Title: MOBILE VOIP COMMUNICATION DEVICE AND METHOD

Abstract: The present invention provides mobile voice over internet protocol (MoVoIP) communication device and method. In one embodiment, a plurality of programmable communication stack elements are provided that route a call to another MoVoIP communication device by connecting to a wireless network and thereafter performing standard mobile Internet Protocol (IP) signaling and resolving electronic numbering (ENUM) schemes.
MOBILE VOIP COMMUNICATION DEVICE AND METHOD

FIELD OF INVENTION

The embodiments herein relate generally to communication devices and methods and more particularly to a mobile VoIP (Voice over Internet Protocol) communication device and method.

BACKGROUND OF INVENTION

In the era of high-speed communication, mobile devices play an important role as these mobile devices can be used for data transfer, as well as for voice communication. The mobile devices such as cell phones, PDAs, laptops etcetera are portable and facilitate both data and voice communication over a communication network. Commonly, the voice communication is referred to as voice over Internet protocol (VOIP) communication. Typically, transmission of voice data is similar to that of data packets transmission. The voice data is compressed into packets before being delivered to the destination.

Various VoIP capable devices are available to the users. However, a traditional VoIP device only supports voice capability on a fixed network device. An IPv4 VoIP device and service requires multiple intermediate network elements and servers to operate making it inefficient and is not scalable.

Various solutions are available in the public domain which illustrates VoIP client communications. However, none of these support true peer-to-peer capability.

Thus what is desired is a communication device and method that can improve the VoIP v4 client communications of the prior art.
SUMMARY OF INVENTION

The present invention provides a device and method for mobile voice over internet protocol (MoVoIP) communication.

In one embodiment a plurality of programmable communication stack elements may be provided within a mobile voice over internet protocol (MoVoIP) communication device. Said MoVoIP communication device may route a call to another MoVoIP communication device by getting connected to a wireless network and thereafter performing standard mobile Internet Protocol (IP) signaling and resolving electronic numbering (ENUM) schemes. A plurality of wireless network communication interfaces (NICs) may be provided for enabling the device to get connected to the wireless network.

As per the embodiments of the present invention, the programmable communication stack may include a session initiation protocol module for initiating a call, a multicast module having voice conferencing applications, a quality of service module for providing integrated and differentiated services, and an internet protocol security module for providing authentication and integrity.

In one embodiment of the invention, the messages and responses during a call may be displayed to the users. The communication device may be provided with an audio input and output unit to make and receive the mobile voice over internet protocol (MoVoIP) calls. Also a digital to analog converter (DAC) may be provided to modulate and demodulate digital voice data.

In various embodiments a power management module may be provided in the device for extending battery life of the said device.
One of the embodiments of the present invention includes a method for providing mobile voice over internet protocol (MoVoIP) communication. The method enables the communication devices to connect to a wireless network. Each said device may have voice conferencing applications and may have the capability to provide integrated, differentiated and authentication services. The method may allow the initialization of a mobile voice over internet protocol (MoVoIP) calls between at least two communication devices with the help of Electronic numbering (ENUM) schemes and then standard mobile Internet Protocol (IP) signaling may be performed to complete the mobile voice over Internet protocol (MoVoIP) communication.

Other objects, features and advantages of the invention will be apparent from the drawings, and from the detailed description that follows below.

BRIEF DESCRIPTION OF DRAWINGS

Reference will be made to embodiments of the invention, examples of which may be illustrated in the accompanying figures. These figures are intended to be illustrative, not limiting. Although the invention is generally described in the context of these embodiments, it should be understood that it is not intended to limit the scope of the invention to these particular embodiments.

Figure 1 illustrates architecture of the mobile communication device that is connected to a wireless network for data transfer as per an embodiment herein.

Figure 2 shows a communication event between two mobile users within a wireless network environment, as per an embodiment herein.

Figure 3 shows IPv6 communication stack and data flow between two VoIP clients.

Figure 4 shows a method of voice over Internet protocol as per an embodiment herein.
A device and method for mobile voice over Internet protocol (MoVoIP) communication is described. In one embodiment, a plurality of programmable communication stack elements are provided that route a call to another MoVoIP communication device by connecting to a wireless network and thereafter performing standard mobile Internet Protocol (IP) signaling and resolving electronic numbering (ENUM) schemes.

In the following description, for purpose of explanation, specific details are set forth in order to provide an understanding of the invention. It will be apparent, however, to one skilled in the art that the invention may be practiced without these details. One skilled in the art will recognize that embodiments of the present invention, some of which are described below, may be incorporated into a number of different systems requiring mobile communication. The embodiments of the present invention may be present in hardware, software or firmware. The best mode of the invention described in the specification illustrates the exemplary embodiment of the invention. It is understood that one skilled in art may modify or change the modules used in the best mode of invention.

Reference in the specification to "one embodiment" or "an embodiment" means that a particular feature, characteristic, or function described in connection with the embodiment is included in at least one embodiment of the invention. The appearances of the phrase "in one embodiment" in various places in the specification are not necessarily all referring to the same embodiment.

Figure 1 illustrates architecture of the mobile communication device 100 that is connected to a wireless network 113 for data transfer 112 as per an embodiment herein. The device 100 comprises multiple wireless-interfaces 111 and employs the most appropriate for Internet Protocol (IP) connectivity according to network coverage, pricing, quality of services etcetera. The wireless access interface 111 of the device 100 may comply with standards of IEEE802.11 and derivative.
Said mobile communication device 100 may be a Mobile Internet Protocol capable device. Preferably the communication device 100 may be a Mobile IPv6 (MIPv6) capable device for voice applications in order to offer true Peer-to-Peer (P2P) capability and seamless mobility.

As can be seen in the architecture of the communication device 100, a plurality of programmable communication stack elements 101 are provided. The communication stack elements 101 are programmed to enable the users to enjoy true peer-to-peer communication.

The programmable communication stack 101 may include a Session Initiation Protocol (SIP) module 102 that is responsible for initiating a call. Said call may be a voice call, that can be made using an IPv6 network (wireless network 113) to globally reachable addresses. A multicast module 103 having voice conferencing applications may be provided for enabling the device to establish voice conferences between multiple users. The programmable communication stack 101 may further include a Quality of Service (QoS) module 104. The Quality of Service (QoS) module 104 may perform the task of providing integrated and differentiated services when a call is made and during handoffs. An Internet protocol security (IPSec) module 105 may be provided in the communication stack 101 for providing authentication and integrity.

As explained above, the communication stack elements 101 enable the peer-to-peer communication and supports Mobile Internet Protocol version 6 (MIPv6) and Electronic Numbering (ENUM), which provides true global mobility.

The communication device 100 further comprises a display unit 106 along with a display interface unit 107 that facilitate the display of messages and responses during a call made between the users. The communication device 100 may also be provided with an audio input and output (I/O) unit 108 to make and receive the calls. In the best mode, the calls are the mobile voice over Internet protocol (MoVoIP) calls. Also a digital to analog converter (DAC) unit 109 may be provided to modulate and
demodulate digital voice data. The battery life of the communication device 100 may be increased by providing a power management module 110.

**Figure 2** shows a communication event between two mobile users within a wireless network environment, as per an embodiment herein. As explained above, programmable communication stack elements 101 (of Figure 1) are provided that route a call to another MoVoIP communication device by connecting to a wireless network and thereafter performing standard mobile Internet Protocol (IP) signaling and resolving electronic numbering (ENUM) schemes.

The communication event may occur between various users using home agents and various routers such as Router 1 - Router 3 as shown. The users may be present at different geographical locations and have their own Internet service providers (ISPs) and home agents or servers. These Internet service providers (ISPs) may provide their services to their respective users within their respective network coverage. However, during a call, when the users are mobile, they might exit the network area of their ISP and enter into the network coverage area of some other ISP. In this scenario the home agent of the mobile users forward the call to the new location.

For example and as shown in the Figure 2, User1 may communicate with User2 by using their respective communication devices 100 (of figure 1). As shown in the figure, User1 and User2 are talking to each other 201. During the call, user1 moves from ISP A's coverage to ISP B's coverage 202 and thus enters into the network coverage of the ISP B. As soon as the ISP A discovers that User1 is out of its coverage area, the home agent of the ISP A forwards the call to the new location of User1 203. Finally the call is established between User1 and User2 204.

The operation or the event of the communication call requires receiving of the voice data in digital format. The input voice from the communication device 100 has to be converted into digital signals and encapsulated in a packet containing the IPv6 headers. In other words the data is sent in form of digital packets including the headers. The headers of each data packets are stripped off and the digital voice data is converted.
into analog signal by using DAC unit 109 (of figure 1). Thereafter the analog signal is sent to the speaker or the audio I/O unit 108 (of figure 1) in order to allow the user to listen to the voice.

**Figure 3** shows IPv6 communication stack and data flow between two VoIP clients. Each VoIP client viz. VoIP client 1 301 and VoIP client 2 302 communicate to each other by using their respective communication devices 100a and 100b respectively. The communication stacks of one device 100a or 100b route a call to the other by connecting to a wireless network and thereafter performing standard mobile Internet Protocol (IP) signaling and resolving electronic numbering (ENUM) schemes.

The call may be initiated by the SIP modules as shown in the figure.

**Figure 4** shows a method for providing mobile voice over Internet protocol as per an embodiment herein. The method may be initiated by connecting 401 communication devices to a wireless network. As explained earlier, each device may have voice conferencing applications and provide integrated, differentiated and authentication services. Thereafter, a mobile voice over internet protocol (MoVoIP) calls between at least two communication devices may be initiated 402. Standard mobile Internet Protocol (IP) signaling may be performed 403 and electronic numbering (ENUM) schemes may be resolved 404 to complete the task of mobile voice over internet protocol (MoVoIP) communication method.

Thus the embodiments of the present invention offers the users, enterprise solutions, telecommunication companies and Internet Service Providers (ISPs) who want to deploy P2P VoIP solutions for their customers. Further, the embodiments of the present invention also offer more scalable, cheaper, efficient VoIP services with a global reach and coverage.

The foregoing description of the invention has been described for purposes of clarity and understanding. It is not intended to limit the invention to the precise form disclosed. Various modifications may be possible within the scope and equivalence of the appended claims.
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CLAIMS

1. A mobile voice over internet protocol (MoVoIP) communication device 100 comprising:
   programmable communication stack elements 101 including
   a session initiation protocol module 102 for initiating a call;
   a multicast module 103 for providing voice conferencing applications;
   a quality of service module 104 for providing integrated and differentiated services;
   an internet protocol security module 105 for providing authentication and integrity;
   wherein the programmed communication stack elements 101 of one MoVoIP communication device 100 route a call set-up to another MoVoIP communication device 100 by connecting to a wireless network 113 and thereafter performing standard mobile Internet Protocol (IP) signaling and resolving electronic numbering (ENUM) schemes.

2. The device as in claim 1, wherein a display unit 106 is provided to display messages and responses during a call to the users.

3. The device as in claim 1, wherein an audio input and output unit 108 is provided to make and receive mobile voice over internet protocol (MoVoIP) calls.

4. The device as in claim 1, wherein a digital to analog converter (DAC) 109 is provided to modulate and demodulate digital voice data.

5. The device as in claim 1, wherein a power management module 110 is provided for increasing battery life of the said device.

6. The device as in claim 1, wherein a plurality of wireless network communication interfaces (NICs) 111 are provided for enabling the device to get connected to the wireless network.
A method for providing mobile voice over internet protocol (MoVoIP) communication, the method comprising the steps of:

- connecting communication devices 100 to a wireless network 113, each device 100 having voice conferencing applications and capable of providing integrated, differentiated and authentication services;
- initiating a mobile voice over internet protocol (MoVoIP) calls between at least two communication devices 100;
- performing standard mobile Internet Protocol (IP) signaling; and
- resolving electronic numbering (ENUM) schemes.

The method as in claim 7, wherein messages and responses are displayed to users during the calls.

The method as in claim 7, wherein the calls are made and received by an audio input and output unit 108 of the communication device 100.

The method as in claim 7, wherein any digital voice data is modulated and demodulated by a digital to analog converter (DAC) 109.

The method as in claim 7, wherein the communication devices 100 are connected to the wireless network 113 through a plurality of wireless network communication interfaces (NICs) 111.
Figure 1
Figure 3
Connecting communication devices to a wireless network **401**.

Initiating mobile voice over internet protocol (MoVoIP) calls between at least two communication devices **402**

Performing standard mobile Internet Protocol (IP) signaling **403**

Resolving electronic numbering (ENUM) schemes **404**

**Figure 4**