

Greater Expectations

The Department of Transportation is leading an effort to help chart the course for tomorrow's 9-1-1 network.

By Linda D. Dodge

The 9-1-1 system has been an unqualified success story for more than 30 years, speeding emergency services in times of personal, regional, and national need. Today, however, changes in the public's use of technology, the saturation of the mobile market, and the spread of VoIP telephony contribute to greater expectations for 9-1-1 — expectations that the current system can't meet. Text, data, images, and video are more common in personal communications and are critical to future transportation safety and mobility advances. Text messages, photos taken by cell phones, and automatic crash notification (ACN) are just a few kinds of data that would expedite emergency response and reduce crash clearance time. As time goes on, the 9-1-1 system will be expected to accommodate highly mobile, dynamic communications modes for which the current system is



neither designed nor equipped.

The 9-1-1 system of the 1970s was created to transmit voice media only. Consequently, the current multimedia, wireless, mobile society presents both opportunities and challenges for the 9-1-1 system. Opportunities include harnessing new technologies that provide instant, accurate location information and incorporating new media, such as video, into the system. These technologies also increase capabilities to share and coordinate critical information and data within the emergency response community. For example, exact location data could be transmitted from a crashed

vehicle to a PSAP and emergency responders to reduce the time it takes to find the crash, especially in rural areas. Challenges include developing universal interfaces that extract the necessary data from mobile and IP-based calls and delivering that information

to PSAPs — not all of which are equipped with the latest communications technology.

As a result, a nationwide vision for a 9-1-1 system for the 21st century — one that builds on and respects current planning — is needed. This vision must give government and industry a means to move from a parochial perspective to a more comprehensive and nationwide vision for the next-generation 9-1-1 (NG 9-1-1) system. To guide and foster that vision, the U.S. Department of Transportation (USDOT) is leading research and development (R&D) efforts among a community of diverse stakeholders to

bring about a new, more capable system surrounding emergency call delivery and response. When implemented, the envisioned system will enable:

- Quick and accurate information delivery to responders
- Better and more useful forms of information (real-time location, text, images, video, and other data) than currently available
- Flexible, secure, and robust PSAP operations
- Low public capital and operating costs for emergency communication services

Building on Past Success

For the past 30 years, pre-hospital EMS providers have relied on USDOT for national leadership. Through the Office of Emergency Medical Services at the National Highway Traffic Safety Administration (NHTSA), USDOT leads development of national consensus standards for emergency medical technicians (EMTs), emergency vehicle operators, medical directors, and emergency medical dispatchers. Sim-

ilarly, USDOT has long been involved with 9-1-1 as an advocate and supporter of a universal emergency number in state highway safety funding policies, in requiring that the universal emergency number should be 9-1-1 and in providing model legislation to help states build 9-1-1 systems.

mentation of wireless enhanced 9-1-1 (E9-1-1). The NG 9-1-1 initiative funded by USDOT's ITS public-safety program will help define a system architecture and develop a transition plan to the NG 9-1-1 system. The transition plan will consider responsibilities, costs, schedules, and benefits for deploying IP-based emergency services across the nation. In addition to leveraging USDOT's earlier wireless E9-1-1 initiative, the NG 9-1-1 initiative builds on IP-based 9-1-1 work already under way within a variety of related efforts. These include, but are not limited to, the FCC Network Reliability and Interoperability Council (NRIC), NENA, the Internet Engineering Task Force, and the Alliance for Telecommunications Industry Solutions (ATIS) Emergency Services Interconnection Forum. USDOT expects that the products of these consensus efforts will form the foundation for the NG 9-1-1 initiative R&D project.

A primary goal of the USDOT's NG 9-1-1 initiative is to demonstrate a proof of concept (POC) to serve as

the foundation for public emergency communications in a wireless environment and enable an E9-1-1 system that works with any communications device. A recommended architecture will be chosen as the most effective alternative to expand and improve the capabilities of PSAPs through internetworking technologies. From this demonstration and other project activities, additional development is expected to be undertaken in the public and private sectors to enable the transmission of voice, data, or video from different types of communication

devices to PSAPs and on to emergency-responder networks.

Right the First Time

In principle, the NG 9-1-1 initiative has gained broad support; however, achieving consensus on the finer details of the architecture will be challenging and complex. Technical and organizational aspects of NG 9-1-1 require sustained commitment from key people and organizations, investment of resources, and changes in the way work is currently done in both the public and private sectors. Underlying the concept of integrating infrastructures among members of the emergency-responder community is a complex array of overlapping technological, institutional, deployment, and management issues. Within this context, the NG 9-1-1's R&D process is being built on a foundation of consensus development and open communication among public and private sector stakeholders.

In tackling these complexities, the USDOT has recognized that a solid set of engineering and governance processes and procedures will be needed. These will support the analysis, design, development, and refinement of a future operational and technical architecture necessary to provide increased integration, responsiveness, flexibility, efficiency, and relevance to the NG 9-1-1 stakeholder community. Toward that end, the USDOT recently selected Booz Allen Hamilton, along with its partners, NENA, L. Robert Kimball & Associates, and the Texas A&M Research Consortium, as the integrated project team that will help execute and meet the goals and objectives of the NG 9-1-1 initiative. The contract to complete the national architecture and transition plan worth \$4.4 million.

The Booz Allen project team is leveraging a systems engineering methodology known as mission engineering (ME). The creation of ME will bridge the gap between business



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In recent years, NHTSA and the USDOT's Intelligent Transportation Systems (ITS) program have worked with the National Emergency Number Association (NENA) and other partners in the public-safety community to support imple-

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and engineering by addressing each dimension of a requirement from both a user and developer perspective. ME focuses on “getting it right the first time.” It provides a unified framework to assemble a detailed description of critical operational processes mapped to system functions and data flow.

Completion of the system requirements and design will set in motion the execution of a POC demonstration in early 2008. The objective of the POC testing is to provide sufficient information to government and industry stakeholders about the viability of the NG 9-1-1-network architecture to support a nationwide deployment of its underlying technologies. The focus of the POC isn’t to deliver production-ready systems, software, processes, or component designs. Rather, because of time and funding limitations, this POC will provide a preliminary, but representative, showcase of the performance, functionality, and value of core NG 9-1-1 technologies to key decision makers.

The POC testing is expected to be conducted in a complex developmental test environment (DTE) that has been designed, evaluated, and implemented to satisfy the critical requirements necessary to support system-level verification. Currently, the Texas A&M Consortium is implementing a prototype NG 9-1-1 solution using various vendors’ media convergence server systems in a pure IP environment. If additional funding becomes available, a test bed based on a configuration of this prototype could be used as an established NG 9-1-1 test bed for the functionality testing of IP-enabled PSAPs. Once the POC integration and test activities conclude in 2008, the NG 9-1-1 DTE could remain operational and be made available to developers of NG 9-1-1 products and those private and public-sector stakeholders who desire to demonstrate and evaluate NG 9-1-1 system performance. As a comprehensive



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hardware and software environment, an NG 9-1-1 DTE — whether within or independent of the NG 9-1-1 initiative — would enable product developers to simplify and speed their development process, and support more efficient delivery of new functionality to PSAPs.

Nationwide Action Blueprint

From a purely engineering perspective, most agree that much of the initial functionality of the envisioned NG 9-1-1 system is technically feasible. There are, however, a large number of operational, economic, political, and institutional issues that must be addressed and reconciled if the NG 9-1-1 system is going to be implemented successfully across the nation. Implementing NG 9-1-1 will likely be a complicated process that requires the effective, timely, and willing cooperation of an array of stakeholders. For example, the dispatch, fire, law enforcement, and EMS communities must be involved long before technology is introduced to the marketplace to assure its seamless integration into the existing 9-1-1 and emergency response systems. Achieving the NG 9-1-1 vision will require upgrades in network infrastructure, new equipment and software, and training programs.

To address these nontechnical issues, the NG 9-1-1 initiative includes the development of a nationwide transition plan or roadmap for success that will help frame how the government and industry view the deployment of NG 9-1-1. Just as we

use roadmaps to plan trips or map our individual futures, both government and industry will need to develop roadmaps to help determine possible routes and decide when and where to stop, partner, or go around problems. The NG 9-1-1-transition plan must target a workable approach, include appropriate stakeholder input, and provide a specific level of detail. Because budgets and development times are finite and limited, the NG 9-1-1 transition plan will be a valuable tool to plot both public and private-sector directions, alongside the public’s priorities and needs.

Drawing on the lessons learned from the POC, the nationwide transition plan will serve as the capstone to the NG 9-1-1 initiative by examining location-determination issues, organizational implications of proposed NG 9-1-1 capabilities, security and assurance issues, and reliability implications of an IP-based system. Additional transition issues, such as privacy, economic, operational, and funding mechanisms, as well as political implications, will also be explored in depth — including the examination of resource-sharing opportunities across the country, which may reduce cost and enhance service, operations, and data and information sharing. Through this nationwide transition plan, a wide variety of stakeholders — regulators, elected and appointed officials, budgeting staff, emergency-management directors, the vendor community, and the public — will have an unbiased, common picture of the key activities that are

needed to deploy NG 9-1-1.

At the conclusion of the NG 9-1-1 project, scheduled for the end of 2008, a comprehensive report will be developed that documents the performance and functionality of NG 9-1-1 components and architecture. Based on the outcome of this report and the nationwide transition plan, decisions about how to proceed with

the development of the NG 9-1-1 concept will be made with input from all stakeholders. In the meantime, a key challenge during the next two years will be to manage expectations of the public, government, and industry. Outreach and communications efforts are well under way at USDOT, and its ongoing dialogue with stakeholders will continue as

NG 9-1-1 moves closer to becoming a reality. ■

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