



Key things to know about the G3 Certification process!

FAQs Answered by Test Labs

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Today's presenters



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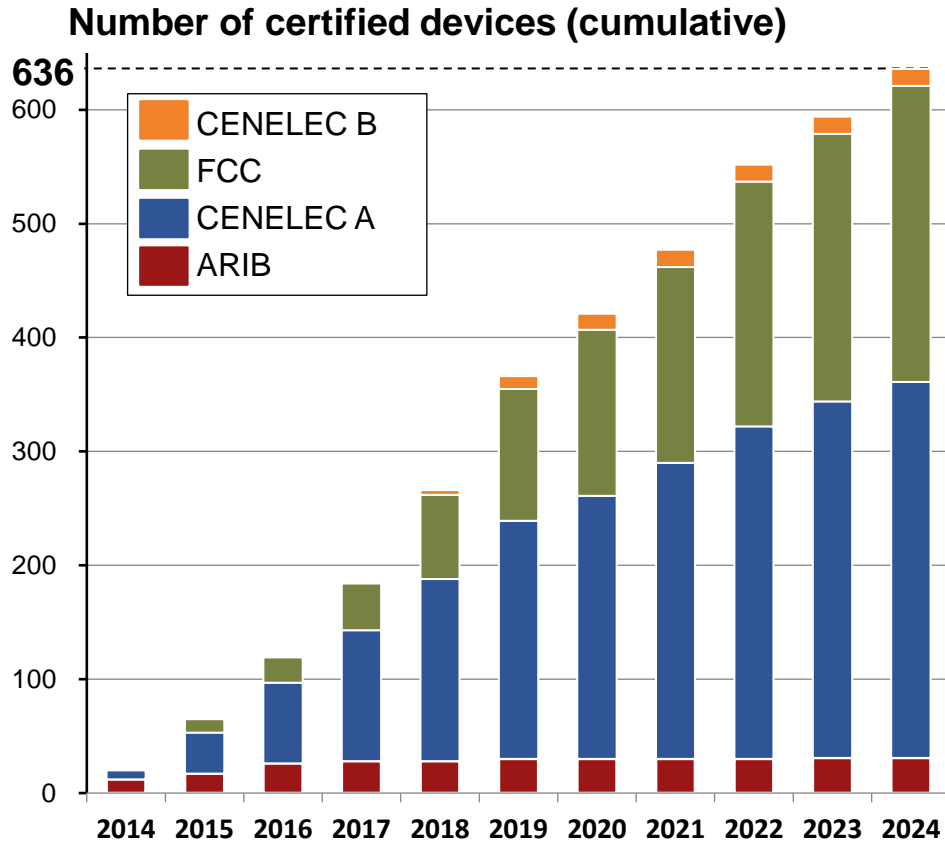
The G3-Alliance developed a thorough certification program so the market can safely invest in G3 technologies



- How to be sure that products correctly implemented the G3 standard?
- How to be sure that products are interoperable?
- How to be sure that the products performance will be sufficient?



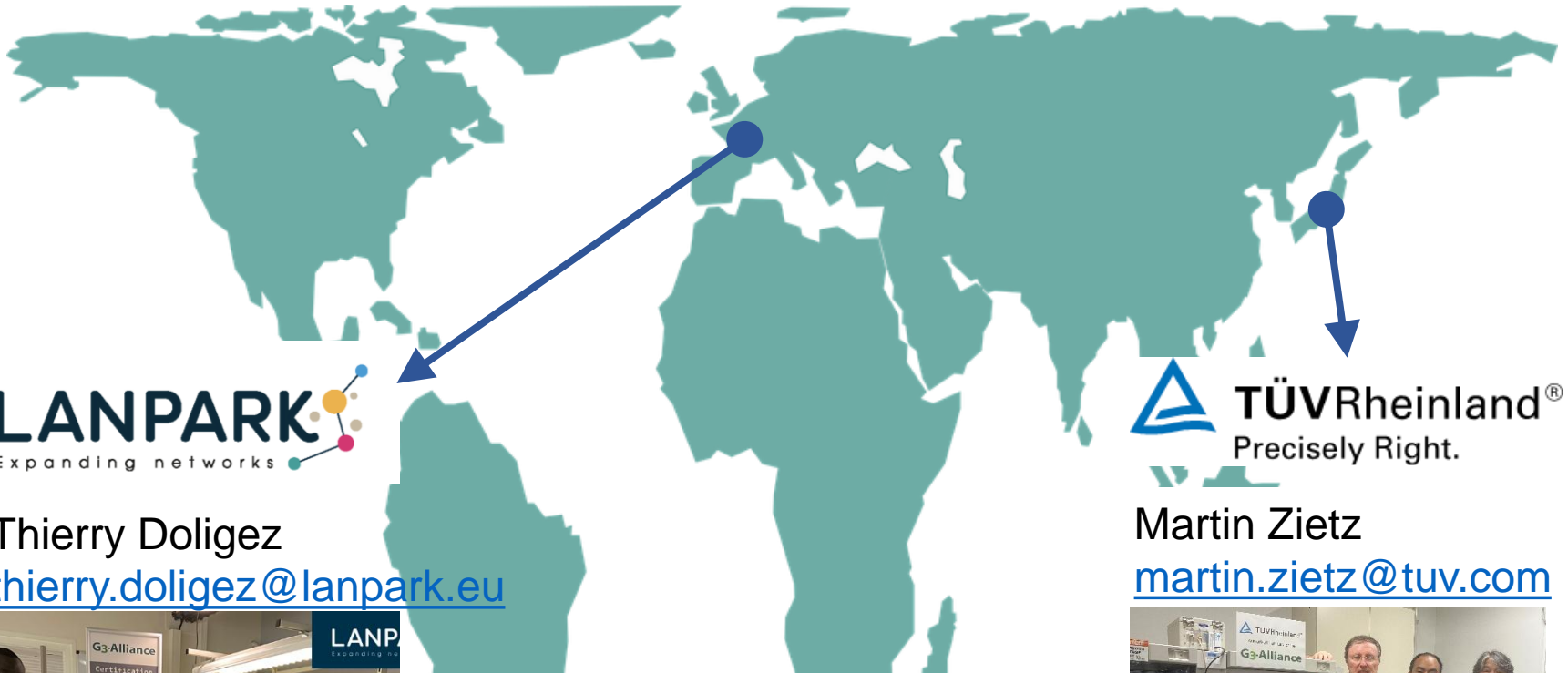
G3-Alliance operates a mature certification program



- **Opened in 2014**
- **Already 650 certificates issued today**
- **Over 70 manufacturers from 25 countries**
- **Continuously expanding**

For list of all certified devices check <https://g3-alliance.com/certification/certified-products/>

Two independent test labs perform the G3 certification testing



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G3-Alliance is responsible for the certification program/tests and issues the certificates

The three steps towards G3 certification

For Chipset manufacturers

Platforms



- 1 Become a Member
- 2 Pass interoperability plugfest
- 3 Certify your chip at a Certification Lab

For End-product manufacturers

Products



- 1 Become a Member
- 2 Use a certified chip
- 3 Certify your product at a Certification Lab

Topics we will address today

Three phases in the certification process



What is the IOT Plugfest?

What testing is required?

How to apply for certification?

What to provide for testing?



What is the IOT Plugfest?

- Objective: Validation of good understanding of the G3 specification
- Passing the interoperability plugfest is mandatory before platform certification
 - Only required for platform manufacturers
 - For new implementors (only once)
 - For new features (eg Frequency Hopping, battery-powered devices, FCC Subbanding, etc.)
- Operated by Trialog in Paris
 - Test vector exchange sessions, analysis of the result / support on debugging
 - Ending with an interoperability plugfest against a golden implementation
 - Contact: yannick.huc@trialog.com

How to apply for certification?

Manufacturer applying for certification:

1. Contact G3 certification laboratory
2. Ask for a quotation and availability for testing
3. Complete the Application Form

The test laboratory then checks with the G3-Alliance:

- Is manufacturer member in good standing?
 - Is the device eligible for certification? e.g.
 - Did platform manufacturer pass IOT plugfest?
 - Is the product based on a certified platform?
 - Is the certification version of product same as embedded platform?
4. Agree commercial contract with the test laboratory
 5. Prepare samples delivery
 6. Complete PICS & PIXIT templates




How to apply for certification?

- Certification is done for the latest version of the *internally* published G3 spec (<https://g3-alliance.com/technologies/specifications-user-guidelines/>)
 - The current version of the G3 certification is V7 and is included in the certificate number, for example: G3.2501.650.2.C7
- Certification profiles
 - PLC Frequency bands include CENELEC A / B, FCC and ARIB
 - RF Frequencies include 800 and 900 MHz bands; one mandatory and one optional mode for each band
 - Optional features:
 - Coherent modulation, support of 12 SYNCP symbols
 - Hybrid PLC+RF mode, Frequency Hopping

What testing is required?

- The Test Procedures describe in detail what testing is required
- Certificates are issued for devices with a specific hardware and firmware version
- Normally full testing for Conformance, Interoperability and Performance
- Full testing is only waived in exceptional situations:
 - No testing is needed for *identical* products (chapter 8.4)
 - Partial re-testing: e.g. after a *hardware* modification in a certified product
 - Details can be found in the Test Procedures document
- For RF Configurations: it may be beneficial to include all RF configurations in the initial testing phase rather than restricting it to a smaller set
- As a general rule:
 - **consult with the lab for guidance prior to starting the testing process**

For G3 Certification, the devices are tested for conformance, interoperability and performance

Type of test	Objective	Platforms	Products
 <p>Conformance (245 tests + 186 additional tests for G3-Hybrid)</p>	<p>Validate correct implementation of the G3 protocol at PHY, MAC and 6LoWPAN layers</p>	✓	✓
 <p>1-to-1 Interoperability (~50 tests)</p>	<p>Validate interoperability with up to six already certified devices</p>	✓	✓
 <p>Performance (~25 tests)</p>	<p>Validate the performance of the device within a limited set of use cases, for PLC as well as RF</p>	✓ (subset)	✓

Topics we will address today

Three phases in the certification process



What is the IOT Plugfest?

What testing is required?

How to apply for certification?

What to provide for testing?



What to
provide for the
testing?

**2 Test
samples
of each
type**

Requirements on
next slides.

**PICS &
PIXIT
Forms**

Contains all
technical data
for testing.
Format provided
by the lab.

**Setup
Instruction
& Wiring
Diagram**

All instructions
which are needed
to set up and
operate the
sample.

**Jigs &
tools for
firmware
updates**


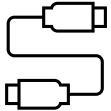


Needed in case of
countermeasures
after failed tests.

What to provide for the testing?

Requirements for the Test Samples - Key Points (1/3):

Sample Preparation



- Two identical test samples for each PLC band plan/role (PAND/PANC) combination 
- Include all cables and jigs required for the test operation of the DUT 
- Install the proper firmware and test it fully before shipment. 
- Functional requirements: ICMPv6 and UDP responder are required
 - See document '**Common test requirements for G3 certification**'
- Discuss with the lab the electrical connections (mainly for the AC line) 






What to
provide for the
testing?

Requirements for the Test Samples - Key Points (2/3):



RF Hybrid Specifics

- Two types of RF tests, performed in a shielded chamber:
 - 1) Radiated  (via antenna): RF CONF, RF IOT, RF PERF
 - 2) Conducted (RF is connected to the DUT via a 50Ω RF cable): PHY PERF
- For 1) Provide the antenna specified for your product 
- For 2) If the antenna is integrated in the DUT or is not detachable: provide a second pair of test samples where the antenna is removed and replaced by an accessible SMA connector 

 Apply all available RF configurations for certification.



- **Inform lab about any potential hazard!**


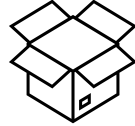





What to provide for the testing?

Requirements for the Test Samples - Key Points (3/3):

Logistics









- Label each sample with appropriate identification (band plan, role, serial #). 
- Ensure the samples are well-protected during transport. 
- Send the samples directly to the lab.
Confirm that the shipping address and contact details are accurate. 
- International shipping: Declare a reasonably low value in the Proforma Invoice.
And indicate: “Test samples of no commercial value.” 
- Samples used for testing remain in the lab after certification. 

What to
provide for the
testing?



Information Needed before Testing

- **PICS & PIXIT** Forms are required before the start of testing 
 - These data will be entered into the test system 
 - Fill in all items carefully and make sure they are correct and suitable
 - **PICS** = Protocol Implementation Conformance Statement; will also be included in the test report and the certificate 
 - **PIXIT** = Protocol Implementation Extra Information for Testing
 - Especially the keys and MAC addresses must be same as in the test samples
- Some items of concern:
 - AC voltage: 220V or 230V? 50Hz or 60Hz? 
 - 3-phase DUT: communicating only on a single line or all 3 lines? 
 - Indicate all performance PICS according to your device (otherwise, the threshold values might be used). 

FREQUENTLY ASKED QUESTIONS





How to increase your chances of being certified on first try?

- Trialog offers Conformance test tools for internal pre-testing (not available for IOT and Performance testing)
- Labs provide pre-certification services

Pre-testing
(optional)

Certification
Testing

De-bugging
(optional)

- To check that prerequisites are well implemented
- To check maturity for CONF/IOT/PERF tests before running the official tests
- To check good behaviour of the product for the PERF tests
- To evaluate and determine the performance PICS
- To identify potential improvement and solve any issues



Application

Testing

Certification

Most Frequent Asked Questions Regarding Testing

1 How long does the certification process take?

Certification process



- The G3 Certification process can be completed within a few weeks provided there are no issues
- This does not include the time needed for the interoperability Plugfest
- Total time needed depends of course on availability of the test lab and the test samples
- Duration of testing depends on the maturity of the device and whether pre-testing is wanted
- If re-testing is required, de-bugging can take long time



Most Frequent Asked Questions Regarding Testing

2 How can we determine the cause of a FAIL result?

The laboratory will supply comprehensive logs, testing data, for every test executed as well as sniffer traces for every test that results in a FAIL. This information is adequate to implement corrective actions. Sniffer traces can be accessed as formatted text as well as in Wireshark format.

3 Are we allowed to observe the testing?

Yes. All laboratories that adhere to international quality standards permit customers to be present during testing.

4 Do we have to attend the testing?

No. Usually the lab operates alone. Attendance by customers is not required. What matters is proper preparation, as previously outlined.

5 Will I receive a test report?

Yes, the laboratory will provide a comprehensive test report that includes all test data.



Most Frequent Asked Questions Regarding Testing

- ⑥ What are the best strategies to prepare for certification and minimise unforeseen issues?**
- Collaborate closely with your chipset supplier
 - Reach out to your certification test lab well in advance
 - Pre-test in the lab focusing on most critical test cases and validation of performance PICS
- ⑦ What are the major challenges encountered in testing?**
- Newly introduced features, like the RF medium, are often particularly challenging
 - Potential impact of product design outside the G3 implementation, such as unwanted noise affecting the antenna
 - Timing and implementation of necessary jitter for PLC & RF CSMA-CA mechanisms
 - Impairments in modulation
 - LQI estimation

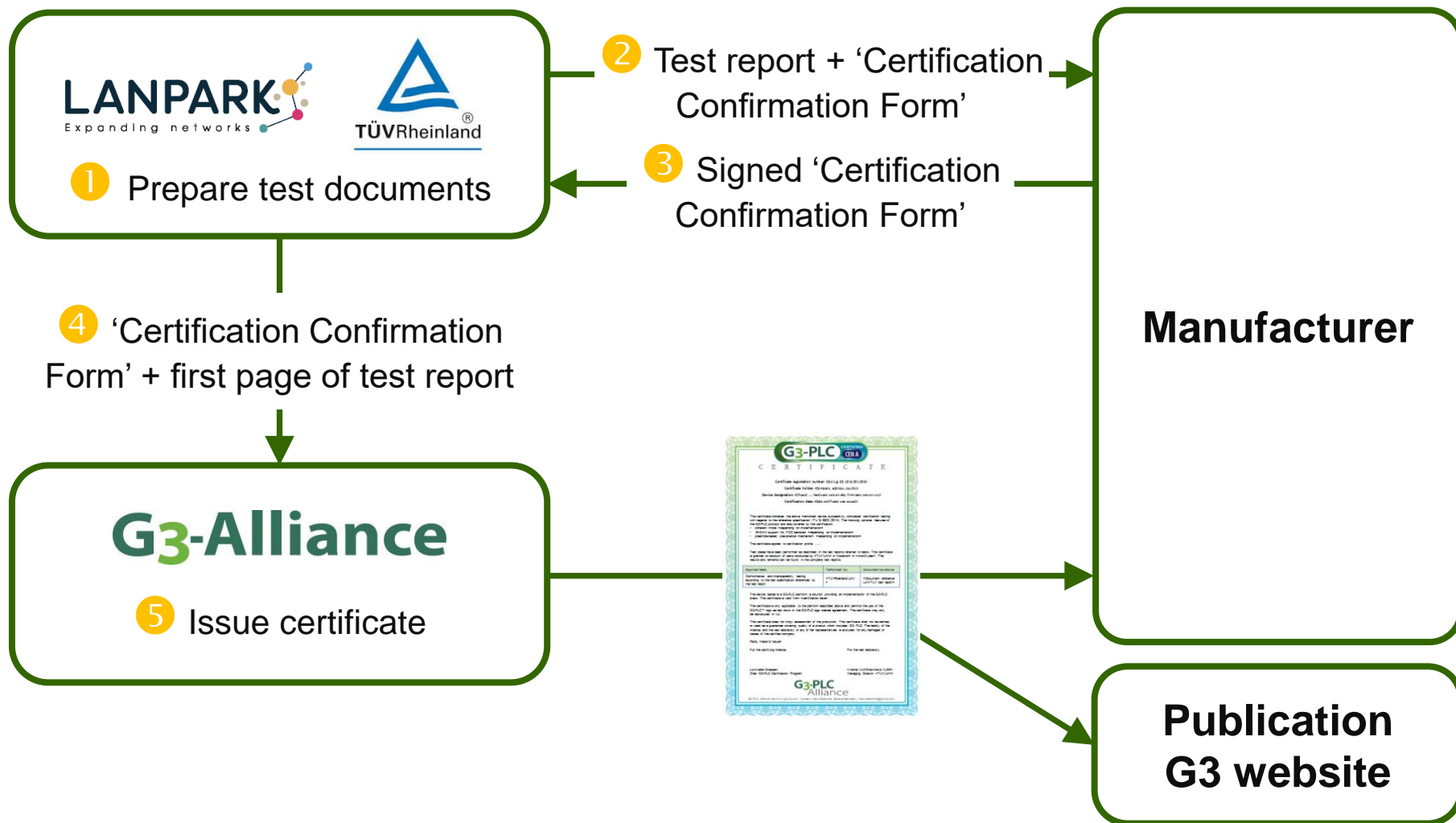


Most Frequent Asked Questions Regarding Testing

⑧ How can I get support if I want to run some PERF tests internally or if I want to understand the implementation of the PERF tests?

- Reach out to the test lab to get assistance and explanations about
 - Test configurations
 - Methodologies applied during the G3 certification test campaigns
- Test laboratories maintain close ties with the G3 Alliance and its technical study groups, enabling them to relay any technical inquiries to the G3 Alliance and obtain accurate answers for you

Once all tests have been successfully passed, the G3-Alliance issues the certificate



All the information regarding certification is available on the G3-Alliance website

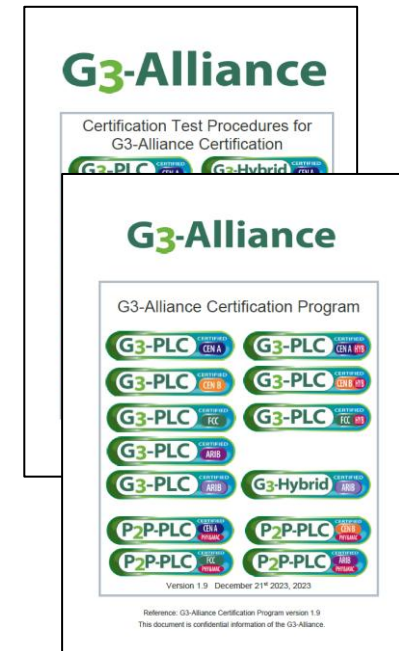
Available for anyone on <https://g3-alliance.com/certification/>:

- General information on the process
- Contact details of test labs
- List of all certified devices
- Guidelines about G3 protocol and certification



Available for members:

- Certification Program & Certification Test Procedures: <https://g3-alliance.com/certification-program/>
- Test Specifications & Common Test Requirements document: <https://g3-alliance.com/certification-tests/>
- Reference version for certification: included in Test Procedures document Annex 3
- If you do not have a login for the website: contact generalsecretary@g3-alliance.com



Q&A



Great success with your certification!

