

Breaking Through the Wireless Location Barriers: The Greater Harris County 9-1-1 Emergency Network is Making History

By John K. Fuller

Paul Guerra's job just got easier. Last year, he helped save a woman's life by successfully locating the signal of her open cellular line. It took him nearly an hour-and-a-half, and some diligent police work, but he was able to thwart an attempted suicide through his familiarity with wireless technology and his own intuition. The deed earned him a coveted Telecommunicator of the Year award from the Advisory Commission on State Emergency Communications and the Texas Chapter of the Emergency Number Association. Guerra was nominated by the Memorial Villages Police Department and the Greater Harris County 9-1-1 Emergency Network (the Network), headquartered in Houston.

Guerra can now accomplish the same task in a matter of seconds. The difference is in technology. Guerra's PSAP, Memorial Villages PS, is part of the Network's master plan to implement the world's first wireless emergency location system. In a landmark coalition, the Network has teamed with Southwestern Bell Telephone (SBC), True Position, Inc., Plant Equipment, Inc. (PEI), SCC Communications Corp. (SCC), some of the area's major wireless carriers and several other companies to develop protocols and implement a feature-rich wireless location system that is fully compliant with FCC docket 94-102.

As the largest 9-1-1 agency in Texas—and the third largest in the U.S.—the Network administers emergency service for 48 cities (including Houston), two counties, and more than 150 police, fire and emergency medical service agencies. In all, more than 3.5 million residents depend on it for 9-1-1 emergency services. With call volumes rising each year, the Network now processes more than 7,000 calls per day, approximately 30 percent of which are placed from wireless phones.

The Integration Effort

"I am very excited about the team of professionals who have come together to bring to reality the next step in emergency communications," says John Melcher, director of information systems for the Network. "As an industry, public safety professionals have proven that we can make things happen through tenacity, gaining familiarity with the issues, and by listening to the concerns of others. This team has done all of that, and is continuing to make more strides."

Melcher and Network Executive Director/NENA Southeastern Vice President Laverne Hogan were responsible for assembling the integration team and pursuing the goal of becoming the first 9-1-1 network in the country to be "Phase II" compliant. The Network, thanks to its forward-thinking governing board, has been at the forefront of wireless location technology since participating in the Wireless Integration Project (WIP) in 1996. WIP was a joint project of the Network, the Advisory Commission on State Emergency Communications and Tarrant County (Texas) 9-1-1 demonstrating the feasibility and advantages of a wireless location system. The 18-month demonstration project spawned the Network's full commitment to wireless location technology.

“We realized immediately that once a system like this is in place, it benefits all of the citizens we serve by reducing response times and providing an ever-growing list of new services,” says Hogan. “With the volume and growth of wireless calls within the Network service area, we felt we needed to go ahead and implement a wireless location system now instead of waiting until the federal mandates take effect in 2001.”

The Network and its team of professionals faced many challenges in designing the system, not the least of which was cost. Such a system could require a whole new network infrastructure, and major retrofitting of wireless network cell-sites and equipment. Accurately identifying wireless ALI would also require a “dynamic” database as opposed to the standard static databases used for wireline 9-1-1 calls. The standard ALI formats, NENA and Bellcore, would need to be altered to accommodate latitude and longitude coordinates as well as other data. Most importantly, all the technologies had to be integrated to work as one system in processing emergency calls.

Making It Happen with Existing Technology

“We had to break a lot of new ground with this project, but in the end we have created a model that other PSAP networks around the country can use,” says Jeff Wittek, integration services manager for PEI. “Actually, all the technologies were in existence when we started. The biggest challenge was bringing them together while using as much existing infrastructure as possible.”

Wittek and his colleagues decided to route the ALI request from PSAP to the ALI database through existing data lines instead of through voice lines. This sounds simple, but it requires establishing a new ALI format standard. In a telephone conference call with Bellcore, Wittek-along with representatives of SBC, the Network and other interested parties-discussed establishing a new wireless standard.

“We explained the situation and the advantages of using these alternative data links to send the PANI and X,Y and Z coordinates,” says Wittek. “They listened, made some suggestions, and we came up with ALI Format 71 right then and there. It’s amazing what you can do when you get the right people on the line.”

Another step was to establish or utilize a dynamically updated ALI database that could track wireless ALI and feed PSAPs with the required data. Boulder, Colorado-based SCC Communications Corp. (SCC) had such a database within its 9-1-1 Connect service, a powerful infrastructure that connects wireless and wireline carriers with PSAPs.

“We were very pleased to be a part of the Network’s team,” says Steve Meer, chief technology officer of SCC. “As a participant in many wireless trials in Texas and other parts of the country, it’s very gratifying bringing a real, live system to a wide area. The Network is proving that you can put a Phase II compliant system in place with available technology and existing infrastructure. That’s a very important accomplishment.”

TruePosition, Inc., a Vienna, VA-based location service bureau, signed a contract with the Network in June of 1998 to provide data from its TruePosition Wireless Location System.

TruePosition's system currently resides on cell-sites in a portion of the Network's service area and provides the Network with an array of wireless data.

"We at the TruePosition are very proud and excited about the deployment of the Phase II location system in the Network territory," says Kent Sander, president and COO of TruePosition. "Its success is directly attributable to the cooperation and hard work of all the parties involved."

Call Flow

A wireless 9-1-1 signal is picked up on the wireless carrier network and at an SBC mobile switching center (MSC). From cell site towers, TruePosition automatically identifies it as a 9-1-1 call and uses TDOA (time differential of arrival) to determine the latitude and longitude (Lat/Lon or X,Y) coordinates to within 410 feet root mean square (RMS). Both the MSC and the cell-site send data bursts via existing ALI database lines to SCC. There, SCC's Service Control Point (SCP) computer receives data bursts, combines them, then sends them back to the MSC. This all happens before the cellular caller ever hears a ring.

The MSC then sends data and voice to a 9-1-1 tandem for selective routing to the geographically correct PSAP. On the desktop, Network telecommunicators process calls with VESTA intelligent workstations from PEI. The computer telephony integration-based system uses the Network's existing Meridian 1 telephone equipment. VESTA allows the call-taker to control the call with a keyboard and mouse.

From the PSAP, the wireless call is handled like a wireline call except SBC's ALI database uses ALI steering to request wireless ALI from SCC's dynamically updated ALI database. Again, the Network system utilizes existing ALI data lines and existing protocols for ALI steering. SCC processes the request and returns formatted ALI (Format 71), ANI, the speed and direction of the cellular call and a confidence level of accuracy as to where the caller is located.

Mapped ALI

ORION MapStar, also from PEI, is a mapping application that connects to VESTA through a DDE (dynamic data exchange) link. When MapStar receives the data, it intuitively launches a map of the corresponding area. The call-taker has the option of placing icons on the map that indicate specific incidents. This can help prevent dispatching multiple response units to a single incident.

"The mapping function helps eliminate the duplication of efforts for both wireless and wireline calls, which is a great savings of manpower and equipment," says Melcher. "In the past, it has required some very coordinated communication efforts to verify when multiple calls are coming in about a single incident. Now, it's just a matter of looking at the map."

Collateral Services

In addition to improved 9-1-1 services, the Network's wireless location solution provides a platform for an array of possibilities. Shell Oil Company, an active supporter of the Network's system, is interested in providing the motoring public with product and services which offer safety, convenience and affordability, including roadside assistance and enhanced concierge information services.

Available technologies such as automatic vehicle locations (AVL) and automatic crash notification (ACN) can be incorporated into the system.

“We will demonstrate that vehicles equipped with a transmitter can send information about their location and how many people are in the vehicle, so in the event of a traffic collision, a PSAP is automatically notified, says Melcher. “Through a process called ‘unsolicited ALI,’ the PSAP receives important information such as how many times it rolled, if it is on fire and other significant facts that can help streamline the dispatching process.”

The Network’s project is being implemented in stages with plans to equip all 48 PSAPs with full wireless location capabilities over the next 12 months. For more information on the Greater Harris County 9-1-1 Emergency Network wireless location solution, contact: Sonya Lopez, public information director, at (713) 625-9911.