ISSI AMS
Analog Mixed Signal Division

G.hn Prime: The Right Choice for Today's Content Delivery Challenge

Introduction:

Service providers are looking for the right technological solutions that ensure they deliver seamless quality content throughout consumers' homes. With the continuing rise of internet services, streaming content and wireless interference, there is a real need for a robust proven solution to deliver content that meet consumers' needs.

This briefing paper is focused on the powerline communications (PLC) mode for G.hn and how ISSI AMS' G.hn Prime PLC meets service provider needs for robust home networks that complement service provider products and content delivery.

The State of the Market

IPTV

The global trend of increased IPTV adoption continues. More and more internet-based services are available in more markets. This global trend adds complexity to the home networks provided by service providers. The increasing bandwidth requirements and simultaneous usage impact the level of quality of service available in the home.

According to Taiwan's Market Intelligence and Consulting Institute (MIC), IPTV continues its expansion into the market. This emphasizes the need for quality service wherever IPTV content is consumed in the home

Worldwide IPTV Subscriber by Top 10 Countries, 3Q 2012 - 2Q 2015 Unit: Thousand

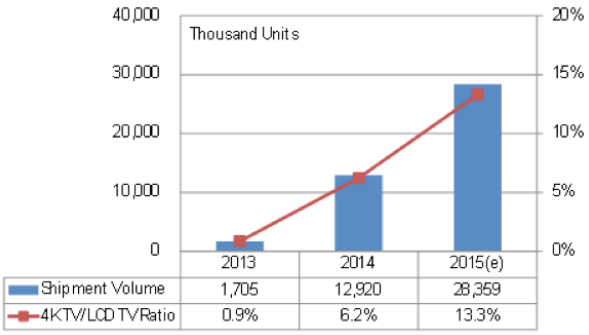
Country	3Q12	4Q12	1Q13	2Q13	3Q13	4Q13	1Q14	2Q14	3Q14	4Q14	1Q15	2Q15
China	17,875	18,769	19,525	20,667	24,117	28,609	30,155	31,747	32,573	33,600	36,302	38,858
France	13,586	13,897	14,080	14,213	14,569	14,791	15,157	15,245	15,458	15,678	15,873	15,912
USA	9,541	9,872	10,244	10,639	10,639	11,149	11,401	11,685	13,087	13,271	12,144	12,148
South Korea	6,013	6,487	6,945	7,503	8,037	8,599	9,086	9,569	10,114	10,627	11,103	11,530
Russia	1,863	2,086	2,540	2,925	3,240	3,411	3,740	4,460	4,683	4,916	5,112	5,317
Japan	3,034	3,138	3,265	3,337	3,449	3,557	4,278	4,332	4,704	4,808	4,877	4,916
Germany	2,341	2,394	2,459	2,494	2,553	2,605	2,700	2,769	2,747	2,812	2,888	2,952
U.K.	840	916	1,042	1,225	1,521	1,688	2,001	2,191	2,262	2,422	2,556	2,715
Netherlands	1,157	1,341	1,457	1,539	1,611	1,690	1,751	1,794	2,063	2,314	2,368	2,437
Canada	940	997	1,047	1,093	1,093	1,093	1,495	1,771	1,953	2,058	2,138	2,205
Top 10 market share	79.7%	80.0%	80.6%	81.0%	81.9%	82.8%	83.3%	83.3%	83.4%	83.3%	83.2%	83.4%
Total	57,189	59,897	62,603	65,634	70,828	77,191	81,764	85,563	89,645	92,506	95,361	98,991

Source: MIC, October 2015

Delivering services high quality, revenue generating services, such as Video on Demand (VoD), requires TCP over the most reliable network possible. Most legacy technologies may meet UDP traffic needs; however the newer IPTV-based services have different requirements.

UHD

Meanwhile, major markets are moving to Ultra-HD (UHD or 4K) IPTV. This service requires higher bandwidth and an even higher quality of service over the home network. Most network technologies cannot meet the demand of this service. Consumers want this technology. As can be seen from the MIC chart at right, the volume of UHD TV sets is accelerating. UHD must be planned for and G.hn Prime is the sole choice to meet the needs of UHD today and beyond.



	2013	2014	2015(e)
Shipment Volume	1,705	12,920	28,359
4KTV/LCD TV Ratio	0.9%	6.2%	13.3%

POWERLINE-BASED SOLUTIONS

G.hn

G.hn home networks are exactly what service providers need. The G.hn (as in "Gigabit Home Networks") technology, standardized by the ITU-T, provides the best networking service over any wire type: powerlines, coaxial cable, and phone lines. The ITU-T is focused on meeting service provider needs and requirements, thus G.hn was "defined by service providers to meet the needs of service providers."

G.hn's substantial capabilities would take pages to explain; here are a few highlights of the technology:

- Security – safeguards in G.hn protect network and data integrity and confidentiality
- Neighboring Networks – immune to cross-network interference when G.hn networks are in close proximity
- Throughput – achieve upwards of a gigabit of throughput over any wire
- Quality of Connectivity – consistent connectivity throughout the home for IPTV
- Interference Mitigation – robust to noise, withstanding interference from other networks

ISSI AMS APPROACH

ISSI AMS and TCP

ISSI AMS continuously exchanges insights with service providers, enabling ISSI AMS to meet their needs while offering quality information on technologies and solutions. With an in-depth knowledge of set top boxes, video platforms such as Mediaroom®, and how service providers use TCP for quality content delivery, ISSI AMS has engineered outstanding TCP performance into its G.hn Prime chipsets.

The results are showing that globally, service providers are reporting best in class TCP performance from G.hn Prime during their home network lab and field tests versus all other options.

ISSI AMS' G.hn Prime technology extends the G.hn technology with service provider-requested enhancements that ensure maximum throughput, coverage and clean connectivity throughout the home.

ISSI AMS and G.hn Prime

G.hn Prime uses state-of-the-art optimization algorithms and techniques to dramatically improve content delivery performance across real-world home networks, providing a significantly higher quality of experience (QoE) for the user versus any other networking option.

- **Unmatched Performance:** up to over twice the TCP performance of any other powerline products
- **High noise resilience:** advanced algorithms, based on years of home network experience, ensure maximum performance and interference mitigation
- **Reliable in Real Environments:** trouble-free connectivity with whole home coverage, unique coexistence mechanisms, surge protector and appliance noise tolerance, and operating in congested/MDU installations
- **Works over power strips and behind surge suppressors:** a frequent failure point for PLC. As can be seen from the Netperian lab tests, G.hn Prime outperforms while others struggle
- **HP AV/AV2 compatibility:** G.hn Prime automatically switches to a "HomePlug AV/AV2 coexistence mode" when near by HomePlug AV networks are detected, enabling the both to operate over the same powerlines, while G.hn Prime achieves best in class performance. The existing HomePlug AV/AV2 network is unchanged
- **Self-Installable/Expandable:** plug-n-play self-install with support for a large number of devices
- **Low power and footprint:** new single chip (CG5300) design offers low power and minimal RBOM for smaller foot print and lower cost PLC adapters and embedded designs
- **Fully HGF Certified:** full interoperability with other certified G.hn devices
- **Remote Management built in:** monitoring tools (including full TR-69 support) enable service providers to monitor and manage the performance of each network (and even each device)
- **The home's backbone network:** Wi-Fi cannot cover everywhere and needs wired links from the gateway. Mean while, the home's Internet of Things depends on a strong backbone network to fulfill its promise of ubiquitous connectivity. G.hn Prime is the right choice for the home's backbone network, the network other networks rely on to interconnect.

Market Tested

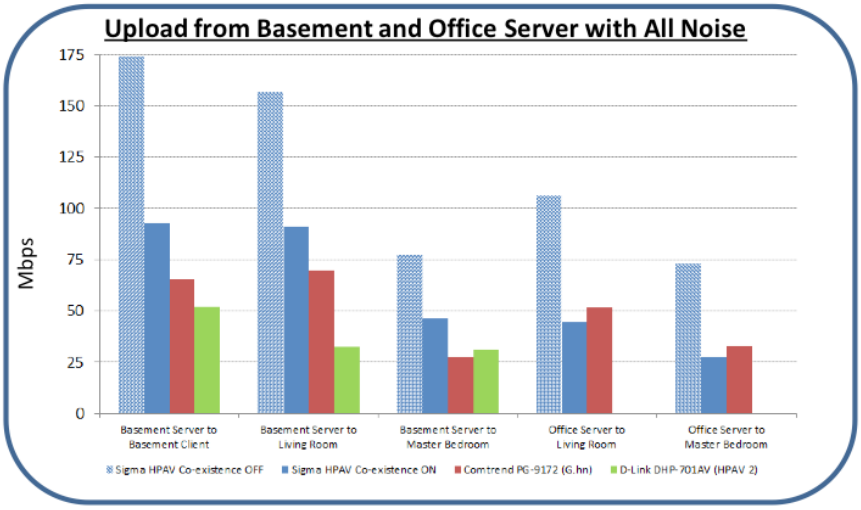
Independent Lab Field Test Results

ISSI AMS believes strongly in service providers' lab and field-testing our products. Here, we present results from two independent lab field tests that report the outstanding performance of G.hn Prime.

The Online Reporter

The Online Reporter tested several powerline communications (PLC) products to see how they performed in the "real world." Following are several quotes from their report about G.hn Prime's results.

"ISSI AMS' home network engineers have developed new firmware called G.hn Prime..." "... the ISSI AMS ... adapters clearly outperformed D-Link's HomePlug adapters in this test."



	All Noise			
	Sigma HPAV Co-existence OFF	Sigma HPAV Co-existence ON	Comtrend PG-9172 (G.hn)	D-Link DHP-701AV (HPAV 2)
Basement Server to Basement Client	174.0	92.7	65.4	51.9
Basement Server to Living Room	157.0	90.9	69.6	32.5
Basement Server to Master Bedroom	77.2	46.1	27.8	31.1
Office Server to Living Room	106.0	44.6	51.7	0.0
Office Server to Master Bedroom	72.7	27.5	33.0	0.0

Among the field test conclusions:

"All three tests showed that G.hn Prime... is faster than HomePlug." Further, G.hn Prime was the best G.hn system tested, as well.

Netperian Lab Tests

ISSI AMS contracted a well-known and respected test lab, Netperian **(www.netperian.com)** that focuses on testing content delivery in the home. Netperian used off-the-shelf systems from ISSI AMS and independently tested them in the field versus the same systems as tested by The Online Reporter: a HomePlug AV2 system from D-Link and Comtrend's G.hn product. We make the full report available under NDA.

The test results showed outstanding performance of G.hn Prime in standard as well as in HomePlug AV/AV2 coexistence modes. While the HomePlug AV2 systems encountered issues with operation over longer distances and power strips, G.hn Prime consistently provided clean connectivity and high throughput regardless of the conditions encountered.

CONCLUSION

Making G.hn Prime the best of G.hn and the Right Choice

The following highlights underscore how ISSI AMS's unique technology know-how enables G.hn Prime to outperform all others:

- Comprehensive knowledge of service provider needs and home networks based on ISSI AMS' HomePNA success
- In-depth understanding, beyond the Layer 2 focus of competing chip vendors, of quality content delivery over a home network through ISSI AMS pioneering leadership in media processing and Mediaroom deployments
- A unique ISSI AMS advancement in G.hn Prime that enables service providers encountering HomePlug AV networks to install G.hn Prime without experiencing inter-network interference or service issues
- Enhanced efficiency and capabilities when passing TCP traffic, such as VoD content, meeting service provider requirements for optimized TCP throughput and performance

For more details, please see our white paper "G.hn Prime – The Right Choice."

http://www.issi.com/WW/pdf/whitepapers/G.hn Prime_The Right Choice.pdf