

Across the country, the move to Next Generation 9-1-1 (NG9-1-1) is taking off. For prospective adoptees, one of the first questions is, “Why should I implement this?” The answer is NG9-1-1 is a standards-based approach to delivering 9-1-1 calls to public safety answering points (PSAPs) using an Internet Protocol- (IP) based transport and Session Initiation Protocol (SIP) signaling that supports multimedia communications in a resilient, scalable, interoperable and secure manner.

A NG9-1-1 solution compliant with the North American Emergency Number Association (NENA) i3 standards, is able to route 9-1-1 calls to the appropriate PSAP based on caller location, validates address data against geographic coordinates and can share 9-1-1 call information with neighboring PSAPs. These are just some of the most vital improvements over current conditions that can help 9-1-1 call center personnel do their job more efficiently and effectively. This white paper examines these key drivers for implementing a NG9-1-1 solution.

Going Mobile While Stuck in a Legacy World

Throughout our history, Americans have lived in a mobile society embracing new, reliable and easy-to-use technology as it becomes affordable. Never is this more prevalent than today as advances in remote computing, networking and communication systems have revolutionized the way we connect to each other and to services using whatever device we have. The advent of the Internet, the miniaturization of computers and the ubiquity of cellular communications allow us to move about with laptops, tablets and smartphones that communicate using audio, email, text or video. At the same time, such devices access applications and services over the same networks that allow us to find the quickest route across town, the nearest restaurant, to make a bank deposit, shop for best product pricing or even search for an answer to any question.

This new communications paradigm of whatever, whenever, wherever is one driver behind the need to upgrade infrastructure of emergency services in local jurisdictions and states across the nation. The current generation of emergency services infrastructure was built at a time when most communications occurred from fixed locations, making it relatively easy to identify where to send first responders. Through development and deployment of cellular and IP networks, patches were implemented on top of wireline emergency services infrastructure to help identify caller locations. More significantly, the current emergency services infrastructure was intended only for voice communication, now just one of many methods we use. In addition, the pace of innovation means more changes will be on the way.

Another aspect of current emergency services infrastructure is the manner in which emergency calls are routed to PSAPs in the current Enhanced 9-1-1 (E9-1-1) environment. In an E9-1-1 solution, calls are routed to PSAPs by carriers using tables. For example, the calling party number of 9-1-1 callers is used to look-up that caller’s street address in the master street address guide (MSAG). Other routing tables map the caller’s street address with an emergency service number (ESN) within an emergency service zone (ESZ), defined to route the call to the appropriate PSAP. In addition, location information obtained after the call is sent to the emergency service provider, which can add time in situations where seconds can help determine life and death. Additionally, the current generation of emergency services infrastructure does not easily allow sharing of information between different PSAPs. So, when natural disasters strike, Mother Nature doesn’t care about boundaries for different PSAPs. It would be more useful for PSAPs in different regions to have the ability to share the same information for a particular emergency call or setup a temporary emergency service center at a different or even mobile location.

Providing a Solution with NG9-1-1

The emergency services community has developed a standards-based framework to help create solutions for these questions and allow emergency service providers to more easily adapt to new communication technologies as they emerge. This framework is referred to as “Next Generation 9-1-1” (or NG9-1-1 for short) and is defined within the NENA i3 set of standards.

As illustrated in Figure 1, the NENA NG9-1-1 i3 architecture relies on a network of networks referred to as an Emergency Services IP network (ESInet) to provide IP-based access to a set of applications that support multimedia communications using geospatial call routing of emergency calls. When an emergency call is processed using the i3 architecture and received at an i3-compliant PSAP, the location of the caller is contained within the call request itself, providing instantaneous location information for the call taker and providing multimedia and other pertinent data right away.

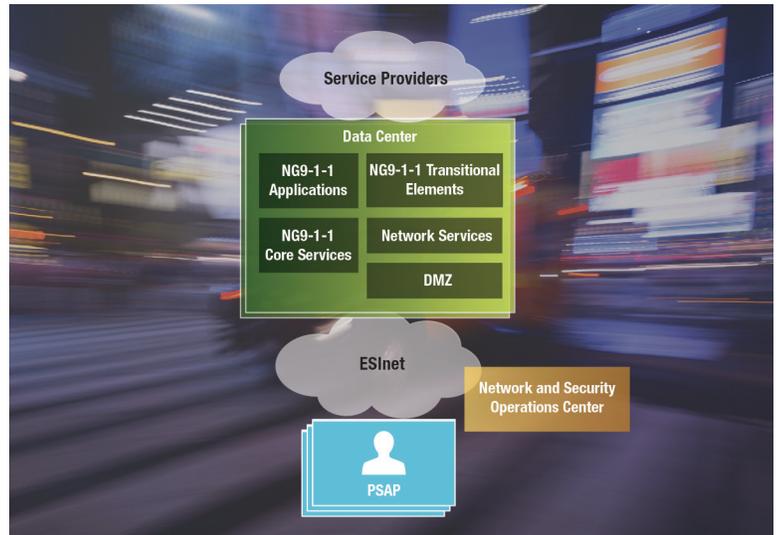


Figure 1. Building Blocks of NG9-1-1 Architecture

The NENA-08-003 standards document describes the detailed functional and interface specifications of the NENA i3 architecture. NG9-1-1 is fundamentally different than the current generation of E9-1-1 infrastructure as NG9-1-1 is based entirely on IP and geographically-based routing instead of analog-based communication methodologies and automatic number identifier (ANI) routing. Today’s multimedia communications including voice, data, text, picture and video can be transmitted using IP-based signaling protocols, which is what the NG9-1-1 infrastructure is based on. IP-based communication systems use networking devices, transport medium and signaling protocols that provide diversity, resiliency, scalability and mobility. These capabilities are required for modern emergency service providers in order to provide the fastest, safest and most reliable ways to respond to requests for help.

As discussed in this paper, one of the key drivers for NG9-1-1 is the change in the way we communicate with one another. The use of mobile phones, computers and tablets allows us to communicate using text, pictures and video wherever we are. The current E9-1-1 solution today hinders the ability for PSAPs to communicate using these technologies and to locate the people using these devices when they use 9-1-1 to call for help.

Emergency service providers do an excellent job of connecting those who call for help to the appropriate resources to respond as quickly as the technology they have allows. But what if the first responders could see a picture or live video of the scene at the emergency - wouldn’t that assist in the aid and response? There are many different scenarios we can think of where this could potentially save lives and reduce property damage. The current generation of emergency services infrastructure simply cannot support those kinds of communication methods.

To address these shortcomings, a NG9-1-1 solution can be deployed today that includes the capability to:

- ✓ Increase call routing speed, accuracy and flexibility
- ✓ Simplify operations, maintenance and reporting at PSAPs
 - ✓ Reduce technology complexity at PSAPs by hosting NG9-1-1 applications in a centralized manner
- ✓ Improve survivability and enable virtual PSAPs using diverse and resilient networks
- ✓ Improve interoperability and information sharing through proven standards
 - ✓ Provide more effective and seamless public safety collaboration
 - ✓ Leverage the convergence and commoditization of unified communication features to lower costs and eliminate proprietary systems
- ✓ Introduce new services and technology without forklift upgrades
- ✓ Accept emergency service requests using real-time data and multimedia options

Delivering NG9-1-1 Solutions with an Experienced Systems Integrator

Since a one-size-fits-all approach is not viable across our diverse country, General Dynamics IT can help design, implement and maintain a NG9-1-1 solution with its role as a large system integrator, bringing best-of-breed solutions to bear for specific needs. Since 2009, the General Dynamics IT NG9-1-1 systems integration lab provides the ability to validate, integrate and test the different components of a complete i3-compliant NG9-1-1 solution. General Dynamics IT takes a very methodical and detailed approach to planning, implementing, monitoring and managing a complex solution such as NG9-1-1, which helps ensure components are correctly installed and the overall system is delivered within budget and time constraints.

A General Dynamics IT solution supports a standards-based approach to designing, implementing, managing, monitoring and maintaining a NG9-1-1 system. General Dynamics IT has more than 20 years of experience in communications and emergency services by implementing and managing U.S. Department of Defense 9-1-1 operations and the U.S. Federal Aviation Administration unified communications systems including voice, conferencing, call center, network security operations center and 9-1-1. In July 2014, General Dynamics IT successfully implemented and cutover an NG9-1-1 system for several counties in Ohio, and is currently deploying large NG9-1-1 systems for other state and local customers.

For more information on NG9-1-1 solutions from General Dynamics IT, visit our website at <http://www.gdit.com/Capabilities/Enterprise-IT/Unified-Communications/ng9-1-1/>.

About the Author



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Tom is a member of the 9-1-1 community through his membership with APCO and NENA, his NENA Emergency Number Professional (ENP) certification and regular speaking engagements at conferences across the country. Tom holds a bachelor's degree in Computer Engineering from Florida Institute of Technology. Throughout his 30-year career in telecommunications and IP network engineering, he has been recognized by his leaders and peers for his passion and focus in leading teams, building quality solutions and for his technical writing and public speaking. Tom can be contacted at tom.sammons@gdit.com.

About General Dynamics Information Technology

As a trusted systems integrator for more than 50 years, General Dynamics Information Technology provides information technology (IT), systems engineering, professional services and simulation and training to customers in the defense, federal civilian government, health, homeland security, intelligence, state and local government and commercial sectors. Headquartered in Fairfax, Va., with major offices worldwide, the company delivers IT enterprise solutions, manages large-scale, mission-critical IT programs and provides mission support services. General Dynamics Information Technology is one of two business units that comprises the General Dynamics Information Systems and Technology business group.

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