

SYSTEM FOR ROUTING WIRELESS COMMUNICATIONS

Background of the Invention

1. Field of the Invention

5 The present invention relates to mobility management in a telecommunications network. More particularly, it relates to a method and system for routing wireless communications to a wireless device having more than one mobile numbers that are serviced by different wireless telecommunications service providers ("service providers").

10 2. Description of the Related Art

Globalization of the communications industry has led to a tremendous increase in connectivity, especially with regard to cell phones and other wireless devices. Mobile phone subscribers traveling across international borders remain contactable because of service agreements between service providers in different countries, which allow calls to
15 be forwarded from one service provider to another.

Though mobility is no longer impedance to accessibility, the expense of both making and receiving a mobile phone call over international borders can be prohibitive. This is particularly true when a mobile phone subscriber is roaming in a foreign or visited network. To connect a call originating from the same foreign network, both an
20 international roaming fee and an international calling fee would be incurred, even if the caller and the subscriber were physically in the same location.

A common way of eliminating the international connection charges is to simply purchase a new account and foreign phone number from a service provider of the foreign country. Hence, the subscriber can be contacted at a number that is local to the foreign
25 country during his stay. The new subscription would therefore eliminate the international connection and international roaming charges. However, the subscriber is then inconvenienced with carrying two mobile devices for receiving calls at his home network phone number and his foreign network phone number, respectively.

To eliminate the need for two mobile devices, a subscriber identity module (SIM) card may be assigned two international mobile subscriber identities (IMSI), one each from the home network service provider and the foreign network service provider. However, mobile devices currently allow only one IMSI and therefore one mobile phone
5 number to be active at any time. The other IMSI and phone number will not be able to receive any calls during the time it is inactive. This limitation is undesirable because a subscriber may miss phone calls made to the inactive phone number. In addition, if the subscriber forgets to switch to the correct IMSI when he changes networks, he may incur international roaming charges.

10 In view of the foregoing, it is desirable to have a more convenient method and system of routing data and establishing mobile connections to eliminate unnecessary roaming and international connections and eliminate the need for a wireless subscriber to subscribe to another mobile phone line.

Brief Description of the Drawings

The present invention will be readily understood by the following detailed description in conjunction with the accompanying drawings. To facilitate this description, like reference numerals designate like structural elements.

5 Figure 1 illustrates a wireless network system for establishing the roaming location of the partner number in accordance with one embodiment of the present invention.

10 Figure 2 illustrates the wireless network system for connecting to a wireless device located in a home network in accordance with one embodiment of the present invention.

 Figure 3 illustrates the wireless network system when the wireless device is roaming in a partner network in accordance with one embodiment of the present invention.

15 Figure 4 illustrates a wireless network system in accordance with one embodiment of the present invention.

 Figure 5 illustrates a wireless network system for sending a data packet to the wireless device in accordance with one embodiment of the present invention.

 Figure 6 is a flow chart of a method for establishing a connection to a wireless device having a partner number serviced by a partner network.

20

Detailed Description

A method and system for connecting to a wireless device are provided. In the following description, numerous specific details are set forth in order to provide a thorough understanding of the present invention. It will be understood, however, to one skilled in the art, that the present invention may be practiced without some or all of these specific details. In other instances, well known process operations have not been described in detail in order not to unnecessarily obscure the present invention.

In general, a wireless device receives communication through a home number assigned by a home service provider that runs and maintains a home wireless network located in the subscriber's home country. The present invention provides for a method and system to enable a wireless subscriber to receive wireless communication through a partner number in addition to the home number in a single wireless device. The partner number is typically assigned and serviced by a partner wireless provider, which is cooperating with the home service provider.

For exemplary purposes, the terms home number and partner number refer generically to either mobile station integrated services digital network (MSISDN) numbers or international mobile subscriber identities (IMSI), which are commonly used in global system for mobile communications (GSM) networks. The partner number and the partner service provider are typically located in outside the subscriber's home country. To enable service to the partner number, the present invention uses a translation device, which is established as a roaming location of the partner number.

Figure 1 illustrates a wireless network system 10 for establishing the roaming location of the partner number in accordance with one embodiment of the present invention. Wireless network system 10 includes a home wireless network or home public land mobile network (H-PLMN) 14 and a partner network (P-PLMN) 22. Home network 14 includes a translation device 20 and partner network 22 includes a partner home location register (P-HLR) 24. Wireless network system 10 may also include mediation devices (MD) and a customer service officer (CSO) to facilitate the process.

To establish the roaming location, translation device 20 transmits a location update (LU) to P-HLR 24. The location update includes the global title translation (GTT) address of translation device 20, which is then stored in P-HLR 24 as the roaming location. Thus, any requests to contact the partner number of the wireless device will be transmitted to translation device 20. Because translation device 20 reroutes calls and data intended only for the partner number and serviced by the partner network, a home number assigned by the home network of the wireless device is not effected.

Figure 2 illustrates wireless network system 10 for connecting to a wireless device 12 located in home network 14 in accordance with one embodiment of the present invention. Home network 14 includes a mobile switching center (MSC) 16, which is coupled to wireless device 12 and a home location register (HLR) 18. Translation device 20 is coupled to HLR 18. Partner network 22 includes a partner mobile switching center (P-MSC) 26, which is coupled to P-HLR 24.

To establish a voice connection to wireless device 12, using the partner number, an initial addressing mode (IAM) is requested by the originating party. The IAM is transmitted, typically from either a mobile phone or through a public switch telephone network (PSTN), to P-MSC 26. Because the requested connection is to a partner number serviced by partner network 22, P-MSC 26 transmits a send routing information (SRI) request to P-HLR 24.

After receiving the SRI, P-HLR 24 transmits a provide roaming number (PRN) request for the partner number to the roaming location of the wireless device, which is translation device 20. Translation device 20 maps the partner number to the home number of wireless device 12 and transmits a SRI request to HLR 18. Upon receiving the SRI, HLR 18 transmits a PRN to MSC 16, which assigns a mobile subscriber roaming number (MSRN) to wireless device 12 and returns the MSRN and a visitor location register (VLR) to P-MSC 26 through HLR 18, translation device 20, and P-HLR 24. Once the MSRN and the VLR is received, P-MSC 26 sets up an IAM to route the voice circuit to MSC 16 and connect the originating party with the wireless subscriber.

The present invention, therefore, enables a wireless device to receive voice data through a partner number assigned by a partner service provider, while also being able to

receive data through a home number assigned by a home service provider. Other forms of data transmission, such as text messaging may be routed to the wireless device through both the partner number and the home number in other embodiments of the present invention. The wireless subscriber may also receive data through the partner number
5 while roaming outside the home network.

Figure 3 illustrates wireless network system 10 when wireless device 12 is roaming in partner network 22 in accordance with one embodiment of the present invention. When wireless device 12 logs into partner network 22, it transmits a LU to a MSC 16' located in partner network 22, which is forwarded to HLR 18 for authentication.
10 The LU includes the IMSI, which is a unique number attached to every SIM card that identifies wireless device 12 and the services available. This login process is repeated whenever wireless device 12 is moved to a location served by a different MSC.

As described above with respect to Figure 2, when a connection to the partner number of wireless device 12 is requested, translation device 20 maps the home number
15 to the partner number and transmits a SRI with the home number to HLR 18. However, because wireless device 12 is roaming in partner network 22, HLR 18 transmits a PRN to MSC 16'. After the MSRN and the VLR are transmitted to P-MSC 26 from MSC 16', a voice circuit to wireless device 12 may be established. In some embodiments of the present invention, a MSC in home network 14 may be required to route the voice circuit
20 from P-MSC 26 to MSC 16'.

Figure 4 illustrates a wireless network system 28 in accordance with one embodiment of the present invention. Wireless network system 28 is similar to wireless network system 10 described in Figure 2, but further includes a visited public land mobile network (V-PLMN) 30 in which wireless device 12 is roaming. Visited network 30
25 includes a visited mobile switching center (V-MSC) 32, which is coupled to MSC 16.

When a connection to the partner number of wireless device 12 is requested, translation device 20 maps the partner number to the home number and transmits a SRI with the home number to HLR 18. Because wireless device 12 is roaming in visited network 30, HLR 18 transmits a PRN to V-MSC 32. After the MSRN and the VLR are
30 returned to translation device 20, because wireless device 12 is in visited network 30, the

home number is substituted for the MSRN. The home number is then transmitted to P-MSC 26 from translation device 20. P-MSC 26 sets up a voice circuit to MSC 16, which in turn sets up a call to reach wireless device 12. In some embodiments of the present invention, P-MSC 26 may be able to route a voice circuit directly to V-MSC 32.

5 Figure 5 illustrates a wireless network system 33 for sending a data packet to wireless device 12 in accordance with one embodiment of the present invention. Network system 33 includes home network 14 and partner network 22. Home network 14 includes translation device 20, which is coupled to a receiving short messaging service center (SMSC) 34, which may be located in any network in which the SMS or any other
10 type of data packet or text message is to be received.

SMSC 34 is further coupled to a MSC 38, which services wireless device 12. In this example, partner network 22 includes an originating short messaging service center (SMSC) 36 coupled to translation device 20 and P-HLR 22. However, it should be noted that SMSC 36 does not need to be located within partner network 22 and may be located
15 in any network from which the SMS originates.

To transmit a SMS for the partner number of the wireless device, P-SMSC 36 transmits a SRI_SM (send routing information short message) request to P-HLR 40. In response to the request, P-HLR 40 transmits a VLR address to SMSC 36, which transmits the SMS to translation device 20. After mapping the partner number to the home
20 number, translation device 20 transmits the SMS to SMSC 34 with a request to connect and deliver to the home number of wireless device 12. SMSC 34 then transmits the SMS to wireless device 12 through MSC 38.

Figure 6 is a flow chart of a method 42 for establishing a connection to a wireless device having a partner number serviced by a partner network. Method 42 begins at a
25 block 44, in which a translation device is established as a roaming location of the wireless device. When a connection to the partner number is requested, the translation device receives a request to route data to the partner number in a block 46. The translation device maps the partner number to a home number of the wireless device in a block 48. Finally, a connection to the wireless device is established based on a request to route data
30 to the home number in a block 50.

An advantage of the present invention is that it allows a mobile subscriber to receive data using a partner number serviced by a partner service provider in a wireless device that has a home number serviced by a home service provider. Not only is it beneficial to the subscriber to be able to receive phone calls and text messages at two
5 different numbers in one wireless device, contacting parties from the partner network are able to avoid unnecessary international roaming charges when contacting the subscriber. By enabling contact through the partner number, the present invention ensures that associates who are subscribers of the partner network are not deterred by international direct dialing charges from contacting the user of the wireless device.

10 Other embodiments of the invention will be apparent to those skilled in the art from consideration of the specification and practice of the invention. Furthermore, certain terminology has been used for the purposes of descriptive clarity, and not to limit the present invention. The embodiments and preferred features described above should be considered exemplary, with the invention being defined by the appended claims.

15

What is claimed is:

1. A method for providing telephone service to a wireless device having a first telephone number in a first network and a second telephone number in a second network, said method characterized by:

maintaining location information in a location register of said first network for said first telephone number;

maintaining location information for said second telephone number in a location register of said second network wherein said location information indicates a translation device is a roaming location of said second telephone number;

receiving a connection request for said second telephone number in said location register of said second network from a switching system;

transmitting a request for location information for said second telephone number from said location register of said second network to said translation device in response to receiving a connection request;

determining said location information for said first telephone number in translation device in response to receiving said request; and

transmitting said location information of said first telephone number from said translation device to said location register in said second network wherein said location information of said first telephone number is used as said location information of said second telephone number to establish said connection.

2. The method of claim 1 wherein said step of determining said location information for said first telephone number comprises:

transmitting a request for location information for said first telephone number from said translation device to said location register of said first network in response to receiving said request in said translation device from said location register of said second network; and

transmitting said location information for said first telephone number from said location register in said first network to said translation device in response to said location register in said first network receiving said request.

3. The method of claim 2 further comprising:

transmitting a request for location information of said first telephone number from said location register in said first network to a switching system in wireless communication with said wireless device in response to receiving said request from said translation device; and

transmitting said location information of said first telephone number from said switching system to said location register of said first network in response to receiving said location register in said first network.

4. The method of claim 3 further comprises:

assigning said location information of said first telephone number to said wireless device by said switching system in communication with said wireless device.

5. The method of claim 3 wherein said switching system is in said first network.

6. The method of claim 3 wherein said switching system is in said second network.

7. The method of claim 3 wherein said switching system is in a third network.
8. The method of claim 1 wherein said location information comprises a visitor location register and a mobile subscriber roaming number.
9. The method of claim 1 wherein said request for location information received by said location register in said second network is a Send Routing Information (SRI) request for said second telephone number.
10. The method of claim 1 wherein said request for location information transmitted from said location register of said second network to said translation device is a Provide Roaming Number (PRN) request.
11. The method of claim 1 further comprising:
 - initializing said second telephone number in said translation device; and
 - transmitting a location update for said second telephone number from said translation device to said location register of said second network.
12. The method of claim 11 wherein said step of maintaining said location register in said second network comprise:
 - storing said translation device as a roaming location of said second telephone number in said location register of said second network.
13. The method of claim 1 further comprising:

transmitting said location information of said first telephone number received by said location register of said second network from said translation device to said switching system requesting said location information of said second telephone number.

14. The method of claim 13 further comprising:

establishing a connection to said wireless device through said switching system requesting said location information using said location information of said first telephone number in response to receiving said location information.

15. A system for providing telephonic service to a wireless device having a first telephone number in a first network and a second telephone number in a second network, said system comprising:

a translation device that acts as a roaming location for said second telephone number.

16. The system of claim 15 wherein said translation device is in said first network.

17. The system of claim 15 further comprising:

a location register of said first network for said first telephone number.

18. The system of claim 15 further comprising:

a location register of said second network storing location information for said second telephone number wherein said location information indicates said translation device is said roaming location of said second telephone number.

19. The system of claim 18 further comprising:

circuitry in said location register of said second network configured to receive a connection request for said second telephone number in said location register of said second network from a switching system;

circuitry in said location register of said second network configured to transmit a request for location information for said second telephone number to said translation device in response to receiving said connection request;

circuitry in said translation device configured to determine said location information for said first telephone number in response to receiving said request; and

circuitry in said translation device configured to transmit said location information of said first telephone number to said location register in said second network wherein said location information of said first telephone number is used as said location information of said second telephone number to establish said connection.

20. The system of claim 19 further comprising:

circuitry in said translation device configured to transmit a request for location information of said first telephone number to said location register of said first network storing said location information for said first telephone number in response to receiving said request from said location register of said second network; and

circuitry in said location register of said first network configured to transmit said location information of said first telephone said translation device in response to said location register in said first network receiving said request.

21. The system of claim 20 further comprising:

circuitry in said location register of said first network configured to transmit a location request for said first telephone number to a switching system in wireless communication with said wireless device in response to receiving said request from said translation device; and

circuitry in said switching system configured to transmit said location information for said first telephone number to said location register of said first network in response to receiving said location request from said location register in said first network.

22. The system of claim 21 further comprises:

circuitry in said switching system in wireless communication with said wireless device configured to assign said location information of said first telephone number to said wireless device.

23. The system of claim 21 wherein said switching system is in said first network.

24. The system of claim 21 wherein said switching system is in said second network.

25. The system of claim 21 wherein said switching system is in a third network.

26. The system of claim 15 wherein said location information of said first telephone number comprises:

a visitor location register; and

a mobile subscriber roaming number.

27. The system of claim 15 wherein said request for location information of said second telephone number is a Send Routing Information (SRI) request.

28. The system of claim 15 wherein said request for location information transmitted from said location register of said second network to said translation device is a Provide Roaming Number (PRN) request.

29. The system of claim 15 further comprising:
circuitry in said translation device configured to initialize said second telephone number in said translation device; and
circuitry in said translation device configured to transmit a location update to said location register of said second network.

30. The system of claim 29 further comprising:
circuitry in said location register of said second network configured to store said translation device as said roaming location of said second telephone number.

31. The system of claim 15 further comprising:
circuitry in said location register of said second network configured to transmit said location information of said first telephone number received from said translation device to said switching system requesting said location information.

32. The system of claim 31 further comprising:

circuitry in said requesting switching system configured to establishing a connection to said wireless device through said switching system using said location information of said first telephone number.