Wireless Internet Information System for Medical Response in Disasters (WIISARD)

Leslie Lenert1,2, MD, Theodore C. Chan2, MD, William Griswold1, PhD, James Killeen2, MD, Douglas Palmer1, PhD, David Kirsh1, PhD, Rajesh Mishra1, MS, and Ramesh Rao1, PhD,

1California Institute for Telecommunications and Information Technology and 2University of California San Diego School of Medicine

Abstract:
The Wireless Internet Information System for Medical Response in Disasters (WIISARD) explores the use of scalable wireless networks to facilitate medical care at the site of a disaster. The focus of the project is care of victims of industrial accidents or terrorist attacks with traumatic injuries complicated by chemical, biological or radiological contamination. We report on developments of new architectures for mesh networks, RFID tracking and telemetry, mobile collaborative work, and command and control informed by deployments in large-scale exercises with the San Diego Regional Metropolitan Medical Strike Team.

The objective of the Wireless Internet Information System for Medical Response in Disasters (WIISARD) project is to apply scalable wireless Internet technologies to address life-threatening problems that occur at the site of a natural disaster or an act of terrorism. The care of victims of mass casualty events poses a number of challenges, particularly when the cause of the casualties is a radioactive substance, toxic agent, or a chemical weapon. In such circumstances, first responders in special protective gear must locate, assess, and then transport victims to a decontamination station while avoiding threats from the environment and secondary devices or other hazards such as snipes if terrorism is involved. After decontamination, victims are reassessed, initially treated, and transported to hospitals for definitive care. Potential problems for first responders may arise due to wind shifts altering plumes of chemical or radioactive substances, victims who leave the scene prior to decontamination, difficulties with queue management for treatment, difficulties managing resources and manpower, and difficulties with tracking of victims and communication of medical data from the scene.

The WIISARD system addresses these issues by means of an integrate information system with networking, middleware, radio frequency identification tracking, handheld and tablet systems, and a command center system. The WIISARD system has been deployed and field tested in disaster drills with the Metropolitan Medical Strike Team for the San Diego Region—an integrated FEMA supported regional team with Law enforcement offices, hazardous materials specialist, medical personnel, fire-fighters and public health officers. The most recent test of the system was during an exercise at the Del Mar Fairground in San Diego County with over 1000 participating first responders. During this exercise the WIISARD team deployed an 802.11 MESH network over an area more than a kilometer wide with 18 nodes. We also fielded 40 802.11 electronic triage tags created for the project and had first responder use those tags, in chemicals weapons gear to assign triage status in the hot zone. We also equipped first responder teams outside the hot zone with 10 handheld computers for recording triage information and medication administration (using integrated barcode scanners). Four tablet computers were deployed to help area managers coordinate triage, treatment and transport activities. A prototype command center system reported victim counts, severity, and locations. Systems were linked by middleware with using publish and subscribe mechanisms combined remote object model design to maximize functionality in settings with partially disconnected communications.

Another large-scale exercise testing WIISARD is planned for August of 2006. In this exercise, we will test new middleware, wireless pulse oximeters, medical data storage on triage tags, and offsite communications with tools to help hospitals better coordinate their response with the disaster site. We also will test alerting mechanisms developed to protect providers and inform them of changes in patients status. Detailed measurements of qualitative and quantitative evaluation of the impact of WIISARD on field care processes are also planned.

During the demonstration, we will deploy a WIISARD network, triage members of the audience using WiFi triage tags, enter physical examination data and record treatments using handheld computers and display cumulative data “casualties” using the command center system. We will describe WIISARD components, and the latest results from testing.

Acknowledgements: This work was supported by contract N01-LM-3-3511 from the National Library of Medicine.