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Communications and its Applications
11-13 May 2020 // Virtual Conference

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*“G.hn Technology for Industrial and Smart Grid
Applications. ITU-T Roadmap and HomeGrid Forum
Certification Update”*

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1 – HomeGrid Forum progress

2 – ITU-T Q18/15 progress

3 – HomeGrid Forum certification

4 – Deployment examples

5 – Summary

HomeGrid Forum progress



Homegrid Forum: Introduction



- 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 provides a flexible connectivity solution across any wire.
- G.hn is a globally recognized ITU-T standard.



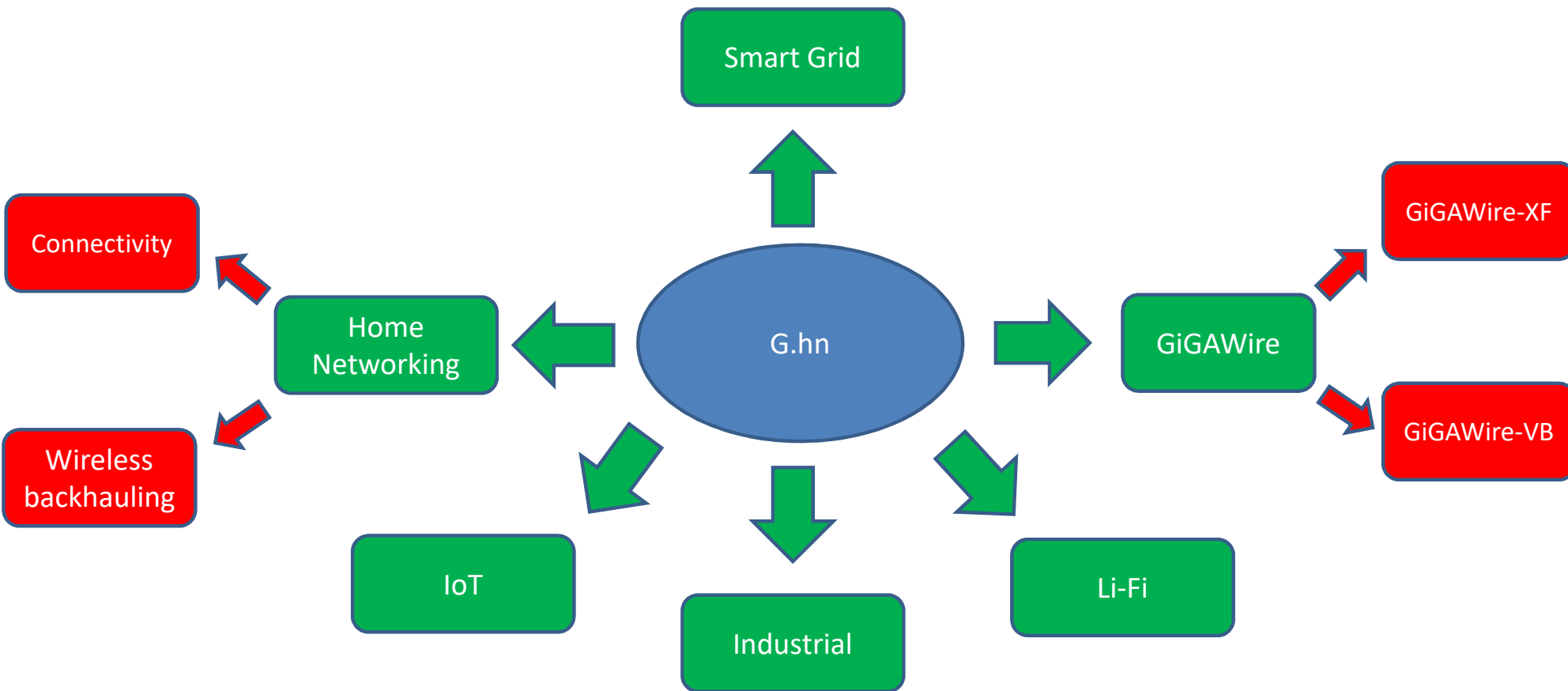
• BOARD OF DIRECTORS



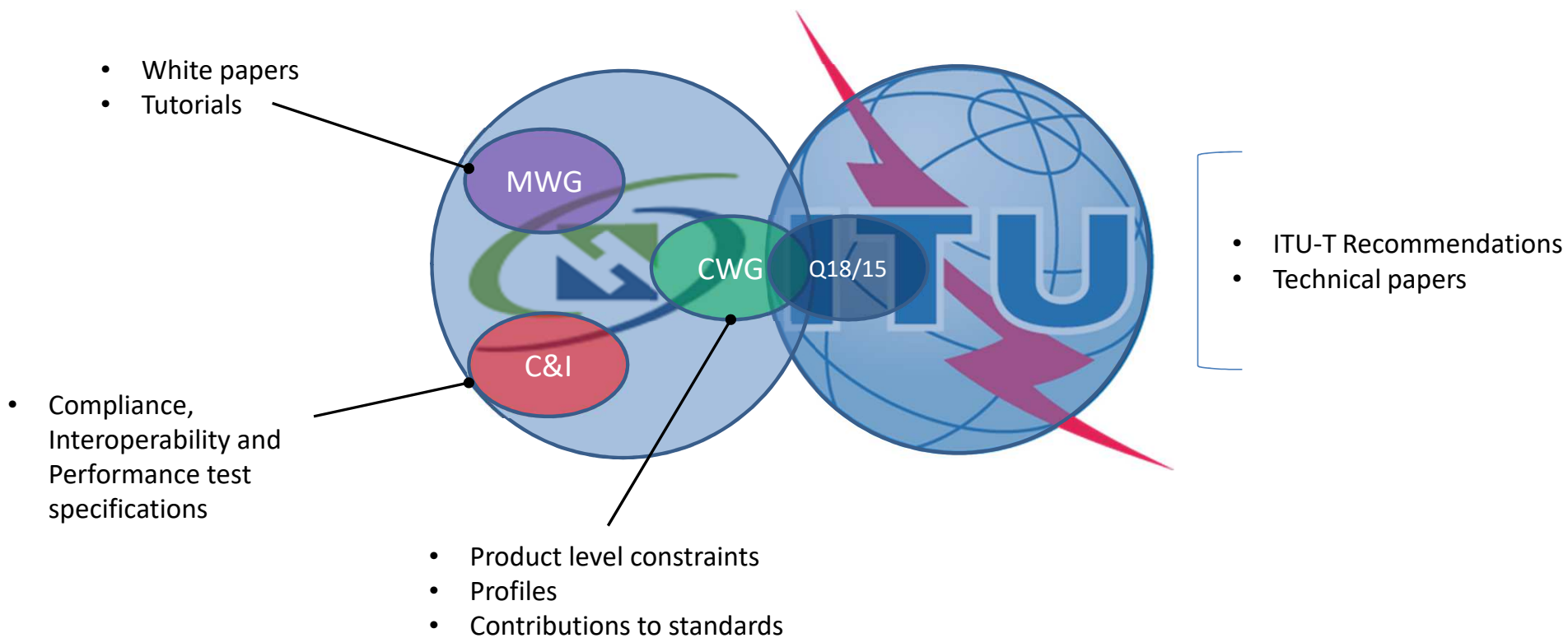
• PROMOTER MEMBERS



Homegrid Forum: Profiles



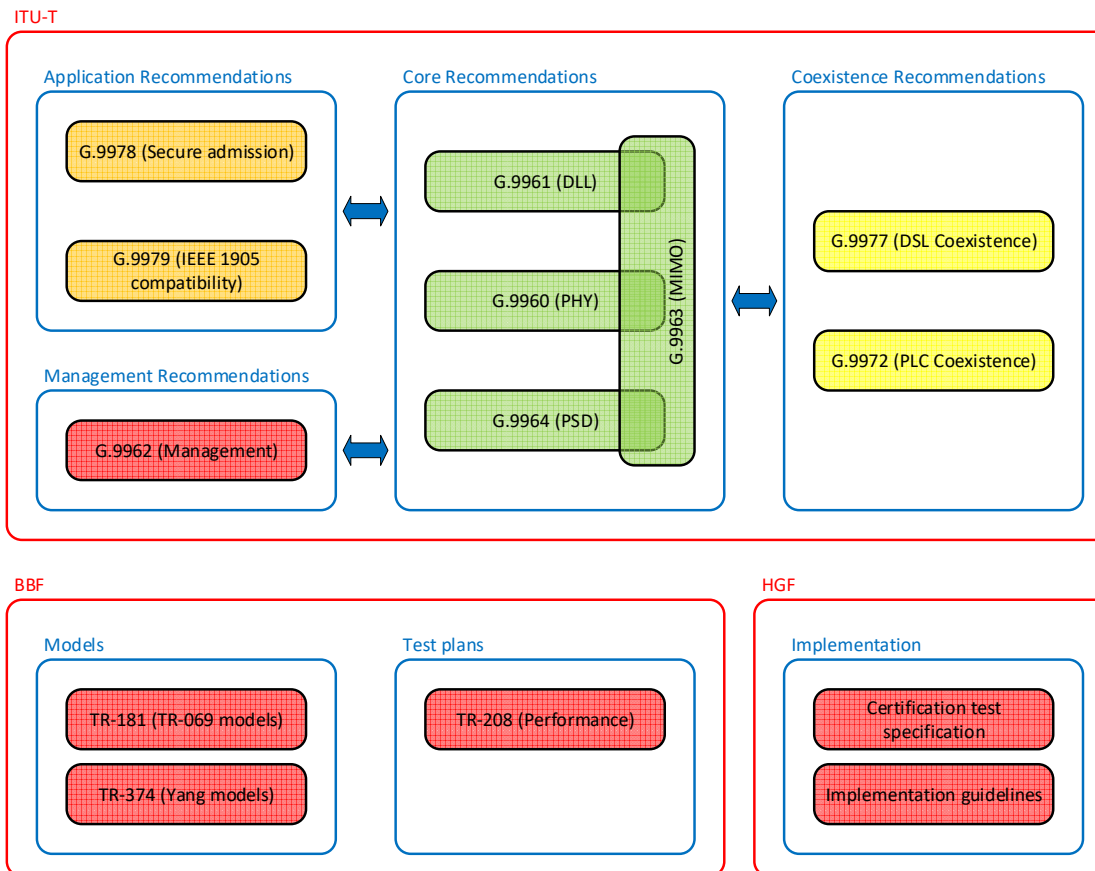
Homegrid Forum: Q18/15 relationship



ITU-T Q18/15 progress



ITU-T Q18/15 Recommendation (Home networking ecosystem)



Smart Grid evolution



- **Q18/15 has been working on adapting G.996x to the new requirements of Smart Grid Applications**
- **4 use cases selected**

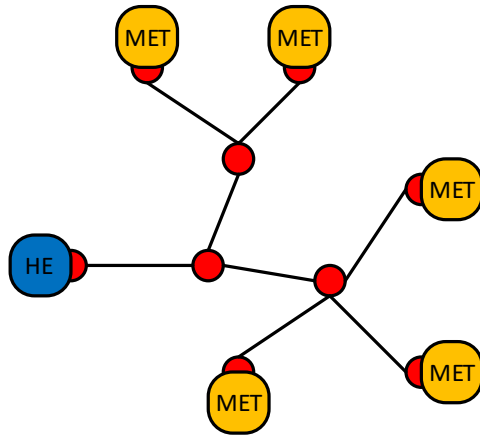
Case	Description
UC1	Smart Metering
UC2	Smart Meter gateway
UC3	Narrowband smart meter concentrator
UC4	Medium Voltage backbone

- **Improvements being implemented:**
 - Support of mesh & tree topologies
 - Routing improvements to support large number of nodes
 - Support of 802.1X authentication framework
 - Management data models

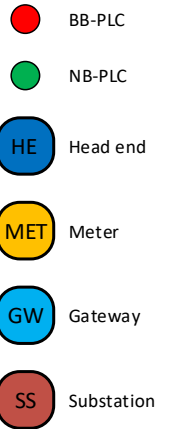
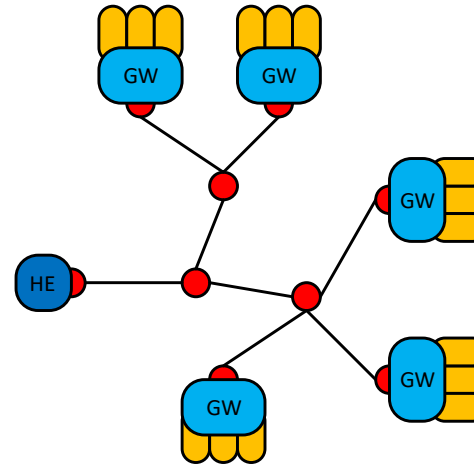
Smart grid evolution: Use cases



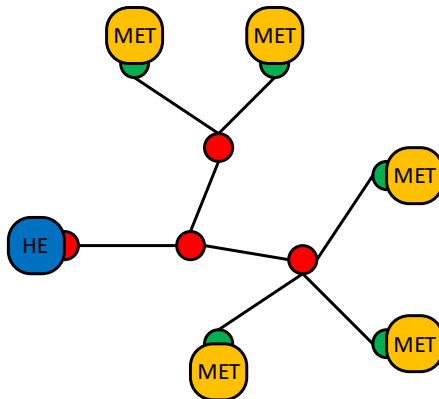
BB-PLC metering



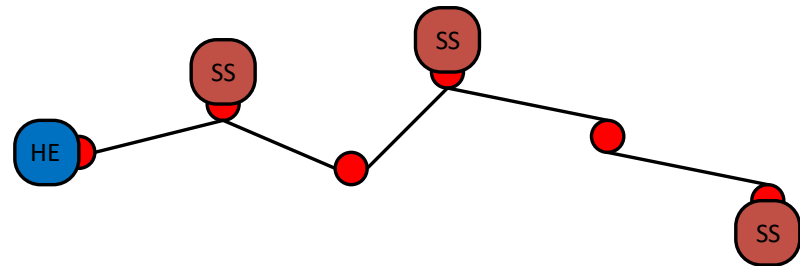
Smart Meter Gateway



NB-PLC concentrator



MV Backbone



Technical Paper for Smart Grid

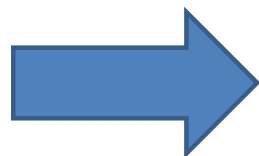


- **Describes the use of G.996x transceivers over power lines infrastructure for smart grid applications**
- **Intended to provide guidance to system vendors and utilities to define, configure, deploy, and network various devices using G.996x transceivers in this type of environment.**
- **Includes the 4 use cases**
- **Currently in development. Expected release Q3/2020**

G.hn for industrial



- Q18/15 has been working on adapting G.996x to the new requirements of industrial applications
- A Technical Paper has been recently published describing use cases for industrial applications (<https://www.itu.int/pub/T-TUT>)
- **Use cases covered:**
 - Entrance guard systems
 - Smart Lighting
 - Smart Traffic lights
 - Navigation lightning aid at airports
 - Charging stations
- **Move the technology to:**
 - Higher number of nodes
 - Longer distances (multi-hop)
 - High level of repetitions
 - Low latency & jitter
 - Extremely noisy environments

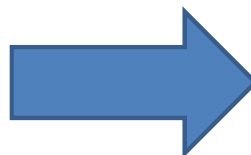


Some of these requirements already covered in SG

G.hn in IoT



- **New effort started in Q1 2020 to create an IoT-friendly variant of G.hn**
- **Fully interoperable with G.hn (part of the same domain) with several coexistence mechanisms**
- **Intended for**
 - Domotic: Likely coexistence with home network G.hn.
 - Industrial IoT: Possible coexistence with “standard” G.hn
- **Main objectives**
 - Low cost
 - Low complexity
 - Low consumption
 - Noise immune
 - Reliable
 - Controlled latency & jitter
 - Very high number of nodes



**Same requirements
than SG/Industrial
but with low-cost
addition**



Other projects in Q18/15

- **G.hn2 evolution (aka G.hn2):**
 - Evolution of powerline home networking to provide
 - More performance
 - Better support for new applications
- **G.uvs: Support UHD video service over G.hn: Specificities of transmission of UHD video service over G.hn.**
 - Typical deployment of UHD video types in home network.
 - Analysis of typical scenarios & typical impact factors to the network (channel capacity, channel stability, etc.)
 - Necessary technical features of G.hn technology to support UHD video.
 - Identification of new features in the G.hn technology that may improve the support UHD video over G.hn.
- **G.vlc (LiFi): Based on G.hn (LiFi): Perfect complement for powerline/Wi-Fi in a distribution network providing:**
 - Low latency access
 - Secure environment
 - Huge capacity
- **G.hn improvements over coax (@10 Gbps) and phone (@5 Gbps)**

Other projects in Q18/15 (2)



- **NB-PLC: Narrowband communications for smart grid (NEW)**

- Q18/15 inherited from the work in Q15/15.
- Perfect complement for broadband powerline activities.

Case	Description
1	Smart Metering (broadband)
2	Smart Meter gateway
3	Narrowband smart meter concentrator
4	Medium Voltage backbone
5	Smart metering (narrowband)

Q18/15 covers both possibilities

Provides interfaces between NB and BB worlds
High flexibility in deployments

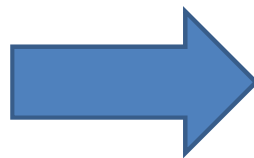
HomeGrid Forum certification



HGF certification process (1)



- **HGF Home networking certification program to provide a logo to products meeting HGF quality levels**
 - Interoperability
 - Between integrators
 - Between silicon vendors
 - Compliance
 - Compliance with ITU-T specifications
 - Performance
 - Minimum performances guaranteed for chosen scenarios



- **Program is being extended/adapted to other profiles**
 - Smart Grid
 - GiGAWire



- **Other profiles in the future?**
 - Industrial?
 - IoT?

HGF certification process (2)



Tests included in the Product Logo Test Specification are:

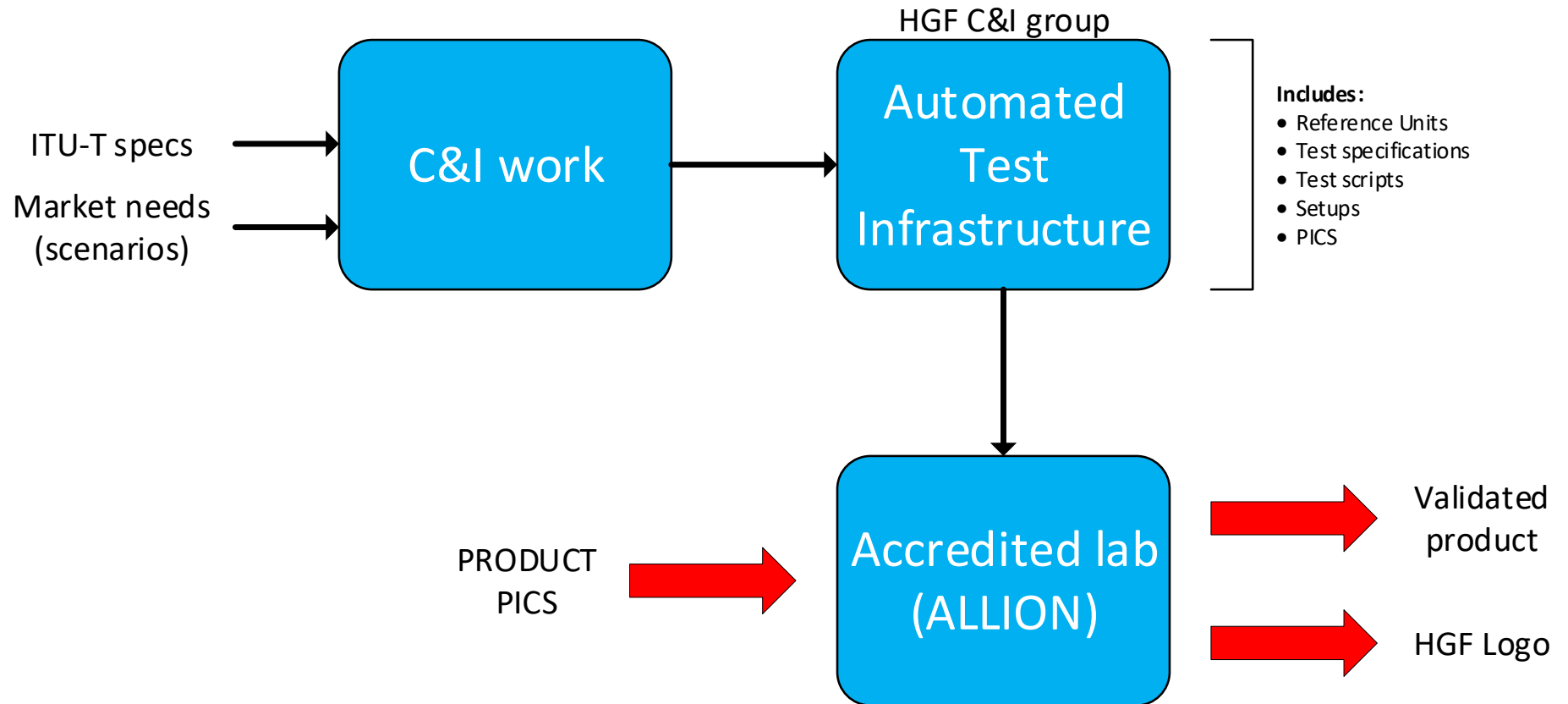
- **Compliance**
 - Full set of compliance tests
- **Performance**
 - Point-to-point tests
 - Throughput – noise free
 - Connection sustainability
- **Interoperability**
 - Multi-node tests
 - NDIM
 - Recovery from power loss
 - Random Domain ID
 - Pairing
 - Security
 - MIMO
 - Versioning



HomeGrid Forum Certified G.hn Products

The mark of Certified Compliance, Interoperability, and Performance

HGF certification process (3)



HGF certification timeline



Certification program	Status	Expected readiness
Home networking	ACTIVE	N/A
Smart Grid	IN PREPARATION	Q4 2020
GiGAWire	IN PREPARATION	Q3 2020
Other?	?	?

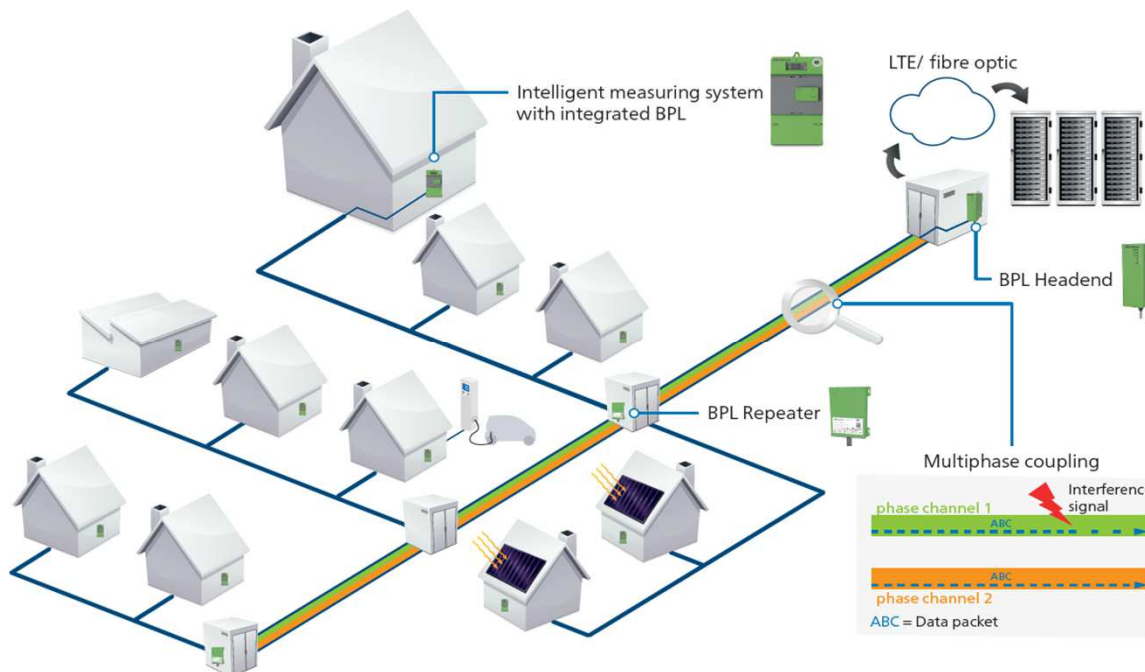
Deployment examples



Example: Smart Grid Scenario in Germany



- Smart meter gateway as a central communication gateway for local devices (smart meters).
- Connectivity: BPL Modems – Repeaters - HeadEnds.
- ITU-T G.hn is a strong candidate for this rollout.






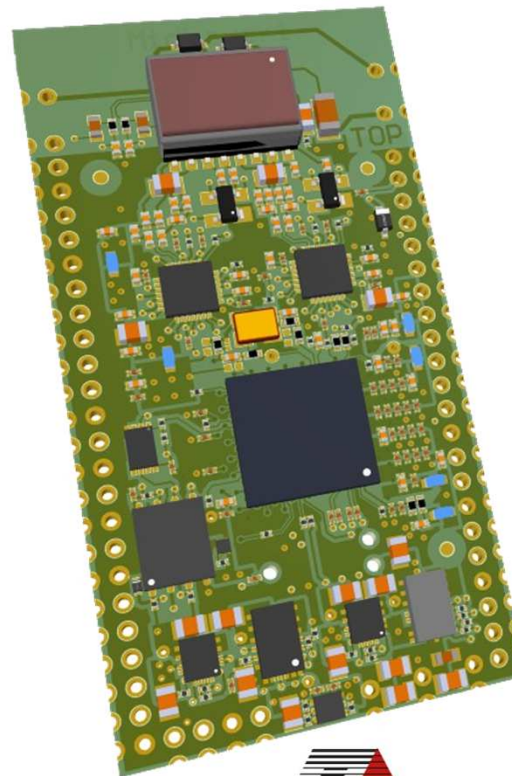
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Example: Industrial applications

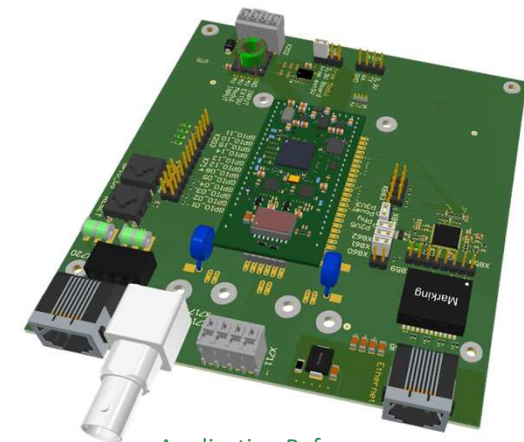


- Easy implementation of G.hn into existing systems
- Direct solder-on or versatile 2.0 mm pin-header interface
- PLC-coupling without insulation on-module
- single wire-range power-supply
- MIMO operation for maximum performance
- best in-class connectivity and robustness
- best interoperability to various G.hn-chipsets and devices, guaranteed coexistence (G.9972)
- G.hn: ITU-T G.9960/9961/9962/9963/9964
- Ethernet: IEEE 802.1d transparent bridge, 802.3/802.1p/802.1q
- Data-Interfaces: SGMII, RGMII, MII

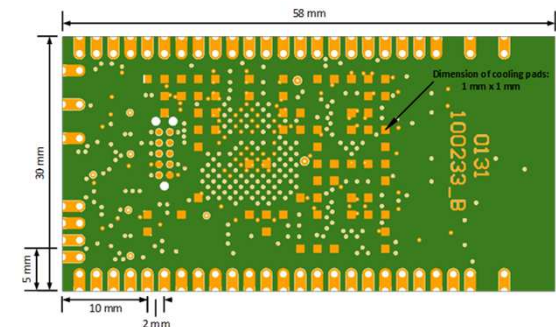
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 sales@teleconnect.de




Teleconnect
Verbindungen in die Zukunft



Application Reference
Board



Example: Smart City applications

Transform “*Outdoor Lighting Networks*” into “*High Speed Data Networks*” for “*Smart City Services*”

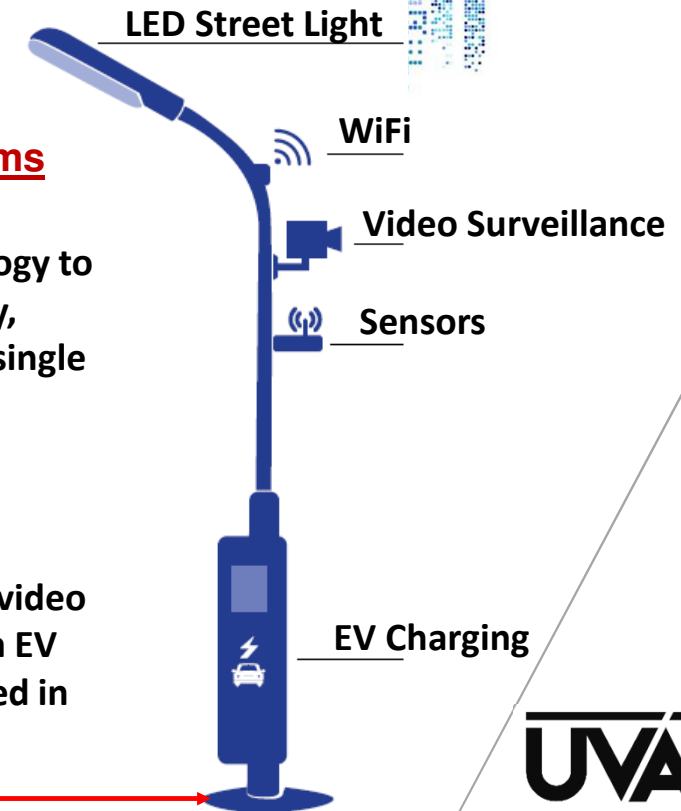
Street Light Infrastructures become a Communication Platforms

- ❑ **UVAX** has developed a Smart City Solution using G.hn Technology to communicate all streetlights in an outdoor lighting network of a City, which allows to aggregate thousands of sensors and IP devices in a single TCP/IP network managed and controlled remotely.

Deployed in over 150 Cities Worldwide

- ❑ More than 150 Cities have installed **UVAX** solution integrating video surveillance systems, sensor networks, WiFi access points and even EV charging stations, all communicating by means of G.hn implemented in the power lines of LED streetlight network.

← G.hn →



UVAX
Technology In Action

Summary



Summary



1

ITU-T is fine tuning G.hn technology to address the challenges of new scenarios

- Smart Grid
- Industrial
- IoT

2

HGF is adapting certification processes to cope with these new applications

3

Process will continue for new applications



Thank you!

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