



www.homegridforum.org

"An Overview of HomeGrid Forum and the Standardization of Multiple Application Profiles"

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HOMEGRID FORUM AND G.hn Technology



- HomeGrid Forum (HGF) is an industry alliance that started in 2008.
- HGF brings together technology innovators, silicon vendors, system manufacturers and service providers to promote G.hn technology.
- G.hn is a globally recognized ITU-T standard.
- G.hn provides a flexible connectivity solution across any wire.



Board/Promoter Membership



- Board of Directors:



- Promoter members:



Marketing Working Group



Promoting Global Awareness

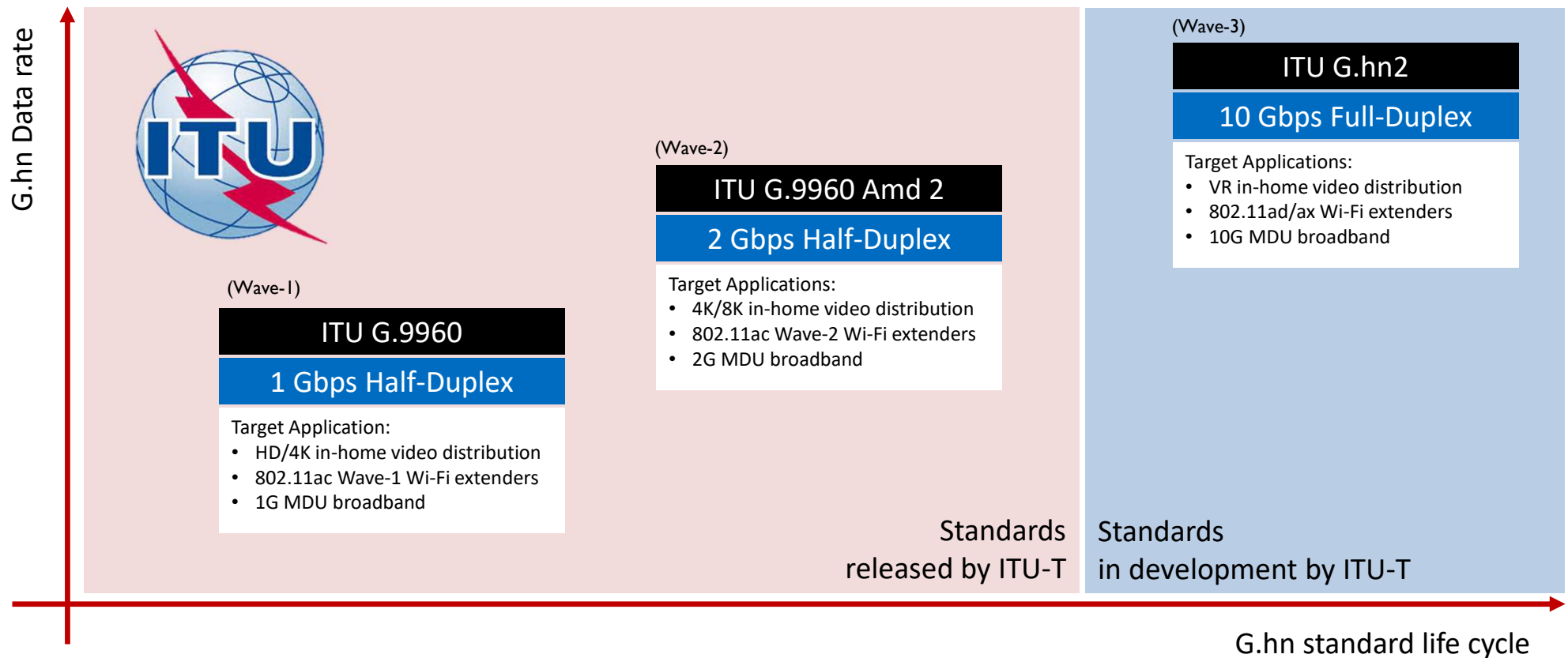
- New Member Announcements
- Trade Show Attendance
- Technology Panel Discussions
- Announce Product Certifications
- White Papers
- Announce Retail and Service Provider Deployments
- Press Releases, Blogs and Video Interviews

Certification & Interoperability Working Group



- **Provide a certification & interoperability program for certifying both silicon and systems**
- **Ensure the highest level of compliance, interoperability and performance**
- **Validate that G.hn products comply to the latest standards and HGF requirements**
- **Certify that retail products and service provider G.hn systems will interoperate and meet performance levels**

G.hn Standard Evolution at ITU-T



PRODUCT LOGO CERTIFICATION



Tests included in the Product Logo Test Specification are:

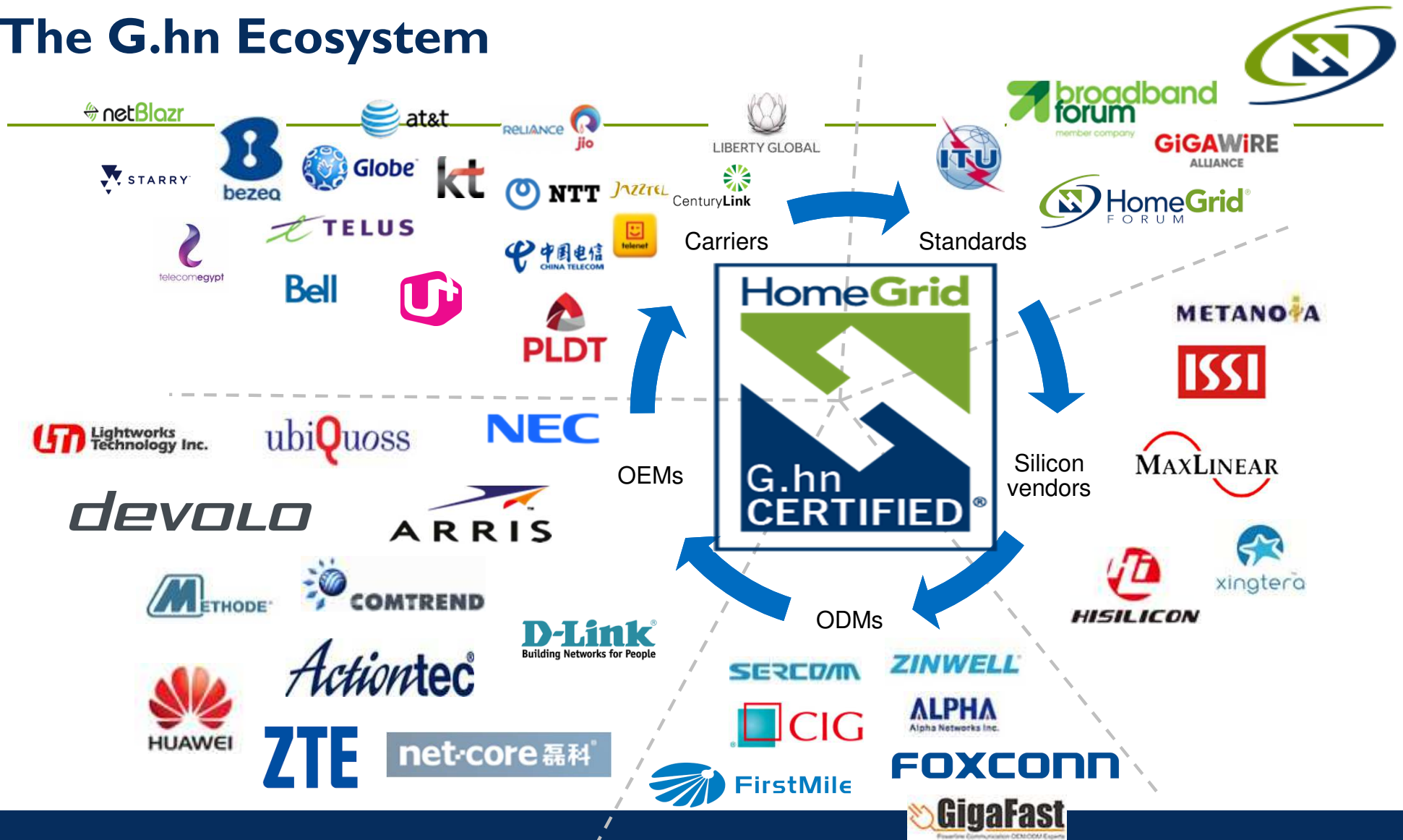
- **Compliance**
 - Full set of compliance tests
- **Performance**
 - Point-to-point tests
 - Throughput – noise free
 - Connection sustainability
- **Interoperability**
 - Multi-node tests
 - NDIM
 - Recovery from power loss
 - Random Domain ID
 - Pairing
 - Security
 - MIMO
 - Versioning



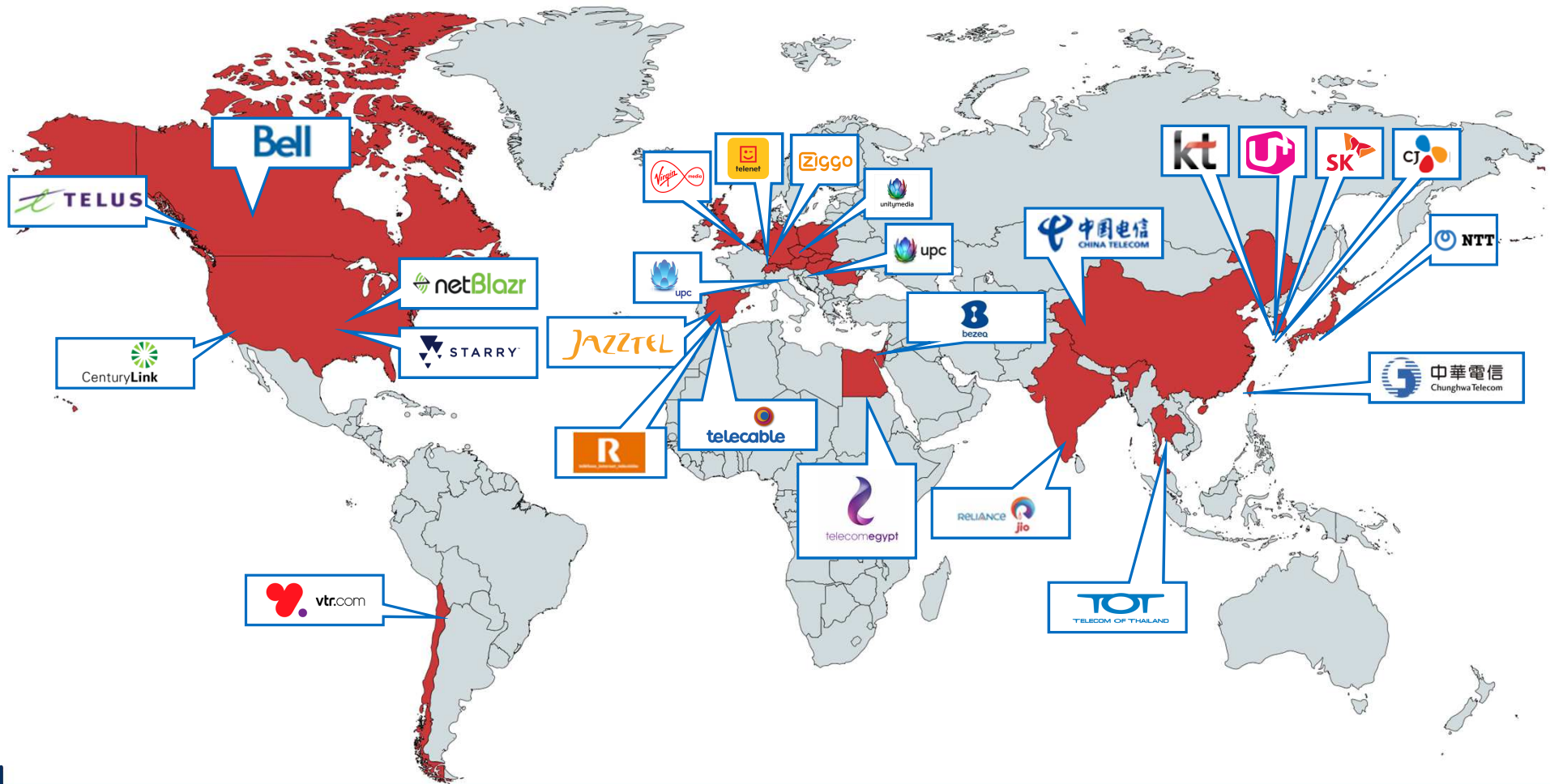
HomeGrid Forum Certified G.hn Products

The mark of Certified Compliance, Interoperability, and Performance

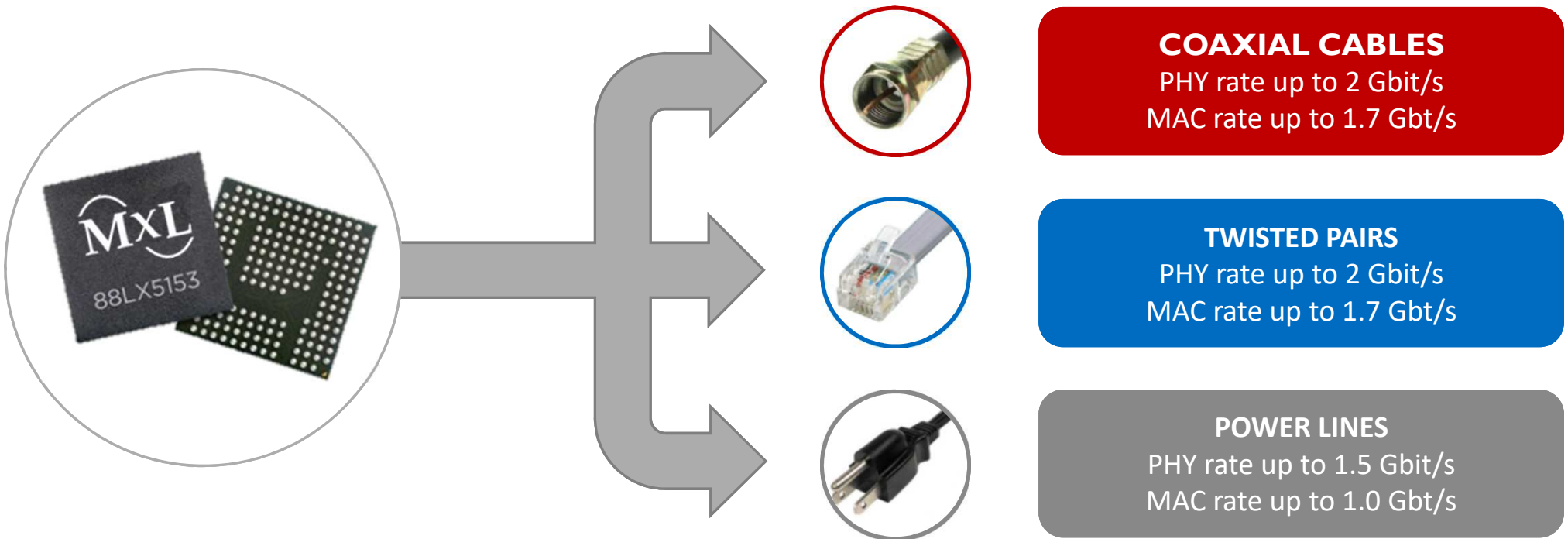
The G.hn Ecosystem



International Adoption of G.hn Technology



G.hn: one standard, multiple physical media



Liberty Global

(including subsidiaries such as Telenet, Ziggo, etc)

A screenshot of the Ziggo website. The browser address bar shows "https://www.ziggo.nl/internet/wifi-punt/". The website header includes the Ziggo logo and navigation links like "Pakketten", "Internet", "Televisie", "Bellen", "Mobiel", and "Klantenservice". The main content area features a large image of a Ziggo Wi-Fi extender plugged into a wall outlet, with a man and a child in the background. Below the image, the text reads: "Overall in huis perfect internet" and "Met een extra wifi-punt".

Overall in huis perfect internet

Met een extra wifi-punt

Overall in huis films en video's kijken, e-mailen en internetten, dat willen we natuurlijk allemaal. Maar isolatie, betonnen muren en apparatuur in huis zorgen er soms voor dat je verbinding niet al te snel en stabiel is. Gelukkig is er hulp.

Vaak los je het op met een extra wifi-punt van Ziggo. Deze wifi-punten zijn speciaal gekozen voor onze klanten. Ze werken namelijk perfect samen met onze modems en verbeteren overall in huis het wifi-signaal. We hebben twee verschillende wifi-punten. Afhankelijk van de situatie bij je thuis.

The challenge

Frequent customer calls complaining about inadequate Wi-Fi speeds in rooms far away from the residential gateway

The solution

Liberty Global developed a Wi-Fi extender solution that uses G.hn technology to provide a reliable wired backhaul for Wi-Fi extenders.

G.hn/Wi-Fi extenders have been deployed on multiple Liberty Global subsidiaries since 2015, with more countries been added each year.





The challenge

When Bell Canada started offering 4K IPTV service, they realized that the Wi-Fi technology they had traditionally used for HD video could not handle 4K video reliably across multiple rooms.

The solution

Bell Canada developed a powerline/ethernet adapter that uses G.hn technology to provide a reliable wired connection for the 4K IP STB.

The flexible ability of G.hn technology has also enabled Bell Canada to expand into other network architectures to leverage the existing coaxial cables in consumers' homes.





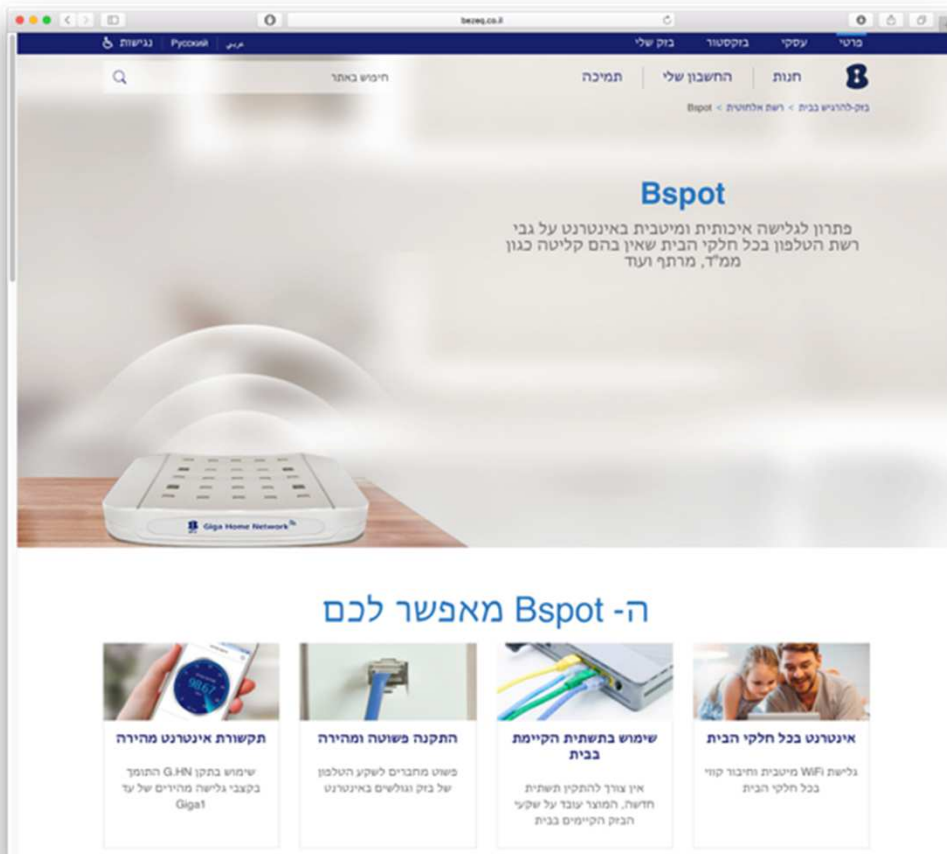
The challenge

Devolo wanted to develop Wi-Fi/PLC products that had double the data rate performance of their legacy products.

The solution

Devolo has launched a new range of powerline/Ethernet and powerline/WiFi extenders that leverage G.hn Wave 2 technology to address both the consumer and carrier markets.





The challenge

Israeli service provider Bezeq received frequent support calls from subscribers who got spotty Wi-Fi signal in some part of their homes, especially basements and safe rooms.

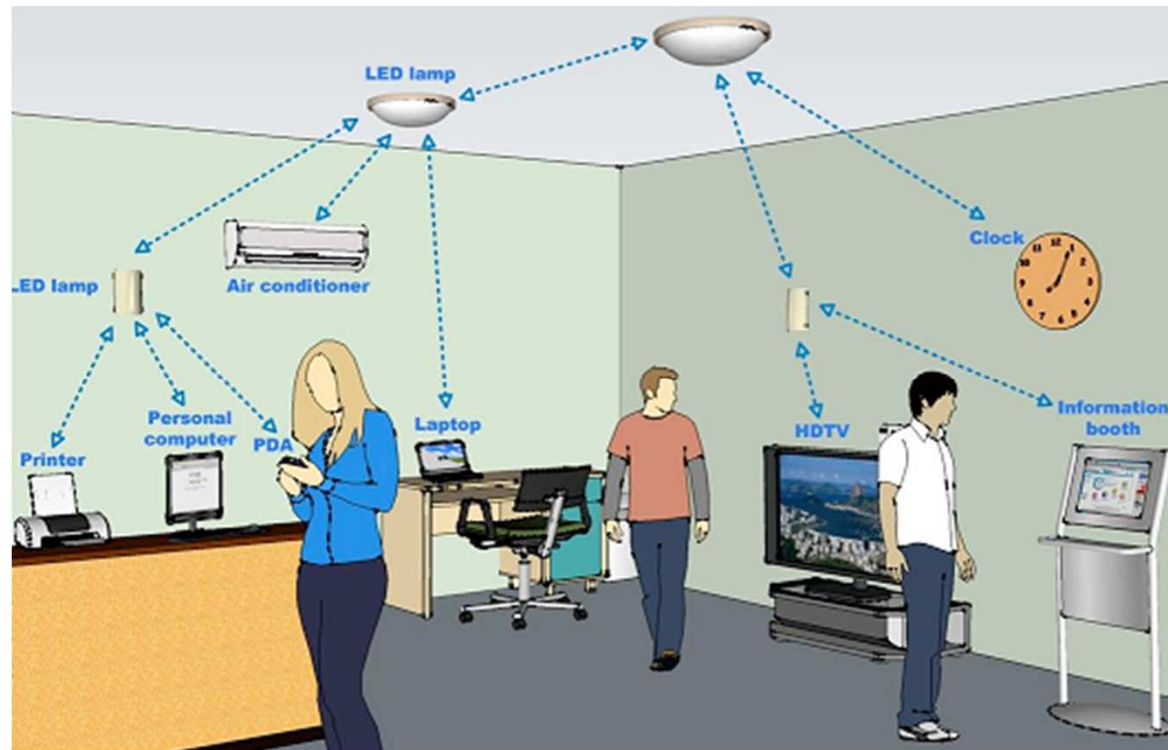
The solution

Bezeq selected a Wi-Fi extender solution that uses G.hn technology over the consumers home phonelines.

Bezeq's Bspot is easy to install by consumers themselves, and fixes Wi-Fi signal strength problems in every room in their homes, including basements and safe rooms.



Visible Light Communications



LED lighting is modulated at high frequencies for unregulated wireless communications
VLC products use G.hn for the backhaul connectivity infrastructure

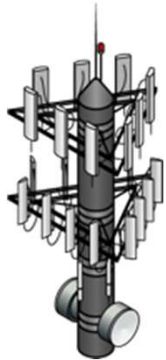


What is Li-Fi?

- **Li-Fi (a play on “Light-based Wi-Fi”)** refers to the technology that enables wireless broadband transmission using optical communications
- **Other names used throughout the industry:**
 - VLC (Visible Light Communications, even though sometimes invisible light - such as infrared – is used)
 - FSO (Free Space Optics)
- **What is the use case for Li-Fi?**
 - It provides high-speed communications in cases in which using RF spectrum is not the best alternative due to RF congestion, security, reliability, EMC regulation or physical constraints



Examples of Li-Fi Applications



Mobile Backhaul



Industrial Wireless



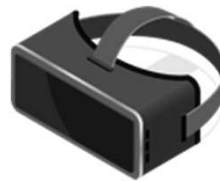
Indoor Li-Fi



IT Security



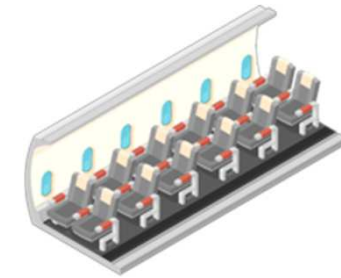
Hospitals



Virtual Reality



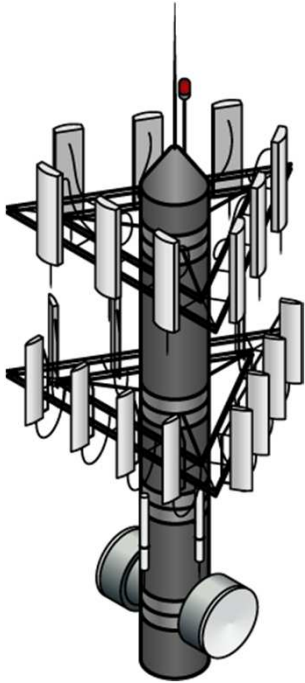
Underwater



Aviation



Example Application: 5G Backhaul



Mobile Backhaul

- 5G deployments will require an increase in the density of base stations needed to cover a given area.
- In some scenarios, micro-wave or millimeter-wave spectrum for backhaul may be unavailable due to licensing constraints
- Optical backhaul (either P2P or P2MP) can provide an inexpensive way to provide wireless backhaul connectivity without the need for licensed spectrum



Example Application: Industrial Wireless



Industrial Wireless

- Increased automation in manufacturing demands higher speed connections to sensors and actuators
- Wired connections on articulating robotic arms experience long term reliability issues due to metal strain and fatigue
- RF-based wireless can be problematic due to interference from other RF signals in the same manufacturing plant
- Optical-based wireless communication provides high-speed, interference-free communications to next-generation robotics

Example Application: Secure Wireless



Indoor Li-Fi



IT Security

- **Certain enterprise sectors are reluctant to allow Wi-Fi to be used for sensitive information:**
 - Defense/Government
 - Finance
 - Insurance
 - Medical
- **Li-Fi provides increased security because light signals unlike RF signals can be contained by physical walls**
 - The risk of externally hacking RF signals is removed
- **Li-Fi also avoids RF congestion (prevalent in 2.4GHz WiFi, and getting worse in 5GHz), improving user experienced in dense environments**

ITU VLC Standard



- The latest standard for Li-Fi technology has been developed by ITU, with contributions from multiple vendors
- G.9991 (a.k.a. G.vlc) has been developed by SG15 Q18, achieved consent in 2018 and will be published in Q1 2019
- G.9991 reuses the same PHY and MAC layer as G.hn (G.9960), ensuring that products can ramp to market quickly by reusing existing G.hn silicon
- Multiple vendors will launch G.vlc-compliant products (using existing standards based silicon) during 2019
 - Some were announced already in 2018:
<https://www.businesswire.com/news/home/20181023005981/en/Firefly-LiFi-Demonstrates-Commercially-ITU-G.vlc-Standard>



Thank you!