



**Homeland
Security**

Science and Technology

U.S. Department of Homeland Security



System Assessment and Validation for Emergency Responders

The U.S. Department of Homeland Security (DHS) established the System Assessment and Validation for Emergency Responders (SAVER) Program to assist emergency responders making procurement decisions.

Located within the Science and Technology Directorate (S&T) of DHS, the SAVER Program conducts unbiased operational tests on commercial equipment and systems and provides those results along with other relevant equipment information to the emergency response community in an operationally useful form. SAVER provides information on equipment that falls within the categories listed in the DHS Authorized Equipment List (AEL).

Information provided by the SAVER Program will be shared nationally with the responder community providing life- and cost-saving assets to federal, state, and local responders.

The SAVER Program is supported by a network of technical agents who perform assessment and validation activities. Further, SAVER focuses primarily on two main questions for the emergency responder community: "What equipment is available?" and "How does it perform?"

For more information on this and other technologies, please see the SAVER Web site or contact the SAVER Program Support Office.

Telephone: 877-336-2752

E-mail: saver@dhs.gov

Web site: <https://www.rkb.us/saver>

Opinions or points of view expressed in this document are those of the authors and do not necessarily represent the view or official position of the U.S. Government.

This SAVER TechNote was prepared by the Space and Naval Warfare Systems Center, Charleston, for the SAVER Program.

SPAWAR



Systems Center
Charleston

TechNote

Enhanced 9-1-1

The idea behind 9-1-1 is simple—a nationally known number that people can easily dial in an emergency. The first 9-1-1 systems routed emergency calls to the nearest public safety answering point (PSAP) and required the caller to provide location information in order for help to be sent to the correct location. Emergency responders, however, saw a need for 9-1-1 systems to automatically report the exact location of the individual calling 9-1-1, reducing the amount of time for emergency responders to arrive on the scene.



To provide the required location information,

engineers developed systems that used selective call routing and reverse number lookup to route calls to the geographically appropriate PSAP without requiring a caller to state their location information. Additional systems were developed that provide the PSAP an exact address of the caller and a mapped location to ensure responders are properly routed to the emergency. This combined capability of selective call routing, automatic number and location identification, and street mapping is known as Enhanced 9-1-1 or E9-1-1. E9-1-1 services are currently provided to 95 percent of the United States population when using traditional wired phones to place emergency 9-1-1 calls.



New Technologies Present Challenges

Advances in technology have presented new challenges to the PSAPs and emergency responder communities. The widespread adoption of wireless telephones and Internet Protocol (IP)-enabled voice communications, such as Voice over IP (VoIP), presents obstacles to determining the proper location of a caller in an emergency. In an effort to address these obstacles, the Federal Communications Commission (FCC) and Congress established requirements for the wireless and VoIP 911 caller's location to be determined and the call routed to the nearest PSAP.

A Phased Approach to Wireless E9-1-1 Location Services

As wireless communications became more prevalent, PSAPs began to notice an increase in the number of calls coming from wireless phones. Wireless callers are not always at their device's registered location when making an emergency call. In fact, they can be in a different city in their state or even a different part of the country when they dial 9-1-1.

A two-phased approach to solve this problem was established, putting the burden of location identification on the wireless service providers. Phase I requires that the 9-1-1 caller's number be provided and the call be routed to the PSAP nearest to their location.

The location of the cellular tower that the caller is connected to is provided as the caller's location. Depending on where the caller is in relation to the tower, this variation could be several feet or, in the worst case, several miles in a rural area. Phase II requires service providers to provide a caller's location with improved accuracy—50 to 150 yards rather than the nearest tower. To satisfy this Phase II requirement, service providers are using either network-based (trilateration) or handset-based location to determine an emergency caller's location. Trilateration uses the known location of three or more cellular towers and the measured distance between the caller and each reference point to determine the caller's location. Handset-based location uses GPS-enabled wireless phones and signals from the GPS network to determine a caller's location.



According to the National Emergency Number Association (NENA) as of January 2007, 80 percent of the U.S. population has been provided with Phase II wireless coverage, though some rural areas are still struggling to implement Phase II requirements. As the location equipment and software is costly to implement, many PSAPs and smaller service providers have been slow to update their systems. PSAPs in some areas, therefore, may not have access to location information coming from wireless callers and must rely on the caller to provide accurate location information.

Currently, the FCC is reviewing the location standards and requirements to increase location capabilities.

VoIP and E9-1-1

VoIP presents PSAPs and service providers with many of the same issues that were originally revealed with wireless communications—routing to the closest PSAP and providing the current caller's location.

Initially, VoIP systems did not provide the caller's name, address, or mapped location, and in many cases the caller was unable to even access 9-1-1 networks from the VoIP device. This severely impaired PSAP operators from properly dispatching aid, especially if the caller was unable to verbally communicate with the operator. While VoIP users are often at fixed locations, such as offices and homes, the devices or software used to place the calls are portable and can be used anywhere with a broadband Internet connection. This mobility can make determining a caller's current location difficult.

The FCC and Congress updated the E9-1-1 legislation (the Wireless Communications and Public Safety Act of 1999) to include VoIP location requirements. As a result, VoIP service providers are required to provide access to the

9-1-1 networks, and VoIP callers are required to register their address and phone numbers with their service provider. This allows the service provider's network to route the E9-1-1 VoIP call to the PSAP closest to the caller's registered address. Since the responsibility for maintaining accurate information falls to the VoIP customer, emergency responders may not always receive the correct location information if the customer has not kept his/her information current. This problem is practically nonexistent with databases for wired phones, which are updated by the service providers when a customer relocates.



Looking to the Future: Next Generation 9-1-1

As communication technologies evolve and change the way people communicate, PSAPs must also adapt to continue providing reliable 9-1-1 services. Next Generation 9-1-1 or NG9-1-1 is the term for a new 9-1-1 communication system architecture that will enhance collaboration and application of disparate emergency responder networks and public safety communication systems. The proposed architecture would create a national 9-1-1 network by linking together local systems. Currently, 9-1-1 systems and PSAPs are part of local, regional, or state networks independently operated by the corresponding government entities. This reduces the ability for PSAPs to coordinate and work together during an emergency.

The NG9-1-1 Program seeks to develop and implement an architectural framework that will support a broad spectrum of technologies, such as video and text, location-specific emergency alerts, and interoperability between PSAPs. NG9-1-1 is poised to expand many of the current capabilities of the PSAP and the emergency responders, and provide access to more communications capabilities.

Resources

Association of Public-Safety Communications Officials-International, Inc.

www.apcointl.org

E9-1-1 Institute

www.e911institute.org

Federal Communications Commission

www.fcc.gov/911

www.voip911.gov

National Emergency Number Association

www.nena.org

9-1-1 Fast Facts

- 200 million 9-1-1 calls were made in 2006
- 99% of US population has basic 9-1-1 service
- 95% of wireline phones have E9-1-1 service
- 80% of the population is provided with Phase II location services for wireless

*Source: NENA www.nena.org