

Network-based Wireless Location System Demonstrated in Phase II Trial

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In the year 2000, nearly 50 million emergency 9-1-1 calls will be made from wireless phones, yet local authorities will not be able to pinpoint callers' whereabouts. This situation now causes life-threatening delays. KSI joined with five other companies—Rural Cellular Corporation (RCC), CML Technologies, GeoComm, Independent Emergency Services, and Datamaster—in developing a solution to this problem in rural Minnesota, making it possible to locate wireless users who are in emergency situations. The field trial of an end-to-end system in Grant and Douglas counties in rural Minnesota was demonstrated live at the annual Association of Public-Safety Communications Officials International Exposition in Minneapolis, Minnesota, on August 10 and 11, 1999.

Emergencies in rural areas pose a difficult challenge for members of the public safety community. According to information released by the United States Department of Transportation, 58 percent of all fatal accidents occur in rural settings, and of those accidents, only 11 percent take place on the more heavily traveled interstate system. Time is of the essence in preventing death and minimizing injury, especially during the “golden hour” between the time of an accident involving injuries and the victim's arrival at the hospital. Nearly one-third of accident victims in rural areas do not arrive at the hospital within an hour, largely due to public safety's inability to quickly reach the accident scene.

The Minnesota field trial was designed to test an end-to-end wireless E9-1-1 system based on the ability of the KSI, Inc. TeleSentinel™ System to locate wireless phones in a rural environment, where cell sites are located as far as 20 miles apart. The location information is used not only to locate the wireless device, but also to route the call to the correct Public Safety Answering Point (PSAP). This is important in areas where a single cell site covers a wide geographic area, and routing the call to the wrong PSAP within that area can introduce additional delay in the response.

The trial participants successfully achieved several objectives for the Minnesota E9-1-1 system:

- The location could be determined for any wireless phone served by RCC's cellular network, whether an RCC customer or a “roamer” from another cellular system.
- The caller's location information was used to route simulated wireless 9-1-1 calls. This enabled each call to be selectively routed to the proper PSAP as quickly, and more accurately, than using the identification of the servicing cell site alone.
- The solution used the existing wireless network, as well as the E9-1-1 network, database structure, and PSAP telephone equipment without modification.
- The overall call set-up and delivery to the PSAP was accomplished in a time frame typical for wireline 9-1-1 calls over the same network.

- The trial demonstrated the viability of this end-to-end solution to meet the FCC's Phase II requirement for locating E9-1-1 calls within 125 meters rms (roughly 67% of the time) by October 2001.

KSI's TeleSentinel™ system is a network-based wireless location system, which uses radio frequency emissions to determine the angle-of-arrival (AOA) of a received signal at as few as two cell sites. This data is then processed to obtain the location of the wireless telephone or other transmitting device. The system has the capability of both determining an initial location and successively tracking the wireless device. This technology has been patented by KSI, along with other location methodologies, which are being developed for deployment.

TeleSentinel™ currently operates on both AMPS analog and TDMA digital wireless networks, and development is underway to accommodate other digital wireless standards, such as CDMA and GSM. KSI has previously demonstrated TeleSentinel™'s capabilities in a light urban/suburban environment in Northern Virginia.

Recent debates before the FCC concerning its E9-1-1 Phase II mandate have centered on the merits and demerits of various technologies, which have been divided into two camps: network-based and handset-based solutions. The latter camp has requested an accommodation by the Commission for the phase-in of location assisted wireless phones. Irrespective of the potential impact of these discussions on the FCC mandate itself, ultimately the competitive market place will determine which technologies will be deployed.

Within the first year of the new millennium, it is projected that there will be 100 million wireless service subscribers in the United States. Many more will continue to have access to vintage wireless equipment capable of making 9-1-1 calls, even without being activated on the service provider's wireless network. Over time, location-enabled handsets will be deployed, though not exclusively, just as today analog phones are sold along side of digital phones. Choices will be made by wireless carriers and their customers concerning which technologies and features best meet their needs.

The location technology selection criteria that the wireless carriers will evaluate include performance in various geographies, the size and composition of the embedded base of customers, the economics of installing network systems versus the cost of trading out customers' phones, and the operational characteristics of the location system. The anticipated result is that multiple location technologies and solutions will coexist as carriers make the best technical, economical, and operational choices for their various markets.

In the Minnesota trial, the technology decision factors included:

- The ability to calibrate location coordinates given the low density of cell sites
- The need for a more exact location than that of the serving cell site for routing the calls
- The requirement to locate "roamers", i.e., subscribers from other cellular carriers who travel into this area

In many rural environments, such as those served by RCC, a high proportion of the total network usage is attributed to roaming traffic. An important aspect of this trial was that phones from other wireless carriers' systems were located, in addition to those of RCC's customers. This is important in that network based solutions can locate any wireless phone, location assisted or not, irrespective of the location technology the caller's "home" carrier chooses to deploy.

As wireless technologies continue to evolve and develop into commercial applications, the community at large will increasingly need to understand opportunities and drawbacks associated with the various alternatives for determining the locations of wireless calls to 9-1-1. Through trials such as the one demonstrated in Minnesota, all the stakeholders—the wireless service providers, the location technology and service vendors, and the public safety community—will be able to better assess how to best serve the public, making Phase II a reality sooner rather than later.

KSI Inc. is based in Annandale, Virginia, and Wallingford, Connecticut. Established in 1986, KSI has become an industry leader in developing and deploying wireless network based commercial location systems to serve the emerging public safety, personal security, fleet management and intelligent transportation markets. For additional information about KSI, contact Joan Wathen, Vice President of Marketing, KSI Inc., at (703) 941-5749 ext. 264, fax (703) 941-5786, e-mail jwathen@ksix.com or visit the KSI web site at www.ksix.com. Detailed information on the Minnesota trial is at <http://members.aol.com/paull911/page/MNPhase2Demo.htm>.