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First Responders Group
National Urban Security Technology Laboratory
New York, NY**



Test Report

First Responder Support Tools (FiRST) Sharing Service (FSS) Operational Field Assessment

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National Urban Security Technology Laboratory

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Executive Summary

On September 18, 2013, the National Urban Security Technology Laboratory (NUSTL) executed the Operational Field Assessment of the First Responder Support Tools (FiRST) Sharing Service (FSS) for the R-Tech program, a program that seeks to rapidly develop new technology solutions for first responders, in conjunction with the New York City Police Department (NYPD) at NUSTL in New York City.

The FSS is an extension of the FiRST application, which was developed by Applied Research Associates Inc. FiRST is a map-based tool used to help the first-on-the-scene responders coordinate response activities. FiRST is specifically designed to help responders handle incidents involving improvised explosive devices or hazardous materials incidents at the very critical moments before specialists can be brought to the scene. FSS is a suite of Web-based software tools that enhance the FiRST tool and allow information to be shared with other first responders who may need access to make more informed response decisions.

Overall, the NYPD participants found the FSS to be useful. It has the ability to positively augment the way first responders approach incidents; however, it was not a high-priority need for their agency. Currently the NYPD's standard operating procedures minimize the need for a technological solution to create safe zones for threats. The value added by the device is great but not high enough to warrant the necessary changes to current operating procedures and the cost of implementation. Participants provided feedback concerning methods of implementation, the graphical user interface, and features that may be incorporated into future iterations to make FSS more useful and marketable to other jurisdictions and agencies.

Table of Contents

1	Introduction	1
1.1	Purpose	1
1.2	Objectives.....	1
1.3	Requirements.....	1
1.4	System Description	2
2	Operational Field Assessment Design.....	4
2.1	Operational Field Assessment Event Design.....	4
2.1.1	Roles.....	4
2.2	Summary of Events	5
2.2.1	Local Application User Test	5
2.2.2	FSS Organization Administrator Test	5
2.2.3	Local Application User Test.....	5
2.2.4	vUSA Test	6
2.2.5	Local Application User Test.....	6
2.2.6	NNSA User Test	6
3	Data Analysis.....	6
3.1	Operational Scenario Survey.....	6
3.1.1	Data Analysis of Operational Scenario Survey	9
3.2	Operational Scenario Debrief	9
4	Results.....	9
4.1	Operational Scenario Survey Results	10
4.2	Operational Suitability Debrief and Feedback	12
4.2.1	Implementation	13
4.2.2	Features	13
4.2.3	Graphical User Interface	13
5	References	13
6	Definitions List.....	15

1 Introduction

The first responder community in the United States consists of approximately nine million personnel. At any time, this community can face unexpected improvised explosive device (IED) or hazardous material (HAZMAT) incidents, and their initial coordinated response is critical in minimizing impacts and maximizing safety.

The First Responder Support Support Tools (FiRST), sponsored by the Department of Homeland Security (DHS) Science and Technology Directorate (S&T), provides the first responder community a simple, easily accessible mobile tool to help plan for and respond to these incidents. The tool provides map-based information with the ability to query surrounding points of interest; calculate and display an optimal set of roadblocks necessary to isolate an area; annotate the map; and email the analysis results, including associated keyhole markup language files and map images.

In January 2013, DHS S&T awarded a contract to Applied Research Associates Inc. (ARA) to extend the functionality of the FiRST application to become a networked application with the ability to share incident information through multiple services, including external emergency response systems and other FiRST applications.

On September 18, 2013, the National Urban Security Technology Laboratory (NUSTL) executed the Operational Field Assessment (OFA) of the FiRST Sharing Service (FSS) for S&T in conjunction with the New York City Police Department (NYPD) at NUSTL in New York City.

1.1 Purpose

The purpose of the OFA was to gauge the suitability of the FSS in its current state to determine its ability to serve the first responder community.

1.2 Objectives

The objective was to conduct a realistic operational scenario with trained first responders utilizing the FSS to assess and evaluate its suitability.

1.3 Requirements

A formal Operational Requirements Document is not associated with this project. The informal guiding requirements for this project are derived from the Statement of Work by the vendor, ARA. ARA identified the following Four project goals were identified by ARA to extend the FiRST's functionality to become a shared service application. They are as follows:

1. Allow FiRST users to send incident details such that other FiRST users or external systems such as Virtual USA (vUSA) may ingest those details and view or interact with the same information. Registration keys are provided that unlock the necessary administrative rights so only users deemed appropriate can send incident details.
2. Provide an IED and HAZMAT widget for the ArcGIS Flex Viewer that allows Flex Viewer users to place incidents, display damage and standoff contours, and share results with other FiRST users.
3. Provide a roadblock analysis capability that allows defining of circular or polygonal areas to isolate and retrieve an optimal set of roadblocks via Web service.
4. Incorporate improvised nuclear device and radiological dispersal device (RDD) incident capabilities geared toward federal teams associated with the National Nuclear Security

Administration (NNSA). This functionality will provide simple tools and capabilities to share sensor-reading results with NNSA operational centers.

The prototype system was evaluated for its ability to meet these four project goals, and its suitability in first responder operations.

1.4 System Description

The FSS is not a single product but a suite of products working together. It primarily leverages the FiRST application. FiRST provides map-based information directly to responders on their laptop computers and smartphones. The FiRST application can be installed on Android- and iOS-based mobile devices, as well as on PC platforms.



Figure 1 – FiRST application on an iPhone (left) and Android device (right)

The application provides information about safe standoff distances, damage and injury contours, nearby areas of concern (e.g., schools, daycare centers), and suggested roadblocks to isolate the area. IED standoff data is based on the "FEMA 426 Reference Manual to Mitigate Potential Terrorist Attacks Against Buildings" (2003). This IED standoff data is restricted to validated users, which include users with a .gov, .mil, or .us email address.

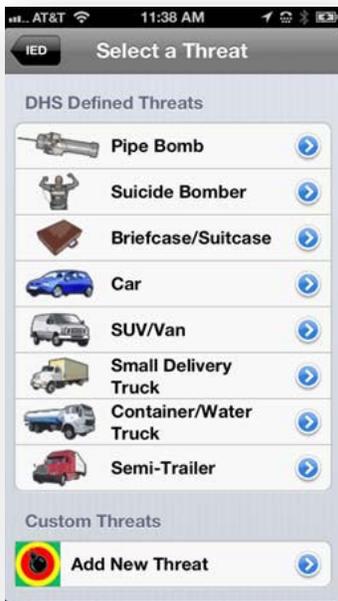


Figure 2 – IED menu of FiRST on an iPhone

FiRST draws on information from other products such as the “HAZMAT Evac” application, the 2012 Emergency Response Guidebook, and weather network services such as those provided by National Oceanic and Atmospheric Administration. FiRST provides standoff data for HAZMAT spills and reference information, guidelines, and critical contact information relevant for IED and HAZMAT incidents.

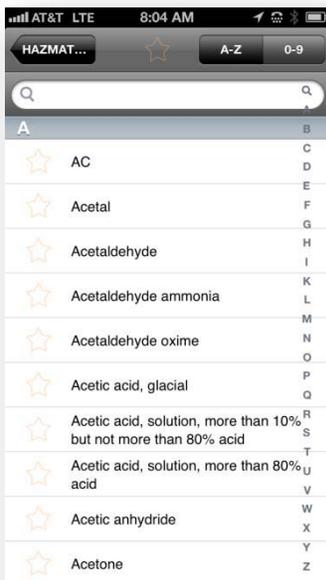


Figure 3 – HAZMAT menu of FiRST on an iPhone



Figure 4 – HAZMAT summary menu of FiRST on an iPhone

FiRST requires minimal to no training and, because it is available on mobile devices, it is accessible anywhere. Users can save images of the maps for later reference and distribute incident details (including map images and attachments) via email or by alerts that are pushed to users in associated groups with the FiRST application. This information can also be shared with external systems such as vUSA. vUSA is an online service that allows agencies to share map-based information with other first responder and emergency management agencies and jurisdictions.

2 Operational Field Assessment Design

This section provides an overview of the assessment and discusses major deviations from the “Operational Field Assessment Plan for First Responder Incident Tool (FiRST) Sharing Service (FSS).” Full assessment planning details can be found in the referenced document.

2.1 Operational Field Assessment Event Design

The FSS consists of multiple platforms and multiple roles, each with different sets of functionality. To address the various platforms and roles, the assessment was broken into four phases:

1. Local Application User Test
2. FSS Organization Administrator Test
3. vUSA User Test
4. NNSA User Test

2.1.1 Roles

FSS is designed to support four different roles, each with its own set of goals, permissions, and functions that were explored during this assessment.

1. FiRST Application User/Local Application User – These users utilize either the mobile or PC-based FiRST application. Typical users are first responders working operations in the field who are reporting for or responding to an incident. Each of these users has a FiRST User ID. They can belong to an organization that has already been registered in FSS (for this test, they were already registered); however, registration is not required to use the FiRST Application and share information.
2. Organizational Administrator (OA) – An OA is a representative of a first responder agency who is tasked with establishing administrative controls over FiRST accounts. OAs request that users accept their administration or permit local application users to make a request to fall under their administration. This, in essence, creates organizational groups within the FiRST system. The OA defines individual user read and write access to FSS, organizational and user alerting profiles, and any external system access to organizational data.
3. FSS Administrator – The FSS administrator creates and establishes OA accounts upon request. An ARA administrator fulfills this action when an organization subscription is established.
4. External System Administrator – The external system administrator communicates with the FSS administrator and OA to establish data access from FSS to an external system. The external system administrator may also communicate with the OA to help establish specific organization permissions.

2.2 Summary of Events

On September 18, 2013, two sergeants from the NYPD Science and Technology Group arrived at NUSTL's facilities to participate in the OFA of the FSS. Program Manager Christine Lee (DHS S&T) and Principal Investigator Carl Jerrett, Ph.D. (ARA) joined the group at NUSTL via teleconference.

2.2.1 Local Application User Test

The assessment began with the basic functions of the FiRST application on the Android OS and iOS mobile devices. Due to the participants' lack of access to their email accounts, both devices were registered to Test Director Bhargav Patel. The participants were asked to simulate the placement of an IED. They explored features such as the points of interest (POIs) and roadblock analysis. The participants then moved on to simulating the placement of a HAZMAT incident. Favorable comments were provided on the weather feature, which provides real-time information.

While using the mobile devices, participants were instructed to attempt to join an organization entitled "FSSTO;" however, due to technical issues at the time, that organization was locked. Participants were then instructed to join another organization entitled "LocalPD," which worked.

2.2.2 FSS Organization Administrator Test

The participants were then shown the OA webpage, which is accessed via www.firstsupporttools.com. They saw how an FSS administrator could set permissions, invite participants, and manage an organization that is set up to share information. There were no issues in its use, and participants reiterated the importance and appreciation of permission controls.

2.2.3 Local Application User Test

Once organization affiliations were established, participants were asked to use the new sharing feature to share IED incidents created on the mobile devices. A few problems arose. First, the iOS device was unable to complete this action on its first attempt. The participant received an error message. The vendor believed that the error stemmed from one of the layers of information (e.g., annotations,

roadblocks) that the participant was attempting to send. The iOS device was able to share an event with only roadblock information but no other layers, such as POIs or annotations. Another local application user issue was observed when the participant tried to send incident data with an attached photo. The entire application closed out when this was attempted. When the application was reopened, all incident data was lost and a new IED incident was created. During this iteration, the participant attempted to attach a pre-existing photo instead of taking a new one; however, doing this prevented the user from being able to share the incident. Only after the user removed the photo and shared only roadblock information was he able to share the incident; even then, once it was shared, the user was kicked out of the application again.

2.2.4 vUSA Test

Next, participants accessed the Flex Viewer Widget, an online portal that allows the user to input streams of map-based layers and data from other sources onto a Web-based version of FiRST via the Internet.

The Flex Viewer Widget provided participants access to view feeds that were available on the vUSA platform. Participants were informed that the Flex Viewer Widget is not capable of sharing information with the sharing service. They commented that the Web-based software was quick and easy to use.

2.2.5 Local Application User Test

The test team ran into a licensing issue while attempting to run the PC-based FiRST software, causing a minor delay. Once it was functioning, however, the participants found it similar to the mobile applications. Participants experienced a small learning curve of three to four minutes in finding all the necessary options. Participants stated that the PC application seemed more useful than the mobile application based on their concept of operations. Incident commanders would likely use this tool on a laptop to aid pre-established procedures on setting up evacuation and safety standoff areas. An issue arose when attempting to add POIs to the display. No POIs showed up on the map, even when all available options (e.g., hospitals, police stations, and schools) were set to display. The users also found the use of the roadblock analysis tool confusing on the PC-based software since it was more difficult to find and read.

2.2.6 NNSA User Test

In this final test, participants used the NNSA feature on the mobile application. There were no comments on its usability. Participants noted that this was a feature that they would probably not use due to pre-established procedures and groups for dealing with threats of radioactive or nuclear devices. NYPD first responders are directed to escalate these situations to specially trained groups and do not see the utility of these features changing their procedures.

3 Data Analysis

This section includes data collection methods, forms, and methods of analysis. Facilitators collected data using the following questionnaires and the test director took notes. This information was then processed and included in this OFA report.

3.1 Operational Scenario Survey

After the completion of the full mission, profile users filled out the following short survey (see table 1).

Table 1 – Operational Scenario Survey

Questions/Response	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Pre-Mission					
I read and understood the Operational Field Assessment Plan before this exercise began					
I had a thorough understanding of the prototype under test before this exercise began					
PC and Mobile Application					
Operating the application (PC/Mobile) was easy and intuitive					
Registering for the IED information was intuitive and timely					
Placing an incident is easy and intuitive					
Preselected Points of Interest are relevant					
Conducting a roadblock analysis is easy and intuitive					
Placing annotations was easy and intuitive					
When placing a HAZMAT incident, updating the incident to account for weather was easy to do					
Sharing an incident through the Shared Service menu was easy and intuitive					
Receiving shared incidents from members of my organization was easy and intuitive					
FSS Organizational Admin					
Receiving an OA account was an easy and intuitive process					

Questions/Response	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Approving a pending user request was an easy and intuitive process					
Sending out invites to potential organization members was easy and intuitive					
Reviewing accounts and setting permissions was easy and intuitive					
Creating an additional FSS Admin account was easy and intuitive					
Flex Viewer with vUSA					
Finding the FSS Test Library was easy and intuitive					
Locating and viewing shared incidents was easy and intuitive					
Using the FiRST Flex Widget to create an IED event with damage contours was easy and intuitive					
Running a roadblock analysis with the FiRST Flex Widget was easy and intuitive					
Moving an incident in the FiRST Flex Widget after it has already been placed is easy and intuitive					
Placing a HAZMAT incident is easy and intuitive using the FiRST Flex Widget					
NNSA/RDD					
Requesting and receiving access to this functionality was easy, intuitive, and timely					
Submitting an RDD event was easy and intuitive					
Attaching a file from my mobile device to submit was easy and intuitive					

Questions/Response	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Attaching a photo to my submission was easy and intuitive					
I received an event number from NNSA in a timely manner					
Submitting an RDD addendum was easy and intuitive					

3.1.1 Data Analysis of Operational Scenario Survey

The Operational Scenario Survey is written in the form of a Likert Scale. The responses were assigned a value from 1 (strongly disagree) to 5 (strongly agree). All questions are written in the affirmative such that a higher score corresponds to a more positive experience with the prototype.

We used the following scale:

- 1 = Strongly Disagree
- 2 = Disagree
- 3 = Neutral
- 4 = Agree
- 5 = Strongly Agree

3.2 Operational Scenario Debrief

After completing the mission, survey participants were debriefed. The test director and data collector led a conversation to gain a better understanding of the suitability of the FSS, deficiencies, efficiencies, and possible improvements. Participants were asked questions such as:

- What did you like about the FSS?
- What did you not like about the FSS?
- What changes would you make to it?
- Would you buy this for your team?
- Is it something that you would actively use if you had it?
- Do you foresee any issues using the FSS for other tasks or missions?

The point of this informal method was to engage the users and promote the type of conversation that leads to feedback that might not be easily gained from the survey.

4 Results

This section discusses the results of the OFA. It includes observations made by participants and the test team, feedback from participants about the system's operational suitability, and the results of the Operational Scenario Survey. This project does not have an Operational Requirements Document, so requirements compliance information does not exist. The results of this section are not an endorsement or rejection of the product or vendor. The goals are to:

- Provide an objective understanding of how first responders interacted with the software
- Determine ways to improve the software,
- Identify other means of filling the capability gap

4.1 Operational Scenario Survey Results

Table 2 illustrates the results of the Operational Scenario Survey in a color-coded format. There were only two participants for this assessment, and thus, green boxes indicate areas where the two participants agreed and red indicates areas where they differed. The column to the far right indicates the average score based on the Likert Scale for the question. It features a traffic light color-coding scheme where shades of green represent positive responses (darker means more positive) and shades of red represent negative responses (darker means more negative) on the Likert Scale discussed earlier.

* indicates areas where the two participants agreed

** indicates areas where they differed

Table 2 – Operational Scenario Survey Results

Questions/Response	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Average Score
Pre-Mission						
I read and understood the Operational Field Assessment Plan before this exercise began		1**	1**			3.5
I had a thorough understanding of the prototype under test before this exercise began			1**	1**		2.5
PC and Mobile Application						
Operating the application (PC/Mobile) was easy and intuitive		2*				4
Registering for the IED information was intuitive and timely		2*				4
Placing an incident is easy and intuitive	1**	1**				4.5
Preselected Points of Interest are relevant		2*				4
Conducting a roadblock analysis is easy and intuitive		2*				4
Placing annotations was easy and intuitive		1**		1**		3

Questions/Response	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Average Score
When placing a HAZMAT incident, updating the incident to account for weather was easy to do		2*				4
Sharing an incident through the Shared Service menu was easy and intuitive		2*				4
Receiving shared incidents from members of my organization was easy and intuitive		1**		1**		3
FSS Organizational Admin						
Receiving an OA account was an easy and intuitive process		1**	1**			3.5
Approving a pending user request was an easy and intuitive process		1**	1**			3.5
Sending out invites to potential organization members was easy and intuitive			2*			3
Reviewing accounts and setting permissions was easy and intuitive		2*				4
Creating an additional FSS Admin account was easy and intuitive		1**	1**			3.5
Flex Viewer with vUSA						
Finding the FSS Test Library was easy and intuitive		2*				4
Locating and viewing shared incidents was easy and intuitive		2*				4
Using the FiRST Flex Widget to create an IED event with damage contours was easy and intuitive	1**	1**				4.5

Questions/Response	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Average Score
Running a roadblock analysis with the FiRST Flex Widget was easy and intuitive		2*				4
Moving an incident in the FiRST Flex Widget after it has already been placed is easy and intuitive		1**	1**			3.5
Placing a HAZMAT incident is easy and intuitive using the FiRST Flex Widget		2*				4
NNSA/RDD						
Requesting and receiving access to this functionality was easy, intuitive, and timely		1**		1**		3
Submitting an RDD event was easy and intuitive		1**		1**		3
Attaching a file from my mobile device to submit was easy and intuitive		1**		1**		3
Attaching a photo to my submission was easy and intuitive		2*				4
I received an event number from NNSA in a timely manner			2*			3
Submitting an RDD addendum was easy and intuitive			2*			3

On a scale of 1 to 5, the FSS received an overall average score of 3.6, which indicates a response that is slightly above neutral, trending toward positive. It is worth noting that these results are based only on the response of two participants from the NYPD, we were unable to secure more first responders due to other commitments. The following section provides qualitative context on what the participants thought about this prototype software.

4.2 Operational Suitability Debrief and Feedback

The test team collected feedback from the NYPD participants during the assessment and at the end during an informal discussion. Their feedback and comments can be neatly broken down into three main categories: implementation, features, and graphical user interface.

4.2.1 Implementation

- The participants envision that this software and suite of tools would most likely be used by incident commanders and duty captains to help them augment in-place procedures and make better decisions. They do not see the tool being used to alter or dictate current procedures.
- Formal training would be required for any user of this suite of tools. Despite the software being designed to be intuitive, participants stated that training is a must if this were to be used under the pressures of a real incident.
- Predefined groups within an organization should exist in the software to make it easier to control the permission for large groups vice individual accounts.
- Participants expressed concerns regarding the use of the 4G wireless data network as a means of communication as it has a propensity to be unreliable during large-scale incidents or disasters.
- Participants preferred the Flex Viewer user interface; however, the inability of it to share information with other FSS users limits its desire for use.

4.2.2 Features

- First responder participants would like to see a default “Incident Command Post” location button (potentially as a POI option) to more efficiently place the incident command post on the map.
- Participants were very pleased with the ability to incorporate real-time weather data when analyzing a HAZMAT incident.

4.2.3 Graphical User Interface

- The map crosshairs were difficult to view on the Android application.
- Participants would prefer to have the contour shading on as default.
- Participants experienced difficulty accurately placing an annotation or moving an incident on the iOS application.
- Participants noted difficulty in finding the legend for the POIs.

Overall, the NYPD participants found the application to be useful. It has the ability to positively augment the way first responders approach incidents; however, it was not a high-priority need for their agency. Currently the NYPD’s standard operating procedures minimize the need for a technological solution to create safe zones for threats. The value added by the device is great but not high enough to warrant the necessary changes to current operating procedures and the cost of implementation.

5 References

Statement of Work, First Responder Support Tools (FiRST) Sharing Service, Applied Research Associates Inc., December 2012.

Operational Field Assessment Plan for First Responder Incident Tool (FiRST) Sharing Service (FSS), DHS S&T, October 2013.

Dr. Joseph J. Collins, Training America's Emergency Responders: A Report on the Department of Justice's Center for Domestic Preparedness and the U.S. Public Health Service's Noble Training Center. Fort McClellan, Anniston, Alabama, Center for Strategic and International Studies, July 2000.

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6 Definitions List

ARA	-	Applied Research Associates Inc.
DHS	-	Department of Homeland Security
FIRST	-	First Responder Support Tools
FSS	-	FiRST Sharing Service
HAZMAT	-	Hazardous Material
IED	-	Improvised Explosive Device
NNSA	-	National Nuclear Security Administration
NUSTL	-	National Urban Security Technology Laboratory
NYPD	-	New York City Police Department
OA	-	Organizational Administrator
OFA	-	Operational Field Assessment
POI	-	Point of Interest
RDD	-	Radiological Dispersal Device
S&T	-	Science and Technology Directorate
vUSA	-	Virtual USA