

# G.hn Is Vital to Gigabit Broadband Services Rollouts

G.hn has emerged as competitive to fiber to the home because it now enables service providers to offer higher data rates by leveraging existing copper assets.

By Livia Rosu / *HomeGrid Forum*

**H**istorically, telecom operators thought that the only way to achieve high-speed broadband services was through the extensive deployment of optical fiber reaching every single home.

Since the early 2000s at least, many people have assumed that existing copper cabling was incapable of delivering the fast data rates required for high-quality fiber-to-the-home (FTTH) services.

Instead, they believed that all copper networks would need to be replaced with newly installed end-to-end optical fiber to enable truly next-generational services.

## CHANGING THE CONVERSATION

The theory about FTTH has proven to be a two-edged sword as cost and speed of installation are linked to the requirement of causing minimal disruption to customers and local area networks. The conversation has shifted, and providers now understand that aspects of the traditional FTTH deployment model had to be modified, largely due to two factors: cost and new technologies.

First, installing fiber to every single home was too expensive in terms of labor costs and disruptive to residents. In addition, FTTH rollouts often were delayed because of the slow process of getting permissions from building owners or local authorities.

At the same time, advances in technology meant the industry was able to develop new

telecom and cable standards, which meant higher data rates could be provided through existing copper assets that leverage the infrastructure and are competitive with fiber.

Though some industry players continued to doubt the practicalities of copper, new innovations enabled copper wires to deliver data rates 10 times higher than those previously possible. As such, a trend has now developed with standards such as gigabit home networking (G.hn) technology being continually enhanced. This specific update means broadband can now reach speeds of up to 1–2 Gbps over copper coaxial and twisted pair cables, with even higher rates promised soon.

## G.HN TAKES CENTER STAGE

It is now possible for service providers to leverage G.hn technology, along with its corresponding copper assets, to reduce the cost of deploying last-mile infrastructure while supplying gigabit class broadband that is virtually indistinguishable from traditional FTTH.

G.hn is a networking standard initially developed by the International Telecommunications Union (ITU). Its original design goal was to specify a physical layer and a data link layer capable of delivering data rates of 1 Gbps via any type of wiring available in residential environments, such as powerlines, phone lines and coaxial cables.

The original achievement for G.hn was to solve home-networking problems, but the industry soon identified G.hn as a great solution for broadband access. It is especially useful in multiple dwelling units (MDUs), such as office buildings or apartment complexes, where installing optical fiber is just not feasible because of high costs and regulatory requirements.

As such, G.hn proved to be perfect for providing the high-speed broadband services customers now demand. It can work through the legacy wiring often found in MDUs, such as twisted-pair cabling for phone service, keeping installation costs low. For these topologies, individual micro-distribution point units (DPUs) can be installed in a central location of an MDU, or multipoint DPUs can serve multiple customers.

G.hn has also become a perfect fit for coaxial cable networks, which typically have a point-to-multipoint (P2MP) topology. It is ideal for delivering gigabit services at a fraction of the cost of more traditional DOCSIS solutions that rely on expensive cable modem termination system equipment.

G.hn is also an extremely valuable connectivity solution for isolated or bundled single-family-unit topologies, in which multiple phone wires or coax wires are either isolated in a point-to-point (P2P) connection or converge as multiple P2P connections in the same bundle to reach a single distribution point (DP). For these networks, the micro-DPU installation can be delayed until customers decide to sign up for the connectivity service, which is what network operators call the pay-as-you-grow business model of the installation.

With technical aspects common for power lines, coaxial and twisted-pair cabling, silicon vendors can develop a single chip that can implement all three, ensuring scale and interoperability through adherence to ITU standards and HomeGrid Forum certification. Today, G.hn chipsets support all three media, enabling system vendors to build products that can adapt to any available wiring by just changing a simple software setting in the device.

## Broadband can now reach speeds of up to 1 to 2 Gbps over copper coaxial and twisted pair cables, with even higher speeds promised soon.

This flexibility is a key reason service providers rely on G.hn technology to provide gigabit broadband services to millions of users worldwide, with many already utilizing it as a solution.

### IMPROVING THE BUSINESS CASE

In addition to the technical parameters that must be considered to reduce the cost of FTTx deployment, such as reliability, robustness, latency, security and data rate, there are several nontechnical aspects to consider. To ensure the broadband industry remains successful and competitive, it is critical that service providers work with a high number of system vendors that rival each other. However, multivendor availability is crucial at both the silicon and system levels to guarantee a competitive ecosystem. For service providers, it is important to choose from a wide portfolio of system vendors working with multiple chipset vendors as well.

Going a step further, multivendor interoperability is also essential. If a carrier has a large installed base of products from vendor A, it will never be able to adopt a lower-cost product from vendor B or mix with a higher-end device from vendor C if they are not able to work together. Though products A, B and C may be based on the same broadband technology or implement the same standard, there often are technical differences in that interoperability can be guaranteed only by a compliance-certification laboratory authorized to test for certification purposes. The connectivity history of GPON and xDSL technologies taught us that several compatibility problems can be avoided by ensuring interoperability certification prior to deployments.

Though vendors have a huge incentive to push service providers to start paying for and deploying new technology as soon as it is available, early adopters often face the risk of finding bugs associated with early implementation. For large carriers, it can often be better to wait until manufacturers have had time to iron out any issues in their hardware and software – being the first customer for any new chip is not without risk. It is important to allow technology to mature.

The last consideration is critical mass. When a given technology is not in wide circulation, it will not generate enough revenue to allow vendors to invest resources in supporting it properly. This means when volumes are reduced, manufacturers are forced to keep prices high to recoup their initial investment in the product's development. Only when a technology is shipping millions of units per year can vendors achieve desired economies of scale.

### MAKING G.HN HIT THE SPOT

G.hn hits all the performance markers perfectly. Currently, dozens of Tier-1 and Tier-2 system vendors offer a range of G.hn products. These address a range of form factors, from G.hn access multiplexers (GAM) to G.hn network terminals, from micro-DPUs to multipoint DPUs, from fiber extenders to home-networking products – all of which rely on chipsets sold by multiple manufacturers.

To ensure interoperability, certification programs, such as the HomeGrid Forum program, guarantee that products work with others on the market. For products that pass all the tests, certification guarantees that they meet international standards. This

helps improve the entire ecosystem by making complete interoperability an industry-level standard all vendors aspire to meet.

G.hn technology has had plenty of time to mature since the release of the first standard in 2009, with multiple updates and improvements made since then. As such, silicon manufacturers have had time to release multiple generations of G.hn products, and millions of broadband users rely on them. G.hn has also achieved critical mass with vendors shipping millions of chips every year at competitive prices. As a result, companies have been able to invest millions of dollars into research and development, ensuring the continual development of G.hn technology as it evolves to meet demands for 10 Gbps networks and other applications in areas such as smart cities, smart grids and industrial IoT.

## LOOKING AHEAD

As demand grows for faster and more reliable connectivity, service providers worldwide experience higher levels of users online now more than ever. To meet demand, technology must be capable of delivering the internet services required. G.hn is vital in enabling this, and it is imperative that innovation continues freely, along with the certification and deployment efforts of industry alliances.

G.hn technology offers a reliable, secure backbone for connectivity, along with multi-gigabit data rates and incomparable interoperability between devices and bidirectional travel. Bandwidth management is ensured with dynamic bandwidth allocation mechanisms for downstream/upstream split per frame adaptation, and crosstalk mitigation techniques applied to network traffic are designed to ensure the best user experience at all levels.

This makes G.hn a powerful tool for service providers committed to meeting subscriber demands. As part of this, HomeGrid Forum will continue to support technology vendors submitting their products for certification to ensure the ecosystem continues developing, and work with members on the continual innovation of G.hn technology.

With further development, it will be possible for the technology to reach even higher data rates. The role of G.hn, and the broadband services it can provide, will play a critical role in the success of innovative technologies, such as the smart home, that have the potential to transform lives and enhance lifestyles. ❖

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