Connected Vehicle System Testing

The Connected Vehicle Testing offering provides validation services on a system level that enable automakers and suppliers to bring their connected mobility solutions to market. Our portfolio includes a wide range of testing services for telematics, vehicle to everything (V2X), diagnostics, vehicle network, over-the-air (OTA) and cybersecurity. For our clients, that means we add unmatched value to products and enhance end-user experiences in connected vehicles.

The challenge

The demand for connected mobility is rapidly evolving, and customer expectations for connected vehicle experiences are high. As vehicles become increasingly connected, the possibility of cybersecurity attacks and interoperability issues is growing, placing increasing demand on test efforts to make the systems safe and secure: Automakers and their partners need to manage these testing efforts. At the same time, automakers must protect their brand reputation, whereas partners and suppliers must deliver on demand and on time. This includes the need to ensure functional safety, reliability and security in connected vehicles, specifically:

- Standards and regulations have to be fulfilled — such as the latest cybersecurity regulations (ISO 21434 and WP29)

- Reliable and efficient communication between connected vehicles must be established — even in complex environments, where components from several manufacturers have been linked together

- Data has to be exchanged in real time — independent of network load and weather conditions

- Illegal access to connected vehicles must be avoided under all circumstances — preventing data tampering, data theft or, in a worst-case scenario, complete remote vehicle control

- Increasing testing effort has to be compensated and new approaches installed — like using simulation environments

We support our clients with tailored solutions for the validation of connected vehicle functionalities meeting their specific requirements as well as market expectations.

Our solution

We provide comprehensive expertise in different areas of connected vehicle testing:

Over-the-air update testing
OTA functionality is a critical component in software-defined vehicles. We support our clients with a structured validation approach to secure the OTA functionality at ECU and vehicle level. Stable OTA updates require robust testing that does not disrupt the development process with downtime. Our OTA end-to-end validation service ensures minimized downtime and a seamless and secure delivery of OTA software updates for connected vehicles. The service covers numerous platform combinations, including carlines and their connectivity ECUs.

Telematics and V2X testing
For the validation of V2X communication systems and telematics functions, such as eCall, remote services, positioning, power mode, telematics control unit (TCU) wake up, etc., we cover all aspects of vehicle connectivity and safety. Providing efficient V2X communication is a major challenge in connected vehicle testing. Flawless interoperability is critical, especially when networks are assembled by different manufacturers. We assess software and hardware interoperability with external devices and infrastructure, thus allowing a consistent and reliable connected experience. In addition, our testing also assesses the responsiveness of connected systems to certify minimal latency for data transfer.

Vehicle network and diagnostics testing
Validation of in-vehicle networks and diagnostic systems is also in the scope of the Connected Vehicle Testing offering.

Optimal performance and reliability are ensured by comprehensive testing of Onboard Diagnostics Systems (OBD), vehicle communication protocols and network connectivity. Our validation approach can be easily adapted to various bus systems. It includes tests related to power management, the communication matrix and layers, as well as simulations.

Cybersecurity and penetration testing
To test the cybersecurity of connected vehicles, we apply comprehensive validation methods, covering all norms and standards. Our thorough approach helps identify and mitigate potential security risks. Penetration testing and vulnerability assessments reduce the risk of attacks reaching their target. The validation includes sensitive vehicle data that preserves the integrity and authenticity of critical vehicle systems and communications. User data ranging from location information to personal preferences is also in scope. Our testing services help clients protect vehicles and their occupants from potential cyberattacks that could otherwise cause high reputation damage.

Regulatory compliance is not only important for cybersecurity, but connected vehicle testing must also consider adherence with other norms in the context of safety, privacy and communication. Therefore, we keep up with changing standards and we adapt testing techniques accordingly.

Our connected vehicle system testing is conducted in simulated environments (test benches) and real-world scenarios (road tests). We implement a holistic test approach that maximizes value for our clients and, ultimately, their end users.

Why work with us?

- Advanced overall capabilities for connected vehicle testing — with a strong focus on market trends

- Strong expertise across the connected mobility lifecycle and a long history of testing experience — with extensive development knowledge

- Quality mindset — with the ability to identify bottlenecks and defects early in the software delivery process

- Reduced costs of testing and overall production — with automated test solutions and simulation environments

What makes us different?

- Highly automated and reusable test frameworks — to identify and fix bugs in the hardware design phase to solve critical functional safety, reliability, and security issues

- Specialized testing labs (e.g., our cybersecurity testing lab in Egypt)

- Onsite experts and the possibility to set up client-specific test centers — an approach we have implemented for several OEMs in different locations

- A guide for the entire software lifecycle: from development strategy, best practices and architecture guidance to the production of software applications and software components

- Hybrid team setups for high scalability, with a huge global test engineering pool to enable fast project ramp-ups — minimizing time-to-market

- Adaptive testing approaches take into account adjusting regulations and emerging trends — identified early through continuous market monitoring

Our customers

Challenge

An automotive supplier wanted to perform data throughput tests for their telematics projects. Data throughput measurements verify the speeds for the download and upload on a TCU modem. With 5G enabling even faster data transfer, these measurements are essential for the supplier and the automakers that purchase these TCUs.

Solution

We provided system test experts who created suitable test processes and scenarios for implementing and performing these tests. Together with the client, we ensured that all results reached the relevant parties while meeting customer expectations.

Results

With our solution, the client achieved the following:

- Suitable test processes defined and implemented based on the project requirements and setup
- Weekly tests performed, with the results shared with the client
- All defects found and addressed so the client could react faster to solving the issues
- Tests requested on a later step (reusability), for all telematics projects, for the same client
- Step-by-step procedure (guidelines) created and used as a starting point for other projects

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