CASE STUDY

Bringing Mobility to the Village

Globecomm Creates a Rural Wireless Network in Alaska for GCI

Since 1996, the telephone bills paid by Americans have contained a surcharge labeled "Universal Service Fund" (USF). The money subsidizes communications services for geographically remote and low-income customers, as well as schools, libraries and rural health care facilities. Without the USF, communication costs would keep a significant percentage of citizens off-line.

Some of those Americans live in small villages scattered across the vast expanse of Alaska. In 2006, General Communications, Inc. (GCI), Alaska's leading integrated communications carrier, set out to create a level playing field for its customers, whether they live in the state's coastal cities or deep in the its rugged interior. It was a striking vision: a single high-capacity, IP-based network serving all of GCI's subscribers and capable of supporting the advanced data and video technology emerging from the laboratories of industry leaders like Ericsson and Nokia.

Given the geography of Alaska, the network had to be cellular rather than wireline, and the base stations would have to link via satellite. When it came to connecting the dots within an IP architecture, GCI concluded that only one company could engineer a solution: Globecomm.

Alaskan Challenge

"I think it's safe to say," says senior vice president of technology Stephen Yablonski, "that this project was significantly more challenging than anything else we have done in the last 20 years."

The challenge was the sum of the many parts that had to mesh to make the network a reality. To begin with: geography. GCI specified a 250-site network serving 200 rural villages. Many of these sites are accessible only for six months of the year due to freezing temperatures and heavy snowfall. Bringing electricity to them, ensuring that the equipment could stay powered and warm in the event of an outage, were major issues. So was their location near the Arctic Circle. "Satellites in orbit over the equator have a tough time reaching so far north because of the curve of the earth," says Yablonski. "We're right at the limit of territory that can be served via satellite."

Next: regulatory requirements. USF and FCC rules required the network to have E-911 capability. Simple enough in most places. But Alaska's extreme weather and northerly position practically guaranteed that the satellite link to the core switch would go down from time to time, taking E-911 offline and severing the connection to the home location registry (HLR) that could authenticate roaming subscribers.

Third: getting new technologies to work together. As an engineering-centric company, GCI was comfortable on the leading edge when it came to network elements. Globecomm won the business, in part, because it proposed as base station technology the Vanu Anywave® radio, which performs all signal processing in software rather than hardware. This allows system upgrades – from additional traffic channels to new wireless standards – to be made via software download instead of a site visit. That's no small matter when the base stations may be separated by hundreds of miles of frozen wilderness. Globecomm also proposed all-IP software-based switching from Star Solutions. These combined systems had to interface with GCI's Ericsson GSM switch in Anchorage. It was Globecomm's job, working with GCI, to mesh these different parts into a fully integrated network.

"I think this was the first time that Vanu and Star Solutions interfaced to each other and a traditional GSM core," says Gerard Johnston, senior director for the project. "Interoperability testing turned out to be a big part of the project."

Executive Summary

For Alaska's leading carrier, Globecomm engineered an all-IP rural cellular network in one of the most challenging environments on Earth. Backhauled via satellite, the network uses a distributed switching architecture that keeps base stations online even through network outages.

Race Against the Weather

Globecomm was originally engaged just to engineer the IP "cloud" running over GCI's satellite network, so that all the elements of this distributed network would work in synch. But when the degree of difficulty became clear, GCI asked Globecomm to serve as prime contractor. Work began in the first quarter of 2007. By the end of that year, pilot sites were undergoing testing. In March of 2008, GCI began operating a pilot network, and Globecomm started up its ISO-9001 production line to manufacture the base station systems.

In addition to the engineering issues, the project faced a constant battle with the Alaskan terrain and climate. "One challenge was to package everything that so that GCI can offload it at their end onto a snowmobile, dog sled or seaplane," says project manager Doug Klein. "The outdoor equipment installation is scheduled to happen between May and September, because outside of that window, the weather conditions take a heavy toll on both equipment and GCI's installation crews." The base stations were engineered with sealed, temperature-controlled shelters, and the satellite antennas with de-icing equipment. An 8-hour battery back-up protected each site from power outages.

High Survivability

Meeting the E-911 requirements led Globecomm and GCI to take a new approach to base station design. In addition to the Vanu radio, satellite antenna and accompanying gear, each base station was equipped with its own Star Solutions IP media gateway and HLR. The effect was to create a distributed switching system, in which each base station operates independently as well as interfacing with the core switch in Anchorage. If the satellite link goes down, local service continues, not only for those who make that area their home but also for roaming visitors. When the satellite link comes back up, the local media gateway restores long-distance service and resynchs to the HLR at the core.

By April 2009, Globecomm had 35 sites up and running and GCI officially launched rural service. Until the full 250-site network is completed, Globecomm will provide remote monitoring from its Network Operations Center. This lets the company identify bottlenecks, track growth patterns and help GCI predict what licenses, software modifications and antenna upgrades may be needed in coming months. "Demand is exceeding GCI's original estimates," says Gerard Johnston. "In one of the larger sites, we originally engineered it to support 1,500 subscribers. By mid-2009, it already had more than 6,000 subs."

"We have enjoyed a real partnership with Globecomm from the beginning," says Dan Boyette, GCI's vice president for rural consumer services. "We did a lot of work on systems design and technology selection before we brought them into the job, but we depend on them to make this complex distributed switching architecture work. At the end of the day, GCI's reputation in rural Alaska will live or die based on the quality of the service we deliver over the network that Globecomm is putting into place."

Stephen Yablonski agrees. "The glue holding the network together is the IP engineering of the cloud. Getting voice and data to move efficiently through the network so that we don't waste satellite bandwidth, while our vendors are also uploading system updates to their individual equipment – well, that's what keeps it exciting."

And well worth it. "We heard about a villager who went out hunting on his snowmobile," says Doug Klein. "It broke down, the temperature was 30 degrees below zero and he was an hour's walk from town. But he was able to call a friend who brought him a replacement part on another snowmobile. It probably saved his life."

That's the bottom line for Globecomm Chairman and CEO David Hershberg. "We are seeing Universal Service Fund requirements springing up in countries around the world, because it makes such a difference in the lives of the average person. We're grateful to GCI for giving us the chance to work on a project of this size and importance." ■

GLOBECOMM
45 Oser Avenue
Hauppauge, NY 11788
+1 631-231-9800
info@globecomm.com
www.globecomm.com