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North Carolina district makes waves with ultra high-speed Ethernet network

October 11, 2006—North Carolina's Iredell-Statesville Schools has deployed a microwave wireless network from Conterra Ultra Broadband that provides dedicated, cost-effective 100 Mbps connectivity between sites--about 65 times faster than T-1 speeds. As a result, the district now enjoys a converged network capable of delivering voice, video, and data to enhance instruction.

Iredell-Statesville Schools is located in west-central North Carolina and educates about 18,500 students. The district is currently implementing the North Carolina Window of Information on Student Education (NC WISE) project, a technology model that changes the way North Carolina school districts conduct business. NC WISE helps school districts meet the requirements of the No Child Left Behind Act and offers many opportunities for local educators to use technology to make better instructional and business decisions in their schools--but it also requires substantial bandwidth to participate.

The education challenge

Iredell-Statesville relied upon T-1 speeds to connect 33 of its 35 schools and four central-office facilities. As the district increased its technology usage, the existing network became severely congested, resulting in bandwidth bottlenecks.

With a mission to "rigorously challenge all students to achieve their academic potential and to lead productive and rewarding lives," the district realized it needed to implement an ultra high-speed and reliable network to help manage centralized, web-based administration functions, implement media-rich learning across all classrooms, and prepare for the future of interactive, video-based distance learning.

Through a national Request for Proposals (RFP), Iredell-Statesville Schools evaluated three companies to provide enough external bandwidth to support data, voice, and video simultaneously in a converged environment.

Of these three responders, one company proposed unlicensed wireless solutions, one delivered access through wireline connections, and the third, Conterra, deployed FCC-licensed wireless technology.

"Conterra was the only organization that responded with dedicated, 100-megabit connectivity between the schools and central-office facilities," said Pam Schiffman, chief accountability and technology officer for the district. "The remaining two companies responded with 'switched' networks and bandwidth-access offerings ranging from 10 Mbps to 100 Mbps."

"Switched" networks utilize shared bandwidth, with network traffic moving through "best-effort" protocol. Within a switched network, the end points--in this case, schools--receive increased bandwidth at various intervals, depending on the intensity of the application being

implemented. With dedicated connectivity, each end point has continuous access to the full bandwidth potential.

"Conterra was by far the most cost-effective of the three bidders, when assessed by price per megabit and dedicated-access criteria," added Schiffman.

With a multi-year contract in place, Conterra began implementation of Iredell-Statesville Schools' Ethernet broadband network.

The Conterra solution

In July 2005, Conterra deployed the first phase of the multi-link Ethernet network, which connected seven schools and one central-office facility with dedicated 100 Mbps broadband access.

During the 2005-2006 school year, the district took advantage of this Phase One Ethernet network and employed interactive learning across select schools and classrooms, such as incorporating web sites and other multimedia features into the curriculum.

"Our teachers were pleased with the availability of digital learning techniques, while our technicians were pleased with the insignificant impact the increased traffic had on our network," said Schiffman. "In fact, the technicians threatened to relocate into one of the eight facilities to take advantage of the ultra high-speed connections."

Conterra deployed the network across the remaining 26 sites and three central-office facilities over the course of the following year.

Planning how to engineer and design an optimal network that meets current and future needs and maintains a high quality of service is the most important part of building an Ethernet network.

Conterra's in-house microwave engineers began the project with a Line of Site (LOS) Path Analysis, calculated from 20 different attributes to determine the most optimal microwave paths between schools and central-office facilities.

After Conterra completed this analysis, field engineers conducted on-site surveys to determine the type of external structures needed to deliver the ultra high-speed, FCC-licensed microwave network.

Microwave, a subdivision of the radio spectrum, operates solely on a "visual" basis. Unlike low-frequency AM/FM radio, microwave does not penetrate physical obstructions and therefore requires the microwave signals to "go above" obstacles. This entails one external antenna and radio to transmit, and--at minimum--one external antenna and radio to receive.

The purpose of the antennas, which take the form of a rooftop mount or concrete utility pole, is to provide microwave networks with true LOS. A licensed microwave radio is attached to an antenna in one location and communicates with an antenna and radio placed at an end point, effectively another school.

In the case of Iredell-Statesville Schools, Conterra designed a ring network topology incorporating three rings into the network for redundancy. To connect the schools and central-office facilities together, Conterra erected concrete utility poles ranging in height from 100 to 140 feet. These poles resemble the light poles often found in school parking areas. The three-ring network then connects back to the main aggregation site at the district office.

The Ethernet network, which is approximately 65 times faster than T-1 speeds, is stringently engineered to ensure interference-free bandwidth, with no degradation in quality or speed--and virtually no latency. To ensure carrier-grade bandwidth speeds, Iredell-Statesville facilities have service-level agreements that guarantee speed and reliability levels equal to or, in some cases, better than fiber-optic connections.

New-world' digital learning

As the 2006-2007 school year ramps up, Iredell-Statesville Schools is looking forward to offering all of its schools the ability to access "new-world" digital learning--and its central-office facilities the capacity to incorporate technology innovation into its web-based administration utility.

The district plans to closely monitor network traffic to ensure that available bandwidth exists for all students, teachers, and administrators--though officials are encouraged by the positive results achieved during the 2005-2006 school year.

"With Conterra as a partner, we know that any issues that may arise will be addressed in a timely manner, with both organizations working together to propose a solution that ultimately helps bring the district and [its] students into the new realm of advanced education," concluded Schiffman.

Links:

Iredell-Statesville Schools
http://www.iss.k12.nc.us

Conterra Ultra Broadband
http://www.conterra.com/