

An ADTRAN White Paper



Don't Stop Thinking About Tomorrow: Continuous Network Improvement

Building the 21st Century Network

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Introduction

At the beginning of 2020, no one could have imagined the ultimate stress test broadband networks would undergo by the end of March. Network bandwidth traffic grew as much as 40 percent within a few weeks, which according to the Internet Society, is a level of growth more typically seen by service providers over an entire calendar year. COVID-19 stay-at-home orders around the world resulted in a near-overnight transition from in-the-office to work-from-home for many businesses. At the same time, school systems shifted from classrooms to distance learning.

Network traffic grew not only in total volume but also in symmetrical demand. Schools and businesses alike moved to video-based collaboration tools such as Microsoft Teams and Zoom. Assumptions for residential bandwidth usage built around asymmetrical service models and technologies went out the window as home workers and school children needed upstream bandwidth to meet with their co-workers and teachers, respectively.

Fiber networks did well, while legacy technologies such as cable and first-generation DSL much less so. Cable operators without “fiber-deep” networks found themselves scrambling to implement more node splits as a short-term fix to open upstream bandwidth, reported *FierceTelecom*. Households without adequate connectivity found themselves scheduling meetings and schoolwork around the limitations of available bandwidth. At the same time, those without access ended up spending time at the closest public Wi-Fi hotspot.

Issues of stress were not solely limited to physical networks either, as service providers increasingly found themselves operationally stressed. Due to physical distancing requirements, on-site truck rolls came to a halt for installation and service. Customers found that their broadband access within the home quickly became a bottleneck due to inadequate Wi-Fi equipment. Customer care center call volumes skyrocketed as many customers asked for more expansive services to meet increased at-home needs.

Every network can improve

In an ideal world, a service provider would have a clean sheet of paper and unlimited funds to build fiber to every possible location, along with sufficient money to upgrade network elements at will when the latest, newest, fastest devices are introduced.

The real world is much messier. Few have greenfield opportunities to design and build “the perfect network” from the ground up, much less the capital. Many service providers have a significant amount of legacy copper plant that cannot undergo a rip-and-replace upgrade to fiber due to cost considerations, right-of-way issues, impeding fiber deployment, and population densities unfavorable to delivering fiber to every household within their territory.

Successful service providers find ways and capital for regular network improvements. This includes phasing out older technology and installing more capable and higher-performance solutions, deploying fiber when economically feasible, and improving customer service and experience. Investments are also made in delivering faster services and expanding service territory when feasible.

There is no “one-size-fits-all” solution, given each service provider is unique in terms of its business model, installed base of hardware and customers, and available fiscal resources. This paper discusses several different service providers’ experiences, and what they are doing to improve their networks and provide better services for their customers.

Alaska Communications – Constantly upgrading network mix

The leading provider for broadband services in the state of Alaska, Alaska Communications, operates a data network with a full portfolio of broadband services encompassing DSL, fiber, fixed wireless, and satellite, with its own redundant fiber optic cables to the lower 48 for good measure. Alaska Communications provides service to around 400,000 customers in an area more than twice the size of Texas that includes islands, few major roads, and distant communities as small as 40 to 50 people and scaling up to the city of Anchorage with more than 300,000 people.

Alaska Communications has several different equipment vendors within its network and is in the process of con-



The ADTRAN Metnet 60GHz mmWave mesh fixed wireless solution enables operators to offer Gigabit services quickly and cost-effectively in conditions where fiber is not practical.

solidating and upgrading its core network gear with one platform. “We have a plan to replace a lot of it with the ADTRAN Total Access 5000 (TA5000),” said Rick Benken, Alaska Communications Vice President for Network Strategy, Engineering & Operations. “In some cases, we’ll be removing DSL and replacing it with fixed wireless.”

Unlike the mix of legacy gear currently in the network, the TA5000 can support 100Mbps speeds and CAF-2 minimum speeds with loop lengths up to 11,000 wire feet on a single copper pair. Having the ability to support high-speed DSL is necessary for CAF-2 requirements in rural communities, especially in areas where fixed wireless is impractical due to geography and in rain forests where moisture and large trees reduce RF effectiveness. A typical edge deployment will use a TA5000 fed by fiber with gigabit speeds or fixed wireless to provide DSL to a

community.

Full fiber deployment represents a challenge for Alaska Communications due to weather and regulatory requirements, making fixed wireless an essential part of its technology mix.

“We have a short construction season,” Benken said. “Communities and cities try to use all buried cable and as little pole-mounted infrastructure as possible. By regulation, we have to replace so much pole-mounted infrastructure every year with buried cable. We have to do all underground deployments and boring in most cases, and if we do put up above-ground cabling, we have to go back and put it underground at some point.”

In more populous areas, 60 GHz gigabit mesh wireless networking technology will be deployed where appropriate as the primary last-mile for broadband service delivery, replacing existing fixed wireless or DSL services. “Mesh is replacing ‘nothing’ in some cases where customers have no service, and older DSL equipment in other areas with low broadband capacity,” stated Benken.

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Rick Benken, Vice President of Network Strategy, Engineering and Operations, Alaska Communications

South Valley Internet: Migrating from copper to wireless and fiber

A short drive from San Francisco, South Valley Internet (SVI) is a small CLEC in San Martin offering a variety of services, including DSL and wireless. Leasing copper loops from Verizon and AT&T to deliver broadband services is becoming more problematic each year.

“I’m not going to say copper is a long-standing solution,” said Elise J. Brentnall, President and COO, South Valley Internet. “We’re looking for others. People live on beautiful lots here, but the copper infrastructure on the ILEC side isn’t well maintained. It rains, it goes down, and it’s out of our control because it’s the ILEC’s responsibility.”

If being dependent upon a third-party for service delivery wasn’t bad enough, the ultimate retirement of copper for delivery of broadband services is happening due to regulatory changes. “It’s not a matter of if but when,” Brentnall said. “How do we provide DSL and Metro Ethernet services? Copper isn’t it.”

Fixed wireless and fiber are SVI’s long-term methods for delivering broadband, with the latest in wireless technology proving to be a just-in-time solution for many customers as work-from-home demands increase the need for speed.

“We’re also a Wireless Internet Service Provider (WISP),” Brentnall said. “A big portion of our customers are just south of Silicon Valley. Previously, we deployed 2.4 GHz and 5 GHz unlicensed solutions. With our unlicensed band, we didn’t have enough bandwidth. We were delivering not more than 5 Mbps per customer. It wasn’t enough, and we knew it. In my opinion, 5.8 GHz just can’t keep up. We’re limited to the number of customers we can put on an access point right now without oversaturating it because we don’t have the spectrum.”

SVI utilized the latest generation of wireless technology from ADTRAN, taking advantage of mesh technologies and expanded radio spectrum options to deliver gigabit speeds to customers. “Using ‘lightly licensed’ access points in the 60, 70, and 80 GHz ranges with point-to-multipoint capability is highly cost-effective and really helps us when it comes to deployment and take rates,” Brentnall said. “Deploying a mesh wireless solution saves us money versus fiber in terms of cash flow, allowing us to be conservative and grow at a rate the company can manage. It affords us the time to build out to the areas where we want to deploy fiber.”

With the sunsetting of ILEC copper availability on the horizon, fiber became the only choice for SVI to deliver gigabit-class broadband to its customers and to support the hottest wireless technology available. “We’re building out fiber to underserved areas and just finishing our first fiber building,” Brentnall said. “Our target market had 150 homes, and we had a take rate of 133 homes. That is not normal.”

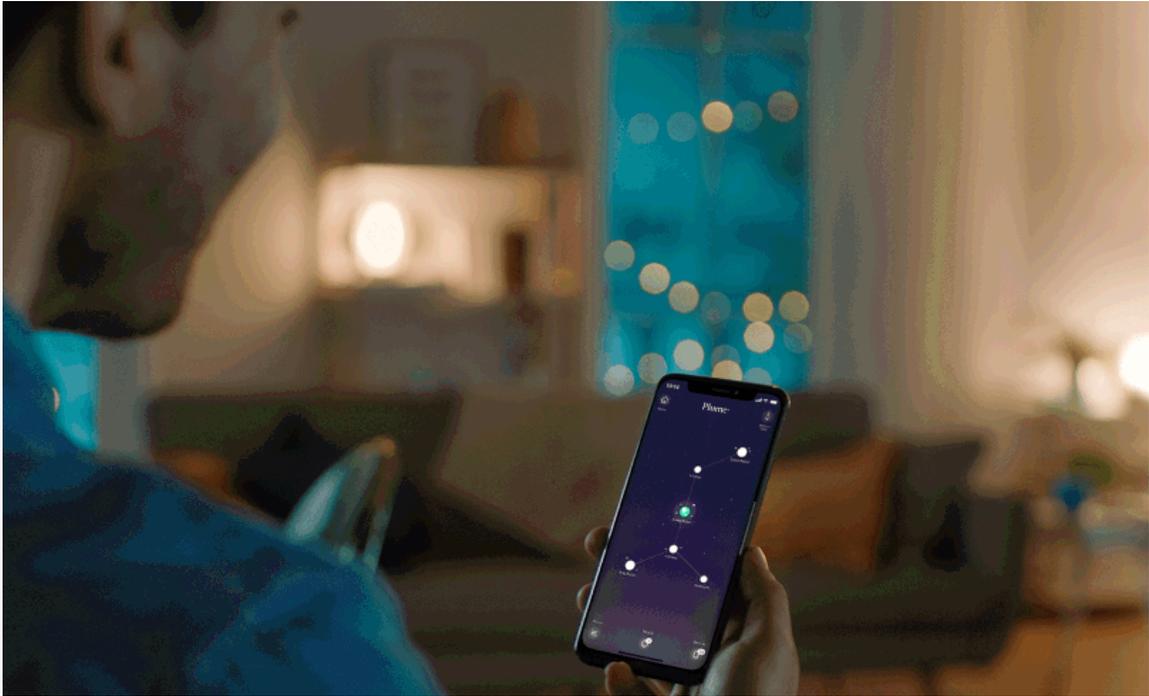
Brentnall says SVI was “very lucky” for its first fiber build, an area located in a narrow valley difficult to provision wireless services. “Not all of our customers chose to take our service. With the fiber deployment, we acquired additional customers as well.”

SVI offered anchor customers symmetrical gigabit services over GPON. The fiber build encompassed a 12-mile run with two underground conduits, one with 144 strands of fiber and another available for lease by third parties. While putting in the conduit was expensive in the short term, costing \$25 to \$30 per foot to put into the ground, it is a “safer bet” enabling SVI to control its outside plant from end-to-end. “Poles are more cost-effective, but there’s some additional costs in operational expense and unknown costs. If you don’t own the poles, you have to work with another party. There’s make-ready costs and other issues,” said Brentnall.

Fiber brings significant benefits over its lifecycle over other technologies. “There’s lower maintenance and potentially lower churn,” Brentnall said. “We’re not losing someone because a competitor offers better infrastructure or services. It potentially increases the longevity of the customer relationship as well. Since we’re delivering fiber at gig speeds, competitors will think twice before they come into the market. Customers will think twice before leaving for another service, so long as we are cost-effective and reliable at the speeds they want.”

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Elise J. Brentnall, President & Chief Operating Officer,
South Valley Internet Incorporated



In today's connected home, operators need to deliver their subscribers a superior in-home experience that empowers more consumer control and insight, while simplifying operations and optimizing cost.

Franklin and SVI: Removing the pain from the last foot

Delivering high-speed broadband to the home has become more complex than simply showing up and turning up a modem or router in the home. People want the same speeds at the most remote point in their home as they get from where broadband comes into the house. Service providers are choosing to go beyond the last mile and provision the "last foot" in-home networks as a part of their service, with many deciding to make this the default option due to the benefits this brings both for themselves and the customer.

Privately owned Franklin Telephone Company provides services within 26 counties and 17 exchanges across Mississippi. The company operates 550 miles of fiber optic cable supporting a mixture of copper and fiber. Within five years, the company expects to have 50 percent of its network migrated to fiber, but the immediate issue generated by COVID-19 stay-at-home policies was unforeseen stress on home wireless networks.

"Individual networks at 6,400 customer homes were saturated," said Tom Griffin, P.E., Vice President/General Manager, Franklin Telephone Company. "Ninety-five percent were Wi-Fi networks, most using 802.11n single antenna routers. People ended up with as many as 30 devices connected to a wireless router that, at max, was only capable of supporting 16 devices and only effectively supporting five or six. When their networks 'died,' they began to call us."

Franklin knew a la carte home Wi-Fi networks were a problem. "The fact that we were not managing [networks] end-to-end was a problem, but it wasn't overwhelming us until COVID-19," Griffin said. "When everyone is working at home, schooling from home, and everyone is in the house all day, that's when it becomes a problem."

Fixing the in-home connectivity problem meant taking responsibility for Wi-Fi beyond the access point. ADTRAN's Mosaic Customer Experience, powered by Plume, is a Smart Home System built around mesh Wi-

Fi network technology and has become the go-to option for Franklin and a favorite for customers who want more visibility into their wireless and broadband connections.

“Going forward, if new customers want wireless, they will pay \$10 a month and get Plume,” said Griffin. “It’s the only option they will get. Existing customers will get two months free with no questions asked if they return the equipment in good working order. I doubt we will see any come back.”

ADTRAN’s Mosaic Customer Experience provides a “best of both worlds” scenario for managed Wi-Fi deployments. Customers that simply want their Wi-Fi to work plug in two or three Plume Pod devices into different places within the home – larger homes may need more for overlapping coverage -- with the system performing automatic setup and self-configuration.

“Younger folks, they are all geeked out with the accompanying Plume app and the things they can do with it,” Griffin said. “They want to monitor bandwidth, and fine tune access so the Smart TV doesn’t glitch when they are streaming programs.”

SVI is also providing Mosaic Customer Experience, powered by Plume, to its customers. “It’s the only thing we’re deploying past the network interface,” said Brentnall. “We’re super impressed with the technology they’ve developed. Plume provides all the information you want in terms of controls and safety. It significantly reduces truck rolls, allowing us to see into the customer’s network and actively monitor bandwidth into the home mesh Wi-Fi network, giving us a tremendous amount of information as to what the customer is getting on their end.”

While Plume isn’t “inexpensive,” it is decreasing truck rolls, enabling SVI to easily show the customers where network issues are through the phone app in the few cases where it is necessary. “Honestly, we don’t get a ton of calls from people with Plume because it just works,” Brentnall stated.

Don’t Stop Thinking About Tomorrow

An integral part of network management in the 21st Century is always looking to the next upgrade in physical media, network hardware, and software. Building the best network means phasing out older gear for better reliability and faster services and simplifying network management to reduce customer service calls and improve customer satisfaction.

Successful service providers are always looking for ways to improve their networks. This includes deploying more fiber when economically feasible, leveraging the latest generation network hardware to reduce operational costs, and delivering more bandwidth. As operators move deeper into the home, they are enabled to provide the best broadband experience possible.

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