Emergency Communications for the General Public
June 19, 2013 Report

Introduction

In regional emergencies in or near major urban areas, workers pour from office buildings and jam the roads, increasing the challenges of emergency response. According to recent survey research in the National Capital Region (NCR), the major reason people take to the roads is that they cannot confirm the safety of loved ones. Concerned workers and residents rely upon landline and wireless telephones for that confirmation, but commercial communications services may become overloaded or inaccessible during an emergency. When their calls don't go through, thousands of people may jump into their cars and add to the gridlock on the streets, further complicating emergency response.

In an effort to address the challenges presented by the public's need to communicate during these regional emergencies—and the resulting impact on emergency response when the public's communications capabilities deteriorate—key stakeholders from the wireless communications carriers and NCR government emergency management organizations came together to begin examining the issue, identifying potential solutions and engaging the organizations of this stakeholder group to implement solutions. The project was funded by the FEMA Regional Catastrophic Preparedness Grant Program (RCPGP), and the All Hazards Consortium (AHC) served as the project coordinator.

Background

Funded by a separate FEMA RCPGP grant, the University of Virginia Center for Survey Research (UVA) conducted surveys in late 2009 and in 2011 that focused on the decision-making of area workers in an emergency.[1] Specifically, the surveys asked workers in the National Capital Region whether they would stay at work or leave if there were a radiological dirty bomb attack. Among the research's most striking findings was

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[1] *Population Behaviors in Dirty Bomb Attack Scenarios: A Survey of the National Capital Region Report of Results*, University of Virginia Center for Survey Research and Center for Risk Management of Engineering Systems (2010); and *NCR Behavioral Survey 2011: Work, School or Home? Issues in Sheltering in Place during an Emergency*, University of Virginia Center for Survey Research and Center for Risk Management of Engineering Systems (2011) ("*NCR Behavioral Survey 2011*").

GENERAL PUBLIC (ECGP) INITIATIVE, JUNE 19, 2013
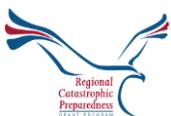
that the number of people leaving work increases substantially if phone service is not available.

For example, when asked how they would respond if a dirty bomb exploded within the NCR but outside their immediate area (so they were not directed to shelter in place), the number of respondents who said they would leave immediately was 59% higher if their calls could not get through. That equates to an additional 1.3 million people clogging the roads while first responders begin to manage the event. Fifty-seven percent of this group said they would be travelling to check on adult family members, children and pets. Even if the dirty bomb explosion was close by and authorities issued instructions to shelter in place, the number of respondents who said they would leave their buildings immediately was over 50% greater if the phones were not working. This equates to 614,000 more people putting themselves in harm's way and increasing the spread of dangerous radioactive contamination throughout the region. Based on the survey findings, a majority indicated that during emergencies, wireless phones are the preferred method of communication.

On August 23, 2011, shortly after UVA issued its report presenting the survey results, a 5.8 magnitude earthquake centered in Mineral, Virginia shook the mid-Atlantic region. Workers streamed out of their buildings, and communications systems became jammed with traffic, making it difficult to place calls confirming the safety of loved ones. According to the *Washington Post*, "They were trying in vain to call spouses and children and parents and friends. (Sprint Nextel declared the quake a 'temporary mass calling event.') … Downtown quickly took on a look very much like that of Sept. 11, with gridlock, blinking traffic lights, Metro platforms overflowing with passengers and hundreds of people standing on street corners, waiting. Hundreds more gave up on transit and hoofed it home."[2]

There have been other emergencies and disasters outside the NCR, to include Super Storm Sandy and the Boston Marathon bombings, that have provided additional experience on how the public attempts to communicate during emergencies. With Super Storm Sandy, long-term power outages created wireless network outages and individual cell phone battery issues that dominated the news reports. In Boston, the public experienced wireless network overload when large concentrations of the public tried to make calls after the bombings.

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[2] Marc Fisher, "Earthquake brings to mind panic of 9/11," *Washington Post*, Aug. 23, 2011.

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Initiatives exist to provide information to the public in an emergency (one-way communication, such as Wireless Emergency Alerts and the Integrated Public Alert and Warning System (IPAWS)) and, to help people locate missing loved ones after an emergency (such as FEMA's National Emergency Family Registry and Locator System. Additional family locator options managed by the American Red Cross and Google are also available, though there is not a well-known program in the NCR or nationally to help ensure connectivity so that people can communicate in the minutes and hours immediately following a disaster, the key period for making the stay-or-go decision.

Defining the Options

There are many measures that could help residents of the NCR confirm the safety of their loved ones immediately following a disaster, from communications providers' network upgrades and investments that improve resilience and capacity to education campaigns urging the public to use text messaging instead of voice communications in an emergency. No such effort would be effective, however, without the involvement and support of the key stakeholders, including those public entities that would be better able to respond to emergencies if the roads were less congested, those private entities that provide commercial communications services and other key community partners, including local businesses and non-profit agencies that work closely with special populations including the elderly and disabled.

The AHC team identified the key stakeholders, facilitated their discussions of potential solution approaches, and convened and organized the stakeholders into an active group focused on addressing these issues. The overall goal of the project is to deliver a plan to mitigate disaster communications challenges through public education, endorsed by the stakeholder group, facilitated and documented by the project team.

The Stakeholder's Group

The ECGP Project's Stakeholder Group ("Stakeholders") consists of major national wireless carriers AT&T, Sprint Nextel, and Verizon Wireless, CTIA–The Wireless Association, and the emergency management agencies of the District of Columbia, the State of Maryland, and the Commonwealth of Virginia.   Participants include:

Commonwealth of Virginia

Michael Cline, State Coordinator, Virginia Department of Emergency
Management
Brett Burdick, Deputy State Coordinator, Virginia Department of
Emergency Management

District of Columbia

Chris Geldart, Director, Homeland Security and Emergency Management
Agency

State of Maryland

Ed McDonough, Public Information Officer, Maryland Emergency
Management Agency

AT&T

Anisa Latif, Associate Director, Federal Regulatory
Jamie Tan, Director, Federal Regulatory

Sprint Nextel

Chuck Brownawell, CISSP/ISSEP, National Security & Infrastructure
Protection, Sprint, Corporate Security
Tanya Jones, Manager, ERT Operations – Emergency Response Team
Vandana Tandon, Senior Manager

Verizon

Don Brittingham, Vice President, Public Safety Policy
Faizun Kamal, Executive Director, National Security & Public Safety Policy
Todd Biebel, Manager of Business Continuity/Disaster Recovery

CTIA—The Wireless Association

> Brian Josef, Assistant Vice President, Regulatory Affairs
> Rick Kemper, Director, Wireless Technology

The project has been facilitated by Janet Clements and Kenneth Boley on behalf of the All Hazards Consortium.

Stakeholder Meetings

The Stakeholders first convened on October 3, 2013, at Virginia Tech's Research Center in Arlington to begin to frame out the cooperative approach they wished to take to address cellular communications' impact on NCR workers' decisions regarding sheltering in place, as identified in the UVA Study.

During that meeting, the discussion raised many issues, falling into two major subject areas. First, much of the discussion focused on wireless network congestion, particularly in emergencies, obstructing efforts by members of the general public to confirm the safety of others via their cell phones. This subject area is referred to as "overload." The Stakeholders noted that despite the growing capacity of wireless networks, spikes in demand for network resources caused by emergency events—particularly widespread events such as the August 2011 earthquake in the mid-Atlantic region—can saturate and overburden wireless networks, preventing them from completing some communications.

The other major area of discussion at the October 3 meeting involved cases where wireless communications were obstructed by a network outage, whatever its cause. The Stakeholders noted that speed of recovery can minimize the impacts of such outages, and that government efforts may be useful in helping repair crews speedily access and redress the cause of the outage (a downed power line or a cut piece of fiber backhaul, for example).

The Stakeholders determined to address these two areas through two separate working groups: the "overload" working group, and the "outage" working group.

In addition to conference calls between face-to-face meetings, the Stakeholders also met on January 31 and May 29, 2013. During its discussions, the Stakeholders adopted

a set of Guiding Principles for the ECGP Initiative, which are provided in the Appendix to this Report.

Addressing Overload of Communications Systems in Widespread Emergencies

Wireless network overload is caused by a spike in demand for network resources, a shortage of installed network capacity, or both. Capacity, often defined in terms of bandwidth, can be constrained at a number of different points in the network, including the communication between the end-user device and the cell tower (the air interface), or between the cell tower and the network core (backhaul). Commercial carriers who continue to make significant investments in their networks, design their systems to accommodate foreseeable periods of high demand for network bandwidth. Emergency events may over-burden these networks when members of the general public attempt to make calls at the same time. Cost considerations to both providers and end-consumers play a factor in determining realistic and implementable next steps in addressing the overload issue.

Wireless end-user devices communicate with wireless networks through panel antennae, usually arrayed on the tower in a triangle formation, providing coverage in the area surrounding the tower in three sectors, one for each panel. As a result, an event in a location served by only one or two sectors on a single tower may result in so much traffic through those panels that some requests for service cannot be accommodated, even though nearby towers—and even other sectors on the same tower—may have plenty of available capacity. It is during widespread events, however, that wireless systems can become broadly overwhelmed and thus unavailable to the extent that shelter-in-place decisions would be effected.

>   *Not All Communications Are Equal*

The amount of bandwidth required by a communication depends upon the type of communication. For example, on a typical second-generation (2G) wireless system, the general public usually can communicate in two different ways: a voice call, or a text message. A simple voice conversation to confirm the safety of a friend—"Are you okay? Yes, I am. Okay, stay inside until they say it's okay to go out."—requires greater bandwidth than the same exchange by text message. Texting a photo requires even greater bandwidth.

Third- and fourth-generation (3G and 4G) data networks also can become overloaded by traffic, though the types of communications differ from 2G networks. For example, a simple email message without images or attachments can be very efficient, but if a 10-minute video file is attached, the required bandwidth to send the message jumps substantially. Similarly, sending a message via social networking sites can require fairly little bandwidth, but if the site or the message requires uploading of audio, image, or video content, the bandwidth requirements can be much greater.

The tremendous variety of communication types accommodated by today's wireless networks and the vast differences in the quantity of network resources among carriers, have enormous implications for potential network overload. Greater use of low-bandwidth communications (such as text messages) and reduced reliance on high-bandwidth methods (such as voice calls and video) where appropriate, would enable the networks to support more communications in a given area during a given period of time, thus reducing overload.

The General Public Must Be Educated and Change Its Behavior

The simple fact that different types of communications over a wireless network place disparate burdens upon the network points to an obvious approach to reducing network overload in an emergency: placing greater reliance on less bandwidth-intensive types of communications. But the public does not generally know to do that. Indeed, in a recent survey, approximately half of respondents did not know that a voice phone call places a greater burden on the wireless network than does a text message.[3] Because the public cannot be expected to shift reliance to lower-bandwidth communications during emergencies if it does not know which types of communications are low-bandwidth, the Stakeholders believe that widespread public education must be a key component of efforts to mitigate network overload.

Of course, even if the public does know that a text message imposes less of a burden on the wireless network than does a voice call, that knowledge alone will not necessarily translate into changed behavior in an emergency. As noted, about half of survey respondents said they were unaware of that fact; in other words, about half of them *did* know. Nonetheless, that same survey found that 75.3% of respondents said they rely primarily on wireless telephone voice communications to contact a loved one in an

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[3] *NCR Behavioral Survey 2011.*
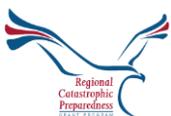
emergency. In other words, despite knowing that voice calls will impose a greater burden on the network, many people rely on such calls anyway.

The drivers behind public choice of wireless voice communications in an emergency may be many, but some explanations seem particularly likely. First, a wireless voice call, if it goes through, provides real-time two-way communication with the other party, regardless of that party's location: if you need to contact someone immediately, you call them on their cell phone, because they may not be near their landline and may not check their email or text messages immediately. Second, there is no risk to the caller in trying the cell call first: if the call does not go through, the caller can try again and can still send a text or email.

The negative impact of this behavior—that when the call does go through, it consumes network resources that could be used by others to make similar or even more urgent communications—is not sufficiently apparent to the caller to impact behavior, as suggested by the survey data. The Stakeholders are convinced that impressing network users with the importance of using lower-bandwidth communications in a widespread emergency will require a focused, effective public education effort.

A Proposal for a Public Education Campaign to Reduce Network Overload

The Stakeholders propose the development of a public education campaign with the goal of changing public behavior so that in an emergency, the public will act in a manner that reduces stress on communications systems by reducing use of network resources, communicating via text message or other less resource-intensive method rather than voice calls in an emergency.

The target audience for the campaign would initially be people who live or work in the National Capital Region or perhaps the mid-Atlantic states. Eventually, the campaign could evolve to target the general public nationwide.

The campaign could engage key partners and media outlets, potentially including:

- Existing efforts to address same issue (for example, Safe America, Ready, CTIA, carrier efforts, state/local government efforts including Resilient DC, etc.)

- High density areas with workplace posters and messages (partner with property management firms to reach office buildings)
- Metro signage
- Grassroots community outreach
- Website
- Facebook
- Twitter
- Media campaigns
- Alert DC and other local government alerting systems (Capital Alert)
- Mobile App
- FEMA's Ready Campaign website
- Carriers send out periodic text reminding people to minimize calling during emergencies and use other methods.
- Carriers include information at their stores and in their electronic or paper bills.

As initial campaign focus areas, the Stakeholders recommend that the campaign work with U. S. Office of Personnel Management (OPM), General Services Administration (GSA) and the legislative branch to reach federal workers and the Apartment and Office Building Association of Metro Washington (AOBA) to reach private sector workers. It should also work with Business Improvement Districts (BIDS) in the District for outreach to workers and property owners/managers. The Stakeholders recommend the campaign work to obtain story placement in *Washington Post* and the free papers that are passed out at Metro stops, as well as the suburban weeklies and local broadcast channels. Finally, the Stakeholders recommend the campaign consider tying its launch to National Preparedness Month in September.

Considering Service Outages

The same incidents that can cause the public to overwhelm communications systems with a surge in traffic can also cause physical damage to those systems, resulting in service outages. For example, very severe storms, such as the *derecho* in July 2012 and Super Storm Sandy in October 2012 can cause widespread disaster conditions requiring substantial emergency response efforts even as they take down power and telephone lines, flood carrier facilities, and otherwise wreak havoc on communications system capabilities. One result, just as in the case of system overload, is that the public's calls

do not go through, so people leave their locations to check on loved ones and neighbors, resulting in an increase in the number of cars on the road and obstructing emergency response.

The Stakeholders discussed ways in which the carriers and government agencies might work together to help speed restoration of communications service. The discussion focused on coordination of carrier repair and government emergency response efforts, including facilitating repair crew access to secured areas. Through these discussions, the carrier and government Stakeholders identified as one beneficial step, the inclusion of a carrier presence in state emergency operations centers and to facilitated the identification of the appropriate contacts on both the carrier and government sides.

The Stakeholders also considered whether there were steps they should take as a group to address system resiliency—essentially focusing on preventative measures to reduce the frequency and/or severity of outages. Because the issue of resiliency is already the subject of substantial at the Federal Communications Commission,[4] the Stakeholder group preferred to focus its energies on other approaches to the problem of ensuring communications for the general public in an emergency. Specifically, in light of limited time and resources, the Stakeholders elected to focus on the public education approach to the addressing the overload issue described in the prior section of this document.

New Technologies

In researching the issue and determining whether there was technology that might offer solutions, the project team found existing and emerging technology that has potential to help address the situation.

Popular social media platforms such as Facebook and Twitter have increasingly been used as communication methods during emergencies. By making a post on either platform, members of the public can instantly alert their family and friends of their

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[4] In the wake of the derecho, the FCC issued a *Report and Recommendations on the Impact of the June 2012 Derecho on Communications Networks and Services* ("Derecho Report") and more recently initiated a Notice of Proposed Rulemaking on Improving 9-1-1 Reliability related to the findings of that Report. Additionally, the FCC recently re-chartered its Communications Security, Reliability and Interoperability Council (CSRIC), a federal advisory committee, comprised of various public safety, industry and government agency representatives, that recommends best practices and actions that the FCC may take to ensure reliable, secure and interoperable communications systems.

status after an emergency. Facebook offers an application called bReddi that allows families to plan for emergencies and connect with each other during emergencies. The key to making this communication effective is for immediate family members to know about that method of communication and be actively signed on to the platform. Anecdotal evidence from the Boston Marathon bombings indicated that both platforms were used effectively to communicate with loved ones

In addition to an array of social media sites and apps, there are two services that utilize a "people finder" methodology. During the Boston Marathon bombings both the Red Cross's Safe and Well and Google's Person Finder systems were advertised and used to learn the whereabouts of loved ones and to report individual's status.

There are "walkie-talkie" applications that enable users to use their smartphones to simulate two-way radios so that they can have a voice communication with key loved ones using the Internet. Examples of such apps include Zello Walkie-Talkie, Heytell and Voxer Walkie-Talkie.

There are a number of other emerging technology solutions that could impact emergency communications by the general public during emergencies. The FCC has recently proposed the exploration of free public WiFi, which could have positive impacts on communications overload during emergencies.

Recommendations

The key to the ECGP Initiative's progress thus far has been its focus on taking actions that all Stakeholders—both commercial and government—support. Though there are many potential actions that some Stakeholders may wish the group to take, the initiative only pursues those areas of work in which the group is unanimous. The Stakeholders, adhering to that approach, recommend that the initiative continue to work to address the problem of overload of communications systems through public education, consistent with the proposal set forth in this Report.

In order to continue the progress of the Initiative, the Stakeholders recommend that CTIA and the RESF 15 group organized through the Metropolitan Washington Council of Governments together take on the role of Initiative project manager to convene the

Stakeholder Group and support the Stakeholders in their pursuit of the Initiative's
Guiding Principles, including accomplishment of the "Next Steps" described below.

Next Steps

The Stakeholders have identified the following next steps for the Initiative:

- Consider identifying an Initiative business entity, whether existing or new, that
  would best facilitate Initiative access to funding.
- Consider submitting a request for NCR UASI funding .
- Consider expansion of the Initiative beyond the NCR, perhaps nationwide.
- Consider engagement of the broader business community (including major
  retailers) in the work of the Initiative.
- With regard to the proposed public education campaign—
  - Consider broadening the group of participating Stakeholders to fashion
    the message to the public.
  - Consider adopting an initial message focused on commercial wireless
    communications services, expanding later to include other
    communications technologies that could benefit from a change in public
    behavior in an emergency.
  - Consider adapting the message into existing Stakeholder outreach efforts.
  - Consider gearing the message to people who work in the targeted
    geography, starting with the District and surrounding area to include
    federal and congressional employees as well as the private sector.
  - Consider pursuing a specific, professionally designed, public education
    campaign.
  - Consider identifying key media outlets the campaign should engage.
- Consider pursuing government funding sources (such as the federal Urban Area
  Security Initiative, for example) as well as potential contributions from partners
  to obtain the necessary resources to develop and implement the campaign.
  Consider approaches to addressing communications system outages such as

- o enhancing partnerships among government and industry to address outage response and
- o improving recovery coordination of all utilities with state regulators.
- Consider addressing the need for on-demand, incident-specific public education.[5]

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[5] In the Boston Marathon bombings instance, the Associated Press reported that law enforcement officials temporarily shut down wireless services in some areas to prevent the detonation of any cell phone triggered bombs. These reports were ultimately determined to be incorrect, but this experience highlights the importance of close coordination between public safety officials and commercial carriers and the need to provide accurate timely information to the public before, during, and after emergencies.

Appendix

Emergency Communications for the General Public Initiative
GUIDING PRINCIPLES

1. Government agencies, communications providers, and the broader business community all recognize that effective and reliable communications for the general public is extremely important to emergency management and recovery efforts.

   a. People in need of aid must be able to reach emergency services personnel to get help.

   b. People unable to communicate with their loved ones are less likely to shelter in place, thereby adding to road congestion and making it more difficult for first responders.

2. Communications networks are more likely to be overloaded during and after a significant emergency, particularly in the immediate area where the emergency occurs.

3. The ways in which the public communicates, e.g., sending a text versus making a voice call, can have a significant impact on the ability of communications networks to handle traffic demands.

4. Broader public education about how to best use communications tools during times of emergency will decrease the likelihood that commercial networks will be overloaded, improve the availability of communications services for everyone, and help emergency management and recovery personnel in performing their mission.

5. Promoting more effective public education can best be achieved through a collaborative effort by a variety of government and private sector stakeholders, including the emergency management community, the communications industry, and the business community at large.

6. The companies and organizations working on this ECGP initiative agree to work cooperatively to develop mutually agreed upon strategies that would achieve this important education objective.