CRITICAL ISSUES IN POLICING SERIES

The Revolution in Emergency Communications

POLICE EXECUTIVE RESEARCH FORUM

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November 2017

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Acknowledgments

THE FIELD OF EMERGENCY COMMUNICATIONS IS ABOUT TO ENTER A period of dramatic change and transformation.

Nearly 50 years after the first 911 call was made in the United States, call-taking and dispatching have become, in a way, the forgotten member of the public safety family. The 911 system is so familiar to us that most people don't even think about it, until an emergency happens. Yet 911 remains a vital part of everyday crime-fighting, as well as the management of major events and the response to natural disasters.

PERF decided to conduct a *Critical Issues in Policing* project on emergency communications because the world of emergency communications is about to undergo an upheaval, as a result of two new technologies: Next Generation 911 systems and the FirstNet wireless broadband network for police and other first responders. The implementation of NG911 and FirstNet will augment traditional mission-critical Land Mobile Radio (LMR) narrowband voice systems. This report explores NG911 and FirstNet and their impact on police agencies and the emergency communications centers that support the police.

Once again, this type of timely, topical research is made possible by the support of the Motorola Solutions Foundation. Since 1998, Motorola has supported more than 30 *Critical Issues in Policing* projects, allowing PERF to examine important issues in policing as soon as they emerge and are identified. The policing profession has benefited greatly from the Motorola Solution Foundation's forward-thinking generosity.

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I also want to thank all of the people who participated in our meeting and shared their experiences and insights. We are especially grateful to the leadership of the National 911 Program, the First Responder Network Authority (FirstNet), and the industry organizations who attended our meeting and devoted considerable time in advance of the meeting, helping our researchers to understand the complex issues detailed in this report. These individuals and organizations are listed in Appendix C on page 84.

I want to single out two people who have played a central role in advancing and modernizing the emergency communications profession. First is Harlin McEwen, retired chief of the Ithaca (NY) Police Department and immediate past chair of the FirstNet Public Safety Advisory Committee. Over the years, Harlin has taught many of us everything we know about radio spectrum, the D Block, interoperability, the importance of broadband and, most recently, FirstNet. Throughout his career, and again at our meeting this year, Harlin reminded us of the real purpose behind all of this new technology: to help the cop on the beat be safer and more effective.

Second, I'm grateful to Steve Souder, who recently completed a remarkable 48-year career in emergency communications, including heading up emergency communications in Fairfax County and Arlington County in Virginia, and Montgomery County, Maryland. Steve was generous with his time and was invaluable in providing PERF's researchers with his unique insights and perspectives on NG911 and FirstNet implementation.

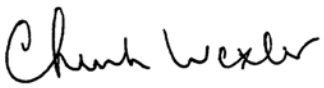
Finally, thanks go to the talented PERF staff who planned and facilitated another successful *Critical Issues* project. This initiative was particularly challenging for us. While PERF has done some work in the past on emergency communications, the field is complex, technical, and changing rapidly, and many key subject matter experts are outside our traditional circles of police executives. Our staff did an outstanding job in conducting the background research, getting the right people to participate in our conference, and making sure we asked the right questions and covered the important topics.

Kevin Morison, PERF's Chief Operations Officer, led the project team and is the lead author of this report. Kevin led an outstanding team that identified the major challenges and opportunities facing police leaders. The team's painstaking attention to detail is reflected in this report. Senior Research Associate Lisa Mantel, whose varied background includes six years as a public safety dispatcher in Washington State, provided invaluable expertise to the project. Research Associate Matt Harman and Senior Research Assistant Allison Heider demonstrated again how versatile and adept they are at researching complex issues as well as handling meeting logistics, taking photographs, and various "other duties as assigned" (including helping to live-tweet the meeting). Research Associates Sarah Mostyn, Meredith Mouser, and Jeremy Barnum also assisted with research and logistics. Summer intern Matthew Rainey was thrown into the deep end of the pool with this project, and he swam like a pro, assisting with research and planning.

James McGinty, Assistant Director of Communications, did his usual masterful job of organizing, designing, and executing the visuals at the meeting. Communications Director Craig Fischer edited this report and assisted with

writing. PERF's graphic designer, Dave Williams, designed and laid out the report. Executive Assistant Soline Simenauer helped to keep the entire project team on track. And Andrea Morrozoff, PERF's Chief Strategy Officer, provided leadership and direction for this *Critical Issues* project.

The future of emergency communications can appear daunting, but we know that these new technologies are going to be extremely helpful in getting all sorts of critically important information to the people who need it, when they need it. We hope that this report will help leaders of police organizations and emergency communications centers to understand and navigate the challenges and opportunities that lie ahead. Our communities and our police offi-



Chuck Wexler
Executive Director
Police Executive Research Forum
Washington, D.C.

EXECUTIVE SUMMARY

18 Facts that Public Safety Leaders Must Understand About the Emergency Communications Revolution of Today

THE POLICING PROFESSION IS EXPERIENCING THE BIGGEST REVOLUTION in emergency communications since the introduction of 911 service 50 years ago. This revolution will fundamentally change how citizens interact with 911 and how public safety agencies provide information to first responders in the field.

Police chiefs, sheriffs, and emergency communications managers need to be preparing **now** for the dramatic changes that are right around the corner. And their preparations need to involve much more than implementing new technology. Public safety leaders also need to address issues of policy, work flow, training, recruiting, and other matters that will directly impact their ability to harness the new communications technology that is coming.

This report is a call to action. It describes the two primary components of the revolution in emergency communications: Next Generation 911 and FirstNet. As importantly, it spells out the key issues that public safety leaders need to be addressing today, as they look to successfully implement the new systems of tomorrow.

On November 22, 2014, a 911 caller to the Cleveland Police Department reported a "guy with a gun" pointing it at people at a neighborhood recreation center. The 911 caller said the person was "probably a juvenile" and the gun was "probably fake." The call was quickly relayed to the police dispatcher, who sent the closest available unit to the scene.

However, the critical clarifying information—that the subject was probably a juvenile and the gun was probably fake—was never passed along to the responding officers. Minutes later, a Cleveland police officer and his trainee arrived at the scene, pulled their cruiser right up on the subject, and within seconds shot and killed 12-year-old Tamir Rice.

For the past three years, PERF has been examining controversial incidents involving police use of force. The Tamir Rice case highlighted the importance of the police dispatch function in these incidents. When 911 dispatchers are able to provide responding officers with critically important information about

the nature of a call for service, there is a much better chance of a successful outcome. But if officers arrive at the scene unaware of key facts, the risks to everyone multiply.

911 call-takers and dispatchers have always played a critical role in improving the police response to critical incidents of all types, including incidents that have the potential for use of lethal force.

This critical communications role is about to expand dramatically, because law enforcement agencies and 911 call centers nationwide are about to undertake the most significant overhaul of emergency communications technology since the 911 system was created five decades ago.

The new technology, which law enforcement agencies will be adopting in the coming months and years, will make it possible for members of the public to send videos, photographs, and other digital data to 911 call centers, and for 911 call centers to send these videos and other resources directly to responding officers, using secure, reliable broadband wireless service.

Using the Tamir Rice incident as an example, consider the following:

- What if the person who called 911 had also been able to **send a photo or video** of the scene to the police department?
- What if the 911 center had been able to **call up a live video feed** from a security camera at the Rec Center? (There was a working camera at the center, and it provided video documentation of the shooting after the fact.)
- What if the dispatcher had been able to **push out photos and video of the scene directly to the responding officers,** allowing them to review the incident in real-time before they arrived on scene?
- What if the officers had been sent **diagrams of the Rec Center grounds,** showing locations where the officers might be able to take cover, maintain distance, and better assess the situation?

These types of technological advancements, which will soon become operational in many local law enforcement agencies, could have altered the outcome of the Tamir Rice case.

This report provides information about the sweeping changes taking place in police communications technology across the nation. It outlines changes that are happening now and those that are coming in the near future, and reflects the expertise of public safety officials who participated in PERF's conference on *The Future of Emergency Communications*, held in Washington on June 16, 2017.

Much of the information in this report is somewhat technical, and it's a complicated story to tell. In order to begin with a "big picture" view, PERF identified 18 key points, listed below, that summarize what police chiefs,

sheriffs, and emergency communications managers must grasp in order to do their jobs effectively in this new communications environment.

1 The United States is on the cusp of the biggest revolution in emergency communications since the introduction of the 911 telephone system.

This revolution will fundamentally change how residents communicate with public safety agencies, how public safety personnel communicate with one another, and how agencies communicate with the public. It is not a matter of "if" this revolution will occur, but rather "when."

2 For the first time, public safety agencies will be able to take full advantage of the tremendous communications and research power that most people have already been using for years.

In many ways, police agencies have been lagging behind in communications technology. Today, even children are accustomed to obtaining almost any kind of information they desire, within seconds, using a smartphone, tablet, or laptop computer. Yet most police agencies still rely largely on basic telephones to receive information from the public, and on radios to communicate with officers in the field. The basic technological backbone of 911 systems has not changed significantly from the first 911 systems of nearly 50 years ago.

3 There are two new communications systems being implemented: Next Generation 911 and FirstNet.

Next Generation 911 will replace existing narrowband, circuit-switched networks, which can only carry voice signals and very limited data, with new Internet Protocol-based networks that can carry a much wider range of data.

FirstNet is a new, nationwide, public safety wireless communications network established by Congress in 2012, which in late 2017 is becoming operational.

NG911 and FirstNet are different systems moving on separate tracks, but they are complementary. Police departments that implement both systems, and do so sooner rather than later, will reap the largest benefits.

4 Next Generation 911 expands the ways in which police can receive information.

As its name implies, Next Generation 911 will eventually replace the current 911 system. NG911, as it is called, will allow people to send text messages, photos, videos, and other digital information to the police.

For example, parents calling 911 to report a missing child will be able to immediately send a photo of the child. Or witnesses to a crime, instead of merely providing a verbal description of the perpetrator, may be able to send a photo or video of the suspect or a vehicle fleeing the scene.

5 **NG911 systems have another major advantage: resiliency and redundancy.**

Because NG911 is based on the internet, rather than old-fashioned copper wire networks, it will be possible for 911 centers to network with each other. So if one jurisdiction's 911 center is overwhelmed by a natural disaster such as a hurricane, a technical failure, a terrorist attack, or some other incapacitating event, its workload can be forwarded automatically to other 911 centers nearby, or even hundreds of miles away, to ensure that 911 calls are not dropped or put on hold.

6 **FirstNet expands the ways in which police can wirelessly share digital information with each other and the public.**

Police agencies will be able to share digital information with anyone in the department, with other responding agencies, or with the public. Any type of information that can be "digitized"—video, photos, text files, maps, audio recordings, etc.—can be shared wirelessly.

For example, in an active shooter situation, dispatchers may be able to send responding officers a floor plan of the building where the shooter is located, perhaps with an indication of the room where the shooter might be found.

Expanding the quality and range of information available to officers will improve the police response to many types of incidents. For example, in the aftermath of a controversial incident involving police use of force, observers sometimes say, *"If only the police officers had known…."* More sophisticated communications systems will help ensure that officers have the information they need to assess situations and respond safely and effectively.

7 **With FirstNet, police will finally get priority service during an emergency or major event.**

Cellular service tends to slow to a crawl when a natural disaster or other large-scale crisis or a planned major event occurs, because everyone is relying on the same limited capacity of cell phone towers. Under the FirstNet system, public safety agencies will be given priority and preemption, so they can maintain communications even if cellular service is slowed down or temporarily suspended to other customers.

8 **These new technologies exist now, and many police agencies are already in the process of adopting them.**

- **NG911:** Twenty states already have a statewide plan in place for adopting NG911, and 17 of those states are installing, testing, and in some cases using NG911 components.
- **FirstNet:** On September 29, 2017, FirstNet launched its plans for operationalizing a new broadband network, in conjunction with AT&T. The Governors

of each state and territory must decide whether to "opt-in" to the FirstNet/AT&T plan, or to build and operate their own systems for connecting to the national network.[1] As of mid-November, 33 of the 56 states and territories had decided to opt-in to the FirstNet system. There is a deadline of December 28, 2017 for Governors to make this decision.

9 **FirstNet implementation will occur sooner in states that opt-in to the FirstNet/AT&T plan.**

Police agencies in states that "opt-in" to FirstNet can begin receiving access to the existing AT&T network. As police departments join FirstNet and officers turn on their department-issued smartphones, instead of seeing a particular carrier's name in the upper-left corner of the screen, they will see "FirstNet." FirstNet will become their new carrier.

In addition to providing priority service to public safety agencies during time of high demand for cellular service, FirstNet has created open standards that will allow software developers to create "apps" that are tailored to law enforcement agencies, similar to the millions of apps that are available to Apple and Android users for various purposes. The FirstNet "App Store" will offer apps in such areas as mapping, records management, forensics, and filing reports in the field.

In states that opt-out of the FirstNet/AT&T system, it will likely take longer for police agencies to obtain similar services, because their states will need to contract with a third party to create a network that meets the specifications of FirstNet, and their plans will need to be reviewed and approved by the Federal Communications Commission and the National Telecommunications and Information Administration (NTIA).

10 **For police chiefs, sheriffs, and emergency communications managers, the challenge will be to understand and address issues of policy, practices, training, and recruiting employees with new types of skills.**

The technology for implementing NG911 and FirstNet already exists, and most remaining technological issues can be left to the technology experts. The more difficult work, which must be done by police chiefs, sheriffs, emergency communications managers, and local elected officials, will involve writing policies and developing systems to take advantage of the benefits of the new technologies.

1. See FirstNet news media release, "FirstNet Momentum: Official Notice Provided to Governors, 90-Day Timeline Begins." September 29, 2017. https://firstnet.gov/news/firstnet-momentum-official-notice-provided-governors-90-day-timeline-begins

11 **One of the most important unresolved issues is: Who will be in charge of processing the new types of information coming in to police departments and 911 call centers, deciding which pieces of information are useful, and forwarding the useful information to responding police officers or others who need to see it, in formats that they can easily and quickly understand?**

- In many cases, particularly in highly populated jurisdictions, existing 911 call centers, known as "Public Safety Answering Points" (PSAPs), may be tasked with receiving the new types of digital information, determining which information is useful, and sending it to the police employees who need to see it. Agencies will need to create new work flows for how this information is handled.
- However, significant increases in staffing of PSAPs will likely be required, and PSAP call-takers and dispatchers will need new training to learn how to manage this information.
- Because 911 call-takers and dispatchers perform difficult, high-stress jobs, and in many jurisdictions are among the lesser-paid employees, the change to Next Generation 911 will provide an opportunity to raise the status of PSAP employees to more appropriate levels.

12 **Some police departments have Fusion Centers, or Real Time Crime Centers, that already have expertise in processing digital information, and could take on NG911 duties.**

For example, the Chicago Police Department has Strategic Decision Support Centers, which function as "mini-fusion centers" in high-crime districts. These units may play a key role in implementing NG911, because they have experience in processing large quantities of digital information and disseminating it effectively.

Fusion Centers or Real Time Crime Centers may take a leadership role, or a support role to PSAPs, depending on local decisions and conditions.

13 **Additional options may emerge regarding who will process, manage, and disseminate digital information coming in to PSAPs.**

For example, agencies may create separate positions within a PSAP, but outside the traditional voice communication process. These new "digital analysts" would focus on accepting and analyzing incoming photos, videos, texts, and other digital information, and then pushing the pieces of information that are useful into the CAD system and dispatch process.

Another possibility is that regional, state, or national organizations may emerge that specialize in deciphering certain types of information, such as video clips, and local PSAPs may contract with these organizations for their services.

14 **Agencies need to ensure that officers do not become overwhelmed with information and that there are policies in place for officers to safely access data on their in-car and mobile devices.**

FirstNet technology has the potential to dramatically enhance the situational awareness of patrol officers and deputies responding to many types of calls for service. In addition to call history information available through most computer-aided dispatch systems, officers in many instances may also have access to photos, videos, building diagrams, and other documents that can help inform their response.

However, agencies must adopt (or strengthen) policies that promote the safety of responding officers who are gaining access to this information. In particular, agency policy should restrict officers from reading documents, watching videos, or processing other data while they are driving. This is an officer safety and public safety issue. In many instances, officers can take a "tactical pause" to review information and consult with supervisors and other personnel on developing a coordinated response.

In addition, agencies should work to ensure that officers are not overloaded with information as they are responding to calls. Photos, video, and other data should be first analyzed by other personnel, and only the most important information about the call should be passed along to responding officers. In the future, in-car or mobile "data dashboards" will help officers manage incoming information and, when combined with strong policies, will help promote officer safety.

15 **Careful "vetting" of incoming information and cyber-security protections will be required.**

Because most people today are aware of cyber security threats, they are suspicious of emails from people they don't know, and extremely careful about opening attached files if they do not know and trust the sender.

By contrast, police agencies will soon be inviting the general public to send them many kinds of digital files of unknown origin. And many of these files will be imported into police computer systems.

Cyber security experts will play an enormous role in protecting police systems from hackers and other criminal offenders.

Another major consideration is that some of the incoming digital information will be used as evidence in criminal cases. Methods of protecting the security of these files and maintaining chain of custody rules will be required.

In addition to cyber security issues, police agencies will need to be wary about the authenticity of incoming information. "Swatting" and "spoofing" (making false emergency calls to 911 that appear to come from another person's home or location, in the hopes of drawing a large police response) are current examples of false information that can put the lives of officers and community members in danger. Next Generation 911 systems will need to guard against police responding to false information.

16 **Governance: Because the intake, processing, and dissemination of information through NG911 will be far more extensive and sophisticated than in the past, it may be difficult for PSAPs in small jurisdictions to keep up with the demands of the new systems.**

911 services are usually a local function, for the same reason that most police departments are operated by cities, towns, or counties: Local control allows police and 911 services to be responsive to local concerns and familiar with the local geography and communities.

However, NG911 is challenging this traditional model of governing PSAPs locally, from the perspective of operations as well as costs. Many experts have questioned whether the nation's 6,000 PSAPs can afford the up-front costs and continuing operational expenses of migrating to Next Generation 911. And state governments, rather than local agencies, are playing an increasing role in coordinating NG911 and FirstNet services.

As a result, jurisdictions are considering a variety of new approaches to governing PSAPs, involving centralization of certain functions, consolidation of all 911 services across multiple jurisdictions, and "virtual" consolidations in which individual PSAPs maintain their local governance but the network infrastructure and support services are shared among multiple PSAPs.

Experts at the PERF conference noted that many officials avoid even mentioning the *word* "consolidation," because communities prefer local control. However, it is clear that there will be pressure to share the high costs of new technologies and to find economies of scale. And in the not-too-distant future, resisting change may be futile, because vendors likely will stop maintaining technical support for outdated 911 systems.

17 **Existing funding streams for 911 services will not be sufficient for NG911.**

For many jurisdictions, finding the money to acquire and operate new emergency communications services is a major challenge, especially regarding the migration to Next Generation 911. Nationally, the transition to NG911 has been estimated to cost more than $2.8 billion. For individual jurisdictions, the costs begin at hundreds of thousands of dollars and can reach more than $5 million for a major metropolitan area. The existing revenue streams for 911—fees assessed on phone users—are often inadequate even for meeting the costs of *current* services.

The costs of the transition to FirstNet should be more predictable and manageable for local jurisdictions, because Congress appropriated funding to create FirstNet. Local agencies bear none of the costs of the network build-out, and the service costs for using FirstNet are already detailed in each state plan.

In states that opt-out of the FirstNet system, costs will be more difficult to predict, because each state will need to work with vendors to create its own network that connects to FirstNet.

18 **The bottom line is that police chiefs, sheriffs, emergency communications managers, and their mayors and city managers have a great deal of work to do.**

As the change to NG911 and FirstNet occurs over the next few years, public safety officials across the country will need to make decisions, write policies, establish protocols and rules, hire and train personnel, and find funding sources to pay for all of this work. This report describes many of the issues that must be addressed. Additional sources of information can be found in Appendix A, page 77. And police chiefs and other local officials can seek guidance from their colleagues in other jurisdictions that are farther along in the process of managing these changes. PERF will continue to monitor these issues and foster debate and exchange of information about best practices.

INTRODUCTION

The Transformation of Emergency Communications Is Here

I'm a little concerned about work flow. As our communication centers gain access to all of this data coming in—the photos, the videos, the text messages—they're going to need effective mechanisms to deal with handling all that information.

We implemented a very simple crime tips system several years back, and honestly, we didn't prepare for the work flows to track, assign, clear, and manage those tips. We have that framework in place now, and we learned a lesson about the importance of managing incoming data.

—Clearwater, FL Police Chief Dan Slaughter

IMPORTANT NEW COMMUNICATIONS TECHNOLOGY IS AVAILABLE NOW, and is rapidly getting within reach of today's public safety agencies. The implementation of two systems in particular—Next Generation 911 and FirstNet—are poised to transform emergency communications in the United States.

- **Next Generation 911 (NG911)** will fundamentally change how community members communicate with police and other public safety agencies, using the full power of their smartphones and other mobile devices. In an NG911 environment, people will be able to send text messages, photos, and videos to their local public safety agency, and more generally, to communicate with authorities in many new ways through mobile apps.
- **The Nationwide Public Safety Broadband Network (commonly known as FirstNet)** will expand the quantity and types of information that police officers and other first responders are able to receive in the field, often before they respond to an incident. This will enhance situational awareness, decision-making, and public and officer safety. The nationwide, interoperable voice and data network will also support greater communication and cooperation among agencies that are involved in a joint incident or operation. And when there is a critical incident or major event that results in heavy use

of cellular communications, FirstNet will ensure that public safety agencies are given priority service, so they can maintain communications even if cellular service is temporarily suspended to other customers.

Although NG911 and FirstNet are being developed independently, with different governance structures and funding streams, these two systems are complementary components of a new, technologically advanced emergency communications system for the United States. The full potential of each network will be realized when they are fully developed and integrated.

Technology Is Outpacing Policy

On June 16, 2017, PERF brought together approximately 150 police and emergency communications officials, industry representatives, and other subject matter experts for a day-long meeting to explore the future of emergency communications. This document summarizes the discussions at that meeting and the research that PERF's staff conducted in preparation for the meeting. Our goal with this report is to provide PERF members and the policing profession with a greater awareness and understanding of the critical issues they will confront in an NG911-FirstNet environment.

One major theme from the meeting was readily apparent: the technology is outpacing policy. As with other new systems introduced into policing in recent years (for example, body-worn cameras and electronic control weapons), the NG911 and FirstNet technology is far ahead of the other supporting elements that are essential for police agencies to take full advantage of the technology itself. Experts at our meeting emphasized that technology acquisition may be the easiest, most straightforward part of the migration to NG911 and FirstNet. The far more complicated challenge will be to write the policies and develop the procedures, funding models, governance structures, and training that will determine how the technology is used.

Right now, the vast majority of Americans can use their smartphones or other mobile devices to compose a text message, snap a photo, or take a video, which can then be shared with other people across the country or even around the world.

In a way, it is rather shocking to realize that the same type of content—text messages, photos, and videos—cannot be shared with most 911 centers (called Public Safety Answering Points, or PSAPs), because they are still operating their legacy 911 systems, which rely on "copper wire and circuit-switch" technology that cannot easily accommodate digital media.

Overcoming that technological hurdle is relatively straightforward. Jurisdictions need to replace their existing 911 infrastructure with new Internet Protocol (IP)-based networks that can accept the type of content generated by smartphone users. A small but growing number of jurisdictions have upgraded their 911 systems, and some of those have begun accepting text messages.

Key Issues That Jurisdictions Need To Address

Simply installing the technology does not solve the broader issue of implementation. Before they can begin accepting texts, photos, and video, PSAPs and the agencies they support—police, fire, and emergency medical services—must address a number of important questions:

- What types of digital messages will the jurisdictions accept? Text? Photos? Video? All of the above?
- Who will be responsible for reviewing and vetting this new content as it comes in? And how will that process work?
- Who will decide what information gets pushed out to officers in the field, and under what protocols?
- What skill sets and specialized training will personnel require to process these vast new sources of multiple types of information?
- How will jurisdictions pay for the technology and the large numbers of skilled people who will certainly be needed to take full advantage of these new systems?
- Are there economies of scale to be achieved if Public Safety Answering Points consolidate, or at least share common resources?
- And who is going to be in charge of any new governance structures?

These were among the major issues that were explored at PERF's *Critical Issues* meeting. While one meeting cannot fully answer complex questions such as these, the meeting did put the key issues on the table, and participants began to provide guidance to the policing profession as it moves forward.

This report is not a deep-dive into the technical intricacies of NG911 and FirstNet. There are a number of excellent resources (listed in Appendix A on page 77) that cover the technical background and related issues in greater detail. Those who are interested in learning more about the technical side of NG911 and FirstNet are encouraged to review those resources as well.

Rather, this report focuses on the key issues that police leaders need to know about, and need to address, if their agencies are to take advantage of the opportunities presented by new emergency communications technology.

Understanding Next Generation 911 and FirstNet

In 1967, President Lyndon Johnson's Commission on Law Enforcement and the Administration of Justice recommended that "a single police telephone number should be established, at least within a metropolitan area and eventually over the entire United States."[2] Less than a year later, AT&T announced the designation of 911 as a universal emergency number, and on February 16, 1968, Alabama State Senator Rankin Fite completed the first 911 call in Haleyville, Alabama.

As the United States has grown over the past five decades, so has our 911 system. Today, 911 may be the most recognizable phone number in America. More than 96 percent of the geographic United States is covered by basic 911 or Enhanced 911 service. The nation's 6,000 PSAPs (Public Safety Answering Points) handle approximately 240 million 911 calls a year.[3]

Steve Souder, who directed emergency communications in three major Washington, DC-area jurisdictions during his 48-year career, has described 911 as the "most significant social contract between local government and its citizens in the history of the United States."[4] Countless lives have been saved, criminal offenders apprehended, crimes solved, and crimes prevented because of the availability and reliability of 911.

An Outdated System That Is Not Keeping Up with the Times

While 911 has served the country and the policing profession well, the current system is becoming outdated and inadequate to meet the needs of 21st

2. *Challenge of Crime in a Free Society.* President's Commission on Law Enforcement and Administration of Justice. 1967. Available at https://www.ncjrs.gov/App/Publications/abstract.aspx?ID=42.

3. "9-1-1 Origin & History." National Emergency Number Association. https://www.nena.org/?page=911overviewfacts

4. Telephone interview with Steven Souder, May 26, 2017.

century communications and policing. Experts cite two glaring, and growing, deficiencies:

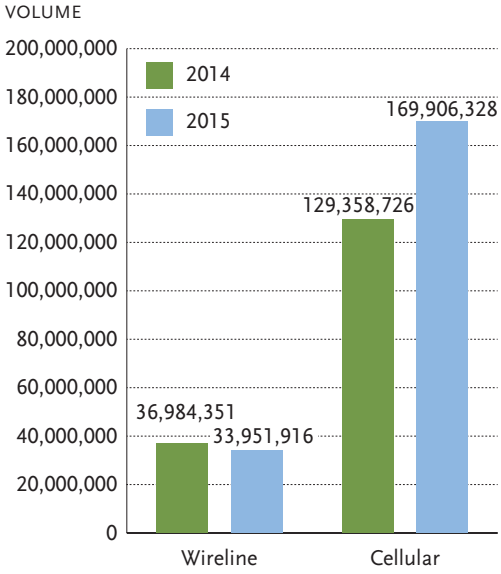
- First, the basic technology backbone of today's 911 systems has not changed markedly from the first systems of nearly 50 years ago. These systems, which are based on analog, copper wire, circuit-switch telephone systems designed primarily for wireline telephones, are old, out-of-date, and increasingly prone to failure. These legacy systems are increasingly costly to maintain, and replacement parts and trained personnel to maintain them are becoming rare. Experts warn that some 911 providers may simply stop supporting their legacy systems, at a date not very far in the future.
- Second, legacy 911 systems do not support the ways that the vast majorities of Americans communicate today—via text message, photo and video sharing, and social media. According to the Pew Research Center, 95 percent of adult Americans own a cell phone of some type. Seventy-seven percent own a smartphone, which is up sharply from the 35 percent who reported owning a smartphone in 2011.[5] Many people own multiple smartphones or other mobile devices, or have access to them through their work.

Wireless users already account for the vast majority of 911 calls. According to the National 911 Program, 80 percent of 911 calls are now made through wireless phones. Fewer than 1 in 6 calls (about 16%) are made via traditional wireline phones.[6] Between 2014 and 2015, the number of wireline calls to 911 decreased by 8 percent, while wireless calls grew by 31 percent, a trend that will certainly continue.

When people contact 911 from a cell phone, in most cases they can do only one thing: speak to a call-taker, just as they would with a wireline phone. They cannot send photos or videos. As FirstNet President TJ Kennedy noted, "The reality is we live in a cellular broadband world today," but our 911 systems have not kept pace with these changes in technology and consumer behavior.

Furthermore, when someone calls 911 from a landline phone, legacy 911 systems are able to capture the caller's phone number and precise location. But when someone uses a cell phone to call 911, it is often difficult for PSAPs to pinpoint a caller's location.

911 Call Volume by Type



Source: "2016 National 911 Progress Report," page 2. U.S. Department of Transportation. https://www.911.gov/pdf/National-911-Program-2016-ProfileDatabaseProgressReport-120516-1.pdf

5. "Mobile Fact Sheet." Pew Research Center, Internet & Technology. Jan. 12, 2017. Available at http://www.pewinternet.org/fact-sheet/mobile/.

6. *2016 National 911 Progress Report.* National 911 Program Office, December 2016. Available at https://www.911.gov/pdf/National-911-Program-2016-ProfileDatabaseProgressReport-120516-1.pdf. The National 911 Program collects data from the states on basic 911 operations and their progress in implementing Next Generation 911. These statistics are based on voluntary reporting by 46 U.S. states, territories and the District of Columbia.

Sending Digital Data to 911: Not a Matter of "If," But "When"

Because the nation's 911 systems cannot accept digital information from the public, they are failing to take advantage of vast amounts of data already being collected by the public that could help police and other first responders do their jobs.

That is about to change with the impending convergence of Next Generation 911 and FirstNet. Leaders at PERF's *Critical Issues* meeting emphasized that it's not a matter of "if," but "when" these changes will occur.

It is important for police leaders to understand these new systems and what they mean for public safety in their communities. Police leaders do not need to become technical experts in broadband technology, but they do need to know enough about NG911 and FirstNet to develop policies, procedures, and governance and funding strategies as these systems are rolled out. This is true regardless of whether police agencies operate their own PSAP or have their 911 calls answered and dispatched by a consolidated or regional emergency communications center.

Next Generation 911 Basics

Next Generation 911 will fundamentally expand the way the public reports emergencies and provides information to public safety officials. Residents will no longer be limited to dialing 911 and providing a verbal description of what they are reporting (or sending text messages in the small number of jurisdictions that have text-to-911 capabilities). Rather, individuals will be able to snap photos and take videos, and send these to augment traditional 911 calls. They may also be able to connect with emergency communications centers through special mobile apps.

NG911 will allow the community to provide more information to public safety agencies, through more types of media, than ever before. And public safety agencies will be able to supplement that citizen-generated information with additional data, such as public and private camera feeds, gunshot detection systems, car crash indicators, and other sensors supported by the Internet of Things.[7]

From a technical standpoint, NG911 networks have two essential elements: 1) the ability to receive, process, and share digitized information (including Enhanced 911 calls) from any networked communications device; and 2) the ability for individual PSAPs to seamlessly connect to one another, thus providing greater redundancy and resiliency. (For example, if a PSAP is overburdened or incapacitated by a power failure, natural disaster, or similar condition, its workload can be forwarded to another PSAP.)

Implementation of NG911 requires the replacement of existing narrowband, circuit-switched 911 networks, which are capable of carrying only voice

7. For a basic explanation of the Internet of Things, see Meola, Andrew. "What is the Internet of Things (IoT)?," Business Insider, December 19, 2016. http://www.businessinsider.com/what-is-the-internet-of-things-definition-2016-8.

and very limited data. In their place are new Internet Protocol (IP)-based broadband networks, which can carry voice and a wide range of data. These IP-based networks are known as ESInets (Emergency Services IP networks). Individual ESInets can easily be connected with one another, thereby creating a "network of networks" in which public safety agencies can collaborate on a regional, statewide, or even national basis.[8]

Laurie Flaherty, Coordinator, National 911 Program:

Next Gen 911 Accepts Any Digital Data, And Allows PSAPs to Connect to Each Other

Let me give you a definition of Next Generation 911, if you're not familiar with it. There's this old adage that "if you've been in one PSAP, you've seen one PSAP." [laughter] There's a lot of variation in PSAPs. But the definition of Next Generation 911 may be different, with larger, more regional and consistent PSAPs.

If you're talking about Next Generation 911, you're talking about two things. You're talking about the fact that digital information can be received, processed, and shared by the 911 call centers. If information can be digitized, it can be received, processed, and shared. Whether it's photographs or video or text messages or alarms, whatever it is, it can be shared.

The second thing that NG 911 does is a function of its infrastructure. Once you move to an Internet Protocol-based infrastructure, it becomes possible for the PSAPs to *connect to each other*, which was not possible at all in the old model, the legacy model. And if you can connect to each other, it will bring a level of resilience and redundancy that the current system does not have.

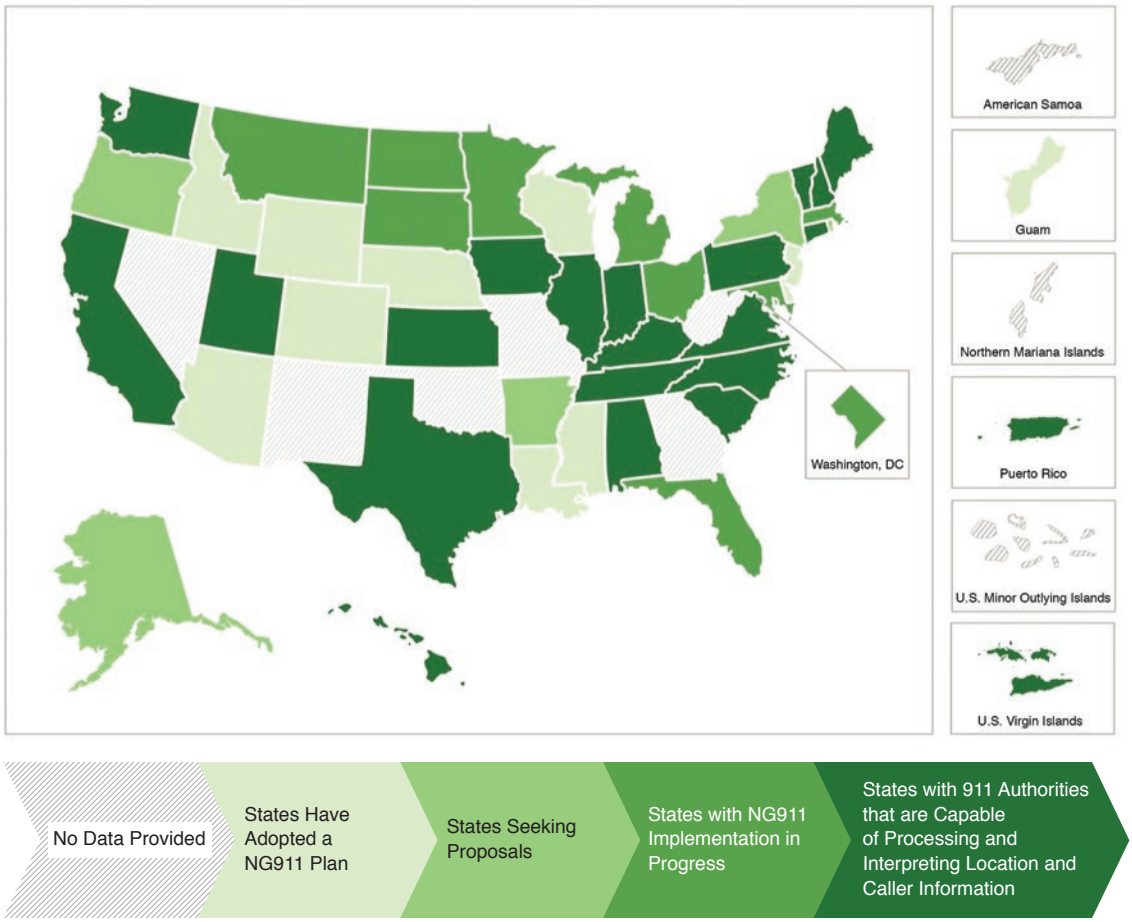
So if there's a big traffic accident and a particular PSAP gets inundated, you can roll those calls over to a PSAP that's not overloaded. Or, in the case of Hurricane Katrina in 2005, where 38 PSAPs were taken completely out of operation, those calls went nowhere. If you fast-forward to Hurricane Irene in 2011, in the state of Vermont, where they have this infrastructure in place, during one of their highest call volumes, they had to close one of their PSAPs, but no one in Vermont knew the difference, because they could transfer the calls to other centers. It works.

The move toward NG911 began nearly a decade ago, spurred in part by Congressional passage in 2008 of the New and Emerging Technologies 9-1-1 Improvement Act.[9] This federal law called for "a national plan for migrating to a national IP-enabled network capable of receiving and responding to all citizen-activated emergency communication and improving information sharing among all emergency response entities." The law did not mandate the adoption

8. For more information on ESInets and the technical aspects of NG911, see the resources included in Appendix A on p. 76.

9. The text of the law is available at https://www.gpo.gov/fdsys/pkg/BILLS-110hr3403enr/pdf/BILLS-110hr3403enr.pdf.

2016 NG911 Progress Snapshot



Source: "Review of Nationwide 911 Data Collection, February 2017. 911.gov, page 9. https://www.911.gov/pdf/2016-Review-of-Nationwide-Data-Collection.pdf

of a national IP-based network, but it did recommend that 911 authorities begin the process.

In recent years, different states and jurisdictions have adopted the new technology at different rates. Twenty states currently have a statewide NG911 plan in place, and 17 of those states are installing, testing, and in some cases using NG911 components (although implementation may not be statewide in all instances). Twenty-two states have the capability of processing 911 calls and interpreting Automatic Number Identification and Automatic Location Identification (ANI/ALI) information using an NG911 infrastructure. Ten states have 100 percent of their PSAPs connected to an ESInet, and eight states have all of their addresses geo-coded,[10] which is a basic building block for full NG911 implementation.[11]

10. For background information on geocoding in an NG911 environment, see http://www.mass.gov/anf/docs/itd/services/massgis/berkcoaa-may2014.pdf.

11. Statistics provided by Laurie Flaherty, Coordinator, National 911 Program.

Other states, however, have yet to fully develop their NG911 plans. And, according to Laurie Flaherty of the National 911 Program, there is no state that has fully implemented all components of NG911.

States play a key role in NG911 implementation. For individual public safety agencies, the ability to take advantage of NG911 capabilities is determined, in large measure, by the state government's level of planning and implementation. It is important for police leaders to know where their state, regional, and individual jurisdictions stand with regard to building their IP-based communications infrastructure and becoming NG911-ready. While individual jurisdictions can move forward, either on their own or on a regional basis with other agencies, NG911 is most powerful and effective when an entire state commits to the new technology.

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How Vermont's NG911 Infrastructure Helped the State to Weather Tropical Storm Irene

Vermont has been implementing NG911 for a decade, beginning in 2007 with the implementation of one statewide ESInet that connected all eight of the state's PSAPs. Today, Vermont has six regional PSAPs, each of which is responsible for answering 911 calls within a primary "call catchment area." Any call originating in that geographic area is initially routed to the primary PSAP for that area. If that PSAP is unavailable for any reason, the call is automatically routed via the ESInet to one of the other five PSAPs. If the second PSAP is unable to immediately handle the call, it continues to roll to the next available PSAP, based on an automated call routing plan.

As a result, 911 calls are almost never "put on hold," and there is no need to manually transfer calls to another PSAP. All call-takers in the state have the same technology, resources, and training. And any call-taker in any PSAP can connect callers with the appropriate emergency resources for the caller's area, thus providing a uniform level of service throughout the state.

The connectivity, collaboration, and redundancy that are central to the NG911 ESInet architecture can be especially important during major events, natural disasters, and other times when 911 call volumes are high. Vermont learned this lesson during Tropical Storm Irene.

Early on the morning of August 29, 2011, Irene hit southern Vermont with drenching rain that flooded nearly every river and stream in the state. Flooding forced the evacuation of the state's second busiest PSAP. But because the statewide ESInet was in place, 911 calls were automatically and seamlessly redistributed to other PSAPs without the need for manual intervention. Although that day had the largest 911 call volume in Vermont history, no 911 calls were missed or dropped. Prior to the statewide ESInet, overflow call volume of this level would have overwhelmed a backup facility that had just two call-taking positions.

Source: PERF interview of Barb Neal, Executive Director, Vermont Enhanced 911 Board, June 9, 2017.

Text-to-911: A First Step in NG911 Deployment

One of the first applications of NG911 being implemented allows people to send text messages to their 911 centers. This application can be especially important for people who are deaf or hard of hearing, as well as victims of such crimes as domestic violence and home invasion, who might not be able to safely talk but can send a text message.

A growing number of PSAPs are beginning to accept text messages, about 15 percent of jurisdictions nationally. But the volume of text-to-911 messages remains relatively low. PSAPs recorded fewer than 85,000 such messages in 2015, although that does represent a sizable jump from fewer than 2,400 text messages in 2014. As more jurisdictions build out their NG911 infrastructures and develop policies and procedures for processing text messages, this application will likely grow dramatically in the years ahead.

However, experts at PERF's *Critical Issues* meeting stressed that accepting text-to-911 messages does not mean a jurisdiction has implemented NG911. Texting is just one application that NG911 can support. As Brian Fontes, CEO of the National Emergency Number Association put it, "Text to 911 is the tip of the NG911 iceberg."

NG911 represents both the IP-based networks that are capable of carrying more information, as well as the ever-changing set of information capabilities (apps) that the architecture can support. Accepting text messages is an early step, but experts advise that jurisdictions looking to fully leverage NG911 need to plan for additional capabilities that go far beyond accepting text messages.

Judy Dunn, Emergency Communications Manager, Burlington Police Department:

Text-to-911 Is A Very Useful Tool

Text-to-911 in Vermont started with a Verizon Wireless trial in April of 2012. This 6-month trial led right into a permanent installation, due in large part to the successful response to two events regarding serious life-threatening issues. By May of 2014, all major wireless carriers were capable of sending text-to-911 messages in Vermont. It is important to remember that placing a voice call to 911 is more efficient and direct, but if someone is unable to make a 911 voice call in Vermont, text-to-911 is an option. When a text-to-911 message is sent, a Vermont 911 call-taker in one of our six PSAPs receives the information on their screen and is able to respond by text message. It is important that the individual texting includes the location of the emergency in the first message sent. The text-to-911 should only be used for emergency situations where one requires an emergency response from police, fire or Emergency Medical Services.

The State of Vermont received 550 texts in the last year.

National 911 Program Coordinator Laurie Flaherty:

Domestic Violence Victims Can Text the Police If They Are Afraid to Be Heard Speaking

There are tremendous benefits of texting in domestic violence situations, where a victim doesn't want her attacker to know she's contacting the police. Or in home invasions. We've also found that people who are thinking about committing suicide are much more apt to send a text message than to call.

CRITICAL ISSUE:

Improving the Response to Persons in Crisis

Across the country, police agencies in recent years have adopted new policies and training to help officers defuse many types of critical incidents and minimize the use of force. A major focus has been on de-escalating situations involving individuals with mental illness or in emotional crisis. As agencies have worked to provide their police officers with more skills and options in these types of encounters, they also realized that they need to better train and equip their telecommunicators to handle these situations from the start.

As the first of the first responders, telecommunicators can help to begin defusing critical situations long before the first officers arrive on scene, by gathering information that will help the officers to understand the nature of what they are dealing with, and the seriousness of any threats.

PERF Executive Director Chuck Wexler explored this issue with several participants at the *Critical Issues* meeting.

Communications Director John Balloni
Volusia County, FL Sheriff's Office:

To Handle That First Call of a Suicidal Person or Barricaded Gunman, Telecommunicators Need Thorough Training from the Start

We instituted CIT training for all of our dispatchers, and we're putting a few of our seasoned dispatch people through CIT with each new class.

What we found is that people were getting out of our academy and dealing with their first suicidal individual or their first barricaded gunman two weeks later. And they had something like two hours of training on this in the regular academy. That's not enough. We need to get these recruits trained in how to deal with suicidal persons and other challenges—not only to help our citizens, but also for their own psychological well-being. They need to know that they are properly trained, so if an incident doesn't turn out the way we hope, at least they can know they did everything they could to save this individual's life.

Laura Usher, Senior Manager,
National Alliance on Mental Illness:

911 Call-Takers Need to Be Skilled At Extracting Info from Nervous or Frightened Callers

Chuck Wexler: In terms of Next Generation 911, what kind of training do you advocate that dispatchers should receive, from the mental health perspective?

Laura Usher: As many others have mentioned, when you have a Crisis Intervention Team (CIT) program and you have specialized officers who have received more extensive training, it's important to have dispatchers who can dispatch the correct officers to a scene, and who can give those officers the information they need. Most CIT programs do not have all officers trained in CIT, so they need dispatchers to be able to identify the CIT officers, identify the CIT calls, and match them up.

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I also think it's important for the dispatchers to have insights into the nature of mental health calls and the people who are involved. Many of the skills and lessons in CIT training are helpful to dispatchers as well as officers—for example, knowing what is involved in de-escalating a person in crisis, and understanding their perspectives and the perspectives of their family members, who often are the ones to call police.

For example, family members of people with mental illness often tell me they're afraid to call the police, or they're scared to disclose that there's a mental health condition involved. And sometimes, when a family member is calling during a crisis, they just forget to mention critical information to the 911 call-taker about the nature of their loved one's condition.[12] For a call-taker or dispatcher, that's very useful information to have—to understand that a caller may be afraid of the police, or may be forgetting to mention key information. The call-taker has to be very skillful at extracting the important information, and reassuring the family member.

Chief Robert Hertman
Wallkill, NY Police Department:

Including Dispatch Staff Members
In Use-of-Force Training Is Effective

About two months ago, our department began training in ICAT.[13] Initially, all the ICAT training was devoted to uniformed personnel, but recently we found that using actual dispatch staff members in the role-playing scenarios for ICAT has proved to be very effective. The feedback so far from the participating dispatchers has been very positive.

Paula Creasy, Communications Manager,
Grand Junction, CO Police Department:

Our Critical Incident Team
Has Given Instruction to Our Telecommunicators

We have a Crisis Intervention Team in our sworn ranks, who have trained our police officers for responding to incidents involving special populations, which include at-risk adults or children, elderly, and mentally or developmentally disabled persons. We have asked that team to teach our 911 telecommunicators about how they can help somebody, via the telephone, who's in distress or on drugs, or has a medical condition. We have taken that program and applied it to our dispatch protocol and are teaching our dispatchers.

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12. See National Alliance on Mental Illness, "Calling 911 and Talking with Police." https://www.nami.org/Find-Support/Family-Members-and-Caregivers/Calling-911-and-Talking-with-Police.

13. ICAT (Integrating Communications, Assessment, and Tactics) is a Training Guide developed by PERF to help officers defuse many types of critical incidents. For more information, visit http://www.policeforum.org/icat.

Deputy Chief Michael Dunne
Arlington County, VA Police Department:

Officers and Telecommunicators Can Benefit from CIT Training

Our dispatchers are all receiving mandatory CIT training as well. Our initial goal with our officers was to hit 40 percent of them receiving CIT training, and we're well over 70 percent now. Now it's part of the basic academy, and the dispatchers are also getting the same level of training.

Chief Edwin C. Roessler, Jr.
Fairfax County, VA Police Department:

All Public Safety Personnel Can Benefit From Our Sanctity of Life Training

You're preaching what we live every day. More than a year ago, I mandated Sanctity of Life training for all my personnel. And under the public safety umbrella, our public safety communications center, our fire department, our sheriff's deputies, emergency management, anybody under that umbrella gets the training on CIT and mental health first aid. All the first responders are going to be trained in how to assess the information and plan the approach.

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FirstNet Basics

Just as NG911 will revolutionize how citizens communicate with 911 and how emergency communications centers access and process information from the public, FirstNet is fundamentally changing how police officers and other first responders receive information in the field. FirstNet will expand the types and amount of information that officers will have access to.

For example, officers responding to a report of a man with a knife inside a shopping mall will no longer be limited to voice descriptions from dispatchers, broadcast over the radio. Rather, officers may also be able to access citizen-generated photos and videos, as well as building diagrams and camera feeds from the mall and individual stores, delivered to officers' in-car and mobile devices. FirstNet can dramatically enhance officers' situational awareness and safety before they arrive on the scene of many calls.

FirstNet can also increase officer safety. In addition to pushing information out to officers in the field, the network has the potential to deliver important information from officers back to their supervisors, dispatchers, or command center personnel. For example, if an officer is having a medical emergency or is involved in a struggle with a subject, precise location information and body-worn camera video can be sent back over the network, so that backup resources can be sent.

TJ Kennedy, President, FirstNet:

Today, Officers Rely on Voice Descriptions of a Suspect; With FirstNet, They Can Get a Photo of the Suspect

It's no longer "Be on the lookout for a man in a red hooded sweatshirt." Now, nearby officers will get a message saying, "Here is a photo of the suspect that was taken 10 seconds ago." That officer now has a much better chance of capturing that guy as he's running down the street.

We can move to a point in the next year or two where, with one device, you'll be able to see any officer in your department. Whether they're running down an alley chasing somebody or whether they've pushed their emergency button. You'll be able to look at the live footage from an officer's body-worn camera and see if they're in a fight for their life, or if they are they having a heart attack. That technology is available now, but we haven't implemented it yet. But with FirstNet, it is going to happen very, very quickly.

Key Features of FirstNet

At PERF's *Critical Issues* meeting, FirstNet leaders emphasized key features of the network:

Nationwide operability. With FirstNet, agencies on the network will be able to access the network and communicate seamlessly across the network regardless of their location. A device connected to the FirstNet network will work in one jurisdiction as well as another, across state lines. This is vitally important not only during major events, disasters, and joint operations, but also in support of everyday emergency response and crime-fighting.

Priority. Priority refers to the process by which wireless users and their individual data packets take precedence over others during a time when there are many active users in an area. With FirstNet, public safety users receive true priority access to broadband network resources at all times. This is especially important during major emergencies, when large numbers of people are trying to use their mobile devices at the same time. Under FirstNet, police, fire, and EMS, along with emergency call centers (PSAPs), are placed at the head of the line for wireless service.

Preemption. In combination with priority, preemption is used to actively remove active sessions of lower-priority users and allocate resources to higher-priority users when network resources are scarce or fully occupied. By the end of 2017, FirstNet will provide public safety users with preemption in these situations.

Security. FirstNet is being designed with end-to-end encryption of communications, along with identity management and authentication. In addition, the physical infrastructure is being hardened to guard against natural and man-made disasters.

FirstNet History, Mission and Organization

Authorized by Congress in 2012, the First Responder Network Authority (FirstNet) is an independent authority within the National Telecommunications and Information Administration (NTIA) at the U.S. Department of Commerce. The mission of FirstNet is to "develop, build and operate the nationwide, broadband network that equips first responders to save lives and protect U.S. communities."[14] The FirstNet concept grew out a recommendation of the 9/11 Commission that called for more reliable and interoperable communications for first responders.[15] On September 11, 2001, many public safety agencies—police, fire, and EMS—had difficulty communicating with one another, which created confusion and likely slowed and disrupted their responses.

Organizationally, FirstNet is led by a Board that includes leaders from public safety agencies; federal, state, and local governments; and the technology, finance, and wireless sectors.

Police chiefs and other public safety leaders are represented in the development of FirstNet through two entities. Each state, territory, and the District of Columbia has a single point of contact (SPOC), appointed by the Governor or chief executive of that jurisdiction, who consults with FirstNet on technical and operational issues.[16] In addition, public safety officials serve on FirstNet's Public Safety Advisory Committee, which provides information, input, and subject matter expertise to ensure that the network meets the needs of police officers and other first responders.[17]

On March 30, 2017, following a competitive bidding process, the First Responder Network Authority announced the selection of AT&T to build the nationwide broadband network. Under the terms of this 25-year agreement, FirstNet will provide 20 MHz of telecommunications spectrum (so-called Band 14) and payments of $6.5 billion over the next five years to support the build-out of the network. (The funds were raised from previous FCC spectrum auctions.) AT&T will spend about $40 billion over the life of the contract to build, deploy, operate, and maintain the network. Under the agreement, FirstNet users will have access to all of AT&T's telecommunications network assets.

TJ Kennedy, President, FirstNet:

A Key Word in All This Is "Operability," To Use the Network Wherever You Go

I think a key word in all this is *operability*. I would love if we could stop using the word "interoperability," because it's no longer just about working with a few other public safety agencies that are nearby and that you have worked with to share operability. I believe that police officers today deserve operability *wherever they go*. You just turn on your smartphone or other device, and it doesn't matter what city or town you're in.

Many of you here today in Washington are from out of town. Superintendent Cox, from Boston, when you got off the plane, you turned on your smartphone or your laptop, and it worked, just the way it did in Boston. In the near future, when you turn on your device, it's going to say

14. https://firstnet.gov/about

15. "The 9/11 Commission Report." July 2014, p. 397. Available at https://www.9-11commission.gov/report/911Report.pdf.

16. For a list of State Single Points of Contact (SPOC), visit https://firstnet.gov/consultation/spoc.

17. For more information and a list of PSAC members, visit https://www.firstnet.gov/consultation/public-safety-advisory-committee.

FirstNet in the upper left-hand corner instead of Verizon or Sprint or some other carrier, and the apps and the network will work the same, whether you are in Boston or in Washington, DC.

Will FirstNet Make Land Mobile Radios Obsolete?

Initial deployment of the FirstNet network will focus on two elements: 1) mission-critical, high-speed data services and 2) non-mission-critical voice services that augment the capabilities of existing Land Mobile Radio (LMR) systems.

The consensus of attendees at the *Critical Issues* meeting is that, even as FirstNet is rolled out, radios will remain a key component of the emergency communications ecosystem for several years, because they provide mission-critical voice communications. However, the push-to-talk features on FirstNet devices can provide backup to LMR voice communications, especially in buildings, vehicle and subway tunnels, underground parking garages, and other locations where radio penetration may be unreliable.

In the future, broadband LTE (Long-Term Evolution) networks may be able to provide voice services, along with data and video. However, this transition will not occur until LTE voice capabilities can meet or exceed the mission-critical standards for first responders. And even then, there will likely be years of overlap between radio and LTE systems.

Harlin McEwen, Chief (ret.), Ithaca, NY Police Department; Former Chairman, FirstNet Public Safety Advisory Committee:

Land Mobile Radios Are Critical, And Will Be for Many Years

Voice communications in the land mobile arena are still critically important, and will be for many years in the future. A lot of people are saying, "When we get FirstNet, we'll get rid of land mobile." That's not a correct notion.

The broadband capability may eventually replace land mobile, but it's not happening yet. So our vision is to *supplement* land mobile by having video, texting, and all the kinds of digital data that we can think of, easily transmitted through a network, seamlessly, nationwide.

Current Status of FirstNet

Unlike Next Generation 911, where the build-out of a new network is essentially a state-by-state and jurisdiction-by-jurisdiction process, creation of the nationwide public safety broadband network known as FirstNet is mandated by federal law.[18] This federal statute requires that the new broadband

18. Middle Class Tax Relief and Job Creation Act of 2012. https://www.gpo.gov/fdsys/pkg/PLAW-112publ96/pdf/PLAW-112publ96.pdf

network be built to specifications that support mission-critical emergency communications. The FirstNet authority has partnered with AT&T to build, operate, and maintain the network.

The 50 states, territories, and the District of Columbia are currently facing a decision known as the "opt-in/opt-out" question. However, that term is slightly misleading, because the question is not whether each state or territory will be a part of the nationwide network. It is a question of *how* they choose to connect to the FirstNet nationwide network and how they will maintain and upgrade the network in their state or territory for the next 25 years.

In June 2017, FirstNet released individual plans for each of the 56 states, territories, and the District of Columbia. These plans detail coverage, capacity, and service levels for the wireless network in each jurisdiction, as well as

How Colorado Officials Used a FirstNet-like System To Help Manage a Major Ski Championship

For public safety officials in the Vail/Eagle County, Colorado area, the 2015 Alpine World Ski Championships presented major security and emergency communications challenges. To help address these challenges, officials created a public safety LTE (Long-Term Evolution) wireless demonstration network, to test how a FirstNet-like application would work in real time.

The ski championships attracted 300,000 visitors from 80 countries over the course of two weeks. Several factors complicated emergency communications. The event took place at two venues that were 10 miles apart. (The race course was in Beaver Creek, while other festivities, including concerts, parties, and awards ceremonies, took place in Vail.) The region's mountainous terrain can create difficulties with regular radio communications. In addition, multiple police agencies took part in securing the event, including the Vail, Eagle, and Avon police departments; the Eagle County Sheriff's Office; the Colorado State Patrol, and the FBI. More than 100 officers per day were part of the operation.

To access the LTE network, officers were provided with rugged, hand-held mobile devices. The officers used the network throughout the event to share large amounts of data, including CCTV camera feeds, photos, push-to-talk, and other messaging and collaboration apps.

Jennifer Kirkland, 9-1-1 Operations Administrator at the Vail Public Safety Communications Center, described one example of how the wireless network was used. Officers received a report of a suspicious vehicle close to one of the awards venues. Command center officials were able to push out to all officers on the network a photo of the type of vehicle involved and a map of its reported location. (Throughout the event, the mapping applications were particularly helpful to officers who weren't familiar with the geography of the venues.) Officers were able to converge on the area and quickly locate and secure the vehicle (which turned out to be a false alarm).

Ms. Kirkland reported that after the ski championships were over, officials held a post-event debriefing and gave high marks to the reliability of the network, the devices, and the apps they were able to run. Officers reported that they would have appreciated more training to take full advantage of the technology.

"I appreciated FirstNet's approval of that test project. It really made a difference in our ability for our police department and our partner police agencies to effectively secure that venue and protect 300,000 visitors," Ms. Kirkland said.

To watch a video describing the network used during the 2015 Alpine World Ski Championships, go to https://www.youtube.com/watch?v=SQnlcT4nMKQ&app=desktop.

initial rate plans. Each jurisdiction was given up to 45 days to review their plans and provide feedback to FirstNet, which had another 45 days to respond to jurisdictions' questions and issues. Late September marked the beginning of an official 90-day clock in which the Governor or chief executive has to decide whether to opt-in or opt-out of FirstNet. Opt-in/opt-out decisions must be made by December 28, 2017.[19]

In states that choose to opt-in, agencies will have immediate access to the existing AT&T network, complete with priority service and (by the end of 2017) preemption on the network. They will also have access to the fully built-out

What a 911 "Call" and Emergency Dispatch of the Future May Look Like

How will NG911 and FirstNet change the way in which 911 "calls" are made and dispatched? To help answer that question, the National Public Safety Telecommunications Council (NPSTC)[20] used a process called Analytic Assisted Emergency Response to model the timeline for the emergency response to a fairly typical call for service: a fight between students in a high school hallway. NPSTC compared the response using traditional technology and protocols with the response in an NG911-FirstNet environment.

The traditional response to this call begins with a call to 911 after a teacher in a nearby classroom hears the incident and runs to the front desk to alert staff. The 911 system routes the call to the PSAP. The call-taker takes the details on the call and enters them into the computer-aided dispatch (CAD) system. The dispatcher then alerts police units to respond; they receive available CAD information on their mobile data terminal.

Officers arrive at the front of the school and determine from witnesses the exact location of the incident and the best way to get there. Once on the scene, they work to differentiate the suspect from bystanders, and then take action. The total time from the incident until the officers arrive and take action is 12 minutes, 50 seconds.

Contrast that with the future response. In this case, the initial "call" to 911 isn't a telephone call at all. A "smart camera" in the school hallway alerts to the incident, and sophisticated video analytics not only determine that there is a fight in progress, but also identify a possible weapon (in this case a knife). The camera automatically alerts the PSAP via the jurisdiction's NG911 network. The incident is automatically entered into the CAD system as a call and reviewed by the telecommunicator, who then dispatches units.

While the officers are en route, building plans, plus images and video files collected from the school's cameras, are forwarded to the officers. Automatic traffic mapping guides officers to the location, and enhanced GIS and 3D building plans help to pinpoint the location within the school. With access to video images, the officers are quickly able to identify the suspect. The total elapsed time in this scenario in 8 minutes, 50 seconds, or four minutes quicker than the traditional response.

In this example, the combination of NG911 and FirstNet have facilitated not only a faster response, but also a safer and more effective response. Units are dispatched within 15 seconds of the incident

19. Virginia was the first state to opt-in, on July 10, 2017. As of mid-November 2017, 33 of the 56 U.S. states and territories had opted-in to FirstNet.

20. NPSTC is a federation of organizations whose mission is "to improve public safety communications and interoperability through collaborative leadership." For more information about NPSTC, visit www.npstc.org.

FirstNet network (the so-called Band 14) when it is completed.[21] Opt-in states will not absorb any cost to develop or maintain the network infrastructure, which AT&T has agreed to operate for the next 25 years.

States that choose to opt-out will still be part of nationwide network, but they will have to contract with a third party to create a network that meets the specifications of FirstNet. Plans for opt-out states will need to be reviewed and approved by the Federal Communications Commission and the National Telecommunications and Information Administration (NTIA). FirstNet officials estimate that the process of getting approval and building out the network to

occurring, versus more than three minutes under the traditional response. In addition, the responding officers arrive on scene with more information, available in a variety of formats, that they can use to plan and execute their response. The officers have much greater situational awareness of what they are walking into and what—and who—they need to be looking for.

Impact of Technology on Time: Detection to Arrival

NPSTC

Process Segment	Emergency Occurs	Detection	Activate 9-1-1	Call Routed to PSAP	Call Taker Questions/ CAD Entry	Dispatcher Assessment/ Assign Units	Turn Out Time	Travel to Address	Arrival at Scene	Assess Conditions	Initiate Action
Time (Min:Sec)	Time Start	1:00	:30	:10	1:00	:30	:10	6:00	3:00	:30	Time Stop
Cumulative Lapse Time	0:00	1:00	1:30	1:40	2:40	3:10	3:20	9:20	12:20	**12:50**	
Key Functions	A fight breaks out in a high school and one of the suspects is holding a large knife.	* A teacher in a nearby classroom is alerted to the fight and runs into the hallway.	* Teacher alerts the school front desk. * Front desk dials 9-1-1.	* 9-1-1 System routes call to PSAP.	* Call Taker determines location, type of emergency, and details. * Front desk has minimal information. * Call Taker enters data into CAD.	* Dispatcher reviews/ confirms which units should respond. * Dispatcher alerts units to respond.	* Units receive CAD data on MDT. * Units review information. * Units plan response.	* Units travel to scene. * Units arrive at address, front door of school.	* Officers enter school, determine route to specific wing. * Arrival at scene.	* Officers at scene, differentiate suspects from bystanders.	* Officers take action.
Next Generation First Responder Improvements		* Video analytics detect fight in progress; identify a probable weapon.	* Sensor alert to PSAP via NG911.	* Data call routed directly to PSAP.	* Automatic call entry using ASAP protocol, reviewed by Call Taker. (Call Taker also processes 911 call from school.)	* Rapid dispatch to officers, with building plan and image/ video file.	* Automatic Route suggestions.	* Enhanced GIS data to ID building and access.	* 3D building plans available prior to arrival.	* Video imagery provides complete suspect description.	
Time (M:SS)	Time Start	:05	:00	:05	:15	:15	:10	5:30	2:00	:30	
New Cumulative Lapse Time	0:00	:05	:05	:10	:25	:40	:50	6:20	8:20	**8:50**	

21. Band 14 refers to the spectrum licensed to FirstNet to create the nationwide public safety broadband network. Band 14 represents 20 MHz of spectrum in the 700 MHz band. For technical details, see https://www.fcc.gov/general/700-mhz-public-safety-spectrum-0

specifications could take considerable time in states that choose to opt-out. In addition, states would be responsible for paying for the network build-out, and for operating and maintaining the infrastructure for the next 25 years, although there will be some support from the federal government in the form of grants.

It is important for police leaders to know what is in their state plans and to ensure the plans meet their operational needs. Once states make their decisions on opting-in or opting-out of FirstNet, police leaders need to follow the timelines established in their state plans. There are also a number of technical, policy, and workflow decisions that agencies must consider (these are discussed in the next chapter).

The Convergence of NG911 and FirstNet

NG911 and FirstNet are separate initiatives, each with its own timeline, technology, and implementation needs and challenges. FirstNet, because it is a federally mandated program, is moving forward on a nationwide basis and will be up and running in a number of states very soon. In fact, some jurisdictions in opt-in states are already using elements of the network. NG911, by its decentralized nature, is progressing differently in different areas.

While jurisdictions don't need to be fully NG911-compliant to take advantage of FirstNet—or vice versa—the true power and potential of these new technologies will be realized when both are in place and are integrated.

Take the example of a child abduction, a situation where fast sharing of information is crucial. With FirstNet, the first responding officer could ask the child's parents for a recent photo of the child, use his or her mobile device to snap a photo of that photo, and immediately transmit it over the network to every other officer in that jurisdiction and neighboring ones as well. If there are CCTV cameras near where the incident occurred, that footage could also be pushed out to units in the field. The possibilities become even greater with NG911 in place. The agency could potentially accept citizen-generated content—photos or video of the victim and/or the suspect, a getaway vehicle, maybe even the abduction itself—and push that out to officers as well.

FirstNet is mandated by law to integrate with NG911 when it becomes available. When the two systems converge, information can flow quickly and seamlessly from residents to police agencies to individual officers and potentially back to the agencies and the public.

As promising as the convergence of NG911 and FirstNet is, participants at PERF's *Critical Issues* meeting cautioned that these developments have the potential to upend the ways that some police leaders have traditionally viewed information. Some agencies and agency leaders have tended to closely guard and protect information. In some situations, there are good reasons for holding information tightly; but in other cases, information has not been widely shared simply because it would require someone to make a special effort to disseminate it. In some ways, there has been a "default" position of not sharing information.

NG911 and FirstNet represent the opposite of that approach; they create an open environment where information can be readily generated and shared. That shift may require a change in mindset for some police leaders, although for younger officers entering the profession, sharing of information over mobile devices is the norm that they grew up with. Developing and harnessing a new ethic of information-sharing—while developing policies for situations in which certain types of information should *not* be disseminated, or should be narrowly shared on a need-to-know basis—will be a challenge for police leaders moving forward.

Jeffrey Cohen, Chief Counsel,
Association of Public Safety Communications Officials (APCO):

We Want NG911 Build-Out to Be Organized, Not Fragmented and Slow

APCO has been working on something called Project 43, which is about exploring the advent of Next Generation 911, FirstNet, other broadband-driven technologies such as "smart cities," intelligent highways, sensors, mobile apps, etc. How are these all going to change and impact the 911 centers across the country? We envision that the PSAP of the future is going to be the nerve center of a much larger emergency response ecosystem.

We are looking at the impact of Next Generation 911 from six vantage points: (1) governance; (2) cybersecurity; (3) technical issues and technology; (4) the work force, i.e., what kinds of positions are we going to need in 911 centers going forward: (5) training, and (6) how all of these issues merge and impact the operations overall.

We want to put 911 on the same innovation curve that FirstNet is doing for public safety and first responder communications. We want to break the cycle that we have now, where 911 is positioned like land mobile radio had been. Through no one's fault, public safety communications have been segmented, "build-by-build," one at a time, without being able to achieve economies of scale and the pace of innovation that we as consumers experience.

So we'd like to be able to leverage commercial technology and drive that innovation and economies of scale.

WHAT'S NEXT:

Five Issues that Public Safety Agencies Must Address to Harness The Potential of NG911 and FirstNet

FOR AMERICA'S PUBLIC SAFETY AGENCIES, THE CONVERGENCE OF NEXT Generation 911 and FirstNet technologies presents enormous challenges.

But many of the participants at the *Critical Issues* meeting noted that the technology itself may be the easiest of the issues that need to be managed. Both FirstNet and, especially, NG911 present an array of other issues in five key areas:

- **Technology Issues**
- **Policy and Workflow Issues**
- **Training and Other Workforce Issues**
- **Governance Issues**
- **Funding Issues**

NG911 and FirstNet will require public safety agencies to rethink many of their traditional ways of doing business. This chapter explores those implications.

1. Technology Issues

For both NG911 and FirstNet, technology is not the primary barrier to full implementation. The wireless broadband infrastructure upon which both systems rely already exists today, and it has been demonstrated to work in real-world settings. The challenge moving forward is to adopt these new technologies in an efficient and coordinated manner.

NG911 Technology Considerations

The implementation of NG911 requires technological upgrades in three key areas. While police leaders will not be expected to become technical experts in these areas, it is important for them to understand why these upgrades are important and to monitor their progress and costs.

- **ESInet implementation.** Emergency Services IP Networks are the backbone of NG911. They are the wireless infrastructure that carries emergency voice calls, as well as text, data, video, and photo communications to the PSAP. As the companies that provide legacy 911 systems phase them out or even eliminate them, jurisdictions will be forced to move toward IP-based ESInets. While the process is already happening in many states, regions, and municipalities, the connections among those networks—the "network of networks"—is still not being fully leveraged. The ultimate vision for NG911 is that regional or statewide ESInets from across the United States will eventually be linked to provide seamless and consistent emergency communications.
- **IP-enabled call-taking stations.** 911 call-taking stations must be able to receive voice calls over the IP-based network. There are many technical solutions to upgrading a facility's CPE (customer premises equipment) to function in an NG911 environment.
- **GIS data.** Most jurisdictions already use Geographic Information Systems data in their CAD systems. In an NG911 environment, ensuring accurate and complete GIS data is critical for two reasons: to dynamically locate today's 911 callers who are using mobile phones and might be calling from any location, and to route those calls to the appropriate PSAP. GIS is a core component within NG911.

FirstNet Technology Considerations

The technology issues that police executives must consider with FirstNet are much different from those with NG911. For opt-in states, the FirstNet technology infrastructure already exists over the current AT&T network. That network is being built out further, and will be operated and maintained by AT&T for the next 25 years. In opt-out states, another vendor will be responsible for building out the network to FirstNet technical specifications. Rather than concentrating on the network itself, police leaders will need to focus their decisions on three other areas: service providers, devices, and applications.

- **Service providers.** Federal law requires that the FirstNet network be built, but it doesn't mandate that individual agencies join it. Agencies can choose to keep their existing wireless service providers, but they will not be able to take advantage of FirstNet's features, including nationwide operability, priority, preemption, enhanced security, and access to mobile apps that are under development.

  For agencies that want to join the FirstNet network and that already equip personnel with smartphones or other mobile devices, they will need to switch service from their existing carrier to FirstNet. In many cases, it may be as simple as swapping out a SIM card in their mobile devices. FirstNet officials said they expect that the prices for accessing broadband services through FirstNet will be comparable to, or in some cases less than, their existing cellular service costs.

- **Devices.** Participants at PERF's *Critical Issues* meeting noted that police officers, like members of public, already rely on their smartphones, whether those devices are department-issued or personally owned. Officers use them to conduct online searches about a location they are responding to, or to use mapping applications, or participate with other officers in "Google Hangouts" (a communications platform that combines instant messaging, voice, and video calling), and share information in other, sometimes unofficial ways. For many officers under the age of 30 who have grown up with smartphones (as well as older officers who appreciate technology), these technologies are second-nature and are invaluable, because they work.

  Many police and sheriffs' departments provide mobile smart devices to their field supervisors and command personnel, but not to their street officers. Because FirstNet will dramatically expand the information available to officers on the street, and will also create new opportunities for efficiency in areas such as report-writing and evidence collection, the advent of FirstNet may prompt some police agencies to rethink their traditional strategies about who is issued a smart device and for what purposes.

  Once the FirstNet network is launched, agencies can choose to purchase devices through FirstNet or connect their existing devices to the network. FirstNet plans to offer a range of devices, including smartphones, laptops, tablets, dongles, and a wide variety of specialty devices. FirstNet has said that it will focus on creating devices that are rugged enough to withstand the environmental hazards that police and other first responders routinely encounter, but will be easy to use and convenient to carry.

William Schrier, Senior Advisor, FirstNet:

Mayors and Local Governments Need to Provide Smartphones to Officers

On May 4, Chief Jonathan Lewin of the Chicago Police Department hosted a meeting of about 20 chief technical officers in the largest police departments, and one of the questions I asked was, "How many of you give your police officers department-issued smart phones?" And the answer was that only about three of the 20 largest departments do so. Most departments give smartphones to sergeants, lieutenants, detectives, but not to the cop on the street.

I fought that battle in Seattle, where I was the CIO for the Police Department. What company, public or private, sends its field workers into the field without a smartphone? Mayors, city councils, and county commissions need to step up and give the officers the tools they need to do their job.

- **FirstNet Applications.** One of the greatest innovations in modern communications was the "crowd-sourcing" of the task of creating applications for smartphones. When Apple created its iPhone, rather than trying on its own to anticipate all the ways in which people could use iPhones and building applications to fill those needs, Apple chose to encourage innovators around

the world to create apps. The result was a proliferation of creativity that is summed up in the catch phrase, "There's an app for that." In other words, if you find yourself wishing that your smartphone could perform a certain task, chances are that someone has already thought of it and has created an application for it.

FirstNet includes an App Store, which will offer customized public safety applications developed by trusted third-party vendors.[22] As it is built out, the App Store is expected to address a range of needs, including report writing, information analysis, team communications and workflow, and situational awareness. The goal is to offer high-competition, low-cost, secure apps that can be used within and across departments.

TJ Kennedy, President, FirstNet:

The Development of Public Safety Apps Will Drive Innovation on FirstNet

We really need to drive innovation on the network. When people use apps that make it easy for officers to digest information in the field, things really change. You see this with the HunchLab app.[23] When we can take information and digest it down to what an officer needs in the field, it's really life changing.

We will soon publish our software development kit and our initial App Store. We will publish the security standards and make it easy for developers to create apps that provide law enforcement solutions. Our goal is to have a high level of competition, so we will see low-cost apps that can be shared across many departments.

We also will provide dedicated customer care, so regardless of where you are in the country, you can always call FirstNet—24/7—for your customer care needs.

Director of Government Marketing Tracy Kimbo, Motorola Solutions:

We Are Working with AT&T on an App To Facilitate Communications at Large, Dynamic Incidents

Motorola has been working on applications for broadband; we're partnered with AT&T. We're creating an application where police will be able to draw a geo-fence, basically, around a dynamic situation such as an active shooter incident. So as multiple officers arrive, anybody who comes on the scene gets added to that "talk group," whether they're on broadband or radio. So everyone can talk to the group. That's a great example of how

22. https://www.firstnet.com/apps/app-store

23. HunchLab describes itself as a web-based proactive patrol management system with advanced statistical models that forecast when and where crimes are likely to emerge. The service is "not just about anticipating crime; it's about figuring out the best way to respond," by providing features that "(1) align patrol activities with the priorities of the community, (2) intelligently allocate resources to prevent over-policing, and (3) determine which tactics work and which don't." https://www.hunchlab.com/

broadband or LTE will be used in conjunction with Land Mobile Radio in an emergency situation.

Cybersecurity

According to participants at the *Critical Issues* meeting, probably the most difficult technology challenge agencies will face in this new environment is cybersecurity. Accepting photos, videos, and other citizen-generated content creates the potential for viruses or malware that could threaten 911 systems. And because networks will be increasingly interconnected, a single intrusion could impact large swaths of the network.

Cybersecurity becomes a particular challenge when you consider there are approximately 6,000 PSAPs currently operating in the United States. Many, especially smaller ones, won't have the capacity or resources to build robust cyber defenses. That is why experts are recommending regional, statewide, or even national approaches to cybersecurity for NG911 systems.

Ronald Hewitt, Director,
DHS Office of Emergency Communications:

Cyber Security Will Need to Be Handled Regionally, Not by Each PSAP

It is not reasonable to expect a high level of cyber security at 6,000 separate public safety answering points, since most of them are very small. Thus, it would not be cost-effective to have an emergency communication cyber security center at every site.

So there will need to be some kind of an architecture at the state level, and maybe even larger, that provides the cyber security framework. That's what we've been working on with the National Governors Association (NGA), which just did a policy academy on emergency communications in five states. Through NGA we will be engaging state leaders to provide greater awareness of these issues.

One thing all elected officials have in common is that they don't want a response to a major incident to go bad. So we've got to make sure that everyone understands the need for cyber security using credentialing, identity management, firewalls, and intrusion detection and prevention systems to protect emergency services Internet Protocol networks. Because these new 911 systems will be interconnected, they're only as strong as their weakest link. So we all have to be working together and know that we will need to rely on each other.

Robert "Dusty" Rhoads, Branch Chief
DHS Office of Emergency Communications:

Cyber Security Challenges Are Immense When We Start Accepting Data from the Public

When the concept of sending photos and video and data to a 911 center was first conceived, it was seen as a great concept. But today, what do we

preach? We preach that you do not open any files from anybody you do not know, because they might be a threat to the integrity of your entire system.

So now, in this new environment, we need to determine what process will ensure that these videos and files coming in to a 911 center do not bring down the 911 system. And in providing this security, how do we ensure that the process doesn't slow everything down and interfere with the work flow? These are some of the challenges when we're thinking about this new concept of accepting files from people we don't know, in a critical infrastructure.

The Federal Communications Commission (FCC) Task Force on Optimal PSAP Architecture addressed this issue and proposed emergency communication cyber security centers across the country. These centers would be specifically focused on cyber security of the 911 network that has been proposed. But as of right now, no one is actually moving forward on that effort.

While the move to NG911 raises significant cybersecurity concerns, it also presents opportunities to get cyber "right"—to establish best practices as the new networks are being built. A lot of work is being done on this issue by government and industry organizations, including the National Institute of Standards and Technology (NIST), the Department of Homeland Security, APCO, NENA, and the FCC.[24]

The consensus among the experts is that cybersecurity needs to be "baked in" from the start when creating NG911 systems, not treated as an add-on after the new systems have been substantially developed. That is the approach FirstNet has taken. It is providing end-to-end encryption of all communications, a duly redundant network, and active monitoring and defending of the network around the clock.

For the NG911 environment, the FCC's Task Force on Optimal PSAP Architecture recommended a national collaborative approach to cybersecurity utilizing a concept called the Emergency Communications Cybersecurity Center (EC3), a centralized function for securing NG911 networks and systems.[25] Under this concept, digital traffic to PSAPs would be routed through the EC3, which would provide round-the-clock intrusion detection and prevention, as well as real-time information sharing about threats. EC3 would identify threats, explain why they are of concern, and make recommendations for mitigation. Importantly, the EC3 would be able to share that information with other PSAPs who may be facing similar threats. While an EC3-like approach would require a substantial up-front investment, the FCC Task Force pointed out that it would provide cost savings over a collection of individual cyber approaches, would increase security, and would accelerate implementation of NG911.

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24. In its final report, the FCC's Task Force on Optimal Public Safety Answering Point Architecture (TFOPA) summarized many of these initiatives and provided a cybersecurity self-assessment checklist. See https://apps.fcc.gov/edocs_public/attachmatch/DA-16-179A2.pdf, pp. 195-212.

25. FCC TFOPA Final Report, pp. 57-67.

CRITICAL ISSUE:

How Artificial Intelligence and Machine Learning Can Improve Emergency Communications

A key responsibility of 911 call-takers is to triage calls for service. This involves asking the right questions to determine the nature of the incident being reported and the most appropriate resources to respond. To carry out this task, call-takers rely on their training, experience, and in many cases, pre-loaded scripts or protocols for gathering detailed information about various types of incidents.

Artificial intelligence (AI) and machine learning have the potential to dramatically speed up and enhance the triage process. These processes can "learn" from the entire body of previous questions and answers from similar calls in the past. Using the analysis, the systems can then prompt the call-taker to ask the most appropriate questions, in the right sequence, to speed up the call triage process and make it more effective.

Artificial intelligence is not designed to replace call-taking scripts and protocols, but rather to enhance their usefulness and efficiency.

Warren Loomis, President/CEO, Versaterm Corporation:

Machine Learning and Artificial Intelligence Can Help to Process Incoming Information

Police can change the way they work by taking technology that's already being used by consumers and adapting it to the public safety paradigm. The best example I can give you is to consider what Apple's "Siri" or the Amazon "Alexa" can do. You just speak to the device and ask a question, and Siri or Alexa gives you the answer. And importantly, Siri and Alexa can become increasingly sophisticated over time.

For example, a year ago, if you asked Siri to direct you to the nearest bridge, it would tell you where the nearest bridge was. And if you told Siri, "I want to jump off a bridge," Siri would respond, "Here are the locations of the nearest bridges." But today, if you tell Siri you want to jump off a bridge, Siri will say, "Would you like to talk to a suicide help line?" This is an example of machine learning and artificial intelligence built into a consumer device.

We can build that into a police CAD system, integrating it with a version of Alexa or Siri, so it's actually *listening* to the conversations going back and forth, and applying machine learning and AI to collect information and come up with better answers. All it has to do is "listen" to the call as it happens.

So when you have a caller on the line who mentions a license plate number or a person's name, the system can fill in that information in a structured way and run the names, run the plates right away, so the call-taker doesn't have to do it.

EMS and police agencies also are using some sort of triaging protocol, using cards or something similar to prompt the call-taker to ask the right questions. But you can program this technology and it will learn over time to start prompting the call taker. For example, it might prompt the call-taker to ask, "Is the suspect still on the scene?" So, not only does it use natural language to collect information and put it into your call so the relevant information will get out to the front line officer, but it's also helping you to triage.

CRITICAL ISSUE:

Harnessing the Power of Public Safety Apps

In addition to the new applications being developed for police officers to use over FirstNet, there is already a large and growing number of public safety apps aimed at the consumer market. Many of these apps target specific demographic groups, such as college students, persons with disabilities, and senior citizens. As more jurisdictions build out their ESInets and move toward full NG911 implementation, the proliferation of apps to interface with 911 will grow. Having standards and common interfaces for these apps will be critical, along with security measures to ensure that "rogue apps" don't gain access to the growing network of ESInets.

To help ensure that apps for public safety and emergency response are as safe and effective as possible, APCO International, the Association of Public-Safety Communications Officials, created the Application Community—AppComm—to "facilitate collaboration and serve as the single trusted site for public safety apps."[26] Working with public safety officials and app developers, AppComm has identified key attributes for public safety apps in such key areas as security, privacy, and data and battery efficiency. AppComm also serves as a forum for police and other public safety professionals, members of the public, and app developers to discuss and rate apps, identify needs that are not being met, and submit ideas for new public safety apps.

Following are two examples of public safety apps that are in wide use:

ASAP to PSAP: Freeing up 911 Resources on Alarm Calls[27]

Burglar alarms are among the most frequent calls to 911. And although a large percentage of those calls are false alarms, police and other public safety officials have to treat the calls seriously. To reduce the number of traditional "calls" to 911 from alarm companies, and to improve the efficiency of how these incidents are handled by PSAPs, APCO played a leading role in developing a data exchange called "ASAP to PSAP."

With this app, alarm calls to 911 automatically populate the jurisdiction's CAD system in a uniform manner, without the need for someone at an alarm company to dial a 911 call center. Jurisdictions that have adopted the technology report that it is freeing up hundreds of 911 center calls a year and improving response.

Jeffrey Cohen, APCO Chief Counsel, and Stephen Willoughby, Emergency Communications Center Director in Richmond, VA, explained how the system works.

Jeffrey Cohen: We developed a common interface for alarm companies to automatically populate the CAD system when a burglar or fire alarm goes off at a home or business. So the alarm companies won't need to have their personnel physically dial in to a 911 call center and relay information; instead, the alarm companies can electronically send the alarm information to the call center. More and more alarm companies are joining it, and by all indications, it's working very well. And the feedback we're hearing from PSAPs is that it's terrific.

We're also thinking about using this as a model to extend to other types of things, like mobile apps, that could send information directly to PSAPs.

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26. See www.appcomm.org.

27. For more information on ASAP to PSAP, see https://www.apcointl.org/resources/interoperability/asap.html,

Stephen Willoughby: Richmond was one of the first to deploy ASAP to PSAP, and it literally saves us hundreds of calls a year where we do not have to pick up the phone, ascertain all the information associated with the alarm, and then enter it into our computer-aided dispatch system. The alarm companies enter that information directly through a message switch into our CAD system, and it populates in front of the radio dispatcher to be dispatched. Not only that, but we're able to communicate back and forth, so if we need key-holder information, we can communicate that in the CAD incident without having to pick up a phone. That frees up my call takers to answer other priority calls in our communication center.

Director Stephen Willoughby, Richmond, VA Emergency Communications Center

Smart911: Providing emergency response personnel with key profile information before they arrive

Smart911 is a web-based application that allows individuals, family members, and even organizations and facilities to generate profiles about themselves that are accessible to emergency communications personnel in cities that subscribe to the service.[28]

A profile for an individual might include medical issues or physical or developmental disabilities that first responders should know about, as well as pets, emergency contacts, and other information. A family could create a profile for a relative who has mental illness or problems with substance abuse.

The profile for a facility could include floor plans, emergency exits, the location of medical equipment, or other information that could be useful to responding officers. This type of information can be especially helpful to officers responding to an active shooter incident.

28. See https://www.smart911.com/.

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2. Policy and Workflow Issues

Robert "Dusty" Rhoads, Branch Chief,
DHS Office of Emergency Communications:

After Decades of Working in the Same Way,
We Are About to Have a Revolution

For decades, we have done work the same way. A citizen talks to somebody in the communication center, and somebody in the communication center talks to the officers who are responding. We've had evolution along the way. For example, today's call-takers and dispatchers have computer-aided dispatch that provides questions to ask and instructions for various types of incidents, rather than the old system of having printed cards with questions to ask for each type of situation. But it's still the same way of doing business.

But with the change in technology happening now, it's no longer going to be an evolution; it's going to be a revolution of how you manage this information. It's all about information management, and being careful not to have information overload that distracts public safety officials from doing their job.

The march toward Next Generation 911 and FirstNet represents the large-scale introduction of "big data" into emergency communications. The technology already exists to collect vast amounts of data from the public and to push data out to police officers and other first responders in the field. What's missing are the policies, workflow protocols and strategies, and business processes for screening and evaluating the new data, and for turning it into actionable information that first responders can use effectively.

Public safety agencies need to ensure that new technology supports and improves emergency response, and does not overwhelm police and other first responders with far more information than they can use, or with information that is not helpful.

Participants at the *Critical Issues* meeting discussed several policy and workflow issues that agencies will need to address as they adopt NG911 and FirstNet. Following are some of the most important issues that agencies will need to understand and address if they are to take full advantage of what these new technologies have to offer.

What types of data and media will be accepted?

The types of data that can be pushed over the wireless broadband networks envisioned by both NG911 and FirstNet are vast. As noted earlier, some jurisdictions have begun implementing basic text-to-911 applications. These

networks will be able to handle much more, including photos, videos, sensor technology such as gunshot detection systems, license plate recognition systems, and a host of Internet of Things devices.

In planning for which types of data to accept, PSAPs and other public safety agencies need to keep in mind both how the public is using their mobile devices today (and tomorrow), and how mobile technology is changing to meet public demands. Some agencies may use an incremental process, in which they begin to accept texts, then photos, and eventually video. Video may take more time to implement because video files are orders of magnitude larger than photos and text files. However, experts said that video generally is emerging as the most popular type of mobile data today and into the future. As people use the Internet to learn about many things they care about, many prefer to watch a video than read about any given subject. To "get NG911 right," public safety agencies need to get video right.

Vice President Jim Bugel, AT&T Public Safety Solutions:

Keep in Mind That Video Is the "Killer App"

It's important for public safety officials to understand that video is the "killer app" across every sector of the economy. When you hear about 4G, 5G, 6G networks, what that really means is more video, faster. The wireless networks are being built to carry more and more video. That's what people want to do. A huge portion of our traffic now is mobile video, and that's true with all the other mobile carriers.

That's what you're looking at. You're looking at more video from more sources, so that's why this is so critical. It's not creeping at you. It's coming at you very, very quickly.

Where will these new data streams go, and who will manage them?

This may be the most difficult question that PSAPs and public safety agencies will face in the NG911 environment: **Who should be responsible for the initial acceptance and processing of text messages, photos, video, and other new data that will be coming in from the public?**

And, as a logical follow-up, who will be responsible for storing and maintaining the new data, which in many cases will become part of an evidentiary package for that incident?

It is clear that NG911 and FirstNet will require new workflows and business processes for managing the increased amount of data, and variety of data, that agencies will receive. There is no one game plan for what these new workflows will look like. They will need to be developed by individual jurisdictions, based on their own resources and needs.

Chief Dan Slaughter, Clearwater, FL Police Department:

We Need Effective Workflows
To Deal with All of This Data

We are in the process of implementing smartphones for all our officers, so we are ahead of the curve on that. But I'm a little concerned about workflow, and about ensuring that the communication centers, as they gain access to all of this data—the photos, the videos, and the text messages coming in—that they will have effective mechanisms to deal with those work flows.

Because 911 call-takers are the primary entry point for calls coming into PSAPs, they might seem a natural choice for assuming responsibility for accepting texts, photos, videos, and other digital data. But experts at the *Critical Issues* meeting cautioned that this not be the most effective or efficient approach. In many areas, call-takers are already handling a steady stream of voice communications. They may not have the time, the capacity, or the skill sets to handle this new responsibility.

There are alternative workflow arrangements that jurisdictions can consider. For example, agencies could create a separate position within the PSAP, but outside the voice communications process, that would be responsible for initially accepting and reviewing texts, photos, and video, and then pushing appropriate data into the CAD system and the dispatch process.

Under another option, data might not even go to the PSAP, but rather to a citywide Real-Time Crime Center or similar command or fusion center operation. If jurisdictions have command centers that are already monitoring CCTV cameras and other data feeds, they may be in a better position than the PSAP to manage the flow of new data coming in from the public and integrate it with their existing data feeds.

Some future workflows may bypass PSAPs or command centers altogether. For example, a gunshot detection system, upon detecting the firing of a gun, could automatically activate CCTV cameras in an area, direct those cameras to the location of the gunfire, and automatically push that video, via FirstNet, to officers responding to the gunshot detection system "hit."

In the private sector, this type of expedited workflow is called "disintermediation," which means reducing the number of intermediaries between the *sources* and the *final users* of goods, services, or information. If managed properly, this type of direct, automatic transmission of information has the potential to vastly improve emergency communications and response.

When considering workflows, agencies also need to remember that they will not only be managing data coming in from the public; they also need to consider how to handle data, such as body-worn camera video, coming from officers in the field back to the agency. As FirstNet President TJ Kennedy noted, "This real-time ability to get video from the scene back to the department, and

to have somebody in the department analyze it, changes the nature of what dispatch does."

As public safety agencies move forward with NG911 and FirstNet, the policies and workflows must focus on two key outcomes:

- **Ensuring that PSAPs or command/fusion centers do not become choke points** between the new data coming in from the public and the information being pushed out to officers in the field. The goal must be to receive, process, and push out information as efficiently as possible.
- **Focusing on the needs of the first responding officers in the field**—not supervisors, intelligence analysts, or others. The promise of these new technologies is to help first responders do their jobs more safely and effectively, and not to overwhelm them with too much information or information they can't use. Part of the solution could be technology, such as mobile dashboards that show officers what kinds of data are coming in, and which ones look useful. But in addition to technology, PSAPs and public safety agencies must have strong policies and workflows in place for the technology to succeed.

CEO Brian Fontes, National Emergency Number Association:

There Will Be State and Federal Organizations That Specialize in Analyzing Video and Other Data

I think there is an unfounded fear among some in the 911 community that NG911 means call-takers will be asked to watch every video and assess every bit of data that is sent through the system. That's not how it will likely work, mainly due to staffing and training limitations.

Instead of videos being delivered directly to a 911 center, they could be sent to a local, state, or federal agency equipped with the expertise to decipher video information, so that such information could be reviewed quickly and distributed, if necessary, to field responders in a timely manner.

Similarly, if a 911 caller has a device- or app-based medical profile, that information would not be provided in detail to the call-taker. It is much more likely that only an icon indicating the availability of additional medical information would be displayed to the call taker. He or she could then simply push the data along to the field responder or triage location for the incident.

In short, in a Next Generation 911 world, data would be pushed and pulled throughout the entire emergency response chain for review and use by those with the appropriate expertise, potentially well beyond your local 911 center, police department, or fire department, to experts equipped to analyze and use data for a better informed and more efficient emergency response.

Chief Jonathan Lewin, Bureau of Technical Services, Chicago Police Department:

We Have Strategic Decision Support Centers – Mini-Fusion Centers That Process Information

One thing that we talked about in our Chicago meeting is that FirstNet is going to change the role of the PSAP, because of the huge amounts of information that PSAPs will have to analyze and process. Some of this will be automated, of course, but there will be some kind of a human process as well that supplements that.

In Chicago we have created Strategic Decision Support Centers,[29] which essentially are like mini-fusion centers in the police districts, which are processing all this real-time information that's coming in from all the sources that we've talked about. This has caused us to think about the roles of these centers, and their capacities to assist with all the information that will be coming in to Next Generation 911 centers and will be pushed out via FirstNet.

Vice President Jim Bugel, AT&T Public Safety Solutions:

Fundamental Changes Can Cause Anxiety, But Remember, This Is a Historic Moment

We have a lot of citizens with smartphones, which means they have broadband capability, and they may have video or other information to share. And we have the first responders who have the broadband capability to see the information, whether it's text, video, data, or multimedia. The choke point is the PSAP. Currently, the multimedia gets reduced down to voice, and a lot can get lost in the translation.

As people have noted, this is a historic moment. What we need to understand is that what's affecting the public safety industry is also affecting every other sector of the economy. Everyone is feeling these changes caused by new internet and IP-enabled services. And you're faced with a marketplace that's moving quickly.

What's happening is called "disintermediation," which is a fancy word for removing intermediaries in an economic supply chain, or "cutting out the middleman." Another way of describing what's happening is to say, "What used to work doesn't work anymore, so we're going to get rid of it."

The question is, what do we do with all the data? Your voice-centric PSAPs will become something more like a Command/Control Analytic Center. We're talking about citizens' multimedia going to first responders. We have ever-growing, multiple inputs that are going to start compounding and growing more rapidly across the horizon. That's what we're faced with, and that's what we have to solve for.

29. See "CPD Launches Second High-Tech Hub To Fight Violent Crime." CBS Chicago, February 8, 2017. http://chicago.cbslocal.com/2017/02/08/cpd-launches-second-high-tech-hub-to-fight-violent-crime/

See also "Police Department Announces Expansion of Predictive Technology in Austin." Chicago Police Department News Release, June 29, 2017. https://home.chicagopolice.org/wp-content/uploads/2017/06/29-Jun-17-Chicago-Police-Announce-Expansion-of-Predictive-Technology-in-Austin.pdf

How will incoming data be reviewed and vetted?

During a major incident, or even a minor one, dozens or even hundreds of individuals may capture photos and videos and try to share them with their local public safety agency. In these situations, it is not realistic that every piece of data can be reviewed and vetted. Agencies may not have the resources or skill sets to process large volumes of digital data.

At the same time, some of the video footage or other information submitted to police may be critically important to effecting a smart and safe response. In some situations, such as active shooter incidents, the need to quickly send video to responding officers may outweigh the need to thoroughly review the footage.

In addition to the issues of maintaining cyber security in a NG911 environment, another concern involves unverified or false information coming from the public. PSAPs are already dealing with issues like "swatting" and "spoofing."[30] Accepting photos and videos will raise this type of issue to a new level of concern. Developing procedures to spot red flags and quickly recognize and discard "garbage" videos and photos will be critical. In other cases, people may send video or other information in good faith, but the information may be misleading or false.

In the long term, artificial intelligence will play a role in helping to triage what pieces of data are useful and which ones are various types of "noise." In the meantime, this review and vetting function will likely require more public safety employees, who will be highly trained professionals, supported by strong policies and procedures.

Fairfax County, VA Chief Edwin C. Roessler, Jr.:

"Spoofing" and "Swatting" Will Get Worse As We Start Receiving Videos and Other Data

In terms of unverified information coming in, we all know about swatting and spoofing, and we deal with that now. This is something we have incorporated into training for our police officers, dispatchers, and call-takers.

This is just going to increase. People may create fake videos indicating that a homicide or other critical incident is occurring. They'll upload it, and it will get pushed over to 911. And if the dispatchers and officers don't realize the video is fake, they may go into the situation at a high level, and someone may get hurt. So we need to train officers and dispatchers to be wary about the veracity of videos and other information that comes in.

30. "Swatting" is the act of giving false information to a 911 center, alleging that an emergency is occurring at an address where in fact there is no emergency. Swatting not only wastes emergency response resources, it also can endanger first responders and traumatize persons at the address.

"Spoofing" is the act of falsifying information that appears on a Caller ID system, in order to trick the recipient of a call into thinking that the call is coming from another person or location.

How will officers safely receive and transmit information?

Police officers can safely take in only so much information while they are responding to a call for service. While it is critical that officers receive the information they need to handle calls safely and effectively, it is also essential that officers not be distracted and have their safety compromised when they receive information in the field.

Officers already face safety issues with their radio systems, in-car computers, and mobile devices (whether personal or department-issued). FirstNet will bring even more data and more types of data to officers while they are in their vehicles. To address these safety concerns, agencies will need to reinforce their policies on accessing in-car information.

Technology can play a role in this area. Voice-activated commands (similar to Apple Siri and Amazon Alexa) will become increasingly prevalent in police vehicles. So will touch-screen dashboards that will organize information and make it more readily available to officers. In the NG911-FirstNet environment, agencies will need to pursue technologies that make the officer's job easier and safer, not more complicated and risky.

Josh Ederheimer, Senior Advisor, DOJ Office of Tribal Justice:

Officers Do Not Have Time to Search For Information; They Want It Sent to Them

When I was handling the law enforcement portfolio for FirstNet, President TJ Kennedy sent me around the country, probably to 20 or 30 states, to meet with sheriffs' associations and police chiefs' associations. I talked to law enforcement leaders, as well as officers and deputies on the street, about what they actually wanted from FirstNet.

What I learned was that they're mostly looking for help on a day-to-day operational basis. They want to receive information "passively." They don't want to be constantly entering requests for data into a computer or their phone. They want information to come to them, preferably without them even having to ask for it. They want heads-up displays in their cruisers, and people or devices telling them what they need to know, audibly.

Because officers on the street want the information to come to them, that puts the onus on everybody here to decide what kinds of information to push out. We need to understand that officers perform a lot of different tasks, and they don't have much time to conduct research.

What are the legal implications of the new technology?

NG911 and FirstNet create new legal challenges for public safety agencies. One key issue that agencies need to consider is that digital content submitted by community members, especially photos and videos, will often become evidence

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CRITICAL ISSUE:

CALEA Accreditation Helps Ensure Emergency Communications Centers Are Up to Standards

When most police leaders think of the Commission on Accreditation for Law Enforcement Agencies (CALEA), they think of accreditation for police departments and sheriffs' offices. But for the past 20 years, CALEA has offered accreditation to emergency communications centers as well. Newport News, VA Police Chief Rick Myers serves as PERF's representative on the CALEA Board of Commissioners and as Chairman of the Commission.* He discussed the benefits of gaining accreditation for emergency communications centers.

Newport News, VA Chief Rick Meyers:

CALEA formed the accreditation program for communications centers in partnership with APCO, and it has been an enduring partnership. It started in the 1990s, and the first communications center was accredited in 1999, so it has legs.

You don't have to be a major center. It's good for comm centers of any size, standalone communication authorities, universities, even private-sector organizations like nuclear power plant police agencies that have a comm center. We can accredit them and their component organizations.

The benefits are similar to the benefits of accrediting your police department. Accreditation is a management tool. It provides for data collection, policy development, and consistent practices. It really comes down to helping managers make better decisions based on relevant data.

Without accreditation, not enough agencies do frequent internal audits and inspections. With accreditation, every four years you have the onsite team come in and do an assessment. It's independent people from outside your area who can give you a green light on running a great organization. It really focuses on the high-liability areas, which we all tend to overlook in the day-to-day.

The standards are the heart of the CALEA accreditation process. My department in Newport News is "TRI-ARC," which means our police department is accredited, our communications center is accredited, and our training academy is accredited. The communication standards really are specific to comm centers, covering quality assurance, emergency medical dispatch, training, and policy development.

CALEA has a wealth of resources available to help you get started on accreditation. There's four phases to get started. You get enrolled, you do up to two years of self-assessment. When you think you're ready and the regional program manager thinks you're ready, the onsite team arrives and they'll help you get through your first accreditation. That report goes to the full commission, and then you're accredited.

Then, you plug into the cycle. We have a new four-year cycle. Every year now, a staff member from CALEA will work with you to make sure you're maintaining compliance with key standards. So you don't have a big scramble at the end of the fourth year before the onsite team shows up.

For more information about CALEA and accreditation for communications centers, visit http://www.calea.org/content/public-safety-communications-accreditation.

* In November 2017, Chief Myers took a new position as executive director of the Major Cities Chiefs Association.

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in criminal cases. Other legal issues include data integrity, confidentiality, ownership of the data and sharing across networks, and availability. Because new types of data will be shared more easily over new broadband networks, the legal issues will take on added importance.

Michael Alagna, Director of Technology, IJIS Institute:

Some Information Coming in Will Be Evidence, So We Need Systems to Maintain the Integrity Of Information Across the Criminal Justice System

The data that will be coming in through this new infrastructure will become evidence. Some of it eventually will be passed on to prosecutors and to the courts, who are going to want assurances about the integrity of that evidence. So, we need to develop ways of maintaining the integrity of the information as it flows through the criminal justice system. We need to work across the community of public safety practitioners and solution providers to develop approaches to these pressing issues.

From the standpoint of a national strategy, emergency response technology typically includes the public providing information to the local government, and the government marshaling resources. There are other aspects to these communications. Not only is the public talking to the government, but the public is talking to other members of the public, sharing information about crime and public safety, and much of that is in the public domain, on social media and other places where police can see it.

And the government needs to be talking to the government. You may have an active shooter incident, and people will send video and texts via NG-911. But what if it's not an isolated event? What if that's happening in five different locales around the country, as a larger terrorist incident? PSAPs will increasingly become a sensor for homeland security, so this information is going to be useful for national authorities.

The last piece of this is that the government needs to talk to the public. The government can send alerts and warnings and ask questions. If people send texts or photos to 911 about an incident, the government should be thinking about how it can reply to those people and ask questions. "What are you seeing now? What are you hearing? Do you have any additional information we can use?"

There are many big issues involved in this—the integrity of the data, confidentiality of the data, availability of the data.

Robert "Dusty" Rhoads, Branch Chief, DHS Office of Emergency Communications:

A Legal Issue To Be Addressed: When Data Is Shared, Who Owns the Data?

One of the issues that we need to discuss is the legal aspects. If I'm sharing data with you, who owns that data? If I share it with you, do you now own it? Do you now have the legal right to do anything with it that you want to do with it?

The challenges are even greater when you are working in an environment like the Washington, DC region, where you are frequently moving between states. What works in one state does not necessarily work in another state. So the legal implications of data-sharing certainly need to be addressed.

3. Training and Other Workforce Issues

Newport News, VA Chief Richard Myers:

We Will Need to Upgrade Dispatch Centers With Analysts and More Skilled Call-Takers

I see this whole concept of a dispatch center evolving into an emergency response and information center, with analysts, telecommunicators, and call-takers who have more training, including training in psychology and communication. We'll also need to educate our elected officials about these developments, so we can raise the pay, again hire to those skills, and train to those skills.

In the early days of 911, the job of the telecommunicator was largely to answer phones and dispatch units for a single agency, mostly with manual processes and limited technology. It was not uncommon for agencies to use limited-duty police officers, often with little or no training, to fill in at the 911 center.

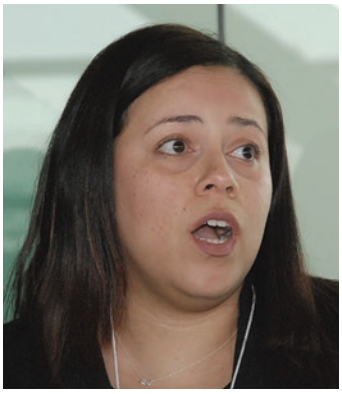
The environment is much different today. Most telecommunicators monitor between seven and nine computer screens, conduct research in a variety of databases, and handle a steady stream of difficult, often stressful situations. Telecommunicators have been described as "the first of the first responders in the 911 public safety delivery continuum."[31] However, many are still classified as "clerical" personnel. Their pay is comparatively low, the shift work can be grueling, and stress levels are high.

As a result, emergency communications centers face tremendous challenges recruiting, hiring, and retaining qualified personnel. The advent of NG911 and FirstNet will likely exacerbate the challenges of hiring and training.

31. FCC TFOPA Final Report, p. 9.

Many participants at the *Critical Issues* meeting noted that to address these challenges, emergency communications centers will need to raise the qualifications for telecommunicators, establish career paths, and otherwise professionalize their operations.

Communications Administrator Katherine Liriano, Coral Springs, FL Police Department:



We Should Expand the Profession Of Public Safety Telecommunications

Our training program takes a whole year, and when we're hiring someone, we try to make sure they see it as a career path in itself, not as a stepping stone to becoming a police officer.

Our agency has worked with APCO to make sure that the Department of Labor changes the classification of what our job is. We are not clerical; in our agency we train our telecommunicators as analysts. They are the ones digging for live information to give to the officers when they are responding to calls. We have most of the information for them by the time they get there. When we had an active shooter incident in our mall last November,[32] we had information for the officers as they were responding.

The biggest issue is making sure that we think outside the box and not put the call-takers and dispatchers in this "clerical" category. We should look at expanding the profession, making sure they get the training they need and the different avenues for researching this information to give the officers, because at the end of the day, the officers are going back to that trusted voice that they hear every day.

Terry O'Malley, Director of 911, Tulsa, OK Police Department:

In Tulsa, Telecommunications Is a Calling, Not Merely a Job

We're dealing with solving our retention or turnover problem, and I think we've actually come to a good conclusion. For Tulsa call-takers and dispatchers, it's a calling, not a job. We're keeping the people we hire. These are people who are extremely dedicated to public safety.

They've got to be smart. They've got to be fast. They've got to be able to think on their feet and multi-task like no other, as well as operate a radio console, a phone console. They know they're being recorded. And we recently achieved CALEA communications standards, so we're strictly adhering to policies of professionalism that we didn't have five or six years ago.

32. "Surveillance video, 911 calls released from mall shooting in Coral Springs." 7 News Miami, December 1, 2016. http://wsvn.com/news/local/surveillance-video-911-calls-released-in-coral-springs-mall-shooting/

Erika Wilson, Emergency Communications Center Director, Albuquerque, NM:

Public Safety Communicators Should Have A Career Path, Just as Sworn Officers Do

Back in the day, sworn officers worked in a lot of dispatch centers. And we gradually civilianized it. But it is generally lower-paid and less trained than everybody else.

I think it would be good to further emergency communications as a profession, with additional education and a career path, like everybody has in the sworn section. Sworn officers move through different departments and gain rank. We have to set that up for professional public safety telecommunicators.

In Albuquerque, we have the 911 operator and dispatch position, but we also have a Real Time Crime Center, which is a little different from some of the fusion centers that have been described here. Our Real Time Crime Center is off-site from us, but they're on our same CAD system and our same radio system. They go into all kinds of databases and can add information into the CAD, which my dispatcher then voices to the responding units.

I see this as an opportunity for my folks to move up and see this as a true profession. I think it's unfortunate that we sometimes hear that they are the lowest-paid when they are the first line, the first responders. At my agency they're mid-range in the civilian world; the pay is equal to or higher than other civilian positions.

What skills sets will the telecommunicator of the future need?

Regardless of whether telecommunicators are tasked with receiving, screening, and vetting the new types of data coming in via NG911, their roles will be enhanced by the advent of NG911 and FirstNet. Telecommunicators will be handling more data and will need to coordinate more closely with Real-Time Crime Centers, fusion centers, and other keepers of "big data" in public safety. In general, they will need greater technical, analytical, and problem-solving skills, to augment their communications and organizational skills.

And for cases involving persons in a mental health or emotional crisis, telecommunicators will need to continue developing specialized skills, such as psychology, de-escalation, and tactical communications. (See pages 23-25 for a more complete discussion of the role of telecommunicators in incidents involving persons with mental illness.) Training for telecommunicators will become even more important in the new environment.

Where can agencies find the people to fill this new role?

Recruiting candidates for telecommunicator positions has long been a challenge in many jurisdictions. In the future, the challenge will be to find candidates who have the qualifications and motivation to succeed in the new technologically advanced environment. Agencies will need to be more creative in how they go about recruiting. This could mean seeking out new partners to help them attract and train the new breed of people the profession will need.

Capt. Daniel Zehnder, Las Vegas Metropolitan Police Department:

We Partner with a Local Technical School That Trains Police, Fire, EMS, and Dispatch

We partner with a vocational technical school that has a dispatch training center. They train fire, EMS, and law enforcement, and they have a dispatch center complete with mock stations. It works very well, and is a feeder program for us. We have a lot of young people who are technically savvy, so they can understand the challenges of what they're getting into. Because they're in a vocational school, they get that mindset for a number of years before they apply to us for a job.

The police department is not the only agency that benefits; it's also all our fire agencies. It's a great program that was started by the wife of a captain in our agency. She was in the Clark County School District system, and she's been a huge advocate of this training center. I welcome anybody to contact us if they are interested in this program, because it's been very successful for all agencies in Las Vegas.

Capt. Frank Tewey, Anne Arundel County, MD Police Department:

We're Trying Everything We Can To Attract Telecommunicators

We are trying everything we can think of to grow interest in becoming a public servant through 911. Our Fire Department just received about 500 applicants for 30 firefighter positions. I see a potential of 470 new dispatchers. I want to send a letter to those who weren't hired to say, "We've got another opportunity for you...."

We're looking at every avenue we can to find new people to come in. We're constantly reshuffling personnel to meet needs for seniority or experience on certain shifts.

Communications Administrator Katherine Liriano, Coral Springs, FL Police Department:

The Local Community College Started a 911 Curriculum; We Recruit Dispatchers from There

The Palm Beach County Community College started a 911 curriculum, and we've recruited a couple of dispatchers from there. We work with the community college and have the students come and sit in with us. From there, we start recruiting possible dispatchers.

What changes in training will be required?

The training regimen for telecommunicators is already rigorous, lasting between 6 and 12 months in most agencies. The level of training will likely increase with the transition to NG911 and FirstNet. This will be especially true if PSAPs take the lead in managing new streams of citizen-generated content, rather than Real-Time Crime Centers or other organizations.

Furthermore, as technology continues to connect PSAPs to each other, there will be a need for greater standardization of training across agencies and jurisdictions. An increasingly mobile population will expect the same high levels of service from 911, regardless of whether they are home or are traveling.

Jennifer Kirkland, 9-1-1 Operations Administrator, Vail, CO Public Safety Communications Center:

PSAPs Should Apply Economies of Scale To Training the People Who Will Manage the New Information

The 911 industry really needs to apply economies of scale to the training of the people who are going to be taking this information. The 6,000 PSAPs across the country are training their people in various degrees, in various ways. If we're looking at a nationwide network where we're receiving this information and the citizens are expecting to send this information, we need to apply the economies of scale and have a training program for all the people who will be receiving the information and pushing it out to the responders in the field.

How will agencies deal with increased stress associated with the job?

Being a telecommunicator is already a stressful job. A groundbreaking 2012 study found that the rate of Post-Traumatic Stress Disorder among telecommunicators was between 18 and 24 percent.[33] Because they repeatedly hear about bad things that happen to other people, telecommunicators are particularly susceptible to secondary PTSD, which itself can lead to PTSD.

As NG911 and FirstNet technology develops, stress levels on telecommunicators are likely to rise. Instead of hearing verbal descriptions of traumatic events, telecommunicators may be seeing and processing photos and videos of those events.

Several participants at the *Critical Issues* meeting expressed concern that repeated exposure to these types of images might affect the health and wellness of telecommunicators, and they outlined steps that will need to be taken. The consensus was that agencies need to build stress relief and wellness into their training programs and day-to-day operations for telecommunicators.

Laurie Flaherty, Coordinator, National 911 Program:

Call-Takers and Dispatchers Experience Stress, So Be Sure to Have a Resiliency Program

I think the training for dispatchers on handling these critical calls is very important, and it's also important to follow up after the event. There's a

33. Lilly, Michelle. "Duty-Related Trauma Exposure in 911 Telecommunicators: Considering the Risk for Post-traumatic Stress." *Journal of Traumatic Stress* (see https://iaedjournal.org/ptsd-in-911-communications-qa/ for an interview with Dr. Lilly about her research).

group called the 911 Training Institute[34] that has done a lot of research in the area of stresses of 911 work. As many as 20 percent of call-takers and dispatchers have some level of PTSD.

And when there's a high-stress event, the responders often can't even take a few minutes to recover from it; they're on to the next call. So building stress resilience into a 911 program is really important if you don't want to lose people over time, because no one can keep up that job without assistance.

Diane Culverhouse, Manager, Public Safety Communications, Aurora, CO Police Department:

We Provide Psychiatric Services To Help with the Stress of Constant Calls

Chuck Wexler: Ms. Culverhouse, some of the most traumatic 911 transmissions ever heard came during the Aurora movie theater shooting in 2012. Twelve people were killed, and 70 injured. Do you give your dispatchers psychological services and counseling to cope with a horrific incident like that?

Diane Culverhouse: Yes, we did. We have a contract with a great psychiatric services practice that specializes in public safety. Public safety agencies throughout the Denver Metro area contract with them. They only see public safety folks, so they really are in tune with our issues. They also come in and do trainings. They're a really great group of folks. But we still have people who have issues from dealing with high-stress calls and don't want to talk about it.

As Laurie mentioned, the day-to-day expectation is that you answer the next call, because the phones keep ringing, and we don't have anyone else who can answer it. You deal with the incident, but the emergencies don't stop after that. The officers may have an option right after they're done with a call to step away from it for a moment. But for us, the phones just keep ringing, and the expectation is that you answer the next call.

Laura Usher, Senior Manager, National Alliance on Mental Illness:

Mass Casualty Incidents Ripple Across an Agency, And Affect Telecommunicators and Civilian Staff

NAMI did some work on mass casualty events and the mental health impact of those incidents. The police chiefs from Aurora; Newtown, CT; Oak Creek, WI; and others who have experienced mass shootings participated in our project and informed our report.[35]

34. See "911 Training Institute" homepage. https://www.911training.net/

35. "Preparing for the Unimaginable: How Chiefs Can Safeguard Officer Mental Health Before and After Mass Casualty Events." National Alliance on Mental Illness and U.S. Dept. of Justice, Office of Community Oriented Policing Services. https://www.nami.org/About-NAMI/Publications-Reports/Public-Policy-Reports/Preparing-for-the-Unimaginable/Preparing-For-The-Unimaginable.pdf

We focused on the officers, but also found that a mass casualty affected the entire agency, including the dispatchers and all the civilian staff. It ripples out through the agency and the broader community. And I think Diane Culverhouse is correct, that you have to take into account that these stressful incidents are going to affect everyone, even if they weren't at the scene of a traumatic incident.

4. Governance Issues

Deputy Superintendent Michael Cox, Boston Police Department:

These Changes in Communications Will Require Changes in the Structure of Police Agencies

I think that police departments are going through a paradigm shift in how we're structured, certainly with regard to communications. We're very good at the traditional legacy 911, but when we start to think about what comes next in a city like Boston, what does that mean? We have these Real Time Crime Centers that are accustomed to getting large amounts of information and pushing it out. But the personnel on the street are different from the personnel in a 911 center. And it seems to me that these two groups are merging, but no one's talking about that or trying to create a structure to prepare for that future.

So the issue I think about most is: How do we go from where we are today to the future and change the structure of police departments? Changing our structure is difficult for us, right? We are adaptable in how we deal with crime, but changes in structure, personnel, and what personnel do, that's more difficult.

911 service has traditionally been a local function provided by local agencies. State utility commissions or similar bodies play a regulatory role, and a federal agency, the Federal Communications Commission (FCC), is tasked with making 911 the universal emergency number for all telephone services and ensuring that wireless telephone carriers provide 911 capabilities to their users.[36] But dating back five decades, 911 has remained largely a service of local government.

911 service is primarily a local function for the same reason that most police departments are operated by cities, towns, or counties: Local control allows for police and 911 services to be responsive to local concerns and customized to the needs of the community. Many people like the idea that their

36. The FCC also collects data to build a registry of PSAPs, promulgates rules to improve the effectiveness and reliability of wireless 911 services, and reports annually to Congress on the collection and distribution of 911 fees and charges by the states. The FCC has played a role in the ongoing development of NG911 by establishing and supporting the Task Force on Optimal PSAP Architecture. For more information on the FCC's role in 911, see https://www.fcc.gov/general/9-1-1-and-e9-1-1-services.

local police officers and 911 call-takers are familiar with the community they serve, because they live in the community or nearby. As the emergency response trade association iCERT (Industry Council for Emergency Response Technologies) noted in its report on the history of 911, "On a human level, emergency response is a service rendered to one's own 'neighbors.'"[37]

NG911 is challenging this traditional governance model, from the perspective of operations as well as cost. The FCC task force noted that standalone, autonomous PSAPs are the most expensive to deploy and operate, and they are prone to fragmentation and duplication of effort.[38] Many experts have questioned whether 6,000 individual PSAPs can afford to pay the up-front costs of migrating to NG911 and the ongoing operational expenses. Some jurisdictions, especially smaller ones, may be left behind if they cannot find a way to upgrade their legacy 911 systems in a cost-efficient manner.

Some jurisdictions are starting to consider new ways of structuring their emergency communications functions. However, experts at PERF's *Critical Issues* meeting said that any discussion of "governance" often turns to the politically charged idea of "consolidating" individual 911 centers. Consolidation is controversial because it cuts against the traditional model of local control.

Participants at the *Critical Issues* meeting emphasized that changing the governance of PSAPs does not necessarily mean the physical consolidation of existing PSAPs, although consolidation is one option to consider. There are other approaches that focus instead on sharing resources and processes across PSAPs, while still maintaining key elements of the traditional, locally driven service model.

Even in the current, generally decentralized 911 environment, it is clear that states play a particularly important role in the move to NG911 and FirstNet. In its final report, the FCC task force found that "based on a review of previous studies on funding 9-1-1, it appears that a cohesive, strong statewide 9-1-1 planning and coordinating mechanism is necessary in all states to facilitate timely and efficient deployment of NG9-1-1 networks."[39] The states that are farthest along with NG911 implementation are generally those with the strongest statewide coordination and leadership.

The answers to the questions of governance are not easy or obvious. Different jurisdictions will need to approach the issue in their own ways. In many instances, decisions about 911 governance will be influenced by local political considerations, availability of funds, and technological capacity. But the experts at the *Critical Issues* meeting agreed that governance is a matter that jurisdictions need to address as soon as possible, if they are to be successful in the NG911 and FirstNet environment.

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37. Industry Council for Emergency Response Technologies and The 911 Education Foundation, "History of 911—And What It Means for the Future of Emergency Communications." Available at https://www.theindustrycouncil.org/publications/iCERT-9EF_Historyof911_WebVersion.pdf.

38. FCC TFOPA Adopted Final Report, p. 74.

39. FCC TFOPA Adopted Final Report, p. 25.

Laurie Flaherty, Coordinator, National 911 Program:

With NG911, Many Services Can Be Shared, Either Virtually or by Cost-Sharing

When 911 was built in the 1970s and 80s, there was no way for any of the PSAPs to connect to each other, so they all had to be independent operations. Now, the culture is changing. Because of Next Generation 911, it's feasible for them to connect with each other. So everybody doesn't necessarily need to have their own equipment and other resources. Also,

Robert "Dusty" Rhoads, Branch Chief
DHS Office of Emergency Communications:

The DHS SAFECOM Advisory Group Is Helping To Drive Interoperability and Cooperation

SAFECOM is an advisory group to the Department of Homeland Security. It was created after the terrorist attacks of 9/11 for the purpose of establishing interoperable communications. We all remember that many 9/11 responders were unable to communicate with each other, because their radios were not compatible.

One of the first things that SAFECOM did was create what is known as the SAFECOM interoperability continuum, which recognizes that the ability to communicate is not just about technology. It's also about governance, policies and procedures, training and exercises, and usage every day.

That interoperability continuum has stood the test of time, over a variety of different platforms, and the first and most important element of it is the governance component. The governance component is about how different agencies, different levels of government, and different disciplines work together to develop policies and procedures for ensuring that they will be able to communicate with each other.

I think the most important thing to realize is that governance is not about control, about "This is mine." It is much more about working together. This is reflected in a 43-page report that SAFECOM published in 2015, called "Emergency Communications Governance Guide for State, Local, Tribal, and Territorial Officials."[40]

This Governance Guide also recognizes that public safety communications are no longer just about land mobile radio. It's about all elements of emergency communications, and all of the stakeholders engaged in emergency communications must work together and develop common policies and procedures.

In the old days, there were copper wires that came into the 911 center, and the people who managed the copper wires did not need to talk to the folks who managed the radio system. But today, we are looking at information flow—information coming from citizens, coming into the PSAP, going out to the people who are responding, and then alerts and warnings going back out to the citizens. All of those elements of the emergency communications ecosystem must be able to work together, or else the entire system will not work. That is the essence of the 2015 Governance Guide.

40. https://www.dhs.gov/sites/default/files/publications/2015%20Governance%20Guide_Master_508c%20Final.pdf

consistency and uniformity, and collaboration and cooperation, matter in a way that they've really never mattered before.

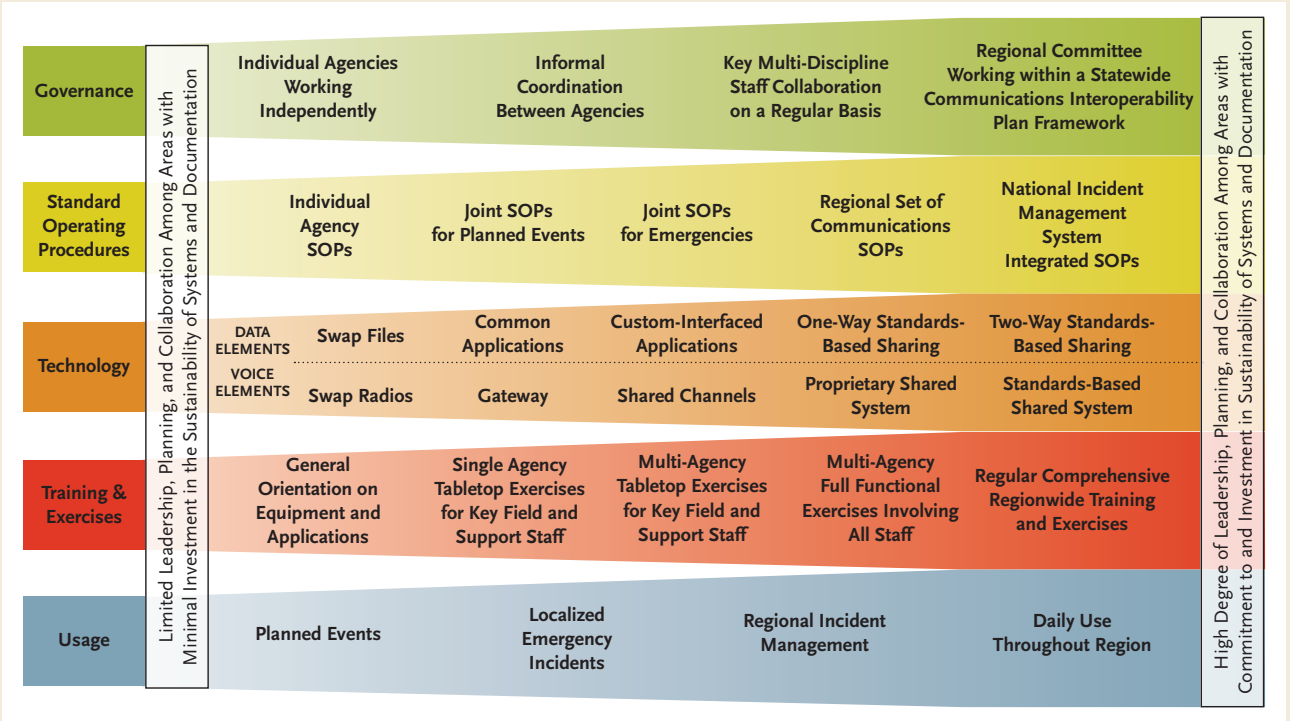
It also raises the question, of, "How many of whatever do we need?" Maybe every PSAP doesn't need to have its own Geographic Information System (GIS). Maybe each one doesn't need its own translation services. Many things can be shared, either virtually or by cost-sharing. There's virtual sharing, which is a group of PSAPs banding together for a particular purpose, like obtaining GIS or something else.

We refer to it as cost-sharing rather than consolidation. The word "consolidation" isn't usually received well, because people are worried about losing jobs, losing control, and losing funding, all legitimate concerns.

We found that there is no one method of governance. There are 56 states and territories, which have different laws, different rules. There are essentially 56 different versions of state governance in the United States. Public safety communications in some states are based on a legislative approach, where the legislature enacts a law governing the system. In other states, there can be an executive order, wherein the Governor says, "This is how we're going to do it." Or in some places, there is simply an ad hoc approach, in which the police chiefs, the fire chiefs, and others recognize that there is a need to work together, and they create an ad hoc governing board.

All of this is covered in detail in the Governance Guide. The systems vary, but the goal is the same. Increasingly complex emergency communications systems have to work when you need them to work.

SAFECOM Interoperability Continuum



Communications Director John Balloni, Volusia County, FL Sheriff's Office:

The Costs of Technology Drive the Trend Toward Consolidation

When I was in Syracuse, NY, I ran the Onondaga County center, and it was fully consolidated prior to 2000. We went through a lot of the growing pains, but the driver needs to be the technology and the cost of technology. Why are we buying three and four CAD systems for a single county? Why are we buying multiple radio systems for a region? There are a lot of drivers for consolidation on the 911 side of departments. For example, smaller agencies are not going to have the benefit of Real Time Crime Centers unless there's consolidation.

PSAP Governance Models

As jurisdictions look toward new governance structures under NG911, there are four basic approaches to consider:[41]

1. **Centralized/full consolidation of police, fire, EMS, and 911 services.** All call answering and dispatch functions—for police, fire, and emergency medical services within a given geographical area—are consolidated into a single facility, usually run by a single entity. Traditionally, the geographical area has aligned with a relatively small unit of local government, such as a municipality or county. However, the NG911 environment makes it easier and often more efficient for multiple jurisdictions to consolidate their 911 operations in a single facility.
2. **Centralized call-taking.** Instead of directing 911 calls to individual PSAPs, calls are routed to a centralized call-taking facility. Call-takers there gather information, triage the call, and transfer the call to the appropriate local agency for dispatch.
3. **Hybrid shared services.** PSAPs can maintain their separate physical locations, but share a wider array of services, such as call-handling, radio, or CAD systems.
4. **Virtual consolidation.** Under this model, both the network infrastructure and supporting services (radio, CAD, mapping, etc.) are shared among multiple PSAPs. Individual PSAPs can maintain their local governance structure and remain either stand-alone or be co-located with other agencies.

While the FCC's task force did not identify one model as preferable over the others, it did note that some models—specifically the latter two—are better positioned to take full advantage of the efficiencies and improved service levels offered by the NG911 architecture. And regardless of the "consolidation" approach, there are three key ingredients for success, according to the Communications Security, Reliability and Interoperability Council: "A trusted and secure governance structure (must) be established; a champion must lead the project; and the political leadership must be in place to support the effort."[42]

41. The options, and their relative advantages and challenges, are explained in the FCC TFOPA Adopted Final Report, pp. 79-96. https://apps.fcc.gov/edocs_public/attachmatch/DA-16-179A2.pdf

42. Communications Security, Reliability and Interoperability Council, Working Group 1A. "Key Findings and Effective Practices for Public Safety Consolidation" Final Report, October 2010. http://transition.fcc.gov/pshs/docs/csric/CSRIC-1A-Report.pdf

I think you don't need substantially less personnel after a consolidation, because you still need the same number of people basically to run the job. However, if you consolidate, you will have people resigning, because people from small agencies who were used to taking 50 calls in a *month* are suddenly taking 100 calls in a *day*. So some of them resign, and that's been a longstanding problem.

When I moved to Volusia County in Florida, I found the same personnel problem. We have staffing problems because in the larger centers, telecommunicator is a much more difficult and challenging job.

Newport News, VA Police Chief Richard Myers:

Police Consolidations Don't Often Save Money, But PSAPs May Be a Game-Changer

In all the years I've been a chief, I've gone through this evolution of thinking about consolidations, and I've always been in favor of it—but not because of cost savings. I've seen good analyses of why you can achieve genuine cost savings consolidating fire departments, but not police departments. It's because more than 90 percent of the costs of a police department are labor costs, while fire departments are more capital-heavy. Fire departments buy a lot of big, expensive trucks that can be shared in many cases. But no police department in America today is grossly overstaffed with cops who can be laid off if they merge with a neighboring police department. So it's hard to find cost savings merging police, but sometimes you can with fire departments.

Dispatch raises a new set of issues that depend on the local situation. In our situation, both Hampton and Newport News currently have dispatch centers that are badly located. Hampton's is on the top floor of a building that can't handle 70-mph winds, in a part of the country that gets hurricanes. And our dispatch center in Newport News is in a basement next to the water. Again, hurricanes.

So we both have to build a new dispatch center, and it's going to be a lot cheaper to build an $8 million center for both communities than for each community to spend $6 million.

I think this is an issue that isn't going to go away. Everything we are hearing about Next Generation 911 and FirstNet is capital-intensive, not labor-intensive. This could be a game changer, because suddenly in many locations, it may be economical to take a hard look at consolidation. If you're thinking of it, it all comes down to the governance. The issue of governance will make or break the consolidation.

Assistant Chief Orrin Gallop,
Hampton, VA Police Department:

Any Consolidation of Services
Can Create Political Problems

We're looking at a possible consolidation of Hampton and Newport News communications centers. In terms of doing the work, it's not as difficult, but the problem is on the political side. When you build a new facility, whichever city you build it in, the other city's going to ask, "Why are we spending all that money to send employees somewhere else? The other city will get all the benefit economically."

So the question is how do we get the citizens and the government to understand that we both benefit, rather than just thinking, "We are sinking millions of dollars into another city."

Director William Ferretti, Emergency Communications Center,
Montgomery County, MD Police Department:

There Are Many Different Ways
To Achieve Consolidation of PSAPs

There are many forms of consolidation. In some respects, Montgomery County has been consolidated for 30 years. We're on the same radio system across law enforcement and fire departments. We've been using a shared CAD system for 25 years, and most of the municipal departments within the county are also on that CAD system.

The consolidation we're doing right now is a cross-discipline consolidation. We've always been a co-located center for police and fire. Neither department is leaving, but now we're being merged under one command structure, within the police department. There was a lot of conversation about that. Should the new merged center be independent? Should it be in the police department, or the fire department? Should it be in emergency management? Ultimately, county leaders decided that the consolidated organization would be in the police department, and we're in the process of making that happen. The Fire Department will continue to have a presence in the center, in a liaison role.

Once it's all said and done, the sworn firefighters who are in the center and who have been doing dispatch for years will return to the fire houses. We're about two years into the process, and for anyone who's done it, that means we're very early in the process. We're going to be doing this for the next five years.

As part of our consolidation effort, we established a governance body, an executive steering committee at the county level with sponsorship out of the county executive's office. As the consolidated organization takes on additional tasks, we're developing service-level agreements between the police and the fire department on how we're going to be a "service provider" for the fire department.

Dave Mulholland, Administrator,
Arlington County Office of Emergency Management:

By Sharing a 911 System, Alexandria and Arlington, VA Can Provide Redundancy and Call Balancing

So what comes first, the technology or the governance? The technology people will argue, "We can put this in place, but it's never going to work if you don't have governance in place." And the governance people say, "We don't know how to figure out the governance until we see what the technology is."

At some point, someone has to stand up, be a leader, and make a decision. In the DC metropolitan area, the Washington Metropolitan Council of Governments (COG) has led that effort. With the leadership of COG, the National Capital Region has really been on the forefront of NG911.

There is a regional effort for northern Virginia. In Alexandria and Arlington, we are getting ready to go into a partnership for a shared CPE (Customer Premises Equipment) system, a shared 911 system. The systems will be completely redundant, which provides a capability for continuity of operations. It will also allow us to achieve call balancing. For example, when Alexandria was getting slammed with 911 calls because of the shooting incident at the Congressional baseball practice, Arlington could potentially take care of the other 911 calls.

We've been into this for well over a year. Once we get our northern Virginia region connected together, it's just a simple step to make the connection over to DC.

CEO Brian Fontes, National Emergency Number Association:

Beyond Technology and Policy Issues, Politics Can Impact Consolidations

Consolidation is far more complex than it sounds. And I agree with Laurie Flaherty from the National 911 Program Office that when you use the terms "consolidation" or "synergy," people interpret that to mean "loss of jobs." And although that is not necessarily the case in the 911 environment, it is still perceived as a negative.

What's happened historically is that all of these 911 centers were very local in nature—which is how we ended up with nearly 7,000 primary centers at one point. And so, you still have these fiefdoms, these silos, these political tugs-of-war that present challenges to looking at governance—and providing the best 911 service—in a different light.

But leaving the terminology aside, in terms of NG911 governance, there are many issues that have to be settled. These include topics such as liability, database management, cost sharing, hardware procurement and location, records storage and maintenance, and much more.

Such governance issues need to be addressed and decided upon by all concerned parties up front, so everyone involved understands what they're getting into before going live with NG911, rather than after the fact. In NG911 you will likely have more than one Public Safety Answering Point functioning within an Emergency Service IP Network (ESInet); thus, the ability to reach agreement on governance prior to deployment of NG911 is important.

Examples of PSAP Consolidation

Consolidation of PSAPs has been occurring since the early 1980s. There are many successful examples of consolidation, especially in major urban areas. In recent years, both Nashville and the District of Columbia consolidated all emergency communications (police, fire, and EMS) into independent city agencies that report to their mayors, while maintaining liaisons with their client agencies.

Consolidation has occurred in other areas as well. In 1981, Oregon had 280s PSAPs; today, there are fewer than 50. Vermont has established a statewide 911 system with six PSAPs connected on a single IP-based broadband network.

Another example is the Counties of Southern Illinois (CSI). In 2015, 13 largely rural counties and one municipality in southern Illinois formed a nonprofit legal entity to build a regional IP-based public safety broadband network. The system is now managing 911 calls for 17 PSAPs, serving nearly 400,000 people, and is poised to handle text, photos, and videos in the future.

5. Funding Issues

For many jurisdictions, finding the money to acquire and operate new emergency communications systems is a major challenge. The up-front costs, especially for migrating to NG911, are substantial, and traditional methods of funding 911 are becoming outmoded and insufficient to meet the needs of the new environment. These funding challenges are complicated by the fact that even as they transition to IP-based broadband networks, jurisdictions will likely have to maintain their legacy 911 systems for some period of time to provide backup and redundancy. There will be multiple costs during the transition period, and the overall price tag will be high.

Participants at the *Critical Issues* meeting noted that for NG911 in particular, a major infusion of money will be needed to support infrastructure and initial operating costs during the transition, and that reliable and sustainable funding sources must be identified for ongoing operations.

FirstNet Costs

For the transition to FirstNet, the costs for local agencies are fairly predictable. Regardless of whether an agency's state chooses to opt-in or opt-out of FirstNet, local agencies bear none of the costs of the network build-out. Those infrastructure costs are borne either by AT&T (in the opt-in states) or the states themselves (in the opt-out states).

The service costs for using FirstNet are detailed in each state plan. Agencies that already equip their personnel with mobile devices and decide to join FirstNet will need to switch from their existing service provider to FirstNet.

NG911 Costs

Implementing NG911 is a completely different story. Nationally, the transition to NG911 has been estimated to cost more than $2.8 billion.[43] These up-front capital expenditure costs include three big-ticket items: Emergency Services Internet Protocol Networks (ESInets), updated Customer Premises Equipment (CPE) to process 911 calls, and new hardware and software for routing and managing those calls.

Depending on the size of the jurisdiction and system features, the costs begin at hundreds of thousands of dollars and can reach $5 million to $7 million for a major metropolitan area.[44]

At the same time that agencies are facing increased costs for migrating to NG911, the existing funding structure for 911—fees assessed on phone users—is becoming outdated. In fact, the funding structure is often inadequate even for meeting the costs of current services. This problem is exacerbated in states that divert some of their 911 fees to pay for other public safety needs or deposit them in their general revenue funds. Continued diversion of 911 fees will likely prolong the transition to NG911 in those areas.

A 2013 Blue Ribbon Panel on 911 Funding identified three major challenges with funding the transition to NG911:

- Lack of a comprehensive cost estimate for the transition to NG911, and for operational and maintenance costs after the transition;
- Existing legislation that excludes new methods for revenue generation for 911, making it difficult to keep pace with the dynamics of the telecommunications user base;
- Diversion of revenues collected for 911 services through existing means to other uses.[45]

Four years later, those challenges largely remain the same.

Other Funding Options

Federal grants: In 2008, approximately $43 million in federal grants were allocated for 911 system upgrades, primarily to help jurisdictions comply with wireless Enhanced 911 requirements. Now, another $115 million is being allocated for NG911 upgrades nationwide. Awarding of grants is expected to begin in early 2018.[46]

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43. Federal Communications Commission. "White Paper: A Next Generation 911 Cost Study: A Basis for Public Funding Essential to Bringing a Nationwide Next Generation 911 Network to America's Communications Users and First Responders." September 2011. Available at https://apps.fcc.gov/edocs_public/attachmatch/DOC-309744A1.pdf.

44. See https://www.911.gov/ng911_law/money_question.html.

45. Blue Ribbon Panel on 911 Funding. "Report to the National 911 Program." December 2013. Available at https://www.911.gov/pdf/BlueRibbonPanel-911Funding-report-dec2013.pdf.

46. For more information about these grants and to sign up for notifications, visit https://www.911.gov/911grants.html.

Traditional Ways of Funding 911 Are Not Keeping Pace with Technology

For years, 911 services were funded through fees assigned to users of wireline phone services. As more and more calls moved from wireline to wireless, most states began collecting 911 fees on wireless phones as well. However, other fast-growing communications options—for example, prepaid wireless phones and Voice over Internet Protocol (VoIP, or using the Internet for voice communications)—are not always covered by state 911 fees. This means that many devices capable of calling 911 are not being assessed the fees to cover 911 service costs.

The situation will grow even more complicated as more devices—video game consoles, portable computers, and Internet of Things devices—are able to contact 911 over new wireless broadband networks. The consensus among many public safety and emergency communications leaders is that any device that can connect to 911 should contribute to funding the system. If public officials agree that that is an appropriate principle for funding 911, states will need to ensure that their statutes on 911 fees are up-to-date and cover the full range to telecommunications technologies.

In addition, there is a wide variation in the 911 fees that individual states charge. According to the National Emergency Number Association (NENA), the fees range from 25 cents or less per wireline or wireless device per month in some states to one dollar or more in others.[47] Some states have structured their surcharge programs to cover many of their NG911 costs through existing fees. Tennessee, for example, has enacted a technology-neutral fee of $1.16 per month on wireline, wireless, prepaid, and VoIP services.

U.S. Senator Amy Klobuchar:

To Accelerate the Transition to NG911, We Need to Ensure State and Local Governments Have Resources

Ten years ago this summer, as Minnesota commuters were driving across the Interstate 35W bridge—a bridge crossed by more than 100,000 cars every day—the 1,907 foot bridge collapsed. Cars crashed into the Mississippi River and fell onto the ground below. Others caught fire, collided into other cars, and got trapped in the bridge that caved into an unrecognizable V-shape.

In the 120 minutes that followed, 51 calls to the Minneapolis Emergency Communications Center were made from the collapsed bridge itself. Over 450 other emergency calls were placed during those same minutes. In two hours, 13 people were killed and 145 were injured.

My home is only six blocks away, and I'll never forget the horror of that day. I'll also never forget the emergency response that followed. We saw first-hand how a coordinated and efficient response in times of crisis can literally mean the difference between life and death for so many.

But in times of crisis, we also see the glaring holes in our nation's emergency communications systems. Persistent coverage gaps in rural areas, interoperability complications, dropped calls—the kind

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47. For a list of 911 user fees by state, see https://www.nena.org/?page=911RateByState.

of preventable technological difficulties that put the lives of first responders and the public in danger.

That's why I've worked to strengthen our country's emergency communications network. As co-chair of the NextGen 9-1-1 Caucus in the United States Senate, it's become clearer than ever to me that our nation's 911 system is in urgent need of upgrades. There are lots of solutions on the table.

Our 911 system remains one of the most consistent and sophisticated systems in the world, but it is beginning to show its age. The majority of 911 calls now come from mobile phones, and call centers are struggling to determine accurate caller locations and handle the types of basic communications that consumers expect from their smartphones today. As we look to the future of emergency communications, the transition to Next Generation 911 is critical to allow people to send text messages, pictures, videos, maps and other information directly to 911.

I'm working on legislation with Senator Bill Nelson of Florida to accelerate the national transition to NG 911 and ensure that state and local governments will have the resources they need for a successful transition. Our bill will provide additional federal support through an existing 911 implementation grant program that I championed as part of the 2012 bill that created FirstNet. Grant funding is dependent on states committing to using accredited, non-proprietary, consensus-based standards that are interoperable across jurisdictions and with FirstNet. This is critical to ensure that our 911 systems can communicate seamlessly with one another during an emergency.

The bill will also provide assistance to strengthen NG 911 cybersecurity by helping local call centers strengthen their systems against cyber-attacks and allow training of call center personnel. Local control is maintained under the bill, which continues the current state and local governance structure.

As we work toward implementation of NG 911, there are additional steps we can take right now to help people more easily reach 911 when they need help. Two of my bills that will improve emergency communications passed the Senate in August 2017. Kari's Law[48] would ensure that multi-line telephone systems (MLTS) allow direct-dial 911 without the need for prefixes. And, my Improving Rural Call Quality and Reliability Act[49] would establish basic quality standards for providers that transmit voice calls to help ensure that businesses, families, and emergency responders can count on phone calls being completed.

If Target can find a pair of shoes in a store halfway across the country by using a simple SKU number, we should be able to make 21st century upgrades to our emergency communications systems that can save lives. Maintaining current, reliable emergency communications systems must be a national priority. Our law enforcement officers and first responders run into dangerous situations every day to keep the public safe and protect people during times of crisis. They deserve the tools and resources necessary to do that job efficiently and effectively.

Senator Klobuchar, who represents the state of Minnesota, serves as co-chair of the NextGen 9-1-1 Congressional Caucus. http://www.ng911institute.org/about-the-congressional-nextgen-9-1-1-caucus.

48. https://www.congress.gov/bill/115th-congress/senate-bill/123

49. https://www.congress.gov/bill/115th-congress/senate-bill/96

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Other grant programs include the Broadband Technology Opportunities Program (BTOP), which some states have used to bring broadband infrastructure to underserved areas. For example, the counties of Southern Illinois used about $5.8 million in federal BTOP and Community Oriented Policing Services (COPS) grants to help build its ESInet and purchase new PSAP hardware and software. The National 911 Program has published a list of federal financial assistance programs that provide funding for emergency communications.[50]

Public safety taxes: One option for funding expanded 911 operations is through local public safety taxes. After the state of Indiana passed legislation allowing municipalities to enact public safety taxes, Monroe County (whose county seat is Bloomington) passed a 0.25 percent public safety income tax, which generates about $7 million a year. Thirty percent of that money is going to fund emergency communications, including operations and upgrades to a new dispatch center that is run by the Bloomington Police Department.

Universal Service Fund: In Vermont, 911 services are state-operated. The state pays for those services through a Universal Service Fund that was established by state law in 1994.[51] All retail users of telecommunications services (including, since 2014, prepaid wireless services) are assessed a universal service surcharge, which is collected by telecommunications providers and deposited in the Universal Service Fund. The funding has helped Vermont to implement a statewide IP-based wireless broadband network for 911.

New funding sources: In recent years, a number of new ideas for sustainable 911 funding have been discussed. These have included sales taxes; health insurance fees; water meter fees; so-called "sin taxes" on alcohol and tobacco; fee-for-service payments (which determine 911 calls by carrier and require carriers to collect the fee from subscribers); tolls on certain calls; proceeds from government property auctions; and special event permitting fees.[52]

CEO Brian Fontes, National Emergency Number Association:

We Need a Thorough Examination of Next Generation 911 Funding

There are several key issues that are essential to timely Next Generation 911 deployment in this country; first and foremost among them is funding. In 2012, legislation provided for FirstNet, allocated the necessary 20 MHz of spectrum, and provided the important $7 billion "starter fee."

50. See https://www.911.gov/pdf/FY_2016_Federal_Financial_Assistance_Programs_for_Emergency_Communications.pdf.

51. For details, see http://publicservice.vermont.gov/telecom/vusf.

52. See Blue Ribbon Panel on 911 Funding. "Report to the National 911 Program." December 2013. Available at https://www.911.gov/pdf/BlueRibbonPanel-911Funding-report-dec2013.pdf. Also, National Association of State 9-1-1 Administrators. "Four Potential Sustainable Funding Models for NG911." August 2015. Available at https://drive.google.com/file/d/0B6UENGshedL6MmI5dWFFMVlneU9PZ2hVakNoUVpCeDdOLVZj/view.

There has been minimal federal funding for NG911, with less than $160 million provided over the past decade for NG pilot projects and early-adopter implementations. By comparison, field responders have received $7 billion for FirstNet and billions more for interoperability—which I applaud. It's well deserved. However, when you compare the levels of investment in our nation's public safety infrastructure, it is clear that 911 is woefully underfunded.

At the state and local levels, the traditional funding model for 911 in this country is changing rapidly and radically. Today, more than 50 percent of U.S. households are wireless-only. When 911 was created nearly 50 years ago, there was typically a fee imposed on wireline subscribers to pay for their community's 911 service. But now, because most people don't have landlines anymore, 50 percent of those fees are gone. This severely limits 911 authorities' ability to pay for severely needed upgrades to the current system or to plan for NG911 deployments.

Today, we have 911 fees for *some* wireless services, but in a number of states, prepaid wireless subscribers (who represent a very rapidly growing segment of the wireless industry) pay *nothing*. Beyond cellular exists the world of VoIP communication (Voice over Internet Protocol), which powers WiFi calling apps and other landline replacement services that may or may not (most likely not) be paying into 911 funds.

A larger discussion needs to take place about why something as critical as emergency communications is being funded on the backs of telecom subscribers, but one thing is for certain: What's needed right now is a significant initial infusion of cash for the build-out of Next Generation 911. After the initial build-out, I would hope there will be an examination of how operating costs of NG911 are addressed on an ongoing basis. A better funding model would provide predictable, adequate funding for NG911 from a mix of state and federal sources for both capital and operating expenditures, allowing for strong performance day-to-day and continuous improvement long-term.

More information on gaps in the current system and recommended solutions are available at NG911Now.org.

A CALL TO ACTION:

Public Safety Needs to Prepare For And Lead the Revolution In Emergency Communications

THE UNITED STATES IS ON THE CUSP OF THE BIGGEST REVOLUTION IN emergency communications since the introduction of 911 nearly a half century ago. This revolution will fundamentally change how residents communicate with public safety agencies, how public safety personnel communicate with one another, and how agencies communicate back to the public.

For the first time, public safety agencies will be able to take full advantage of the tremendous communications power that most residents already carry in their hands today, in the form of smartphones and other mobile devices. Until now, the most sophisticated action that most smartphone users could take when contacting the police or other emergency services was to dial three digits: 9-1-1. In the near future, residents will be able to send text messages, photos, and videos to public safety agencies, and those agencies will be able to quickly push those types of information out to first responders in the field.

These advances in technology are not being undertaken for their own sake. Next Generation 911 and FirstNet are costing federal, state, and local governments billions of dollars, and will require massive commitments of time and effort. The purpose of all this effort is not to merely keep up with the latest innovations; it goes much deeper than that. The purpose is to help police officers do a better job, and to protect public safety and the well-being of the officers themselves.

To mention just one important example of how advanced communications technology has the potential to improve policing, PERF points to an issue that has dominated our work since 2014: Re-engineering police use of force, particularly in situations where police encounter persons with a mental illness, developmental disability, drug addiction, or other condition that can cause them to behave erratically and dangerously.

Too often, police use deadly force in these cases because they simply do not have enough information about the nature of the situation they are trying to handle.

- In the Tamir Rice case, for example, responding officers did not know that the call was about a juvenile playing with a toy gun.

- In other situations, police respond to a call about a person with mental illness and have no idea that police have responded to calls about the same person before, and that there are friends or family members who can help control the person if they can be called to the scene.
- In many situations, police arrive at a scene not knowing exactly what is happening and what the risks may be. Often, they could have much greater situational awareness if they had access to photos, video, building plans, and other information that could be reviewed before they arrive.

These are the types of information that will be provided to police as Next Generation 911 and FirstNet become a reality across the nation.

A Call To Action

For the nation's public safety leaders, the revolution in emergency communications presents many challenges. Interestingly, the biggest hurdle is not the technology itself. The networks, systems, and applications needed to power NG911 and FirstNet already exist for the most part, and technology experts are working to put the pieces together to make these systems fully operational in the very near future.

Rather, the greater challenges for public safety leaders involve the underlying organizational and operational reforms that will be needed to fully realize the benefits of NG911 and FirstNet. What are the policies for accepting new types of data from the public? What are the optimal work flows for how data will be received, secured, and analyzed? What skill sets and training will employees of the future need? How will agencies ensure that first responders are getting valuable, actionable information, in the most efficient and safe manner possible? What mobile devices and applications should agencies be equipping their officers with? How can small agencies join forces with each other to efficiently implement these new technologies? And how will jurisdictions pay for all of these innovations?

These are among the difficult questions confronting the nation's police chiefs, sheriffs, and other public safety leaders. As occurred in recent years with other technologies such as electronic control weapons and body-worn cameras, today's emergency communications technology is far ahead of the policies and procedures that are needed to fully and effectively implement NG911 and FirstNet.

This report is a call to action for America's public safety leaders. While the report does not answer all of the challenging questions they face, it does provide an outline of the key issues that need to be addressed. Much more work lies ahead, and public safety leaders need to get started now, before the gap between technology and policy grows even wider.

About the Police Executive Research Forum

THE POLICE EXECUTIVE RESEARCH FORUM (PERF) IS AN INDEPENDENT research organization that focuses on critical issues in policing. Since its founding in 1976, PERF has identified best practices on fundamental issues such as reducing police use of force; developing community policing and problem-oriented policing; using technologies to deliver police services to the community; and developing and assessing crime reduction strategies.

PERF strives to advance professionalism in policing and to improve the delivery of police services through the exercise of strong national leadership; public debate of police and criminal justice issues; and research and policy development.

The nature of PERF's work can be seen in the titles of a sample of PERF's reports over the last decade. Most PERF reports are available without charge online at http://www.policeforum.org/free-online-documents.

To learn more about PERF, visit www.policeforum.org.

- *The Unprecedented Opioid Epidemic: As Overdoses Become a Leading Cause of Death, Police, Sheriffs, and Health Agencies Must Step Up Their Response (2017)*
- *The "Crime Gun Intelligence Center" Model: Case Studies of the Denver, Milwaukee, and Chicago Approaches to Investigating Gun Crime (2017)*
- *Hiring for the 21st Century Law Enforcement Officer: Challenges, Opportunities, and Strategies for Success (2017)*
- *ICAT: Integrating Communications, Assessment, and Tactics (2016)*
- *Guiding Principles on Use of Force (2016)*
- *Identifying and Preventing Gender Bias in Law Enforcement Response to Sexual Assault and Domestic Violence (2016)*
- *Advice from Police Chiefs and Community Leaders on Building Trust: "Ask for Help, Work Together, and Show Respect" (2016)*
- *Re-Engineering Training on Police Use of Force (2015)*
- *Gun Violence: Regional Problems, Partnerships, and Solutions (2015)*
- *Constitutional Policing as a Cornerstone of Community Policing (2015)*
- *Defining Moments for Police Chiefs (2015)*
- *Implementing a Body-Worn Camera Program: Recommendations and Lessons Learned (2014)*

- *Local Police Perspectives on State Immigration Policies (2014)*
- *New Challenges for Police: A Heroin Epidemic and Changing Attitudes Toward Marijuana (2014)*
- *The Role of Local Law Enforcement Agencies in Preventing and Investigating Cybercrime (2014)*
- *The Police Response to Active Shooter Incidents (2014)*
- *Future Trends in Policing (2014)*
- *Legitimacy and Procedural Justice: A New Element of Police Leadership (2014)*
- *Social Media and Tactical Considerations for Law Enforcement (2013)*
- *Compstat: Its Origins, Evolution, and Future in Law Enforcement Agencies (2013)*
- *Civil Rights Investigations of Local Police: Lessons Learned (2013)*
- *A National Survey of Eyewitness Identification Procedures in Law Enforcement Agencies (2013)*
- *An Integrated Approach to De-Escalation and Minimizing Use of Force (2012)*
- *Improving the Police Response to Sexual Assault (2012)*
- *How Are Innovations in Technology Transforming Policing? (2012)*
- *Voices from Across the Country: Local Law Enforcement Officials Discuss the Challenges of Immigration Enforcement (2012)*
- *2011 Electronic Control Weapon Guidelines (2011)*
- *Managing Major Events: Best Practices from the Field (2011)*
- *It's More Complex than You Think: A Chief's Guide to DNA (2010)*
- *Promoting Effective Homicide Investigations (2007)*
- *"Good to Great" Policing: Application of Business Management Principles in the Public Sector (2007)*
- *Police Management of Mass Demonstrations: Identifying Issues and Successful Approaches (2006)*
- *Strategies for Intervening with Officers through Early Intervention Systems: A Guide for Front-Line Supervisors (2006)*
- *Managing a Multi-Jurisdiction Case: Identifying Lessons Learned from the Sniper Investigation (2004)*

In addition to conducting research and publishing reports on our findings, PERF conducts management studies of individual law enforcement agencies; educates hundreds of police officials each year in the Senior Management Institute for Police, a three-week executive development program; and provides executive search services to governments that wish to conduct national searches for their next police chief.

All of PERF's work benefits from PERF's status as a membership organization of police officials, who share information and open their agencies to research and study. PERF members also include academics, federal government leaders, and others with an interest in policing and criminal justice.

All PERF members must have a four-year college degree and must subscribe to a set of founding principles, emphasizing the importance of research and public debate in policing, adherence to the Constitution and the highest standards of ethics and integrity, and accountability to the communities that police agencies serve.

PERF is governed by a member-elected President and Board of Directors and a Board-appointed Executive Director.

About Motorola Solutions and the Motorola Solutions Foundation

MOTOROLA SOLUTIONS CREATES INNOVATIVE, MISSION-CRITICAL COMMUNICATION solutions and services that help public safety and commercial customers build safer cities and thriving communities.

Our solutions, including devices, infrastructure, software and services, help people be their best in the moments that matter. We serve public safety and commercial customers in industries including law enforcement, fire, emergency medical services, utilities, mining, manufacturing and education. Customers in more than 100 countries around the world depend on our radio networks and devices, as well as our managed and support services. We are also continuing our rich history of innovation by creating "smart public safety solutions," which are technology-driven software, systems and applications that provide critical intelligence to public safety users, improving safety and efficiency.

The Motorola Solutions Foundation is the charitable and philanthropic arm of Motorola Solutions. With employees located around the globe, Motorola Solutions seeks to benefit the communities where it operates. We achieve this by making strategic grants, forging strong community partnerships, and fostering innovation. The Motorola Solutions Foundation focuses its funding on public safety, disaster relief, employee programs and education, especially science, technology, engineering and math programming.

Motorola Solutions is a company of engineers and scientists, with employees who are eager to encourage the next generation of inventors. Hundreds of employees volunteer as robotics club mentors, science fair judges and math tutors. Our "Innovators" employee volunteer program pairs a Motorola Solutions employee with each of the nonprofits receiving Innovation Generation grants, providing ongoing support for grantees beyond simply funding their projects.

For more information on Motorola Solutions Corporate and Foundation giving, visit www.motorolasolutions.com/giving.

For more information on Motorola Solutions, visit www.motorolasolutions.com.

APPENDIX A:

Resources for Additional Information

FOLLOWING ARE SOME OF THE KEY ORGANIZATIONS HELPING TO GUIDE the development of emergency communications. Their websites include a range of reports and other resources that can help public safety leaders understand the issues they need to consider as they implement new technologies.

Acronym	Organization	Description	Website
APCO	Association of Public Safety Telecommunications Officials	APCO is an international organization of public safety communications professionals that provides expertise, professional development, technical assistance, advocacy and outreach in support of public safety communications practitioners and the public at large.	www.apcointl.org
CALEA	Commission on Accreditation for Law Enforcement Agencies	A national credentialing authority, CALEA works to improve the delivery of public safety services by maintaining a body of standards, establishing and administering an accreditation process, and recognizing professional excellence. In addition to law enforcement agencies, CALEA credentials emergency communications centers.	www.calea.org
ECPC	Emergency Communications Preparedness Center (within the U.S. Department of Homeland Security)	Comprised of 14 federal departments and agencies, the ECPC is the federal interagency focal point for interoperable and operable communications coordination.	www.dhs.gov/emergency-communications-preparedness-center
FCC	Federal Communications Commission	The FCC regulates interstate and international communications by radio, television, wire, satellite, and cable in all 50 states, the District of Columbia and U.S. territories. The FCC is an independent U.S. government agency overseen by Congress, and is responsible for implementing and enforcing America's communications law and regulations.	www.fcc.gov

Acronym	Organization	Description	Website
FEMA	Federal Emergency Management Agency	FEMA's mission is to support our citizens and first responders to ensure that as a nation we work together to build, sustain and improve our capability to prepare for, protect against, respond to, recover from and mitigate all hazards.	www.fema.gov
FirstNet	First Responder Network Authority	FirstNet is an independent authority within the U.S. Department of Commerce. Authorized by Congress in 2012, its mission is to develop, build and operate the nationwide, broadband network that equips first responders to save lives and protect U.S. communities.	www.firstnet.gov
iCERT	The Industry Council for Emergency Response Technologies	iCERT serves as the voice of the commercial sector in the emergency response technologies field. Through advocacy, research, and in coordination with the public sector, iCERT plays a vital role in the development and deployment of emergency response technologies.	www.theindustrycouncil.org
IJIS	Integrated Justice Information Systems Institute	The IJIS Institute is a 501(c)(3) nonprofit corporation that represents industry's leading companies that collaborate with local, state, tribal, and federal agencies to provide technical assistance, training, and support services for information exchange and technology initiatives.	www.ijis.org
	National 911 Program	The National 911 Program's mission is to provide federal leadership and coordination in supporting and promoting optimal 911 services. This federal "home" for 911 plays a critical role by coordinating federal efforts that support 911 services across the nation.	www.911.gov
NASCIO	National Association of State Chief Information Officers	NASCIO fosters government excellence through quality business practices, information management, and technology policy.	www.nascio.org
NASNA	National Association of State 911 Administrators	NASNA is the voice of the states on public policy issues impacting 911. NASNA focuses on three areas: (1) developing strategic partnerships with key organizations and individuals who share our interests; (2) serving as an information sharing and support network for state 911 program administrators; and (3) strengthening relationships with federal lawmakers and agencies.	www.nasna911.org
NENA	National Emergency Number Association	NENA: The 911 Association improves 911 through research, standards development, training, education, outreach, and advocacy. NENA's vision is a public made safer and more secure through universally-available state-of-the-art 911 systems and trained 911 professionals.	www.nena.org

Acronym	Organization	Description	Website
	NG911 NOW Coalition	The coalition includes public safety leaders and industry representatives who are working to address the funding, technical, policy, and legislative issues needed to accelerate implementation of NG911 throughout the United States.	www.ng911now.org
NHTSA	National Highway Traffic and Safety Administration	Part of the U.S. Department of Transportation, NHTSA is responsible for keeping people safe on America's roadways. The National 911 Program is housed within NHTSA.	www.nhtsa.gov
NPSTC	National Public Safety Telecommunications Council	NPSTC is a federation of organizations whose mission is to improve public safety communications and interoperability through collaborative leadership.	www.npstc.org
NTIA	National Telecommunications & Information Administration	NTIA, located within the U.S. Department of Commerce, is the Executive Branch agency that is principally responsible by law for advising the President on telecommunications and information policy issues. FirstNet is an independent authority within NTIA.	www.ntia.doc.gov
OEC	Office of Emergency Communications (within the U.S. Department of Homeland Security)	Established in 2007 in response to communications challenges faced during the attacks on September 11, 2001 and Hurricane Katrina, OEC supports and promotes communications used by emergency responders and government officials to keep America safe, secure, and resilient. OEC provides training, coordination, tools, and guidance to help its federal, state, local, tribal, territorial and industry partners develop their emergency communications capabilities.	www.dhs.gov/office-emergency-communications
	SAFECOM (within the U.S. Department of Homeland Security)	Formed in the aftermath of the terrorist attacks of September 11, 2001, SAFECOM works to improve public safety interoperability, allowing emergency responders to communicate effectively before, during, and after emergencies and disasters.	www.dhs.gov/safecom
TFOPA	Task Force on Optimal Public Safety Answering Point Architecture	TFOPA was created by the FCC to study and report findings and recommendations on structure and architecture in order to determine whether additional consolidation of PSAP infrastructure and architecture improvements would promote greater efficiency of operations, safety of life, and cost containment, while retaining needed integration with local first responder dispatch and support.	www.fcc.gov/about-fcc/advisory-committees/general/task-force-optimal-public-safety-answering-point

APPENDIX B:

Glossary of Common Acronyms and Terms

ABANDONED CALL	A call placed to 9-1-1 in which the caller disconnects before the call can be answered by the telecommunicator.
ALI	Automatic Location Identification provides street address information and dispatch information associated with the caller's Directory Number (DN) to be displayed at the answering PSAP.
ANI	Automatic Number Identification allows the Directory Number (DN) of the calling station (i.e., phone) to be automatically forwarded to the PSAP and displayed.
AVERAGE BUSY HOUR	The 1-hour period during the week in which the most telephone calls are received.
BCF	Border Control Function provides a secure entry into the ESInet for emergency calls presented to the network.
CAD	Computer Aided Dispatch provides automated services for selected dispatching and record-keeping activities.
CALL PROCESSING PROTOCOL	Standardized set of questions for each type of emergency call. Available as hard copy cards or as computer software that posts each subsequent question on the screen, once the incident type is entered. A standard prioritization of calls is provided. Protocols exist for police, fire and EMS calls.
CALL SET-UP TIME	The time that elapses between the dialing by the caller of the last 9-1-1 digit and the presentation of the call to the appropriate PSAP.
CALL-TAKER/RECEIVER	The person in the PSAP answering the 9-1-1 call.
CPE	Customer Premise Equipment is the communications or terminal equipment located at a PSAP.
DEFAULT ROUTING	A standard E9-1-1 service that allows a 9-1-1 call to be rerouted to a default PSAP when the call cannot be selectively routed.

DENIAL OF SERVICE ATTACK	A type of cyber-attack intended to overwhelm the resources of the target and deny the ability of legitimate users of the target to obtain the normal service the target provides.
DHCP	Dynamic Host Configuration Protocol is a set of rules used by a communications device to allow the device to request and obtain an Internet address from a server which has a list of addresses available for assignment.
DIRECT DISPATCH	The performance of 9-1-1 call answering and dispatching by personnel at the primary PSAP.
DISPATCHER	Person in primary or secondary PSAP who assigns calls to field personnel.
DLR	Digital Logging Recorder that records date, time, audio and call detail data and other transactions involved in the processing of calls to the PSAP.
DMS	Data Management System
DN	Directory Number
E911	Enhanced 9-1-1 is a telephone system which includes network switching, database and Public Safety Answering Point premise elements capable of providing automatic location identification data (ALI), selective routing, selective transfer, fixed transfer, and a call back number (ANI).
ECC	Emergency Communications Center is a set of call takers operating under common management which receives emergency calls for service and asynchronous event notifications and processes those calls and events according to a specified operational policy.
EM CIRCUITS	Emergency Message Circuits are the special service circuits used to carry 9-1-1 calls to the PSAP.
ENS	Emergency Notification Systems include any system used to notify persons or devices of an emergency (telephone, sirens, electronic sign boards, etc.).
ESInet	Emergency Services IP Network is a managed IP network that is used for emergency services communications which can be shared by all public safety agencies.
ESRD	Emergency Services Routing Digit is a 10-digit North American Numbering Plan number that uniquely identifies a base station, cell site, or sector that is used to route wireless emergency calls through the network.
FCC	Federal Communications Commission
FIRSTNET	First Responder Network Authority
FIRST RESPONDER	Emergency Service Provider (police, sheriff, fire, EMS) to whom emergency call is dispatched. Could also include public works employees, e.g., water, gas, roads.
FOOT PRINT	The geographic area covered by a particular wireless cell or cell sector.
GATEWAY	Equipment that provides interconnection between two networks using different communications protocols.

GIS	Geographic Information System is a computer software system that enables one to visualize geographic aspects of a body of data.
IoT	The Internet of Things is the network of devices and physical objects that have embedded technology (e.g., sensors, software) that allows them to connect to the Internet. Examples of devices in the Internet of Things include home locking systems, wearable technology like Fitbits, automobiles, video game consoles, and security cameras.
IP	Internet Protocol
IRR	Instant Replay Recording is a process used in PSAPs to record either radio calls from field officers or phone calls from callers. The calls are time stamped and the telecommunicator can replay them immediately, adjusting volume and tone in order better to discern what has been said.
ISP	Internet Service Provider is a company that provides Internet access to other companies and individuals.
ITSP	Internet Telephony Service Provider is a company providing Internet-based telephony services.
LAN	Local Area Network
LEGACY GATEWAY	A signaling and media interconnection appliance between analog callers in legacy wirelines/ wireless originating networks and an i3 architecture so that PSAPs are able to receive emergency calls from such legacy networks.
LOS	Level of Service
LVF	Location Validation Function provides sufficient location-based information to a PSAP to allow a 9-1-1 call taker to dispatch emergency responders to a 9-1-1 call scene. The location information is provided by civic based addresses or latitude/longitude data.
NG911	Next Generation 9-1-1 (incorporates digital data: videos, text, photos).
NHTSA	National Highway Traffic Safety Administration
NIMS	National Incident Management System was created by FEMA to provide a nationwide incident management system to enable all government, private-sector, and nongovernmental organizations to work together during hazardous incidents across jurisdictions and disciplines.
NCIC	The National Crime Information Center is an FBI database for criminal justice information.
Nlets	Beginning as the Law Enforcement Teletype System, Nlets is a private not-for-profit corporation owned by the states that provides an interstate justice and public safety network for the exchange of law enforcement-, criminal justice-, and public safety-related information.
NRC	National 9-1-1 Resource Center (911.gov)
POTS	Plain old telephone service

PSAP	Public Safety Answering Point is an agency or group of agencies designated and authorized to receive and respond to emergency calls requiring one or more public services.
Legacy PSAP	Traditional PSAP based on land-line, analog service
Primary PSAP	Original answering point (e.g., communications center)
Secondary PSAP	Point to which a call may be routed from a primary PSAP (e.g., local dispatch entity)
QoS	Quality of service
REDUNDANT CALLS	Calls which report an incident for which a call already has been received. The call taker notes in the call record that this is an additional call and highlights any new or contradictory information that may be provided by this or subsequent calls.
RTT	Real Time Text is text transmission that is character at a time, as in TTY.
SR	Selective Routing is a standard service which routes an E9-1-1 call to the appropriate (primary) PSAP based on the calling party's telephone number.
TCO	Telecommunication Operator (call-taker and/or dispatcher at PSAP). TCOs can be thought of as "the first of the first responders."
TDD/TT/TTY	Telecommunications Device for the Deaf/Text Telephone/Teletype are telecommunications devices consisting of modems that permit typed telephone conversations with or between persons who are deaf, hard of hearing or have speech disorders.
VoIP	Voice over Internet Protocol is a type of IP-enabled service that allows for the two-way real-time transmission of voice communications and has access to the public switched network.
WSP	Wireless Service Provider is a cellular, satellite or other radio-based telephony or data transport commercial entity.

APPENDIX C:

Participants at the Critical Issues Meeting: The Future of Emergency Communications

June 16, 2017, Washington, D.C.

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