G3-PLC Alliance

Enabling the smartest grid...together

¡Bienvenido al seminario web de hoy!

Comunicación G3-PLC para medición inteligente en América del Sur

5 de febrero 2021

Today's presenters

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General Secretary of the G3-PLC Alliance. Has been working with the G3-PLC Alliance since 2014 in setting up the certification program. Worked with many utilities in The Netherlands including in the smart metering program of Enexis.
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G3-PLC Alliance

Agenda

1. **Introduction to G3-PLC**
2. Smart metering roll-out in France
3. G3-PLC networks
4. Hybrid PLC&RF: Extended capabilities for the smart grid
5. Q&A

G3-PLC was developed from the start for mass rollout AMI

G3-PLC is a protocol for power line communications providing cost effective, reliable and secure communication

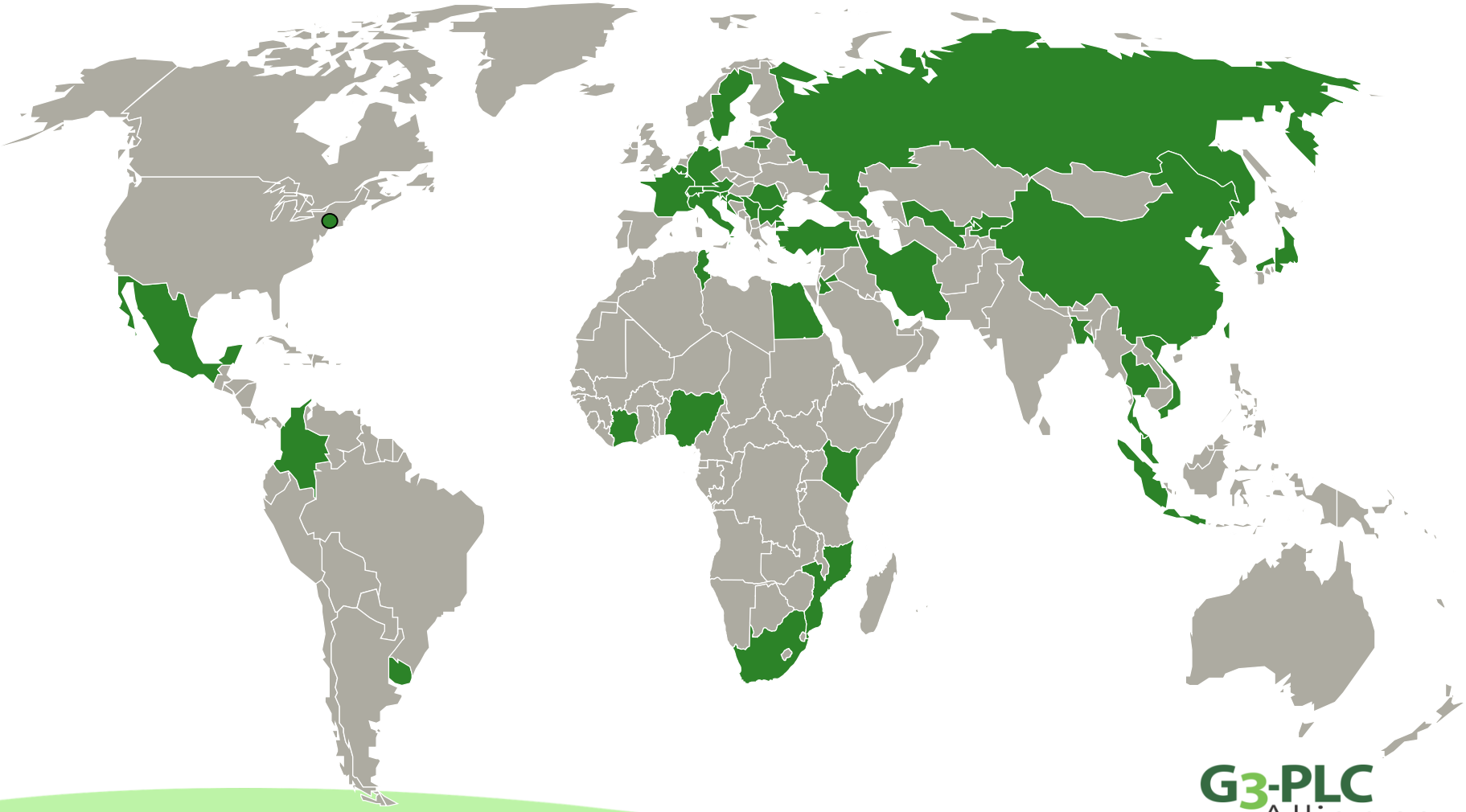
Cost-effective		Long range communi-cation	Real-time communi-cation
ITU standard	Supports IPv6	Secure	
	High robustness	High data rate	Future proof
Routing		Plug and play	

G3-PLC Alliance

Over 90 members from more then 30 countries today!

Currently, there are over 50 million G3-PLC products in operation in more then 30 countries worldwide

Known pilots and roll-outs of G3-PLC worldwide

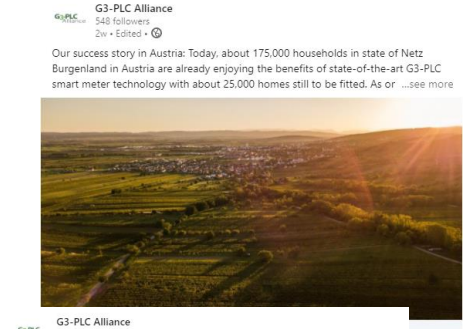


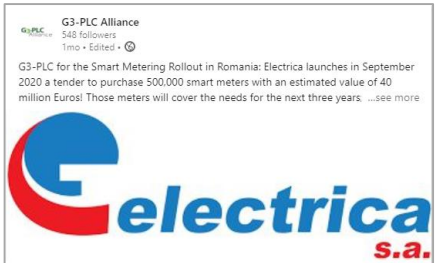
G3-PLC Alliance

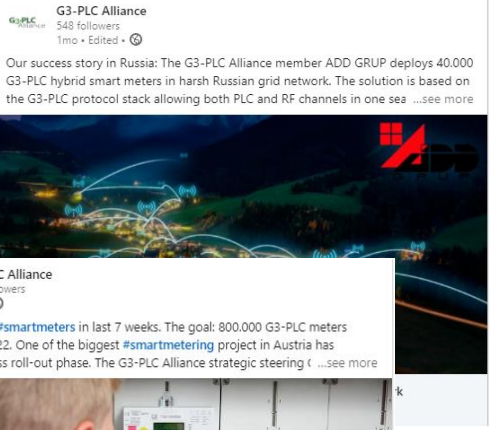
If you follow G3-PLC Alliance on LinkedIn you know there have been many new implementations around the globe

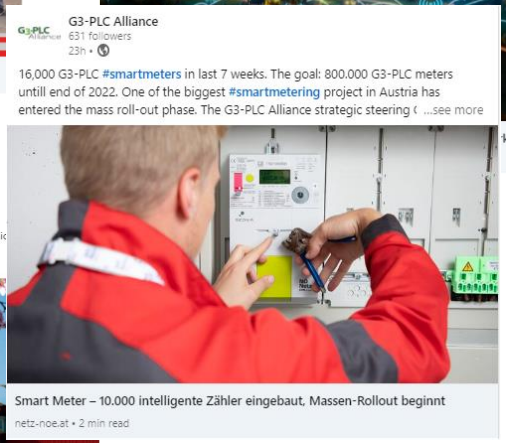
Current implementations include:

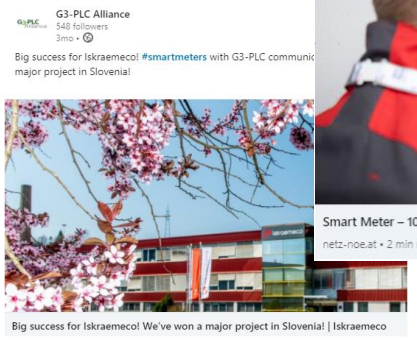
- Netz Burgerland in Austria
- Netz Niederösterreich in Austria
- Electrica in Romania launched a tender for G3-PLC
- Egyptian Canal Distribution Company
- Four regional utilities in Slovenia
- Tatu Connect Power in Nairobi Kenya
- TNB Malaysia
- ST Latvia
- Multiple pilots with hybrid PLC&RF technology
- And many other implementations and pilots!











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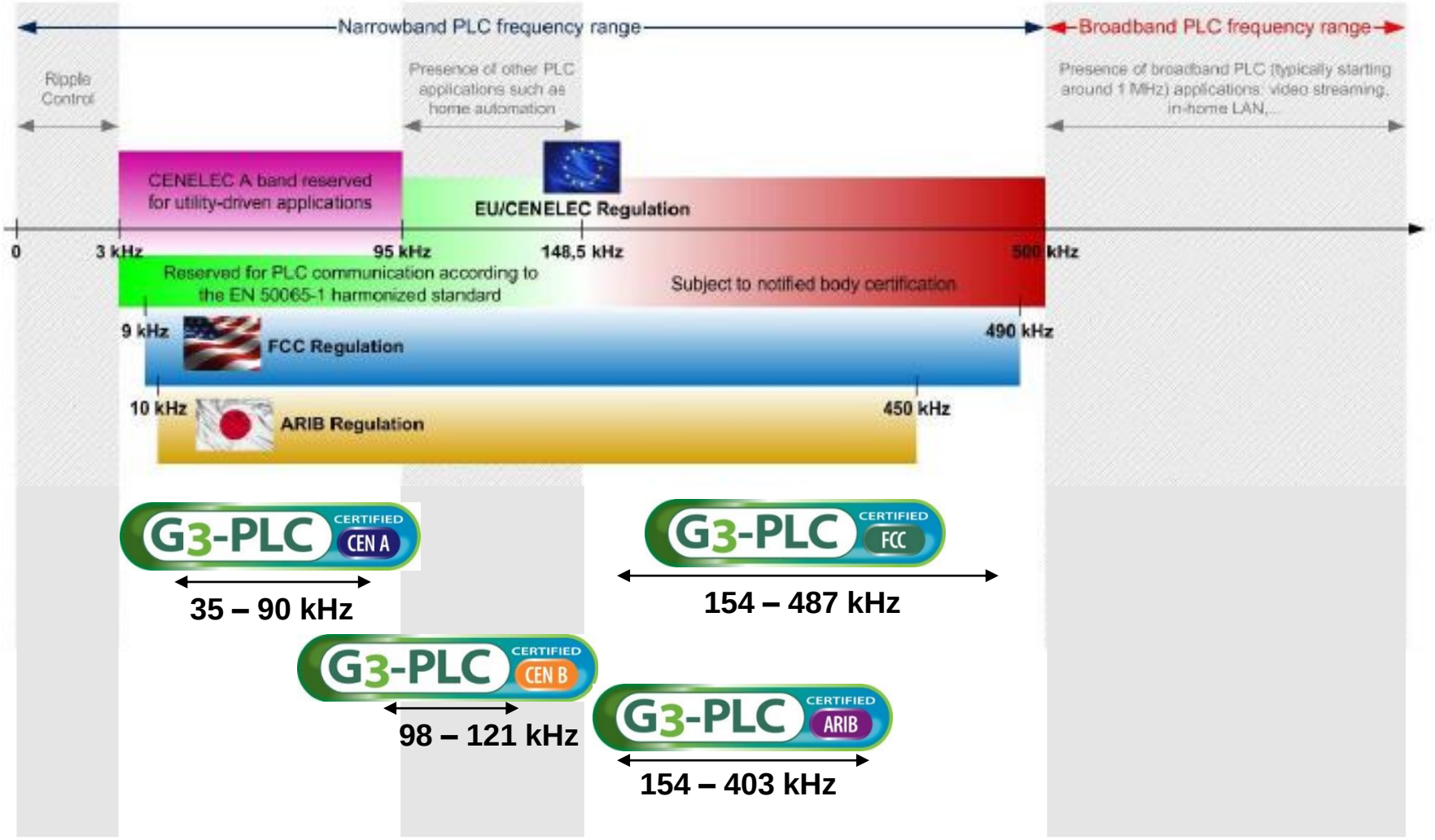
G3-PLC operates in different band plans to address different needs and match regional regulation



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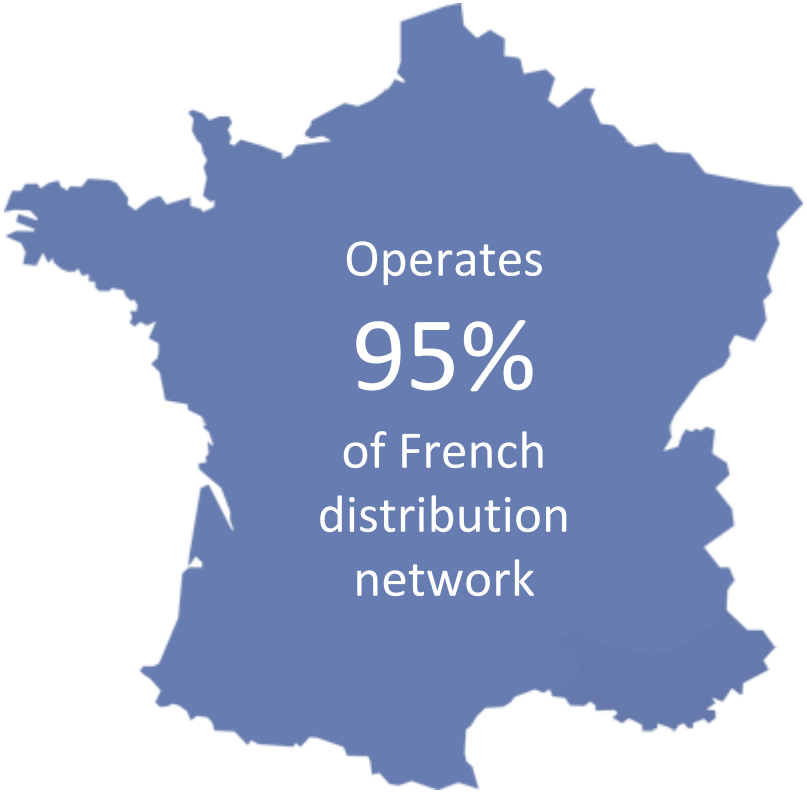
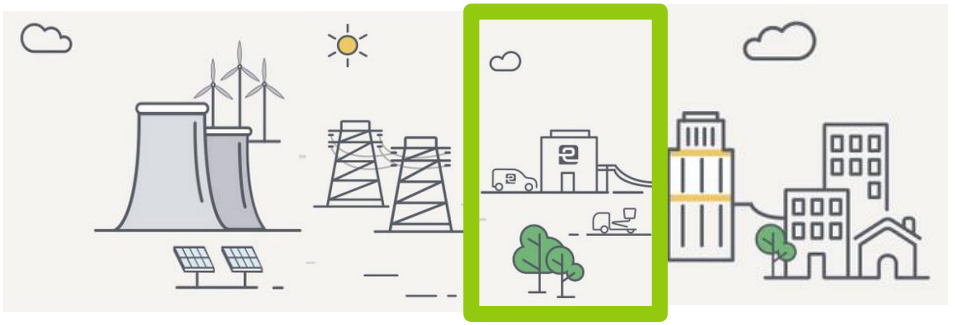
The French Electricity DSO





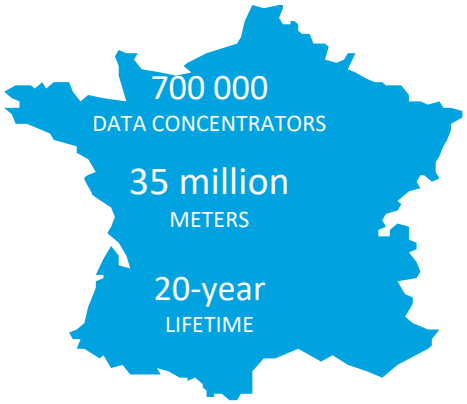
Distribution

Linky Roll Out in France : Main targets

ENEDIS
L'ELECTRICITE EN RESEAU

6 years

2015→ 2021
MASS ROLL OUT



€5 billion

6 MANUFACTURERS WITH FACTORIES BASED IN FRANCE

45 ELECTRICAL INSTALLATION COMPANIES AND RECYCLING COMPANIES

10 000 JOBS CREATED

"Interoperability between different brands of meters at the hub level and Head End Systems?"

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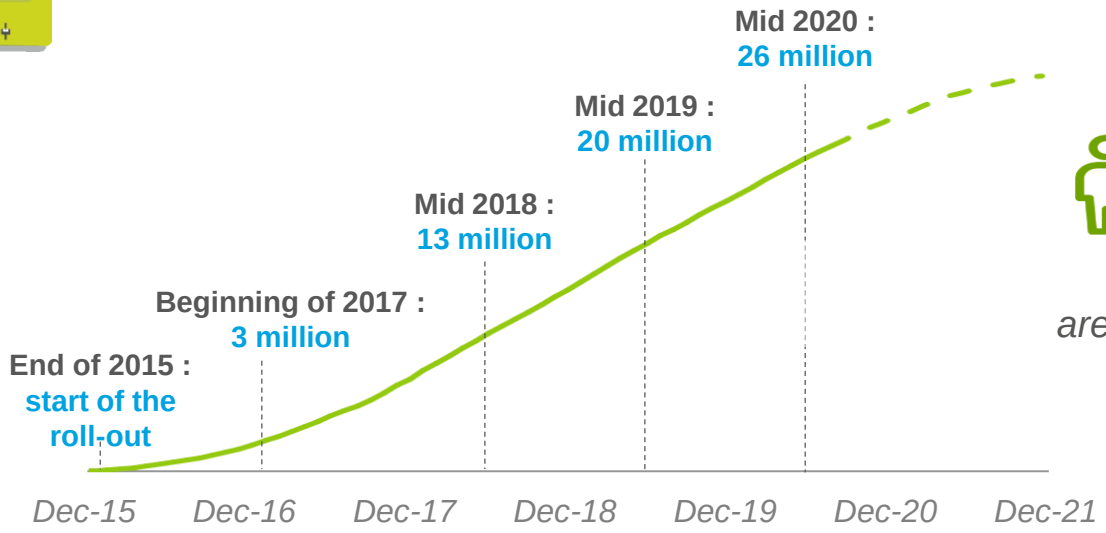
Where are we now ?

30 million smart meters installed



4/5 of French people
are now equipped with Linky

40 000 remote operations per day

99 % success rate for remote operations

7 million people follow their consumption online

How is the network supervision organised ?

National Linky Hyper vision control centre

8 Local supervision centres

Regional level actors

Including, for PLC troubleshooting :

Planners

On-field PLC technicians

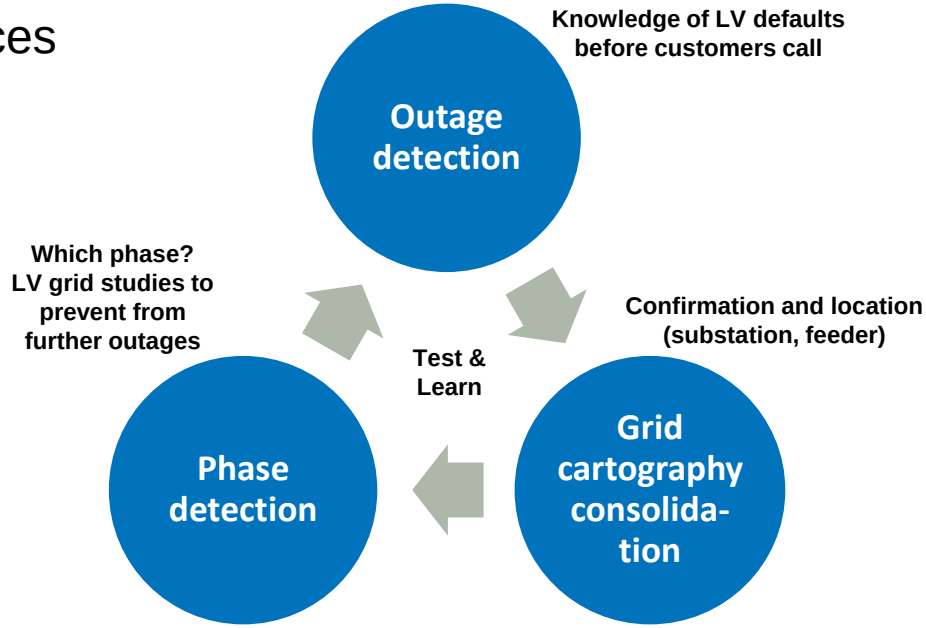
"Challenges of AMI implementation, critical path of AMI implementation?"

"Use of smart metering communication network for MV network operation and smart grids?"

G3-PLC communication is by nature connected to the grid so it also enables Enhanced Grid Operation

Enedis runs 3 major grid-oriented services on top of the 30 million G3-PLC meters:

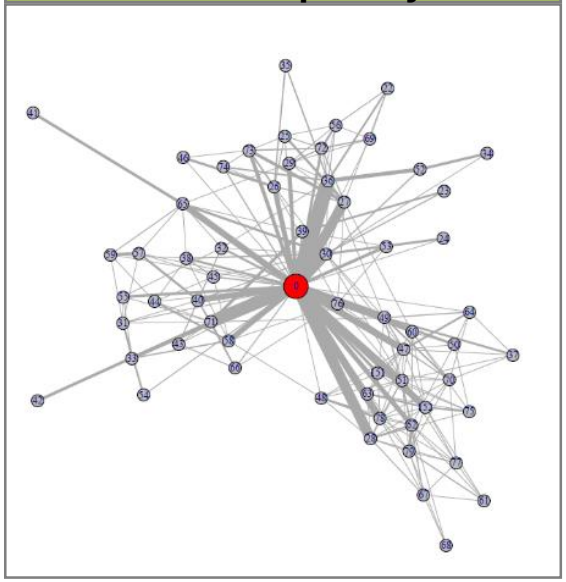
1. Power outage detection
2. Phase detection
3. Grid cartography consolidation



- It is pure software based: no additional devices than meters and DC using G3-PLC are needed
- G3-PLC is by nature connected to the grid, so the protocol actually gathers key information from the grid state
- G3-PLC offers a smarter approach based on neighbour tables

Question: Is there a maximum of smart meters per DC? Up to how many devices are really manageable via G3-PLC?

Communications aggregated over multiple days



- G3-PLC was designed to handle several hundreds of meters per DC
- Largest substation managed in Enedis grid has 1200 smart meters

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G3-PLC a proven Standard

1. Experience in PLC and RF technologies
2. Performant Mesh Network
3. Many countries have adopted G3-PLC
4. Feedback in reliability is very good
5. New tenders are imposing the G3-PLC Standard
6. Most of the component providers are offering the solution
7. Libraries (soft modem) are also available for cost efficient solutions
8. Electric networks are getting more convenient for PLC
9. The interference in the air is getting worse for RF
10. Domestic noise will be reduced in the future mainly because of more performant designs.

G3-PLC: a real and secure option for South America

Past Experiences

1. Not real standards (except Prime and S-FSK)
2. Prime is a tree not a mesh network and has not IPV6 addressing
3. Prime 1.4 is not getting successful
4. S-FSK is not responding entirely to the market requirements
5. Several proprietary PLC implementations
6. Not real proven solutions
7. Pilots with not mature implementations

The option today…

1. G3-PLC an Open and proven standard
2. Many successful roll-outs and pilots worldwide
3. Proposing G3-PLC Hybrid, an excellent option to upgrade existing G3-PLC networks and to operate under the most challenging conditions

G3-PLC embeds all modern features for a long term network operation and is designed for harsh network conditions

Robust communication	• Operates at very low SNR • High-rise building, in home applications • Plug and play
Long distance	• Easily covers several hundreds of meters • We know of communication over 800 meters (LV in CENELEC A) and 2,4 km (MV in FCC) without branches and without repeaters
High data rate	• Complies with future needs for energy demand management and demand response policies
Strong security	• State-of-the-art Security with MAC security combined with data integrity mechanisms in higher layers
Evolutive	• End to end IP communication • Designed to accept diverse application layers (EV, lighting, …)
International Standard	• International open ITU standard • Compliant with IEEE, Cenelec

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Hybrid Solutions

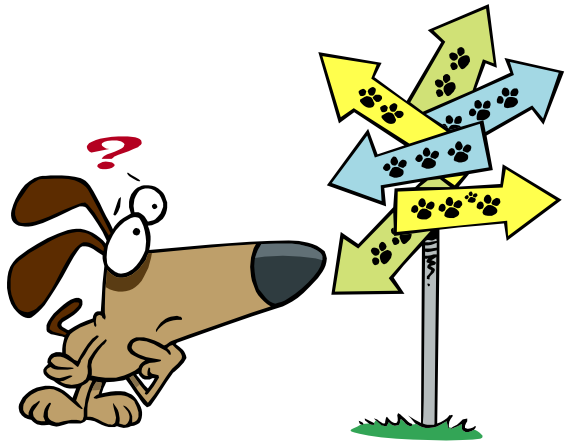
Their existence dates back a long time….

Why?

a. **Looking for a reliable communication system**
b. **PLC has the inconvenience of the noise and a low impedance**
c. **RF has the inconvenience of the interferences and the penetration in solid obstacles**
d. **Market requirements force actors in the smart metering sector to look for cost effective and reliable options**
e. **….**

Where to go?

Which design?



The present situation

1. **Heterogeneous network topologies**
2. **Several PLC technologies**
3. **Several RF technologies**
4. **New microcontrollers that are more powerful and a low consumption**
5. **The ratio between the cost and MIPS & resources of the microcontrollers is going down quite fast**

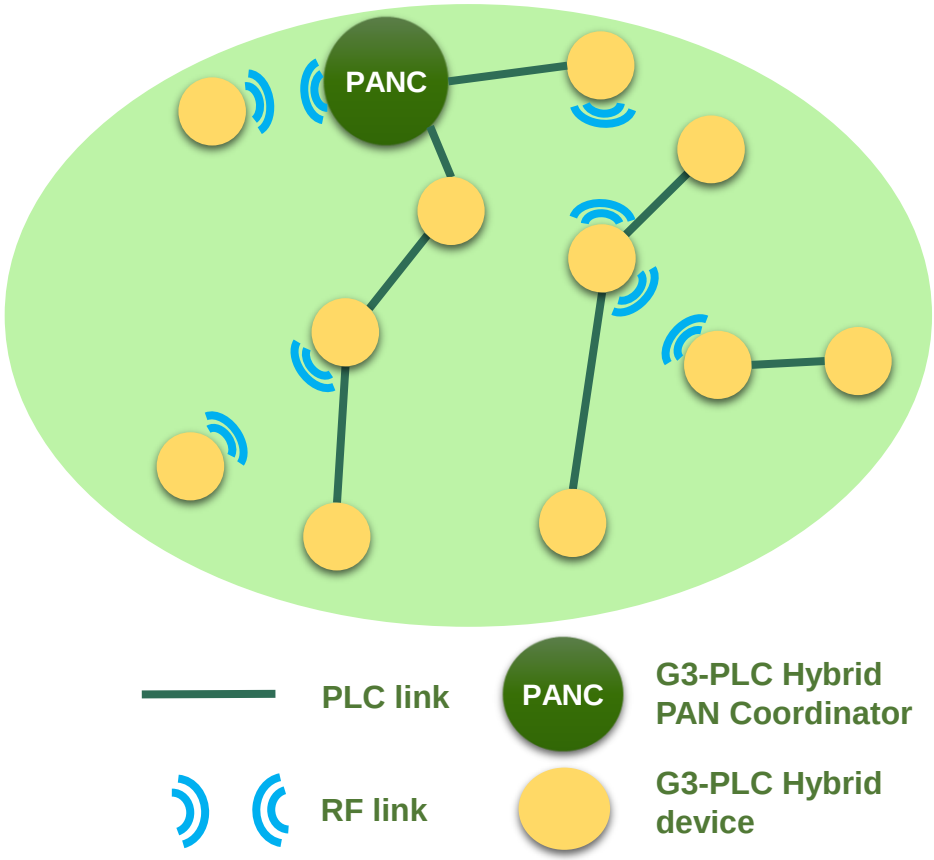
The options

1. **Selecting proven technologies (do not invent the wheel again)**
2. **Talking with the institutions (Alliances) to validate the idea**
3. **Creating prototypes and show performances & reliability**
4. **Because of the cost of microcontrollers the soft solution is a real and valid option, easily upgradable**

G3-PLC Hybrid: 1 Stack & 2 Transceivers

- Each device can use PLC as well as RF for communication
- For each individual link the best media is selected
- Automatic channel selection during network setup and dynamic adjustment based on media status
- Maximises coverage and connectivity
- Fully backwards compatible with existing G3-PLC implementations

Hybrid PLC&RF mesh network



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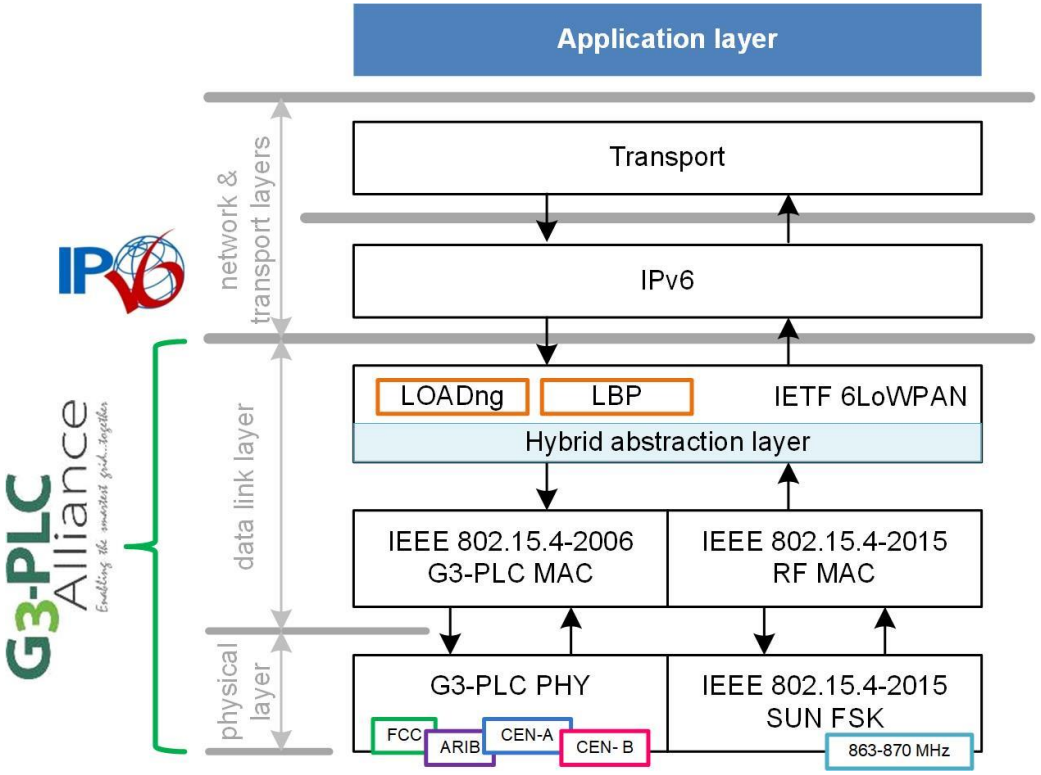
- Unifies wired PLC and wireless RF communication
- One, seamlessly managed network for both media
- The hybrid protocol stack is built using open standards IEEE 802.15.4-2015 in addition to the existing G3-PLC protocol
- Switching between PLC and RF is decided above the hybrid abstraction layer

How does it work?

1. Sends first request over PLC & RF
2. Analyzes the tone map of the answers
3. Selects the best channel and send requests for that one
4. In case of issues it comes back to step 1
5. If no issues, and after an interval, it comes back to step 1



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Some Successful implementations

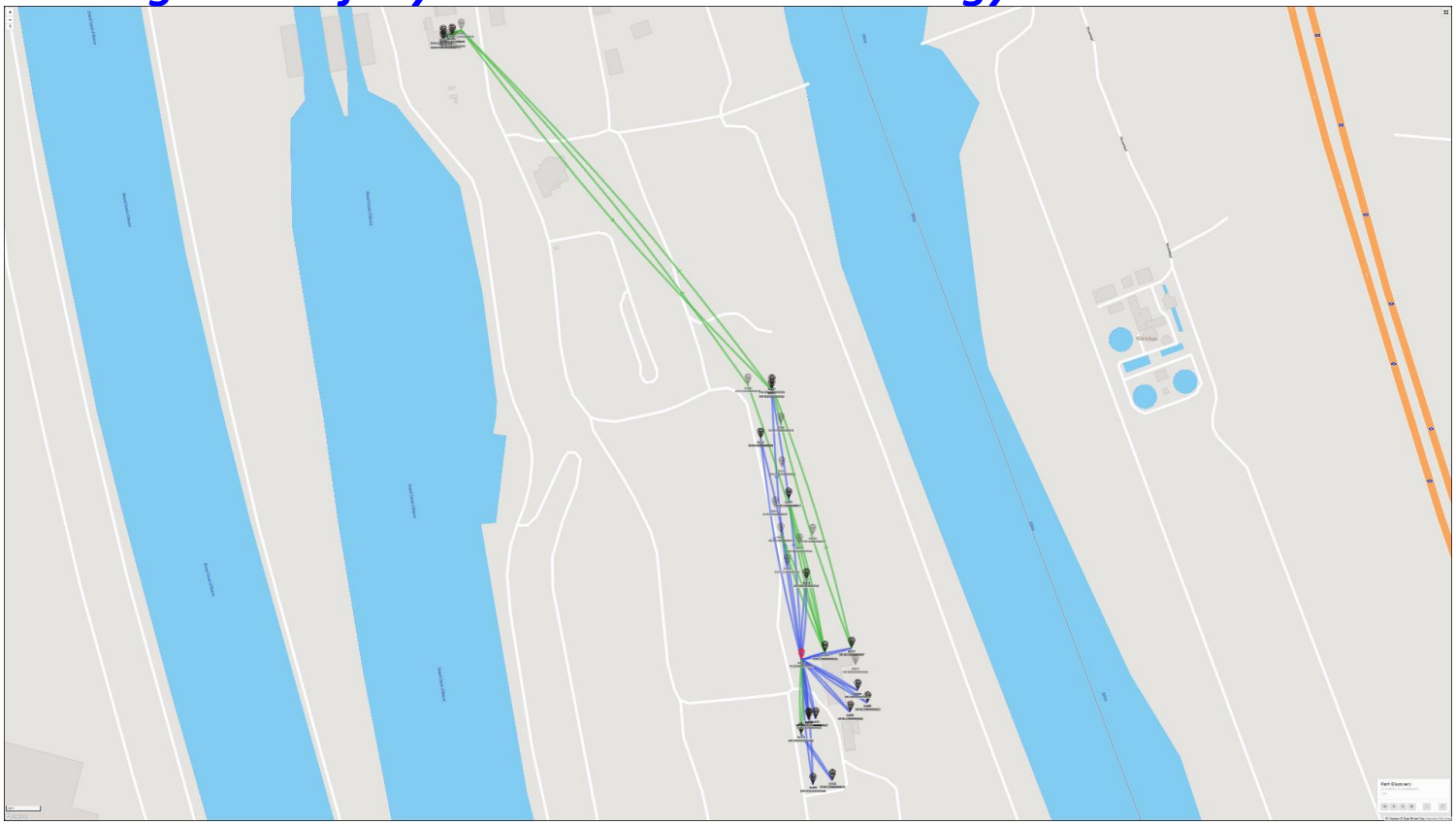
Ready for large-scale deployment

- For energy distributors in **Russia**, ADD GRUP already did a successful field trial with Hybrid PLC & RF:
  - The network was know to be a tough environment: long distances, strongly varying consumer density & network quality as well as a large number of noise-generating equipment in PLC as well as in RF
  - First stage with 5.000 meters showed very good results with daily reading rates of 98-99,7%
  - Full-scale project with 40.000 G3-PLC Hybrid smart meters has been launched
- Other pilots for example in **Siberia** and in **India** also show good results

ENEDIS, EDF R&D and ANDREA

Representative topology in Ottmarsheim, France (EDF testing site)

Testing successfully the G3 HYBRID technology



ENEDIS L'ELECTRICITE EN RESEAU

EDF

ANDREA informatique

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G3-PLC Hybrid: Opens up New Use Cases…

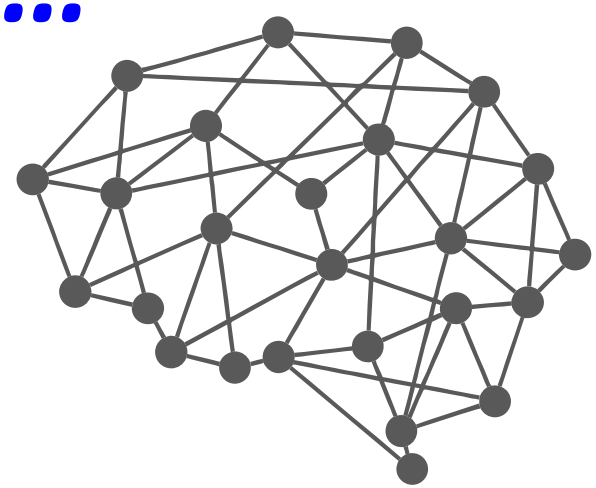
- Communication with In Home Displays
- Communication with keypads for prepaid solutions
- Environmental monitors, lighting controllers and industrial sensors
- Communication with water & gas meters
- Connect different electric networks (different transformers)
- …

Your questions…

About G3-PLC

- G3PLC, what are the advantages and disadvantages in relation of the other technologies?
- G3-PLC Alliance, what is its strategy in relation with other Alliances?
- Network type (air & underneath), equipment (HES/MDM, DC, meter), effectiveness, data rate, filters
- Data rate and load profile, where the data is saved to improved the data collection?

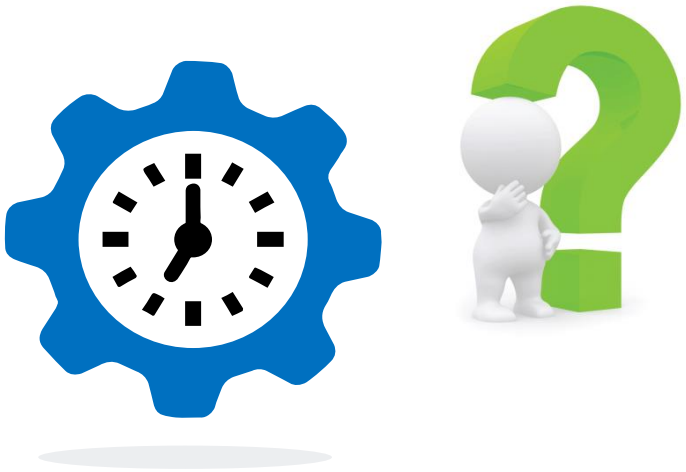
Your questions…



MESH Network

- Middle Tension and G3PLC, capacitive & inductive coupling
- G3-PLC : Vertical and Horizontal Infrastructure
- G3-PLC : Integration in an existing system (Firewall, router, etc)

Your questions…



Meters

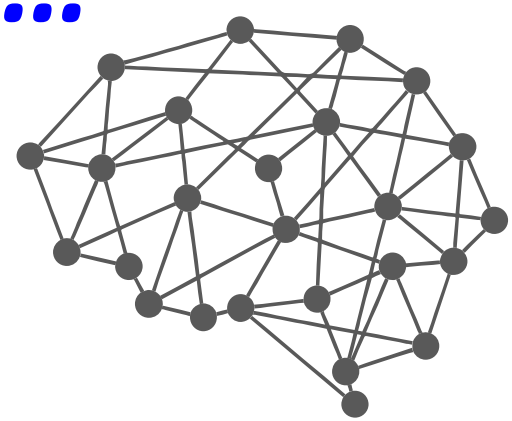
- G3-PLC solution with integration of modems or…
- With soft libraries more flexible, cost efficient easy to upgrade remotely
- Split meters : DC <> Meter and then Meter <> IHD
- Make the difference among:
  - The G3-PLC Specifications and or G3 Hybrid
  - The solution provided by the components providers
  - The soft solution provided by smart metering companies
  - Meters provided by meter providers and smart metering companies

Your questions…

AMI System

- Interoperability with other RF technologies by means of the DC.
- Multi-vendor and Interoperability, Meters, DC and HES
- Security is covered by G3PLC, DLMS COSEM and then HES/MDM.

Your questions…



PLC&RF Hybrid solution

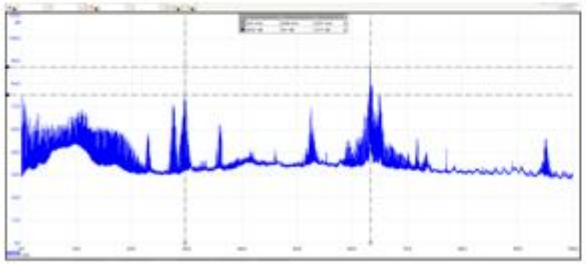
- For the hybrid version, what level of autonomy will each communication technology available in the module have?
- Potential of hybrid PLC&RF communication in South America

Status of the G3-PLC Hybrid:
- Specification has been published for members
- 5 international chip manufacturers have demonstrated interoperability in plugfest
- All certification tests have been defined and implemented
- Test labs are in final stage of validating test set-up in their labs and certification will officially start soon

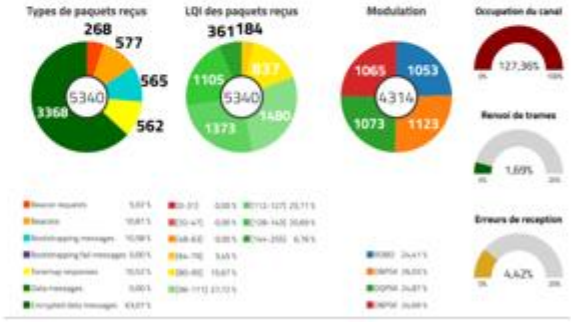
ENEDIS Sniffer

An all-in-one toolcase to facilitate field interventions

Oscilloscopes



PLC Sniffer



Recently we organised a well appreciated webinar 'Setting-up and managing G3-PLC networks' with more information about this:
https://www.youtube.com/watch?v=9YpM_7GJBFw

Q&A session

G3-PLC is powerful communication backbone for the Smart Grid, also for South America!

- ✓ G3-PLC has proven its robustness in the 50+ million devices already deployed worldwide
- ✓ G3-PLC is backed by a international group of DSOs and industrial players to ensure its continuity and evolution over a long time
- ✓ G3-PLC is designed for harsh network conditions thanks to its automatic adaptive modulation, mesh routing and by using different frequency bands
- ✓ G3-PLC by nature enables enhanced grid operations through sophisticated software analysis to address DSO's critical processes
- ✓ In addition to the existing profiles, the G3-PLC Hybrid now offers extended capabilities for the smart grid and IoT

Thank you for your attention!

If you have any questions,
please visit www.g3-plc.com or
contact me at generalsecretary@g3-plc.com

G3-PLC Alliance

Enabling the smartest grid...together