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(54) **METHOD FOR DYNAMICALLY
CONFIGURING GROUP CALLS IN A RADIO
SYSTEM**

6,304,558 B1 * 10/2001 Mysore 370/312
6,330,244 B1 * 12/2001 Swartz et al. 370/401

* cited by examiner

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(57) **ABSTRACT**

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455/520; 455/521; 455/522; 455/426.1;
455/426.2; 455/458; 455/456.1; 455/456.2;
370/312; 370/328; 370/390; 370/348; 370/401;
345/329

(58) **Field of Search** 455/519, 518,
455/520, 521, 522, 15, 455, 426, 458, 456;
370/312, 328, 320, 348, 801; 345/329

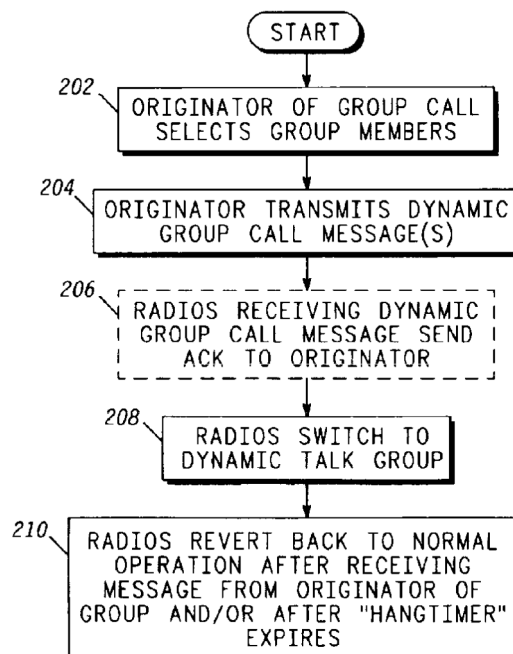
(56) **References Cited**

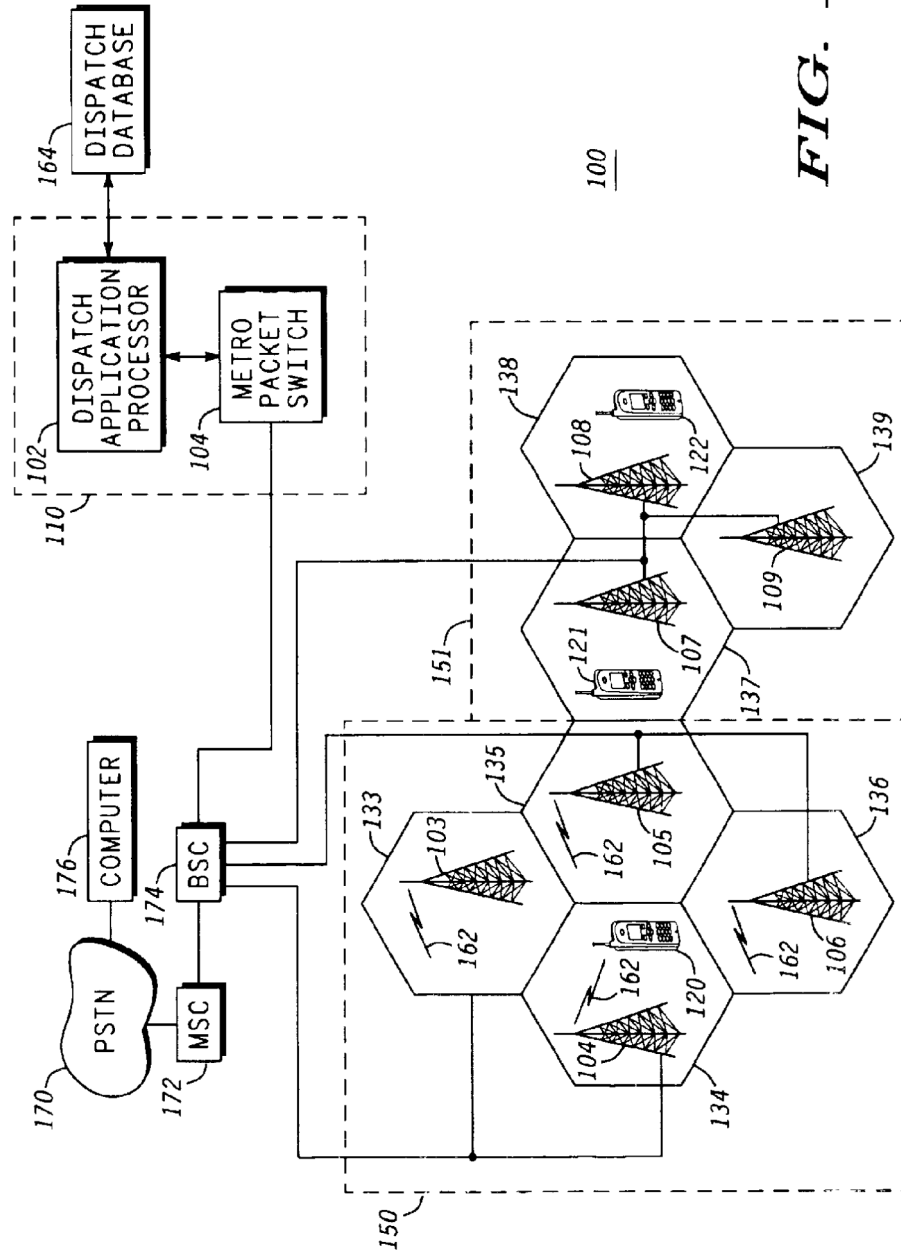
U.S. PATENT DOCUMENTS

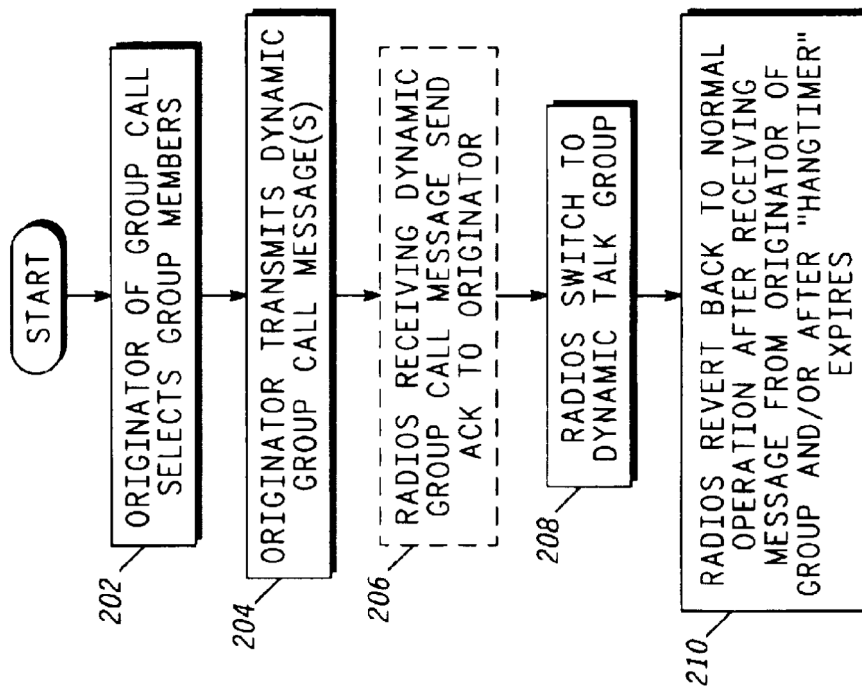
4,817,190 A 3/1989 Comroe et al. 455/11
5,058,199 A * 10/1991 Grube 455/15
5,471,646 A 11/1995 Schultz 455/54.1
6,031,832 A * 2/2000 Turina 370/348
6,141,347 A * 10/2000 Shaughnessy et al. 370/390
6,204,844 B1 * 3/2001 Fumarolo et al. 345/733

A method for setting up a dynamic group call includes the step (202) of selecting a group of radios (120, 121) by a dynamic group call originator (122). Once the radios that will be part of the dynamic group have been selected, the dynamic group call originator (122) transmits a dynamic group call message(s) to each of the selected radios. Each of the transmitted dynamic group call message(s) includes the IP address of one of the selected radios. Upon each of the target radios receiving their individually directed message, the target radios (120, 121) can each send an optional acknowledgment message to the dynamic group call originator (122). The originator (122) and the target radios (120, 121) then switch to the dynamic talk group number assigned by the dynamic talk group message. Once the dynamic talk group call has been completed, the originator of the dynamic group call can send a dynamic group call disconnect message, which once received by the target radios (120, 121) causes them to revert back to their previous operational state. Alternatively, instead of the dynamic talk group originator transmitting a disconnect message, the radio communication system controller (110) can transmit a disconnect message such as based on a timer (e.g., hangtimer, etc.).

6 Claims, 3 Drawing Sheets





**FIG. 2**

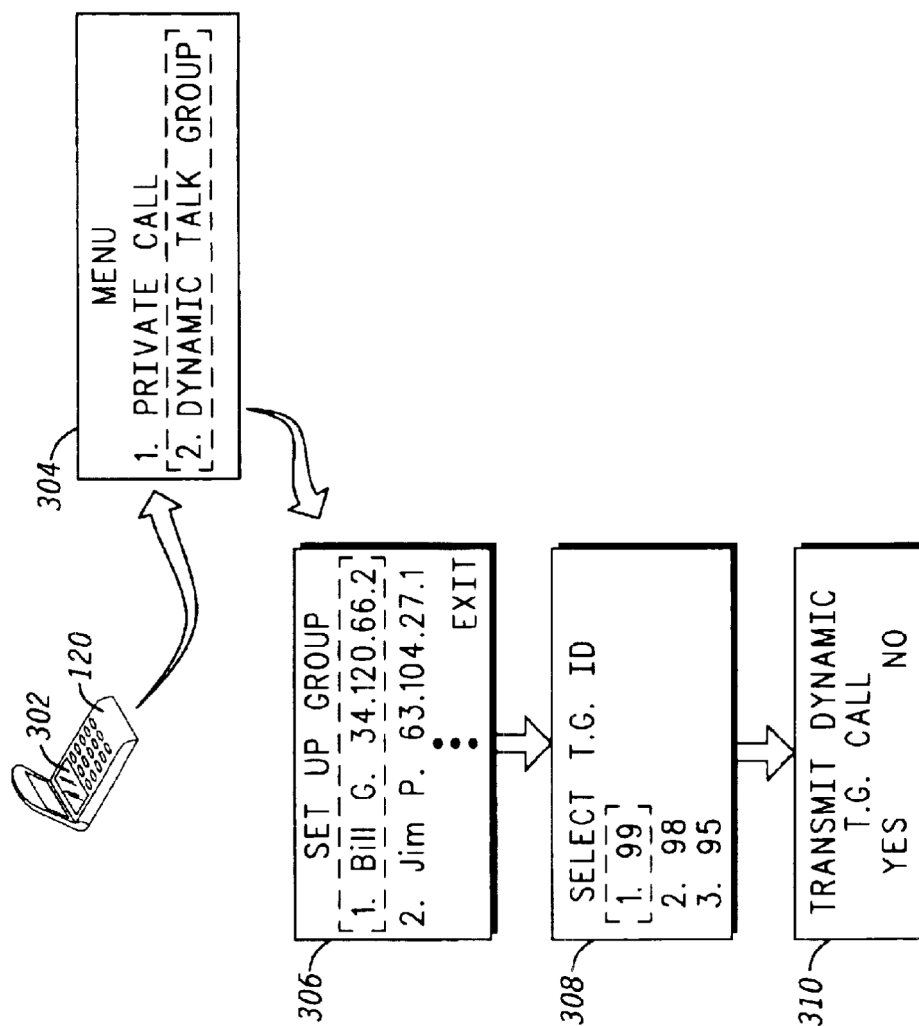


FIG. 3

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METHOD FOR DYNAMICALLY CONFIGURING GROUP CALLS IN A RADIO SYSTEM

TECHNICAL FIELD

This invention relates in general to radio communication systems, and more particularly, to a method for dynamically configuring group calls in a radio system.

BACKGROUND

Radio talk groups are typically pre-defined and static and can not be changed by any individual subscriber radio user within a radio communication system. In a trunked radio system for example, if a radio is programmed with a particular talk group that is linked to a particular radio channel selection, the radio user can not alter the members assigned to that talk group. Although preprogrammed talk groups are a valuable feature, especially among radio users who work in teams (e.g., building security guards, etc.); preprogrammed talk groups have their limitations.

At times it may become desirable for a particular radio user to establish a radio talk group that includes select radio users located in the system. For example, a supervisor may want to speak to a few select subordinates. Some solutions to the above problem have come in different forms. One feature found in trunked radio systems called "Dynamic Regrouping", is a way by which an operator at the fixed-end (e.g., at the central controller) of a radio communication system, can group two or more radio users together. The fixed-end operator can cancel the dynamic regrouping when the radio users no longer need to communicate with each other. The main problem with dynamic regrouping is that it requires an operator at the fixed-end to set up the group. Although acceptable for private trunked systems (e.g., city fire department system), is not practical in a large public metropolitan radio communication system.

Another solution for providing dynamic talk group is found in U.S. Pat. No. 5,471,646, entitled "Method for establishing a user defined radio talk group in a trunked radio communication system", assigned to Motorola, Inc. In the above patent, radio users who want to be part of the same radio talk group all select the same virtual talk group number at their respective radios. Once all of the radio users who want to be part of the virtual group have selected the same virtual talk group number, they all can talk and listen to their group conversation using the assigned virtual talk group. One drawback to this invention is that each of the radio users who wants to be part of the talk group must perform some action, in this case select the same virtual talk group number, to become affiliated with the talk group. This thus requires some coordination between the potential group members prior to the talk group being set up. For example, this may require the potential virtual talk group members to communicate with each other before hand and coordinate when they will all transfer to the virtual talk group. Given the above, a need exists in the art for a method for dynamically configuring a group call by a single device.

BRIEF DESCRIPTION OF THE DRAWINGS

The features of the present invention, which are believed to be novel, are set forth with particularity in the appended claims. The invention, together with further objects and advantages thereof, may best be understood by reference to the following description, taken in conjunction with the

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accompanying drawings, in the several figures of which like reference numerals identify like elements, and in which:

FIG. 1 illustrates a block diagram of an exemplary communication system that may beneficially employ the present invention.

FIG. 2 shows a simplified flowchart that highlights the steps taken in accordance with the present invention in order to establish a dynamic group call by a radio user.

FIG. 3 shows a graphical flow diagram showing different exemplary portable radio display contents in accordance with the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

While the specification concludes with claims defining the features of the invention that are regarded as novel, it is believed that the invention will be better understood from a consideration of the following description in conjunction with the drawing figures, in which like reference numerals are carried forward.

Referring now to FIG. 1, there is shown a diagram of a wireless communication system **100** that may beneficially employ the present invention. The communication system **100** includes a system or dispatch controller **110**, a plurality of base sites **103-109**, a plurality of communication units **120-122**, a base site controller ("BSC") **174**, a mobile switching center ("MSC") **172** and a dispatch database **164**. Each base site **103-109** provides communication service to a corresponding service coverage area **133-139**. The base site service coverage areas **133-139** are grouped into one or more location areas **150-151** (two shown). Each location area **150-151** thus includes one or more of the base site service coverage areas **133-139** and, accordingly, one or more base sites **103-109**. Base sites **103-109** communicate using radio frequency signals **162** to radios **120-122**. The base sites **103-109** are coupled to a metro packet switch ("MPS") **104** via communications links, such as T1 wireline, fiber optic, microwave links, etc. and preferably communicate using frame relay packet-switching technology.

In the preferred embodiment, the wireless portion of communication system **100** comprises an IDEN® radio communication system that is commercially available from Motorola, Inc. of Schaumburg, Illinois. The wireless portion of communication system includes the location areas **150-151**, the communication units **120-122**, base sites **103-109**, the MSC **172**, the BSC **174** and the dispatch controller **110**.

The Dispatch Application Processor ("DAP") **102** functions to allocate communication resources amongst dispatch service users, such as the users of communication units **120-122** and performs the important function of alerting all members of a dispatch group that a dispatch call is imminently, or presently, underway, so that all members of the dispatch group can participate in the call. The metropolitan packet switch **104** comprises a switch, as well understood in the art, that routes audio signals between sites in order to facilitate the inclusion of group call members that are located in other sites that are also serviced by the radio dispatch system. The dispatch database **164** is coupled to the dispatch application processor **102** and includes information regarding current dispatch operability states of communication units that are serviced by the radio dispatch system. Such information includes, for example, individual identification (ID), group ID, alias information, roaming status, priority information, and so forth, as is well understood by one of ordinary skill in the art.

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The base sites **103–109** preferably support one or more trunking and cellular communications platforms, such as frequency division multiple access (FDMA), time division multiple access (TDMA), or code division multiple access (CDMA). In the preferred embodiment, the base sites **103–109** comprise IDEN Enhanced Base Site Transceiver Sites. The base sites **103–109** are coupled to the metro packet switch **104** via the BSC **174**. The BSC **174** is the controlling element between the base sites **103–109** and the MSC **172**. The BSC **174** also transcodes the digital VSELP phone calls to pulse code modulation (PCM) to enable communications with a communication network such as the public switched telephone network (PSTN) **170**. The MSC **172** provides the interface between the PSTN **170** and the Motorola IDEN radio network. The MSC **172** is the telephone switching office for all calls that are sent or received by subscriber units **120–122**.

The communication units **120–122** preferably comprise any wireless devices, such as wireless data terminals, radios, radiotelephones, etc., that are capable of receiving and transmitting (transceiving) data packets, or radio dispatch communications, or cellular communications, or any combination thereof. An example of such a communication unit is an IDEN i1000plus portable radio manufactured by Motorola, Inc. of Schaumburg, Ill. In alternative embodiments, one or more of the communication units **120–122** may comprise a data terminal coupled to a wireless communication device. The communication units **120–122** are alternatively referred to herein as radios **120–122**. The system controller **110** preferably comprises an IDEN Dispatch Application Processor **102** and a metro packet switch **104**. The dispatch database **164** is coupled to the DAP **102** as shown.

When each communication unit **120–122** is initially activated, it registers with the controller **110** by first identifying a serving base site from control channel transmissions of all the base sites **103–110**, as is well known in the art. Then the unit transmits a registration message to the controller **110** via the identified serving base site. Upon receiving the registrations, the controller **110** affiliates each communication unit **120–122** with its serving base site and the location area that includes the service coverage area of the serving base site. The controller **110** then stores the registrations in the dispatch database **164**.

As is well known in existing IDEN radio communication systems, when a mobile radio (e.g., **122**) desires to engage in a dispatch call such as a group call with one or more mobile communication units, the requesting communication unit **122** transmits a request to communicate to its serving base site **108** over a control channel. The request to communicate includes the dispatch IDs of the requesting communication unit **122** and the communication unit (e.g., **121**) or dispatch group that is the intended target of the desired communication, and identifies each communication unit as either a requester or target as is well known.

Upon receiving the request at the base site **108**, the base site **108** provides the request to the controller **110**. The controller **110** queries the dispatch database located either within the controller **110** or external to the controller **110** to determine which location area(s) currently contain the target communication unit(s). Once the controller **110** locates the target communication unit(s), the controller **110** attempts to contact the target communication unit(s) as is well-known in the art and proceeds to establish a communication path between the requesting communication unit and the target communication unit(s) to support the call.

The controller **110** can support a radio dispatch operational mode that handles both individual dispatch calls such

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as private calls between two communication units, as well as group dispatch calls. The dispatch mode operates much like a wide-area walkie-talkie radio call and uses push-to-talk (PTT) to gain almost instantaneous voice access to individuals and groups. Unlike a cellular phone, a dispatch call has almost no setup time because it does not require dial up access to a mobile switch center (MSC) and the public switched telephone network (PSTN). The controller **110** also supports a packet data mode of operation.

In accordance with the present invention, using packet data and the Internet Protocol (IP) address assigned to each IDEN subscriber radio **120–122**, a single radio user or any Internet appliance can configure group calls dynamically on the fly. The radio user (dynamic group call originator) will be able to select radio users using aliases (e.g., user names, etc.) and/or IP addresses from a list stored within the subscriber radio **120–122**. When all of the required users are selected from the list, special packet data messages are sent to each of those selected radios (one message sent to each of the selected radios). The special packet data message will then cause the “target” subscribers to switch to an assigned reserved talk group number, where the dynamic group call will proceed. An additional feature of the present invention includes an optional acknowledgment by each of the target radios to the special packet data message. These acknowledgment messages by each of the target radios gives the dynamic group call originator the ability to track which radios (IP addresses) responded and participated in the group call and which radios did not respond.

Referring now to FIG. 2, there is shown a simplified flow chart showing the steps taken in order for a particular radio user to establish a dynamic group call in accordance with the invention. In step **202**, the originator of the group call, for example the user of radio **122**; selects the group members (radio users, also referred to as target radios) he wants to participate in the group call. This is accomplished by the user of radio **122** scrolling through a list of radio users stored in radio **122**. This list preferably includes the IP addresses of all of the radios in the list as well as an alias that can help identify each of the radio users, for example, the name of the user.

Once all of the dynamic talk group members have been selected in step **202**, in step **204** the radio **122** (“dynamic group call originator”) transmits dynamic group call set up messages using packet data to each of the selected target radios, for example radios **120**, **121**. These messages are preferably all automatically sent by radio **122**, although they could be sent one at a time at the option of the user of radio **122**. Optionally in step **206**, upon radios **120** and **121** receiving the dynamic group call message addressed to each of the radios, they individually acknowledge the dynamic group call message received by sending an acknowledgment message back to radio **122**. This allows radio **122** to track which radios that had been selected will participate in the dynamic talk group call.

In step **208**, once the dynamic group call messages have been received by each of the target radios, radios **120**, **121**, they each switch to the specific dynamic talk group number assigned by the dynamic group call message sent by radio **122**. Once the radio **122** and the target radios **120**, **121** have switched to the assigned dynamic talk group, the group call can proceed as normal. In accordance with the invention, the originating radio **122** sends dynamic group call disconnect messages at step **210** to each of the radios **120**, **121** in the dynamic talk group in order to disconnect the dynamic talk group. Alternatively, or in addition to, the ability of the originating radio **122** to send disconnect messages, the

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controller **110** can send a "hangtimer" disconnect message if there has been no activity by any of the radios in the dynamic talk group **120-122** after a predetermined period of time has elapsed, or if the dynamic group call has exceeded a predetermined period of time.

It is worth noting that since the dynamic group call setup in accordance with the invention uses packet data and the IP address information to set up the participating radios in the dynamic group call, that not only can a subscriber radio in the system **100** set up a dynamic talk group call, but any communication device (e.g., computer **176**, etc.) connected to the communication system **100** can set up the call. For example, a computer coupled through the PSTN **170** via the MSC **172** could send dynamic group set up messages to select radios in the system in order to establish a group call.

In FIG. 3, there is shown a graphical illustration of some of display screens shown to a radio user who wants to set up a dynamic group call in accordance with the present invention. Radio **120** includes a display **302**, which functions as a user interface that allows the radio user to select the dynamic talk group features and select the target member(s) for the group call.

When a radio user wants to set up a dynamic talk group he scrolls through the radio feature menu until he reaches the dynamic talk group feature as shown in display **304**. Once the dynamic talk group feature is selected, a set up group screen **306** is presented to the radio user. The user then scrolls through the list and selects all of the people he wants to include in his dynamic group call. This screen also allows the radio user to enter an IP address for one or more target radios that are not found in the list.

Once all of the dynamic group members have been selected, the user exits the set up screen **306** and a select talk group identification (ID) screen **308** is presented. A default talk group ID (e.g., **99**, etc.) is presented to the user or the user can select from a list of talk group IDs which have been specifically assigned to the system **100** for the purposes of establishing dynamic talk groups. After the talk group ID number has been selected, a transmit dynamic talk group screen **210** is presented to the user, in order for the user to cause radio **120** to transmit dynamic talk group setup messages to each of the target radios (e.g., **121**, **122**) using their IP addresses. Alternatively, the setup messages can be transmitted automatically after the dynamic talk group ID number is selected.

In another embodiment of the invention, the system controller **110** can assign the dynamic talk group ID to the dynamic group call originator in order to reduce system contention. In this embodiment, the dynamic group call originator can send a request in to the system controller **110** in order to reserve a dynamic talk group ID, prior to or in association with the dynamic talk group message(s) being transmitted by the dynamic talk group originator.

Other user control screens can include a screen that shows which of the target radios acknowledged the talk group set up message sent by radio **120**, and a screen for allowing the radio **120** to transmit a dynamic talk group call disconnect message to each of the radios participating in the group call.

As has been discussed above, the present invention uses IP addresses of radios **120-122** to send messaging, preferably using packet data that sets up a dynamic talk group. The radios **120**, **121** can also in accordance with the invention

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inform the originator of the dynamic talk group that they do not want to participate by sending to the originator a message. The radios **120-122** can also setup and breakdown a dynamic talk group they have created as previously discussed. By giving an individual device, for example radio **120** or computer **176** coupled to a packet data radio through the PSTN **170** (FIG. 1), the ability to set up a dynamic talk group independently and without the need for action from the communication system **100**, provides for improved communication flexibility is provided for the communication system users.

While the preferred embodiments of the invention have been illustrated and described, it will be clear that the invention is not so limited. Numerous modifications, changes, variations, substitutions and equivalents will occur to those skilled in the art without departing from the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A method for establishing a dynamic talk group in a radio communication system, comprising the steps of:

- (a) selecting a set of target radios from amongst a plurality of subscriber radios by a dynamic group call originator, each one of the plurality of subscriber radios having a unique Internet Protocol (IP) address, the dynamic group call originator being a subscriber radio located in the radio communication system;
- (b) querying a dispatch database to determine a current location area for each one of the plurality of subscriber radios in the set of target radios;
- (c) transmitting a message from the dynamic group call originator to each of the set of target radios whose IP addresses match those radios selected in step (a), the message containing a dynamic talk group number; and
- (d) causing the target radios and the dynamic group call originator to establish a dynamic talk group where the dynamic group call will take place, using the dynamic talk group number.

2. A method as defined in claim 1, wherein the message transmitted to each of the target radios in step (b) comprises a packet data message.

3. A method as defined in claim 1, further comprising the further step of:

- (d) transmitting an acknowledgment message to the dynamic group call originator from each of the target radios that successfully received the message transmitted in step (b).

4. A method as defined in claim 1, comprising the further step of:

- (e) transmitting a dynamic talk group disconnect message by the dynamic group call originator to the target radios.

5. A method as defined in claim 4, comprising the further step of:

- (f) disconnecting the target radios from the dynamic group call in response to step (e).

6. A method as defined in claim 1, wherein at least one of the target radios in response to step (b) transmits a message to the dynamic group call originator informing it that it is not available to participate in the dynamic talk group.

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