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Detect-to-Warn SNIFFER, Ready to Save Lives

High-profile public events can be odorous affairs—accompanied by the aromas of auto emissions, cigarette smoke, popcorn, hot dogs, and hamburgers. Even so, the Department of Homeland Security (DHS) needed a threat-mitigation system to quickly distinguish between background chemicals present at public events vs. a terrorist release of toxins intended to cause harm. Applying world-class chemical/biological detection capabilities, Sandia National Laboratories met the challenge and developed SNIFFER: Sensing Nodes Informing and Facilitating Fast Emergency Response. SNIFFER provides swift, broad, high-confidence detection of more than 40 chemicals by using multiple overlapping detection technologies.

In addition to chemical-warfare agents, SNIFFER also detects toxic industrial chemicals. Its technology platform can be easily adapted to accept other types of detectors for use against weapons of mass destruction threats. Bottom line: This portable detect-to-warn system alerts emergency responders to a release of toxins early on and enables timely response to minimize casualties.

The current system contains 12 nodes, each with 8 chemical detectors on board using different technologies. SNIFFER offers redundant wireless communications for transmitting and receiving data to a central command station. The SNIFFER also has a satellite that enables remote system monitoring from anywhere via the Internet.

By using multiple orthogonal technologies, SNIFFER avoids over-reliance on a single detector. During a special event, SNIFFER nodes are deployed throughout a venue—both indoors and outdoors—taking into account threat scenarios, wind trajectories, and other environmental variables. As a tamper-proof system, it incorporates video-surveillance cameras to confirm findings and monitor illicit attempts to alter system components.

A sophisticated system, SNIFFER can be packaged and set up at a venue within a day's notice, without sacrificing robustness or any required features.

Sandia's Challenge

In designing and testing SNIFFER for DHS, a major obstacle was preventing false positives from background "noise" present in or near a large venue. For example, in tests conducted at McAfee Coliseum in Oakland, Calif., the detector had to differentiate between test releases (of non-hazardous chemicals) vs. food, perfumes, cleaning agents, and other odors, said Steve Orth, SNIFFER project principal investigator at Livermore, Calif. A chemical "has to hit on two different technologies" to register as a positive detection with the system, said Orth. Indoor spaces that concentrate smells and chemicals also can trig-

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ger false positives from the presence of items such as floor wax and cleansers.

Using commercial-off-the-shelf hardware, Sandia experts incorporated multiple different detection platforms in each of the 12 nodes. This orthological capability was designed into SNIFFER to mitigate false positives.

Benefits

As a DHS tool to protect dignitaries and large gatherings at special events, SNIFFER can be packaged and deployed nationwide in 24 hours. The orthogonal capability identifies chemical-weapon agents and toxic industrial chemicals, while minimizing against false positives.

Along with offering the benefits of early detection and warning, SNIFFER can provide continuous monitoring of contaminated zones after an attack has occurred. A Command Center can make recommendations for emergency responses based on current detector readings. For example, if a contaminant plume had reached a particular exit, a Command Center using SNIFFER could give first responders information to guide a safe evacuation via alternate routes.

Applications

SNIFFER is already protecting crowds at large events. In 2005, it was tested at the San Francisco International Airport. During 10 baseball games the following year with the Oakland A's at McAfee Coliseum in Calif. it was deployed. These tests verified that the technology indeed can save lives in the event of a terrorist attack. The technology was further tested in 2006 against 57 real chemical releases at the Nevada Test Site, a massive outdoor laboratory and national experimental center. After the Nevada testing, SNIFFER officially became an asset for the Department of Homeland Security. In 2007 SNIFFER was deployed in California at the Rose Bowl Stadium in Pasadena and the HP Pavilion in San Jose for two hockey games and arena football. During 2008, it was deployed at the Rose Bowl, the Super Bowl in Glendale, Ariz.; and the Democratic National Convention in Denver, Colo.

Making a Difference

The goal over the next few years is to build a network of chemical sensors (requiring little attention) able to detect dangerous chemicals to quickly warn venue operators or high-profile targets to activate emergency response measures. Although SNIFFER has been tested at individual events, it may be installed permanently in the future at locations thought to be high-risk terrorist targets.

Learn more at: http://www.sandia.gov/mission/homeland/index.html

For more information contact:
Steve Orth
Advanced Systems Engineering and Deployment
925.294.3303
sporth@sandia.gov

Sandia National Laboratories
P.O. Box 969
Livermore, CA 94551

www.sandia.gov