Certification Process Overview

1. Radio device
2. Wi-Fi Alliance qualification (optional)
3. Radio qualification
4. Software qualification
5. Bluetooth qualification
6. Radio qualification
7. Software qualification
8. End Product Listing (EPL)
9. Regulatory certification
10. 2.4 GHz radio
11. EMC
12. Safety
13. Medical, Automotive etc. requirements
14. Go to market
Bluetooth Qualification
Bluetooth Qualification Process

- All Bluetooth products must be qualified, in order to
  - Verify conformance
  - Grant IP license
  - Logo and word mark usage rights
  - Promote interoperability

- Consists of three steps
  - Radio qualification
    - Controller Subsystem
  - Software qualification
    - Host Subsystem
  - End product listing
    - Controller Subsystem combined with Host Subsystem
Radio Qualification

- Verify the radio’s conformance to the Bluetooth specification

- Radio testing at Bluetooth Qualified Test Facility
  - AT4 wireless
  - SGS
  - UL
  - etc.

- Obtaining QDID from Bluetooth SIG

- Component or subsystem listing
Software Qualification

- Verify the Bluetooth stack’s conformance to Bluetooth specification

- Protocol testing at a Bluetooth Qualified Test Facility (or Profile Tuning Suite, PTS)
  - RFCOMM
  - L2CAP
  - ATT
  - etc.

- Profile testing at a Bluetooth Qualified Test Facility (or PTS)
  - SPP
  - A2DP
  - Proximity
  - etc.

- Obtaining QDID from Bluetooth SIG

- Component or Subsystem listing
End Product Listing

- Combining the Subsystems to an end product
- End products can be sold as is without limitations of the Bluetooth license
- End products represent a complete Bluetooth wireless solution
- Typically a combination of two (or three) Subsystems:
  - A Bluetooth Controller Subsystem (radio and HCI)
  - A Bluetooth Host Subsystem (protocols and profiles)
  - Profile Subsystem (profiles)
End Product Listing

- End Product Listing process changed 1st of February 2014:
  - Qualification of Bluetooth products is still necessary - just like before

- However End Product Listing (EPL) is no longer free of charge:
  - $2500 / EPL - 1st Bluetooth product and company revenues <$1M
  - $8000 / EPL - Adopter members (free-of-charge membership)
  - $4000 / EPL - Associate members (annual $7500 membership fee)

- Multiple EPLs can however be made with a single fee as long as the Bluetooth components (hardware and software) remain the same
End Product Listing

- Bluegiga (company A) builds and supplies a Bluetooth module
- Company B builds two new Products (speakers) with Bluetooth module
- Company C rebrands Company B’s Products (speakers) as their own
End Product Listing

- Bluegiga (Company A) builds and supplies a Bluetooth module
- Company B builds two new Products (speakers) with Bluetooth module
- Company C sells Company B’s Products (speakers) as is (not rebranded or represented as their own)
Wi-Fi Qualification
Wi-Fi Qualification Process

- Wi-Fi qualification is optional unlike Bluetooth

- Qualification consists of core programs and optional parts
  - Core programs such as: 802.11 b/g/n/ac WPA2, etc.
  - Optional programs such as: Miracast, Wi-Fi Direct etc.

- Wi-Fi qualification - just like Bluetooth - is used to:
  - Improve interoperability
  - Promote interoperability
  - Logo and word mark usage rights

- Consists of three steps
  - Join the Wi-Fi Alliance
  - Test the product at an Authorized Test Lab
  - Listing the product on the Wi-Fi Alliance website
Regulatory Certification
Compliance Testing

- Market and application specific certification requirements
  - Europe: CE
  - USA: FCC
  - Canada: Industry Canada
  - South-Korea: KCC
  - Japan: Telec
  - Australia: C-tick
  - etc.

- Typically split into three separate categories
  - RF
  - EMC
  - Safety

- Application specific requirements
  - Medical
  - Automotive
  - Aviation
  - etc.
Europe: CE

- Declaration from a manufacturer that the product meets the requirements of the R&TTE directive
- The manufacturer of the end product is responsible for the product being compliant
- Relevant standards for a product implementing a 2.4GHz radio
  - RF: EN300328 (radio emissions)
  - EMC: EN301489 (other emissions and immunity)
  - Safety: EN60950 (safety)
CE Limitations

- TX power level is higher than 13 dBm (20 mW)
  - RF exposure needs to be evaluated
  - Might require SAR (Specific Absorption Rate) testing
  - Depends on end products use case
  - Close to human body
  - etc.

- Multiple radios used in the end product
  - If co-located radios are NOT transmitting simultaneously - RF exposure and emissions can be considered independently for each radio.
  - If the radios transmit simultaneously, RF exposure must be evaluated
What Needs to Be Done?

- All Bluegiga products have been tested for CE
  - EN300328 v.1.8.1
  - EN301489-1/17
  - DoC are available
  - Test reports are available

- For the end product, all conducted test cases of EN300328 can be inherited from the modules test report.

- Any radiated test cases or ESD under EN300328 and EN301489 must be tested with the end product

- RF exposure evaluation depends on the application and the TX power of the module
Countries Following the CE Standard

- EU countries
- ETFA countries - Iceland, Norway, Switzerland (and Liechtenstein)
- French DOMs
- Guadeloupe, Martinique, French Guiana, Reunion
- Afghanistan
- Andorra
- Georgia
- Gibraltar
- Maldives
- Monaco
- San Marino
- Sao Tome and Principe
- Seychelles
- Vatican City
- Faroe Islands, Greenland, Svalbard, Azores, Madeira, Canary Islands, Guernsey, Jersey, Isle of Man, Montserrat, Pitcairn Islands
North America: FCC and IC

- Types of authorization
  - Certification (radio)
  - DoC (computer peripheral)
  - Verification (other electronic devices)

- Modular certification
  - End product using a modular certified radio will not need radio certification provided that the restrictions mentioned in the modules grant are met

- Relevant standards for a product implementing a 2.4GHz radio
  - Radio
  - Unintentional radiators
  - CPU, memories etc.

- Class 1 Permissive Change (C1PC)
  - Changes that do not increase emissions (ex. small BOM change)
  - Does not need application to FCC

- Class 2 permissive change (C2PC)
  - Changes that increase emissions (different type of an antenna, colocation, RF layout change)
  - Must be filed with FCC
FCC and IC Limitations

- Typical scenarios requiring extra testing with FCC
  - Co-location of radios
  - Antenna change
  - Product used close to a human body

- Limitations are described in the products FCC grant

- If restrictions cannot be met - end customer needs to file C2PC
FCC Example: WT41

<table>
<thead>
<tr>
<th>Modular Type: Single Modular</th>
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<tr>
<td>Grant Notes</td>
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Output power listed is conducted. Single Modular Approval for mobile RF Exposure conditions, this transmitter must be installed to provide a separation distance of at least 22 mm from all persons and must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures. Approval is limited to OEM installation only. OEM integrators must be provided with antenna installation instructions. OEM integrators and end-users must be provided with transmitter operating conditions for satisfying RF exposure compliance. This grant is valid only when the device is sold to OEM integrators and the OEM integrators are instructed to ensure that the end user has no instructions to remove or install the device.

Only the antennas listed with this filing and documented in the test report and user manual can be used with this module. This Grant covers variants WT41A and WT41N.

Class 2 Permissive Change to allow mixed portable and mobile use.
**What Needs to Be Done for FCC and IC**

- All Bluegiga products have been tested for FCC and IC
  - Products have unique FCC and IC IDs
  - The grants are available
  - Test reports are available

- End users can use our FCC ID and test reports if radio co-location rules can be obeyed
  - Instructions in product data sheets

- If the rules in the grant cannot be met - C2PC testing needed by the end customer
Countries Following the FCC Standard

- Anguilla
- American Samoa
- Bolivia
- Cayman Islands
- El Salvador
- Federated States of Micronesia
- Guam
- Guatemala
- Marshall Islands
- Northern Mariana Islands
- Palau
- Panama
- Puerto Rico
- Virgin Islands (US)
Typically local regulation and test cases exist
- These vary depending on the country
- In most cases additional testing is needed

Testing effort and costs need to be evaluated based on the market

Bluegiga products have been certified for:
- Japan
- South-Korea
- Brazil (some products)
Steps to Regulatory Compliance

- **Europe: CE**
  - Contact an accredited test laboratory for CE testing services
  - EN300328 conducted test cases can be inherited from the modules test report
  - All radiated test cases of EN300328 and EN301489 must be tested with the end product in an accredited test laboratory
  - Safety / RF exposure (if needed) must be tested with the end product in an accredited test laboratory
  - Based on the test reports write a Declaration of Conformity. The person who signs must be traceable and the test reports with the technical information must be saved in a Technical Construction File
  - Label the end product with the CE logo
Steps to Regulatory Compliance

- **North America: FCC/IC**
  - Read the FCC grant and the FCC info in the datasheet of the module if there are restrictions that must be taken into account with the end product.
  - If there are no restrictions that concern the end product, the labeling of the end product with "*Contains FCC ID: QOQ….***" is all that is needed.
  - If there are any restrictions that do concern the end product (co-location or RF exposure limit), contact your local test laboratory for services to remove the restrictions.
Steps to Regulatory Compliance

- **Japan / Korea**
  - No further RF testing is needed when using a certified module in Japan or South-Korea.

- **Australia / New Zealand**
  - Contact your local representative / importer. The local representative or importer is responsible for the compliance and holds the evidence.
  - CE test reports cannot be used as an evidence of compliance but they can be used for generating the official test reports based on ACMA standards.
Compliance Testing Costs
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<tr>
<th>Sales volume (EAU)</th>
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<td>Total Equipment cost</td>
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</table>

| Bluetooth sniffer  | $15 000|
| Bluetooth analyzer  | $15 000|
| Spectrum analyzer   | $15 000|
| Wi-Fi Analyzer      | $30 000|
| Total               | $75 000|
Summary

- All Bluegiga Bluetooth modules are qualified
  - End Product Listing (EPL) needs to be made by the end customer

- All Bluegiga products have CE, FCC and IC certifications
  - Reduce testing time and cost for end product manufacturer
  - Test reports can be reused and most test cases inherited
  - Co-location and RF exposure rules must be obeyed or otherwise additional testing is needed

- All Bluegiga products have Japan and South-Korea qualifications

- Significant money and time savings for end users
  - $100-150k+ cost savings
  - 3-6 months faster time-to-market
Thank You