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(71) Applicant *(for all designated States except US)*: **GENISTA CORPORATION** [JP/JP]; Aoyama Nozue Building 3rd Floor, 11-10, Kita Aoyama 2-chome, Minato-ku, Tokyo 107-0061 (JP).

(72) Inventors; and

(75) Inventors/Applicants *(for US only)*: **ESMAILZADEH, Riaz** [AU/JP]; 2-24, Shin-Ishikawa 1-chome, Aoba-ku, Yokohama-shi, Kanagawa 225-0003 (JP). **HOMAYOUNFAR, Kambiz** [US/JP]; Daikanyama Tower 303, 35-11, Ebisu-nishi 1-chome, Shibuya-ku, Tokyo 150-0021 (JP).

(74) Agents: **KITAMURA, Kinichi** et al.; 703 New Shinbashi Building, 16-1, Shinbashi 2-chome, Minato-Ku, Tokyo 105-0004 (JP).

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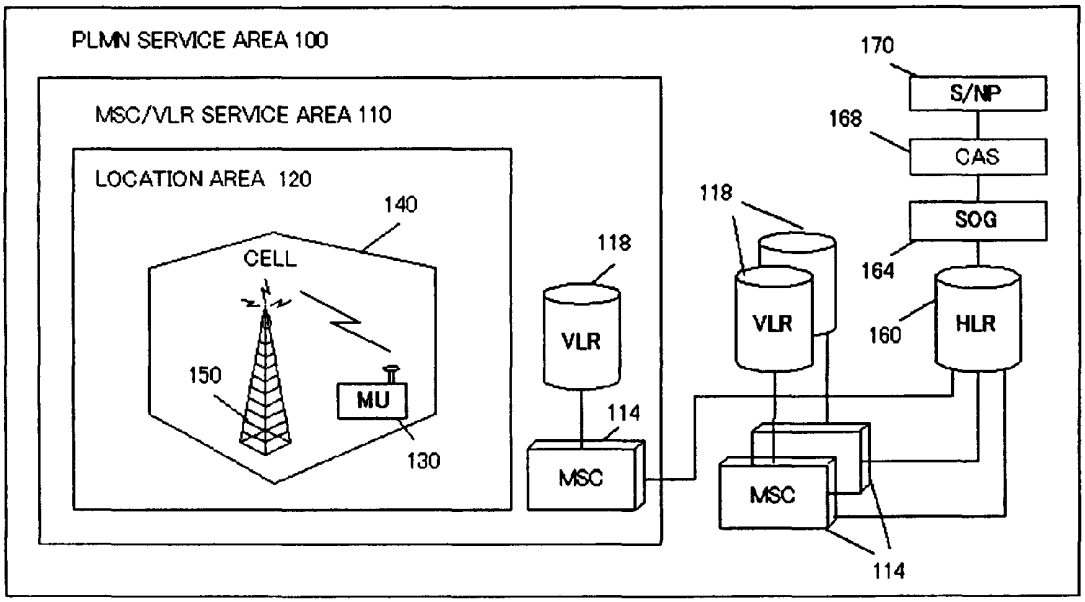
(54) Title: SYSTEM, METHOD, AND APPARATUS FOR QUALITY FEATURES FOR MOBILE AND INTERNET TERMINALS



(57) Abstract: A system, method and apparatus for allowing user adjustment of the perceptual quality of service (QoS) the user may experience during a communications session includes a signal adjustment button, a processing unit for processing a signal adjustment request from the signal adjustment button, and a transmitter for transmitting the signal adjustment request to a remote device, which then modifies the perceptual QoS of the signal. The system also includes a network node which interprets the signal adjustment request and determines whether or not to grant the signal adjustment request.

WO 02/32161 A2

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DESCRIPTION

SYSTEM, METHOD, AND APPARATUS FOR QUALITY FEATURES FOR MOBILE AND INTERNET TERMINALS

(Technical Field)

The present invention relates to features for mobile, fixed wireless, and internet communications. In particular, the invention relates to a system for user adjustment of the perceptual quality of service during a mobile communications session.

(Background Art)

In a little over a decade, mobile telephony and mobile communications, as well as the Internet, have become common features in our daily lives. Although mobile telephones were initially intended to provide a tether-less means of voice communications, these devices have evolved to be terminals for sending and receiving various kinds of information. However, with the fast growth and great popularity of these mobile terminals, the quality of the offered services has degraded due to over-loading and over-crowding of mobile networks. Problems such as bad voice quality, dropped calls, denied access to the network, and delay in accessing and receiving services are common in over-crowded areas and

at peak usage times. In the case of the Internet, delays associated with access to service and problems associated with audio and video streaming occur frequently.

A further problem is that little service differentiation presently exists. Although present standards provide for different classes of service and levels of priority, no specification exists describing how these levels may be practically used. For example, business phone calls or Internet access may be more important than a personal call. Therefore, the user may be willing to pay a higher usage fee for a better quality of service that ensures receipt of the business phone call or Internet access. However, no provision exists for a user to adjust the quality of service that the user is receiving, or for the mobile or the Internet browser to automatically adjust the quality of service in accordance with the type of call that is being made.

Presently, a user cannot request or adjust the perceptual quality of service ("QoS") that the user is receiving. Likewise, a mobile service provider cannot provide service level agreements ("SLAs") that charge users higher or lower fees for increased or decreased perceptual QoS, respectively. For example, a mobile telephone user may wish to improve the perceptual QoS of its present connection, and may be willing to pay more.

Also, a mobile telephone user may wish to save money by reducing the perceptual QoS for individual conversations. Likewise, an Internet user may wish to increase or decrease the speed of reception of information in exchange for higher or lower costs. Moreover, a Voice over IP ("VoIP") user may wish to increase or decrease the perceptual quality of the received voice for the same reason.

It is desired that mobile communications and Internet terminals have features (such as a physical button) that provide for adjustment of the perceptual QoS. Furthermore, it is desired that features which indicate the present level of perceptual QoS, will also indicate the level of perceptual QoS that can be expected with a requested change in perceptual QoS, and indicate any charges or savings that may be associated with a requested change in the perceptual QoS.

(Disclosure of Invention)

The present invention is a method and system that overcomes the above-mentioned shortcomings by allowing user adjustment of the perceptual quality of service (QoS). An advantage of the present invention is that the perceptual QoS may be adjusted during a communications session. Another advantage of the present invention is

that a mobile service provider can provide service level agreements (SLAs) that charge users higher or lower fees for increased or decreased perceptual QoS, respectively. Still another advantage of the present invention is that it enables service differentiation based on the perceptual QoS.

These and other advantages are achieved in an apparatus for modifying a signal. The apparatus includes a signal adjustment button, a processing unit, in communication with the signal adjustment button, for processing a signal adjustment request from the signal adjustment button, and a transmitter, in communication with the processing unit, for transmitting the signal adjustment request to a remote device. The remote device then acts to modify the perceptual QoS of the signal.

These and other advantages of the present invention are also achieved in a system for modifying a signal. The system includes a signal adjustment button, a network node, in communication with the signal adjustment button, and a module, in communication with the network node. The network node interprets the signal adjustment request from the signal adjustment button and determines whether or not to grant the signal adjustment request.

These and other achievements are also achieved in a method for modifying a signal, including the steps of

requesting an adjustment of the signal, interpreting the request for adjustment of the signal, and responding to the request for adjustment of the signal. A user requests a change in perceptual QoS of the signal and the remote device determines whether the user is entitled to the change in perceptual QoS of the signal and whether the resources are available for the change in the perceptual QoS of the signal. Depending on availability of resources, the remote device grants (or denies) the request for the change in status and informs the user accordingly.

(Brief Description of Drawings)

The objects, features, and advantages of the present invention are readily apparent from the detailed description of the preferred embodiments set forth below, in conjunction with the accompanying Drawings in which:

FIGURE 1 is a block diagram of a telecommunications system according to a preferred embodiment of the present application;

FIGURE 2 is a block diagram of a mobile unit according to a preferred embodiment of the present application;

FIGURE 3 is a block diagram of a portion of the telecommunications system shown in FIGURE 1, illustrating

the steps for implementing a preferred embodiment of the present application;

FIGURE 4 is a flowchart illustrating a method of adjusting perceptual QoS according to a preferred embodiment of the present invention;

FIGURE 5A is an illustration of the present application in a mobile communications system;

FIGURE 5B is an illustration of the present application in a personal digital assistant;

FIGURE 6 is a simplified block diagram of the Internet network according to a preferred embodiment of the present application; and

FIGURE 7 is an illustration of the present application in a computer accessing the Internet.

(Best Mode for Carrying Out the Invention)

The following detailed description is presented to enable any person skilled in the art to make and use the invention. For purposes of explanation, specific nomenclature is set forth to provide a thorough understanding of the present invention. However, it will be apparent to one skilled in the art that these specific details are not required to practice the invention. Descriptions of specific applications are provided only as representative examples. Various modifications to the

preferred embodiments will be readily apparent to one skilled in the art, and the general principles defined herein may be applied to other embodiments and applications without departing from the spirit and scope of the invention. The present invention is not intended to be limited to the embodiments shown, but is to be accorded the widest possible scope consistent with the principles and features disclosed herein.

A signal adjustment request may be made for several reasons, *e.g.*, in order to improve or decrease the quality of mobile communications services or to improve or decrease the speed of information (*e.g.*, data, voice packets, etc.) reception over the Internet. As such, a user of such mobile communications services as a mobile phone, a personal digital assistant ("PDA"), or the Internet may be interested in making these types of perceptual quality of service (QoS) adjustments. The user may wish to make these adjustments in order to decrease the cost of making less important connections or to improve the perceptual QoS of more important connections despite an associated increase in cost.

In one embodiment, the user may make an adjustment request by using tangible tools (*e.g.*, buttons, toggles, etc.) or by using virtual tools (*i.e.*, soft buttons on a screen). A user makes an adjustment request, perhaps

after checking the current perceptual QoS level, using either the tangible or virtual tools to increase or decrease the current perceptual QoS level. The use of the tools initiates a request to the user's service/network provider ("S/NP"). The S/NP determines whether or not the user is entitled to the requested perceptual QoS level based on the user's service level agreement ("SLA"). If the user is not entitled to the requested perceptual QoS level, the S/NP denies the request and notifies the user that the requested perceptual QoS level is not available. If the user is entitled to the requested perceptual QoS level, the S/NP determines whether the resources are available to fulfill the request. If the resources are not available, the S/NP denies the request and notifies the user that the request cannot be completed. If the resources are available, the S/NP grants the request and notifies the user by way of a current level of service indicator that the request has been fulfilled. The current perceptual QoS may be indicated by a numerical value, on a scale, by a plurality of symbols or in any other convenient manner.

Once the S/NP has granted a request for adjustment of a perceptual QoS level, the new perceptual QoS level is maintained through a measurement and control feedback process, the perceptual QoS level may be maintained by

continuously measuring the received perceptual QoS level and comparing the received perceptual QoS level with the quality level associated with the specified SLA and then returning the comparison information to the communications network. The communications network then maintains the perceptual QoS level by adjusting a number of parameters such as power control and transmission rate control.

With reference now to FIGURE 1 of the Drawings, there is illustrated therein a Public Land Mobile Network ("PLMN"), designated by the reference numeral 100, utilizing the principles of the present invention. PLMN Service Area 100 includes a plurality of service areas 110, each with a Mobile Switching Center ("MSC") 114 and an integrated Visitor Location Register ("VLR") 118. There MSC/VLR service areas 110, in turn, include a plurality of Location Areas ("LA") 120, which are defined as that part of a given MSC/VLR service area 110, in which mobile unit ("MU") 130 may move freely without having to send update location information to the MSC/VLR service area 110 that controls that LA 120. Each LA 120 is divided into a number of cells 140. Mobile unit ("MU") 130 is physical equipment, *e.g.*, a car phone, mobile phone, pager, PDA, portable computer or other portable device, used by mobile subscribers to

communicate with the PLMN Service Area 100. A Base Station ("BS") 150 is physical equipment, illustrated for simplicity as a radio tower, that provides radio coverage to the geographical area of cell 140 in which to handle radio traffic to and from MU 130.

PLMN Service Area 100 further includes a Home Location Register ("HLR") 160, which is a database maintaining all subscriber information, *e.g.*, user profiles, current location and routing information, International Mobile Subscriber Identity ("IMSI") numbers, SLA information, and other administrative information. The HLR database 160 may be co-located with a given MSC 114, as an integral part of the MSC 114, or the HLR database 160 may service multiple MSCs 114, as is illustrated in FIGURE 1. An IMSI number is a unique 17-digit identification number assigned to each MU 130, and includes a Mobile Country Code ("MCC") of three digits, a Mobile Network Code ("MNC") of two (or three) digits, and a Mobile Subscriber Identification Number ("MSIN"), the latter two constituting a National Mobile Subscriber Identity ("NMSI") number.

The VLR 118 is a database containing information about all of the mobile units 130 currently located within the MSC/VLR service area 110. If a new MU 130 roams into the new MSC/VLR service area 110, the VLR 118

connected to that MSC 114 will request data about that MU 130 from the HLR database 160 (simultaneously informing HLR database 160 about the current location of MU 130). Accordingly, if the user of MU 130 then wants to make a call, or otherwise connect to PLMN Service Area 100, local VLR 118 will have the requisite identification information without having to reinterrogate HLR database 160.

As further illustrated in FIGURE 1, PLMN Service Area 100 also includes a Service Order Gateway ("SOG") 164, connecting HLR database 160 with a Customer Administration System ("CAS") 168, and a S/NP 170. CAS 168 allows a network administrator residing at S/NP 170 to modify the HLR database 160, on a subscriber basis, to reflect changes in the subscriber's status. For example, if a subscriber wants to alter the current level of perceptual QoS, thus altering the profile of the subscriber's MU 130, the network administrator at S/NP 170 may update the perceptual QoS level that the subscriber may access and send the updated information through CAS 168 and SOG 164 to the subscriber's data records in HLR database 160.

One metric used for gauging a particular perceptual QoS level by human perception is called the Mean Opinion Score ("MOS"). The MOS is obtained through subjective

tests on a human audience. For example, a conversation clip is transmitted over a communication channel and is recorded. Both the original clip and the received clip are played to an audience. The audience then scores the quality of the clip on a scale, for instance from 1 (bad) to 5 (excellent). An average of the scores given by the audience yields the MOS for that particular transmission. As an alternative to obtaining the MOS through human testing, the MOS may be obtained through computer analysis. For example, a computer program may be devised to analyze the two voice clips, as is done by the human audience, and to yield a MOS value. The computer program can be devised such that the computer program yields a MOS value which has a very high correlation with the subjective human test result.

With reference now to FIGURE 2 of the Drawings, there is illustrated therein a box-diagram further illustrating the features of a MU, generally designated by the reference numeral 130, according to an embodiment of the present invention. MU 130 includes processor 132, transmitter/receiver 134, which is used generally to send and receive signals to and from MU 130, and display 136. MU 130 may also include a perceptual QoS adjustment request button 138 for requesting an adjustment of a perceptual QoS level and a current perceptual QoS request

button 139 for requesting a current perceptual QoS level. A user's SLA with a S/NP may allow the user to adjust the user's perceptual QoS level within a given range.

The adjustment of the perceptual QoS level may affect the billing rate applied to a particular communications session. For example, a user with a MU 130 may be in a congested network area, such as a downtown in a large city. The user may receive a personal call on the MU 130 and not mind if the call is unclear or is dropped due to the congestion of the local network cell or location area. In this case, the user may wish to be billed at a lower rate for the lower priority call. Later, the same user may use the MU 130 to make a business call while still in the congested downtown area. In the later case, the user may not want the call interrupted or dropped. The user may then wish to request that the perceptual QoS level is increased to insure that the call will continue uninterrupted, even though the increased perceptual QoS level will raise the billing rate for that particular call.

The user may request an increase in the perceptual QoS level by engaging the QoS adjustment request button 138, as shown in FIGURE 2. The QoS adjustment request button 138 may be a physical button that the user can press or a virtual button, *i.e.*, a soft button, that the

user may engage by means of a pointer. The pointer may be, *e.g.*, a stylus on a PDA or a cursor pointer in a computer system. Once the user engages the QoS adjustment request button 138, a signal is sent to processor 132. Processor 132 interprets the signal as a request signal 133 for a change in perceptual QoS level and sends the request signal 133 to transmitter 134.

With reference now to FIGURE 3 of the Drawings, there is illustrated therein a diagram depicting the transmission of a request signal according to the principles of the present invention. The request signal 133 is transmitted to MSC 114 and VLR 118 in the user's current MSC/VLR service area 110. VLR 118, which contains information regarding the SLA and the current perceptual QoS level of MU 130, recognizes the request signal as a request for a change in the perceptual QoS level. The VLR 118 preferably determines whether granting the requested change would take the perceptual QoS level of the MU 130 outside of the authorized perceptual QoS level range specified by the SLA associated with the MU 130. If the requested change will take the perceptual QoS level outside of the parameters authorized by the mobile unit's 130 SLA, VLR 118 forwards a message to MU 130, by way of MSC 114, informing the user that the requested perceptual QoS level is not

available to the user. If the requested change would keep the perceptual QoS level within the range authorized for the MU 130, VLR 118 forwards the request signal 133, by way of MSC 114, to HLR database 160. HLR database 160, which contains information regarding the service provider for MU 130, forwards the request signal 133 to the appropriate S/NP 170, by way of SOG 164 and CAS 168.

S/NP 170 interprets the request signal 133 in perceptual QoS adjustment response module 172. S/NP 170 consults resource monitor 174 to determine whether the network resources are available to fulfill the user's request for a change in perceptual QoS level. If the resources are not available, *e.g.*, there is too much congestion in PLMN Service Area 100 to allocate increasing the quality or strength of a signal received by MU 130, request for the perceptual QoS adjustment response module 172 informs S/NP 170 that the request is denied. S/NP 170 in turn sends a return signal 135 by way of CAS 168 and SOG 164 to HLR database 160. The return signal 135 contains information that there is a limit on the perceptual QoS level available to MU 130. It is to be appreciated that the network conditions may be continuously monitored in case the network conditions change and granting of the request becomes possible. The information is stored in a user's current QoS entry 162

in HLR database 160. The limit information in the user's current QoS entry 162 enables a VLR 118 in any MSC/VLR service area 110 that MU 130 may happen to enter to easily determine the limit on the perceptual QoS level for that particular MU 130. HLR database 160 forwards the denial information to the appropriate VLR 118.

Alternatively, if resource monitor 174 informs request for perceptual QoS adjustment response module 172 at S/NP 170 that the resources are available to satisfy the user's request for change in perceptual QoS level, request for perceptual QoS adjustment response module 172 informs S/NP 170 that the request is granted. S/NP 170 then sends a return signal 135 by way of CAS 168 and SOG 164 to HLR database 160. The return signal 135 contains information regarding the new perceptual QoS level available to MU 130. The information is stored in the user's current QoS entry 162 in HLR database 160. The information in the user's current QoS entry 162 enables a VLR 118 in any MSC/VLR service area 110, that a MU 130 may happen to enter, to easily determine the new perceptual QoS level available to the MU 130. HLR database 160 forwards the new perceptual QoS level information along with new billing rate information for the new perceptual QoS level to the appropriate VLR 118.

Once a decision regarding the change in perceptual QoS level request has been made, VLR 118 in the current MSC/VLR service area 110 for MU 130 forwards the appropriate information by way of MSC 114 and base station 150 to MU 130, via a return signal 135. With reference now back to FIGURE 2 of the Drawings, the return signal 135 is received by receiver 134 and is interpreted by processor 132. If the return signal 135 indicates a denial of the request for a change in perceptual QoS level, processor 132 sends information to display 136 whereby the user is informed of the denial of the request. For example, the denial message may read, "INCREASED SERVICE IS NOT AVAILABLE AT THIS TIME." Usually, denials for change in perceptual QoS level will most likely occur when the request is for an increase in the perceptual QoS level since an increase will require the allocation of more resources to the MU 130.

Likewise, if the return signal 135 indicates a grant of the request for a change in perceptual QoS level, processor 132 sends information to display 136 whereby the user is informed of the grant of the request. For example, the display may show a message reading, "YOUR NEW SERVICE LEVEL IS X," where X is the new perceptual QoS level. Alternatively, the grant of the request may be indicated by simply displaying the new perceptual QoS

level without any additional explanation. The user may determine the new billing rate associated with the new service level by referring to his or her SLA with the service provider. Alternatively, the return signal 135 may include information regarding the new billing rate for display on display 136.

A user may wish to determine his or her current perceptual QoS level before requesting a change in perceptual QoS level or at any other time. With reference again to FIGURES 1 and 2, by engaging the current perceptual QoS request button 139, a user can request a current perceptual QoS level status. Engaging the current perceptual QoS request button 139 sends a request signal to processor 132. Processor 132 interprets the request signal and causes transmitter 134 to transmit the request signal. The request signal is transmitted by way of base station 150 and MSC 114 to VLR 118 in the current MSC/VLR service area 110 for the MU 130. VLR 118 contains information, obtained from HLR 160, concerning the current perceptual QoS level for MU 130. VLR 118 sends a return signal 135 by way of MSC 114 and base station 150 to MU 130. The return signal 135 contains information regarding the current billing rate associated with the current perceptual QoS level being utilized by MU 130. Receiver 134 receives the return

signal. Processor 132 interprets the return signal 135 and sends information to display 136 whereby the user is informed of his or her current service level and/or billing rate. Alternatively, the current perceptual QoS level may be continuously displayed using a bar in display 136.

With reference now to FIGURE 4 of the Drawings, there is illustrated therein a high-level flowchart, generally designated by reference numeral 400, depicting a method for user adjustment of perceptual QoS according to the principles of the present invention as described in FIGURES 1-3. The method 400 preferably includes the steps of a user requesting a change in a perceptual QoS level 410, a VLR receiving the request 420, the VLR determining whether the user is entitled to the requested change 430, if the user is not entitled to the requested change, a denial of the request 440, if the user is entitled to the requested change, a S/NP receiving the request 450, the S/NP querying a resource monitor for a current resource availability 460, the S/NP determining whether sufficient resources are currently available to fulfill the requested change 470, and if sufficient resources are available, granting the requested change 480.

A user of the MU 130 preferably requests a change in the currently perceptual QoS level (step 410). VLR 118 receives (step 420) the request signal 133 and determines whether the user is entitled to the requested change according to the user's SLA (step 430). If the user is not entitled to the requested change, VLR denies the requested change and informs the user, by way of return signal 135, that the requested perceptual QoS level is not available to the user (step 440). If the user is entitled to the requested change, VLR 118 forwards the request signal 133 to S/NP 170, which in turn receives the request signal 133 (step 450).

S/NP 170 queries (step 460) the resource monitor 174 for the currently available network resources and determines whether there are sufficient resources currently available to grant the requested change in perceptual QoS level (step 470). If the resources are not available, *e.g.*, there is too much congestion in PLMN Service Area 100 to allocate increasing the quality or strength of a signal received by the MU 130, the S/NP 170 denies the requested change and informs the user, by way of return signal 135, that the requested perceptual QoS level is not currently available, as described above (step 440). If the resources are available, the S/NP 170 grants the request, changes the user's perceptual QoS

level, and sends a message, by way of return signal 135, to MU 130 to inform the user of the changed perceptual QoS level, as described above (step 480).

With reference now to FIGURE 5A of the Drawings, there is illustrated therein a mobile phone, generally designated by the reference numeral 130, utilizing the principles of the present invention. MU 130 includes a display 136 for displaying messages, including messages regarding the perceptual QoS level currently used by the mobile phone. For instance, display 136 of the mobile phone shown in FIGURE 5A represents the current perceptual QoS level as a plurality of symbols, in this case parallel bars of differing lengths. MU 130 has perceptual QoS adjustment request button 138 for requesting an adjustment of the perceptual QoS level. In this example, the perceptual QoS adjustment request button 138 is a dual function button, such that pressing on one end sends an increase perceptual QoS level request while pressing on the other end sends a decrease perceptual QoS level request. MU 130 also has the current perceptual QoS request button 139 for requesting the current perceptual QoS level. In FIGURE 5A, the current perceptual QoS request button 139 is a single toggle button where a first press causes display 136 to

display the current perceptual QoS level while a second press returns the display to a standby mode.

With reference now to FIGURE 5B of the Drawings, there is illustrated therein a personal digital assistant (PDA), *e.g.*, a Palm Pilot, Casio® Pocket Viewer, Compaq iPAQ®, Handspring Visor®, etc., generally designated by the reference numeral 130, utilizing the principles of the present invention. MU 130, in this case a PDA, includes a display 136 for displaying messages, including messages regarding the perceptual QoS level currently used by the mobile phone. For instance, display 136 of the PDA displays the current perceptual QoS level as a numerical value, in this case as a rank of the current perceptual QoS level out of the maximum possible perceptual QoS level available to the user. MU 130 has a perceptual QoS adjustment request button 138 for requesting an adjustment of perceptual QoS level. In this example, the perceptual QoS adjustment request button 138 is actually two virtual soft buttons that are accessed through display 136. Stylus pointer 180, such as is common for use with PDAs, is used to engage the soft QoS adjustment request buttons 138. MU 130 also has the current perceptual QoS request button 139 for requesting the current perceptual QoS level. In FIGURE 5B, the current perceptual QoS request button 139 is not

shown, however, the current perceptual QoS request button 139 may be a soft button similar to the soft buttons shown in FIGURE 5B. In this example, the current perceptual QoS request button 139 can exist as a permanent soft button accessed through display 136 when display 136 is in a typical standby mode.

The present application may also be used by a user accessing the Internet through a personal computer or some other means. A user may wish to increase or decrease the speed and or delay of the reception of information in exchange for higher or lower costs depending on the nature of the Internet session. The speed may be of particular importance in the cases when Internet service is delivered through a wireless connection, where speed of delivery is directly related to cost. For instance, a user who is merely browsing the Internet for pleasure may not be concerned about receiving information at a rapid speed and perhaps expensive billing rate. On the other hand, a user who is accessing the Internet for businesses purposes or some other purpose where time may be a factor may wish to increase the speed at which information is being received regardless of the increased billing rate. Likewise, a VoIP user, using his or her computer as a telephone or as a fax machine, may wish to increase or decrease the

perceptual quality of the received voice or adjust the quality of the fax. Likewise a multimedia streaming service receiver may request the service provider to adjust the perceptual quality of the received signal.

With reference now to FIGURE 6 of the Drawings, there is illustrated therein an Internet network, generally designated by the reference numeral 600, utilizing the principles of the present invention. The Internet network 600, includes a plurality of local areas 607. Each local area 607 includes a plurality of user computers ("UCs") 610. UCs 610 are connected to a local web server 620 by way of a local exchange 630. Local exchange 630 may be the local telephone switching office, a coaxial cable switch, or a DSL switch. Each local area 607 is in communication with a regional service/network provider 640, which includes a resource monitor 650. Similar to MU 130, UCs 610 have a perceptual QoS adjustment request button 138 (not shown in Figure 6) for requesting a change in the perceptual QoS level. The perceptual QoS adjustment request button 138 may be a physical button, located for instance on a keyboard interface of UCs 610, such that a user need only press the appropriate button on the keyboard to make a request for a change in the perceptual QoS level. Alternatively, the perceptual QoS adjustment request button 138 may be a

virtual soft button located on the screen of UCs 610 and accessible by a cursor controlled by a mouse or some other tracking user input device. Likewise, UCs 610 may include a current perceptual QoS request button 139 for requesting a current perceptual QoS level. This button may also be either physical or virtual.

Engagement of the perceptual QoS adjustment request button 138 sends a request for change in perceptual QoS level to local web server 620 by way of local exchange 630. Local web server 620 may contain information relating to a SLA for the requesting UCs 610. Local web server 620 determines whether the requested change in perceptual QoS level falls within the SLA for the UCs 610. If the requested change exceeds the SLA for the requesting UCs 610, local web server 620 sends a message to the UCs 610 by way of local exchange 630 that the requested perceptual QoS level is not available to the user. If the requested change falls within the SLA for the requesting UCs 610, local web server 620 forwards the request to regional S/NP 640. S/NP 640 consults resource monitor 650 regarding whether the resources are available to fulfill the requested change in the perceptual QoS level.

If the resources are not available, regional S/NP 640 sends a return signal to local web server 620

indicating the denial of the request and a cap on the perceptual QoS level available to the UCs 610. Information in local web server 620 concerning the UCs 610 is updated to reflect the maximum perceptual QoS level available to the UCs 610. Local web server 620 then sends a return signal to the UCs 610, which displays the denial of the request to the user. If the resources are available, regional S/NP 640 sends a return signal to local web server 620 indicating the grant of the request. Information in local web server 620 concerning UCs 610 is updated to reflect the new perceptual QoS level to be used by UCs 610. Local web server 620 then sends a return signal to the UCs 610, which displays the new service level and/or billing rate to the user.

With reference now to FIGURE 7 of the Drawings, there is illustrated therein a UC 610, generally designated by the reference numeral 610, utilizing the principles of the present invention. UC 610 displays information to the user concerning the current perceptual QoS upon engagement of the current perceptual QoS request button 139. The current QoS request button 139 may be part of a keyboard 702 or may be a virtual button, which remains as part of the display that appears when the user accesses the Internet. For example, engaging the current perceptual QoS request button 139 may bring up a screen

on UC 610 similar to the one illustrated in FIGURE 7. The perceptual QoS adjustment request button 138 for adjusting the perceptual QoS level appears as part of the screen 610 as two virtual soft buttons. A mouse 704 may be used to control cursor 706 and to select the appropriate soft button for requesting an increase or decrease in the perceptual QoS level. The current perceptual QoS level is represented as a position 708 on a scale 710, which ranges from the lowest to highest allowed perceptual QoS level, Furthermore, pricing options associated with a particular perceptual QoS level may be made available to the user through a click here for pricing options 712 on screen 610, which may also be accessed using cursor 706 or some other means of selection. The perceptual QoS level may be maintained by continuously measuring the received perceptual QoS level and comparing the received perceptual QoS level with the quality level associated with the specified SLA and then returning the comparison information to the communications network. The communications network then maintains the perceptual QoS level by adjusting a number of parameters such as power control and transmission rate control.

The objects of this invention may be accomplished utilizing components known in the art. Furthermore, the

objects of the present invention may be accomplished by the operation of computerized system components implementable in hardware or software or in combination. Accordingly, a computer readable medium storing a program or containing instructions for realizing the objects of the present invention may be produced and is disclosed. Likewise, a processor with a memory containing instructions for realizing the objects of the present invention may be produced and is disclosed. The foregoing description of the present invention provides illustration and description, but is not intended to be exhaustive or to limit the invention to the precise one disclosed. Modifications and variations are possible consistent with the above teachings or may be acquired from practice of the invention. Thus, it is noted that the scope of the invention is defined by the claims and their equivalents.

The present application claims priority on a provisional application, U.S. Serial No. 60/240,434, entitled "System, Method and Apparatus for Quality Features for Mobile and Internet Terminals", filed on October 13, 2000, which is incorporated herein by reference.

(Industrial Applicability)

The present invention is applied to features for mobile, fixed wireless, and internet communications. In particular, the invention is applied to a system for user adjustment of the perceptual quality of service during a mobile communications session.

CLAIMS

1. An apparatus for modifying the perceptual quality of service (QoS) of a signal, the apparatus comprising:

a signal adjustment button;

a processing unit, in communication with said signal adjustment button, for processing a signal adjustment request from said signal adjustment button; and

a transmitter, in communication with said processing unit, for transmitting the signal adjustment request to a remote device, wherein the remote device modifies the signal.

2. The apparatus of claim 1, wherein the signal adjustment button is user controlled.

3. The apparatus of claim 2, wherein the signal adjustment button is a physical button.

4. The apparatus of claim 1, wherein the apparatus is selected from the group consisting of a mobile communications terminal, a personal digital assistant, and a computer system.

5. The apparatus of claim 4, wherein a user of the apparatus accesses the Internet.

6. The apparatus of claim 1, wherein the signal adjustment button is a virtual button.

7. The apparatus of claim 6, wherein the apparatus is selected from the group consisting of a mobile communications terminal, a personal digital assistant and a computer system.

8. The apparatus of claim 7, wherein a user of the apparatus accesses the Internet.

9. The apparatus of claim 1, wherein the remote device is a service/network provider center.

10. The apparatus of claim 1, further comprising a signal check button, wherein a user engages said signal check button to determine a current quality of service level.

11. The apparatus of claim 1, further comprising a display, wherein the current perceptual quality of

service and messages from said remote device are displayed.

12. An apparatus for modifying a signal, the apparatus comprising:

button means for requesting a modification of the perceptual QoS of the signal;

processing means, in communication with the button means, for processing a signal adjustment request from the button means; and

transmitting means, in communication with the processing means, for transmitting the signal adjustment request to a remote device, wherein the remote device modifies the signal.

13. The apparatus of claim 12, wherein the button means is user controlled.

14. The apparatus of claim 12, wherein the button means is a physical button.

15. The apparatus of claim 14, wherein the apparatus is selected from the group consisting of a mobile communications terminal, a personal digital assistant and a computer system.

16. The apparatus of claim 15, wherein a user of the apparatus accesses the Internet.

17. The apparatus of claim 12, wherein the signal adjustment button is a virtual button.

18. The apparatus of claim 16, wherein the apparatus is selected from the group consisting of a mobile communications terminal, a personal digital assistant and a computer system.

19. The apparatus of claim 18, wherein a user of the apparatus accesses the Internet.

20. The apparatus of claim 12, wherein the remote device is a service/network provider center.

21. The apparatus of claim 12, further comprising button means for assessing the signal, wherein a user engages the signal check button to determine a current quality of service level.

22. The apparatus of claim 12, further comprising display means for displaying, wherein the current

perceptual quality of service and messages from said remote device are displayed.

23. A system for modifying the perceptual QoS of a signal, comprising:

a signal adjustment button;

a network node, in communication with said signal adjustment button, wherein said network node interprets the signal adjustment request from said signal adjustment button and determines whether or not to grant said signal adjustment request; and

a module, in communication with said network node, wherein the grant of said signal adjustment request is implemented.

24. The system of claim 23, wherein said signal adjustment button is user controlled.

25. The system of claim 24, wherein said signal adjustment button is a physical button.

26. The system of claim 25, wherein said signal adjustment button is included in an apparatus selected from the group consisting of a mobile communications

terminal, a personal digital assistant and a computer system.

27. The system of claim 26, wherein a user of the system accesses the Internet.

28. The system of claim 23, wherein the signal adjustment button is a virtual button.

29. The system of claim 28, wherein said signal adjustment button is included in an apparatus selected from the group consisting of a mobile communications terminal, a personal digital assistant and a computer system.

30. The system of claim 29, wherein a user of the system accesses the Internet.

31. The system of claim 23, wherein the network node is a service/network provider center.

32. A system for modifying a signal, comprising:

button means for requesting a modification of the perceptual QoS of the signal;

processing means, in communication with the button means, for interpreting the request and determining whether or not to grant the request; and

transmitting means, in communication with the processing means, for implementing a grant of the request.

33. The system of claim 32, wherein said button means is user controlled.

34. The system of claim 32, wherein said button means is a physical button.

35. The system of claim 34, wherein said button means is included in a terminal selected from the group consisting of a mobile communications terminal, a personal digital assistant and a computer system.

36. The system of claim 35, wherein a user of the terminal accesses the Internet.

37. The system of claim 32, wherein said button means is a virtual button.

38. The system of claim 37, wherein said button means is included in a terminal selected from the group

consisting of a mobile communications terminal, a personal digital assistant and a computer system.

39. The system of claim 38, wherein said user of the terminal accesses the Internet.

40. The system of claim 32, wherein said processing means is a service/network provider center.

41. A method for modifying a signal, comprising the steps of:

requesting an adjustment of said signal, wherein a user requests a change in perceptual quality of service of said signal;

interpreting said request for adjustment of said signal, wherein a remote device determines whether said user is entitled to said change in perceptual quality of service of said signal and whether the resources are available for said change in perceptual quality of service of said signal; and

responding to said request for adjustment of said signal, wherein the remote device grants or denies the request for said change in status and informs said user accordingly.

42. The method of claim 41, wherein said request for adjustment of said signal is implemented with a signal adjustment button.

43. The method of claim 42, wherein said signal adjustment button is user controlled.

44. The method of claim 42, wherein said signal adjustment button is a physical button.

45. The method of claim 44, wherein said signal adjustment button is included in a terminal selected from the group consisting of a mobile communications terminal, a personal digital assistant and a computer system.

46. The method of claim 45, wherein said user of the terminal accesses the Internet.

47. The method of claim 42, wherein said signal adjustment button is a virtual button.

48. The method of claim 47, wherein said signal adjustment button is included in a terminal selected from the group consisting of a mobile communications terminal, a personal digital assistant and a computer system.

49. The method of claim 48, wherein said user of the terminal accesses the Internet.

50. The method of claim 41, wherein a service/network provider interprets said request for adjustment of said signal.

51. The method of claim 41, wherein a service/network provider responds to said request for adjustment of the signal.

FIG.1

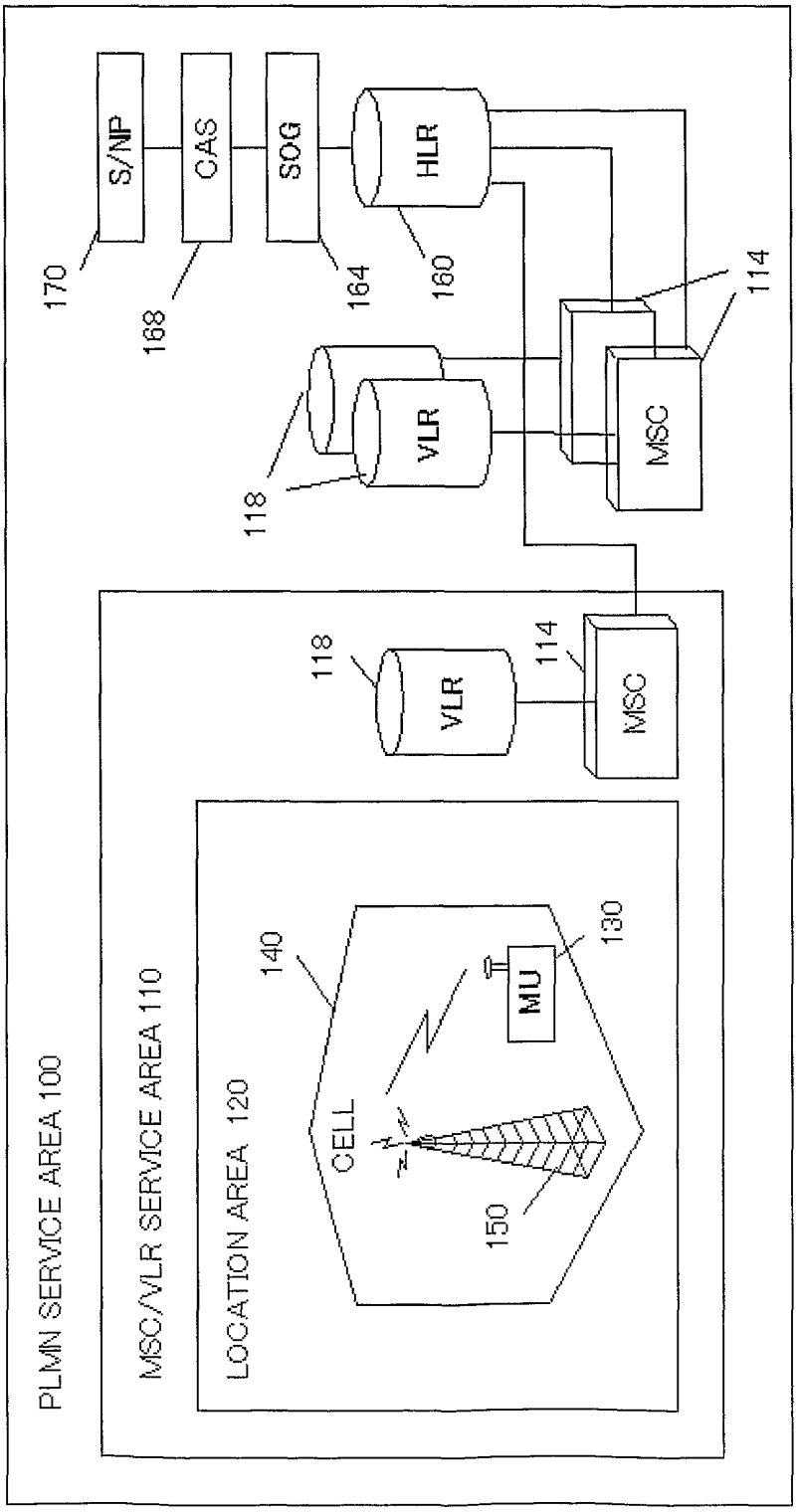

PLMN SERVICE AREA 100
MSC/VLR SERVICE AREA 110
LOCATION AREA 120
CELL
MU
S/NP
CAS
SOG
HLR
VLR
MSC
170
168
164
160
118
114
140
130
150

FIG.2

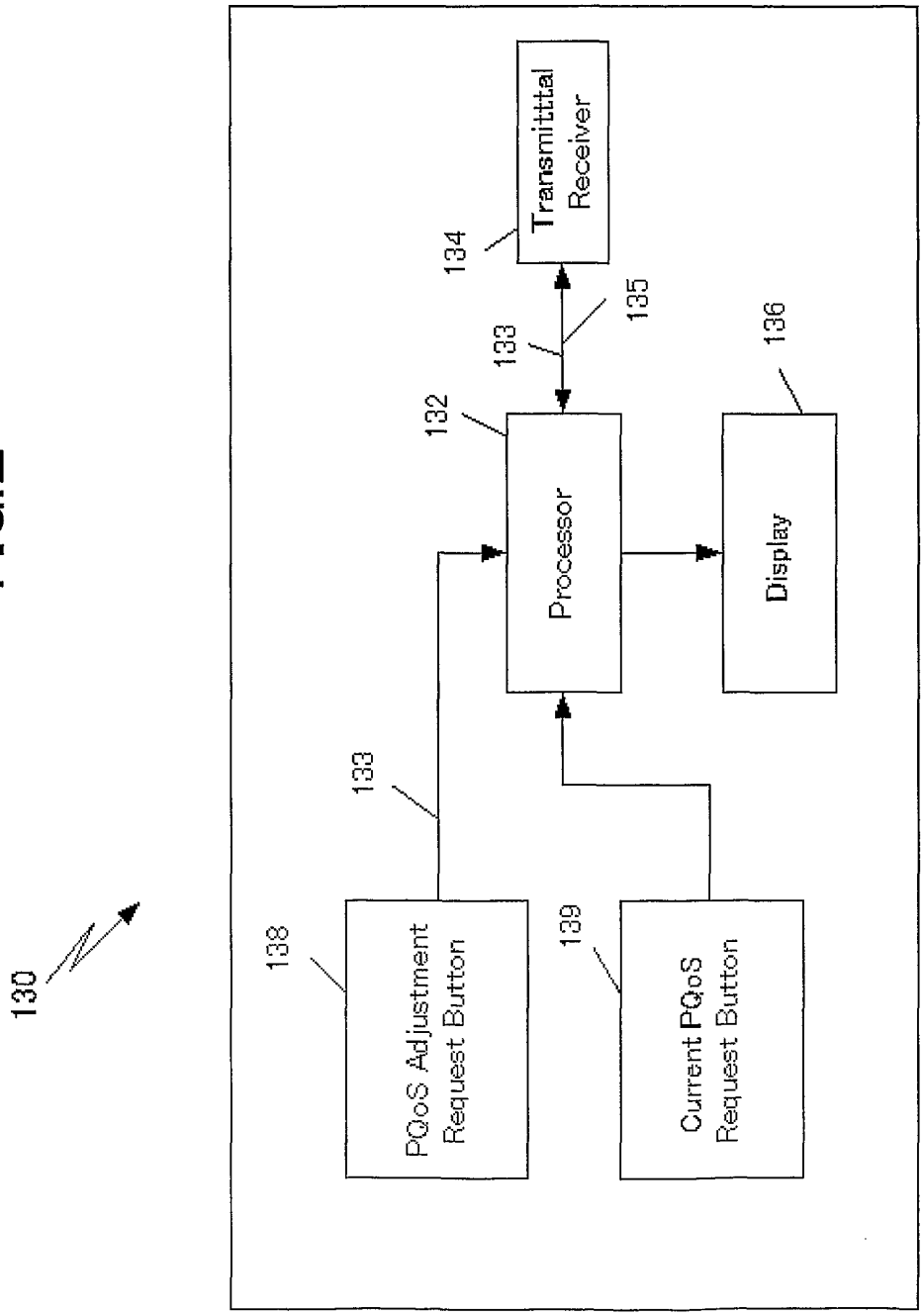

130
138
PQoS Adjustment Request Button
133
139
Current PQoS Request Button
132
Processor
133
135
134
Transmitttal Receiver
136
Display

FIG.3

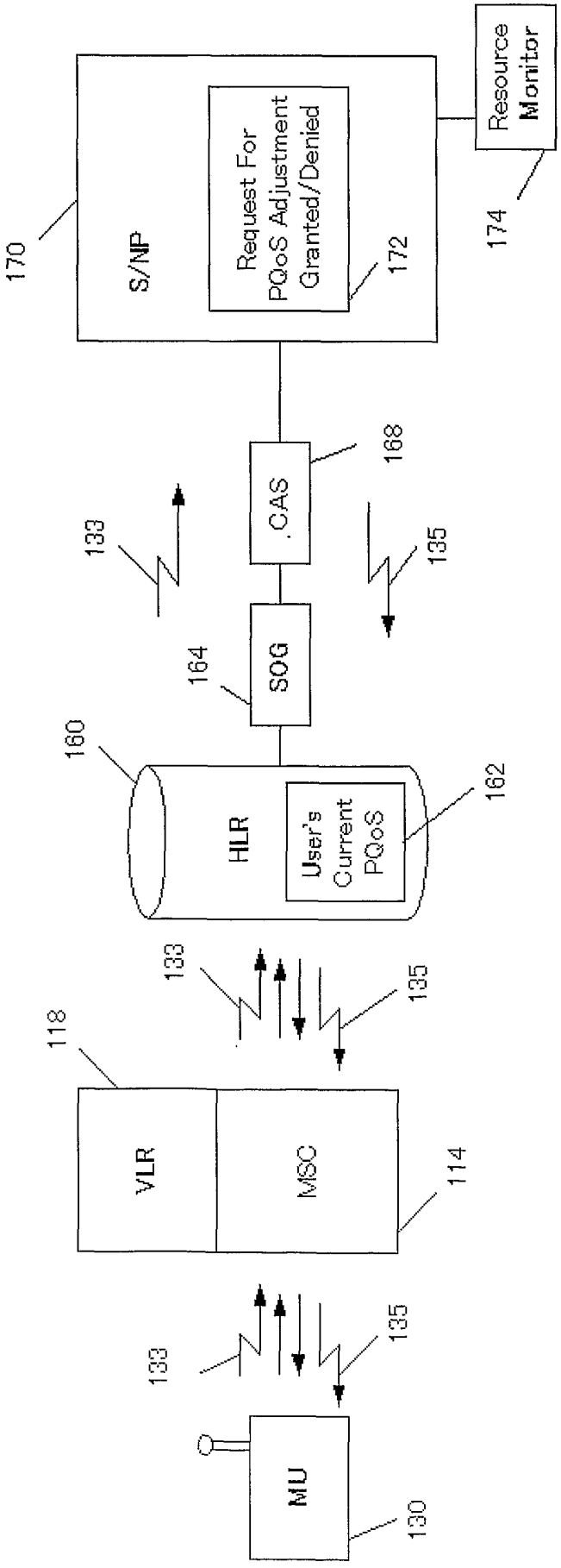

Resource Monitor
174
170
S/NP
Request For PQoS Adjustment Granted/Denied
172
168
CAS
133
135
164
SOG
160
HLR
User's Current PQoS
162
133
135
118
VLR
MSC
114
133
135
MU
130

FIG.4

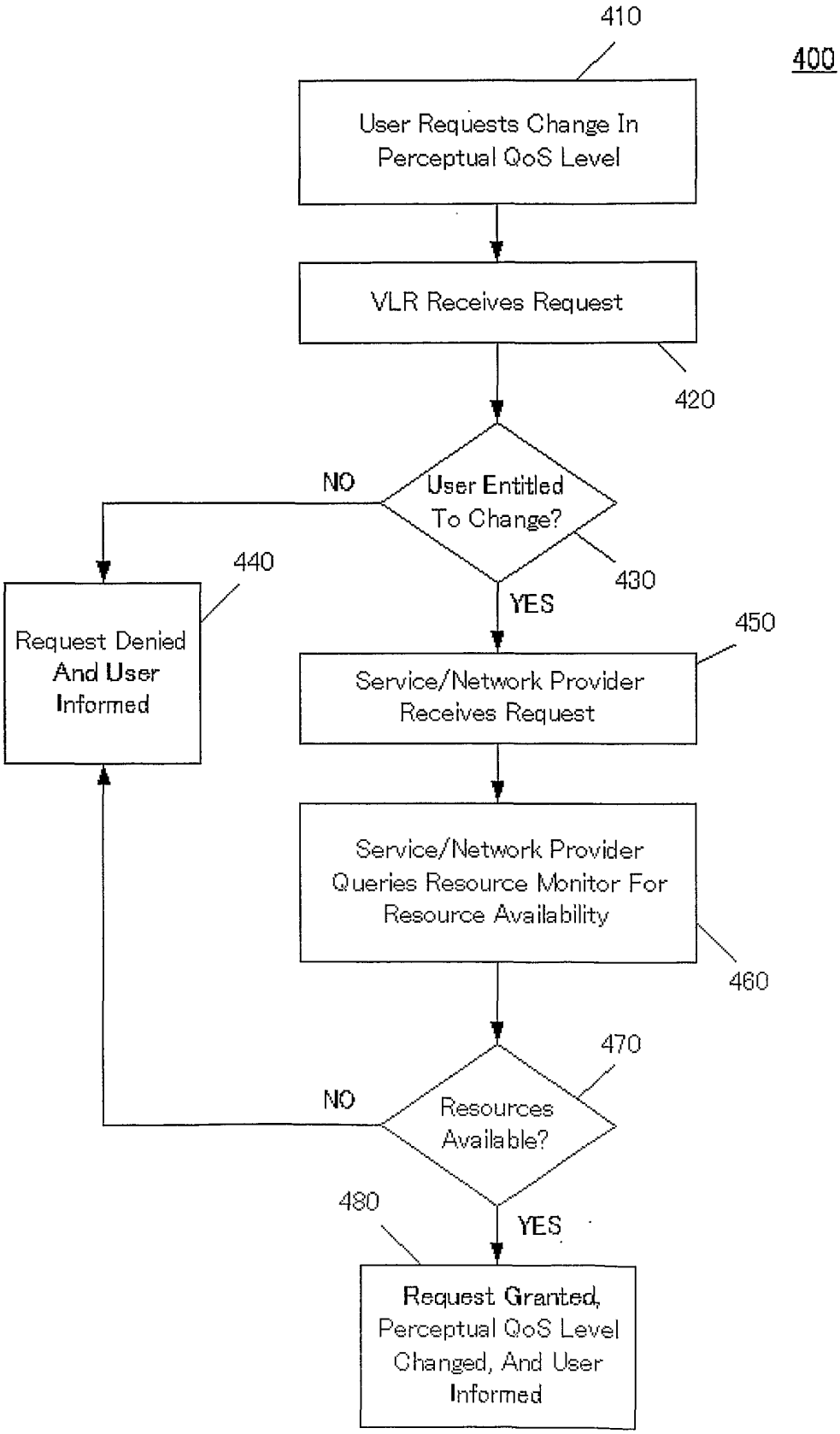

400
410
User Requests Change In Perceptual QoS Level
VLR Receives Request
420
User Entitled To Change?
NO
YES
430
440
Request Denied And User Informed
450
Service/Network Provider Receives Request
Service/Network Provider Queries Resource Monitor For Resource Availability
460
470
Resources Available?
NO
YES
480
Request Granted, Perceptual QoS Level Changed, And User Informed

FIG.5A

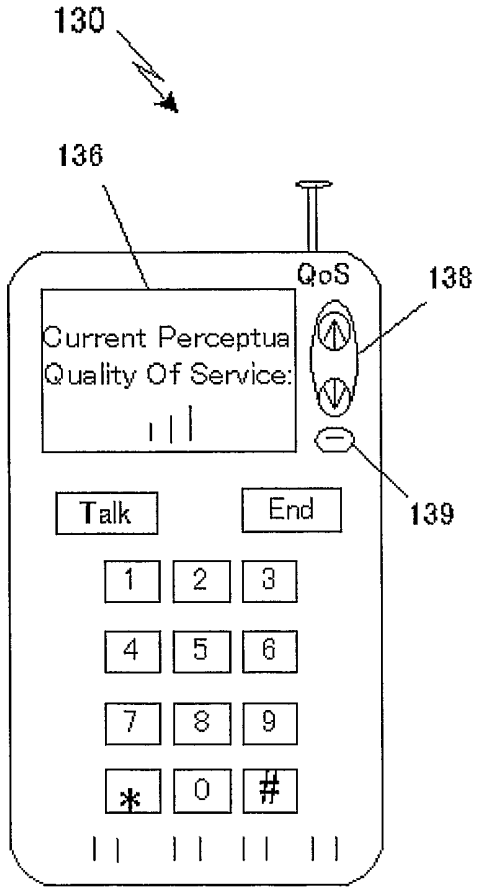

130
136
QoS
138
Current Perceptua
Quality Of Service:
139
Talk
End
1
2
3
4
5
6
7
8
9
*
0
#

FIG.5B

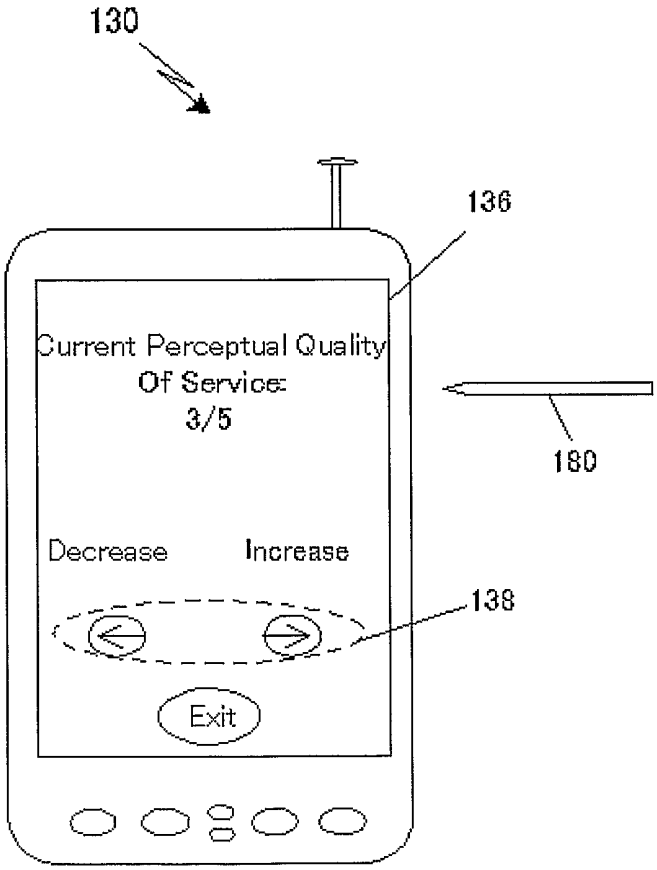

130
136
Current Perceptual Quality
Of Service:
3/5
180
Decrease
Increase
138
Exit

FIG.6

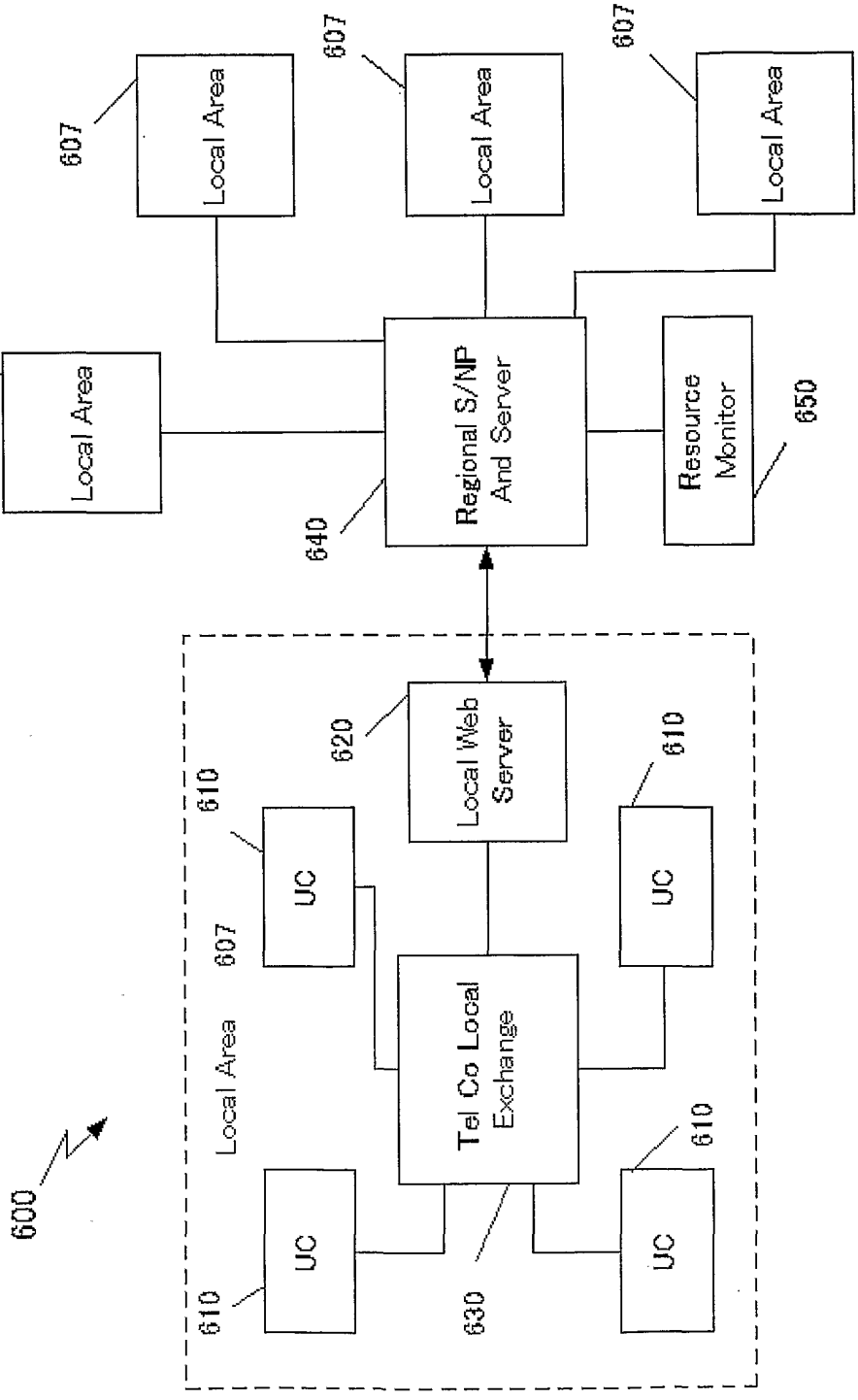
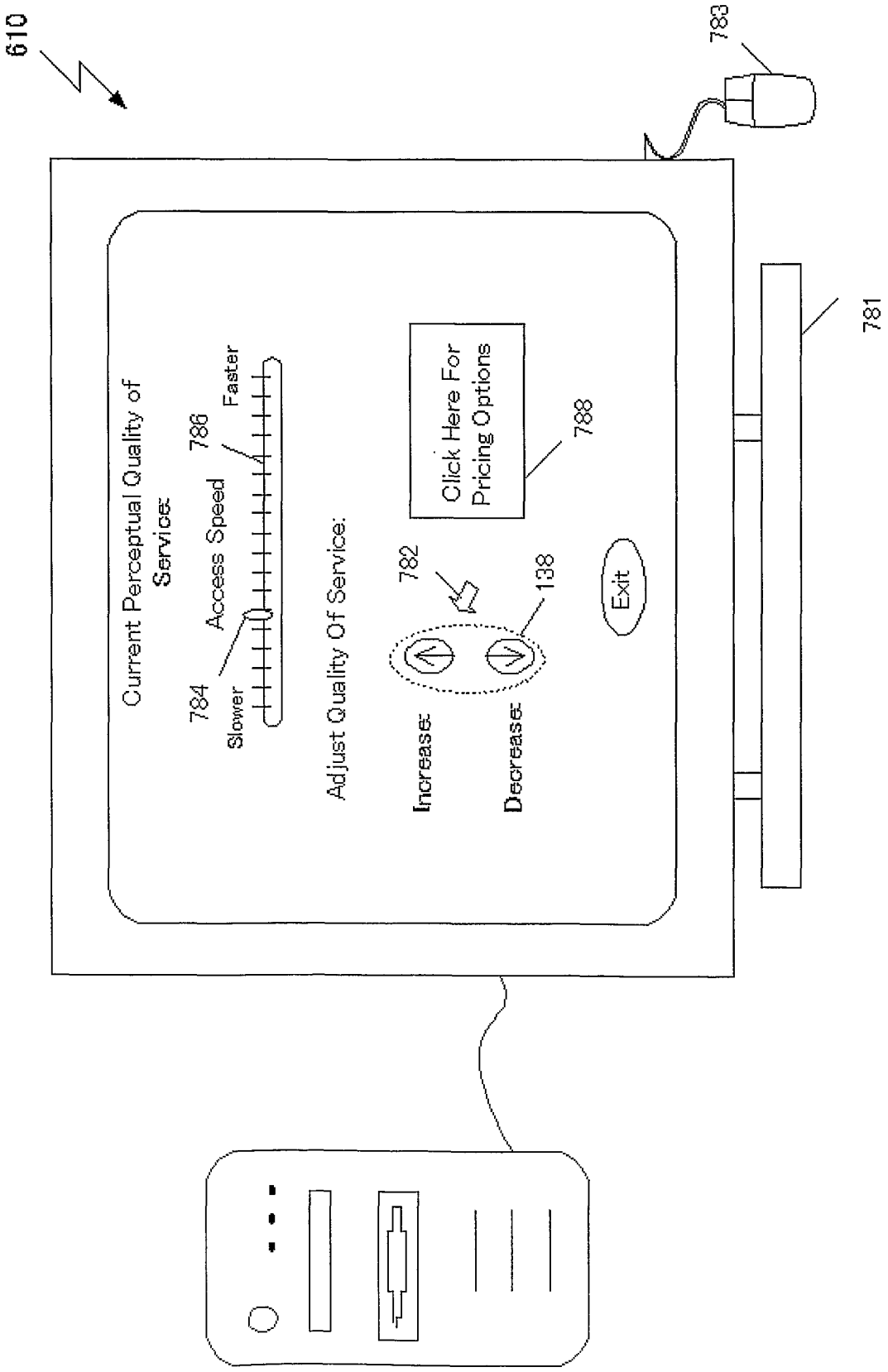

600
Local Area
607
Local Area
607
Local Area
607
Local Area
607
Local Area
607
Local Area
Regional S/NP And Server
640
Resource Monitor
650
Local Web Server
620
Tel Co Local Exchange
630
UC
610
UC
610
UC
610
UC
610

FIG.7


610
783
781
Current Perceptual Quality of Service:
Access Speed
786
Faster
784
Slower
Adjust Quality Of Service:
Increase:
Decrease:
782
138
Click Here For Pricing Options
788
Exit