

SkyWest

Finding gold in broadband wireless Internet access

SkyWest Broadband utilizes SkyPilot Networks wireless technology to bring high-speed Internet access to Grass Valley, located in California's "Gold Country."



Thanks to carrier-class wireless access technology developed by SkyPilot Networks, Larry Bowman, co-founder of SkyWest Broadband, is bringing high-speed ("broadband") Internet access to an area that's starved for high-speed connectivity, and largely devoid of any existing solutions.

The town of Grass Valley is located in the foothills of the Sierra Nevada mountains, northeast of Sacramento, and about 40 miles from Sutter's Mill, where gold was first discovered in California. Grass Valley might have a rich history as part of the California Gold Rush, but for present-day citizens of the town and those in the surrounding area, it doesn't offer a wealth of high-speed Internet access options. In this hilly, rural country, DSL and cable modem access aren't widely available (Bowman

estimates that perhaps 5 percent of homes have high-speed access), and given the relatively low population density, the incumbent telephone and cable providers haven't put a priority on making broadband more prevalent here. When Bowman and his partner, David Wellman, read about SkyPilot's technology, "we figured this would be a great way for us to bring high-speed Internet connectivity to the foothill areas."

The wireless broadband opportunity

DSL and cable modem have been the technologies of choice for broadband in the "last mile," and deployments are proceeding at great pace. But for marketing as well as cost reasons, rural areas are lowest in service providers' priorities for rolling out these services.

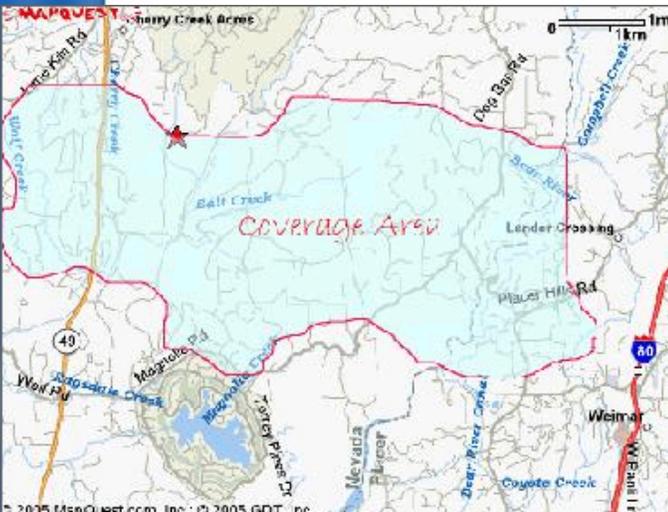
That's where broadband fixed wireless technology looks most promising, as it can fill an unmet need at relatively low deployment costs.

Service providers attempting to deploy broadband fixed wireless technology have frequently run into performance problems – mostly due to spotty radio frequency (RF) coverage, as the microwave signals are easily blocked by buildings, hills, and even the foliage on bushes and trees. The need for a clear line of sight (LOS) has been problematic for wireless Internet service providers (WISPs).

SkyPilot's technology largely side-steps the LOS requirement for a couple of reasons. First, the company uses orthogonal frequency division multiplexing (OFDM). OFDM – because it spreads the data to be sent across a large number of frequencies – is quite robust against multi-path interference.

SkyPilot also uses much higher transmit power levels than are commonly employed in most other broadband wireless products. Higher power output helps the SkyPilot system "punch" through dense foliage, rain, and other environmental attenuation.

Lastly, but importantly, SkyPilot has developed an advanced wireless mesh routing technology that allows packets to take a variety of paths in getting from Point A to Point B. As a result, information can automatically be routed around hills, buildings or dense foliage



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Broadband, LLC

that create “shadows” in the coverage pattern of less sophisticated wireless access technologies. This mesh networking technology does more than eliminate holes in a service provider’s coverage map. It can also bolster network capacity, support increased subscriber density, and create a “self-healing” network that automatically routes packets around a failed link in the mesh.

SkyPilot Networks has a suite of products that allow service providers to deploy their technology. The SkyGateway base station is connected to the WISP’s Internet connection, and allows individual subscribers – equipped with customer-premises equipment (CPE) known as SkyConnectors – to utilize that Internet connection. There’s a third element, known as a SkyExtender, which builds out the mesh infrastructure.

Staking a claim

After making a visit to SkyPilot’s Santa Clara, CA headquarters, Bowman and his partners decided to order SkyPilot’s demo package, which consists of the SkyGateway, a SkyExtender, and two SkyConnectors. They put the gateway up at one house, put the extender up at another house, about two miles away, and found that worked well. Says Bowman: “We did a lot of testing, transferring all types of data and media, including live video. It worked flawlessly.”

Next, they brought in the SkyConnectors, and started testing with them, with a particular eye to finding out where they could get a good signal, and where they couldn’t. “This led us to place another extender in a location we had access to, about six miles away, atop another ridge – and we realized that we got signal in quite a few areas,” he says.

SkyWest tested from February through April, when winter and spring storms typically come to the California mountains and foothills, so they were able to give the SkyPilot gear an effective stress test. Heavy rain did not present any problems for the setup.

Hitting “paydirt”

By late April, the team was ready to proceed from testing into actual commercial deployment, and SkyWest Broadband, LLC was ready to launch. They ordered a T-1 line to get the SkyGateway connected to the Internet.

As an indication of just how starved local residents were for broadband Internet access, in just four hours after putting up signage announcing service availability, SkyWest was overrun with customer calls. “We were just overwhelmed by the response,” says Bowman, “and we had to take the advertisement down.”

“When the SkyConnectors arrived, we got everyone online, and it was just a very simple, easy process,” observed Bowman. “It works as well on Apple computers as it does on PCs. Most people also have routers, and we’re letting them use them; we’ve had no issues with routers.”

Prior to this, neither Bowman nor his partners had any wireless expertise. As an indication of the simplicity of deploying a SkyPilot broadband wireless network, Bowman made the wry observations that “we knew what the antennas on our vehicles were for, but that was the extent of our RF and wireless experience.”

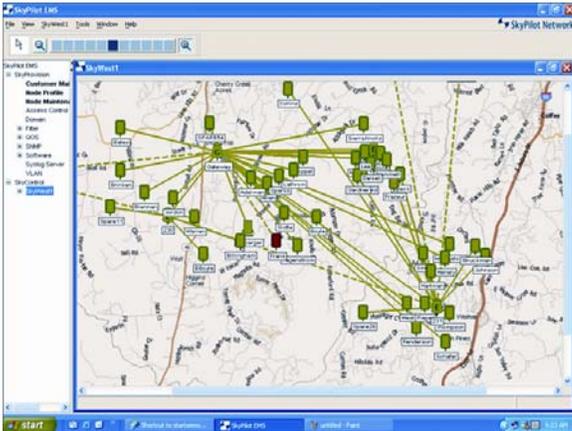
Seeking the Mother Lode

Although SkyWest started out with small ambitions, the reality of the need for broadband Internet is readily apparent. SkyWest is in talks to expand coverage to neighboring counties and with an exclusive residential development of some 300 homes, all in the \$2.5-million - \$13-million range. Bowman says it’s an area that the incumbent telco does not want to deliver DSL service to – regardless of how upscale the community might be. For SkyWest Broadband, it looks like an excellent opportunity to once again serve unmet needs, and the team is about to embark on a trial in which a SkyExtender will be put up in the development to serve prospective subscribers there.

According to Bowman, placing a SkyExtender in this development could pay double dividends, not only allowing SkyWest to sign up subscribers within the development, but the

mesh networking capabilities of the SkyExtender would allow them to extend service to the nearby town of Auburn.

Bowman estimates that with the single SkyGateway that they have in place, and with enough strategically-placed SkyExtenders, SkyWest could serve as many as 800 subscribers, though they'd have to expand the "pipe" to the Internet by adding more T-1 lines. Adding more SkyGateways would also allow the company to tap into a much greater market opportunity since Nevada County (where SkyWest is based) has 42,000 homes. Bowman says that even using very conservative estimates, some 15,000 to 20,000 of these are homes are legitimate prospects that SkyWest could potentially reach.



Even with a small staff with no previous wireless experience and no previous experience building an Internet access service, SkyWest has already shown the financials work for them. With broadband Internet access costing subscribers \$40 per month, SkyWest will start to turn a profit after only 6 months. In addition, their "payback period" is only 12 months, which means that they will have paid off all accumulated debt by the end of the first year. Longer term financials, of course, are even rosier.

To manage the network and its growth, SkyWest relies on SkyPilot's Element Management System (EMS). SkyProvision provides the utility to easily manage the configuration and provisioning of subscribers, and SkyControl provides a graphical network view for ongoing management. Bowman adds that "SkyControl makes our lives much easier and is critical to the successful operation of our network."

Not everything glitters

"Ironically," says Bowman, "what causes us the most headaches, in terms of equipment or technical issues, is the T-1 line. It's been down 3 or 4 times, and there have been glitches that the phone company cannot seem to track down." SkyWest sees this as a major issue, because when the T-1 line goes down or experiences glitches, customers easily perceive the problem to lie with the wireless equipment – even in those cases where the wireless portion of the network is working fine.

Finding likely – and available – locations for the SkyExtenders has proved to be one of SkyWest's challenges as it builds out its network. It's a problem every wireless provider knows well, but the task is made somewhat easier by the NLOS capabilities of the SkyPilot equipment as well as the mounting flexibility.

Concluding the quest

Unlike the participants in the original California Gold Rush, the SkyWest team has been patient in their prospecting for customers, preferring to make sure that each one they sign on is satisfied with the service they've been seeking for so long. SkyWest, in turn, is happy with their equipment and vendor selection. Remarks Bowman: "The SkyPilot equipment that we've deployed in the field has performed flawlessly. We have numerous connections that are absolutely non-line-of-sight – you can't even remotely see the antenna. It just works."

For SkyWest, the fact that the SkyPilot Networks equipment has been so easy to deploy gives them a major edge. It lets them focus on – and execute – their business plan, instead of fighting technology battles.

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