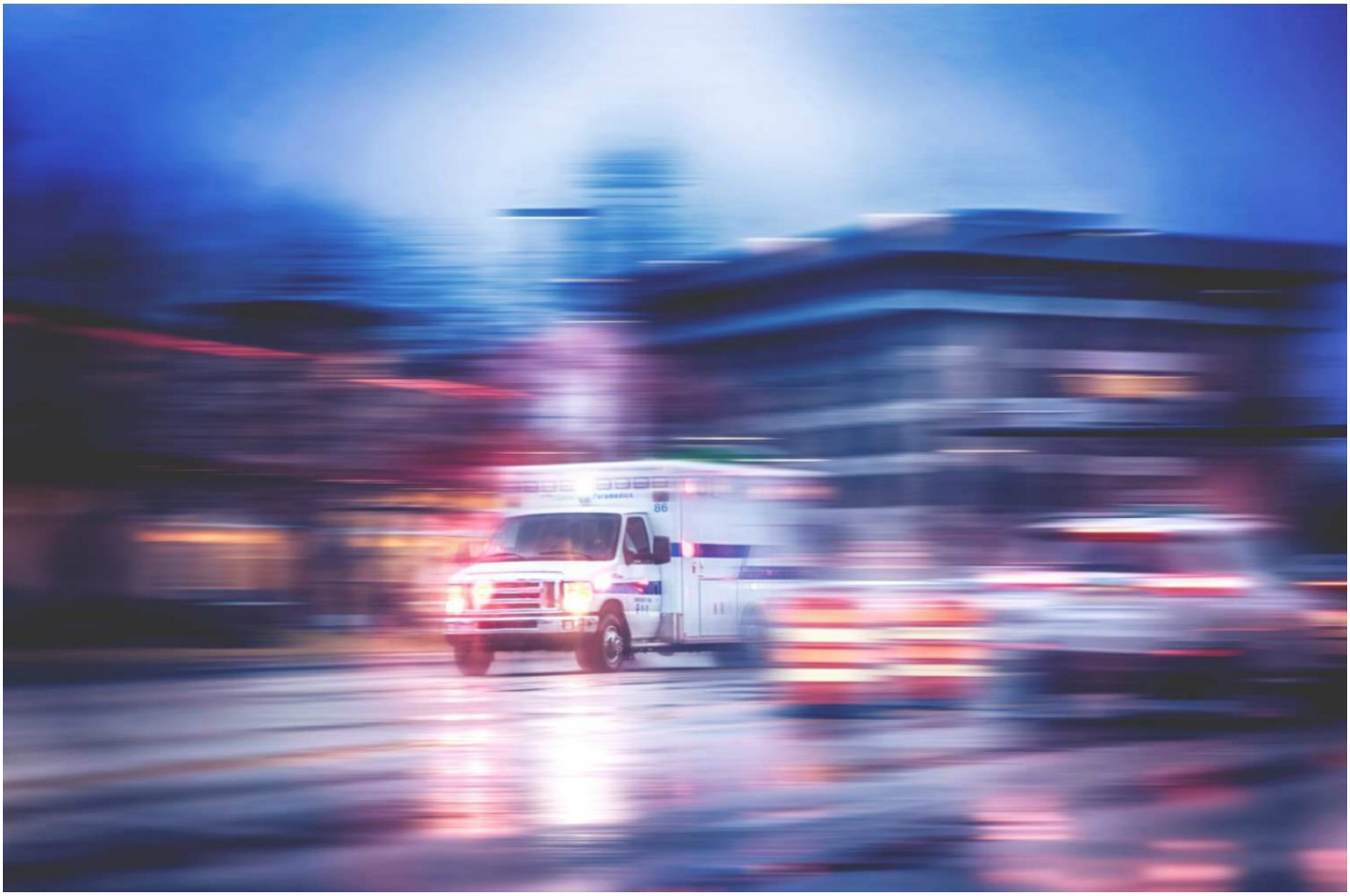
Rapid Deployment, Broadband Communications System Developed For Disaster Recovery

Purdue Research Foundation
Purdue University



When the winds scream, the earth shakes and the tsunami moves inland, communications systems typically are among the first casualties. Yet communications are critically in demand when disaster strikes — initially to summon help and coordinate first responders. Then, as rescue efforts kick into high gear, broadband communications links are needed to handle a torrent of information: requests for equipment and personnel, detailed situation reports, lists of casualties, streaming video and so forth.

It's a conundrum: How do you get broadband communications up and running in a disaster situation when they've just been wiped out?

Thanks to a chance remark at a meeting at Purdue University, a company in Indianapolis, Ind., has the answer.

> *Now, when disaster strikes — such as tsunami, earthquake or hurricane — rapidly deployable BATS systems offer new hope for responding to those in peril and in need faster and better than ever before.*

Mind What You Say, an Invention Might Happen

In 2005, Professor Lonnie Bentley in the Department of Computer and Information Technology at Purdue University was collaborating on a project with Anthony Smith, also a professor in the same department. At a project meeting, Smith arrived late complaining about an unrelated topic: "I just spent five hours on a tower trying to aim a microwave broadband antenna. There has got to be a better way!"

Bentley said, "Can't you automate that?" Smith replied, "I think maybe I can." Bentley considered this for a moment, then said, "Do you want to scrap the other project and work together on this instead?" Smith agreed and began explaining why aiming broadband wireless antennas is so difficult. And with that, an idea, a collaboration and, ultimately, a company was born.

The heart of the problem is twofold. First, broadband wireless systems generally employ a unidirectional antenna at each end to establish a communication link. Each station's antenna must be accurately aimed at the other station's antenna for the broadband link to work properly.

Second, at the microwave frequencies at which broadband wireless systems operate, the beam width of unidirectional antennas is incredibly narrow, on the order of .4 degrees. It can be like aiming a laser at a target antenna that may be 35 miles away and only 2 feet to 3 feet in diameter. Until now, aiming the antenna required climbing the antenna tower and manually adjusting it, a time-consuming and frustrating procedure.

Further, current technology is vulnerable to failure. Because the beam width is so narrow, it doesn't take much — high wind, an aftershock — to move the antennas out of alignment and break the communications link, which requires another manual antenna alignment procedure.

The Light Bulb Comes On

Bentley and Smith, working with Michael Kane, Ph.D., and Raymond Hansen did, indeed, come up with a better idea. "With funding from the state of Indiana, we automated the system," Bentley says. "We created a computer algorithm that automatically aims the antenna for optimal communications. It controls the antenna rotation and tilt while measuring signal strength and other factors to determine when the antenna is properly aimed."

The system is not only automated, it's incredibly fast. Bentley says, "Typically, it takes half a day to manually align an antenna. Our system routinely locates the target and connects in less than a minute."

By 2008, they wanted to start a company.

Licensing the Technology

The new antenna-aiming technology was licensed exclusively by the Purdue Research Foundation to a new venture spinoff: Broadband Antenna Tracking Systems Inc. (BATS). "Purdue University has a long and excellent history of tech transfer," says Hilton Turner, project manager, Office of Technology Commercialization, Purdue University Foundation. "Senator Birch Bayh, of the Bayh-Dole Act, is a Purdue University graduate. Right now, we have 67 faculty members who are directly involved with startup companies."

In keeping with Purdue's policy of encouraging spinoffs, the actual licensing process took about 30 days. The Purdue Research Foundation filed a provisional patent application, the inventors obtained permission from Purdue to engage in an outside activity, the company was incorporated and the technology license was granted. "It was easy," Turner says. "All the participants knew what they wanted to do, and this was their opportunity to do it."

Triple-Digit Growth

BATS hit the ground running and has been expanding quickly ever since. "We incorporated in March 2008, and had our first sale in June," says Bob Peterson, CEO of BATS. "Our first customer wanted us to establish the broadband link in less than an hour, as a condition of the sale. We obtained the signal and optimized it in 45 seconds. The next question from the customer was: 'How fast can we get it?' And it's been like that ever since."

BATS sales rose 500 percent from 2009 to 2010, and Peterson expects sales to double again in 2011. The company, which became profitable in 2010, now has stock integrated hardware and software systems available for most of the major radio brands and distributors and value-added resellers to cover much of the world. "We give vendors something new to sell theircustomers, an enabling technology. When customers see whatit can do, the checkbooks come out," Peterson says.

Powerful Capabilities

Beyond its speed, the strength of the BATS antenna aiming system is that it automatically seeks the best signal quality, regardless of the source. Because microwave signals can bounce off objects and behave in unexpected ways, this can lead to unusual solutions to problems. An oil refinery wanted to establish a temporary secure network during a shutdown for maintenance and overhaul. Numerous storage tanks dot the landscape, making line-of-sight communication difficult. A BATS system quickly found the highest quality signal path could be achieved by bouncing the signal off a storage tank. "It would have taken human operators a week to find that communications path, if they found it at all," Peterson says.

In another instance, at the 2010 G-20 Toronto Summit, a BATS system provided secure and flexible broadband communications between a mobile command post and a fixed unit on the top of the U.S. delegates' hotel. The BATS system, which performed flawlessly throughout the conference, eliminated the need to re-aim the antennas whenever the mobile command post was deployed or moved.

More Tricks up BATS' Technological Sleeve

Not content merely to offer the fastest broadband antenna aiming system, the technical team at BATS continued to refine the system until it could provide broadband communications with a mobile target by tracking it as it moved. "We did the first ever ship-to-shore high-speed wireless communication where the ship was in motion," Peterson says.

Recently BATS systems permitted an entire fleet to stay in broadband communication while under way, and BATS technology enabled vessel-to-vessel broadband communications for greater efficiency in seismic oil mapping. In a technological tour de force, BATS was able to maintain broadband communications communications with an aircraft from takeoff to 30,000 feet — at a distance of 200 nautical miles.

"With capabilities like these, it's little surprising that our primary markets at present are the military, the oil and gas industries, and emergency responders," Peterson says.

BATS to the Rescue

When a Louisiana parish wanted a rapidly deployable mobile command center to provide onsite command and control at disaster sites and to act as a redundant 911 call center, emergency managers turned to BATS for a solution. They wanted to be able to quickly deploy the mobile command center to any location across the 270-square-mile parish and initiate communications — by nontechnical personnel — within 10 minutes.

By installing automated antenna aiming systems on the mobile command post and on each of the four towers that cover the area, BATS systems provide uninterrupted communications throughout the entire area, with integrated voice, video and data transmissions among all public safety organizations simultaneously. This is disaster response communications on steroids. Now, whether there is a hurricane, chemical spill or plane crash, the parish is enabled to respond as quickly as possible while maintaining seamless communications among all emergency response resources.

Thanks to a great idea from professors Bentley and Smith, development by the Purdue team and rapid technology transfer by the Purdue Research Foundation, BATS systems promise to revolutionize broadband usage in situations where communications links are hard to establish and difficult to maintain.

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