

Hybrid Emergency Radiation Detection Network: Minimize radiation risks after an attack

"We wanted to create a rapidly deployed, affordable system that first responders can use to quickly identify and monitor dangerous areas after a radiological attack or accident."

*Ronald Kyker, project engineer
Sandia National Laboratories*

Context

In an attack or accident that involves the release of radioactive material, first responders need to know where radiation levels are high to guide rescue and recovery strategies. Existing centralized systems are too expensive to densely cover large affected areas and may not be able to communicate in urban environments.

Solution

Recognizing the need for a system that could overcome technical, power, and cost challenges, researchers at Sandia National Laboratories developed the Hybrid Emergency Radiation Detection (HERD) Network.

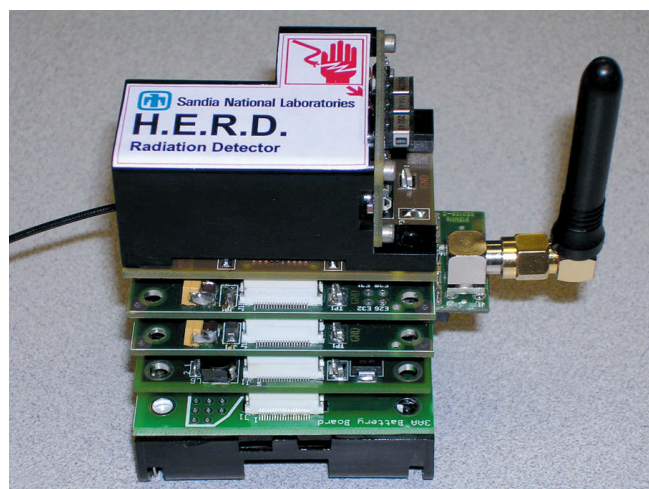
This network consists of about 40 small-sized (2-inch by 2-inch), low-cost radiation sensors that can be rapidly scattered throughout a wide area. Thanks to wireless mesh routing protocols that provide dense

coverage and reliable communications, each sensor can communicate with other nearby sensors and with a central computer.

The sensors rapidly deliver radiation counts for the immediate area back to a central computer, which maps radiation levels on a geographical-based display, alerting local authorities of current radiation levels and hot spots. Thus warned, first responders can take appropriate action to save lives and begin recovery operations.

Benefits

As its prime benefit, this system gives first responders information on radiation levels prior to entering an area after a nuclear incident.



The small size of each HERD sensor helps reduce cost and decrease power demand

In addition, this system offers a number of unique features that make it a practical, flexible solution for a wide array of potential users:

- Researchers developed a low-power wireless routing layer, which intelligently manages wireless communications and provides high reponsiveness. Its low power demand makes the system much smaller and more economical than otherwise possible.
- The sensor network is self-assembling and self-configuring—which means that regardless of where an individual sensor is placed, it will be able to communicate with other nearby sensors and with a remote central computer.
- The system is highly modular, allowing for low-cost changeout or replacement of components. For example, new sensors, alternate wireless communications options, or more advanced technology can be added as available or appropriate.
- The sensors support a wide variety of battery options, such as off-the-shelf AA batteries, making battery replacement easy and affordable.
- The entire system is available at low cost—within a price range practical for cities, facility operators, and other groups that might benefit from its capabilities.

Applications

The HERD network is ideal for municipalities; large public facilities, such as sports arenas or convention centers; and facilities that provide basic services, such as power plants or water treatment centers. It could also be deployed to help protect troops during conflicts.

Status

The project team has advanced HERD to the second prototype stage and conducted successful field tests. Next steps are to connect the network to a spectrometer to allow identification of the type of radiation detected, as well as to dosimeters attached to first responders to keep exposures under check. Sandia is currently seeking partners to take HERD through these next development steps and commercialization.