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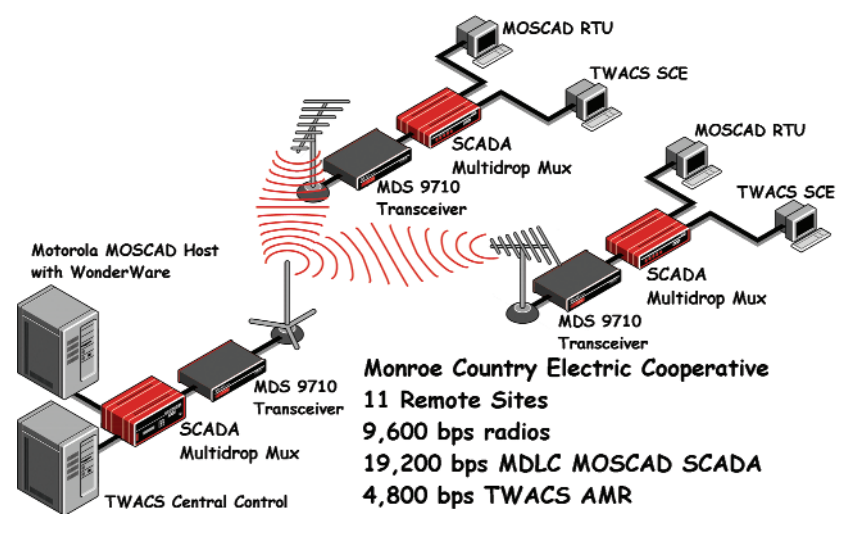
Illinois Co-op Squeezes Both SCADA and AMR Onto a Single Multidrop Radio Link

By Russ Straayer
President, Data Comm for Business

While working on a project for Monroe County (Illinois) Electric Co-operative, Jeff Tankersley of DA Solutions, had been searching for a cost effective way to integrate SCADA and Automatic Meter Reading (AMR) over the single radio communications links that most electric co-operatives use for SCADA.



MCEC is one of the many co-ops that are adding AMR and need a cost effective way to communicate with the AMR at the substations. At MCEC, SCADA is already in place using licensed 900 MHz Microwave Data Systems 9710 transceivers. Tankersley was aware of a multidrop multiplexer, the SRX/SPL multidrop multiplexers from Data Comm for Business, Inc (DCB). He thought the SRX/SPL would help electrical cooperatives combine SCADA and AMR on the same radio link.

When he tested the SRX/SPL, found it works, but the implementation was somewhat clumsy at the host end. The host end SRX requires a multiple port unit and a 1 to many "Y" cable. In addition, the SRX/SPL multiplexer protocol was designed for point-to-point connection from each host port to each remote port, which resulted in acceptable, but reduced performance for a SCADA plus AMR application.

Tankersley was convinced that there is a significant need for a SCADA/radio/multiplexer solution. His market logic, experience and enthusiasm helped convince DCB to modify the SRX/SPL protocol and move it to a different hardware platform. Out of this effort came the SCADA Multidrop Mux (SMD).

The SMD Mux uses a protocol that delivers all polling data to all remote locations as soon as it is received at the host unit. Poll responses are retrieved from the remote equipment (RTUs, AMR, etc) using a host to remote fast polling system that operates independently from the SCADA or AMR polling. The SMD Mux has 4 asynchronous user ports, allowing a single radio system to deliver up to 4 separate data streams from the host location to the substations.

When Tankersley was testing the SMD Mux, one of his analytical tools was simply listening to the

modem carrier. With standard polling from a SCADA host to RTUs, he heard the carrier turn on three or four times a second, a typical polling interval for SCADA systems. When the SMD was added to the system, the carrier turned on so often is sounded as though it was on most of the time. "This is pretty awesome" said Tankersley, when installing the SCADA Multidrop Multiplexers for MCEC. "It's amazing how fast the polling runs and doesn't miss a lick."

The standard SCADA system is tuned to provide acceptable performance. SCADA hosts and RTUs are not tuned to squeeze maximum efficiency out of the radio system. SCADA and AMR are designed to collect data and provide system status in real time. But the amount of data that can be processed by the SCADA system is usually less than the amount of data the radio system is capable of delivering. Adding the SMD Mux squeezes more data through the radio system without a negative impact on the existing SCADA.

In the Monroe County application, the AMR system and the RTUs use different protocols and operate at different data rates. The AMR system is the DCSI TWACS (Two-Way Automatic Communication System), operating at 4800 bps. The SCADA system uses Motorola MOSCAD MDLC at 9600 bps. Different speeds and different protocols require separate communications channels.

If MCEC were to install a separate, parallel communications system for AMR and SCADA, there are three solutions, all with roughly the same cost.

One choice would be a new, parallel radio system. This would cost $30,000 to $50,000. If a second radio system were installed in parallel, 900 MHz licensed would is the first choice. However, Monroe County is near St. Louis, so getting a second license is quite unlikely. Channels in the 900 MHz licensed band are hard to come by near metropolitan areas.

A second communications system using phone lines would cost $20,000 to install and $20,000 or more a year to operate. Phone lines could be analog or digital, with analog being more likely in the rural areas served by MCEC.

And the third choice for a parallel second communications system would be unlicensed spread spectrum radios. This solution is also very costly, running $30,000 to $50,000 installed. Since unlicensed radios operate in the ISM band, there is no guaranteed frequency protection in such a system. If a nearby system interferes, there is no recourse if both systems are operating legally.

Tankersley convinced MCEC to try the SMD Mux approach. He pointed out the increased efficiency with the SMD Mux. This allows the existing radio system to carry more data. The impact on the existing SCADA system is not noticed by the user.

And best of all, this efficiency comes at a lower cost when compared to a new, parallel communications system. The total equipment cost is about $12,000 for a host and 11 remote locations. This is a 60 to 80 percent savings over a second, parallel system. For many utilities, this is the difference between proceeding or not with online AMR.

With the MCEC application in and running, statistics are available that illustrate the more efficient use of the radio system. At MCEC, the RTUs are polled at the rate of one poll per second. Statistics from the SMD Mux show the round trip for data to go from the host SMD to the remote and back is just 22 milliseconds. The host SMD takes advantage of that quick round trip time to check each remote SMD up to 32 times per second. The SMD multiplexers communicate with each other at a rate 30 times faster than the SCADA polling. Thus the MDS radio system is used far more efficiently, allowing SCADA and AMR to share one system without degrading either system.

The SMD also provides the user with statistical information regarding performance of the radio system. This includes activity by port and by remote drop. The user can see how many good or failed attempts to contact the remote sites have occurred. Response time to each remote site is also reported. Host and remote units can be managed from the host location using a terminal or PC.

Monroe County Electric Co-operative's success combining multiple applications, SCADA and AMR, over the same communications channel serves as a model example for all electric utilities throughout the country. Through innovative networking solutions, any electric utility can add information technology to its system easily and cost effectively.

Russell A Straayer is President of Data Comm for Business, Inc., a position he has held since founding the company in 1981. Data Comm for Business can be reached at 217-897-6600 or www.dcbnet.com

Jeff Tankersley of DA Solutions can be reached at 217-463-8694.

Data Comm for Business, Inc.
2949 CR 1000E ■ Dewey, IL 61840 USA
Phone: 217-897-6600 ■ FAX: 217-897-1331
EMAIL: info@dcbnet.com

WEB: http://www.dcbnet.com
1-800-432-2638

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