

Nation's Largest Electric Reliability Council Maintains Constant Data Analysis via Always-On Communications Path

*An Ethernet-enabled device helps Texas' ERCOT
poll RTUs over "packet" networks, permitting instantaneous backup.*

Under constant scrutiny by local public utility commissions, independent system operators (ISOs) throughout the country must, first and foremost, ensure the fail-safe reliability of their operations. Without the continuous up-to-the-second monitoring and analysis of field data, ISOs cannot carry out their mission as arbiter and guarantor of the electric grid upon which its constituents rely.

One ISO, the Electric Reliability Council of Texas (ERCOT), recently cinched its assurance of a constant data feed by installing a unique backup communications path to poll its remote transmitter units (RTUs). A serial SCADA server unit that operates instantly—as opposed to standard modems that take several, critical seconds to establish a connection—allows ERCOT's data management staff to ensure that grid shortages are detected in time to correct them. This unit operates over frame-relay WANs; thus avoiding the need to run additional costly telephone lines.

A Texas-sized networking challenge

Everything is big in Texas. Yet, the Electric Reliability Council of Texas has proved up to the task of serving approximately 85 percent of the state's electric load and overseeing the operation of up to 70,000 megawatts of generation and 37,000 miles of transmission lines.

In order to fulfill this mission, while operating under the reliability and safety standards set by NERC, the administrators of ERCOT realized that reliable data monitoring was absolutely necessary to accurately oversee and trouble-shoot the high-voltage transmission system and generating facilities throughout Texas.

Managing ERCOT's technical infrastructure requires an extensive, interconnected computer system. Load data is gathered from grids in various corners of the state via field-located RTUs. This data is then communicated back to the operations center to study and analyze trends to forecast future electricity transmission requirements and back-end financial settlements. More important, for the purpose of maintaining electricity transmission reliability, these computer systems and their networks continually monitor and analyze actual system conditions in order to instantly detect and correct grid problems.

But operating in "real time" mandates, by definition, that RTUs respond within split seconds when polled. Without immediate feedback, grids could fail in a matter of seconds. To circumvent such problems, most ISOs maintain hard-wired, point-to-point networks on a 24/7 basis. In the event of network failure, most of these systems will automatically switch over to a redundant line of communication.

Yet only too often, these backup lines rely on dial-up modems to transmit data. However, such reliance places the entire system in jeopardy since modems take as much as 20-30 seconds to establish a connection. Compounding matters, most RTUs only operate using serial SCADA protocols, which can ordinarily be transmitted only over expensive serial lines.

Neither unexpected delays or extra networking expenses would be tolerated by Texas taxpayers.

The search for a solution

Acutely aware of the shortfalls of standard modems, the designers of ERCOT's infrastructure sought a fresh approach when installing redundant lines to their new RTUs.

"I'm in energy management systems, so I basically take care of the front end of the SCADA system and check out any discrepancies that we are getting," says David

Dickenson, Advanced Application Data Analyst for ERCOT. "But while I primarily maintain the data base and evaluate the RTU data quality we receive from the RTUs, I also work with our communications group. I knew that the network designers were looking for the most efficient and reliable method of establishing a redundant line to backup our system."

Dickenson explained that ERCOT's RTUs gather status information from the grids and transmit this SCADA data back to the head-end using DNP3 (Distributed Network Protocol) through three ports. The two main lines of the communication are point-to-point. However, as a means of saving the expense of running a third line out to the "last mile" to meet every RTU, the system's designers sought to utilize an existing Ethernet WAN. The challenge lied in finding a way to instantaneously transmit serial data over a frame-relay digital line.

"We were just primarily looking for something to scan the RTUs over the network in the fastest, most reliable and cost-effective manner possible," recalls Dickenson. "We started evaluating different types of equipment to see which direction we would head, but most of the modems didn't meet the guidelines established by our system designers. There were several things that didn't quite meet our needs. Mainly, they failed in the time it took to make the data exchange. When we sent a message, it took way too long for the message to come back."

Dickenson explained that their search narrowed when one of the evaluators heard about an Ethernet-enabled device that could send serial data over IP lines of communication.

"It was word of mouth," says Dickenson. "We were just casually talking about it over the phone and this colleague mentioned that he was looking at something called EtherPoll modems. He knew we wanted to establish a reliable redundant connection, so he e-mailed over the contact information for the device's manufacturer, Data Comm for Business, and that's how we got started."

An innovative approach to sending SCADA data over packet lines

Based in Champaign, Illinois, Data Comm for Business, Inc. (DCB) has manufactured and supplied data communications equipment since 1981. Its EtherPoll™ multi-drop modem/server was designed to meet the needs of utilities and businesses that require extensive polling of RTUs. Because the EtherPoll functions independently of the RTU protocol, it permits most 8-bit asynchronous polling protocols—such as Poll Select, DNP, Modbus ASCII and Modbus RTU—to communicate over IP protocol networks and existing line-of-business Ethernet LANs or WANs without expensive digital-line extensions or RTU change outs.

"There are lots of RTUs in the field with serial interfaces, and in an era of deregulation and tightening profit margins for utility companies, they are going to stay out there a long time," notes Russ Straayer, president of Data Comm for Business. "By utilizing an EtherPoll serial server, grid operators and ISO's don't have to spend \$6-7,000 for each new RTU with built-in Ethernet connectivity. Nor do they have to invest thousands of dollars in time, travel, reprogramming and rewiring expenses to expand the Ethernet WAN out to the 'last mile' to meet each RTU."

Equally important for ERCOT's purposes, the EtherPoll device permitted faster polling responses.

"Modern modems take a while to connect," explains Straayer. "The modem has to dial a number, then the handshaking process begins. The modems have to negotiate what speed they are going to operate at. Then the correct protocols have to be established—usually it's PPP [point to point protocol]. So the whole connection process can stretch out to 30-40 seconds. But with the EtherPoll, the connection is essentially there all the time. So it responds in less than a second."

The decision to implement

Based on the appeal of the technologic advantages, ERCOT decided to purchase and test DCB's EtherPoll units.

"We do 2-second polls, so when we send a message we expect it to arrive within a certain, rapid time," says ERCOT's Dickenson. "I personally tested the EtherPoll, and it's just like a direction connection. There's no waiting because there's no need to go through other devices that take extra time to process the data."

"We ultimately chose the DCB EtherPoll primarily because they proved quite reliable," continues Dickenson. "We need that redundant line in case we have problems with the other paths. This data is extremely critical. If one RTU goes down, another RTU cannot take its place. We would simple loose the data stream."

Reliable and rapid response to polling, at last

In July of 2001, ERCOT purchased enough EtherPolls to communicate with four RTUs out in the field, one of which was located out of state.

"The ease of implementation and configuration, further sold us on them," notes Dickenson. "I'm not a network engineer, so the guys at DCB helped me out—they answered a lot of my questions. Still, the EtherPoll modems were pretty easy to install and get going over our Ethernet WAN."

Now that ERCOT has established a secure and fast redundant path, it ends up getting used quite often.

"At any instant, there are probably several RTUs that are talking along that path—it's not just sitting there idle, says Dickenson. "We do run on it from time to time, and even I do some moving around myself. I'll switch an RTU over to that path and put my DNP3 analyzer on it so I can trouble-shoot the protocol and the data that's coming in."

Currently, ERCOT runs maintains 20 RTUs. All of them have EtherPoll devices on either end of the redundant lines.

"Once we saw that they could perform to what we needed, we went ahead and purchased more EtherPolls to expand out to all the RTUs, continues Dickenson. "They were reasonably priced for what you got, especially compared to what else there was out there. As we move forward and expand our system, we will continue to use these EtherPolls on any new RTUs that we add. If the point-to-point circuit goes down on any one of them, we are confident that we'll have this alternate path to bring data back."

ERCOT's early success in handling Texas' \$16 Billion electricity industry serves as a model example for all ISOs, and even electric utilities themselves, throughout the country. Through innovative networking solutions, an electric reliability council in any state can guarantee that its suppliers and customers will receive uninterrupted service well into the future.

For more information regarding the EtherPoll or other DCB products such as DSUs, statistical multiplexers, FRADs, routers, and wireless access devices, contact Data Comm for Business, Inc. at 2949 CR 1000E, Dewey, Illinois 61840; 800-4-DCB-NET; 272-897-6600; Fax 217-897-1331; Info@dcbnet.com or www.dcbnet.com.

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