7layers
A Bureau Veritas Group Company

Bring smart IIoT processes to life with 7layers

7LAYERS
DRIVING SUCCESSFUL IIOT PROCESSES

Test House | Systems House | Software House

Use our wireless expertise and engineering know-how to optimize IIOT processes.

BENEFIT FROM TECHNOLOGICAL PROGRESS FOR THE IIOT

A smart factory as part of the IIOT (Industrial Internet of Things) combines production capabilities, resources, products and people in order to optimize the industrial production.
The analysis of production and/or product specific data - which are being collected and exchanged throughout the complete value chain, is deployed to initiate fast and optimized actions which can improve not only the production process but even the complete product lifecycle. Such optimization encompasses the improvement, security and safety of supply chains, production centers and people to enhance customer satisfaction and value creation.
The necessary cross-linking of logistics, production and usage requires end-to-end surveillance and remote access along the entire value-adding chain.
All this becomes feasible thanks to a combination of new wireless technologies, high-performance wireless devices, sensors, robots etc. plus new IoT platforms with big-data analytic capabilities.
Based on our experience in wireless technologies, 7layers has developed a comprehensive service portfolio for industries and organizations who are planning to exploit the opportunities arising from ubiquitous connectivity and smart industrial IoT processes.

MARKETS

7layers serves all industries employing the continuously growing array of wireless technologies. For many years, we have worked together with wireless chipset and module manufacturers as well as the world's leading manufacturers of mobile devices.

Today we are actively involved in the development of new opportunities for many different players across diverse industry sectors, who are able to benefit from our expertise and engineering excellence. Some examples:

- Industrial Internet of Things (IIoT)
- Connected transport systems
- Vehicle-2-x services
- Smart home
- Utilities
- Wearable technologies
- Media & entertainment ...

ABOUT 7LAYERS

Founded in 1999, 7layers is an international group of engineering and test centers, working in close cooperation with enterprises involved in wireless communication and smart IoT services.

We have gained extensive experience in developing and managing efficient validation & certification processes not only for complex high-tech products such as smartphones, but also in support of many other industries that benefit from the integration of wireless functionalities into their devices or services.

OUR PARENT COMPANY AND OTHER PARTNERS

In 2013, 7layers became part of the Bureau Veritas Group, a global leader in testing, inspection and certification. The group provides solutions in quality, health & safety, environmental protection and social responsibility. For over 180 years Bureau Veritas has been serving clients in all industries around the world.

In line with the trend towards ubiquitous connectivity and the ongoing digitization, Bureau Veritas is focusing on additional aspects in order to respond to the increasing complexities that manufacturers, suppliers and consumers are currently encountering. With its expertise in developing and managing complex wireless communications test environments and supporting the development of smart IoT services, 7layers ideally enhances this future orientation.

To extend its portfolio beyond these combined services, 7layers also maintains strategic partnerships with other organizations supporting the ongoing technological transformation.

7LAYERS SELECTED HIGHLIGHTS

- Road-toll program:
  developed the certification scheme
- Rail transport services provider:
  developed verification & validation concept
- Public safety:
  set-up of interoperability test environment
- USDOT "Connected Vehicle Certification Environment":
  supported the certification program development
- Smart telematics services:
  established the test concept
- Media & entertainment services provider:
  supporting the development
- Certification portal for mobile devices:
  developed and maintained for PTCRB
- LoRa certification program:
  involved in development

OUR CORE SERVICES FOR WIRELESS INDUSTRY AUTOMATION

SMART FACTORIES & IIOT PROCESSES

- Consulting
- Engineering
- Validation

WIRELESS CONNECTED MACHINERY, PARTS & END-USER DEVICES

- Consulting
- Testing
- Market Access Approvals

SUCCEED WITH FACTORY AUTOMATION AND IIOT PROCESSES

The technological developments leading up to the IIoT are creating new, sometimes disruptive business opportunities for many different players, whether they are manufacturers, services providers, suppliers, administrations or end-users.

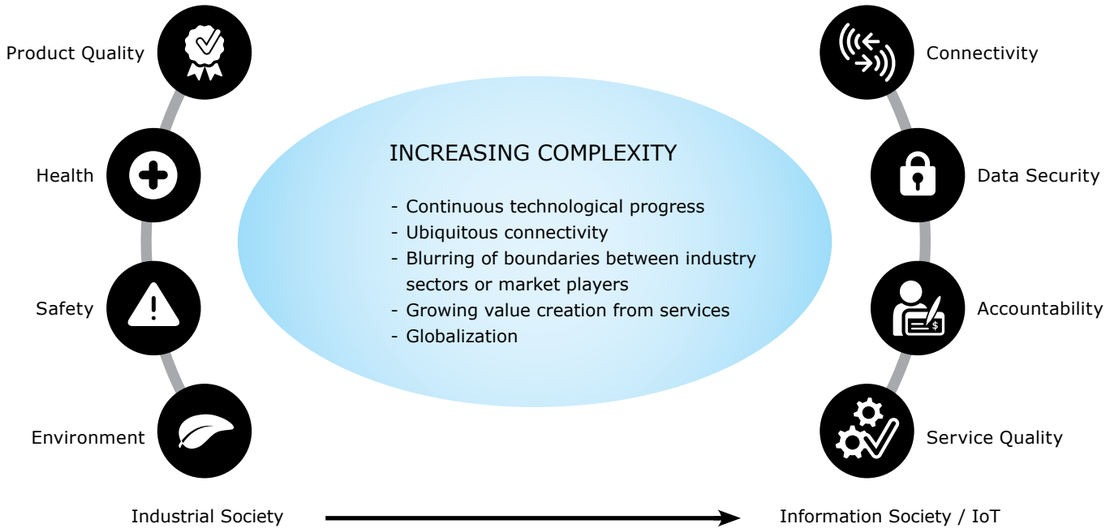
Consequently, the nature of their roles is changing. Manufacturers also offer services, local service providers gain access to the global market, mass production tends towards individualization. In some areas, even the boundaries between industry sectors are becoming blurred.

While enterprises can benefit immensely from these developments, they are confronted with growing complexities regarding the continuously evolving standards, rules and regulations that may or may not have to be considered throughout the complete value-adding chain, from logistics to production, marketing new products, and aftermarket services.

Partnering with 7layers can provide significant benefits during the complete lifecycle

- of an IIoT process
- for factory automation
- for connected machinery
- for connected parts
- for end-user devices

We not only offer a deep understanding of wireless technologies, which form the basis for nearly all IIoT applications, but 7layers also supports the development and lifecycle management of such processes with our engineering services and supporting systems.



GROWING NUMBER OF ESSENTIAL REQUIREMENTS

In the industrial society, the vast majority of official rules and regulations have been formulated by country-specific regulatory bodies.

The information society, which relies heavily on Internet of Things (IoT) developments, also has to adhere to the requirements set by specific standardization organizations.

Additionally, industry interest groups, suppliers to market or the manufacturers themselves define essential requirements to protect their specific interests and the interests of their customers.

Quality, health, safety, environmental and corporate social responsibility aspects are the traditional requirements of the industrial society, with which the Bureau Veritas Group, mother company of 7layers, has been involved for nearly two decades.

Bureau Veritas supports its industrial clients by assessing equipment and processes from the design stage to installation, commissioning and operation. The group also offers a wide range of services to ensure a safety-assurance process and asset availability performance

Requirements evolving with the IoT, such as ubiquitous, wireless connectivity, data security, accountability and non-repudiation plus the overall quality of smart processes, are now coming into focus. They are being covered by wireless specialists such as 7layers and its experienced partners within the Bureau Veritas Group and beyond.

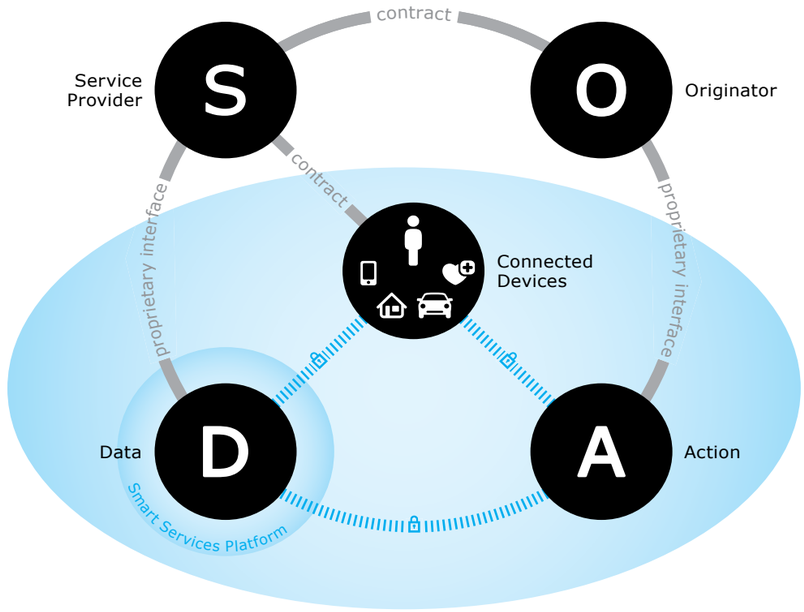
THE SODA® MODEL - FOR THE ANALYSIS OF SMART IIOT PROCESSES

To help our customers manage growing complexities, 7layers has developed a unique model with which we examine and also analyze the business processes around the IoT and also the industrial IoT.

To gain an initial overview and a mutual understanding, we analyze and structure the various stakeholders, activities and requirements of a smart IIoT process.

The 7layers SODA® model describes IoT processes in terms of a dynamic, "circular" process that needs to be continuously monitored once it has been set up:

We place the **User**, seeking an improved value-adding chain at the center of the process.
The Service **Originators** realize their IoT business ideas with the support of a **Service Provider**, who is responsible for the business relationship.
Users and wireless connected devices, permit data to be sent to a smart services **Data Platform**.
The data platform in turn initiates the physical or virtual **Action** required by the user.
The various stakeholders interact at different points in time.
The process is ongoing and not completed with the initiation of the (sometimes pre-emptive) action.



The 7layers group has many years experience in supporting the development and market access processes of complex high-tech products, applications and services:

USING OUR SODA MODEL, we analyze IIoT processes and define measures that need to be taken in order to set these up safely and successfully.

ENGINEERING SERVICES provide confidence when your latest business idea is not sufficiently covered by official standards, rules and regulations.

VERIFICATION & VALIDATION SERVICES - focusing on wireless connectivity - are provided by 7layers for connected devices, and IIoT processes.

GAIN CONFIDENCE - FOR YOUR IIOT PROCESSES - BASED ON OUR TECHNICAL CONSULTING & ENGINEERING SERVICES

Parties participating in an IIoT process need a joint concept to achieve the required results. Only formal approaches provide the confidence and the means to control the complexities so that the involved connected end-products and machinery, applications and the complete IIoT process adhere to (pre-)defined requirements during their entire value chain.

To optimize logistics, production and aftermarket processes, it is not sufficient to simply choose a suitable data platform plus some applications and devices, enhanced with wireless connectivity. One should also consider:

- suitablity of wireless technologies regarding reliability, energy consumption, performance, bandwith, latency, reach, sustainability etc.
- interoperability of devices, platforms and applications
- adequacy of official standards to safeguard connectivity, data security, accountability, quality of service
- development of additional private standards and technical quality policies
- methods to keep track of continuously evolving requirements and standards

TECHNICAL CONSULTING

Our consulting services aim to ease the initial set-up or enhance already existing processes in line with the requirements of IIoT stakeholders.

INITIAL SURVEY OF AN IOT PROCESS
We analyze the process on the basis of our SODA® model, creating a detailed and well-structured picture of the planned set-up.

ANALYSIS OF SUITABLE TECHNOLOGIES
After collecting requirements and restrictions, we deliver a clear decision matrix to define the most suitable technologies.

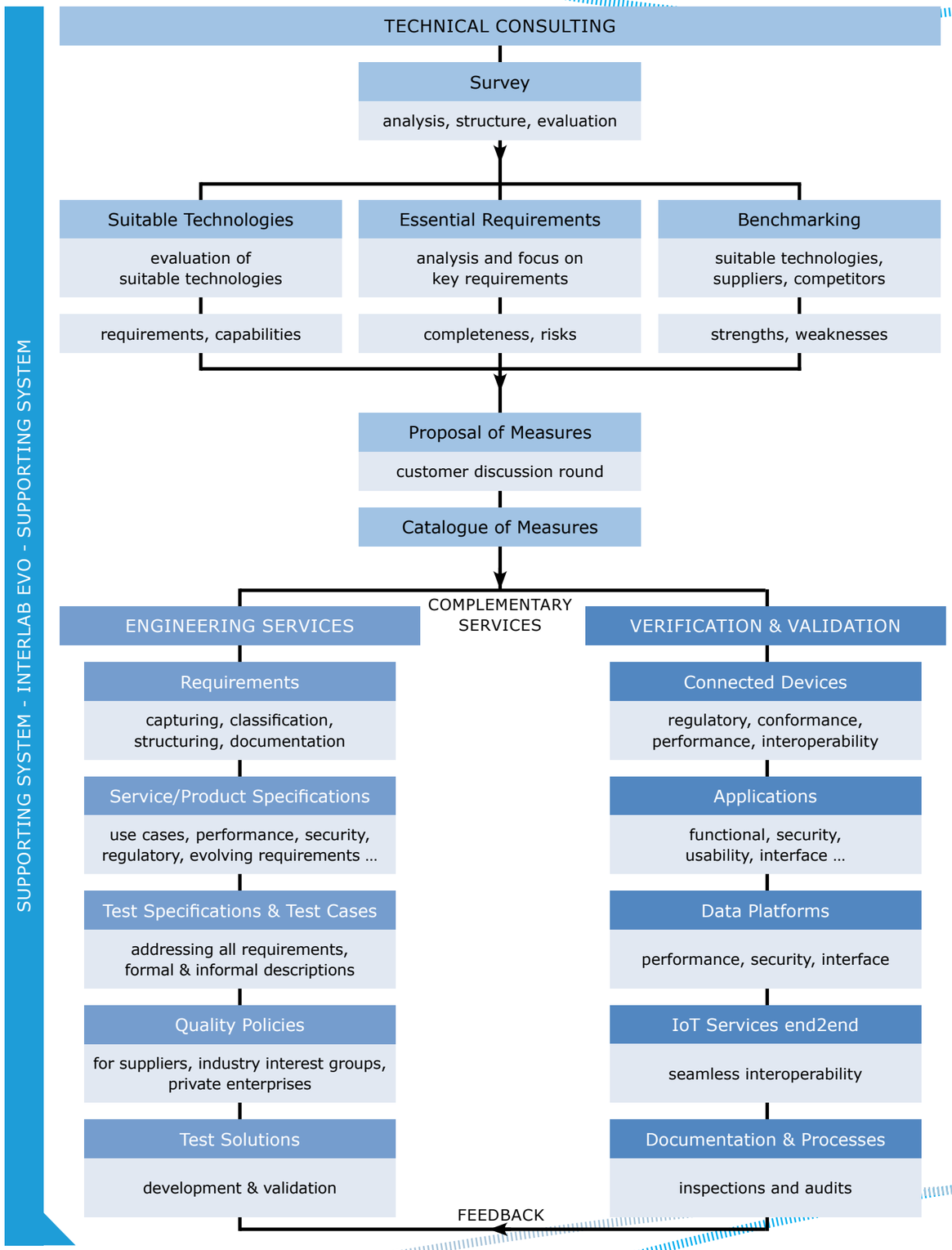
REVIEW OF ESSENTIAL REQUIREMENTS
We structure the essential requirements according to

- Smart IIOT process components
  - Connected devices
  - Data platform
  - Action / application
  - Full IIOT process
- Requestors
  - Proprietary standards
  - Regulatory bodies
  - Industry interest groups
  - Suppliers to market

Our evaluation process helps to focus on the key requirements for business success, and to analyze them with respect to strengths, weaknesses and completeness.

BENCHMARKING
We compare the appropriate technologies, the potential suppliers and/or competitors, providing an overview of their advantages and disadvantages.

MEASURES
Should issues arise, we propose and define methods that give IoT services the desired confidence level.



ENGINEERING SERVICES

To support the development, verification and lifecycle management of IIoT processes we offer:

REQUIREMENTS CAPTURING
The objective is to create a full description of an IIoT process or its elements. Requirements are captured by reviewing conceptual papers, interviewing stakeholders, analyzing existing devices or processes etc. After classification and structuring, the requirements are described and documented using formal description techniques.

IIOT PROCESS SPECIFICATIONS
Based on established requirements, we help define the basic IIoT process to document it in a complete, consistent, correct, unambiguous and testable way.

REQUIREMENTS AND SPECIFICATION MANAGEMENT
Requirements and specifications evolve during the lifecycle of an IIoT process or its elements. The respective feedback into the process needs to be managed via supportive systems.

TEST SPECIFICATIONS & TEST CASES
Requirements are analyzed and test specifications, including test cases, are defined by informal, semi-formal and formal descriptions.

QUALITY POLICY DEVELOPMENT
Quality policies help ensure that IIoT processes and their elements adhere to pre-defined requirements. If official certification policies are insufficient, we develop technical quality policies that match the proprietary requirements of IIoT process stakeholders, such as suppliers, manufacturers, distributors etc.

TEST SOLUTIONS & TEST CASE IMPLEMENTATION
7layers has been a provider of test solutions for complex wireless test set-ups for many years. We build on this experience when creating test solutions for proprietary processes. Our test solutions and implemented test cases go through validation and documentation processes to verify that they adhere to the initial requirements and specifications.

VERIFICATION & VALIDATION

The connected machinery, end-products, parts, data platforms, applications as well as the complete IIoT process must go through official and/or private verification & validation processes. In certain cases this is followed by certification or type approval. 7layers helps you to navigate through these processes as smoothly as possible.

INTERLAB EVO - SUPPORTING TOOL

Interlab EVO can support the verification lifecycle management of complete IIoT processes.

BENEFIT FROM CERTIFICATION CONSULTING FOR WIRELESS CONNECTED DEVICES

By adding wireless connectivity to machinery, to end-products or their parts, or other devices used in an IIoT process, such devices are becoming “radio products”. They therfore must adhere to specific regulatory requirements as well as requirements of industry interest groups - such as the Bluetooth SIG or the LoRa Allicance for example.

For the smooth market introduction of a device with integrated wireless connectivity (whether these are robots, sensors, machinery, end-products, parts or modules), it is essential to understand market access requirements as well as the effect that technical details can have on its certification status.

TYPE APPROVAL & CERTIFICATION STANDARDS

To support manufacturers of wireless modules and devices with integrated wireless connectivity, in-depth technology and market access know-how is required.

Our international team of type approval experts offers you support, relating to worldwide regulations concerning radio and short-range devices.

7layers is also actively engaged in a large number of wireless associations, such as 3GPP, ETSI, PTCRB, GCF etc. For wireless connected devices and service markets, that are going to shape in the Internet of Things, new certification approval processes are being developed. For this reason, 7layers is involved in those associations that promise to play a leading role in the IoT. By working with the LoRa Alliance, One M2M, Connected Vehicle Trade Organization, Continua Health Alliance and many more, we are able to advise you on current and upcoming certification requirements.

TEST PLAN STRATEGY

We minimize the required test time by taking into account your complete product family, the general product features, the product variances, and the certification status of the integrated modules.

Depending on your target markets, we establish the most efficient order for testing, certification and other market access processes to optimize the re-use of test and certification results and therefore your time-to-market.

CERTIFICATION MAINTENANCE

Connected devices are often built by implementing wireless chipsets or certified modules. This speeds up market access of the end-product but can lead to complications if modules have to be updated. 7layers analyzes the impact of such updates on the certification status of the end-product and establishes a process to optimize the handling of module updates.

ENHANCE PERFORMANCE OF WIRELESS CONNECTED DEVICES WITH OUR R&D SUPPORT

The integration of wireless connectivity into machinery, sensors, end-products or their parts can ease the coordination of production capabilities, resources and products considerably, thus playing an important role in optimizing the industrial production and product lifecycle management.

Depending on the use case, the performance of a wireless connected device, integrated in an IIoT process, is more or less critical. In some cases housing, positioning, antenna integration, interferences etc. however can have a negative effect on wireless connectivity. In such cases, our RF consulting services and antenna integration support can be a great help to stabilize and/or improve the performance.

RF CONSULTING PACKAGES

There are many variables when it comes to maximizing the performance of wireless connectivity. 7layers reviews the performance of the respective wireless enhanced devices and recommends the changes necessary to increase the performance and reliability of wireless connections.

Customers can choose between different RF consulting service packages:

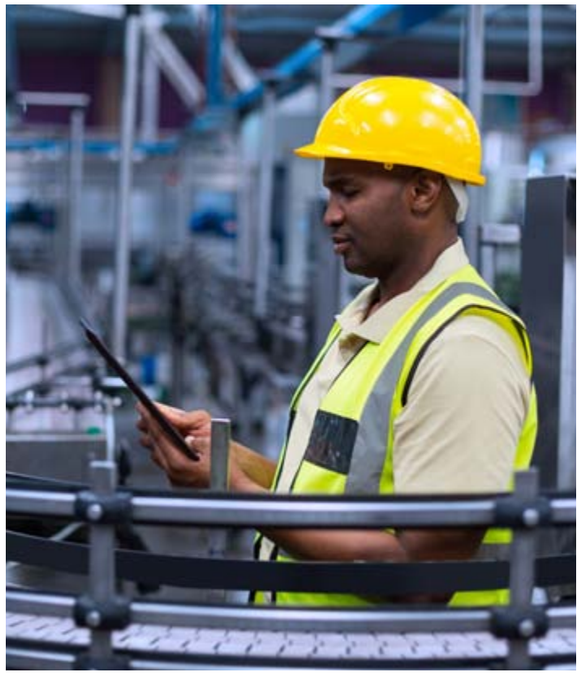
DEVELOPMENT SUPPORT
7layers will review your design and support the antenna integration. We go over a small set of spot-checks to provide confidence in the early development phase.

DESIGN REVIEW
7layers provides you with an in-depth design review by our experienced RF engineers, including identification of potential problems. This can play an important role to improve RF performance in a very early stage.

ANTENNA INTEGRATION
The evaluation of key performance parameters of the antenna and recommendations on how to correctly integrate the antenna into a wireless enhanced device will result in optimized performance.

ANTENNA CHARACTERIZATION
Identifying the antenna that performs best together with a specific device can be a challenge. Through comprehensive antenna measurements, our experts can help you find the right antenna that meets your needs.

CHANGE EVALUATION
In case you are planning engineering changes, these may affect the performance of connected devices considerably. 7layers can evaluate and benchmark the change to the overall performance for you.



BENEFIT FROM OUR EXPERIENCE WITH

- Wireless technologies
- RF issues
- Antenna integration
- Over the air (OTA) testing
- Market access approval

TESTING & MARKET APPROVAL FOR CONNECTED DEVICES

7LAYERS TEST SERVICES

7layers accredited engineering & test centers in Europe, Asia and North America offer

- EMC testing
- Radio testing
- OTA (over-the-air) antenna testing
- Application testing
- Sensor accuracy
- Battery and SAR testing
- Function testing
- User experience testing
- Interoperability & field testing
- Performance testing
- R&D testing
- Conformance testing
- Regulatory testing

TEST PROJECT MANAGEMENT

Our test projects and test laboratories are managed by experienced, dedicated project managers supported by the Interlab® EVO test management system for fast and reproducible results.

OUR ACCREDITATIONS AND LISTINGS

- DAkkS & A2LA accredited according to ISO/IEC 17025:
  - GSM, UMTS, LTE, Bluetooth®, W-LAN
  - Electromagnetic compatibility
  - OTA RF performance
  - FCC part 2, 15, 22, 24,27
  - ISM wideband transmission systems
  - Short range devices
  - Low power devices
  - Cellular interoperability
  - Application enabler

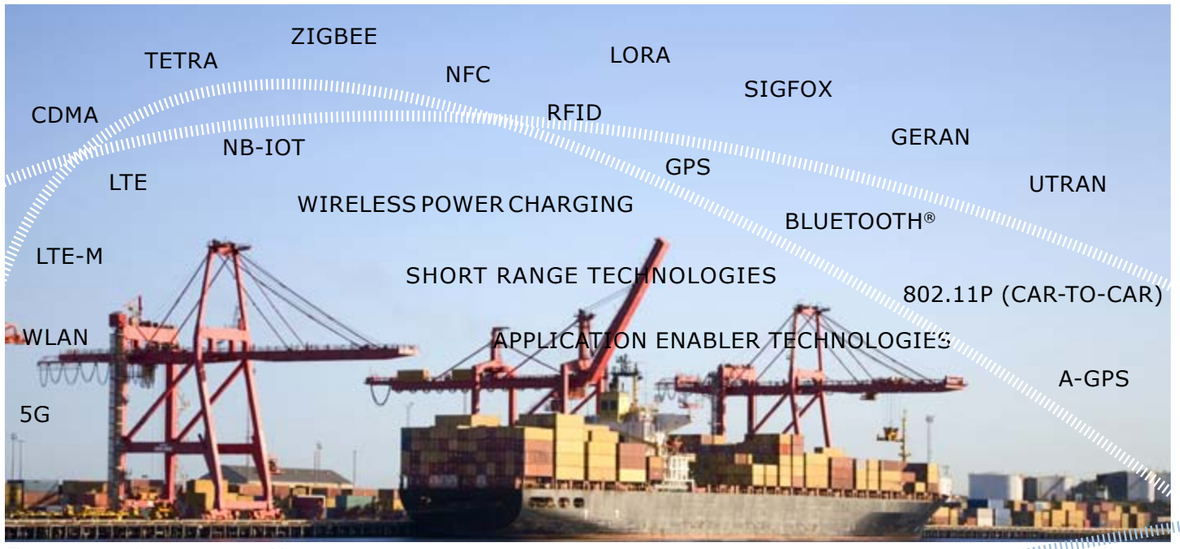
- CTIA authorized testing laboratories
- FCC listed / accredited
- ISED (IC) Canada listed
- CNAS China National Accreditation Services

- GCF Global Certification Forum Laboratory
- GCF Assessment Capable Entity (ACE)
- PTCRB accredited

- LPWAN test facilities
- LoRa authorized
- SIGFOX accredited

- Bluetooth® qualification experts and test facilities
- Car Connectivity Consortium (MirrorLink)
- German Federal Agency of Information Security for devices in TETRA BOS networks
- OMNIAIR authorized for DSRC based V2X

- Service Provider and Network Operator accredited (Verizon, Vodafone, Orange and others)



REGULATORY APPROVAL

Whether your products are subject to rules and regulations from regions such as the USA, Canada and Europe, or from more restrictive markets, our expertise in type approval handling, combined with the capabilities of our accredited wireless test facilities, means that compliance with all worldwide standards can be ideally supported by us.

The 7layers international team of type approval experts offers consultancy and support regarding the rules and regulations for devices with integrated radio or short-range technologies in all countries of the world. Our network of local type approval agencies and global Bureau Veritas partner labs provides a solid basis you can rely on to bring machinery, sensors, end-products or parts with integrated wireless connectivity to market.

CERTIFICATION

Due to the complexities of the wireless world, industry standards that safeguard reliability and interoperability of wireless connected products are subject to continuous development. As an active member of several certification organizations, associations and industry interest groups, we support the continuous development of certification programs and certification databases.

7layers laboratories are authorized by the world's leading wireless industry interest groups. Based on our recognitions and experience we can guide you through the necessary certification processes. After certification testing, we provide you with the highly regarded 7layers test reports.

QUALITY POLICY MANAGEMENT FOR PROPRIETARY SOLUTIONS

7layers has a high level of expertise in setting up customized quality policies and validation programs. This is beneficial when it comes to assessments that do not adhere to official standards, but follow the unwritten demands of the marketplace made by manufacturers and other users, consumers and suppliers. 7layers helps define proprietary quality policies for connected devices or complete IIoT processes including the respective validation processes.

APPROVALS FOR SUPPLIERS TO MARKET

Network operators and other branded suppliers to market have developed their own standards for testing and certification, to avoid poor performance and lack of interoperability. In this context, 7layers offers network operator approvals and manufacturer authorizations.

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