

# Communicating Next-Generation 911 with local 911 professionals: Preliminary recommendations

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*Next-Generation 911 (NG911) infrastructure will replace analog systems designed to support voice services for landline 911 callers with digital, IP-based systems that will allow smartphone users to “call” 911 via voice, text, image, and streaming video. This brief paper reports findings from a workshop conducted at the 2019 911 Early Adopters’ Summit, during which local 911 professionals from across the United States reflected on strengths, weaknesses, opportunities, and threats associated with the adoption of NG911 infrastructure and, in particular, multimedia 911 services. Workshop participants pointed to long-standing issues NG911 stands to exacerbate, including high non-emergency call volumes, poor staff retention, and inadequate psychological support which the influx of multimedia 911 calls, including those with graphic imagery, may worsen. At the same time, participants looked to local, existing resources to mitigate these issues and exploit new opportunities afforded through NG911 infrastructure. Using these findings, preliminary recommendations are offered to improve information resources available to local 911 professionals adopting NG911 systems for effective and efficient multimedia 911 services.*

***Emergency response, infrastructure, technology adoption, technical communication, SWOT analysis***

## INTRODUCTION

The transition to Next-Generation 911 (NG911) infrastructure replaces analog systems designed to support voice services among landline callers with digital, IP-based systems that will enable multimedia — voice, text, image, and video — 911 services for a nation of smartphone users. Designed to help local 911 professionals serving in Public-Safety Answering Points (PSAPs) during the NG911 transition [1]–[3], national-level communications envision NG911 as the future of 911 service and the solution to widening problems associated with legacy systems, such as identifying the locations of mobile phone callers. This is, no doubt, the case.

However, the adoption experiences of local 911 professionals do not seamlessly match the NG911 vision outlined in national-level professional communications. This brief paper reports findings from a workshop conducted at the 2019 911 Early Adopters’ Summit, during which local 911 professionals from across the country reflected on Strengths, Weaknesses, Opportunities, and Threats (SWOT) associated with the NG911 transition and, particularly, the adoption of multimedia 911 services. These findings recommend that national-level organizations need to build a case for multimedia 911 service adoption among skeptical 911 professionals and coordinate resources for designing NG911 systems and protocols at early adopter PSAPs.

The following sections summarize central tensions characterizing information resources now available to local PSAPs transitioning to NG911, describe the SWOT analysis conducted at the 2019 Early Adopter’ Summit, report an overview of the findings, and discuss the two recommendations for improving NG911 communications to local 911 professionals.

## COMMUNICATING NG911 TO LOCAL 911 PROFESSIONALS

Components of NG911 infrastructure involve not only hardware and software, but a field of technical and operational documentation facilitating the design, adoption, implementation, and maintenance of NG911 systems and services. These information resources are primarily communicated through national-level organizations that include the National Emergency Number Association (NENA), National 911 Program, and Association of Public-Safety Communications Officials (APCO), as well as multiple government, professional, and industry organizations such as the Federal Communication Commission (FCC) and National Association of State 911 Administrators (NASNA).

Part of a larger project, this brief paper can only summarize two thematic tensions [4] that characterize these national-level information resources available to local 911 professionals adopting NG911 systems and developing protocols for effective and efficient multimedia

911 services. These tensions— future vision vs. present adoption and national standardization vs. local implementation— are returned to in the discussion to recommend improvements that address the needs of local 911 professionals that emerged during the workshop conducted at the 2019 911 Early Adopters’ Summit.

#### *Future Vision vs Present Adoption*

National organizations focus on a future, unifying vision for NG911 as a system of systems with “capabilities at the jurisdictional level across the U.S., as well as interconnectivity and interoperability amongst those systems using common standards nationwide [1], while devoting less attention to the present adoption hurdles of local 911 professionals faced with the transition to NG911 systems and services. The National 911 Program, for example, explains that NG911 “will revolutionize how the public can communicate in emergencies, by allowing them to share texts, videos, audio recordings, and pictures with call-takers and dispatchers.” However:

With NG911 in planning stages nationwide, it is up to local and state leaders, legislators, and community groups to ensure NG911 projects have appropriate support and resources to make these important, lifesaving technology upgrades to better serve the public in emergencies and protect first responders. [3]

Local governance and funding of public safety agencies, including PSAPs, limits the role of national organizations such as the National 911 Program and NENA to coordinating national-level policy by articulating a common vision and technical, service, and operational standards that help coordinate state and local NG911 initiatives. As the previous quotation makes clear, in lieu of federal and state mandates, a national NG911 system of systems remains predicted on, first, motivating local stakeholder adoption decisions and, second, aligning adoption decision-making with the unifying NG911 vision articulated by national-level policy documents.

#### *National Standardization vs. Local Implementation*

National organizations such as NENA and APCO define core technical, service, and operational standards that ensure NG911 system interoperability and service continuity across 6000+ PSAPs in the United States. However, each local PSAP must implement custom solutions to meet these requirements. The *National NG911 Roadmap*, for example, “does not include specific solutions to the issues it discusses, nor does it identify specific groups to address them” [1]. Similarly, APCO’s *Core Competencies, Operational Factors, and Training for Next Generation Technologies in Public Safety Communications*, includes requirements such as: “The telecommunicator shall demonstrate the ability to visually

verify call details when utilizing streaming video,” and “... process incoming photos/video that may contain graphic details” [2]. Despite the availability of such forward-looking standards, it remains up to local PSAPs to develop and implement protocols and associated training to meet these standards as “consistent with general practices and locally defined parameters” (p. 10). Consequently, while national-level policy and standards describe the “what” of future multimedia 911 services, resources facilitating the “how” remain scarce for local 911 professionals charged with developing suitable technical, service, and operational implementation plans. Altogether, national-level communications of NG911 policy and standards suggest that local 911 professionals lack information resources facilitating NG911 system and service adoption and implementation.

#### METHODS

For insight into the actual information needs of local 911 professionals adopting and implementing NG911 infrastructure, a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis was conducted at the 2019 911 Early Adopters’ Summit in Charleston, South Carolina. The summit annually draws a select group of 911 practitioners and industry representatives from across the United States to discuss on-the-horizon issues that will impact PSAP operations. Conducted as an afternoon workshop, the SWOT analysis invited 25 local 911 professionals to reflect on the adoption of NG911 infrastructure and multimedia 911 services.

SWOT analysis is a well-known framework for identifying internal and external factors that impact organizations to inform strategic decision-making [5]. SWOT analysis generally involves assessing the internal strengths and weaknesses of an organization in relation to external opportunities and threats it faces in order to guide decision-making to improve performance and accomplish long-term goals [6]. The workshop saw 911 professionals divided into two concurrent sessions to discuss PSAP strengths and weaknesses with respect to the adoption of multimedia 911 services, as well as opportunities and threats PSAPs face when using multimedia information with citizens and first responders in the community. Data was collected by audio recording and transcribing all three sessions, and then analyzed thematically by identifying patterns and iterative coding to elaborate specific strengths, opportunities, and threats for each category [4].

#### FINDINGS

The SWOT analysis saw discussion of nineteen themes among workshop participants at the 911 Early Adopters’ Summit (Table 1). The following describes the themes (*italicized*) participants identified as strengths, weaknesses, opportunities, and threats facing local 911 professionals.

TABLE 1. SWOT ANALYSIS FINDINGS

	<i>Positive</i>	<i>Negative</i>
<i>Internal</i>	<b>Strengths:</b> Existing partnerships Millennial workforce Problem-solving	<b>Weaknesses:</b> Costs Processing protocols Processing tools Staff impacts Staff resistance
<i>External</i>	<b>Opportunities:</b> Enhanced accessibility Enhanced resilience Enhanced SA New career paths New partnerships	<b>Threats:</b> Data volume/velocity Data/channel variety Information veracity Public safety/privacy Cybersecurity risks Uneven adoption

When asked to consider strengths that would help PSAPs handle multimedia data, including multimedia 911 requests for assistance, participants encountered the most difficulty. Only a few PSAPs represented by 911 professionals in attendance had adopted such services and so, for most, identifying weaknesses, opportunities, and threats came more easily. However, participants identified three important strengths: *existing partnerships* with public and private agencies that can assist the collection and processing of multimedia data, a *millennial workforce* of 911 telecommunicators accustomed to smartphone-enabled multimedia communication, and the *problem-solving capacity* developed by PSAPs continually faced with non-routine emergency situations.

Considering PSAP weaknesses in the face of the NG911 transition, participants identified *costs* for new systems, services, and personnel required from processing multimedia data, the lack of *processing protocols* that 911 telecommunicators-turned-analysts would require to efficiently and effectively interpret and relay information gathered in images and videos to first responders or appropriate public agencies, as well as *processing tools* to collect, store, process, and visualize these multimedia data. Adopting multimedia 911 services stand to also impact PSAP staff. Participants identified *staff impacts* including stress and trauma from viewing graphic imagery, and *staff resistance*, especially among senior staff, to the organizational change required to support multimedia 911 services.

Participants more easily identified opportunities, including *enhanced accessibility* when using images and video can overcome language barriers or caller incapacity to communicate an emergency situation, *enhanced resilience* when processing text and social media information can ensure continuity of operations during disruptions to 911 or telecommunication networks, and *enhanced situational awareness* when aggregated multimedia messages can supplement information provided by 911 callers. Opportunities also include *new*

*career paths* available to 911 telecommunicators or recruits transitioning or hired to new analyst or “communications specialist” positions, as well as *new partnerships* between PSAPs and state information fusion centers that could serve as analytic hubs for real-time crime fighting or disaster response operations.

Lastly, participants identified threats to PSAPs that would impact or result from the deployment of multimedia 911 services. Concerns about the *volume*, *velocity*, and *variety* of multimedia data that PSAPs might be responsible for collecting across multiple physical (e.g., gunshot detectors, traffic cameras) and social (e.g., social media, text-to-911) sensors overshadow many of the identified opportunities. Moreover, issues of *data veracity* concern 911 professionals who would be faced with the challenge of determining the recency and provenance of imagery submitted by the public, to include imagery citizens discover second-hand on social media platforms and the Internet and then relay to PSAPs.

Deploying multimedia 911 services would also create risks. Additional threats identified by participants include the risks to *public safety and privacy* if, knowing 911 accepts streaming video and images, bystanders feel encouraged to congregate around emergency scenes to broadcast real-time imagery. Citizens’ privacy may also be violated through the collection and deployment of security and traffic camera footage in sensitive environments such as hospitals and schools. PSAPs would also face new *cybersecurity risks* posed by malware communicated through multimedia data or introduced by authorized users charged with processing these data. Lastly, PSAPs that adopt multimedia 911 services cannot ensure that other regional PSAPs do so as well, creating *uneven adoption* that would prevent information sharing among responsible agencies in neighboring jurisdictions.

## DISCUSSION

These findings suggest preliminary recommendations for improving communications with local 911 professionals adopting NG911 infrastructure and, specifically multimedia 911 services.

### *Build a Case for Present Adoption*

The extensive literature on technology adoption often describes a five-stage adoption process—awareness, persuasion, decision, implementation, and confirmation [7]. Findings from the SWOT analysis suggest that many local 911 professionals must be persuaded to adopt multimedia 911 services. That these participants attended the 911 Early Adopters’ Summit suggests that the majority of local 911 professionals remain only aware of multimedia 911 services and, likely, far from adopting these services during the NG911 transition.

The opportunities highlighted during the SWOT analysis recommend building an operational case for



adopting multimedia 911 services. Opportunities to interact with 911 callers via text, image, or streaming video suggest that multimedia 911 services can improve the quality of information PSAPs gather compared to voice-only communications. Moreover, dedicating at least one telecommunicator to multichannel, multimedia communications may improve the efficiency of PSAP call taking operations if the analyst can engage in high-quality interactions that lead to decreases in time telecommunicators need to spend on the line with callers providing redundant or lower quality information. Building a case for improved information quality and efficiency, while also easing professionals' concerns about multimedia data volume, variety, and velocity, will require documenting and disseminating early adopter success stories that can persuade the early and late majority of local PSAPs to similarly adopt and implement multimedia 911 services.

Findings also suggest that a case for multimedia 911 service adoption must address existing concerns over telecommunicator recruitment and retention. Adopting multichannel, multimedia 911 services would open new possibilities for recruiting a millennial workforce to fill "communications analysts" positions, and open advancement opportunities for telecommunicators seeking promotion. Building such a case depends on sharing success stories from PSAPs whose adoption of multimedia 911 services positively impacted staff recruitment and retention.

#### *Coordinate Resources for Local Implementation*

Infrastructure emerges in resolutions "between local, customized, intimate and flexible use on the one hand, and the need for standards and continuity on the other" [8]. Similarly, NG911 infrastructure emerges when local PSAPs implement custom hardware, software, and procedures aligned with national policy guidelines and standards. Whereas available information resources focus on the latter to ensure NG911 interoperability across 6000+ PSAP in the United States, greater attention must be given to the information needs of local 911 professionals tasked with implementing multimedia 911 services suited to local resources and requirements.

Again, these resources will emerge first as innovations at early adopter PSAPs which then become examples for other PSAPs to follow. Required innovations include implementations of communication analyst workstations that can model system configurations (and costs) required to efficiently process multimedia 911 calls, training for telecommunicators-as-analysts, and protocols that integrate analysts and multimedia data within PSAP call taking and dispatch workflows [9], [10]. Such innovations, however, hinge on providing local 911 professionals with resources to adopt, trial, and develop systems and protocols at PSAPs with existing concerns over service quality/efficiency and staff stress. Consequently, national-

level organizations should facilitate partnerships between local government, industry, and research organizations that can help early adopter PSAPs develop systems and operational protocols required for multimedia 911 services. Resourcing and disseminating innovations at local PSAPs can begin to fill in the "how" currently missing from the "what" outlined in national-level NG911 standards.

Overall, the preliminary recommendations offered in this brief paper suggest opportunities for improving information resources available to local 911 professionals adopting and implementing NG911 infrastructure for effective and efficient multimedia 911 services.

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