



# NG911 ROADMAP

Pathways toward nationwide interconnection of 911 services

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# Executive Summary

## Envisioning a Nationwide Next Generation 911 (NG911) System of Systems

The *NG911 Roadmap* (Roadmap) is a collaborative effort between the National 911 Program and 911 stakeholders from both the public and private sectors. It focuses on what needs to be done at the national level—by all members of the 911 community—to achieve a nationwide NG911 system of systems. This concept involves the existence of NG911 capabilities at the jurisdictional level across the U.S., as well as interconnectivity and interoperability amongst those systems using common standards nationwide. Among the benefits of nationwide interoperability are the ability to respond to 911 requests faster, with greater accuracy, greater situational awareness, greater resilience, and with more consistent quality. It would enable first responders, emergency management, and other public safety entities to provide optimal service not only to their own communities, but also to neighboring communities in need of additional resources or assistance. Furthermore, interconnectivity and interoperability among 911 systems positions the nation to obtain better awareness of community needs, identify trends, and evaluate how effectively U.S. residents and visitors are served.

## NG911 Capabilities at the Jurisdictional Level—An Essential Ingredient

The nation is progressing toward NG911, but there are roadblocks ahead. Since 2012, the National 911 Program<sup>1</sup> and the National Association of State 911 Administrators (NASNA) have reported annually on progress made by U.S. states, commonwealths, and territories toward achieving NG911 capabilities (for the purpose of this report, the term “state” will be used when referencing any such entity). The November 2017 report, [2017 National 911 Progress Report](#),<sup>2</sup> shows forward momentum toward NG911 services since the year 2012; however, data voluntarily shared by states<sup>3</sup> (reflecting 2015 and 2016 activity) suggests that progress may have plateaued in certain areas. For example, findings show that in 2015, 20 of 45 reporting states indicated they have adopted statewide NG911 plans—this is the

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<sup>1</sup>The National 911 Program, created by Congress in 2004 as the 911 Implementation and Coordination Office, is housed within the U.S. Department of Transportation’s National Highway Traffic Safety Administration. It is a joint program with the U.S. Department of Commerce’s National Telecommunication and Information Administration. <https://www.911.gov>.

<sup>2</sup>[2017 National 911 Progress Report](#) findings are based on data collected during the calendar year 2017, which reflects data produced in 2016.

<sup>3</sup> State data is collected and maintained via the National 911 Program’s [National 911 Profile Database](#).

same number of states that reported having plans by the end of 2016.<sup>4</sup> The Federal Communications Commission (FCC) also reports annually on aspects of NG911 developments. In its [\*Ninth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges\*](#), the FCC found that in calendar year 2016, 39 of 46 reporting states “engaged in NG911 programs” and 13 states deployed statewide Emergency Services Internet Protocol Networks (ESInets),<sup>5</sup> which are a core component of NG911 functionality. When considering these numbers, it is important to note that the data provided in these reports does not necessarily present a qualifiable picture. It is difficult to holistically assess how successfully NG911 system components have been implemented after they have been installed. Therefore, the level of progress toward *operational* NG911 capabilities is unclear and difficult to measure.

Meanwhile, the speed at which technology advances remains stunningly rapid, and the resulting effects on the public’s mobility and access to new communication devices and applications continue to challenge 911 services. As the 911 community strives to enhance its reach, operations, and efficiency, it often encounters crossroads and barriers that influence or are influenced by various policy, governance, funding, technical, and operational factors. Such challenges impede the rate at which jurisdictions are able to achieve NG911, hindering their ability to consistently provide and continuously improve 911 services to their immediate populations. Jurisdictional systems also are rendered vulnerable to situations that potentially can disrupt service delivery entirely. Without homogeneous NG911 capabilities at the jurisdictional level, broader progress toward achieving seamless interoperability and the vision of nationwide interconnectivity is hindered, resulting in a national inability to efficiently address emergency service needs that span boundaries.

## **Identifying What Should be Done at the National Level**

This Roadmap focuses on what can be done *at the national level* to enable 911 stakeholders to contribute to the completion of a nationwide NG911 system of systems. It is important to understand that as it relates to this document, the term “national” is used specifically to indicate nationwide importance, relevance, or impact. It does not imply federal responsibility. This Roadmap does not attribute tasks to specific agencies or entities because the 911 community is best suited to identify steps for moving forward and which individuals and entities might be in the best position to carry them out. Furthermore, some tasks already may be in progress (or completed).

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<sup>4</sup> National 911 Program, [\*2017 National 911 Progress Report\*](#): 59-60.

<sup>5</sup> Federal Communications Commission [\*Ninth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges\*](#): 3.

In other words, use of the term “national” is not intended to convey that creating and implementing solutions, strategies, or a nationwide system of systems should or will be an initiative of the federal government. While the federal government may play a supportive role in some areas, the goals identified in this Roadmap are expected to be achieved through efforts undertaken by the spectrum of stakeholders that comprise the 911 community.

Specifically, the Roadmap identifies potential tasks in support of the following goals:

1. ***Business/Governance Goal:*** Identify strategies and resources to address policy, regulatory, governance, and funding issues or obstacles faced by jurisdictions both independently (along their transition to NG911 capabilities) and collectively (as they relate to achieving nationwide interconnectivity).
2. ***Technology (Tech) Goal:*** Stimulate adoption and enable implementation of NG911 technology by promulgating NG911 open standards and establishing means by which emerging technologies can be validated for compliance and security.
3. ***Data Goal:*** Support the enhancement of 911 services by establishing technical and operational data solutions that support cross-jurisdictional and nationwide situational awareness, interoperability, information sharing, and predictive data analysis.
4. ***Operations (Ops) Goal:*** Distinguish, enhance, and promote operating procedures, performance evaluation, and professional-development strategies that support complete and streamlined implementation of NG911 capabilities.
5. ***Cross-Cutting Goal:*** Facilitate education and knowledge transfer on an ongoing basis.

## **The ‘Call to Action’**

*The Roadmap is relevant to everyone.* Any entity or individual who influences, contributes to, or benefits from 911 services has a potential role in bringing the Roadmap to life. While the National 911 Program will maintain information on the ongoing status of the implementation of this Roadmap and will monitor progress in completing the tasks identified in this document, it does not assign responsibilities for specific tasks. As a national Roadmap, the individuals, agencies, organizations, and the 911 community at large will be encouraged to address, inform, or champion specific issues once they are identified and publicized. Simply put, the “call to action” is to *take action in a manner that aligns best with your expertise, interests, and priorities.*

## Contributors

The National 911 Program would like to thank the following individuals who, on behalf of their organizations, worked tirelessly to develop this document.

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Without the generous contribution of their experience and expertise, the completion of this document would not have been possible.

The National 911 Program will maintain and update the Roadmap as the community makes headway. Please contact the program at [NHTSA.National911@dot.gov](mailto:NHTSA.National911@dot.gov) if you have any questions, updates, or information on progress made in any of the goal areas described.

# About the Roadmap

## The Purpose of the Roadmap

This Roadmap focuses on what needs to be done at the national level—by any and all members of the 911 community (including the public)—to achieve a nationwide NG911 system of systems. It does not include specific solutions to the issues it discusses, nor does it identify specific groups to address them—there are many individuals and entities that have produced formative work on how to address relevant issues on a granular level. Instead, the Roadmap focuses on how to best leverage all of the hard work that already has been accomplished, identify any gap areas that need attention, and provide context as to why certain initiatives and tasks are worth exploring. Any entity or individual who influences, contributes to, or benefits from 911 services is encouraged to step forward and contribute to the implementation of any task.—The 911 community has the collective knowledge, experience, and reach necessary for advancing the evolution of NG911.

## How the Roadmap is Organized

The Roadmap begins by introducing the definition of NG911, then relates NG911 capabilities to how they would look conceptually at both jurisdictional and national levels. From there, it dives into each of the five goal areas: 1) Business/Governance, 2) Technology, 3) Data, 4) Operations, and 5) Cross-Cutting, which involves ongoing education and knowledge transfer. Within each, specific issue areas of national focus are described and followed by one or more potential tasks for exploring next steps toward achieving a nationwide, interconnected, interoperable NG911 system of systems. Some activities will require further research and are not intended to identify exactly what is needed to “turn the corner.” Others involve developing best practices and guidance so that jurisdictions can avoid inconsistency and having to “reinvent the wheel.” Additionally, the Roadmap includes the cross-goal task of identifying the best way to harness and leverage research, tools, standards, best practices, requirements, and other resources that have been developed throughout the 911 community over the years. To help determine a path toward contributing to any activity, recent and current efforts of note are included. A general snapshot of goal elements is provided in Figure 1 on the next page.

Also included in the Roadmap is a glossary of widely used terms relevant to 911 service (*Appendix 1: 911 Terms & Definitions*), a list of key 911 stakeholder entities (*Appendix 2: Associations, Organizations & Other Stakeholder Entities Relevant to 911*), and a list of resources that address various 911 and NG911 topics (*Appendix 3: Useful Resources*).

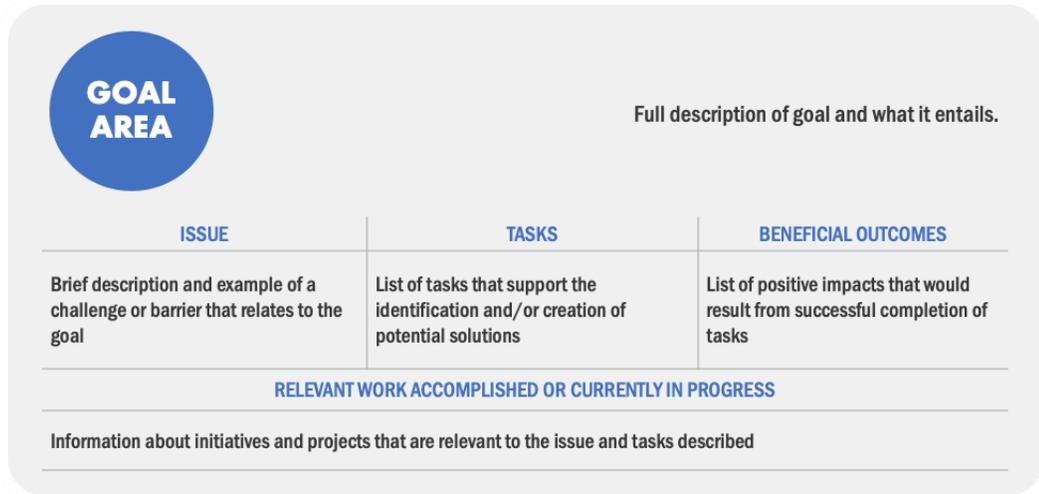


Figure 1: Snapshot of How Goal Areas Are Organized

## A Note on Terminology

In some cases, to keep things simple, generic terms have been used to identify entities, circumstances, or activities that are quite complex once dissected. Key instances for which this approach was taken pertain to the following terms:

- *State*. The Roadmap applies the term “state” to include U.S. states, commonwealths, territories, and tribal communities.
- *National*. The Roadmap applies the term “national” to describe activities, systems, or resources that are important, relevant, impactful, or applicable to the nation as a whole. The term, as used, is not intended to refer to the federal government.
- *Jurisdiction*. The Roadmap applies the term “jurisdiction” generically to include localities, regions, towns, rural communities, and states.
- *Call*. While the ability to process 911 requests that are initiated via multiple modes of communication lies at the essence of NG911 capabilities, the Roadmap applies the term “call” generically to include any mode of contact. This use of the term aligns with the definition that appears in National Emergency Number Association’s (NENA) [Master Glossary of 9-1-1 Terminology](#).<sup>6</sup>

<sup>6</sup> “Call: A generic term used to include any type of Request for Emergency Assistance (RFEA) and is not limited to voice. This may include a session established by signaling with two way real-time media and involves a human making a request for help. We sometimes use ‘voice call.’”

# Working Toward a Nationwide NG911 System of Systems

## What We Mean by NG911

On January 12, 2018, the National 911 Program and the NG911 NOW Coalition (which involves NENA, NASNA, and the Industry Council for Emergency Response Technologies [iCERT]) mutually agreed that “NG911 services” means a secure, Internet Protocol (IP)-based, open standards system comprised of hardware, software, data, and operational policies and procedures that:

- Provides standardized interfaces from emergency call and message services to support emergency communications.
- Processes all types of emergency calls, including voice, text, data, and multimedia information.
- Acquires and integrates additional emergency call data useful to call routing and handling.
- Delivers the emergency calls, messages, and data to the appropriate public safety answering point (PSAP) and other appropriate emergency entities based on the location of the caller.
- Supports data, video, and other communications needs for coordinated incident response and management.
- Interoperates with services and networks used by first responders (and other 911 systems) to facilitate emergency response.

In addition to the technical factors described above, the implementation of NG911 functions involves many governance and operational issues. These elements are described in the FCC Task Force on Optimal PSAP Architecture (TFOPA)’s [\*Adopted Final Report\*](#), released on January 29, 2016.<sup>7</sup>

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‘video call,’ or ‘text call’ when specific media is of primary importance. The term ‘non-human-initiated call’ refers to a one-time notification or series of data exchanges established by signaling with at most one way media, and typically does not involve a human at the ‘calling’ end. The term ‘call’ can also be used to refer to either a ‘voice call’, video call’, ‘text call’ or ‘data-only call,’ since they are handled the same way through most of NG9-1-1.”

<sup>7</sup> <https://www.fcc.gov/document/fcc-releases-tfopa-final-report>

## NG911 at the Jurisdictional Level

As shown below in Figure 2, the end state of NG911 capabilities at the jurisdictional level encompasses both technical and operational aspects of implementing and operating Next Generation Core Services (NGCS). These core services facilitate interaction with originating service providers (OSPs), PSAP systems and operations, radio networks, extended emergency services, and geographic information systems (GIS).

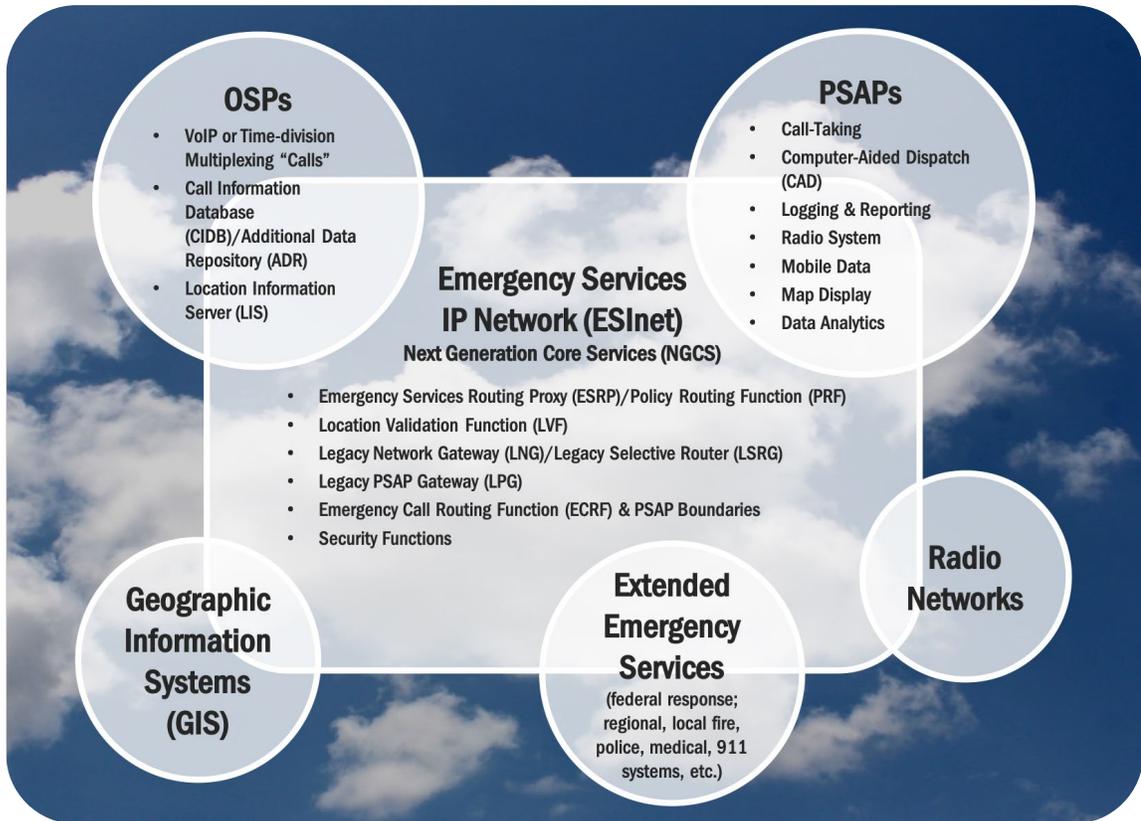


Figure 2: High-Level Abstract View of a Jurisdictional NG911 Environment

## NG911 Nationwide

Looking at the future state of NG911 as a nationwide capability involves moving from *approximately 6,000 independent operations to a system of approximately 6,000 interconnected and interoperable operations*. Figure 3 below depicts a simplified view of a nationwide NG911 system of systems. The 911 community will decide how this environment is manifested, and this broad concept will be defined incrementally and sculpted jurisdiction by jurisdiction.

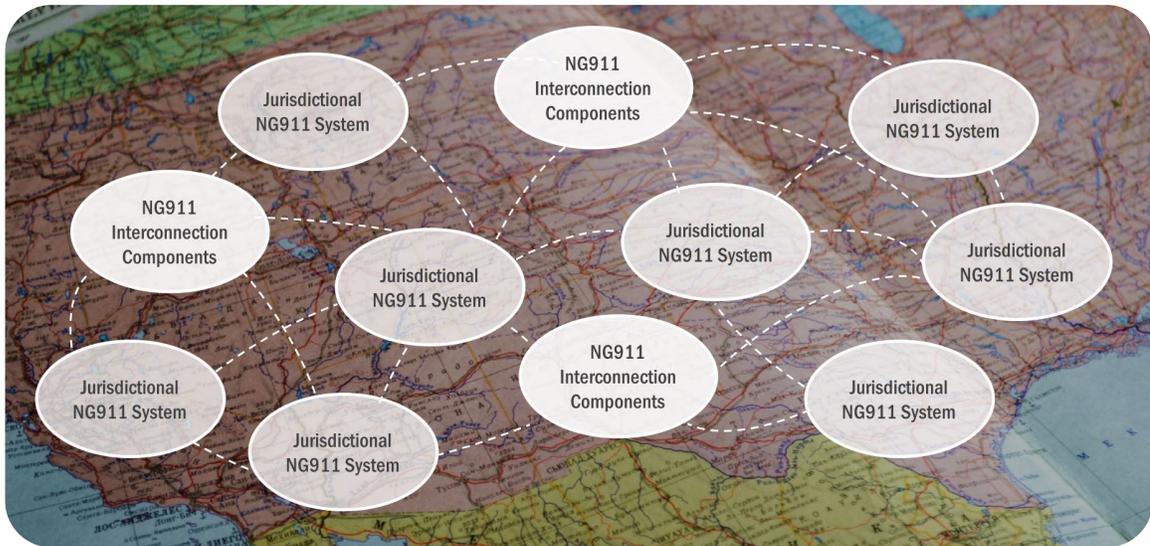


Figure 3: Abstract View of a Potential NG911 System of Systems that Interconnects via Technical Linkages **and** Operational Policies and Procedures

## Why Nationwide Interconnectivity and Interoperability?

Among the benefits of nationwide interconnectivity and interoperability driven by common standards is the ability to respond to 911 requests faster, with greater accuracy, greater resilience, and more consistent quality. For example, first responders often cross boundaries to serve their own communities or help neighboring jurisdictions. Trying to operate with different systems and/or with incompatible or inconsistent policies, procedures, and standards presents challenges that may hinder optimal service to the public. Without interoperability, jurisdictions will not have the means to truly communicate effectively, know how to interact with the communities that surround them, identify 911 trends, or evaluate their performance.

To help ponder the benefits of nationwide NG911 interconnectivity, we can look through the lens of real-life scenarios. Imagine that you are talking to your grandmother who lives across the country. Suddenly, she becomes fearful she is having a heart attack, so you call 911 but get your local PSAP. With NG911 in place nationwide, the PSAP would be able to transfer the 911 call from your location to the appropriate PSAP—an improvement from how such a situation would be handled in today’s siloed environment. More efficient call-handling and -transferring capabilities also will be helpful when calls are routed to PSAPs based on outdated addresses registered to Voice over Internet Protocol (VoIP) phones.

In addition to the benefits for the individual U.S. resident or visitor, a nationwide NG911 system of systems also poses national-scale value. The ability to comprehensively collect, view, and analyze 911 data at the national level will enable identification of 911 trends; evidence-based decisions about how to address pervasive challenges; identification of evolving needs; and better preparation of resources to help meet those needs.

## **Value Propositions for Every Stakeholder**

The value of nationwide interconnection and interoperability of 911 networks and systems is multifaceted and unique to each stakeholder group that contributes to, operates within, and benefits from effective 911 services. Table 1 on the following page identifies a few distinct value areas for 911 service providers, public safety professionals, organizations that provide support for populations in crisis, private industry, and the public.

	INCLUDES, BUT IS NOT LIMITED TO	VALUE PROPOSITIONS
	<ul style="list-style-type: none"> <li>• PSAP managers and telecommunicators</li> <li>• 911 administrators</li> <li>• 911 legislators</li> <li>• Governmental offices and national organizations that provide services in support of 911, e.g., information technology (IT), GIS, and standards development organizations (SDOs)</li> </ul>	<ul style="list-style-type: none"> <li>• More efficient handling of 911 requests at every phase of a call's entire lifecycle.</li> <li>• Heightened (and more purposeful) access to richer, more accurate data, enabling more effective response and more purposeful decision-making at the policy level.</li> <li>• Access to richer data and information on requestor location and level of need at all times and from any PSAP.</li> <li>• Continuity of operations and avoidance of any lapse in service availability due to disruptions experienced by a given PSAP.</li> <li>• Opportunities for increased standardization of 911 operations and establishment of baseline skillsets for 911 professionals across the country.</li> <li>• Ability to support translation capabilities for limited English-proficient persons (e.g., text sessions).</li> </ul>
	<p>Agencies and professional organizations that represent:</p> <ul style="list-style-type: none"> <li>• Emergency medical services</li> <li>• Fire services</li> <li>• Law enforcement</li> <li>• Emergency management</li> <li>• Search and rescue</li> <li>• Poison control</li> </ul>	<ul style="list-style-type: none"> <li>• Heightened awareness of a caller's needs, location, and conditions.</li> <li>• Ability to accurately transfer information to the most appropriate responders who can provide the most expedient services.</li> <li>• Ability to arrive at the right scene faster.</li> <li>• Ability to more rapidly procure augmentative support from other public safety services within or outside of jurisdictional boundaries.</li> <li>• Access to richer, more comprehensive data that enables the ability to establish and meet purposeful performance metrics, justify funding requests, and heighten efforts to keep responders safe and healthy.</li> </ul>
	<p>Centers/hotlines providing specialized response and support services, such as:</p> <ul style="list-style-type: none"> <li>• Suicide prevention</li> <li>• Abuse and crisis intervention</li> <li>• Missing persons intervention</li> </ul>	<ul style="list-style-type: none"> <li>• Easier, more expeditious access to 911 systems, enabling rapid response to specialized needs.</li> <li>• Ability to send richer, more contextual data to 911 systems.</li> </ul>
	<ul style="list-style-type: none"> <li>• Telecommunications carriers</li> <li>• Network service providers</li> <li>• CAD vendors</li> <li>• Customer premises equipment (CPE) vendors</li> <li>• Telematics providers</li> </ul>	<ul style="list-style-type: none"> <li>• Mechanisms by which to certify services and technology as compliant with NG911 open standards.</li> <li>• Parity regarding legal liability protection.</li> <li>• Reduction in interconnection points.</li> <li>• Heightened ability to route 911 calls to the most appropriate PSAP.</li> </ul>
	<p>All U.S. residents and visitors; includes specialized support for groups with specific needs, such as:</p> <ul style="list-style-type: none"> <li>• Users of mobile health devices</li> <li>• Persons with disabilities</li> <li>• Limited English-proficient persons</li> </ul>	<ul style="list-style-type: none"> <li>• Faster connection to telecommunicators (thus emergency services that can respond in the most immediate manner).</li> <li>• Ability to use existing technology.</li> <li>• Able to provide better data and information (e.g., multimedia).</li> <li>• In some cases, negation of need to physically initiate the emergency call.</li> </ul>

Table 1: Value of a Nationwide NG911 System of Systems

## Where We are Now ... and Where We are Headed



### *Today, we operate in a siloed environment*

Coordinating across jurisdictions is a challenge. There are approximately 6,000 PSAPs in operation, each with varying governance structures and operational environments.

### *We do not know how ready we are for NG911*

Assessing levels of NG911 functionality is a challenge. PSAPs that are operating through an ESInet or that have installed and tested other NG911 functions and/or components may or may not be using these elements to their full potential.

### *Not every jurisdiction has an NG911 champion or planner*

Getting buy-in at local, regional, state, tribal, and federal levels is crucial for moving forward. Without a jurisdictional champion, motivating transition is a steep uphill climb.

### *We all will be on the same page!*

All jurisdictions will have “bought in” and will have access to the tools needed to garner support and commit time and resources to moving forward.

### *We will know more so we can do more!*

With all jurisdictions on board, we truly can assess our current technical and operational capabilities and connect the dots between gap areas and end-state capabilities.

### *No more silos!*

Ultimately, as jurisdictions reach full NG911 functionality and NG911 interconnection components are in place nationwide, 911 systems will be interconnected, interoperable, and able to provide optimal services to anyone at any location.



## Key Challenges Faced by the 911 Community

As indicated in the December 2016 TFOPA Working Group 2 report titled, [Phase II Supplemental Report: NG9-1-1 Readiness Scorecard](#), the barriers that impede nationwide progress toward NG911 capabilities include lack of understanding, funding, standards, outreach, and bandwidth for planning.

*“The slow transition has been impacted by many factors, including but not limited to:*

- *The absence of agency buy-in resulting from a lack of understanding of the elements associated with a transition to the NG9-1-1 end state*
- *Inadequate funding*
- *Incomplete or incoherent recognized standards*
- *Lack of stakeholder outreach*
- *Potential job losses*
- *Day-to-day demands which do not afford the time to plan for such a significant change.*

*This lingering development will result in crisis as time-division multiplexing (TDM) switched Legacy 40 plus year old current platform of today is overwhelmed by the rapidly emerging internet protocol (IP) platform unless progress can be made to move to the NG9-1-1 end-state.”<sup>8</sup>*

Additionally, the lack of champions to help address these issues, as well as challenges regarding training and upgrading skills of PSAP personnel, creates other barriers. These issues and challenges are complex and nuanced by various distinct characteristics of each jurisdiction (e.g., regulatory conditions, governmental structure, state-strong versus local-strong environment).

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<sup>8</sup> FCC TFOPA, *Working Group 2 Phase II Supplemental Report: NG9-1-1 Readiness Scorecard*: 6.

# A Path Forward

The majority of tasks identified in this Roadmap are categorized by four interdependent topic-specific goals. Within and across each goal area are tasks that are interrelated and interdependent, each serving as a building block to the broader vision. For example, funding and operational support, and standards and requirements development, are ubiquitous enablers of success. Furthermore, outcomes produced as a result of addressing Roadmap tasks will need to be socialized and disseminated to ensure synchronization across efforts. Therefore, the fifth goal (cross-cutting) addresses the need for ongoing education and knowledge transfer.



Identify strategies and resources to address policy, regulatory, governance, and funding issues or obstacles faced by jurisdictions both independently (along their transition to NG911 capabilities) and collectively (as they relate to achieving nationwide interconnectivity).



Stimulate adoption and enable implementation of NG911 technology by promulgating NG911 open standards and establishing means by which emerging technologies can be validated for compliance and security.



Support the enhancement of 911 services by establishing technical and operational data solutions that support cross-jurisdictional and nationwide situational awareness, interoperability, information sharing, and predictive data analysis.



Distinguish, enhance, and promote operating procedures, performance evaluation, and professional-development strategies that support complete and streamlined implementation of NG911 capabilities.



Facilitate education and knowledge transfer on an ongoing basis.



Identify strategies and resources to address policy, regulatory, governance, and funding issues or obstacles faced by jurisdictions both independently (along their transition to NG911 capabilities) and collectively as they relate to achieving nationwide interconnectivity.

ISSUE	TASK(S)	BENEFITS
<p><b>INTEGRITY OF 911 FUNDS</b>            Across the U.S., 911 funds are used for a variety of expenditures and sometimes are used for non-911 related interests. For example, how “fee diversion” is defined across jurisdictions is inconsistent, thus jeopardizing the integrity with which 911 funds are used and whether they are applied to NG911 maturation.</p>	<p><b>Business 1. Concretely define what constitutes eligible spending of 911 funds.</b></p> <p><b>Business 2. Identify financial inefficiencies and other issues regarding current spending approaches.</b></p> <p><b>Business 3. Develop a nationally accepted definition of the term, “fee diversion.”</b></p> <p><b>Business 4. Develop an adequate and sustainable jurisdictional financial model that includes clear funding and spending guidelines.</b></p>	<ul style="list-style-type: none"> <li>• Visibility of funding approaches and techniques that have or have not worked for jurisdictions.</li> <li>• Data that may inform potential opportunities for establishing a nationwide mechanism for mitigating diversion.</li> <li>• Information that informs the development of a nationally adopted baseline taxonomy by which jurisdictions can develop effective legislative language that prevents state-level raiding of 911 fees and provides authority to audit providers to ensure accuracy of fees collected.</li> <li>• Increased motivation for jurisdictions to accurately report spending activities on a routine basis.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The FCC TFOPA discusses the tenets of sustainable funding in its report, [Funding Sustainment Model](#).
- As mandated by the New and Emerging Technologies 911 Improvement Act of 2008 (NET 911 Act), the FCC [surveys states annually on their collection and distribution of 911 and Enhanced 911 \(E911\) fees](#).
- In 2013, the U.S. Government Accountability Office (GAO) released the report titled, *Most States Used 911 Funds for Intended Purposes, but FCC Could Improve Its Reporting on States’ Use of Funds*.
- On December 29, 2017, the FCC published its ninth annual report to Congress, [On State Collection and Distribution of 911 and Enhanced 911 Fees and Charges](#).



Identify strategies and resources to address policy, regulatory, governance, and funding issues or obstacles faced by jurisdictions both independently (along their transition to NG911 capabilities) and collectively (as they relate to achieving nationwide interconnectivity).

ISSUE	TASK(S)	BENEFITS
<p><b>FUNDING OF NATIONWIDE RESOURCES</b>            Funding mechanisms for NG911 interconnection components and related products are needed in key areas. The lack thereof stagnates development and implementation of adopted concepts for solutions that enable nationwide NG911 capabilities. For example, capabilities and tools will need to be designed, implemented, and operated to support interconnectivity across the nation and security of an NG911 system of systems. These potentially include ESInets, a nationwide Forest Guide, a nationwide PSAP registry, a nationwide GIS data store, a nationwide Identity, Credential, and Access Management (ICAM) capability, and nationwide EC3<sup>9</sup> capabilities for cybersecurity.</p>	<p><b>Business 5. Develop a comprehensive cost analysis for nationwide products in need of development, testing, implementation, adoption, operations, and maintenance.</b></p> <p><b>Business 6. Develop a strategy for developing public policies that support implementation and proper use of nationwide products.</b></p> <p><b>Business 7. Develop an outreach and stakeholder engagement plan to explore feasible ownership and sustainable funding models.</b></p> <p><b>Business 8. Identify sources of funding for the development, implementation, operation, and support of required nationwide components.</b></p>	<ul style="list-style-type: none"> <li>• Visibility into nationwide products and solutions that are in need of champions/owners.</li> <li>• Clarity regarding the qualifications, capabilities, partnerships, and other resources that product champions/owners would need to possess to effectively develop, implement, and/or maintain solutions.</li> <li>• Visibility into the willingness of qualified champions (and partners) to undertake responsibility.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- NENA has published the guidance titled, [NENA Requirements for a National Forest Guide](#). The document contains an analysis of cost factors and cost recovery considerations that are helpful to identifying the next level of information needed to recruit and formalize a development-and-implementation champion.
- The FCC TFOPA describes the EC3 capability and related requirements in its report, [Optimal Cybersecurity Approach for PSAPs](#).
- APCO’s [Project 43](#) addresses funding issues related to broadband implications for the PSAP.

<sup>9</sup> Emergency Communications Cybersecurity Center



Identify strategies and resources to address policy, regulatory, governance, and funding issues or obstacles faced by jurisdictions both independently (along their transition to NG911 capabilities) and collectively (as they relate to achieving nationwide interconnectivity).

ISSUE	TASK(S)	BENEFIT
<p><b>FUNDING FOR JURISDICTIONAL NG911 PLANNING AND IMPLEMENTATION</b></p> <p>Jurisdictions face funding issues that hinder their ability to implement or maintain steps toward NG911 maturation.</p>	<p><b>Business 9. Maintain a funding stream for the NG911 grant program.</b></p> <p><b>Business 10. Identify long-term jurisdictional funding streams, including traditional and non-traditional sources (e.g., public-private partnerships).</b></p>	<p>Funding available to jurisdictions to develop and implement NG911 plans.</p>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The National 911 Program is reenacting rules based on a new funding source. [https://www.911.gov/project\\_911grantprogram.html](https://www.911.gov/project_911grantprogram.html)
- The FCC TFOPA discusses the tenets of sustainable funding in its report, [Funding Sustainment Model](#).
- The U.S. Department of Agriculture oversees [Rural Utilities Grants](#) that relate to 911 concerns by increasing access to broadband and 21<sup>st</sup> century telecommunications services.
- The U.S. Department of Homeland Security (DHS) supports 911 capacity building under its [Long-Range Broad Agency Announcement](#) program.



Identify strategies and resources to address policy, regulatory, governance, and funding issues or obstacles faced by jurisdictions both independently (along their transition to NG911 capabilities) and collectively (as they relate to achieving nationwide interconnectivity).

ISSUE	TASK(S)	BENEFITS
<p><b>NG911 KNOWLEDGE TRANSFER AND PLANNING GUIDANCE</b></p> <p>Jurisdictional NG911 planning and implementation is inconsistent, thus stagnating the establishment of a nationwide environment that accommodates cross-jurisdictional interconnectivity.</p>	<p><b>Business 11. Develop an inventory of jurisdictional NG911 roadmaps/plans.</b></p> <p><b>Business 12. Develop an analysis report on jurisdictional accomplishments regarding cross-boundary interconnectivity and identify how approaches can be scaled nationwide.</b></p>	<ul style="list-style-type: none"> <li>• Visibility into how jurisdictions have approached NG911 strategies and handled policy, technical, governance, funding, and operational aspects of the transition.</li> <li>• Identification of effective approaches (and relevant standards and requirements) toward interconnectivity that can be scaled and applied to the establishment of an NG911 system of systems.</li> <li>• Data that informs efforts toward establishing materials that heighten understanding (among all 911 stakeholders and the public safety community) about what the NG911 end state entails and how to achieve it.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The National 911 Program highlights jurisdictional accomplishments through its webinar series, [State of 911](#), and is in the process of working with NASNA to update the guidance titled, *Guidelines for Developing a State NG911 Plan* (to be published in 2019), and has published the guidance titled, [NG911 Interstate Playbook](#).
- TFOPA Working Group 1 describes the EC3 concept and requirements in its report titled, [Optimal Cybersecurity Approach for PSAPs](#).
- NASNA publishes [planning considerations and regional case studies](#).
- NENA published the guidance titled, [NG911 Transition Plan Considerations Information Document](#) and several technical requirements documents concerning [i3 requirements](#).
- The Association of Public-Safety Communications Officials, International (APCO) provides a variety of [operational, technical, and training standards and best practices](#) that are relevant to the planning stage.



Identify strategies and resources to address policy, regulatory, governance, and funding issues or obstacles faced by jurisdictions both independently (along their transition to NG911 capabilities) and collectively as they relate to achieving nationwide interconnectivity.

ISSUE	TASK(S)	BENEFITS
<p><b>POLICY CONFLICTS</b> Jurisdictional NG911 planning and transition is often hindered by policy-related issues that affect multiple business factors. For example, planning for the decommissioning of legacy systems can be difficult to navigate due to necessary repeals of old governance frameworks, statutes, and/or laws. Or demarcation of cost-sharing responsibilities is sometimes unclear and predicated on legal decisions that were made prior to the existence of NG911 capabilities and the expectation of a nationwide NG911 system of systems, thus stagnating forward momentum.</p>	<p><b>Business 13. Continue to develop case studies about how issues identified have been resolved at jurisdictional and federal levels.</b></p> <p><b>Business 14. Develop NG911 policies that address parameters for nationwide interconnectivity of jurisdictional 911 systems.</b></p>	<ul style="list-style-type: none"> <li>• Visibility into how jurisdictions have approached NG911 strategies and handled cases of policy repeal and replacement.</li> <li>• Data that informs efforts toward establishing best practices and other guidance materials.</li> <li>• A strategy for ensuring that 911 policies take into account the needs and impacts of NG911 functions, components, systems, transition, and maturation.</li> <li>• Policies that govern how jurisdictions interact within a nationwide NG911 system of systems.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The FCC [Communications Security Reliability, and Interoperability Council \(CSRIC\)](#) working groups have addressed a variety of specific NG911 transition issues including the decommissioning of legacy systems.
- APCO is an active participant in advancing [legislative issues related to NG911](#) addressing policies related to network resiliency, 911 reliability, the handling of non-emergency calls, and PSAP text-to-911 readiness and implementation.
- The National 911 Program’s guidance titled, [NG911 Interstate Playbook](#) discusses demarcation/cost-sharing issues.
- Two relevant resources produced by the National 911 Program and NASNA have been updated and will be released in 2018: *Guidelines for State NG911 Legislative Language* and *Guidelines for Developing a State NG911 Plan*.
- The National Conference of State Legislatures (NCSL) maintains the [State 9-1-1 Bill Tracking Database](#), which helps identify areas where policies may need adjustment in an interconnected environment.
- APCO’s [Project 43](#) addresses policy and governance issues related to broadband implications for the PSAP.



**Stimulate adoption and enable implementation of NG911 technology by promulgating NG911 open standards and establishing means by which emerging technologies can be validated for compliance and security.**

ISSUE	TASK(S)	BENEFITS
<p><b>NG911 INTERNCONNECTION COMPONENTS</b></p> <p>Several components will be needed to help establish and support an interconnected and interoperable NG911 system of systems. An environment that would require all jurisdictional ESInets to connect directly to multiple other ESInets would be cost prohibitive. Technical and operational requirements for nationwide interconnection components will need to be defined and explored for feasibility.</p>	<p><b>Tech 1. Design, implement, and operate nationwide interconnected ESInets.</b></p> <p><b>Tech 2. Design, implement, and operate a nationwide Forest Guide.</b></p> <p><b>Tech 3. Design, implement, and operate a nationwide PSAP registry.</b></p> <p><b>Tech 4. Design, implement, and operate a nationwide GIS data store.</b></p> <p><b>Tech 5. Design, implement, and operate a nationwide ICAM capability.</b></p> <p><b>Tech 6. Design, implement, and operate a nationwide cybersecurity capability such as EC3.</b></p>	<ul style="list-style-type: none"> <li>• Nationwide sharing of information.</li> <li>• Optimized interconnection possibilities and achievement of a cost-effective yet non-restrictive nationwide NG911 system of systems.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- NENA has published the guidance titled, [NENA Requirements for a National Forest Guide](#). The guide contains an analysis of cost factors and cost recovery considerations that are helpful to identifying the next level of information needed to recruit and formalize a development-and-implementation champion.
- NENA is exploring requirements, structures, costs, and timelines for developing the [NENA Enhanced PSAP Registry and Census \(EPRC\)](#)—the enhanced iteration of its existing PSAP Registry. The EPRC will include additional data fields and geographic polygon-based search capabilities.
- The FCC maintains the [911 Master PSAP Registry](#) that contains data about primary and secondary PSAPs.
- The First Responder Network Authority (FirstNet) has brought together various stakeholders within the public safety community to address the development of a national ICAM solution.
- TFOPA Working Group 1 describes the EC3 concept and requirements in its report titled, [Optimal Cybersecurity Approach for PSAPs](#).
- APCO’s [Project 43](#) addresses interoperability of mobile applications and other components as it relates to broadband implications for the PSAP.



**Stimulate adoption and enable implementation of NG911 technology by promulgating NG911 open standards and establishing means by which emerging technologies can be validated for compliance and security.**

ISSUE	TASK(S)	BENEFITS
<p><b>NATIONWIDE CYBERSECURITY</b>            Reticence about NG911 migration exists due to valid concerns about added cyberthreats and the need to fortify cybersecurity measures. For example, multiple PSAPs across 12 states experienced telephony denial of service (DoS) attacks that were spread via a hyperlink on a well-known social media site. Wireless phones of users who clicked on the link were infected by malware that instructed the phone to auto-dial 911 repeatedly.</p>	<p><b>Tech 7. Develop a research report on the need for, and feasibility of, a nationwide cybersecurity and cyberthreat response framework.</b></p> <p><b>Tech 8. Develop minimum standards and requirements for network interconnection and impacts on facility and personnel security.</b></p> <p><b>Tech 9. Develop a strategy for expanding the connection between national Information Sharing Analysis Centers (ISACs) and PSAPs to augment nationwide NG911 security.</b></p>	<ul style="list-style-type: none"> <li>• Identification of cybersecurity strategies and cyberthreat mitigation and response models that may be nationally scalable for NG911 purposes.</li> <li>• Improved and more-focused requirements or standards that establish minimum capabilities for securing NG911 systems, workforces, etc.</li> <li>• Identification of ways/mechanisms by which ISACs can partner with jurisdictions to help augment cyberthreat detection and mitigation.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The National 911 Program partnered with the DHS Office of Emergency Communications on the development of the [NG911 Cybersecurity Primer](#).
- The National Institute of Standards and Technology (NIST) has published [cybersecurity standards for critical infrastructure](#).
- NENA has published the resource titled, [Next Generation 9-1-1 Security \(NG-SEC\) Audit Checklist](#).
- TFOPA Working Group 1 describes the EC3 concept and requirements in its report titled, [Optimal Cybersecurity Approach for PSAPs](#).
- The [Information Sharing and Analysis Organization \(ISAO SO\)](#) addresses cybersecurity risks and best practices as they relate to emergency management and response.
- The FCC [CSRIC Council II](#) focuses on cybersecurity best practices.
- The [DHS National Coordinating Center for Communications \(NCC\)](#) oversees the goal to avert/mitigate impacts on telecommunications infrastructure.
- [InfraGard](#) addresses cybersecurity issues as they relate to critical infrastructure.
- APCO’s [Project 43](#) addresses cybersecurity education and training, resources and strategic planning related to broadband implications for the PSAP.



Stimulate adoption and enable implementation of NG911 technology by promulgating NG911 open standards and establishing means by which emerging technologies can be validated for compliance and security.

ISSUE	TASK(S)	BENEFITS
<p><b>CARRIER MIGRATION AND DELIVERY STANDARDS</b></p> <p>A baseline standard for ubiquitous carrier services does not exist. More than 1,000 carriers currently provide services and are looking for a common standard for interconnection. Standards were developed for Enhanced 911 (E911) migration and delivery but have not been adapted for NG911.</p>	<p><b>Tech 10. Define technical requirements and successes for carrier migration and interconnection using industry standards.</b></p> <p><b>Tech 11. Develop policies that promote accelerated migration to NG911 by carriers and PSAPs.</b></p>	<ul style="list-style-type: none"> <li>• Identification of negative impacts that occur due to the absence of such requirements.</li> <li>• Visibility into cases where carrier gateway requirements have been instituted successfully at the jurisdictional level.</li> <li>• Data that informs whether requirements actually are needed, and if so, what it would take to achieve development and adoption.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The FCC has published guidance on [modernizing telecommunications networks](#).
- The [Alliance for Telecommunications Industry Solutions \(ATIS\)](#) has developed models for network-to-network interfaces.



## Stimulate adoption and enable implementation of NG911 technology by promulgating NG911 open standards and establishing means by which emerging technologies can be validated for compliance and security.

ISSUE	TASK(S)	BENEFITS
<p><b>VALIDATION, VERIFICATION, TESTING AND EVALUATION OF NG911-RELEVANT FUNCTIONS AND SYSTEMS</b></p> <p>Jurisdictional reticence to invest in and adopt NG911 components and/or functions exists due to the lack of bandwidth, ability, and/or understanding required to validate NG911 compliance, verify legitimacy of certain emerging technologies, and/or test functions or technologies in a beta environment that is safe and not disruptive to day-to-day operations and supportive systems.</p> <p>A certification of solutions by a standards body that verifies compliance would assure decision-makers that the solutions they are considering will perform certain functions and not require costly upgrades in the future to become compliant.</p>	<p><b>Tech 12. Develop minimum requirements that technologies must meet to verify overall legitimacy of 911 service delivery and impact to the 911 ecosystem (e.g., workforce needs, cybersecurity risks).</b></p> <p><b>Tech 13. Develop standards and requirements for NG911 system testing and evaluation, including external systems that interact with NG911 functions (e.g., FirstNet, alarm systems, telematics devices).</b></p> <p><b>Tech 14. Research the feasibility—including cost implications and funding considerations—of establishing sanctioned testing facilities to enable focused, safe evaluation of NG911 products and emerging technologies.</b></p> <p><b>Tech 15. Research the feasibility—including cost implications and funding considerations—of establishing a credentialing authority for NG911 compliance.</b></p>	<ul style="list-style-type: none"> <li>• Set of baseline requirements that enable appropriate emerging applications to enter the NG911 ecosystem safely, purposefully, and in support of nationwide interconnectivity and interoperability.</li> <li>• Set of baseline performance metrics and requirements for testing the effectiveness of NG911 systems, applications, and workflows.</li> <li>• Risk-free accommodations for testing, piloting, and evaluating technology.</li> <li>• Motivation for industry to develop standards-compliant technology.</li> </ul>

### RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS

- In 2018, NENA issued a [Request for Information](#) pertaining to plans for an NG911 conformance testing service. NENA also has published a wide array of [performance standards](#), including product certification standards, and has established a working group focused on application verification needs.
- [APCO](#) has addressed standards issues between NG911 and a variety of emergency applications, has published best practices for PSAP processing of vehicle telematics calls from service providers and alarm companies and, through its [Project 43](#), addresses broadband implications for the PSAP.



Support the enhancement of 911 services by establishing technical and operational data solutions that support cross-jurisdictional and nationwide situational awareness, information sharing, and predictive data analysis.

ISSUE	TASK(S)	BENEFITS
<p><b>NG911 DATA SYSTEM</b></p> <p>Nationwide 911 data collection and analysis is limited and typically does not entail sharing and exchanging of performance-based information, making it difficult to accurately assess NG911 maturation, the quality of 911 service delivery that is occurring across the country, and future needs of U.S. residents and visitors based on data-driven trend analysis. Additionally, data models and standards for every aspect of NG911 implementation must exist to enable seamless cross-jurisdictional information sharing.</p> <p>Such an effort would enable cross-pollination of data with emergency medical services, fire management, and law enforcement, making possible data-driven, evidence-based decision-making and capabilities to mitigate impact.</p>	<p><b>Data 1. Address recommendations that surface as a result of the National 911 Program’s Strategic Planning for Collection and Use of Nationwide 911 Data project.</b></p> <p><b>Data 2. Develop NG911-related data models, requirements, and standards relevant to the entire lifecycle of 911 call handling and response (as sanctioned by the 911 community).</b></p>	<ul style="list-style-type: none"> <li>• Identification of nationwide data-collection frameworks that exist, the purpose they fulfill, and the extent to which they serve stakeholders nationwide.</li> <li>• Data that informs efforts toward establishing a model and requirements for nationwide data collection regarding 911 service delivery and performance evaluation.</li> <li>• Comprehensive visibility into any gap areas pertaining to security, data handling, data transfer, record keeping, and data management procedures.</li> <li>• Data that informs efforts toward establishing new NG911 standards or updating existing standards to align with NG911 technical and operational capabilities.</li> <li>• Availability of data relevant to the provision of mutual aid, ensuring optimal services under collaborative circumstances.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The National 911 Program is collaborating with private- and public-sector stakeholders on its [Strategic Planning for Collection and Use of Nationwide 911 Data](#) project. The intended products of this effort include strategic and implementation plans for establishing a national 911 data system. The National 911 Program also engages with the Program Managers-Information Sharing Environment (PM-ISE) and the Information Sharing Council (ISC) to examine lessons learned by other federal agencies regarding data collection and information sharing.
- NENA has commissioned [several working groups focused on NG911-level data management](#).
- APCO’s [Project 43](#) addresses data storage, retention, evidence control, and enhanced data processing related to broadband implications for the PSAP.



Support the enhancement of 911 services by establishing technical and operational data solutions that support cross-jurisdictional and nationwide situational awareness, information sharing, and predictive data analysis.

ISSUE	TASK(S)	BENEFITS
<p><b>MULTIMEDIA DATA COLLECTION AND MANAGEMENT</b></p> <p>There is a lack of understanding regarding what is possible regarding data collection and management, as well as the service-delivery benefits involved in expanding to NG911 data formats, thus impeding NG911 planning and functional investments.</p>	<p><b>Data 3. Assess successful national and international efforts, and develop pilot projects to test the integration, use, and aggregation of additional data and multimedia (e.g., images, real-time text, social media, videos).</b></p> <p><b>Data 4. Assess successful national and international integration with other governmental agencies (OGAs) and develop pilot projects to test NG911 integration with Smart City initiatives and Internet of Things (IoT) systems.</b></p>	<ul style="list-style-type: none"> <li>• Visibility into successes and lessons learned in areas of: enhanced service delivery; technical requirements and impacts; operational needs to accommodate the collection of larger and different data sets; and what is procedurally required to ensure the integrity, proper handling, privacy, and security of such data.</li> <li>• Identification of any needs for NG911 data standards.</li> <li>• Data that informs efforts toward establishing best practices and other guidance materials.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The National 911 Program publishes its report titled, [NG911 Standards Identification and Review](#), on an annual basis, and is addressing multimedia data issues as part of its [Strategic Planning for Collection and Use of Nationwide 911 Data](#) project.
- NENA examines the impact of IoT devices and emergency applications on NG911 through its [IoT and Apps Working Group](#).
- The Smart Cities Council and the NG911 Institute have addressed the intersection of IoT, smart communities, and NG911 through several white papers and presentations.
- Multiple vendors have conducted or are conducting pilot projects regarding multimedia issues. As one example, RapidSOS conducted the [NG911 Clearinghouse Android ELS Pilot Project](#) in January 2018 to identify what is possible regarding the use of the Android Emergency Location Service (ELS) to more quickly and accurately determine the location of wireless 911 calls.
- APCO’s [Project 43](#) addresses media and Smart City technology related to broadband implications for the PSAP.



Support the enhancement of 911 services by establishing technical and operational data solutions that support cross-jurisdictional and nationwide situational awareness, information sharing, and predictive data analysis.

ISSUE	TASK(S)	BENEFITS
<p><b>USE OF GIS DATA</b></p> <p>The use of real-time, geographic data and GIS is lacking throughout the 911 community due to various factors that include the lack of technology to support such data, the lack of awareness of where to find such data, and a given jurisdiction’s lack of GIS resources or assets. This impacts the ability of ESI providers to conduct geospatial routing of 911 calls and hinders cross-jurisdictional situational awareness. Impacts of these challenges could include data interoperability and sharing issues, lack of consistent data across jurisdictions at all levels, and disparate jurisdictions interpreting GIS data differently, causing first responders to arrive at different locations.</p>	<p><b>Data 5. Develop an inventory of existing policies relevant to geospatial routing of 911 calls (regardless of technology used).</b></p> <p><b>Data 6. Develop needed standards, requirements, and best practices for NG911 consumption and handling of GIS data.</b></p> <p><b>Data 7. Research the feasibility—including cost implications and funding considerations—of establishing a national map that can be accessed by all PSAPs.</b></p>	<ul style="list-style-type: none"> <li>• Comprehensive visibility into how jurisdictions have handled policies related to geospatial routing.</li> <li>• Data that informs efforts toward establishing a baseline for NG911 GIS standards and requirements.</li> <li>• Set of baseline requirements or standards that establish minimum capabilities for consuming, transferring, and handling GIS data, and enable sharing of GIS data among jurisdictions (especially for those that share borders).</li> <li>• Guidance that helps jurisdictions: improve accuracy of GIS data compared with automatic location identification (ALI) data, to a minimum of 98 percent; establish boundary rectification; update maintenance plan processes; incorporate floor plans for buildings, etc.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The National 911 Program publishes its report titled, [NG911 Standards Identification and Review](#), on an annual basis and is addressing GIS data issues as part of its [Strategic Planning for Collection and Use of Nationwide 911 Data](#) project.
- The FCC adopted a Notice of Inquiry, [Location-Based Routing for Wireless 911 Calls](#), to examine how to route wireless 911 calls to the proper PSAP more quickly.
- The [National States Geographic Information Council \(NSGIC\)](#), NENA, and the [National Alliance for Public Safety GIS Foundation \(NAPSG\)](#) address these issues through reports, webinars, etc.
- The [Open Geospatial Consortium \(OGC\)](#) develops standards related to GIS data for multiple entities, including the 911 community.



Distinguish, enhance, and promote operating procedures, performance evaluation, and professional-development strategies that support complete and streamlined implementation of NG911 capabilities.

ISSUE	TASK(S)	BENEFITS
<p><b>CROSS-JURISDICTIONAL CALL HANDLING</b></p> <p>Cross-jurisdictional service delivery requires revision of both day-to-day procedures and processes for call handling when systems are stressed. Without consistency across jurisdictions, it will be difficult to avoid causing harm or disruption in services.</p>	<p><b>Ops 1. Develop best practices based on how states have overcome cross-jurisdictional issues (e.g., call routing, liability).</b></p> <p><b>Ops 2. Develop best practices and/or national standards for operations within the NG911 environment.</b></p> <p><b>Ops 3. Create best practices for network operations center (NOC) and security operations center (SOC) notifications.</b></p>	<ul style="list-style-type: none"> <li>• Visibility into the extent of impact that call routing failure has had on jurisdictional service delivery and will have on cross-jurisdictional engagements.</li> <li>• Data that informs efforts toward establishing technical and operational requirements for avoiding call routing failure situations.</li> <li>• Comprehensive guidance that helps PSAPs anticipate, mitigate, and troubleshoot routing issues.</li> <li>• Guidance that would help jurisdictions establish/improve NOC/SOC establishment and operations.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- The Virginia Information Technologies Agency (VITA) has published [best practices for 911 call handling](#).
- The FCC issued the September 26, 2017, Notice of Inquiry, [Inquiry Concerning 911 Access, Routing, and Location in Enterprise Communications Systems \(FCC 17-125\)](#), that sought information on 911 alternate call routing and how cross-jurisdictional call transfers from remote call centers via enterprise communications systems (ECS) compare with the transfer volume regarding calls received from non-ECS networks.
- CSRIC working groups have addressed a variety of system sustainability issues.
- Best practices for NOC/SOC operations exist in a variety of fields (identifying model approaches that exist outside the 911 community may be useful).



Distinguish, enhance, and promote operating procedures, performance evaluation, and professional-development strategies that support complete and streamlined implementation of NG911 capabilities.

ISSUE	TASK(S)	BENEFITS
<p><b>EVOLVING WORKFORCE REQUIREMENTS</b></p> <p>A nationwide NG911 system of systems will require a new way of looking at how the 911 workforce is structured and the skillsets that are needed to navigate new technologies, workflows, and data. Establishing a national baseline for these factors is especially important when considering the impact on cross-jurisdictional call handling—workforce members will need to possess parallel skillsets to effectively perform their duties and avoid disrupting any phase of the call-handling process. For example, the advent of presenting new data sources (e.g., video, images) to the PSAP requires automation methods and analytical skills that will need to be identified and defined. Additionally, decisions will be needed regarding whether analysis is conducted by the PSAP or another jurisdictional entity (e.g., a fusion center).</p>	<p><b>Ops 4. Develop NG911-appropriate job descriptions (e.g., operational, systems management, GIS)</b></p> <p><b>Ops 5. Identify necessary training (e.g., cross-jurisdictional call handling) and professional development needed to bolster the skills and growth paths of those currently in the workforce, as well as opportunities to integrate NG911 education for those who are interested in 911 as a career.</b></p>	<ul style="list-style-type: none"> <li>• Visibility into skillset gaps in the current workforce as they relate to NG911 functions.</li> <li>• Standardized, baseline requirements for performing in an NG911 environment.</li> <li>• An increase in retention of 911 staff through proactive professional-development opportunities and skillset enhancement.</li> <li>• Standardized framework for educating new 911 workers.</li> <li>• Skillset and education criteria by which stakeholders can advocate for reclassification of PSAP personnel positions.</li> </ul>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- APCO offers new hire and refresher training through its [Public Safety Telecommunicator \(PST\) curriculum](#). APCO’s [Project 43](#) studied workforce recruitment and training issues, new hiring models, and professional development related to the implications of broadband for the PSAP.
- NENA has published a wide array of [PSAP operations and staffing standards](#) and has overseen an [NG911 Education and Training Work Group](#).
- The National Initiative for Cybersecurity Education (NICE) developed the [National Cybersecurity Workforce Framework](#) to define the cybersecurity workforce and provide a common taxonomy and lexicon by which to classify and categorize workers.



## Distinguish, enhance, and promote operating procedures, performance evaluation, and professional development strategies that support complete and streamlined implementation of NG911 capabilities.

ISSUE	TASK(S)	BENEFITS
<p><b>INTERCONNECTIVITY WITH NONTRADITIONAL ENTITIES</b></p> <p>The ability to establish a true NG911 system of systems does not entail interoperability at just the jurisdictional level, but also across domains and disciplines. Without horizontal and vertical connection, groups with special needs may go unserved, valuable data may go unmined, and whole-community analysis of 911 needs, trends, and effectiveness will be difficult to assess.</p> <p>Furthermore, PSAPs sometimes are operated by academic institutions, federal agencies (e.g., Department of Defense, National Park Service), and non-traditional organizations. Interoperability with these PSAPs likely will involve unique technical and operational considerations. There are also a variety of nontraditional entities that intercept crisis situations that may require 911 support (e.g., suicide prevention hotlines, social media networks). Identifying ways to provide the same level of services to meet their 911 needs is as critical as traditional call handling.</p>	<p><b>Ops 6. Assess successful national and international interconnectivity with OGAs, and develop pilot projects and demonstrations to identify needs and best practices related to the various nontraditional domains, disciplines, and entities that either require interconnectivity or would benefit from a more direct level of access to 911 services.</b></p> <p><b>Ops 7. Develop guidelines and procedures for interconnecting with nontraditional entities.</b></p>	<ul style="list-style-type: none"> <li>• Comprehensive visibility into: nontraditional entities that need to be included in the NG911 system of systems; unique technical and operational considerations for establishing interconnectivity; legal ramifications that should be examined; and approaches for securing agreements or memoranda of understanding.</li> <li>• Models and best practices for information-sharing agreements and procedures.</li> <li>• New datasets that can help enhance 911 service delivery and enable continuous improvement.</li> <li>• An expanded network of stakeholders that broadens the 911 community’s reach.</li> </ul>

### RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS

- NENA is currently working with the North American Aerospace Defense Command (NORAD) and U.S. Department of Defense (DoD) on pipeline notifications between PSAPs and aircraft.
- RapidSOS, Penn State University’s College of Information Sciences Technologies 3C Informatics Team, and Mission Critical Partners are addressing the prioritization of social media data in the Charleston County, South Carolina, Consolidated 911 Center ([Identifying Actionable Information on Social Media for Emergency Dispatch](#)).



Distinguish, enhance, and promote operating procedures, performance evaluation, and professional-development strategies that support complete and streamlined implementation of NG911 capabilities.

ISSUE	TASK(S)	BENEFIT
<p><b>STANDARDIZED PERFORMANCE EVALUATION</b></p> <p>When contemplating a nationwide NG911 system of systems, it is envisioned that all U.S. residents and visitors will receive the same level of service nationwide. This is difficult at this stage of jurisdictional maturity given the variation of performance data that is collected and lack of ability to analyze such data. Furthermore, performance measures do not exist for evaluating services provided across the entire 911 service request-and-response lifecycle.</p>	<p><b>Ops 8. Evaluate the best nationwide approaches for collecting performance-related data.</b></p> <p><b>Ops 9. Develop national models for performance analysis and evaluation.</b></p> <p><b>Ops 10. Develop best practices for applying national models at the jurisdictional level.</b></p>	<p>A nationally adopted model that defines baseline performance metrics, performance-related data collection, and analysis of such data.</p>

**RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS**

- NENA has a wide array of performance standards available through its website.
- The National 911 Program has developed the guidance titled, [National State 911 Assessment Guidelines](#), which addresses performance evaluation issues.
- APCO has developed standards for the establishment of [quality assurance and quality improvement programs for PSAPs](#).



## Facilitate education and knowledge transfer on an ongoing basis.

ISSUE	TASK(S)	BENEFIT
<p><b>NATIONAL KNOWLEDGE TRANSFER</b>            This Roadmap contemplates numerous research products, best practices documents, guidance materials, and other tools. Additionally, there are scores of materials, model plans, templates, standards documents, and other products that are available through associations and agencies that address 911 and NG911 transition issues. Materials are only useful if they can be found and if they are able to be digested with context. Therefore, useful approaches for aggregating and distributing materials is greatly needed.</p>	<p><b>Cross-Goal 1. Conduct a feasibility study, including cost implications and funding considerations, regarding creation of a national database/repository that houses and makes accessible guidance materials, research, and other resources that are relevant to the entire NG911 spectrum.</b></p>	<p>Comprehensive visibility into what such an effort would entail technically, operationally, and financially; how other national clearinghouse or database initiatives were developed and implemented; and whether other efforts have been successful (and why).</p>

### RELEVANT WORK ACCOMPLISHED OR CURRENTLY IN PROGRESS

The [National 911 Program](#), [NENA](#), [NASNA](#), [APCO](#), and other organizations, working groups, and associations have a wide array of 911 materials available through their websites and/or member portals.

# Now What? Where Do We Start?

While Roadmap tasks are organized by specific goals, all tasks are interdependent in some way. Each task drives and/or is driven by the outcomes of others and many may even change in nature or scope depending on such outcomes. Many tasks can be tackled simultaneously, some already may be underway in some capacity, and some may entail long-term efforts that can be started now but targeted for completion many years from now.

To help anticipate how implementation of the Roadmap may play out (and how it can be traversed), stakeholders who contributed to its development examined how tasks might be prioritized based on what should be accomplished first (or what can be accomplished easily). Each stakeholder reviewed tasks within each goal independently, then voted on approximately five tasks he or she considered priorities. Stakeholders then reviewed voting outcomes as a group and discussed nuances of the tasks that received the most votes. As a result, the group identified tasks listed in Figure 4 as top-priority tasks for each goal. The order in which they are listed reflects which tasks received the greatest number of votes.



Figure 4: Top Tasks Per Goal in Order of Greatest Priority

The stakeholders then applied the same voting process to identify top priorities across the first four goals, recognizing that further in-depth discussion within the 911 community is needed to ascertain initial activities, attributions, reasonable and realistic timelines, and other factors crucial for Roadmap implementation. Figure 5 below lists the five highest-ranking tasks, in descending order, based on the number of votes received.

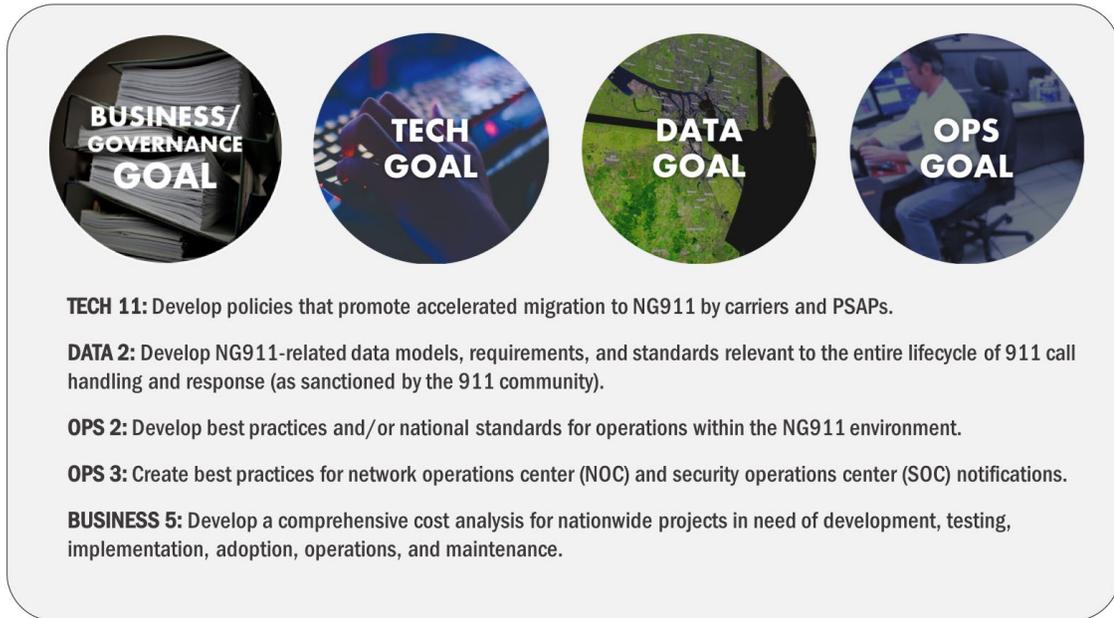


Figure 5: Top-Priority Tasks

NHTSA welcomes *your* thoughts on how to prioritize tasks and how they can be accomplished. Are these the most urgent areas in need of attention? Are you already working on any of these tasks? Are there other activities that should be accomplished to make room for Roadmap tasks? How do we make progress without getting lost in trying to accomplish such a large task?

# In Conclusion...

## We Have Work to Do

We have some ways to go before achieving a nationwide NG911 system of systems, and an abundance of collective thought must occur to determine how to best configure the tasks in this Roadmap into an actionable timeline that ensures each is able to inform and build upon the other. As you consider your potential role, remember that there are a multitude of ways you can contribute.



- Become more informed about NG911.
- Advocate within your community for more effective 911 services or education.
- Engage with your community and your elected officials about the importance of NG911 capabilities.
- Help articulate technical and operational needs and challenges.
- Document and promulgate best practices and successful policies and procedures.
- Help identify jurisdictional partnerships that could help elevate 911 issues to stakeholders who need to understand them.
- Help articulate day-to-day operational challenges that may arise due to disconnections at the policy level.
- Articulate issues experienced by industry that either hinder or enable enhanced involvement in 911 communications.
- Help develop use cases to inform standards, garner buy-in, influence technological advances, and establish nationwide policies and standard operating procedures.
- Join a standards development organization or working group.
- Submit changes, recommendations, and additions to this Roadmap!

*Figure 6: Ways to Take Action*

The National 911 Program is excited to witness how the 911 community continues to come together toward advancing NG911 capabilities across the U.S. Working together, we *can* accomplish this goal. Please contact the program at [NHTSA.National911@dot.gov](mailto:NHTSA.National911@dot.gov) if you have any questions, updates, or information on progress made in any of the goal areas described. The National 911 Program looks forward to working with the community as progress is achieved.

# Appendix 1: 911 Terms and Definitions

TERM	DEFINITION
911 (or 9-1-1)	A three-digit telephone number to facilitate the reporting of an emergency requiring a response by a public safety agency.
911 authority	A state, county, regional, or other governmental entity responsible for 911 service operations. For example, this could be a county/parish or city government, a special 911 or Emergency Communications District, a Council of Governments or other similar body.
911 “call”	A generic term used to include any type of Request for Emergency Assistance (RFEA); a 911 call is not limited to voice. This may include a session established by signaling with two-way, real-time media and involves a human making a request for help. We sometimes use “voice call,” “video call” or “text call” when specific media is of primary importance. The term “non-human-initiated call” refers to a one-time notification or series of data exchanges established by signaling with at most one-way media, and typically does not involve a human at the “calling” end. The term “call” also can be used to refer to either a “voice call,” “video call,” “text call” or “data-only call”, because they are handled the same way through most of NG911.
911 fund	The fund established by state statute that is specifically used to fund 911 activities and/or infrastructure.
911 service area	The geographic area that has been granted authority by a state or local governmental body to provide 911 services.
911 state plan	A document prepared, maintained, implemented, and updated by a state that provides a comprehensive plan for operating a statewide 911 system that communicates 911 call information across networks and among PSAPs, addresses all aspects of the statewide 911 system, and describes the allowable uses of revenue in the 911 fund.
911 system	A coordinated system of technologies used by a collaborative group of people to operate an efficient and effective network for accepting, processing, and delivering emergency information to facilitate an emergency response. A set of networks, services, software applications, databases, customer premises equipment (CPE) components, and operations and management procedures required to provide 911 service. This may include commercial, governmental, and human resources.
Access provider	An access provider is any organization that arranges for an individual or an organization to have access to the internet.
Additional data	Data that further describes the nature of how a call was placed, the person(s) associated with the device placing the call, or the location the call was placed from. There are three types of additional data: for the call, for the caller, and for the location.
Agency	In NG911, an organization that is connected directly or indirectly to the ESInet. Public safety agencies are examples. An entity such as a company that provides a service in the ESInet also can be an agency. Agencies have identifiers and credentials that allow them access to services and data.
Agent	In NG911, an agent is an authorized person—an employee, contractor or volunteer, who has one or more roles in an agency. An agent also can be an automaton in some circumstances (e.g., an interactive media response [IMR] answering a call).

TERM	DEFINITION
<b>Alternate routing</b>	The capability of routing 911 calls to a designated alternate location(s) if all 911 trunks are busy or out of service. May be activated upon request or automatically, if detectable, when 911 equipment fails or the PSAP itself is disabled.
<b>Automatic location identification (ALI)</b>	The automatic display at the PSAP of the caller’s address/location of the telephone and supplementary emergency services information of the location from which a call originates.
<b>Automatic number identification (ANI)</b>	The automatic display at the PSAP of the caller’s telephone number associated with the access line from which a call originates.
<b>Basic 911</b>	An emergency telephone system that automatically connects 911 callers to a designated answering point. Call routing is determined by the originating telephone central office only. Basic 911 may or may not support ANI and/or ALI.
<b>Call handling</b>	Functional element concerned with the details of the management of calls. It handles all communication from the caller. It includes the interfaces, devices and applications utilized by the agents to handle the call.
<b>Call routing</b>	The capability to selectively route the 911 call to the appropriate PSAP.
<b>Call-taker</b>	An agent of a PSAP who answers and processes emergency calls. Synonymous with the term, “telecommunicator.”
<b>Call taking</b>	The act of processing a call for emergency assistance up to the point that the call is ready for dispatch, including the use of equipment, call classification, location of a caller, and determination of the appropriate response level for emergency responders.
<b>Carrier</b>	The business entity providing service to a customer base, typically for a fee. Examples of carriers and associated services are public switched telephone network (PSTN) service by a local exchange carrier (LEC), voice over Internet Protocol (VoIP) service by a VoIP provider; email service provided by an internet service provider (ISP).
<b>Commercial call center</b>	A privately-operated call center, which answers emergency and/or nonemergency calls.
<b>Commercial mobile radio service (CMRS)</b>	An FCC designation for any carrier or licensee whose wireless network is connected to the PSTN.
<b>CMRS connection</b>	Each mobile handset telephone number assigned to a CMRS subscriber with a place of primary use in-state.
<b>CMRS provider</b>	An entity, whether facilities-based or non-facilities-based, that is licensed by the FCC to provide CMRS or that resells CMRS within a state.
<b>Computer-aided dispatch (CAD)</b>	A computer-based system that aids PSAP telecommunicators by automating selected dispatching and record-keeping activities.
<b>Continuity of operations (COOP)</b>	The ability to continue operations during and after a service-impacting event through a specific set of procedures designed to reduce the damaging consequences of unexpected events resulting in the loss of 911 capabilities.
<b>Customer premises equipment (CPE)</b>	Communications or terminal equipment located in the customer’s facilities—terminal equipment at a PSAP.
<b>Database</b>	An organized collection of information, typically stored in computer systems, comprised of fields, records (data), and indexes. In 911, such databases include the Master Street Address Guide (MSAG), telephone number/emergency service number (ESN), and telephone customer records.
<b>Data exchange</b>	The process of exchanging 911 data between service providers and the database management system provider.

TERM	DEFINITION
<b>Dispatch system</b>	Functional element used to assign appropriate resources (emergency responders) to an incident, monitor the response and relay relevant information. Tracks and logs all transactions associated with the emergency response.
<b>Enhanced 911 (E911)</b>	A telephone system that includes network switching, database and PSAP premises elements capable of providing ALI data, selective routing, selective transfer, fixed transfer, and a callback number. The term also includes any enhanced 911 service so designated by the FCC in its Report and Order in WC Docket Nos. 04-26 and 05-196, or any successor proceeding.
<b>Emergency medical services (EMS)</b>	A service providing out-of-hospital acute care and transport to definitive care, for patients with illnesses and injuries that the patient believes constitute a medical emergency.
<b>Emergency services IP network (ESInet)</b>	An ESInet is a managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core services can be deployed, including, but not restricted to, those necessary for providing NG911 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks). The term ESInet designates the network, not the services that ride on the network.
<b>First Responder Network Authority (FirstNet)</b>	Signed into law on February 22, 2012, the <a href="#">Middle Class Tax Relief and Job Creation Act</a> created the First Responder Network Authority (FirstNet). The law gives FirstNet the mission to build, operate and maintain the first high-speed, nationwide wireless broadband network dedicated to public safety. FirstNet will provide a single interoperable platform for emergency and daily public safety communications. <a href="http://www.firstnet.gov/">http://www.firstnet.gov/</a>
<b>Geographic information system (GIS)</b>	A system for capturing, storing, displaying, analyzing and managing data and associated attributes that are spatially referenced.
<b>i3 solution</b>	NENA i3 is a term for the NENA NG911 system architecture that standardizes the structure and design of functional elements which make up the set of software services, databases, network elements, and interfaces needed to process multi-media emergency calls and data for NG911.
<b>Interconnectivity</b>	The capability of disparate systems to be joined by connections between parts and elements.
<b>Interlocal services agreement</b>	An agreement among governmental jurisdictions or privately-owned systems, or both, within a specified area to share 911 system costs, maintenance responsibilities, and other considerations.
<b>Internet of Things (IoT)</b>	A network of physical internet-connected devices embedded with electronics, sensors, and software able to collect and exchange data with other linked devices.
<b>Internet Protocol (IP)</b>	The method by which digital data is sent from one computer to another on the internet or other networks.
<b>Interoperability</b>	The capability of disparate communications systems to seamlessly interconnect and work together as a collective system.
<b>Landline</b>	Colloquial term for PSTN access via an actual copper or fiber-optic transmission line that travels underground or on telephone poles. Used to differentiate the “wireless” connectivity of a cellular or Personal Communication System (PCS).
<b>Legacy network gateway (LNG)</b>	An NG911 functional element that provides an interface between a non-IP originating network and a NGCS-enabled network.

TERM	DEFINITION
Legacy PSAP gateway (LPG)	The Legacy PSAP Gateway (LPG) is a signaling and media interconnection point between an ESInet and a legacy PSAP. It plays a role in the delivery of emergency calls that traverse an i3-compliant ESInet to get to a legacy PSAP, as well as in the transfer and alternate routing of emergency calls between legacy PSAPs and NG911 PSAPs. The LPG supports an IP (i.e., Session Initiation Protocol [SIP]) interface toward the ESInet on one side, and a traditional multi-frequency (MF) or enhanced MF interface (comparable to the interface between a traditional selective router and a legacy PSAP) on the other.
Local exchange carrier	A telecommunications carrier under the state/local Public Utilities Act that provides local exchange telecommunications services. Also known as incumbent local exchange carriers, alternate local exchange carriers, competitive local exchange carriers, competitive access providers, certified local exchange carriers, and local service providers.
Location information server (LIS)	A functional element in an IP-capable originating network that provides locations of endpoints (i.e., calling devices). A LIS can provide location by reference, or location by value, and, if the latter, in geo or civic forms. A LIS can be queried by an endpoint for its own location, or by another entity for the location of an endpoint. In either case, the LIS receives a unique identifier that represents the endpoint, for example an IP address, circuit-ID or Media Access Control (MAC) address and returns the location (value or reference) associated with that identifier. The LIS is also the entity that provides the dereferencing service, exchanging a location reference for a location value.
Master Street Address Guide (MSAG)	A database of street names and house number ranges within their associated communities defining emergency service zones (ESZs) and their associated ESNs to enable proper routing of 911 calls.
Memorandum of agreement (MOA)	A memorandum of agreement (MOA) or cooperative agreement is a document written between parties to cooperatively work together on an agreed-upon project or meet an agreed-upon objective.
Memorandum of understanding (MOU)	A memorandum of understanding (MOU) is a document that expresses mutual accord on an issue between two or more parties.
Mutual-aid agreement	Written agreement between agencies and/or jurisdictions by which they agree to assist one another upon request, by furnishing personnel and equipment.
National Incident Management System (NIMS)	A standardized approach to incident management developed by DHS. It is intended to facilitate coordination between all responders (including all levels of government with public, private, and non-governmental organizations). <a href="https://www.fema.gov/national-incident-management-system">https://www.fema.gov/national-incident-management-system</a>
National Information Exchange Model (NIEM)	A community-driven, standards-based, national model for structured information sharing. <a href="http://www.niem.gov">www.niem.gov</a>
Next Generation 911 (NG911) services	<p>“Next Generation 9-1-1 services” means an IP-based system comprised of hardware, software, data, and operational policies and procedures that:</p> <ol style="list-style-type: none"> <li>a) provides standardized interfaces from emergency call and message services to support emergency communications;</li> <li>b) processes all types of emergency calls, including voice, data, and multimedia information;</li> <li>c) acquires and integrates additional emergency call data useful to call routing and handling;</li> <li>d) delivers the emergency calls, messages, and data to the appropriate public safety answering point and other appropriate emergency entities;</li> <li>e) supports data or video communications needs for coordinated incident response and management; and</li> <li>f) provides broadband service to public safety answering points or other first responder entities.</li> </ol> <p>REF: <a href="#">Middle Class Tax Relief and Job Creation Act of 2012</a></p>

TERM	DEFINITION
<b>Order of authority</b>	A formal order by the state or local authority that authorizes public agencies or public safety agencies to provide 911 service in a geographical area.
<b>Prepaid wireless telephone service</b>	Telephone service authorized by the purchase of CMRS, either exclusively or in conjunction with other services. This service must be paid for in advance and is sold in units or dollars whose number or dollar value declines with use and is known on a continuous basis.
<b>Private 911 emergency answering point</b>	An answering point operated by non-public safety entities with functional alternative and adequate means of signaling and directing response to emergencies. Includes training to individuals intercepting calls for assistance that is in accordance with applicable local emergency telecommunications requirements. Private 911 emergency answering points are an adjunct to public safety response and as such must provide incident reporting to the public safety emergency response centers per local requirements.
<b>Proprietary information</b>	Subscriber lists, technology descriptions, technical information, or trade secrets that are developed, produced, or received internally by a voice communications service provider or by a voice communications service provider’s employees, directors, officers, or agents.
<b>Public safety agency</b>	A functional division of a public agency that provides firefighting, law enforcement, medical or other services to respond to and manage emergency incidents.
<b>Public safety answering point (PSAP)</b>	<p>An entity responsible for receiving 911 calls and processing those calls according to a specific operational policy.</p> <ul style="list-style-type: none"> <li>• Primary PSAP: A PSAP to which 911 calls are routed directly from the 911 Control Office.</li> <li>• Secondary PSAP: A PSAP to which 911 calls are transferred from a primary PSAP.</li> <li>• Alternate PSAP: A PSAP designated to receive calls when the primary PSAP is unable to do so.</li> <li>• Consolidated PSAP: A facility where multiple public safety agencies choose to operate as a single 911 entity.</li> <li>• Legacy PSAP: A PSAP that cannot process calls received via i3-defined call interfaces (IP-based calls) and still requires the use of centralized automatic message accounting (CAMA) or integrated services digital network (ISDN) trunk technology for delivery of 911 emergency calls.</li> <li>• Serving PSAP: The PSAP to which a call normally would be routed.</li> <li>• NG911 PSAP: This term is used to denote a PSAP capable of processing calls and accessing data services as defined in NENA’s i3 specification, NENA NENA-STA-010, and referred to therein as an “i3 PSAP.”</li> </ul>
<b>Service provider</b>	An entity providing one or more of the following 911 elements: network, CPE, or database service.
<b>Standards development organization (SDO)</b>	An entity whose primary activities are developing, coordinating, promulgating, revising, amending, reissuing, interpreting, or otherwise maintaining standards that address the interests of a wide base of users outside the standards development organization.
<b>Subscriber</b>	A person who purchases a communications service and is able to receive it or use it periodically over time.
<b>Telecommunication</b>	The transmission, between and among points specified by the user, or information of the user’s choosing, without change in the form of content of the information sent and received, regardless of the facilities, equipment or technology used.

TERM	DEFINITION
<b>Virtual PSAP</b>	An operational model directly enabled through NG911 features and/or network-hosted PSAP equipment in which telecommunicators are geographically dispersed, rather than working from the same physical location. Remote access to the PSAP applications by the dispersed telecommunicators requires the appropriate network connections, security, and workstation equipment at the remote location. Unified communications applications supporting voice, data, instant messaging, and video communications between telecommunicators may be used to enable the telecommunicators to work cooperatively from diverse locations. The virtual workplace may be a logical combination of physical PSAPs, or an alternate work environment such as a satellite facility, or any combination of the above. Workers interoperate via IP connectivity.
<b>Voice communications service</b>	The transmission, conveyance, or routing of real-time, two-way voice communications to a point, or between or among points, or through any electronic, radio, satellite, cable, optical, microwave, wireline, wireless, or other medium or method, regardless of the protocol used, including interconnected VoIP service.
<b>Voice over Internet Protocol (VoIP)</b>	Technology that permits delivery of voice calls and other real-time multimedia sessions over IP networks.

# Appendix 2: Associations, Organizations & Other Stakeholder Entities Relevant to 911

NAME/ACRONYM	DESCRIPTION	WEBSITE
Alliance for Telecommunications Industry Solutions (ATIS)	A U.S.-based organization that is committed to rapidly developing and promoting technical and operations standards for the communications and related information technologies industry worldwide using a pragmatic, flexible and open approach.	<a href="https://www.atis.org/">https://www.atis.org/</a>
American National Standards Institute (ANSI)	Entity that coordinates the development and use of voluntary consensus standards in the United States and represents the needs and views of U.S. stakeholders in standardization forums around the globe.	<a href="http://www.ansi.org">www.ansi.org</a>
American Registry for Internet Numbers (ARIN)	An organization that provides services related to the technical coordination and management of internet number resources.	<a href="https://www.arin.net/">https://www.arin.net/</a>
Association of Public-Safety Communications Officials (APCO)	APCO is the world's oldest and largest not-for-profit professional organization dedicated to the enhancement of public safety communications.	<a href="http://www.apcointl.org/">http://www.apcointl.org/</a>
Commission on Accreditation for Law Enforcement Agencies (CALEA)	<p>Created in 1979 as a credentialing authority through the joint efforts of law enforcement's major executive associations:</p> <ul style="list-style-type: none"> <li>• International Association of Chiefs of Police (IACP)</li> <li>• National Organization of Black Law Enforcement Executives (NOBLE)</li> <li>• National Sheriffs' Association (NSA)</li> <li>• Police Executive Research Forum (PERF).</li> </ul> <p>The purpose of CALEA's accreditation programs is to improve the delivery of public safety services, primarily by: maintaining a body of standards, developed by public safety practitioners, covering a wide range of up-to-date public safety initiatives; establishing and administering an accreditation process; and recognizing professional excellence.</p>	<a href="http://www.calea.org/">http://www.calea.org/</a>

NAME/ACRONYM	DESCRIPTION	WEBSITE
<b>Communications Security, Reliability, and Interoperability Council (CSRIC) (formerly known as the Network Reliability and Interoperability Council [NRIC])</b>	An advisory body of the FCC that provides recommendations to the FCC to ensure, among other things, optimal security and reliability of communications systems, including telecommunications, media, and public safety.	<a href="https://www.fcc.gov/about-fcc/advisory-committees/communications-security-reliability-and-interoperability-council-0">https://www.fcc.gov/about-fcc/advisory-committees/communications-security-reliability-and-interoperability-council-0</a>
<b>CTIA—The Wireless Association</b>	CTIA represents the U.S. wireless communications industry. From carriers and equipment manufacturers to mobile app developers and content creators, CTIA brings together a dynamic group of companies that enable consumers to lead a 21st Century connected life.	<a href="https://www.ctia.org/">https://www.ctia.org/</a>
<b>Emergency Services Interconnection Forum (ESIF)</b>	An open, technical/operational forum, under the auspices of ATIS, with the voluntary participation of interested parties to identify and resolve recognized 911 interconnection issues.	<a href="https://www.atis.org/01_committ_forums/ESIF/about.asp">https://www.atis.org/01_committ_forums/ESIF/about.asp</a>
<b>Federal Communications Commission (FCC)</b>	An independent U.S. government agency overseen by Congress, 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.	<a href="https://www.fcc.gov/">https://www.fcc.gov/</a>
<b>Federal Geographic Data Committee (FGDC)</b>	An interagency committee that promotes the coordinated development, use, sharing, and dissemination of geospatial data on a national basis.	<a href="https://www.fgdc.gov/">https://www.fgdc.gov/</a>
<b>First Responder Network Authority (FirstNet)</b>	Signed into law on February 22, 2012, the <a href="#"><i>Middle Class Tax Relief and Job Creation Act</i></a> created FirstNet. The law gives FirstNet the mission to build, operate and maintain the first high-speed, nationwide wireless broadband network dedicated to public safety. FirstNet will provide a single interoperable platform for emergency and daily public safety communications.	<a href="http://www.firstnet.gov/">http://www.firstnet.gov/</a>
<b>Industry Council for Emergency Response Technologies (iCERT)</b>	iCERT’s mission is to serve as the voice of the commercial sector in the emergency response technologies field. iCERT members assist public policymakers and government emergency communications professionals as they address complex choices regarding advanced communications technology alternatives in the years ahead. Through advocacy, research, and in coordination with the public sector, iCERT plays a vital role in the development and deployment of emergency response technologies.	<a href="https://www.theindustrycouncil.org/">https://www.theindustrycouncil.org/</a>
<b>Institute of Electrical and Electronic Engineers (IEEE)</b>	A publishing and standards-making body responsible for many telecom and computing standards.	<a href="https://www.ieee.org/">https://www.ieee.org/</a>

NAME/ACRONYM	DESCRIPTION	WEBSITE
<b>Integrated Justice Information Systems Institute (IJIS)</b>	The IJIS Institute, a 501(c)(3) nonprofit corporation, 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. The mission of the IJIS Institute is to unite the private and public sectors to improve critical information sharing for those who provide public safety and administer justice in our communities.	<a href="http://www.ijis.org">www.ijis.org</a>
<b>International Academies of Emergency Dispatch (IAED)</b>	A non-profit, standards-setting organization, formerly known as the National Academies of Emergency Dispatch (NAED), promoting safe and effective emergency dispatch services worldwide.	<a href="http://www.emergencydispatch.org/">http://www.emergencydispatch.org/</a>
<b>International Committee for Information Technology Standards (INCITS)</b>	A U.S.-based standards development organization dedicated to the creation of information technology standards.	<a href="http://www.incits.org">www.incits.org</a>
<b>International Organization for Standardization (ISO)</b>	An independent, non-governmental international organization with a membership of 161 national standards bodies.	<a href="http://www.iso.org">www.iso.org</a>
<b>International Telecommunication Union (ITU)</b>	The telecommunications agency of the United Nations established to provide worldwide standard communications practices and procedures. Formerly the Consultative Committee for International Telephony and Telegraphy (CCITT).	<a href="https://www.itu.int/en/Pages/default.aspx">https://www.itu.int/en/Pages/default.aspx</a>
<b>Internet Architecture Board (IAB)</b>	The IAB is the committee charged with oversight of the technical and engineering development of the internet by the Internet Society (ISOC). It oversees numerous task forces, of which the most important are the Internet Engineering Task Force (IETF) and the Internet Research Task Force (IRTF). The body that eventually became the IAB originally was formed by the DOD’s Defense Advanced Research Projects Agency (DARPA), under the name Internet Configuration Control Board, in 1979; it eventually became the Internet Advisory Board in September 1984, and then the Internet Activities Board in May 1986 (the name was changed, while keeping the same acronym). It finally became the Internet Architecture Board, under ISOC, in January 1992, as part of the internet’s transition from a U.S. government entity to an international public entity.	<a href="https://www.iab.org/">https://www.iab.org/</a>
<b>Internet Assigned Numbers Authority (IANA)</b>	IANA is the entity that oversees global IP address allocation; Domain Name System (DNS) root zone management, and other IP assignments.	<a href="http://www.iana.org">www.iana.org</a>
<b>Internet Corporate for Assigned Names and Numbers (ICANN)</b>	Authority for public domain addresses and uniform resource locators (URLs), including related policies and databases.	<a href="https://www.icann.org/">https://www.icann.org/</a>
<b>Internet Engineering Steering Group (IESG)</b>	The IESG is a body composed of the IETF chair and area directors.	<a href="https://www.ietf.org/about/groups/iesg/">https://www.ietf.org/about/groups/iesg/</a>
<b>Internet Engineering Task Force (IETF)</b>	Lead standards-setting authority for internet-related protocols.	<a href="https://www.ietf.org/">https://www.ietf.org/</a>

NAME/ACRONYM	DESCRIPTION	WEBSITE
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.	<a href="https://www.911.gov/">https://www.911.gov/</a>
National Association of Search and Rescue (NASAR)	Non-profit association dedicated to advancement of professional, literary and scientific knowledge and training in the search-and-rescue field.	<a href="http://www.nasar.org/">http://www.nasar.org/</a>
National Association of State 911 Administrators (NASNA)	An association that represents state 911 programs in the field of emergency communications.	<a href="http://www.nasna911.org">www.nasna911.org</a>
National Center for Missing and Exploited Children (NCMEC)	The National Center for Missing and Exploited Children® opened in 1984 to serve as the nation's clearinghouse on issues related to missing and sexually exploited children.	<a href="http://www.missingkids.com">www.missingkids.com</a>
National Emergency Number Association (NENA)	NENA is a not-for-profit corporation established in 1982 to further the goal of "One Nation—One Number." NENA is a networking source and promotes research, planning and training. NENA strives to educate, set standards, and provide certification programs, legislative representation and technical assistance for implementing and managing 911 systems.	<a href="http://www.nena.org">www.nena.org</a>
National Exchange Carrier Association (NECA)	A membership association of U.S. local telecommunications companies dedicated to keeping customers connected on state-of-the-art communications networks.	<a href="http://www.neca.org">www.neca.org</a>
National Fire Protection Association (NFPA)	A global nonprofit organization, established in 1896, devoted to eliminating death, injury, property and economic loss due to fire, electrical and related hazards.	<a href="http://www.nfpa.org">www.nfpa.org</a>
National Highway Traffic Safety Administration (NHTSA)	NHTSA is a U.S. executive branch agency that is part of the Department of Transportation. It describes its mission as "Save lives, prevent injuries, reduce vehicle-related crashes." The National 911 Program is housed under NHTSA.	<a href="http://www.nhtsa.gov">www.nhtsa.gov</a>
National Information Standards Organization (NISO)	NISO is a non-profit association accredited by the American National Standards Institute (ANSI); it identifies, develops, maintains, and publishes technical standards to manage information in our changing and evermore digital environment. NISO standards apply both traditional and new technologies to the full range of information-related needs, including retrieval, re-purposing, storage, metadata, and preservation.	<a href="http://www.niso.org">http://www.niso.org</a>
National Institute of Standards and Technology (NIST)	A part of the U.S. Department of Commerce (DOC) that oversees the operation of the U.S. National Bureau of Standards. NIST works with industry and government to advance measurement science and to develop standards in support of industry, commerce, scientific institutions, and all branches of government. Its mission is to promote innovation and industrial competitiveness.	<a href="http://www.nist.gov">www.nist.gov</a>

NAME/ACRONYM	DESCRIPTION	WEBSITE
<b>National Integration Center (NIC)</b>	DHS's National Integration Center (NIC) is responsible for managing the implementation and administration of the National Incident Management System (NIMS).	<a href="https://www.fema.gov/fema-technical-assistance-program">https://www.fema.gov/fema-technical-assistance-program</a>
<b>National Joint Telecommunicator Emergency Response Taskforce (TERT) Initiative (NJTI)</b>	A partnership between APCO and NENA that has worked to develop the many facets of a TERT program and to help states lacking an active TERT program to develop one. TERT involves a comprehensive program that includes assistance to individual states in developing programs that would lead to the establishment of predetermined and selected trained teams of individuals who can be mobilized quickly and deployed to assist communications centers during disasters.	<a href="http://www.njti-tert.org">www.njti-tert.org</a>
<b>National Suicide Prevention Lifeline</b>	The National Suicide Prevention Lifeline is a national network of local crisis centers that provides free and confidential emotional support to people in suicidal crisis or emotional distress 24 hours a day, 7 days a week.	<a href="https://suicidepreventionlifeline.org/">https://suicidepreventionlifeline.org/</a>
<b>National Telecommunications and Information Administration (NTIA)</b>	NTIA is the executive branch agency that is principally responsible for advising the president on telecommunications and information policy issues. NTIA's programs and policymaking focus largely on expanding broadband internet access and adoption in America, expanding the use of spectrum by all users, and ensuring that the internet remains an engine for continued innovation and economic growth.	<a href="https://www.ntia.doc.gov/">https://www.ntia.doc.gov/</a>
<b>North American Network Operators Group (NANOG)</b>	A governing body that provides guidance and instructions for the design of an IP network. NANOG typically is involved in the best current operational practices for IPv6 planning.	<a href="https://www.nanog.org/about/home">https://www.nanog.org/about/home</a>
<b>North American Numbering Plan Administration (NANPA)</b>	The organization that has overall administrative responsibility of the North American Numbering Plan (NANP), an integrated telephone numbering plan serving 20 North American countries that share its resources.	<a href="http://www.nationalnanpa.com">www.nationalnanpa.com</a>
<b>Open Geospatial Consortium (OGC)</b>	A standards development organization that promulgates standards for the global geospatial community.	<a href="http://www.opengeospatial.org/">http://www.opengeospatial.org/</a>
<b>Open Mobile Alliance (OMA)</b>	A standards development organization that develops standards for the mobile phone industry.	<a href="http://www.openmobilealliance.org">www.openmobilealliance.org</a>
<b>Organization for Advancement of Structured Information Standards (OASIS)</b>	A standards development organization that promulgates standards for data interchange.	<a href="http://www.oasis-open.org">www.oasis-open.org</a>
<b>Packet Technologies and Services Committee (PTSC)</b>	PTSC is an ATIS standards committee that develops standards related to services, architectures, signaling, network interfaces, next generation carrier interconnect, cybersecurity, and government emergency telecommunications service within next-generation networks.	<a href="https://www.atis.org/01_committ_forums/ptsc/">https://www.atis.org/01_committ_forums/ptsc/</a>
<b>Urban and Regional Information Systems Association (URISA)</b>	A non-profit association of professionals using GIS and other information technologies to solve challenges in U.S. state and local government agencies.	<a href="http://www.urisa.org/">http://www.urisa.org/</a>

# Appendix 3: Useful Resources

## Federal Rules, Regulations & Laws

- [Wireless Communications and Public Safety Act of 1999 \(PL 106-81\)](#)
- [Enhance 911 Service Act of 2004 \(PL 108-494\)](#)
- [New and Emerging Technologies 911 Improvement Act of 2008](#)
- [Food, Conservation and Energy Act of 2008 \(“Farm Bill”\) \(PL 110-246\)](#)
- [Implementing Recommendations of the 9/11 Commission Act of 2007 \(PL 110-53\)](#)

## Reports

- FCC TFOPA [Adopted Final Report](#)
- TFOPA Working Group 1 Supplemental Report—[Optimal Cybersecurity Approach for PSAPs](#)
- TFOPA Working Group 2 Supplemental Report—[Phase II Supplemental Report: NG9-1-1 Readiness Scorecard](#)
- TFOPA Working Group 3 Supplemental Report—[Funding Sustainment Model](#)
- APCO Report—[Project 43: Broadband Implications for the PSAP](#)
- Government Accountability Office (GAO) Report to Congressional Committees: [911 Services Most States Used 911 Funds for Intended Purposes, but FCC Could Improve Its Reporting on States’ Use of Funds](#)
- FCC Emergency Access Advisory Committee (EACC) Working Group 7 Report—[Recommendations on Timeline Alignment](#)
- Canadian Radio-television and Telecommunications Commission, [A Report on Matters Related to Emergency 911](#)

## Guidance & Research Documents

- National 911 Program [Guidelines for State NG911 Legislative Language](#)
- National 911 Program [Guidelines for Developing a State NG911 Plan](#)
- National 911 Program [State Assessment Handbook: A Guide for States Participating in the Statewide 911 System Assessment Process](#)
- National 911 Program [State Assessment Guidelines Synopsis Chart](#)
- National 911 Program [Next Generation 911 \(NG911\) Standards Identification and Review](#)
- [NG911 & FirstNet: Together Building the Future of Public Safety Communications \(A Guide for State & Local Authorities\)](#)
- [Guidelines for Minimum Training](#)
- National 911 Program [Next Generation 911 \(NG9-1-1\) Interstate Playbook](#)
- National 911 Program [Next Generation 911 \(NG9-1-1\) Interstate Playbook, Chapter 2](#)

## Databases & Resource Repositories

- APCO [Standards to Download](#)
- NASNA [How to Start a State 911 Program](#)
- NASNA [State 911 Contacts](#)
- NASNA 911 [Regionalization—Tools and Information](#)
- National 911 [Program Documents & Tools](#)
- [National 911 Profile Database](#)
- NCSL [Key Enacted 911 Legislation Database](#)
- NENA [Company Identifier Program](#)
- NENA [Standards & Other Documents](#)