Gigabit Fiber Comes to Los Altos Hills

Residents of an underserved town use a micro-scale community model to get gigabit broadband.

By Masha Zager / *Broadband Communities*

Los Altos Hills, in the heart of California's Silicon Valley, is the fourth richest town in the United States. The green, rolling hills are populated by tech company executives living in palatial estates. Olympic-size swimming pools, Zen gardens and thoroughbred horses abound. It's an idyllic place to live, except for one thing: The internet service is terrible. The lack of a commercial center or multifamily housing, along with the wide expanses between houses, makes the town uneconomical for service providers. Though pockets of the town have access to cable service, many residents can't get internet service at all, and others use satellite or fixed wireless. Even the cable service has proved inadequate to meet pandemic-fueled demands for videoconferencing.

However, all that is about to change. A dozen or so residents now have access to fiber to the home, and if all goes well, the entire town – about 3,800 households – will have access to it in the near future.

Several years ago, the town government formed a volunteer subcommittee on emerging technologies; its first project, not surprisingly, was to bring better broadband to residents. The committee issued a request for information from providers, asking how they could deliver gigabit service to the community.

One respondent to the RFI was a new company, Next Level Networks, that proposed to install and manage a community-owned fiber network. The committee, intrigued with this suggestion, decided to pursue it. Though the town government did not want to own a network, interested residents got together to form Los Altos Hills Community Fiber (LAHCF), a "mutual benefit corporation" under California law similar in organization to a homeowners association. LAHCF, which owns the network being constructed, is run by a volunteer board and funded by its members. It contracts with Next Level Networks, which in turn hires subcontractors for the outside-plant construction.

Scott Vanderlip, president of LAHCF, explains that his organization recruits, coordinates and supports broadband champions in each neighborhood of the town; these champions recruit their neighbors to join the network. "There are a lot of very interested people here who want to connect," he says. "Everyone wants to be first in the queue." In the most underserved neighborhoods, interest is extremely high. Even in better-served neighborhoods, some homeowners are willing to pay for a redundant line because executives working from home "can't afford to have outage time." Vanderlip suspects these backup connections may soon become the homeowners' primary connections.

Next Level works with community organizers, providing tools to assist in generating interest and assessing participation levels and costs. When a neighborhood reaches a critical

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mass of committed subscribers, LACHF collects installation fees from them and turns over a payment to Next Level Networks so it can begin engineering and building that neighborhood. In addition to the upfront installation fee, each member pays a monthly fee once service begins. Next Level Networks is the service provider in this case, though LAHCF is building the network as an open-access network enabling other internet service providers to deliver service over LAHCF's network.

As new members join, a portion of their installation fees goes to reimburse earlier subscribers so that all members end up paying an equitable amount for installation. Because the monthly service fees are shared costs for operating the network, the monthly service fee is reduced for everyone as new members join. Next Level Networks can provide advance estimates of the installation and service fees required for any number of subscribers in a neighborhood, so that LAHCF can decide for itself when a neighborhood reaches critical mass – which may occur with only a few homes. In the same vein, Next Level Networks also presents LAHCF with other sorts of tradeoffs – such as battery backup versus standby generator for each neighborhood headend – so that potential customers can make these decisions based on their own needs. As Darrell Gentry, founder and chief technology officer of Next Level Networks, says, "Transparency is disruptive."

LAHCF is investigating several ideas for financing the upfront installation costs, which are on the order of $5,000, over a period of several years. The earliest subscribers have been people who could afford to pay the lump sum out of pocket – one even fronted the costs for his neighborhood to get to critical mass sooner – but LACHF or individual members may also be able to borrow money from HOA financing or home-loan financing organizations. Another idea is for the town to float a bond issue.

Once a neighborhood goes live, Next Level Networks takes responsibility for

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customer installation, billing, customer support, and internet service delivery.

TECHNOLOGY CHALLENGES

For the project to be feasible at all, LAHCF sought to use dark fiber for backhaul to the internet. This was a challenge, Vanderlip says, because the incumbent phone and cable companies do not offer the option to lease dark fiber. Eventually, LAHCF was able to lease unused capacity on a fiber cable originally installed to serve a town school and connect to a data center in Santa Clara, 25 miles away.

Another challenge was that the first neighborhoods to sign up for FTTH were not contiguous, and building fiber trunks between them at the outset was not practical. LACHF and Next Level Networks decided to create "fiber islands" and install point-to-point microwave connections, using Siklu radios mounted on housetops, to backhaul data from each "island" to the fiber backbone. "This allows us to bring in neighborhoods much faster," Vanderlip explains. The fiber backbone will eventually be extended to these neighborhoods, and the radios will either be left in place as backup equipment or be repurposed to serve new fiber islands.

To keep FTTH equipment costs down, Next Level Networks uses an open-source Active Ethernet solution developed by the Telecom Infra Project that Facebook Intel, Nokia and others launched in 2016. White-box switches from EdgeCore Networks and others are equipped with the Open Network Install Environment (ONIE) and the SONiC open-source network operating system that stems from the open-networking mindset. The solution originally was intended to provide an agnostic, open-source, cost-effective approach for rapidly scaling organizations, but the technology is catching on in new market segments and for diverse applications. For example, it's well suited to micro-scale builds because the length of each fiber run is fairly short. (Active Ethernet, a point-to-point architecture, usually requires more fiber runs than a PON architecture.) "It's much cheaper than GPON," Gentry explains, "though it has some drawbacks" – for example, increased expense to repair backbone fiber cuts.

Gentry says Next Level Networks is exploring next-generation PON solutions to see whether they might make sense for future builds. "We're ultimately agnostic about technology," he says. "We're looking for a superior level of connectivity at the lowest cost."

One advantage of active Ethernet over GPON is that customers who need multigigabit service can easily access it. At present, 10 gigabit customer-premises equipment is relatively expensive, and Next Level Networks does not directly support it (though a couple of customers have bought their own). However, as prices fall over the next year or two, the company expects to standardize on 10G service.

DEPLOYMENT IN LOS ALTOS HILLS

As befits its micro-scale model, LAHCF started very small. A pilot project in 2019 connected four customers. After supply-chain issues and technical glitches paused the deployment, the backbone is now functional, and the network passes 24 homes. As of press time, 14 of these have subscribed to the network and are now connected; another property owner has asked to join the network, which will be the first test of the reimbursement mechanism. Construction has begun on two more network extensions, which will pass a total of 16 more homes.

Many more network extensions are in the pipeline – including one that has already made a financial commitment, several others that are close to doing so, and dozens of others that are in some stage of organizing. "We're finally showing that this can work and be successful," says David Barron, Next Level Networks' CEO. Barron notes that customers are so excited about the project and have such a sense of pride and ownership in the network that they are turning out to help the construction crews with everything from digging trenches to pulling fiber.

Barron expects to have more than 200 homes connected to fiber by the end of 2021, and he thinks the pace will accelerate in 2022. "We'll never get 100 percent of the homes in the town," he says, "but this was never intended to be a universal solution. Insisting on universal coverage can delay things; it's easier to base coverage on people's needs and desires." This approach can be politically advantageous compared with municipally owned networks, which sometimes generate pushback from taxpayers who object to paying for infrastructure they don't plan to use. Even with a minority of homeowners on the LAHCF network, prices will be reasonable – gigabit service will cost $70 per month once the network gets to about 230 customers, and it will continue to go down from there.

FUTURE PROJECTS

Although Los Altos Hills is not a typical underserved town, Next Level Networks believes its model will work in many other situations. The company is currently in discussions with a variety of potential clients.

Closest to home is the community college in Los Altos Hills, which would not become part of LAHCF but would simply lease fiber from Next Level Networks. However, because of the college's location in the town, building a fiber extension to reach it would help accelerate the buildout to homes in the community and bring some of the "islands" into the fiber network.

Two other projects in Silicon Valley that are currently in the design stages, are similar to LAHCF, but in communities that are less wealthy, though equally spread out. Barron is confident that micro-scale community networks aren't a solution for only the super-rich, especially once homeowner financing is available.

Other potential clients include a large apartment building in North San Jose and a new single-family-home development near Sacramento, California. Unlike the micro-scale projects, these networks will cover their entire communities – close to 200 units in the case of the apartment building, several thousand in the case of the new development – and provide internet service to residents as an amenity. They are more similar to the bulk-service model common in multifamily housing.

Although COVID-19 delayed these projects, it also made them more urgent. "There's a skyrocketing vacancy rate in Silicon Valley," Barron explains, noting that new hires are working remotely rather than moving to the Valley. "Buildings are trying to differentiate themselves."

In Los Altos Hills, Vanderlip is enthusiastic about the future of private, community-owned fiber. "It's just not going to happen unless people take it on themselves," he says. "There's nothing crazy about fiber that communities couldn't take on a project like this." ❖

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