“As IOT in the consumer sector experience wireless crowding, are backbones the key to its savior”…

www.homegridforum.org

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IOT SLAM 2016
IOT in the Digital Home

Digital Home Network
Wired and Wireless

Print server
Broadband Gateway
Audio Zone
Wi-Fi zone
CCTV
PC/LCD/Plasma/Projector
Media Server
What is the HomeGrid Forum?
HomeGrid Forum (HGF) is an industry alliance that started in 2008 and the first HGF certified product was deployed in 2013. HGF brings together the world’s best in technology innovators, silicon vendors, system manufacturers and service providers to promote G.hn, the globally recognized gigabit home networking technology based on ITU-T standards. G.hn, Gigabit home network, provides a single service delivery platform for your entertainment, your workspace – all your digital lifestyle needs – across any wire, simply and reliably.
WHAT IS G.hn?

G.hn is one chipset that supports multi wired home networking: Power line, Coax, Phone line and POF (Plastic Optical Fiber).
What makes a Great Backbone?
WHAT MAKES A GREAT BACKBONE?

- Security
- No Interference
- Highest Performance
The Best Backbones avoid Wireless “Dead Spots” in a Home
Cellular Networks Methodology

Increasing network capacity by reducing cell size

A few high-power macro-cells

Multiple low-power micro-cells
Powerline to Wireless vs. Wireless to Wireless as a Backbone
The New Power line: G.hn

- **Panels**: Unlike the legacy power line technologies of the past, G.hn works through multiple electrical panels in a consumer's home.

- **AFCI**: AFCI outlets, mainly found in North America, historically prevented legacy power line technology from working, but not G.hn.

- **Noise**: Treadmills, phone chargers, lights are inherent in most consumers home. G.hn, as compared with legacy power line does better the further the room.
“Per-Link” encryption reduces security threats

G.hn backbone

- AES-128 encryption
- Each link uses a different key
- One compromised device “cannot” spy on others

Legacy Powerline

- AES-128 encryption
- All links use the same encryption key
- One compromised device “can” spy on others
G.hn Security

G.hn backbone to Wireless

G.hn over Power line is a secure means to provide the aggregated SSID passwords in a per link encryption network back to the router versus having it exposed on a multiple array of Wi-Fi hotspots where one hotspot compromises all.
No Interference
Scenario: “High Power Wi-Fi Access Point”

Potential interference between homes, due to high power transmission

Wi-Fi (channel A)
Legacy Powerline as a Wired Backbone

“Neighbor Interference” from legacy powerline networks

Wi-Fi (channel A)
Wi-Fi (channel B)
Wi-Fi (channel C)
Legacy Powerline (all in same “collision domain”)
G.hn over Powerline has “Neighbor Protection”

No interference between homes!
Highest Performance
Why do they disappoint?: Wi-Fi to Wi-Fi

Wi-Fi to Wi-Fi extenders:

Wi-Fi radio in extender switches is constantly switching between client mode and AP mode effectively cutting bandwidth in half.
Wired Backbone to Wireless

Wired-to-WiFi extenders:

- Wi-Fi radio in an extender is in AP mode 100% of the time and can be in different channels.
Wi-Fi to Wi-Fi: Cut’s Bandwidth in Half

Wi-Fi to Wi-Fi extender, with single transceiver switching between AP and Client mode

Time required to send 3 data frames from Access Point to client via extender

G.hn to Wi-Fi extender, with dedicated transceiver and no switching

Time required to send 3 data frames from Access Point to client via extender

<table>
<thead>
<tr>
<th>Extender type</th>
<th>Throughput</th>
<th>Latency</th>
<th>QoS</th>
</tr>
</thead>
<tbody>
<tr>
<td>WiFi-to-WiFi extender</td>
<td>&lt;50% wireless capacity</td>
<td>&gt;2x latency and jitter</td>
<td>Not suitable for IPTV delivery</td>
</tr>
<tr>
<td>G.hn-to-WiFi extender</td>
<td>100% wireless capacity</td>
<td>Normal latency and jitter</td>
<td>Perfect for IPTV delivery</td>
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</tbody>
</table>
Latency: delay in a network

Legacy Powerline “CSMA” (up to 90ms) and Wireless (20-30 ms)
G.hn has the least latency

G.hn “TDMA” (1ms)
G.hn Backbone

- Security
- No Interference
- Highest Performance