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Sicherheitsarchitekturen für automotive Systeme

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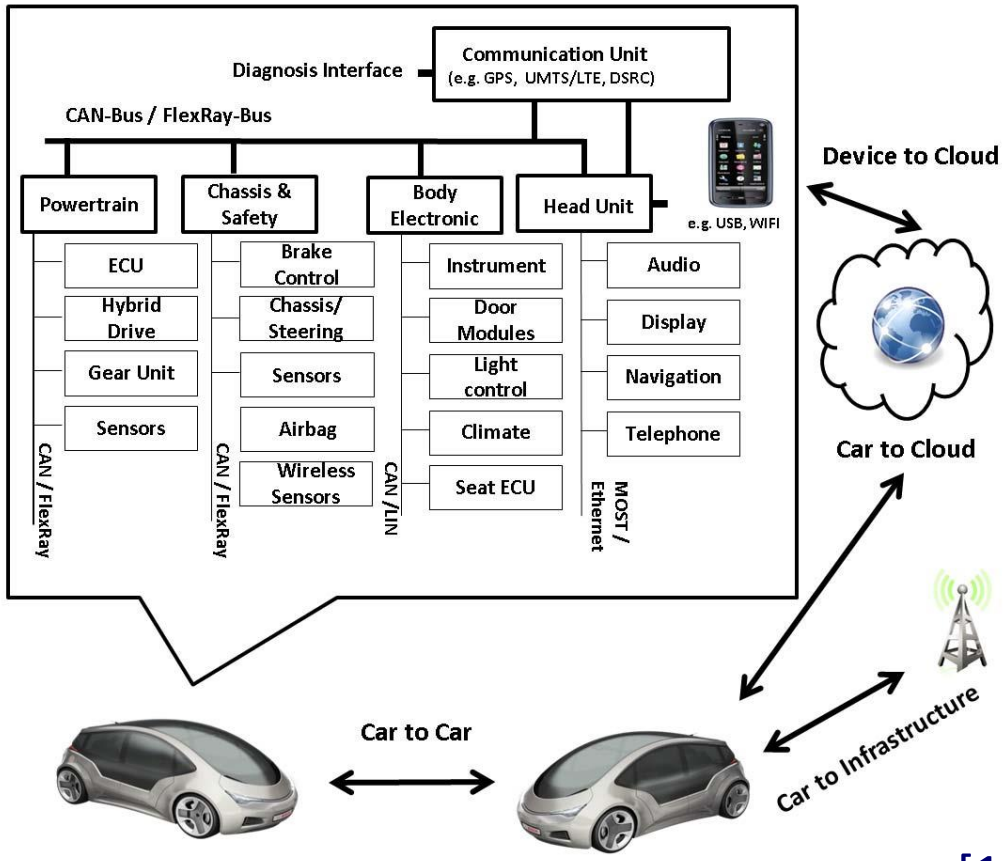
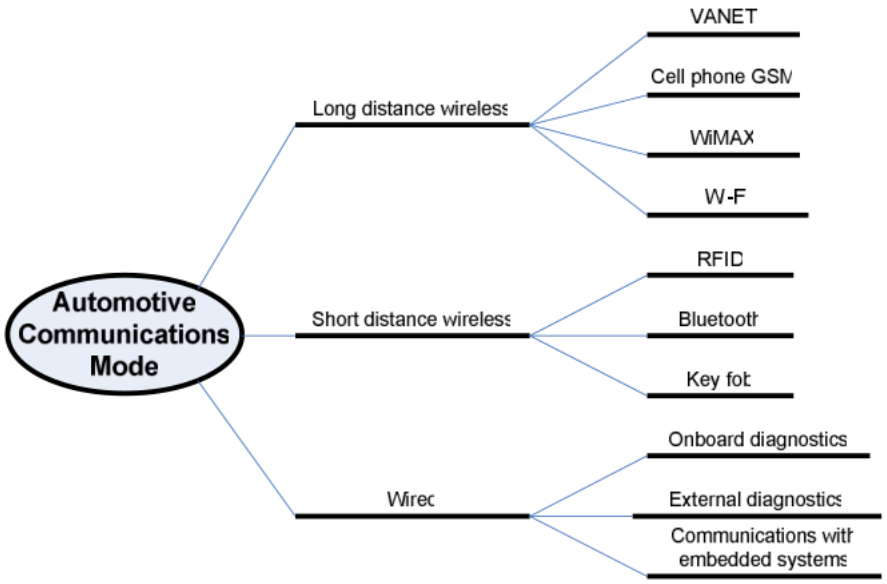
IVN Communication



[1]

V2X Communication

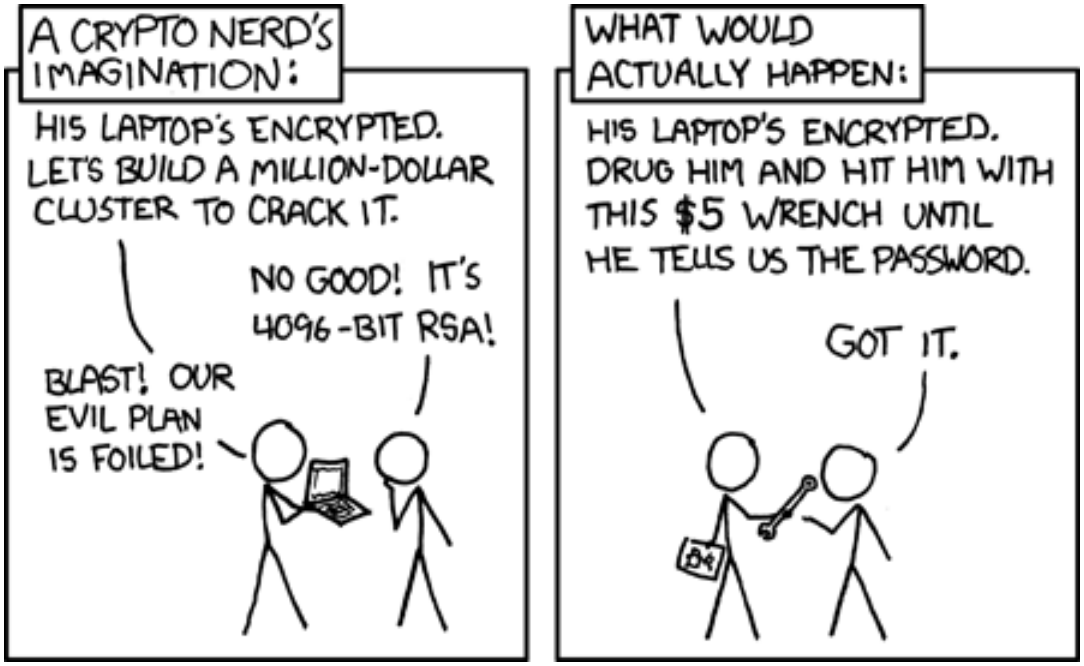


[3]

Schwierigkeiten

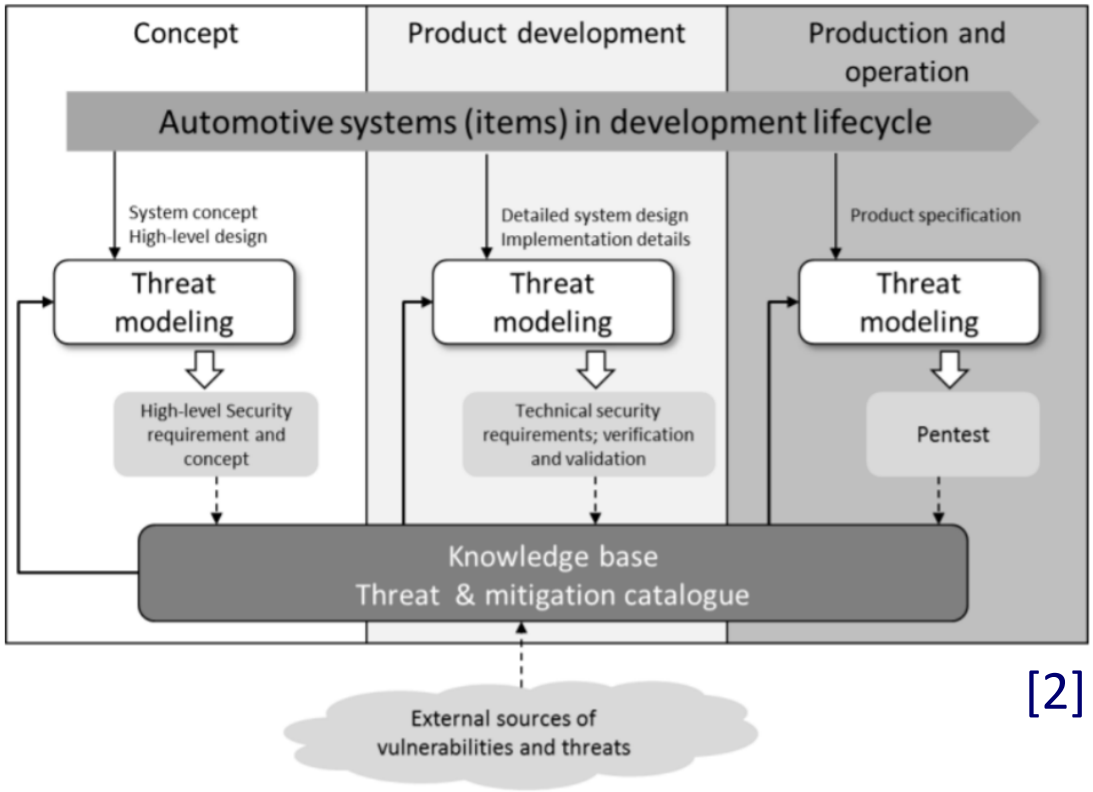
- hohe In-Field Lifetime
- verschiedene Designer, Hersteller, Zulieferer
- Time-to-Market sehr kurz
- Zahlreiche neue Technologien
- „Einfacher“ Physischer Zugang
- Plug & Play
- Limitierte Resourcen
- Harte Constraints

Der Weg zur Sicherheitsarchitektur



[6]

Threat Model



[2]

Nichtfunktionale Anforderungen an eine Sicherheitsarchitektur für automotive Systeme [4]

- Anpassbar
- Verteilt
- Erweiterbar
- Multilevel

Standards in der Entwicklung von Automotive Systemen

- AUTOSAR
- ISO 9001
- IEC-61508
- ISO 26262
- Automotive SPICE

Secure Hardware Extension (SHE):

- Spezifikation
- Definiert API einer ‚Secure Zone‘
- Key Management
- Encapsulating Authentication
- Encryption / Decryption

E-Safety Vehicle Intrusion Protected Applications (EVITA):

- Guidelines für Design, Verifikation und Prototyping verschiedener Sicherheitsarchitekturen für ECUs
- Definiert Funktionalität in drei verschiedenen Sicherheitsstufen (low – high)
- Management von Schlüsseln
- Encryption und Decryption Operationen

Preparing Secure Vehicle-to-X Communication Systems (PRESERVE)

- Baut auf EVITA auf
- Ziel ist es ein Subsystem für V2X Anwendungen zu Entwickeln, Implementieren und zu Testen
- Sichere übertragung von Daten- und Steuernachrichten
- Hardware Sicherheitsmodul mit Elliptic Curve Cryptography (ECC)

Forschungsfragen

- Wie muss eine Sicherheitsarchitektur für automotive Systeme aussehen?
- Welche Konzepte sind in welchem Teilbereich anwendbar?
- In welcher Form lassen sich neue Konzepte und Technologien in vorhanden Strukturen integrieren?

Vorgehensweise

Grundprojekt:

„Bestandsaufnahme“ neuer Konzepte / Technologien und Überprüfung auf Anwendbarkeit im automotive Bereich.

Hauptprojekt:

Implementierung eines ausgewählten Konzeptes.

Masterarbeit:

Validierung / Auswertung / Integration in vorhandene Strukturen

Risiken

- Umsetzung fehlerhaft -> Nicht sicher
  (Ziel verfehlt)
- Nicht anwendbar
- Fehleinschätzung des Aufwandes

Konzepte

- Location-enhanced authentication using the IoT: because you cannot be in two places at once. [17]
- Automotive Electrical and Electronic Architecture Security via Distributed In-Vehicle Traffic Monitoring. [16]
- Fingerprinting Electronic Control Units for Vehicle Intrusion Detection [15]
- Video-based Face Recognition Technology for Automotive Security [19]
- BlockChain: A Distributed Solution to Automotive Security and Privacy [13]
- Towards viable certificate-based authentication for the internet of things. [21]
- An Intrusion Detection System against Black Hole Attacks on the Communication Network of Self-Driving Cars [20]

Weitere Ansätze

Ausnutzen neuer Hardware:

- **Drive PX Pegasus:**
  - 16 NVIDIA Custom Carmel ARM64
  - 2x Volta iGPU (512 CUDA cores)
  - 2x post-Volta dGPUs

Secure Microcontrollers

- **ST33GXXX Microcontroller Family:**
  - ARM SC300 32-Bit RISC
  - Hardware security-enhanced DES and AES accelerators
  - Memory protection unit (MPU)
  - Monitoring of environmental parameters
  - 16- and 32-bit CRC calculation
  - True random number generator
  - NESCRYPT coprocessor for public key cryptography algorithm

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