

ECSEL Project

Intelligent Secure Trustable Things_(InSecTT)

Abstract of the project results achieved by Johannes Kepler University
Linz – Institute for Communication Engineering and RF-Systems

The InSecTT project was focused on intelligent, secure, and trustworthy systems for industrial applications to provide comprehensive cost-efficient solutions of intelligent, end-to-end secure, trustworthy connectivity and interoperability to bring the Internet of Things (IoT) and Artificial Intelligence (AI) together. The project consortium of 52 partners from industry and academia from Europe and Turkey dealt with “trustable intelligent things that are securely and reliably connected”, i.e. moving AI to the edge and making AI and machine learning (ML) based systems trustable, and explainable. The project partner Johannes Kepler University Linz – Institute for Communications Engineering and RF-Systems (JKU) contributed, among others, the following highlights:

JKU successfully set up a wireless sensor network with up to 40 ultra-wideband (UWB) and Bluetooth Low Energy (BLE) -enabled wireless sensor nodes. The sensor nodes were developed during the InSecTT project and were used to demonstrate our algorithms to reliably localize the sensor nodes. We used the UWB transceivers of the nodes to measure distances between the nodes and communicated the results via BLE, which allowed for accurate localization of the sensor nodes. While this was already state-of-the-art before InSecTT started, we enhanced the UWB-based localization by assigning a trustworthiness score to the distance measurements. This is useful as high accuracy of UWB-based localization can only be achieved if there is a direct line-of-sight (LOS) between the sensor nodes. Otherwise, the distance measurements give wrong results, leading to poor localization accuracy. Thus, the most important task is to figure out if this LOS condition is met or not. This can be done with the help of our trustworthiness score. It is computed from the measurement results the UWB transceiver provides by means of ML algorithms and indicates if this is a “trustable” distance or not.

We furthermore provided a signal processing algorithm that computes the location of the sensor nodes from their distance measurements and incorporates our trustworthiness score to improve the location accuracy. We demonstrated this in an indoor localization experiment which showed a reduction of the average localization error by up to 50% as compared to the conventional algorithm in a dynamic scenario. Our sensor nodes were also integrated into the demonstrators of two other InSecTT project partners. In one demonstrator our localization results were compared with localization results from satellite-based localization like GPS and showed comparable performance. In the second demonstrator, the nodes were integrated in a testbed to perform automated and repeatable jamming tests.