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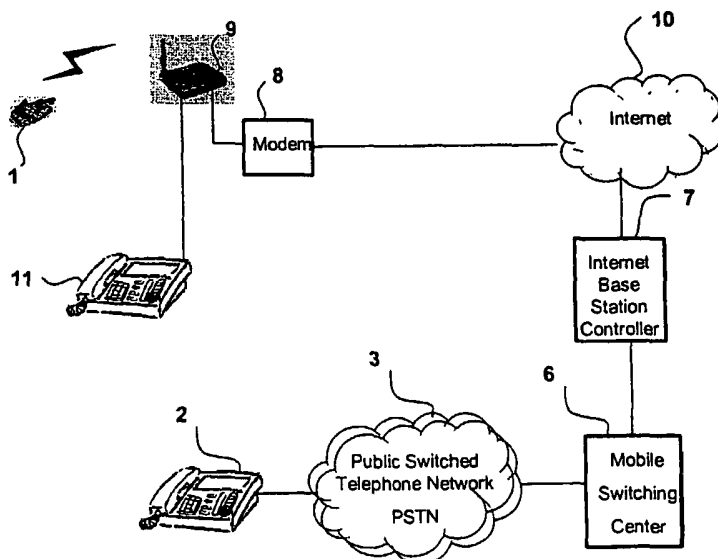
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(54) Title: INTERNET BASE STATION WITH A TELEPHONE LINE



(57) Abstract: A low power base station with a VOIP telephone line is used to combine fixed and wireless services. The device uses the Internet to communicate with a Mobile Switching Center. The base station is configured to connect to the Internet at a user-selected location and establishes a small area of wireless coverage within a greater macrocell network and providing a fixed line connection for the analog telephones at home or in the office.

INTERNET BASE STATION WITH A TELEPHONE LINE

Related Applications

[01] This application claims the benefit of U.S. provisional application no. 60/492,794, filed August 6, 2003. This application is a continuation-in-part of U.S. non-provisional application serial no. 10/280,733, filed October 25, 2002, and is also a continuation-in-part of U.S. non-provisional application serial no. 10/264,463, filed October 3, 2002, which claims the benefit of U.S. provisional application serial no. 60/327,098, filed October 3, 2001.

Field of the Invention

[02] The present invention relates generally to radio or wireless communications and, more particularly, relates to a personal base station with an integrated telephone output for connection of analog or digital phones.

Background of the Invention

[03] In conventional communication networks, wireless phones and wire line phones are handled by different systems. Wireless phones are handled by wireless carriers and wire line phones are handled by local telephone companies. Long distance calls are sometimes handled by long distance service providers. This is a difficult scenario for users of both wireless and wire line phones, as they must deal with several service providers, several telephone numbers, and usually must pay a premium for use of

multiple service providers. Another disadvantage is the separate distribution of call records in both systems.

[04] A conventional telecommunications network is illustrated in **Figure 1**. Mobile handset 1 communicates via wireless connection with base station 4. Base station 4 is connected to base station controller 5 via a dedicated line which forwards calls to mobile switching center 6. Switching center 6 routes calls to public switched telephone network (PSTN) 3. Hence, mobile handset 1 is able to reach any phone connected to PSTN 3. Wire line telephone 2 is also linked to PSTN 3. Even should wire line telephone 2 and mobile handset 1 belong to the same user, they will have different telephone numbers.

[05] Some VOIP (Voice Over IP) providers offer IP telephones that are linked through the Internet to a VOIP gateway, as a substitute for an existing wire line phone. As an option the subscriber terminal can be an analog telephone adapter (ATA) with an analog interface so that standard analog phones can be connected to it. The ATA converts signals into VOIP messages and sends them through the Internet to the VOIP gateway.

[06] United States application no. 10/280,733, filed October 25, 2002 and having common assignee, proposes a portable, low power base station configured to convey wireless traffic between a mobile base station and a conventional wireless network via the Internet. The base station may be referred to as a "personal" or "Internet" base station ("iBS"), and is configured to connect to the Internet at a user-selected location and establishes a small area of wireless coverage within a greater macrocell network. The user sets the operating parameters of the base station. Here also, however, is a separation of mobile services and landline services. United States application no. 10/280,733 is

incorporated by reference, and its subject matter has been published in corresponding International Publication No. WO 2004/040938.

[07] United States application no. 10/264,463, filed on October 3, 2002 and having common assignee, suggests use of a wireless local loop for connection of a landline
5 telephone. The communications interface device or "homekit" of this application provides an interface between a mobile network and a land line phone. The homekit, however, is essentially a modified mobile with an RJ-11 output and uses costly wireless resources. United States application no. 10/264,463, published under publication no. US 2003/0134630 A1, is incorporated by reference.

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Summary of the Invention

[08] The present invention combines a low power, personal base station as described in USSN 10/280,733 with an ATA (analog telephone adaptor), which is a VOIP terminal with an RJ-11 output, to allow connection of any analog phone to the low power,
15 personal base station. This new device is called VOIP-BS. The base station and ATA may be two different devices.

[09] Other features, objects and implementations of the invention will be or will become apparent to one with skill in the art upon examination of the following figures and detailed description. All such additional features, objects and implementations are
20 intended to be included within this description, to be within the scope of the invention and to be protected by the accompanying claims.

Brief Description of the Drawings

[10] **Figure 1** is a diagram of a conventional telecommunications network.

[11] **Figure 2** is a diagram of a telecommunications network according to the present invention.

5 [12] **Figure 3** is a diagram of another embodiment of a telecommunications network according to the present invention.

Detailed Description of the Invention

[13] The present invention combines a low power, personal base station as described
10 in USSN 10/280,733 with an ATA (analog telephone adaptor), which is a VOIP terminal with an RJ-11 output, to allow connection of any analog phone to the low power, personal base station. This new device is called VOIP-BS. The base station and ATA may be two different devices.

[14] The VOIP-BS of the present invention is connected to a broadband modem at
15 home, the office or anywhere else where wireless coverage is desired. It may use the public internet or a dedicated backhaul lines. It may have a digital output, so that ISDN phones or IP phones can be used.

[15] A MSC (mobile switching center) can forward calls intended for a mobile to the VOIP-BS, so that an analog phone can be used instead. In this case the ATA functions
20 are used (like a regular wire line phone). In another embodiment, a VOIP-gateway or soft switch is utilized rather than a MSC.

[16] Trigger events that may cause the MSC to forward a mobile call to the VOIP-BS include:

- the mobile is switched off;
- the mobile is switched off in the home cell;
- 5 • the mobile is not reachable (e.g. no coverage or busy);
- the mobile is sending a signal to the VOIP-BS (i.e. via Bluetooth or other license-free standards), so it knows it is close by;
- the subscriber sends a message to the MSC (e.g. call forwarding on/off).

[17] If the mobile is still reachable, the MSC will set up the call through the
10 corresponding base station. In case the mobile is "at home", the personal base station will be used to communicate with the mobile.

[18] In another embodiment of the invention, the mobile subscriber gets an ATA only, so that the mobile carrier can forward the calls over the Internet to the mobile subscriber's home or office. If call forwarding is not activated the mobile will be called
15 through standard base stations.

[19] The MSC can "mark" calls with the mobile's handset number (caller ID information) for outgoing calls through the VOIP-BS, and the VOIP-BS can handle multiple handsets. Hence, incoming calls may be displayed as "calling 858 123 4567 from 858 999 8888", or the like, in order to separate multiple mobile users by using the
20 caller-ID information. In this connection, the VOIP-BS may have multiple RJ-11 lines, so that each mobile phone or group thereof has a separate line.

[20] For outgoing calls, the user may enter a prefix to distinguish different mobile numbers in the same household or office. For example, "1 " for dad; "2" for mom, "3" for kid and so on. The prefix may consist of one or more digits. The VOIP-gateway or MSC will translate the call as a call from "dad" or "mom", etc., which means it will show
5 the corresponding mobile number as the originator.

[21] Registration of mobiles can be done through the Internet by the subscriber. One or more mobiles may be assigned to a VOIP-BS. A prefix, as described above, can be assigned during registration and can be dependent on the number of mobiles registered. That is, if less than 10 mobiles are registered, only one digit is necessary, whereas if more
10 than 10 mobile are registered two digits will be required. The grouping of mobile numbers and RJ-11 lines can be configured on the Internet by listing the RJ-11 lines and entering mobile numbers accordingly. Different ring tones may be programmed as well to distinguish different users.

[22] In another embodiment, the MSC calls the mobile and its corresponding VOIP-BS
15 simultaneously. The telephone answering first is used. In this connection, for example, if a fax is received on the VOIP-BS, the mobile may be notified of the fax by SMS (short message service).

[23] Since many mobile handsets have multi-media capabilities, the VOIP-BS may be configured to send photos, videos, etc. to a PC or to a TV, and the audio signals to other
20 devices, such as loudspeaker and microphones. This could facilitate video conferencing between mobiles and home equipment. For example, if one mobile is calling another mobile and the caller wants to do video conferencing, and the called party is at home and

call forwarding is activated, the incoming call will be forwarded to the ATA function of the VOIP-BS. The video signal is forwarded to the TV (either via WiFi or dedicated lines) whereas the audio signals are forwarded to the loudspeaker of the TV. The video camera and the microphone are linked to the VOIP-BS so the base station can send the
5 signals back to the originator of the call for display on his mobile, or on similarly configured audio/video equipment connected to his VOIP-BS.

[24] **Figure 2** is a diagram of a wireless and fixed line communications network according to the present invention. Mobile switching center (MSC) 6 connects to PSTN 3 and can reach any fixed telephone 2 connected to the PSTN 3. In accordance with the
10 present invention, MSC 6 is connected to Internet base station controller (iBSC) 7 through dedicated lines. Internet base station controllers are described in detail in USSN 10/280,733, which has been incorporated by reference. In brief, iBSCs function in a fashion similar to traditional BSCs, but they are connected to the Internet and control low power, personal Internet base stations (connected to the iBSC via a modem and the
15 Internet) rather than traditional base stations.

[25] Usually, iBSC 7 is co-located with MSC 6, and is linked to the Internet 10 and broadband modem 8. VOIP-BS 9 is linked to modem 8 through an Ethernet, USB or even wireless connection such as 802.11 or any other license free wireless standard. The VOIP-BS performs all base station functions for GSM (including GSM/GPRS and
20 GSM/EDGE), CDMA and WCDMA or UMTS.

[26] If mobile station 1 sets up a call, the call is processed by VOIP-BS 9, which forwards the information to iBSC 7 and MSC 6. MSC 6 makes the corresponding connection in PSTN 3 and stores the records for the call.

[27] If fixed subscriber 2 wants to call mobile station 1, he dials the mobile number which is sent to corresponding MSC 6. MSC 6 looks up the mobile number 1 in its HLR to identify the status and location of the mobile 1. If there is a trigger event as described in [16] above, the call is forwarded to the corresponding iBSC 7 and VOIP-BS 9, where the analog phone is connected. As previously described, MSC 6 forwards the call with a caller ID like "858 123 4567 for 858 555 6666", informing analog telephone 11 which number called and for which mobile number the call is. If the mobile is active and there is no trigger event or other reason to forward to the VOIP-BS, the call is forwarded to a regular base station (e.g. base station 4 of FIG. 1) and on to the mobile device.

[28] **Figure 3** shows an alternative network where calls to and from mobile 1 are routed through MSC 6, base station controller (BSC) 5 and to base station 4. If call forwarding is activated, calls for mobile 1 are forwarded through the Internet 10 to broadband modem 8 and ATA 12. ATA 12 is connected to a regular analog phone 11. Alternatively, ATA 12 has digital output to permit connection of IP or ISDN phones. If the subscriber wants to make a call from his analog phone 11, the call is routed through the Internet to MSC 6. MSC 6 inserts the identification information of mobile 1, so that it appears to others that the call is actually coming from mobile 1, rather than from analog phone 11.

[29] Other embodiments and implementations of the invention will be or will become apparent to one with skill in the art. All such additional embodiments and implementations are intended to be included within this description, to be within the scope of the invention and to be protected by the accompanying claims.

Claims

1. A base station with an integrated terminal adapter (TA) configured to convey wireless traffic between a mobile station and a conventional wireless network via the Internet, the base station being configured to connect to the Internet at a user-selected
5 location, wherein the base station is configured to connect to at least one fixed telephone.
2. A base station as claimed in claim 1, wherein the TA is linked to an RJ-11 analog telephone output.
3. A base station as claimed in claim 1, wherein the TA is linked to an ISDN
10 or an Ethernet output to permit connection of ISDN phones or IP phones to the base station.
4. A base station as claimed in claim 1, wherein the user-selected location is a home or office.
5. A base station as claimed in claim 1 that is configured for connection to
15 multiple fixed telephones.
6. A base station as claimed in claim 1 that can handle multiple mobile handsets by utilizing different caller ID content and/or different prefixes for outgoing calls for fixed telephones.
7. A Mobile Switching Center (MSC) that forwards calls from mobiles to a
20 base station as claimed in claim 1.

8. A terminal adapter (TA) device that links a mobile subscriber's fixed phones to the MSC or VOIP gateway of the subscriber's mobile carrier via the Internet.

9. A device as claimed in claim 8 that provides multiple outputs for
5 connection of multiple fixed phones.

10. A device as claimed in claim 8 that can handle multiple mobile handsets by using different caller ID content and/or different prefixes for outgoing calls for the fixed telephones.

11. A Mobile Switching Center (MSC) that forwards calls from the mobiles to
10 a device as claimed in claim 8.

12. A Mobile Switching Center (MSC) that uses a VOIP line to generate a mobile originated call.

13. A Mobile Switching Center (MSC) as claimed in claim 12 that uses a "mobile identification" when using a VOIP line as a call originator.

14. A base station which detects if the mobile is being switched off or being
15 set to "fixed" and locally linked to the fixed telephone to activate the call forwarding to the corresponding fixed telephone.

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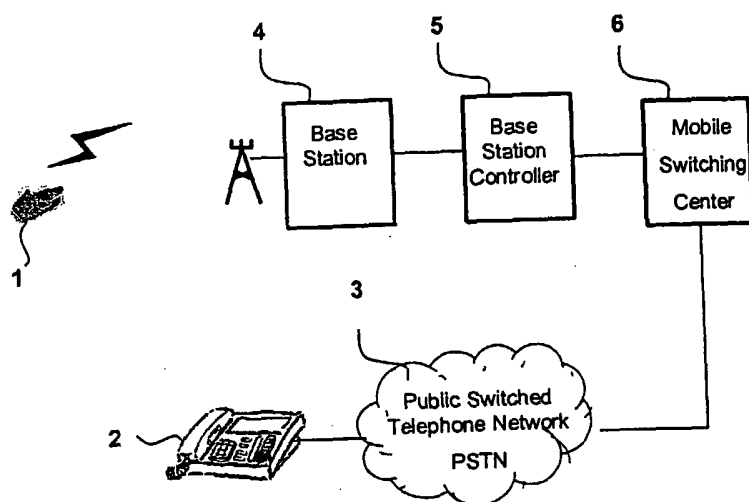


Fig. 1

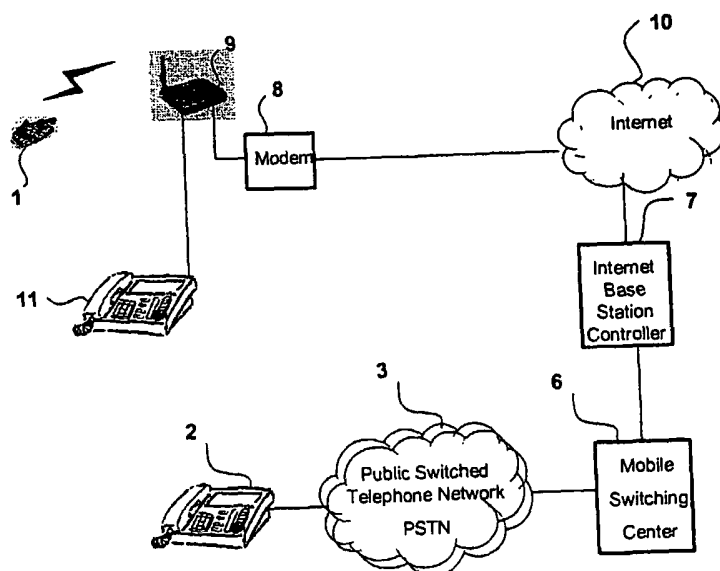


Fig. 2

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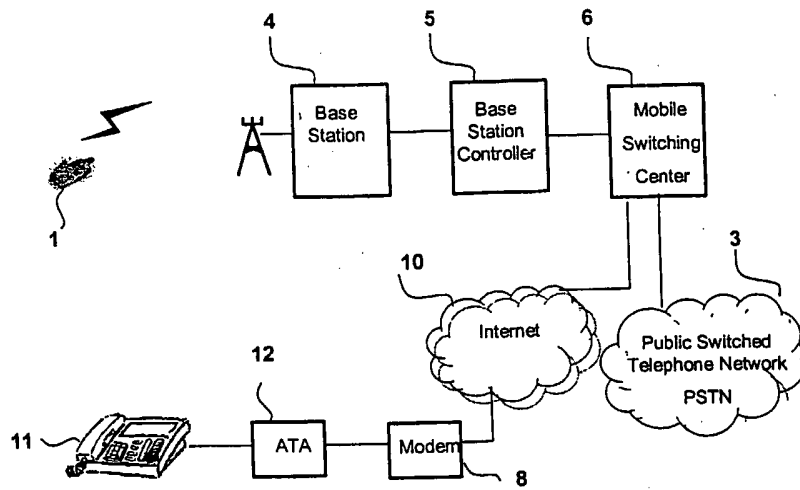


Fig. 3