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The Value of Physical-Layer Technology Certification Programs to ISPs

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About HomeGrid Forum

HomeGrid Forum (HGF) merged with the HomePNA Alliance in May 2013, forming an industry alliance of over 70 members including some of the world's largest Service Providers, system manufacturers, and silicon companies. HGF promotes development and deployment of a single, unified, multi-sourced home networking technology, G.hn, over coax, phone wires, powerline, and plastic optic fiber while continuing to support the existing base of HomePNA deployments. HGF provides silicon and system certification through its compliance and interoperability testing programs to ensure that retail customers and service providers can have confidence in all G.hn and HomePNA products.

HGF members collectively provide an eco-system covering all aspects of the technology from Retailers to Service Providers, utilities to Smart Grid think tanks, system developers to test houses and silicon companies. Our goals include promoting the benefits of G.hn; enhancing G.hn technology to meet evolving industry requirements; ensuring interoperability, performance based on our certification program; and supporting the needs of Service Providers deploying G.hn and HomePNA technologies.

For more information on HomeGrid Forum, please visit our website at http://www.homegridforum.org

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Note

The Value of Physical-Layer Technology Certification Programs to ISPs

Service provider deployment of legacy powerline technologies has been haphazard due to compatibility and interoperability issues. Some providers used it only to extend the reach of Wi-Fi, some used it for TV services, and some used it for home automation services. It is also available in many retail markets. As with coax technologies, service providers did their own performance testing and discovered Interoperability is almost non-existent, which has required service providers to single-source their deployed devices. This also caused confusion when some consumers tried to buy additional adaptors at retail and add them to telco services. Finally, problems with neighboring networks (especially in multi-dwelling units) are becoming more common as deployment increases. Unfortunately, these problems are all being made worse as powerline technologies evolve and both HomePlug AV2 and G.hn products make their way into consumers' homes and service provider test labs. Tests that allowed for repeatable, accurate, and meaningful testing of performance of powerline technologies have become so important that Broadband Forum has published TR-208 "Performance Test Plan for In-premises Powerline Communication Systems".

Well-designed certification programs can be very valuable to ISPs who want to deploy certain physical-layer networking technologies. Just as standardized technologies can provide solutions that meet or mostly meet the needs of a service provider through a structure that distributes Research and Development costs among multiple companies and that can be produced at attractive prices because of larger scale (larger than just what a single provider would procure) and multiple manufacturers, industry certification programs can distribute the cost of developing the program and provide more thorough review and vetting of the program. While a service provider may still find they need to do some testing beyond that of the certification program, the quantity and time required to do this extra testing can be decreased significantly if the certification program is well-designed.

Wireless and "no new wires" physical-layer technologies are complex and require careful encoding in order to achieve specification compliance (including security specifications), desired performance (including throughput, latency, and packet loss), interoperability among devices from different manufacturers, non-interference (or limited interference) with other neighboring technologies, and co-existence with other technologies or neighboring networks of the same technology that are competing to use the same physical medium. Developing a comprehensive test program for all of these elements takes considerable resources. Achieving accurate and precise test results requires test requirements, tools that automate these requirements, and a well-defined test environment.

Service providers have deployed "no new wires" physical-layer technologies for various purposes since the start of broadband Internet services. One of the earliest of these was ADSL. Service providers quickly discovered they needed multiple sources of chips for the DSL modems, so they worked with vendors in the DSL Forum (now called the Broadband Forum) to create conformance, interoperability and performance test specifications for ADSL (TR-031, TR-067, and TR-100 respectively) and subsequently for ADSL2 and VDSL. Service providers realized quickly that testing performance would be key to the success of DSL technologies, so

they placed a strong emphasis on pushing vendors to maximize both rate and reach performance through the performance test specification.

The first “no (new) wires” home networking technology to be deployed by service providers was Wi-Fi (802.11b). Most service providers relied on certifications from Wi-Fi Alliance (WFA) for vendors to prove they could pass the WFA test specifications (which were mostly for testing compliance with parts of IEEE 802.11 specifications). The WFA test specifications were very useful as they served to define a “mandatory to implement” set of 802.11 requirements and ensured interoperability among the many chip vendors producing Wi-Fi silicon. This sort of interoperability was critical as Wi-Fi was used to connect a variety of consumer-owned devices (all with chips from different manufacturers). However, service providers found it necessary to do their own performance testing for Wi-Fi, in addition to requiring WFA certifications. This continued as the Wi-Fi standards evolved, and resulted in different providers around the world testing performance differently and setting different performance expectations on vendors.

Where a service provider is deploying a technology over coax just to support their own services inside a customer’s home (e.g., MoCA or HomePNA over coax), the service provider is often willing to use just a single source for all chips (making interoperability easy to achieve); but the service provider does still usually require compliance certification from the industry alliance responsible for certification of the technology. Since consumers rarely use the coax in their homes (where coax exists) for networking, unexpected and unpredictable impacts by and on neighboring networks and technologies has not been important for coax technologies. However, performance was again a critical element of such deployments, and service providers found themselves doing the performance testing.

It is therefore clear that a certification program that can provide testing for compliance, interoperability, neighboring network co-existence, and performance would provide great value not only to service providers, but also to vendors (who benefit by having a single test plan instead of different tests and expectations from different service providers). The benefit is clearest for powerline, but is also important for coax and phoneline technologies. The tests are clearly necessary and valuable, and the test plans and tools can be created more quickly and with higher quality if resources are pooled in an industry alliance. Membership and participation in an industry alliance costs significantly less than the headcount, equipment, and lab resources needed to create and run a proprietary test setup.

In addition to the benefits of facilitating the provision of equipment from multiple, independent vendors, equipment certification can help to reduce the operating and support costs for service providers by preventing some of the causes of trouble calls from customers. Equipment certification provides a high degree of assurance that the equipment implements all of the essential functions correctly with adequate performance for an identified set of use cases.

When service providers demand, participate in, and receive a well-designed certification program that tests all these elements, the vendors, consumers, and service providers all benefit.