NG 911-FirstNet Whitepaper

NPSBN as a Strategic Enabler of Next Generation 9-1-1

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Emergency Communications in a Mobile World

The E911 systems throughout the Country have enabled emergency communications and location of callers with much success for the last decade. With the advent of Smartphones and rapid spread of broadband mobile technologies, the emergency callers are able to text, send pictures and video to E911 center. This information, if communicated directly to first responders, can provide vital information about the incident scene, potential suspects, or other clues, speeding and improving response and saving lives. However, most of the 911 command centers are not able to handle or process this additional information, as the E911 systems were not designed to handle the new kinds of information that modern technology had put in the hands of average citizens who might call during emergencies.

Take the example of the Boston Marathon bombings in April 2013. The twin explosions along the marathon route occurred at 2:49 p.m. on Monday, April 15. Late that night, the FBI began searching for pictures and videos of the attack, from store security cameras and from onlookers' cellphones. On Tuesday, the agency created a website for witnesses to contribute images and videos; soon agents were gathering and analyzing thousands of them (before the investigation was done, they would study a massive 120,000 photographs and 13,000 video clips.) After a full day of the search, they spotted images of two young men who seemed suspicious. It wasn't until five p.m. on Thursday, however – three full days after the attack – that authorities were able to identify the two suspects and issue a lookout for them.

Surprisingly, though, the two brothers had made the inexplicable mistake of remaining in town. If they had driven away immediately after the explosions, they could have been in another state before the FBI had spotted their images in the trove of photos and videos. In the two days that followed before they were positively identified, they could have been in another country – perhaps one that shared their violent philosophy – and been safe from capture forever.

Unfortunately, the communication capabilities of the public safety community have not evolved at the same rate as those of the commercial space. The explosive growth of smartphone usage as well as the almost daily creation of new applications and features has created a gap between what the public can offer and what emergency response facilities can handle. If America could close that gap, the ability of public safety organizations to meet the needs of the communities that they serve would be immensely improved.

Imagine that 911 centers were able to receive directly the thousands of photos and videos taken by witnesses to a catastrophic event, whether a terrorist attack or a natural disaster. Imagine that those witnesses could text their information to 911 operators rather than struggling to get through crowded phone networks during emergencies (text messages may be delayed somewhat by congestion or system problems, but they keep trying, all by themselves, until they get through). Imagine that there was a nationwide, interoperable broadband communications network for public safety agencies; all of those agencies would have the same information at the same time, making coordination of their efforts far easier. With access to such information, identifying suspects in a bombing, for instance, could happen a lot sooner, reducing their chances of escape. Fortunately, a concerted effort is under way already to make that very thing happen. The combination of Next Generation 911 (NG911) and National Public Safety Broadband Network (NPSBN) together bring the potential for vastly increased capabilities for the public safety community.

Overview of NG911

NG911 is a current effort to update the E911 infrastructure nationwide to enable Public Safety Answering Points (PSAP) to communicate with wireless and other non-traditional users. NG911 will preserve the existing Enhanced E911 functionality while adding the capability to handle and process text, photos, and video to E911 Public Safety Answering Points (PSAPs). The National Emergency Number Association (NENA) has taken a leading role in identifying the need and defining the specification for NG911 systems since 2003, and has published numerous specification documents outlining technical, regulatory, security and policy areas. Additionally, the US Department of Transportation has also led a program as part of the Intelligent Transportation Systems Program to research and develop new designs and technologies aimed at advancing NG911. This DOT program has produced detailed studies of capabilities and architecture to help guide the future development of NG911 deployments.

Victims may be in threatening situations in which trying to call 911 might put them in increased danger, or they may be physically incapacitated. NG911 will enable the public to be able to provide emergency information (text, location map, video, photos etc.) when they may be unable to place a phone call. Armed with this new information first responders will have access to vital visual information from the scene prior to arrival, giving them a more accurate account of the situation in progress than verbal information from citizens in distress.

NG911 will also allow for improved exchange of information among PSAPs and agencies throughout the country. Emergency and public safety agencies will be able to receive E911 call information and supporting data directly from the PSAPs, rather than having to create websites or other ways to solicit that data. This will allow better disaster management and intercommunication from PSAPs to other EOCs, State and Federal public safety agencies. This increased access will also help PSAPs to serve people better and provide proper responses more swiftly.

Overview of NPSBN

The Middle Class Tax Relief and Job Creation Act of 2012 created the First Responder Network Authority (FirstNet), an independent authority established within the National Telecommunications and Information Administration (NTIA). FirstNet is responsible not only for the management of the 700 MHz spectrum, but also for the planning, design, and build-out of the Nationwide Public Safety Broadband Network (NPSBN). The needs of federal, state, local and tribal public safety agencies are all being considered by the FirstNet board in an effort to address as many different needs and concerns of the user community as possible. After consulting with representatives in each region and state, FirstNet will issue Requests for Proposals for deployment of the network throughout the country.

The key driver of the NPSBN is to provide a single, interoperable broadband data network across the nation for public safety users at all levels of government across the country to provide advanced capabilities on a hardened, secure infrastructure. This will allow agencies all across the country to share data and information quickly and securely.

Using NPSBN to Deliver on NG911s Potential

In the event of a situation like the Boston Marathon bombings, where the rapid exchange of video feeds from surveillance cameras, drones, or other aerial units could be critical to the apprehension of suspects, having the technology and the network in place to share this information among agencies in real time will be critical. While NG911 brings new capabilities to PSAPs and enhances the response to incidents, the real leap in capabilities comes when first responders in the field have instant access to this enhanced information during an incident.

The agencies today are trying to take advantage of NG911 capabilities by utilizing commercial broadband networks. But the issues of security and reliability of the commercial networks casts a shadow on the potential benefits. If the network cannot be counted on to provide service during a disaster event due to congestion or non-hardened sites being taken offline, then the first responders won't have the benefit of these new capabilities precisely when they need them the most. Concerns with data security and protecting privacy of citizens are also key to ensuring that the trust of the public is maintained while agencies try to adapt to new ways of doing things.

Rapid information sharing is one of the toughest challenges facing a team coordinating a multi-agency response. NPSBN will provide first responders with a dedicated, hardened system that promises to deliver reliable broadband service in a predictable area. This will ensure that first responders have access to critical data that will be available even when commercial systems are congested or failing during major events. This will enable agencies to fully incorporate advanced applications of NG911 into their response plans.

There are several key capabilities of NG911 that if enabled via NPSBN will provide first responders with a significant leap in capabilities that will improve responsiveness and efficiency. As more and more 911 calls will also provide text, pictures, and videos from citizens, this new information can be of vital importance to first responders to have visual information from the scene prior to arrival to give them a more accurate account of the situation in progress than by relaying verbal information from a citizen in distress that may be inaccurate. With this kind of access, these agencies and organizations can work in tighter communication with first responders and improve coordination beyond what is experienced today.

Taking it to the Next Level

For all the impressive capabilities and synergies that NPSBN and NG911 will offer immediately, the future will see these capabilities grow and develop to meet current and future user needs. User groups continue to define desired capabilities and research new applications that in many cases can adapt currently available technologies from the commercial world for use in the public safety environment. With FirstNet adopting the commercial LTE standard and NG911 utilizing IP industry standards, the rapid development cycles commonly associated with commercially available equipment can be leveraged to benefit public safety. While many of these technologies and applications need to be adapted (adding increased security, device ruggedizing, etc.), much of the basic research and development efforts from the initial technology development can be applied to these new applications. Some examples of potential scenarios include:

Direct Transmission of Vehicle Telematics Data

Properly equipped vehicles can potentially transmit crash information directly to NG911 centers, immediately informing a call taker of the incident, the vehicle type, number of passengers, airbag deployment, precise vehicle location and any hazardous cargo aboard (if the vehicle is a shipping truck). This information can then be passed directly to first responders to ensure that the proper equipment (HazMat trucks, heavy wreckers for large vehicles, etc.) is immediately dispatched to speed the response and recovery.

Improved Routing and Unit Coordination

By integrating current traffic information and vehicle GPS data, Computer Aided Dispatch (CAD) systems can automatically route units along the most efficient routes, taking into account traffic, weather, construction or other dynamic conditions that could slow response time for first responders or medical transport personnel. Dynamic traffic signal pre-emption and highway messaging signs can be coordinated from the PSAP to flow traffic away from an incident or to clear routes for responding units. Road crews can receive instant notification of oncoming emergency units and can clear traffic lanes to speed access. Highway assistance trucks or other traffic units can be automatically dispatched via CAD and directed to critical traffic locations to close roads and establish detours well away from the incident location.

Integrating Diverse Sources of Information

The ability to share precise call location on a map, special medical needs of patients, license plate numbers or suspect pictures can all make the difference in dangerous situations. Similarly, communications from inside buildings during active shooter or hostage incidents can be invaluable to first responders, allowing them to direct their response more effectively and save lives. With NG911, the PSAPs will also have the ability to access additional information that can be provided to responders in the field, such as video from fixed cameras (DOT, municipal surveillance or businesses), maps or building plans. This additional information can be provided directly to first responders, improving the speed and efficiency of their work.

Enhanced Regional Response

After using NG911 to connect multiple PSAPs throughout the region, officials can employ analytics to monitor call traffic and trends across multiple PSAPs. This allows for a more rapid response to an emerging situation, such as a weather event. Using NPSBN, public safety units can directly receive weather alert information, including maps showing roadways that need to be closed. An incident commander can instantly communicate with hot zone area as well as identify ingress/egress routes for all units responding through the use of mapping applications. Public works units can be directly included to integrate response and get heavy equipment where it is needed the most to clear roads or set up variable messing signs to alert motorists. Using Reverse 911 systems or other alerting systems, agencies can send notifications directly to the public with instructions to avoid certain areas or shelter in place as the situation demands.

Improved Coordination during Disasters

Capabilities of NG911 will be immensely helpful not only in terrorist or criminal events, but in natural disasters or other large-scale emergencies. Events such as tornados or hurricanes can overwhelm a local dispatch center with voice traffic, both from the public and from first responders in the field. Using NPSBN, those on the scene can share data directly, showing routes that have been cleared, neighborhoods that have been searched, and the real-time location of

vehicles and equipment in the area. Non-governmental organizations that are responding to the event, such as the Red Cross, can be included in data sharing on a limited basis to help manage citizens or share the locations of aid centers and food distribution in real time. Users from multiple jurisdictions, as well as state and federal agencies, will be able to share information at the scene in ways that have never been possible. Using NPSBN, the broadband capabilities can even be established with transportable sites in the event that the regular infrastructure has been damaged or destroyed during the disaster.

Better information Security

One of the major concerns that come with this new technology is securing and protecting the data that travels across the network from hackers and criminals who could potentially intercept it or attempt to impact the network. What if a video from a 9-1-1 call ends up on YouTube? Using NPSBN built with the Information Assurance (IA) and security standards that are widely used within the federal government, particularly within the Department of Defense, agencies will be assured that the sensitive information that is critical to maintaining the public's confidence and managing these threats, is secure and protected.

Summary

NG911 and NPSBN will enable new tools that can be used by planning groups to develop more effective responses to critical situations and improve not only interoperability with other agencies, but also improve communications with the public. Together, these two technologies will narrow gap between commercial and public safety technology capabilities. Even though these systems are not widely deployed yet, public safety organizations need to lay the foundations and begin planning now, not only within their own organizations, but with adjacent jurisdictions so all can realize the full benefits of broad, rapid coordination and data sharing.

There are many things that agency leaders can do now to prepare for this transition over the coming years. Agencies throughout a region will need to work together to discuss this new technology, its potential benefits to their operations, and ways they can come together to share funding and resources to deploy these systems. In these days of tight budgets, few agencies will be able to go it alone to deploy and manage these complex networks.

By working together at the local and state levels, agencies can develop multi-year plans that address the complex operations, technology, and funding issues that will be encountered with the transition to these networks. There is much work still to be done in preparing for this transition, and only by starting now can agencies be ready to meet the ever-changing needs of the citizens they serve.