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Additional inventors are being named on the _____ separately numbered sheets attached hereto		
TITLE OF THE INVENTION (500 characters max):		
METHOD AND APPARATUS FOR EFFICIENT AND RELIABLE GROUP ALERTING		
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ENCLOSED APPLICATION PARTS (check all that apply)		
<input type="checkbox"/> Application Data Sheet. See 37 CFR 1.76		
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(if appropriate)
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47726

Patent Application

for

METHOD AND APPARATUS FOR EFFICIENT AND RELIABLE GROUP
ALERTING

by

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and

Brian Claise

Detailed Description of the Preferred Embodiments

[0001] Overview

[0002] A method is described for reliable, wireless group alerting. In this system, an encrypted message is broadcast to a group address. This message is received by a number of mobile receivers, each of which then acknowledges back to the system, decrypts the message, displays it to the user, and allows the user to respond. The system comprises a database, switch, a wireless network, and a plurality of intelligent mobile receivers. It employs centralized management to simplify the role of the mobile users and administrators, minimizing configuration and operational human errors that would otherwise result in confusion or lost messages. It also employs novel mechanisms to compress the responses from the receivers to use minimal airtime. The system is particularly relevant to public safety and critical infrastructure operators, where large group dispatches must be delivered quickly and deterministically to a heavily distracted mobile workforce, and their responses must be delivered to the dispatch center efficiently. As such, this system provides a comprehensive, meaningful solution to support distracted users with simple, resilient group messaging.

[0003] System Description

[0004] With reference to Fig. 1, a central switching system ('Switch') connects to a Wireless Network and communicates with a number of subscriber devices ('Receivers') such as pagers, cell phones, or wireless personal data assistants. Each Receiver contains one identifying Primary Address and multiple Group Addresses, and is capable of receiving broadcast alert messages directed to any of its addresses. The Switch contains a Receiver Database describing receivers, their group membership, and connects to a Wireless Network, such as a PCS network employing cell broadcast, a paging network, or a broadcast-capable data network employing group addressing.

[0005] With reference to Fig. 2, the Receiver Database comprises an independent table of Receivers and an independent table of Groups. Each Receiver row contains an identifying personal address, as well as other information specific to a single device and its Wireless Network architecture. Each Group row contains an identifying group address, an encryption key, and a symbolic name. A dependent table, Membership, provides the many-to-many relationship between Receiver and Group rows. Each Membership row assigns one receiver to one group. Membership rows contain GroupAddress and PersonalAddress columns, identifying a Group and Receiver row, respectively. Each Membership row also contains a ReceiverGroupNumber column, a small mnemonic value that uniquely identifies the Group from other Groups programmed into the same Receiver, and CC ('carbon copy') flag to define specific behavioral aspects of the Receiver. Receivers do not respond to messages received by group addresses if their CC flag is set, while they can respond to messages received by group addresses with if their CC flag is clear. This mechanism allows users to monitor alerts to specific groups, without expectation by the source of the alerts for a response.

[0006] As administrative changes occur to the Receiver Database, configuration transactions are executed over the air with individual Receivers to synchronize their configuration memory with the Receiver Database. The system therefore maintains an up-to-date image in each the configuration memory of each Receiver, including a list

of Group addresses, their ReceiverGroupNumber values, their symbolic names, encryption keys, and CC flags.

[0007] A 'Client' (e.g., a computer-aided dispatch center, a human user, or other network client) uses this system to broadcast alert messages to groups of Receivers. To do so, the client composes a message, including display content and a list of response strings. The Client then connects to the Switch and requests transmission of the message to a particular group name. Depending on architecture of the Wireless Network, either the Client or the Wireless Network assigns an identifying field to the message such that user responses can be associated with the correct message.

[0008] Upon receipt of the message, the Switch responds to the Client with detailed information on the group such as a list or a count of group members. It then encrypts the Group Message, assigns a cyclical message sequence number, and transmits the message to the Group Address.

[0009] Upon receiving the Group Message, the Receivers decrypt the message and display the content, group name, and multiple choice options to the user. Each Receiver with a CC flag of false transmits one or more acknowledgement codes through the Network back to the Switch, specifying message received, message read notifications, and enumerated multiple-choice responses. The datagram carrying the acknowledgement code also includes the personal address of the receiver, the ReceiverGroupNumber of the group address, and the message sequence number of the message, which together efficiently and uniquely identify the specific group message at the specific Receiver.

[0010] Each receiver provides a configuration display for the user. This display allows the user to specify, by group name, how notification should occur for messages received by each group address. Similarly, the Switch provides an administrative human interface that allows a system administrator to set up and maintain the Receivers belonging to each Group.

[0011] An Exemplary Computer Aided Dispatch (CAD) System

[0012] The foregoing system description discusses the high-level organization and data flow of a group messaging system that can use any of a variety of network types.

With reference to Figs. 3, 4 and 5, the following is a description of an exemplary type of network, that is, a ReFLEX “two-way” paging network that incorporates the new group messaging layer of the present invention. Fig. 3 is a Sparkgap campus server or network controller which is configured to implement group messaging in accordance with the present invention. Fig. 4 illustrates the use of a Sparkgap network controller in a system configuration similar to Fig. 1. Fig. 5 illustrates another exemplary system configuration.

[0013] The Sparkgap network controller in Fig. 3 provides private two-way paging, mobile data, and wireless email over inexpensive channel pairs in the 800/900 ESMR band. Coverage can be configured for a single building, multiple counties, or state-wide service, supporting small user devices such as pagers and personal data assistants (PDAs) with Motorola’s proprietary ReFLEX protocol. Since the Sparkgap server provides encrypted acknowledgement paging, responders reply immediately to CAD events and other messages directly from their pagers, and AES encryption protects all transmissions. Since the Sparkgap server supports mobile applications, law enforcement officers can use PDAs to connect wirelessly with municipal, state, and federal databases to run license checks, warrants, and other mobile applications. Further, the Sparkgap server is useful for automatic vehicle location. Small, inexpensive GPS sending units can monitor vehicles and heavy equipment, sending real-time location and status information on a 24/7 basis. The Sparkgap server can also support wireless e-mail. Users can send and receive secure, wireless email using pagers and PDAs.

[0014] The Sparkgap server can support one base station or hundreds of base stations, each consisting of a standard 900MHz paging transmitter and ReFLEX base receiver. A single station covers a 7-20 mile radius, and a network can coordinate multiple stations using simulcast or cellular arrangements to optimize coverage and capacity. A single channel pair can serve thousands of users, and multiple channels can be aggregated for additional capacity. Even under worst-case peak conditions, ReFLEX uses centralized arbitration to prevent contention and channel overloading.

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