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(54) **Title:** METHOD OPTIMISING RADIO CONNECTIONS IN MOBILE TELECOMMUNICATIONS NETWORKS

APN type	*Type of equipment and service*
APN-1	*Operator's services accessed on the mobile handsets*
APN-2	*Internet accessed on the mobile handsets*
APN-3	*Corporate intranet accessed on the mobile handsets*
APN-4	*Operator's services accessed on a laptop*
APN-5	*Internet accessed on a laptop*
APN-6	*Corporate intranet accessed on a laptop*
APN-7	*Operator's services accessed on a PDA*
APN-8	*Internet accessed on a PDA*
APN-9	*Corporate intranet accessed on a PDA*

(57) **Abstract:** A method of optimising radio connections in cellular mobile communications network on the basis of the user equipment and data service being used. The network allocates Access Point Names to various user equipment/data service combinations. In turn the Access Point Names are allocated Quality Service parameters which are appropriate to the corresponding user equipment and data service. When a user terminal requests a data service with a particular Access Point Name, the radio connection is established with a Quality of Service which is appropriate to the user equipment and data service currently being used.

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Method optimising radio connections in mobile telecommunications networks

The present invention relates to the establishment of radio connections in mobile telecommunication networks, such as 3G networks, on the basis of the equipment and/or data service being used, and in particular to the establishment of such links using secondary information to inform the network of the type of equipment and/or data service being used.

Background to the Invention

Present mobile telecommunication devices carry much more information than simply voice conversations, in particular users can access high-speed packet data services from mobile devices. Further, in addition to using their mobile handset to access such data services directly, users are also able to utilise a mobile handset as a connecting device to connect another device, for instance a laptop computer, to the data network. The problems which arise in such systems are described below in the context of a 3G network, it being understood that corresponding issues arise also in other networks.

Typically, mobile users may access three different types of data or service domain:

(1) The services offered by the mobile telecommunications network operator (e.g. news browsing, messaging...),

(2) The internet (e.g. web browsing...) via the network operator or a third party internet service provider (ISP).

(3) A corporate intranet (e.g. email, intranet browsing, corporate applications...).

Also, the same mobile users may access data services via three main different types of equipment:

(a) directly from a 3G mobile handset (i.e. the browser or messaging application resides on the mobile handset); or

(b) from a laptop connected to a 3G mobile handset (i.e. the browser or application resides on the laptop, the 3G mobile handset or alternatively a 3G data card is used only as a modem); or

(c) from a PDA connected to a 3G mobile handset (i.e. the browser or application resides on the PDA, the 3G mobile handset or alternatively a 3G data card is used only as a modem).

When offering access to data services, the operator aims to optimise its radio network with two main objectives. Firstly, it aims to provide the best user experience to its customers, and secondly it aims to maximise the capacity of the network in order to accommodate as many users as possible.

In a 3G WCDMA (Wideband Code-Division Multiple Access) radio network, the optimisation of data services usually consists in finely tuning the parameters that rule the management of the packet radio bearer.

The following provides an overview of how packet radio bearers are managed.

Figure 1 shows the Quality of Service (QoS) architecture in UMTS networks as depicted in 3GPP specification (TS 23.107 "QoS concept and architecture").

Figure 2 shows a simplified representation of the topology of a 3G network and of the essential bearers that enable the user to access data services.

In Figure 2, the 3G network is simplified and represented by:

- A radio network (UMTS Terrestrial Radio Access Network (UTRAN)): responsible for handling users' mobility and for allocating resources to the users in an efficient manner.

- A core network (CN): responsible for routing the packets and accessing external service domains (such as operator's services, internet...).

- A home location register (HLR): responsible for authenticating and policing the users wanting access to the 3G network.

Outside of the 3G network are the servers offering access to the different service domains.

Figure 2 also shows, in a simplified manner, the hierarchy of the different bearers supporting the connection:

- The TCP/IP connection runs between the applications on the user's equipment (the laptop in the Figure 2) and the servers where the services are located;
- The Packet Data Protocol (PDP) context is the bearer supporting the TCP/IP connection across the 3G network, hence it is established between the mobile handset and the end point of the CN; and
- The packet radio bearer is the bearer supporting the PDP context across the UTRAN, hence it is established between the mobile handset and the UTRAN.

Note that in Figure 2, the user is actually using a laptop connected to his 3G mobile handset (via e.g. a USB cable or bluetooth) to access data services. If the user was using his handset directly, then the TCP/IP connection would terminate in the mobile handset. Hereinafter the term, terminal equipment, is used to refer to the device through which the user is accessing the data service. This may be a laptop, PDA or indeed the mobile handset. Hereinafter, the term, mobile terminal, will be used to refer to the 3G device which is in direct communication with the 3G network. This may be a mobile phone or a mobile data card. It will be understood that these terms apply to corresponding devices in other mobile telecommunication networks. The term, user equipment, is used to refer to either mobile terminals or terminal equipment.

When the user wants to access data services from one of the web sites, the following process will occur:

- The mobile handset shall first request the CN to establish a PDP context. In its request, the handset shall specify, among other things, the access point name (APN) and the quality of service (QoS).
    - The APN represents the service domain the user wants to access (e.g. the operator's web sites, the internet...). Depending on the operator's strategy, it may have one unique APN for all the services, or one APN per domain (operator's sites, internet, corporate intranet...) or even one APN per service (weather,

news, sport, etc.). This is totally left to the operator's choice in the 3GPP standards.

- The QoS for non real time (NRT) data packet services is defined by attributes such as the traffic class (interactive or background), the bit rate, the priority (1, 2, 3), packet size, etc.

- Before granting the PDP context, the CN checks with the HLR that the request from the mobile is permitted for this user. The HLR contains a database which specifies for each user what APNs the user is allowed to access, and what QoS is permitted for each APN. Depending on his subscription level, a customer may have access to one or more APNs, and each permitted APN may have a different QoS profile.
- If the APN requested is allowed for this user, then the CN may accept the PDP context either with the requested QoS or with a lower QoS depending on the QoS profile stored in the HLR for this APN.
- Then the CN requests the UTRAN to establish the packet radio bearer for the mobile handset. The UTRAN is informed of the QoS granted for this packet radio bearer, but it has no information about the APN.
- Finally, if sufficient radio resources are available, the UTRAN establishes the packet radio bearer towards the mobile handset based on the QoS specified by the CN.

Once all the bearers are set up, the user may send and receive data to and from the domain towards which it has established connection. The UTRAN is then in charge of dynamically allocating and reallocating radio resources to this user depending on his level of activity and on the number of users in the network.

In order to do that, the UTRAN will continuously reconfigure the packet radio bearer. The 3GPP standards allow a packet radio bearer to take many forms: different bit rates (e.g. 8, 32, 64, 128, 384 kbps), different types of channel (dedicated, common, shared), etc. Depending on the UTRAN implementation, there are usually several parameters that enable the operator to trigger the reconfigurations of the packet radio bearer based on its data activity and on timers. In the following, these parameters and timers shall be called packet optimisation parameters.

It is important that the distinction between QoS and packet optimisation parameters be recognised. The QoS parameters are characteristics of the PDP context, such as Traffic Class, THP, Maximum Bit Rate, Maximum Packet Size, etc. They represent the level of service (or SLA) that the network should provide, and are agreed/negotiated at the start of the connection, in response to a request for a certain QoS from the mobile terminal. If resources allow for it, the requested QoS will be allowed, otherwise a reduced set of QoS parameters may be allocated. QoS procedures are standardised by 3GPP (3G Partnership Project).

Packet optimisation parameters on the other hand are generally internal to the UTRAN and are used to decide how to manage the packet radio bearers in the most efficient way. They are not standardised, so each UTRAN vendor can implement its own algorithms and own parameters. For this reason, it is difficult to give an exhaustive list of packet optimisation parameters, however the following briefly summarises the main points.

A packet radio bearer can take many forms. First, it can use different types of physical channels, e.g. a dedicated channel, a shared or common channel or even a non-physical channel. To simplify, when the mobile terminal has a dedicated or shared channel it is in DCH (dedicated channel) state; when the mobile terminal uses a common channel it is in FACH (forward access channel) state; when the mobile terminal has no physical channel it is in PCH (paging channel) state. Furthermore, the UTRAN may decide to release the packet radio bearer while the PDP context remains active. Second, when the mobile terminal has a dedicated channel, this channel may have different bit rates.

The whole point of the optimisation parameters is to decide when to change the type of channel and when to change the bit rate. Those decisions depends mainly on the usage of the bearer by the user, but also of external conditions such as network load (if the network is congested) or radio link conditions (if the user is going too far away from the Node B).

For example, the packet optimisation parameters could include the following:

- Amount of data transmitted or waiting in the buffer over a period of time to trigger the allocation of a dedicated channel,

- Amount of data transmitted or waiting in the buffer over a period of time to trigger the increase of the bit rate a dedicated channel,

- Duration of inactivity to trigger the release of the dedicated channel and the transition to the common channel,

- Duration of inactivity to trigger the complete release of the packet radio bearer,

- Average utilisation of a dedicated channel to trigger the increase or decrease of the bit rate,

- Maximum amount of radio resources (e.g. transmit power, interference) allowed for one dedicated channel before triggering the decrease of the rate,

- Maximum network load before triggering the release of some dedicated channels,

- Amongst other things.

As explained above, the UTRAN is not aware of the type of equipment used by the user, or of the type of service domain accessed, or even of the APN. The only information given to the UTRAN by the CN is the QoS profile of the bearer.

Within the QoS profile, most of the attributes are actually technical parameters, such as for example packet size, maximum bit rates, etc. However, there are two attributes which define the priority level of the bearer with respect to other bearers. These two are:

- The traffic class: which values can be in this case (NRT packet data services) either interactive or background.

- The traffic handling priority (THP): which values can be 1, 2 or 3 and which applies only to interactive traffic class.

Therefore, four different level of priority are available for NRT PDP contexts: (1) interactive THP1, (2) interactive THP2, (3) interactive THP3, and (4) background.

3GPP standards do not specify in detail how to use these two attributes, but only specify the relative priorities of bearers with those attributes. The highest priority bearer will be one with traffic class interactive and THP 1. The lowest priority is one with traffic class background.

In the prior art, this prioritisation is commonly used to decide the amount of resources to allocate to packet radio bearers.

For instance, when two handsets requires at the same time the allocation of radio resources but the UTRAN does not have sufficient capacity to give the maximum bit rate (say 384 kbps) to both of them, then the UTRAN may decide to use the priority attributes of their bearers to differentiate them. If one of the two handsets is higher priority (say interactive THP1) than the other one (say interactive THP3), then the UTRAN may decide to allocate the highest bit rate to the former (say 384 kbps) and a lower available bit rate (say 64 kbps) to the later.

Nevertheless, if there is sufficient capacity in the network to accommodate both requests, then both users would get the maximum bit rate and the quality of service would be the same even though they have different priority attributes.

Another example of how these attributes are commonly used in the literature is in case of congestion in the network and the UTRAN decides to downgrade existing users. Then the UTRAN may use the priority attributes to select the users to downgrade. For instance, if two users have a 384 kbps bearer but one of them is higher priority (say interactive THP2) than the other one (say background), then the UTRAN may first release the bearer of the latter, and only if the congestion is situation is not resolve after that, it will downgrade the former from 384 kbps to say 64 kbps or release its bearer.

Although the above management structures exist, optimising WCDMA radio networks in which users can access three different types of service domain (operator's

sites, internet, corporate intranet) over the three different types of equipment (mobile handset, laptop, PDA) as listed above is a key issue for 3G network operators.

Each type of equipment or site has very different behaviour in terms of data transmission. For instance, when the customer uses a mobile handset to access operator services, both the handset and the sites are usually designed to be efficient over a wireless connection, which means that transmission of data over the air is limited to the minimum required. On the other hand, when a customer uses a laptop to access his corporate intranet, neither the laptop nor the intranet are designed to be efficient over wireless connections.

As a result, the laptop and the site tend to send non-essential packets of data (called background traffic hereafter). This background traffic is commonly accepted over fixed networks like the internet or a corporate LAN because the total amount of data sent is deemed fairly small compared to the available bandwidth. However, in a wireless network where resource management is crucial and where the bandwidth is limited, this background traffic may cause serious capacity issues.

This is especially the case in a 3G WCDMA network, where the radio network has been optimised for the accessing operator services from mobile handsets. Indeed, the packet radio bearer parameters are tuned to allocate resources in an efficient manner for this type of services and equipment. However, the background traffic generated by a laptop accessing a corporate intranet may be misinterpreted by the radio network, and therefore may wrongly trigger allocation of resources. This will inevitably result in a waste of resources in the radio network.

Unfortunately, the current 3GPP standards do not have provisions which allow radio networks to ascertain the type of equipment being used by the user or the type of services accessed. Hence, the radio network cannot differentiate between a user accessing the operator's services on his mobile handset and a user accessing his corporate intranet on his laptop connected to his mobile handset.

Summary of the invention

A method of establishing a data link between a terminal device and a data service over a radio connection between a mobile terminal and a base station in a mobile telecommunication network, comprising the steps of: receiving a request, from said mobile terminal, for a data link to be established, the request including first information primarily indicative of the data service to which access is desired; establishing a radio connection between said mobile terminal and said base station; and establishing a data link over said radio connection between said terminal device and said indicated data service; characterised in that said first information is secondarily indicative of the type of terminal device in use; the method further comprising the steps of: determining a set of radio connection optimisation parameters on the basis of said primary and secondary indications; wherein said radio connection is established according to said optimisation parameters.

Brief Description of the Drawings

So that the present invention be more readily understood, preferred embodiments will now be described with reference to the accompanying drawings in which:

Figure 1 shows the Quality of Service (QoS) architecture in UMTS networks as depicted in 3GPP specification, TS 23.107 "QoS concept and architecture");

Figure 2 shows a simplified representation of the topology of a 3G network and of the essential bearers that enable the user to access data services;

Figure 3 shows the one aspect of the APN architecture according to an embodiment of the present invention; and

Figure 4 shows another aspect of the APN architecture according to an embodiment of the present invention.

Description of the Preferred Embodiments of the Present Invention

In order that the present invention be implemented in a 3G mobile telecommunications network, the network, mobile terminal and terminal equipment must be provided with the necessary functionality as will be explained in the following.

Firstly, as described above, in existing systems the mobile terminal may request a priority level when it makes the request for a PDP context. The Core Network, will either allow a PDP context with the priority level that has been requested or will allow a PDP context with a lower priority level if the HLR indicates that a lower priority level is appropriate for the requested APN. So that the present invention may be implemented in a 3G network, when a mobile terminal requests a PDP context to access certain data services, the mobile terminal always requests the highest QoS profile possible, in terms of priority attributes (i.e. traffic class interactive and THP1), whatever terminal equipment is being used or data services accessed. Advantageously, this does not require any change to the 3GPP standards and may be implemented by agreement between the network operator and the manufacturer of the mobile handset.

Secondly, as described above, in existing systems, UTRAN manufacturers usually provide only one set of packet optimisation parameters which applies to all priority levels. So that the present invention may be implemented in a 3G network, the UTRAN manufacturer provides the network operator with a distinct set of packet optimisation parameters for each priority level. Hence, there would be four sets of packet optimisation parameters (one for packet radio bearers with priority interactive THP1, one for packet radio bearers with priority interactive THP2, etc.). Again, this does not require any changes to the 3GPP standards and is instead an implementation option for the UTRAN manufacturer.

Thirdly, in existing systems, there is generally no direct correlation between APNs and terminal equipment and data services. So that the present invention may be

implemented in a 3G network, the network operator reserves priority levels for specific usage, i.e. for a specific combination of equipment type and data service domain. QoS profiles, especially priority levels, are assigned to each APN. To achieve this, the operator makes sure that the mobile terminals, and the software given to the users to connect terminal equipment (e.g. laptop or PDA) to their mobile terminals, are provisioned with the correct APNs (this falls under typical agreements between a network operator and its mobile handset manufacturer), and that the HLR is provisioned with the right mapping between APNs and QoS priority levels. Since there are only four priority levels and there may be more combinations of equipment types and service domain types, the operator will regroup together several combinations under the same priority level. This regrouping shall be driven by the similarities in the traffic pattern between different combinations.

This third concept is again beyond the scope of 3GPP standards and is more an implementation option for the operator in its network. Nevertheless, this specific implementation by the network operator may cause issues if one user manage somehow to activate a PDP context with the wrong APN (say the user activates a PDP context for the laptop with the APN reserved for mobile handset based services), or when in bound roamers activate a PDP context to access their home network services but the QoS priority level stored in the HLR is not under the control of the network operator.

A preferred embodiment of the present invention will now be described with reference to Figure 3. Firstly, the mobile terminal, when activating a packet data service, will request a PDP context with:

- The highest priority (interactive THP1) as agreed between the network operator and the mobile terminal manufacturer.
- The appropriate APN as configured by the network operator in the software for the type of service and the type of equipment which the user is using.

The CN will receive the PDP context activation request and will compare the requested QoS with the QoS profile stored in the HLR for this APN. If the QoS profile in the HLR is lower, then the CN will request that the UTRAN establishes a packet radio bearer with a downgraded QoS (say interactive THP3). The UTRAN will then

set up the packet radio bearer using the packet optimisation parameters for this priority level (interactive THP3).

The UTRAN does not know that the packet radio bearer is used by a laptop connected to a mobile terminal to access this particular service, but the operator will have optimised the packet optimisation parameters for this specific usage. As a result, the UTRAN will be able to manage the packet radio bearer for this user in the most efficient way possible without affecting the users using different equipments and services.

Figure 3 shows one aspect of the APN architecture which would be implemented by the network operator. Each APN type shown in Figure 3 may contain more than one APN address. For instance, each corporate customer of the network operator will have its own APN for its employees accessing its intranet over their laptops, but all these APNs will fall under type APN-6.

In order to implement this architecture, the network operator would ask the mobile handset manufacturer to configure APN types 1, 2 and 3 for applications on the handset requesting a NRT packet data connection with the mapping shown in Figure 3. Hence, if the user wants to access the internet from his mobile handset, the handset would automatically activate a PDP context towards the APN type 2.

Also, the network operator could ask the handset to reject any PDP context request coming from an external equipment with an APN type 1, 2 or 3. This is to make sure that a user cannot activate a PDP context with one of the APN types reserved for handset-based applications for an external equipment.

The network operator specifies the connection software that is provided to its customers to configure their computer equipment in order to connect to their mobile terminal.

The operator would offer one type of software for laptops, and one software for PDAs. The laptop software would allow the user to connect to one of the three service domains (operator's services, internet, corporate intranet) and would use the right APN type as defined in the table above. The PDA software would do the same.

Figure 4 shows the mapping between APN types and QoS priority levels. The operator provisions its HLR with this mapping. The mapping shown in Figure 4 is based on the following assumptions:

1) Mobile handset based applications, whatever the service accessed, are naturally radio resources efficient, and therefore can be managed in the same manner by the UTRAN. Hence, APN types 1, 2 and 3 are mapped to the same priority level interactive THP1.
2) Corporate intranet applications that are not mobile handset based are very radio inefficient and their traffic pattern is more dictated by the corporate IT applications than by the equipment type. Hence, APN types 6 and 9 are mapped to the same priority level interactive THP2.
3) Operator's services accessed from external equipment are fairly radio efficient and have a very specific traffic pattern dictated by the operator's services design. Hence, APN types 4 and 7 are mapped to the same priority level interactive THP3.
4) Internet applications that are not handset-based have no specific traffic pattern (more depending on the ISP) and can be handled by a default set of parameters that can also be applied to unknown traffic type such as inbound roamers. Hence, APN types 5, 8 and all other types are mapped to the same priority level background.

The network operator tunes the packet optimisation parameters of the UTRAN based on the mapping defined in the table above and on the assumptions made above. This optimisation would require a fair amount of testing in order to find the right parameters. For example, the operator could adapt the resource release timers and the thresholds triggering resource allocation based on the traffic pattern of the types of service and equipment mapped on the relevant priority level.

If the operator was to find out during the optimisation phase that the mapping of APN types onto QoS priority levels is not the optimum one, because for example the traffic pattern of one service type was wrongly estimated, then the operator can simply modify the mapping in the HLR. It does not need to modify the mobile terminals or the connection software already deployed in the field.

In the same way, if the operator was to introduce a new type of external equipment or a new type of service that presents a completely new traffic characteristics and that requires a new tuning of the packet optimisation parameters, then the operator may simply modify the mapping of APN types onto QoS priority levels in the HLR.

It will be appreciated that above APN architecture has been provided by way of example only and that other APN architecture configurations may be used to satisfy the requirements of the network in which the present invention is implemented.

Furthermore, although the present invention has been described in the context of the above preferred embodiments, it will be appreciated that it may be implemented in alternative networks in which similar problems arise and in which solutions are required which fall within the scope of the claims.

In particular, we have indicated above that the present invention relates generally to mobile communications networks. The preferred embodiment details a 3G cellular mobile telecommunications network, and we have also indicated the present invention is particularly applicable to networks corresponding to 3G networks. It should be clarified that in this context, the present invention is applicable generally to cellular mobile telecommunications networks, examples of which include GSM (Global System for Mobile communications) , D-AMPS (Digital Advanced Mobile Phone Service), CDMA [IS-95] (Code-Division Multiple Access), GSM + GPRS (General Packet Radio Services), GSM + HSCSD (High-Speed Circuit-Switched Data), GSM + EDGE (Enhanced Data Rates for Global Evolution), UMTS, IMT-2000 and cdma2000.

CLAIMS

1. A method of establishing a data link between a terminal device and a data service over a radio connection between a mobile terminal and a base station in a mobile telecommunication network, comprising the steps of:

receiving a request, from said mobile terminal, for a data link to be established, the request including first information primarily indicative of the data service to which access is desired;

establishing a radio connection between said mobile terminal and said base station; and

establishing a data link over said radio connection between said terminal device and said indicated data service; characterised in that

said first information is secondarily indicative of the type of terminal device in use; the method further comprising the steps of:

determining a set of radio connection optimisation parameters on the basis of said primary and secondary indications; wherein

said radio connection is established according to said optimisation parameters.

2. The method of claim 1 further comprising the step of establishing a first bearer between the mobile terminal and said network in response to said request for a data link.

3. The method of claim 2 in which said first bearer is defined by at least one attribute and said step of determining a set of radio connection optimisation parameters comprises the steps of:

defining said at least one attribute on the basis of said primary and secondary indications; and

defining a set of radio connection optimisation parameters, on the basis said at least one attribute.

4. The method of claim 3 wherein the first bearer is a Packet Data Protocol (PDP) context which is established between the mobile terminal and the core network.

5. The method of claim 3 in which the radio connection is a radio bearer.

6. The method of claim 5 in which said first information is an Access Point Name.

7. The method of claim 6 in which said at least one attribute is a Quality of Service (QoS) parameter.

8. The method of claim 7 in which said QoS parameters include traffic class and traffic handling priority.

9. The method of claim 8 wherein said step of defining said at least one attribute is a step of defining traffic class and traffic handling priority on the basis of a correspondence between the traffic class and traffic handling priority and the Access Point Name, the correspondence being stored in the network.

10. The method of claim 9 in which said correspondence is stored in a Home Location Register.

11. The method of claim 10 in which said optimisation parameters are defined on the basis of a correspondence between the optimisation parameters and the traffic class and traffic handling priority, the correspondence being stored in the network.

12. The method of claim 11 in which said correspondence is stored in a UTRAN.

13. The method of any preceding claim in which said mobile telecommunications network is a cellular network.

14. The method of claim 13 in which said cellular network is a 3G network.

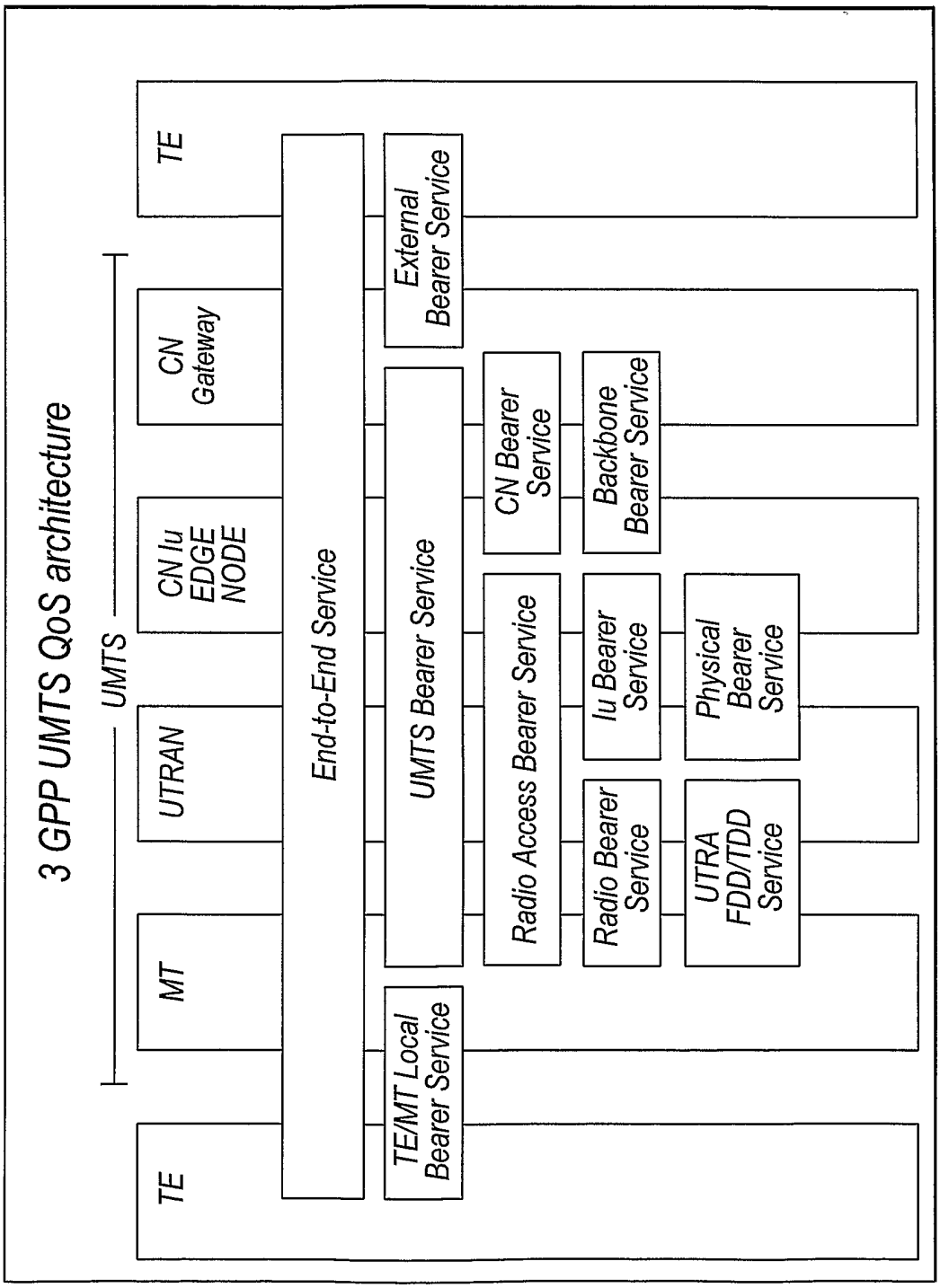

3 GPP UMTS QoS architecture
UMTS
TE
MT
UTRAN
CN Iu EDGE NODE
CN Gateway
TE
End-to-End Service
TE/MT Local Bearer Service
UMTS Bearer Service
External Bearer Service
Radio Access Bearer Service
CN Bearer Service
Backbone Bearer Service
Radio Bearer Service
Iu Bearer Service
Physical Bearer Service
UTRA FDD/TDD Service

Fig.1

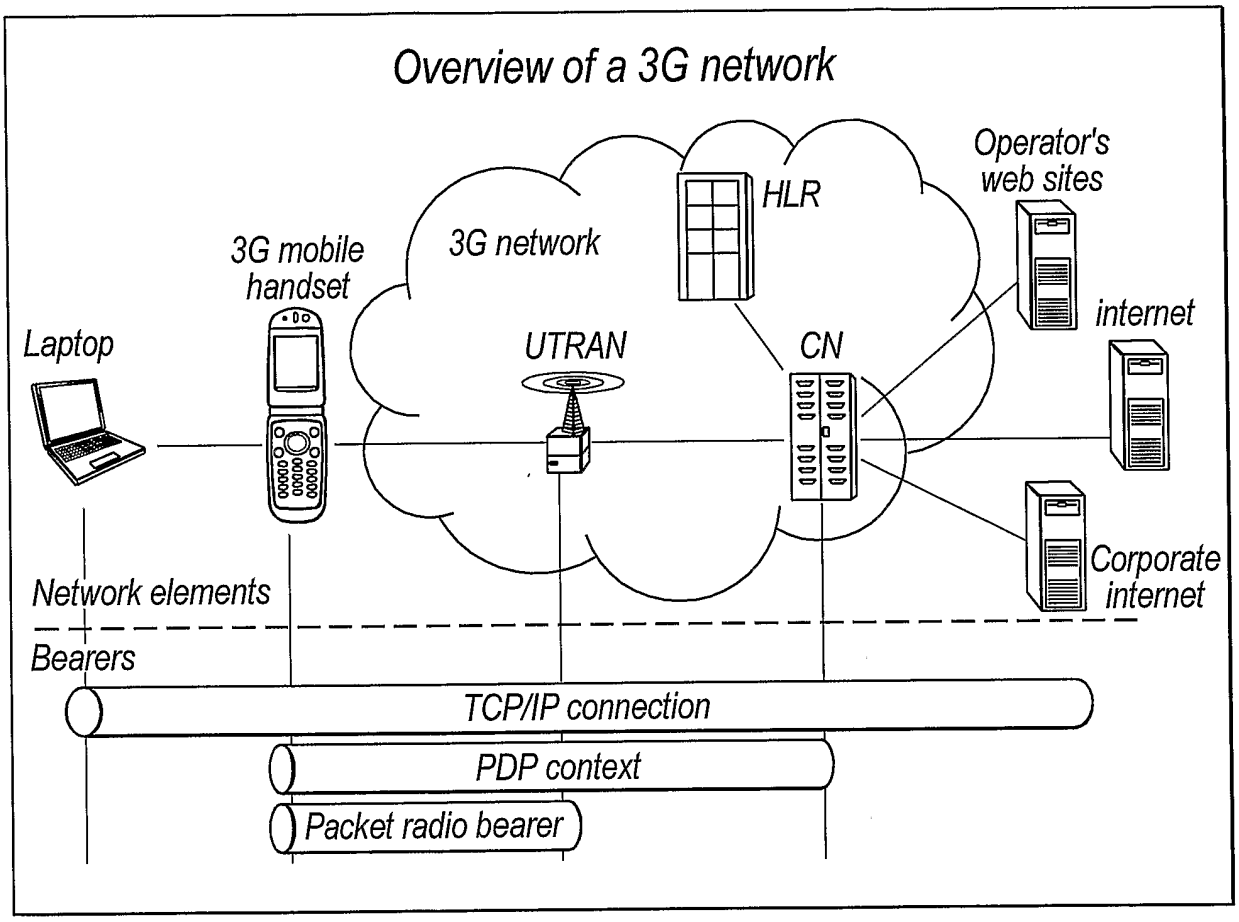

Overview of a 3G network
Operator's web sites
HLR
3G network
3G mobile handset
internet
Laptop
UTRAN
CN
Corporate internet
Network elements
Bearers
TCP/IP connection
PDP context
Packet radio bearer

Fig.2

APN type	***Type of equipment and service***
APN-1	*Operator's services accessed on the mobile handsets*
APN-2	*Internet accessed on the mobile handsets*
APN-3	*Corporate intranet accessed on the mobile handsets*
APN-4	*Operator's services accessed on a laptop*
APN-5	*Internet accessed on a laptop*
APN-6	*Corporate intranet accessed on a laptop*
APN-7	*Operator's services accessed on a PDA*
APN-8	*Internet accessed on a PDA*
APN-9	*Corporate intranet accessed on a PDA*

Fig.3

APN type	QoS priority level
APN-1	Interactive THP1
APN-2	Interactive THP1
APN-3	Interactive THP1
APN-4	Interactive THP3
APN-5	Background
APN-6	Interactive THP2
APN-7	Interactive THP3
APN-8	Background
APN-9	Interactive THP2
Other types	Background

Fig.4

INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2006/000248

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04Q7/38 H04L12/28
ADD. H04Q7/32

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04Q H04L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal, WPI Data, PAJ, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 103 06 453 A1 (DEUTSCHE TELEKOM AG) 26 August 2004 (2004-08-26) paragraphs [0007] - [0013], [0017], [0018] -----	1-3,5,7, 8,10,11, 13
A	WO 03/055257 A (SIEMENS AKTIENGESELLSCHAFT; SCHNIEDENHARN, JOERG) 3 July 2003 (2003-07-03) page 1, line 30 - page 2, line 9 page 6, line 26 - page 7, line 21 -----	1-14
A	US 6 397 061 B1 (JORDAN LARRY DAVID ET AL) 28 May 2002 (2002-05-28) column 2, lines 31-52 column 3, line 27 - column 4, line 29 -----	1-14

-/--

[X] Further documents are listed in the continuation of Box C.

[X] See patent family annex.

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search	Date of mailing of the international search report
24 April 2006	02/05/2006

Name and mailing address of the ISA/	Authorized officer
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INTERNATIONAL SEARCH REPORT

International application No
PCT/GB2006/000248

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No
PCT/GB2006/000248

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