

Rivada Networks gets patent for peer-to-peer location method created for fireground use

Urgent Communications By Donny Jackson

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Rivada Networks has received patent approval for its peer-to-peer method of determining the location of mobile devices that does not rely on GPS-based or network-based location technology.

Rivada Networks' latest patent describes technology that lets nearby mobile devices triangulate off one another, "taking advantage of modern devices' accelerometers and other means to determine relative location and movement, independent of the availability of a device's main network," according to a company press release.

Clint Smith, Rivada Networks' chief technology officer (CTO), is an active firefighter who said he developed the technology in an effort to provide more location information in a fireground scenario that didn't rely on GPS—a satellite technology that does not work well in buildings—or traditional network-based triangulation, which often requires additional network infrastructure that may not be available.

"This was done to try to improve situational awareness for our incident commander," Smith said during an interview with [IWCE](#)'s *Urgent Communications*. "The Holy Grail is trying to find where your interior search team, your interior host team or your fireground team are and where all the people are, especially in a night situation or during a chaotic event, because you lose track of where people are, no matter how good you are—things happen."

Instead of trying to deliver absolute locations (such as XY coordinates) of personnel and other assets to the incident commander, Smith took a page from submarine-location technology to devise a method that would provide the relative locations of a handset based on a known fixed point—in this case, the fire truck.

"I was thinking that, when you start from the truck, where the incident commander is, that's the center focus," Smith said. "It doesn't matter what the lat-long coordinates really are for that location. What the incident commander needs to know is: Is he 50 feet in front of me and 20 feet

up? That's what he needs to know, not [XY coordinates].

"We ping each one of the handsets, so we know what distance is between each of the handsets, and they basically try to position against each other. So they know how high they are, what their altitude could be and they know their distance, so they've got their vector information. And, once you have your vector information with two sources or three, you can determine your position."

The Rivada patent leverages features that already exist in current commercial handsets, including accelerometers and sensors that estimate the handset's altitude based on barometric pressure, Smith said.

"When you start putting all of these little pieces together that haven't really been available to us, your positional location capabilities start increasing greatly—at least the potential is there," he said.

The realities of the fireground are unique and can impact the performance of certain sensors, but the patented method still should provide helpful information, Smith said.

"On a fire scene, one of the things that happens is that the pressure changes occur, so you can't rely on the altitude sensor at that point. That's where the pinging comes in," he said. "I knew where I was before, and I know where I'm at now, so it's able to do an estimate on the vector.

"So, if a firefighter falls from one floor to the next, you're going to know—based on the accelerometer—that you had a quick change in direction, and you'll know that something bad has happened at that point. That's just one of the many things to think about, in terms of how I'm trying to address this."

For the peer-to-peer communication, Smith said a variety of protocols could be used, including Bluetooth and Wi-Fi. In addition, the use of peer-to-peer technologies allows one device that is not connected to the network relay its information through another nearby device that does have

a network connection, thereby expanding the effective reach of the network.

“So, if you can reach the network, you can send that information,” Smith said. “If you can’t reach the network, then Mobile A sends its position location to Mobile B. Mobile B may have access to the network, and it sends information about Mobile A—as well as its own information—back to the network itself.”

While Smith said the patented method was designed to address a fireground problem, such technology could have a significant impact in a number of key communications sectors, from location-aware social and commercial services to search-and-rescue and home-automation uses, including machine-to-machine communications, according to a Rivada Networks press release.

“This peer-to-peer capability frees network resources and will speed the development of an ecosystem of a locally independent 'Internet of things,'" Rivada CEO Declan Ganley said in a prepared statement. "Having individual devices efficiently communicate directly with each other to establish awareness of each device's position relative to others—and doing so while being radio-resource efficient—is another game changing innovation from Rivada Networks.”

Smith echoed this sentiment, noting the potential for using the patented method to help prevent vehicle accidents and to enhance location information regarding containers at a port—for both security and efficiency purposes.

Within the public-safety realm, the peer-to-peer links also could be used to deliver voice and data communications—the type of off-network capabilities that public-safety representatives have said are necessary to fully utilize [LTE](#) devices at an emergency scene.

In addition, the location method described in the patent also could be used to help provide the location of 911 callers using wireless phones in indoor locations—a vexing problem that [has been a hot topic](#) before the [FCC](#) in recent months.

“If I lose GPS, the algorithm basically goes down to a dead-reckoning program. So, it says, ‘What was my last lat-long coordinate?’” Smith said. “With dead reckoning—and this is how a lot of aircraft navigate—you’re able to estimate the reasonable position, based on where your last known fixed was as it relates to where you are right now.

“Based on that, if you press 911 ... and you can’t get a good position fixed from the network, the handset goes, ‘This is what my best position is, based on where I believe I’m at,’ and it sends that to the network as part of a 911 call.”

From a purely technical standpoint, Smith believes it would be possible to implement a system that uses the patented location method within a year to 18 months. However, incorporating it into the larger ecosystem and operational practices likely would take much longer.

“To have this reasonably working with everything, I don’t see why a year and a half is that far of a reach,” Smith said. When it comes to having it fully implemented within a wireless company, that may take another year or year and a half.

“It always moves faster, if they’re told to do it. If [policymakers] say, ‘You will get this done now,’ then all barriers to entry get dropped, and stuff happens quickly.”

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