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(54)   Abstract Title: **Routing messages between different networks**

(57)   Disclosed is a message routing method and system in which an identifier of the mobile device in a
 telecommunications network is used to route messages to a client in another network, for example via a
 wireless LAN connection. This may enable a user to receive a mobile telecommunications message on
 another device via another network without requiring multiple identifiers and may enable offloading of
 telecommunications network bandwidth.
 An embodiment describes a mobile telephone unique identity assigned to a computer in a WLAN. There
 fore, when the user is sent an SMS or MMS it is routed to the user's computer and not their mobile
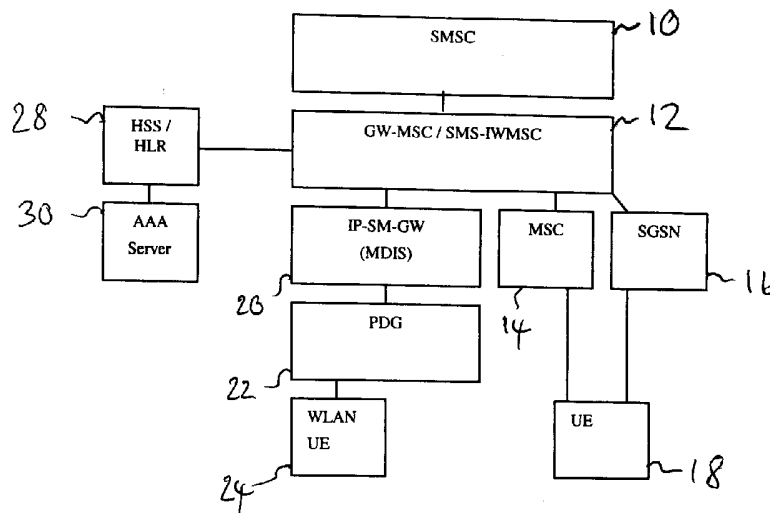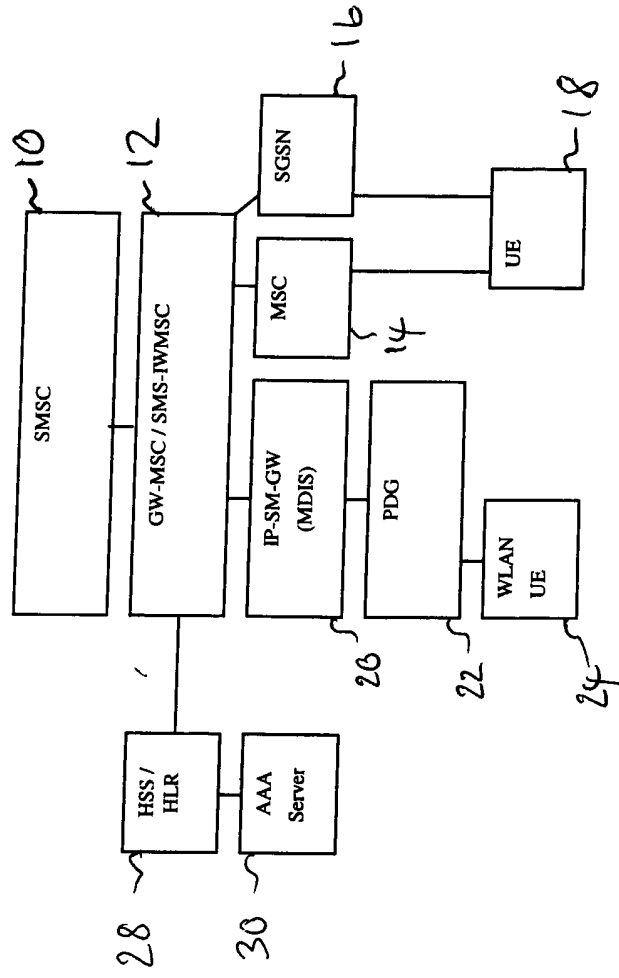 telephone.

Fig. 1

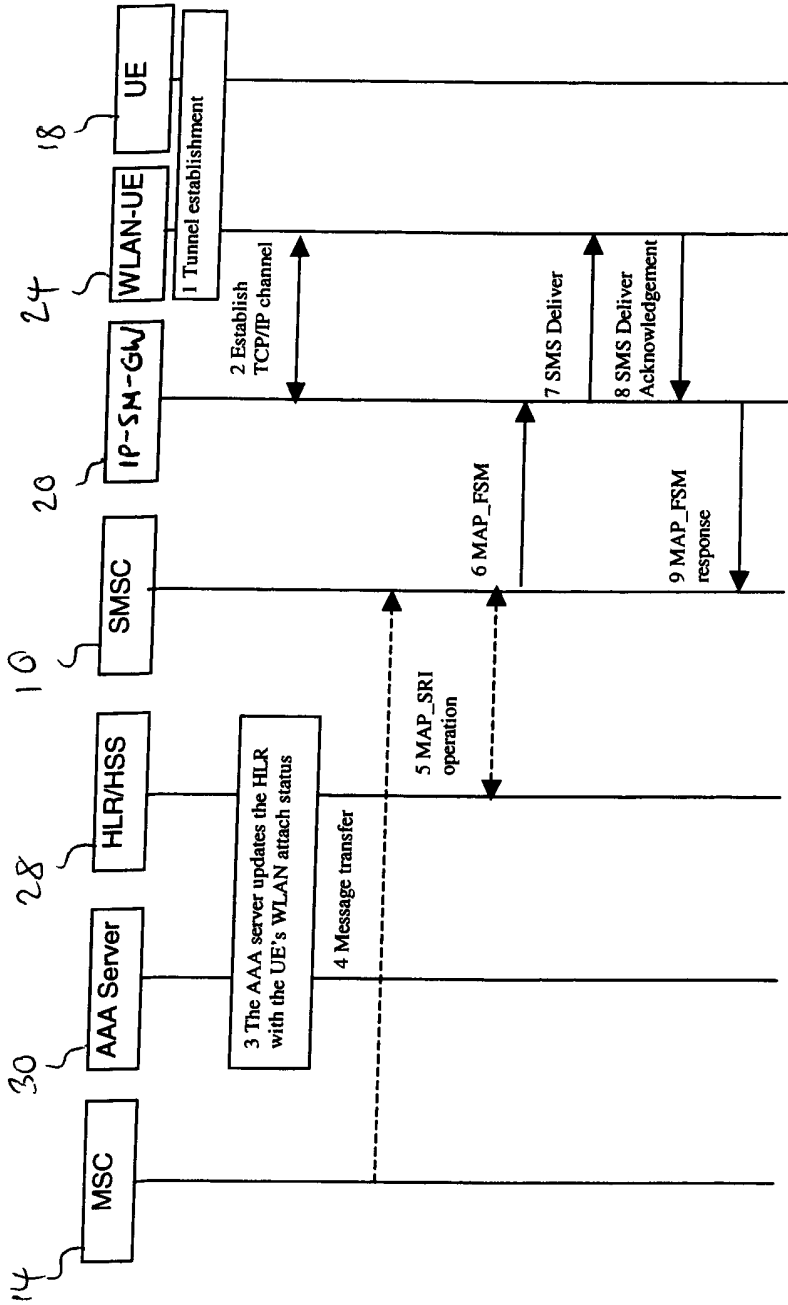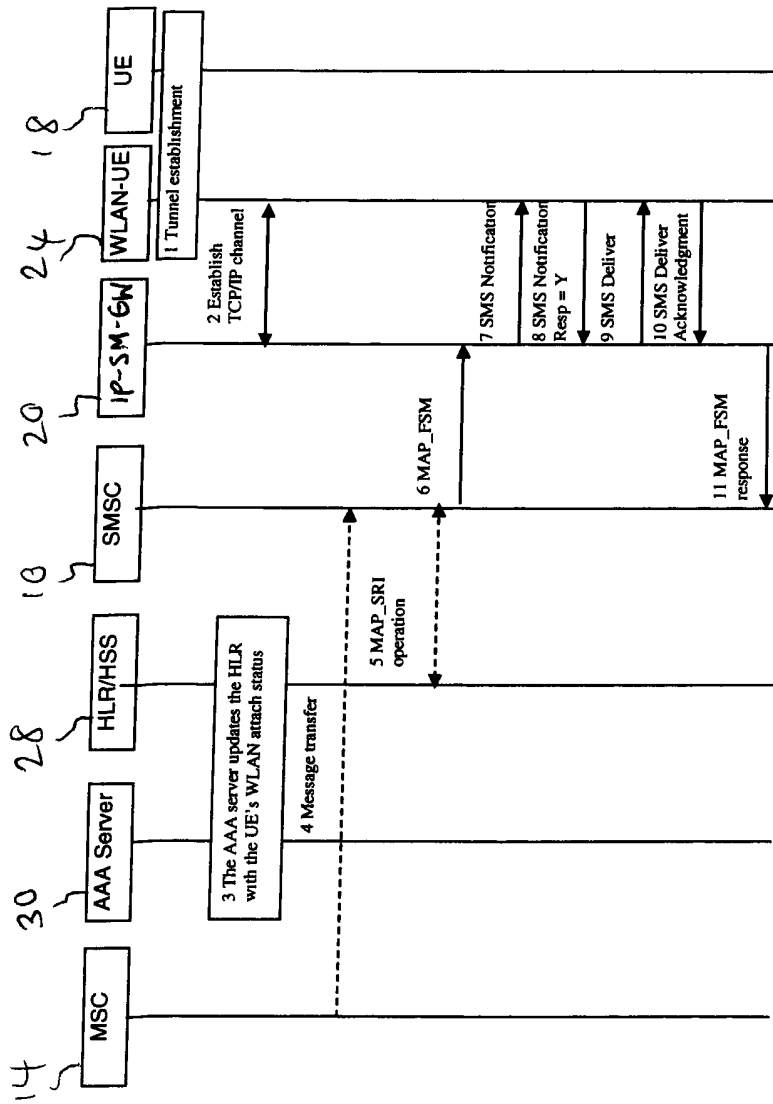GB 2 414 364 A

Fig. 1

Fig. 2

Fig. 3

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UE 18

WLAN-UE 24

IP-SM-GW 20

SMSC 10

HLR/HSS 28

AAA Server 30

MSC 14

1 Tunnel establishment

2 Establish TCP/IP channel

3 The AAA server updates the HLR with the UE's WLAN attach status

4 Message transfer

5 MAP_SRI operation

6 MAP_FSM

7 SMS Notification

8 SMS Notification Resp = N
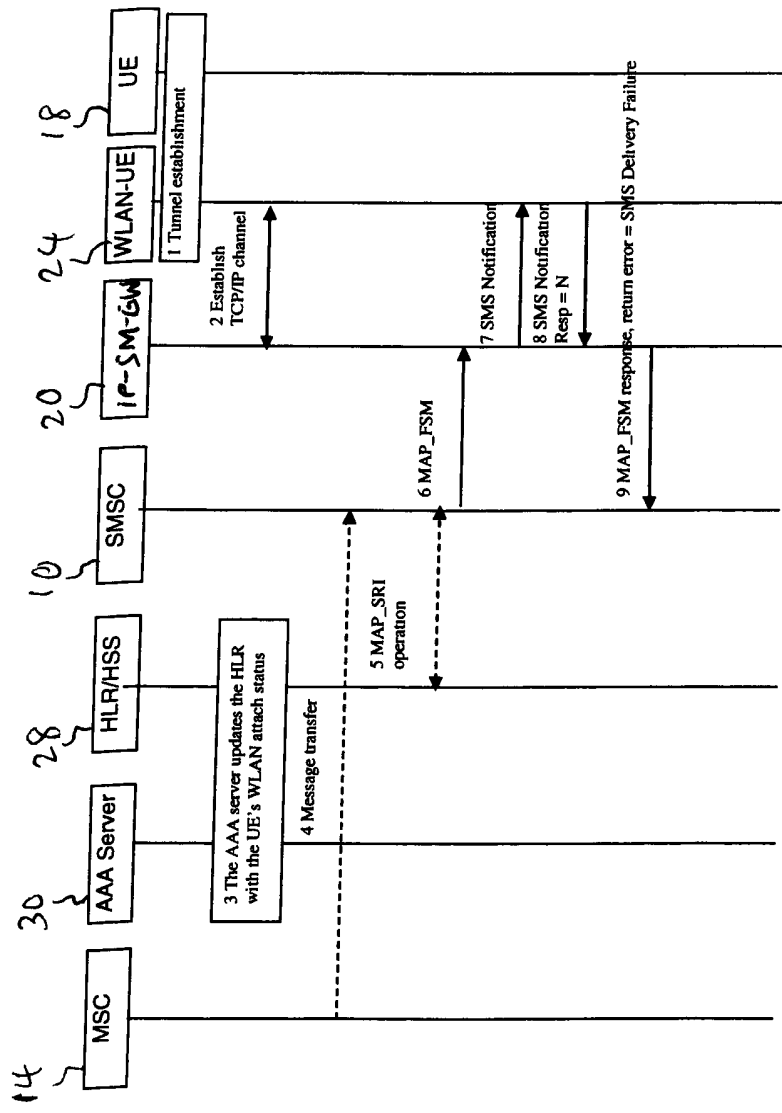
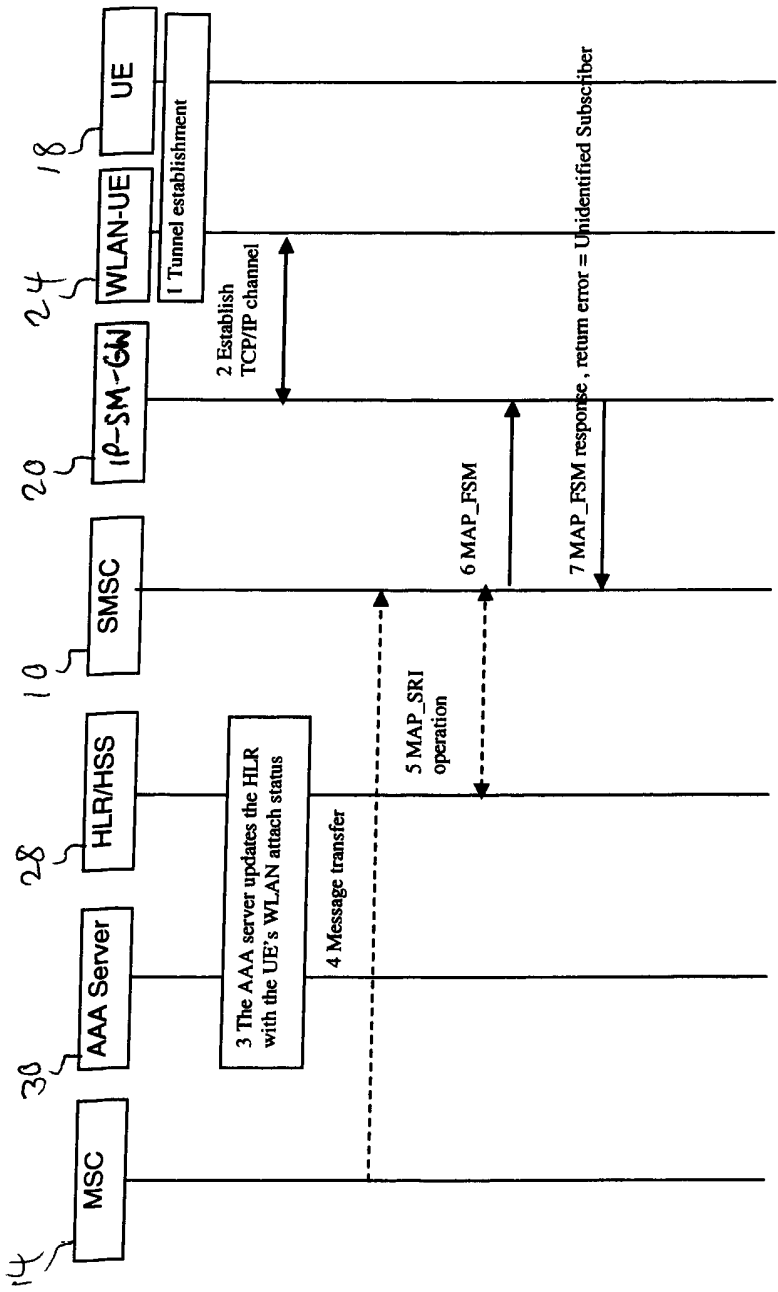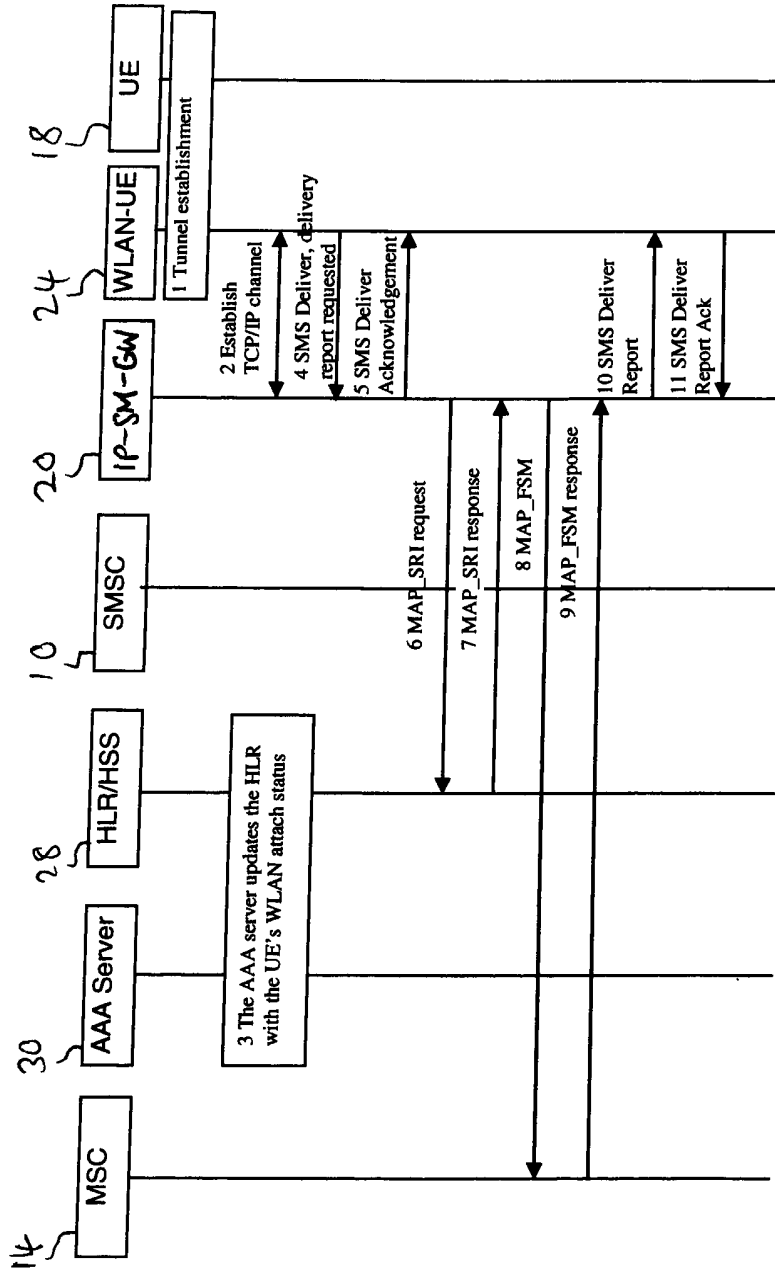9 MAP_FSM response, return error = SMS Delivery Failure

Fig. 4

Fig. 5

Fig. 6
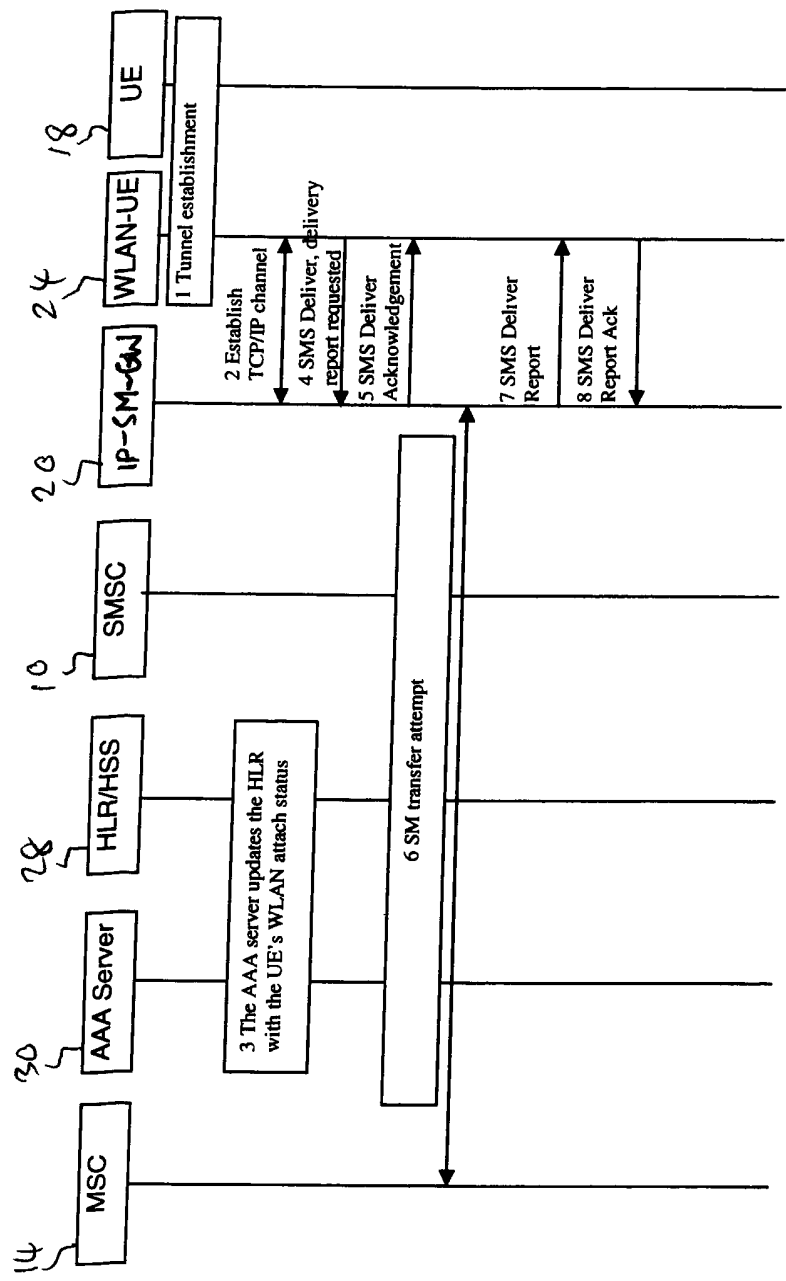
Fig. 7

MESSAGE ROUTING METHOD AND SYSTEM

The present invention relates to the field of mobile telecommunications, and particularly but not exclusively to the transmission and routing of messages such as Short Message Service (SMS) or Multimedia Message Service (MMS) messages. The invention is applicable to the transmission of messages in a GSM network, but can also be applied to the transmission of messages in other wireless or mobile telecommunications networks, for example CDMA networks or third generation (3G) networks.

The use of mobile telecommunications networks for the transmission of messages, such as SMS (Short Message Service) or MMS (Multimedia Message Service) messages, has become increasingly widespread, to the extent that mobile subscribers are becoming increasingly reliant on these messaging services. However, use of these services is often limited to mobile devices specifically adapted to connect to the mobile communications network. When this network is unavailable (for example, because the user is out of range of the nearest base station), or the user's mobile device is not functioning correctly for some other reason (such as a depleted battery), the messaging services become unavailable.

Although some limited services offer the ability to send messages, in particular SMS messages, from a computer connected to the Internet (for example, via a form on a web page or via an e-mail addressed to a particular server), these are generally not associated with a mobile subscriber's regular messaging service. As such, they generally do not enable a user to conduct their regular messaging tasks, in particular in relation to receiving messages from other users. Also, these services are generally provided and hence charged entirely separately.

It is an object of the present invention to alleviate some of the above problems and to provide an improved messaging system.

Accordingly, in a first aspect of the invention, there is provided a method of routing messages between a first network and a client connected to a second network, the first network being a mobile telecommunications network in which

5 mobile devices are assigned unique identifiers, the method comprising: assigning the identifier of a mobile device associated with the first network to the client; and routing messages between the first network and the client using the assigned identifier.

10 In this way, a more flexible routing system can be provided, in which messages can be routed to a client on one network using an identifier identifying a device on another network. The messaging functionality of the mobile telecommunications network can thereby be extended to a second network.

15 To provide more efficient routing of messages, the client is preferably identified in the second network by an address, and the method preferably further comprises storing a mapping between the identifier assigned to the client and the address of the client. For the same reason, the method preferably further comprises receiving a message intended for the mobile device from the first network;

20 determining the address of the client using the stored mapping; and transmitting the message to the client via the second network using the determined address.

Transmitting the message to the client may comprise transmitting to the client a notification that a message has been received; receiving a response indicating

25 whether or not the received message should be transmitted to the client; and transmitting the message to the client if the response is positive. This can provide increased flexibility. For the same reason, the method may further comprise only transmitting the message to the client if a positive response to the notification is received within a given time limit.

30

Preferably, the first network comprises a plurality of network nodes representing connection points for mobile devices, and the method comprises providing an interface node representing a connection point for the client. The first network preferably comprises a location database which records information relating to

5   network nodes associated with the last known locations of given mobile devices; the method preferably further comprising recording in the location database, for the mobile device whose identifier has been assigned to the client, the interface node instead of the network node associated with the last known location of the mobile device. This can enable efficient routing of messages without

10   necessitating substantial changes to the mobile telecommunications network. For the same reason, the method preferably further comprises receiving a request for routing information for the mobile device, and providing routing information corresponding to the interface node in response to the request.

15   The location database may be provided by a Home Location Register (HLR) or Home Subscriber Server (HSS). The network nodes may be Mobile Switch Centres (also sometimes referred to as Mobile Switching Centres or MSCs). In this way, the method can be applied to certain types of networks such as GSM networks.

20

For efficiency, the interface node preferably provides an interface between the first and second networks.

Preferably, the method further comprises receiving a message intended for the

25   first network from the client via the second network; and transmitting the message to the first network. This can enable messages to be sent from the client to the first network. For added flexibility, the method may further comprise receiving an indication of whether the client requires a delivery report relating to the message; and recording the indication. The method may also comprise

30   receiving a delivery report from the first network relating to whether or not the message was delivered successfully, and transmitting the delivery report to the

client via the second network. For efficiency, transmitting the delivery report to the client may comprise determining an address of the client using a stored mapping between the identifier assigned to the client and an address of the client, and transmitting the delivery report using the determined address.

5

The client may comprise one or both of: a client device and a client application executing on a client device. In this way, the method may be applied to systems using clients implemented in hardware, software or a combination of the two.

10 The second network preferably comprises an Internet Protocol (IP) based network. This can enable the method to be used with a wide variety of networks and client devices. The second network may comprise a Wireless Local Area Network (WLAN). This can enable messages to be routed to wireless devices. Accordingly, the client may comprise a WLAN-enabled client device.

15

The identifier may comprise an International Mobile Subscriber Identity (IMSI). This may provide improved security. Alternatively or in addition, the identifier may comprise a Mobile Subscriber ISDN number (MSISDN). To further enhance security, the identifier may comprise a combination of an IMSI and an MSISDN.

20

In a further aspect of the invention, there is provided a messaging application for use with a client device connectable to a first network via a second network, the first network being a mobile telecommunications network in which mobile devices are assigned unique identifiers, the messaging application comprising means for 25 receiving a mobile device identifier, and means for transmitting messages between the client device and the first network via the second network using the received identifier.

For efficiency and security purposes, the receiving means preferably comprises 30 means for connecting to a mobile device, and means for receiving the mobile device identifier from the mobile device. Alternatively or in addition, the receiving

means may comprise means for receiving user input (for example, via keyboard, keypad, touch screen, pointer device or other input means), which may improve the flexibility and usability of the application.

5   Where the first network comprises an interface node for providing an interface between the first and second networks, the messaging application preferably further comprises means for establishing a connection with the interface node via the second network. This can enable efficient routing of messages. The transmitting means preferably comprises means for sending a message to the

10   first network, and preferably comprises means for receiving a message from the first network. Advantageously, the sending means may comprises means for sending a delivery report request, and the receiving means may comprise means for receiving a delivery report. This can provide improved flexibility.

15   For the same reason, the receiving means preferably comprises means for receiving a notification that a message is due to be delivered, and means for responding to the notification, the response comprising an indication of whether the message should be delivered to the messaging application. This can also enable more efficient use to be made of the client device's resources (such as

20   memory) and of the second network's transmission capabilities (for example, of its bandwidth).

The messaging application is preferably adapted to perform or participate in a method as described herein.

25

The invention also provides a client device comprising a messaging application as described herein.

In a further aspect of the invention, there is provided a client device connectable

30   to a first network via a second network, the first network being a mobile telecommunications network in which mobile devices are assigned unique

identifiers, the client device comprising means for receiving a mobile device identifier, and means for transmitting messages between the client device and the first network via the second network using the received identifier. The client device preferably further comprises the features of the messaging application

5   described herein, and is preferably adapted to perform or participate in a method as described herein.

The invention further provides apparatus for routing messages between a first network and a client connected to a second network, the first network being a

10   mobile telecommunications network in which mobile devices are assigned unique identifiers, the apparatus comprising: means for assigning the identifier of a mobile device associated with the first network to the client; and means for routing messages between the first network and the client using the assigned identifier. The apparatus preferably further comprises means for performing a

15   method as described herein.

The invention further provides a computer program or computer program product for routing messages between a first network and a client connected to a second network, the first network being a mobile telecommunications network in which

20   mobile devices are assigned unique identifiers, the computer program or computer program product comprising: means for assigning the identifier of a mobile device associated with the first network to the client; and means for routing messages between the first network and the client using the assigned identifier. The computer program or computer program product preferably further

25   comprises means for performing a method as described herein.

The apparatus, computer program or computer program product may, for example, be provided in the form of a message routing system.

30   The invention further provides an interface node for use with a mobile telecommunications network, the interface node being adapted to perform a

method as described herein; and a message routing system adapted to perform a method as described herein.

The invention further provides a method of routing messages, a client device, a messaging application, an interface node and a message routing system substantially as described herein with reference to and as illustrated in the accompanying drawings.

The invention also provides a computer program and a computer program product for carrying out any of the methods described herein and/or for embodying any of the apparatus features described herein, and a computer readable medium having stored thereon a program for carrying out any of the methods described herein and/or for embodying any of the apparatus features described herein.

The invention also provides a signal embodying a computer program for carrying out any of the methods described herein and/or for embodying any of the apparatus features described herein, a method of transmitting such a signal, and a computer product having an operating system which supports a computer program for carrying out any of the methods described herein and/or for embodying any of the apparatus features described herein.

The invention extends to methods and/or apparatus substantially as herein described with reference to the accompanying drawings.

Any feature in one aspect of the invention may be applied to other aspects of the invention, in any appropriate combination. In particular, method aspects may be applied to apparatus aspects, and vice versa.

Furthermore, features implemented in hardware may generally be implemented in software, and vice versa. Any reference to software and hardware features herein should be construed accordingly.

5   Preferred features of the present invention will now be described, purely by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a schematic diagram illustrating the architecture of a message routing system; and

10   Figures 2 to 7 illustrate message flows within the system of Figure 1 in various messaging scenarios.

Reference is made to the following technical specifications relating to the implementation of the Short Message Service in mobile telecommunications

15   networks:

- GSM 03.40, version 4.13.0, Phase 2; Technical Realization of SMS
- GSM 09.02, version 4.19.1, Phase 2; MAP Specification
- 3GPP TS 23.040, version 5.6.1, UMTS; Technical Realization of SMS
- 3GPP TS 29.002 version 3.17.0, UMTS; MAP Specification

20

The following table provides a summary of some abbreviations used herein:

Abbreviation	Description
3GPP	Third Generation Partnership Project
ESME	External Short Message Entity
GPRS	General Packet Radio Service
GW-MSC	Gateway Mobile Switch Centre
HLR	Home Location Register
HSS	Home Subscriber Server
IMSI	International Mobile Subscriber Identity
ISDN	Integrated Services Digital Network

MAP-FSM	Mobile Application Part Forward Short Message
MAP-SRI-SM	Mobile Application Part Send Routing Information for SM
MDIS	Mobile Data Interworking Switch
MO	Mobile Originated
MSC	Mobile Switch Centre
MSISDN	Mobile Subscriber (or Station) ISDN Number
MT	Mobile Terminated
PDG	Packet Data Gateway
PDU	Protocol Description Unit
SGSN	Serving GPRS Support Node
SM	Short Message
SMPP	Short Message Peer to Peer
SMS	Short Message Service
SMSC	Short Message Service Centre
SMS-IWMSC	Short Message Service Inter Working Mobile Switch Centre
SM-TL	Short Message Transfer Layer Protocol
SS7	Signalling System No. 7
TCP/IP	Transmission Control Protocol / Internet Protocol
UE	User Equipment
UMTS	Universal Mobile Telecommunication System
WLAN	Wireless Local Area Network

Messages sent using a Short Message Service (SMS) will be referred to herein as Short Messages (SM). These messages are commonly also known as SMS messages or simply text messages.

5

The following description refers to two main types of end user equipment: user equipment connecting to an IP network via a Wireless LAN (WLAN UE), generally referred to herein as *WLAN devices*; and user equipment connecting to a mobile telecommunications network (UE), such as mobile telephones and

10   "smartphones", generally referred to herein as *mobile devices*. In this context, the

term "mobile" is therefore generally not intended to refer to the mobility of the device but to the fact that the device is associated with and may connect to and communicate with a mobile telecommunications network.

5   The architecture of the message routing system will now be described in overview with reference to Figure 1.

User equipment in the form of a mobile device 18, such as a mobile telephone, is connected via a mobile telecommunications network to a Short Message Service

10   Centre (SMSC) 10 for the purpose of sending and receiving Short Messages (SM). Specifically, the mobile device 18 is connected to a Mobile Switch Centre (MSC) 14 and/or a Serving GPRS Support Node (SGSN) 16, which are able to communicate with the SMSC 10 via a Gateway MSC (GW-MSC) or SMS Interworking MSC (SMS-IWMSC) 12.

15

The Gateway MSC (or SMS Interworking MSC) 12 is connected to a Home Subscriber Server (HSS) or Home Location Register (HLR) 28, which stores information such as the last known location of subscribers' mobile devices, subscription information and service restrictions. The HSS or HLR 28 is

20   connected to an Authentication, Authorization and Accounting (AAA) server 30 which performs authentication, authorization and accounting functions.

Mobile device 18 may send and receive Short Messages via MSC 14 and SMSC 10 in the normal way. Additionally, the system can enable Short Messages to be

25   transmitted to or from a Wireless LAN (WLAN) device 24, also referred to as the WLAN User Equipment (WLAN UE), which is associated with the mobile device 18.

The WLAN device 24 is connected to the Gateway MSC (or SMS Interworking

30   MSC) 12 for communication with the SMSC 10. Communication with the WLAN device 24 is based on the Internet Protocol (IP). Accordingly, an IP to SM (Short

Message) interface is provided in the form of IP-SM Gateway (IP-SM-GW) 20. The IP-SM-Gateway 20 provides an interface between the mobile telecommunications network and the IP based WLAN network. The WLAN device 24 communicates with the IP-SM-Gateway 20 via a Packet Data Gateway (PDG) 22, which transmits IP packets between the WLAN device 24 and the IP-SM Gateway 20. The WLAN device 24 provides messaging functionality by way of SMS client application software executing on the device.

Specifically, once the mobile device 18 has successfully established a connection to the WLAN device 24, a short message can either be received as a text message on the WLAN client software (direct method), or a notification that a short message is awaiting delivery can be sent to the WLAN device (notification method). In the latter case, the mobile subscriber may respond to specify whether or not the message should be delivered to the WLAN client software.

For messages sent to or from the WLAN device 24, the IP-SM-Gateway 20 takes the place of the Mobile Switch Centre (MSC) 14. As such, the IP-SM-Gateway 20 behaves for the purposes of the remaining network as an MSC, and translates Short Message related communications with the remaining network into appropriate IP traffic with the WLAN device 24.

If the WLAN device 24 is connected to the WLAN at the same time as the associated mobile device 18 is connected to the mobile telecommunications network, it may be necessary to specify to which of the devices incoming Short Messages should be delivered. This can be achieved by sending an indication to the AAA (Authentication, Authorization and Accounting) server 30 from the client application specifying the desired recipient device for Short Messages. For example, when the client application is first started it may notify the AAA server 30 that the WLAN device 24 should be the recipient device for any Short Messages. Then, when the client application terminates, it may send a further notification indicating that the WLAN device 24 should no longer receive any

Short Messages. Alternatively or in addition, this selection may be made directly by the user of the WLAN device.

When a mobile subscriber is attached to the WLAN via the WLAN device 24, the
5   AAA server 30 then notifies the Home Subscriber Server (HSS) or Home Location Register (HLR) 28 of its attach status and its preferred recipient device for Short Message (SM) delivery.

In the case that the preferred recipient device is the WLAN device 24, the
10   HLR/HSS 28 returns the address of the IP-SM-Gateway 20 instead of the address of the MSC 14 or SGSN 18 in its response to a "MAP Send Routing Information for SM" (MAP-SRI-SM) operation. The IP-SM-Gateway 20 then performs a look-up in an external or internal database to determine the IP address for routing a Short Message to the WLAN device 24. This process is
15   described in more detail below.

In the case that the preferred recipient device is the mobile device 18, the Short Message is delivered to the mobile device in the normal way (that is, the HLR/HSS 28 returns the address of the MSC 14 or SGSN 18 in response to a
20   MAP-SRI-SM operation).

The WLAN device 24 can therefore effectively adopt the identity of the associated mobile device 18 for the purposes of sending and receiving messages, and thereby receive any messages intended for the mobile device.
25   Furthermore, any messages sent from the WLAN device 24 will appear to have originated from the mobile device 18.

The identity adopted by the WLAN device 24 is given by the mobile device's IMSI and/or MSISDN. Either the IMSI or the MSISDN, or a combination of the two, can
30   be used for this purpose.

Use of the MSISDN may be simpler, since this is generally known to a mobile subscriber and can easily be entered into the WLAN device. On the other hand, use of the IMSI as the mobile device identity may provide improved security, since this can usually only be obtained directly from the mobile device and is

5   generally not known to others (unlike the MSISDN). Use of a combination of the IMSI and MSISDN as mobile device identity can further improve the security of the system, in particular in terms of the authenticity of the mobile device identity.

Accordingly, where reference is made herein to IMSI or MSISDN, such

10   references shall, where appropriate, be taken to include a mobile device identity based on either IMSI or MSISDN, or on a combination of the two.

The following description distinguishes between two types of SM-related communication with the WLAN device: reception of Short Messages at the

15   WLAN device, which will be referred to as IP Terminated Message Delivery; and Short Messages sent from the WLAN device, which will be referred to as IP Originated Message Delivery.

The WLAN Device

20

The WLAN device 24 is typically (though not necessarily) a device which is not itself capable of communicating with a mobile telecommunications network, but which can be associated with a mobile device such as a mobile telephone or the like. The WLAN device can communicate with the mobile device on the one hand

25   (and via it with the mobile telecommunications network) and with a WLAN on the other hand.

A common example of such a device is a WLAN-enabled Personal Digital Assistant (PDA). The PDA can connect to the Internet via a WLAN, for example

30   using an IEEE 802.11 related WLAN standard (also commonly referred to as "Wi-Fi"), in areas where WLAN access points are available. The PDA can further

communicate with the mobile device, for example, via a Bluetooth (TM) or infrared link, to exchange data such as phone book or calendar entries, and to access data services such as the Internet via the mobile telecommunications network, in particular where WLAN access points are not available.

5

To receive a Short Message from the IP-SM-Gateway 20 (via the Packet Data Gateway 22), a client application is provided on the WLAN device 24 which mimics the behaviour of a Phase 2 mobile station with regard to the sending and receiving of Short Messages. For simple applications, the client application is

10   capable of decoding text messages from the User Data field of the SM-Transfer Layer (SM-TL) as defined in GSM 03.40. The client application may additionally be able to decode other types of messages, for example business cards, ring tones, picture messages and so on.

15   When mobile device 18 registers with the WLAN device 24, the client application is launched and establishes a connection to the IP-SM-Gateway 20 over TCP/IP on a pre-assigned port number. The client application sends the WLAN device's IP address, the MSISDN and/or IMSI digits of the mobile device that it is serving and the mobile subscriber's selected method for delivery (direct delivery or

20   notification delivery). Although in the present example, the client application only serves a single mobile device at any given time, in other embodiments it could be extended to serve multiple mobile devices connected to the WLAN device.

For IP originated message delivery, the client application provides the capability

25   of optionally requesting a Delivery Report to confirm that the message was delivered to its intended recipient.

The IP-SM-Gateway

30   The IP-SM-Gateway 20 accepts and establishes a TCP/IP connection from the client application residing on the WLAN device 24.

The connection request includes the IP address of the WLAN device 24, the IMSI and/or MSISDN digits of the mobile device 18 that it is serving and the preferred method of delivery (either direct delivery or notification delivery). The IP-SM-
5   Gateway 20 responds to the connection request to confirm that a channel has been successfully established.

The IP-SM-Gateway 20 stores the IP address of the WLAN device 24 and its associated IMSI (and/or MSISDN) digits in an internal IMSI / IP address mapping
10   table and records the indicated delivery method.

Once the connection between the WLAN device 24 and the IP-SM-Gateway 20 has been established, the WLAN device can then receive and send Short Messages as described below.
15

a) IP Terminated Message Delivery

Upon receipt of a "MAP Forward Short Message" (MAP-FSM) message relating to a Short Message intended for receipt by the mobile device 18, the IP-SM-
20   Gateway 20 queries its internal IMSI / IP address mapping table to determine the IP address of the WLAN device 24 that the mobile device 18 is attached to.

If the mapping table query successfully returns the IP address of the WLAN device 24, the IP-SM-Gateway 20 packages the SM-Transfer Layer (SM-TL)
25   portion of the MAP-FSM operation and sends it in a TCP/IP packet to the WLAN device. For simple applications, only the SMS Deliver PDU may be sent to the WLAN device. Alternatively, support can be extended to the other SM-TL PDU types as defined in GSM 03.40.

30   If the mapping table query does not return the address of the WLAN device, for example because the client application has disconnected from the IP-SM-

Gateway 20, the IP-SM-Gateway returns a MAP-FSM response with a return error of "Unidentified Subscriber" as defined in GSM 09.02.

5   Alternatively, in the event that delivery to the WLAN device 24 fails, the IP-SM-Gateway could attempt to reroute the message for delivery to the mobile device 18 in the normal way (via MSC 14 or SGSN 16).

b) IP Originated Message Delivery

10   Upon receipt of a message delivery request from the WLAN device 24, the IP-SM-Gateway 20 issues an acknowledgement signal ("ack") to the WLAN device. It should be noted that this signal merely indicates to the WLAN device that the message has been successfully delivered to the IP-SM-Gateway 20 - it does not confirm message delivery to the destination mobile subscriber.

15

If a Delivery Report was requested by the WLAN device 24, the IP-SM-Gateway 20 sets an internal flag to ensure that a Delivery Report is sent to the WLAN device 24 after an SS7 message delivery attempt.

20   The IP-SM-Gateway 20 then issues a "MAP-Send Routing Information for SM" (MAP-SRI-SM) request to HLR/HSS 28. Upon receipt of a response to the MAP-SRI-SM from the HLR/HSS 28, the IP-SM-Gateway 20 packages the message to be delivered in a MAP-FSM operation and sends it to the MSC address returned in the MAP-SRI-SM response.

25

If a Delivery Report was requested in the message delivery request from the WLAN device, then the IP-SM-Gateway 20 performs an IMSI look-up in the IMSI / IP address mapping table to obtain the IP address of the WLAN device 24 and sends (in the direct method) a Delivery Report (indicating Success or Failure), as

30   specified by GSM 03.40, to the WLAN device.

If the message delivery fails, that is the MAP-SRI-SM or MAP-FSM responses return an error condition, the IP-SM-Gateway 20 may optionally store the message for later delivery.

5   Examples of message flows occurring under various circumstances will now be described with reference to Figures 2 to 7.

IP Terminated Message Flows

10 This section describes possible message scenarios in delivering an IP terminated message to the WLAN device 24.

Figure 2 illustrates the steps involved in the successful delivery of a Short Message using the direct delivery method.

15

1. The mobile device 18 establishes a connection (referred to as a "tunnel") with the WLAN device 24.

2. Upon successful mobile device – WLAN device tunnel establishment, a client application residing on the WLAN device 24 is launched and
20   requests a channel connection to the IP-SM-Gateway 20 over TCP/IP. It sends the following information:

    •   The IP address of the WLAN device 24

    •   IMSI digits of the attached mobile device 18

    •   The delivery method, in the present example "Direct Delivery"

25   The IP-SM-Gateway 20 stores the IMSI to IP address mapping in its internal IMSI / IP address mapping table along with the selected delivery method.

3. The AAA Server 30 informs the HLR 28 of the device's WLAN attach status and the HLR 28 sets the IP-SM-Gateway's address as the serving
30   MSC for the mobile device 18.

4. A Short Message arrives at the Short Message Service Centre (SMSC) 10.

5. The SMSC 10 sends a MAP-SRI request to the HLR 28. The HLR 28 returns the IP-SM-Gateway's address and the mobile device's IMSI digits.

6. The SMSC 10 sends the Short Message to the IP-SM-Gateway 20 in a MAP-FSM operation.

7. The IP-SM-Gateway 20 performs an IMSI look-up in its internal IMSI to IP address mapping table and finds a corresponding entry specifying the IP address of the WLAN device 24. The entry also specifies that the delivery method to be used is Direct Delivery and so it sends the entire SMS Deliver portion contained in the MAP-FSM operation to the WLAN device.

8. The WLAN device client application receives the data stream from the IP-SM-Gateway 20 and assembles the message. Upon successful assembly of the message, it returns an SMS Deliver acknowledgement to the IP-SM-Gateway.

9. Upon receiving a successful acknowledgment, the IP-SM-Gateway 20 returns a MAP-FSM response indicating successful message transfer.

Figure 3 illustrates the steps involved in the successful delivery of a Short Message using the notification method.

1. The mobile device 18 establishes a connection (referred to as a "tunnel") with the WLAN device 24.

2. Upon successful mobile device – WLAN device tunnel establishment, a client application residing on the WLAN device is launched and requests a channel connection to the IP-SM-Gateway 20 over TCP/IP. It sends the following information:

   - The IP address of the WLAN device 24
   - IMSI digits of the attached mobile device 18
   - The delivery method, in the present example "Notification Delivery"

The IP-SM-Gateway 20 stores the IMSI to IP address mapping in its internal IMSI / IP address mapping table along with the selected delivery method.

3. The AAA Server 30 informs the HLR 28 of the device's WLAN attach status and the HLR 28 sets the IP-SM-Gateway's address as the serving MSC for the mobile device 18.

4. A Short Message arrives at the Short Message Service Centre (SMSC) 10.

5. The SMSC 10 sends a MAP-SRI request to the HLR 28. The HLR 28 returns the IP-SM-Gateway's address and the mobile device's IMSI digits.

6. The SMSC 10 sends the Short Message to the IP-SM-Gateway 20 in a MAP-FSM operation.

7. The IP-SM-Gateway 20 performs an IMSI look-up in its internal IMSI to IP address mapping table and finds a corresponding entry specifying the IP address of the WLAN device 24. The entry also specifies that the delivery method to be used is Notification Delivery so it notifies the WLAN device 24 that a message is awaiting delivery and requests a reply to determine whether or not the message should be delivered to the WLAN device. A configurable timer is set specifying the seconds that the IP-SM-Gateway 20 will wait to receive a response.

8. The user at the WLAN device 24 requests delivery of the SM via the client application within the configurable timer period.

9. The IP-SM-Gateway 20 sends the entire SMS Deliver portion contained in the MAP-FSM operation to the WLAN device 24.

10. The WLAN device client application receives the data stream from the IP-SM-Gateway 20 and assembles the message. Upon successful assembly of the message, it returns SMS Deliver acknowledgement to the IP-SM-Gateway 20.

11. Upon receiving a successful acknowledgment, the IP-SM-Gateway 20 returns a MAP-FSM response indicating successful message transfer.

Figure 4 illustrates the steps involved in the delivery of a Short Message using the notification method in which delivery of the message is not requested.

Steps 1 to 7 are as described above with reference to Figure 3. In step 8, the
5   user at the WLAN device 24 requests via the client application and within the timer period that the message should not be delivered. In step 9, the IP-SM-Gateway 20 sends a MAP-FSM response indicating SMS Delivery Failure.

Alternatively, instead of step 8, the user may fail to respond within the timer
10 period to the notification sent in step 7 by the IP-SM-Gateway 20. On expiry of the notification timer period, the IP-SM-Gateway 20 then sends the MAP-FSM response indicating SMS Delivery Failure.

Figure 5 illustrates the steps involved in the delivery of a Short Message to the
15 WLAN device 24 in which delivery of the message is unsuccessful.

Steps 1 to 6 are as described above with reference to Figure 3, except that the delivery method specified may be either Direct Delivery or Notification Delivery.

20 In step 7, the IP-SM-Gateway 20 performs an IMSI look-up in its internal IMSI / IP address mapping table but does not find a matching IMSI entry. IP-SM-Gateway 20 returns a MAP-FSM response indicating a return error of Unidentified Subscriber (in a GSM network, this error is returned when a mobile subscriber is no longer being served by the MSC or SGSN address that was
25 returned in the MAP-SRI response).

In an alternative error scenario, in step 7 the IP-SM-Gateway 20 performs an IMSI look-up in its internal IMSI / IP address mapping table and finds a corresponding entry. It then attempts to deliver the message, or a notification, to
30 the WLAN device 24 but is unable to do so, for example because of a socket

exception. A MAP-FSM response is returned indicating a return error of SMS Delivery Failure.

IP Originated Message Flows

This section describes possible message scenarios in delivering an IP originated message to a mobile station.

Figure 6 illustrates the steps involved in the successful delivery of a Short Message originating at the WLAN device 24.

1. The mobile device 18 establishes a connection (referred to as a "tunnel") with the WLAN device 24.

2. Upon successful mobile device – WLAN device tunnel establishment, a client application residing on the WLAN device is launched and requests a channel connection to the IP-SM-Gateway 20 over TCP/IP. It sends the following information:

   • The IP address of the WLAN device 24

   • IMSI digits of the attached mobile device 18

   • The delivery method (Direct Delivery or Notification Delivery)

   The IP-SM-Gateway 20 stores the IMSI to IP address mapping in the internal IMSI / IP address mapping table along with the selected delivery method.

3. The AAA Server 30 informs the HLR 28 of the device's WLAN attach status and the HLR 28 sets the IP-SM-Gateway's address as the serving MSC for the mobile device 18.

4. The WLAN device 24 submits (via the client application) a Short Message for delivery, indicating whether a Delivery Report is requested.

5. The IP-SM-Gateway 20 returns an acknowledgement signal ("ack") to confirm receipt of the Short Message.

6. The IP-SM-Gateway 20 issues a MAP-SRI request to the destination mobile subscriber's HLR.

7. The IP-SM-Gateway 20 receives a successful MAP-SRI response indicating the destination IMSI and the serving MSC or SGSN address.

5   8. The IP-SM-Gateway 20 packages the Short Message in a MAP-FSM and issues this to the serving MSC or SGSN.

9. The IP-SM-Gateway 20 receives a MAP-FSM response indicating successful delivery.

10. If a Delivery Report was requested then the IP-SM-Gateway 20 issues an
10   SMS Deliver message, in accordance with GSM 03.40, to the WLAN device 24 indicating that the Short Message has been successfully delivered.

11. The WLAN device 24 acknowledges that it has received the SMS Deliver message.

15

It should be noted that steps 10 and 11 are only performed if a Delivery Report has been requested and communicated to the IP-SM-Gateway 20 in step 4.

Figure 7 illustrates the steps involved in the delivery of a Short Message
20   originating at the WLAN device 24, in which delivery of the message is unsuccessful.

Steps 1 to 5 are as described above with reference to Figure 6.

25   In step 6, the IP-SM-Gateway 20 attempts to deliver the Short Message but receives an SS7 error condition in response to either a MAP-SRI-SM operation or a MAP-FSM operation.

If a Delivery Report has been requested, in step 7 the IP-SM-Gateway 20 issues
30   an SMS Deliver message, in accordance with GSM 03.40, to the WLAN device 24 indicating that the Short Message has not been successfully delivered. In

step 8, the WLAN device 24 acknowledges that it has received the SMS Deliver message.

5   It should again be noted that steps 7 and 8 are only performed if a Delivery Report has been requested and communicated to the IP-SM-Gateway 20 in step 4.

It will be understood that the present invention has been described above purely by way of example, and modification of detail can be made within the scope of 10   the invention.

For example, the WLAN device 24 need not necessarily remain connected to the mobile device 18 during use of the messaging system. Instead, the WLAN device 24 may connect to the mobile device 18 only briefly to obtain the IMSI / MSISDN 15   identity information. Once the WLAN device 24 and the associated client software has, in effect, adopted the identity of the mobile device 18 (as given by the IMSI / MSISDN), connection to the mobile device may no longer be required. The mobile device could then be disconnected or switched off. Alternatively, the WLAN device may obtain its mobile device identity in some other way, not 20   requiring any connection to an actual mobile device, for example by direct input of identity information. Additionally, once the WLAN device has recorded the identity information, it may then be used for messaging purposes in place of the mobile device indefinitely, without requiring reconnection of the mobile device or re-entry of the identity information. The WLAN device can then be used as an 25   alternative to the mobile device, which may be particularly useful in situations where the mobile device cannot be used, for example due to a depleted battery.

The system described above offers both direct delivery and notification delivery of Short Messages to the WLAN device for improved flexibility. However, the 30   system may also simply provide one of the above delivery methods.

In the system as described, a WLAN device is used to connect via a WLAN to the IP-SM-Gateway for the purpose of sending and receiving Short Messages. However, methods of communication other than by WLAN can be used. For example, other IP based devices and communication methods may be

5   substituted. The client application may, for example, execute on a personal computer which is connected to the Internet, for example via a dial-up or broadband connection. The client application on the personal computer then communicates with the IP-SM-Gateway 20 via the Internet, and can send and receive Short Messages as described above. In this way, a mobile subscriber

10   can select to receive Short Messages on their personal computer rather than on their mobile telephone, and can send messages from their personal computer which appear to originate from the their mobile telephone.

Also, the device assuming the identity of a mobile device, and the mobile device

15   whose identity is used, need not necessarily be physically separate devices. For example, some Personal Digital Assistants and smartphones provide both mobile telephone functionality and WLAN connectivity. In this case, the user of the PDA could choose to send and receive messages using the client application via the WLAN (or other IP network) rather than via the mobile telecommunications

20   network. This may be useful in places where WLAN access is available, but access to mobile telecommunications networks is not. For example, WLAN access is now being provided on some aeroplanes for in-flight Internet access, whereas use of mobile telephones is not generally permitted during flights.

25   Instead of (or in addition to) Short Messages, the IP-SM-Gateway 20 could also provide an interface between an IP based network and the mobile telecommunications network for other forms of messaging and communication, such as Multimedia Messaging (MMS) or voice communication. In the latter case, the IP-SM-Gateway would package voice data received from the mobile

30   telecommunications network and transmit it to a user device (such as the WLAN device described above, or a personal computer) via an IP network to which the

user device is connected. The IP-SM-Gateway would further receive voice data from the user device and forward it to the intended recipient mobile station over the mobile telecommunications network.

5   The functionality of the IP-SM-Gateway 20 may be provided in part or in full by a Mobile Data Interworking Switch (MDIS), which resides on the SS7 network and operates as an "SMS Interworking" MSC. An example of an MDIS is described in WO 03/001819 (PCT/GB02/02885). Said application describes a Virtual Mobile Redirector (VMR) which includes a Virtual Mobile Switch Centre (VMSC). The

10 VMSC of WO 03/001819 is an example of the MDIS presently referred to.

The MDIS (or VMSC) can receive messages from SMSCs and terminate them to connected applications (referred to as External Short Message Entities or ESMEs) over TCP/IP, and it can accept messages from ESMEs and deliver them

15 to a mobile handset via the SS7 network.

For ESME terminated message delivery, the MDIS interfaces with the SS7 network and the EMSE in the following ways:

- Accepts MAP-(MT)-FSM operations from SMSCs

20 - Issues MAP-(MT)-FSM Responses to SMSCs for message delivery attempts

- Accepts SMPP Bind_Receiver PDUs from ESMEs

- Issues SMPP Bind_Receiver Responses PDUs to ESMEs

- Transfers messages to ESMEs via the SMPP Deliver_SM PDUs

25 - Accepts Deliver_SM acknowledgement / negative acknowledgement PDUs from ESMEs

The MDIS receives provisioning data for ESME's and their associated MSISDN and IMSIs. When a MAP-FSM arrives at the MDIS, it performs an IMSI look-up to ascertain which ESME the IMSI is assigned to. If the ESME is connected to the

30 MDIS, then the MDIS delivers the SM to the ESME over SMPP and return a MAP-FSM response.

For ESME originated messages, the MDIS interfaces with the SS7 network and the ESME in the following ways:

- Accepts SMPP Bind_Transceiver PDUs from ESMEs
5
- Issues SMPP Bind_Transceiver PDUs to ESMEs
- Accepts Submit_SM PDUs from ESMEs
- Issues Submit_SM PDUs to ESMEs
- Issues MAP-SRI-SM request operations to the HLR
- Accepts MAP-SRI-SM responses from the HLR
10
- Issues MAP-(MT)-FSM operations to an MSC
- Accepts MAP-(MT)-FSM Responses from an MSC
- Issues Deliver_SM acknowledgment / negative acknowledgement PDUs to ESMEs.

The MDIS receives provisioning data for ESME's and their associated MSISDN
15 and IMSIs. When it receives a request for delivery to a mobile handset from an ESME, it issues a MAP-SRI-SM request to the HLR and sends a MAP-FSM operation to the address returned in the MAP-SRI-SM response. It then sends an "ack" (acknowledgement) or "nack" (negative acknowledgement) to the ESME.

20 The MDIS described above (and the VMR / VMSC described in WO 03/001819) can be modified to additionally perform the functionality required from the IP-SM-Gateway 20.

CLAIMS

1.   A method of routing messages between a first network and a client connected to a second network, the first network being a mobile telecommunications network in which mobile devices are assigned unique identifiers, the method comprising:

assigning the identifier of a mobile device associated with the first network to the client; and

routing messages between the first network and the client using the assigned identifier.

2.   A method according to Claim 1, wherein the client is identified in the second network by an address, the method further comprising storing a mapping between the identifier assigned to the client and the address of the client.

3.   A method according to Claim 2, further comprising receiving a message intended for the mobile device from the first network; determining the address of the client using the stored mapping; and transmitting the message to the client via the second network using the determined address.

4.   A method according to Claim 3, wherein transmitting the message to the client comprises transmitting to the client a notification that a message has been received; receiving a response indicating whether or not the received message should be transmitted to the client; and transmitting the message to the client if the response is positive.

5.   A method according to Claim 4, further comprising only transmitting the message to the client if a positive response to the notification is received within a given time limit.

6. A method according to any of the preceding claims, wherein the first network comprises a plurality of network nodes representing connection points for mobile devices, further comprising providing an interface node representing a connection point for the client.

5

7. A method according to Claim 6, wherein the first network comprises a location database which records information relating to network nodes associated with the last known locations of given mobile devices; the method further comprising recording in the location database, for the mobile device

10 whose identifier has been assigned to the client, the interface node instead of the network node associated with the last known location of the mobile device.

8. A method according to Claim 7, wherein the location database is provided by a Home Location Register or Home Subscriber Server.

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9. A method according to any of Claims 6 to 8, further comprising receiving a request for routing information for the mobile device, and providing routing information corresponding to the interface node in response to the request.

20 10. A method according to any of Claims 6 to 9, wherein the network nodes are Mobile Switch Centres.

11. A method according to any of Claims 6 to 10, wherein the interface node provides an interface between the first and second networks.

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12. A method according to any of the preceding claims, further comprising receiving a message intended for the first network from the client via the second network; and transmitting the message to the first network.

13.   A method according to Claim 12, further comprising receiving an indication of whether the client requires a delivery report relating to the message; and recording the indication.

5   14.   A method according to Claim 12 or 13, further comprising receiving a delivery report from the first network relating to whether or not the message was delivered successfully, and transmitting the delivery report to the client via the second network.

10   15.   A method according to Claim 14, wherein transmitting the delivery report to the client comprises determining an address of the client using a stored mapping between the identifier assigned to the client and an address of the client, and transmitting the delivery report using the determined address.

15   16.   A method according to any of the preceding claims, wherein the client comprises one or both of: a client device and a client application executing on a client device.

17.   A method according to any of the preceding claims, wherein the second 20   network comprises an Internet Protocol (IP) based network.

18.   A method according to any of the preceding claims, wherein the second network comprises a Wireless Local Area Network (WLAN).

25   19.   A method according to Claim 18, wherein the client comprises a WLAN-enabled client device.

20.   A method according to any of the preceding claims, wherein the identifier comprises an International Mobile Subscriber Identity (IMSI).

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21.   A method according to any of the preceding claims, wherein the identifier comprises a Mobile Subscriber ISDN number (MSISDN).

22.   A method according to any of the preceding claims, wherein the identifier comprises a combination of an IMSI and an MSISDN.

23.   A messaging application for use with a client device connectable to a first network via a second network, the first network being a mobile telecommunications network in which mobile devices are assigned unique identifiers, the messaging application comprising means for receiving a mobile device identifier, and means for transmitting messages between the client device and the first network via the second network using the received identifier.

24.   A messaging application according to Claim 23, wherein the receiving means comprises means for connecting to a mobile device, and means for receiving the mobile device identifier from the mobile device.

25.   A messaging application according to Claim 23 or 24, wherein the first network comprises an interface node for providing an interface between the first and second networks, the messaging application further comprising means for establishing a connection with the interface node via the second network.

26.   A messaging application according to any of Claims 23 to 25, wherein the transmitting means comprises means for sending a message to the first network.

27.   A messaging application according to any of Claims 23 to 26, wherein the transmitting means comprises means for receiving a message from the first network.

28. A messaging application according to Claims 26 and 27, wherein the sending means comprises means for sending a delivery report request, the receiving means further comprising means for receiving a delivery report.

5 29. A messaging application according to Claim 27 or 28, wherein the receiving means comprises means for receiving a notification that a message is due to be delivered, and means for responding to the notification, the response comprising an indication of whether the message should be delivered to the messaging application.

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30. A messaging application according to any of Claims 23 to 29, adapted to participate in a method as claimed in any of Claims 1 to 22.

31. A client device comprising a messaging application according to any of 15 Claims 23 to 30.

32. Apparatus for routing messages between a first network and a client connected to a second network, the first network being a mobile telecommunications network in which mobile devices are assigned unique 20 identifiers, the apparatus comprising:

    means for assigning the identifier of a mobile device associated with the first network to the client; and

    means for routing messages between the first network and the client using the assigned identifier.

25

33. Apparatus according to Claim 32, further comprising means for performing a method as claimed in any of Claims 2 to 22.

34. A computer program or computer program product for routing messages 30 between a first network and a client connected to a second network, the first network being a mobile telecommunications network in which mobile devices are

assigned unique identifiers, the computer program or computer program product comprising:

means for assigning the identifier of a mobile device associated with the first network to the client; and

5   means for routing messages between the first network and the client using the assigned identifier.

35.   A computer program or computer program product according to Claim 34, further comprising means for performing a method as claimed in any of Claims 2

10   to 22.

36.   An interface node for use with a mobile telecommunications network, the interface node being adapted to perform a method as claimed in any of Claims 1 to 22.

15

37.   A message routing system adapted to perform a method as claimed in any of Claims 1 to 22.

38.   A method of routing messages substantially as described herein with

20   reference to and as illustrated in Figures 1 to 7 of the accompanying drawings.

39.   A client device or messaging application for a client device substantially as described herein with reference to Figures 1 to 7 of the accompanying drawings.

25   40.   An interface node substantially as described herein with reference to Figures 1 to 7 of the accompanying drawings.

41.   A message routing system substantially as described herein with reference to Figures 1 to 7 of the accompanying drawings.

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Application No:	GB0411059.9	**Examiner:**	Steve Evans
Claims searched:	All	**Date of search:**	2 November 2004

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
A,E	-	GB 2397730 A (INTELLPROP) - Whole document
A	-	US 6618592 B1 (ERICSSON) - Whole document

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H04L; H04Q

The following online and other databases have been used in the preparation of this search report

Online: WPI, EPODOC, JAPIO