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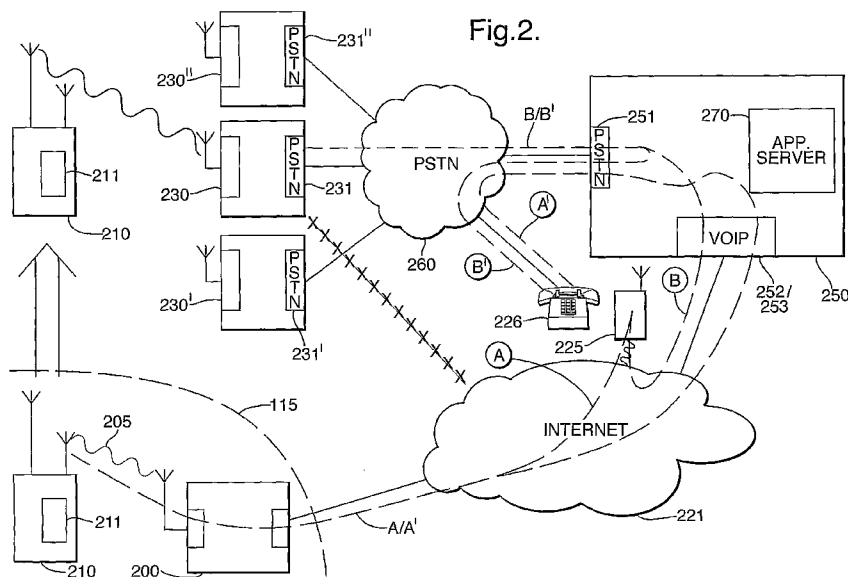
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(57) Abstract: Telephone calls may be transmitted over the PSTN but also using packet switched networks such as the Internet, e.g. using the VOIP protocol and gateways can be used to route calls between the two systems. A mobile handset capable of placing calls via the PSTN and the Internet has its call rerouted as follows. When it is decided to move the handset from VOIP to the PSTN the handset calls the gateway via the PSTN using a special access number associated with the gateway, which then identifies the handset from its CLI and then reroutes the call to the other party using the call placed to it by the handset as one leg of the new route.

TELEPHONY METHOD AND APPARATUS

The present invention relates to telephony.

5 Figure 1 shows a known arrangement in which a mobile handset 110 can, for carrying a voice conversation, utilise both the usual voice wireless communication system of GSM and an 802.11 wireless link (also known as "WiFi"), which carries packet data using the Internet
10 protocol (IP). This arrangement is according to the UMA standard and it operates as follows.

A user of the system is provided with a special router unit 100 for installation in their home. This comprises
15 an ADSL modem for providing a connection to the Internet via ADSL, a WiFi base station for communicating with a user handset 110 and telephony control unit 103. The user's handset 110 is also capable of using the wireless voice communication system of GSM for calls while user,
20 with handset, are away from home.

When the user wishes to place a telephone call to a destination 125 on the public switched telephone network he dials the number on the handset. This request is
25 relayed over the WiFi link 105 to the telephony control unit 103 which then routes the call over the Internet 120 to the service operator's network 130. The call is carried from the user's handset 110 to the operator's network using the voice over IP protocol (VOIP). The
30 operator's network then routes the call over the PSTN network using a PSTN switch 131.

The special router box 103 also provides a mechanism for handling the situation where the user moves away from it

out of the range of the WiFi link, which range is symbolised by the dashed line 115, the Figure also showing the handset 110 in its new position outside that range. The user will want to continue the conversation
5 and the system allows that by rerouting the call via a GSM link 135 set up between the handset and the nearest GSM base station 132 of the service operator's network, without the user having to reconnect the call. The route of the call is then via the GSM link to the operator's
10 network 130 and from there via the operator's PSTN switch to the destination 125.

In detail this rerouting of the call, or "handover", is achieved as follows. While the call is in progress using
15 the WiFi link 105 the telephony control unit 103 in the special router box 100 monitors the connection between the router box 100 and the handset 110; when that is broken because the handset has moved out of range the telephony control unit responds by signalling a handover
20 control unit 133 in the operator's network. In turn the unit 133 requests the nearest GSM base station 132 of the operator's network to establish a voice link with the handset 110, which is done in such a way as not to cause the handset to ring, and then reroutes call, which is
25 still established to the destination 125, the path of the call then being from the handset 110 via the GSM link 135, the operator's GSM base station 132, and the operator's PSTN switch to the destination 125.

30 Disadvantages of this handover system are that it relies on the installation of a special box 100 at the user's home and limits the service to the customers of the mobile operator, whose base station 132 has to cooperate

with the special box and be able to establish a GSM voice link without the handset ringing.

The present invention provides a telephony system and
5 components thereof as claimed in the appended claims.

Examples of the invention will now be described, with reference to the accompanying drawings, of which

- 10 FIGURE 1 is block diagram of an example of a known telephony system providing handover between WiFi and GSM connection to the user's handset,
FIGURE 2 is a block diagram of a new telephony system providing handover between WiFi and GSM that
15 is in accordance with the invention,
FIGURE 3 shows the components of the client telephony program,
FIGURE 4 shows the components of the gateway, and.
FIGURE 5 shows an example of the telephony system
20 according to a second aspect of the invention.

Figure 2 shows a telephony system having a handover system in accordance with the present invention. In this system the user has again a handset that is capable of
25 forming WiFi and GSM links. In fact the WiFi link may alternatively be any kind of link that provides IP connectivity to the Internet (or in principle connectivity to a packet data network, public or private, having a VOIP telephony provider connected to it), which
30 link may include Bluetooth, or a wired connection such as a USB cable to an Internet connected computer or a LAN cable, or even mobile packet data such as GPRS. The GSM link may, in fact, be any kind of wireless mobile telephone link capable of carrying voice calls, such as

UTMS or CDMA; in various parts of the world such networks are known by their users as "mobile phone" or "cell phone" (or even "satellite phone") networks.

5 In this system voice calls can be made from the user telephone apparatus 210, usually a handset 210, via the Internet and will probably be made by the user via that route in preference to the mobile phone network on grounds of cost. (GPRS could be used for the packet
10 switched voice call but is at present expensive; in future, however GPRS may be billed at a fixed monthly cost and then be economic for that - the dotted line in marked with a "+" symbol in Figure 2 shows the path of GPRS data to the packet switched data network). A client
15 telephony control unit 211, preferably in the form of a client telephony program, is provided on the user's handset 210. This maintains its own contacts list and when the user selects a contact gives him the option of calling either via the packet switched network 221 or via
20 the mobile phone network. (The client program 211 maintains its own contacts list but could in principle utilise the standard one kept by the standard software of the user telephone apparatus 210.) If the user chooses the packet switched network then the call is placed via
25 that route. In Figure 2 the Internet 211 is shown as by far the most likely example of the packet switched network. Also as an example the user handset is shown to have its connectivity to that network via a combined WiFi and ADSL modem router 200. Note that this is an ordinary
30 such unit providing a connection for packet switched data and, unlike the known system of Figure 1, does not require any modification to be used in the present invention.

The communication of telephone calls over packet switched data networks is usually called Voice over IP (VOIP) and protocols for establishing calls and communicating the voice data itself are well known and include standards such as H.323 and SIP. In many VOIP arrangements and in this example calls are established via the intermediary of a server, in this case gateway 250, that is connected to the packet switched network. This maintains user accounts, presence information such as whether the user is online or wishes to receive calls, and the current network address of the user's telephone apparatus. Once a call is established with another user's telephone apparatus 225 (for example a handset or a PC softphone) the transfer of the voice data is usually directly between the two telephone apparatus (i.e. 210 and 225) but can be via some intermediary. The telephone call made by the handset 210 can also be to a user telephone apparatus that is reachable via the gateway 250, for example user telephone apparatus 226 which is reachable via the gateway's PSTN switch 251, in which case the voice call is carried between the user telephone apparatus 210 and an interface 252/253 of the gateway via the Internet and between the gateway 250 and the other user telephone apparatus 226 via the PSTN 260 (public switched telephone network), the gateway translating the data between the two. Such connections to PSTN destinations are already provided by many VOIP services. In the Figure dotted paths for telephone connections in the two destination cases (225 and 226) are marked with dotted lines marked A and A'.

The present invention deals with switching the connection of a call involving the user telephone apparatus 210 away from its connection to the packet switched network 221

and rerouting it to use a connection over the mobile phone network. As will be seen, it is not relevant to this process whether the call was made from the user telephone apparatus 210 or was made to it. Further it
5 does not matter whether the other user telephone apparatus 225 or 226 is connected directly to the packet switched network 221 or is on some other network, reached via the gateway 250.

10 When a decision is made to switch the call the client telephony program 211 causes the user telephone apparatus 210 to place a call via the mobile telephone network to the gateway 250. This call is connected via the
15 basestation 230 to which the user subscribes. The system would work equally well with any other mobile phone operator having a base station 230' or 230'' in the area, if the user were to subscribe to one of those. The client telephony program 211 makes the call to the gateway 250 using a PSTN telephone number with which it has been
20 preset or of which has been notified by the gateway, which PSTN telephone number is associated with its PSTN switch 251. The gateway may wish to update the number used because of congestion on that number (the number preferably being one that can receive many different
25 separate calls simultaneously from many users) or because the gateway has changed its connection to the PSTN 260 , or for security, reliability or cost reasons. The mobile phone network routes that call via its PSTN switch 231 to the PSTN 260 generally, which routes it to the PSTN
30 switch 251 of the gateway 250. On receiving the call the gateway immediately connects it to the other telephone apparatus 225 or 226 that was involved in the original call. To do this the gateway first identifies the user telephone apparatus 210 from its caller line ID (CLI),

which is provided automatically by the mobile telephone network, or from some other identifying code provided by the client program 211 via the mobile telephone route. The gateway uses the identity of the telephone apparatus 5 210 making the new call via the mobile telephone apparatus to look up the identity of the other user telephone apparatus 225 or 226 that was involved in the original call. The gateway 250 knows the identity of the other telephone apparatus from its role in establishing 10 the original call. In the case of the telephone apparatus 225 that is connected to the packet switched network 221 the gateway accepts the new mobile call and informs the telephone apparatus 225 that the call is being continued using voice data packets that it will supply and that the 15 telephone apparatus 225 should send its voice data packets to the packet data interface 252 of the gateway; the gateway then forwards the voice data between the new mobile phone call and the packet switched network connection to the user telephone apparatus 225 in both 20 directions, translating it as necessary. In the case that the original call is with user telephone apparatus 226, which is connected to the PSTN, the gateway informs its PSTN switch 251 that the end of the original call connected to the apparatus 226 should be connected to the 25 new call from the mobile telephone network. The handover using this system can be achieve very quickly leaving the user with little or no impression of interruption of the call.

30 In Figure 2 the call paths marked B and B' are those after the handover has taken place.

The telephony client software 211 both allows the user of the user telephone apparatus 210 to initiate the handover

manually and is arranged for it to carry out the handover automatically, which method being used on any particular occasion being according to a user setting of the program 211. As a basis for the automatic decision and to provide
5 relevant information and/or a prompt to the user the client telephony program 211 monitors packet loss over the packet switched network 221. To that it end sends test packets, preferably at the rate of 10 per second to the gateway 250 via the packet switched network; these
10 the gateway 250 by sending back answer packets, which if they are not received are counted by the client software 211 as a loss. For an automatic transfer, going over a threshold of preferably 30% loss for a period of a second seconds is used by the client telephony program 211 to
15 trigger the switch. For the manual handover mode the client program 211 displays on a screen of the user telephone apparatus 210 a packet loss meter and prompts the user to make the switch if the packet loss exceeds the threshold.

20

In an alternative example of the packet loss monitoring the packet loss of the voice data packets themselves rather than the specially provided test packets is used.

25 The system also allows a handover of a call to be made in the other direction, i.e. rerouting the end of a call that is at user telephone apparatus 210 from being via the mobile telephone network to being via the packet switched network 211. The handover is performed by the
30 gateway 250, and the mobile calls that it is able to reroute are ones that are routed through it. This may arise in at least two ways. First the call may have been previously switched from connecting the user telephone apparatus 210 via the packet switched network to the

mobile network in the manner described above. Second the original call may have been initiated using gateway 250; this may happen for example when the user telephone apparatus 210 is used to dial an access number via the
5 PSTN which makes the call to the gateway and then a final destination is specified using the user telephone apparatus 210 using its number dialled with DTMF tones (or in some other manner), the gateway responding by making a call to that PSTN number and linking that to the
10 mobile call. This process is a further aspect of the invention, which is described later below.

When a decision is made to switch the end of a call involving the user telephone apparatus 210 from the
15 mobile network to the packet switched network, the client telephony program 211 sends a request via the packet switched network for to the gateway, which then responds by rerouting the call. In the case where the other end of the call is a user telephone apparatus 226 on the PSTN it
20 instructs its PSTN switch 251 to drop the mobile part of the call, while maintaining the part to the user apparatus 226 which it links to a VOIP connection over the packet switched network 221 that it creates between its packet switched network interface 252/253 and the
25 user apparatus 210.

The client telephony program 211 allows the handover of the end of the call at the user telephone apparatus 210 from being via a mobile phone network to being via the
30 packet switched network to be either manually initiated or automatic. When the user telephone apparatus 210 makes a connection to the packet switched network, for example when it comes in range of a WiFi network or a cable is connected to the phone, the operating system of the phone

notifies the telephony client program 211, which then begins the packet loss monitoring procedure described previously above, preferably displaying the packet loss meter on the screen of the user telephone apparatus 210.

- 5 If the packet loss is below a threshold it either prompts the user to initiate the handover or initiates it automatically (depending on a user setting).

The above examples refer to the handover of voice
10 telephone calls. However the invention also handles the handover of video telephone calls in the same way.

Figure 3 shows the components of the client telephony program 211. The functions of the invention of provided
15 to user telephone apparatus 210 by the program may of course be provided as hardware but a program is used for preference, in particular one that may be downloaded to the user telephone apparatus 210 since that is a simple and effective way of upgrading these devices. Many user
20 handsets allow programs to be downloaded in this way, either receiving the new program via a mobile data service, such as GPRS, or via a connection to a personal computer (PC), e.g. Bluetooth or a USB cable.

25 The client program 211 controls the hardware/software components of the user telephone apparatus 210, which components typically comprise, a mobile radio unit 209 which provides radio connections for mobile telephone calls and in some cases GPRS packet data, a mobile
30 telephone call control unit 208 which coordinates the operation of the apparatus to make calls and to respond to user input and to present information and audio to the user, a user interface 207 including an audio interface of speaker and microphone, a display screen and keys for

user input, a packet switched data unit 206 which provides a general packet switched data service which can connect to a packet switched network via various means, for example, a WiFi radio interface 204, a USB cable connection or a packet data transport provided by the mobile radio interface 209 (e.g. GPRS). The apparatus 210 also provides an application programmer's interface (API) 202 which allows additional programs, such as client telephony program 211 to use and control the hardware/software of the apparatus 210. The API 202 includes an interface 201 for packet data.

The client telephony program has an application program 212, which coordinates the operation of the handover functions described above as well as the basic VOIP calling functions of a softphone. It also includes an H323 VOIP unit 213 and a standard codec 214 for making and receiving VOIP calls (although of course non-standard VOIP protocols and non-standard codecs could be used), a packet loss monitor 215 for issuing the test packets to the gateway 250 and monitoring the results as described previously, and a presence protocol unit 216, which communicates with the gateway 250 to log the user into their account at the gateway, inform the gateway whether the user wishes to receive VOIP calls, and of the current network address of the user's telephone apparatus on the packet switched network 221.

Figure 4 is more detailed block diagram of the gateway 250. This includes the PSTN switch 251 for routing PSTN telephone calls (and PSTN legs of telephone calls) and the router 253 for providing an interface to the packet switched network 221. The gateway also includes an application server computer 270 linked to the switch and

the router by a local area network (LAN) 254. The application server provides the gateway with its functionality to provide the known basic VOIP services of coordinating the set up of VOIP calls and a gateway for such calls to the PSTN, and also of the new handover functions of the invention described above. The application server includes the software components shown in the Figure. Application program 255 coordinates and controls the operation of the other software components and also that of the switch 251 to provide the functionality. User account manager 256 maintains a list of user accounts and provides log in facilities. The presence information unit 257 maintains information as to whether the users are online, wish to receive VOIP calls etc. The packet loss responder 258 replies to the test packets sent from the user telephone apparatus, such as 210. The VOIP unit 252 (In Figure 2 items 252 and 253 were shown as one box) coordinates the set up of VOIP calls between users on the packet switched network and provides an endpoint for VOIP legs of calls that the gateway is bridging between the packet switched network and the PSTN. The data converter 259 converts, between VOIP and PSTN formats, the data for the calls being so bridged. Active call list 261 maintains a list of the endpoints of the telephone calls in progress; for VOIP connected user telephone apparatus the IP address of the user telephone apparatus is recorded and for PSTN connected calls legs the telephone number is recorded. The handover call unit coordinates the handover functions described above, being responsive to incoming mobile calls to the special handover number received by the PSTN switch or requests from the user telephone apparatus received by the packet switched network to initiate the

handover and utilising the information in the active call list 261.

An example of the second aspect of the invention is now
5 described. This aspect of the invention relates to the making of calls from mobile user telephone apparatus using the mobile telephone network at the originating end of a call to destinations using VOIP at that end. Figure 5 shows a user telephone apparatus 210' having a user
10 telephony client program 211' loaded. This may include the functionality and components described above for the user telephone apparatus 210 but only those particularly relevant to this aspect of the invention are shown in Figure 5. The telephony client program 211 includes an
15 application program 212' which coordinates the provision of the new functionality of the present aspect of the invention utilising the software components of telephony client program 212' and the hardware/software of the user telephony apparatus 210' via an API 202.

20 Providing a VOIP user with individual PSTN telephone number and allowing PSTN users to dial calls to that number via a gateway having a PSTN switch with which that telephone number is associated and that bridges PSTN
25 calls to that number to the VOIP user over a VOIP leg is known. However this aspect of the invention proceeds differently. The client telephone program 211' maintains its own contacts list 217. When the user selects one of the contacts and indicates that a call is to be made to
30 that contact a dialler component 218 dials an access number associated with the PSTN switch 251 of the gateway 250. At the gateway 250' a PSTN to VOIP set-up component 262 recognises that the telephone number is the access number and accepts the call. It then listens for DTMF

tones. At the user telephone apparatus the dialler then causes the user telephone apparatus to emit an ID number, identifying that destination, which is recorded in the contacts list, using DTMF tones.

5

The ID number may be signalled by other means. One alternative is single stage calling in which the ID number is appended to and sent as part of the access number when dialler calls the access number. This still
10 calls the access number and the call is received by the PSTN switch at gateway where the excess digits (i.e. the ID number) are available to the gateway for use in redirecting the call. Another method, which is available in GSM at least, is that the in the protocol to make a
15 request to make a call has a private field available in which the ID number is stored and from which the PSTN switch at the gateway can retrieve it.

The ID number is associated with a telephone apparatus
20 225 that is connected to the packet switching network 221 and that has an account at the gateway 250, and the component 262 then causes the VOIP unit 252 to call that apparatus 225 using VOIP and bridges the incoming mobile call to that call. The path of the call is then as marked
25 in Figure 5 with a dotted line. The ID number for the purpose is also stored at the gateway with the destination telephone apparatus' account details. Since the PSTN does not respond to the ID number, its form is not dependent on that, however for reasons of user
30 familiarity it could be presented in that form; however it is not necessary for the users to see the ID number, if for example the client telephone program, when it is connected to the packet switched network 221, obtains it with an update of its contacts list from the gateway.

In order to keep charges to the user low the system provides a separate gateway in each billing area, which is usually a country, the gateway having a local access
5 number in that area. The dialler stores a list of these and selects one either as a user choice or from information about the present locale of the user telephone apparatus 210' obtained from the mobile phone network 230.

10

The use of a downloadable client program 211' again means that mobile user telephone apparatus' can be easily updated. When the client program 211 also provides a VOIP call service via the packet switched network this aspect
15 of the invention provides a useful extension to that service, namely that when the user can easily call his VOIP connected contacts even when his user telephone apparatus is not connected to the packet switched network (for example, it has moved out of WiFi range). Indeed the
20 use of a mobile telephone call could be made transparent, the dialler choosing, when the user indicates that a contact is to be called, a VOIP call if available and a mobile call via the gateway if not; preferably however the application program 213' is arranged to prompt the
25 user first before a mobile telephone call is placed, owing to the expense.

The client program 211' maintains its own contacts list but could in principle utilise the standard one kept by
30 the standard software of the user telephone apparatus 210'.

Again in this aspect of the invention may be applied to voice calls and video calls equally.

CLAIMS:

1. A telephony system comprising:

a mobile telephone network including at least one wireless base station for providing telephone call connections to user mobile telephone apparatus,

a packet switched data network,

a gateway connected to the mobile telephone network and to a packet switched data network and capable of connecting telephone calls over those networks, and

a user telephone apparatus comprising:

(a) wireless mobile telephony hardware allowing telephone call connections to a mobile telephony base station of the mobile network,

(b) a packet switched network data interface allowing packet switched data to be transmitted between its user telephone apparatus and stations on the packet switched network, and

(c) a telephony control unit arranged to:

(i) communicate a telephone call via the packet switched data network interface with a user telephone apparatus reachable via that route, that being in a way that identifies, to the gateway the two user apparatus that are connected by the telephone call, and

(ii) in response to a decision to switch the routing of the said telephone call, place a mobile telephone call via the wireless mobile telephony hardware to the said gateway,

wherein the gateway is arranged to respond to that mobile telephone call by rerouting the original telephone call between the two telephone apparatus.

2. A telephony system as claimed in claim 1 wherein the gateway is arranged to respond to the mobile telephone call by rerouting the original telephone call to use the mobile telephone call as the leg between the gateway and the user telephone apparatus.

3. A telephony system as claimed in claim 1 or claim 2 wherein the gateway is arranged to reroute calls in the said manner for calls where the leg connecting the other user telephone apparatus of the original telephone call is via the public switched telephone network.

4. A telephony system as claimed in any preceding claim wherein the gateway is arranged to reroute calls in the said manner for calls where the leg connecting the other user telephone apparatus of the original telephone call is via the public switched telephone network.

5. A telephony system as claimed in any preceding claim wherein the gateway is responsive to the caller line ID of the user telephone apparatus to identify the original telephone call.

6. A telephony system as claimed in any preceding claim wherein the telephony control unit comprises a packet loss monitor arranged to monitor loss of packets communicated with the packet switched network.

7. A telephony system as claimed in claim 6 wherein the packet loss monitor is arranged to send test packets for the purpose of monitoring the packet loss.

8. A telephony system as claimed in claim 7 wherein the gateway comprises a packet loss responder arranged to send packets in answer to the test packets.

9. A telephony system as claimed in claim 6 wherein the packet loss monitor is arranged to monitor the loss of packets of call video or voice data.

10. A telephony system as claimed in any one of claims 6 to 9 wherein telephony control unit is arranged to take the decision initiating the mobile telephone call in response to the level of packet loss found by the packet loss monitor.

11. A telephony system as claimed in any one of claims 6 to 10 wherein the telephony control unit is arranged, in response to the level of packet loss found by the packet loss monitor, to prompt the user to take a decision to reroute the call and is arranged to initiate the mobile telephone call in response to user input to do that.

12. A telephony system as claimed in any preceding claim wherein the mobile telephone call is to a telephone number that is associated with the gateway and that the user telephone apparatus has stored.

13. A telephony system as claimed in claim 12 wherein gateway is arranged to update telephone number that is used to make the mobile telephone call and that is stored in the user telephone apparatus.

14. A user telephone apparatus comprising:

wireless mobile telephony hardware allowing telephone call connections to be made via a mobile telephony base station,

a packet switched network data interface allowing packet switched data to be transmitted between the user apparatus and stations on a packet switched network, and

a telephony control unit arranged to:

(i) communicate a telephone call via the packet switched data network interface with a user telephone apparatus reachable via that route, that being in a way that identifies, to a gateway connected to the packet switched data network, the two user apparatus that are connected by the telephone call, and

(ii) in response to a decision to switch the routing of the said telephone call, place a mobile telephone call via the wireless mobile telephony hardware to the said gateway, that is also reachable via that route, and that is capable of rerouting the original telephone call between the two telephone apparatus in response to the mobile telephone call placed the telephony control unit.

15. A user telephone apparatus wherein the telephony control unit is arranged to continue the original call using the mobile call it has placed, the gateway bridging that mobile telephone call to the other user.

16. A user telephone apparatus as claimed in claim 14 or claim 15 wherein the telephony control unit comprises a packet loss monitor arranged to monitor loss of packets communicated with the packet switched network.

17. A user telephone apparatus as claimed in claim 16 wherein the packet loss monitor is arranged to send test packets for the purpose of monitoring the packet loss.

18. A user telephone apparatus as claimed in claim 16 wherein the packet loss monitor is arranged to monitor the loss of packets of call video or voice data.

19. A user telephone apparatus as claimed in any one of claims 16 to 18 wherein telephony control unit is arranged to take the decision initiating the mobile telephone call in response to the level of packet loss found by the packet loss monitor.

20. A user telephone apparatus as claimed in any one of claims 16 to 19 wherein the telephony control unit is arranged, in response to the level of packet loss found by the packet loss monitor, to prompt the user to take a decision to reroute the call and is arranged to initiate the mobile telephone call in response to user input to do that.

21. A user telephone apparatus as claimed in any one of claims 14 to 20 wherein the telephony control unit is arranged to make the mobile telephone call to a telephone number that it has stored as being associated with the gateway.

22. A user telephone apparatus as claimed in claim 21 wherein the telephony control unit is arranged to receive update telephone number that is used to make the mobile telephone call and that is stored in the user telephone apparatus.

23. A user telephone apparatus as claimed in any one of claims 14 to 22 wherein the telephony control unit is provided by a computer program product installed on the telephone apparatus.

24. A telephony control program product installable on a user telephone apparatus that comprises:

wireless mobile telephony hardware allowing telephone call connections to be made via a mobile telephony base station, and

a packet switched network data interface allowing packet switched data to be transmitted between the user apparatus and stations on a packet switched network, and

the telephony control program being arranged, when executed on the user telephone apparatus, to cause that to:

(i) communicate a telephone call via the packet switched data network interface with a user telephone apparatus reachable via that route, that being in a way that identifies, to a gateway connected to the packet switched data network, the two user apparatus that are connected by the telephone call, and

(ii) in response to a decision to switch the routing of the said telephone call, place a mobile telephone call via the wireless mobile telephony hardware to the said gateway, that is also reachable via that route, and that is capable of rerouting the original telephone call between the two telephone apparatus in response to the mobile telephone call placed the telephony control unit.

25. A telephony control program product as claimed in claim 24 that is arranged, when executed on the user telephone apparatus, to cause that to continue the original call using the mobile call it has placed, the

gateway bridging that mobile telephone call to the other user.

26. A telephony control program product as claimed in claim 24 or claim 25 that comprises a packet loss monitor arranged, when executed on the user telephone apparatus, to monitor loss of packets communicated with the packet switched network.

27. A telephony control program product as claimed in claim 26 wherein the packet loss monitor is arranged, when executed on the user telephone apparatus, to send test packets for the purpose of monitoring the packet loss.

28. A telephony control program product as claimed in claim 26 wherein the packet loss monitor is arranged, when executed on the user telephone apparatus, to monitor the loss of packets of call video or voice data.

29. A telephony control program product as claimed in any one of claims 26 to 28 that is arranged, when executed on the user telephone apparatus, to take the decision initiating the mobile telephone call in response to the level of packet loss found by the packet loss monitor.

30. A telephony control program product as claimed in any one of claims 26 to 29 that is arranged, when executed on the user telephone apparatus, in response to the level of packet loss found by the packet loss monitor, to prompt the user to take a decision to reroute the call and is arranged to initiate the mobile telephone call in response to user input to do that.

31. A telephony control program product as claimed in any one of claims 24 to 30 that is arranged, when executed on the user telephone apparatus, to make the mobile telephone call to a telephone number that it has stored as being associated with the gateway.

32. A telephony control program product as claimed in claim 31 that is arranged, when executed on the user telephone apparatus, to receive update telephone number that is used to make the mobile telephone call and that is stored in the user telephone apparatus.

33. A telephony gateway comprising
a public switched telephone network switch reachable from a mobile telephone network,
an interface connected to a packet switched data network,
the gateway being capable of connecting telephone calls over those networks, and
wherein the gateway is arranged in response to receiving a call from a user telephone apparatus via a mobile telephone network the public switched telephone network switch, in the case that said user telephone apparatus is involved in a call via the packet switched network known to the gateway, to reroute that known call to the said user telephone apparatus.

34. A gateway as claimed in claim 33 arranged to respond to the mobile telephone call by rerouting the known telephone call to use the mobile telephone call as the leg between the gateway and the said user telephone apparatus.

35. A gateway as claimed in claim 33 or claim 34 arranged to reroute calls in the said manner for calls where the leg connecting the other user telephone apparatus of the original telephone call is via the public switched telephone network.

36. A gateway as claimed in any one of claims 33 to 35 arranged to reroute calls in the said manner for calls where the leg connecting the other user telephone apparatus of the original telephone call is via the public switched telephone network.

37. A gateway as claimed in one of claims 33 to 36 wherein the gateway is responsive to the caller line ID of the user telephone apparatus to identify the known telephone call.

38. A gateway as claimed in any one of claims 33 to 37 comprising a packet loss responder arranged to send packets in answer to test packets.

39. A gateway as claimed in any one of claims 33 to 38 arranged to update the telephone number stored in the user telephone apparatus that is used to make the mobile telephone call.

40. A telephony system comprising:

- a mobile telephone network including at least one wireless base station for providing telephone call connections to user mobile telephone apparatus,
- a packet switched data network,
- a gateway connected to the mobile telephone network and to a packet switched data network and capable of connecting telephone calls over those networks, and
- a user telephone apparatus comprising:

- (a) wireless mobile telephony hardware allowing telephone call connections to a mobile telephony base station of the mobile network,

- (b) a packet switched network data interface allowing packet switched data to be transmitted between its user telephone apparatus and stations on the packet switched network, and

- (c) a telephony control unit arranged to:

- (i) communicate a telephone call via the mobile telephone network and via the gateway with another user telephone apparatus, and

- (ii) in response to a decision to switch the routing of the said telephone call, send a request to the gateway,

wherein the gateway is arranged to respond to that request by connecting end of the call at the user telephone apparatus via the packet switched network.

41. A telephony system as claimed in claim 40 wherein the telephony control unit is arranged to send the said request to the gateway via the packet switched network.

42. A telephony system as claimed in claim 40 or claim 41 wherein the gateway is arranged to reroute a said call where the other user telephone apparatus is connected to the call via the packet switched network.

43. A telephony system as claimed in any one of claims 40 to 42 wherein the gateway is arranged to reroute a said call where the other user telephone apparatus is connected to the call via the public switched telephone network switch of the gateway.

44. A telephony system as claimed in any one of claims 40 to 43 wherein the telephony control unit comprises a packet loss monitor arranged to monitor loss of packets communicated with the packet switched network.

45. A telephony system as claimed in claim 44 wherein the packet loss monitor is arranged to send test packets for the purpose of monitoring the packet loss.

46. A telephony system as claimed in claim 45 wherein the gateway comprises a packet loss responder arranged to send packets in answer to the test packets.

47. A telephony system as claimed in any one of claims 40 to 46 wherein telephony control unit is arranged to take the decision to switch the routing of the telephone call in response to the level of packet loss found by the packet loss monitor.

48. A telephony system as claimed in any one of claims 40 to 46 wherein the telephony control unit is arranged, in response to the level of packet loss found by the packet loss monitor, to prompt the user to take a decision to reroute the call and is arranged to initiate the rerouting in response to user input to do that.

49. A user telephone apparatus comprising:

wireless mobile telephony hardware allowing telephone call connections to be made via a mobile telephony base station of a mobile telephone network,
a packet switched network data interface allowing packet switched data to be transmitted between the user apparatus and stations on a packet switched network, and
a telephony control unit arranged to:

(i) communicate a telephone call via the mobile telephone network and via the gateway with another user telephone apparatus, and

(ii) in response to a decision to switch the routing of the said telephone call, send a request to the gateway to reroute the call, and cooperate with the gateway to continue the call via the packet switched network.

50. A user telephone apparatus as claimed in claim 49 wherein the telephony control unit is arranged to send the said request to the gateway via the packet switched network.

51. A user telephone apparatus as claimed in claim 49 or claim 50 wherein the telephony control unit comprises a packet loss monitor arranged to monitor loss of packets communicated with the packet switched network.

52. A user telephone apparatus as claimed in claim 51 wherein the packet loss monitor is arranged to send test packets for the purpose of monitoring the packet loss.

53. A user telephone apparatus as claimed in claim 51 or claim 52 wherein telephony control unit is arranged to take the decision to switch the routing of the telephone call in response to the level of packet loss found by the packet loss monitor.

54. A user telephone apparatus as claimed in claim 51 or claim 52 wherein the telephony control unit is arranged, in response to the level of packet loss found by the packet loss monitor, to prompt the user to take a decision to reroute the call and is arranged to initiate the rerouting in response to user input to do that.

55. A telephony control program product installable on a user telephone apparatus that comprises:

wireless mobile telephony hardware allowing telephone call connections to be made via a mobile telephony base station of a mobile telephone network, and

a packet switched network data interface allowing packet switched data to be transmitted between the user apparatus and stations on a packet switched network, and

the telephony control program being arranged, when executed on the user telephone apparatus, to cause that to:

(i) communicate a telephone call via the mobile telephone network and via the gateway with another user telephone apparatus, and

(ii) in response to a decision to switch the routing of the said telephone call, send a request to the gateway

to reroute the call, and cooperate with the gateway to continue the call via the packet switched network.

56. A telephony control program product as claimed in claim 55 that is arranged, when executed on the user telephone apparatus, to send the said request to the gateway via the packet switched network.

- 57. A telephony control program product as claimed in claim 55 or claim 56 that comprises a packet loss monitor that is arranged, when executed on the user telephone apparatus, to monitor loss of packets communicated with the packet switched network.

58. A telephony control program product as claimed in claim 57 wherein the packet loss monitor is arranged, when executed on the user telephone apparatus, to send test packets for the purpose of monitoring the packet loss.

59. A telephony control program product as claimed in claim 57 or claim 58 that is arranged, when executed on the user telephone apparatus, to take the decision to switch the routing of the telephone call in response to the level of packet loss found by the packet loss monitor.

60. A telephony control program product as claimed in claim 57 or claim 58 that is arranged, when executed on the user telephone apparatus, in response to the level of packet loss found by the packet loss monitor, to prompt the user to take a decision to reroute the call and is arranged to initiate the rerouting in response to user input to do that.

61. A telephony gateway comprising
a public switched telephone network switch reachable
from a mobile telephone network,
an interface connected to a packet switched data
network,
the gateway being capable of connecting telephone
calls over those networks,
(ii) in response to a decision to switch the
routing of the said telephone call, send a request to the
gateway,
wherein the gateway is arranged to respond to a
request from a user telephone apparatus that is taking
part in a call in which it is connected is via the mobile
telephone network and a public switched telephone network
switch by connecting end of the call at the user
telephone apparatus to be via the packet switched
network.

62. A telephony gateway as claimed in claim 61 wherein
the gateway is arranged to reroute a said call where the
other user telephone apparatus is connected to the call
via the packet switched network.

63. A telephony gateway as claimed in claim 61 or claim
61 wherein the gateway is arranged to reroute a said call
where the other user telephone apparatus is connected to
the call via the public switched telephone network switch
of the gateway.

64. A telephony gateway as claimed in any one of claims
61 to 63 wherein the gateway comprises a packet loss
responder arranged to send packets in answer to test
packets.

65. A client telephony program product that is installable on a mobile user telephone apparatus that has wireless mobile telephony hardware allowing telephone call connections to be made via a mobile telephony base station, the program being arranged, when executed on the mobile user telephone apparatus, to:

(i) in response to a request to place a call, cause the mobile telephone to place a mobile telephone call to an access number stored in the mobile associated with a gateway,

(ii) cause the mobile telephone apparatus to signal, in association with the said placing of a call to the gateway, a number indicated by the user that identifies a destination for the call.

66. A client telephony program as claimed in claim 65 wherein the program is arranged to cause the signalling of the number using DTMF tones emitted into the call.

67. A client telephony program as claimed in claim 65 wherein the program is arranged to cause the signalling of the number using single stage calling.

68. A client telephony program as claimed in claim 65 wherein the program is arranged to cause the signalling of the number using a field in the request to make the call.

69. A client telephony program product as claimed in any one of claims 65 to 68 wherein the number signalled is a number of a user capable of receiving telephone calls via a packet switched network to which the gateway is connected.

70. A client telephony program product as claimed in any one of claims 65 to 69 that is also arranged to provide the mobile telephony apparatus capabilities to take part in telephone calls via a packet switched network.

71. A client telephony program product as claimed in claim 70, wherein the program is arranged, when executed on the mobile telephony apparatus, to:

in response to a user request to select or dial a contact either to choose between, or prompt the user to choose between, making the call via the mobile telephone network or via the packet switched network.

72. A mobile user telephone apparatus having installed a client telephony computer program product as claimed in any one of claims 65 to 71.

73. A telephony system comprising:

a mobile user telephone apparatus as claimed in claim 72

the said mobile telephone network,
the said gateway.

74. A telephony system as claimed in claim 73 wherein the gateway is responsive to the number signalled to place a call to a telephone apparatus that it identifies and to bridge the mobile telephone call from the mobile user telephone apparatus to the call the gateway has placed.

75. A telephony system as claimed in claim 74 wherein the gateway is arranged to place said call to a telephone apparatus connected to the public switched telephone network.

76. A telephony system as claimed in claim 74 wherein the gateway is arranged to place said call to a telephone apparatus connected to the a packet switched network to which the gateway is connected.

77. A telephony system as claimed in both, or all of, two or more claims, each selected from a different one these groups of preceding claims: (i) 1 to 13, (ii) 40 to 48, and (iii) 73 to 76.

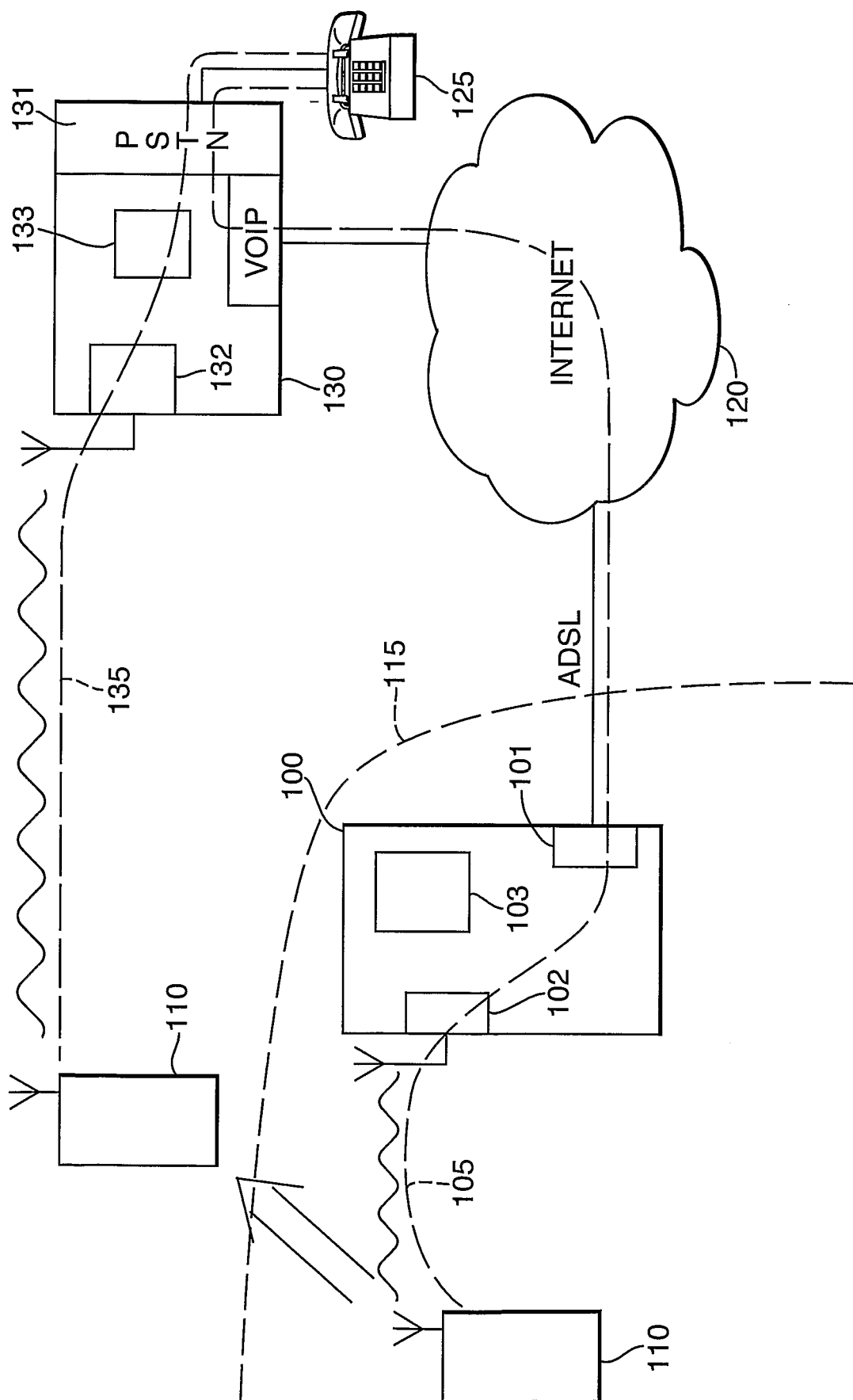
78. A user telephone apparatus as claimed in both, or all of, two or more claims, each selected from a different one these groups of preceding claims: (i) 14 to 23, (iii) 49 to 54 and (iii) 72.

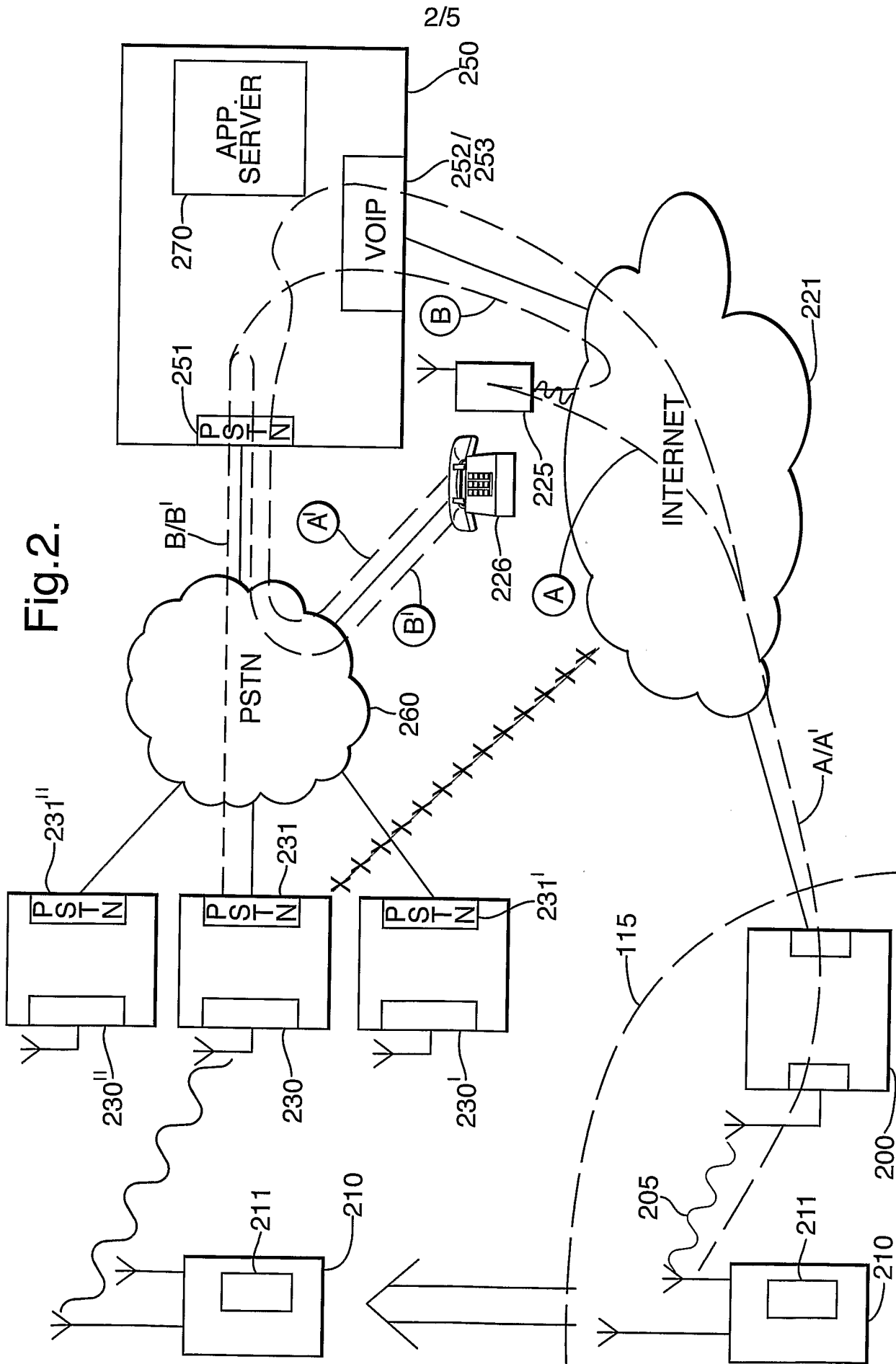
79. A program product as claimed in both, or all of, two or more claims, each selected from a different one these groups of preceding claims: (i) 24 to 32, (ii) 55 to 60 and (iii) 65 to 71.

80. A telephony gateway as claimed in any one of claims 33 to 39 and as claimed in any one of claims 61 to 64.

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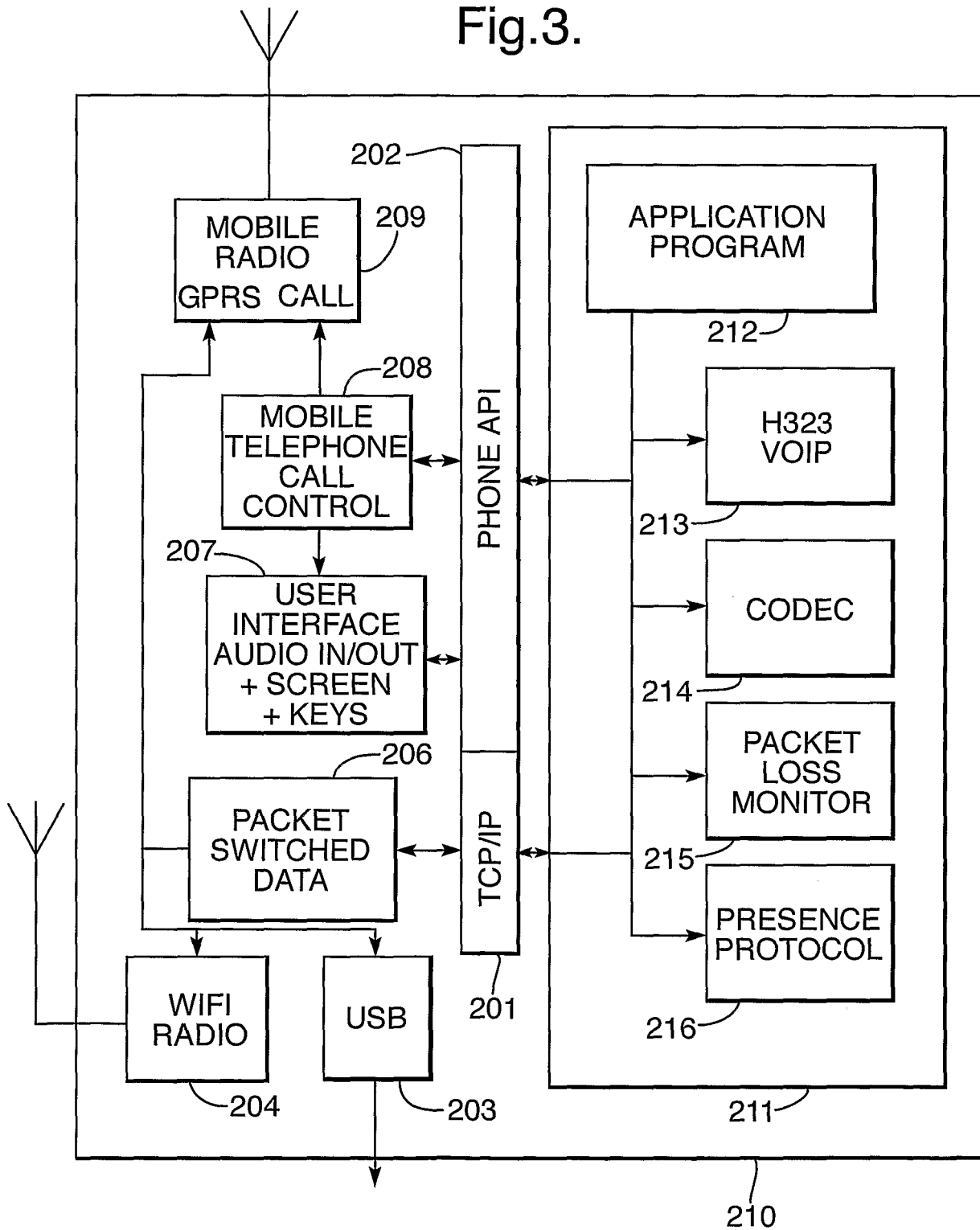
Fig.1.

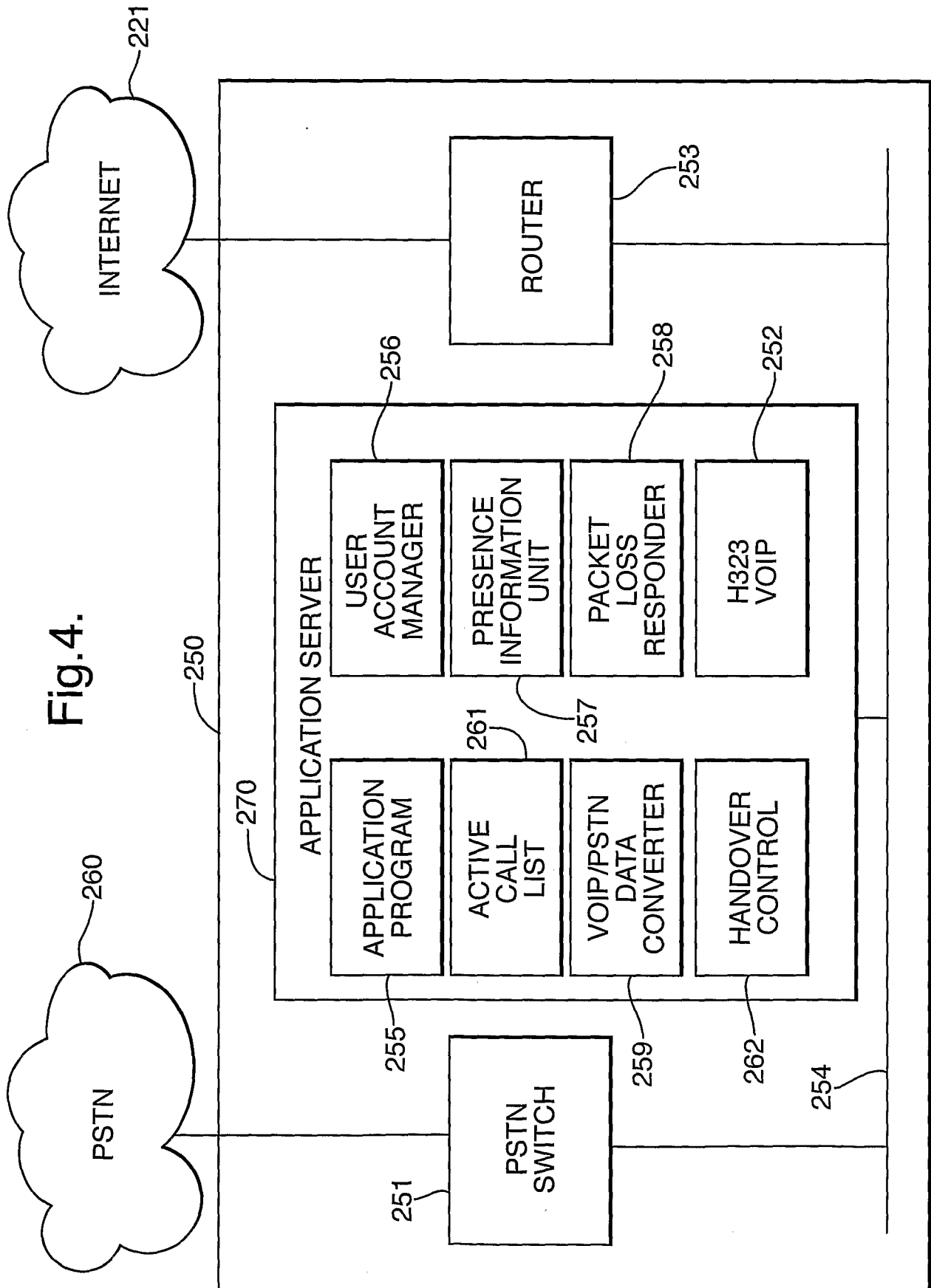




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Fig.3.





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