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[54] **METHOD OF REGISTRATION IN A COMMUNICATION SYSTEM**

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[52] **U.S. Cl.** **455/518**; 455/435; 455/519

[58] **Field of Search** 455/435, 518, 455/519, 520, 517, 432, 527; 340/825.52

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[57] **ABSTRACT**

A method of registration in a communication system includes the steps of detecting **(201)** an elevated registration level of at least a part of a communication system, selecting **(203)** a group recovery time, determining **(205)** a first random registration time that is less than or equal to the group recovery time, registering **(209)** a first communication unit **(111)** from a first talkgroup at the first random registration time, and upon receiving **(212)** a group activity message for the first talkgroup, delaying **(213)** registration by at least a second communication unit **(113)** from the first talkgroup.

36 Claims, 3 Drawing Sheets

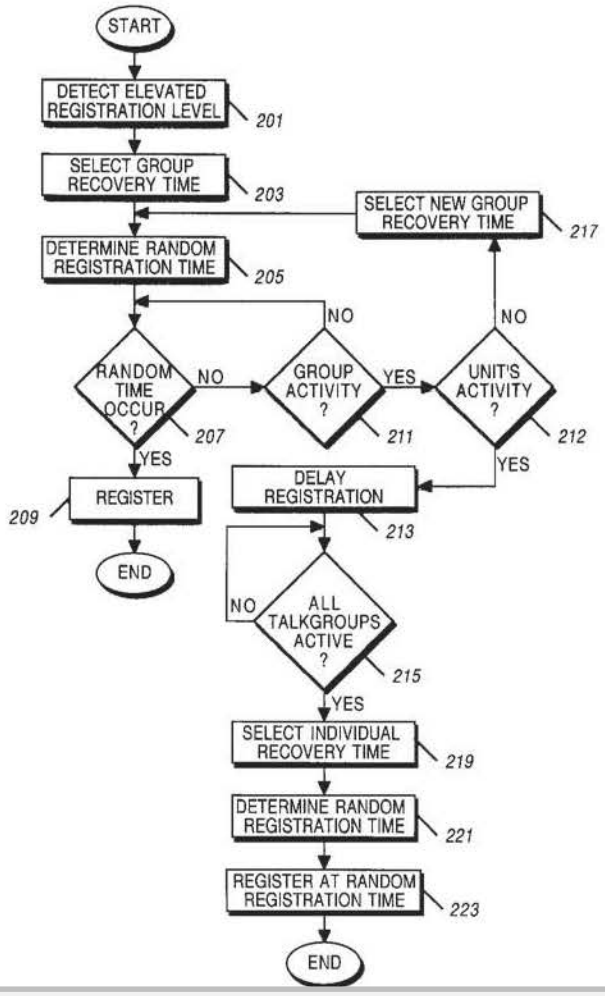


FIG. 1

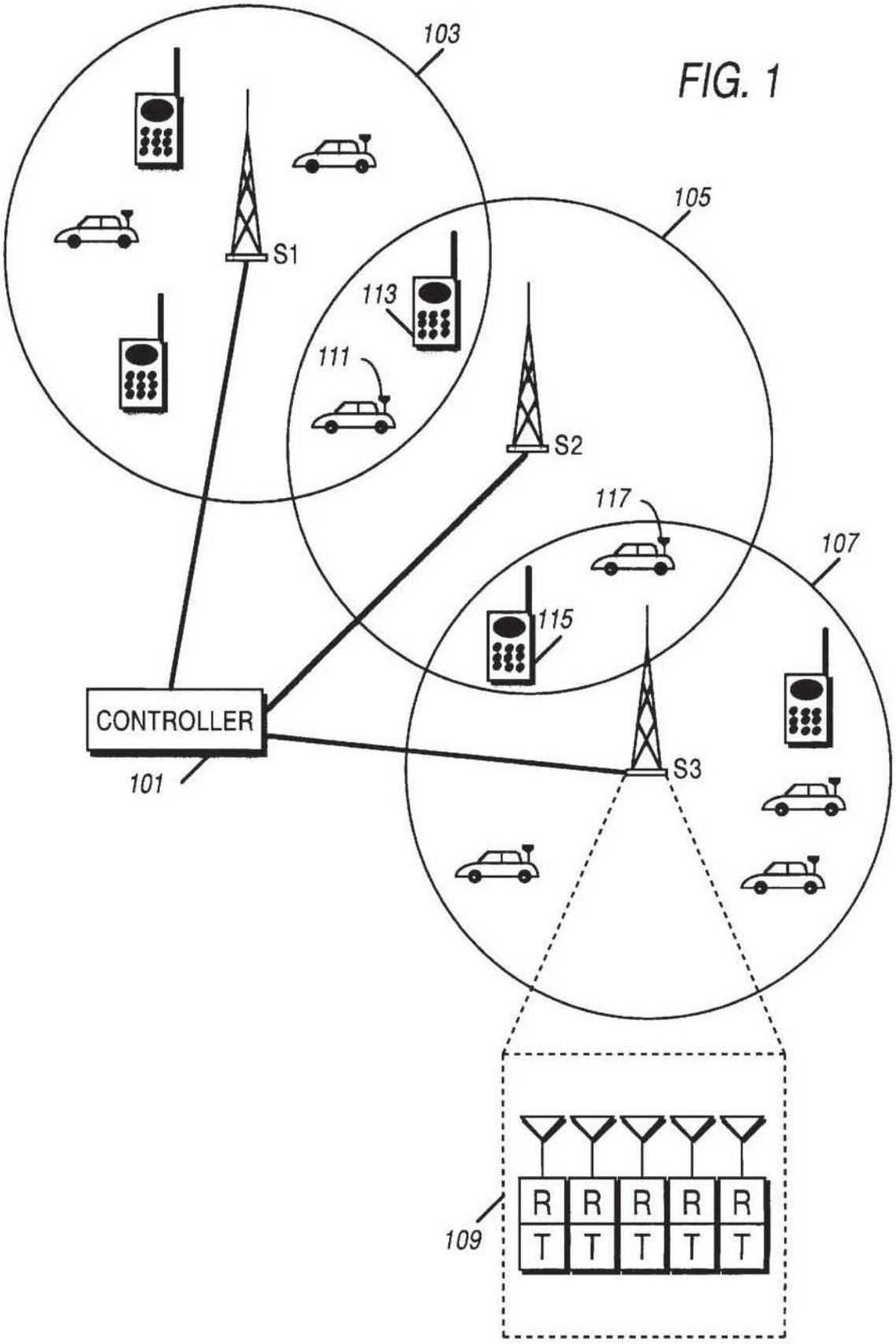
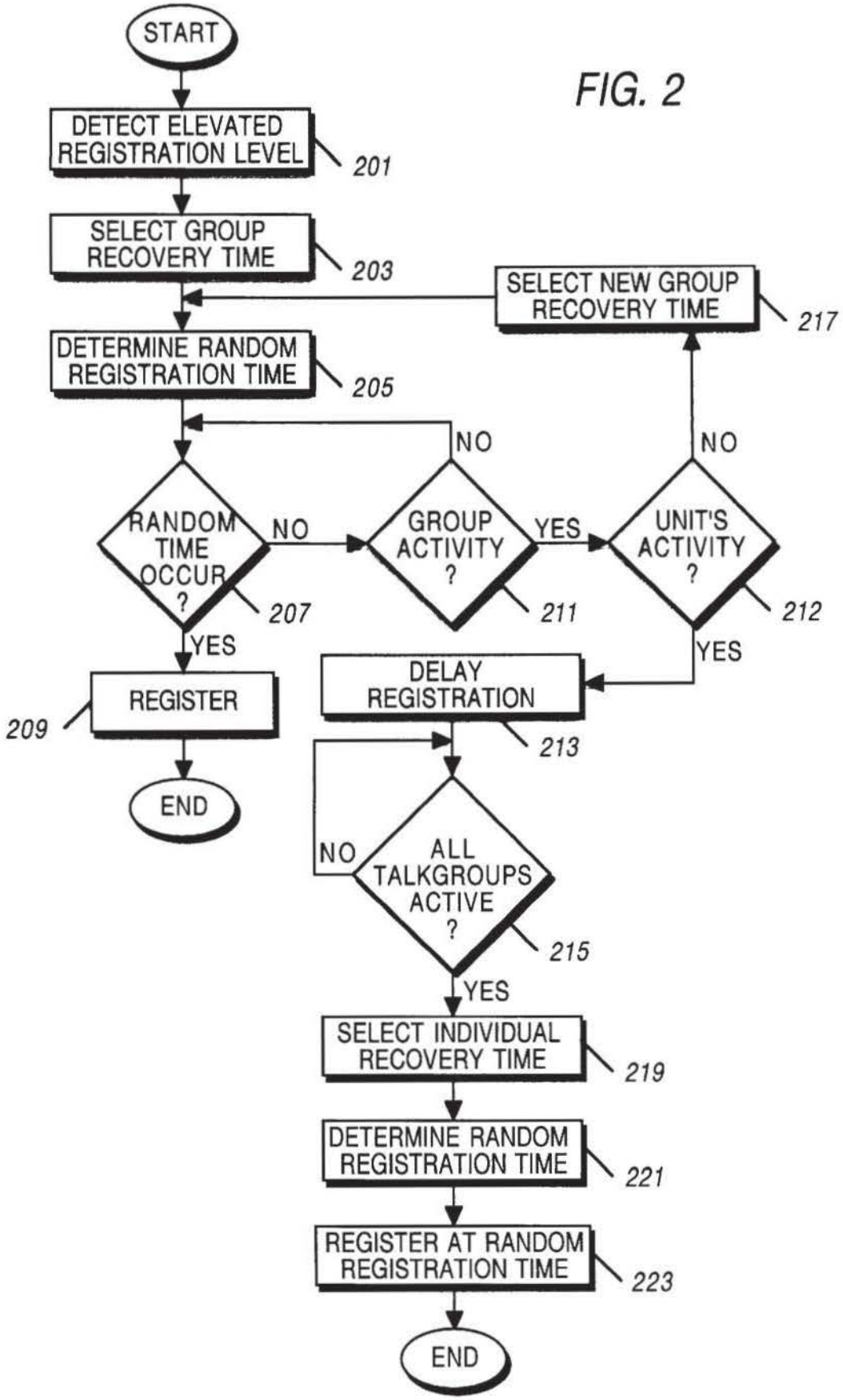


FIG. 2



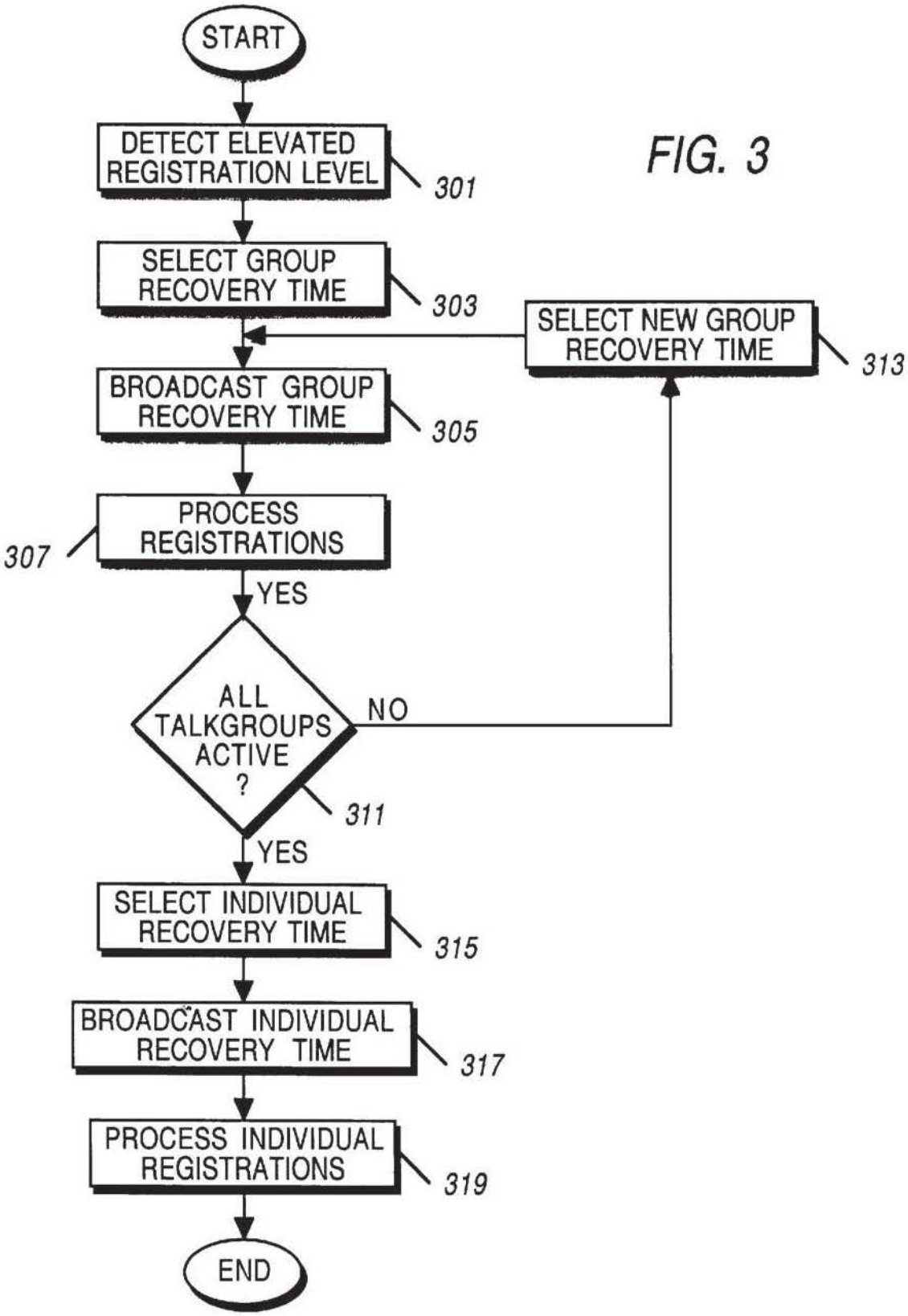


FIG. 3

METHOD OF REGISTRATION IN A COMMUNICATION SYSTEM

FIELD OF THE INVENTION

This invention relates to communication unit frequency (RF) communication systems, including but not limited to transmission of messages in RF communication systems.

BACKGROUND OF THE INVENTION

The basic operation and structure of a land mobile communication unit system is well known. Land mobile communication unit systems typically comprise one or more communication units (e.g., vehicle-mounted or portable communication units in a land mobile system and communication unit/telephones in a cellular system) and one or more repeaters that transceive information via the RF communication resources. These communication resources may be narrow band frequency modulated channels, time division multiplex slots, frequency pairs, and so forth. Land mobile communication unit systems may be organized as trunked communication systems, where a plurality of communication resources is allocated amongst a group of users by assigning the repeaters on a communication-by-communication basis within an RF coverage area.

Large communication systems comprising a large number of communication units are known to exist. At times, when a site failure occurs in such a system, the communication units that are presently registered at a failed site will want to affiliate or register with an adjacent site in order to avoid being isolated from their group communications. At times, however, it is possible that a very large number of communication units will try to re-register at an adjacent site in a very short time frame, causing the control channel on which registration takes place to become flooded with requests and the site may subsequently become incapable of processing any requests, including normal communication requests.

At other times, there may be a need for a large number of communication units to transmit messages on a single channel in a short period of time. In a broadcast data system, a single transmission may target numerous receiving communication units, sometimes thousands of units. Because each of the units must send either an ACK (acknowledgment) or a NACK (negative acknowledgment) for each data frame, the return channel becomes inundated with thousands of messages, consuming valuable time on the communication channel. If use of the return channel is not coordinated, many of these messages are likely to coincide at least partially, resulting in corrupted ACKs and NACKs, rendering the transmitter unable to distinguish which messages were received successfully and which ones were not. One method for returning ACKs and NACKs via a return channel in a coordinated manner is to designate a particular time interval for each unit to transmit an ACK/NACK. When there are numerous communication units, such a system is wasteful of the communication channel, and messages will take a very long time to be transmitted.

Accordingly, there is a need for a method of coordinating transmission of a large number of messages on a single channel in an orderly fashion, such that all messages are received without taking an extraordinary amount of time or flooding the channel to such degree that the communication site becomes unusable.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a block diagram of a communication system in accordance with the invention.

FIG. **2** is a flowchart showing a method of registering multiple communication units in accordance with the invention.

FIG. **3** is a flowchart showing a method of registering multiple communication units as performed by a controller in accordance with the invention.

DESCRIPTION OF A PREFERRED EMBODIMENT

The following describes an apparatus for and method of scheduling or coordinating transmission of a large number of messages on a single channel in an orderly fashion. In the case where a large number of communication units need to register in a system, messages are coordinated such that at least one communication unit of each talkgroup in the system is quickly registered, thereby enabling talkgroup activity to take place, and the remaining unregistered communication units are then expediently registered by transmitting their registration messages. All messages are received without taking an extraordinary amount of time or flooding the channel to such degree that the communication site becomes unusable.

A method of the present invention comprises the steps of detecting an elevated registration level of at least a part of a communication system, selecting a first time, determining a first random registration time that is less than or equal to the first time, registering a first communication unit from a first talkgroup at the first random registration time, and upon receiving a group activity message for the first talkgroup, delaying registration by at least a second communication unit from the first talkgroup. The method may additionally comprise the steps of selecting a second time, determining a second random registration time that is less than or equal to the second time, registering a first communication unit from a second talkgroup at the second random registration time, and upon receiving a registration acknowledgment for the second talkgroup, delaying registration by at least a second communication unit from the second talkgroup. The method may further comprise the steps of detecting a group activity message from each intended talkgroup of a plurality of talkgroups, selecting a third time, determining a third random registration time that is less than or equal to the third time, and registering at the third random registration time.

Another method of the present invention comprises the steps of detecting, by a controller, an elevated registration level of at least a part of a communication system, selecting a first time, broadcasting the first time to a plurality of communication units, receiving a registration from a first communication unit of a first talkgroup, and sending a registration acknowledgment to the first communication unit of the first talkgroup. The method may additionally comprise the steps of selecting a second time, broadcasting the second time to the plurality of communication units, receiving a registration from a first communication unit of a second talkgroup, and sending a registration acknowledgment to the first communication unit of the second talkgroup. The method may further comprise the steps of detecting a group activity message from each intended talkgroup of a plurality of talkgroups, selecting a third time, broadcasting the third time to the plurality of communication units, and receiving a registration from a non-registered communication unit of the plurality of communication units.

The step of selecting the first time may comprises the steps of determining at least one of: a number of communication units expected to register; a current inbound request load; and a tolerable registration failure rate; and selecting

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