

HYBRID CELLULAR NETWORK SYSTEM AND COMMUNICATIONS METHOD

FIELD OF THE INVENTION

5 The present invention relates generally to wireless telecommunications, and specifically to advanced cellular telephone networks.

BACKGROUND OF THE INVENTION

10 The Global System for Mobile (GSM) telecommunications is used in cellular telephone networks in many countries around the world. GSM standards define communication protocol stacks, built on a time-division multiple access (TDMA) physical layer, which are used in conveying signaling and user traffic between elements of the network. These elements include subscriber units (known as mobile stations - MSs) and base station
15 subsystems (BSSs). The standard GSM network protocol is known as GSM-MAP (Mobile Application Protocol), and the interface between the BSSs and the network is known as the GSM A-Interface.

20 Code-division multiple access (CDMA) is an improved digital communications technology, which affords more efficient use of radio bandwidth than TDMA, as well as a more reliable, fade-free link between cellular telephone subscribers and base stations. The leading CDMA standard is TIA/EIA-95 (commonly referred to as IS-95), promulgated by the Telecommunications Industry Association (TIA). IS-95 defines its own protocol stacks, built on a CDMA physical layer and a signaling model for
25 call processing that is compatible with the TIA/EIA-41 (IS-41) network standard. The interface between CDMA BSSs and the network is defined by the TIA/EIA-634 (IS-634) standard.

30 Because the IS-95 CDMA air interface is based on fundamentally different technology from the GSM TDMA interface, there are substantial differences between the conventional IS-95 and GSM protocol stacks, as well as between GSM and CDMA-oriented network standards, such as IS-41.

PCT patent application PCT/US96/20764, which is incorporated herein by reference, describes a wireless telecommunications system that uses a CDMA air interface to implement GSM network services and protocols. Using this system, some or all of the TDMA base stations and subscriber units of an existing GSM network are replaced or supplemented by corresponding CDMA equipment. CDMA BSSs in this system are adapted to communicate with a GSM network via a standard GSM A-interface. The core of GSM network services is thus maintained, and the changeover from TDMA to CDMA is largely transparent to users. A system of this type, in which GSM protocols are implemented over a CDMA air interface, is referred to in the present patent application as a GSM-CDMA system.

Hybrid cellular communications networks, incorporating both GSM and CDMA elements, are also described in PCT patent publications WO 95/24771 and WO 96/21999, and in an article by Tscha, et al., entitled "A Subscriber Signaling Gateway between CDMA Mobile Station and GSM Mobile Switching Center," in Proceedings of the 2nd International Conference on Universal Personal Communications, Ottawa (1993), pp. 181-185, which are incorporated herein by reference. None of these references, however, relates to the question of maintaining or adding IS-95/IS-41 or other non-GSM network services in the context of the hybrid GSM-CDMA network.

SUMMARY OF THE INVENTION

It is an object of some aspects of the present invention to provide methods and apparatus for supporting IS-95 communication protocols in coexistence with a hybrid GSM-CDMA cellular communications network.

It is a further object of some aspects of the present invention to provide a hybrid cellular base station capable of supporting mobile stations operating in accordance with multiple protocols and/or network standards.

In preferred embodiments of the present invention, a GSM-CDMA cellular communications system includes a hybrid base station subsystem (BSS), having multiple network interfaces so as to communicate both with a GSM network and with one or more networks operating according to other

standards, preferably including the IS-41 standard. The hybrid BSS has a CDMA air interface that simultaneously serves both GSM-CDMA MSs and other MSs compatible with different CDMA protocol standards, preferably compatible with IS-95. The GSM-CDMA MSs communicate with the hybrid
5 BSS using GSM protocols over a CDMA physical layer, as described, for example, in a U.S. patent application entitled "Improved Base Station Handover in a Hybrid GSM-CDMA Network," filed 20 July 1998, U.S. Application Serial No. 09/119,717, which is assigned to the assignee of the present patent application and is incorporated herein by reference.

10 The present invention thus allows GSM network services to be offered over a CDMA-based air interface, without requiring that all of the CDMA MSs be GSM-CDMA-compatible. Subscribers whose MSs support GSM-CDMA protocols are able to communicate with the GSM network, while coexisting IS-95 MSs communicate with the IS-41 or other network.
15 Compatibility with existing IS-95 MSs is thus maintained.

Preferably, the GSM-CDMA and IS-95 MSs coexist in the same cell or cells served by the hybrid BSS and share a common CDMA frequency. During dedicated mode operation (i.e., during a call) the GSM-CDMA and IS-95 MSs communicate over different, dedicated traffic channels, which are
20 coupled via the hybrid BSS to the respective networks. In idle mode (while waiting to make or receive a call), however, the GSM-CDMA and IS-95 MSs preferably share a common synchronization channel and, most preferably, common paging channels in relation to the BSS. But the different types of MSs respond to different messages on the synchronization and/or paging
25 channels, dependent on their respective network standards and protocols.

There is therefore provided, in accordance with a preferred embodiment of the present invention, in a mobile wireless telecommunications system, a base station subsystem, including:

at least one base station transceiver, which communicates over an air
30 interface with a plurality of mobile stations operating in accordance with a plurality of different protocol standards, including at least one first mobile station operating in accordance with a first protocol standard and at least one

second mobile station operating in accordance with a second protocol standard; and

a paging/access manager, which for each call between the base station subsystem and one of the mobile stations routes the call via a network responsive to the protocol standard of the mobile station.

Preferably, the base station subsystem includes a plurality of call processing units, which couple the base station subsystem to a plurality of networks in accordance with different, respective interface standards. Further preferably, the paging/access manager determines the respective protocol standards of mobile stations placing calls via the base station subsystem and routes the calls accordingly to call processing units that are associated with the respective protocol standards.

In a preferred embodiment the plurality of networks includes a GSM-MAP network and an IS-41 network, and the respective interface standards include a GSM A-interface and an IS-634 standard. Additionally or alternatively, the plurality of networks includes a public switched telephone network, and the respective interface standard preferably includes a V 5.x standard.

Preferably, the air interface includes a CDMA-based air interface. Most preferably, the first protocol standard includes an IS-95 standard, and the second protocol standard is based on GSM networking protocols. In a preferred embodiment, the base station subsystem transmits a CDMA message, which is received and decoded by both the first and second mobile stations in idle mode, and a further GSM-CDMA message, which is received and decoded only by the second mobile station.

In another preferred embodiment, the first protocol standard includes a CDMA2000 standard, and the second protocol standard includes a WCDMA standard.

Preferably, the at least one base station transceiver supports at least one cell on which both the first and second mobile stations camp. Most preferably, a common frequency assignment is used for the first and second mobile stations in the cell, as well as a common synchronization channel and a common paging channel.

There is also provided, in accordance with a preferred embodiment of the present invention, in a mobile wireless telecommunications system, including a plurality of mobile stations operating in accordance with a plurality of different protocol standards, a method for communicating with the mobile stations, including:

initiating a call between a base station subsystem and one of the plurality of mobile stations; and

routing the call between the base station and a network in communication with the base station, responsive to the protocol standard of the mobile station.

Preferably, routing the call includes determining the protocol standard of the mobile station and selecting the one of a plurality of networks responsive to the determination. Preferably, selecting the one of the plurality of networks includes selecting a GSM-MAP or, additionally or alternatively, an IS-41 network, and routing the call comprises routing a call via a GSM A-interface or routing the call via an IS-634 interface. In a preferred embodiment, selecting the one of the plurality of networks includes selecting a public switched telephone network and, preferably, routing the call via a V 5.x interface.

Preferably, initiating the call includes placing a call over a CDMA-based air interface. Preferably, placing the call includes placing a call in accordance with an IS-95 protocol standard or, alternatively or additionally, placing a call based on GSM networking protocols. In a preferred embodiment, placing the call includes placing a call in accordance with a CDMA2000 protocol standard and/or with a WCDMA protocol standard.

There is further provided, in accordance with a preferred embodiment of the present invention, in a mobile wireless telecommunications system, including a plurality of mobile stations operating in accordance with a plurality of interface standards, which mobile stations include at least one first mobile station operating in accordance with a first protocol standard and at least one second mobile station operating in accordance with a second protocol standard, a method for communicating

with the mobile stations, including transmitting signals to at least one cell on which both the first and second mobile stations camp.

Preferably, transmitting the signals includes using a common frequency assignment for the first and second mobile stations in the cell.

5 Additionally or alternatively, transmitting the signals includes using a common synchronization channel and, preferably, using a common paging channel for the first and second mobile stations in the cell.

Preferably, transmitting the signals includes transmitting over a CDMA-based air interface. Most preferably, the first protocol standard
10 includes an IS-95 standard, and the second protocol standard is based on GSM networking protocols. Alternatively, the first protocol standard includes a CDMA2000 standard, and the second protocol standard includes a WCDMA standard.

The present invention will be more fully understood from the
15 following detailed description of the preferred embodiments thereof, taken together with the drawings in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a schematic block diagram of a hybrid GSM-CDMA base
20 station subsystem, in communication with multiple mobile stations and networks, in accordance with a preferred embodiment of the present invention;

Fig. 2 is a schematic block diagram illustrating communication
protocol stacks between the hybrid BSS and the MSs of Fig. 1, in accordance
25 with a preferred embodiment of the present invention;

Fig. 3 is a flow chart that schematically illustrates a process of cell selection and camping by an MS in communication with the BSS of Fig. 1, in accordance with a preferred embodiment of the present invention; and

Fig. 4 is a schematic block diagram of a hybrid base station subsystem,
30 in communication with multiple mobile stations and networks, in accordance with an alternative preferred embodiment of the present invention.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENTS

Reference is now made to Fig. 1, which is a schematic block diagram of a hybrid GSM-CDMA base station subsystem (BSS) 20, in communication with mobile stations (MSs) 22 and 24 and with networks 26, 28 and 30, in accordance with a preferred embodiment of the present invention. GSM-MAP network 28 comprises a public land mobile network based on GSM communications standards, and IS-41 network 26 operates in conjunction with standards defined for use with CDMA communications, as described above.

Network 30 may operate in accordance with any suitable network standard known in the art, including standards not specifically designed for mobile communications. In a preferred embodiment of the present invention, network 30 comprises a public switched telephone network (PSTN). The interface between BSS 20 and network 30 is defined in accordance with one of the V 5.x standards promulgated by ETSI, such as V 5.1 or V 5.2. Alternatively, network 30 and the interface thereto may be defined in accordance with other standards known in the art, such as GR 3.03 or "Generic C." Although only one "other network" is shown in Fig. 1, it will be understood that BSS 20 can be configured to communicate with greater numbers of such other networks, as well as with multiple GSM-MAP and IS-41 networks.

MSs 22 and 24 communicate with BSS 20 over a wireless RF link using an IS-95 CDMA physical layer, in one or more of the accepted cellular communications frequency bands. MS 22 operates in accordance with substantially standard IS-95 protocols, most preferably in accordance with the IS-95B standard. MS 24 communicates with BSS 20 using GSM protocols over a CDMA physical layer compatible with IS-95, as described further below. Although for the sake of clarity, only one each of MSs 22 and 24 is shown in Fig. 1, it will be understood that in actuality, BSS 20 generally communicates simultaneously with a plurality of each of these types of MS.

A typical cellular communications system will include many BSSs of the type described herein.

BSS 20 is built around a cell interconnect switch (CIS) 34, which controls and communicates with a number of base station transceivers (BTS) 32. Each BTS transmits RF signals to and receives RF signals from MSs 22 and 24 when the MSs are within a geographical area, or cell, served by the particular BTS. Each cell and each CDMA frequency (as defined by IS-95 standards) preferably serves both IS-95 MS 22 and GSM-CDMA MS 24. Alternatively, different cells and/or different CDMA frequencies may be assigned for the two types of service. In idle mode, MSs 22 and 24 each attempt to identify and "camp on" a suitable cell that provides a strong signal and high likelihood of successfully opening a traffic channel to BSS 20 when required. Idle mode treatment in a hybrid GSM-CDMA system is described generally in Israel Patent Application 126,869, which is assigned to the assignee of the present patent application and incorporated herein by reference. Aspects of idle mode handling that are specifically relevant to hybrid BSS 20 are described further below.

In order for one of the MSs 22 or 24 to initiate a call, the MS sends an appropriate access request to BSS 20, in accordance with respective IS-95 and GSM-CDMA protocols. CIS 34 passes the request to a hybrid paging/access manager (PAM) 36, which analyzes the request so as to determine to which of networks 26, 28, 30 the call should be routed. The choice of routing depends on the identity and program parameters of the MS and, optionally, a network preference indicated by a user of the MS.

Based on the determination made by PAM 36, CIS routes the call for processing to one of the call signaling processors 38 or 40. Calls by IS-95 MS 22 are routed to IS-95 call processor 38, which sets up a traffic channel to IS-41 network 26, as is known in the art. Calls by GSM-CDMA MS 24 are preferably routed to a GSM-CDMA call processor 40, which is compatible with GSM signaling and sets up a traffic channel to GSM-MAP network 28, as is likewise known in the art. Alternatively, if MS 24 has suitable software, the user of the MS may choose to place the call through IS-41 network 26, in which case the call is routed to call processor 38. Under some circumstances,

such as a fault in GSM-MAP network 28, calls may be routed automatically from MS 24 through call processor 38. Preferably, call processor 38 is also used to set up traffic channels to other networks 30. After set-up, PAM 36 informs the MS of its traffic channel assignment, and the call proceeds via a selector 42.

The signaling interfaces between call processors 38 and 40 and respective networks 26 and 28 are preferably respectively in accordance with the IS-634 and GSM A-interfaces standards described hereinabove. Some aspects of the operation of these interfaces, as well as message flow through the GSM A-interface, are described in greater detail in U.S. patent application entitled "Base Station Handover in a Hybrid GSM/CDMA Network, U.S. Application Serial No. 09/119,717, filed 20 July, 1998 and assigned to the assignee of the present application. Alternatively, any other suitable interface types known in the art may be used in communications between call processors 38 and 40 and networks 26, 28 and 30.

Operation of each of the traffic channels is managed by selector 42, which performs tasks such as vocoding and controlling signal power level. Since in CDMA operation, MSs 22 and 24 may communicate simultaneously with two or more BTSs 32, selector 42 also chooses and transmits to the network the best copy of any traffic frame arriving from the BTSs.

Paging of MSs 22 and 24 is initiated in response to paging signals received from respective networks 26 and 28. Other networks 30, however, such as the PSTN, mentioned above, may not inherently support mobility of subscriber units (i.e., MSs 22 and 24), and are therefore not capable of generating paging signals. In such cases, paging is preferably generated by call processor 38 in response to an incoming call from network 30.

Fig. 2 is a block diagram that schematically illustrates protocol stacks used in signaling interfaces between MSs 22 and 24 and GSM-CDMA BSS 20, in accordance with a preferred embodiment of the present invention. Communications between MS 22 and BSS 20 are substantially in accordance with a standard IS-95 interface, based on a CDMA physical layer (Layer 1) and data link layer (Layer 2), which support a standard IS-95 radio

interface/signaling layer. If MS 24 places or receives a call through IS-41 network 26, this protocol stack is also used.

Generally, however, MS 24 exchanges signals with BSS 20 using a hybrid GSM-CDMA protocol stack, based on the same CDMA IS-95 physical layer (Layer 1) as is used by MS 22. Details of the protocol layers are described in the above-mentioned U.S. patent application entitled "Base Station Handover in a Hybrid GSM-CDMA Network," U.S. Application Serial No. 09/119,717, filed 20 July, 1998 and assigned to the assignee of the present application, which is incorporated herein by reference. The upper layer of the protocol stack is compatible with the GSM Radio Interface Layer 3 (RIL3), which includes radio resource management (RR), mobility management (MM) and call management (CM) sublayers. The RR sublayer and a GSM-CDMA data link layer (Layer 2) are modified so as to accommodate both standard IS-95 signaling and special GSM-CDMA messages, as described in the above-mentioned U.S. patent applications.

Fig. 3 is a flow chart that schematically illustrates an idle mode process followed by MSs 22 and 24 to select and camp on a cell associated with one of BTSs 32, in accordance with a preferred embodiment of the present invention. In this embodiment, MS 22 and MS 24 share common synchronization (sync) and paging channels, on which the BTS transmits respective sync and paging messages. These messages, to be decoded by the MSs, include both standard IS-95 interface information and additional information required only for GSM-CDMA operation. Only GSM-CDMA MS 24 is able to decode the additional information, which comprises overhead information provided by GSM standards and is consequently ignored by IS-95 MS 22.

In search for a cell to camp on, MSs 22 and 24 first acquire a pilot signal from BTS 32 and then attempt to find and identify the BTS sync channel. BTS 32 transmits two messages over the sync channel: a standard IS-95 sync channel message and a special GSM-CDMA sync channel message. The IS-95 message can be decoded by both MS 22 and MS 24, but the GSM-CDMA message is decoded only by MS 24. Therefore, in order to avoid transmitting duplicate information, the GSM-CDMA message preferably

includes only the additional information that is not already present in the IS-95 message. Alternatively, the GSM-CDMA message may include all of the relevant sync channel information. In any case, if either MS 22 or 24 is unable to decode the sync message or messages, it searches for another cell.

5 After decoding the sync message or messages, MSs 22 and 24 go on to decode the corresponding paging channel. In the case of IS-95, the paging channel message contains IS-95 System Parameters, and is preferably decoded by both MSs 22 and 24. As in the case of the sync messages, the
10 paging channel messages preferably include an additional message decoded only by MS 24, containing special GSM-CDMA System Information, such as GSM location area and cell ID of the cell issuing the message. If MS 22 or 24 is unable to decode the paging channel, it returns to search for another cell.

 Once the System Parameters and, as appropriate, GSM-CDMA System Information have been successfully decoded, MS 22 or 24 camps on the cell
15 to which the sync and paging channels belong. Thus, the cell supports a condition of "full coexistence," in which both standard IS-95 MSs and special GSM-CDMA MSs can camp on and receive messages in the same cell. Such full coexistence ensures that system resources are used efficiently, since for a given cell, all MSs are supported on a single CDMA frequency, using the
20 same sync and paging channels.

 The paging messages transmitted by BSS 20 preferably include substantially all paging channel overhead messages defined in the IS-95 standard, for example:

- System Parameters (as described above).
- 25 • Access Parameters message.
- CDMA Channel List message.
- Extended System Parameters message.
- Neighbor List message.
- Extended Neighbor List message.
- 30 • General Neighbor List message.

 The messages also include GSM-CDMA messages, intelligible only to MS 24, including:

- GSM System Information message (as described above).
- GSM Neighbor List message.

Preferably, the GSM-CDMA messages transmitted over both the sync and paging channels include a unique identifier, such as a MSG_TYPE field, which allows them to be distinguished from ordinary IS-95 messages.

To initiate a call, BSS 20 transmits IS-95 General Page messages in order to page MS 22, and special GSM-CDMA Paging Request messages to page MS 24. After paging, different types of dedicated channels are set up for the IS-95 and GSM-CDMA MSs. Although both types of dedicated channels are based on the IS-95 physical layer, they use different signaling protocols and identify accordingly the respective types of MS that they serve. BSS 20 preferably supports both types of dedicated channel in substantially every cell.

In other preferred embodiments of the present invention, IS-95 MS 22 and GSM-CDMA MS 24 do not share the same cells, but rather use separate, overlapping cells. In one such embodiment, the sync channel message in a GSM-CDMA cell is not compatible with the standard IS-95 sync message, because the GSM-CDMA sync message has a different MSG_TYPE field, for example. MS 22 is unable to decode the sync message, and therefore leaves the cell.

In another such embodiment, both MSs 22 and 24 can decode the sync channel message in the GSM-CDMA cell, but only MS 24 can decode the paging message and read the System Information. In this case, too, MS 22 will leave the cell. Alternatively, the sync message may redirect MS 22 to another paging channel that complies with the IS-95 standard. The load on the paging channel that is used for GSM-CDMA communications is thus reduced.

Although preferred embodiments are described hereinabove with reference to a particular hybrid GSM-CDMA system, it will be appreciated that the principles of the present invention may similarly be applied to signaling in other hybrid communication systems, as well. Moreover, although the preferred embodiments make reference to specific TDMA- and

CDMA-based communications standards, those skilled in the art will appreciate that the methods and principles described hereinabove may also be used in conjunction with other methods of data encoding and signal modulation.

5 Fig. 4, for example, is a schematic block diagram showing a hybrid BSS 50 in communication with diverse MSs 52 and 54 and networks 56, 58 and 60, in accordance with an alternative preferred embodiment of the present invention. In this example, MS 52 operates over an air interface compliant with CDMA2000, a third-generation cellular communications standard,
10 which is based generally on the IS-95C standard and is backward-compatible with current IS-95 standards. MS 54 operates over an air interface based on the WCDMA standard proposed by ETSI, which is similarly a third-generation standard (also known as UMTS), based on GSM networking protocols with a CDMA physical layer. BSS 50 has an internal structure that
15 is similar to that of BSS 20, shown in Fig. 1. It routes calls between each of MSs 52 and 54 and the appropriately-selected network, which in the present example include IS-41 network 56, GSM-MAP network 58 and another network 60, such as a PSTN. As in the case of MS 22 and MS 24 described hereinabove, CDMA2000 MS 52 and WCDMA MS 54 preferably coexist in a
20 common cell of BSS 50.

 The scope of the present invention encompasses not only the complete systems and communications processes described hereinabove, but also various innovative elements of these systems and processes, as well as combinations and sub-combinations thereof. It will thus be appreciated that
25 the preferred embodiments described above are cited by way of example, and the full scope of the invention is limited only by the claims.

We claim:

CLAIMS

1. In a mobile wireless telecommunications system, a base station
2 subsystem, comprising:

at least one base station transceiver, which communicates over an air
4 interface with a plurality of mobile stations operating in accordance with a
plurality of different protocol standards, including at least one first mobile
6 station operating in accordance with a first protocol standard and at least one
second mobile station operating in accordance with a second protocol
8 standard; and

a paging/access manager, which for each call between the base station
10 subsystem and one of the mobile stations routes the call via a network
responsive to the protocol standard of the mobile station.

2. A base station subsystem according to claim 1, and comprising a
2 plurality of call processing units, which couple the base station subsystem to
a plurality of networks in accordance with different, respective interface
4 standards.

3. A base station subsystem according to claim 2, wherein the
2 paging/access manager determines the respective protocol standards of
mobile stations placing calls via the base station subsystem and routes the
4 calls accordingly to call processing units that are associated with the
respective protocol standards.

4. A base station subsystem according to claim 2, wherein the plurality of
2 networks comprises a GSM-MAP network.

5. A base station subsystem according to claim 4, wherein the interface
2 standards include a GSM A-interface standard.
6. A base station subsystem according to claim 2, wherein the plurality of
2 networks comprises an IS-41 network.
7. A base station subsystem according to claim 6, wherein the interface
2 standards include an IS-634 standard.
8. A base station subsystem according to claim 2, wherein the plurality of
2 networks comprises a public switched telephone network.
9. A base station subsystem according to claim 8, wherein the interface
2 standards include a V 5.x standard.
10. A base station subsystem according to claim 1, wherein the air
2 interface comprises a CDMA-based air interface.
11. A base station subsystem according to claim 10, wherein the first
2 protocol standard comprises an IS-95 standard.
12. A base station subsystem according to claim 10, wherein the second
2 protocol standard is based on GSM networking protocols.
13. A base station subsystem according to claim 12, wherein the base
2 station subsystem transmits a CDMA message, which is received and
decoded by both the first and second mobile stations in idle mode, and a

4 further GSM-CDMA message, which is received and decoded only by the
second mobile station.

14. A base station subsystem according to claim 10, wherein the first
2 protocol standard comprises a CDMA2000 standard.

15. A base station subsystem according to claim 10, wherein the second
2 protocol standard comprises a WCDMA standard.

16. A base station subsystem according to claim 1, wherein the at least one
2 base station transceiver supports at least one cell on which both the first and
second mobile stations camp.

17. A base station subsystem according to claim 16, wherein a common
2 frequency assignment is used for the first and second mobile stations in the
cell.

18. A base station subsystem according to claim 16, wherein a common
2 synchronization channel is used for the first and second mobile stations in
the cell.

19. A base station subsystem according to claim 16, wherein a common
2 paging channel is used for the first and second mobile stations in the cell.

20. In a mobile wireless telecommunications system, including a
2 plurality of mobile stations operating in accordance with a plurality of
different protocol standards, a method for communicating with the mobile
4 stations, comprising:

initiating a call between a base station subsystem and one of the
6 plurality of mobile stations; and
routing the call between the base station and a network in
8 communication with the base station, responsive to the protocol standard of
the mobile station.

21. A method according to claim 20, wherein routing the call comprises
2 determining the protocol standard of the mobile station and selecting the
one of a plurality of networks responsive to the determination.

22. A method according to claim 21, wherein selecting the one of the
2 plurality of networks comprises selecting a GSM-MAP network.

23. A method according to claim 22, wherein routing the call comprises
2 routing a call via a GSM A-interface.

24. A method according to claim 21, wherein selecting the one of the
2 plurality of networks comprises selecting an IS-41 network.

25. A method according to claim 24, wherein routing the call comprises
2 routing a call via an IS-634 interface.

26. A method according to claim 21, wherein selecting the one of the
2 plurality of networks comprises selecting a public switched telephone
network.

27. A method according to claim 26, wherein routing the call comprises
2 routing a call via a V 5.x interface.

28. A method according to claim 20, wherein initiating the call comprises
2 placing a call over a CDMA-based air interface.

29. A method according to claim 28, wherein placing the call comprises
2 placing a call in accordance with an IS-95 protocol standard.

30. A method according to claim 28, wherein placing the call comprises
2 placing a call based on GSM networking protocols.

31. A method according to claim 28, wherein placing the call comprises
2 placing a call in accordance with a CDMA2000 protocol standard.

32. A method according to claim 28, wherein placing the call comprises
2 placing a call in accordance with a WCDMA protocol standard.

33. In a mobile wireless telecommunications system, including a
2 plurality of mobile stations operating in accordance with a plurality of
interface standards, which mobile stations include at least one first mobile
4 station operating in accordance with a first protocol standard and at least one
second mobile station operating in accordance with a second protocol
6 standard, a method for communicating with the mobile stations, comprising
transmitting signals to at least one cell on which both the first and second
8 mobile stations camp.

34. A method according to claim 33, wherein transmitting the signals
2 comprises using a common frequency assignment for the first and second
mobile stations in the cell.

35. A method according to claim 33, wherein transmitting the signals
2 comprises using a common synchronization channel for the first and second mobile stations in the cell.
36. A method according to claim 33, wherein transmitting the signals
2 comprises using a common paging channel for the first and second mobile stations in the cell.
37. A method according to claim 33, wherein transmitting the signals
2 comprises transmitting over a CDMA-based air interface.
38. A method according to claim 37, wherein the first protocol standard
2 comprises an IS-95 standard.
39. A method according to claim 37, wherein the second protocol
2 standard is based on GSM networking protocols.
40. A method according to claim 37, wherein the first protocol standard
2 comprises a CDMA2000 standard.
41. A method according to claim 37, wherein the second protocol
2 standard comprises a WCDMA standard.