

Communication Link Puts Illinois Toll Highway Authority on the Information Highway

Mary Estes • Florida

Every day, 1.3 million vehicles travel the toll roads of the Illinois State Toll Highway Authority (ISTHA). That's roughly 43 percent of the population of metropolitan Chicago moving through 274 miles of highway in 12 counties.

Imagine this network of roads as a symphony where vehicles are the musical notes accelerating down the path of least resistance, entering and leaving multiple jurisdictions along the way. Now, think of the Tollway Authority as the master conductor, managing the speed, direction and intensity of the music, not unlike what Tollway does for half a billion drivers a year. Add safety and maintenance to the mix, and the enormity of the Tollway's job comes into focus.

shared. Each could receive real-time information about the location and severity of accidents, road-maintenance needs, traffic tie-ups and expected travel delays. By funneling the data through a central operating center, it could be sent to the appropriate groups in a keystroke. What better way to create a safer and more favorable driving environment for the motorists and the agents who serve them?

The Nation's First

Though complicated, the Tollway accomplished this vision of joining public safety and road maintenance with traffic operations. After two years of work, the last components in the system that links the Tollway's key constituents went live in Spring 2003.

Vital Steps

A central step to achieving the CAD-to-TIMS integration was to upgrade the Tollway's outdated text-based CAD system to a Windows®-based CAD. The job went to Geac Public Safety. Geac is experienced in installing systems requiring high-volume reporting, dispatching, multi-tasking and multi-links like those needed at public-safety organizations.

With Geac on the CAD side of the integration team, the Tollway looked to National Engineering Technology Corp. (NET) to achieve the TIMS integration. NET, a systems-engineering firm, specializes in end-to-end planning, design, integration and operation of advanced transportation-management and traveler-information systems. NET provided the technology that monitors the toll roads, with a network of cameras, sensors, algorithms and message boards strategically placed to monitor high-traffic and high-accident areas, toll plazas, road damage and weather conditions.

The integration produced a partnership of highly dedicated teams, according to Tollway officials. Not only was it important to produce seamless connectivity, the results had to meet performance standards without compromising speed and reliability. And the converged systems had to take the Tollway's operation to a higher level of excellence in the future.

The CAD system's integration demands varied based on the complexity and nature of the programs it was required to join. One challenge was connecting CAD with the state's law-enforcement data system, which links to law enforcement's time-keeping system.

Matching terminology and field codes presented another challenge. While TIMS uses the term "accident" to define a collision in broad terms, the CAD definition fields specify the nature of the incident, such as "1050PI," an abbreviated version of accident with injuries.

Beyond monitoring and dispatching, the team has been asked to capture information correlating the nature of an accident with the speed of the vehicle and road conditions at the time of the incident. Capturing and assimilating such data for analytical use is



CAD system is monitored by Jennifer Anderson, senior telecommunications communicator with the Illinois Tollway. The graphical mapping feature that helps pinpoint the location of an incident along the Tollway is shown in the monitor on the far right. The CAD system was provided by Geac Public Safety.

Imagine a central information system that collects data and shares it with key players in real time. These may be motorists, police and fire departments dispatched to protect them, toll plazas they pass through, towing and maintenance crews who clear and repair the roadway or the Tollway's management team. Put an Internet interface in the equation so motorists can access traffic reports online, and the communications loop is complete.

Before beginning this complex information interface, the Tollway recognized the major players on its road system could be managed better if communications were integrated and

"It is the first known successful integration of a system that dispatches public safety and public works with one that monitors and manages traffic," said John Benda, manager of Tollway's maintenance and traffic divisions.

Call it a challenging courtship and a triumphant marriage of a Computer-Aided Dispatch (CAD) system and a Traffic and Incident Management System (TIMS). Simply put, it combines a sophisticated emergency-dispatch system with an elaborate network of computerized roadside cameras, sensors, message signs and maps that dramatically improve the Tollway travel experience.

just one example of the forward thinking required from the team.

Building a Better CAD

“Before we got involved with TIMS, we had developed a notification system of response around CAD capabilities – fire, roadway weather, snow removal, lane closures. It was a subsystem that required manual intervention,” Benda said. “The key with Geac’s CAD is that we could be automated, tie to TIMS and integrate all our systems, including cameras, sensors, road signs and more.”

Benda and Tollway officials wondered about the risk of converting from a text-based CAD to a Windows-based system. Would it be slow? Reliable? Over time, the questions would subside as the positive results rolled in. Among them is geographic mapping.

“It allowed us to use a geographic-reference system for our geographic maps, so we could easily pinpoint an incident,” Benda said.

Ironically, the CAD mapping was an intricate process that involved converting the Tollway’s quarter-inch grid maps to maps measuring every one-tenth of a mile, including the potential to use aerial views of road segments.

“The breadth of the assignment was challenging,” said Molly Crews, general manager of Geac Public Safety, noting that her firm’s software program, which dispatches police, maintenance and emergency systems, is equipped to maximize a municipal agency’s standard operating procedures. As an example, the new CAD has the ability to increase the Tollway’s access to important management and statistical information.

NET executive Joseph Brahm described the TIMS side of the interface as similar to most projects where systems designed for different purposes are merged. He said the TIMS side had to deal with interconnecting the kind of events CAD records, such as police and ambulance dispatch, that are outside the parameter of the NET network.

NET’s system provides dynamic message signs, road-weather information systems and cameras. It provides an interface to the electronic toll-tag system that calculates travel time. It also provides the gateway for event- and traffic-data flow to the broader

How Traffic Congestion Gets Relief with the CAD/TIMS Interface

As every road-delay minute requires four to nine minutes to clear the resulting traffic congestion, time is of the essence. To put the efficiency factor of the CAD/TIMS interface into perspective, Illinois Tollway official John Benda gave this example of how the integration saves time and resources and can save lives.

Detection: A motorist calls *999, an emergency number funded by the Illinois Tollway and the Illinois Department of Transportation, to report a car fire. The call data is entered at the Tollway calltaker’s CAD console and transmitted to a CAD telecommunicator who dispatches initial responders. The incident information also goes to the TIMS system, which helps the operator select the camera nearest the event.

Confirmation: With cameras in the area, the incident is confirmed visually, but it is seen to be an overheated car. A message is sent back to CAD. The incident is downgraded, requiring only a tow truck. One is sent while emergency responders are cancelled.

Motorist-messaging: The TIMS operator activates the message boards posted along the road to provide motorists with information. Traffic-flow data and travel times are made available to motorists on graphical maps via the Gary-Chicago-Milwaukee Corridor website (www.gcmtravel.com). Meanwhile, a tow truck arrives, clears the incident and the lane is reopened.

Result: Without a CAD/TIMS interface and the camera component, this response scenario could have led to deploying unnecessary resources, Benda said. “If a car is simply overheated, we won’t put the responders at risk by sending them out unnecessarily and causing more congestion with fire engines, ambulances and vehicles that are not needed.”

Gary-Chicago-Milwaukee (GCM) regional traffic-control system, which in turn connects to the GCM Internet website.

Showcase Technology

Not surprising is that the Tollway’s CAD/TIMS integration has become a showcase for transportation departments nationwide and other parts of the globe. Abby Malloy, the Tollway’s traffic operations-center supervisor, is asked often to demonstrate the new system to visiting industry professionals from at home and abroad. “We’re pleased. The systems have some very impressive functionality.”

“Technologically, we accomplished what people have talked about for a long time,” Benda said. “It works, and I am convinced it will do more in the future.” ■

About the Author

Mary E. Estes is a Florida-based freelance journalist who contributes articles to a variety of trade publications, including manufacturing, design and technology.

TIMS/CAD Interface at a Glance

- Centralizes collection of roadway information from I-PASS, CAD, driver *999 calls, roadway cameras and weather sensors.
- Sets the standard as the first known system integrating public safety and public works with traffic operations.
- Integrates information with the regional system’s Gary-Chicago-Milwaukee (GCM) Corridor.
- Built on a system-wide fiber-optic network to bring camera images into the traffic operations center and TIMS, which is used to assist in event response.
- Allows quantification of Tollway performance.

- Provides better communications for planning future improvements.

Tollway TIMS Components:

- Up to 120 surveillance cameras.
- Eight dynamic, changeable message signs to communicate with motorists.
- Interface to road-weather information system.
- Interface to electronic toll-collection system.
- Automated event-response-plan generation.
- Automated congestion signage.

Tollway CAD Components:

- 155 police officers from District 15 and the police-operations desk.
- 11 maintenance garages across northeast Illinois.
- Alarms at toll plazas and radio buildings.
- Radio communications.
- Payroll system for state police.
- Mapping to identify call location.

Annual Tollway Call Volume:

- Three million law-enforcement inquiries.
- 275,000 calls for emergency services.
- 4,500 rescue calls.