Smart Keys for Cyber-Cars: Secure Smartphone-based NFC-enabled Car Immobilizer

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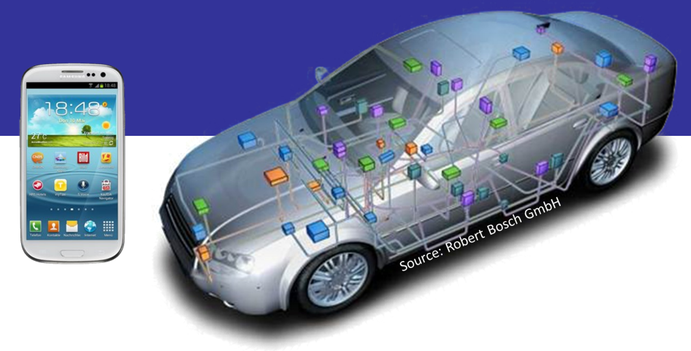


Motivation

- Increasing integration of smartphones into modern automotive systems
- Customized access without physical key transponder possible: e.g. delegation of rights, location based access
- Security of current available automotive smartphone-based solutions unclear since undisclosed from review

Requirements & Challenges

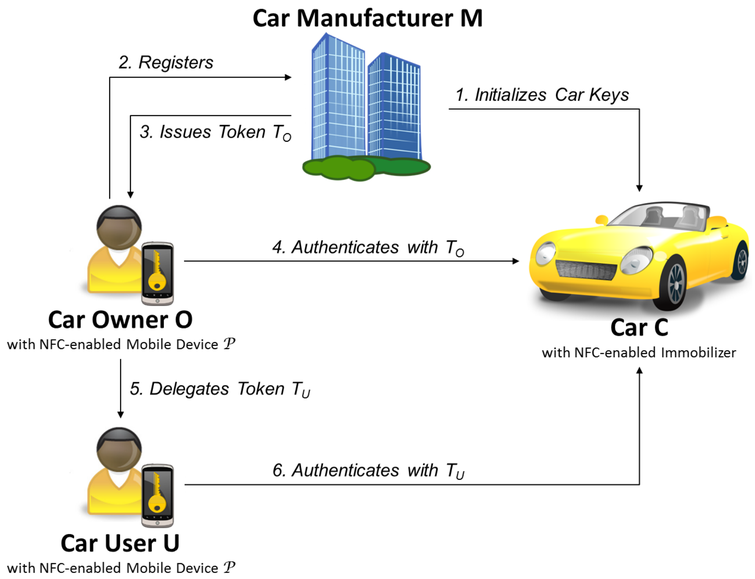
- Fast authentication for positive user experience
- Remote key management (issuing/revocation)
- Direct delegation of access rights (without the issuer)
- Context-aware access policies (e.g., time-limited)

Related Work

- Prototypes of Smartphone-based immobilizers available but their security is unclear since undisclosed
- Existing open specifications of security stacks are focusing exclusively on immobilizer part
- No automotive solution proposes delegation of access rights

General Architecture

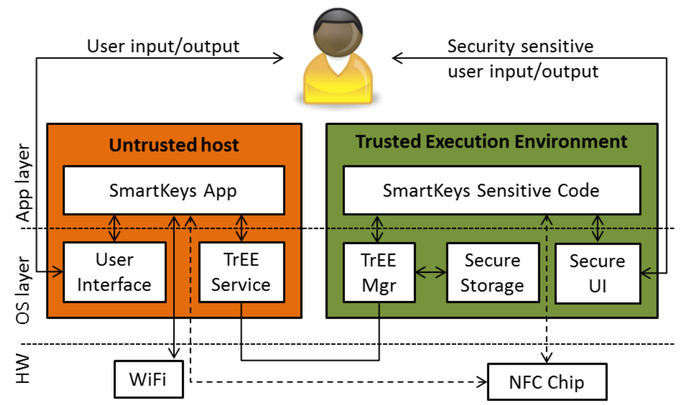
- Token-based authentication system
- Enables secure deployment and storage of tokens
- Supports token delegation and revocation



Design

Platform Security Architecture

- Secure storage to protect sensitive data (e.g., crypto keys)
- Isolated execution to protect sensitive code
- Access control to security sensitive code and data



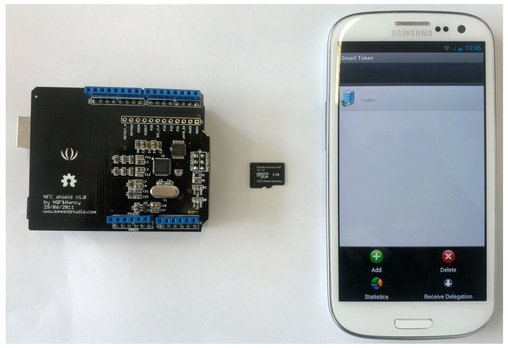
Secure Protocols

- Use well-established crypto primitives (AES, SHA-1, RSA)
- Formal tool-aided protocol verification (ProVerif)

Implementation

Platform

- NFC-enabled Galaxy S3 smartphone
- Arduino board as proof-of-concept immobilizer platform
- Secure microSD card as trusted execution environment



Performance

- Performance-critical parts use symmetric crypto
- Tokens optimized for small NFC bandwidth
- Authentication protocol runs in under 700 ms

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