



System Assessment and Validation for Emergency Responders (SAVER)

HazMat/CBRNE Mobile Apps Application Note

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FOREWORD

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 objective assessments and validations 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). The SAVER Program mission includes:

- Conducting impartial, practitioner-relevant, operationally oriented assessments and validations of emergency responder equipment; and
- Providing information, in the form of knowledge products, that enables decision-makers and emergency responders to better select, procure, use, and maintain emergency responder equipment.

Information provided by the SAVER Program will be shared nationally with the responder community, providing a life- and cost-saving asset to DHS, as well as 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?”

As a SAVER Program Technical Agent, the Space and Naval Warfare Systems Center (SPAWARSYSCEN) Atlantic has been tasked to provide expertise and analysis on key subject areas, including communications, sensors, security, weapon detection, and surveillance, among others. In support of this tasking, SPAWARSYSCEN Atlantic developed this application note to provide emergency responders with information on commercially available HazMat/CBRNE mobile apps. HazMat/CBRNE mobile apps fall under AEL reference number 04AP-06-CBRN: Software, CBRNE/Commercial Chemical/Hazard.

Visit the SAVER section of the [DHS S&T](#) website for more information on the SAVER Program or to view additional reports on mobile apps or other technologies.

POINTS OF CONTACT

National Urban Security Technology Laboratory

U.S. Department of Homeland Security

Science and Technology Directorate

201 Varick Street

New York, NY 10014

E-mail: nustl.saver@hq.dhs.gov

Website: <https://www.dhs.gov/science-and-technology/saver>

Space and Naval Warfare Systems Center Atlantic

Advanced Technology and Assessments Branch

P.O. Box 190022

North Charleston, SC 29419-9022

E-mail: ssc_lant_saver_program.fcm@navy.mil

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1. INTRODUCTION

Hazardous material (HazMat) and chemical, biological, radiological, nuclear, and explosive (CBRNE) incidents occur when substances such as toxic chemicals, biological agents, radiological or nuclear materials, or explosives pose a threat to life, property, and/or the environment. These two types of incidents are differentiated by the fact that a CBRNE incident is considered to be a deliberate, malicious act with the intention to maim, kill, and disrupt, whereas a HazMat incident is accidental.

Software applications installed on mobile devices, such as smartphones and tablets, can be useful to emergency responders, humanitarian groups, and the public. The use of these software applications, commonly called mobile apps, can improve situational awareness for the emergency responder during a HazMat/CBRNE incident by quickly providing critical information, such as emergency response procedures, identification and treatment of medical hazards, identification of protective zones, and exposure limits.

This application note provides information about the capabilities and operational considerations related to HazMat/CBRNE mobile apps.

2. TECHNOLOGY OVERVIEW

A mobile app is similar to software installed on a personal computer, but it is developed for a mobile device operating system (OS) such as Android, Apple® iOS®, BlackBerry®, or Windows® Mobile. These apps are able to integrate with other features of a mobile device, enabling them to capitalize on the functionality of global positioning system (GPS) technology, e-mail, a built-in camera, and a notification system.

Many mobile apps require an Internet connection to maximize their operational capabilities. These apps access the Internet by using a cellular service plan or Wi-Fi.



Figure 2-1. Sample of Disaster Related Mobile Apps

Image courtesy of Scientific Research Corporation

Wi-Fi usually provides fast access; however, the user must be near a wireless router or hotspot to connect. Since public Wi-Fi is an open network, it is more prone to virus, malware, and security attacks, which pose a security risk. Some mobile apps, such as reference guides, may be self-contained and thus do not require an Internet connection.

Mobile apps can be downloaded from a digital distribution website such as an app store, a government website, or directly from a mobile app developer. For example, the U.S. Department of Health and Human Services (HHS) website provides direct access to their recommended disaster related mobile apps, some of which are shown in Figure 2-1. Many mobile apps are available at no cost or can be purchased for much less than software developed for personal computers.

3. EMERGING TECHNOLOGY

In 2012, Congress passed legislation for the creation of a nationwide interoperable broadband network that will help police, firefighters, emergency medical service professionals, and other public safety officials communicate over a single, national wireless network. This network, called FirstNet, will enable agencies to communicate using standard smartphones on a dedicated public service frequency.

NG9-1-1 is an initiative to update the 9-1-1 service infrastructure in the U.S. and Canada to improve mobile public emergency communication services. This initiative will enable call connectivity for a wide range of new communication technologies. NG9-1-1 will enable the public, using mobile apps, to transmit text, images, and video data to a 9-1-1 call center. The transition to this new network will require modifications to existing communication devices, such as smartphones and tablets, which may result in modifications to the mobile apps that reside on affected devices.

The Association of Public-Safety Communications Officials International (APCO) is an organization that provides expertise, professional development, and technical assistance in the area of communications to the emergency responder community. With the introduction of FirstNet and NG9-1-1 services, APCO announced its plans to collaborate with the public safety and app developer community for the benefit of public safety.

Hybrid mobile apps, another emerging technology, combine a mobile app built to run on a specific OS, with a web-based mobile app, built to run on any OS. Hybrid mobile apps are developed using the HTML5 markup language, which incorporates HTML, CSS, and JavaScript, and uses the device browser engine but not the browser itself, thereby effectively enabling the app to run on any OS.

4. STANDARDS AND REGULATIONS

Currently, no universally recognized standards or regulations exist that cover the development of mobile apps. However, guidelines and best practices have been independently established by mobile app vendors and government agencies. The World Wide Web Consortium, an international group that develops web standards, has developed the *Mobile Web Application Best Practices* which includes:

- Advice on using the appropriate web protocol to reduce network loading;
- Collection and use of personal information;
- Ensuring consistent user experience across devices; and
- Design of a more flexible application that can run across multiple operating systems.

5. APPLICATIONS

Mobile apps offer a variety of analytical tools that can enhance decision-making for the emergency responder. The implementation of plans and procedures, as well as the allocation of critical resources, are areas that mobile apps can support during HazMat/CBRNE incidents.

While some mobile apps are developed specifically for HazMat/CBRNE incidents, many HazMat/CBRNE needs can be satisfied by mobile apps not originally developed for this purpose. These mobile apps may still be useful to the emergency responder community and should be considered an additional resource.

5.1 Information Management Tools

The ability for emergency responders to effectively manage multiple sources of information during and after a HazMat/CBRNE incident is important. Many of the available HazMat/CBRNE mobile apps provide information management tools that help formulate the response and record the results after an incident. For example, the National Incident Management System (NIMS) Incident Command System (ICS), developed by Informed® Publishing Group, is a mobile app which provides emergency responders access to the NIMS Incident Command Field Guide. NIMS ICS provides a section on the operational planning process, standard operating procedures, dynamic checklists for all functional command positions, integrated ICS forms and templates, and import of address book information.

Information management tools can provide emergency responders with checklists, forms, data sharing, and incident action logs, as described below.

- Checklists provide relevant, hazard-specific information used by emergency responders to ensure that necessary tasks supporting the incident are completed at appropriate and specified times.
- Integrated forms are used to report critical information and data related to an incident. These forms can be customized for specific local requirements and are designed to automatically prefill common data into other forms.
- Texting and other messaging capabilities allow responders to communicate and share data during an emergency incident. These communication capabilities can be used to transmit incident data, provide personnel and equipment status, and dispatch resources.
- Incident action logs are used to enter information to record all users' actions during an incident. This log can be combined with images, forms, and other accessed information to produce an incident report. Logs can then be submitted electronically to higher levels of authority and maintained as a legal account of actions taken during an incident response.

5.2 Mapping Tools and Applications

HazMat/CBRNE mobile apps may incorporate mapping capabilities or can integrate with a commercial mapping application, such as Google Maps™. Mapping tools and applications aid emergency responders by delivering on-scene, street-level geographic displays that can enhance situational awareness. HazMat/CBRNE incidents and plume models can be plotted using mapping tools. Plume models displayed on mobile apps provide information that can be analyzed, identified, recorded, and shared among decision-makers to define exclusion zones or safe standoff distances. For example, the First Responder Support Tools (FiRST) mobile app provides access to map-based evacuation and consequence information related to improvised explosive devices (IEDs) and HazMat incidents. It integrates with other mobile apps to retrieve

current wind information, HazMat reference data, and data related to the effective range of an IED. FiRST is available for Apple iOS and Android.

5.3 Global Positioning System

GPS integration in mobile apps provides the ability to obtain current location, speed, and heading information, and may also support the reporting of this information in incident report logs. HazMat/CBRNE mobile apps can use GPS data to help responders identify access routes to an incident. An example of this type of GPS mobile app is Navfree, which allows users to access maps with or without a data connection. Other features include turn-by-turn directions, spoken instructions, and address search. Navfree is available for Apple iOS, Android, and Windows.

5.4 Meteorological Data

Factors such as wind speed and direction, precipitation, and other weather factors can have a great effect on HazMat/CBRNE response efforts. Mobile apps interface with the mobile device's GPS software to identify the user's location and deliver up-to-date local weather information. Some mobile apps, such as the Weather Channel®, can be customized to display specific weather conditions such as wind gust speed, wind direction, ultraviolet index, humidity, dew point, cloud cover, and visibility. Many weather apps provide hourly updates and detailed forecasts extending out several days.

The Weather Channel app is available for Apple iOS, Android, Blackberry, and Windows. Mobile apps that provide meteorological data are one example of a common-use mobile app that has direct applications in support of HazMat/CBRNE operations.

5.5 HazMat/CBRNE References

Timely identification of HazMat/CBRNE hazards during response operations is dependent on many factors, and the availability of reference material is critical. HazMat/CBRNE references are searchable documents, guides, or databases. These references contain information used by the emergency responder to quickly identify specific or generic hazards caused by the materials involved in an incident. Rapid access to the appropriate information is enhanced with the electronic search capabilities provided by mobile apps.



Figure 5-1. HazMat Cargo Classification Signage

Image courtesy of the Department of Transportation

Reference databases may interface with other public or private databases to provide immediate hazard information. The Emergency Response Guide (ERG) 2012 mobile app provides information to help manage a HazMat/CBRNE incident. With searchable features, users can find relevant data for many hazards, including health risks to victims, equipment for response, and recommended first aid for victims of exposure. For example, Figure 5-1 shows standard HazMat cargo signage that can be quickly identified with the aid of the ERG mobile app. The ERG mobile app is available for Apple iOS and Android.

5.5.1 Biological Agents

This type of reference provides emergency responders with information on biological agents including diseases and toxins used as weapons of mass destruction (WMD). Information relating to diseases may include the physical form, type of organism, incubation period, natural hosts, symptoms, treatment options, and mortality rate if not treated. For toxins, the reference may include the physical form, the most likely form when used as a weapon, lethal dose, and method of exposure.

5.5.2 Chemical Warfare Agents

This type of reference includes information specific to chemical warfare agents and their precursors. Some industrial chemicals (e.g., phosgene, hydrogen cyanide) are also considered chemical warfare agents, are highly toxic, and are key ingredients in numerous commercial products.

5.5.3 Explosives

An explosives reference includes information on explosive materials found in IEDs. Individual explosive materials may be displayed by proper chemical name, chemical abstract service (CAS) number, or United Nations/North America (UN/NA) number and information may include appearance, possible precursors, formula, molecular weight, and trinitrotoluene (TNT) equivalency.

5.5.4 Toxic Industrial Chemicals/Toxic Industrial Materials

A toxic industrial chemical or toxic industrial material is any substance that, because of its chemical, physical, or biological properties, poses a potential risk to life, health, the environment, and/or property when not properly contained. Figure 5-2 shows an example of this type of reference which provides the emergency responder with HazMat/CBRNE information on the hazards and behaviors of any gases or vapors released during an incident. Specific information on personal protective equipment, respirator requirements, and symptoms of exposure may also be included.

5.5.5 Radiological Materials

This type of reference provides responders with information on radioactive isotopes. Information may include the half-life, atomic weight, inhalation and ingestion exposure limits, and symptoms of exposure at various levels.

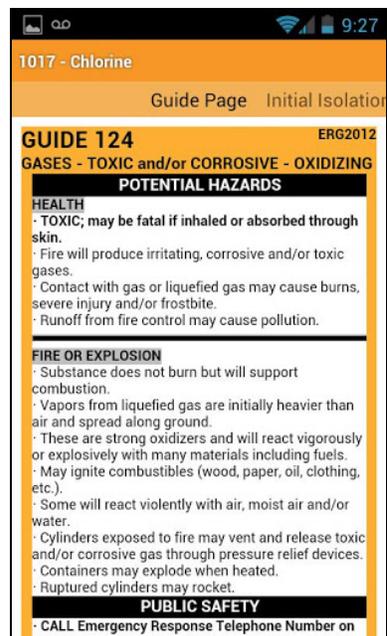


Figure 5-2. ERG 2012 Guide

Image courtesy of FEMA

5.6 HazMat/CBRNE Tools

Some HazMat/CBRNE mobile apps provide tools that perform complicated calculations related to hazards, such as radiation exposure, chemical reactivity, and blast calculators. These tools save the responder valuable time during response operations and improve the accuracy of the data that emergency responders depend on during a HazMat/CBRNE incident.

5.6.1 Radiological Tools

Radiological tools can perform several functions such as: calculating the activity of an unstable product given either the mass or volume and the purity; calculating the mass and volume of radiological material based on its corresponding activity; and calculating the number of minutes a responder can be exposed before exceeding the National Research Council/Occupational Safety and Health Administration exposure standards.

Mobile radiation emergency medical management (Mobile REMM) is an example of a radiological mobile app tool that helps diagnose radiation exposure and determines the proper treatment during radiological or nuclear emergencies. It contains algorithms for radiation exposure, a dose estimator, adult and pediatric triage assistance, and emergency contacts, as seen in Figure 5-3. Mobile REMM is available for Apple iOS and Android.

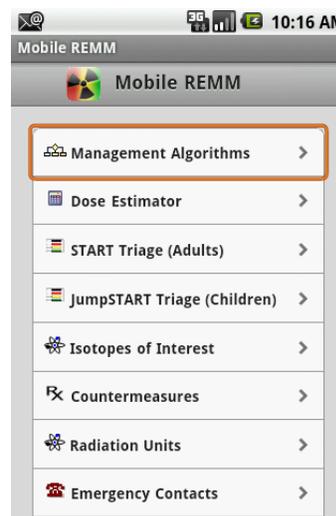


Figure 5-3. Mobile REMM Search

Image courtesy of NLM

5.6.2 Nuclear Tools

Nuclear tools provided by mobile apps include calculations of fireball radius, radiation fallout, decay levels over time, and the decrease in radioactivity over its half-life. Some nuclear tools calculate the total dose for each hour as a function of the distance from the source while others may calculate the gamma radiation dose.

5.6.3 Chemical Tools

Chemical tools provide a wide range of information on hazardous chemical substances, identification support, physical characteristics, human health information, and containment and suppression advice. Wireless Information System for Emergency Responders (WISER) is a mobile app developed by the National Library of Medicine (NLM) and has access to 460 substances from the Hazardous Substance Data Bank by NLM. This mobile app has radiological and biological detail information, integrates with Chemical Hazards Emergency Medical Management (CHEMM) content, and updates to the searchable version of ERG 2012.

5.6.4 Biological Tools

Biological tools provide the emergency responder with comprehensive information about protective clothing, respirators, exposure hazards, isolation zones, and first aid during biological threats. The WISER mobile app provides biological support that consists of a substance list and

data for the Category A biological agents, the highest priority agents that pose a risk to national security. These agents include anthrax, botulism, plague, smallpox, tularemia, viral hemorrhagic fevers, and arenaviruses.

5.6.5 Explosives Tools

Explosives tools can provide information that is helpful to emergency responders in an IED or homemade explosive (HME) incident. These tools can include powder factor, air blast prediction, ground vibration, unit conversions, and blast calculators.

As previously mentioned, the mobile app FiRST provides access to map-based IED standoff data, which is based on criteria set by the U.S. Department of Homeland Security (DHS) Office for Bombing Prevention. Some of the capabilities are: display of shelter-in-place zones; isolation and down-wind protection zones; roadblock analysis; calculation of distance to glass breakage, injury, and structural damage based upon bomb size; and retrieval of current wind direction.

Alluviam LLC's HazMasterG3[®] mobile app provides tactical decision support for threat identification and response. Capabilities include: identification of unknown threats whether chemical, radiation or IED/HME; calculation of standoff distances and blast effects; location of hidden labs; and calculation of improvised nuclear device stand-off distances, stay-times, and fatalities. HazMasterG3 is available for Apple iOS, Android, Blackberry, and Windows.

6. OPERATIONAL CONSIDERATIONS

Incorporating mobile apps into an agency's operations requires the adoption of new strategies, policies and procedures regarding communication and security of data transmission methods. U.S. government agencies and private industry organizations have developed guidelines and recommendations for mobile app use, as discussed below.

The U.S. Government's Chief Information Office Council (CIO Council) has developed a guide to assist agencies in establishing policies for defining a strategy for bring your own device (BYOD). This guide, *Government Use of Mobile Technology*, lists the top mobile policy challenges as mobile device management, properly vetting third-party mobile apps distributed through app stores, proper implementation and support for user authentication tools, and improved governance and standards.

BYOD is a policy gaining popularity in the private and government sectors that allows employees to use their own personal mobile devices to access the organization's information and applications. Many organizations are adopting this policy to promote employee productivity; however, it does introduce security and network concerns which should be addressed before implementation. The CIO Council produced the document *Bring Your Own Device Toolkit* as a guide for implementing Federal BYOD programs. It outlines key considerations from managing devices that contain different levels of data sensitivity, to security, privacy, and legal challenges. BYOD should fit the agency's environment, support mission requirements, and meet the needs of staff. A BYOD security policy should be implemented which provides detailed security requirements and procedures for each type of personal device that will be used in the workplace and connected to the network.

7. IMPLEMENTATION ISSUES

In order to implement a mobile app policy, it is important to understand how mobile apps may compromise user privacy, network security, and data integrity. The use of mobile apps in the workplace introduces new threats, vulnerabilities and risks to network security and data integrity. Organizations must understand how mobile apps work in order to build effective mobile use and access policies for their network. Mobile risk management products are available that analyze mobile apps, determine the associated risks to the network, and report how to best manage mobile app security.

Typically, when downloading a mobile app, the user is required to provide certain personal information and grant access to the information that resides on the mobile device. This may include phone and email contacts, call logs, internet browser data, device unique identification number, and location of the device. Some mobile apps may share this personal data regularly with other organizations.

Some mobile apps display a permission banner before the app is installed, indicating the information that will be accessed on the device. Users should thoroughly read the permissions and make sure they understand the risks involved prior to downloading the app. Organizations should determine if the security features offered with the mobile app support their agency's information security policies and protocols.

8. CONCLUSION

Mobile apps can provide emergency responders with information useful in assisting with decision-making during a HazMat/CBRNE incident. These mobile apps can be used during all phases of an incident starting with the preparedness phase, when responders and emergency managers develop plans and procedures, to the response phase, when users track the hazard and determine courses of action for the current and subsequent operational periods. While some mobile apps have been developed specifically for HazMat/CBRNE incidents, other mobile apps can provide capabilities useful to emergency responders regardless of the incident type.

Currently, there are no universally recognized standards and regulations governing mobile app development. However, best practices and guidelines that have been independently established by mobile app vendors and government agencies are a good source of reference.

Challenges such as lack of standards, security of information, and lack of agency policies and procedures apply to all mobile apps. Organizations should determine if the security features offered with the mobile app support their information security policies and protocols prior to authorizing their use.

9. REFERENCES

Internet research can be conducted to find more information on mobile apps available for the emergency responder. Below are some online mobile app reference sites, but it should be noted that these references may change as technology evolves.

Disaster Apps for Apple iOS is a community online discussion board that requests input from emergency responders on recommended mobile apps for the iPhone and iPad.

<http://ios-disasterapps.ideascale.com>.

Decisions [D4H]TM has a website that lists favorite iPhoneTM and Android mobile apps for fire and HazMat responders. <http://www.d4h.org/blog/post/20121017-Best-Phone-Apps-for-Fire-and-Hazmat-Responders>.

APCO International's Application Community (AppComm) website provides a list of public safety and emergency response related apps. <http://appcomm.org>.

Safety Awakenings, an online resource for the health and safety community, has published a page of safety apps. <http://www.safetyawakenings.com/apps>.

MissionMode, an emergency notification and incident management application provider, has published a list of the top 15 disaster and crisis apps for iPhone and iPad.

<http://blog.missionmode.com/blog/15-disaster-and-crisis-apps-for-iphone-and-ipad.html>.

HHS Disaster Information Management Research Center (DIMRC) provides online access to disaster mobile apps and mobile optimized web pages for mobile device users. Users can install apps on their mobile device or access the mobile web page from the site.

<http://sis.nlm.nih.gov/dimrc/disasterapps.html>.

USA.gov, the U.S. government's official web portal, offers a Mobile Apps Gallery for Apple iOS, Android and Blackberry apps. Users can install apps on their mobile device or access the mobile web page from the site. <http://apps.usa.gov>.

The Apple App Store contains apps developed specifically for Apple iOS.

<http://www.apple.com/iphone/from-the-app-store>.

Android Apps are available on the Google Play Shop for download.

<https://play.google.com/store/apps?hl=en>.

BlackBerry[®] World[™] is the storefront for mobile apps for BlackBerry.

<http://us.blackberry.com/apps/blackberry-world.html#tab-1>.

The Windows Phone app store contains mobile apps for Windows.

<http://www.windowsphone.com/en-us/store/overview>.