

## **2005 ESRI International User Conference**

### **GIS and Mass Notification: Changing the Face of Emergency Communications**

*Paper UC1752*

Author: Kim Terry  
Chief Information Officer  
National Notification Network

*May 23, 2005*

## Abstract

In the event of a crisis, mass notification--the ability to communicate to thousands within seconds--can alert emergency responders, security professionals, and even evacuate entire geographic regions in just minutes by using ESRI GIS and mapping software. A Mass Notification system with a GIS feature is an invaluable asset for major emergencies that seriously threaten life or property. For example, during natural disaster--such as fire or flood--officials need to ensure that specific areas are evacuated in a safe manner, and that other locations are given clear updates or instruction. Geographic targeting combined with notification can also aid in searches for missing persons and speed warnings to communities about industrial accidents, child abductions, or terrorist threats. In this session, you will learn the steps for choosing and integrating a Mass Notification system with GIS and mapping software into your own emergency management plan.

## Contents

1	Overview.....	3
2	How Do You Choose a Geographical Notification System?.....	3
3	How Are Populations Selected for Notification? .....	4
4	How Are these Systems Built?.....	6
5	When Would You Use the System?.....	6
6	Conclusion .....	7
11	Author Information.....	7

## 1 Overview

Mass Notification gives organizations the ability to broadcast voice, text, or data to any number of people instantly. A Mass Notification system integrated with ESRI GIS features is an invaluable asset for companies that need to be prepared for major emergencies that seriously threaten life or property. In the event of a crisis, the ability to communicate to thousands within a geographical region in seconds is essential. Products that combine mass notification features with ESRI GIS and mapping software can alert emergency responders, security professionals, and even residents and business owners within a specified geographical region.

## 2 How Do You Choose a Geographical Notification System?

The Notification System that you choose should include the following features:

1. Robust notification services with Industry-Standard ESRI GIS and mapping capabilities already integrated
2. Easy set up, easy maintenance
3. Advanced Mapping Features:
  - § Intuitive, easy-to-use features to select geographical regions for notification. These features should include the option to select a region by drawing a free-form polygon.
  - § Standard and familiar interactive map and tools for viewing, zooming, panning, and directional shift. Standard zoom levels should include the street, city, state, and country levels.
  - § The ability to add layers of meaningful and viewable map information.
4. Advanced Notification Features:
  - § The ability for notification recipients to confirm receipt of the message
  - § The capability to send a message immediately or to schedule it later.
  - § The ability to send the message in multiple languages
5. Complete Reporting Capabilities:
  - § Detailed audit reports of the broadcast results that include summary statistical information as well as detailed information regarding who was contacted, on what telephone number, and the date and time that they confirmed receipt of the message.

- § Broadcast history tracking that includes summary statistical information regarding the broadcast including the percent confirmed, unconfirmed, confirmed late, or unreachable (due to a disconnected number etc.). Reports should also include details such as the recipient name, phone number and date and time of confirmation.
- 6. All critical aspects of a mass notification system – particularly an emergency notification system -- including:
  - § 24x7 availability – A fully monitored, self-correcting, self-healing system with full redundancy within every data center, across multiple data centers and through multiple access points even during system maintenance and upgrades
  - § Reliability – Consistent message delivery regardless of geographic area or time of day
  - § High Capacity and Throughput – The ability to contact thousands of recipients every minute.
  - § Security – Built-in layers of security and defense covering all aspects of the infrastructure including people, processes, and technology.
  - § Scalability – System-wide monitoring to ensure that capacity meets pre-determined threshold and that performance meets pre-determined standards. Assurance that during a crisis in a wide-spread geographical area, performance will be acceptable.
  - § Service – 24 x7 customer service for critical or emergency support issues
  - § Cost Effectiveness – A Notification System with GIS capabilities can be expensive to build and maintain. The optimal solution should provide services *on-demand*, where customers can take advantage of fully managed and maintained software, hardware, and high-volume telephone and messaging infrastructure, without incurring all of the costs normally associated with such a robust environment. Enhanced features and additional capacity are routinely added to the system without passing costs unnecessarily onto customers.

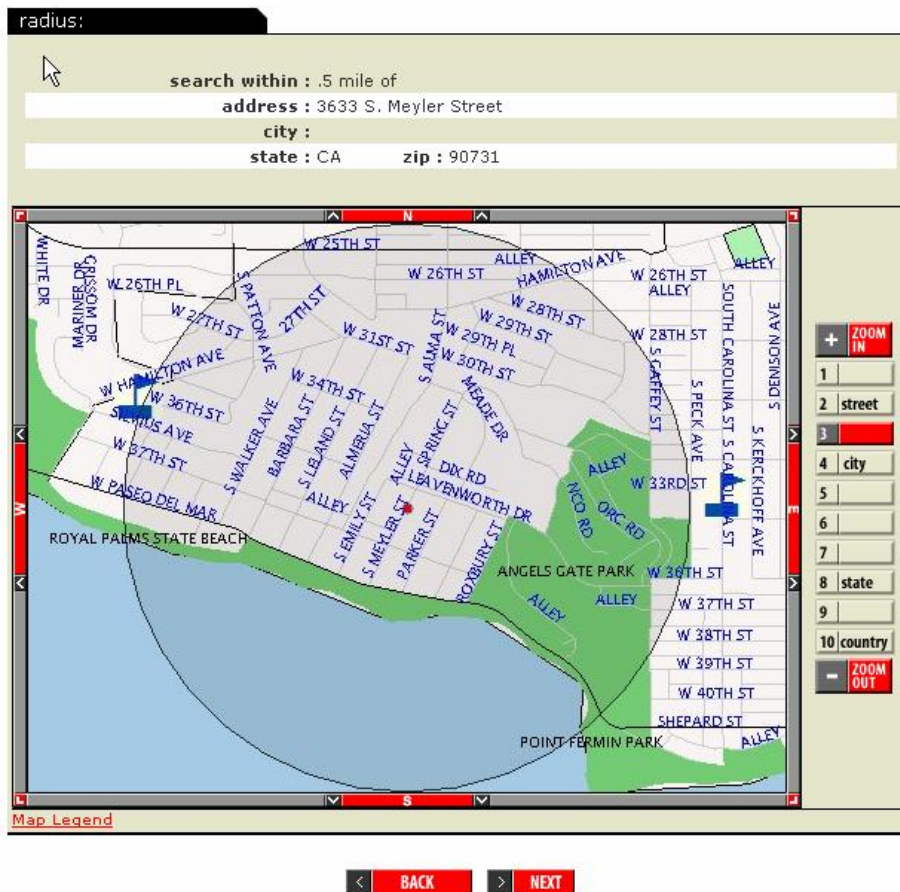
### 3 How Are Populations Selected for Notification?

By combining GIS/mapping software and notification services with geocoded Reverse Telephone Directory data, communication can be targeted according to geography by zip code, physical streets or the vicinity surrounding an incident. Fire departments, for example, can rapidly coordinate with local fire stations alerting volunteer and off-duty personnel within minutes for quick response to emergencies from fires to a broken fire hydrant. Affected residents can also be notified by region to accelerate evacuation procedures.

There are multiple ways to identify a geographic region and different products invoke different methods for doing so. Then, residences and businesses within a specified area determined in one of the following ways will be contacted using geo-coded Reverse Telephone Directory data.

- **Radius:** A geographical area can be selected by entering a street address with a radius, in feet or miles, around the address.
- **Street Segment:** A geographical area can be selected by entering a street name and two cross streets and a radius in either feet or miles. Residences and businesses within the specified area around the street segment will be contacted using geo-coded Reverse Telephone Directory data.
- **Zip Code:** A geographical area can be selected by entering a zip code.
- **Free Form Polygon(s):** A geographical area(s) can be selected by using intuitive map tools to draw a free-form polygon(s).

Sample population selection using the radius option from 3n InstaCom GIS:



Screen example provided from 3n InstaCom GIS™ by National Notification Network

## 4 How Are these Systems Built?

In the event of a crisis, it is vital that your GIS and mapping solution be tightly integrated with your mass notification system. Those that are, integrate key pieces of technology including a notification engine and database with both Reverse Telephone Directory data that can be uploaded from local telephone companies or other sources, and intelligent street centerline data from Tele Atlas®. It then leverages ArcGIS®, ArcIMS® and SDE® from ESRI (Environmental Systems Research Institute), the industry standard Geographic Information Systems (GIS) software, to geographically select an area or region and dial all of the telephone numbers within the specified area.

When the system is used to geographically select an area on a map, the street centerline database and the reverse telephone directory database are linked using the address of the telephone directory entry and the address range of the intelligent centerline. The system can, in essence, identify geographically where every phone is located. In a matter of seconds, the system has built a file of all records matching the geographical query. The phone numbers from the query are then passed to the notification system for dialing. The notification engine can then dial 10,000 phone numbers in less than ten minutes and report the detailed results of the call attempts and confirmations.

The infrastructure required to maintain sufficient call-capacity in the event of a geographically far-reaching catastrophe can be costly. The best GIS notification systems are delivered to customers as a service. The cost to maintain high-volume infrastructure is provided to customers *on-demand* through a “software-as-a-service” model for a low monthly fee. Maintenance, support, disaster recovery, redundancy, phone-line capacity, and seamless upgrades are provided by the software-as-a-service provider.

The optimal GIS notification systems are web-native applications that were built to take advantage of the power of the internet. The best web-native applications employ web-services API's (Application Programming Interfaces) to support easy integration with other applications even when the applications are architected differently.

## 5 When Would You Use the System?

This powerful system has a variety of uses in emergency situations. It can be used to notify first responders such as fire-fighters, police, medical response teams, and hazardous waste teams so that they can be deployed to the affected location or to command centers. It can also be used to contact residences and businesses within or near affected areas providing them with evacuation or safety instructions.

As an example, in the event of a missing child, police and search teams can begin a house-to-house search beginning with a call to all neighbors on the same block. Critical time can be saved and information can be obtained quickly by polling the neighbors for

information or by requesting that they call a predetermined number if they have information or can provide a lead.

The system can be used to contact people in affected areas during:

- Terrorist attacks
- Hostage situations
- Prison escapes
- Local crimes
- Utility disruptions
- Missing children
- Fires
- Hazardous waste incidents
- Industrial accidents
- Natural disasters

## 6 Conclusion

In the event of a crisis, a mass notification system with GIS capabilities can fill a critical need not easily met by other forms of communication such as broadcast news. The systems are designed to immediately contact only those within a targeted geographic area whether it be a single address or thousands of individuals within a pre-determined area.

## 7 Author Information

Kim Terry  
Chief Information Officer

National Notification Network  
505 North Brand Blvd.  
Suite 700  
Glendale, CA 91203

Phone: 888.366.4911

[Kim.Terry@3nonline.com](mailto:Kim.Terry@3nonline.com)

[www.3nonline.com](http://www.3nonline.com)