of rapid application/service development,
- . support of easy deployment of new services,
- . scalability.

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## 5 Bearer Services

### 5.1 Definition of bearer services

If the bearer service is a telecommunication service the Bearer services provides the capability for information transfer between access points and involve only low layer functions. These functions are sometimes referred as low layer capabilities (in reference to OSI layers). The user may choose any set of high layer protocols for his communication and the UMTS network does not ascertain compatibility at these layers between users. For end-to-end bearer control a signalling system (e.g. N-ISUP) is typically used throughout the communication link.

In the general case a communication link between access points provides a general service for information transport. The communication link may span over different networks such as Internet, Intranets, LANs and ATM based transit networks, having network specific means for bearer control. Each network contribute to the end-to-end QoS perceived by the end-user.

### 5.2 Description of bearer services

The general bearer service are characterised by a set of end-to-end characteristics with requirements on QoS. The characteristics and requirements shall cover major network scenarios, i.e. the cases when the terminating network is PSTN, N-ISDN, GSM, IP networks/LANs, X.25 and a UMTS network.

If the bearer service is a telecommunication service the Bearer services are-is characterised from a static point of view by a set of low layer attributes. This set has been chosen so that a bearer service can be entirely defined by giving a value to each attribute of the set.

In this document the bearer services will not be described by their attributes. The bearer service will be described using end-to-end characteristics with requirements on QoS.

In particular, the set and the associated allowed values enable characterisation of future (not yet used or foreseen) transfer needs.

Giving one of the possible values to each attribute defines a possible bearer service. However, any combination is neither meaningful nor necessarily supported by the UMTS system. This section defines the attributes and their possible values. The authorised combinations are specified in the following sections.

The parameters of the set are grouped into two categories;

- Information transfer attributes, which characterise the network transfer capabilities required for transferring user information between two or more access points.
- Information quality attributes, which characterise the quality of the user information transferred between two or more access points.

Most of the attributes presented further down may be attributed several values when the bearer service required by an application involves more than one traffic type (connection/connectionless) or more than one connection.

It shall be possible to negotiate/re-negotiate the bearer characteristics defined by the QoS related requirements ~~all of the attributes~~ presented in this clause at call set-up/ during the call (mobile or network initiated).

## 5.2.1 ~~Information transfer attributes~~

### Connection mode attribute

~~The two possible values for this attribute are connection oriented and connectionless. The end-to-end bearer shall have the ability to support message transport in connectionless mode as well as in connection oriented mode. In a connection oriented mode, information is delivered to the destination entity in the same order as it was provided by the source entity, but an establishment/release phase is required at the beginning and the end of the information transfer. In a connectionless mode, information can directly be transferred, but with no guaranty of ordered delivery.~~

### Traffic type attribute

~~It is required that the bearer service provides guaranteed/constant bitrate and a non-guaranteed/dynamically variable bitrate. The four possible values for this attribute are constant bit rate, variable bit rate, available bit rate and unspecified bit rate.~~

### Symmetry attribute

~~The three possible values for this attribute are a Unidirectional, bi-directional symmetric and bi-directional asymmetric. bearers must be supported.~~

### Communication configuration attribute

~~This attribute indicate the Possible spatial arrangement for transferring information between the implicated access points. The possible values are: point-to-point, and point-to-multipoint. When the value arrangement of the attribute is point-to-multipoint, it shall be further characterised as multicast or broadcast. The addresses of the source entity and the destination entities should also be provided. One multipoint address should be reserved for broadcasting.~~

~~Requirements on supported topologies is defined in clause 5.5.~~

### Information transfer rate attributes

Information transfer rate is the amount of information transmitted per unit of time from a source access point to destination access point(s). In clause 5.3 requirements on supported bit rates is defined.

~~The three attributes used to characterise the information transfer rate are the peak bit rate, the minimum bit rate and the mean bit rate. . The possible values for these three attributes are not a limited set, but a continuous range of values. More parameters may certainly be needed, such as the sustainable bit rate or the occupancy (FFS).~~

## 5.2.2 Information quality attributes

[Editors note: Clause 5.2.2 shall be rewritten to reflect requirements on bearer characteristics and not the attributes. See Tdoc S1-99xxb suggesting modified text]

Information quality attributes characterise the bit integrity and delay requirements of the applications.

Other parameters may be needed.

**Maximum transfer delay attribute**

This attribute sets the maximum transfer delay of the information. The two reference points for the maximum transfer delay are the Iu interface and the point located between the mobile termination and the terminal adaptation function. The possible values for this attribute are not a limited set, but a continuous range of values.

**Delay variation attribute**

This attribute sets the variation in the received information. This attribute is important for real-time services, e.g. video conference, where a value approaching 0 would typically be requested. The possible values for this attribute are not a limited set, but a continuous range of values.

**Bit error ratio attribute**

The ratio between incorrect and total transferred information bits. The possible values for this attribute are not a limited set, but a continuous range of values.

**Error characteristics attribute**

This attribute characterises the arrivals of errors. The two possible values are uniform and bursty.

## 5.3 Supported bit rates

It shall be possible for one application to specify its traffic requirements to the network by requesting a bearer service with any ~~value for the~~ connection mode, traffic type, symmetry and information transfer rate ~~attributes~~. It shall be possible for the network to satisfy these requirements without wasting resources on the radio and network interfaces due to granularity limitations in bit rates.

It shall be possible for one mobile termination to have several active bearer services simultaneously, each of which could be connection oriented or connectionless.

The only limiting factor for satisfying application requirements shall be the cumulative bit rate per mobile termination at a given instant (i.e. when summing the bit rates of one mobile termination's simultaneous connection oriented and connectionless traffic, irrespective of the traffic being real time or non real time) in each radio environment :

- At least 144 kbits/s in satellite radio environment (Note 1).
- At least 144 kbits/s in rural outdoor radio environment.
- At least 384 kbits/s in urban/suburban outdoor radio environments.
- At least 2048 kbits/s in indoor/low range outdoor radio environment.

NOTE 1 : This Peak Bit Rate may only be achieved in a nomadic operating mode.

## 5.4 Supported QoS

It shall be possible for one application to specify its QoS requirements to the network by requesting a bearer service with any ~~value for the~~ maximum transfer delay, delay variation, bit error rate and error characteristic ~~attributes~~.

The following table indicates the range of values that shall be supported by UMTS end-to-end for the QoS attributes. These requirements are valid for both connection and connectionless traffic. It shall be possible for the network to satisfy these requirements without wasting resources on the radio and network interfaces due to granularity limitations in QoS.

	Real Time (Constant Delay)	Non Real Time (Variable Delay)
Operating environment	BER/Max Transfer Delay	BER/Max Transfer Delay
Satellite (Terminal relative speed to ground up to 1000 km/h for plane)	Max Transfer Delay less than 400 ms BER 10-3 - 10-7 (Note 1)	Max Transfer Delay 1200 ms or more (Note 2) BER = 10-5 to 10-8
Rural outdoor (Terminal relative speed to ground up to 500 km/h) (Note 3)	Max Transfer Delay 20 - 300 ms BER 10-3 - 10-7 (Note 1)	Max Transfer Delay 150 ms or more (Note 2) BER = 10-5 to 10-8
Urban/ Suburban outdoor (Terminal relative speed to ground up to 120 km/h)	Max Transfer Delay 20 - 300 ms BER 10-3 - 10-7 (Note 1)	Max Transfer Delay 150 ms or more (Note 2) BER = 10-5 to 10-8
Indoor/ Low range outdoor (Terminal relative speed to ground up to 10 km/h)	Max Transfer Delay 20 - 300 ms BER 10-3 - 10-7 (Note 1)	Max Transfer Delay 150 ms or more (Note 2) BER = 10-5 to 10-8
NOTE 1; There is likely to be a compromise between BER and delay. NOTE 2; The Max Transfer Delay should be here regarded as the target value for 95% of the data. NOTE 3; The value of 500 km/h as the maximum speed to be supported in the rural outdoor environment was selected in order to provide service on high speed vehicles (e.g. trains). This is not meant to be the typical value for this environment (250 km/h is more typical).		

## 5.5 Supported topologies

It shall be possible for an application to specify its traffic topology requirements to the network by requesting a bearer service with any value for the communication configuration attribute. However, ~~some combinations with the symmetry attribute are not authorised.~~ The supported configurations are limited to :

- 1) Point-to-Point
  - Uni-Directional
  - Bi-Directional
    - Symmetric
    - Asymmetric
- 2) Uni-Directional Point-to-Multipoint
  - Multicast
  - Broadcast

A multicast topology is one in which sink parties are specified before the connection is established, or by subsequent operations to add or remove parties from the connection. The source of the connection will always be aware of all parties to which the connection travels.

A broadcast topology is one in which the sink parties are not always known to the source. The connection to individual sink parties is not under the control of the source, but is by request of each sink party.

In the case of a mobile termination with several active bearer services simultaneously, it shall be possible for each bearer service to have independent topologies and source/sink parties.