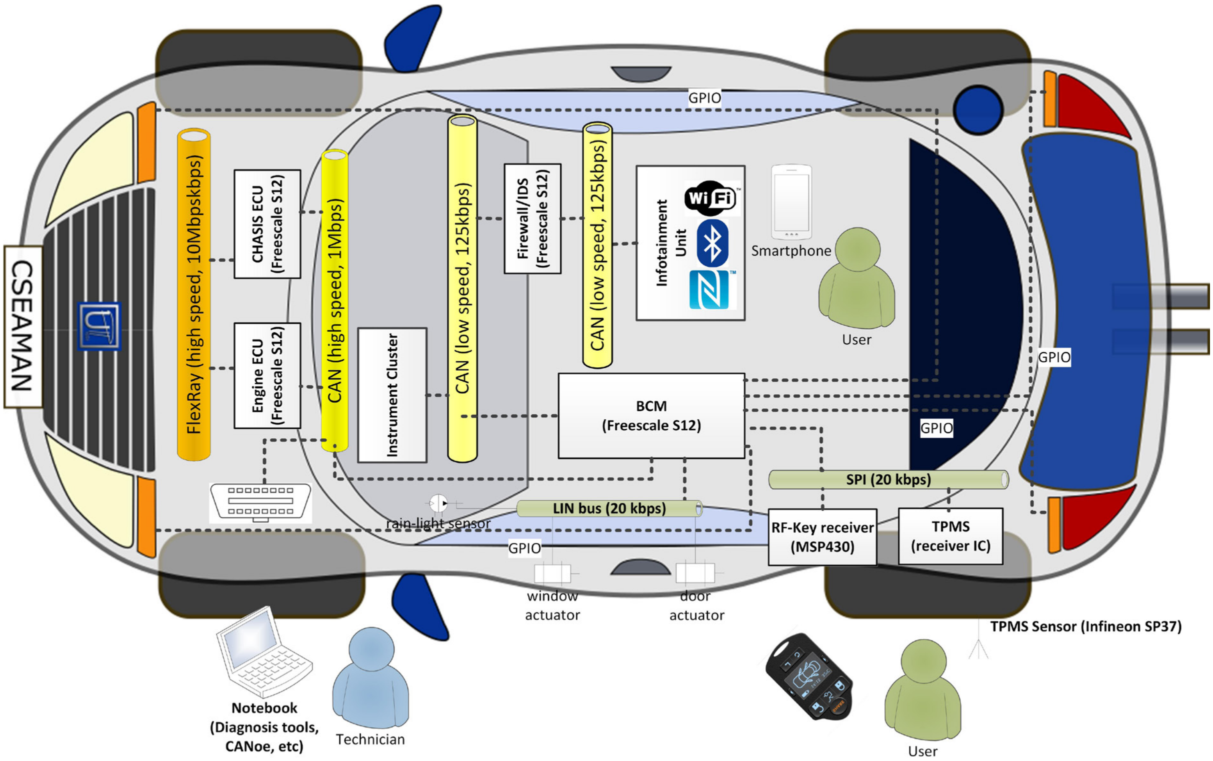
CSEAMAN - CRYPTOGRAPHIC SECURITY FOR AUTOMOTIVE EMBEDDED DEVICES AND NETWORKS

Goal of the project:

The design and analysis of cryptographic security solutions for automotive embedded devices and networks



Short description of the project:

The project aims at the design and analysis of cryptographic security solutions with applications in the automotive domain. Our main challenge is to accommodate cryptographic security on automotive-grade devices with low computational and memory resources that communicate over in-vehicle networks with constrained bandwidth. We focus both on wired and wireless channels that open cars to outsiders and bring a complex adversarial setup. Existing security sub-systems in cars (e.g., wireless keys, TPMS units) are also within reach.

Project implemented by

Research Group on Embedded Systems and Security, Department of Automation and Applied Informatics, Faculty of Automatics and Computers (UPT)

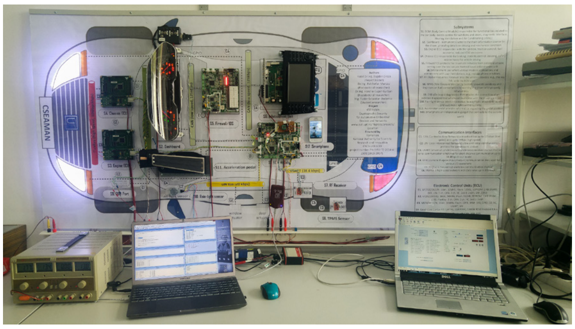
Implementation period:

Oct. 2015 – Sept. 2017

Main activities:

- Implementation and security analysis of cryptographic functions on automotive grade embedded devices, e.g., AUTOSAR compliant cryptographic libraries,
- Design and analysis of cryptographic protocols for wired in-vehicle networks, e.g., CAN bus, J1939, FlexRay, etc.
- Design and analysis of cryptographic protocols for wireless in-vehicle connectivity, e.g., RF keys, TPMS systems, etc.
- Implementation of an experimental platform for security critical subsystems inside the car: communication buses linking various ECUs with potentially insecure third-party devices (e.g. infotainment units)
- Risk analysis and security implications within new automotive paradigms: optimized traffic flows, vehicle-to-vehicle communications, etc.

Results:



- An experimental model for in-vehicle networks and subsystems
- Comprehensive performance analysis of cryptographic functions on automotive-grade controllers
- Analysis of fingerprinting and randomness extraction mechanism from SRAM state
- Design of new security solutions for wireless vehicle access
- Design of new security solutions for the CAN bus
- Security analysis and fixes for the J1939 commercial-vehicle bus protocol
- Analysis of traffic models with adversarial vehicle behavior
- Risk analysis and security implications for attacks on BCM units and vehicle instrument clusters

Applicability and transferability of the results:

Various applications in the automotive industry for securing critical vehicular systems and networks, e.g., wireless keys, CAN bus, ECU fingerprinting, etc.

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