Along with the population growth being experienced by many cities in the Western U.S., comes the challenge of managing that growth. Traffic and transportation infrastructure is one of those challenges, and the city of Boulder, Colorado faced the same issue as many other cities: how to control and coordinate traffic signals from a central location. Like many cities, it initially used wired communications to get the job done.

The Challenge
Boulder traffic signal technicians were able to communicate with traffic signals regionally by using phone lines. The phone system worked like this:

- The traffic server connected to a com or data concentrator (essentially a multi-port serial replicator).
- The com concentrator then connected to a modem.
- The modem was attached to a T1 connector, which went directly to the phone company’s main office.
- The phone line was then patched to seven intersections with twisted pair wire (old party line phones).
- A line from the phone drop was run to each signal cabinet.

But as the number of signal controllers grew, it became apparent that a phone-based system had some serious drawbacks. “For many years, we used 22 T1 phone lines to communicate with 140 traffic signals across the city,” says Dale Beaupre, traffic signal technician for Boulder. “Both the phone modems and T1 lines operated at only 1200 baud. Pretty soon, our phone bills were skyrocketing and we were looking for a way to put in radios with a faster com rate and avoid monthly bills.”

Additional drawbacks to the phone system included limited coverage; communications could only occur where there was a phone drop. Further, whenever communications were lost, the city was forced to rely on the phone company to make repairs. This would typically happen on the phone company’s schedule, not on the city’s timeline. To add to the problem, Boulder’s varied terrain, including numerous small hills, contributed to line of sight issues. If at all possible, Beaupre didn’t want a mass of antennas at the Traffic Signal control center.

Clearly, a system overhaul was called for—one that would reduce communications costs and enable remote monitoring of traffic signals.

Fortunately, there was an alternative: a GE MDS wireless solution.

The Boulder IT department had been in the process of developing a citywide, fiber-optic Ethernet backbone. “Working with IT, we could use the city’s fiber and Ethernet to communicate directly with traffic signals via wireless radio modems,” notes Beaupre. Rather than transmit strictly from a central location, a series of access points could be created to distribute communications to traffic signals throughout the city.

Here’s how they did it.

The GE MDS Solution: MDS EntraNet™ 900 Spread Spectrum Radios
Using a closed-loop system—which is a more dependable “order and acknowledgement” system—the city is able to monitor all traffic signals using a series of access points that communicate with several controllers.

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The solution contains seven high-bandwidth access points that connect to Boulder’s wired Ethernet backbone. The radios that comprise the access points are mounted on various city buildings, including a fire station, public transportation building, wastewater treatment plant, and library. Each access point provides wireless communication between a central location (headquarters) and 12 to 14 traffic signals.

This diagram shows how high-speed wireless radios are used to communicate with traffic signals to provide citywide coverage. Access points are strategically located for the best coverage.

**Benefits**

“With the new system, we’ve eliminated four T1 lines in the past two years,” notes Beaupre. “Since radio modems are far less expensive, we’re seeing about a one-year payback by replacing our T1 phone lines with high-speed wireless radios.”

Other immediate benefits include:

- Remote signal monitoring. With a closed-loop system, traffic signals can be monitored remotely without traveling to a site, resulting in significant manpower savings.
- Scalability. As controllers are added and coverage areas increased, radios can be attached to any building with Ethernet potential. All that’s needed is permission from a Facilities Department to attach a radio and antenna.
- Best coverage can be achieved by using GPS and ground height.
- Cost savings and no maintenance on fiber for the signal shop, since the system uses an existing fiber backbone.
- Curb appeal. Rather than mounting, numerous antennae on one building, antennae are distributed over a wide area.

“The Boulder model can also be used to convert legacy serial communication systems to an Ethernet solution,” notes Rod Wilkins of Twin Eagle Consulting, the GE MDS full service provider heading up this project. “Not only can Ethernet and serial communication be mixed on the same communications system, but signal shops can move at their own pace to an all-Ethernet system over time.”

Readers interested in more information on industrial wireless solutions should contact GE MDS, 175 Science Parkway, Rochester, NY 14620, 585-242-9600. Information can also be found on the company’s Web site at: [www.gemds.com](http://www.gemds.com)