Title: AUTOMATIC UPDATE OF PRIVATE TELECOMMUNICATION SYSTEMS INFORMATION IN MOBILE TERMINALS

Abstract: Communication between registered mobile terminals and a private telecommunications system having neighboring cells of a public mobile telecommunication system is facilitated. A mobile terminal includes a transceiver for communicating via radio signals with the private and public mobile telecommunication systems, a memory storing information about radio signals of the cells neighboring the private telecommunication system, and a processor monitoring the radio signals received by the transceiver for such information. The processor writes the received information to the memory, and uses the information to detect and establish communication with the private telecommunication system includes scanners monitoring radio signals of neighboring cells, a system processor determining changes in the radio signals of the neighboring cells, and a signal generator generating a signal including monitored changes in the radio signals of the neighboring cells.
AUTOMATIC UPDATE OF PRIVATE TELECOMMUNICATION SYSTEMS INFORMATION IN MOBILE TERMINALS

BACKGROUND OF THE INVENTION

This invention relates to cellular communication systems and more particularly to improving the ability of at least one mobile terminal to communicate with a private system.

The private system generates updated information about itself and neighboring cells, hereafter referred to as private system information, which is sent to the mobile terminal. The mobile terminal uses the private system information to find the private system in order to make a call through to the private system.


A mobile telecommunication system includes a mobile terminal, such as a mobile telephone, communicating with any one of a plurality of geographically spaced base stations. Broadly, each base station defines a cell, and each cell forms an integral part of a larger cellular network. The size of a cell largely depends on the power rating of the corresponding base station. The base stations communicate with a mobile switching center (MSC) by means of intercellular trunk lines. The mobile switching center
determines which of the base stations and channels should process a call with the mobile terminal based on considerations such as signal strength between each available channel and the mobile terminal.

A mobile terminal can also communicate with an autonomous private system such as a digital wireless office system. A digital wireless office system provides an autonomous extension to the private branch exchange ("PBX"). The mobile terminal commonly communicates with the private system based on the ANSI-136 standard or GSM protocol. The ANSI-136 standard and GSM protocol are hereby incorporated by reference in their entirety.

A mobile terminal can roam between a private system and a public cellular system. Specifically, a mobile terminal can roam between a private system and the public cellular system ("PCS") using, for example, the ANSI-41 protocol (the ANSI-41 standard is hereby incorporated by reference in its entirety). A mobile terminal can also roam directly between private systems, and indirectly by roaming from a first private system into the public system and then into a second private system.

Information on a private system and its neighboring cells ("private system information") can be stored on the mobile terminal, which can use its stored private system information in order to find an autonomous private system in which it is authorized to operate. The mobile terminal can experience problems when the private telecommunication system or the surrounding public cellular system updates its radio network, particularly when such updating occurs while the mobile terminal is out of the area. Consequently, a mobile terminal camped on the public cellular telephone
system might not readily be able to find the autonomous private telecommunication system. This can result in quality of service issues and increased call costs.

SUMMARY OF THE INVENTION

In one aspect of the present invention, a mobile terminal is provided including a transceiver for communicating via radio signals with a private telecommunication system and cells of a mobile telecommunication system wherein at least one of the cells neighbors the private telecommunication system, a memory storing mobile telecommunication system information comprising information on radio signals of cells neighboring the private telecommunication system, and a processor monitoring the radio signals received by the transceiver for mobile telecommunication system information. The processor writes the mobile telecommunication system information received by the transceiver to the memory, and uses the mobile telecommunication system information to detect and establish communication with the private telecommunication system using the transceiver.

In another aspect of the present invention, a private telecommunication system is provided, including scanners monitoring radio signals of cells of a public mobile telecommunication system that neighbor the private telecommunication system, a system processor determining changes in the radio signals of the cells of the public mobile telecommunication system that neighbor the private telecommunication system, and a signal generator generating a signal comprising mobile telecommunication system
information comprising changes in the radio signals of the cells that neighbor the private telecommunication system monitored by the scanners.

BRIEF DESCRIPTION OF THE DRAWINGS

The following is a brief description of the drawings that are presented for the purposes of illustrating the invention and not for purposes of limiting the same.

FIG. 1 shows a mobile terminal according to one aspect of the invention;

FIG. 2 is a perspective view of a mobile telecommunication system with which the present invention may be used;

FIG. 3 is a schematic view of intersystem communications between a private telecommunication system, a public mobile telecommunication system, and a mobile terminal;

FIG. 4 is a schematic view of a public mobile telecommunication system from the perspective of two private telecommunication systems located within the public network;

FIG. 5 is a schematic view of a public mobile telecommunication system from the perspective of a private telecommunication system that is monitoring control channel broadcasts from neighboring cells;

FIG. 6 shows a schematic of intersystem communication from the perspective of a private telecommunication system and a mobile terminal, according to one embodiment of the invention; and

FIG. 7 is an interaction diagram illustrating one aspect of the invention.
DETAILED DESCRIPTION OF THE INVENTION

While the invention will be described in connection with one or more embodiments, it should be understood that the invention is not limited to those embodiments. On the contrary, the invention includes all alternatives, modifications, and equivalents as may be included within the spirit and scope of the appended claims.

It should be understood that the term "mobile terminal", as used in the context of the invention, applies to any device capable of communicating with a cellular system. As used herein, the term "mobile terminal" may include a cellular radiotelephone with or without a multi-line display; a Personal Communications System (PCS) terminal that may combine a cellular radiotelephone with data processing, facsimile and data communications capabilities; a personal digital assistant (PDA) that can include a radiotelephone, pager, Internet/intranet access, Web browser, organizer, calendar and/or a global positioning system (GPS) receiver; and a conventional laptop and/or palmtop receiver or other appliance that includes a radiotelephone transceiver. Mobile terminals may also be referred to as "pervasive computing" devices.

Fig. 1 is a block diagram of a typical mobile terminal 10. The mobile terminal 10 includes an antenna 12, a receiver 16 and a transmitter 18 (collectively referred to as a transceiver), a speaker 20, a processor 22, a memory 24, a user interface 26 and a microphone 32. The antenna 12 is configured to send and receive radio signals between the mobile terminal 10 and a wireless network (not shown), including mobile telecommunication systems such as private telecommunication systems (such as digital
wireless office systems or other home or base systems) and public mobile telecommunication systems (such as public land mobile networks). The antenna 12 is connected to a duplex filter 14 which enables the receiver 16 and the transmitter 18 to receive and broadcast (respectively) on the same antenna 12. The receiver 16 demodulates, demultiplexes and decodes the radio signals into one or more channels. Such channels include a control channel and a traffic channel for speech or data. The speech or data are delivered to the speaker 20 (or other output device, such as a modem or fax connector).

The receiver 16 delivers messages from the control channel to the processor 22. The processor 22 controls and coordinates the functioning of the mobile terminal 10 and is responsive to messages on the control channel using programs and data stored in the memory 24, so that the mobile terminal 10 can operate within the wireless network (not shown in Fig. 1). The processor 22 also controls the operation of the mobile terminal 10 and is responsive to input from the user interface 26. The user interface 26 includes a keypad 28 as a user-input device and a display 30 to give the user information. Other devices are frequently included in the user interface 26, such as lights and special purpose buttons. The processor 22 controls the operations of the transmitter 18 and the receiver 16 over control lines 34 and 36, respectively, responsive to control messages and user input.

The microphone 32 (or other data input device) receives speech signal input and converts the input into analog electrical signals. The analog electrical signals are delivered to the transmitter 18. The transmitter 18 converts the analog electrical signals into digital data, encodes
the data with error detection and correction information and multiplexes this
data with control messages from the processor 22. The transmitter 18
modulates this combined data stream and broadcasts the resultant radio
signals to the wireless network through the duplex filter 14 and the antenna
12.

A public mobile telecommunication system 110 (such as a
public land mobile network ["PLMN"]) with which the present invention
may be used is illustrated in Fig. 2, and is defined by plural cells, including
representative cell locations A, B, C and D. Each cell A-D includes a re-
spective base station 112, 113, 114, and 115. Each of the base stations
112-115 communicates with a mobile switching center (MSC) 116 via
intercellular trunks 117. It will be recognized by those skilled in the art that
the public mobile telecommunication system, to the detail illustrated in Fig.
2, is consistent with current constructions. As used herein, however, it
should be understood that a public mobile telecommunication system is not
limited to systems which may be used by the general public, but rather is
used to distinguish it as a different system from private mobile telecommu-
nication systems such as the private telecommunication system discussed
below.

The public mobile telecommunication system 110 is operable
to select from one of the base stations 112-115 to process a call with the
mobile terminal 10. The mobile terminal 10 (not shown) is carried in a
vehicle 118 located in cell location D. Consequently, a cellular channel
associated with base station 115 would handle the call in progress. If the
mobile terminal 10 were stationary, then the call would likely be handled
until completion by the base station 115. However, if the mobile terminal is moving, then it could cross into different cells. For example, as illustrated, the mobile terminal 10 might be moving in a direction as indicated by the dashed line 120 and traverse into cell location B and subsequently cell location A. A typical public mobile telecommunication system 110 utilizes handoffs to hand a call off from a channel of the base station 115 to a channel of the base station 113, and subsequently from the base station 113 to the base station 112, as the mobile terminal traverses from cell location D to respective cell locations B and A.

A schematic of a mobile network 200 with which the present invention may be used is illustrated in Fig. 3. The mobile network 200, which may be consistent with current constructions insofar as illustrated in Fig. 3, includes a private telecommunication system 202 (which may be a digital wireless office system ["DWOS"]) and a public mobile telecommunication system 110.

The private telecommunication system 202, located in business premises 203, interacts with the public mobile telecommunication system 110 using, for example, the ANSI-41 intersystem operations protocol (see 206). Specifically, the ANSI-41 protocol supports roaming between the private telecommunication system 202 and the mobile telecommunication system 110. More specifically, the private telecommunication system 202 can communicate with a home location register ("HLR") 208, via signal system 7 ("SS7") gateway 210 and a wireless office system SS7 gateway ("WGW") 212. Traffic connections between the private telecommunication system 202 and the mobile telecommunication system 110 are
alternately routed via networks such as a private branch exchange ("PBX") 214 and a public switch telephone network ("PSTN") 216; the PSTN is shown linked to a MSC 116. A voice mail system 215 may also be provided.

Traffic between the PBX 214 and the private telecommunication system 202 is supported by a primary rate interface ("PRI") (see 218). Hyper text transfer protocol ("HTTP") and file transfer protocol ("FTP") (see 220) support traffic between the private telecommunication system 202 and a private telecommunication system office management client ("DWOS O&M client") 222 and therefore may be used. A local area network and wide area network 224 may provide support for connecting to a world wide web ("www") (see 226).

Still referring to FIG. 3, the mobile terminal 10 can establish a connection with the private telecommunication system 202 by using, for example, the IS-136 protocol. It will be appreciated to those skilled in the art that other protocols, such as CDMA, GSM, FDMA or any combination of the same, may be used to establish an air interface between the mobile terminal 10 and private telecommunication system 202. The mobile terminal 10 can also establish a radio connection with a base station 15 of the mobile telecommunication system 110.

Fig. 4 shows a schematic of intersystem communications 300 comprising private telecommunication systems 202A and 202B and neighboring cells 304, 306, 308, 312, 314. Private telecommunication system 202A includes neighboring cells 304, 306 and 308, and private telecommunication system 202B includes neighboring cells 312 and 314.
Fig. 5 is a schematic of a private telecommunication system and a public mobile telecommunication system including a private telecommunication system 202C surrounded by neighboring cells 404, 406, 408 of the public mobile telecommunication system 110. The private telecommunication system 202C, which includes a system processor 430 and a signal generator 435, is linked to scanners 410, 412, and 413 by means of landlines 420, 422, and 424. The scanners 410, 412, and 413 monitor radio signal broadcasts such as control channel broadcasts from base stations 414, 416, and 418 to provide radio network information on the neighboring cells 404, 406, and 408, respectively.

The radio network information from the neighboring cells 404, 406, and 408 is relayed to the system processor 430 of private telecommunication system 202C via the landlines 420, 422, and 424, respectively. The radio network information relayed to the system processor 430 may include the identity, and frequencies of control channel broadcasts from each base station of each neighboring cell. The radio network information relayed to the system processor 430 preferably may also include the color code of the neighbor cells, such as neighbor cell 406. For mobile terminals 10 using the global system for mobile communications ("GSM") protocol, the radio network information may include the cell identities of neighboring cells.

The radio network of the private telecommunication system 202C broadcasts on several control channels and frequencies (for example, eight channels in ANSI-136 systems) with the express purpose of establishing a radio link with at least one mobile terminal 10 registered to use the
private telecommunication system 202C. It will be appreciated by those skilled in the art that a plurality of individual mobile terminals 10 may be used. The system processor 430 combines the radio network information on the frequency and number of control channels broadcast by the private telecommunication system 202C with the radio network information relayed from the scanners 410, 412, and 413 (e.g., the identity, frequencies and number of the control channel broadcasts from each base station of each neighboring cell) to provide “combined radio network information” that describes the radio signals broadcast by the private telecommunication system and radio signals transmitted by the base stations 414, 416, and 418, in the neighboring cells 404, 406, and 408, respectively. The combined radio network information is relayed to registered mobile terminals 10 as described below and stored on the mobile terminal memory 24.

The mobile terminal 10 uses the combined radio network information to establish a connection with the private telecommunication system 202C. For example, when the mobile terminal 10 roams near the private telecommunication system 202C, combined radio network information stored on the mobile terminal memory 24 enables it to recognize base station broadcasts from neighboring base stations 416, 418 and 414. When the mobile terminal 10 recognizes control channel broadcasts from a base station such as 416, the mobile terminal 10 uses its stored combined radio network information to make signal strength measurements on radio frequencies used by the private telecommunication system 202C. The combined radio network information enables the mobile terminal 10 to detect the private telecommunication system 202C even if modifications
have been made to the operation of the private telecommunication system 202C and/or the radio network of the neighbor cells.

In one aspect of the invention, the private telecommunication system 202A uses dial-up numbers for each registered mobile terminal 10 to forward the updated combined radio network information. In another aspect of the invention, the private telecommunication system sends updated combined radio network information on a cyclical basis and requires a response from each registered mobile terminal. The private telecommunication system redials those registered mobile terminals that failed to acknowledge receipt of the updated system information. Newly registered mobile terminals authorized to use the private telecommunication system can be added to the list of dialup numbers to receive updated combined radio network information.

Certain aspects of the present invention ensure that information on a change to the private telecommunication system or neighboring cells is sent to mobile terminals 10 registered to the private telecommunication system. Hence, whenever a registered mobile terminal 10 is roaming near the private telecommunication system 202C and attempts a call through to the private telecommunication system 202C, the mobile terminal 10 can use the updated combined radio network information to establish a connection with the private telecommunication system 202 regardless of recent changes to the radio network of the private telecommunication system 202C and/or in the radio network of the surrounding neighbor cells such as 404, 406, and 408 (Fig. 5).
Alternatively, referring to Figs. 3 and 5, the private telecommunication system 202C may utilize the SS7 gateway 210 and a wireless office system SS7 gateway ("WGW") 212 to establish a connection with the MSC 116 and establish a radio link to registered mobile terminals 10 via a base station connected to the MSC 116.

The updated combined radio network information may be encrypted by the private telecommunication system 202C using suitable encryption technology and un-encrypted upon receipt by the registered mobile terminal 10.

The updated combined radio network information may be forwarded to the registered mobile terminal 10 via the private branch exchange 214 and then via the public switch telephone network 216 to the MSC 116 and onward to the registered mobile terminal 10 via a broadcast message by means of the intercellular trunk 117 and base station 115. If the PBX/PSTN or WGW routes are utilized then encryption technology may be utilized to avoid, for example, putative hackers reprogramming registered mobile terminals and causing one or more failures.

Fig. 6 shows another aspect of the invention in which the private telecommunication system 202 sends updated combined radio network information via a communication interface or link 502 and onto a mobile telecommunication system such as the illustrated public mobile telecommunication system 110. A mobile terminal 10 receives the updated combined radio network information via a cellular radio transmission from a base station (such as base station 115 in Fig. 2). Updated combined radio network information may be sent to a communication interface 506.
which includes a suitable interface 503 which may use the Internet protocol ("IP") with a secure socket layer ("SSL") for security and a message center 504. The communication interface 502 relays combined radio network information from the private telecommunication system 202 and mobile terminals 10 registered to use the private telecommunication system 202.

Referring now to Figs. 5 and 6, in another aspect of the present invention, the signal generator 435 is used to broadcast a signal, which includes the combined radio network information, to the communication interface 502. In another aspect of the present invention, the signal generator 435 is connected to the communication interface via a landline. The signal generated by the signal generator 435 may also include the combined radio network information based on the changes in the radio signals of neighboring cells (e.g., 404, 406, and 408) and modifications to radio broadcasts of the private telecommunication system 202.

The message center 504 may provide verification and authentication and challenge procedures required to ensure that the registered mobile terminal 10 is updated with an authentic version of updated combined radio network information. Alternatively, an over-the-air teleservice may be used by the private telecommunication system 202 to send updated combined radio network information to at least one registered mobile terminal 10.

In another aspect of the invention the most recent combined radio network information overwrites older combined radio network information previously stored on the mobile terminal 10. For example, a change in the number and/or frequency of control channels broadcast by the base
stations 414, 416, and 418 in neighboring cells 404, 406, and 408 is incorporated into the combined radio network information and forwarded to the mobile terminal 10. Alternatively, the previously stored combined radio network information may be given a new file name and stored separately from the latest combined radio network information on the mobile terminal 10.

Referring to Fig. 7, which is an interaction diagram 600 according to one aspect of the invention, private telecommunication systems are authorized to provide programming instructions for reprogramming mobile terminals. The private telecommunication system 202 facilitates the reprogramming of registered mobile terminals 10 with updated combined radio network information including a private telecommunication system identity update. To avoid security problems (e.g., a hacker illicitly substituting incorrect private telecommunication system identities) a service provisioning function 610 ensures that each request for reprogramming is verified prior to forwarding the reprogramming request with updated combined radio network information to the mobile telecommunication system such as the public mobile telecommunication system 110.

Referring to Figs. 5 and 7, the private telecommunication system 202 monitors the radio network of neighboring cells at 620 using, for example, scanners 410, 412, and 413 linked to the private telecommunication system 202C to scan control channel broadcasts from neighboring base stations. The private telecommunication system 202 processes the radio network information at 625. If the private telecommunication system 202 has modified its own radio broadcasts, for example the frequency
and/or number of control channel broadcasts, then this information is combined with the radio network information of the neighbor cells and sent to registered mobile terminals 10 at 625. Updating the combined radio network information triggers a private telecommunication system identity update ("PSID update") at 630. Specifically, the private telecommunication system 202 monitors for change in order to generate updated combined radio network information, shown here as a PSID update. The updated combined radio network information is forwarded at 630 to a service provisioning function at 635. In this aspect, the private telecommunication system 202 is also charged with the responsibility of deciding which mobile terminals 10 should receive the updated combined radio network information at 625.

The provisioning function represented at 610, which is provided for example by the message center 504 (Fig. 6), handles the private telecommunication system identity update at 635. In Fig. 7 the service provisioning function 610 assumes the responsibility of validating private telecommunication system identity updates from one or more private telecommunication systems (a single private telecommunication system is shown at 202). Each private telecommunication system identity update is validated by the service provisioning function at 640. Specifically, the service provisioning function validates each incoming private telecommunication system update at 640 and forwards the updated combined radio network information, at 645, to the public mobile telecommunication system 110. The public mobile telecommunication system 110 broadcasts the updated combined radio network information at 650 to one or more regis-
tered mobile terminals 10. The updated combined radio network infor-
mation is stored on the memory 24 in the one or more registered mobile termi-
nals 10.

While the invention is described above in connection with the
illustrative or exemplary embodiments, these embodiments are not intended
to be exhaustive or limiting of the invention. Rather, the invention is in-
tended to cover all alternatives, modifications and equivalents included
within its spirit and scope of the invention, as defined by the appended
claims.
CLAIMS

1. A method of operating a mobile terminal to facilitate communication with a private telecommunication system operating in a mobile telecommunication system, comprising:
   receiving system information comprising modifications to radio signals of at least one cell of said mobile telecommunication system neighboring said private telecommunication system and modifications to radio broadcasts of said private telecommunication system;
   storing said system information on said mobile terminal; and
   using said system information to detect and establish communication with said private telecommunication system.

2. The method of operating a mobile terminal according to claim 1, wherein said system information comprises modifications to a frequency of control channel broadcasts originating from a base station of said at least one neighboring cell.

3. The method of operating a mobile terminal according to claim 2, wherein said system information further comprises information on frequencies of control channel broadcasts of said private telecommunication system.
4. The method of operating a mobile terminal according to claim 1, wherein using said system information to detect and establish communication with said private telecommunication system uses said system information to recognize a broadcast from a base station in said at least one neighbor cell.

5. The method of operating a mobile terminal according to claim 4, wherein using said system information to detect and establish communication with said private telecommunication system comprises establishing communication with said private telecommunication system when a broadcast from a base station in said at least one neighbor cell is recognized.

6. A method of operating a mobile terminal to facilitate communication with a private telecommunication system operating in a public mobile telecommunication system having a plurality of cells at least one of which neighbors said private telecommunication system, comprising:
   receiving system information comprising modifications to frequencies of radio signals of said at least one cell neighboring said private telecommunication system and modifications to frequencies of radio broadcasts of said private telecommunication system;
   storing said system information on said mobile terminal; and
   monitoring said frequencies in said stored system information to detect and establish communication with said private telecommunication system.
7. The method of operating a mobile terminal according to claim 6, further comprising recognizing a broadcast in said frequencies in said stored system information.

8. The method of operating a mobile terminal according to claim 6, further comprising performing signal strength measurements on said frequencies in said stored system information.

9. The method of operating a mobile terminal according to claim 8, further comprising establishing communication with said private telecommunication system when said strength measurements of one of said frequencies exceeds a selected level.

10. The method of operating a mobile terminal according to claim 9, wherein said one of said frequencies is one of said stored frequencies of radio signals of said at least one cell neighboring said private telecommunication system.
11. A method of operating a home mobile telecommunication system, comprising:

scanning broadcasts of a neighboring mobile telecommunication system to identify modifications to radio signals of said neighboring mobile telecommunication system;

monitoring for modifications to radio broadcasts of said home mobile telecommunication system;

compiling combined radio network information based on said modifications to said radio signals of said neighboring mobile telecommunication system and said modifications to said radio broadcasts of said private telecommunication system; and

including said combined radio network information in said radio broadcasts of said home mobile telecommunication system.

12. The method of operating a home mobile telecommunication system according to claim 11, wherein scanning broadcasts of a neighboring mobile telecommunication system to identify modifications to radio signals of said neighboring mobile telecommunication system comprises monitoring at least one control channel transmitted by at least one base station of said neighboring mobile telecommunication system.
13. The method of operating a home mobile telecommunication system according to claim 11, wherein said combined radio network information comprises frequencies of control channel broadcasts originating from neighboring base stations of said neighboring mobile telecommunication system.

14. The method of operating a home mobile telecommunication system according to claim 13, wherein said combined radio network information further comprises information on frequencies of control channel broadcasts of said private telecommunication system.

15. The method of operating a home mobile telecommunication system according to claim 11, further comprising validating said combined radio network information prior to including said combined radio network information in said radio broadcasts of said home mobile telecommunication system.

16. The method of operating a home mobile telecommunication system according to claim 11, further comprising transmitting said combined radio network information to said neighboring mobile telecommunication system for retransmission by said neighboring mobile telecommunication system.
17. A method of operating a private telecommunication system, comprising:
   scanning broadcasts of neighboring cells of a public mobile telecommunication system to identify modifications to radio signals of said neighboring cells;
   monitoring for modifications to radio broadcasts of said private telecommunication system;
   compiling combined radio network information based on said modifications to said radio signals of said neighboring cells and said modifications to said radio broadcasts of said private telecommunication system; and
   transmitting said combined radio network information.

18. The method of operating a private telecommunication system according to claim 17, wherein transmitting said combined radio network information comprises said combined radio network information in said radio broadcasts of said private telecommunication system.

19. The method of operating a private telecommunication system according to claim 17, wherein transmitting said combined radio network information comprises forwarding said combined radio network information to said public mobile telecommunication system for retransmission by said public mobile telecommunication system.
20. The method of operating a private telecommunication system according to claim 17, wherein scanning broadcasts of neighboring cells of said public mobile telecommunication system to identify modifications to radio signals of said neighboring cells comprises monitoring at least one control channel of each of said neighboring cells.

21. The method of operating a private telecommunication system according to claim 17, wherein said combined radio network information comprises frequencies of control channel broadcasts originating from said neighboring cells.

22. The method of operating a private telecommunication system according to claim 21, wherein said combined radio network information further comprises information on frequencies of control channel broadcasts of said private telecommunication system.
23. A mobile terminal, comprising:

- a transceiver for communicating via radio signals with a private telecommunication system and cells of a mobile telecommunication system wherein at least one of said cells neighbors said private telecommunication system;
- a memory storing mobile telecommunication system information comprising information on radio signals of said at least one cell neighboring said private telecommunication system;
- a processor monitoring said radio signals received by said transceiver for mobile telecommunication system information, said processor writing said mobile telecommunication system information received by said transceiver to said memory, said processor further using said mobile telecommunication system information to detect and establish communication with said private telecommunication system using said transceiver.

24. The mobile terminal of claim 23, wherein said processor scans for radio signals received by said transceiver and corresponding to said mobile telecommunication system information to determine proximity to said private telecommunication system.

25. The mobile terminal of claim 24, wherein said processor establishes communication with said private telecommunication system using said transceiver when it determines close proximity to said private telecommunication system.
26. The mobile terminal of claim 25, wherein said mobile telecommunication system information further comprises information on radio broadcasts used by said private telecommunication system, and said processor establishes communication with said private telecommunication system using said information stored in said memory on radio broadcasts used by said private telecommunication system.

27. The mobile terminal of claim 23, wherein said mobile telecommunication system information comprises information on a frequency of control channel broadcasts used by said at least one cell that neighbors said private telecommunication system, and said processor monitors for radio signals at said frequency.

28. The mobile terminal of claim 27, wherein said processor monitors said radio signals received by said transceiver to detect radio signals at said frequency of said control channel broadcasts used by said at least one cell neighboring said private telecommunication system stored in said memory.
29. A mobile terminal, comprising:
   a transceiver for communicating via radio signals with a private
telecommunication system and cells of a public mobile telecommunication
system wherein at least one of said cells neighbors said private telecommu-
nication system;
   a memory storing combined radio network information com-
prising information on a frequency and number of control channel broad-
casts used by said private telecommunication system and information on a
frequency and number of control channel broadcasts used by said at least
one cell that neighbors said private telecommunication system;
   a processor monitoring said radio signals received by said
transceiver for combined radio network information, said processor writing
said combined radio network information received by said transceiver to
said memory, said processor further using said combined radio network
information to detect and establish communication via said transceiver with
said private telecommunication system using said transceiver.

30. The mobile terminal of claim 29, wherein said processor
monitors for radio signals at said frequency of said control channel broad-
casts used by said at least one cell neighboring said private telecommunica-
tion system stored in said memory.
31. The mobile terminal of claim 30, wherein said processor communicates with said private telecommunication system at said frequency of said control channel broadcasts used by said private telecommunication system stored in said memory when it detects radio signals at said frequency of said control channel broadcasts used by said at least one cell neighboring said private telecommunication system stored in said memory.

32. A private telecommunication system, comprising:

scanners monitoring radio signals of cells of a public mobile telecommunication system that neighbor said private telecommunication system;

a system processor determining changes in said radio signals of said cells of said public mobile telecommunication system that neighbor said private telecommunication system; and

a signal generator generating a signal comprising mobile telecommunication system information comprising changes in said radio signals of said cells that neighbor said private telecommunication system monitored by said scanners.

33. The improved private telecommunication system of claim 32, wherein said mobile telecommunication system information further comprises information on frequency and number of control channel broadcasts used by said private telecommunication system.
34. The improved private telecommunication system of claim 32, wherein said changes in said radio signals of said cells that neighbor said private telecommunication system monitored by said scanners comprise scanner monitored changes in frequency of control channel broadcasts used by said cells that neighbor said private telecommunication system.

35. The improved private telecommunication system of claim 32, further comprising a signal transmitter transmitting said signal generated by said signal generator.

36. The improved private telecommunication system of claim 35, wherein said signal transmitter transmits said signal generated by said signal generator in a radio broadcast.

37. The improved private telecommunication system of claim 35, wherein said signal transmitter transmits said signal generated by said signal generator to said public mobile telecommunication system.
38. A private telecommunication system, comprising:

scanners monitoring radio signals of cells of a public mobile telecommunication system that neighbor said private telecommunication system;

a system processor determining changes in said radio signals of said cells of said public mobile telecommunication system that neighbor said private telecommunication system;

a communication link to said public mobile telecommunication system; and

a signal transmitter communicating combined radio network information comprising said changes in said radio signals of said cells that neighbor said private telecommunication system and modifications to radio broadcasts of said private telecommunication system, said signal transmitter communicating said information signal over said communication link.
FIG. 1.