City Automates Traffic Management and Gains Unlimited New Possibilities

Midland, Texas, implements an outdoor wireless mesh network to manage traffic and creates a foundation for citywide service delivery.

EXECUTIVE SUMMARY

CITY OF MIDLAND

Texas, United States

CHALLENGE

- Gain ability to monitor and manage traffic signals remotely
- Reduce time and travel required by technicians to resolve problems
- Simplify management of growing traffic volumes

SOLUTION

Cisco outdoor wireless mesh network solution for supporting Naztec automated traffic management system

RESULTS

- Expected to reduce troubleshooting and repair time by up to 30 percent
- Anticipated to reduce city vehicle fuel consumption
- Will form a foundation for delivering additional city services

Challenge

Midland, Texas, ranks as the best small city in the United States for conducting business. Located in the oil- and gas-rich Permian Basin of West Texas, Midland is experiencing an annual growth rate of approximately 10 percent, which increases the number of vehicles on the city's main arteries and city streets. In 2007, traffic volume increased by 17 percent, and 50,000 more vehicles traveled the main arterial routes each day when compared to the preceding year.

Midland's traffic signals and traffic management equipment had been installed in the early 1990s and implemented as two separate systems. Traffic in the downtown area is controlled by a grid system, which changes traffic signals at fixed intervals. Intervals can be set independently for inbound traffic and outbound traffic, and by times of day. Arterial streets were managed using fixed time intervals for peak inbound and outbound periods.

Traffic-actuated signals are located on less heavily traveled routes. Currently, loop detectors are embedded in the pavement. When a vehicle stops at the light, the detector signals a controller device, which changes the light signal to clear waiting traffic. Midland is currently deploying cameras at intersections, which will replace the embedded loop detectors. Emergency services vehicles, such as fire engines and ambulances, have the ability to send an emergency vehicle preemption signal to controllers at intersections, which will stop all traffic and clear the intersection for them to pass.

Much of Midland's equipment was approaching the end of its useful life. Parts were becoming difficult to find, and operations and maintenance costs were increasing. In addition, communication between the traffic management center and the two signaling systems was limited. If a traffic signal began flashing red in all directions, a citizen or police officer would usually notify the management center staff, and a technician would be dispatched to the intersection. Without the ability to diagnose problems remotely, the technician would have to download signaling commands from a laptop into the controller or call the operations department for additional support. Resolving issues could require several hours, multiple staff members, and significant driving time. And because

technicians are also responsible for maintaining traffic signals, school flasher systems, and emergency services sirens, routine maintenance projects could be delayed.

Other traffic tasks also had to be managed manually. For example, routing traffic for weekly football games and special events required driving to the location with a trailer that carries a programmable message sign. This would have to be hauled out and back for each event.

"In the beginning, I was looking at a traffic signal system. Once we had the wireless mesh network component of the solution, potential applications kept building. Now we are discussing citywide capabilities, adding transit, and even expanding it regionally. As we say in Midland, the sky is the limit."

– Gary Saunders, Transportation Manager, City of Midland

Solution

"I had been looking for a way to implement two-way communication on our systems for several years," says Gary Saunders, traffic manager for the City of Midland. "I wanted to be able to send and receive data, so that we could minimize manual intervention. As I evaluated solutions and talked with colleagues in other cities, I repeatedly heard about Cisco® solutions combined with automated traffic management systems."

Saunders had already chosen traffic control hardware and automated traffic management software from Naztec, Inc., a leading provider of traffic control systems and traffic engineering services. Working with Cisco, he developed a plan that would enable him to solve the city's immediate traffic management needs, as well as provide a platform for other innovative applications across the city. Saunders and the city chose the Cisco Aironet® 1520 Series Wireless Broadband Platform as the foundation for a high-performance outdoor wireless mesh network. Approximately 200 Aironet 1520 Series Platforms will be installed across Midland to create a powerful wireless network that supports the Naztec automated traffic management system. Naztec software uses the network to programmatically control all signal lights and pedestrian crossing signals.

The solution is being implemented by Coleman Technologies, Inc., a Cisco Gold Certified Partner with Master unified communications and security specializations. Coleman Technologies provides information technology and systems engineering services. Once the network is fully implemented, Midland can add wireless IP cameras, school zone flashers, or mobile access routers in vehicles, such as for technicians or emergency services personnel.

Results

Saunders expects the new wireless system to begin delivering benefits immediately. Drivers will notice less congestion and experience fewer delays due to malfunctioning signals and high traffic volumes.

"We want to encourage motorists to maintain a consistent speed when traveling through the city," says Midland Mayor Wes Perry. "They can expect to drive Midland's roadways with minimal red light stops. Texans drive friendly, and Midlanders are no exception."

The primary traffic management benefit will be improved productivity for technicians. The Naztec system will notify the traffic management center when a signal malfunctions or has received conflicting commands. For example, a technician might receive a call that there is a gridlock on an arterial route. He can pinpoint the location on the automated transportation management system and quickly identify the problem. Perhaps a controller has lost synchronization, or simultaneous emergency vehicle preemption calls created a signal conflict. The signaling issue can be remedied remotely, or in the event of physical equipment or wiring problems, a technician can be dispatched to the light pole or controller box with the correct tools.

“By having the automated system analyze an issue, I estimate that we will be able to reduce the amount of time spent on troubleshooting and issue resolution by at least 30 percent,” says Saunders. “By reducing manual intervention, we can also reduce fuel costs for the city. At the same time, Midland motorists experience fewer delays, emissions are reduced, and drivers gain improved fuel mileage. Collectively these savings translate into millions of dollars annually.”

The new system will also simplify implementing traffic monitoring and signage for special events. Messages can be typed in and automatically displayed across the city at critical signage points, and traffic flow can be monitored in real time to adjust light intervals or establish detours.

One of the most significant benefits to Midland, however, will be the ability to build applications on a robust, wireless, multiservice platform that will support future applications benefiting a wide range of departments. Saunders is evaluating a video monitoring application that will enable him to monitor critical intersections for abnormal traffic congestion and adjust signals as needed or notify police of an accident.

Implementing its automated traffic light management system on Cisco’s wireless network is Midland’s first step toward achieving a Cisco Open Platform for Safety and Security; a platform on which Cisco and partner technology come together using open standards to deliver unprecedented innovation for a safer, more secure, and efficient city. The Cisco Open Platform for Safety and Security will enable the same wireless network that serves traffic management to also enable the city to implement security cameras in school districts. In addition, Midland-based drilling and refinery operations can employ wireless transport as part of their business continuity and disaster recovery plans.

Mobile access routers can also be installed in police and fire vehicles, providing access to vital information, streaming video, and communication resources anywhere in the city through a common operating view. By using Mobile Ad Hoc Networking capabilities, which enable mobile nodes to associate on an on-demand basis, responders have access to critical data, real-time visibility, and situational awareness.

Potentially, the network could connect with the fiber and copper communications infrastructure that already is deployed along major regional traffic routes. Overlaying the wireless mesh network with existing fiber and copper creates a backbone infrastructure that enables mobility for every city and county emergency responder vehicle.

Next Steps

The new automated system is expected to be fully implemented in January 2009. Next, Saunders plans to install mobile access routers in maintenance trucks for delivering work orders and eliminating excess driving between the office and repair sites.

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For More Information

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