NG9·1·1

Next Generation 9·1·1

What's Next Forum

Report From Law Enforcement, Fire-Rescue, Emergency Medical Services and Transportation Operations Stakeholder Panels

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Promoting Technology for Public Safety

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Introduction

1.   Introduction

Purpose of This Report

This report is intended to encapsulate the initial recommendations of subject-matter experts in law enforcement, fire - rescue, emergency medical services (EMS), and transportation operations on the types of information that could be transmitted to them as end users of the forthcoming Next Generation 9-1-1 (NG9-1-1) system.

To date, much of the discussion about NG9-1-1 has taken place in the technical arena. This report is intended to aid that effort by providing insight into the *cultural*, *organizational* and *operational* environments in which NG9-1-1 will be implemented. As such, it represents the commitment among members of these emergency responder groups, as well as the national stakeholder organizations they represent to a collaborative process that ensures that the developers of the NG9-1-1 system understand the needs and priorities of the nation's emergency responders. In short, the goal is to get the right information to the right people at the right time.

This report is intended for distribution to a variety of stakeholders, each with an interest or involvement in NG9-1-1. Both public and private organizations are encouraged to consider next steps that could be undertaken to meet the information needs of emergency responders, and how these needs could be met within the NG9-1-1 framework.

Note: This report is not intended as an in-depth analysis of the implications of NG9-1-1 for individual emergency responder agencies. It is not designed to give advice to emergency responder agencies, to help them make decisions about NG9-1-1, or to influence policy.

How This Report Was Created

This report is the result of the **NG9-1-1 What's Next Forum**, convened by the Transportation Safety Advancement Group (TSAG) at the request of the U.S. Department of Transportation (USDOT), Intelligent Transportation Systems Joint Program Office (JPO). The project is co-managed by the JPO and the National 911 Program at the National Highway Traffic Safety Administration (NHTSA).

On September 23 and 24, 2010, the What's Next Forum was convened in Washington, D.C., hosting a group of subject matter experts representing national stakeholder groups in four emergency responder professions (law enforcement, fire & rescue, EMS and transportation operations). Also present were 9-1-1 technical experts and public safety experts, who acted as resources for the panelists.

Following a half-day overview presentation on NG9-1-1 by a nationally respected expert, the panelists broke into four groups, one for each of the four disciplines, for a half-day session. During these breakout sessions, the panelists were asked to identify major challenges facing their professions (to provide context), and to discuss ways in which NG9-1-1 could help them fulfill their missions as emergency responders. Each panel presented its initial findings to the larger group the following day.

In a series of follow-up conference calls, members of the four groups worked to develop the corresponding sections of this report, one for each discipline. Each of the groups identified background issues relevant to their fields, consensus points for future collaboration on NG9-1-1, potential obstacles to NG9-1-1 within their respective disciplines, desired benefits, potential data points/capabilities to be prioritized, and a suggested process for moving forward. Each group also developed a comprehensive set of sample scenarios to illustrate the potential for NG9-1-1 to support them in their respective missions.

Each group worked independently, to allow focus on the needs of their particular discipline. Each section of this report (law enforcement, fire & rescue, EMS and transportation operations) represents the consensus of the panel members involved.

Stakeholder Groups Represented

A variety of national professional organizations were invited to participate. The following stakeholder groups were represented in the Forum.

American Ambulance Association
American Association of State Highway and Transportation Officials
American College of Emergency Physicians
American College of Osteopathic Emergency Physicians
Association of Metropolitan Planning Organizations
Association of Public-Safety Communications Officials - International
Governors Highway Safety Association
I-95 Corridor Coalition
International Association of Chiefs of Police
International Association of Fire Chiefs
International Association of Fire Fighters
National Association of Counties
National Association of Emergency Medical Technicians
National Association of EMS Physicians
National Association of State EMS Officials
National Association of State Fire Marshals
National Emergency Number Association
National Fire Protection Association
National Sheriffs' Association
National Traffic Incident Management Coalition
National Volunteer Fire Council
Transportation Safety Advancement Group

2.   What is NG9-1-1?

The original 9-1-1 system, introduced in 1968, was based on wired telephones connected by copper landlines. Over the past four decades, that original system has been updated in many (but not all) locations to include such features as automatic location information, the capability to route wireless calls to the appropriate 9-1-1 center, and others. Yet the devices and technologies people use to communicate with one another are growing, in both number and complexity, faster than the legacy 9-1-1 system's ability to keep up. In this environment, there is consensus among 9-1-1 stakeholders that the time has come to update the 9-1-1 infrastructure to enable the transmission of digital information (e.g., photographs, video, etc.) from callers to the 9-1-1 center, and on to emergency responders.

Next Generation 9-1-1, or NG9-1-1, is a system of 9-1-1 services and databases that run on an Emergency Services Internet Protocol (IP) Network (ESINet). The ESINet has been designed as an *emergency services network*, not just a 9-1-1 network. This network can allow automatic and advanced sharing of digital data among all public safety responders, public safety answering points (PSAPs), emergency management, traffic operations, and other entities. Collectively, NG9-1-1 brings the potential to:

- Allow 9-1-1 to adapt more quickly and less expensively to new technologies
- Permit "plug and play"-type access and interfaces for new communications technologies
- Allow 9 -1- 1 to function in a data-rich environment
- Permit greater data bandwidth over a modernized IP network with open standards
- Allow greater flexibility

Potential capabilities offered by NG9-1-1 that are generally not available in the legacy 9-1-1 system include:

- Improved ability to transfer misrouted calls
- Ability to transfer calls in the event of call overload or inoperable PSAP
- Available data (e.g., location information, photographs) delivered with calls
- 9-1-1 authority ability to base call routing on policy
- Text/multimedia
- Additional data handling
- Sharing data across regions
- Improved data sharing with responders
- Improved ability to establish virtual PSAPs

NG9-1-1 system design features include:

- Employing consensus-based open standards as an essential feature to achieve national interoperability and to share data among geographically dispersed PSAPs and other responder agencies
- Reliance on commercial off-the-shelf (COTS), open source and common telecommunications and networking products used throughout the industry
- The capacity to provide *scalability* (sized to fit and expandable), *extensibility* (ability to support future technologies), *reliability* (resistance to failure) and *configurability* (compatible with a mix of public and private networks)

It is important to understand that the ESInet will not simply handle 9-1-1 calls in a more advanced way: The same backbone that transports 9-1-1 calls can provide access for remote databases, as well as transmit voice, images, video or virtually any type of data within an agency and across multiple agencies. As such, many of the potential benefits that NG9-1-1 offers are not part of the system itself, but are applications that the NG9-1-1 backbone makes possible.

It is also important to note that NG9-1-1 is not generally expected to replace existing computer-aided dispatch (CAD) systems, records-management systems (RMS) or mobile data systems currently used by responder agencies. Rather, these systems will likely connect to the NG9-1-1 system/ESInet.

3.   Common Concerns Emerging From the Forum

As noted above, the four panels (law enforcement, fire-rescue, EMS, and transportation operations) collaborated independently of one another, apart from a verbal report delivered to the larger group following the initial half-day of panel discussions. Despite this, a number of common concerns emerged in their discussions. These concerns, which are summarized below, are presented with additional details in the corresponding sections of this report for each of the four panels. The concerns are presented here in no particular order.

1. **Safety is a top concern**
   The panelists universally agreed that enhancing safety for responders and citizens should be a key consideration in the development of NG9-1-1. Priority should be given to developing data, applications and capabilities that enhance the ability of emergency responders to operate safely, as well as their ability to carry out their missions to enhance public safety.

2. **Response-related information should be prioritized**
   Although it is anticipated that further discussion and formal processes will be necessary to prioritize the data that is communicated to field responders via the NG9-1-1 system, the panels' initial discussions suggest that a high priority should be placed on data and capabilities that relate to *response*—that is, getting the right responders to the correct location in the least amount of time appropriate for the situation. (For example, knowing as early as possible that a car crash involves multiple victims will allow additional ambulances to be dispatched sooner, rather than waiting for an assessment from the first-arriving emergency responders.)

3. **Overload should be avoided**
   The panelists noted the importance of filtering data and delivering necessary information at a time and in a manner that avoids "information overload" for responders. Unnecessary information could complicate or delay decision-making. Great care should be taken to avoid creating distractions for any responder driving a vehicle.

4. **Interoperability is a key consideration**
   All four panels noted the importance of interoperability, and several panelists suggested that NG9-1-1 carries the potential to introduce complexity in interoperable communications. The panel discussions also revealed the critical importance of creating *cultural* interoperability, to allow agencies to benefit from the technical interoperability and information-sharing that NG9-1-1 is expected to facilitate, particularly among different disciplines.

5. **Importance of uniform standards underscored**
   Panelists firmly underscore the importance of NG9-1-1 technical standards and open architecture protocols developed in parallel with a national NG9-1-1 deployment plan. NG9-1-1 Standards and Protocols should be developed through a process that ensures broad inclusive input, and through an ANSI-accredited organization, to ensure national and international compatibility and interoperability.

6. **NG9-1-1 should be considered a matter of national importance for emergency responder groups**
   All four of the panels reported that to date there has been little publicized national activity within their professional disciplines related to NG9-1-1. A number of the panelists were aware of NG9-1-1 progress within technical organizations such as APCO and NENA, and several were aware of progress on state migration plans and/or local initiatives. Generally, however, they were not aware of any formal, national-level efforts related to NG9-1-1 within the stakeholder organizations they represent.

7. **Rural agencies' needs must be considered**

The panelists noted that NG9-1-1 may offer significant potential benefits to residents and emergency responders in rural areas, where emergency responders typically operate with fewer resources, limited personnel, extended response times, greater distances to hospitals, and other special challenges. It is essential for the needs of rural communities to be taken into account as NG9-1-1 is developed.

8. **Particular consideration must be paid to the needs of people with hearing disabilities**

The panelists observed that people with hearing disabilities have been enthusiastic adopters of text messaging, instant messaging, sign language-compatible video chat, and related technologies for their daily personal and business communications. These newer enabling technologies are typically not compatible with the current 9-1-1 system, and callers using them must rely on an intermediary to contact help in an emergency. Noting the potential for callers to connect to emergency services (including the PSAP and beyond) using these technologies via NG9-1-1, the panelists recommended that such concerns be given particular consideration, and technologies that enable people with hearing disabilities to contact emergency responders are referenced throughout this report.

9. **Stakeholder education is viewed as essential**

The impression of all four panels is that without concerted education/outreach efforts directed at their professions, NG9-1-1 will likely continue to be viewed narrowly by many in their professions, as a primarily technical topic, with a perceived scope that begins with callers and ends at the public safety answering point (PSAP). To build support for NG9-1-1 within law enforcement, fire-rescue, EMS and transportation operations, it is critical to build awareness and understanding of what NG9-1-1 is and the benefits and capabilities it can bring to field-level responders, management, partner agencies, researchers, stakeholder groups and other entities. The panelists generally agreed that such education/outreach efforts should begin as soon as possible. Once emergency responders and their stakeholder groups more fully understand the potential of NG9-1-1 and its relevance to their respective missions, the panelists expressed confidence that support and interest will be strong.

10. **A clear process for future collaboration is likely to build support and buy-in from stakeholder groups**

Stakeholder groups participating in the What's Next Forum have expressed, through their designated representatives, a commitment to ongoing participation in collaborative steps as NG9-1-1 is developed. It is the hope of the panelists that this commitment will be reciprocated by a lead federal agency in organizing and hosting meetings of emergency responder stakeholders over the next phase of collaboration.

11. **Emergency responder agencies will likely require assistance with costs**

The What's Next Forum panelists universally expressed the opinion that emergency responder agencies are extremely concerned about the costs associated with technology, training and other expenses of transitioning to and operating in an NG9-1-1 environment. Nationwide, emergency responder agencies are widely said to be facing serious financial difficulties already. The panelists observed that agencies typically feel unable to pay any of the costs of transitioning to and operating in an NG9-1-1 environment on their own, even without knowing what those costs might be.

4. Desired Capabilities and Data Points

Each of the four panels developed an initial list of capabilities and data points, either expected to be available as part of the NG9-1-1 system or made possible via applications or hardware that connect to the system (examples: dynamic mapping with location of all responder units and real-time traffic/road conditions information; two-way live video capabilities; text messaging capability; vehicle telematics data; ability to receive real-time data from "smart building" or roadway sensors; and many others). Not all of the panels were able to prioritize these lists.

The lists, presented within each discipline's section of this report, represent the consensus for each of the panels. It is essential to note that these lists should be viewed as preliminary in nature, and that it was beyond the scope of the What's Next Forum to create an exhaustive or well-vetted list of desired capabilities. These lists are intended to be used as a starting point in a subsequent collaborative process that further clarifies the needs of first responder stakeholders. In that process, it is anticipated that formal criteria will be developed for completing and prioritizing these lists (e.g., expected use and benefits, considerations about cost and feasibility, etc.).

Finally, from a broader national perspective, the participating disciplines recognize and acknowledge the U.S. Department of Transportation's *Connected Vehicle Program* and its ongoing research and development efforts. The development of a fully connected transportation system that makes the most of multi-modal, transformational applications is expected to employ combinations of well-defined technologies, interfaces and processes. These will ensure safe, stable, interoperable and reliable system operations that minimize risk and maximize travel safety and public safety opportunities, including the unique needs of emergency responder risk and emergency vehicle safety. While these and related Vehicle to Vehicle (V2V) and Vehicle to Infrastructure (V2I) programs can be expected to interface with NG9-1-1 systems, this report has not attempted to define or address these interfaces.

5.   Note on Recurring Themes in This Document

Several themes appear in multiple sections of this document. This redundancy is a reflection of the significance of those themes and how they relate to NG9-1-1. Themes may appear in the following sections and contexts:

In the **Background** sections, themes are presented in the context of issues or important topics that occupy the attention of the emergency responder community. These are relevant to the Forum because they provide a view of the context in which NG9-1-1 development and rollout will occur. Themes presented in the Background section may, or may not, have direct application to NG9-1-1, but they do have significant potential to occupy the attention of leaders in the emergency responder professions (both nationally and locally), possibly to the detriment of NG9-1-1 initiatives. No conclusions are drawn in this section.

In the **Working Consensus Points** sections, concepts are presented in terms of their specific relevance to NG9-1-1, with the idea that each of them must be considered from the beginning of the NG9-1-1 process, and regularly throughout it.

In the **Potential Obstacles** sections, concepts are presented in terms of their potential to hinder NG9-1-1 development or adoption, or, in the case of cultural issues, to reduce support for it.

In the **Sample Scenarios** sections, concepts are presented in a practical sense, to help readers understand how a particular issue could be addressed through NG9-1-1.

6. About the Transportation Safety Advancement Group

The Transportation Safety Advancement Group (TSAG) is a multidisciplinary assembly of professionals sharing a common interest in promoting technology for public safety. Members represent emergency response and public safety domains including fire and rescue, emergency communications, emergency medical services, law enforcement, transportation operations, emergency management, technology and telematics, and academic and research.

TSAG serves as a forum for the review of technologies for the emergency response interests in transportation-related public safety and provides input to the USDOT, ITS Joint Program Office. TSAG volunteer members are dedicated to enhancing both traveler and responder safety on the nation's transportation networks through the application of advanced technologies in emergency communications and response, and the promotion of interdisciplinary and interagency coordination. www.tsag-its.org.

7. Contact Information

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Law Enforcement Panel Report

8.   About This Section

This section encapsulates the findings and opinions of the Law Enforcement Emergency Response Group, as expressed during the Forum and in subsequent group discussions via telephone between October 2010 and January 2011.

A.   Law Enforcement Group Description

The Law Enforcement ERG comprised four participants plus a facilitator, an NG9-1-1 technical advisor, and an additional TSAG public safety advisor. The Law Enforcement ERG focused on considerations for NG9-1-1 in law enforcement's three-fold role as day-to-day service providers, emergency responders, and criminal investigators.

Panel members included:

> Sgt. Dan Dytchkowskyj, Facilitator
> > Erie County (NY) Sheriff's Office
> > *National Sheriffs Association*

> Deputy Chief Eddie Reyes
> > Alexandria (VA) Police Dept.
> > *International Association of Chiefs of Police*

> Mathew Jackson
> > Oklahoma County (OK) Sheriff's Office
> > *National Sheriffs Association*

> Dan Householder
> > Jefferson County (CO) Sheriff's Office
> > *National Sheriffs Association*

> Tom Martin
> > I-95 Corridor Coalition

> Nancy Pollock (9-1-1 Advisor)
> > APCO International

> Rick Comerford (Public Safety Advisor)
> > Transportation Safety Advancement Group

B. Law Enforcement's Actions to Date on NG9-1-1

The panel members were not aware of any formal positions or policies on NG9-1-1, either put forth or under development, by major associations representing the law enforcement profession. They further observed that NG9-1-1 has not noticeably emerged as a topic of discussion at an informal level.

The panel reports that the International Association of Chiefs of Police (IACP) Communications & Technology Committee would be a likely body to take up the topic of Next Generation 9-1-1 within law enforcement. The panel's perception is that because the work that has been done to date has been technical in nature, it has taken place primarily within APCO and NENA. The panel is not aware of any efforts to date that have addressed the operational needs and priorities of the law enforcement community for an NG9-1-1 system.

9.   Law Enforcement Emergency Response Group: Major Backdrop Issues

A. Introduction

Like other emergency responder groups, much of the law enforcement community's attention and energy are consumed by major issues of the day. These issues are anticipated to have either direct or indirect impact on how NG9-1-1 is perceived by law enforcement nationwide, and could potentially influence support for it. The issues are presented briefly here for context only, and in no implied order of priority. There are undoubtedly additional issues that occupy the attention of law enforcement on a regional or local level, and depending on the priority of these issues for a particular agency, support for NG9-1-1 could potentially be influenced by how NG9-1-1 impacts or addresses them.

B. Funding

Law enforcement, like other public services, has come under substantial financial pressure in recent years, and faces growing responsibilities with more limited personnel. Although the degree of severity varies, this is particularly true at the municipal level, as many cities nationwide struggle with decreased tax revenues. As a result, many chiefs' and departments' priorities are focused on fulfilling their mission despite limited resources. According to figures from the Police Executive Research Forum, law enforcement budgets declined an average of 7 percent in 2010.[1]

C. Officer Safety

In 2010, according to preliminary figures from the National Law Enforcement Officers Memorial Fund, there were 162 line-of-duty deaths.[2] As in years past, traffic-related fatalities were the leading cause of death, accounting for 43 percent of deaths in 2010, according to the same source.[3] Figures from the Department of Justice show that more than 57,000 police officers are assaulted every year in the U.S.[4]

Officer safety remains a high-profile concern among rank and file, department leaders, elected officials and the public. Many decisions regarding training, equipment, procedures and policies are made in consideration of their potential affect on officer safety.

D. Changing Nature of Police Work

The environment in which law enforcement agencies operate has evolved substantially over recent years. Security, terrorism and cybercrime are among the more high-profile concerns that have emerged relatively recently. The proliferation of security cameras; dashboard cameras; members of the public using digital cameras and video-capable cell phones; blogs and video-sharing websites also put police operations in the public light on a scale not seen before. (See: "Keeping Up With Technology," below.)

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[1] Police Executive Research Forum: "Critical Issues in Policing Series: Is the Economic Downturn Fundamentally Changing How We Police?" December 2010. http://policeforum.org/library/critical-issues-in-policing-series/Econdownturnaffectpolicing12.10.pdf

[2] National Law Enforcement Officers Memorial Fund: "Law Enforcement Officer Deaths: Preliminary 2010 Report." http://www.nleomf.org/assets/pdfs/reports/2010_Law_Enforcement_Fatalities_Report.pdf

[3] Ibid.

[4] U.S. Department of Justice – Federal Bureau of Investigation: "Law Enforcement Officers Killed and Assaulted 2009" (Uniform Crime Report). http://www2.fbi.gov/ucr/killed/2009/documents/assaults.pdf, http://www2.fbi.gov/ucr/killed/2009/data/table_67.html

E. Keeping Up With Technology

Recent years have seen many technological innovations related to law enforcement, from records management systems to DNA capabilities to automatic license-plate recognition technology and more. Even dash cams and in-vehicle computers—now relatively commonplace—were much rarer just a few years ago. Generally speaking, however, law enforcement lags behind the public in adopting new technology. Adoption is typically slowed by such factors as:

- Prioritization of funding
- Training considerations
- Assessing appropriateness/testing
- Incorporation into current systems
- Reliance on third-party software and hardware providers
- Due diligence/procurement issues
- Limited internal specialty knowledge
- Need to modify products/solutions for law enforcement use

F. Interoperability

The terror attacks of September 11, 2001, highlighted the need for public safety agencies of all types to have compatible systems for communicating and working with each other. 9/11 also elevated the issue of interoperability to the national level. Across the different types of emergency services, the word *interoperability* is not always well defined or used consistently. Its meaning can be as narrow as describing voice radio systems that are capable of talking with each other, or as broad as having processes, policies and technology that allow multiple agencies to work together seamlessly. Although achieving interoperability requires overcoming resistance to change, it is widely viewed as a desirable goal worth pursuing, and it has been the subject of much effort within the law enforcement community.

10.   Working Consensus Points

Introduction

The working consensus points outlined in this section represent shared considerations for law enforcement agencies that emerged, often repeatedly, during the Forum and subsequent panel discussions. This list is intended, possibly after further refinement/development in future collaborative steps, to form a foundation for building operational requirements, followed by technical requirements.

It is anticipated that these points will continue to come up, either directly or indirectly, during future NG9-1-1 efforts, and again when individual agencies begin to think about implementing NG9-1-1 technologies. Therefore, it is essential to take them into account at every step of the process if buy-in and support for NG9-1-1 are to be obtained from the law enforcement community.

It is not the expectation of the panel that any of the issues listed in this section will have to be resolved before further discussion or progress can be made on NG9-1-1. Rather, the panel's recommendation is that each of these points must be taken into careful consideration as the law enforcement community moves forward with NG9-1-1. In other words, these points are the major principles that should guide further discussion and development.

The order in which the points are presented here is not intended to imply priority.

A. Funding

The panel anticipates that the expense associated with new NG9-1-1 equipment, training, software, consulting and related costs will be beyond the abilities of the typical law enforcement agency to shoulder. This is particularly important to law enforcement (relative to other responder groups) because the majority of PSAPs nationwide are operated by law enforcement. The issue is compounded by the outdated funding model for 9-1-1, which was based on landline phones, and further complicated in states where dedicated 9-1-1 levies are diverted to other uses. The resulting cost gap, even if not yet quantified, is almost certainly greater than law enforcement agencies—many of which are facing unprecedented economic challenges of their own—can fill.

A 20-year cost projection by the National E9-1-1 Implementation Coordination Office projected that post-transition costs resulting from NG9-1-1 implementation, regardless of deployment strategy over the 20-year period, fall within the cost range of continuing with current circuit-switched 9-1-1 systems.[5] However, the panelists observe that these projections have not been widely publicized in the law enforcement community, and many agencies are likely unaware of them.

While some law enforcement agencies may welcome the opportunity to save or share costs through PSAP consolidation (and there are examples of successful consolidations already), the panel anticipates that for many agencies, any potential cost savings associated with consolidation would be outweighed by the benefits from local control. In other circumstances, consolidation is simply not achievable or desirable.

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[5] National E9-1-1 Implementation Coordination Office. "A National Plan for Migrating to IP-Enabled 9-1-1 Systems," September 2009. http://www.911.gov/pdf/National_NG911_Migration_Plan_FINAL.pdf

Therefore, in order to build the broadest possible support for NG9-1-1 in the law enforcement community, the panel recommends that funding assistance not be conditioned on agencies' willingness to consolidate.

B. Officer Safety

There's little question that NG9-1-1 technologies present a multitude of opportunities to significantly enhance law enforcement officer safety. Indeed, many of the examples of technology raised in the What's Next Forum and elsewhere would either directly or indirectly benefit officer safety.

Despite this fact, the newness of NG9-1-1 and the existence of other daily priorities conspire to leave many individual officers and agencies unaware of the potential for NG9-1-1 technologies to enhance officer safety.

The panelists observed that the connection between NG9-1-1 and improved officer safety has the potential to transcend other issues and, in many cases, transform the perception of NG9-1-1 from a specialized, technology-focused issue that centers around PSAPs to a larger issue of critical importance for law enforcement as a whole.

It is also important to note that NG9-1-1 can have unintended consequences, and its benefits must be weighed against possible increased risk—for example, delivering additional information to a patrol car's computer could cause distraction and increase the chance of a crash. (In this example, technology must support department administrators' ability to set policy and control how much information is delivered, to whom, and when).

With so much to gain from incorporating officer safety into NG9-1-1 development, the panelists recommend that officer safety be taken into consideration as a regular checkpoint throughout the process for developing NG9-1-1 technologies and policy.

C. Rural/Underserved Communities

The panel members noted that as 9-1-1 technologies have advanced over the years, rural and underserved communities have on several occasions been left behind. The panelists recommend that special attention be paid to the needs of these communities and the law enforcement agencies that serve them.

It is particularly worth noting that residents of rural areas and rural law enforcement agencies alike could have the most to gain from NG9-1-1 technologies. This is because these areas typically have significantly longer response times than urban areas, and law enforcement officers there are much more likely to need to handle situations on their own (and thus would benefit from more information). Officers working in rural communities are also more likely to interact with officers from other agencies (for example, sheriff's deputies receiving mutual aid from a neighboring county or from the state police), driving the need for enhanced interoperability and real-time information exchange.

The panelists noted that approximately 21 percent of the U.S. population lives in rural areas, per U.S. Census Bureau figures. Without a conscious effort to consider the needs of these citizens (and the law enforcement agencies that serve them) during every step of the development of a Next Generation 9-1-1 system, there is increased risk of being left behind again.

D. Standards and Interoperability

The panel members agreed that standards and interoperability are among the most important considerations for a Next Generation 9-1-1 environment. Standards need to be defined in advance of development to ensure seamless interface with legacy systems and to transfer data to other PSAPs. "Interoperability" is a multifaceted concept, with different levels of meaning even within a discipline such as law enforcement. It is often applied in a narrow sense, describing the ability of radio systems to communicate with each other, either within an agency or between different agencies. As a larger issue, interoperability suggests a state in which law enforcement agencies are capable of communicating with and working with departments in neighboring jurisdictions and with outside agencies such as fire, EMS, public works, towing, hospitals, transportation, state and federal agencies, etc.

The principles of interoperability apply in both day-to-day operations and large-scale or high-profile events such as disasters, incidents of terrorism, disease outbreaks, civil unrest and the like.

In some uses, *operational interoperability* suggests that all systems, processes, policies and personnel are capable of working in sync, both internally and with other agencies, while *technical interoperability* suggests, at a minimum, voice and data communications capability in real time.

The panel members supported the need for consensus-based, open-source data standards as critical to achieving interoperability. In their current state, law enforcement data systems are typically based on proprietary standards developed by commercial vendors. As a result, one county's PSAP often cannot transfer caller data or other critical information to a neighboring county if, for example, mutual aid is needed, or if it is determined that the call is actually coming from the neighboring county. While considerable effort has been expended addressing the issue of PSAP-to-PSAP data exchange, the need to exchange data with other, non-law-enforcement agencies, such as fire, EMS, public works, etc., is also critical in developing NG9-1-1.

E. Properly Managing Information & Avoiding Overload

NG9-1-1 presents the likelihood of increased information flowing to field responders. In law enforcement, this typically involves a scenario where information is delivered wirelessly to a mobile computer installed in a police car; however, information could flow to any device, including handheld devices carried by officers on foot or responding via aircraft, motorcycle, bicycle, Segway-type unit, or other mode. Regardless of the officer's mode of transport or type of device through which the information is delivered, the panelists stressed the critical importance of limiting distractions that could increase the risk of a crash or otherwise endanger the officer(s), other responders, or the public.

Best practices for "information management" call for determining what data is to be sent, when, and to whom (proper staging of information), and the NG9-1-1 system should support this as an agency-level decision.

Equally important, particularly for law enforcement agencies that operate or oversee PSAPs, is the need to properly manage information flow and avoid overload in the PSAP itself. Call-takers who are overwhelmed with information, or who lack direction or training on prioritizing data or making decisions when different data sources conflict, may require assistance from technology to "make sense of the data."

Important note: It is anticipated that NG9-1-1 will lower barriers to communication, possibly leading to a dramatic increase in the volume of incoming data. (This is because the ease of sending a text or e-mail, together with the perception of anonymity, could make it more likely that people will use 9-1-1.) At the same time, this increase in data volume could come with a corresponding decrease in the *reliability or completeness* of that data, especially if it comes from members of the public. The combination of these factors could present a considerable burden for law enforcement agencies that oversee PSAPs. Currently, it is not uncommon for PSAPs to receive multiple voice calls reporting the same incident (for example, a car crash), and agencies typically have established protocols for querying callers, confirming that the incident being reported is the same one, deciding among conflicting data, and clearing the calls as quickly as possible. The potential for vastly increased reports coming in via text messages, e-mails and other methods raises issues such as whether someone at the PSAP must read every message, respond to the message, verify its source and the information included, caller the sender by phone, etc.

To prevent law enforcement and PSAPs from being paralyzed by information overload, technical solutions will be necessary to help analyze, route, prioritize, confirm, and otherwise act on incoming data. The law enforcement community would also benefit from a collaborative effort to draft policies and sample standard operating procedures that pertain to the above.

Additional consideration needs to be given to the evidentiary value NG9-1-1 data will eventually attain. One possible consideration is additional workload due to evidence collection and storage of photos and/or videos sent to a PSAP. This will inevitably require PSAP personnel to dedicate more full-time equivalent (FTE) time to evidence collection. Additional costs should also be anticipated to support hardware (such as CD or DVD storage for evidence collected via the PSAP) as well as personnel and space requirements associated with storage of this data in evidence vaults.

F. Evidentiary & Investigative Concerns

As a profession, law enforcement has more complex requirements than other emergency response groups when it comes to capturing, using, storing and sharing data. These requirements stem from law enforcement's role in the criminal and civil justice systems, where the integrity of evidence must be safeguarded.

Policies, procedures and mechanisms for collecting, storing, sharing and releasing data are well established for radio voice and data communications used by law enforcement, as well as 9-1-1 audio tapes. These policies, procedures and mechanisms will need to be significantly expanded to accommodate not only the anticipated increased volume of data that can come from NG9-1-1, but also from the increased complexity of that data.

The panel anticipated that for many law enforcement agencies, the possibility of sharing data with other (non law-enforcement) responder groups may raise concerns related to privacy, preservation of evidence, the potential for unauthorized or unwanted access, the possibility of hampering investigations or other police activities, and "need to know" issues.

Other concerns related to evidence and investigations included: Privacy issues subject to state and federal laws; concerns of what is allowable to capture and store; concerns about medical data; and concerns related to Freedom of Information Act (FOIA) requests.

11.   Potential Obstacles to NG9-1-1 in Law Enforcement

The Forum panelists were asked to identify potential factors that could impede implementation or support for NG9-1-1 in the law enforcement community. Those factors are presented here in no particular order of importance.

A.   Culture & Tradition

The panelists observed that law enforcement is by design a culture of consistency, order and rules. It also has a long tradition in the United States, and the vast majority of senior leadership in police departments is made up of individuals who have risen through the ranks of their organization and who do not typically bring in outside knowledge or practices from other fields. This may translate into difficulty in introducing change. Furthermore, leaders typically do not come from deep technological backgrounds.

B.   Lack of Public Demand

The panelists noted that there has been very little public demand for NG9-1-1 services (such as the ability to send text messages to 9-1-1). Although the issue appears periodically in the media following such events as the Virginia Tech shootings, neither national law enforcement organizations nor local agencies have come under substantial pressure. One exception involves advocates for people with hearing disabilities, many of whom rely on text messaging and related technologies for daily communications and emergencies alike.

C.   Turf Wars

The panel members observed that many law enforcement agencies operate in geographic overlays or in close proximity to other agencies. This has, in numerous instances, resulted in adversarial relationships. Agencies have come under additional pressure in the current financial climate, and there have been anecdotal reports of departments "jumping" calls in pursuit of statistics that can be used to justify budgets.

Additional territorial factors are at work in many PSAPs run by law enforcement, where officials can be unwilling to give up local control, even if doing so brings benefits from sharing resources. Panel members recognized that more and more PSAPs are being combined into regional communications centers and morphing into stand-alone agencies. This has the potential to lessen territorial and control issues; however, it could complicate the evidence collection and storage issues.

D.   Personnel Issues

The panelists observed that law enforcement hiring practices did not seek out technical skill sets, and people with high-demand technical skills can often command much higher salaries in the private sector. Both of these factors also affect hiring in PSAPs, many of which are run by law enforcement agencies. The panelists pointed out that a significant investment in training and potential changes to recruiting, screening and hiring practices, as well as identifying new desired skill sets related to changes how officers do their jobs—will be necessary to avoid impeding implementation of NG9-1-1.

E. CAD/RMS Dissimilarities

Law enforcement agencies using Computer Aided Dispatch (CAD) and Records Management Systems (RMS) typically depend on commercial vendors whose code and standards are proprietary. This makes interoperability challenging. The panelists offered the opinion that open standards would receive strong support from agencies seeking parity in an NG9-1-1 environment.

F. Limited Technical Expertise/Guidance

Many agencies reportedly do not feel that they have the depth of expertise to evaluate technologies and must depend on vendors for information to help make key purchasing decisions.

G. Potential for Information Overload

The panelists expressed serious concern about the potential for NG9-1-1 bringing a deluge of information to PSAP personnel, commanders and officers in the field. Negative implications range from simple overloading of resources to the possibility of a fatal crash caused by an officer distracted by incoming data while driving.

H. Data Backup and Severe Peak Issues

The panel members noted that law enforcement agencies are almost always required to keep secure records of activities and communications. The potential for exponentially larger volumes of information (even, for example, having to handle video files, which are many times larger physically than simple voice recordings or text-based data logs), and the need to store all of it in accordance with statute and agency policy, could present a significant burden.

I. Standardization and Adoption of Policies and Procedures

The panelists observed that an environment such as NG9-1-1, which allows *technical* interoperability, would also require compatibility in policies and procedures in order to avoid complications when sharing data or working together.

J. Need for Support From Elected Officials

The law enforcement panelists noted that NG9-1-1 implementation would go faster and more smoothly if local agencies received support from their local elected officials. For those officials to treat NG9-1-1 as a priority, the panelists observed that outreach and education will be necessary, to help foster understanding of NG9-1-1's technical concepts, operational considerations and benefits to citizens, law enforcement and other emergency responders at the local level.

12.   Desired Benefits and Example Scenarios

The Forum panelists found that using example scenarios of incidents and responses was helpful in focusing their discussion on real-world benefits for responders and the public, while avoiding some of the complexities related to technical and operational considerations. The scenarios also gave them common ground for discussion, despite their varying backgrounds and levels of technical knowledge.

Because they offer a way to "bring the issues to life" and spur discussion, the panelists strongly recommend using scenarios in future collaborative efforts to identify law enforcement needs for the NG9-1-1 system.

The following sample scenarios illustrate a small number of desired potential benefits attainable via NG9-1-1. They are neither exhaustive nor prioritized, nor are they presented with any consideration for cost or technical feasibility. In some cases, capabilities presented may already be available via existing technology, but it is anticipated that NG9-1-1 will either bring such capabilities as part of the infrastructure of the PSAP, or that implementing them will be made easier by NG9-1-1. Nevertheless, the scenarios are presented here to help advance understanding of the potential benefits of NG9-1-1, either direct or indirect, in real-world situations faced by law enforcement agencies.

A.   Desired Benefit: Increased Officer Safety

Sample Scenario #1:
A county sheriff's deputy in a solo car is dispatched to a reported bar fight. The responding deputy is able to see real-time, map-based location data for other deputies, as well as the location and ETA for state police units. The deputy bases his or her decisions for staging and approach to the scene on the availability and ETA of backup units.

Sample Scenario #2:
An officer performing a traffic stop is automatically provided with data showing that the car's registered owner is a suspected gang member with a violent history. The officer cannot see through the car's tinted windows, but telematics data reveals that there are four occupants in the vehicle. Based on this information, the officer treats the stop as a felony traffic stop per department protocol.

Sample Scenario #3:
An officer in a rural area experiences a sudden cardiac event and becomes unconscious. The officer's biometric sensor automatically alerts the comm. center, providing both vital signs data and location information to EMS responders and additional officers.

B.   Desired Benefit: Increased Public Safety

Sample Scenario #1:
Officers respond to an emergency call for help at a residence in a gated community. Unable to gain access through the gate, a responding officer uses VOIP telephony to contact the caller directly and gain access, avoiding a potentially life-threatening delay.

C. Desired Benefit: Better Transfer of Caller Information to the Field

Sample Scenario #1:

A mother reports her toddler missing at a public park. The NG9-1-1 system receives an MMS picture from the mother's cell-phone camera and transmits it to multiple responding units in the field, who subsequently use the image to locate the missing child.

D. Desired Benefit: Right Information to the Right People at the Right Time

Sample Scenario #1:

Officers are dispatched to a reported after-hours break-in at a light industrial facility. While responding, they receive information on a suspicious vehicle seen in the area by the reporting party. They are also notified that alarm sensors in the building are still detecting movement in the northwest corner of the second floor. After arriving at the scene, they are able to access a building schematic through a tie-in to the alarm company's database, as well as contact information for the manager of the business.

E. Desired Benefit: Improved Resource Management

Sample Scenario #1:

A 9-1-1 caller reports a disabled truck blocking a freeway off-ramp, with traffic backed up on the freeway. Using GPS data combined with DOT video from the scene and road sensor data, the 9-1-1 dispatcher quickly determines the location of the incident and severity of the backup. A specialized tow truck is dispatched and assigned a route to navigate through the backup. Because the incident is cleared quickly, fewer highway units are needed and for a significantly shorter period of time. The chance of a secondary crash is significantly reduced as well.

Sample Scenario #2:

A 9-1-1 caller reports a multi-vehicle crash with serious injuries and people trapped. Multiple police officers are dispatched for scene and traffic control. At the same time, fire and EMS units are dispatched, and an EMS helicopter and the trauma center are put on standby. The first-arriving patrol unit determines that the incident is actually a minor collision with no injuries, and the parties have left the scene. The officer simultaneously cancels all other responding units, allowing them to return to service, and also notifies the trauma center to stand down.

F. Desired Benefit: Improved Interoperability

Sample Scenario #1:

A gunman fires at students at an elementary school. Multiple agencies respond and their locations are plotted in a live GPS database. The senior law enforcement commander is able to view a real-time map overlay showing the location of every responding unit, including municipal police, deputies, SWAT personnel, FBI, aircraft, fire and EMS, and other responders.

G. Desired Benefit: Improved Evidence Capture & Investigations Capability

Sample Scenario #1:

A liquor store is robbed at gunpoint. The clerk uses his cell-phone video camera to record the robber's vehicle as it exits the parking lot, and subsequently forwards the video recording to the 9-1-1 center, where it is shared in real-time with responding units. The recording is used by investigators to help identify the suspect and later is used as evidence in court.

Sample Scenario #2:

A hit-and-run driver causes a fatal crash. The incident is reported by multiple 9-1-1 callers; however, witnesses at the scene are unable to provide a description of the hit-and-run vehicle. Using GPS data and time-stamping functionality, the investigating traffic officer uses callback capabilities to contact all 9-1-1 callers from the area surrounding the crash at time of the incident, including abandoned calls. Using this canvassing approach, she locates several witnesses who describe the suspect and his vehicle, leading to an arrest and successful prosecution.

13.   Data Points/Capabilities Considered

In the example incident/response scenarios presented in "Desired Benefits and Example Scenarios" (above) and elsewhere during its discussions of the potential for NG9-1-1 systems, the Forum panelists referenced various data points, such as telematics, mapping, and so on. It is important to note that these data points were referenced without the benefit of standard definitions (so, for example, "mapping" could mean pinpoint location on a map, or X/Y coordinates, live traffic, data overlays, or other possibilities). It is also important to note that the panelists are not primarily technical experts. There may also be some blurring between "data elements" per se and capabilities/functionality.

The following items emerged during the panel discussions and were noted as "important to have." Prioritization represents the consensus of the panel. No implication is made about the completeness of this list; it should be considered a starting point for law enforcement involvement in future development of priorities for data-sharing with responders.

A.   High Priority:

- Mapping (good location, auto display)
- AVL data for all public responders, with sharing
- Video
- Photos
- Telephony capability to police vehicle (VoIP to apparatus)
- Better triage/availability of more resources
- Air bag deployment and location for squad car

B.   Medium Priority:

- Real-time plotting/tracking of Project Lifesaver/special needs people
- Real-time updates for data, e.g., license plate recognition
- Telematics data (vehicle speed, airbags deployed, seat belt data, number of passengers in vehicle, etc)
- Real-time plotting of "Shot Spotter" information (gunshot plotting system)

C.   Low Priority:

- Voice/video feed from squad car back to comm. center
- Biometric officer data that is sent back to comm. center (when, for example, officer can't touch the button on the radio to request help, particularly if unconscious or incapacitated)
- Contact info for callers requesting help (tie into emergency contact info – e.g., through ICE badge, cell phone number, license plate, etc.)

14.   Process

The Panel's final task was to recommend a process for moving forward, and to suggest groups representing the law enforcement community whose participation could contribute to ongoing collaborative efforts.

A.   Suggested Stakeholders

The panelists recommend, at a minimum, that invitations to future collaborative functions be extended to the same national stakeholder groups that were initially invited to participate in the What's Next Forum. They further recommend that technical experts again be made available in future collaborative functions, as a resource to assist stakeholders who have varying backgrounds and degrees of familiarity with technology.

B.   Venue Considerations

The panelists recognize the value and efficiency of in-person meetings, which help allow as exclusive focus as possible on the group goal. The panelists all felt that a setting similar to the facilities used for the What's Next Forum (University of California Washington Center) would be appropriate.

C.   Glossary

The panelists recommend creating a "living," growing glossary document that defines concepts, acronyms and terms used throughout any future collaborative steps. The intent of such a glossary would not be to define terms or technical concepts in an official sense, but simply to clarify understanding and help prevent misinterpretation.

D.   Usefulness of Scenario-Based Discussion

Earlier in this document, the Forum panelists noted that using example scenarios of incidents and responses was helpful in focusing their discussion on real-world benefits for responders and the public, while avoiding some of the complexities related to technical and operational considerations. The scenarios also gave them common ground for discussion, despite their varying backgrounds and levels of technical knowledge.

For this reason, the panelists recommend that sample scenarios be explored in future collaborative efforts, perhaps including some of the scenarios presented in this document as a foundation, followed by development and discussion of additional scenarios.

The panelists also recommend considering the "Working Consensus Points" outlined in Section III of this document as a basis for organizing future collaborative efforts.

E.   Importance of Clarifying the Distinction Between NG9-1-1 System and Applications

It became apparent in the What's Next Forum and subsequent conference calls that many of the panelists lack the technical expertise to draw a distinction between capabilities that are *part of the NG9-1-1 system* and capabilities/functionality that come from *applications that run on the system or plug into it.* This seeming confusion may actually be valuable, because it shows that the panelists did not limit their thinking

to PSAP-only topics or assume that NG9-1-1 would be limited to handling 9-1-1 calls. However, to make future collaborative efforts as useful as possible for subsequently drawing business rules and technical requirements, it is important to brief participating stakeholders on the distinction between the NG9-1-1/ESINet backbone and the applications that it facilitates.

Fire-Rescue Panel Report

15.   About this Section

This section encapsulates the findings and opinions of the Fire-Rescue Emergency Response Group, as expressed during the Forum and in subsequent group discussions via telephone between October 2010 and January 2011.

A.   Fire-Rescue Group Description

The Fire-Rescue ERG comprised five participants plus a facilitator, an NG9-1-1 technical advisor, and an additional TSAG public safety advisor.

Panel members included:

Chief Mike Brown, Facilitator
>   Washington State Association of Fire Chiefs
>   *International Association of Fire Chiefs*

T.J. Nedrow
>   Washington Department of Transportation
>   *National Volunteer Fire Council*

Scott Potter
>   Thomaston (CT) Volunteer Fire Department
>   *National Volunteer Fire Council*

Chief Bill McCammon
>   East Bay (CA) Regional Communication System
>   *International Association of Fire Chiefs*

Ken Holland
>   Fire Service Specialist
>   *National Fire Protection Association*

Mike Manning
>   Emergency Operations Analyst, Fire & EMS Operations/GIS
>   *International Association of Fire Fighters*

Larry Matkaitis
>   Office of the Illinois State Fire Marshal
>   *National Association of State Fire Marshals*

Skip Yeakel, TSAG/Public Safety Advisor
>   Volvo North America

Jim Goerke, NG9-1-1 Advisor
>   Texas 9-1-1 Alliance
>   *National Emergency Number Association (NENA)*

B. The Fire Service's Actions to Date on NG9-1-1

The panel members were not aware of any formal positions or policies on NG9-1-1, either put forth or under development, by major associations representing the fire service. They noted that NG9-1-1 has not emerged as a topic of discussion at an informal level.

Although committee work is under way in NFPA that relates to elements of NG9-1-1 (such as GIS), the panel is not aware of any specific efforts to date that have addressed the operational needs and priorities of the fire service for an NG9-1-1 system.

The panelists noted that there exist an unknown number of state and local initiatives (such as legislation or plans for implementation) that would complement the NG9-1-1 effort; these initiatives are in varying stages of development. The group recommends that future collaborative efforts include survey work to identify and catalog these initiatives.

Fire-Rescue Emergency Response Group: Major Backdrop Issues

Introduction

Like other emergency responder groups, much of the fire-rescue community's attention and energy are consumed by major issues of the day. These issues are anticipated to have either direct or indirect impact on how NG9-1-1 is perceived in the fire service nationwide, and could potentially influence support for it. The issues are presented briefly here for context only, and in no implied order of priority. There are undoubtedly additional issues that occupy the attention of fire departments on a regional or local level.

The panelists observed that at both the local level and national levels, there is probably very little knowledge in the fire service about the potential impact of NG9-1-1, or even its potential benefits. This knowledge deficit is likely the result of:

- Attention being consumed by other concerns

- Perceptions that 9-1-1 is not a "fire" issue (especially because the vast majority of primary PSAPs are under law enforcement control)

- A general lack of education and awareness efforts about NG9-1-1 directed toward the fire service

- Assumptions within the fire service (and likely among the public as well) that the current legacy 9-1-1 system works very well

A.   Responder Safety

Firefighters are exposed to a litany of occupational hazards, including (but not limited to) risk while responding to emergencies, risk of injury while operating at the scene of an emergency, risk of inhalation injury, risk of occupational-related illness (including long-term and/or cumulative effects) and others. While considerable progress has been made in developing standards, training and equipment that enhances firefighter safety, this issue still ranks among the top concerns in the fire service as a whole.

As an institution, the fire service has evolved noticeably over several hundred years of existence, with a greater focus on safe operations than ever before. Much of what the fire service has learned has come as the result of tragedies, which are a reminder of the dangerous nature of the work. Today, responder safety permeates virtually every aspect of the fire-rescue field, from recruitment to training, equipment to operations. The National Fire Protection Association has published extensive standards on safe operations, and states typically maintain their own safety standards as well, some of which exceed national standards.

B.   Funding

As municipalities nationwide struggle to maintain critical infrastructure and services despite the current economic recession, many of them have made financial cuts to public safety (which, according to a recent report from the International City & County Managers Association, typically represents about two-thirds of a city's budget). Many fire departments today are facing layoffs, station brownouts and across-the-board budget cuts at a level not experienced before. U.S. Fire Administration officials have estimated that once the recovery begins, it will take one to three years for cities to see signs of increasing revenue, with fire departments anticipated to experience a three- to five-year lag in making up budget shortfalls.

Anecdotal reports suggest that fire departments, seeking to preserve the most essential services, typically make the deepest cuts in the areas of public education and fire prevention.

In some cases, so-called "right-sizing" cuts in fire department readiness levels have led to downgraded ratings by the Insurance Services Office, Inc., (ISO), which creates risk ratings on which property insurance rates are based. According to a statement from the ISO, downgraded ratings have been based on reductions in firefighting personnel available to respond to calls; reductions in the number of responding fire apparatus; gaps in optimal deployment of apparatus; and deficiencies in firefighter-training programs.

C. Evolving Mission

Generally speaking, the mission of the fire service has evolved to a much broader scope than simply extinguishing fires, and indeed is described by some as an "all hazards" mission. Over the years, specialties such as emergency medical services (EMS), vehicle rescue, heavy rescue, swiftwater rescue, hazardous materials response, lifeguard services and others have been added, typically requiring specialized training and equipment. At the same time, the number of structure fires has decreased, both in raw numbers and as a percentage of responses (5% in 2009, according to NFPA statistics). The most common fire department response today involves medical aid (65%).

Fire departments also typically engage in public education efforts to prevent fires, reduce preventable injuries, prevent climate-related illness, encourage smoke detector use, teach CPR and AED use, increase proper use of car seats for children, prevent drownings, and related goals.

D. Response Times

NFPA 1710 defines a standard for the first-arriving unit responding to an emergency (one minute to receive the alarm plus four minutes of travel time, 90 percent of the time; NFPA 1221 allows for an additional minute to process and dispatch the call). Cities and other jurisdictions often draft their own response time requirements. Response times are one of the most high-profile ways in which a community can assess the performance of its fire department, even though the issue is complex and requires specialized knowledge.

Rural areas are covered by NFPA 1720, which does not have a specific response time requirement, but instead identifies deployment methodologies for rural areas.

Many fire departments use response times as one way to determine appropriate apparatus staffing levels and station locations, as part of an overall effort to balance the need for rapid response to emergencies with the need to use limited public resources (i.e., tax dollars) responsibly. In recent years, various technologies have been introduced that assist fire-service leaders in choosing deployment options and tracking response-time performance.

Public expectations are closely linked to response times. From the point of view of a person whose family member is experiencing a life-threatening emergency, no response time is "fast enough." Furthermore, because standards typically set forth percentage-based goals for compliance, the potential exists even in the best-performing fire departments for a delayed response to a high-profile emergency, and such cases typically receive significant media attention locally.

E. Interoperability

"Interoperability" is often applied in a narrow sense, based on its original meaning describing the ability of radio systems to communicate with each other. However, as a larger issue, interoperability suggests a state in which fire departments are capable of communicating and working with departments in neighboring jurisdictions and with non-fire responder agencies (such as law enforcement, ambulance services, public works, utilities, hospitals, transportation, state and federal agencies, etc.).

The principles of interoperability apply in both day-to-day operations and large-scale or high-risk events such as disasters, incidents of terrorism, disease outbreaks and the like. *Operational interoperability* suggests that all systems, processes, policies and personnel are capable of working in sync, both internally and with other agencies. *Technical interoperability* includes, at a minimum, voice and data communications capability in real time.

F. Differences Between Urban and Rural Fire Services

While the structure of fire departments varies nationwide, the single largest difference is seen between departments that serve large cities and departments that serve rural areas. Fire departments serving major metropolitan areas are primarily staffed by career firefighters who respond from stations 24 hours a day. Mid-sized communities with populations above 10,000 are typically served by a combination of volunteers and career personnel. Smaller, rural departments serving areas with populations less than 10,000 are typically staffed by either all volunteers or a combination of career and volunteer personnel; these responders may respond from full- or part-time stations or may respond from the workplace or home (or in combination). A limited number of for-profit agencies also exist.

According to the NFPA, the majority of fire departments in the United States are staffed by volunteers: Out of the nation's 1.2 million firefighters, 72% are volunteers and 28% are career firefighters. Of 30,170 fire departments nationwide, approximately 70% are staffed by volunteers, approximately 16% are mostly volunteers, approximately 6% are mostly career, and approximately 8% are fully career staffed.

16. Working Consensus Points

Introduction

The working consensus points outlined in this section represent shared considerations for fire-rescue stakeholders that emerged, often repeatedly, during the Forum and subsequent panel discussions. This list is intended, possibly after further refinement/development in future collaborative steps, to form a foundation for building standards

It is anticipated that these points will continue to come up, either directly or indirectly, during future NG9-1-1 efforts, and again when individual agencies begin to think about implementing NG9-1-1 technologies. Therefore, it is essential to take them into account at every step of the process if buy-in and support for NG9-1-1 are to be obtained from the fire-rescue community.

It is not the expectation of the panel that any of the issues listed in this section will have to be resolved before further discussion or progress can be made on NG9-1-1. Rather, the panel's recommendation is that each of these points must be taken into careful consideration as the fire-rescue community moves forward with NG9-1-1. In other words, these points are the major principles that should guide further discussion and development.

The order in which the points are presented here is not intended to imply priority.

A. Responder Safety

In recent years, many—perhaps the majority—of the technological advances that have been adopted by the fire service are related to improving responder safety. Examples include carbon-dioxide monitoring devices, improved personal protective equipment (PPE), power-lift EMS stretchers, traffic-control devices and reflective apparel, among others. Because the fire service has shown a willingness to adopt technologies that improve responder safety, the panelists believe that fire departments will be more likely to support NG9-1-1 implementation if they understand the potential safety-related benefits it brings. (See Section 18 of this report (page 39), for example scenarios showing how NG9-1-1 could improve fire-rescue responder safety.)

B. Funding

The panelists noted that although there is no established consensus in the fire service about NG9-1-1, the universal reaction seems to be one of concern about how fire departments will pay for costs associated with transitioning to and/or operating in an NG9-1-1 environment. This initial resistance is likely compounded by a general lack of understanding of NG9-1-1 and how it will affect the fire service. Education/outreach efforts may be beneficial in building support, particularly because of the unprecedented financial pressures being felt throughout the fire service today.

As noted elsewhere in this document, the vast majority of 9-1-1 calls to primary PSAPs currently are handled by law enforcement and regional authorities, not fire departments. With some exceptions, the role of a local fire department in 9-1-1 is typically limited to being a *recipient* of dispatch information. Because of this, the relatively small number of fire agencies that do operate 9-1-1 dispatch centers may be at risk of being overlooked in funding the transition to NG9-1-1. The panelists noted the critical importance of considering this issue in developing funding models.

C. Special Considerations for Rural Agencies

The panelists noted that NG9-1-1 solutions for fire services in rural settings need to be considered separately from solutions for urban settings. In urban settings, responders typically operate under a more consistent and predictable context (such as having round-the-clock staffing at stations and standardized equipment). In rural settings, responders are more likely to respond from home or work, sometimes in their personal vehicles, and are in many cases responsible for buying their own equipment. They may also work under mutual aid conditions more often than responders in urban settings. These factors may make sending the right information to responders in the field more difficult.

Rural areas typically have longer response times than urban areas, especially when multiple alarms are involved. They are also typically located farther from trauma centers and other specialized medical care, necessitating longer transport times. Because of these factors, possibly among others, both residents of rural areas and the fire-rescue agencies that serve them may actually have more to gain from NG9-1-1 than their counterparts in urban areas.

The panelists suggested that future NG9-1-1 collaborative efforts involving fire-rescue stakeholders make a special effort to focus on rural needs.

D. Agreement and Considered Process for Standards, Data Sets and Training

The fire service is supported by numerous standards-setting groups, most prominently NFPA. The standards process typically involves various committees. Work is under way on standards that may be related to NG9-1-1, such as GIS and data sharing, and other topics. The panelists noted that communication and/or involvement with these committees may be beneficial, and will likely be necessary at some point. The panelists specifically recommended that NG9-1-1 standards be developed through the ANSI process, regardless of which standards-making entity or entities are involved.

The panelists noted a general lack of uniformity in current call-taking standards for fire departments. Organizations such as the National Academies of Emergency Dispatch have developed protocols for handling fire, EMS and police calls, with an interrogation sequence and pre-arrival instructions for the caller. In addition, many departments maintain their own set of protocols. In an NG9-1-1 environment, with greater amounts of data and more variation in data, the panelists felt expanded protocols and potentially national standards will be necessary.

With these expansions comes the need for training and new specialization. See the following Paragraph, Personnel, and Paragraph E, Training (page 36), for more on this topic.

For more on this subject, see Section 20, Process, beginning on page 43.

E. Personnel

In an NG9-1-1 environment, new skills and greater specialization will be necessary, and in fact, because NG9-1-1 will facilitate the introduction of a steady stream of new applications and functionality, the need for new skills and specialization is likely be ongoing. This will likely require a new approach to recruiting, hiring and training new personnel, as well as delivering ongoing training to current personnel.

In many cases, dispatchers already serve in an environment that is highly stressful, with high turnover. The panelists noted the importance of recognizing the potential for NG9-1-1 to either exacerbate or alleviate these factors.

F. Interoperability

The panel members agreed that interoperability is among the most important considerations for a Next Generation 9-1-1 environment. "Interoperability" is a multifaceted concept, with different levels of meaning even within a discipline. It is often applied in a narrow sense, describing the ability of radio systems to communicate with each other, either within an agency or between different agencies. As a larger issue, interoperability suggests a state in which law enforcement agencies are capable of communicating with and working with departments in neighboring jurisdictions and with outside agencies such as fire, EMS, public works, towing, hospitals, transportation, state and federal agencies, etc.

The principles of interoperability apply in both day-to-day operations and large-scale or high-profile events such as disasters, incidents of terrorism, disease outbreaks, civil unrest and the like.

In some uses, *operational interoperability* suggests that all systems, processes, policies and personnel are capable of working in sync, both internally and with other agencies, while *technical interoperability* suggests, at a minimum, voice and data communications capability in real time.

The panel members supported the need for consensus-based, open-source data standards as critical to achieving interoperability. They also noted that, in addition to technical considerations, agencies must be willing to put in the work necessary to achieve operational interoperability with one another.

The panelists also noted the critical importance of considering the fire service's special need to have interoperability in an EMS environment. The majority of fire departments function either as first responders in a cooperative multi-agency EMS environment, working alongside a dedicated EMS organization, or perform both the first responder and transport functions themselves. Even in a non-EMS-specific context, the nature of the fire service's mission necessitates frequent interaction with EMS responders. As NG9-1-1 is developed, the side-by-side working relationship between fire and EMS agencies (whether fire-based or not) will require the highest possible degree of technical interoperability.

17.   Potential Obstacles to NG9-1-1 in Fire-Rescue

The Forum panelists were asked to identify potential factors that could impede implementation or support for NG9-1-1 in the fire-rescue community. Those factors are presented here in no particular order of importance. Additional obstacles may exist or arise that are not listed here.

A.   Information Overload

The panelists expressed concerns that NG9-1-1 carries the potential to exponentially increase the volume and complexity of data reaching responders, possibly slowing or complicating decisions and potentially causing distraction. They noted the importance of filters and policy-controlled systems to ensure safety and consistency, while getting responders the information they need.

B.   Confidentiality Issues

The panel members noted the importance of clear policy about what kind of personal information can be shared, when it can be shared, and with whom, and what safeguards need to be in place to protect personal information on the network.

C.   Getting Information to Rural Areas

The panelists observed that infrastructure necessary to support wireless services and broadband are more likely to be lacking in rural areas. The importance of this component of the NG9-1-1 system cannot be overstated.

D.   Public Expectations/Education

The panelists noted that educating the public about 9-1-1 has been difficult in the past, as evidenced by the level of misunderstanding and inappropriate use of 9-1-1. The issue is further complicated by the fact that many of the benefits of NG9-1-1 are technical in nature or require an understanding of PSAP operations (for example, the ability to stand up a virtual PSAP in a remote area). There may be value in conducting focused outreach within the fire service itself, to help increase understanding of the benefits of NG9-1-1 and build support for implementation, which can then be communicated to the public.

The panelists observed that lack of awareness of the legacy 9-1-1 system's limitations often also extends to elected officials, who may simply see a system that they believe is working well.

E.   Training

The panelists pointed out that NG9-1-1 would likely require additional training for dispatchers, call-takers and first responders so they can operate effectively and accurately in an environment that has higher data volumes and greater data variety/sophistication.

F.   Standards

As noted earlier in this document, the fire service is a standards-oriented institution. Because NG9-1-1 has the potential to significantly change the way fire departments operate, the fire service should anticipate that changes to standards will also be necessary.

Changes to Existing Fire Service Standards: NG9-1-1 will make new data available for use in training, operations and beyond, and the availability of this new data will undoubtedly necessitate modifications to existing standards, both to use the data effectively and to ensure continued smooth and safe operations.

Creation of New Fire Service Standards: NG9-1-1 will likely necessitate the creation of new standards, the need for which previously did not exist.

Greater Integration with Non-Fire Service Standards: NG9-1-1 will likely necessitate a greater degree of integration with other standards that cover multiple disciplines (examples include call routing, GIS, data formats, communication protocols, etc.). The panelists noted that collaboration between the organizations that set these standards and fire-service standards-setting bodies would be desirable.

The panelists noted that there currently is little clarity within the fire service about which standards-setting body or bodies would take the lead on NG9-1-1-related standards. Regardless of which organizations are involved, the panelists recommend that an ANSI-based standards-development process be followed.

The panelists also observed that standards for the architecture and operation of NG9-1-1 PSAPs are likely to come from standards-setting bodies covering law enforcement, as the majority of PSAPs fall under law enforcement jurisdiction. The panel noted the importance of fire service participation in developing standards that would cover PSAPs that fall under the jurisdiction of the fire service.

The panel members also noted that local departments may resist new national or state standards necessitated by NG9-1-1, as well as changes to existing standards. Having fire-service standards-setting bodies involved may lessen the likelihood and/or degree of resistance, but cannot be relied on to eliminate it entirely.

G. Additional Investments

The panelists noted that to realize the full benefits of NG9-1-1 would require additional investments in hardware (including mobile data terminals, handheld devices, communications hardware and the like), training, and personnel with the technical expertise to keep the system operating reliably and securely.

H. Culture

The panelists observed that the fire service's quasi-military structure, low turnover and tendency to promote from within have resulted in chiefs and other leaders who may be highly skilled in running a department, but whose focus and priorities are typically not related to technology or 9-1-1. There are notable exceptions to this trend. However, the panelists felt that for many chiefs, education is necessary to show them how NG9-1-1 can support the core mission of the fire service, thereby increasing local support.

I. Funding

As noted throughout this document, funding is a significant issue for the fire service nationwide, especially in the current economic climate. The panelists noted that money is tight in many fire departments, and local fire officials feel more pressure than ever to manage their resources well. Like other public entities, fire departments in many cities are facing increased scrutiny from elected officials, the media and the public, and there is a growing expectation that spending will be limited to essential items only. In this environment, extra attention is typically paid to "new" spending, and the panelists expressed concern that

NG9-1-1, while necessary, may be perceived as new spending, and may be difficult to justify in an environment of hiring freezes, station brownouts, reductions in prevention services, and a widespread perception of compromises in critical services.

The panelists noted that in the current economic climate, taxpayers want to know where money is coming from and where it goes. Although a limited number of exceptions exist, if fire chiefs do not see outside funding support for NG9-1-1-related expenses, the panelists felt that support for NG9-1-1 will likely be undermined in local departments. Therefore, the panelists felt that it is essential for fire departments to receive state or federal funding for NG9-1-1-related expenses.

Funding is a particular concern in underserved areas, where the legacy 9-1-1 surcharge model has left communities without Enhanced 9-1-1 (E9-1-1) services. This further illustrates the need for a state or federal solution.

J.   Concerns About Interoperability

As noted in the Background Issues section of this document, interoperability has been an important concern in the fire service, especially after September 11, 2001. Considerable progress has been made toward better interoperability *within* departments (internal interoperability), *among* different fire departments (interagency interoperability), and *between* fire departments and outside agencies (interdiscipline interoperability); however, the ability to interoperate is not consistent across the nation. Interoperability "deficits" exist in both *interoperable communications* and *interoperations;* both of these may involve equipment/systems, language/nomenclature, operating procedures, EMS protocols, policies, department structure, communications, and possibly other areas.

The panelists anticipate that NG9-1-1 will expose these interoperability deficits. It is not expected that these issues must be fully resolved prior to implementing NG9-1-1, but it must be acknowledged during development and planning phases that interoperability issues have the potential to complicate NG9-1-1 implementation, *and vice-versa*. All reasonable effort must be made to prevent such complications and minimize the potential negative impact on fire departments.

18.   Desired Benefits and Example Scenarios

The Forum panelists found that using example scenarios of incidents and responses was helpful in focusing their discussion on real-world benefits for responders and the public, while avoiding some of the complexities related to technical and operational considerations. The scenarios also gave them common ground for discussion, despite their varying backgrounds and levels of technical knowledge.

Because they offer a way to "bring the issues to life" and spur discussion, the panelists strongly recommend using scenarios in future collaborative efforts to identify fire-rescue needs for the NG9-1-1 system.

The following sample scenarios illustrate a small number of desired potential benefits attainable via NG9-1-1. They are neither exhaustive nor prioritized, nor are they presented with any consideration for cost or technical feasibility. In some cases, capabilities presented may already be available via existing technology, but it is anticipated that NG9-1-1 will either bring such capabilities as part of the infrastructure of the PSAP, or that implementing them will be made easier by NG9-1-1. Nevertheless, the scenarios are presented here to help advance understanding of the potential benefits of NG9-1-1, either direct or indirect, in real-world situations faced by fire-rescue organizations.

Note: The fire service plays an important role in the delivery of EMS in the U.S. To reduce overlap, the following scenarios focus on the non-EMS functions of the fire service. Desired benefits and sample scenarios related to the delivery of EMS appear in the EMS Section of this report.

A.   Desired Benefit: Increased Responder Safety

Sample Scenario #1:
A firefighter participating in a department training exercise experiences a heat-related emergency, which is detected by a bio-sensor. The training officer is notified electronically and the exercise is halted. EMS units are dispatched automatically to the training site and provided with vital-sign information from the stricken firefighter's bio-sensor.

Sample Scenario #2:
At the scene of a working structure fire, sensors in the building detect structural stress associated with imminent collapse. Firefighters withdraw from the building and continue fighting the fire from a safer position.

Sample Scenario #3:
Researchers investigating the long-term effects of possible exposure to occupational hazards among firefighters are able to tap into NG9-1-1 data to explore possible links between firefighter cancer and responses involving chemicals, certain types of fires, or even specific addresses or incidents, even years after the fact.

B.   Desired Benefit: Enhanced Ability to Protect Life & Property

Sample Scenario #1:
Integration with advanced roadway technology allows fire personnel to reach and clear a traffic incident more quickly, reducing backup and mitigating the risk of a secondary crash.

Sample Scenario #2:

"Smart building" technology provides fire responders with detailed information about the spread of a fire within an industrial building, as well as information about the contents of the structure. Schematics for the building are available to responders on a call-up basis, and the incident commander can share annotated/highlighted schematics in real-time with other responders.

Sample Scenario #3:

Vehicle telematics report a collision between a car and a tanker truck. Telematics data is provided to emergency responders, including the number of occupants of the car and truck, injury-prediction information, the exact location of the crash, the truck's payload, a prediction scale for spill potential, air-bag deployment, battery information for both vehicles, and other essential information. This data allows fire officials to assign appropriate resources, plan their response and approach to the scene, mitigate any possible material spills, and rescue and treat victims more efficiently and effectively.

C. Desired Benefit: Better Interoperability

Sample Scenario #1:

Fire apparatus responding to an incident continuously transmit their locations to a transportation operations system that automatically manipulates traffic flow to clear a path along the apparatus' route to the emergency scene. The transportation operations system provides real-time data back to the responding fire apparatus showing recommended routes and ETAs. All information is simultaneously shared with the PSAP and the incident commander, and control is available to individuals authorized by department policy to make changes to the response route.

Sample Scenario #2:

An elderly woman calls her son in a different city and tells him that there is a fire in her basement. The son tells her to leave the house and then calls his local 9-1-1. After the call-taker inputs the mother's address into her system, the caller and all associated data are automatically transferred to the PSAP in the mother's city.

Sample Scenario #3:

Firefighters respond to an overturned truck/chemical spill on a freeway. The incident commander is able to share live mapping, instructions and requests for resources with mutual-aid fire departments, EMS units, local and state police, and transportation operations officials via the NG9-1-1 backbone.

Sample Scenario #4:

During a blizzard, city fire officials and apparatus view real-time maps showing routes that have been plowed. Fire officials coordinate with the city's public works department to make sure that specified routes (e.g., near hospitals) are kept clear. Public works officials are able to view live fire and medical calls on a real-time map, and redirect GPS-enabled plows into position to clear or sand selected routes to minimize response times or facilitate ambulance transports from the scene of an emergency.

D. Desired Benefit: Improved Resource Management

Sample Scenario #1:

An individual calls 9-1-1 to report a leaking fire hydrant. The call is redirected, complete with the caller's data, to the city's 3-1-1 system, where the caller connects with city services.

Sample Scenario #2:

A caller reports a brush fire near her home. Multiple units and agencies are dispatched. The first-arriving unit quickly determines that there is no fire, and the caller's actual intention was to "teach a lesson" to some neighborhood boys who were playing with matches. Instead of using voice communications and involving multiple dispatch centers at different agencies, the first-arriving unit simultaneously cancels all other responding units electronically, allowing them to return to service.

Sample Scenario #3:

An incident commander in charge of a large-scale incident is able to view all resources potentially at his or her disposal, complete with real-time geo-location information, across multiple agencies. The incident commander also has the ability to query specific assets for availability.

E. Desired Benefit: Improved Response Times

Sample Scenario #1:

A family traveling on vacation stops on the side of the road when they notice smoke coming from the engine compartment of their minivan. They call 9-1-1 but are unfamiliar with the area and cannot describe their location. The 9-1-1 call-taker uses geo-location information from the caller's cell phone to pinpoint the incident location and dispatch the closest fire department with specific location information.

Sample Scenario #2:

A building sensor detects the presence of a dangerous substance in the air. Before any of the building's occupants begin to exhibit symptoms, an evacuation alert is issued and the fire department is notified without anyone having to call 9-1-1, resulting in a faster response.

19.   Data Points/Capabilities Considered

The Fire-Rescue ERG referenced various data points during its discussions; these appear throughout this document and are summarized below. Discussion did not focus on prioritizing the data points, although the panelists agreed that future collaborative efforts should include this step.

The data points are presented here as "important to have," without implication as to priority or completeness. It is important to note that the panelists are not primarily technical experts, and there may be some blurring between data elements per se and capabilities/functionality.

- Ability to contact less-traditional first responders (interoperable communications)
- Automatic vehicle location data for emergency responder vehicles, with cross-department and cross-discipline information
- Biometric monitoring
- Building information (e.g., sensors, structural integrity, schematics, smart buildings)
- Cameras/data for telemedicine
- Crash data (for example, payload/hazmat, number of occupants, predicted severity of injuries, type of vehicle, data on preventing airbag deployment, critical information on the vehicle such as lithium-ion batteries which could explode, fire information)
- Enhanced mobile command center capabilities
- Firefighter tracking (PASS-type technology)
- Floor plans and building schematics
- Live video capabilities from incident scenes and to/from responder units
- Mapping data with real-time traffic flow and route information
- Real-time information on public works/DOT activities/road closures/maintenance
- Real-time notification of citizens
- Traffic signal pre-emption
- Wildfire sensors

20.   Process

The Panel's final task was to recommend a process for moving forward, and to suggest groups representing the fire-rescue community whose participation could contribute to ongoing collaborative efforts.

The following represents a high-level sketch of a process that the panelists feel would address critical components for reaching consensus—and ultimately, broad support in the fire service—for NG9-1-1.

A.   White Paper Circulation and Commitment to Ongoing Collaboration

The panelists recommended circulating this paper to the following stakeholder groups with a request that each group adopt a resolution committing to collaborating in ongoing initiatives to develop standards and priorities for NG9-1-1 as it affects the fire service:

- International Association of Fire Chiefs

- International Association of Fire Fighters

- Metropolitan Fire Chiefs Association

- National Association of State Fire Marshals

- National Fire Protection Association

- National Volunteer Fire Council

B.   Determination of Participants in Standards Process

The panelists recommended convening a committee, with representation from each of the above-listed stakeholder groups, to reach consensus on who (individuals and/or stakeholder groups) should be involved in the standards process.

Questions for this committee to answer may include (but should not be limited to) the following:

- What type of experience is necessary to set standards for technical emergency responder communications?

- What type of experience is necessary to set standards for emergency operations?

- How many ANSI standards-setting organizations should be involved, and at what level?

- What mix of technical and operations orientation is optimal?

- What mix of fire-specific and non-fire standards-setting organizations should be involved?

- What is the anticipated scope of the standards?

- How and where should fire technical and operational standards related to NG9-1-1 intersect with technical and operational standards for other disciplines (such as law enforcement, EMS, transportation groups and other fields)?

- What international scope is anticipated, and what involvement from international stakeholders should be required?

The outcome for this step should be formal invitations to the recommended groups to be involved in the standards-setting process.

C. Emergency Responders Summit on NG9-1-1

The panelists recommended that a federal agency take the lead in developing, hosting and facilitating a national summit to continue the work started in the NG9-1-1 "What's Next" Forum. Representatives from each of the fire stakeholder groups that committed to ongoing collaboration should be invited (see "White Paper Circulation and Commitment to Ongoing Collaboration," above). To maintain momentum, the panelists felt that such a summit should be convened as soon as possible, preferably within the next year.

The panelists drafted the following recommended priorities for issues to be addressed in the Summit (listed in order of recommended priority):

1. Governance issues

2. Interoperability concerns

3. Standard data points

4. Training (data would predicate what the training is going to be)

5. Changing internal response guidelines

D. Education/Outreach

Because of the general lack of awareness and understanding among leaders in the fire service about NG9-1-1, and the resulting absence of support for it, the panelists noted that it may be valuable to conduct education/outreach to the fire-rescue community about NG9-1-1. Potential benefits of such an outreach effort include:

- Increasing awareness and understanding of the benefits of NG9-1-1

- Shortening the time to build support for implementation

- Easing fears about potential costs and other obstacles (or at least putting them in perspective)

- Enlisting local and regional champions, who can lend either talent or support to NG9-1-1 development

- Building awareness about the involvement of the fire service in developing standards

- Elevating the topic to the level of a high-priority, national concern worthy of local attention

- Easing frustrations with the current, antiquated system

- Showing leaders in the fire service the array of potential benefits that NG9-1-1 holds for the general public

The panelists suggested that outreach efforts could begin immediately, to shorten the time to achieve the above-listed benefits and gain earlier support.

EMS Panel Report

21.   About the EMS Panel

This section summarizes the recommendations and observations of the Emergency Medical Services (EMS) Emergency Responder Group, developed during the Forum and in subsequent group discussions via telephone between October 2010 and March 2011.

Important Note

The What's Next Forum convened four emergency responder groups (ERGs): Law Enforcement, Fire-Rescue, Emergency Medical Services, and Transportation Operations. Although each of these is recognized as a distinct discipline, varying degrees of overlap exist among these groups, the greatest occurring between EMS and Fire &Rescue.

Unless otherwise noted, the operational and patient-care-related observations and recommendations of the EMS panelists in this report are intended to apply to *both* fire-service EMS and non-fire-service EMS. Cultural issues referenced in this report, unless otherwise noted, are intended to apply to EMS *outside of the fire service.* Cultural issues related to the fire service (including fire-based EMS) were discussed by the Fire-Rescue ERG and are noted in the corresponding section of this report.

EMS Group Description

The Emergency Medical Services ERG comprised six participants plus a facilitator and an NG9-1-1 technical advisor.

Panel members included:

> Ted Delbridge, MD, MPH, FACEP, Facilitator
> > Brody School of Medicine, East Carolina University
> > *National Association of EMS Physicians*

> Mary Pat McKay, MD, MPH, FACEP
> > The George Washington University Hospital
> > *American College of Emergency Physicians*

> Jay Bradshaw
> > Maine Emergency Medical Services
> > *National Association of State EMS Officials*

> Michael Millin, MD, MPH
> > Johns Hopkins University School of Medicine
> > *National Association of EMS Physicians*

> Jim McPartlon
> > Mowhawk Ambulance Service
> > *American Ambulance Association*

Dennis Rowe
   Rural/Metro Corporation
   National Association of Emergency Medical Technicians

Murry Sturkie, DO
   St. Luke's Regional Medical Center
   American College of Osteopathic Emergency Physicians

Steve Wisely, NG9-1-1 Advisor
   Association of Public-Safety Communications Officials - International

22.   Emergency Medical Services Response Group: Major Backdrop Issues

Introduction

The EMS panelists identified the following major backdrop issues. These are defined as topics that occupy the attention of leaders in EMS at the national and local level, and are often interwoven with other issues, both large and small. They therefore have the potential to positively or negatively influence support for NG9-1-1, either directly or indirectly, and NG9-1-1 has a similar potential to influence them. They are listed here in no particular order.

A.   Service Delivery Variations

Modern EMS is a young institution. A 1966 white paper published by the National Academies of Science, "Accidental Death and Disability: The Neglected Disease of Modern Society," identified a need for better pre hospital care. Not long afterward, in the late 1960s, the nation's first paramedics-level EMS providers debuted in cities like Miami and Columbus, Ohio.

Since then, much of the development of EMS nationwide has taken place at the community level, with considerable variation in which organizations provide service, as well as the type and level of service provided. As a result, EMS involves multiple delivery models. Emergency medical service is provided by fire departments; municipal agencies; private companies contracted by municipalities; public/private partnerships; community-based, not-for-profit organizations; volunteer departments; tribal departments; hospitals; air-medical services; universities; the military; lifeguard departments; county, state and federal entities; and even some law enforcement agencies. Private, for-profit companies also provide non-emergency transport services, but in many cases are also considered part of the EMS system.

The EMS mission overlaps with public health, public safety and medical care. Depending on individual organization type and culture, EMS may be seen as a discipline unto itself, such as is often the case in organizations that focus exclusively on EMS. When provided by an organization with a broader mission (such as a fire department, hospital or police agency), emergency medical services may be viewed, both internally and externally, as a service that is provided, rather than a distinct profession.

B.   Funding and Reimbursement

While the other responder groups in the Forum – fire departments, law enforcement agencies and transportation operations – typically receive funding from public sources, not all EMS systems do. In fact, many EMS systems operate either with limited public funding or in some cases without any. With limited exceptions, only transporting ambulance services can bill for services, and only when they actually transport a patient (as opposed to, for example, treating and releasing, or assisting a patient who subsequently refuses transport). Agencies that provide emergency medical first response but do not transport are currently not eligible for reimbursement.

EMS organizations of all types that transport patients often bill for their services, seeking reimbursement from Medicare or insurance carriers, as well as from patients directly. Reimbursement levels are often so low that systems struggle to maintain operations: According to a May 2007 Government Accountability Office (GAO) cost report, ambulance services are reimbursed by Medicare at an average of 6 percent

below the actual cost of providing service.[6] This issue is complicated by difficult collections, as people who are more likely to use the EMS system are often less likely to have insurance or the ability to pay patient balances.

Nationwide, systems that depend on local tax support have been widely affected by budget restrictions in the wake of shrinking local tax revenues.

EMS has also been described as "the forgotten first responder" because of its poor track record in attracting federal grant funding. By way of example, a report by New York University's Center for Catastrophe Preparedness and Response revealed that of billions in federal terrorism-preparedness dollars awarded to emergency responders, only 4% went to EMS organizations. [7]

C. Education, Training and Personnel Considerations

Emergency Medical Services agencies that operate, maintain an affiliation with, or depend on education programs are currently paying attention to coming changes in requirements for paramedic education. Paramedic programs in most states make graduating students eligible to take the National Registry of Emergency Medical Technicians (NREMT) paramedic exam. As of January 1, 2013, these education programs will be required to maintain (or have applied for) accreditation by the Commission on Accreditation of Allied Health Education Programs, necessitating an affiliation with a college or university.

Regardless of type, EMS organizations are also facing an increase in the number of mandatory training requirements for new hires, as well as periodic required training for existing employees (for example, annual training on federal privacy laws, Homeland Security classes, periodic training mandated by individual states, and local requirements, which may or may not be related to medical care). With high volumes of training to accomplish and limited or nonexistent overtime budgets for training, EMS organizations have had to become innovative at delivering training to field personnel – many of them using online learning systems to allow personnel to complete training requirements on a flexible schedule and from any location.

One of the challenges facing the EMS field is a relative lack of opportunities for personnel to advance in their careers. As a result, turnover and burnout can be high. Some locales operate advanced-practice paramedic programs that allow personnel to perform additional clinical interventions, while others have launched "community paramedic" programs that offer field practitioners an opportunity to work with at-risk patients on a non-emergency, non-transport basis; these programs are designed to employ preventive care and intervention to reduce the need for emergency responses, ambulance transport and hospital admissions, reducing costs to the system. They also allow EMS personnel an opportunity to build a career beyond emergency work and to practice in a different environment.

The panelists observed that in many locales, the pay, benefits and advancement opportunities in the EMS field are insufficient to support long-term career paths in the profession. As a result, EMS loses many of its

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[6] United States Government Accountability Office. Report to Congressional Committees: "Ambulance Providers Costs and Expected Medicare Margins Vary Greatly." GAO-07-383; May 2007.

[7] New York University Center for Catastrophe Preparedness and Response. "Emergency Medical Services: The Forgotten First Responder. A report on the critical gaps in organization and deficits in resources for America's medical first responders." http://www.nyu.edu/ccpr/NYUEMSreport.pdf, accessed Feb. 2011.

most promising and talented individuals to other fields, such as the fire service, law enforcement, nursing, and other healthcare professions. The panelists noted that the more that EMS creates programs that allow people to build careers in the EMS field, the easier it becomes to recruit personnel, and the less likely it becomes for EMS to function as a stepping stone to other careers.

On a related note, the panelists observed that EMS is relatively unique in that it sometimes asks personnel with limited training to make complex decisions with little support (such as deciding whether to summon a helicopter, or determining when specialized care is needed.

D. Safety

EMS personnel face both physical hazards (such as vehicle crashes, back injuries, risk of violence, exposure to infectious disease and pathogens) and emotional stress (such as exposure to extremely traumatic events or chronic human suffering) in the course of their work. As a result, injury and illness rates among EMS workers are approximately six times higher than the national occupational average,[8] and EMS personnel are at least twice as likely as the general population to suffer from post-traumatic stress disorders.[9]

Safety and health for EMS workers has emerged as a priority in a variety of recent reports, including *EMS Workforce for the 21th Century: A National Assessment*, *EMS Workforce Agenda for the Future, Feasibility for an EMS Workforce Safety and Health Surveillance System*, and the Institute of Medicine's *Future of Emergency Care: Emergency Medical Services at the Crossroads*.

In an effort to advance national dialogue, the National Highway Traffic Safety Administration (NHTSA), with support from the Health Resources and Services Administration's (HRSA) EMS for Children (EMSC) Program, recently began a three-year cooperative agreement with the American College of Emergency Physicians (ACEP) to create a national forum of representative groups from throughout EMS, charged with drafting a strategy for building a culture of safety within the profession.

E. Inappropriate Use of EMS

There is little question that inappropriate use of EMS is among the more vexing issues facing the field. The subject appears in peer-reviewed research, in professional journal articles, on conference schedules, in EMS leadership forums, in legal newsletters, and in casual conversations among EMS personnel, all with predictable frequency.

In some cases, inappropriate consumption of resources occurs because of poor information or poor communications (such as when a call is unfounded, when there is no patient at the scene, or when a response is not canceled after first responders determine that EMS is not needed). Many times, however, inappropriate resource use occurs when low-risk patients do not know about appropriate alternatives to EMS and/or treatment in an emergency department. Commonly, patients call 9-1-1 for an ambulance because they believe it is a way to avoid waiting for care at the emergency department.

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[8] Maguire, BJ. Hunting KL. Guidotti TL. Smith GS. Occupational Injuries among Emergency Medical Services Personnel. Prehospital Emergency Care. 2005; 9(4): 405-11

[9] Mitchell JT: Critical incident stress management. In Kuehl AE (ed): Prehospital Systems and Medical Oversight. 2d ed., St. Louis: Mosby-Year Book, Inc., 1994, 239-344.

The costs associated with repeated use of EMS and the emergency department can be dramatic. In San Diego, doctors tracked 15 randomly selected patients with chronic alcohol abuse (one of the most common factors among frequent EMS/ED users) and found that these "frequent flyers" ran up a tally of $1.5 million over the 18-month study period. A Serial Inebriate Program was subsequently launched to reduce EMS and ED use by chronic alcoholics, curbing costs by 50 percent over a 4-year period.[10] In another case, a serial inebriate known as "Million-Dollar Murray" was profiled in *The New Yorker* after doctors in Reno calculated that he had run up bills of $1 million for emergency medical care and related services in 10 years of homelessness. And in Alameda County, Calif., a patient was profiled in *Annals of Emergency Medicine* after 1,000 ED visits in a 3-year period, usually arriving by ambulance.[11]

F. Response Times

Response times are the subject of considerable attention—and debate—in the EMS field. While responding quickly is among the core principles of EMS, there is scant clinical evidence supporting a universal standard for response times. Nevertheless, EMS services typically operate either under a formal standard (for example, a basic life support unit arriving at the scene of an emergency within four minutes of being dispatched, and advanced life support arriving within eight minutes, with these intervals being met for 90 percent of calls) or under an informal expectation that responders will arrive as quickly as possible. The latter is more common in rural areas, where response times can be extended when travel distances are greater or when volunteer departments face a shortage of volunteers.

It is well understood within the EMS field that reducing response times requires either adding resources or using existing resources more efficiently. In the latter scenario, variable staffing levels and deployment plans (that is, increasing staffing for peak hours and moving EMS vehicles around a response area to anticipate demand) are used to help lower response times, although doing so must be balanced against the potential for personnel fatigue and burnout.

In addition to these considerations, EMS organizations must deal with the public's expectation that emergencies will be responded to quickly, and the reality that for someone whose loved one is unconscious and not breathing, no response time is fast enough.

In some systems, budget restrictions have led to decisions to reduce resources to save money, despite an expected increase in response times. In one recent example, the city of San Diego closed several fire stations and began "browning out" others on a rotating basis to reduce its budget. Response times increased in almost all areas of the city, and a number of high-profile cases were reported in which fatalities occurred after EMS providers were delayed.

It is widely felt that getting the appropriate responders to the scene quickly is aided by the availability of accurate information about the patient and the location.

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[10] Dunford JV, Castillo EM, Chan TC, et al. Impact of the San Diego Serial Inebriate Program on Use of Emergency Medical Resources. Ann Emerg Med. 2006;47:328-336.
[11] Schaulis MD, Snoey ER. Three years, a thousand visits: A case study of the ultimate frequent flyer. Ann Emerg Med. 2001;38:87–89

G. Clinical Issues

At a clinical level, the panelists stressed the importance of considering EMS as *part of a system to deliver clinical care to patients* rather than merely as a transportation mechanism. As care becomes more complex and specialized, whether related to post-cardiac arrest, stroke, pediatric or similar systems of care, the expectations for EMS, as part of the integrated system of care for those patients, increase in complexity correspondingly.

As such, much of the EMS community's attention is consumed by clinical issues. These include: ensuring that EMS providers are competent to perform the expectations of EMS; large variations in scope of practice across the country; the need for paramedics in high-need rural areas; evidence-based medicine; patient safety; the pressing need for more research; and related considerations.

One essential clinical consideration involves the role of EMS physician medical directors who oversee systems, create protocols, translate science for field applications, and match resources to need. As part of their role in supervising the delivery of out-of-hospital medical care, EMS medical directors monitor performance measures to ensure that standards are met. EMS medical directors also act as liaisons to the medical community, ensuring EMS integration into the system of clinical care.

The panelists noted that clinical innovations virtually always must be funded by the EMS system itself, regardless of system type. Recent clinical advances such as non-invasive positive-pressure ventilation (e.g., CPAP), 12-lead EKGs and ST elevation myocardial infarction (STEMI) cardiac programs—despite leading to shorter, less expensive hospital stays and improved patient outcomes—typically offer zero return on the dollar for EMS systems, as they are not reimbursed by Medicare.

The panelists further identified the considerable level of recurring education necessary to maintain the skills needed to deliver clinical care and to support awareness of protocols that allow field practitioners to deliver the latest clinical care to the patient's side, regardless of location.

23.   Working Consensus Points

Introduction

The working consensus points outlined in this section represent shared considerations for EMS stakeholders that emerged during the Forum and subsequent panel discussions. This list is intended, after further refinement/development in future collaborative steps, to form a foundation for building standards.

It is anticipated that these points will continue to come up, either directly or indirectly, during future NG9-1-1 efforts, and again when individual agencies begin to think about implementing NG9-1-1 technologies. Therefore, it is essential to take them into account at every step of the process if buy-in and support for NG9-1-1 are to be obtained from the EMS community.

It is not the expectation of the panel that any of the issues listed in this section will have to be resolved before further discussion or progress can be made on NG9-1-1. Rather, the panel's recommendation is that each of these points must be taken into careful consideration as the EMS community moves forward with NG9-1-1. In other words, these points are the major principles that should guide further discussion and development.

The order in which the points are presented here is not intended to imply priority.

A.   Improved Patient Care

NG9-1-1 technologies will offer many opportunities to enhance patient care, from the time the patient contacts the 9-1-1 system through discharge from the hospital (and possibly even beyond). Indeed, many of the examples of technology discussed in the What's Next Forum and elsewhere would either directly or indirectly benefit patient care.

Despite this fact, NG9-1-1 may not automatically be perceived by the EMS community as an opportunity to improve patient care, but rather assumed to be an "upstream" concept primarily related to connecting callers to 9-1-1. This thinking may also be culturally influenced, as the majority of PSAPs are run by law enforcement, not EMS, and many EMS personnel do not interact frequently or directly with 9-1-1.

The panelists noted that because patient care lies at the core of the EMS mission, the connection between NG9-1-1 and improved patient care has the potential to transform the perception of NG9-1-1 from a specialized, technology-focused issue that centers around PSAPs to a larger issue of critical importance for the EMS community.

With so much to gain from incorporating patient care into NG9-1-1 development, panelists recommend that patient-related concerns be taken into consideration as a regular checkpoint throughout the process for developing NG9-1-1 technologies and policy.

B.   Continuity of Patient Data

The panelists stressed the critical importance of making consistent patient data available to caregivers at all points. This could include information about previous 9-1-1 calls, information obtained through dispatcher questions, the name of the person who called 9-1-1 (to be used by EMS providers or hospital personnel seeking additional information), prior EMS responses and transport destinations, patient

medical history, past EKGs or other clinically relevant information, interactions with social services or referrals to substance abuse or mental health resources, and the like. The panelists noted that information from the PSAP should be available to caregivers in the field as well as in the hospital. The system should accommodate all requests for information in a secure environment that is compliant with federal and local privacy requirements, and should be subject to local/organizational policies.

C. Safety

As noted earlier, safety is a chief concern to EMS personnel. As such, it presents an opportunity to gain support for NG9-1-1: newer technologies and the availability of more information, as well as more timely and accurate information, could all reduce risks to field personnel. While the potential ways in which safety could be enhanced are innumerable, the panelists observed that because many EMS practitioners and leaders do not know what NG9-1-1 is or will be (or think of it primarily as PSAP-only technology), they do not automatically draw a connection between NG9-1-1 and enhanced EMS and patient safety. Education and outreach may help with better understanding of this key benefit of NG9-1-1 for the EMS community. In any case, safety considerations should play an important role in the development of NG9-1-1 technologies and policies.

D. Need for Agreement on Data Points

Data points that arose during the panel's discussions are listed in Section 26 in this Chapter of the document. The panelists stressed the need for further discussion about the types of EMS data that need to be considered in developing the architecture for NG9-1-1.

The panelists also pointed out the importance of EMS involvement in planning data management—that is, where data is stored, who stores it and for how long, who has access to it, and related issues.

E. Research Considerations

The panel members stressed the need to be deliberate about the design/architecture of NG9-1-1 so that it supports longitudinal evaluation and research across patients' whole experiences, not just at select points. The system should facilitate and encourage standardized collection of EMS-related data points to allow for research into patient outcomes after EMS intervention, and also to allow EMS to better integrate research with other health, public safety and public health partners. The system must be designed to be searchable and to get information out, not just in. Years from now, the potential payoffs of building a research-friendly system could be considerable.

F. Cross-Discipline Information Sharing/Interoperability

The EMS panel noted that one of the chief benefits of NG9-1-1 for all emergency response groups will be the ability to interoperate and share data with one another. In addition to connections with traditional responder groups (both voice and data), the panelists pointed out the importance of providing linkages to "other than typical" responders, such as social services, health departments and public transportation.

The panelists also noted the critical importance of considering EMS' special need to have interoperability with fire departments. The majority of fire departments function either as first responders in a cooperative multi-agency EMS environment, working alongside a dedicated EMS organization, or perform both the first responder and transport functions themselves. As NG9-1-1 is developed, the synergy between EMS agencies and fire departments will require the highest possible degree of technical interoperability.

G. Need to Consider EMS Diversity

The panelists stressed the importance of reminding the developers of NG9-1-1 that EMS is a particularly diverse field, with many different types of provider organizations performing similar functions despite dramatically different organizational structures and cultures. The panelists noted that much of EMS is provided in small towns and rural settings with limited people and scant resources. Not all systems provide emergency medical dispatch/"dispatch life support," in which callers are queried using a questioning protocol to identify their conditions and send the right responders, and given pre-arrival instructions by specially trained dispatchers. The qualifications of EMS personnel range across a spectrum. While urban and suburban regions often deploy paramedics, many rural and frontier areas only have EMT-Basics available and are not capable of providing advanced life support interventions. Thus, the diverse clinical and technical sophistication of the end-user EMS personnel needs to be considered.

Ambulance and other EMS services in mid-size and small communities are supported in large measure by volunteer personnel. EMS agencies in smaller, rural departments serving populations of less than 10,000 are typically staffed by either all volunteers or a combination of career and volunteer personnel. These responders may respond from full- or part-time stations or directly from the workplace or from home. Special consideration will need to be given to this diverse environment and to the characteristics and needs of the end-user organizations, not just to their job functions.

H. Need for Data/Access Standards

The panelists noted the need for a set of standards to facilitate secure, reliable linkage to outside data registries, such as databases housing information on the location of automated external defibrillators (AEDs), patient information registries (e.g., Invisible Bracelet), automotive telematics/crash notification systems, and similar repositories, both currently existing or yet to be devised.

I. Need for Bandwidth

The panelists observed that NG9-1-1 will almost certainly increase the volume of data flowing to, from and among emergency responders. This increase in data must be accommodated via a reliable public safety broadband wireless network with the capacity to carry it.

24.   Potential Obstacles to NG9-1-1 in EMS

Introduction

The panelists noted a number of factors that could undermine support for NG9-1-1 among EMS leaders or impede implementation. Future collaborative efforts to engage thought leaders in advancing NG9-1-1 should consider these factors. The potential obstacles outlined here are listed in no particular order.

A.   Political/Attitude Issues (Political Will)

The panelists characterized NG9-1-1 as a "white hat issue" for EMS, indicating general support for it. However, the panelists also noted that as a discipline, EMS is not known for being well organized politically. Because of this, it can be difficult to build deep commitment to any particular process or initiative. While the national organizations that represent EMS are typically open to new ideas and have a reputation for collaborating with other organizations, they do not enjoy the same funding, membership numbers or level of influence—either inside the profession or outside it—that their counterparts in law enforcement and the fire service do. As a result (and with some exceptions), EMS historically has not emerged as a priority for legislators at the state or federal level.

As noted earlier in this document, because 9-1-1 and NG9-1-1 have little existing overlap with EMS, it is essential for EMS to be an active participant in the development of new technologies and policies. Otherwise, the NG9-1-1 system may be built without taking into account the true needs and priorities of EMS systems—and their patients.

B.   Limited Understanding of Other Responders' Roles/Priorities

The panelists noted that EMS and other public safety responders often suffer from a limited understanding of each other's roles and priorities, often causing a disconnect between responders at the scene. When technical innovations make interagency interoperability possible, this knowledge gap could impede agencies' attempts to work together and take advantage of the features the technology provides.

C.   Updating Field Practice

The panel members observed that despite its relative youth, EMS is a tradition-bound institution. The extended time involved in translating science to the front lines of pre hospital care contributes to sometimes outdated policies and protocols. Once protocols are firmly established, they can become routine. One example of this can be seen in protocols that associate visible damage to a crashed vehicle with a high index of suspicion for traumatic injury—a legacy of the vehicles of the 1970s and the early days of EMS trauma care. Today's vehicles are designed to crush to absorb energy and protect their occupants—but many EMS personnel are still taught to assume that vehicle damage means injury. The panelists noted that the slow pace at which changes reach the field may result in some agencies failing to embrace the potential of NG9-1-1.

Despite this trend, the panelists noted that doing something new and better, such as NG9-1-1, provides an opportunity to educate people in general (both EMS and the public), and this opportunity should not be overlooked. In other words, NG9-1-1 should be looked at as an opportunity to engage the public and the profession.

D. Lack of Training Funds/Personnel Skills

Because many EMS systems operate with limited budgets, training dollars are scarce. Further, although EMS personnel use technology to a greater degree than ever, they may require substantial additional training to function in the data-rich environment that NG9-1-1 will create. Developers should assess and take into account the varying degrees of skill and comfort with technology among EMS workers.

E. Limited Resources

The panelists noted that EMS has a finite ability to respond, balanced against the reality that in many systems, the number of calls is ever-increasing. Many systems use dynamic deployment, call triaging and prioritization along with other approaches to try to match resources to needs. When demand outgrows the capabilities of the EMS system, however, increased costs must be incurred to keep up.

F. Questionable Reliability of Information

The panelists observed that the NG9-1-1 system, like any data repository, is vulnerable to incomplete, inaccurate or outdated factual information about patients and their needs. Like the "vial of life" program (in which patients are asked to store medical information in a special vial in their refrigerator, for responders to access in an emergency) information must be accurate and up-to-date or it is not helpful— and could actually be harmful. The panelists noted that if the NG9-1-1 system becomes "tainted" with unreliable information, EMS personnel could come to view the system itself as questionable, and may not trust any unverified information that comes from it.

G. Potential for Complicating Decision-Making

NG9-1-1 brings the potential for PSAP and EMS personnel to have to deal with multiple data sources that may conflict. It also may require personnel to prioritize data, to identify and filter extraneous or irrelevant information, to make decisions among competing priorities, and to identify and filter extraneous or unnecessary information, all in a highly stressful, time-sensitive environment where lives are on the line, and data is flowing in real-time. In such an environment, overload is a serious consideration, as is the potential for hampered decision-making.

25.   Desired Benefits and Example Scenarios

Introduction

The following sample scenarios illustrate a small number of desired potential benefits attainable via NG9-1-1. This list is neither exhaustive or prioritized, nor are the scenarios presented with in-depth consideration for cost or technical feasibility. In some cases, capabilities presented may already be available via existing technology, but it is anticipated that NG9-1-1 will either bring such capabilities as part of the infrastructure of the PSAP, or that implementing them will be made easier by NG9-1-1. Nevertheless, the scenarios are presented here to help advance understanding of the potential benefits of NG9-1-1, either direct or indirect, in real-world situations faced by EMS organizations.

A.   Desired Benefit: Enhanced Safety

Sample Scenario #1:
An EMS unit is dispatched to a business address for an unknown injury. Responders are automatically informed that gunshots had been reported at an intersection near the scene 10 minutes prior to the EMS call. Police are dispatched and the EMS unit is advised to proceed with caution.

Sample Scenario #2:
An EMS unit is responding with lights and siren to a reported car crash with injuries. First-arriving police units determine that the call is unfounded. They electronically cancel the EMS response while the ambulance is more than a mile from the scene, instantly eliminating an unnecessary emergency response and reducing risk to the EMS personnel and the public (a process that currently can take minutes and involve several people to complete).

Sample Scenario #3:
Upon answering a call for a medical emergency at a residence, a call-taker is presented with automatic call-history information indicating that a patient living at the home weighs approximately 500 lbs. After confirming information with the caller, the dispatcher sends a bariatric ambulance equipped with a high-capacity power-lifting cot, reducing the likelihood of back injuries to the EMS personnel.

B.   Desired Benefit: Improved Resource Allocation

Sample Scenario #1:
In a rural area, dispatchers use injury-severity prediction data from vehicle telematics, real-time road and traffic conditions between the scene and the trauma center, and video of the crash scene from traffic cameras to determine whether to dispatch an EMS helicopter to a crash scene.

Sample Scenario #2:
A PSAP call-taker using medical dispatch protocols determines that a caller does not need emergent care. The call and its accompanying data are seamlessly transferred to a secondary call center, where a call-taker arranges an appointment for the patient at a walk-in clinic the following day, and sends video-based self-care instructions and an electronic transportation voucher directly to the caller's smartphone.

Sample Scenario #3:
A gas leak in a nursing home results in multiple patients requiring hospitalization. Real-time hospital capacity information is used to make the most efficient transport plan for all patients.

Sample Scenario #4:

A software package analyzes historical data and GPS information to make geographic-based predictions for call demand and recommendations for vehicle deployment, including real-time routing recommendations in response to changing conditions.

Sample Scenario #5:

EMS field personnel are able to view up-to-the-minute data on the availability of resources such as mutual aid, hospital resources (e.g., C.T., neurosurgeon availability, etc.), helicopters, and the like.

C. Desired Benefit: Improved Cross-Discipline Communication

Sample Scenario #1:

EMS responders responding to a large-scale incident are electronically sent a map-based template from the incident commander showing hot zones, their assigned approach route and staging area at the scene, helping coordinate response and allowing for safer, more efficient operations.

Sample Scenario #2:

Automatic vehicle-location technology (AVL) allows EMS responders to view live maps indicating the location of fire, police and other EMS units, eliminating the need to confirm locations and ETAs through radio or text-based communication with separate dispatchers. The same system allows police and fire-department first responders to view real-time location information for EMS units.

D. Desired Benefit: Improved Patient Care

Sample Scenario #1:

A caller experiencing a medical emergency is unable to speak, or is unable to provide his location. Location information from his cell phone is used to determine his location so EMS responders can be dispatched.

Sample Scenario #2:

A patient's past medical history is sent to responders for review while they are en route to a medical emergency. This important background information, which they might not be able to obtain at the scene, gives them a foundation for assessing and treating the patient.

Sample Scenario #3:

A medical emergency occurs at a home in a rural area. Responders are 20 minutes away. The PSAP provides video pre-arrival instructions to the caller's cell phone, helping the caller care for the patient until the first responders arrive.

Sample Scenario #4:

Physicians and emergency department staff view live or recorded video from an emergency scene, giving them helpful information about potential injuries or other patient needs.

Sample Scenario #5:

Hospital emergency department personnel access caller records to obtain important patient information from the scene of an emergency, which would otherwise be unavailable.

E. Desired Benefit: Support for Decision-Making

Sample Scenario #1:

Paramedics are assessing a patient who is experiencing chest pain are able to look for changes in the patient's EKG by comparing it with prior EKGs taken in the field and the hospital.

Sample Scenario #2:

The transport officer at a multiple-casualty incident uses real-time data on hospital capacity, together with dynamic maps showing traffic patterns and estimated transport times, to identify the most appropriate transport options for multiple patients.

Sample Scenario #3:

A "pop-up" electronic decision-support tool is delivered to the wireless notebook computer of a field EMS crew to help provide them guidance in the form of protocol cues, drug dosages or related information.

Sample Scenario #4:

PSAPs in neighboring communities begin to experience an increase in calls reporting flu-like symptoms. Through an automated alerting system that monitors 9-1-1 call data, officials are able to detect a regional geographic pattern that would otherwise have gone unnoticed locally, allowing an earlier response to a pandemic flu outbreak.

Sample Scenario #5:

EMS providers using a secure interface access an unconscious patient's medical history stored in her smartphone.

F. Desired Benefit: Support for Research

Sample Scenario #1:

Researchers use medical records and 9-1-1 call data to explore the connection between emergency dispatch instructions provided to callers and patient outcomes.

Sample Scenario #2:

Researchers investigating the effectiveness of community paramedic programs, in which specially trained EMS providers make scheduled home visits to high-risk patients, are able to demonstrate a connection between these interventions and reduced ambulance transports/hospital admissions, as well as to identify the interventions that make the biggest difference. Access to hospital databases ensures a complete picture.

G. Desired Benefit: Improved Response Times

Sample Scenario #1:

A patient wearing a 24-hour cardiac monitoring device experiences a cardiac event at home. The device automatically sends a wireless signal to request aid, and also transmits the patient's location, identifying data and relevant medical information.

Sample Scenario #2:

Dynamic traffic controls are used to clear traffic and pre-empt intersection signals along a responding EMS unit's assigned route to an emergency scene. Real-time mapping shows the responders their location and a

recommended route based on live traffic/congestion data, as well as the locations, intended routes and ETA for other responders en route to the incident.

H. Desired Benefit: Continuity of Patient Information

Sample Scenario #1:

ED staffers have questions about a patient's condition, but the patient has become unconscious. They use a secure interface to review the original 9-1-1 call, including the patient's answers to the call-taker's advanced questioning protocol, filling in the missing information.

Sample Scenario #2:

A central data repository, accessible from multiple points via a secure interface, makes a patient's complete information available for use by EMS field personnel, hospital staff, researchers, pharmacy staff and the patient's primary-care physician(s).

26.   Potential Data Points

Introduction

The EMS ERG panelists identified the following data points/capabilities as having clear benefits for EMS responders and their mission. Points are listed here without implication as to priority. The panel members noted that these data points or capabilities may either come as part of the NG9-1-1 system itself, or be made possible by hardware and/or software that connect via the system.

- Ability to receive patient-specific information from storage devices (such as their phone)

- Access to the actual 9-1-1 call (recording)

- Accurate information about resource availability (e.g., helicopter availability, real-time awareness about hospital capacity)

- Accurate information about the patient

- Accurate information about the scene

- Cross-discipline sharing

- Linkages to other first responders

- Major crash incident notification – provide advance notice to responders and hospitals

- Multimedia input capability

- Proactive transmission of decision-support tools to the field

- Social network compliance

- Streaming video from the scene for the physician

- Text message capability

- Vehicle telematics (must be meaningful, predictive information)

- Video instruction back to caller

- Video of caller to aid in remote assessment

- Voice, video, data, call forwarding linkages to other-than-typical responders (social services, health dept., public transportation)

27.   Process

Introduction

Each ERG panel was tasked with recommending a process for moving forward and suggesting groups representing their respective professions whose participation could contribute to ongoing collaborative efforts on NG9-1-1 development.

A. Parties/Entities Represented

The EMS ERG panelists recommended inviting a broad coalition of stakeholder organizations from the EMS field to participate in future collaborative efforts on NG9-1-1. Sample stakeholder groups include the following:

- American Academy of Orthopedic Surgeons
- American Academy of Pediatrics
- American Ambulance Association
- American College of Emergency Physicians
- American College of Osteopathic Emergency Physicians
- American College of Surgeons Committee on Trauma
- American Trauma Society
- Association of Air Medical Services
- Commission on Accreditation of Ambulance Services
- Commission on Accreditation of Medical Transport Systems
- Committee on Accreditation of Educational Programs for the EMS Professions
- Continuing Education Coordinating Board for EMS
- Emergency Medical Services for Children National Resource Center
- Emergency Medical Services for Children Data Analysis Resource Center
- Emergency Nurses Association
- EMS Labor Alliance
- Governors Highway Safety Association
- International Association of Fire Chiefs
- International Association of Fire Fighters
- International Association of Flight Paramedics
- National Association of Emergency Medical Technicians
- National Association of EMS Educators
- National Association of EMS Physicians

- National Association of State EMS Officials

- National EMS Advisory Council

- National EMS Management Association

- National Fire Protection Association

- National Native American EMS Association

- National Organization of State Offices of Rural Health

- National Registry of EMTs

- National Rural Health Association

- National Volunteer Fire Council

- Society for Academic Emergency Medicine

- State and Territorial Injury Prevention Directors Association (now "Safe States")

B. Possible Venue

To allow maximum participation by stakeholders, the EMS panelists recommended a federally hosted forum in an easily accessible major city.

C. Likely Agenda

The panelists anticipate a year-long process that includes separate follow-up among sub-groups, with planned milestones throughout the process and communication back to the stakeholders. The Working Consensus Points (Section 23, page 53) and Potential Data Points (Section 26, page 62) contained in this document could be used as a foundation for building a formal agenda.

D. Collateral/Supportive Efforts

The panelists noted that significant support could be nurtured within the EMS community itself (and among the various stakeholder groups associated with EMS) through various collateral and supportive efforts, undertaken concurrently with the collaboration described above. Activities could include:

- Policy & position papers

- Press releases related to the above

- Outreach and discussion in communities of interest (membership organizations, working groups) including newsletters, websites and meetings

- Outreach/awareness-building efforts directed at EMS providers and agencies (via publications, websites, national and regional conferences and the like)

- Social media outreach (forums, bloggers, listservs)

- Statement on the role of physicians

Transportation Operations Panel Report

28.   About the Transportation Operations Panel

This section encapsulates the work of the Transportation Operations Emergency Response Group during the Forum and in subsequent group conference calls between October 2010 and March 2011.

Transportation Operations Group Description

The Transportation Operations ERG comprised seven participants plus two co-facilitators and a TSAG NG9-1-1 technical advisor. Panel members included:

John Corbin, Co-facilitator
    Wisconsin Dept. of Transportation
    National Traffic Incident Management Coalition

Jill Ingrassia, Co-facilitator
    American Automobile Association
    Transportation Safety Advancement Group

Chuck Runyon
    West Virginia Department of Transportation
    American Association of State Highway and Transportation Officials (AASHTO)

Bill Brownlow
    American Association of State Highway and Transportation Officials (AASHTO)

Leo Bowman
    Benton County (WA) Commission
    National Association of Counties

Michael Fischer
    Maryland Department of Transportation
    Governors Highway Safety Association

Eileen Singleton
    Baltimore Metropolitan Council
    Association of Metropolitan Planning Organizations

Tom West
    Partners for Advanced Transportation Technology
    University of California at Berkeley

Cynthia Manley
    Cross Country Automotive Services
    Transportation Safety Advancement Group

Bill Hinkle, NG9-1-1 Advisor
    Transportation Safety Advancement Group

29. Transportation Operations Major Backdrop Issues

Introduction

The Transportation Operations ERG panelists identified a number of major backdrop issues that are currently affecting the transportation operations field. These represent universal concerns that may either distract attention from NG9-1-1 or have a direct impact on it.

A. Funding

The panelists identified a significant concern in the transportation operations community in the challenge of matching financial resources with the need to adequately manage and operate the nation's transportation infrastructures. The panelists identified concerns in the transportation operations community relating to the Highway Trust Fund (HTF). Because the HTF receives revenue from gasoline taxes (18.3 cents per gallon of gas sold domestically), it is vulnerable to economic factors, e.g., when people drive less, as they do when gas prices rise or when the economy is in a downturn, the HTF receives less revenue. The panelists noted that the HTF was originally established for the purpose of highway construction, and while traffic management technology infrastructure has been accommodated in the HTF, priority is typically given to construction. In addition, the panelists described uncertainty in the transportation operations community over what happens once Federal Stimulus funds are expended.

Funding is complicated by the disparate makeup of transportation operations stakeholders and their tendency to operate in independent systems isolated from one another.

Historically, transportation agencies have focused on the design and construction of transportation facilities and systems. More recently, traveler and shipping expectations have led transportation professionals to emphasize overall transportation systems performance, as well as the value of effective management and operations of the transportation system in that performance-driven context.

B. Disparate Nature of Transportation Operations Stakeholders

Transportation operations stakeholders are many, and are often isolated from one another or functioning in independent, disparate systems across agencies and jurisdictions. This has the effect of complicating funding, planning, governance, technology and other issues. The panelists identified the following high-level overview of transportation operations stakeholders:

- Emergency managers at local, regional, state and federal levels
- Local agency transportation operators (both urban and rural)
- State departments of transportation
- Public and private transit providers
- Metropolitan Planning Organizations (MPOs), Regional Transportation Planning Organizations (RTPO)s, and Counties
- Special Districts
- Public utilities and municipal utilities
- Private telematics providers
- Connected Vehicle-type systems(as an example of an emerging universal technology)
- Travelers/end users

C. Safety Advances and Expectation

The panelists noted that the past several decades have brought major reductions in traffic-related injury and fatality rates, through improved vehicle and road design, advances in trauma care, enforcement and educational efforts aimed at reducing impaired drivers and encouraging seat-belt use, and related factors. However, they noted that these reductions may represent one-time gains, and the per-mile numbers of injuries and deaths may not continue to fall at the same rate, despite expectations by the public and/or elected officials.

D. Future Demands on the Highway System

The panelists observed that population growth, immigration and an aging population (i.e., people driving longer) are expected to result in increased traffic on the roads. This has the potential to increase both primary and secondary incidents (which are more likely to occur in heavier traffic). The potential for increased incidents on roadways and transit systems poses an operations challenge that requires both resources and real-time incident management information. Demands on the highway system are also anticipated to rise as economic activity increases.

E. Pressure to Clear Incidents Quickly

Clearing roadway incidents quickly is among the most important goals for transportation operations, particularly in high-traffic areas where congestion builds rapidly. The panelists cited a widely accepted axiom that for every minute from the time an incident occurs until it is cleared, there is a demonstrated corresponding increase in both congestion and the risk of a secondary collision. Further, congestion can impede the ability of responders to reach the incident. The panelists also noted the escalating potential of an active incident to delay travelers and interrupt transport of goods, impacting the economy (particularly so in a "just in time" freight model). In fact, for every minute that a freeway travel lane is blocked during a peak travel period, four minutes of travel delay results after the incident is cleared.[12]

F. Transportation Operations Mission Not Always Understood

The panelists noted that the transportation operations discipline is not always fully understood by others, including emergency responders. For the purposes of this report, transportation operations addresses several areas of need:

- Traffic incident management and assistance with emergencies
- Work zone management
- Signal system management
- Freeway/tollway/interstate highway traffic management
- Other functions, such as providing information to travelers

The panelists noted that not all of the activities of transportation operations involve direct interaction with "traditional" emergency responder groups. However, there are many functions that represent high risk, with a corresponding high need for communications interoperability and interagency sharing of information.

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[12] National Traffic Incident Management Coalition: National Unified Goal (NUG) for Traffic Incident Management. http://www.transportation.org/sites/ntimc/docs/Quick%20Clearance11-07-06v2.pdf

30.   Working Consensus Points

Introduction

The working consensus points outlined in this section represent shared considerations for transportation operations' involvement in NG9-1-1. Like the Working Consensus Points documented by other responder groups in the Forum, it is anticipated that these points will continue to come up, either directly or indirectly, during future NG9-1-1 efforts involving transportation operations. In other words, these points are the major principles that should guide further discussion and development.

The order in which the points are presented here is not intended to imply priority.

A.   Need for a Seat at the Table

Throughout their discussions, the panelists stressed their desire for PSAP personnel and traditional first responder groups to think of transportation operations as willing and able to help them in their respective missions, particularly in facilitating response to incidents. Currently, when transportation operations centers don't receive information from PSAPs about active incidents or the needs of emergency responders, opportunities to assist the mission are missed (for example, closing a street or on-ramp to alleviate congestion at an incident scene and reduce risks for responders and the public). Modifying policies to facilitate greater communication between PSAPs and transportation operations should not wait for NG9-1-1; however, the panel recognizes that the advent of NG9-1-1, and the planning process that precedes it, may bring opportunities for transportation operations to enhance the ways it plans and works with law enforcement, fire and EMS, to mutual benefit.

B.   Unique Nature of Transportation Operations as Provider of NG9-1-1 Data and Incident Management Support

The panelists noted that transportation operations is uniquely positioned among emergency responder groups in that its activities and infrastructure offer the potential to provide NG9-1-1 data and support. This typically includes:

- *Surveillance:* Data from pavement sensors, video cameras and automated vehicle locators (AVL) communicated directly to transportation operations centers

- *Control:* Via regulatory devices such as ramp meters and high-occupancy vehicle (HOV) and high-occupancy toll (HOT) lanes

- *Management:* Through variable tolling, variable speed controls and variable access controls

- *Incident Detection:* Through the above-referenced surveillance systems, as well as via reports from the public.

Once an incident is detected, transportation operations can provide the NG9-1-1 system with incident management support, including:

- Incident identification (nature, location, severity)

- Notification and response support

- Management support (e.g., information about traffic conditions, surveillance of the incident scene, and related support to enable more effective management of emergency response)

- Clearance support

C.   Need for Improved Data Handling

The panelists noted the need for transportation operations to have access to improved systems for reporting, archiving and researching incident statistics and trends. This is for the benefit of both transportation operations and its partner emergency responders, and would be helpful in such activities as: identifying, analyzing and mitigating risks by location, conditions, and time of day/time of year; analyzing/critiquing response to and management of incidents by all responder groups; planning for disasters, scheduled major events, and day-to-day operations; and related activities.

D.   Recognition of Cultural Factors in Interoperability

The panel members observed that cultural factors play as much of a role as do technical considerations in the ability of transportation operations to interoperate with other emergency responder groups. They noted one positive example in which highway patrol dispatch and personnel are collocated with transportation management personnel, and the two agencies share cameras and other equipment. They further pointed out the potential for interagency partnerships developed through collaborative planning to ultimately evolve into operational partnerships, suggesting benefits to bringing regional groups together for planning.

E.   Statute Recognition of Transportation Operations as First Responder

The panel expressed strong support for universal recognition of transportation operations as a first responder, established in statute. This recognition will promote improved interagency coordination of policies and protocols.

F.   Need for Transparent Integration With Emergency Responders

The panel emphasized the importance of communicating data, whether it be signals, text, video, voice or other format, as transparently as possible to PSAPs, law enforcement, fire and EMS responder groups. Noting that PSAPs, supervisors and field personnel in these professions are, in many cases, extremely busy, the panelists expressed a desire to make transportation operations data available to them without creating overload or impeding their ability to do their jobs.

G.   Need for a Consistent Rollout Vision

The panelists cited a strong need for a consistent national vision for how NG9-1-1 can be employed at the state and local level for enhanced transportation emergency response and operations. Benefits could include better ability for states and agencies to plan implementation, as well as more efficient and effective use of tax dollars.

H.   Need for Integration into DOT Missions

The panelists noted that state transportation agencies are the progeny of the Interstate highway construction era, originally created to design and build roads. Even today, dollars spent on building roads overshadow dollars spent on operations by a large margin. The panelists stressed the importance of educating state DOT executives about the potential NG9-1-1 brings for their agencies, as well as the need for the research and resources necessary to successfully support the system.

31.   Potential Obstacles to NG9-1-1 in Transportation Operations

Introduction

The panelists noted a number of factors that could potentially impede the transportation operations community's recognition of NG9-1-1's potential benefits; complicate implementation of NG9-1-1 in the transportation operations environment; and/or impair support for (or prioritization of) NG91-1-1 and operational interoperability with traditional emergency responder groups.

The panelists observed that the potential for each of these factors to impede NG9-1-1 in transportation operations is largely short-term, and in fact, the factors that present potential obstacles in the near term could be turned into opportunities or advantages in the long term. For example, the very complexity of transportation operations stakeholder groups (see Section A below) presents a rich set of possible data and opportunities to benefit a great number of people—transportation operations stakeholders and emergency responders alike.

A.   Disparate Makeup of Transportation Operations Stakeholders

As noted earlier, the disparate makeup of transportation operations stakeholders functioning in independent systems is a major impediment to streamlined transportation operations across agencies and jurisdictions. While NG9-1-1, as a "system of systems," presents an opportunity to mitigate this concern, it could also become complicated by it.

B.   Misperceptions in Transportation Operations About NG9-1-1

The panelists observed that without education efforts, NG9-1-1 may be assumed by members of the transportation operations community to be merely a step in the evolution of 9-1-1, rather than an enabling technology that can facilitate interoperability and data sharing between transportation operations and other responder groups. The panelists recommended that communication/outreach efforts be considered to help members of the transportation operations community to see why NG9-1-1 has greater relevance to them (and offers greater potential) than 9-1-1, as a next-generation *transportation operations and emergency response* system. The transportation operations community has deployed technologies to support communications, surveillance, and notification, with some jurisdictions and regions deploying more technologies than others. The members of this community should be educated that NG9-1-1 functions almost certainly will be deployed to the extent needed in a community, i.e., that NG9-1-1 is not a "one size fits all" installation.

C.   Cultural Considerations

The panel members pointed out that transportation is an engineering-based field, with emphasis on deliberation and a high value on consensus. In such an environment, decisions are typically the result of systematic analysis and deliberation, sometimes taking decades. Although transportation operations likely has more of a "real-time" orientation than the transportation field as a whole, the panelists noted that the culture of transportation operations is nevertheless different from that of law enforcement, fire and emergency medical services, where decisions are typically made in seconds.

The panelists also noted that transportation operations focuses on a macro/multiregional level, considering different areas at the same time, while most local responders tend to think primarily inside their own jurisdiction. (For example, during a flood, local responder agencies focus on assisting citizens in

their areas, while transportation operations agencies must take a larger view, focusing, for example, on routing traffic around the affected area.)

These cultural differences should be taken into consideration to ensure successful planning and collaboration among responder groups via NG9-1-1.

32. Desired Benefits and Example Scenarios

Introduction

The following sample scenarios illustrate a small number of desired potential benefits attainable via NG9-1-1. This list is neither exhaustive nor prioritized, nor are the scenarios presented with in-depth consideration for cost or technical feasibility. In some cases, capabilities presented may already be available via existing technology, but it is anticipated that NG9-1-1 will either bring such capabilities as part of the infrastructure of the PSAP and Emergency Services Intranet (ESInet), or that implementing them will be made easier by NG9-1-1. Nevertheless, the scenarios are presented here to help advance understanding of the potential benefits of NG9-1-1, either direct or indirect, in real-world situations faced by emergency responders.

A. Desired Benefit: Dispatching Proper Responders

Example Scenario:
A rockslide blocks lanes of a state highway, causing minor injuries to the driver of a car that strikes a rock. Video from traffic cameras and the smartphone of a 9-1-1 caller shows that traffic control, EMS and a front-loader tractor are required, and these units are dispatched simultaneously. This focused response, in which responders are not sent to the scene unnecessarily, lowers the risk of a crash during the response, allows units to stay in service to respond to other incidents, and reduces congestion on the scene.

B. Desired Benefit: Clearing Incidents Quickly

Example Scenario:
A heavy wrecker is needed to remove a jackknifed big-rig from a metropolitan freeway during rush hour. Using real-time data from cameras and road sensors, the tow operator is directed to the scene by the most efficient route, in coordination with city police who direct traffic on surface streets while the wrecker transitions a crowded intersection to reach the designated on-ramp, as well as highway patrol officers who clear a lane between the on-ramp and the incident. Early identification of the need for the heavy wrecker, combined with the rapid and coordinated response, allows the roadway to be reopened much more quickly, reducing traffic backup and the risk of secondary crashes associated with traffic congestion.

C. Desired Benefit: Data on Vehicle Contents

Example Scenario:
PSAP personnel receive a report of a vehicle that has run off the road and down an embankment. Vehicle telematics data reveals the vehicle type (a small delivery van), the number of occupants (one), the likelihood of injury (very low), the vehicle's final resting position (overturned), the degree of damage to the vehicle (substantial damage to the right-rear side and roof), and the vehicle's exact location (immediately adjacent to a waterway). Included with the telematics data is information on the vehicle's contents (pool-cleaning chemicals). Law enforcement and fire responders are dispatched, and an on-call environmental contractor is dispatched and automatically provided with information on the nature of the chemicals involved.

D. Desired Benefit: Automatic Routing of Relevant Data

Example Scenario:

A vehicle penetrates a highway work zone and strikes two pieces of construction equipment, injuring both the driver and a transportation worker. Law enforcement, fire-rescue and EMS units respond. At the same time, state department of transportation officials are notified of the incident, and details of the incident are also forwarded to the contractor responsible for the work zone. Transportation operations personnel act immediately to close upstream on-ramps and activate variable messaging warning equipment, facilitating a faster response to assist the injured persons and reducing congestion. Basic information about the incident is also channeled to websites that warn travelers about the incident.

E. Desired Benefit: Enhanced Emergency Preparedness

Example Scenario:

A system in a county PSAP automatically monitors 9-1-1 call patterns and activity in emergency responder computer-aided dispatch (CAD) systems in surrounding counties and across a state line. When it detects a growing cluster of ice-related incidents to the north, tracking with weather patterns, automatic alerts are sent to emergency responder groups about the approaching potential for icy roads. Sanders and salt trucks are diverted to the northernmost part of the county, and variable messaging signs are activated to warn travelers of the potential for icy conditions. State police units are assigned increased patrols along routes that the system has identified as having particular risk, based on historical data and current conditions. This not only positions them to be better able to respond to incidents, but the increased law enforcement visibility also helps deter speeding near the ice zone, reducing the risk of a crash.

F. Desired Benefit: Improved Response to Infrastructure-Based Emergencies

Example Scenario:

A cement truck strikes a bridge support. Traffic camera video footage of the scene and data from instrumentation built into the bridge are forwarded to the PSAP and to on-call bridge engineers, who respond quickly to the scene to assess possible structural damage before the roadway can be reopened.

G. Desired Benefit: Improved Interoperability

Example Scenario:

During a blizzard, GPS-equipped snowplows automatically report their progress to a database, allowing law enforcement, fire and EMS responders to see a real-time, map-based depiction of routes that have been cleared recently. The same system automatically alerts plow operators to nearby 9-1-1 calls, so they can focus on clearing designated paths for responding emergency vehicles. Emergency responders using the system can also electronically request support from plows and other public works resources without having to burden PSAP personnel in a voice-based relay system. 9-1-1 call-takers have access to the real-time system, and can advise callers of estimated arrival times for responding units based on timely, accurate information.

H.   Desired Benefit: Data Available to Emergency Responders

Example Scenario:

An ambulance transporting an unstable patient to a hospital receives automatic real-time routing recommendations from the local traffic-management center, comprising traffic congestion, road conditions, weather data, traffic cameras, and related information from sensors. The EMS providers are provided with a suggested route that enables them to take the route that allows them to bypass a congested bridge, avoid a rail crossing where a freight train is approaching, and avoid uneven road surfaces, facilitating the patient care procedures being performed in the ambulance.

I.   Desired Benefit: Helpful Information Available to Travelers

Example Scenario:

An incident on a controlled-access roadway is anticipated to delay traffic for an extended period. The incident commander's designated hot zone and ingress/egress routes for emergency responders are tracked in a dynamic mapping system, which subsequently ties into variable messaging systems, media advisory systems, in-vehicle or smartphone-based notification systems that update travelers on conditions and advise them of alternate routes.

J.   Desired Benefit: Enhanced Responder Safety

Example Scenario:

Emergency responders en route to a roadway emergency scene are aided by dynamic traffic-signal pre-emption, variable message signs, on-ramp controls, and similar signal devices along their intended route, enabling them to reduce the likelihood of their having to cross intersections against red signals. At the scene of the incident, upstream traffic is directed away from the scene, reducing the risk to responders working at the scene.

K.   Desired Benefit: Active Assistance From Transportation Operations During Emergency Responses

Example Scenario:

 A road crew operating alternating one-way traffic controls at a roadway construction site is automatically notified of an approaching fire vehicle well in advance of hearing the siren, allowing them to clear motorists from the area before the apparatus approaches.

L.   Desired Benefit: Precise Location Information

Example Scenario:

Vehicle telematics and GPS data enable precise location of a fatal motorcycle crash at an intersection at a county line, enabling PSAP personnel to notify the correct jurisdiction for response and investigation. The crash is quickly determined to have occurred on a state road, and state DOT investigators are immediately dispatched to the scene to document the condition of the roadway, visibility and presence of warning signs, and other factors relevant to their investigation.

M. Desired Benefit: Support for Law Enforcement Activities

Example Scenario:

A law enforcement agency requires several roads to be immediately closed during SWAT activity. The NG9-1-1 backbone is used to facilitate communication between law enforcement and transportation operations to close the necessary roads and route traffic around the area; other emergency responders not involved in the incident are provided with real-time updates on routes to avoid.

33.   Potential Data Points

Introduction

The Transportation Operations ERG panelists identified the following data points/capabilities as having clear benefits for their mission, as well as significant value for other emergency responder groups. Points are listed here without implication as to priority. The panel members acknowledged that these data points or capabilities may either come as part of the NG9-1-1 system itself, or be made possible by hardware and/or software that connects via the system.

- Voice, including inter-discipline communications

- Text (SMS) with forwarding functions

- Video, including adaptability to major formats

- Photo, including adaptability to major formats

- Automated vehicle location (AVL) and tracking

- Computer-aided dispatch (CAD) interfaces

- Disabled vehicle status

- Telematics data (airbag deployment, etc.)

- Advanced data archiving and reporting systems

- Vehicle contents (e.g., hazmat information, etc.)

- Others

34.   Process

The Panel's final task was to recommend a process for moving forward, and to suggest groups representing the transportation operations community whose participation could contribute to ongoing collaborative efforts.

A.   Additional Engagement / Outreach

The panelists observed that the culture and priorities of state DOTs have historically been shaped by decades of focus on interstate highway construction. As demands on the transportation system increase, it is anticipated that state DOTs will increasingly shift their focus toward operations. This shift presents a critical opportunity to educate state DOT executives on the mutual benefits of the NG9-1-1 system for transportation and traditional emergency responder groups in a collaborative "next generation transportation operations and emergency response system."

As noted throughout this document, the investments made in intelligent transportation systems have given the transportation field the ability to capture considerable amounts and types of data. Much of this data carries enormous value to emergency responders in day-to-day operations and major incidents alike. The panelists noted that the transportation community has a moral obligation to make this information available in real time to support law enforcement, fire-rescue and emergency medical services in their respective missions to safeguard lives and property.

The panelists envisioned that outreach and educational efforts directed at the transportation sector (and state DOT executives in particular) could help integrate NG9-1-1 into the transportation mission. In other words, such outreach efforts could help transportation executives see the relevance of an integrated NG9-1-1/transportation operations system in meeting the public's expectations for more efficient transportation systems with improved safety and enhanced information for travelers. This is seen as an essential step toward building the support necessary to make the system a reality.

The panelists recommended that engagement/outreach efforts be undertaken in parallel with ongoing collaboration between transportation operations and other emergency responder groups working to develop standards and priorities for NG9-1-1.

B.   Ongoing Collaboration on NG9-1-1: Parties/Entities Represented

The panelists expressed an appreciation for the inclusion of transportation operations in the What's Next Forum, and stressed the importance of continued representation in ongoing collaboration among emergency responder groups as NG9-1-1 is developed. All of the panelists expressed confidence that the stakeholder groups they represent would welcome the opportunity for such collaboration.

The panelists recommended that the following national groups representing the transportation field be invited to participate in ongoing collaboration:

- American Association of State Highway and Transportation Officials (AASHTO)
- American Automobile Association
- Association of Metropolitan Planning Organizations
- Governors Highway Safety Association
- Institute of Transportation Engineers

- National Association of Counties

- National Association of County Engineers

- National Transportation Operations Coalition

- Transportation Research Board (Research Needs)

- Transportation Safety Advancement Group (TSAG)

- Others to be identified

C. Possible Venue for Ongoing Collaboration

The panel members noted the value of collaboration in a face-to-face setting, and further pointed out the likelihood that partnerships formed during collaboration and planning will evolve into operational partnerships.

Like the other groups participating in the What's Next Forum, the transportation operations panelists envisioned a collaboration process that extends over a full year or longer, with several one- to two-day meetings in a central location interspersed with teleconferencing and/or online collaboration. They also suggested that rotating the location to allow each of the represented disciplines (law enforcement, fire-rescue, EMS and transportation operations) to "host" the group in turn could help foster both collaboration and a deeper understanding of each group's needs, culture and priorities, as well as what each group can offer to the others via the NG9-1-1 system.

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