CASE STUDY

Review of the 2018-2019 Pilot Program
Emerging Technology in Outdoor Mass Notification

Conducted by:

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March 2021

Mass Notification in the 21st Century: Protecting the Public through enhanced communications equipment and software.

A review of research and development efforts to better prepare for, respond to, and recover from emergencies/disasters- How strategic partnerships between equipment and software provides a collaborative strategy for mass notification in order to further protect the general population during both emergency and non-emergency events.

Emerging Concerns about Mass Notification Systems

It is critically important to note that the following areas of concern, both individually and as a community, revolve around the effectiveness of mass notification systems during emergency events. This is a complex issue for not only our nation, but also for the local community emergency managers and emergency responders. There is a general consensus that most of the systems currently in use are state of the art and work as designed, however, when a community needs to alert all local residents, visitors, workers, as well as those just passing through, there are several software packages available for the community to purchase. One example is the National Integrated Public Alert and Warning System (IPAWS), which is operated by the Federal Emergency Management Agency and used for the President to alert/notify everyone in the United States within a 10 minute period. This is a state-of-the-art system, but it is not without its flaws.

The community of Oak Ridge, Tennessee, which has three Department of Energy (DOE) nuclear sites within the city limits, sought to improve their mass notification capabilities. In this endeavor their Emergency Management Director struggled to locate and purchase a system that was guaranteed to be totally effective. Therefore, he sought several options to assist in mass notifications. These options will be discussed in detail.

Software Packages – There are multiple commercial software packages available for subscription in the United States that will automatically call local residents to provide an emergency message when needed. These vendors usually contract their service based on the population of the community served and the amount of calling minutes the community estimates it might use. Some of the vendors provide, at no additional charge, automated notification services based on the National Weather Service (NWS) issuance of a particular storm warning, such as tornado, flooding, ice, etc. In this case the residents within the warning area will automatically be called without intervention by any local official. Community members can also register their cell phones with the software provider and then receive notifications on their cell

phone, that is Geo-Coded to their home or business address. Many communities refer to this as a reverse 911 system, which it is not; however, it emulates a reverse 911 system.

Pros of a software system for Mass Notification:

- The system can store canned, pre-recorded messages developed by the end user for transmission when needed. This saves the message development time during a critical emergency.
- The system can dial 30,000 phones within 5-minutes in most cases, so they can reach many people quickly.
- Most commercially sold products will allow the end user to select a defined portion of the community to send a message to by using the Geo-fencing map product. Particular single homes, neighborhoods, or regions can be defined in the software package for a much more designated notification.
- The system can be used for non-emergency notifications such as power outages, water main breaks, closed roads, etc.

Cons of a software system for Mass Notification:

- It has been determined that a considerable portion of the notifications sent via this kind of software may only be reaching 30-percent or less of the community. Most software systems record the data of the message sent and the end user can read a report that lists who received the message, who hung up before hearing the message, who never answered the call, and when an answering machine takes the call. It is with this data that the end user can determine who actually heard the message. With a low percentage of messages heard, the Oak Ridge Emergency Manager began researching the situation and was surprised with the results; although all homes and cell phones were dialed, many folks failed to stay on the line and hear the recorded message. Instead, they saw the number on caller ID and did not answer. Additionally, some of them answered and heard the pause, which is inherent in a computer based dialing system, so they hung up thinking it was a sales call. The growing number of unsolicited telemarketing sales calls and spoofing with fake phone numbers which appear to be local has had a negating effect on the ability of Mass Notification Software to reach the general population during an emergency. Even after extensive public education campaigns in Oak Ridge, many residents still did not answer the emergency notification when sent one.
- Another drawback of computer software systems is that they are designed to only call the phone numbers loaded into the system database. In Oak Ridge, the emergency manager found that he must contact the 911 database system vendor each year and get the updated 911 data to load in the calling system for annual updates. He also found that he had to contact the local cable company annually and buy their data containing the addresses of those using the cable provider (both for homes and businesses). Both of these events are time consuming and in the

case of the cable provider, expensive- $500.00 per year for the updated phone data.

- Because the system will only call numbers loaded in the system, individuals who do not have a home phone must go online and load their information into the system database in order to receive emergency notifications. Even with an extensive cell phone registration campaign in Oak Ridge, Tennessee, less than 800 cell phones were signed up for the system.
- If you visit the community or work in the community you will not receive an emergency notification of a disaster in progress unless your cell phone is registered to a work address. This means visitors to a community will never receive notification with a commercial vendor.

Integrated Public Alert and Warning System (IPAWS) – IPAWS is operated by the Department of Homeland Security via the Federal Emergency Management Agency (FEMA). It was designed to allow the President of the United States the ability to notify every American of an emergency within 10 minutes. This requires the integration of all media sources; A series of computer systems and equipment sends the messages to local TV news media for Public Service Announcements as well as all cell towers in the United States, interstate message boards, and radio stations.

Pros to IPAWS:

- It can reach almost everyone in a community in a matter of minutes through their cell phones, TV news media, radio stations, and message boards. Consequently, an emergency manager doesn't have to worry about all of the visitors in the community or employees of local businesses who travel into the community every day for work.
- The geographic area required to send a notification can be selected by Geo-coding a parameter on the GIS maps.
- The system is well maintained and kept continuously updated so that the end user only has to develop and send a message. There is no system maintenance or cost for use involved.

Cons of IPAWS:

- The end user must apply with FEMA to become an end user of the system. This requires on-line training, practice using the system, and the approval of the State Emergency Management Agency. It can take up to 8-months to receive licenses as an end user.
- Not all messages that need to be sent to a community are qualified to be sent by IPAWS. The federal government managers of IPAWS set the parameters for which messages are allowed on the system.

- The type-in message boxes and dropdown menus on the system are limited to particular situations, and although they are in the process of updating the message system, many messages will not be covered by what is currently allowed within the message box. The end user must therefore limit the amount of information which can be sent to the community.
- The end user must participate in monthly testing of the system in order to maintain user status. Accidental misuse or a simple, unintentional mistake can terrify a community; IPAWS was notably at the center of a false alarm in Hawaii when an employee sent a notification warning residents of an incoming missile attack. That message was intended for the test system, but accidentally got sent to the live system which then notified everyone in the state. This incident highlights the necessity of being careful with this incredibly powerful system of communication.
- As with the commercial software dialing systems, many individuals will ignore a message or call from someone they do not know. Therefore, it is not guaranteed that everyone will actually be notified.

Computer-Aided MNS Summary:

Both the commercial and IPAWS systems are state-of-the-art systems that operate extremely well 24 hours a day, 365 days a year. However, there are circumstances outside of their control which can affect the delivery of an emergency message. In several cases such as the wildland fires in Gatlinburg, Tennessee and throughout California, Arizona, and Colorado, it was not the notification system which failed, but rather the local infrastructure delivering the message. In Gatlinburg, the Sevier County Office of Emergency Management was not an IPAWS user. Gatlinburg has a permanent population of approximately 6500, but maintains a tourist population of more than 50,000 on most days. The IPAWS system would be one of the best systems for public notification in their particular situation. However, by the time a message was crafted and sent to Tennessee Emergency Management Agency in Nashville, Tennessee (where it had to be reformatted for the IPAWS system), all of the fiber optic cable, cell, and telephone lines had been destroyed and the radio systems/antennas were gone. Between the high winds and the raging fire, the community was paralyzed in a matter of minutes and destroyed in a matter of seven hours.

In Butte County, California and specifically the City of Paradise, lawsuits are being filed placing blame on everyone responsible for sending emergency alerts. The CodeRed system was used, but only 64-percent of the 15,000 phone calls were answered (Moffitt, 2019). There were 229,000 residents living in Paradise at the time, however, only 132,000 emails, text, and phone calls were sent. Typically, you will find that the commercially sold computerized mass notification systems like CodeRed will function as designed and advertised; It's normally the end user and the community which cause the system to be ineffective. The frequency of solicitous telemarketing

calls have also contributed to citizens not answering a phone number they do not recognize. In the case study of Paradise, it appears several events contributed to the communications failure.

For example, according to the news article written by Bob Moffitt in 2019, there was a severe lack of communications and coordination between agencies involved. Also, it appears that the employee who was designated to send alerts for the City of Paradise, a person in IT, may have been inexperienced in the process of developing and sending messages of this nature. When the messages were sent, some areas of Paradise (such as the west side of town- referred to as "Emergency Fire Zones 4, 9, and 10") were never sent notifications (Moffitt, 2019). In order for a computerized Mass Notification System to function as designed a number of steps must be taken. First, the system must be setup and maintained properly. This means updating the phone database as needed. If there is little to no growth in a community, then annually may be sufficient. However, if a community is adding several hundred new addresses each year through land development, then the data may need to be updated semi-annually. This kind of decision would be made by the local authorities. In Butte County there were approximately 57-percent more residents living in the county than phone numbers registered. The data seems to indicate that the system database had not been updated recently. Emergency notifications take training and practice in order to be efficiently executed. Most emergency managers would expect phone calls to begin being transmitted to residents within 10 to 15 minutes of notification of a problem in the community.

The Integrated Public Alert and Warning System (IPAWS) operates much like a commercial mass notification system, however, users must accomplish monthly testing to remain licensed to use it. FEMA utilizes a computer system that will check a message for the correct formatting before it is sent out. As a result, communities using IPAWS are more likely to be more familiar with computerized mass notification systems in general.

Current Mass Notification System Options

The emergency manager for the City of Oak Ridge researched equipment available to augment the computerized software, and during this process he discovered that the choices of equipment were limited. If one is looking for portable equipment, a quick internet search will leave you with two kinds of systems: those that are small and compact but must be set-up and assembled at a particular location, or systems designed for notifications within a fixed-facility (schools, businesses, churches, or other assembly areas). These systems can also have wireless capabilities; however, due to power requirements, they are typically installed permanently in the facility. These systems are effective if used for their designed purpose, but the emergency manager was looking for a mobile mass notification system to use at outside venues around the city.

The City of Oak Ridge initially purchased a system by Ritron called the LoudMouth**.** The LoudMouth wireless PA system is an ideal solution in situations where a hard-

wired PA proves either too expensive or impossible to install. The system allows managers to get a message to everyone... from plant-wide to small pinpoint areas using a business band radio system (Ritron.com). The City purchased six of these units at 1,500-dollars each but had to build aluminum stands at 250-dollars each in order to use the devices at events in the parks and other locations. These units also require a 110-volt power source, so the City purchased six 2,000-Watt portable generators to power them. Although these units were used several times at various venues in the city, the City emergency manager stated, "They are not ideal for outdoor venues as they require a lot of staff hours to deploy, setup, and keep the generators fueled during an event. They would be much more valuable if mounted at a power source and used as a fixed system in an outdoor setting."

Another system evaluated by the city emergency management director was a trailer-mounted system used by the Department of Energy (DOE) at their nuclear facility in Oak Ridge. As the nuclear site was being demolished and reclaimed, the site's public address and emergency notification system was being decommissioned. Therefore, the DOE needed some method of notifying employees of storm events or site-area emergencies during the final stages of demolition. The DOE purchased eight (8) Long Range Acoustical Devices (LRAD) mounted on trailers. The eight units were placed in areas where demolition work was taking place and could be moved from site to site as demolition progressed.

The City of Oak Ridge emergency manager borrowed one of these units to demo at the annual festival in the Park. The unit was set up in the middle of the park and used to make announcements, notify attendees of approaching lightning storms, and announce lost children. Although the unit functioned fairly well, one unit would not cover the entire venue. The system is rather heavy at approximately 3,500 (est) pounds for the PA unit, speaker mast, batteries, and trailer, and it takes about 15 minutes to set it up and make it usable. It must be towed with a pickup truck or other vehicle rated for 3,500-pound towing capacity. When set up, the emergency manager stated that it occupies an area approximately 10-feet wide and 20-feet long. The size and weight of the unit limited where the unit could be set up within the park.

Based on the performance, cost (approximately 120,000-dollars), and the weight of the unit, it was not selected by the emergency manager for purchase.

The final system tested by the Oak Ridge Emergency Manager was the SUMO TacPA. It is a truly mobile system. Weighing only 310 pounds, this system can be mounted in the back of a pickup truck, on a trailer, in the bed of an all-terrain vehicle (ATV), or even on a boat for water operations. After demonstrating the system at a couple of venues, the emergency manager placed a request to purchase a unit. Based on the multiple capabilities of the unit for various applications, the Tennessee Emergency Manager Agency (TEMA) approved the City to use annual grant funds which were specifically allocated to assist the DOE with off-site emergencies. The City purchased a unit and had a custom-built trailer designed to meet the requirements of the fire department.

The new SUMO MNS unit has now been deployed during various events: the annual Festival in the Park, the National Time Trials Cycling Races, the Fire and Police open house community

event in the park, and the Fourth of July Fireworks event. The unit has been determined to be valuable for use at an emergency response staging area to call for and manage the staging area, and it is planned for use at incident command centers to make announcements to responders awaiting assignments. The SUMO TacPA can also be loaded in a fire department's ATV and driven through tornado-damaged neighborhoods in order to assist in search and rescue operations or provide evacuation instructions.

The emergency manager determined this unit was the most versatile system available. It is totally portable, mobile, and can be deployed in less than 30 seconds in the most severe of weather conditions. The decision to mount the unit on a trailer allows the unit to be towed by an ATV into tight areas of a venue and left in place throughout the event.

Lessons learned during the development of the City Emergency Plan

1. The number one lesson learned is that there is no single product that can be purchased to meet the needs of Mass Notification. The City initially contracted with CodeRed for the community mass notification system and today still maintains that agreement. Because of the three Department of Energy sites located within the city limits, the City is not allowed to use a siren system to alert citizens of a tornado. Sirens in Oak Ridge are reserved for DOE off-site emergencies only. Therefore, the city needed a system to notify residents of an approaching tornado. CodeRed is an excellent product to do this and is totally automated with the National Weather Service for these events. However, after using the CodeRed system several times, the emergency manager discovered the system will not reach all addresses and phone numbers in the system database. This is mainly due to citizens not answering their phones because of telemarketers. Many people no longer have hardwired home phones and CodeRed will not dial cell phones automatically. The cell phone numbers must be entered and stored in the system database for notification. Many citizens are reluctant to register their cell phone number in the system. Therefore, the emergency manager was researching equipment which could be deployed in neighborhoods when needed to make contact with homeowners. New regulations for siren speakers mounted on emergency response vehicles require the speakers to be mounted in the front of the vehicle below the level of the windshield so that they reduce the likelihood of responders suffering hearing loss and to allow for better sound projection to vehicles in front of the emergency vehicle. Although still used today during emergency evacuations, the siren speakers are ill-suited for making announcements while driving; the message is lost with vehicle noise and the forward travel of the vehicle.
2. The LRAD trailer-mounted unit the city borrowed from the Department of Energy is extremely effective as a fixed device that can be moved from location to location, which is how it is currently being utilized at an industrial site in the community; the emergency manager director, however, did not see this unit being used as a mobile device. The LRAD system cannot be towed or moved during use. Outriggers must be deployed in order to stabilize the trailer before the speaker mast can be deployed. Because the system is not truly mobile, along with the size, weight, and cost, the city was not able to justify the purchase of this system.

3. Currently, when an Incident Command Post and staging area(s) are established for large scale emergencies it can take a few hours to get responders on location and radio protocols established. Therefore, both the command post and staging area uses runners to go look for agency contacts and to deliver messages. The TacPA, however, can be set-up quicker than the command posts or staging operations and can deliver intelligible voice communication to responders awaiting instructions. So, instead of a runner going out into the staging area to try and locate a task force leader, the staging manager can use the hand-held radio to communicate through the TacPA and announce for "Task-1 Leader to please report to the staging manager's desk". This reduces the staffing required to operate staging by one person, making that person available for other assignments. The same can take place at the command post, whether it be a mobile command trailer, vehicle, or command that has been established inside a building. Either way, the command staff can use their radio system to summon personnel into the command post by using the TacPA to make the announcement. Several TacPAs can be deployed in different locations within the emergency operation and one radio can communicate with personnel in staging, at the command post, in the rehab area, or at base camp simultaneously if needed. Otherwise, each unit can operate independently at the assigned location.

4. The Oak Ridge Fire Chief-Emergency Management Director was doing research for a type of equipment that was both portable and mobile in order to be used as an emergency mass notification system at various outdoor venues within the city. During events such as the rowing competitions on the waterfront where more than 3,000 athletes and visitors attend the week-long college races, the fire department must be prepared to make emergency announcements for accidents or approaching lightning. When lightning travels within 25-miles of an outdoor event, the city will typically place the event on-hold until lightning clears the area. The Office of Emergency Management located at Fire Department Headquarters monitors the weather during outdoor events if inclement weather is predicted in the area.

   Several thousand people attend the annual two-day Secret City Festival in the Park. During this event, an outdoor public address system must be set up in different areas of the venue in order to make emergency announcements to the attendees to warn of weather events. Twice the park had to be evacuated due to lighting and once the event had to be cancelled just before the headlining band began to play.

   The SUMO TacPA can also be utilized during an active shooting event. The shooting is typically over in less than 5 minutes; however, the scene must be managed for hours. With parents and emergency vehicles rushing to a school, the TacPA mounted in emergency response vehicles (fire or police department pickup trucks) can quickly be deployed for mass notification and communication at the scene in order to control crowds and manage responders.

5. During the pilot program conducted with the City of Oak Ridge Fire Department, the emergency manager discovered several additional applications for the TacPA. The department realized that the system could be easily moved from the trailer-mount to the bed of an All-Terrain Vehicle for search and rescue operations in the back country and that it could also be deployed in their rescue boat to control navigation along the waterfront during the fireworks on the water. The fire chief worked with the SUMO

research and development team to further modify the unit for additional ease-of-use during routine programming and maintenance.

Bob Moffitt July 11, 2019 Sacramento California City of Paradise, Camp Fire