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S&C Electric Company Rapidly Replaces Legacy Mesh Without Changing Any External Hardware

S&C Featured Solution: SpeedNet™ Radio

Location: St. Paul and Minneapolis, Minnesota

Customer Challenge

In Minnesota, XCEL ENERGY used two different communications systems to provide connectivity: a point-to-point supervisory control and data acquisition (SCADA) and mesh for S&C Electric Company's IntelliTeam® Automatic Restoration System switches that requires peer-to-peer communications.

Although the automated distribution had been deployed for a while, XCEL ENERGY decided to upgrade the switches in December of 2010 to the IntelliTeam® II Automatic Restoration System. Unfortunately, ever since the new deployment, XCEL ENERGY was not able to bring the switches to "ready state."

There were multiple efforts to resolve the issue, which included replacing a portion of the peer-to-peer network with the new hardware. XCEL ENERGY determined that the primary cause preventing the automated switches from obtaining "ready state" was the existing, legacy mesh technology.

S&C Solution

To overcome this peer-to-peer challenge, XCEL ENERGY invited S&C Electric Company to recommend a communications solution that would offer stability for their current and future needs. This included mitigating existing point-to-multipoint SCADA communications where the remote device does not have line-of-sight to the master radio but can use SpeedNet mesh radios to reach the end point.

After analyzing the system requirements, S&C determined that by deploying S&C's SpeedNet mesh radios, there would be a higher probability that the targeted IntelliTeam system switches could be brought back to "ready" status.

On further analysis, S&C experts determined that there was no requirement to replace the existing antennas and/or ac wiring and connectors to power the radios.

The S&C SpeedNet mesh radio platform is ideal for difficult applications that require cost-effective flexibility.

S&C provided XCEL ENERGY with a strategic plan that would include staging the system integration and configuration prior to deployment. The primary goal of doing so was to minimize the interruption of SCADA traffic and customer (line crew) resources while in the field. System integration included configuring and testing all SpeedNet mesh radios relative to IP scheme and setup of the serial DNP address for the IntelliTeam system switching equipment.

Once system integration was complete, the system was deployed to the field.

S&C experts met with the on-site line crew to instruct on required procedures for mounting the repeaters on the light poles in order to maintain optimal position relative to the antenna's designed radiation pattern.

While the line crew was installing the repeaters, XCEL ENERGY engineers went to each device, replacing the existing legacy equipment. Accessing the end-device radio was the next step after installing the SpeedNet Radio mesh, verifying that the node came on Net and the link/reverse link were within targeted calculations.

S&C provided successful integration of XCEL ENERGY's communications systems and deployed a peer-to-peer network in just two days.

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As part of the commissioning process, the entire network was first pinged to establish that all nodes were functioning. This ping test consists of what is commonly referred to as the 300/300 test, requiring 98 percent successful packets. All ping tests were 100 percent successful.

*"The test deployment took less than two hours to complete and about one hour to commission"*

To check the status of the teams, the S&C IntelliLink® Remote Setup Software was used, through the "truck radio," to access each IntelliTeam system-controlled switch.

With the exception of team I showing that packets were being exchanged with bad pack sequence, all the other teams were in "ready" with no packet loss.

From testing and analysis, it was determined that node 10 to node 20 were providing a good transport medium but were experiencing an issue with either the automatic switch control or a faulty interconnect cable. By accessing the automatic switch control enclosure, S&C experts decided to first try to reseat the serial connect; and within 30 seconds, the team that consisted of node 10 and node 20 came into "ready" state.

Before leaving the system for overnight testing, the team communications statistics were reset, and left to operate hands-free for approximately 16 hours.

Upon returning the following day to test each team, S&C experts used the IntelliLink remote software to access all the switches. And even after 16 hours, no teams had gone "out of ready," and no packets were lost; achieving an average of 1500 to 2000 coach

SpeedNet mesh radio with antenna on utility pole.
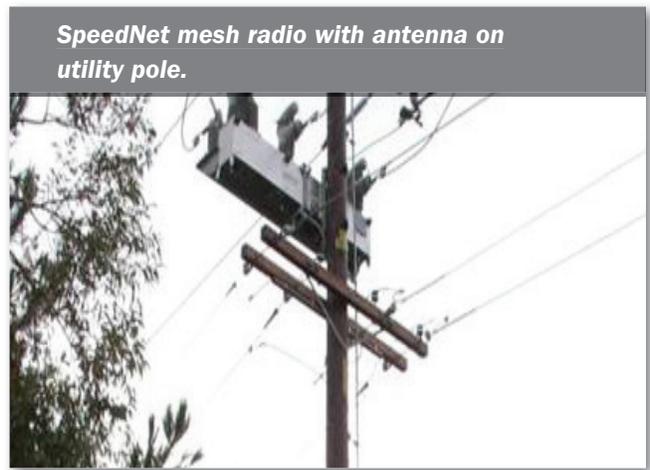
packets. Switch reentry was less than one percent of total packets sent.

The virtual memory system (VMS) files provided statistics for the IntelliTeam system radio, and were subsequently downloaded from truck radio for node 20 and node 40 to review with XCEL ENERGY.

S&C experts followed up the testing by providing training to the XCEL ENERGY staff and provided screen shots of all appropriate SpeedNet mesh radio configuration settings.

Results

After a few months of trying to achieve successful peer-to-peer communications, the S&C Communications Systems team offered XCEL ENERGY immediate response and expert customer service.

With the IntelliTeam system switchers already in place, the potential value of creating a power network was taken away by the legacy mesh network.

By employing the flexibility of SpeedNet mesh radios into the grid, in combination with IntelliTeam system switchers, XCEL ENERGY now experiences superior automated distribution.

XCEL ENERGY mesh network using SpeedNet mesh radios and IntelliTeam system switchers for reliable peer-to-peer communications. (Satellite image courtesy of Google Earth™)