

Industry Intelligence Program

Communications

Evolution of Next Generation Broadband Technology - G.hn



Abstract

G.hn (Gigabit Home Networking), the next-generation standard for wired home networks has been under discussion over the past two years, but the result has not been as expected. However, with the launch of large exhibitions, regional business match-making seminars, and telecom operators' interoperability tests on chips and equipment, products based on G.hn standards which use three home wires for data transmission are likely to hit shelves in 2013, starting from the retailing and telecom markets. In addition, China Telecom carried out interoperability tests in April. This report summarized the key points mentioned in the HomeGrid Forum-backed business opportunity match-making seminar held in Taiwan and examines the G.hn deployment of major Chinese telecom operators and equipment vendors.

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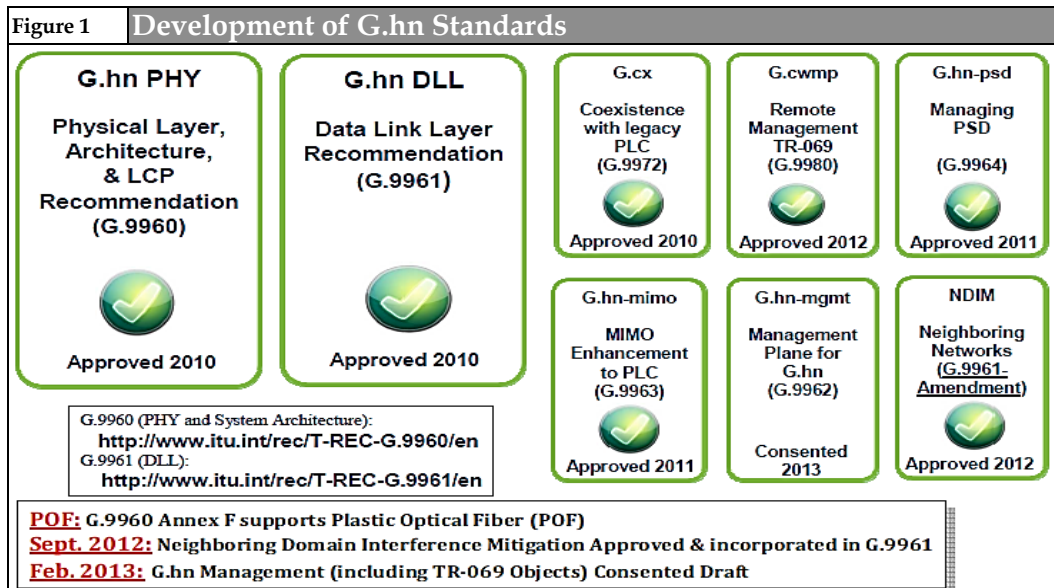
1. Summary of Business Opportunity Match-making Seminar for G.hn Standards and Applications

1.1 HomeGrid Chairman's Points of View: Development of G.hn Standard

At the business opportunity match-making seminar for G.hn standards and applications held in Taiwan in March 2013, HomeGrid Forum chairman John Egan shared the latest development and future trends of G.hn technology and applications. Egan explicitly discussed current G.hn development, followed by talks on the future of the industries involved including chip vendors, equipment vendors, and telecom operators.

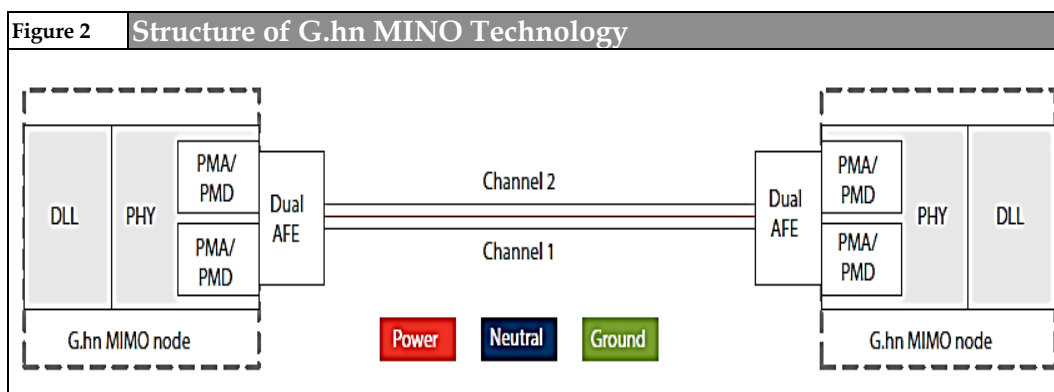
G.hn standards made several breakthroughs between 2010 and 2012. ITU-T approved Recommendation G.9960 for G.hn PHY, Recommendation G.9961 for G.hn DLL (Data Link Layer), and Recommendation G.9972 for coexistence protocols that communicate with other home networked devices in 2010. In line with power line interference problems, Recommendations G.9963 and G.9964 were completed in 2011. G.9963, also known as G.hn-mimo, defines MIMO (Multi-input Multi-output) specifications, which use power line as a multiple input and output channel; G.9964, also known as G.hn-psd, regulates power spectral density. To support smart grid applications, ITU-T also developed G.hnem standard to address energy management of smart grids.

In order to integrate management in the last mile, HomeGrid Forum and ITU-T approved G.9961 Amendment and completed two standards in 2012. The amendment is based on G.cwmp (G.9980) standard that allows for data transmission over home networks based on the CWMP (CPE WAN Management Protocol) specifications defined by TR-069, and NDIM (Neighboring Domain Interference Mitigation) that endows G.hn power line devices with resistance to interference from nearby G.hn power lines. After the draft was proposed in 2012, Recommendation G.9962 on G.hn management and diagnostics was approved in February 2013.



Source: HomeGrid Forum, compiled by MIC, May 2013

The emergence of G.hn standards is to satisfy telecom operators' demand for mutual communications between home networked devices by using the in-house wiring of power lines, phone lines, and coaxial lines. G.hn can provide up to 1Gbps theoretical data rate. As the initial applications of G.hn standards will target the PLC (Power line Communication) market, the establishment of the G.hn MIMO standard for higher data speed and quality will enable the G.hn camp to better compete with its main rival, the HomePlug camp.

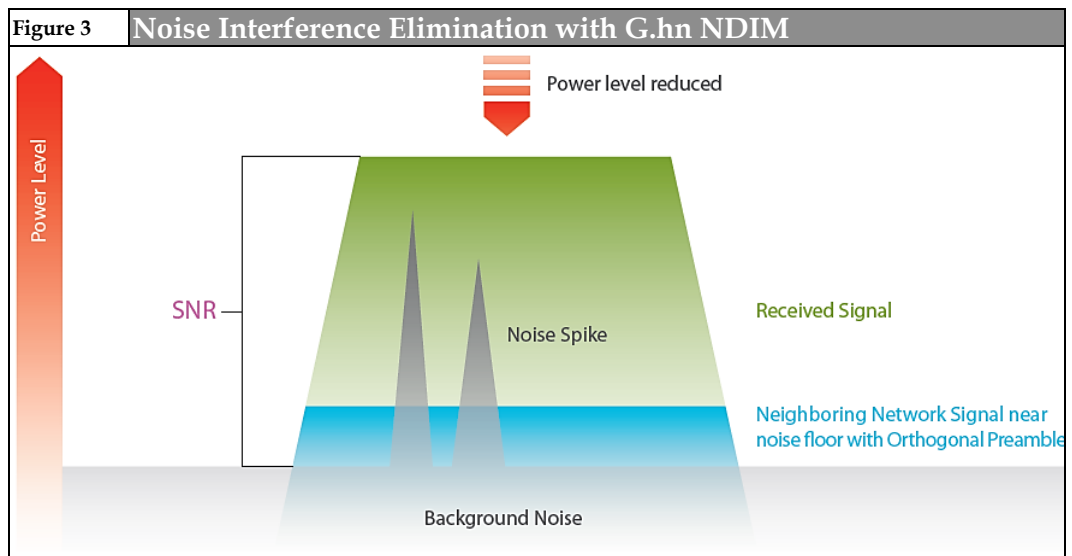


Source: HomeGrid Forum, compiled by MIC, May 2013

Most people in populous cities, especially in China and other Asian countries, live in community buildings nowadays, or known as MDUs (Multi-dwelling Unit). The high population density has resulted in

interference on high-speed networks, especially when transmitting data over power lines. This is so-called neighboring networks interference.

Hence, ITU-T and HomeGrid Forum has revised and reinforced G.hn DLL standard by introducing NDIM technology, which uses techniques such as orthogonal preambles, adaptive power control, and MAC cycle alignment and inter-domain coordination. These approaches effectively solve the problems of weakening transmission performance and signals over power lines due to network interference and noises from neighboring networks, while adjusting traffic between networks automatically.

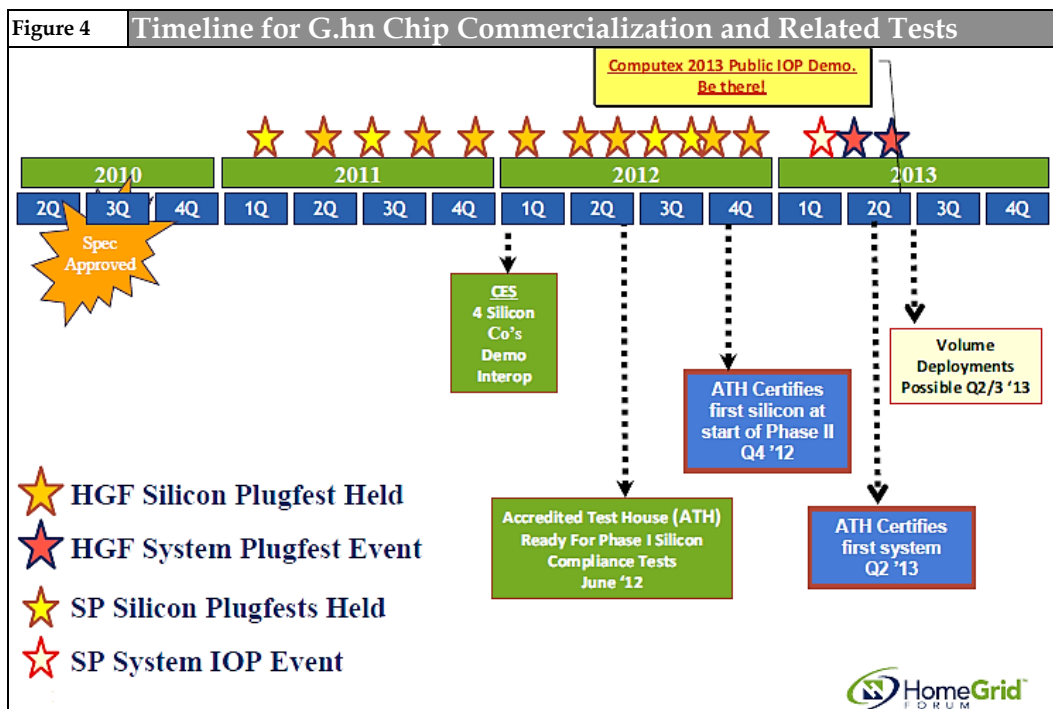


Source: HomeGrid Forum, compiled by MIC, May 2013

ITU-T established G.cwmp (TR-069) standard in line with telecom operators' demand for initialization and management tasks on end-user devices, such as the launch of end device services, configuration of functions, document uploads and downloads, and system inspection. The development of these standards shows that G.hn standards have factored in telecom operators' needs to ensure more comprehensive considerations. With the upcoming commercialization of G.hn chips, it is hoped that more ISPs (Internet Service Providers) will jump in and then accelerate the adoption of G.hn technology in end devices and homes.

1.2 IC Vendors' Points of View: Current Product Development

At the match-making seminar, five IC vendors including US Marvell and Sigma Designs, Taiwanese Metanoia Communication, Israeli Tangotec, and Chinese Xingtera were invited to share the commercialization status of their chips. In fact, a series of chip interoperability tests have been conducted in 2012 and HomeGrid Forum also awarded the G.hn certification to Marvell 88LX3142/88LX2718 chips in late 2012. Hence, most G.hn chip vendors have planned to roll out commercial platforms or help OEMs (Original Equipment Manufacturers) launch the first mass produced end devices around the third quarter of 2013. These plans can be traced back to the CES held in early 2013.



Source: HomeGrid Forum, compiled by MIC, May 2013

Among all chip vendors at the CES, Marvell and Sigma Designs are closest to mass production. Marvell has rolled out a series of solutions based on its G.hn chips in cooperation with Teleconnect, CIG (Cambridge Industries Group), Woxter, Comtrend, and Billion. These solutions, which prove Marvell's leadership in G.hn chips, include bridges and modular access devices. Sigma Designs also presented its next-generation CG5200 Series G.hn chipsets and has worked with several network communications device

ODMs (Original Design Manufacturers)/OEMs to develop end devices, so strengthening its market status

Metanoia Communication, Tangotec, and Xingtera have focused on demonstrating their chip technologies and maintaining business exposure by stepping up engagement with telecom operators in interoperability tests and match-making events. They expect these efforts would win the favor of network communications device makers and telecom operators. For example, Metanoia Communication presented its research results on NDIM at the match-making seminar, indicating its determination and ambition to reinforce deployment of the G.hn market through technology R&D.

2. Major Chinese Telecom Operators and Equipment Vendors' G.hn Deployment

2.1 China Telecom Operators' Interoperability Tests Likely to Create First Business Opportunities in 2013

To provide more diverse integrated broadband services, China Telecom has been evaluating the introduction of wired home network technologies over the past two years. Despite a constant delay in G.hn chip commercialization, China Telecom has continued to invite Marvell, Metanoia, Sigma Designs, and Xingtera to participate in their interoperability tests.

Pegged for the second quarter of 2013, China Telecom's G.hn interoperability tests will include the interoperability between vendors' chips as well as performance of some equipment vendors' end devices. With service differentiation in mind, and to enlarge the gap with the two fixed network telecom operators China Unicom and China Mobile, China Telecom is likely to make G.hn a required standard in their next-generation home gateways. In addition, the high data rate and multi-interface support of G.hn devices will help China Telecom develop more complete and appropriate solutions for high-bandwidth applications such as image monitoring, remote medical care, and education on their wired/wireless broadband networks, thereby benefiting their smart city projects.

Marvell and Metanoia's G.hn chipsets have been used in commercial PON (Passive Optical Network) and

VDSL (Very-high-bit-rate Digital Subscriber Line) platforms, while Sigma Designs has spent years cultivating the STB (Set Top Box) market. Once China Telecom introduces G.hn-enabled multiplexing gateways in 2013, these chip vendors are likely to bundle their G.hn chips with their WAN (Wide Area Network)/LAN (Local Area Network) solutions or media gateways to boost shipments.

2.2 T&W Targets Multiple Markets with Dual Platforms

Following the adoption of Marvell's G.hn chipsets in June 2012, leading Chinese network communications equipment vendor T&W Electronics announced to incorporate Sigma Designs's CG5200 chipsets in their G.hn-enabled end devices in March 2013.

T&W, which merged with Shenzhen Gongjin Electronics in 2009, is the largest DSL maker in China, and has applied different partnership strategies with telecom operators and branded equipment vendors: the front is more direct while the later more indirect. In recent years, T&W has been devoted to developing home networked devices and aggressively expanding their footholds to the international market. Ruling out the possibility of platform transition, T&W's adoption of two different G.hn platforms carries the following meanings. From HomeGrid Forum and G.hn camp's perspectives, this shows chip vendors' efforts to achieve interoperability and compatibility of their G.hn solutions have been recognized by equipment vendors. Furthermore, as T&W's DSL CPE (Consumer Premises Equipment) has been widely available in China and some international markets, the company is able to accelerate the pace of G.hn commercialization through its price advantage and bundled sale strategies.

With a large DSL installation base, T&W has enjoyed price negotiation advantages when procuring components. As all G.hn chip vendors are competing for the first commercial shipment or the largest market share, the adoption of two different G.hn chip platforms will benefit T&W in terms of better procurement prices, acquisition of samples, and chip vendors' technological support. Moreover, G.hn is likely to replace or serve as a complimentary technology to HomePNA, another standard backed by ITU-T. HomePNA has been adopted in DSL devices or STBs in the US for years,

and large telecom operators such as AT&T and Bell Aliant have launched their IPTV (Internet Protocol Television) and home networked applications based on HomePNA, with over 30 million bases being installed. If T&W successfully take the lead in G.hn commercialization, other than vying for China Telecom's orders, the company will also aggressively move into the commercial HomePNA market.

3. Conclusion

3.1 Commercialized G.hn Products for Computex

According to HomeGrid Forum chairman John Egan, HomeGrid and its members have hoped G.hn standards to be as well-rounded as possible. Therefore, in order to fully support the three wired media, HomeGrid has continued to develop G.9972 (G.cx) and G.9980 (G.cwmp) after the completion of G.9960 and G.9961 standards in 2010. HomeGrid has counted on these efforts to make G.hn superior to HomePlug and MoCA (Multimedia over Coax Alliance) in terms of coexistence, management, and security, and to attract more telecom operators' adoption with the advantage of being an ITU standard.

With the completion of comprehensive G.hn standards, several leading international telecom operators' have conducted performance and interoperability tests on G.hn chips. Leading chip vendors involved in the tests include Marvell, Sigma Designs, and Metanoia. Through the ongoing tests, vendors have constantly improved chip interoperability and heat dissipation. Commercialization of G.hn products is likely to take place at two periods in 2013. The first commercialization will hinge on China Telecom's decision to release the first equipment procurement bid in the second half once they finish evaluating their latest interoperability tests in early April. The bid will make China Telecom the early adopter of G.hn technology in the telecom market. The second turning point is the Christmas holiday in the US as Egan believes leading US retailer Best Buy, also one of HomeGrid Forum members, is likely to distribute the first G.hn products in the retailing market. Factoring in the lead time of the two commercialization timelines and HomeGrid Forum's related campaigns, commercialized G.hn products were expected to make their debut at Computex.

Besides China Telecom and Best Buy's endorsement in the telecom and retailing markets, the growing market visibility of G.hn standards in the second half of 2013 will rely on the involvement of more equipment vendors. Their efforts to diversify the price and the product will play a key role, whether they are G.hn adapters that only support PLC interfaces or highly integrated home gateways. Additionally, whether telecom operators in favor of UPA or HomePNA standards are willing to introduce G.hn products to deepen the coverage of their broadband services and applications will also contribute to G.hn development.

Appendix

Glossary of Terms

CPE	Consumer Premises Equipment
CPU	Central Processing Unit
CWMP	CPE WAN Management Protocol
DLL	Data Link Layer
DNIM	Neighboring Domain Interference Mitigation
G.hn	Gigabit Home Networking
IPTV	Internet Protocol Television
ISP	Internet Service Provider
LAN	Local Area Network
MDU	Multi-Dwelling Unit
MIMO	Multi-Input Multi-Output
ODM	Original Design Manufacturing
OEM	Original Equipment Manufacturing
PLC	Power Line Communication
PON	Passive Optical Network
STB	Set Top Box
VDSL	Very-high-bit-rate Digital Subscriber Line)
WAN	Wide Area Network

List of Companies

Best Buy
Billion
China Mobile
China Telecom
China Unicom
CIG Cambridge Industries Group
Comtrend
Marvell
Metanoia Communication
Sigma Designs
T&W Electronics
Tangotec
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