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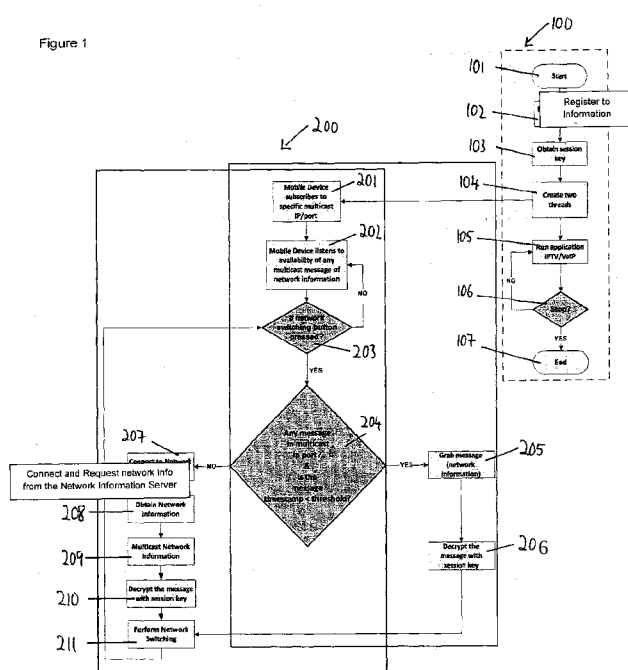
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(54) Title: A METHOD OF DISSEMINATING NETWORK INFORMATION

Figure 1



(57) Abstract: A method of disseminating network information within a wireless network structure, which is constituted of a plurality of accessible networks employing at least one telecommunication protocol, comprises the steps of requesting (207) information of all accessible networks available in the wireless network structure from an information server by a primary client connect to a first network via a request message; receiving (208) a response message containing the information of all accessible networks by the primary client from the information server; and multicasting (210) the response message to at least one secondary client in the first network by the primary client via a multicasting port in the first network that the primary and secondary clients are connected to; wherein both the primary and/or secondary clients wait and/or search for the response message from the multicasting port in the first network and retrieve the response message upon available of response message in the multicasting port without requesting information of all accessible networks from the information server; while the primary and secondary clients request the response message from the information server when there is no response message available in the multicasting port of first network.

A METHOD OF DISSEMINATING NETWORK INFORMATION

FIELD OF INVENTION

5The present invention relates a method to disseminate network information, particularly network availability information, among a plurality of clients with reduced utilization of an information server and with minimum direct client-server network interaction. In more specific, the network availability information is multicast among the clients within the same network which can be particularly useful in performing network selection for seamless
10network handover.

BACKGROUND OF THE INVENTION

There are basically two methods to facilitate wireless network detection that either a client is able to identify surrounding wireless network by itself, or a client to refer to one or more
15servers which keep information about the surrounding networks. In a more desired approach, a server may be employed to keep track of surrounding networks availability and deliver the information about the surrounding networks to the client. In order to receive the latest update about the surrounding network information, clients existed in a wireless network continuously request for network information from the server in a predetermined interval, for
20example 5 seconds. However, the delivered network information may be encapsulated in different sizes, partly relying on the amount and the format of the info. Therefore, the moment all clients perform query to the server, the network traffic will be suddenly increased and probably causing congestion at the network unnecessarily. To avoid the possible bandwidth congestion in the wireless network, a more effective approach to disseminate the
25network information among the clients is needed.

International patent publication no. 2008/091893 discloses a method and apparatus for reliable multicast communication over a wireless network. In the disclosed method, the priority of the multicast message is determined at first followed by assigning one of the

recipient as leader to send the multicast communication source an acknowledgement frame to indicate safe receipt of the multicast message.

Further in United States patent publication no. 2008/01 12350, another method to perform multicast in a wireless communication is described. The disclosed method mainly employs multiple multicast channels to transmit the multicast message that each transmission uses a different multicast channel from the previous occasion to avoid confusion in the recipients, particularly recipient runs older version of telecommunication protocols which are not able to detect repetition of the transmitted message and distinguish sequence of the received messages.

Gupta and Bangolae filed another United States patent with publication no. 2008/024350 offering a method to perform network handover. The described method essentially requires a wireless device to send an information query to an information server, and the information server determine the available wireless network access for the wireless device based on the data contained within the information query.

SUMMARY OF THE INVENTION

The present invention aims to provide a method and an apparatus to perform multicast communication within a wireless network structure composed of a plurality of accessible networks where each may work on similar or different telecommunication protocols, forming an IP-based heterogeneous network structure.

Another object of the disclosed invention is to provide a method and an apparatus to gather and deliver information of a plurality of accessible networks to a plurality of clients upon request. In more specific, the disclosed method and apparatus employs an approach which helps reducing the workload of the server by getting the clients themselves to transmit and share the information in a multicasting mode.

Still another object of the present invention is to offer a method and an apparatus to avoid network traffic congestion due to simultaneous requests made to an information server. The congestion may affect accuracy of the information received by a plurality of clients making the query due to the transmission delay of the information.

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At least one of the preceding objects is met, in whole or in part, by the present invention, in which one of the embodiment of the present invention is a method of disseminating network information within a wireless network structure, which is constituted of a plurality of accessible networks employing at least one telecommunication protocol, comprising the steps
10 of requesting (207) information of all accessible networks available in the wireless network structure from an information server by a primary client connect to a first network via a request message; receiving (208) a response message containing the information of all accessible networks by the primary client from the information server; and multicasting (209)
15 the response message to at least one secondary client in the first network by the primary client via a multicasting port in the first network that the primary and secondary clients are connected to; wherein both the primary and/or secondary clients wait and/or search for the response message from the multicasting port in the first network and retrieve the response message upon available of response message in the multicasting port without requesting information of all accessible networks from the information server; while the primary and
20 secondary clients request the response message from the information server when there is no response message available in the multicasting port of first network.

Another aspect of the present invention further comprises the steps of multicasting the response message in the first network by the secondary client via the multicasting port in the
25 first network.

Another aspect of the present invention further comprises the step of analyzing the information of all accessible networks contained inside the response message in the primary and/or secondary clients and executing a network switching process from the first network to

a second network by the primary client and/or secondary client upon fulfilling partly or completely of a set predetermined criteria or policy.

Further aspect of the present invention has the primary client or the secondary client to
5subscribe to the multicasting port before it is allowed to multicast and/or search and/or wait for information of all accessible networks in the first network.

Another aspect of the disclosed method further comprises the step of tagging the response message with a time-stamp by the information server, the primary client and/or the secondary
10client; and requesting the information of all accessible networks by the primary client and/or the secondary client from the information server upon expiry of the time stamp after a predetermined duration.

Another major embodiment of the disclosed invention is a wireless telecommunication
15system comprising a plurality of accessible networks forming a wireless network structure that each networks employs similar or different telecommunication protocol; an information server in communication with the plurality of accessible networks and continuously collecting information of the plurality of accessible networks; a plurality of clients in which a primary client requests information of the plurality of accessible networks from the
20information server via a request message and receives the information of the plurality of accessible networks from the information server in the form of a response message; wherein the response message is tagged with a time-stamp and a first network of the plurality of networks allocates a multicasting port for the primary client to subscribe and allows the response message to be transmitted to at least one secondary client of the plurality of clients
25in connection to the multicasting port; whereby the primary client and/or secondary client clients wait and/or search for the response message from the multicasting port in the first network and retrieve the response message upon available of response message in the multicasting port without requesting information of all accessible networks from the information server; while the primary and secondary clients request the response message
30from the information server when there is no response message available in the multicasting

port of first network.. Preferably, the telecommunication protocol refers to GSM, Cdma One, GPRS, EDGE, CDMA 2000, UMTS, WCDMA, HSDPA, HSUPA, HSPA+, LTE, mobile WiMAX, LTE advance, IEEE 802.16m, and/or IEEE 802.11.

Further, the information of all accessible networks in the disclosed apparatus may refer to any one or combination of, but not limited to, network name, signal strength, network type, operator, and encryption mode.

Preferably, the primary client stops transmitting the response message when the tagged time-stamp is expired after a predetermined duration; or the secondary client refuses to analyze or cancel the response message when the tagged time-stamp is expired after a predetermined duration and requests a new response message directly from the information server.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows one of the embodiments disclosed in the present invention.

DETAILED DESCRIPTION OF THE INVENTION

It is to be understood that the present invention may be embodied in other specific forms and is not limited to the sole embodiment described above. However modification and equivalents of the disclosed concepts such as those which readily occur to one skilled in the art are intended to be included within the scope of the claims which are appended thereto. Various aspect of embodiments of the present invention maybe performed using various means that can be hardware, computer readable instructions organized into one or more program (software), or combination thereof.

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The present invention, as illustrated in figure 1, includes a method of disseminating network information within a wireless network structure, which is constituted of a plurality of a plurality of accessible networks employing at least one telecommunication protocol, comprising the steps of requesting (207) information of all accessible networks available in the wireless network structure from an information server by a primary client connect to a

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first network via a request message; receiving (208) a response message containing the information of all accessible networks by the primary client from the information server; and multicasting (209) the response message to at least one secondary client in the first network by the primary client via a multicasting port in the first network which the primary and secondary clients are connected to; wherein both the primary and/or secondary clients wait and/or search for the response message from the multicasting port in the first network and retrieve the response message upon available of response message in the multicasting port without requesting information of all accessible networks from the information server; while the primary and secondary clients request the response message from the information server
10 when there is no response message available in the multicasting port of first network.

It is important to be noted that the plurality of accessible networks mentioned herein may refer to various telecommunication service providers and each of the service provider may run the accessible networks using different telecommunication protocols and standards.
15 These telecommunication protocols or standards can be, but not limited to, Global System For Mobile Communication (GSM), High-speed Circuit Switched Data (HS-CSD), Code Division Multiple Access One (Cdma One), General Radio Packet Service (GPRS), Enhanced Data Rate for GSM Evolution (EDGE), CDMA 2000, Universal Mobile Telecommunication System (UMTS), Wideband Code Division Multiple Access One
20 (WCDMA), High Speed Downlink Packet Access (HSDPA), High Speed Uplink Packet Access (HSUPA), Evolved High Speed Packet Access (HSPA+), 3GPP Long Term Evolution (LTE), mobile Worldwide Interoperability for Microwave Access (Mobile WiMAX), LTE advance, IEEE 802.16m, and/or IEEE 802.11. Further the client described herein throughout the specification may be any device equipped with a wireless means to
25 engage with one or more accessible networks and capable of communicating with the accessible networks through one or more protocols or standards. The device can be a laptop computer, a desktop computer, a personal digital assistant (PDA), a multimedia player, a netbook, a smartphone or so.

Referring to figure 1, the flow (100) shows the steps taken by the client which is subsequently designated as the primary client to transmit the response message received from the information server. The primary client of the present invention is preferably the client acquired response message tagged with the latest time-stamp from the information server.

5 The primary client will always multicast the acquired response message into the same network for at least one secondary clients to consume the same network availability information. Specifically, any client will start by first registering to the information server once one of the plurality of clients engages with the first network that it is allowed to start (101) communicating with the information server. The information server is preferably a

10 Session Initiation Protocol (SIP) server and it is capable of communicating all the networks via one or more wireless and/or wired communication means. Before the client can actually communicate with the information server or start exchanging information, the client has to register with the information server (102). Later, the client shall obtain a session key (103).

15 Subsequently, the client may perform at least two separate threads or actions thereon with or without notice of the user. These actions or threads can happen simultaneously or one after another depending on the program running the instruction in the client. The first thread shall serve the user application, e.g. an IPTV or VoIP application (105) independent from the second thread. The client may need the service provided by the first network and run any

20 application using service of the first network (105) until it is stopped by the user (106) to end the service (107). The second thread shall subscribe to the multicasting port in the first network and look for any response message available in the port. Whenever the user gives a command to perform network switching (203), the second thread will start listen to the multicasting port for any message, and if there is a message, it will then check on its time-

25 stamp to determine whether the message has expired (204). If there was no message or the received message was expired, the client shall then establish connection to the information server (207) making request on information of all surrounding accessible networks. The client is hereon referred as the primary client as it is the client initiates the request to the information server and receives the response message tagged with the latest time-stamp.

30 Meaning that the step of requesting (207) information of all accessible networks available in

the wireless network structure from the information server by the primary client is performed upon the primary client received a command to perform network switching (203) from the user. The primary client obtains the information of all accessible networks (208) in the form of the response message. The disclosed method may comprise the step of tagging the response message with the time-stamp by the information server at this stage, or probably by the primary client and/or the secondary client upon receiving and/or transmitting the response in the multicasting port. The time-stamp is an important means in the disclosed method to allow the client to determine validity of the available response message in the multicasting port and requesting the information of all accessible networks by the primary client and/or the secondary client from the information server upon expiry of the time stamp after a predetermined duration. In more details, the primary client is able to decrypt the response message to acquire the needed information of all accessible networks with the given session key (210) obtained from upon registration (103). The information of all accessible networks can be, but not limited to, any one or combination of network name, signal strength, network type, operator, and encryption mode. This information is essential in determining subsequent actions to be taken by the client after being analyzed according to criteria or policy configured by the user. The client may perform network handover or switching (211) if the client finds another available network, or a second network, is more preferred after analyzing the information fed by the information server. For example, the second network may have stronger signal, faster data transferring rate, cheaper price, and the like compared to the first network. These factors can be the user preference setting preconfigured in the client to prompt the switching.

More preferably, both the request message and response message are encrypted to reinforce confidentiality of the exchanged information.

In the more preferred embodiment, the primary client may instantly multicast or transmit the received response message in the multicasting port to expedite the process for transmitting the received info (209) to the counterparts in the first network upon obtaining the response message (208) from the information server prior to decrypting the response message with the

session key. Through this embodiment, the updated information of all accessible networks is always available in the multicasting port for consumption and the secondary client can acquire the needed information as soon as it subscribes the multicasting port. The primary client and/or the secondary client are required to subscribe the multicasting port before it is allowed to multicast and/or search and/or wait for information of networks in the first network.

In one embodiment where an updated response message is available in the multicasting port, the client subscribed the multicasting port become the secondary client and receives the transmitted response message. It is possible that no communication will be set up in between the secondary client and the information server if there was a response message available in the multicasting port available for consumption. In another embodiment, the secondary client may still register with the information server in order to obtain the session key to decrypt the response message transmitted in the multicasting port without making any further request on the information of all accessible networks that the registration may occur before subscribing the multicasting port. Thus, in this embodiment, both the primary and/or secondary client is required to register with the information server prior to receiving the response message either from the information server or the multicasting port.

Likewise, the secondary client may perform network switching as the primary client in one of the embodiments. More specifically, the disclosed method comprises the step of analyzing the information of all accessible networks contained inside the response message in the primary and/or secondary clients and executing a network switching process from the first network to a second network by the primary client and/or secondary client upon fulfilling partly or completely of a set predetermined criteria or policy. The switching or network handover may happen without awareness from the user. Yet, in another embodiment, the client may prompt the user about the switching to be performed and request permission from the user to finally perform the handover.

Though in one aspect of the present invention that waiting or listening or searching for the response message either from the information server or the multicasting port is set to be performed automatically in the clients, the searching can be manually inspired by the user in another embodiment in order to perform the network switching. For example, the user instruct the client, probably a smart phone, by pressing a network switching button and the client may then begin to subscribe the multicasting port to look for updated response message. The client retrieves the response message and makes the decision if switching shall be proceeded when the response message is available in the multicasting port, while requesting the response message from the information server in the absence of updated response message in the multicasting port.

It is possible also the present invention further comprises the step of multicasting the response message in the first network by the secondary client via the multicasting port in the first network, particularly if the expiry of the time-stamp was sufficient long that the transmitted information or response message is still useful when the other counterparts receive it. Further, the other clients shall be able to recognize repeated response message received through verifying the time-stamp to avoid confusion in the clients.

Pursuant to another preferred embodiment, the present invention also includes a wireless telecommunication system comprising a plurality of accessible networks forming a wireless network structure that each networks employs similar or different telecommunication protocol; an information server in communication with the plurality of accessible networks and continuously collecting information of the plurality of accessible networks; a plurality of clients in which a primary client requests information of the plurality of accessible networks from the information server via a request message and receives the information of the plurality of accessible networks from the information server in the form of a response message; wherein the response message is tagged with a time-stamp and a first network of the plurality of networks allocates a multicasting port for the primary client to subscribe and allows the response message to be transmitted to at least one secondary client of the plurality of clients in connection to the multicasting port; whereby the primary client and/or secondary

client clients wait and/or search for the response message from the multicasting port in the first network and retrieve the response message upon available of response message in the multicasting port without requesting information of all accessible networks from the information server; while the primary and secondary clients request the response message from the information server when there is no response message available in the multicasting port of first network. It is patentably important to be noted that the disclosed system is able to deploy the above mentioned method of transmitting information via multicast.

In the preferred embodiment, the telecommunication protocol used in the system refers to 10GSM, Cdma One, GPRS, EDGE, CDMA 2000, UMTS, WCDMA, HSDPA, HSUPA, HSPA +, LTE, mobile WiMAX, LTE advance, IEEE 802.16m, and/or IEEE 802.11. The client is able to engage with at least one of the accessible network using at least one of the mentioned protocols. More preferably, the client shall be equipped with wireless means to enable its communication with more than one network that the protocols used in these communicable 15networks maybe different.

In another preferred embodiment, the information server can be a Session Initiation Protocol (SIP) server which is equipped with some authentication and security mechanism with session key distribution to clients upon successful registration. Preferably, the primary client 20and/or the secondary' client are required to register with the information server to obtain a session key for decrypting the response message which can be transmitted from the information server itself or by the multicasting primary client in the known or allocated multicasting port of the first network. Further, the information server may tag the delivered response message with a time-stamp to allow the received client to recognize the validity of 25the response message within a predetermined duration. The time stamp also acts as a tool to permit the client recognizes if a repeated response message was received or transmitting the in the multicasting port. More specific, the client checks the validity of the received response message by verifying if the time-stamp exceeds the predetermined threshold. In the case which the time-stamp is expired, the client shall make request to the information server for 30more updated information of all accessible networks and the expired response message will

be ignored. On the other hand, a non-expired response message is consumed by the client once it is verified. Moreover, the primary client only transmits the response message for a preferred duration in the multicasting port according to the time-stamp tagged in the response message. Once it exceeds the threshold duration, the transmission in the multicasting port is stopped and new response message has to be requested from the information server or sought from the multicasting port. In further embodiment, the secondary client may refuse to analyze or use the information contained with the response message which the tagged time-stamp is expired after a predetermined duration. Subsequently, the secondary may then requests a new response message from the information server becoming the primary client and begin to transmit the newly received response message in the multicasting port. For the disclosed system, the primary client preferably multicast the received response message for a specific duration either it continues connecting to the first network or initiates the network switching.

Moreover, information of all accessible networks is, but not limited to, any one or combination of network name, telecommunication protocols employed, signal strength, network type, operator, and encryption mode. Preferably, the disclosed information is needed for the client to decide if network switching has to be performed or continue with the service provided by the first network.

According to the preferred embodiment, each client can become primary or secondary client depending on the timing the client participates in the multicasting process of the disclosed system. The tagged time-stamp of the response message may not actually reflect lifespan of the response message. More specifically, in such embodiment, the time-stamp acts solely as a tool to prompt the client to cease analyzing and/or multicasting the response message, while the information contained in the response message may be used for duration longer or exceeds the lifespan of the time-stamp. For example, a primary client stops transmitting the response message when the tagged time-stamp is expired after a predetermined duration yet the primary client continues to use the decrypted info for another few seconds before searching updated response message in the multicasting port or making another request to the information server. A newly participated client by that timing of the process where the

primary client has stopped the multicasting and yet making another query to the information server, the newly participated client shall then send a query to the information server acting as the new primary client to transmit the updated response message upon obtaining the updated response message from the information server.

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As in the foregoing, the primary client and/or secondary client need to register with the information server prior to receiving response message from the information server. The registered client shall receive a session key to allow decryption of the response message and use the contained network information. The clients in the present invention are equipped with one or more wireless means providing freedom to the clients to communicate and use service supplied by different networks, which probably running different telecommunication protocols or modules.

The present disclosure includes as contained in the appended claims, as well as that of the foregoing description. Although this invention has been described in its preferred form with a degree of particularity, it is understood that the present disclosure of the preferred form has been made only by way of example and that numerous changes in the details of construction and the combination and arrangements of parts may be resorted to without departing from the scope of the invention.

CLAIMS

1. A method of disseminating network information within a wireless network structure, which is constituted of a plurality of accessible networks employing at least one telecommunication protocol, comprising the steps of
5 requesting (207) information of all accessible networks available in the wireless network structure from an information server by a primary client connect to a first network via a request message;
receiving (208) a response message containing the information of all accessible
10 networks by the primary client from the information server; and
multicasting (209) the response message to at least one secondary client in the first network by the primary client via a multicasting port in the first network which the primary and secondary clients are connected to;
wherein both the primary and/or secondary clients wait and/or search for the response
15 message from the multicasting port in the first network and retrieve the response message upon available of response message in the multicasting port without requesting information of all accessible networks from the information server; while the primary and secondary clients request the response message from the information server when there is no response message available in the multicasting port of first
20 network.
2. A method of claim 1 further comprising the step of multicasting the response message in the first network by the secondary client via the multicasting port in the first network.
- 25 3. A method of claim 1 further comprising the step of analyzing the information of all accessible networks contained inside the response message in the primary and/or secondary clients and executing a network switching process from the first network to a second network by the primary client and/or secondary client upon fulfilling partly or
30 completely of a set predetermined criteria or policy.

4. A method of claim 1, wherein the primary or secondary client is required to register with the information server prior to receiving the response message.
- 5 5. A method of claim 1, wherein the step of requesting (207) information of all accessible networks available in the wireless network structure from the information server by the primary client is performed upon the primary client received a command to perform network switching (203) from the user.
- 10 6. A method of claim 1, wherein the primary client or the secondary client is required to subscribe the multicasting port before it is allowed to multicast and/or wait and/or search for information of all accessible networks in the first network.
- 15 7. A method of claim 1, wherein the request message and response message are encrypted.
8. A method of claim 1 further comprising the step of tagging the response message with a time-stamp by the information server, the primary client and/or the secondary client; and requesting the information of networks by the primary client and/or the secondary
20 client from the information server upon expiry of the time stamp after a predetermined duration.
9. A method of claim 1, wherein the telecommunication protocol is GSM, Cdma One, GPRS, EDGE, CDMA 2000, UMTS, WCDMA, HSDPA, HSUPA, HSPA+, LTE,
25 mobile WiMAX, LTE advance, IEEE 802.16m, and/or IEEE 802.11.
10. A method of claim 1, wherein the information of network is any one or combination of network name, signal strength, network type, operator, and encryption mode.
- 30 11. A wireless telecommunication system comprising

a plurality of accessible networks forming a wireless network structure that each networks employs similar or different telecommunication protocol;

an information server in communication with the plurality of accessible networks and continuously collecting information of the plurality of accessible networks;

5 a plurality of clients in which a primary client requests information of the plurality of accessible networks from the information server via a request message and receives the information of the plurality of accessible networks from the information server in the form of a response message; wherein the response message is tagged with a time-stamp and

10 a first network of the plurality of networks allocating a multicasting port to the primary client and allowing the response message to be transmitted to at least one secondary client of the plurality of clients in connection to the multicasting port;

whereby the primary client and/or secondary client clients wait and/or search for the response message from the multicasting port in the first network and retrieve the response message upon available of response message in the multicasting port without requesting information of all accessible networks from the information server; while the primary and secondary clients request the response message from the information server when there is no response message available in the multicasting port of first network.

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12. A wireless telecommunication system of claim 11, wherein the telecommunication protocol is GSM, Cdma One, GPRS, EDGE, CDMA 2000, UMTS, WCDMA, HSDPA, HSUPA, HSPA+, LTE, mobile WiMAX, LTE advance, IEEE 802.16m, and/or IEEE 802.11.

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13. A wireless telecommunication system of claim 11, the information of the accessible networks is any one or combination of network name, signal strength, network type, operator, and encryption mode.

14. A wireless telecommunication system of claim 11, wherein the primary client stops transmitting the response message when the tagged time-stamp is expired after a predetermined duration.
- 5 15. A wireless telecommunication system of claim 11, wherein the secondary client refuses to analyze the response message when the tagged time-stamp is expired after a predetermined duration and requests a new response message from information server.
- 10 16. A wireless telecommunication system of claim 11, wherein the primary client and/or secondary client is registered with the information server prior to receiving response message from the information server.

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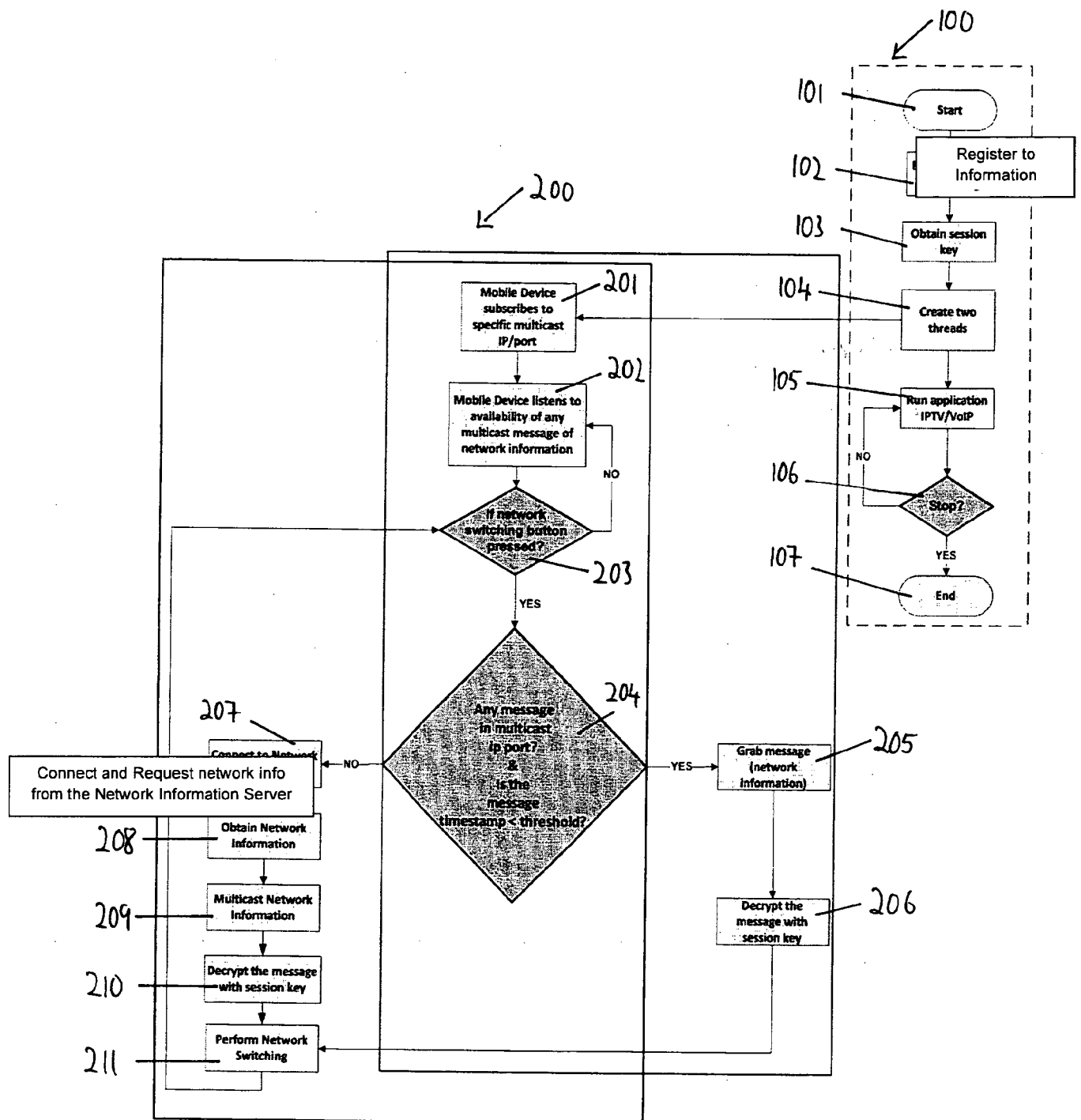


Figure 1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/MY20 10/000228**A. CLASSIFICATION OF SUBJECT MATTER****H04W 4/06(2009.01)i, H04W 48/08(2009.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04W 4/06; H04W 76/02; H04W 48/08; H04W 8/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: network information , multicast , wireless network**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	KR 10-2007-0048113 A (SAMSUNG ELECTRONICS CO., LTD.) 08 May 2007 See claims 1-35 and figures 1-6 .	1-16
A	US 2003-0134622 A1 (RAYMOND T. HSU et al.) 17 July 2003 See claims 1-38 and figures 1-31 .	1-16
A	KR 10-2006-0045917 A (LG ELECTRONICS INC.) 17 May 2006 See claims 1-46 and figures 1-9 .	1-16

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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International application No.

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