

EVITA

E-safety vehicle intrusion protected applications



EVITA is a project co-funded by the European Commission. Its objective is to design, verify, and prototype an architecture for automotive on-board networks where security-relevant components are protected against tampering and sensitive data are protected against compromise. Thus, EVITA will provide a basis for the secure deployment of electronic safety aids based on vehicle-to-vehicle and vehicle-to-infrastructure communication.

At a Glance

Project coordinator:

Fraunhofer Institute for
Secure Information Technology (Germany)

Partners:

BMW Research and Technology (Germany)
Continental Teves AG & Co. oHG (Germany)
escrypt GmbH (Germany)
EURECOM (France)
Fraunhofer ISI (Germany)
Fujitsu Services AB (Sweden)
Infineon Technologies AG (Germany)
Institut TELECOM (France)
Katholieke Universiteit Leuven (Belgium)
MIRA Ltd. (UK)
Robert Bosch GmbH (Germany)
TRIALOG (France)

Duration:

36 months (July 2008 – June 2011)

Total cost:

6 million €

Programme:

FP7-ICT-2007 of the European Community

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Background

Future automotive safety applications based on vehicle-to-vehicle and vehicle-to-infrastructure communication have been identified as a means for decreasing the number of fatal traffic accidents. Examples of such applications are local danger warnings, traffic light pre-emption, or electronic emergency brakes. While these functionalities herald a new era of traffic safety, new security requirements need to be considered in order to prevent attacks on these systems.

A modern car may be equipped with up to 70 embedded ECUs (electronic control units) for a diversity of functions. The ECUs are connected via various vehicular buses (e.g. CAN, MOST, LIN), forming a complex distributed system. So far, there has been little incentive and opportunity for tampering with automotive networks. This will change with the advent of new vehicular communication interfaces. There are various threats, such as forced malfunctioning of safety-critical components or the interference with the traffic flow by means of fake messages.

Objectives

Secure and trustworthy intra-vehicular communication is the basis for trustworthy communication among cars or between cars and the infrastructure. Therefore, the

objective of the EVITA project is to design, verify, and prototype an architecture for the on-board networks where security-relevant components are protected against tampering and sensitive data are protected against compromise when transferred inside a vehicle.

By focusing on the protection of the intra-vehicle communication, EVITA complements other e-safety related projects that focus on the protection of inter-vehicle communication.

Approach

Security requirements analysis

Starting from relevant use cases and security threat scenarios, security requirements for on-board networks will be specified. Also legal requirements on privacy, data protection, and liability issues will be considered.

Secure on-board architecture design

Based on the security requirements and the automotive constraints, a secure on-board architecture and secure on-board communications protocols will be designed. The security functions will be partitioned between software and hardware. The root of trust will be placed in hardware security modules that may be realised as extensions to automotive controllers or as dedicated security controller chips similar to Trusted Platform Modules (TPMs).

In order to ensure that the identified requirements are satisfied, selected parts of the secure on-board architecture and the communications protocols will be modelled using UML and automata and verified using a set of different but complementary model-based verification tools.

Implementation

For prototyping, FPGAs will be used to extend standard automotive controllers with the functionality of cryptographic co-processors. The low-level drivers for interacting with the hardware will be partially generated from UML models.

For even faster prototyping, the security functionality will also be implemented purely in software. An API will be defined so that applications on top of this API can use the cryptographic functions regardless of whether they are provided in hardware or software. All developed code will be validated to ensure its correctness.

Prototype-based demonstration

The secure on-board communication will be deployed inside a lab car demonstrating e-safety applications based on vehicle-to-X communication. Cryptographic methods will ensure the integrity and authenticity of information exchanged within the vehicle and will protect ECUs against theft, tampering, and unauthorised cloning.

Releasing the automotive hardware security modules for deployment in cars on public roads requires further implementation and testing efforts, which are out of scope of this project.

Dissemination and external interfaces

In order that the entire automotive industry may benefit from the project results, the secure on-board architecture and communications protocol specifications will be published as open specifications.

The EVITA project partners will liaise with related initiatives in the fields of e-safety and embedded security to achieve multi-lateral synergies.

For further information:

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