

CASE STUDIES

Together with industrial partners, Fraunhofer FOKUS has started to provide manufacturers with test equipment for IoT testing. Currently, the focus is on two technical case studies from the fields:

- Automotive and
- Industrial production domain.

Within these areas, the focus is on:

- challenges of processes within a modular shopfloor-IT for production constructions linked to material bearing,
- the inclusion of a cloud-based IoT platform.

CONTACT

Dipl.-Inf. Michael Wagner
Business Unit SQC
Tel. +49 (0)30 3463-7391
michael.wagner@fokus.fraunhofer.de

Axel Rennoch
Business Unit SQC
Tel. +49 (0)30 3463-7344
axel.rennoch@fokus.fraunhofer.de

Fraunhofer FOKUS
Kaiserin-Augusta-Allee 31
10589 Berlin
Germany

www.fokus.fraunhofer.de



We
connect
everything

jda | 1402 (Fotos: istock/vitranc; istock/akpin; shutterstock/Natalya Hora)

IoT TESTING

INTERNET OF THINGS

The term *Internet of Things* (IoT) describes a vision of the global networking of physical and virtual objects using information and communication technologies. At the same time, the Internet of Things is steadily growing: The research and advisory company Gartner forecasts 20,4 billion worldwide networked products by 2020. In recent years, the Internet has established itself as a worldwide communication platform that in the near future will not only connect all areas of daily life, but also the economy. This is accompanied by a number of challenges: components, functionality, interoperability, robustness, security and trustworthiness of the technologies must be secured and the quality of IoT solutions improved. Because IoT solutions operate in harsh and unreliable environments, devices and infrastructures need to be tested in different environments and under various conditions. Therefore, Fraunhofer FOKUS develops advanced test strategies, test automation solutions as well as equipment for individual test runs.



CHALLENGES

In order to make Germany's IT systems and digital infrastructures among the world's safest, in 2015 the Federal Government has passed a *Law on the Increase of Information Technology Security* (IT-Security Act). Compliance with industry-specific standards must be demonstrated every two years. Among other things, the requirements concerning the protection of citizens and data were increased. The resulting implications lead to enormous challenges for manufacturers and operators.

GOAL OF THE PROJECT

The IoT Testing project contributes to provide security and protection as well as certification of IoT components at low cost. Together with research and industry partners, Fraunhofer FOKUS develops IoT test methods and tools. The aim of the project is to develop and build a comprehensive IoT test and quality assurance platform. Together with its partners Fraunhofer IPK, Audi AG, DEKRA EXAM and relayr, Fraunhofer FOKUS is working on this project.

INNOVATIONS

One of the most important tasks at IoT testing is to define suitable test cases. Based on user scenarios and system architectures of IoT applications, the test components must be configured to simulate appropriate environmental behavior. Therefore, as part of the IoT-T project, a testware will be developed that can be used in a testlab to test and ensure the quality of IoT products. In addition, the insights gained through IoT-T will be used to work on various standardization activities.

Testware and Testlab

The IoT-Testware provides a rich set of IoT test suites to test conformance, interoperability, robustness as well as safety and security of IoT applications. It enables developers to set up automated test environments right from the beginning of a project. Special attention is paid to the testing of safety and security aspects as well as the scalability of the systems under test. Advanced test methods such as fuzz testing and risk-based testing are taken into account. Integration of the IoT-Testware into the ecosystem of the Eclipse community set an important milestone. Eclipse as an independent and transparent community for the development of open source software makes it possible to offer the test suites legally secure and simultaneously open source.

To ensure independence of test and implementation technologies, the test suites are developed by using TTCN-3 and implemented as well as executed with the tool *Eclipse Titan*. The TTCN-3 language, released by ETSI, allows to use the test suites for flexible and complex configurations in resource-constrained environments. The IoT-Testware is developed in accordance with the ISO standard ISO 9646 *Conformance Test Methodology and Framework* as well as the ETSI White Paper No. 3 *Achieving Technical Interoperability – the ETSI Approach*. It is a general ETSI procedure to secure standards. In the IoT-T project this method is also applied to standards that have been defined outside of ETSI, such as the protocols CoAP (Constrained Application Protocol) and MQTT (Message Queue Telemetry Transport). In order to offer cost-effective testing and certification of IoT applications, the IoT-Testware is used in a testlab. The IoT-Testlab is a testbed that will cover a wide range of industry-relevant IoT test scenarios in the long term. The focus is on systematic test methods and test processes. The IoT-Testlab offers product managers, developers and testers an infrastructure to develop test strategies, test automation solutions and custom test runs.

Standardization

In addition to the development of a platform for testing IoT products, IoT-T participates in international working groups of associations and for standardization, such as:

- oneM2M
- DIN / ISO
- AIOTI
- ETSI

The experiences and insights gained in the IoT-T project especially will be incorporated into the Working Group *TST*, newly established by ETSI TC MTS. This working group will develop studies, guidelines, test catalogues and test specifications for specific ICT technologies.

More information:
www.iot-t.de/en