

PUBLIC SERVICE MESSAGE BROADCASTING
SYSTEM AND METHOD

FIELD OF THE INVENTION

[0001] The present invention relates to emergency message broadcast systems and in particular location-specific public service message broadcasting.

BACKGROUND OF THE INVENTION

[0002] With the events of 9/11, there has been increased concern with the ability of present systems for providing public service broadcasting of messages and warnings to the public. Existing public service warning systems are antiquated and provide only limited access to the public who may be in need of knowing of potential emergencies or danger. Additionally, existing systems do not provide for location-based notification or broadcasting.

[0003] As such, there is a need for an improved method and system for providing timely information to the public related to potential hazards affecting them. One suggested solution is the utilization of the subscription-based Short Message Service (SMS) messaging capability for mass messaging using mobile telephones and compatible devices. However, SMS systems and technology have significant technical limitations and experience with such systems has been disappointing due to significant delays in the delivery of SMS messages and negative impacts to the networks due to congestion.

[0004] Short Message Service (SMS) is only offered or available on a limited basis. This is due to the limited technical and network support for the service and is also due to the service being offered by Mobile Service Providers and wireless network providers on a subscription basis. As such, use of the SMS service capability for emergency broadcasting is very limited.

[0005] Additionally, the use of SMS technology for broadcasting requires enormous network infrastructure utilization. A telecommunication system can suffer from congestion, not only in its voice traffic channels, but also in its narrow-band data channels as are used for the SMS service. To send an SMS message, network components are utilized to provide an SMS message call set up for each individual SMS

message recipient. In order to send a single SMS message, all SMS message call processing procedures have to be repeated for each and every message, one by one, for all intended recipients. A single SMS message requires signaling and processor capacity and utilization similar to that required to establish a voice call. As such, the impact on network resources for broadcasting SMS messages is the same as having thousands of phone users attempt to initiate a voice call at the same time. Telecommunication networks are not designed or deployed to handle such high levels of simultaneous call attempts.

[0006] When an SMS message is transmitted, the SMS message is signaled to an SMS center of the telecommunication service provider. The SMS center acknowledges each and every requested SMS message individually and attempts to deliver the SMS message through an interrogation of the Home Location Register (HLR) of the telecommunication service. An HLR is a data base which registers or keeps track of the presence of a mobile unit user within the HLR's defined serving network. The HLR queries the database and determines whether the intended SMS message recipient is currently attached to the network and if so, to which network switch the user is attached. The HLR is queried using the telecommunication signaling network.

[0007] If an intended user is located or attached to a switch in the telecommunication service provider's network, the particular network switch is signaled over the telecommunications signaling network to set up the SMS message call. That serving network switch of the mobile carrier initiates a query or message attempt to every cell in the location area where the intended user's mobile unit was last known to be operating. If the intended recipient is located in the particular cell area, the mobile unit is paged. As such, potentially thousand of cells are queried in order to determine the presence of an intended mobile unit. Each queried cell requires paging and calling capacity resources for each mobile unit which is attempted to be paged. In some cases, if the mobile unit does not reply, the whole Mobile Service Carrier (MSC) area is paged which in many instances requires the paging of several thousands of cells.

[0008] When the mobile unit replies by sending an access burst to the cell transceiver currently serving the mobile unit, the cell site allocates a stand-alone dedicated control channel (SDCCH) to perform SMS call set up with the mobile unit.

Next, a cipher key is sent by the Home Location Register (HLR)/Authentication Center (AUC) to the mobile unit, assuming that the mobile unit had previously activated the ciphering of the channel. Once the cipher key is successfully received and acknowledged, the SMS message is sent over the control channel to the mobile unit. The SMS message transmission utilizes about 5 seconds of control channel time per SMS message.

[0009] If, however, the intended recipient is not located in the home serving area of the HLR, then signaling message is sent to the serving mobile network's Visitor Location Register (VLR). The VLR registers and tracks mobile unit users who are outside of their home location. In that case, the VLR is queried via the signaling network to verify that the user is currently attached to the remote switch.

[0010] Each SMS message is a narrow-cast message in that each message is generated and transmitted via the SMS Center to a particular telecommunication user or unit. The SMS message is delivered, as discussed above, to the intended recipient by capable networks wherever the intended recipient is located, independent of geographic area or location.

[0011] As such, SMS messaging for emergency-based messaging requires that SMS messages be created and sent to each mobile unit even though the particular user phone is not located in the particular geographic area in which the emergency is located. SMS service is not capable of position-specific messaging.

[0012] Additionally, SMS messaging requires considerable call processing load on the telecommunication system and infrastructure considering that the above process is multiplied by the demand of thousands or tens of thousands of SMS call set up requests at the same time. The potential initiation of broadcast SMS volumes will not only affect network resources for SMS messaging, but also negatively affect ability of the telecommunication networks to set up and support voice traffic during any period of message broadcasting as these resources are shared by both services.

[0013] As a further example of the limitation of existing solutions to message broadcasting, the well deployed Global Standard for Mobile Communications (GSM) system typically deploys in a single GSM cell several transceivers. A typical GSM cell

configuration includes between 6 and 12 transceivers. Each such transceiver includes 8-timeslots. Each timeslot supports a single phone call.

[0014] In such an arrangement, one of the transceivers is selected to be the SMS carrier. The SMS carrier transceiver is arranged differently, having one timeslot dedicated to broadcast SMS messages and paging and another one which is utilized to from 8 control channels which are referred to as Stand-Alone Dedicated Control Channels (SDCCH). The SDCCH carry out control and call set-up functions and carry the SMS traffic which is not normally handled by the traffic channels on the other timeslots.

[0015] However, in this prior art system, SMS and Wireless Access Protocol (WAP) messaging utilize capacity on these channels making them unavailable for other purposes such as voice call set up. Additionally, each of the SDCCH channels can only handle a limited number of SMS and/or paging calls. As such, during heavy messaging, the related high volumes of messaging traffic may have a negative affect on other services including the set up of voice calls.

[0016] To compensate for these and other SMS messaging limitations, dynamic channel allocation was developed. Dynamic channel allocation utilizes an additional traffic channel which is converted into another 8 control channels for the duration of the peak SMS or paging loads. However, this results in the loss of the traffic channel for voice communications.

[0017] Further strategies have included the immediate assignment to a traffic channel. In this system, when a voice call is attempted, the voice call is sent to a traffic channel directly where signaling will be performed on the traffic channel. This, however, occupies the traffic channel for a longer time than would otherwise be the case. There is a limit on the number of traffic channels that can utilize this feature. In most cases, only one traffic channel is converted thereby only limited the solution to 8 new SDCCH channels. The impact of call failure due to control channel depends on the traffic capacity of the cell. In high density cells, when a large quantity of SMS messaging traffic is offered, congestion occurs due to the each cell having over one hundred traffic channels within the cell.

[0018] In operation, the telecommunication service provider addresses this limitation by throttling the SMS messaging rate so that it is manageable and does not create congestion problems. However, such message load management negatively impacts the opportunity for using SMS messaging for broadcasting emergency messages to users of those networks. Throttling often significantly delays the delivery of the SMS message, even though it's timing delivery in an emergency is critical. Furthermore, if a message fails to be delivered, the SMS center repeatedly attempts to deliver the message, thereby causing further congestion and message backlog.

[0019] Additionally, as discussed SMS messaging is not location based and does not send messages to intended recipients located within a defined geographic location. Since many telecommunication users will be messages independent of their location, many of the generated SMS messages are sent to users who are not in the intended area.

[0020] In the alternative, some next-generation phone systems include a basic cell-based broadcasting capability, e.g., GSM, CDMA and UMTS. In such systems, the cell broadcasting capability allocates a portion of each timeslot bandwidth capacity in each cell as a reserved broadcast timeslot. While the cell broadcast capability is included in many new equipment being deployed, cell broadcasting systems and services have not been developed which effectively utilize the technology.

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