*Pinellas County, Florida, Implements Cutting-Edge GIS Solution for Emergency Medical Services*

Maximizing Time, Resources, and Money with Real-Time Vehicle Tracking and Intelligent Routing

For any emergency medical services (EMS) responder, time is the most precious commodity. It can mean the difference between life and death. For Sunstar Paramedics in Pinellas County, Florida, GIS is helping the county ambulance service provide more accurate and expedient emergency planning and response.

The EMS system takes advantage of GIS as a cutting-edge solution to place ambulances in the best possible locations, track vehicles in real time, and provide intelligent time-of-day-based routing that improves response capabilities for its entire fleet. This results in faster response times, which can make all the difference in an emergency.

"Getting an ambulance to the scene of a 911 call might seem simple on the surface," says Jim Pennington, director of Information Technology for Sunstar Emergency Medical Services, "but the planning required to ensure that the right number of emergency medical technicians are working at the right hour of the day and are posted at the right geographic location takes a tremendous amount of time and effort. Our GIS assists in this planning and makes this task easier with more accurate results. We can place our vehicles where they need to go in the fastest time possible."
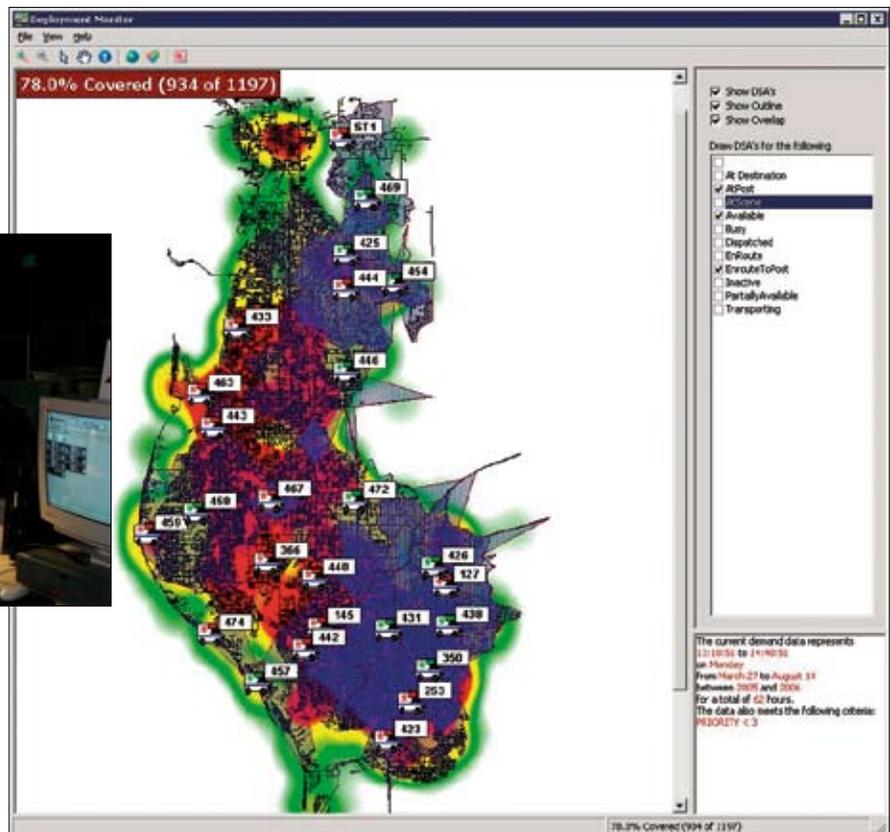
MARVLIS is a complete solution for dynamically managing and deploying public safety resources to consistently meet response time requirements while reducing costs. Left: MARVLIS Deployment Planner at Sunstar Paramedics.

Raising the Level of Response

Pinellas County is populated with nearly 950,000 year-round residents and is a peninsula bordered by the Gulf of Mexico on the west and by Tampa Bay on the east. Located in the west central portion of the state, the county is 38 miles long and 15 miles wide at its broadest point. Its land area covers approximately 289 square miles.

Like many emergency service agencies across the United States, the Pinellas County EMS organization is a public utility model. The county EMS is managed and operates as a public service agency, similar to a publicly owned and operated electric, gas, or water company. An elected board has oversight authority and contracts out to a private company to provide ambulance service under a performance-based contract.

In 2004, Paramedics Plus won the contract to provide emergency medical services to

Pinellas County under the Sunstar oversight agency. The company is a high-performance EMS agency, one of the largest in the nation. It is a leader in system status management (SSM) for emergency operations, which is a process of dynamic resource allocation based on where calls are likely to occur during a given time of day and a given day of week using up to 20 weeks of historical data.

The county benchmark for EMS services under the previous contractor required meeting a response time of 90 percent of calls within an industry-standard 10-minute time period between when an emergency 911 call is received and when EMS arrives at an incident. Prior to deploying GIS, the county's previous contractor had a difficult time meeting the 90 percent rating for incident response within the 10-minute time period standard. Dispatch commanders used paper and manual mapping methods for planning purposes. Paramedics Plus, under its contract proposal, promised to improve the response times and meet a 92 percent benchmark.

"The Sunstar EMS operation had new and more stringent emergency response time requirements beginning in October 2004, and utilizing the traditional automatic vehicle location (AVL) tools alone was not going to be enough to be successful with our new standards," explains Pennington. "Paramedics Plus, the contractor organization under Sunstar, turned to GIS and the ESRI-based solutions for advanced applications that would provide a new level of service. These applications provided our organization with new tools and methods for planning, implementing, and monitoring the deployment of our ambulances in Pinellas County."

Paramedics Plus selected Washko & Associates, which has a successful track record working with other Paramedics Plus companies, for SSM implementation and consulting services. Washko & Associates helped Paramedics Plus learn to effectively implement the Mobile Area Routing and Vehicle Location Information System (MARVLIS), which provides a complete solution for SSM through enhanced GIS. MARVLIS is a suite of GIS applications from ESRI Business Partner Bradshaw Consulting Services, Inc. (BCS), a leader in providing GIS solutions for public safety. In addition to providing its MARVLIS solution, BCS also provided training and implementation services to Paramedics Plus.

MARVLIS uses several ESRI software components, including ArcView with ArcGIS Spatial Analyst, MapObjects, and NetEngine for high-level spatial data management, desktop query and analysis, routing, and map visualization functionality. It provides GIS functionality in a customized application environment designed specifically for public safety professionals.

"The science has been around for 20 years," says Jonathan Washko, president, Washko & Associates. "The technology tools have finally caught up with the science. They're really the first in the industry to deal with the science behind the scenes for EMS in a way that makes sense and is extremely accurate. And it's proven to work as it's been deployed in many agencies and all with similar results as Pinellas, which was one of the first."

The System: Working Before, During, and After an Incident

The newly implemented GIS provides preplanning; real-time resource tracking; incident response; and postevent information capture, analysis, and redeployment of personnel and resources.

For preplanning, MARVLIS Demand Monitor is used by EMS staff to look at historic views of call demand based on queries to the computer-aided dispatch (CAD) incident database. Demand Monitor uses embedded components of ArcGIS Spatial Analyst to generate likely hot-spot areas for a specified time period. The application mines CAD data to provide an information-based method for predicting future demand. EMS staff not only utilize demand analysis and mapping for decision making, but they also have a faster, more efficient means to update and track demand as often as every five minutes. The Deployment Planner application uses the data from Demand Monitor to determine the best possible location to position ambulances in the county in anticipation of the next 911 call. The program uses historic CAD information to determine the best place to station available EMS vehicles based on demand and time of day and day of week, as well as other variables, such as emergency type. Previously, the county used a paper map and pins to geographically plan unit posts.

At the command and control center, a large computer screen shows a county area map, along with road networks and emergency station locations, such as hospitals, vehicles, and response coverage areas. Each vehicle location, whether the vehicle is moving through the street network or stationed at a post, is displayed on the digital map. MARVLIS Deployment Monitor uses MapObjects to provide a map display of AVL and current status. It also utilizes embedded NetEngine components to generate a drivetime polygon around each vehicle, known as a Dynamic Service Area (DSA), which represents the distance a vehicle can travel in the specified response time (nine minutes). The DSA polygons and vehicle locations allow EMS personnel at the command and control center to visually monitor vehicles in real time

and ensure that potential high-demand areas are always covered by an available vehicle. Staff can also make sure that units are not overlapping in coverage and can move vehicles as needed to fill a coverage area left unattended by a vehicle responding to an emergency. The MARVLIS Impedance Monitor application also captures and analyzes the real-time AVL information to determine the actual travel speed of each road for the current time of day. This information is used to refine the deployment-planning process, improve routing, select the best vehicle for a response, and size the DSA in the Deployment Monitor application.

When an incident occurs, information from the dispatch center is sent via wireless networks to in-vehicle computers. In addition to sending the full incident report from the command center, a detailed map and intelligent routing to the incident and the nearest hospital are provided. Paramedics enter new information as the response happens by simply pressing application touch screen buttons. The CAD system at the command and control center is instantly updated to display the new status data.

Since deploying the system, Pinellas County EMS has received tremendous results. The contractor not only met its 92 percent benchmark but has exceeded it with a 95 percent on-time incident response since its implementation. The agency has been able to do this with fewer vehicles, maximizing resources and achieving cost savings in the process.

Says Pennington: "We have the flexibility to perform new and different types of analysis as needed, and we can constantly update our database to refine and reassess our deployment plans. Commanders have a visual, real-time method for carrying out their daily tasks."

More Information

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