Reimagine Delivery of Gigabit Services in the MDU or MTU

Internet providers and building owners that want to offer gigabit services should investigate G.hn technology and reuse the existing copper wiring or coax cabling.

By Pierre Trudeau / *Positron Access Solutions*

For both condominiums and apartments to rent, gigabit internet access is highly valued, on par with state-of-the-art kitchens and spa-like health facilities.

A recent report from market research firm RVA LLC indicates that high-speed broadband, which usually means (up to) gigabit services, adds 2 percent to the value of a condominium and 8 percent to the rental price of an apartment.

Fiber-to-the-home technologies, such as GPON, EPON and active Ethernet, are great technologies to serve single-family homes, thanks to recent advances in fiber deployment with techniques such as directional boring or aerial fiber. But the complexity of reaching all doors inside MDUs or multi-tenant units (MTU) with a fiber feed is a major problem, particularly in brownfield buildings. Bringing fiber to each door, deep inside a building, can be costly, complex and disruptive to residents. There is a need for a simple, cost-effective way to extend gigabit coverage deep inside the MDU or MTU without relying on the installation of new fiber.

The answer is to reuse the existing telephone wiring or coaxial cabling inside the building. That's why the concept of G.fast appeared to hold some promise. Unfortunately, in many brownfield situations, G.fast has failed to deliver.

Another broadband protocol, G.hn, which was originally developed for in-home networking, has potential to solve this problem. Distributing gigabit services with G.hn from the fiber feed into the building, using the existing wiring infrastructure, benefits both building owners and operators. For owners, the availability of gigabit internet services is a great value-add. As mentioned above, it can increase the monthly rent by as much as 8 percent. Operators can deliver gigabit services at a fraction of the cost of deploying fiber to each door, avoiding major disruptions for building owners and residents. Operators can expand network coverage quickly without a major capex and opex investment, and they can feel confident that their investment is future-proof because it will deliver any bandwidth up to gigabit speeds to each subscriber.

EXISTING COPPER, COAX REALITIES

The desire to leverage the existing telephone wiring or coaxial cabling is not new. This was the underlying premise of G.fast. Unfortunately, the lofty goals set for G.fast have yet to materialize, even with the anticipated availability of newer G.fast chipsets supporting Amendment 3 that promise to improve achievable bandwidth.

Despite numerous announcements, many operators have quietly reduced or abandoned their plans to deploy G.fast. Real-life use of G.fast highlights its scalability limitations. Although both G.hn and G.fast work on existing telephone wiring and coax cabling, only G.hn will work over coax cabling with splitters.

WEIGHING G.HN, G.FAST

The ITU-T G.hn standard (G.9960), also known as Wave-2, was ratified a few years ago. It allows operators in many international markets to leverage existing telephone wiring or coaxial cabling to deliver gigabit internet and related services to each door of an MDU or MTU over the existing infrastructure. When operating over coaxial cabling, the current G.hn standard takes advantage of standard coaxial splitters to serve as many as 16 subscribers over a single coaxial port, achieving economies of scale previously limited to cable TV with DOCSIS.

Let's compare G.hn and G.fast. The most prevalent configuration of a G.fast distribution point unit (DPU) solution is 16 ports. This raises two major concerns. The first is that the delivery of true gigabit speeds on current-generation DPUs requires the bonding of two G.fast ports, reducing by half the number of subscribers the DPU can serve with gigabit services. This effectively doubles the cost for subscribers.

The second problem with G.fast is that it's not possible to add another small DPU when the ports of the first DPU are all in use because the noise cancellation/vectoring processor in the DPU cannot work alongside another DPU. This forces the operator to go through a "rip and replace" process to install a larger (and more expensive) DPU. With the typical coaxial cable infrastructure being point-to-multipoint, to support cable TV and DOCSIS, it is nearly impossible to use G.fast because it is strictly a point-to-point technology.

G.hn doesn't have these problems. Each port on the G.hn solution can operate as a single input, single output (SISO) single-pair or multiple input, multiple output (MIMO) two-pair port on copper. The G.hn VectorBoost technology for copper pairs works from the get-go across multiple G.hn access multiplexers (GAMs) for seamless scalability. Furthermore, G.hn leverages the point-to-multipoint nature of coaxial cabling to deliver gigabit services at a much lower cost. This means it's possible to serve up to 16 subscribers per coaxial port. The cost per subscriber with G.hn is a lot less than with G.fast.

For operators and building owners that rely on satellite TV such as DirecTV or DISH, G.hn is 100 percent compatible with the satellite TV signal. This means that a single medium (coaxial cable) delivers gigabit internet, IPTV and IP telephony to each subscriber. Operators offering an IPTV service rely on the existing telephone pairs or coaxial cabling for *all* services they deliver to subscribers. Either way, building owners no longer need to worry about the impact of any construction work in their buildings.

NEXT-LEVEL USER EXPERIENCE

The delivery of gigabit services over G.hn Wave-2 is as scalable and predictable as the fiber feed into the GAM serving the building. Although speed is a critical component of the user's quality of experience, subscribers now demand a lot more from their overall experience with the service.

Millennials and other internet-savvy subscribers expect additional capabilities such as self-installation and zero-touch provisioning. They have little tolerance for long delays before they can talk to a support specialist or get their service levels modified.

When deployed with the optional GAM captive portal option, G.hn facilitates subscribers' self-installation with zero-touch provisioning and automated activation. With GAM, operators now always have the tools to allow subscribers to remain in control of their subscriptions.

G.hn redefines the gigabit internet service user experience. The technology not only offers users a hotspot-like experience from the moment they initially connect to the "always on" G.hn gigabit infrastructure, but allows users to change bandwidth levels in real time. Subscribers can experience bandwidth changes within seconds. This enhanced user experience is the best antidote to the high churn

Positron GAM product family for Copper (-M) and Coax (-C)

rate plaguing the industry and it helps retain MDU tenants who value gigabit access.

POSITRON'S GAM

The Positron GAM leverages a non-blocking CE 2.0 Carrier Ethernet core for reliable delivery of managed gigabit services for MDUs and MTUs. The GAM is a fiber-to-the-distribution-point (FTTdp) solution typically installed inside a wiring closet. Each GAM comes with multiple 10 gigabit SFP-plus interfaces to support any type of fiber or PON standards (using an ONT as required). These SFP-plus ports also support connectivity with additional GAM devices in medium to large MDUs and share the fiber backhaul link.

With the Positron GAM, high-speed gigabit internet services are more stable, reducing support calls and customer churn. The GAM software extends its management capabilities to the G.hn endpoint (aka G.hn to Ethernet bridge) devices to simplify and eliminate the more complex functions of the residential gateway. The GAM hardware enforces per-subscriber bandwidth profiles and always guarantees a fair and balanced use of the backhaul link to include value-added services such as IPTV, video streaming, online gaming and telephony. Its extensive support for VLAN (including Q-in-Q) allows for seamless integration with the operator xPON services and the OSS and BSS functions already in place. The service operations administration and maintenance (OAM) capabilities of the GAM provide real-time information to the operator about the overall grade of services without any additional cost or complexity.

With cross-GAM hardware-assisted synchronization to improve the efficiency of VectorBoost, the GAM optimizes the bandwidth for each subscriber based on the real-time traffic demand and on the condition of the twisted pair wiring.

The Positron GAM is available in 24- and 12-port configurations for either coaxial cable or twisted pair with support for SISO (one pair per port) and MIMO (two pairs per port).

REDEFINING MDU, MTU GIGABIT SERVICE

G.hn Wave-2 provides an affordable and proven alternative to more complex and expensive gigabit solutions for MDU and MTU buildings. It redefines how building owners and operators can cost-effectively deliver the gigabit experience demanded by condominium owners or tenants over the existing building infrastructure and avoid substantial construction work otherwise required to deploy fiber. ❖

Pierre Trudeau is president and CTO of Positron Access Solutions. He can be reached at ptrudeau@positronaccess.com.

G.HN TECHNOLOGY PRIMER

The ITU-T G.9960 G.hn Wave-2 standard leverages existing telephone wiring (UTP, Cat 3 or Cat 5/5e) or coax cabling (RG-6/RG-59) to deliver gigabit internet service to each subscriber inside an MDU or MTU without the cost, complexity and delays associated with in-building fiber installation.

G.hn allows operators to simplify the management of their access networks with an Ethernet-like technology that is highly scalable and less complex than DSL-related technologies. With G.hn, operators deliver advanced services such as gigabit high-speed residential internet and 4K IPTV without the high capital and operational expenses associated with a fiber retrofit. Each G.hn subscriber port supports up to 1.7 Gbps of dynamically allocated bandwidth for near-symmetrical gigabit services over existing telephone wire or coaxial cable. In addition to delivering residential high-speed internet, Positron's G.hn access multiplexer (GAM) solution complies with MEF CE 2.0 and is ideally suited to deliver business Ethernet services in an MTU deployment.

G.hn Wave-2 is widely used by large operators in multiple markets with a strong base in Southeast Asia, where it provides gigabit services to MDUs of all sizes and for residential neighborhoods. Operators such as Korea Telecom leverage the robustness of G.hn and its predictable bandwidth to scale to large deployments and complement PON infrastructure investments.

G.hn is also a perfect fit for coaxial cable networks, which typically have a point-to-multipoint topology, providing a solution capable of delivering gigabit services at a fraction of the cost of traditional DOCSIS solutions that rely on expensive remote PHY or remote MAC CMTS equipment.