



Next Generation 9-1-1 Initiative: Addressing the Opportunities and Challenges of Tomorrow at the U.S. Department of Transportation

Why a Next Generation?

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 Voice-over-Internet-Protocol (VoIP) telephony are contributing to greater expectations – expectations that the current system cannot meet. Text, data, images, and video are increasingly 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 are just a few kinds of data that would expedite emergency response and reduce crash clearance time. The 9-1-1 system will increasingly 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, today's 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 incorporate new media (e.g., video) into the system. These technologies also promise increased 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 the PSAP and emergency responders, reducing the time it takes to find the crash, especially in rural areas. Challenges include developing universal interfaces that can extract necessary data from mobile and IP-based calls and deliver that information to public safety answering points (PSAPs), not all of which are equipped with the latest communications technology.

As a result, what is needed is a nationwide vision for a 9-1-1 system for the 21st century – one that builds upon and respects current planning. 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 system. To guide and foster that vision, the U.S. Department of Transportation (USDOT) is leading research and development 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:

- Quicker and more accurate information delivery to responders;
- Better and more useful forms of information (real-time location, text, images, video, and other data);
- More flexible, secure, and robust PSAP operations; and
- Lower public capital and operating costs for emergency communication services.

The USDOT NG9-1-1 Initiative: Building upon Past Success

For the past 30 years, prehospital providers of emergency medical services 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, for emergency vehicle operators, for medical directors, and even for emergency medical dispatchers. Similarly, 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 their 9-1-1 systems. 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 implementation of wireless enhanced 9-1-1 (E9-1-1). The NG9-1-1 initiative, funded by USDOT's ITS Public Safety Program will help define a system architecture and develop a transition plan to the Next Generation 9-1-1 System. The transition plan will consider responsibilities, costs, schedule, and benefits for deploying IP-based emergency services across the nation. In addition to leveraging USDOT's earlier wireless E9-1-1 initiative, the NG9-1-1 initiative builds upon IP-based 9-1-1 work already underway within a variety of related efforts. These include, but are not limited to the Federal Communications Commission Network Reliability and Interoperability Council, NENA, the Internet Engineering Task Force, and the Alliance for Telecommunications Industry Solutions (Emergency Services Interconnection Forum). USDOT expects that the products of these consensus

efforts will form the foundation for the NG9-1-1 initiative research and development project.

A primary goal of the USDOT's NG9-1-1 initiative is to demonstrate a Proof of Concept (POC) that will serve as the foundation for public emergency communications in a wireless environment and enable an enhanced 9-1-1 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 onto emergency responder networks.

Building the NG9-1-1 Concept Right the First Time

The NG9-1-1 initiative has gained broad support in principle. However, achieving consensus on the finer details of the architecture will be challenging and complex. Technical and organizational aspects of NG9-1-1 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 NG9-1-1's research and development 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 needed to provide increased integration, responsiveness, flexibility, efficiency, and relevancy to the NG9-1-1 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 NG9-1-1 initiative.

The Booz Allen project team is leveraging a systems engineering methodology known as Mission Engineering™ (ME). ME is a Booz Allen innovation created to bridge the gap between business and engineering by addressing each dimension of a requirement from both a user and developer perspective. Mission Engineering focuses on "getting it right the first time." It provides a unified, graphically rich framework for progressively assembling 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 Proof of Concept (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 NG9-1-1 network architecture to support a nationwide deployment of its underlying technologies. The focus of the POC is not 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 NG9-1-1 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 NG9-1-1 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 NG9-1-1 test bed for the functionality testing of IP-enabled PSAPs. Once the POC integration and test activities conclude in 2008, the NG9-1-1 DTE could remain operational and be made available to developers of NG9-1-1 products and those private and public sector stakeholders desiring to demonstrate and evaluate NG9-1-1 system performance. As a comprehensive hardware and software environment, an NG9-1-1 DTE – whether within or independent of the NG9-1-1 initiative – would enable product developers to simplify and speed their development process, supporting more efficient delivery of new functionality to PSAPs.

Developing an Action Blueprint for Nationwide Deployment

From a purely engineering perspective, most agree that much of the initial functionality of the envisioned NG9-1-1 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 NG9-1-1 system is going to be implemented successfully across the nation. Implementing NG9-1-1 will likely be a complicated process, requiring 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, in order to assure its seamless integration into the existing 9-1-1 and emergency response

systems. Achieving the NG9-1-1 vision will require upgrades in network infrastructure, new equipment and software, and training programs.

To address these non-technical issues, the NG9-1-1 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 NG9-1-1. 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 NG9-1-1 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 NG9-1-1 transition plan will be a valuable tool to help plot both public and private sector directions alongside the general public’s priorities and needs.

Drawing on the lessons learned from the POC, the nationwide transition plan will serve as the capstone to the NG9-1-1 initiative by examining location determination issues, organizational implications of proposed NG9-1-1 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 general public – will have an unbiased, common picture of the key activities that will need to happen to deploy NG9-1-1.

Going Forward

At the conclusion of the NG9-1-1 project (scheduled for the end of 2008), a comprehensive report will be developed that documents the performance and functionality of NG9-1-1 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 NG9-1-1 concept will be made with input from all stakeholders. In the meantime, a key challenge in the next two years will be to manage expectations of the public, government, and industry. Outreach and communications efforts are well underway at USDOT, and its ongoing dialogue with stakeholders will continue as NG9-1-1 moves closer to becoming a reality.

Editorial Note: Linda D. Dodge [the author of this article] is the Public Safety Coordinator for the ITS program in USDOT’s Research and Innovative Technology Administration, the sponsor of the NG9-1-1 initiative.