

# Fiber Anyhaul: The ‘Build-It-Once’ Approach

As communities build out fiber infrastructure, they will be able to address a host of service opportunities: residential broadband, wireless backhaul, wholesale dark fiber, and pathways for future networks.

By Kara Mullaley / *Corning Optical Communications*

Communities once looked to railroads, road networks and the electric grid as necessary components to ensure a viable future for their constituents. Now fiber-based broadband networks have joined this critical list of infrastructure necessities for any meaningful participation in the 21st century economy. Communities, and the broadband providers that serve them, now actively evaluate the best approach to wire for the future, and those that find a way to bring fiber to every premises within those communities are laying the best technology infrastructure foundation for perhaps the next 50 to 100 years.

The benefits of fiber-based networks are well documented. They include empowering the best technology conditions for economic growth and enabling life-changing experiences for citizens. The benefit of choosing deep fiber networks goes beyond these significant factors, though. It includes the ability for a community to build its technology infrastructure one time, preparing it for whatever the future may bring. That’s a tremendous advantage – one that will last for decades to come.

## BROADBAND DEMAND CURVE

The home broadband experience continues to evolve, with demand growing at a constant rate. Consumers demand a better broadband experience, thanks in large part to increased video consumption, interactive gaming, and the growing work-from-home trend. This demand

curve is pushing legacy broadband technologies of twisted pair copper and coax toward exhaustion. Service providers are pushing fiber deeper into the network as a result, with fiber to the premises (FTTP) becoming not just preferred, but also necessary.

Applications necessitating a gigabit to the home may have seemed mythical just a few years ago but that reality is now here, with ultra-broadband of 100 Mbps and faster becoming expected. With multiple smart devices in the home, all demanding their own captive bandwidth simultaneously, ultra-broadband service is now required. But it’s not just home broadband that’s in play now.

Consumers increasingly expect the home broadband experience whenever and wherever they go. Indeed, the home broadband experience is now becoming expected with mobile. The same factors drive expectations for an ultra-broadband mobile experience – video, gaming and mobile workers. Communities need to have a technology infrastructure that can enable commerce, entertainment, social connectedness and collaboration virtually anywhere within their borders. Fiber technology will serve as the foundation that delivers on the promise of the digital society.

## BUILD IT ONCE

Previous technology infrastructure strategy could include multiple interconnected networks. Legacy copper or coax networks fed homes

and businesses. Mobile networks used a combination of wired and wireless transport solutions. The result was an independent, complex and expensive interconnected network of networks to achieve a technology foundation. We can now do better. Much better.

Communities now have the option to build one network foundation – fiber infrastructure – that can enable all other technology requirements. FTTP ideally delivers ultra-broadband-capable service to every home and business within the community. But where the FTTx premise is challenged (because of cost or other factors), ultra-broadband service now can be extended to hard-to-reach places with fixed wireless service, provided it is backhauled by fiber infrastructure.

Fiber infrastructure also will be necessary to achieve the aforementioned mobile broadband experience that customers expect. Fiber-fed small cells that leverage any manner of wireless technology (4G, 5G, Wi-Fi) make that expected mobile ultra-broadband experience possible. Without deep fiber infrastructure, wireless networks depend on legacy technologies for backhaul and fronthaul, delivering a subpar mobile broadband experience. The thousands, or even millions, of sensors needed to deliver on the promise of the smart city will need fiber infrastructure to truly deliver on the promise of connected communities.

The choice is clear – build it once and leverage it for whatever technology requirements a community may have. A fiber foundation offers tremendous flexibility in this regard. Fiber network operators have the flexibility to employ different protocols and different end electronics to meet whatever technology demand exists. Whether it's utilizing wave-division multiplexing on an optical transport network for 5G transport or employing NG-PON2 to meet both home and enterprise needs from a single fiber, operators can maximize their broadband opportunities.

The Verizon One Fiber program illustrates this approach. Verizon decided several years ago that it wanted a fiber infrastructure in its markets that would serve all its technology needs. Launched in 2016, the program currently reaches 60 major U.S. cities, and, according to

one report, involves deploying 1,000 miles of fiber and spending as much as \$30 million per month.

Verizon's Fiber One strategy includes laying up to 1,728-count fiber strands, and never using fiber with fewer than 864 strands on major routes. This gives the carrier the ability to meet whatever the future holds, whether that's backhauling and fronthauling its growing 5G network, feeding smart-city sensors or delivering a robust FTTP broadband experience or even wholesaling capacity. Verizon is building fiber once, a fiber "anyhaul" strategy, with confidence that it will meet any technology need for the next 50 years or more.

### LEAN DEPLOYMENT STRATEGY

Although a "build-it-once" fiber infrastructure strategy represents the best long-term investment any community can make, it also represents a significant capital investment. For service providers, deploying capital in the most cost-effective manner possible is critically important. Careful planning is required to achieve this. Luckily, various strategies can be employed.

Deferring capital is a key strategy; it involves planning for the long term while building incrementally. Strategies for building incrementally include

- Deploying a construction strategy that targets anchor institutions first and branches out to consumers and small businesses after securing those anchor institutions.
- Taking a "deep fiber" approach in which fiber is pushed deeper and deeper into the network, but doesn't necessarily go all the way to every premises right away. A measured approach over time brings fiber to the premises as capital is allocated. In the interim, leveraging existing copper, coax or even fixed wireless technologies in the last mile are all options operators are exploring.
- Crowdsourcing where prospective customer "clusters," say within a neighborhood, commit to buying FTTP service before the actual FTTP construction is started, demonstrating adequate demand to justify the investment.

- Laying fiber cables throughout the network without "lighting them up," reserving them for future use, also known as dark fiber. As demand requires and as capital becomes available, active electronics are added to this dark fiber, saving the civil works expense of deploying more fiber.
- Creating future-use pathways with microducts as a fiber network is being built. An alternative to investing in dark fiber itself, the process lays an important infrastructure.
- Using the fiber network for resale and wholesale opportunities – municipal Wi-Fi for example – generating revenue and cash flow that can be tapped to help fund deployment of fiber closer to the premises.

Utilizing some or all of these strategies allows network operators and communities to take a phased approach to a build-it-once strategy. It's important to evaluate this phased approach and avoid trying to accomplish everything all at once, which can seem overwhelming, especially to less-experienced network operators. Lean deployment strategies can make a long-term, build-it-once, anyhaul goal achievable for even the smallest of network operators, wherever that operator may be.

The future technology road map is ever evolving, but one thing is clear – the explosive growth in bandwidth-intensive applications and devices is not going away. Though even technologists with the most accurate crystal balls can only guess at the future state of customer expectations, fiber-based infrastructure will always be a sure bet. ❖

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