MOBILE DATA SYSTEM MOVES
TO PRIVATE RADIO CHANNELS

With a capital expense payback of about one year, it made sense for a concrete supplier to move its mobile data system from a public network to its own radio channels. At the same time, Nevada Ready Mix made improvements and upgrades that add value to products and services its customers receive.

BY JIM MOORE

Step into the headquarters of Nevada Ready Mix in Las Vegas, Nev., and you'll see a dispatch center that resembles those in public safety agencies. As many as seven dispatcher positions can be activated to handle up to 300 mobiles, although generally at most 180 concrete delivery trucks are active at any given time.

This view of the Nevada Ready Mix dispatch center shows five of seven dispatch positions used to route and track deliveries from four batch plants in the Las Vegas, Nev., area. As many as 180 delivery trucks could be active at any given time.

The computer-aided dispatch center is the most visible element of how the concrete supplier uses computers and wireless telecommunications to offer contractors the most efficient order-processing and delivery of product as specified, where it is needed and when delivery is optimum. When multiple trucks are needed to deliver an order — a situation not uncommon at large Las Vegas construction sites — careful sequencing in dispatching and routing allows trucks to arrive just in time, one after another, avoiding a line of trucks waiting to offload their concrete. Ready-mixed concrete must be delivered within a relatively short time after it is batched. The limit generally is two hours and can be less in warm weather, but the sooner the better. Prompt delivery and offloading from the nearest batch plant is the best.

When the familiar drum trucks rumble out of batch plants operated by Nevada Ready Mix, a Mobile Data System (MDS) helps the company continue to track orders for concrete from the time the order was placed to the moment the order is off-loaded. The MDS tracks the exact mix of the concrete formula for any particular customer, when the activating agent is added, the temperature inside the drum, the route taken by the driver, and the time of delivery.

Pressure sensors connected with an interface to the MDS gather information from the truck's hydraulic system. One advantage that the MDS adds is that the customer receives enough information about the concrete as delivered to allow release of payment without waiting for test results and other steps that might otherwise be taken to ensure the quality of the concrete delivered matches the order.

Prior to our engineering team's modification and upgrade to the MDS and to Nevada Ready Mix's base station and mobile units, the concrete supplier used a public wireless telecommunications network to update its automatic vehicle location information. Its parent company suspected that using the public network was more expensive than necessary. Because Nevada Ready Mix already had licenses for 800 MHz private radio channels, the corporate office asked the company to see whether there was a way to use them to save money on its mobile data communications.

Each Nevada Ready Mix delivery truck is equipped with a two-way mobile radio and a modem that links it with a mobile data system and the company's host computer, plus a computer display for use by the driver.

MetroConnect's team of engineers were among the vendors that Nevada Ready Mix asked for an evaluation. An analysis of the concrete supplier's mobile communications method at that time and a quotation or two for improvements led to the conclusion that the payback on a capital investment in an improved MDS using the radio channels would be achieved in about a year. After that, the capital investment would be positive.

The first step was to conduct a pilot project to quantify Nevada Ready Mix's use of its system, its data, and the various types of data involved. The company's engineer in charge of software development helped with the mobile interface development and testing.

In addition to displays with details for orders in process, trucks en route and the condition of the trucks' individual loads of ready-mixed concrete, the dispatcher can watch truck movements in the batch plants using cameras that send video to several monitors.

MetroConnect's engineer's supplied a gateway, also known as a link interface controller, as a standard hardware product that runs on a Unix-based system, making it reliable and virus-free. The gateway interfaced existing radio system base stations with the Nevada Ready Mix corporate Ethernet network and its computer-aided dispatch system. The Ethernet network extends to the mountaintop repeater sites and other locations, augmented with some leased services. The MDS taps a port that drives the base station controller and a base station radio. Our enigineer's gave Nevada Ready Mix an interface document along with some suggestions for adjustments to the company's TCP/IP interface for efficiency's sake.

The mobile unit interface is identical to the gateway interface. MetroConnect's team of engineers converted Nevada Ready Mix's existing mobile radios and added a modem tailored and equalized for those radios. Equalization adjusts the audio input and output and the transmit attack time.

The base station portion of the system was tested and proved on site using the Internet, which is similar to Nevada Ready Mix's corporate Ethernet. The mobile radios and configuration files were set at our engineer's facility and shipped back to Nevada Ready Mix. In all, the equipment was sufficiently configured and tested such that the concrete supplier could have made the installation without on-site assistance, but because this was one of our engineer's first "shrink-wrapped" system deliveries, a specialist accompanied the delivery to ensure successful plug and play.

The improved MDS uses the company's 800 MHz radio channels, most of which were being used for voice communications. Some of them were trunked. Fortunately, no change to the radio system was necessary because it already had adequate coverage. Our engineering team prepared propagation studies and conducted drive tests to confirm the coverage. The assessment revealed 95 percent coverage of the desired area, and areas without coverage were small. Nevada Ready Mix accepted the coverage as satisfactory.

The mobile side of the wireless telecommunications link has a simple, basic, large and easy-to-read status display with GPS reporting. A screen allows drivers to see their jobs being delivered to them.

A mobile radio fixed to the roof of the cab provides voice communications, plus its modem connects a data terminal and computer display mounted on an extension from the console. In operation, the terminal has a large status display with GPS reporting and the screen allows drivers to see their jobs being delivered to them.

Once the new MDS system using the private radio channels was up and operating, Nevada Ready Mix received some additional upgrades. Its radio base stations were older Motorola MS 5000 units, and these were replaced by new Tait base stations. A number of mobile units were replaced with Tait 8100 mobiles that allow a modem and control board to be fitted inside for a cleaner, packaged installation, and the combination offers high performance for data throughput. Plus, some units were added to the mobile system.

As are most MDS users, Nevada Ready Mix was concerned about the cost. Using as much of its existing equipment as possible allowed the company to convert from using the public wireless telecommunications network to its private radio channels and realize an initial savings in operating expense. The newer equipment installed subsequently allows the faster transmit attack time, which in turn allows more mobiles to be loaded onto the system.

The concrete supplier is considering whether to devote a second radio channel to the MDS to accommodate additional mobile units. Another base station at a new location may be added for network redundancy, failsafe operation and some diversity reception to improve coverage.

A request from Nevada Ready Mix stimulated a product innovation. The company wanted a fail-safe feature such that if the driver overlooked turning the mobile data terminal on or if it otherwise failed to function, the trucks still would be able to report information about their location and the concrete they carry.

In front of the mobile unit's modem, the engineer's added an auxiliary RS-232 controller with a processor that monitors whether the mobile data terminal is on. If it is not turned on or is otherwise not working, the controller starts up, reinitializes the modem and starts to report pressure readings and the vehicle's location on its own. Vital data about the delivery passes through to the dispatcher and the host computer system even without the mobile data terminal. If later the driver sees that the terminal is off and then powers up and activates the application, the controller senses that, shuts off, and lets the terminal take over the modem.

Delivery truck drivers have the option of communication with the dispatcher by voice radio, but most communications are carried by the mobile data system. The system automatically transmits the trucks' location and the condition of the concrete it carries. In addition, a monitor in the cab displays instructions and other information of the driver.

The Nevada Ready Mix installation offers an example of how a conversion from the use of a public telecommunications network to a private radio system offers cost savings and operational advantages. In this time when many enterprises are using public networks because they are easy and convenient, some are rethinking whether to use public networks because of the operational expense, and some public safety agencies have worries about the availability of public networks during a crisis.

Sometimes the use of a public network hides the reason behind high costs. For example, an evaluation of another user's MDS on a public network conducted during the installation of a new computer-aided dispatch center and mobile products found that the system was transmitting tens of thousands of bytes over the network when the module being supported wasn't needed. This unnecessary data load would be hidden in a public network and reflected only in the bill.

In a time when bandwidth use in general is doubling every year on the public networks, it makes sense to weigh options for using private radio channels for the functional improvements and cost savings they may offer.

MetroConnect's highly-skilled team of engineers have been providing custom mobile data solutions to businesses and public safety organizations for over 35 years. More references are available upon request.