Will Cable Companies Become Fiber Companies?

The evolution of technology is enabling cable companies to transition gradually to all-fiber networks.

By Masha Zager / *Broadband Communities*

Just 10 years ago, this magazine reported on the first new technology that promised to allow cable companies to deliver all-fiber services without disrupting their existing hybrid fiber-coaxial (HFC) networks. A few months later, I wrote an article that began, "2008 may become known as cable's Year of Fiber." (Spoiler alert: It didn't.)

Every few years since then, we've reported on cable companies' love-hate relationship with FTTH, and with each report, that relationship becomes more complex. Cable companies have been much slower to transition to all-fiber networks than telcos – largely because their existing infrastructure is more successful at meeting growing bandwidth demands – yet any discussion of cable's long-term future includes some variant of the sentence, "Everyone agrees that FTTH is the endgame."

On the one hand, virtually all cable companies have deployed some residential fiber. (They've also been quite aggressive in deploying fiber to the enterprise, but their business networks are generally separate from their residential networks.) All the large cable companies and many smaller companies have announced fiber-to-the-home projects, as have several municipal networks that were originally built with HFC.

BROADBAND COMMUNITIES' list at www.fiberville.com shows about 50 franchised cable operators (MSOs) deploying fiber to the home in the United States. This represents projects started by many more cable companies that were later consolidated into the larger companies that exist today. There are probably many others not on the list, as cable companies don't always publicize fiber deployments.

On the other hand, the scope of these deployments is still small. Michael Render, president of market research firm RVA, estimates that in total, franchised cable companies pass about 1.3 million homes with fiber and have 0.7 million fiber customers. Altogether, U.S. cable companies have more than 60 million broadband customers, so their fiber operations are still a blip on the screen.

FIBER IN GREENFIELD CONSTRUCTION

How will cable companies transition from providing 1 percent of their customers with fiber services to providing 100 percent, and when will that happen?

The most obvious path – and the situation in which most cable companies deploy FTTH today – is through new housing construction. In new construction, there usually isn't a great cost difference between deploying HFC and all-fiber networks, and developers of new communities, whether single-family or multifamily, often specify fiber to the unit for future proofing. Mike Slovin, vice president of national field sales for Comcast's XFINITY Communities, comments in regard to multifamily housing, "For greenfield, most owners are comfortable with fiber in new builds." Comcast has developed several fiber-to-the-unit solutions, which are used mainly, but not exclusively, in new construction.

However, even cable companies that favored fiber in new construction ran into difficulties in the last couple of years. Hossam Salib, vice president for cable and wireless strategy at the technology vendor ADTRAN, notes that large fiber rollouts by AT&T and Google pushed up prices for fiber, splicing equipment and other inputs, raising the cost of fiber deployment by as much as 25 percent. "That changed the business case considerably," he comments.

In addition, according to Salib, cable companies that deploy fiber generally use RFoG technology for compatibility with the RF-based video in their HFC networks. RFoG was relatively inexpensive when it was introduced 10 years ago, but it didn't work well with higher bandwidths, and deployers had to either add an expensive fix (optical beat interference) or use more expensive RF-over-PON solutions.

Even without these problems, transitioning solely via new housing construction would be slow. Currently, about 1.3 million new housing units are added annually – about 1 percent of the total housing stock and 2 percent of the total number of cable broadband customers. Even if cable companies served all these new units, which they don't, and even if they served them all with fiber, which they certainly don't, replacing HFC networks with fiber would take generations.

Another option for cable companies is to build FTTH when they expand beyond their traditional service territories. The issues are similar to the issues for new construction. There have been instances of this, but in general, to the disappointment of cable customers, cable companies tend to stay within their existing service areas and not compete with one another.

Thus, if the "endgame" is to arrive anytime in the foreseeable future, cable companies will have to convert HFC infrastructure to all-fiber. And that, in turn, requires one or more of the following to be true:

- The existing HFC network faces competition from a fiber network.
- The condition of the existing HFC network is too poor to upgrade.
- Someone is willing to share the costs.

- The existing network can be upgraded, but replacing it with fiber is less expensive than upgrading it.

Some of these conditions already exist, if only very locally – such as in a single apartment community – and others will become more common as time goes on.

COMPETITION

The most common reason for cable companies to deploy fiber in brownfield areas is that they need to compete locally with fiber deployers. Sometimes, the competition is more about perception than reality, at least in terms of current usage patterns. Salib says, "If AT&T continues to deploy fiber at the rate they're doing, cable MSOs may have to deploy fiber to compete. … But it's a marketing push more than anything. Consumers won't see the difference."

Other industry observers agree. Both Calix, a technology vendor, and CCI Systems, an integrator that works with Calix products, are beginning to see operators in ultra-competitive environments plan to cap investment in their traditional HFC networks and turn to fiber instead.

Perhaps the most striking example of a cable company's building FTTH for competitive reasons is Altice. In 2016, this European company acquired Cablevision, a large cable operator in the New York metropolitan area that was struggling to compete with Verizon's Fios service in much of its territory. Six months after the acquisition, Altice (now Altice USA) announced it would overbuild the entire Cablevision footprint – approximately 3 million customers – with FTTH over five years. That build is just beginning, and the company expects to launch fiber services in some areas by the end of 2018.

Eventually, more cable companies will find it difficult to match their

fiber-based competitors – which is one reason for the statement that "fiber is the endgame." That won't happen soon. The next major upgrade for HFC networks, full-duplex broadband, which Salib estimates will be commercially available in two to three years, will allow cable operators to offer symmetrical gigabit service to residential customers. This could keep well-maintained cable plant competitive in some places for 20 years to come.

However, Salib adds, "There's still no parity with fiber. Full-duplex will be capable of 8 Gbps downstream and 3 Gbps upstream, but fiber will always be faster. Look at NG-PON2 or next-generation EPON – those fiber technologies are capable of much higher rates, and there are plans for even higher rates. These speeds will be used for applications we don't even know about today."

CABLE IN POOR CONDITION
HFC systems that have been kept current can generally accommodate today's bandwidth demand, at least for downstream bandwidth. Gigabit (downstream) service over HFC networks is now common. However, not all operators keep all their systems up to date.

Todd Gingrass, solution director at CCI, cites an operator that was considering what to do with some very old HFC plant that had a capacity of only 550 MHz. "They were strapped for bandwidth," he says. "The plant was really old. The cable itself was old. It had aged poorly, and they'd have to replace a lot of it. So why replace it with cable again? It made more sense to scrap the whole thing."

Even large cable operators have some systems in poor condition, Gingrass adds. However, smaller operators tend to be more flexible and more willing to move forward with big decisions such as converting to all-fiber.

> Facing competition from fiber-based services, Altice USA plans to overbuild the former Cablevision HFC plant with fiber over five years.

PROPERTY OWNERS TO THE RESCUE

Developers' and property owners' arrangements with broadband providers vary widely in terms of who invests in what, who owns what and who pays whom for what. Over the years, this magazine's Property of the Month feature has documented nearly every type of agreement imaginable. In at least some cases, however, property owners concerned about future proofing pay to install fiber from the entrance to the property to each unit, even in brownfield properties.

In this case, a provider still incurs costs to support fiber services, but those costs are lower than they would be if the provider had to build all the way to each unit. Some cable companies will agree to bring fiber up to the property line and deliver fiber services over infrastructure the owner installs. For example, Comcast's Slovin says that if an owner puts in fiber-to-the-unit infrastructure, XFINITY Communities will connect to it and deliver services over it.

COST-EFFECTIVE CONVERSION

PON technology was originally developed by the telephone industry and designed to integrate into telephone networks. Fiber to the home became practical for cable companies only with the arrival of RFoG, which made last-mile fiber look as if it were part of the cable plant. Later technologies, including DOCSIS Provisioning of EPON (DPoE) and DOCSIS Provisioning of GPON (DPoG), gave cable operators alternatives for managing fiber as part of a cable network. But these were "baby steps," according to Doug Blue, director of solutions marketing for Calix, and have been used primarily in greenfield builds. "Cable operators still felt like they were operating two plants," he says.

As cable operators drive fiber deeper and deeper into HFC networks, the cost of replacing the coaxial part of a network becomes lower and lower. However, cost-effective conversion still depends on two things: better technology for replacing the outside plant (or installing new outside plant) and better ways to manage mixed infrastructure as a single network.

The construction part of the problem could conceivably be solved, at least in some areas, by using methods such as core extraction (in which the interior portion of the coaxial cable is removed and replaced with fiber) or microtrenching. However, the jury is still out on whether either of these, or any other construction method, will significantly affect the business case for FTTH.

But the technologies used to manage networks are indeed converging. Gingrass, who works with cable and telco networks across the United States, says the two are "starting to look very much the same." This trend will make cable networks even more compatible with fiber and thus allow a mixed network to be managed more like a single network. Some new developments include the following:

- Many cable companies are preparing to transition from RF to IP video, which will allow them to use standard PON architectures (especially EPON) without special fixes. Some are beginning this transition with IP-based over-the-top services that can eventually be leveraged into full IPTV platforms. Says Gingrass, "That's when the gates will open and you'll see more fiber to the home."

- Remote optical line terminals (OLTs) that can attach to fiber-fed cable nodes have become available and will allow for a more gradual migration to fiber. Blue explains, "They're fed off the cable power plant and fully hardened. That means no rights-of-way issues, no permitting – it's an option to deploy like a cable operator." If 10 to 15 percent of the customers on a node (either residential or small-business customers) require higher bandwidth than the node can supply, it can make economic sense to add a remote OLT to support those customers instead of adding channels or splitting the node.

- Software-defined networking is enabling virtualization of network management functions, which will separate provisioning from the physical equipment. Blue says, "We won't necessarily have to put a DOCSIS provisioning component on the optical networking terminal [as with DPoE] – we'll virtualize it instead."

- The remote PHY technology specified two years ago by CableLabs is now becoming a reality. This technology pushes the physical RF layer (PHY) to the edge of the access network and enables the core of the headend to connect with it via Ethernet over fiber. Kevin Morgan, chief marketing officer for equipment vendor Clearfield, says, "Remote PHY will allow a converged network and will leverage a number of different architectures using optics."

- Better in-home Wi-Fi equipment allows cable operators to install fiber to the home without rewiring homes.

In every location, as capacity becomes constrained, cable operators will have to examine all the costs and benefits of converting to fiber versus upgrading their HFC networks incrementally. In some cases, fiber will be the answer, and in other cases, HFC will be. Gingrass sums up the decision process this way:

"Our first approach is to define the problem the cable operator is trying to solve. If you don't define the problem, and just ask people what they want – well, as Henry Ford is supposed to have said, 'If I had asked people what they wanted, they would have said faster horses.' … There's some thought [among cable operators] that deploying fiber is consorting with the enemy, but they need to use the right technology to solve the problem. Fiber deep architecture starts getting really close to looking like FTTH, and that's what costs the dollars. They need to figure out what's the total cost of owning, building, and maintaining the system – both with fiber and HFC – and operating it every single day over a comparable amount of time." ❖

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